



**TW1m**  
Instruction Manual

PS11730AENAG01  
11/2023

**AIRBUS**

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The use and operation of this device is subject to permission: for details contact your local frequency authority.



Includes RSA BSAFE cryptographic or security protocol software from RSA Security.

# Contents

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<b>1. INTRODUCTION</b>	<b>4</b>
General	4
Company policy	4
Typographic conventions	4
<b>2. IMPORTANT SAFETY INFORMATION</b>	<b>5</b>
Operating environment	5
Medical devices	5
Active implanted medical devices (AIMD)	5
Hearing aids	5
Vehicles	5
Aircrafts	5
Potentially explosive environments	6
Care and maintenance	6
<b>3. DEVICE OVERVIEW</b>	<b>7</b>
Feature summary	7
Device structure	7
<b>4. TECHNICAL DATA</b>	<b>8</b>
Interfaces	8
Device layout	9
Operating modes	11
Data mode	11
Parametering mode	11
RF interface	11
Audio	11
<b>5. INTERFACES</b>	<b>12</b>
Power Connector	12
System Connector 1	13
System Connector 2	14
RS-232 Connector	15
U.FL connectors	16
SIM card holder	16
<b>6. TOOLS AND ACCESSORIES</b>	<b>17</b>
<b>7. INSTALLATION</b>	<b>18</b>
Safety warnings and cautions	18
Environmental conditions	19
Tools and installation materials	19
Cable types, making of cables	19
Installation procedure	19
Powering up considerations	20
Connecting the power supply	20
Special considerations for vehicles, vessels and so on	20
Lightning protection	21
Grounding	21
<b>8. PROGRAMMING</b>	<b>22</b>
PC Software	22
Programming cable	22
Configuring TW1m	22
Updating TW1m	26
<b>9. FEATURE GUIDE</b>	<b>27</b>
AT commands	27
<b>10. GLOSSARY</b>	<b>28</b>

## 1. INTRODUCTION

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### ■ General

This document describes the TW1m TETRA Voice and Data Modem, including the key technical data, hardware, installation, and features of the device.

The TW1m modem described in this manual is approved for use in the TETRA network. Contact your service provider for more information about networks.

When using the features in the TW1m modem, obey all laws and respect the privacy and legitimate rights of others.



#### **Note:**

GPS was replaced with GNSS in deliveries in 04/2023.

### Company policy

Our policy is one of continuous development; details of all technical modifications will be included with service bulletins. While every endeavour has been made to ensure the accuracy of this document, some errors may exist. If any errors are found by the reader, Airbus Defence and Space Oy should be notified in writing.

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### ■ Typographic conventions

Notes (including cautions, tips, warnings and general notes) call your attention to information.

The following symbols are used in the notes:



#### **WARNING:**

Warnings alert to dangers which may cause loss of life, physical injury or ill health in any form.



#### **CAUTION:**

Cautions indicate possible damage to equipment or a possibility of loss of data.



#### **Note:**

Notes indicate additional information such as recommendations or tips.

1.

Task sequence symbol. Indicates the start of a procedure.

## 2. IMPORTANT SAFETY INFORMATION

---

### ■ Operating environment

Remember to follow any special regulations in force in any area, and always switch off your radio when its use is prohibited or when it may cause interference or danger. Use the radio only in its normal operating positions.

To maintain compliance with radio frequency exposure guidelines, only use enhancements approved by Airbus Defence and Space for use with this radio.

Using two TETRA devices in close proximity (in the same vehicle, for example) may cause them to interfere with each other. If you experience such interference, separate the two devices until the interference stops.

### ■ Medical devices

Operation of any radio transmitting equipment may interfere with the functionality of inadequately protected medical devices. Consult a physician or the manufacturer of the medical device to determine if they are adequately shielded from external RF energy or if you have any questions.

Switch off your radio in health care facilities or near medical devices when any regulations posted in these areas instruct you to do so. Hospitals or health care facilities may be using equipment that could be sensitive to external RF energy.

#### Active implanted medical devices (AIMD)

To avoid potential interference with persons carrying active implanted medical devices (AIMD), it is important to follow and respect the AIMD manufacturers' safety recommendations.

In general, persons with AIMD should keep the radio at least 20 cm (7.9 in) away from the AIMD device. If you have any reason to suspect that interference is taking place, switch off your radio immediately and contact the nearest medical service supporting the interference AIMD.

#### Hearing aids

Some digital wireless terminals may interfere with some hearing aids. If interference occurs, consult your service provider.

### ■ Vehicles

RF signals may affect improperly installed or inadequately shielded electronic systems in motor vehicles. These systems include, for example, electronic fuel injection systems, electronic antiskid (antilock) braking systems, electronic speed control systems, and air bag systems. For more information, check with the vehicle or additional-equipment manufacturer or its representative.

Only qualified personnel should service the radio or install the radio in a vehicle. Faulty installation or service may be dangerous and may invalidate any warranty that may apply to the radio.

Check regularly that all radio equipment in your vehicle is mounted and operating properly.

Do not store or carry flammable liquids, gases, or explosive materials in the same compartment as the radio or its parts and enhancements.

For vehicles equipped with an air bag, remember that air bags inflate with great force. Do not place objects, including installed or portable wireless equipment, in the area over the air bag or in the air bag deployment area. If in-vehicle wireless equipment is improperly installed and the air bag inflates, serious injury could result.

### ■ Aircrafts

Using or installing this radio in an aircraft is prohibited. Switch off your radio before boarding an aircraft. The use of wireless teledevices in an aircraft may be dangerous to the operation of the aircraft or disrupt the wireless telephone network, and may also be illegal.

## IMPORTANT SAFETY INFORMATION

### ■ Potentially explosive environments

Using or installing this radio in an area with a potentially explosive atmosphere is prohibited.

Switch off the radio when in any area with a potentially explosive atmosphere and obey all signs and instructions.

Potentially explosive atmospheres include areas where you would normally be advised to turn off your vehicle engine. Sparks in such areas could cause an explosion or fire resulting in bodily injury or even death.

Switch off the radio near refueling points such as gas pumps at service stations.

Observe restrictions on the use of radio equipment in fuel depots, storage and distribution areas, chemical plants, or where blasting operations are in progress.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include below-deck on boats, chemical transfer or storage facilities, vehicles using liquefied petroleum gas (such as propane or butane), and areas where the air contains chemicals or particles such as grain, dust, or metal powders.

### ■ Care and maintenance

The TW1m modem is a product of superior design and craftsmanship and should be treated with care. The suggestions below will help you fulfil any warranty obligations and enjoy this product for many years.

- Keep the TW1m modem and all its parts and accessories out of reach of small children.
- Keep the TW1m modem dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the TW1m modem in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the TW1m modem in hot areas. High temperatures can shorten the life of electronic devices, damage batteries and warp or melt certain plastics.
- Do not store the TW1m modem in cold areas. When it warms up (to its normal temperature), moisture can form inside, which may damage electronic circuit boards.
- Do not drop, knock or shake the TW1m modem. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the TW1m modem. Use only detergents meant for electronic devices and printed circuit boards.
- Do not paint the TW1m modem. Paint can clog the moving parts and prevent proper operation.
- Use only the accessory antennas or other approved antennas. Unauthorised antennas, modifications or attachments could damage the phone and may violate regulations governing radio devices.

All of the above suggestions apply equally to the product, charger or any accessory.

### 3. DEVICE OVERVIEW

The TW1m modem has the following specific characteristics:

- Compact size
- Voice and data capability
- Integrator friendly - simple to connect interfaces using commercial connectors
- RF performance with power class 3L
- Location service GNSS
- Programming interface

The TW1m modem is designed to be a TETRA modem solution that is compact in size yet provides a full TETRA feature set required by typical data and voice applications. It has been made integrator- and service friendly with commercial off-the-shelf connectors and a standard programming interface.

The TW1m modem is used as a TETRA radio, which allows applications to send and receive SDS messages as well as use IP data services via a PEI-based serial interface. It can also transmit TETRA voice communication.

The device is available with the following features:

- Diplexer for GNSS support
- SIM card reader (E2EE / BSI)
- USB or RS-232C data interface



**Note:** TW1m's USB interface is working as a USB device. It means that the application USB entity should work as the USB host.

Note that the integrator must develop their own adapter to fit for mechanics and IP class.

