TDM880i

Instruction Manual

PS11129BENAC01
06/2017

AIRBUS
DEFENCE & SPACE

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- 2011/65/EC (ROHS).
- 2014/53/EU (Radio Equipment Directive).

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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

1. INTRODUCTION

General

This document describes the TDM880i TETRA Data Module, including the key technical data, hardware, installation, and features of the device.

The radio 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 this radio, obey all laws and respect the privacy and legitimate rights of others.

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.

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 refuelling 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 TDM880i TETRA Data Module 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 radio and all its parts and accessories out of reach of small children.
- Keep the radio dry. Precipitation, humidity and all types of liquids or moisture can contain minerals that will corrode electronic circuits.
- Do not use or store the radio in dusty, dirty areas. Its moving parts can be damaged.
- Do not store the radio in hot areas. High temperatures can shorten the life of electronic devices, damage batteries and warp or melt certain plastics.
- Do not store the radio 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 radio. Rough handling can break internal circuit boards.
- Do not use harsh chemicals, cleaning solvents, or strong detergents to clean the radio.Use only detergents meant for electronic devices and printed circuit boards.
- Do not paint the radio. 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.

Note:

The Global Positioning System

The Global Positioning System (GPS) is operated by the United States government, which is solely responsible for the accuracy and maintenance of the system. The accuracy of location data can be affected by adjustments to GPS satellites made by the United States government and is subject to change with the United States Department of Defense civil GPS policy and the Federal Radionavigation Plan. Accuracy can also be affected by poor satellite geometry.

Availability and quality of GPS signals may be affected by buildings and natural obstacles as well as weather conditions. The GPS receiver should only be used outdoors to allow reception of GPS signals. The GPS should not therefore be used for precise location measurement and you should never rely solely on location data from the GPS receiver.

3. DEVICE OVERVIEW

The TDM880i is used as a data-only radio allowing applications to send/receive SDS messages as well as use IP data services via a PEI-based serial interface.

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 communications. The RS232 voltage levels and HW flow control are provided with accessories.

The TDM880i also provides a set of digital I/O lines that can be configured as inputs or outputs. The outputs can be controlled by SDS messages; the inputs can be used to trigger a status message or location sending to predefined destinations. For the I/O lines, a 15-pin board-to-wire connector is provided.

The radio module features a GPS receiver for positioning applications. An external active GPS antenna is required for the receiver. A passive GPS antenna must not be used.

The radio module does not have an integrated TETRA antenna. Thus, a connector for an external antenna is provided. A combined TETRA/GPS antenna can also be used.

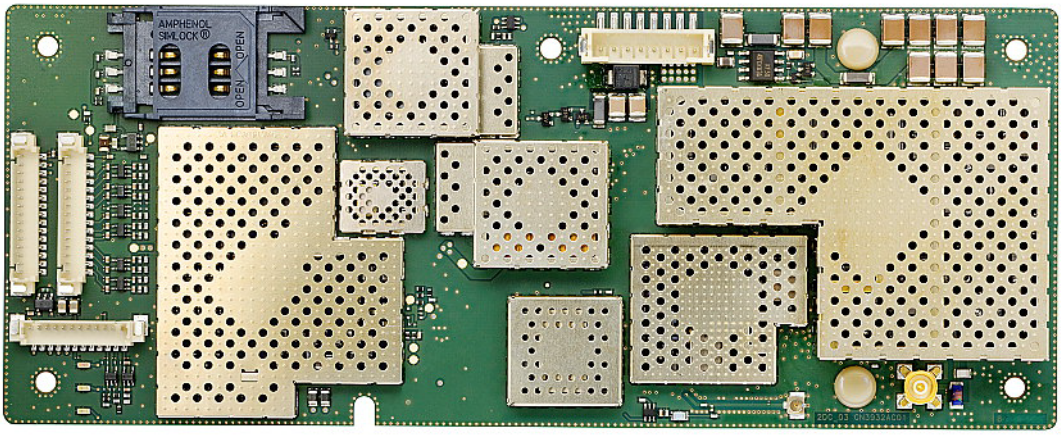

Figure 1 TDM880i radio module

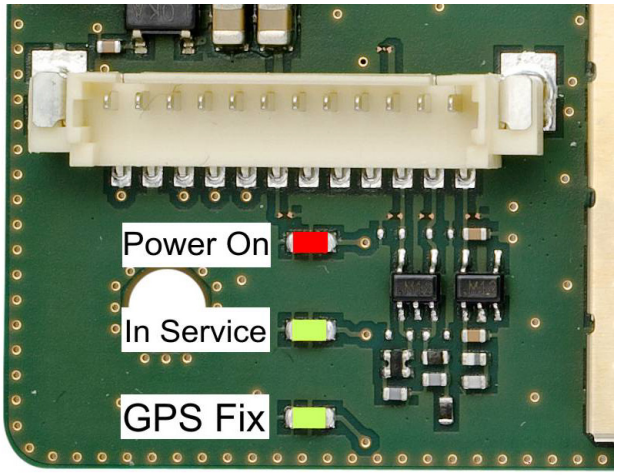

Figure 2 LEDS in TDM880i radio module

The module provides various LED indications for the user (see Figure 2):

- **Power On**: The LED is lit when the power is switched on. Note that this indicates the actual operational status of the module, not the existence of a power supply. Even if the supply power is present, the LED is not lit unless the radio module itself is switched on.
  If the red Power On LED is blinking, the module is in sleep mode. For more information, see Sleep mode on page 17.
- **In Service**: The LED is lit when the radio has successfully registered into the network and the field strength is good enough for communications.
  If the green In Service LED is blinking, the module is searching for the network.
- **GPS Fix**: When the GPS has a fix and is aware of its position, the LED is lit.
  If the green GPS Fix LED is blinking, the module is searching for the GPS fix.

SW upgrades or parametering is done via the I/O connector using cables made for this purpose. For more information, see Section I/O cable on page 13.

■ Accessories

The accessories are not included in the standard sales package. They are available as separate items and priced separately.

External AC Power Supply ACR-1

The external power supply ACR-1 is used to supply +13.6 VDC for the device from AC mains.

The AC power supply has various mains plug options available (UK, US, IEC).

The external AC power supply is intended for indoor use in weather protected dry conditions only. The power supply is CE approved and conforms to EU EMC requirements.

DC Power Cable CA-124

The DC power cable CA-124 has a matching connector for connection to the TDM880i. The other end of the cables are stripped bare wire ends (= no connector). The thickness of wire ends is AWG12 (equals to 4.0 mm²). The cable includes two fuse holders for the ATO fuses. The fuse must be 5 A for 12 V line and 1 A for the IGS line.

Data Cable Adapter CA-125

The data cable adapter must be used together with a DLR-3T for connecting data between the PC and TDM880i. The adapter has a 12-pin matching board-to-wire connector for the TDM880i and a keyed RJ-45 connector for the DLR-3T.

Flashing and Parametering Adapter CA-123

The flashing and parametering adapter must be used together with a DAU-9S. The adapter has a 15-pin matching board-to-wire connector for the TDM880i and a RJ-45 connector for the DAU-9S.

TETRA Antenna Cable CA-126

This antenna cable is an adapter to connect an external TETRA antenna to the TDM880i. The cable has a MMBX matching connector for the TDM880i and for the external antenna a SMA(F).

Select the best suitable good quality antenna for the use case. Airbus offers a selection of antennas, for which you can find more information in the accessory catalogue. Alternatively, consult your local AIRBUS distributor for the antenna selection.

The TDM880i frequency band is 380-400MHz and 410-430MHz. Select an antenna which serves best in the used RF band.

GPS Cable CA-127

This antenna cable is an adapter to connect an external GPS antenna to the TDM880i. The cable has an IPX matching connector for the TDM880i and for the external GPS antenna a SMA(F).

Select the best suitable good quality antenna for the use case. Airbus offers a selection of antennas, for which you can find more information in the accessory catalogue. Alternatively, consult your local AIRBUS distributor for the antenna selection.

PC Software

Parametering is based on the TETRA Terminal management tool TAQTO 2.6 or newer version.

4. 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, modules 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 TDM880i data radio'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 TDM880i can be installed in an environment meeting the specifications shown in Table 1.

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 1 TDM880i environmental conditions

WARNING: Do not install the TDM880i in a dusty environment. If the module and the heat sink are dusty, they can overheat.

