

TD9300 Data Terminal Installation and Configuration Manual

MNE-00003-09 · Issue 9 · June 2023

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Contact Information

Tait Communications

Corporate Head Office

Tait International Limited
P.O. Box 1645
Christchurch
New Zealand

Imported into the EU by:	Imported into the UK by:
Tait Communications GmbH Stipcakgasse 40 1230 Vienna Austria	Tait Europe Limited Unit A, Buckingham Business Park Anderson Road Swavesey Cambridge, CB24 4UQ United Kingdom

For the address and telephone number of regional offices, refer to our website: www.taitcommunications.com

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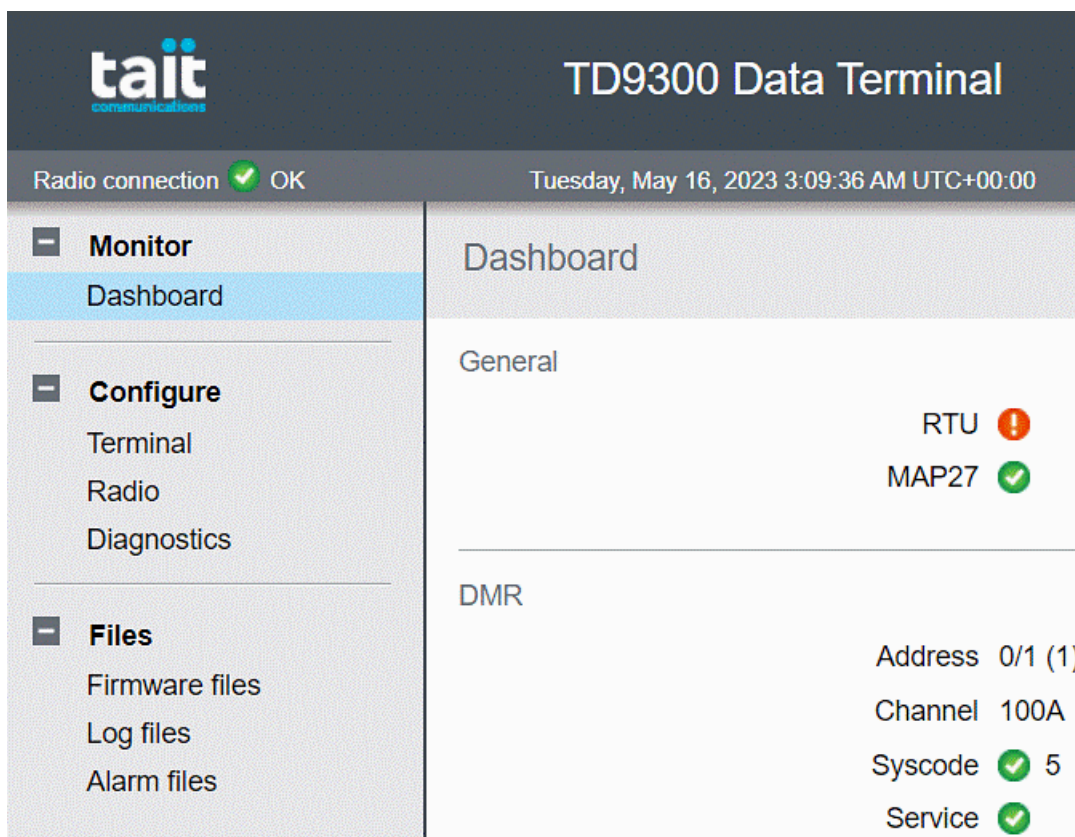
Preface

Scope of Manual

This manual explains how to install, set up, and use the TD9300 Data Terminal in a TN9300 DMR trunked network. It is intended for experienced technicians familiar with installing and operating radio network equipment.

Document Conventions

The TD9300 Data Terminal has a web interface with an accordion menu on the left. 'Select **Monitor** > **Dashboard**' means select the **Monitor** option in the top-level menu, then the **Dashboard** option in the expanded Monitor menu tree.



There are four types of alerts in this manual:



WARNING! There is a hazardous situation which, if not avoided, could result in death or serious injury.



Caution! There is a hazardous situation which, if not avoided, could result in minor or moderate injury.



Information that might improve your understanding of the equipment or procedure.

Note: Information that is required to make sure procedures are done correctly. Procedures performed incorrectly could result in equipment damage or malfunction.

Associated Documentation

Please also see the SCADA Gateway Installation and Configuration Manual (MNE-00020-xx).

Note: The characters **xx** indicate the documentation issue number.

Makes sure you always get the latest issue of a manual from [Tait Technical Support](#).

You can also find software release notes and technical notes (TNs) on the website. These provide technical details not yet in the manuals and solve problems that might arise.

Publication Record

Issue	Publication Date	Description
10	June 2023	<ul style="list-style-type: none">• Added "Regulatory and Compliance Information" on page 12• Made general content enhancements throughout• Updated screenshots• Removed outdated information
9	May 2021	Unreadable screenshots replaced with legible images
8	September 2018	New web interface reference chapter describing fields in web interface
7	March 2018	<ul style="list-style-type: none">• General updates• Specifications chapter updated for content accuracy
6	December 2017	<ul style="list-style-type: none">• General updates for release 1.10• Updated images throughout• Updated 'isolated ports' and 'RF connector' under "Safety" on page 11• TD9300 model terms: non-isolated, isolated v1 and isolated v2 now included throughout• Added subsection "Fuse and Wiring Requirements" on page 23• 'Connections' chapter replaced with 'System Connections' (features "System Connections" on page 22 'Example system connections')• 'Connectors' section split – a 'Pinouts' section now exists• "Specifications" on page 68 chapter updated to include comprehensive general specifications for all TD9300 models
5	April 2017	<ul style="list-style-type: none">• General updates for release 1.05• Added section "Enable or Disable Communication using the Web Interface" on page 38 for those using firmware version 1-06-xx or later
4	February 2017	<ul style="list-style-type: none">• General updates for firmware version 1.04• Added "Confirm Operation" on page 61• Added "Troubleshooting" on page 66
3	July 2016	<ul style="list-style-type: none">• General updates for release 1.03• Added information on isolated models
2	August 2015	<ul style="list-style-type: none">• General updates for release 1.02• Minor updates

Issue	Publication Date	Description
1	June 2015	<ul style="list-style-type: none">• First release• Firmware version 1.00

Safety

Personal Safety

Explosive Environments



WARNING! Do not operate the equipment near electrical blasting caps or in an explosive atmosphere. This is a definite safety hazard.