#### ■ Feature summary

The current feature combinations are listed below.

FEATURE	OPTIONS
Adapter	• AB1: RS-232/USB data, Audio, GNSS, SIM card reader, Smart interface license included
TH1n radio board	• RC-47: 380-400MHz, 406-430MHz

**Table 1** Current feature summary



**Note:**

Activating the Tx power class and DMO repeater license at the factory is optional. By default, the customer can activate the feature using Taqto. The smart interface is activated at the factory in the case of the AB1 adapters by default.

#### ■ Device structure

The TW1m modem consists of an adapter board, MAB-1, and the Airbus TH1n TETRA radio's radio board. Both the TH1n board and the software are the same as used in the TH1n radio. Note that the software license of the smart accessory, which enables the simultaneous use of voice and data, must be activated because the TH1n board detects the adapter as a smart device. This is preconfigured at the factory for new orders; otherwise it can be configured in the Taqto tools as a maintenance activity.

MAB-1 is an adapter board that routes the RF-, audio- and digital I/O interfaces from the TH1n main PCB to the external ports for modem use.

MAB-1 is specified to be connected to the following TH1n types: RC-36 (HWID 07xx only) and RC-47 main PCB's.

MAB-1 must be integrated into an enclosure for environmental protection. Interfaces are provided as commercial connectors and external cabling must be customized by the user.

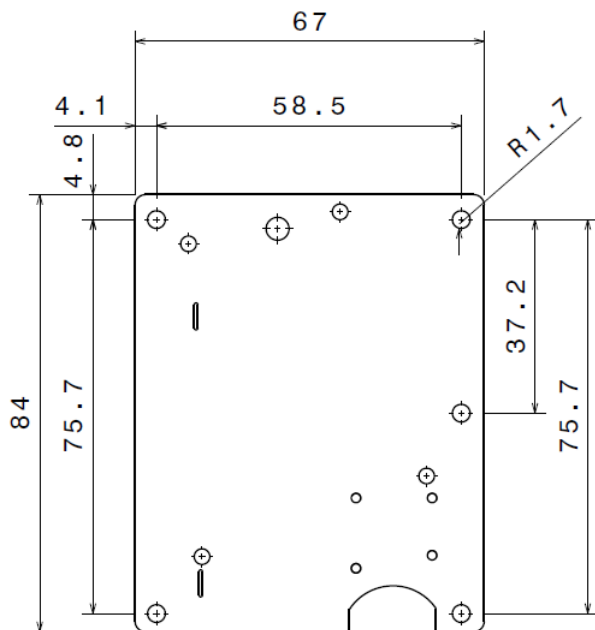
## 4. TECHNICAL DATA

The technical specifications of the TW1m modem are listed in Table 2.

<b>FREQUENCY:</b>	Band 3 : TX 380-390 MHz, RX 390-400 MHz Band 4: TX 410-420 MHz, RX 420-430 MHz
<b>RF OUTPUT POWER</b>	EN 300392-2 compliant, power class 3L (1.8W)
<b>DIMENSIONS (W X H X D) MM</b>	84 mm x 64 mm x 24,7 mm
<b>WEIGHT</b>	66 g
<b>POWER SUPPLY REQUIREMENTS</b>	+Regulated 3.9V +/- 0.2V DC / max 2.5A
<b>GNSS ANTENNA POWER SUPPLY</b>	Feed for the active GNSS antenna: 35mA (max) / + 3.9V DC
<b>POWER CONSUMPTION</b>	<b>Note</b> that all figures are subject to change. TETRA Call: 8 W (maximum TX slot consumption in 50Ω antenna load.) GNSS: 180 mW (typical average, in addition to other power consumption when on) and 280mW maximum peak consumption
<b>OPERATING TEMPERATURE</b>	-20 to +55°C

**Table 2** Technical data

The mounting of the screw positions is shown in Figure 1.



Front view

**Figure 1** Mounting of screw positions

### ■ Interfaces

The TW1m modem uses commercial connectors (Molex) available from electronic connector resellers. Molex cable kits are available to simplify the setup. The integrating requires that the cables are tailored to the optimum length. Airbus does not provide the tailored cables.

The RF antennas should be installed a minimum of 50cm from the TW1m boards to avoid TETRA interferences.



**Note:**

Simultaneous use of AT commands and IP data is not supported.

The PCB connector has a 3-wire serial port with 2.78 V voltage levels for data communication. The RS-232 voltage levels and HW flow control are provided with accessories.



The TW1m modem features a GNSS receiver for positioning applications. An external active GNSS antenna is required for the receiver. Do not use a passive GNSS antenna!

The TW1m modem does not have an integrated TETRA antenna. Therefore, a connector for an external antenna is provided. A combined TETRA/GNSS antenna can also be used.

Audio and the majority of the control signals are routed straight from the system connectors to the TH1n side connector flex.

These may be connected to external devices in all cases regardless of the MAB-1 operation mode. Operations on these signals are determined by TH1n.

Data signals are routed to the RS-232 transceiver by default. Connecting the USB\_VBUS voltage of 5V routes these signals via USB. These ports may not be used simultaneously.

For data signals, the MAB-1 operation may be split into three operating modes. These are described in chapter *Operating modes*.

