

DRAFT 3



TD9300 Data Terminal Installation Manual

MNE-00003-01 · Issue 1 · March 2015

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In China, we comply with the Measures for Administration of the Pollution Control of Electronic Information Products. We will comply with environmental requirements in other markets as they are introduced.

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Preface

Scope of Manual

This manual describes the TD9300 data terminal. The manual is intended for use by experienced technicians familiar with installing and operating radio network equipment. It includes information on installing the TD9300 in a TN9300 DMR trunked network.

Document Conventions



Rewrite this when UI is finalised.

The TD9300 data terminal has a web interface with an accordion menu on the left side of the screen. “Configuration > Users” means click Configuration in the top-level menu, then click Users in the expanded Configuration menu tree to display its page.

Within this manual, four types of alerts may be given to the reader. The following paragraphs illustrate each type of alert and its associated symbol.



Warning This alert is used when there is a hazardous situation which, if not avoided, could result in death or serious injury.



Caution This alert is used when there is a hazardous situation which, if not avoided, could result in minor or moderate injury.

Notice This alert is used to highlight information that is required to ensure procedures are performed correctly. Incorrectly performed procedures could result in equipment damage or malfunction.



This icon is used to draw your attention to information that may improve your understanding of the equipment or procedure.

Associated Documentation



Update as needed

[DMR System Manual \(MNB-00003-xx\)](#)
[DMR Node Controller Installation Manual \(MNB-00001-xx\)](#)
[DMR Node Controller online Help.](#)

The characters **xx** represent the issue number of the documentation.

Technical notes are published from time to time to describe applications for Tait products, to provide technical details not included in manuals, and to offer solutions for any problems that arise. Look for new or updated technical notes on the Tait Technical Resources website.

All available product documentation is provided on the Product CDs supplied with individual items of equipment. Updates may also be published on the Tait Technical Resources website. Printed copies of the manuals are available on request.

Publication Record



| Issue | Publication Date | Description |
|-------|------------------|---------------|
| 1 | March 2015 | First release |

1 Safety and Regulatory Information

1.1 Personal Safety

1.1.1 Explosive Environments



Warning Do not operate the equipment near electrical blasting caps or in an explosive atmosphere. Operating the equipment in these environments is a definite safety hazard.

1.1.2 Proximity to RF Transmissions / A proximité des émissions RF

To comply with the RF Field Limits for Devices Used by the General Public for (Uncontrolled Environment)^a, a safe separation distance of at least 3.3 feet (1 metre) from the antenna system should be maintained.

This figure is calculated for a typical installation, employing one 25 W transmitter. Other configurations, including installations at multi-transmitter sites, must be installed so that they comply with the relevant RF exposure standards.

a. Reference Standards

Health Canada's Safety Code 6: *Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3kHz to 300GHz*

USA Federal Communications Commission OET bulletin 65 (47CFR 1.1310)

IEEE C95.1 2005: *Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300GHz*

Pour respecter les limites imposées au champ RF au niveau des équipements utilisés par le grand public (environnement non contrôlé)^a, une distance de séparation de sécurité d'au moins 1 mètre du bloc d'antenne devrait être observée.

Ce nombre est calculé pour une installation typique, ayant un émetteur de 25 W. D'autres configurations, incluant les installations ayant des sites de plusieurs émetteurs, doivent être installées de façon à se conformer aux normes pertinentes des expositions RF.

a. Normes de référence

Code de sécurité 6 de Santé Canada: *Limites d'exposition humaine à l'énergie électromagnétique radioélectrique dans la gamme de fréquences de 3kHz à 300GHz*

Commission fédérale des communications (FCC) des Etats Unis d'Amérique bulletin OET numéro 65 (47CFR 1.1310)

IEEE C95.1 2005: *Norme pour les niveaux de sécurité compatibles avec l'exposition des personnes aux champs électromagnétiques de radiofréquence 3kHz à 300GHz*

1.1.3 LED Safety (EN60825-1)

This equipment contains Class 1 LED Products.

1.2 Equipment Safety

1.2.1 Installation and Servicing Personnel

The equipment should be installed and serviced only by qualified personnel.

1.2.2 Antenna Load

Transmitting into a low VSWR will maximize the power delivered to the antenna.

Notice Do not remove the load from the TD9300 while it is transmitting.