Equipment Safety

Installation and Servicing Personnel

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

Environmental Conditions

Operating Temperature Range

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

1 Regulatory and Compliance Information

Compliance

Tait International Limited is committed to making sure all our products comply with the regulatory requirements of our markets.

Quality is at the core of the Tait philosophy and core manufacturing processes are certified to meet the stringent requirements of [ISO 9001:2015](#).

Tait is also committed to:

- The environment – certified to ISO 14001:2015
- Safety – certified to ISO 45001:2018
- Information Security – certified to ISO 27001:2013

All shipments from Tait's manufacturing facility into the European Union and North Ireland comply with the Restriction of Hazardous Substances (RoHS) Directive 2011/65/EU. Tait's material supply chain also complies with this directive.

All shipments from Tait's manufacturing facility into the United Kingdom comply with the UK Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 No. 3032.

Distress Frequencies

The 406 to 406.1MHz frequency range is reserved worldwide for use by Distress Beacons.

Do not program transmitters to operate in this frequency range.

EU Simplified Declaration of Conformity

EN Hereby, Tait International Limited declares that the radio equipment type TD9300 Data Terminal is in compliance with Directive 2014/53/EU. The full text of the EU declaration of conformity is available at the following internet address:

taitcommunications.com/our-resources/compliance

BG С настоящото Tait International Limited декларира, че този тип радиосъоръжение TD9300 Data Terminal е в съответствие с Директива 2014/53/ЕС. Цялостният текст на ЕС декларацията за съответствие може да се намери на следния интернет адрес:

taitcommunications.com/our-resources/compliance

ES Por la presente, Tait International Limited declara que el tipo de equipo radioeléctrico TD9300 Data Terminal es conforme con la Directiva 2014/53/UE. El texto completo de la declaración UE de conformidad está disponible en la dirección Internet siguiente:

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CS Tímto Tait International Limited prohlašuje, že typ rádiového zařízení TD9300 Data Terminal je v souladu se směrnicí 2014/53/EU. Úplné znění EU prohlášení o shodě je k dispozici na této internetové adrese:

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DA Hermed erklærer Tait International Limited, at radioudstyrstypen TD9300 Data Terminal TD9300 Data Terminal er i overensstemmelse med direktiv 2014/53/EU. EU-overensstemmelses-erklæringens fulde tekst kan findes på følgende internetadresse:

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DE Hiermit erklärt Tait International Limited, dass der Funkanlagentyp TD9300 Data Terminal der Richtlinie 2014/53/EU entspricht. Der vollständige Text der EU-Konformitätserklärung ist unter der folgenden Internetadresse verfügbar:

taitcommunications.com/our-resources/compliance

ET Käesolevaga deklareerib Tait TD9300 Data Terminal vastab direktiivi 2014/53/EL nõuetele. ELi vastavusdeklaratsiooni täielik tekst on kättesaadav järgmisel internetiaadressil:

taitcommunications.com/our-resources/compliance

EL Με την παρούσα ο/η Tait International Limited, δηλώνει ότι ο ραδιοεξοπλισμός TD9300 Data Terminal πληροί την οδηγία 2014/53/EE. Το πλήρες κείμενο της δήλωσης συμμόρφωσης EE διατίθεται στην ακόλουθη ιστοσελίδα στο διαδίκτυο:

taitcommunications.com/our-resources/compliance

FR Le soussigné Tait International Limited, déclare que l'équipement radioélectrique du type TD9300 Data Terminal est conforme à la directive 2014/53/UE. Le texte complet de la déclaration UE de conformité est disponible à l'adresse internet suivante:

taitcommunications.com/our-resources/compliance

HR Tait International Limited ovime izjavljuje da je radijska oprema tipa TD9300 Data Terminal u skladu s Direktivom 2014/53/EU. Cjeloviti tekst EU izjave o sukladnosti dostupan je na sljedećoj internetskoj adresi:

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IT Il fabbricante, Tait International Limited, dichiara che il tipo di apparecchiatura radio TD9300 Data Terminal è conforme alla direttiva 2014/53/UE. Il testo completo della dichiarazione di conformità UE è disponibile al seguente indirizzo Internet:

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LV Ar šo Tait International Limited deklarē, ka radioiekārta TD9300 Data Terminal atbilst Direktīvai 2014/53/ES. Pilns ES atbilstības deklarācijas teksts ir pieejams šādā interneta vietnē:

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LT Aš, Tait International Limited, patvirtinu, kad radijo įrenginių tipas TD9300 Data Terminal atitinka Direktyvą 2014/53/ES. Visas ES atitikties deklaracijos tekstas prieinamas šiuo interneto adresu:

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HU Tait International Limited igazolja, hogy a TD9300 Data Terminal típusú rádióberendezés megfelel a 2014/53/EU irányelvnek. Az EU-megfelelőségi nyilatkozat teljes szövege elérhető a következő internetes címen:

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MT B'dan, Tait International Limited, niddikjara li dan it-tip ta' tagħmir tar-radju TD9300 Data Terminal huwa konformi mad-Direttiva 2014/53/UE. It-test kollu tad-dikjarazzjoni ta' konformità tal-UE huwa disponibbli f'dan l-indirizz tal-Internet li ġej:
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NL Hierbij verklaar ik, Tait International Limited, dat het type radioapparatuur TD9300 Data Terminal conform is met Richtlijn 2014/53/EU. De volledige tekst van de EU-conformiteitsverklaring kan worden geraadpleegd op het volgende internetadres:
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PL Tait International Limited niniejszym oświadcza, że typ urządzenia radiowego TD9300 Data Terminal jest zgodny z dyrektywą 2014/53/UE. Pełny tekst deklaracji zgodności UE jest dostępny pod następującym adresem internetowym:
taitcommunications.com/our-resources/compliance

PT O(a) abaixo assinado(a) Tait International Limited declara que o presente tipo de equipamento de rádio TD9300 Data Terminal está em conformidade com a Diretiva 2014/53/UE. O texto integral da declaração de conformidade está disponível no seguinte endereço de Internet:
taitcommunications.com/our-resources/compliance

RO Prin prezenta, Tait International Limited declară că tipul de echipamente radio TD9300 Data Terminal este în conformitate cu Directiva 2014/53/UE. Textul integral al declarației UE de conformitate este disponibil la următoarea adresă internet:
taitcommunications.com/our-resources/compliance

SK Tait International Limited týmto vyhlasuje, že rádiové zariadenie typu TD9300 Data Terminal je v súlade so smernicou 2014/53/EÚ. Úplné EÚ vyhlásenie o zhode je k dispozícii na tejto internetovej adrese:
taitcommunications.com/our-resources/compliance

SL Tait International Limited potrjuje, da je tip radijske opreme TD9300 Data Terminal skladen z Direktivo 2014/53/EU. Celotno besedilo izjave EU o skladnosti je na voljo na naslednjem spletnem naslovu:
taitcommunications.com/our-resources/compliance

FI Tait International Limited vakuuttaa, että radiolaitetyyppi TD9300 Data Terminal on direktiivin 2014/53/EU mukainen. EU-vaatimusten-mukaisuus-vakuutuksen täysimittainen teksti on saatavilla seuraavassa internetosoitteessa:
taitcommunications.com/our-resources/compliance

SV Härmed försäkrar Tait International Limited att denna typ av radioutrustning TD9300 Data Terminal överensstämmer med direktiv 2014/53/EU. Den fullständiga texten till EU-försäkran om överensstämmelse finns på följande webbadress:
taitcommunications.com/our-resources/compliance

UK Simplified Declaration of Conformity

Hereby, Tait International Limited declares that the radio equipment type TD9300 Data Terminal is in compliance with Regulation 2017 No. 1206, Telecommunications, The Radio Equipment Regulations 2017.

Here's where you can find the full text of the UK declaration of conformity:

Product	Full Declaration
TD9300 Data Terminal	taitradio.com/our-resources/compliance

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 3 trunked network to exchange DMR control channel and packet data messages with the Tait SCADA Gateway.

The TD9300 Data Terminal transfers industry-standard SCADA protocols over its RS-232/RS-485¹ and Ethernet interfaces. This is to enable interconnection to outstation devices such as RTUs and IEDs.



¹RS-485 only available on T04-00002-xCxx (non-isolated) model.

TD9300 Models

The TD9300 is available in the following models:

Model	DC Input Connector Labeling
<p>T04-00002-xCxx and T04-00002-xExx (non-isolated)</p>  <p>Signal ports and DC input not isolated</p>	
<p>T04-00002-xAxx (isolated v1) with external DC/DC Converter</p>  <p>Only signal ports isolated</p>	

Model

DC Input Connector Labeling

T04-00002-xDxx (isolated v2)



Signal ports and DC input isolated



For all models, the RF port is **not** isolated.

You can identify each model by its DC input connector label. Both isolated models have a warning symbol.

The non-isolated and isolated v1 models have a black powder-coated finish. The initial run of V2 isolated had a grey finish, but all production now has a black powder-coated finish.

The DC input of the T04-00002-xAxx (isolated v1) is electrically isolated with an external DC/DC converter.

Frequency Bands

The TD9300 is available in these frequency bands:

- 136MHz to 174MHz (B1)
- 400MHz to 470MHz (H5)
- 174 to 225MHz (C0)

To learn how the product code identifies the frequency band, see "Tait Product Numbering" on page 24.

LEDs

LED	Color	State	Description
POWER	green	off	Power is not connected to the TD9300.
		steady	Power is connected to the TD9300.
RTU	green	off	<p>The TD9300 is not receiving data.</p> <p>From TD9300 v1.08 onwards the RTU LED behaviour for a serial connected RTU is:</p> <ul style="list-style-type: none"> • Off when the connection is unknown or disabled. • Solid on when the connection is up. • Flashing every two seconds when the connection is down. • Flashing every 500 milliseconds during data transfer.
		flashing (100ms)	<p>The TD9300 is receiving a message (for transmission over Tait GridLink).</p> <p>This will happen for proxy SCADA connections over serial or Ethernet, or for any IP packets transmitted by an externally connected RTU or other device. There is no flash for outgoing transmissions to an RTU.</p> <p>This LED will also flash if any other IP activity originates on the TD9300 – for example ping/SCP/SSH over Tait GridLink.</p>
DMR	green	off	The TD9300 is not on or the data terminal application is not running.
		flashing – one second intervals	The RF board is trying to register on the DMR network ^a .
		flashing – two second intervals	The RF board is not communicating with the TD9300 application.
		steady	The TD9300 is registered on the DMR network.
1	From TD9300 v1.06 onwards, LEDs 1 and 2 will flash simultaneously at 500ms intervals while the TD9300 is in radio programming mode (when selected from the TD9300 web user interface).		
2			
Ethernet link status/activity	amber (isolated)	flashing	Activity present
	green (non-isolated)	steady	Link connected
Ethernet link speed	green (isolated)	off	10BASE-T
	amber (non-isolated)	steady	100BASE-T

^aThere can be a delay of up to two minutes between the steady and flashing states (1-second intervals) when the radio switches from registered, to trying to register.