■ Device layout

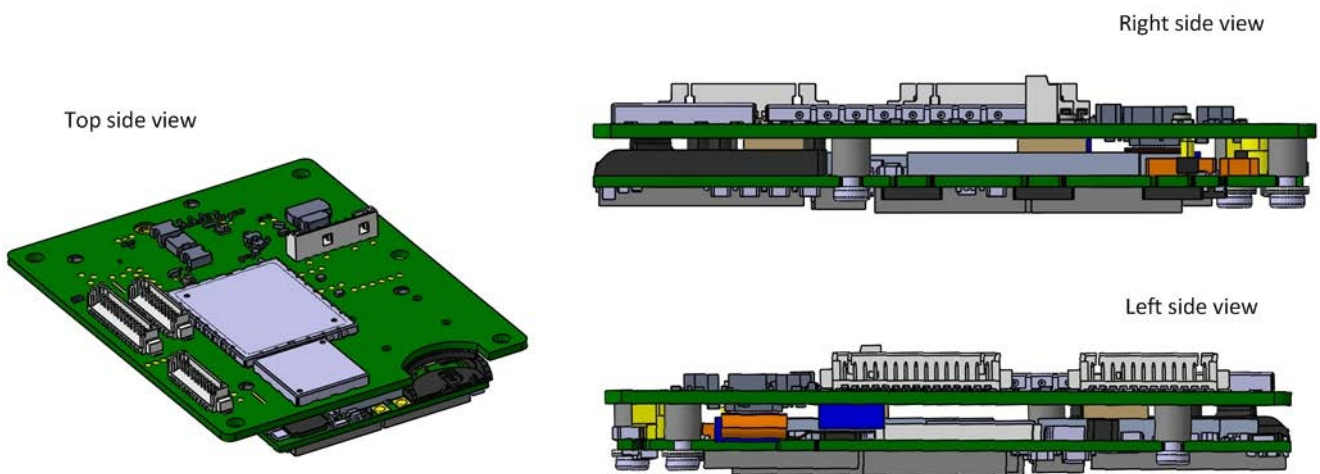


Figure 2 TW1m modem

# TECHNICAL DATA

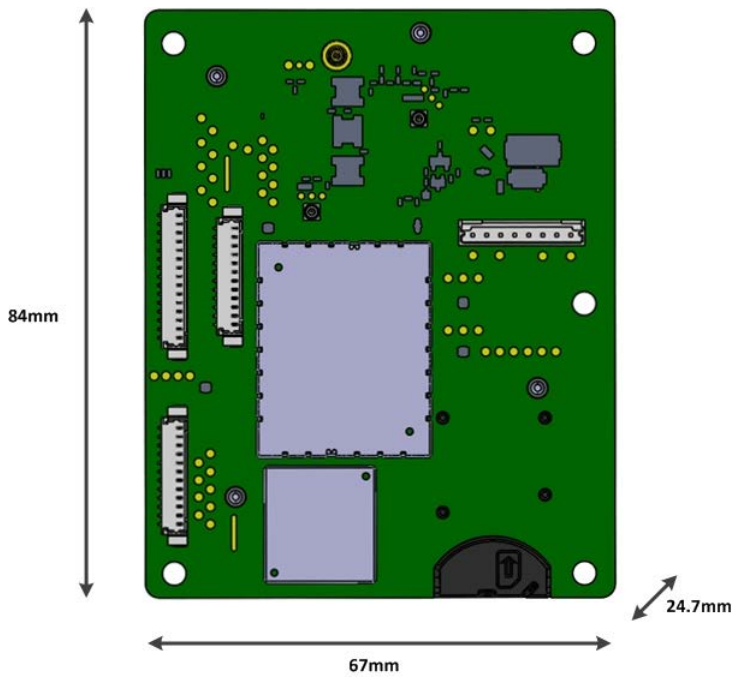


Figure 3 TW1m modem's top side view

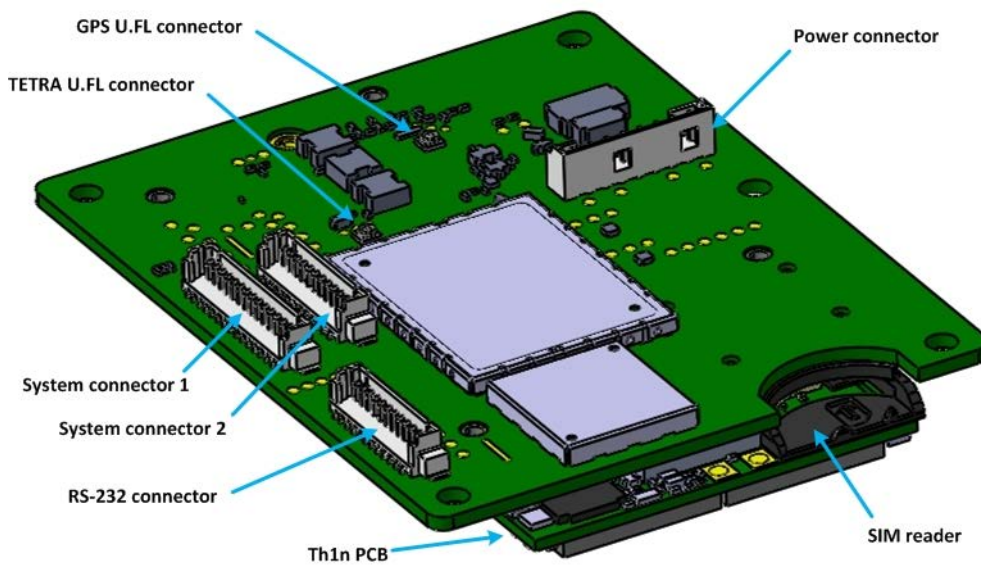


Figure 4 Overview of the TW1m modem's connectors

OPT_SEL2	DTR	MODE
0	X	Data mode
1	0	FBUS parametering
1	1	MBUS prametering

Table 3 Operation mode truth table (X = Any value)

■ **Operating modes**

**Data mode**

In the data mode, the device may be controlled with AT commands from the terminal software and transfer data packets as with DLR-8U Data Cable. AT tiny MCU handles conversion from MBUS to UART handshake signals for flow control.

The USB or RS-232 interfaces are used for communication to MAB-1. RS-232 is used as default and MAB-1 enables USB connection when USB\_VBUS voltage of 5V is detected. USB and RS-232 cannot be used simultaneously.

The data mode is toggled by pulling the OPT\_SEL2 I/O signal to low. After 6 seconds the data mode is ready to use.

**Parametering mode**

In the parametering mode, the device communicates with the Taqto TETRA programming tool using MBUS or FBUS signals. Taqto selects the data bus by using the DTR handshake signal.

The USB or RS-232 interfaces are used for communication to MAB-1. RS-232 is used as default and MAB-1 enables USB connection when USB\_VBUS voltage of 5V is detected. USB and RS-232 cannot be used simultaneously.

The parametering mode is the default mode that is enabled when the OPT\_SEL2 signal is left floating.

■ **RF interface**

The MAB-1 RF path is connected to the TH1n antenna springs. The TETRA- and GNSS antenna paths are separated by a diplexer.

An assembly option without diplexer is possible when only the TETRA functionality is desired.

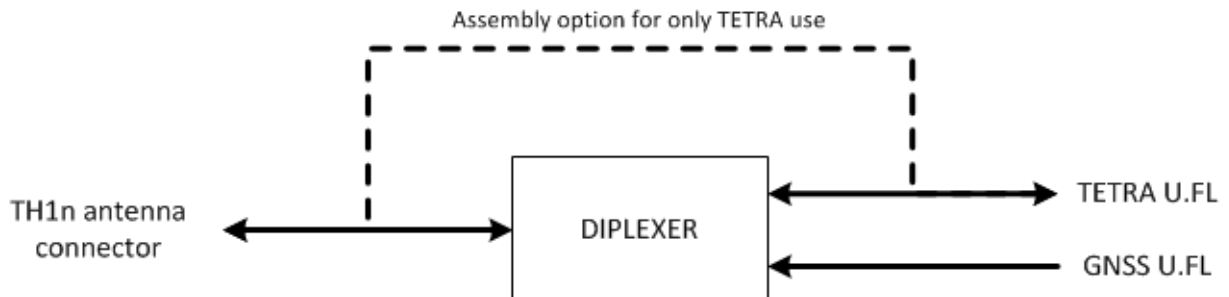


Figure 5 RF interface

■ **Audio**

Microphone and speaker signals are routed directly from the TH1n side connector to System Connector 1.

5. INTERFACES

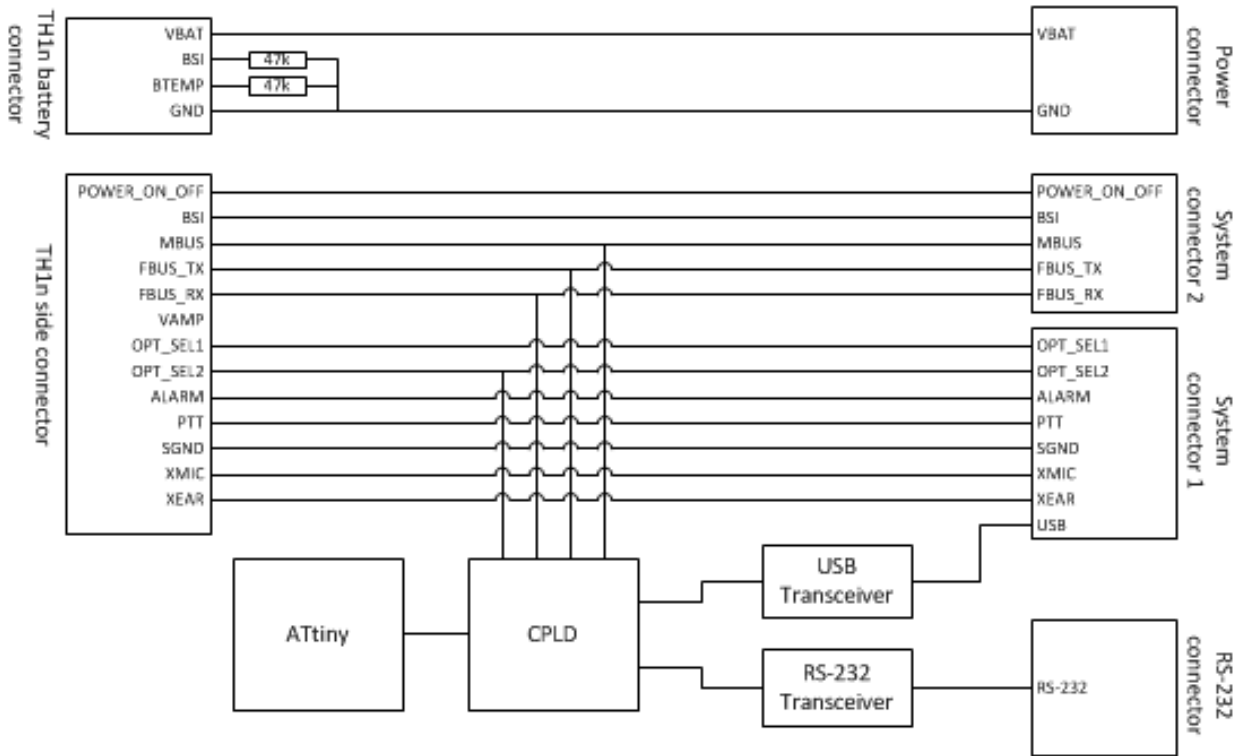


Figure 6 MAB-1 Adapter board block diagram

■ Power Connector

A regulated VBAT supply voltage is fed to the power connector X105. The Power Connector’s pinout is shown in Table 4.