Load transients (switching or removing the load) can damage the transmitter.

1.2.3 Anti-tampering Devices

All network elements should be physically secured, where possible. This includes the use of locked cabinets and the use of seals on connectors.

All network and audio connectors should be sealed with the stick-on type of seal. The purpose of the seals is to detect unauthorized tampering. The seal should reveal if any of the connectors have been unplugged or if any unauthorized equipment has been plugged in.

The seals must be difficult to remove without breaking, and must bridge between the cable and equipment side (plug and socket) of the connection.

Seals must cover any unused network or audio sockets. This includes the Ethernet connector, any spare switch ports, and the console port on the router and switch.

The seals must be difficult to reproduce. A sticker initialed or signed by the technician should satisfy this.

Seals must be replaced if they need to be disturbed during maintenance.

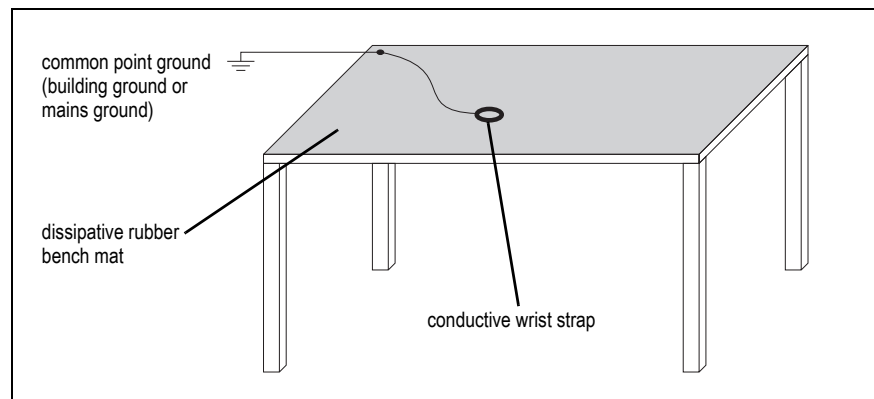
1.2.4 ESD Precautions

Notice This equipment contains devices which are susceptible to damage from static charges. You must handle these devices carefully and according to the procedures described in the manufacturers' data books.

We recommend you purchase an antistatic bench kit from a reputable manufacturer and install and test it according to the manufacturer's instructions. [Figure 1.1](#) shows a typical antistatic bench set-up.

You can obtain further information on antistatic precautions and the dangers of electrostatic discharge (ESD) from standards such as ANSI/ESD S20.20-1999 or BS EN 100015-4 1994.

Figure 1.1 Typical antistatic bench set-up



1.3 Environmental Conditions

1.3.1 Operating Temperature Range

The operating temperature range of the equipment is –22°F to +140°F (–30°C to +60°C) ambient temperature.

1.3.2 Humidity

The humidity should not exceed 95% relative humidity through the specified operating temperature range.

1.3.3 Dust and Dirt

The TD9300 has the following ingress protection ratings:

- IP40
- IP51 (dust category 2) with the front panel connectors facing down.

1.3.4 Grounding and Lightning Protection

Electrical Ground A threaded grounding connector is provided on the front panel for connection to the site ground point (refer to [“Overview of Inputs and Outputs”](#) on page 20 for more details).

Lightning Ground It is extremely important for the security of the site and its equipment that you take adequate precautions against lightning strike. While it is outside the scope of this manual to provide comprehensive information on this subject, we recommend that you conform to your country’s standards organization or regulatory body.

1.3.5 Equipment Ventilation

Always ensure there is adequate ventilation around the equipment.

1.4 Regulatory Information

1.4.1 Distress Frequencies

The 406 to 406.1 MHz frequency range is reserved worldwide for use by Distress Beacons. Do **not** program transmitters to operate in this frequency range.

1.4.2 Compliance Standards

This equipment has been tested and approved to various national and international standards. Refer to [“Compliance Standards” on page 29](#) for a complete list of these standards.

1.4.3 Radio Frequency Emissions Limits in the USA

CFR Title 47 Part 15.19 (a) (1) - Receivers

Part 15 of the FCC Rules imposes RF emission limits on receivers. This radio complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

CFR Title 47 Part 15.19 (a) (3) - All Others

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

1.4.4 Radio Frequency Emissions Limits in Canada

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

1.4.5 Unauthorized Modifications

Any modifications you make to this equipment which are not authorized by Tait may invalidate your compliance authority’s approval to operate the equipment.