Connectors

This section describes the connectors along with their signals and pinouts. It also illustrates basic system connections.

Overview of Connectors

The TD9300 has these connectors:

Connector	T04-00002-xCxx (non-isolated)	T04-00002-xAxx (isolated v1)	T04-00002-xDxx T04-00002-xExx (isolated v2)
LMR	BNC connector for RF input and output. 50Ω impedance Note: The maximum RF input level is +27dBm. Higher levels might damage the TD9300.		
Ethernet	10BASE-T or 100BASE-T connection to the RTU/IED or the network. Also used to configure the TD9300 Data Terminal from a web browser.		
Serial 1	RS-232/RS-485 connection to an RTU/IED.	RS-232 connection to an RTU/IED. Note: A shielded serial cable must be used to maintain integrity of the immunity protection.	
Serial 2	RS-232/RS-485 connection to the TD9300 data terminal.	RS-232 connection to the TD9300 data terminal. Note: A shielded serial cable must be used to maintain the integrity of the immunity protection.	
Digital I/O	Two digital inputs, two digital outputs.		
DC input	9–36V DC, 15A max (12 or 24 V DC nominal) with negative earth)	24VDC nominal, 4.5A max, external DC/DC converter with positive or negative earth	9–36V DC, 15A max, (12 or 24 VDC nominal) with positive or negative earth
	TD9300 comes with a matching cable connector.		
Ground	M4 chassis ground connector. TD9300 comes with an M4x10mm screw and washers.		



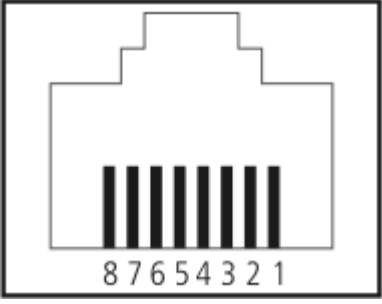
For more information on these signals, see "Specifications" on page 68.

Pinouts

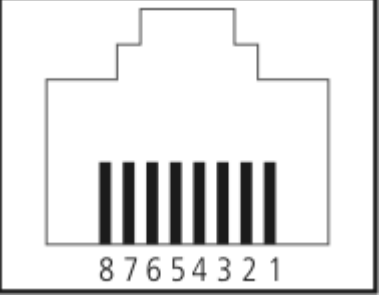
LMR Connector

Pinout	Pin	Signal Name	Signal Type
	1	RF	RF analog
	2	GND	RF ground

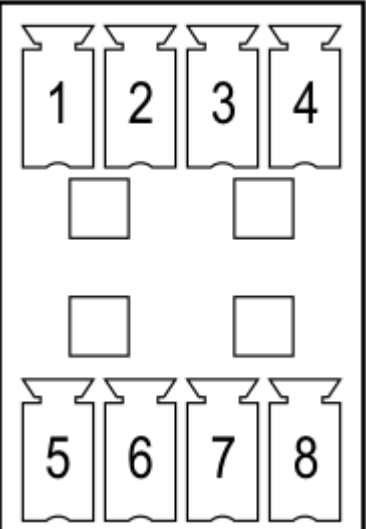
Ethernet Connector

External View	Pin	Description
	1	transmit data+
	2	transmit data-
	3	receive data+
	4	not connected
	5	
	6	receive data-
	7	not connected
	8	

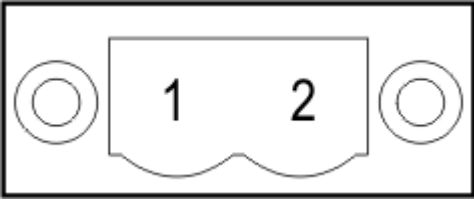
Serial Connectors

External View	Pin	Description
	1	not connected
	2	
	3	
	4	ground
	5	RS232 transmit data out from TD9300 (or RS485-)
	6	RS232 receive data in to TD9300 (or RS485+)
	7	clear to send out from TD9300
	8	request to send in to TD9300

Digital Input-Output Connector

External View	Pin	Description
	1	input 1+
	2	input 1-
	3	input 2+
	4	input 2-
	5	output 1A
	6	output 1B
	7	output 2A
	8	output 2B

DC Connector

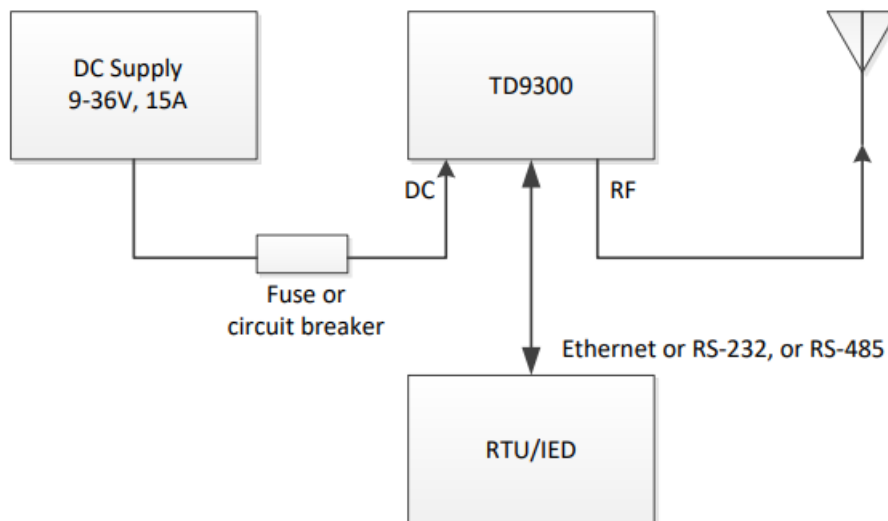
External View	Pin	Description
	1	-V input
	2	+V input