The connector type is JST B8B-PH-SM4-TB(LF)(SN) and the mating connector is JST PHR-8.

**JST: B8B-PH-SM4-TB(LF)(SN),CONN B8B-PH 1x8 2MM 2A SMT**

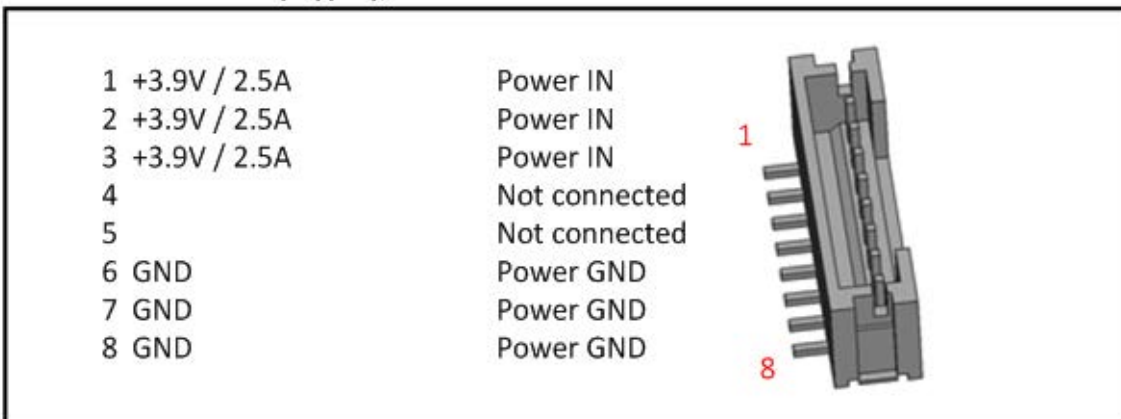


Figure 7 Power connector

PIN	SIGNAL	IN/OUT	LEVEL	CURRENT	NOTES
1	VBAT	IN	3.7 V - 4.1V DC	2.5A	Total current between pins 1-3
2	VBAT	IN	3.7 V - 4.1V DC		
3	VBAT	IN	3.7 V - 4.1V DC		
4	n.c. *)				
5	n.c. *)				
6	GND	IN	0V	2.5A	Total current between pins 6-8
7	GND	IN	0V		
8	GND	IN	0V		
*) not connected					

**Table 4 Power Connector’s pinout**

**■ System Connector 1**

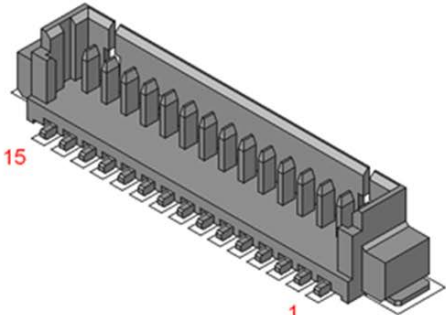
System Connector 1 is used for data/audio user applications.

The connector type is Molex Picoblade 53398-1571 and the mating connector is Molex 51021-1500.

**System Connector 1**

**MOLEX 53398-1571**

15	GND	Ground for XEAR
14	XEAR	Audio interface
13	XMIC	Audio interface
12	SGND	Audio interface
11	PTT	Audio interface
10	ALARM	Audio interface
9	GND	Ground
8	OPTSEL 1	Smart accessory ID
7	OPTSEL 2	Smart accessory ID
6	GND	Ground
5	USB VBUS	Data interface /USB connector
4	USB GND	Data interface /USB connector
3	USB DM	Data interface /USB connector
2	USB DP	Data interface /USB connector
1	USB GND	USB ground



**Figure 8 System connector 1**

PIN	SIGNAL	IN/OUT	LOW LEVEL	HIGH LEVEL	CURRENT	NOTES
1	USB_GND	IN				
2	USB_DP	IN/OUT	0 - 0.3V	2.8 - 3.6V	10mA	
3	USB_DM	IN/OUT	0 - 0.3V	2.8 - 3.6V	10mA	
4	USB_GND	IN				
5	USB_VBUS	IN	0 - 0.8V	5.0V ±5%	500mA	
6	GND					
7	OPT_SEL2	IN	0 - 0.54V	1.26 - 1.8V	10mA	Data/Parametering toggle (Internal pull-up)
8	OPT_SEL1	IN	0 - 0.54V	1.26 - 1.8V	10mA	(Internal pull-up)
9	GND					
10	ALARM	IN	0 - 0.54V	1.26 - 1.8V	10mA	(Internal pull-up)
11	PTT	IN	0 - 0.54V	1.26 - 1.8V	10mA	(Internal pull-up)
12	SGND	IN	0V	2.78V	40mA	MIC- / Accessory supply
13	XMIC	IN	0V	2.78V		MIC+

## INTERFACES

14	XEAR	OUT	0V	2.1V <sub>P-P</sub>		SPK+
15	GND					SPK-

**Table 5 System Connector 1's pinout**

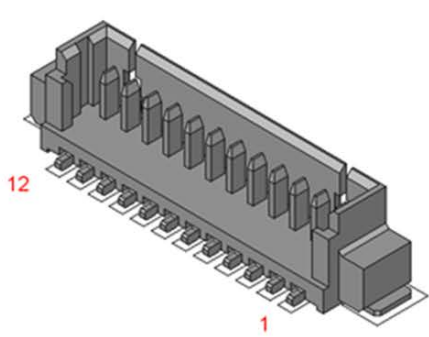
### ■ System Connector 2

System Connector 2 is used for power on/off and as a service interface for parametering and updating the terminal SW.

The PIN header for connections to parametering cable (e.g. CA-119) and flash box interface.

The connector type is Molex Picoblade 53398-1271 and the mating connector is Molex 51021-1200.

System Connector 2		MOLEX 53398-1271	
12	GND	Ground	
11	BSI	Parametering / flashing	
10	MBUS	Parametering / flashing	
9	FBUS_TX	Parametering / flashing	
8	FBUS_RX	Parametering / flashing	
7	-	not connected	
6	GND	Ground	
5	-	not in use	
4	PWR_ON_OFF	Radio ON/OFF	
3	GND	Ground	
2	-	not connected	
1	-	not connected	



**Figure 9 System Connector 2**

PIN	SIGNAL	IN/OUT	LOW LEVEL	HIGH LEVEL	CURRENT	NOTES
1	n.c. *)					
2	n.c. *)					
3	GND					
4	POWER_ON_OFF	IN	0 - 1.3V	3.0 - VBAT	10mA	Power button (Internal pull-up)
5	Reserved					Reserved for R&D use. Do not connect.
6	GND					
7	n.c. *)					
8	FBUS_RX	IN	0 - 0.83V	1.95 - 2.78V	10mA	
9	FBUS_TX	OUT	0 - 0.83V	1.95 - 2.78V	10mA	
10	MBUS	IN/OUT	0 - 0.83V	1.95 - 3.0V	10mA	
11	BSI	IN	0	2.70V	10mA	10-bit ADC input
12	GND					

\*) not connected

**Table 6 System Connector 2's pinout**

■ **RS-232 Connector**

The RS-232 Connector X103 signals are described in Table 7.

The connector type is Molex Picoblade 53398-1271 and the mating connector is Molex 51021-1200.