The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user’s authority to operate the equipment.

2 Introduction



The TD9300 Data Terminal is an element of the Tait solution for grid automation on electricity distribution networks. It uses its RF capability to connect over the Tait DMR Tier III trunked network to exchange DMR control channel and packet data messages with the Tait SCADA Gateway.

The TD9300 transfers industry-standard SCADA protocols over its RS-232/RS-485 and Ethernet interfaces to allow interconnection to industrial control equipment such as RTUs and IEDs.

The TD9300 can be installed in pole-mounted or other box enclosures (refer to [“Installation” on page 15](#)). The operating temperature range is -22°F to $+140^{\circ}\text{F}$ (-30°C to $+60^{\circ}\text{C}$).

Refer to the System Manual for more information.

3 Installation

The TD9300 can be mounted on a standard 35 mm DIN rail using the optional DIN rail adaptor. Ten holes are provided on the bottom of the chassis for mounting this adaptor, using M3 Taptite screws (refer to [Figure 3.1 on page 16](#) and [Figure 3.3 on page 18](#)). These holes allow the TD9300 to be mounted flat against the DIN rail. Up to two units may be mounted in this way across a 19 inch rack or cabinet.

Notice Make sure that the mounting rail is strong enough to bear the weight of the TD9300 units without bending.

The TD9300 can also be mounted directly on a flat surface using the optional mounting brackets (refer to [Figure 3.2 on page 17](#)). Four holes are provided on the bottom of the chassis for securing these brackets with M4 Taptite screws. Tighten to a maximum torque of 22 lbf·in (2.5 N·m). If a different mounting method is required, the measurements for these mounting holes are provided in [Figure 3.3 on page 18](#).

The TD9300 has an IP40 rating when mounted in any orientation. It also has an IP51 rating (dust category 2) when mounted with the front panel connectors facing down.

i If access to the rear of the TD9300 is restricted when it is installed, it may be difficult to release the latch to remove the unit at a later date. Before mounting the unit, feed a cable tie through the hole in the end of the latch and fasten it into a loop. This may help you to pull the latch open when required.

Mounting

1. Mount the DIN rail adaptor to the bottom of the TD9300 as shown, using four M3 Taptite screws. Use a Torx T10 driver. Tighten to a maximum torque of 15 lbf·in (1.7 N·m).
2. Fit the top of the adaptor onto the top of the DIN rail ①.
3. Push the bottom of the adaptor in and down onto the rail until the latch clicks into position ②. Pulling the latch down may make this easier.

Removal

1. Insert a flat-bladed screwdriver into the latch ③. Push the screwdriver down to hold the latch open.
2. Pull the bottom of the adaptor away from the rail first ④, then lift the TD9300 off the rail ⑤.