Tools and installation materials

The TDM880i is to be mounted on mechanics using ø 3 mm screws (5 pcs) suitable for a printed circuit board. The screw type depends on the material (metal/wood/plastic). For the detailed dimensions of the TDM880i, see Figure 10 and Figure 11.

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 TDM880i module, because they can cause short-circuits in the module.

Power cable

The Airbus Defence and Space power cable CA-124 consists of a matching board-to-wire connector and of three separate stripped wire ends. The wire ends should be connected to a power supply (to a battery or another DC supply) so that the black wire is GND (0V), the green wire is the IGS signal, and the red wire is the VCC signal (10.6 - 16.0 V). The maximum recommended length of the power cable is 1.5 meters. If a longer cable is needed, the voltage drop and inductance of the cable should be taken into consideration; fast load transients may cause the input voltage to drop below the operational limits of the device.

- Cable diameter minimum AWG 14
- The pinout is given in Section Power supply on page 31.
- Recommended cable suppliers: Carol Cable, Dearborn, Belden, Alpha Wire, West Penn Wire.
- Connector suppliers: Tyco Electronics, Conec, Amphenol, Molex, JST.

I/O cable

Airbus Defence and Space does not provide any kind of I/O cables. The system integrator must make the cables according to the needs of the applications.

All customer-specific I/O pins are 5 V logic level compatible. The pinout is given in Section I/O lines on page 32. The maximum load for a single I/O line is 20 mA. Note that the total I/O load should be limited to 160 mA (all I/O pins combined).

- Recommended cable suppliers: Carol Cable, Dearborn, Belden, Alpha, West Penn Wire. A multi-wire cable is recommended, the cable size depends on the chosen connector (may vary from AWG20 to AWG28).
- Connector suppliers: Tyco Electronics, Conec, Amphenol, Molex.

Data cable

The Airbus Defence and Space data cable CA-123 consists of a matching board-to-wire connector and a keyed RJ-45 connector for the DLR-3T cable. For custom-made cables, Airbus Defence and Space recommends to use the following suppliers:

- Cable suppliers: Carol Cable, Dearborn, Belden, Alpha, West Penn Wire.

  A multi-wire cable is recommended. The cable size depends on the chosen connector (may vary from AWG20 to AWG28).
- Connector suppliers: Tyco Electronics, Conec, Amphenol, Molex.

TETRA RF cable

The connector of the TDM880i board is a 50 Ω impedance-matching MMBX (Huber+Suhner 82_MMBX-S50-0-1/111_N). For custom-made cables, use a 50 Ω low-loss cable with a matching connector. Use a proper cable size for the connector selected.

An optional accessory (CA-126) is available in Airbus Defence and Space to convert from a MMBX to a TNC (female).

GPS RF cable

The connector of the TDM880i board is a 50 Ω impedance-matching IPX connector (female) (Hirose U.FL-R-SMT-1(10).

For custom-made cables, use a 50 Ω low-loss cable with a matching connector. Use a proper cable size for the connector selected, for example RG58C/U, RCG316U or RG142B/U.

An optional accessory (CA-127) is available in Airbus Defence and Space to convert from a IPX to a SMA (female).

■ Installation procedure

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

Installing the TDM880i

1. Check and clean the surface the radio module is to be installed on. Also make sure that the mechanics is suitable for the radio module. If you are uncertain what the installation procedure is or if the mechanics selected can be used with the radio module, consult the retail dealer.
   The components on the TDM880i board are not mechnically protected. Therefore, ensure that the board does not come into contact with any external equipment, cables or surfaces when mounted to avoid damaging the TDM880i or causing short circuits.
   Always ensure that there is sufficiently space around the heatsink 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.
2. Check that you have the tools and mounting screws that are suitable for the material the radio is to be installed on, and the accessories needed for the installation and operation of the TDM880i.
3. Remove the radio from the package and dispose the packing materials according to the local instructions.

 **WARNING:** Remember that the radio module is ESD sensitive.

4. Place the radio 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 arragement causes twisting or bending to it.
5. Fasten the radio using mounting screws and procedures suitable for the surface material. Do not overtighten the screws.
6. Connect the GPS antenna. **Optional**

   Accurate torque must be used for the RF connectors[1]:

   - for the GPS SMA connector in CA-127, the torque needed is 0.34…0.57 Nm (material: brass).

   For lightning protection, see Section Lightning protection on page 15.
   The GPS antenna is not needed if the GPS functionality of the radio is not used.
7. Connect the TETRA antenna.

   Accurate torque must be used for the RF connectors[1]:

   - for the TETRA TNC connector in CA-126, the torque needed is 0.46…0.69 Nm (material: brass).

   For lightning protection, see Section Lightning protection on page 15.
   The TETRA antenna is not needed if the TETRA functionality of the radio is not used.
8. Connect the IO cable. **Optional**
   IO cabling is not needed if the IO functionality of the radio is not used.
9. Connect the serial/AT cable. **Optional**
   The serial/AT cable is not needed if the AT functionality of the radio is not used.
10. Ensure that all the cables which are connected to the radio module are fastened in a manner that does not cause bending, twisting, pushing, pulling, or vibrating in the connectors of the radio.
11. Connect the power cable. Set the IGS signal (the green wire in the power cable) to supply voltage. The red Power On LED lights up.
12. If the GPS is ON, the green GPS LED (the outer LED) starts blinking. If the GPS antenna is attached, the LED lights up (continuously) when the radio has a GPS fix.
    For information on using the GPS functionality, see Section Tracking and positioning on page 17 .
13. If the radio is configured with the network parameters, the green LED in the middle starts blinking. If the TETRA antenna is attached and the radio is in network coverage, the LED lights up when the radio has network service.

■ Powering up considerations

Connecting the power supply

The prerequisites to power up the TDM880i are the following:

- a main DC supply (10.6…16.0 V) in the connector X104, pins 1,2,3. (6,7,8 = GND)
- at least one of the three IGS signals must be held high.

Note: Every IGS signal has its own logic 'high' level, see Table 2.

■ Cabling

Connecting the power supply

DC input from 5A and 1A (IGS) fused 12 V power source line. Make sure that the matching board is properly attached to the wire connector.

1. When the TDM880i's own accessory antenna is used, the above-mentioned torque values are valid for both ends of the antenna cable. If you use other antennas/cables/connectors than the ones listed as TDM880i accessories, the valid torque values for those must be checked from their manufacturer. The above-mentioned values are valid for the TDM880i connectors in this case, too. For more information on how to fix the TDM880i accessory antenna (including the valid torque value), see the leaflet provided with the antenna package.

Special considerations for vehicles, vessels etc.

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

The positive voltage must be taken directly from the battery, unless the mains voltage of the vehicle differs from 12 V. This minimizes the risk of disturbances from or to the radio module, 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 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 TDM880i has been designed for negative ground systems. If you install the TDM880i 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 X104 (pins 6,7 and 8).

■ Starting up

Starting up after flash / parametrization

1. Remove the parametrization/flash cable.
2. Power down the device.
3. If you have to check the GPS and/or network functionality, connect the antennas. **Optional**
4. Power up the device.
5. Make sure that the red Power On LED is lit. This tells you that the device is powered on and the root software is running.

Verifying the AT functionality

1. Power down the device.
2. Connect the DLR-3T cable to a COM port of a PC, and connect the DLR-3T with the CA-125 and radio module.
3. Power up the device.
4. Open a serial connection to the device using an appropriate terminal program, for example the HyperTerminal.

Communication settings:

- 9600 baud
- 8 data bits
- N (no parity)
- 1 stop
- none (handshake)

5. Execute the AT info command. Check that the device replies with OK as in the following sequence:

   > AT
   OK.

Verifying the parametrization functionality

1. Power down the device.
2. Connect the DAU-9S cable to a COM port of a PC, and then connect the DAU-9S with the CA-125 and radio module.
3. Start the TETRA Terminal Programming Tool (the version 2009.20.53.4 or later of TPT should be used).
4. Power up the device.
5. From the **Connections:** drop down menu, select the connection type as **FBUS**. In case of TPT errors, see *TPT manual.*
6. Select **File** →**Scan Product**. The TPT should recognize the TDM880i as RC-18, and allow the parametrization of the device.