System Connector 3		MOLEX 53398-1271	
12	GND	Ground	Ground
11	GND	Ground	Ground
10	GND	Ground	Ground
9	RI	Ring Indicator	Ring Indicator
8	CTS	Clear To Send	Clear To Send
7	RTS	Request To Send	Request To Send
6	DSR	Data Set Ready	Data Set Ready
5	GND	Ground	Ground
4	DTR	Data Terminal Ready	Data Terminal Ready
3	TXD	Data TX	Data TX
2	RXD	Data RX	Data RX
1	DCD	Data Carrier Detect	Data Carrier Detect

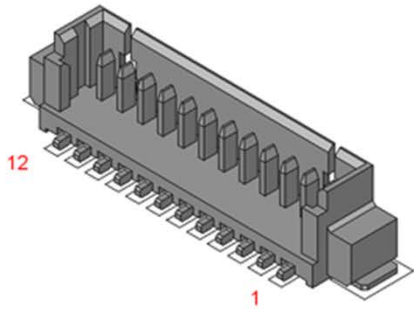


Figure 10 RS-232 connector

PIN	SIGNAL	IN/OUT	MAX LEVEL	CURRENT	NOTES
1	DCD	OUT	± 5.4V	10mA	
2	RXD	OUT	± 5.4V	10mA	
3	TXD	IN	± 25V	10mA	
4	DTR	IN	± 25V	10mA	
5	GND				
6	DSR	OUT	± 5.4V	10mA	
7	RTS	IN	± 25V	10mA	
8	CTS	OUT	± 5.4V	10mA	
9	RI	OUT	± 5.4V	10mA	
10	GND				
11	GND				
12	GND				

Table 7 RS-232 Connector's pinout

## INTERFACES

### ■ U.FL connectors

The TETRA- and GNSS antenna connectors are standard U.FL connectors.

TETRA & GPS connector

Hirose U.FL connector CL331-0471-0-01

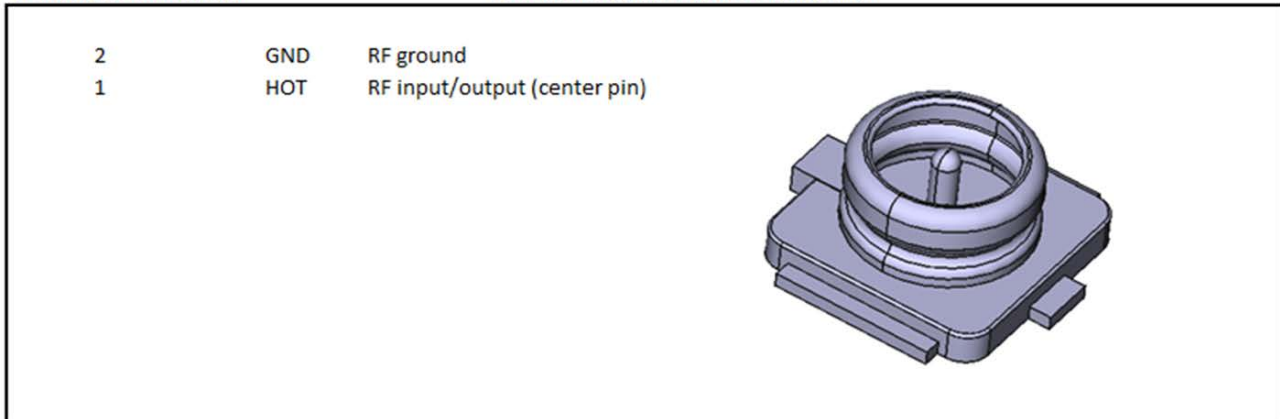


Figure 11 U.FL connectors

### ■ SIM card holder

The SIM card holder is a plastic guide to support the SIM card on the TH1n SIM connector.



## 6. TOOLS AND ACCESSORIES

---

The accessories and connectors are not provided by Airbus. The connectors are globally commercially available connectors which enable using optimized cables at a reasonable cost. The overall device cabling is typically specific made to fit for purpose by the integrator.

## 7. INSTALLATION

---

### ■ Safety warnings and cautions



#### **WARNINGS:**

1. If the device is installed in a vehicle, care must be taken on installation in vehicles fitted with electronic engine management systems and anti-lock braking systems. Under certain fault conditions, emitted RF energy may affect to operation of these systems. If necessary, consult the vehicle dealer/manufacturer to determine the immunity of vehicle electronic systems to RF energy.
2. The radio must not be operated in areas likely to contain potentially explosive atmospheres, for example petrol stations (service stations), blasting areas etc.
3. Operation of any transmitting radio equipment may interfere with the functionality of inadequately protected medical devices. Consult a physician or the manufacturer of the medical device if you have any questions. Other electronic equipment may also be subject to interference.



#### **CAUTIONS:**

1. Servicing and alignment must be undertaken by qualified personnel only.
2. Ensure that all work is carried out at an anti-static workstation and that an anti-static wrist strap is worn.
3. Ensure that solder, wire or foreign matter do not enter in to mechanics of the radio, as damage may result.
4. Use only approved components as specified in the parts list.
5. Ensure all components, modems screws and insulators are correctly re-fitted after servicing and alignment. Ensure all cables and wires are repositioned correctly.
6. It is recommended that the radio is powered down before disconnecting or switching off the radio's battery or other input power supply. This method ensures the integrity of the file system. Make sure that the power is really switched off (the powering down takes about 3 seconds after which the Power On LED goes off).

### **ESD protection**



Airbus Defence and Space requires that the TW1m modem's service points have sufficient ESD protection against static electricity when servicing the product. Any product which has its covers removed must be handled with ESD protection. To replace the covers, ESD protection must be applied. All electronic parts of the product are susceptible to ESD.

All ESD-sensitive parts must be packed in metallized protective bags during shipping and handling outside any ESD Protected Area (EPA).

Every repair action involving opening the product or handling the product components must be done under ESD protection.

ESD-protected spare part packages **MUST NOT** be opened/closed outside of an ESD Protected Area.

For more information and local requirements about ESD protection and ESD Protected Area, contact your local Airbus Defence and Space After Market Services representative.

**■ Environmental conditions**

The TW1m modem can be installed in an environment meeting the specifications shown in Table 8.

PARAMETER	RANGE
Operating temperature	-20...+55°C
Humidity	Up to 95%, non-condensing
Vibrations and shocks	According to ETSI EN 300 019-2-5 V3.0.0 (5M3), installations only inside vehicles. According to ETSI EN 300 019-2-6 V2.1.2 (6M3)
IP Classification	Not applicable
EMC & SAR	EMC approved according to EU regulations. SAR is not evaluated as the device is not a handheld device.

**Table 8 TW1m modem’s environmental conditions**



**WARNING:**

Do not install the TW1m modem in a dusty environment. If the modem and the heat sink are dusty, they can overheat.

**■ Tools and installation materials**

The TW1m modem is to be mounted on mechanics using ø (M3) screws suitable for a printed circuit board. The recommended torque is 80 - 100 Ncm. The screw type depends on the material (metal/wood/plastic). For the detailed dimensions of the TW1m modem, see chapter 4.

**Cable types, making of cables**

Depending on your application and its environmental conditions, you should consider the requirements relevant to your cables, for example:

- Direct exposure to sunlight
- Common chemicals such as:
  - alcohol
  - isopropanol
  - petrol
  - sun lotion and hand creams
  - insecticides.

All the cables and other materials must be selected so that they tolerate the conditions in your application and its environment.



**WARNING:**

When cutting and joining cables, take care not to drop pieces of cables and thin copper wires on the TW1m modem, because they can cause short-circuits in the modem.

**■ Installation procedure**

It is recommended that the radio’s parameter and network configuration is done before its installation.

1. Check and clean the surface the TW1m modem is to be installed on. Also make sure that the mechanics is suitable for the TW1m modem. If you are uncertain what the installation procedure is or if the mechanics selected can be used with the TW1m modem, consult the retail dealer.
  - The components on the TW1m board are not mechanically protected. Therefore, ensure that the board does not come into contact with any external equipment, cables or surfaces when mounted to avoid damaging the TW1m modem or causing short circuits.
  - Always ensure that there is sufficient space around the heat sink for ventilation, and that the enclosure, if any, is sufficiently cooled and/or ventilated. In certain conditions and usage forced air-cooling may be necessary.

## INSTALLATION

2. Check that you have the tools and mounting screws that are suitable for the material the TW1m modem is to be installed on, and the accessories needed for the installation and operation of the TW1m modem.
3. Remove the TW1m modem from the package and dispose the packing materials according to the local instructions.



### **WARNING:**

Keep in mind that the TW1m modem is ESD sensitive.