Figure 3.1 DIN rail mounting

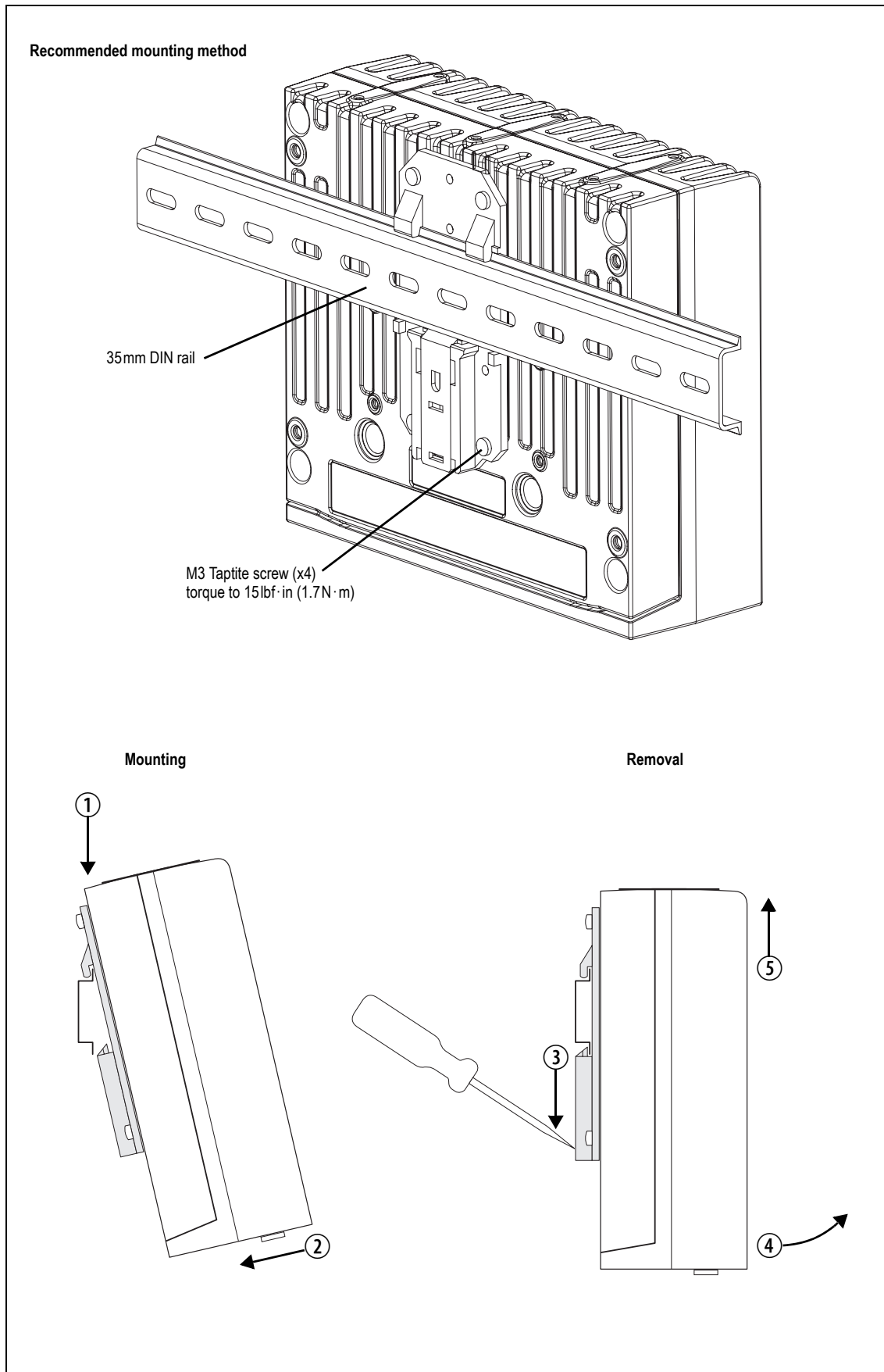


Figure 3.2 Flat mounting