5. FEATURE GUIDE

Feature overview

Based on the Airbus Defence and Space TETRA i-range platform, the TDM880i contains a lot of functionality common to this product family. This document focuses on the new features and major feature changes introduced in the TDM880i product. Thus the common TETRA features are not described in depth here.

The main new features of the TDM880i are:

- Tracking capability of the location history (see Section Tracking and positioning on page 17)
- Configurable low power consumption mode with time and periodical capabilities - the sleep mode (see Section Sleep mode on page 17)
- Controlled periodic reset powers the device off and re-starts it within a configurable period (see Section Periodic reset on page 18)
- Possibility to route GPS output as NMEA through the AT port (see Section NMEA output on page 18)
- Enhanced clock recovery after power failure (see Sections Time recovery on page 19 and Recovery from power failure on page 19)
- Enhanced temperature protection by controlling the RF and extension chip powering in heating conditions (see Section Temperature protection on page 19)
- Configurable group management with background scanning and the ability to use FACCH for messaging when available (see Section Load management (group management + FACCH) on page 20)
- I/O line bound Alert condition management feature with configurable OTA notification and configuration options (see Section Alert condition and notification feature on page 20)
- Ignition signal recognition and powering the radio ON/OFF accordingly (see Section Ignition sense (IGS) functionality on page 21).

Tracking and positioning

The TDM880i can be configured to send its location information periodically to the controller that needs to keep track of the location history. When the TDM880i is in service, the location information is sent as SDS messages.

When the TDM880i is out of service and the GPS tracking functionality is enabled, the TDM880i stores the location information in permanent memory until it is back in service again. The tracking information is then sent to the controller as SDS messages.

The SW component that provides the tracking functionality in the TDM880i is called the GPS Tracking Server (GTS).

Note: Due to the background nature of this feature, it should be noted that when this feature is configured and activated, it takes partial control over the GPS circuit powering and in certain situations prevents the powering down the GPS circuit. In cases where the power consumption should be turned to an absolute minimum, or complete control of the GPS circuit is required, this feature should be turned off.

Sleep mode

The sleep mode functionality adds a special *timed hibernation* possibility for the product. In general this means that the product can be set to low-power consumption mode - for example sleep - for a specified amount of time. In this mode, the device is aware of its internal clock and powering events, but has turned down all other external PEI / RF interfaces.

When using this feature, the device can be configured to hibernate for a certain time or the time periods can be defined when the device is operational and when it hibernates

It should be noted that the sleep mode itself does not include calendar functionality, and the given time parameters are treated as absolute values of specified time units like minutes.

Sleep mode activation

Sleep mode can be activated by passing a configuration message to the device which defines sleep and optional wake time. See PARAMETER REFERENCE (TDM880I SPECIFIC PARAMETERS) on page 22 for Sleep mode parameter information.

Sleep mode termination

Sleep mode is terminated - either temporarily or permanently - if at least one of the following conditions occur:

Termination time reached
The Sleep mode service periodically checks the current time and date to resolve the possible wake-up condition. When the specified time is reached, the device is started up into operative mode.

Power switched ON by the end user
Powering the TDM880i can be controlled by bringing high any of the IGS input signals. If the device is powered on when the Sleep mode is configured, the device will boot up into operative mode and remain in that state for a fixed time of 10 minutes. If the Sleep Mode configuration is not updated during this period, the Sleep Mode continues execution as previously configured.

Power failure
When the main power is returned after a power loss, the device will boot up and check the time settings of the device. If the power loss caused a reset to the Real Time Clock (RTC), the device is powered to a fully operative mode, and the RTC recovery routine is started. During this mode, the all Sleep mode settings are temporarily cancelled until the correct time/date are recovered. After the successful retrieval of the correct time, the Sleep mode functionality continues execution as configured.

Note: Sleep mode cannot be terminated through the AT/OTA interface when the device is in the hibernate mode. Such termination always requires interfacing the power switching functionality or the main power itself.

Periodic reset

Data terminals can be installed in remote locations or in locations that are hard to access by maintenance personnel. TDM880i has a built-in mechanism to recover from possible erroneous conditions within a reasonable period of time. Controlled periodic reset powers the device off and re-starts it within a configurable period in a managed way.

Countdown timer for the next periodic reset can be read with the following AT-command.

AT+CXWDCT

NMEA output

The TDM880i provides two ways of routing the NMEA output from the GPS module directly to the AT interface. Both require an AT command for initiation. To enable the GPS, use the following AT command (if the GPS is not enabled by default using the parameter settings of the TDM880i):

AT+CXGPSC=value

value 1 activates and 0 disables the GPS.

Periodic Output:
The end user may request the device to enter a state where NMEA is queried periodically from the GPS facilities and routed to the AT channel at a speed of 9600 b/sec. To enable this mode, the end user must use the following command.
AT+CXGPSPLR=value

values 1-30 equals time in seconds, the value 0 disables periodic output

Direct Timed Output:
In this mode the device routes the 4800 b/sec. NMEA output directly to the AT output for a specified period of time. In order to turn this mode on, the following AT command must be used.
AT+CXNMEARD=password, value

password parametrized, the time value can be anything between 1-160, the value 0 sends NMEA to TE until power off.

Note: During the period of direct routing, the AT channel is not available.

Note: After the NMEA redirect period ends, the GPS is disabled.

Time recovery

If the radio has been out of main power and has consumed all the power stored in the backup batteries, the in-device main clock resets. At the next startup the condition is recognised and the TDM880i starts to recover the clock state. During the recovery process, the following steps are taken:

1. The device tries to connect into the network and receives the current network time.
2. If the network does not provide the main time within 10 minutes, the network recovery is continued and the device tries to recover the time from the GPS signal.

Note: At any time during the recovery, the end user is able to set the time using the AT interface, but if the network recovery is activated, it supersedes other recovery functions.

Note: The TDM880i utilizes UTC time (Coordinated Universal Time).

Recovery from power failure

The TDM880i is powered by an external DC supply (10.6 - 16 V).

Starting up the TDM880i after an external power supply failure requires that at least one of the three IGS signals is held in the logic high state. If all the IGS signals are kept in the logic low state after a power supply failure, the device does not start up.

When an external DC supply is applied, or if you want to start up the TDM880i automatically after a power failure, you should permanently connect the IGS signal in the connector X104 (pin #5) to the power supply pins #1, #2 and #3 of the same connector (that is to the main DC supply pins/wires). In that case, you must shut down the device by disconnecting the external power supply.

If the device has lost main power and runs out of backup power, the main clock of the device resets. In this case the Time Recovery sequence is started during the next startup. See Section Time recovery on page 19.

When the device has no power, the I/O lines are in an undefined state. Use external pull-up and pull-down resistors in the I/O lines if the I/O should have a defined state in power off. Note also that the Power On indicator, In Service, and Over-temperature indication signals are driven high but are in high-Z when not driven. These signals should not have an external pull-up resistor in order to get a valid result (there is a weak pull-down in each signal line). An external pull-down resistor is recommended to be used in these signals. After recovering from a power failure, the I/O lines are driven to the state they were in before the power failure. The only pins that do not behave this way are the GPS fix and In Service indication pins. These I/O pins indicate the real status of the GPS or TETRA service availability.

Temperature protection

The device monitors its internal temperature and shuts down the transmitter in the event of overheating. An overheating indication will be sent over an AT command interface (and indicated by I/O line).

After a sufficient drop in internal temperature, the device returns the transmitter to normal operation, and indicates this event to an external application by the I/O line and by AT indication.

Load management (group management + FACCH)

While the TDM880i cannot establish outbound individual calls or accept them, it is able to register and scan group traffic. Group management in the TDM880i is done exactly the same way as in the THR880i (TETRA handportable radio) product. During the group connectivity, the TDM880i can utilize FAC channel (FACCH) in SDS sending when there is no other traffic.

Alert condition and notification feature

The TDM880i can be configured to monitor I/O line changes and to react to them by setting an alert condition into the system. Depending on the configuration, the action taken may be a single shot SDS message to a defined address, continuous sending until the alert condition is removed, or an SDS notification requiring acknowledgement before turning off the alert condition.

In addition to immediate and Alert dedicated SDS sending, the TDM880i can be configured to include alert status information into LIP messaging.

AT commands

AT commands can be used to manage and control the functionality of the TDM880i.

For a complete list of the AT commands, refer to the latest version of Airbus Defence and Space TETRA AT command list.