4. Place the TW1m modem on the mechanics as recommended. Also ensure that all the mounting holes of the printed circuit board are on the same level. This reduces mechanical stress of components and connectors on the board, and guarantees a longer product lifetime. Never mount the board in a manner that the mounting arrangement causes twisting or bending to it.
5. Fasten the TW1m modem using mounting screws and procedures suitable for the surface material. Do not tighten the screws too much.
6. If the optional GNSS antenna is going to be used, connect it.
7. Connect the TETRA antenna.
8. Connect the serial/AT cable.
9. Ensure that all the cables which are connected to the TW1m modem are fastened in a manner that does not cause bending, twisting, pushing, pulling, or vibrating in the connectors of the TW1m modem.
10. Connect the power cable.

## ■ Powering up considerations

### Connecting the power supply

The prerequisites to power up the TW1m modem are the following:

1. Connect the TW1m to a main DC supply (3.9V) in the power connector before you power it up.
2. Power up the board by pulling down the **System Connector 2**'s Pin4 PWR\_ON\_OFF to GND at least for 3 seconds.

Pin4 can also be permanently left to GND (that is, automatic start-up and shut down by power supply).

Note that if you have the automatic start-up function in use, the rise time between 2.0Vdc to 3.9Vdc must be less than 15ms.



**Note:** The PWR\_ON\_OFF signal must be released during the programming operation in Taqto. The flashing fails if the PWR\_ON\_OFF is pulled low during the flashing.

3. Select the mode and set the PIN code.
  - Pull **System Connector 1**'s Pin7 OPTSEL2 to GND permanently to get the DATA mode selected.
  - Connect to the USB or RS-232C interface.  
USB data is always primary compared to RC-232 when the USB supply voltage 5V is detected by the USB interface.
  - Set the PIN code 1234 by using the AT commands. For example, AT+CPIN="1234"  
The pin code query can be set OFF by using Parameters or AT command.

Now the TW1m modem is started up and running.

### Special considerations for vehicles, vessels and so on

Mount the device and all the cables securely to the installation base to avoid product damage because of shocks and vibrations. Sharp bending of cables, especially RF cables, must be avoided.

The positive voltage must be taken directly from the battery to the 3.9V regulator, unless the mains voltage of the vehicle differs from 12V. This minimizes the risk of disturbances from or to the TW1m modem, as well as guarantees a loss-free power distribution. The grounding cable is connected to the car chassis with a lead as short as possible (NOT directly from the negative pole of the battery).

If the vehicle has a +24 V electrical system (trucks, all-terrain vehicles, etc), an external voltage converter must be used. The converter must be well protected against transients produced by the vehicle's electrical system. It must also be capable of maintaining a stable output during the rapid changes in the load current. Some vehicles have a main switch (for instance the gas trucks) that separates the chassis of the vehicle from the negative lead of the battery. Never pass this switch, that is, the grounding of the reducer must be taken from the body of the vehicle, NOT directly from the battery.

### Lightning protection

Protect the antennas in particular from lightning by using lightning rods, surge arrestors, gas discharge tubes and/or other methods. As the installation and climatic conditions vary, the customer is always responsible for the lightning protection of the final installation.

### ■ Grounding

The TW1m modem has been designed for negative ground systems. If you install the TW1m modem in a system with positive ground, take a special care to ensure that the grounding and supply voltages are correctly connected. All the input and output signal voltages in this document are always referred to the GND pins of the connector.

Always connect the power connector GND first and last. Antenna GND needs to be always galvanically connected to the power GND.

## 8. PROGRAMMING

### ■ PC Software

The parametering is based on the TETRA Terminal management tool Taqto Rel. 2.6 or newer version.

Taqto identifies the product as a TH1n radio, type RC-36 or -47 depending on which modem is used. The modem name is available in the type plate on the radio board.

### ■ Programming cable

The model of the programming cable depends on the TW1m variant:

- AB1 supports USB cable for programming and flashing in the USB device mode.

**System connector 1.** Connection example for using a standard USB cable to TW1m AB1 parameterization is shown in Figure 12.

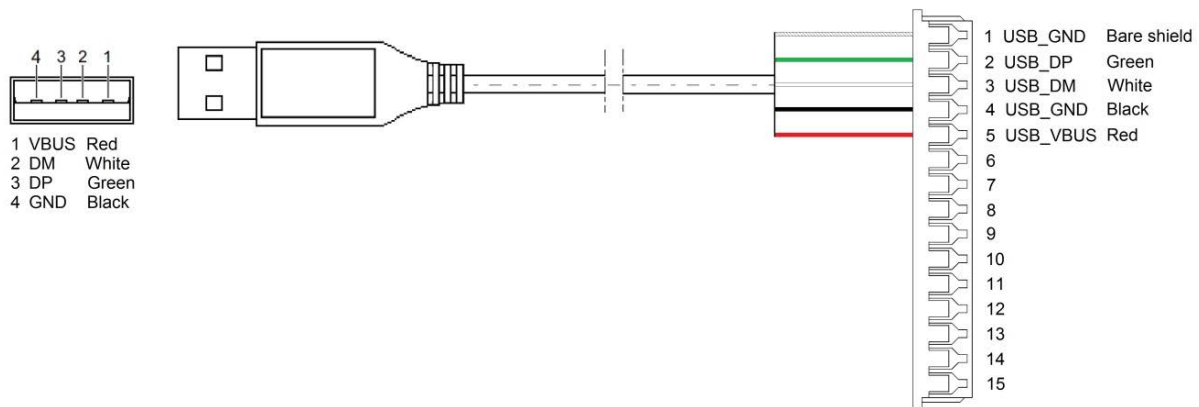


Figure 12 AB1 variant USB Parameterization cable connection



**Note:** The PWR\_ON\_OFF signal must be released during the programming operation in Taqto. The flashing fails if the PWR\_ON\_OFF is pulled low during the flashing.

### ■ Configuring TW1m

In some cases it is possible that Transmit Inhibit is active after the terminal has been programmed by using Taqto. This can be avoided by not using the `NORMAL_NO_SERVICE` mode in the Terminal mode settings.

Note that there is one set of settings that is common for Taqto, and it is possible to override them for each connection.

It is recommended to keep the default values for the common settings (see Figure 13) and then adjust the settings for the connection to which TW1m is configured (see Figure 14 for an example).