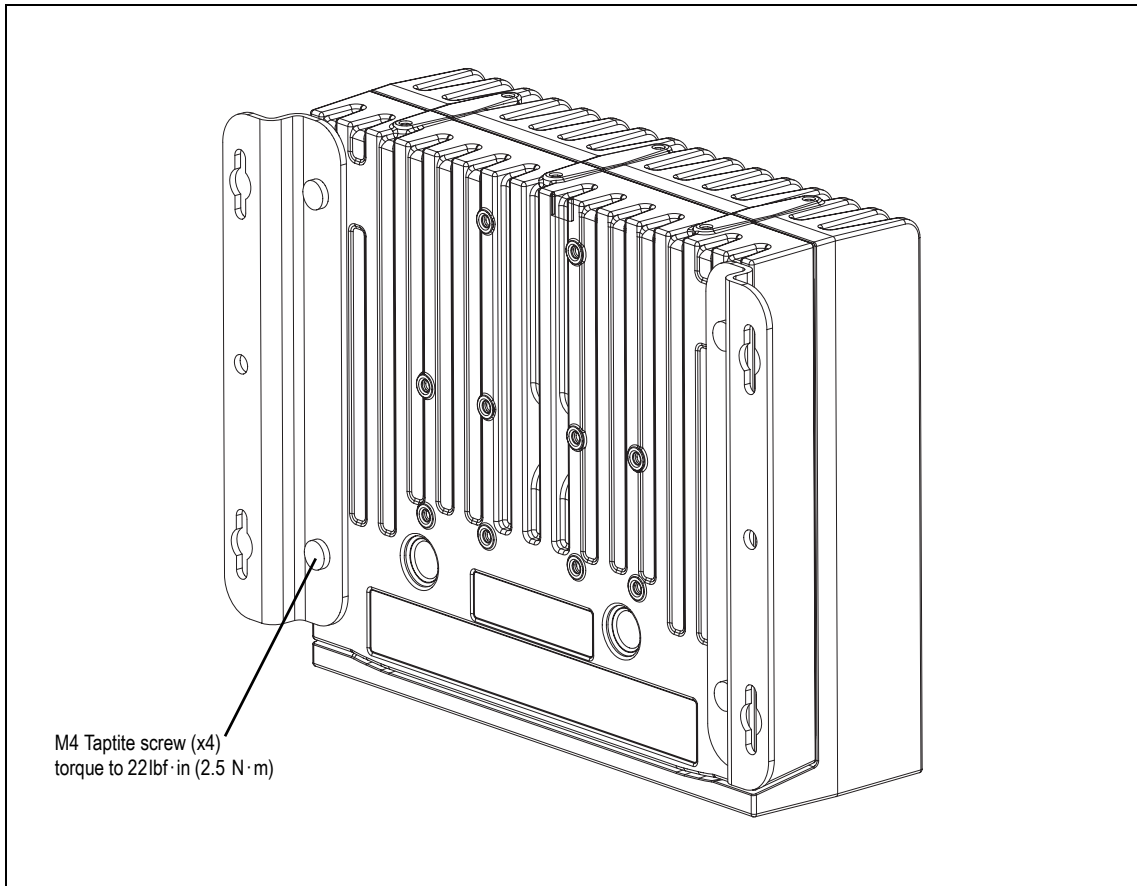
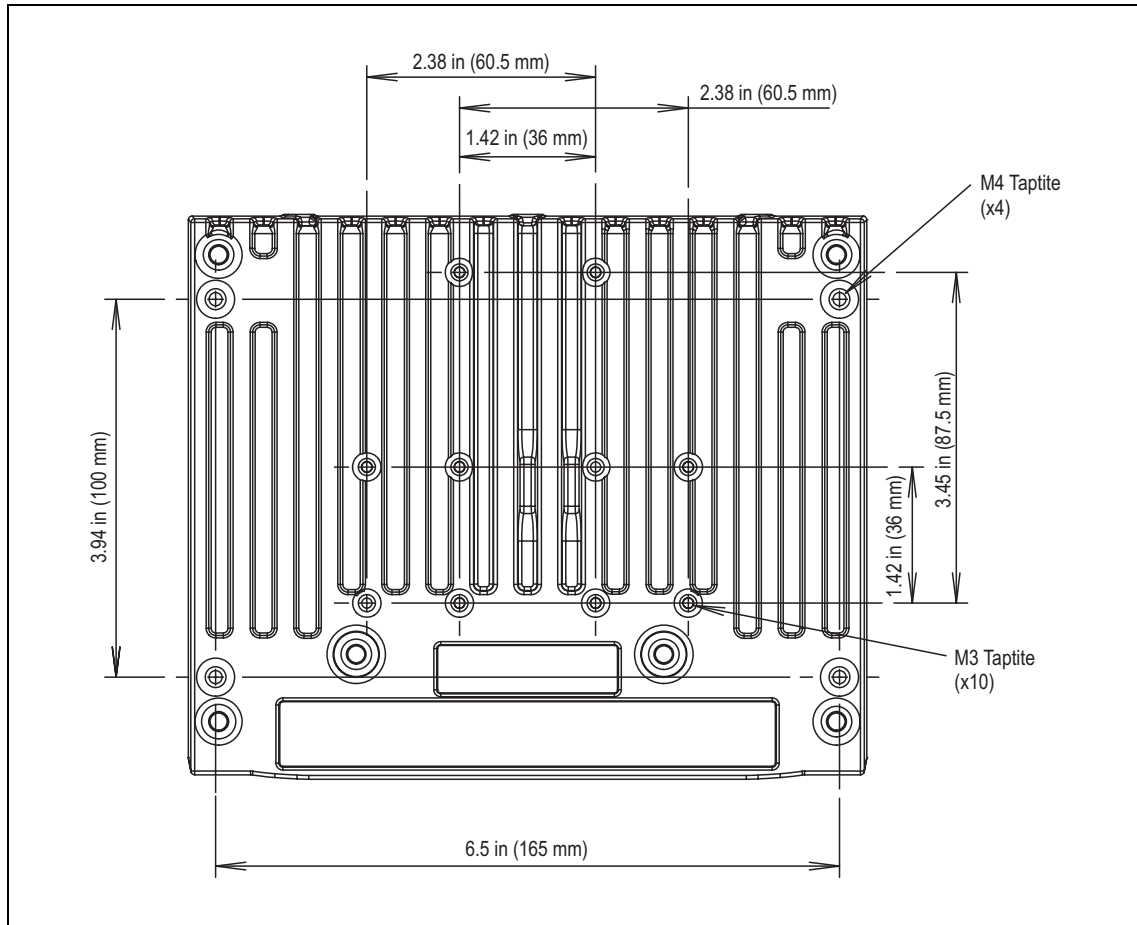