System Connections

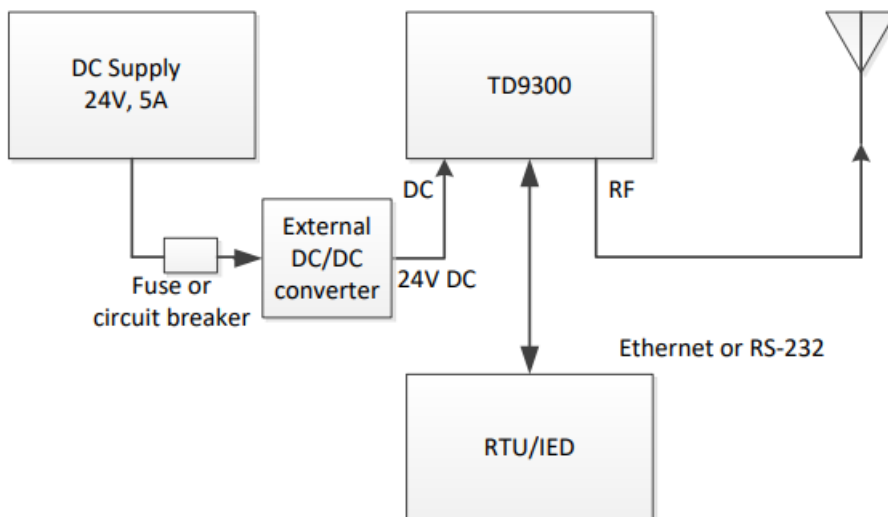
This flowchart shows examples of the basic system connections when a TD9300 Data Terminal is used with an RTU or IED.

Note: All cables (except the RF cable) that are connected to the TD9300 Data Terminal must be less than 10ft (3m) long.

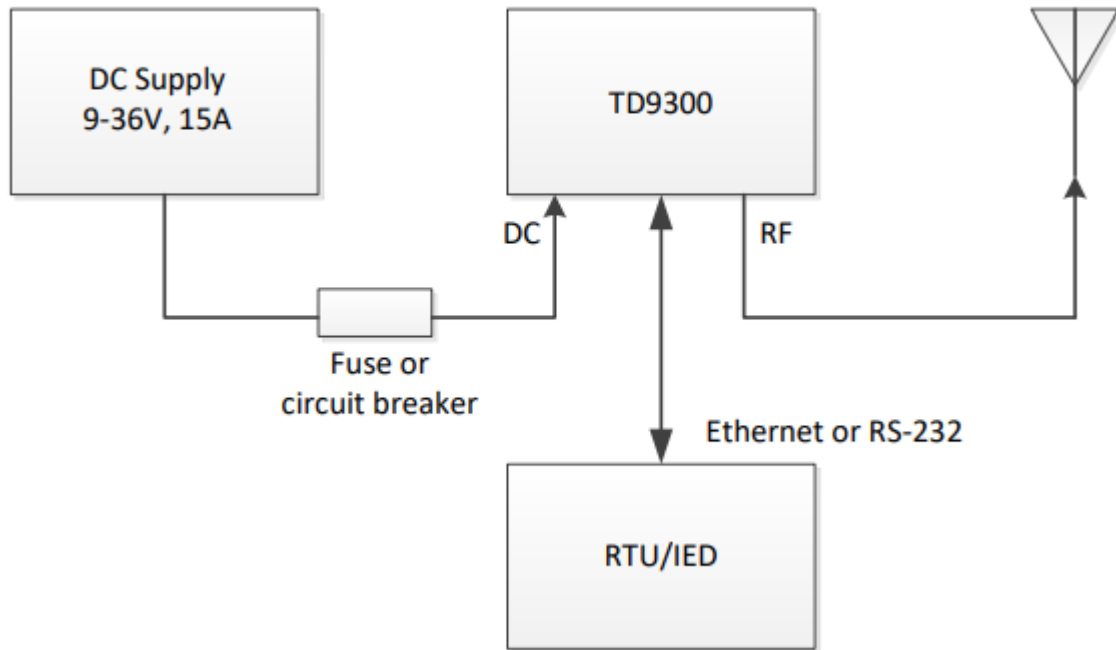
T04-00002-xCxx (Non-Isolated)



T04-00002-xAxx (Isolated v1)



T04-00002-xDxx and T04-00002-xExx (Isolated v2)



System connections



You can identify isolated models by the warning  icon above the DC input connector. See "TD9300 Models" on page 17 for more information.

Fuse and Wiring Requirements

The TD9300 must be connected to the DC power supply using a fuse with a maximum rating of:

- 10A/250VP (Littlefuse Type 314 or equivalent) for 12V operating at 25W RF Power
- 5A/250VP (Littlefuse Type 314 or equivalent) for 24V operating at 25W RF Power

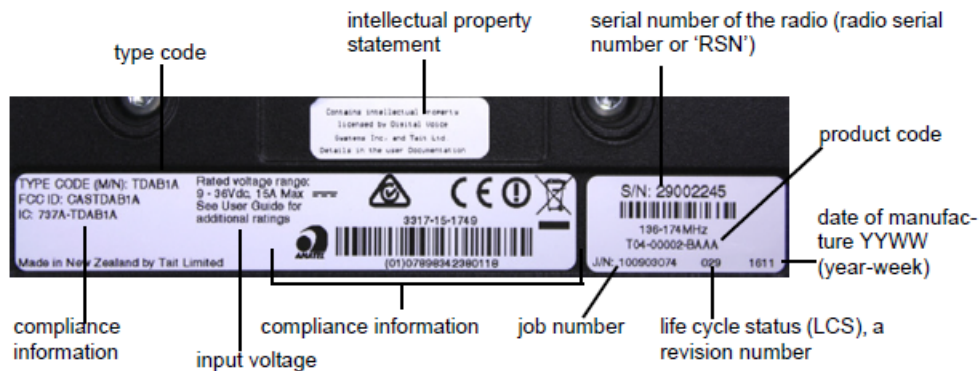
The supply leads between the external PSU and the TD9300 should be as short as possible.