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.

I/O lines functionality

The TDM880i includes one 12-pin connector (AT or CPU) and two 15-pin board-to-wire connectors in which certain pins can be used as indications of the device state or as directly configurable I/O between the device and a remote unit. In X103 and X102 connectors, the levels of input and output signals are 5 V TTL excluding the FBUS and MBUS signal. See Section CONNECTOR INTERFACES on page 31. In the CPU-connector the inputs and outputs are 2.8 V.

Power On output, X103, X901:
The Power On signal indicates the power status of the device. It will be held inactive until the device has booted up properly and is ready to operate (for example, ready to receive a command via the AT interface).[1]

In Service output, X103, X901:
The line indicates the status of the radio signal reception. When the terminal has successfully registered in the system, and the signal it is receiving is good enough for communications, this line is active.[1]

GPS Fix output, X103, X901
This line is active when the GPS receiver is enabled and the satellite fix for positioning is good enough.[1]

Over Temp output , X103, X901:
The output is active when the device is unable to communicate due to overheating. The output will go inactive when the temperature is back within specified limits.[1]

IGS input , X103, X901:
The TDM880i can be toggled on/off by an external application. To toggle the power on, set the IGS to logic high level (see Table 2), and to power off, set it to 0 V.

DC output, X102, X103:
5 V output voltage is provided through the connectors X102 and X103, the maximum load current is 100 mA.

1. Note that this signal is not driven actively to the low state when the device is powered on. The device has a weak pull-down on board. Use an external pull-down resistor in a harsh environment. This applies to X103.

Programmable IO pins, X102:
In addition to the fixed output and input lines, the X102 connector of the TDM880i is equipped with twelve programmable IO lines that can be configured to control actions in the device. Possible actions for the pins are:

- Status message sending that can be used in conjuction with the status LIP trigger
- SDS-4 message sending
- raising the Alert condition

The last one can be further configured as described later on in this document.

Ignition sense (IGS) functionality

The power on/off is controlled in the TDM880i through an IGS input signal. The signal is provided through multiple connectors with multiple voltage level variants. To power up the TDM880i, raise any of the IGS signal inputs into the high state. The device boots up and remains on as long as at least one of the IGS signal inputs is held in the high state.

To turn off the TDM880i, set all IGS inputs into the low state. When detecting such a condition, the device powers down after a configurable delay. If any of the IGS inputs goes into the high state while the power off delay is in progress, the power off sequence is cancelled, and the TDM880i remains in the operational state.

The IGS input is provided through the connectors shown in Table 2.

CONNECTOR	PIN	LEVEL
X901	#1	2.78V
X103	#11	TTL
X104	#5	VCC (= main DC supply voltage)

Table 2 Logic high level of the IGS signals

6. PARAMETER REFERENCE (TDM880I SPECIFIC PARAMETERS)

■ Sleep mode

Sleep mode has the following parameters:

PARAMETER	DESCRIPTION	VALUES
Operating Mode	periodic / one-shot	0 = off 1 = periodic 2 = one shot
Sleep Time	Time to hibernate (minutes)	0<n<65536
Wake Time	Time to remain in operational mode after previous wake-up (minutes)	0<n<65536
Activation time	Countdown time before entering the specified configuration (minutes)	0<n<65536

Table 3 Sleep mode parameters

* The maximum wake- and sleep time duration is approximately 45 days and the minimum 1 minute.

The Sleep mode functionality can be configured using the TETRA Terminal Programming Tool (TPT) in the parametrization phase, the PEI/AT interface or OTA using an SDS configuration message from a predefined SSI.

TETRA Terminal Programming Tool (TPT)

The TPT can be used to configure the Sleep mode feature in two ways:

- to configure the set of SSI from which the configuration SDS messages are allowed
- to configure the actual parameters required by the Sleep mode functionality.

Allowed SSI configuration

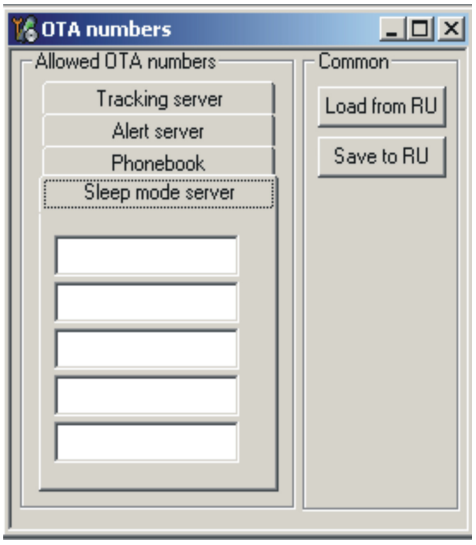

Figure 3 Sleep mode OTA numbers

The end user can insert five different numbers into the Sleep mode **OTA numbers** fields. The OTA configuration of the Sleep mode functionality is allowed from these numbers.

Parametrization of Sleep mode functionality

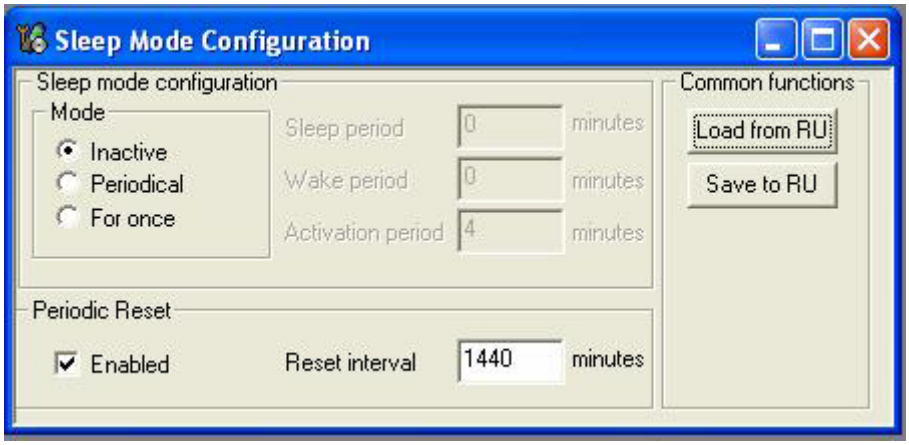

Figure 4 Sleep mode configuration

In TPT configuration, the user is able to select the Operating mode, Sleep, Wake, and Activation periods as defined in the Sleep mode parameters.

AT interface

Parametrization of the Sleep mode functionality:

DESCRIPTION	COMMAND	RESPONSE
Sleep mode off	+CXSLMS=0	OK
Sleep mode configuration	password, +CXSLMS=[mode], [waketime], [sleeptime], [Activation time]	OK, FAIL

Table 4 Sleep mode parametrization: AT interface

SDS interface

Parametrization of the Sleep mode functionality over an SDS message requires that the message format presented below is used.

FIELD	TYPE
Protocol Identifier	SDS_TL_GENERAL_OTA_ID
Sub-protocol Identifier	SDS_TL_SLEEPMODE_OTA_ID [
Message Length	unsigned byte. Note! Includes both protocol identifiers and the payload length
Payload	char[n] : [mode],[sleeptime],[waketime],[activation time]

Table 5 Sleep mode parametrization: SDS interface

After a new configuration is retrieved, a special acknowledgement message is sent to the configuration sender. The format of the acknowledgement is as follows:

FIELD	DESCRIPTION
Protocol Identifier	SDS_TL_GENERAL_OTA_ID
Sub-protocol Identifier	SDS_TL_SLEEPMODE_OTA_ID [
Message Length	1 byte
Status	1 = success 0 = failure

Table 6 Acknowledgement message format

Note: The acknowledgement message requires that at least the protocol and sub-protocol identifiers are correct.

Periodic reset

The Periodic reset has the following configuration options (Figure 4):

- Enable/disable Periodic Reset feature
- Time interval between controlled periodic resets

Location tracking

The Tracking feature has the following configuration options:

- Enable/disable tracking feature
- Maximum total amount of entries in track
- Time interval between stored tracks - the time trigger - expressed as minutes
- Distance delta between stored tracks - the distance trigger - expressed as meters.