Figure 3.3 Location of mounting holes in the chassis



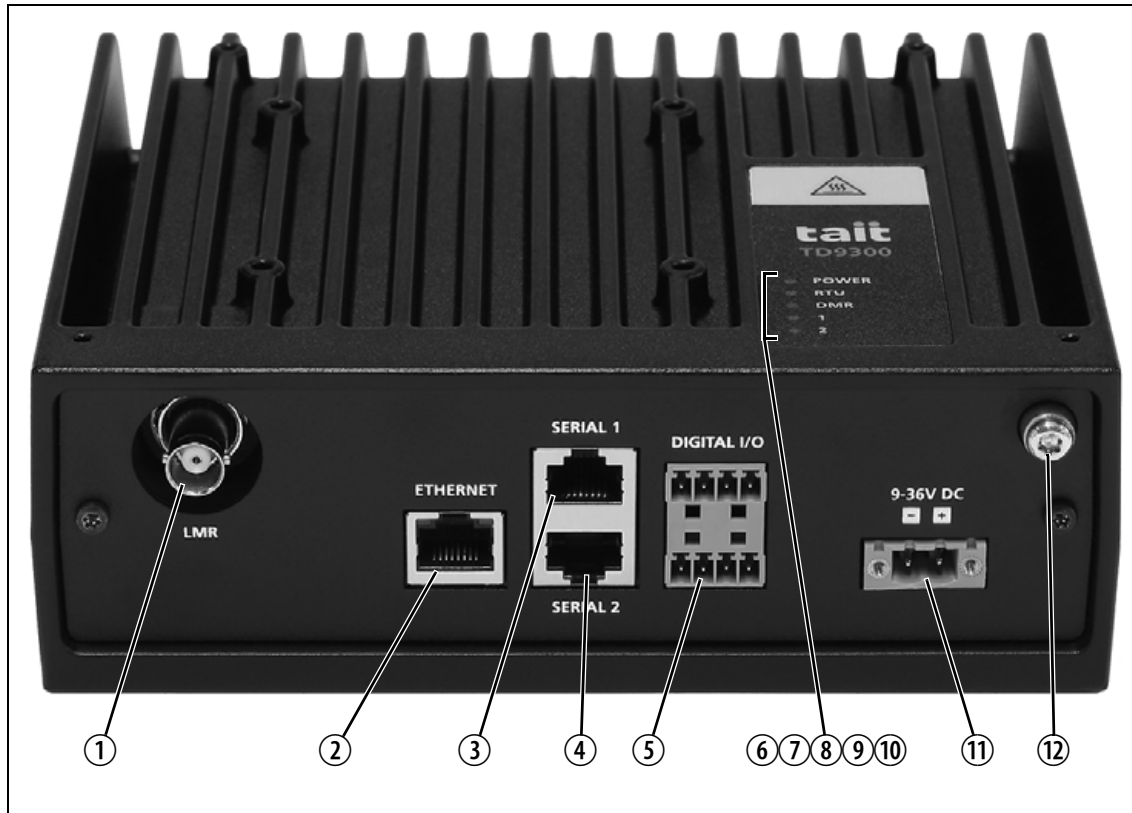
4 Connection

This chapter provides detailed information on connecting the various inputs and outputs on the front panel.