For all installations the minimum recommended gauge of the DC supply leads is 2mm² or 14AWG.

Labels

The labels provide important information about the device.

Note: Do not remove the labels!



Labels

Tait Product Numbering

Product Codes

For the TD9300, the Tait product codes follow the **T04-00002-XXXX** format:

- **T04** identifies the code for a data terminal radio
- **00002** identifies the product as a TD9300
- **XXXX** (alphabetic) identifies the configuration

The product code is printed on the label.

Product Code Configuration

The final four digits of the product code describe the configuration.

X	X	X	X
		Software Features	
		A	Default
	Models		
	C	Signal ports and DC input not isolated ('non-isolated')	
	A	Signal ports only isolated ('isolated v1')	
	D	Signal ports and DC input isolated ('isolated v2') – grey chassis	
	E	Signal ports and DC input isolated ('isolated v2') – black chassis	
Transmit power and frequency band			
B		136 to 174MHz (B1)	
C	25W	174 to 225MHz (C0)	
J		400 to 470MHz (H5)	

Type Codes (Compliance Codes)

Along with a product code, each device has a type code. A type code is a regulatory compliance code that identifies the unique characteristics of individual devices. The type code is printed on the label.

The characters used in the type code are numeric or uppercase alphabetic. The type code has six or eight characters in this format:

TDAcdx

T	Tait
D	Data terminal
A	TD9300 series
cd	Frequency Bands of device – See "Frequency Bands" on page 18
x	Unique character showing the distinct set of compliance attributes for this device

3 Installation

DIN Rail Mounting

You can mount the TD9300 Data Terminal on a standard 35mm DIN rail using the optional DIN rail adaptor (mounting kit T04-00088-0000).

Ten holes are provided on the bottom of the chassis for mounting this adaptor using M3 Taptite screws – see "System Connections" on page 22 and "Flat Mounting" on page 28. These holes enable the TD9300 Data Terminal to be mounted flat against the DIN rail. You can mount up to two TD9300s this way across a 19-inch rack or cabinet.

Note: Make sure the mounting rail is strong enough to bear the weight of the TD9300 Data Terminal without bending. It must also be rigid enough to prevent excessive vibration of the TD9300 Data Terminal.



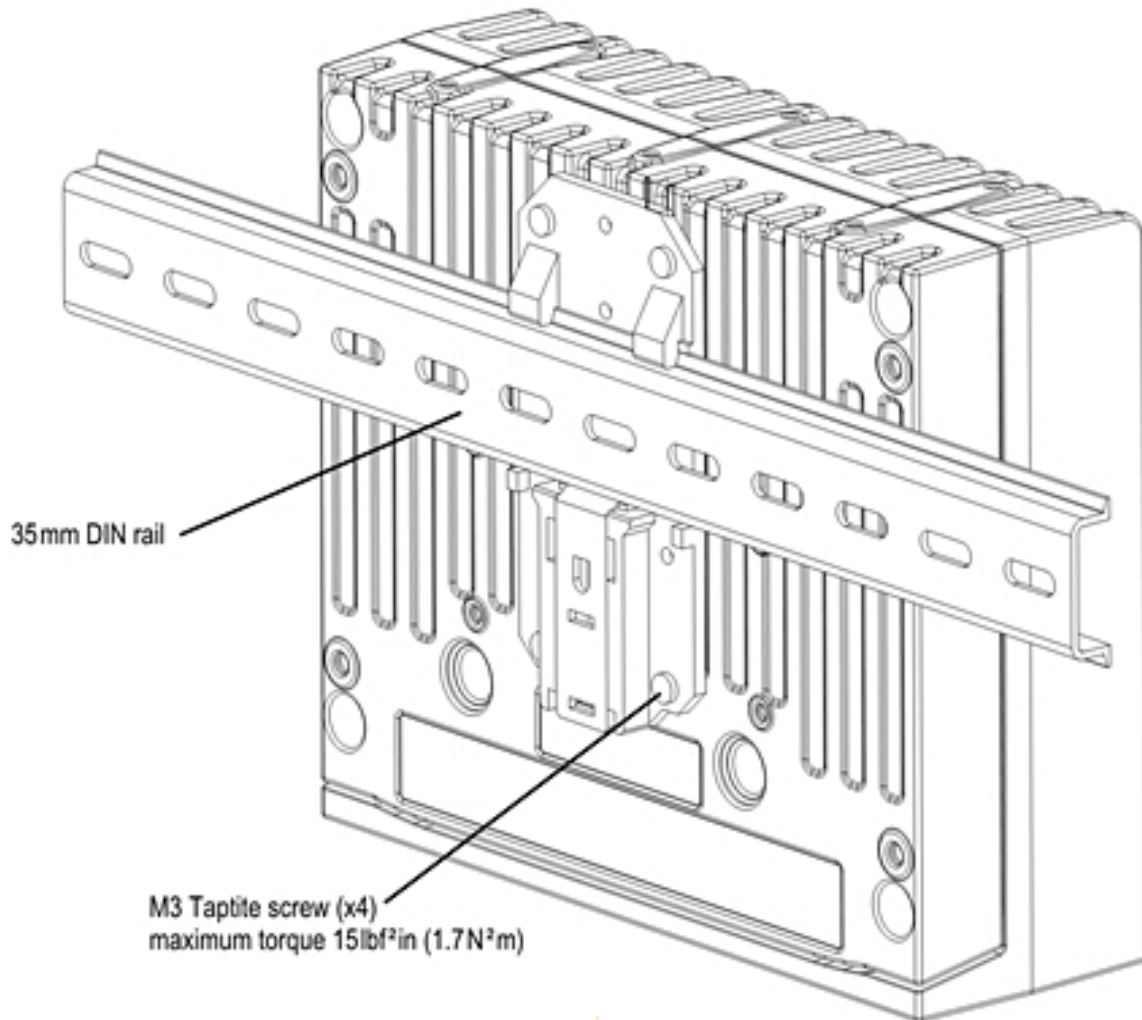
If access to the rear of the TD9300 Data Terminal is restricted when installed, it might be difficult to release the latch to remove the TD9300 later. Before mounting the TD9300, feed a cable tie through the hole in the end of the latch and fasten it into a loop. This might help pull the latch open later if you need to.