PARAMETER	DESCRIPTION	VALUES
Enable/Disable	Execution control	0 = off 1 = enabled
Maximum Amount of entries	Amount of entries reserved for track storing	0<=200<=500
Time Trigger	Time delta between stored locations	0<x<(2^31)-1
Distance Trigger	Distance delta between stored locations	0<x<(2^31)-1

Table 7 Location tracking parameters

TETRA Terminal Programming Tool (TPT)

The TPT can be used to configure the Location tracking feature in two ways:

- to configure the set of SSI from which the configuration SDS messages are allowed
- to configure the actual parameters required by the Tracking functionality.

Allowed SSI configuration

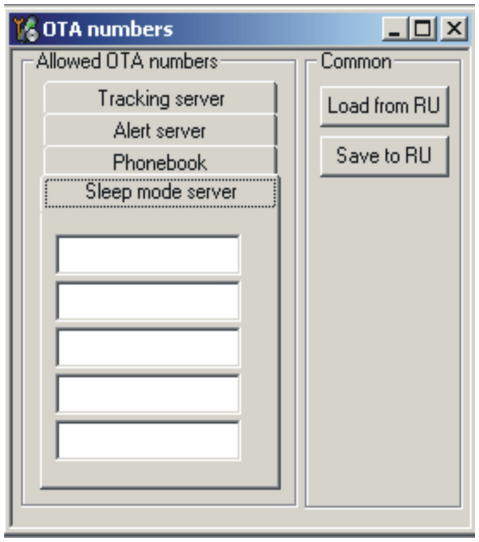

Figure 5 Tracking OTA numbers

The end user can insert five different numbers into the Tracking **OTA numbers** fields. The OTA configuration of the Tracking functionality is allowed from these numbers.

Parametrization of Tracking feature

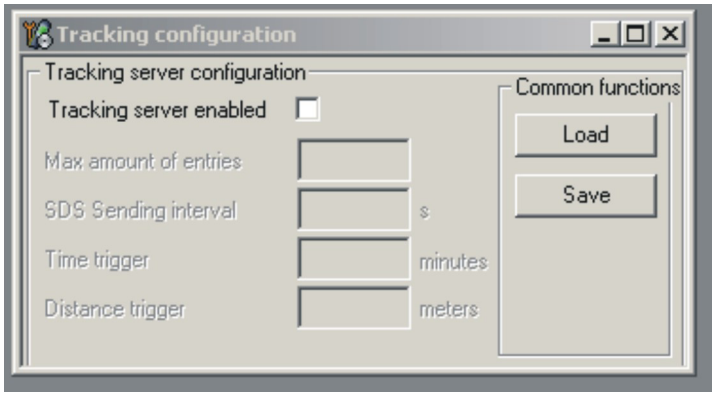

Figure 6 Tracking configuration

In TPT configuration, the user can enable/disable the feature, select track storage size, default SDS intervals on track transmission, and both the time and distance triggers for collecting location information into track.

AT interface

Parametrization of the Tracking functionality:

DESCRIPTION	COMMAND	RESPONSE
Configuration	+CXGTSP=<Password>,<Tracking enabled>[,<Max amount of entries>,<SDS interval>,<Timer trigger>,<Distance trigger>]	OK, ERROR
Read configuration	+CXGTSP?	

Table 8 Tracking parametrization: AT interface

SDS interface

Parametrization of the Tracking functionality over an SDS message requires that the message format presented below is used.

FIELD	TYPE
Protocol Identifier	SDS_TL_GENERAL_OTA_ID
Sub-protocol Identifier	SDS_TL_GTS_OTA_ID
PDU Type	4 bits : 0000
Tracking Enabled	4 bits : 0000 = disabled, 0001 = enabled
SDS Sending interval	8 bits : interval in seconds
Max amount of entries	16 bits : value range 200>=n<=500
padding	8 bits
padding	8 bits
Time trigger	32 bits : 0 = disabled, >0 = trigger interval in minutes
Distance trigger	32 bits : 0 = disabled, >= distance change in meters

Table 9 Tracking parametrization: SDS interface

After a new configuration is retrieved, a special acknowledgement message is sent to the configuration sender. The format of the acknowledgement is as follows:

FIELD	DESCRIPTION
Protocol Identifier	SDS_TL_GENERAL_OTA_ID
Sub-protocol Identifier	SDS_TL_GTS_OTA_ID
PDU type	4 bits : 0000
Result code	4 bits : 0000 = OK, 0001 = invalid parameters, 0010 = Failed due buffer IO error

Table 10 Acknowledgement message format

Alerting feature

The Alerting feature configuration is divided into two parts:

- general parametrization available for all alerts
- alert specific parameters.

The generic configuration parameters are:

- LIP inclusion, giving the possibility to include alert statuses into LIP messaging
- Acknowledgement allowed from all numbers.

The alert specific parameters are:

- IO line bound to alert
- Alert handling: None, SDS-1 or SDS-4 messaging when alert condition occurs
- Handling including one shot messaging, continuous - until alert condition is removed, until successful sending or special acknowledge required before clearing the condition
- Encoding of the message (SDS-4)
- Status value or SDS-4 payload
- Lifetime of the alert
- Destination address into which the alert messages are sent.

TETRA Terminal Programming Tool (TPT)

The Alerting feature can be configured using the Mobile Parametrization view shown in Figure 7.

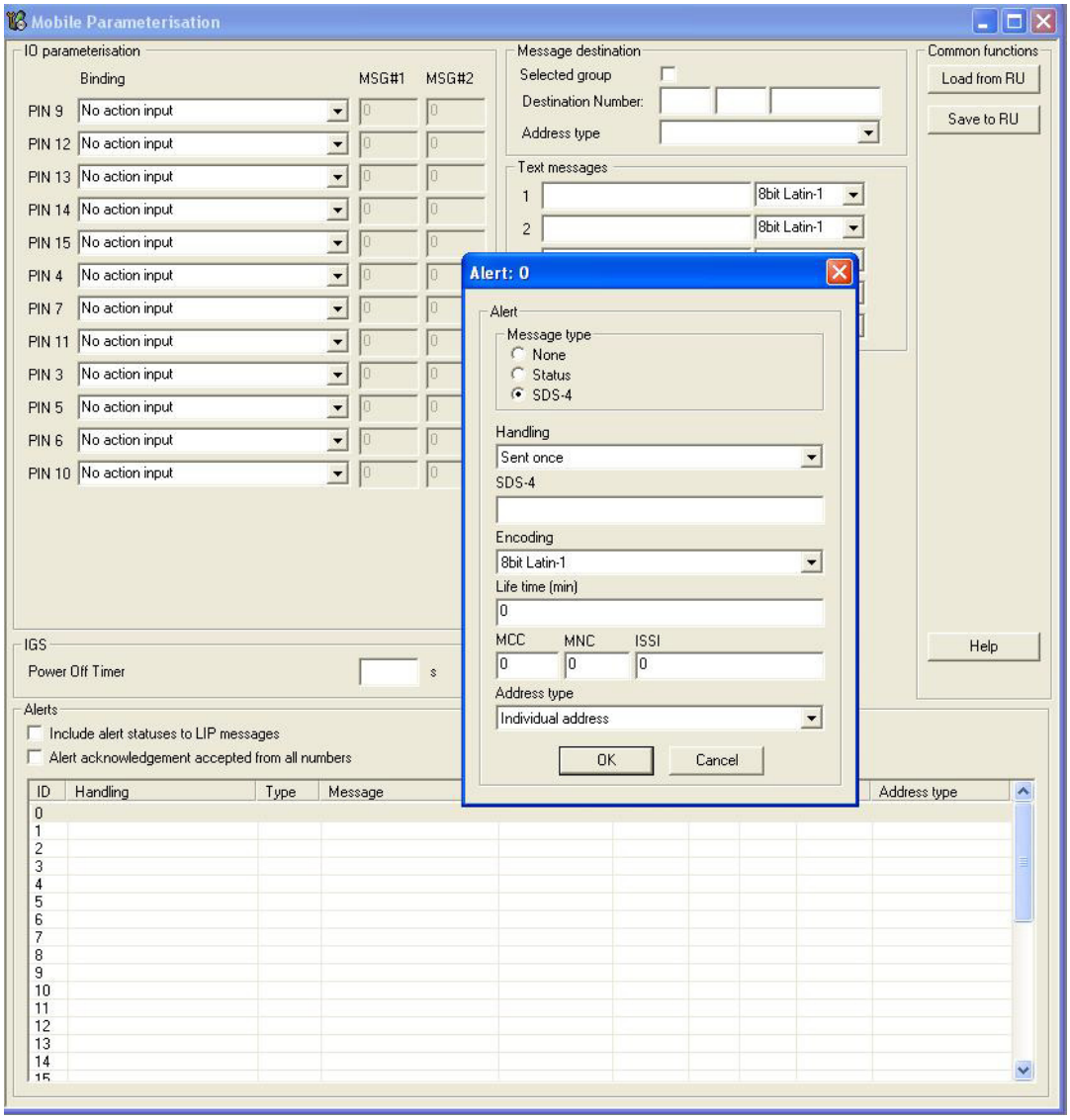

Figure 7 Alerting - Mobile Parameterisation view

Explanation of parametrization:

- The **IO parameterisation** area allows binding between external IO line to trigger alert condition. The target alert can be selected.
- In the **Alerts** area there are 32 individual alerts which can be configured using the shown dialog to:
  - Send a status message on alert
  - Send an SDS-4 on alert
  - Configure the message contents and destination address

In addition to the previous, messaging can be configured (using the **Handling** field) to:

- Try to send once on alert
- Send messages as long as the alert is active - for example, IO line is active
- Send until sending is accepted by the network
- Require an acknowledgement for the alert message

For alerting conditions the feature can also be configured to:

- Include Alert statuses into LIP messages' extended user data field
- Allow alert acknowledgements from all numbers (not only the destination numbers)

AT interface

Parametrization of the Alerting Feature:

DESCRIPTION	COMMAND	RESPONSE
Read Alert Status	+CXALERT?	+CXALERT: <alert in 32 hexadecimal coding>, (<alert statuses 1=on 0=off, starting with alert 0, grouped in 4 alerts>)
Test	+CXALERT=?	-

Table 11 Alerting: AT interface

SDS interface

Parametrization of the Alert functionality over an SDS message requires that the message format presented below is used.

Note: OTA supports the configuration of a single alert per message. Configuring multiple alerts requires the usage of multiple messages.

FIELD	TYPE
Protocol Identifier	0x46
Sub-protocol Identifier	0x5
PDU Type	4 bits : 0011
LIP Enabled and Allowed for all numbers	4 bits : 0000 = both disabled, 0001 = LIP enabled, 0010 = Allowed from all numbers, 0011 = Both enabled
Sub block count	8 bits : Number of sub-blocks, single block update supported currently
Sub block ID	8 bits : reserved
Sub block size	8 bits : reserved
Message type	8 bits : 0x0 = No message, 0x01 = SDS-1, 0x02 = SDS-4
Reserved	8 bits
SDS-4 Message length	16 bits : Conditional, see message type.
SDS-4 Protocol ID	8 bits: reserved. 0x00. Conditional, see message type.
SDS-4 Message type	8 bits: 0x03. Conditional, see message type.
SDS-4 Message reference	8 bits: 0x01. Conditional, see message type.
SDS-4 Coding scheme	8 bits: 0x01. Conditional, see message type.
SDS-4 Message	60 chars. Conditional, see message type.
SDS-4 <reserved padding>	16 bits.
Destination address: TETRA number	32 bits.
Destination address: MCC	16 bits.
Destination address: MNC	16 bits.
Destination address: TETRA Number Type	8 bits.
Destination address: reserved fields	24 bits.
SDS-1 status value	16 bits. Conditional, see message type.
Lifetime	16 bits. Alert lifetime in minutes.
Interval	16 bits. 0x001E = Default 30 seconds. Reserved.
Message sending mode	8 bits. 0x00 = one shot, 0x01 = Continous, 0x02 = Until success, 0x03 Requires acknowledgement
Alert number	8 bits. Number of the alert to configure : 0<n<32

Table 12 Alerting: SDS interface

After a new configuration is retrieved, a special acknowledgement message is sent to the configuration sender. The format of the acknowledgement is as follows:

FIELD	DESCRIPTION
Protocol Identifier	SDS_TL_GENERAL_OTA_ID, 0x46
Sub-protocol Identifier	0x05
PDU type	4 bits : 0000
Result code	4 bits : 0000 = OK, 0001 = invalid parameters, 0010 = Failed due buffer IO error

Table 13 Acknowledgement message format

IGS feature

The IGS feature can be configured using the Mobile Parameterisation view shown in Figure 8.

Explanation of parametrization:

- The Power Off Timer gives the delay in seconds (0 - 600 s) to turn the radio off after the IGS signal has gone into the low state.

Note: If the IGS signal goes into the high state during this delay of the timer, the power off is cancelled.

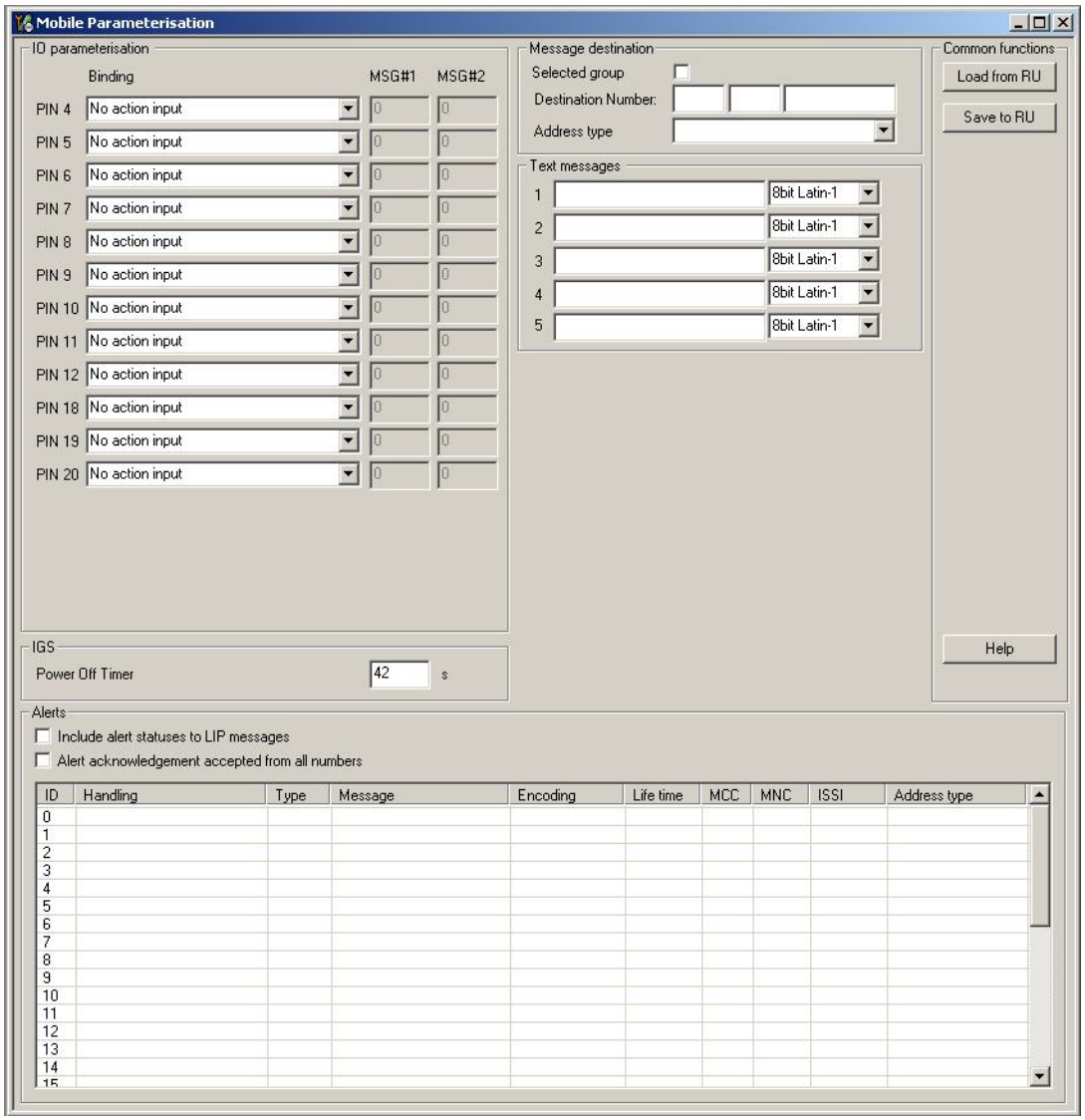

Figure 8 IGS - Mobile Parameterisation view

7. CONNECTOR INTERFACES

■ Connector placement

The locations of the components (the pin 1 marked) in the in the TDM880i board are illustrated in Figure 9.