4.1 Overview of Inputs and Outputs

Refer to “[Interface Pin Allocations](#)” on page 22 for the pin allocations of the front panel connectors.

Figure 4.1 Front panel connections and indicator LEDs



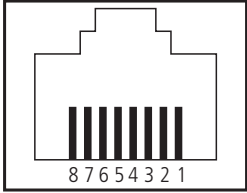
- | | |
|--------------------------|---|
| ① RF connector | LMR RF input and output. |
| ② Ethernet | The Ethernet interface is used to connect the TD9300 to the RTU/IED or to the network. It is also used to configure the TD9300 via a web browser. It is a 10BASE-T or 100BASE-T connection. The green link speed LED indicates the negotiated link speed. The LED is lit when the link speed is 100BASE-T. The amber link status and activity LED is lit when the link is active, and flashes when activity is present. |
| ③ Serial RS-232/RS-485 | Serial RS-232/RS-485 connection 1 is used to connect to an RTU/IED. |
| ④ Serial RS-232/RS-485 | Serial RS-232/RS-485 connection 2 is used to connect to a remote console. |
| ⑤ Digital inputs/outputs | This connector provides two digital inputs and two digital outputs. |

- | | |
|------------------|---|
| ⑥ Power LED | The green power LED is lit when power is connected to the TD9300. |
| ⑦ RTU Status LED | The green RTU status LED is lit when the RTU is linked to the TD9300. |
| ⑧ DMR LED | The green DMR LED is lit when the TD9300 is registered on the DMR network. |
| ⑨ 1 LED | Reserved for future use. |
| ⑩ 2 LED | Reserved for future use. |
| ⑪ DC input | Connect a 9–36 VDC power supply to this input using the supplied connector. The maximum current drawn by the TD9300 is 4.5 A at 24 VDC when transmitting at 25 W. Refer to “Connecting DC Power” on page 23 for more information. |
| ⑫ Ground | M4 chassis ground connector. An M4x12 mm screw and washers are supplied with the unit. |

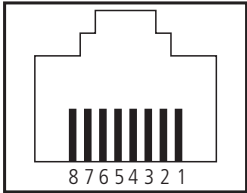
4.2 Interface Pin Allocations

Refer to “Specifications” on page 27 for more information on these connectors.

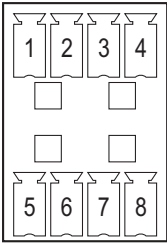
Ethernet Connector

| | Pin | Description |
|--|-----|-----------------|
|  <p>external view</p> | 1 | transmit data + |
| | 2 | transmit data – |
| | 3 | receive data + |
| | 4 | not connected |
| | 5 | not connected |
| | 6 | receive data – |
| | 7 | not connected |
| | 8 | not connected |

Serial Connectors

| | Pin | Description |
|---|-----|-----------------------|
| <p>serial 1 shown</p>  <p>external view</p> | 1 | not connected |
| | 2 | not connected |
| | 3 | not connected |
| | 4 | ground |
| | 5 | receive data output |
| | 6 | transmit data input |
| | 7 | clear to send output |
| | 8 | request to send input |

Digital Input/Output Connector

| | Pin | Description |
|--|-----|-------------|
|  <p>external view</p> | 1 | input 1 A |
| | 2 | input 1 B |
| | 3 | input 2 A |
| | 4 | input 2 B |
| | 5 | output 1 A |
| | 6 | output 1 B |
| | 7 | output 2 A |
| | 8 | output 2 B |

4.3 Connecting DC Power

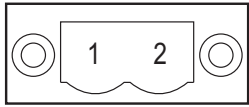
The TD9300 is designed to accept an input of 9–36 VDC (12 or 24 VDC nominal) with negative ground.



What about a shutdown process for the Linux console?

The TD9300 is powered down by disconnecting the front panel DC connector.

The pin allocations for the DC input on the TD9300 are given in the following table.

| | Pin | Description |
|--|-----|-------------|
|  external view | 1 | –V input |
| | 2 | +V input |
| | | |

4.4 System Connections

Example connection diagram to be supplied later

5 Getting Started

5.1 Confirming Operation

The LEDs on the front and top panels will indicate that the TD9300 is operating correctly.