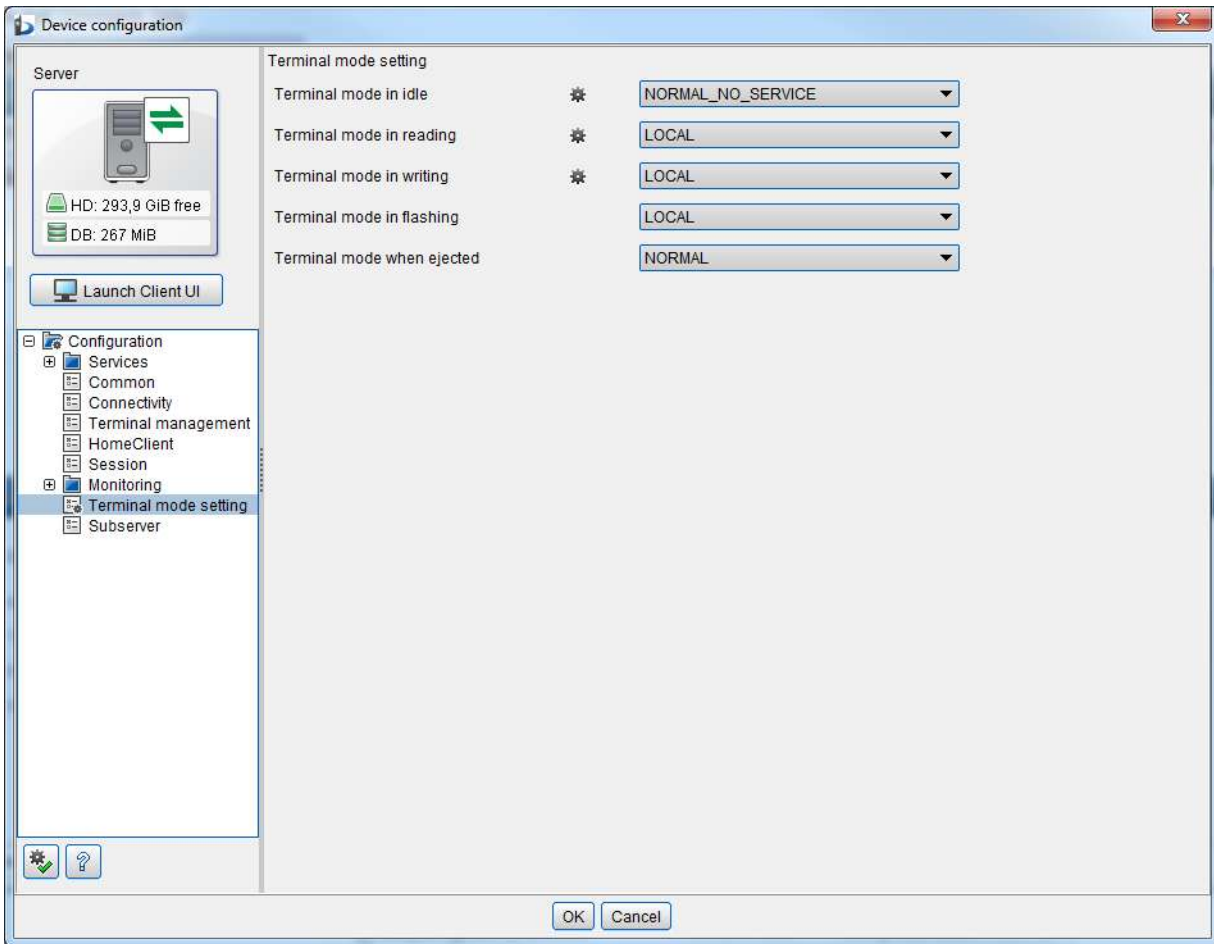


Figure 13 Device configuration: Default values of the common settings

# PROGRAMMING

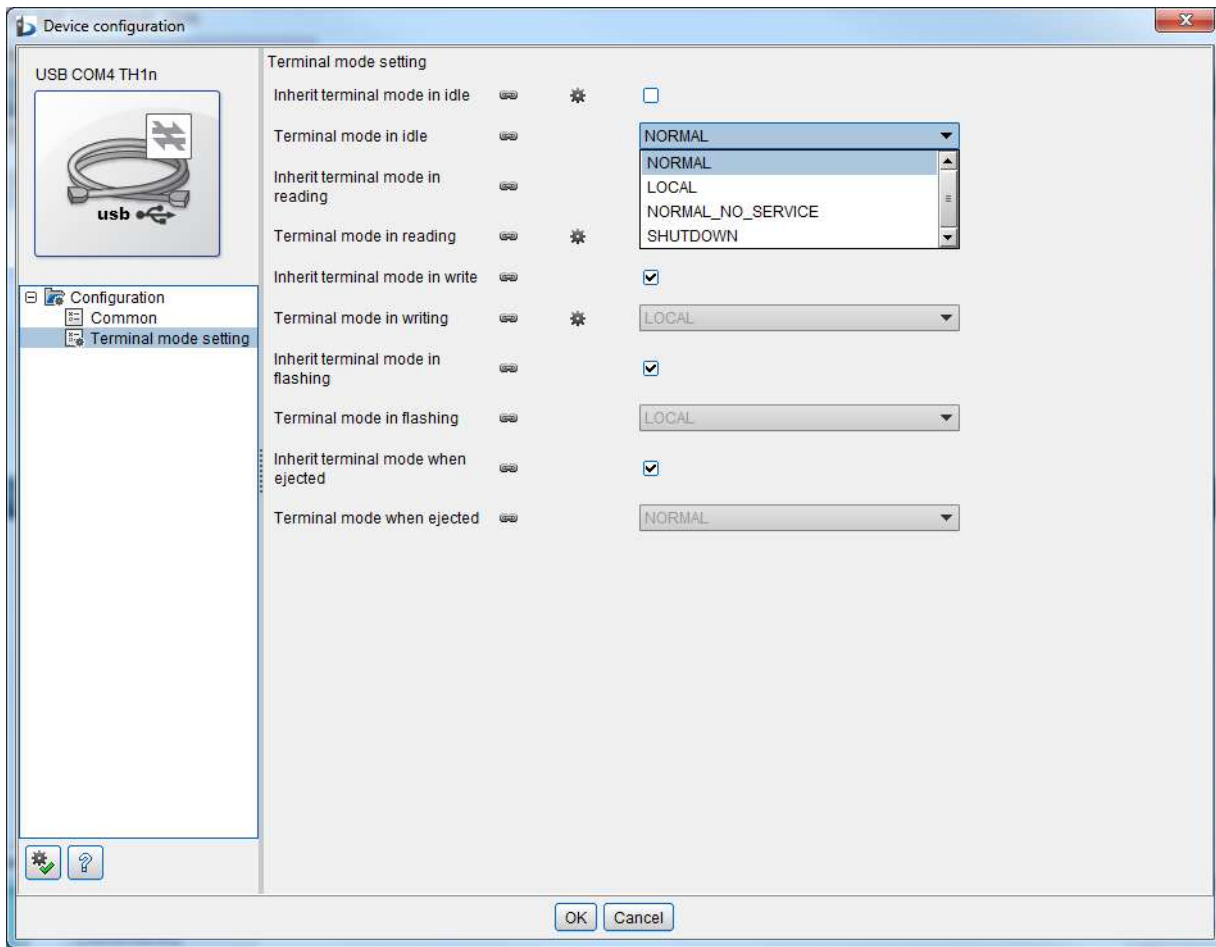


Figure 14 Device configuration: Example of adjusting the connection specific settings



It is recommended that you set the terminal parameter `Accessory Detection` to the value `TW1m` in **User interface settings > Enhancement settings > Accessories**.

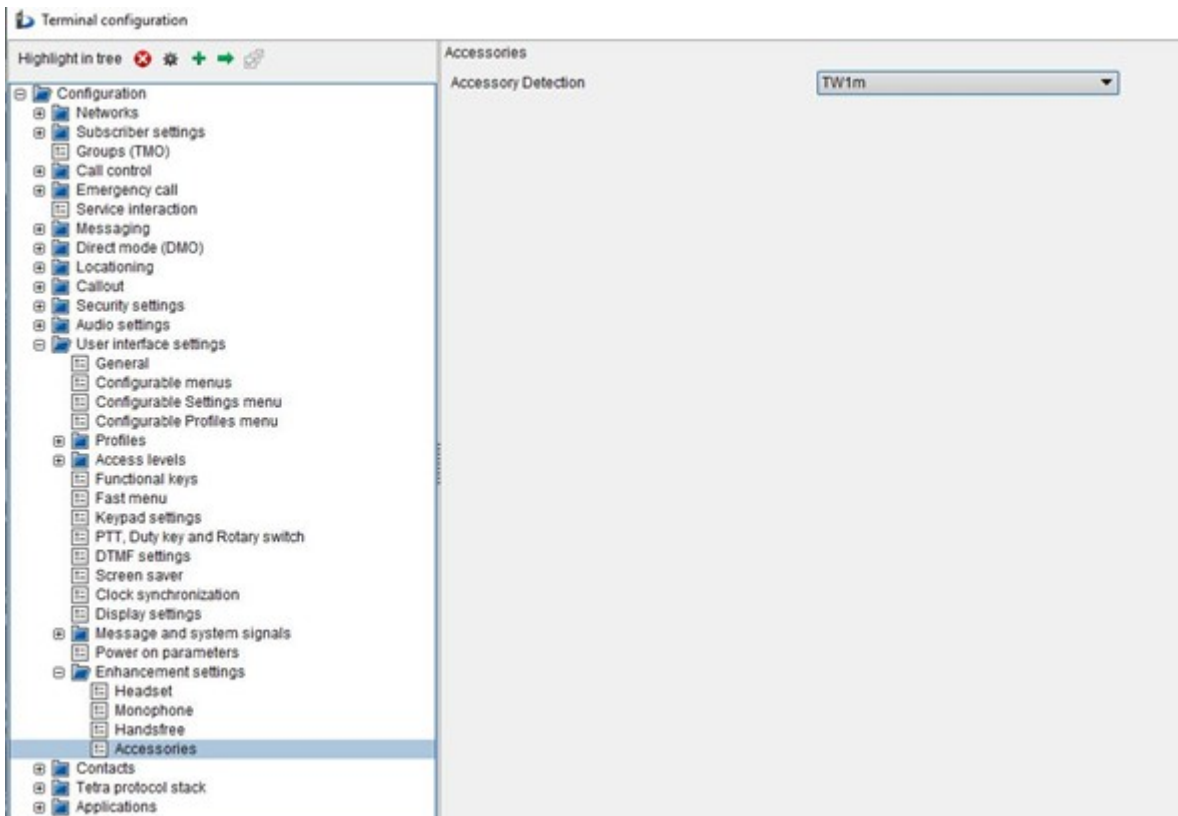


Figure 15 Accessory detection

Activate the smart accessory interface by selecting it in the **Applications > AT commands settings**.