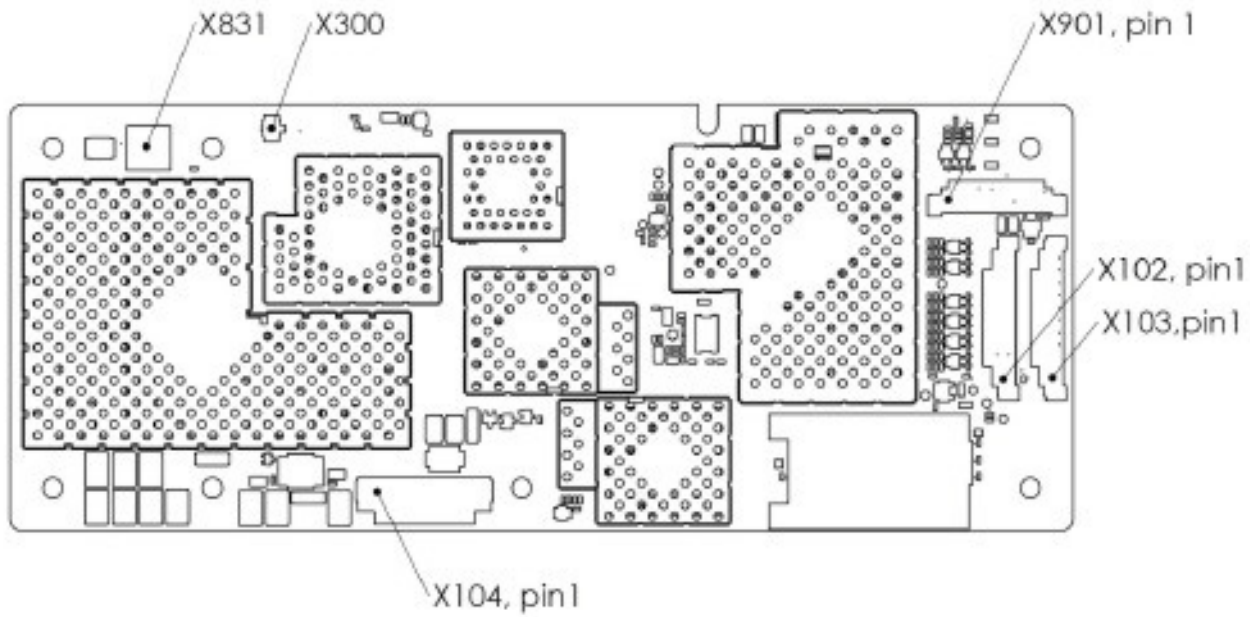

Figure 9 TDM880i connector placement

■ Power supply

The power input cable CA-124 must be fuse-protected (VCC 5A, IGS 1A). Use the wire size AWG 12 or larger.

It is recommended to connect all the power cable pins according to Table 14.

PIN	SIGNAL	IN/OUT	VOLTAGE LEVEL	NOTES
1	12 V	in	10.6 - 16 V	Voltage input pin
2	12 V	in	10.6 - 16 V	Voltage input pin
3	12 V	in	10.6 - 16 V	Voltage input pin
4	NC	-	-	DO NOT CONNECT
5	IGS	in	10.6 - 16 V	Ignition signal
6	GND	gnd	0 V	Ground pin
7	GND	gnd	0 V	Ground pin
8	GND	gnd	0 V	Ground pin

Table 14 Power supply connector (X104) pinout (JST 8 pin board to the wire connector)

AT interface

PIN	SIGNAL	IN/OUT	VOLTAGE LEVEL	NOTES
1	IGS_CPU	in	(2.78 V)	Ignition (level sensitive)
2	FBUS_RX	in	(2.78 V)	FBUS receive data signal
3	FBUS_TX	out	(2.78 V)	FBUS transmit data signal
4	POWER_ON_IND	out	(2.78 V)	Power on indicator signal, active high
5	10V	out	10	Power supply for DLR-3T
6	IN_SERVICE	out	(2.78 V)	In Service indicator
7	VIO2V8	out	(2.78 V)	I/O Power supply
8	OVERTEMP	out	(2.78 V)	Over temperature indicator signal, active high
9	MBUS	in/out	(2.78 V)	MBUS serial line, connect 560 Ω pull-down resistor to BSI line to switch MBUS from X901 to X103 (requires reset)
10	DATA_CABLE	in		Data cable detection for DLR-3T
11	GND	gnd	0	Ground
12	GPX_FIX_CPU	out	(2.78 V)	GPS fix indicator signal, active high

Table 15 AT interface / CPU (X901) connector pinout (Molex 12-pin board-to-wire connector)

I/O lines

The signals listed in Table 16 are provided through the I/O connector. The connector geometry is Molex 0533981571 compatible.

PIN	SIGNAL	IN/OUT	VOLTAGE LEVEL	NOTES
1	5V	out	5 V	Max. current 200mA (see Note)
2	GND	gnd	0 V	Ground pin
3	GEN IO	in/out	TTL	User configurable IO 0.1pin
4	GEN IO	in/out	TTL	User configurable IO 02 pin.
5	GEN IO	in/out	TTL	User configurable IO 03 pin.
6	GEN IO	in/out	TTL	User configurable IO 06 pin.
7	GEN IO	in/out	TTL	User configurable IO 07 pin.
8	NC			Do not connect
9	GEN IO	in/out	TTL	User configurable IO 1.1 pin.
10	GEN IO	in/out	TTL	User configurable IO 1.2 pin.
11	GEN IO	in/out	TTL	User configurable IO 1.3 pin.
12	GEN IO	in/out	TTL	User configurable IO 1.4 pin.
13	GEN IO	in/out	TTL	User configurable IO 1.5 pin
14	GEN IO	in/out	TTL	User configurable IO 1.6 pin
15	GEN IO	in/out	TTL	User configurable IO 1.7 pin

Table 16 I/O connector (X102) pinout (Molex 15-pin board to the wire connector)

PIN	SIGNAL	IN/OUT	VOLTAGE LEVEL	NOTES
1	5V	out	5 V	Max. current 200mA (see Note)
2	NC			Do not connect
3	GPS_FIX	out	TTL	GPS fix indicator signal, active high
4	GND	gnd	0 V	Ground
5	IN_SERVICE	out	TTL	In service indicator signal, active high
6	POWER_ON_IND	out	TTL	Power on indicator signal, active high
7	GND	gnd	0 V	Ground
8	BSI	in	2.8 V	Battery size indicator fixed 30 kΩs connector on PCB
9	OVERTEMP	out	TTL	Over temperature indicator signal, active high
10	GND	in/out	TTL	User configurable IO pin
11	IGS_TTL	in	TTL	Ignition (level sensitive)
12	MBUS	in/out	2.8 V	MBUS serial line, connect 560 Ω pull-down resistor to BSI line to switch MBUS from X901 to X103 (requires reset)
13	GND	gnd	0 V	Ground
14	FBUS_RX	in	2.8 V	FBUS receive data signal
15	FBUS_TX	out	2.8 V	FBUS transmit data signal

Table 17 I/O connector (X103) pinout (Molex 15-pin board to the wire connector)

Note: The current rating is the total allowed current provided by the DC-DC converter. If a 5 V current is taken from both X102 and X103 connector, the maximum current is 100 mA /pin.

GPS antenna

The GPS antenna connector (X300) is a female 50 Ω impedance-matching IPX connector. The GPS antenna connector feeds 5 VDC out of the RF connector. Therefore, do not use passive antennas because they can short-circuit the DC voltage output and damage the device. The maximum load for the 5 VDC feed is 50 mA.

TETRA antenna

The TETRA antenna connector (X831) is a 50 Ω impedance-matching female MMBX connector.

8. TECHNICAL DATA

The technical specifications of the TDM880i are listed in Table 18.