1. Connect power to the TD9300.
2. Check that the LEDs indicate normal operation, as described below.

| LED | Color | State | |
|-----------------------------------|-------------------------|--------------------|--|
| Power | green | off steady | power is not connected to the TD9300 power is connected to the TD9300 |
| RTU status | green | off steady | the RTU is not linked to the TD9300 the RTU is linked to the TD9300 |
| DMR | green | off steady | the TD9300 is not registered on the DMR network the TD9300 is registered on the DMR network |
| 1 | reserved for future use | | |
| 2 | reserved for future use | | |
| Ethernet link speed | green | off steady | 10BASE-T 100BASE-T |
| Ethernet link status/ activity | amber | steady flashing | link connected activity present |

- [What else needs to go in this chapter?](#)

6 Specifications

The performance figures given in these specifications are minimum figures, unless otherwise indicated (e.g. “typical”), for equipment operating at standard room temperature (+71.6°F to +82.4°F [+22°C to +28°C]) and standard test voltage (24VDC).



Where applicable, the test methods used to obtain these figures are those described in the ETSI-EN specifications. You can obtain further details of test methods and the conditions which apply for compliance testing in all countries from Tait.

General

Supply Voltage

| | |
|-----------------------|------------------------------------|
| Operating Voltage | 9VDC to 36VDC |
| Standard Test Voltage | 24VDC |
| Polarity | negative earth |
| Polarity Protection | active isolation (rated to -36VDC) |

Supply Current (at 24VDC) 4.5A at 25W output power

Operating Temperature Range -22°F to +140°F (-30°C to +60°C) ambient temperature

Dimensions

| | |
|--------|-----------------|
| Height | 2.4 in (61 mm) |
| Width | 7.1 in (180 mm) |
| Length | 6.1 in (156 mm) |

Weight 4.2lb (1.9kg)

Serial Ports

Port Type DCE (Tx, Rx, CTS, RTS)

Signal Levels RS-232 and RS-485 compatible

Format 8 bit ASCII, 1 stop bit, no parity

Baud Rate 1200 to 115,200 bps

Ethernet Interface

Transceiver 10/100Base-T

Indicator LEDs

| | |
|--------|---------------|
| Green | speed |
| Orange | link/activity |

Digital Inputs and Outputs

Digital Inputs

| | |
|--------------------------|-------------------------------------|
| Input Voltage Range | 5–50VDC |
| Input Current | 10mA |
| Input Low Threshold | $V_{IL} \geq 1.0V$ |
| Input High Threshold | $V_{IH} \leq 3.5V$ |
| Input Source Current | $I_{IL} > -1mA$ ($V_{IL} = 0V$) |
| Continuous Input Voltage | $ V_{IN} \leq 30V$ |
| Transient Input Voltage | $ V_{IN} \leq 50V$ ($t \leq 1s$) |

Digital Outputs

| | |
|---------------------------|---|
| Output Voltage Range | 5–50VDC |
| Output Current | 100mA |
| Relay Interface | NO/NC |
| Output Low Voltage | $V_{OL} \leq 0.6V$ ($I_{OL} = 250mA$) |
| Output High Voltage | $V_{OH} \geq 3.5V$ [TTL and 5V CMOS compatible] ($I_{OH} = -100\mu A$) |
| Maximum Off-state Voltage | $-0.3V \leq V_{OH} \leq 30V$ (transients outside this range may be clamped) |
| Off-state Leakage Current | $I_{OH} \leq 6mA$ ($V_{OH} = 30V$, pulled up through an external load) |

Compliance Standards

Where applicable, this equipment has been tested and approved to the following standards.

| | |
|-------------------------|--|
| EMC | EN 301 489-1 EN 301 489-5 EN 300 113 CFR Title 47 Part 15 RSS-119 ICES-003 AS/NZS 4768 |
| Safety | EN 60950-1 ANSI/UL 60950-1 CAN/CSA-C22 60950-1-07 |
| Ingress Protection | IP40 - all orientations IP51 (dust category 2) - front panel connectors facing down |
| Environmental | |
| Low Pressure (Altitude) | MIL-STD-810G 500.5 Proc 2 |
| Humidity | MIL-STD-810G 507.5 Proc 2 |
| Vibration | MIL-STD-810G 514.6 Proc 1 |
| Shock | MIL-STD-810G 516.6 Proc 1 |

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