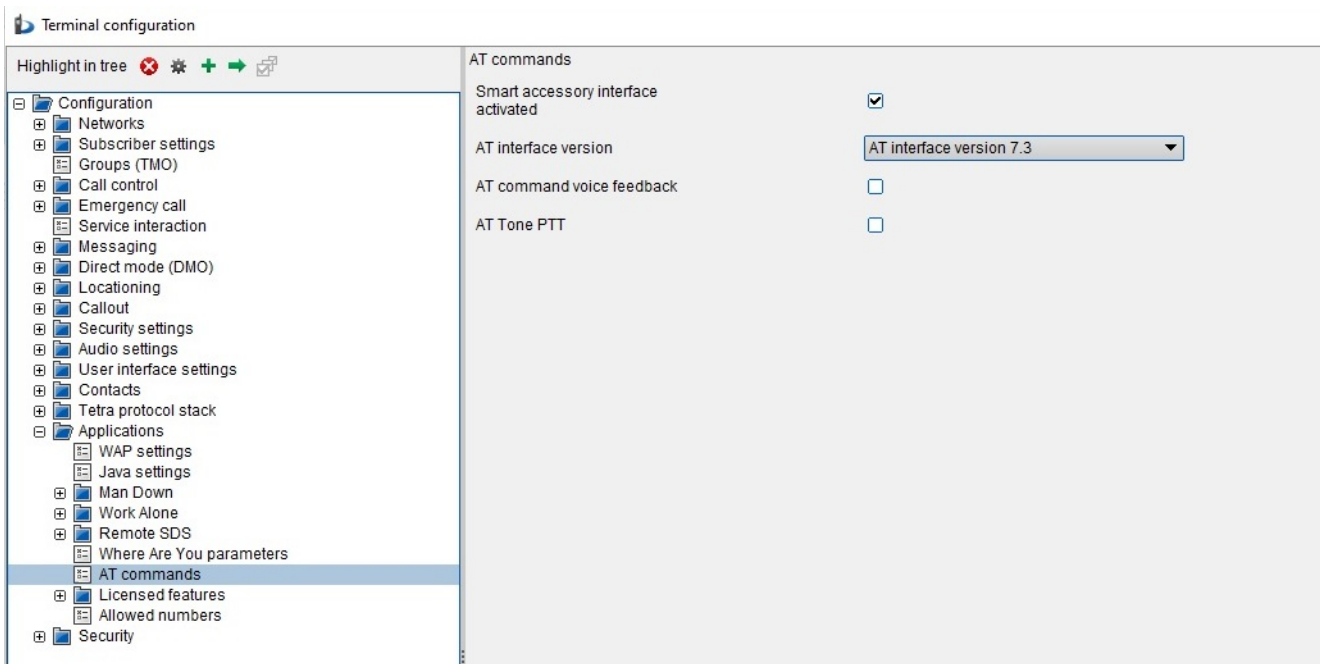


Figure 16 Activating the smart accessory interface

## PROGRAMMING

If the Power class 3L (1.8 W) TX power feature is used, activate the option 1.8 W TX power in **Subscriber settings > RF parameters** in trunked mode (TMO). Select also an appropriate value for the Max TX power level. For direct mode (DMO), define these settings in **Direct Mode (DMO) > Channels: TX power level**.

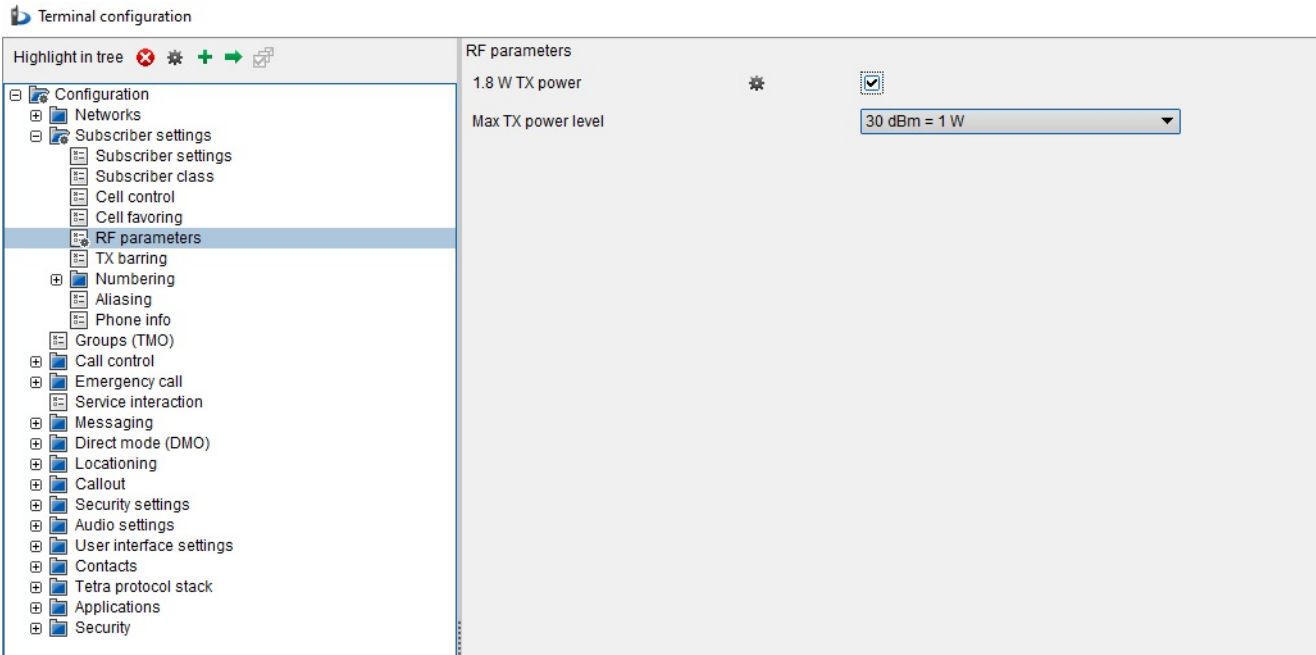


Figure 17 Power class 3L (1.8 W) TX power

### ■ Updating TW1m

When updating TW1m from an earlier release, features that are already enabled, remain enabled. Note, however, that if the SW update is done using the Force flash option in Taqto, the enabled features are not enabled automatically.

## 9. FEATURE GUIDE

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### ■ AT commands

AT commands can be used to manage and control the functionality of the TW1m modem.

For a complete list of the AT commands, refer to the latest version of the document *AT Command set for Airbus DS TETRA products*, which is available in the My Contents and smarTWISP customer portals.

**Note:**

AT passwords cannot contain quotation marks ("...").

**Note:**

The data connection must be disconnected before removing the data cable.

If the data cable is removed before the data connection is disconnected, the connection will stay reserved and new connection attempts will fail.

## GLOSSARY

### 10. GLOSSARY

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This section explains the abbreviations that are used in this document.

TERM	DESCRIPTION
AIMD	Active implanted medical device
AT	Attention command language
DLR-8U	Airbus data cable name and type
DTR	Data terminal ready
EMC	Electromagnetic compatibility
EPA	ESD protected Area
ESD	Electrostatic discharge
ETSI	European Telecommunications Standards Institute
FBUS	Fast bus
FPS	Frames per second
GND	Ground
GNSS	Global Navigation Satellite System
HW	Hardware
I/O	Input/output
LED	Light Emitting Diode
MAB	Module adapter board
MBUS	Meter-bus
MCU	MicroController
Ncm	Newton centimeters
PCB	Printed circuit board
PEI	Peripheral equipment interface
RC	Airbus Terminal ID type
RF	Radio frequency
SAR	Specific absorption rate
SDS	Short data service
SIM	Subscriber identity module
TETRA	Terrestrial trunked radio
TX	Radio transmitter
UART	Universal asynchronous receiver-transmitter
USB	Universal serial bus
USB_VBUS	USB voltage line
VBAT	Voltage battery line



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