Mounting

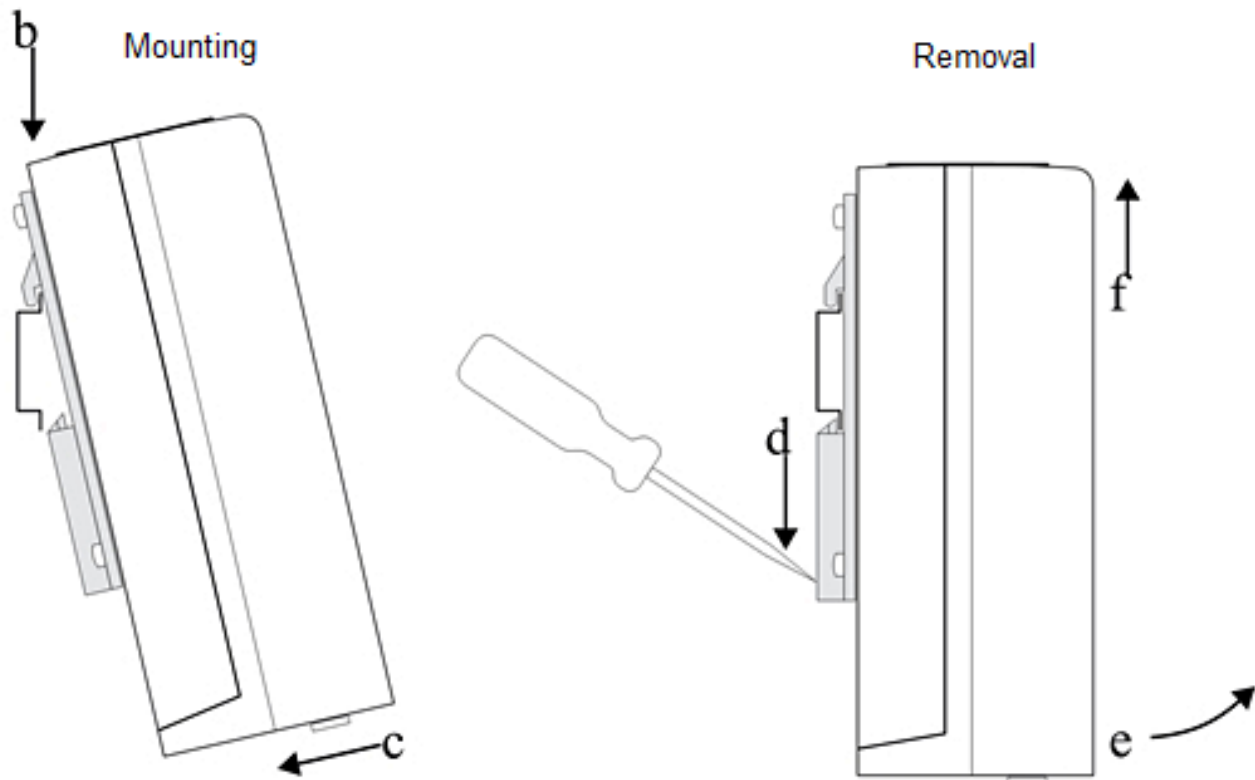
1. Mount the DIN rail adaptor to the bottom of the TD9300 Data Terminal as shown, using four M3 Taptite screws.
2. Use a Torx T10 driver and tighten to a maximum torque of 15lbf·in (1.7N·m).
3. Fit the top of the adaptor to the top of the DIN rail **(b)**.
4. Push the bottom of the adaptor in and down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

Removal

1. Insert a flat-bladed screwdriver into the latch **(d)**.
2. Push the screwdriver down to hold the latch open.
3. Pull the bottom of the adaptor away from the rail **(e)**.
4. Lift the TD9300 Data Terminal off the rail **(f)**.