FREQUENCY:	Band 3 : TX 380-390 MHz, RX 390-400 MHz Band 4: TX 410-420 MHz, RX 420-430 MHz
RF OUTPUT POWER	EN 300392-2 compliant, power class 4 (3 W)
DIMENSIONS (W X H X D) MM	160 mm x 64 mm x 21 mm
WEIGHT	105 g
POWER SUPPLY REQUIREMENTS	+12 VDC, continuous power 24W (10.6 - 16 V)
POWER CONSUMPTION	**Note** that all figures are subject to change. Device Peak Power: 32 W (momentary maximum consumption) TETRA Call: 6.7 W, full tx power (typical average consumption) GPS: 414 mW (typical average, in addition to other power consumption when on) Idle: 960 mW (typical average) Sleep: 864 mW (typical average, IGS in logic high state) Shut down: 3.6 mW (typical average)
OPERATING TEMPERATURE	-20 to +55°C
HUMIDITY	Up to 95%, non-condensing
I/O LINES	12, inclusive of the various indications
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)
EMC & SAR	EMC approved according to 2004/108/EC. SAR is not evaluated as the device is not a handheld device.
TETRA ANTENNA CONNECTOR	MMBX female, 50 Ω impedance **Note!** The combined VSWR (antenna + cabling) should be better than 4:1
GPS ANTENNA CONNECTOR	IPX female, 50 Ω impedance
DATA CONNECTOR	12-pin board-to-wire connector, Molex 0533981271 compatible
PARAMETERING CONNECTOR	15-pin board-to-wire connector, Molex 0533981571 compatible
I/O CONNECTOR	15-pin board-to-wire connector, Molex 0533981571 compatible

Table 18 Technical data

The mechanical dimensions of the TDM880i illustrated in Figure 10 and Figure 11.

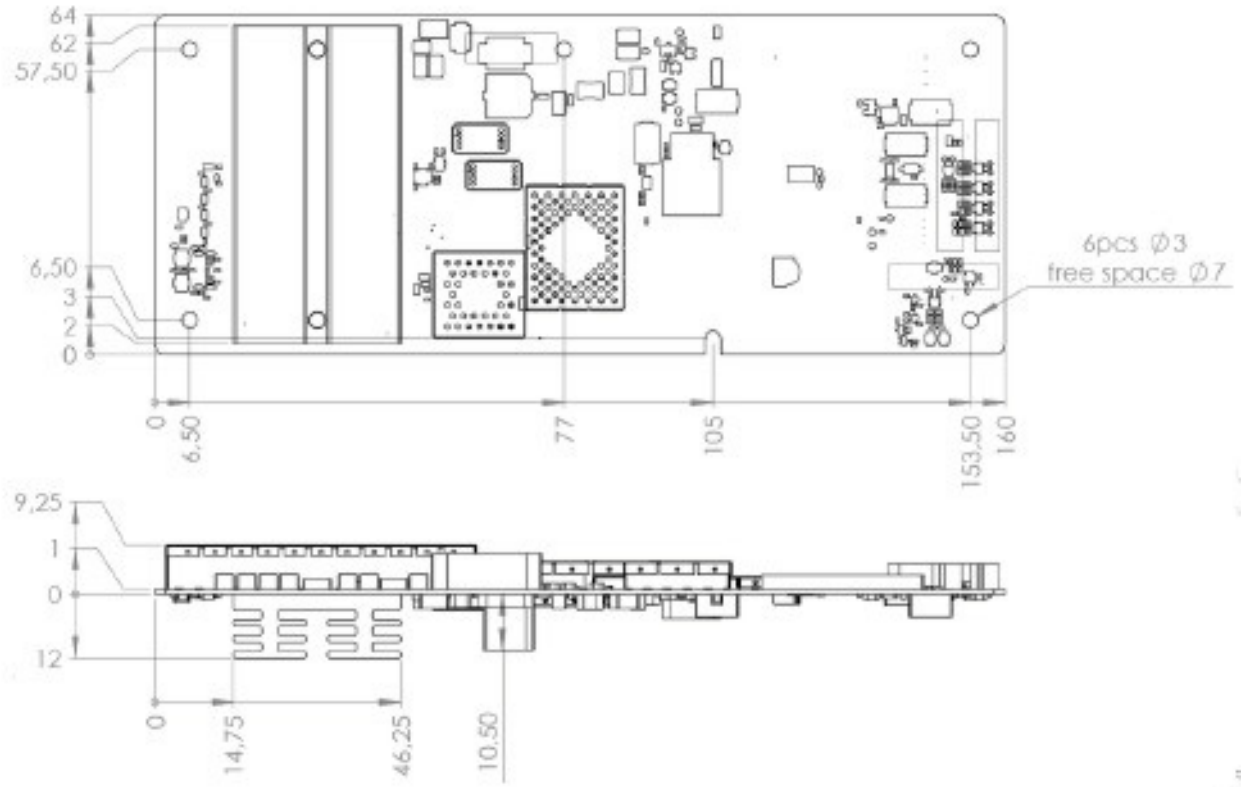

Figure 10 TDM880i assembly holes and height information

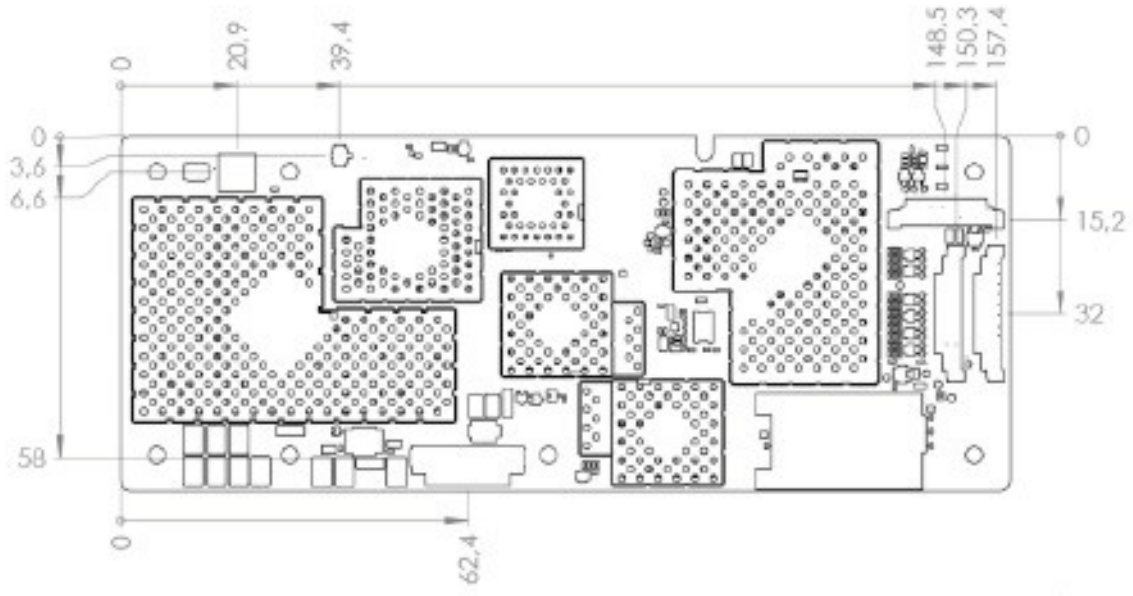

Figure 11 TDM880i connector locations

9. GLOSSARY

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

AT	: Attention command language
AWG	: American Wire Gauge
EMC	: Electromagnetic Compatibility
EPA	: ESD Protected Area
ESD	: Electrostatic Discharge
ETSI	: European Telecommunications Standards Institute
FACCH	: Fast Associated Control Channel
FME	: For Mobile Equipment
GPS	: Global Positioning System
GTS	: GPS Tracking Server
IGS	: Ignition Sense
I/O	: Input/output
LED	: Light Emitting Diode
LIP	: Location Information Protocol
LNA	: Low Noise Amplifier
MMBX	: Microminiature Board Connector
NMEA	: National Marine Electronics Association
OTA	: Over-the-air Technology
PEI	: Peripheral Equipment Interface
RF	: Radio Frequency
RTC	: Real-time Clock
SAR	: Specific Absorption Rate
SDS	: Short Data Service
SMA	: SubMiniature version A
SSI	: Short Subscriber Identity
TETRA	: Terrestrial Trunked Radio
TNC	: Threaded Neill-Concelman
TPT	: TETRA Terminal Programming Tool
TTL	: Transistor-Transistor Logic
TX	: Radio transmitter
UTC	: Coordinated Universal Time
VDC	: Direct voltage

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