Recommended mounting method



DIN rail mounting

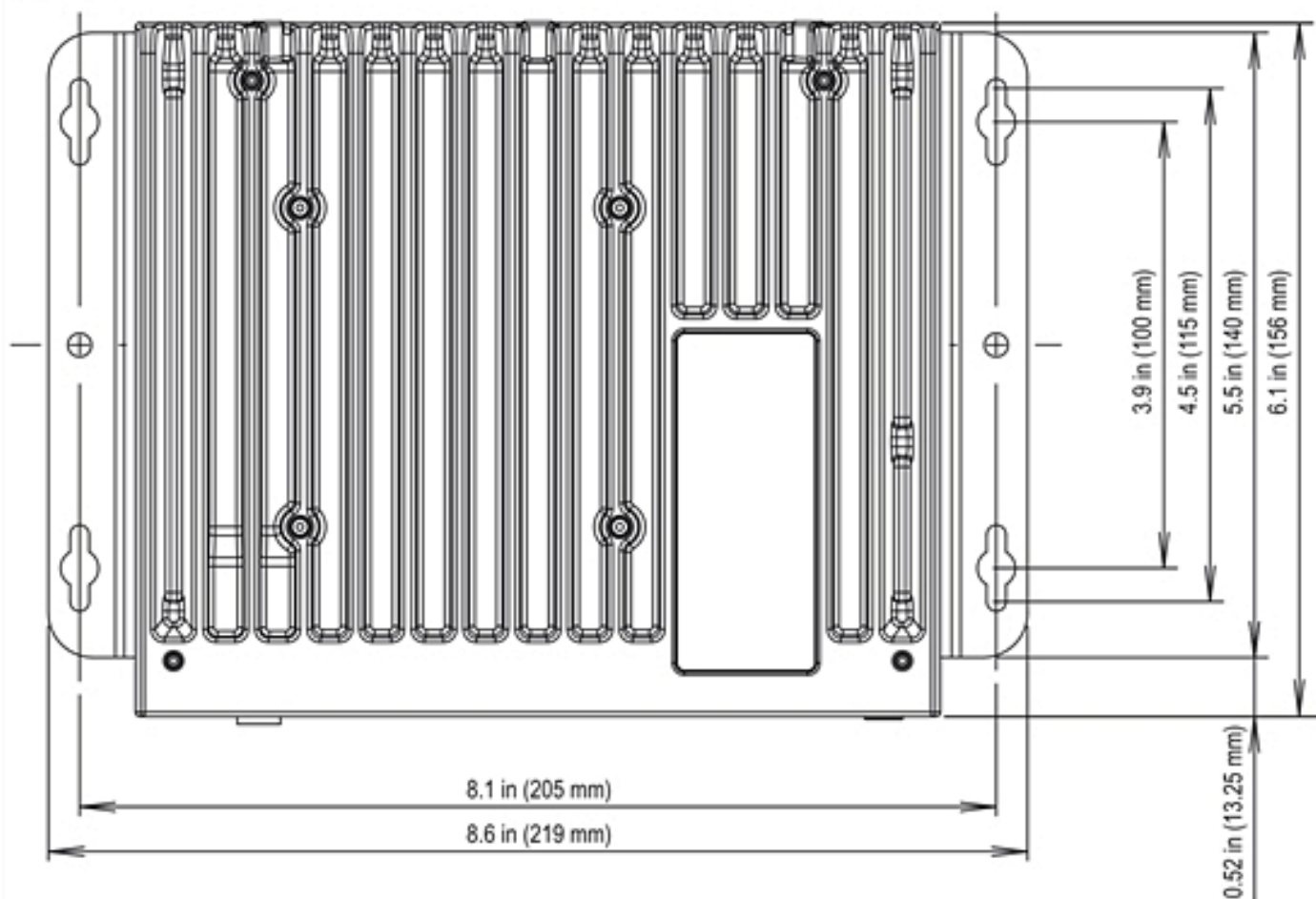
Flat Mounting

You can also mount the TD9300 Data Terminal directly on a flat surface using the optional mounting brackets (mounting kit T04-00088-0001 – see image below).

Four holes are provided on the bottom of the chassis for securing these brackets with the M4x12 Taptite screws supplied with the TD9300 Data Terminal. Tighten to a maximum torque of 22lbf·in (2.5N·m).

If you need to use a different mounting method, the measurements for these mounting holes are provided in the second image below.

Top view



Front view

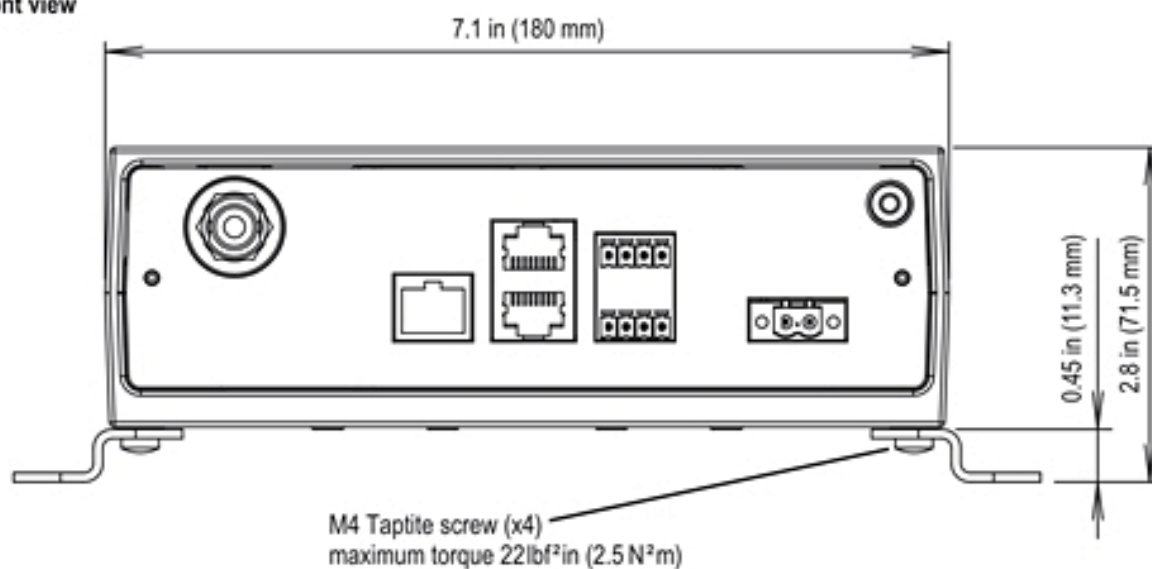
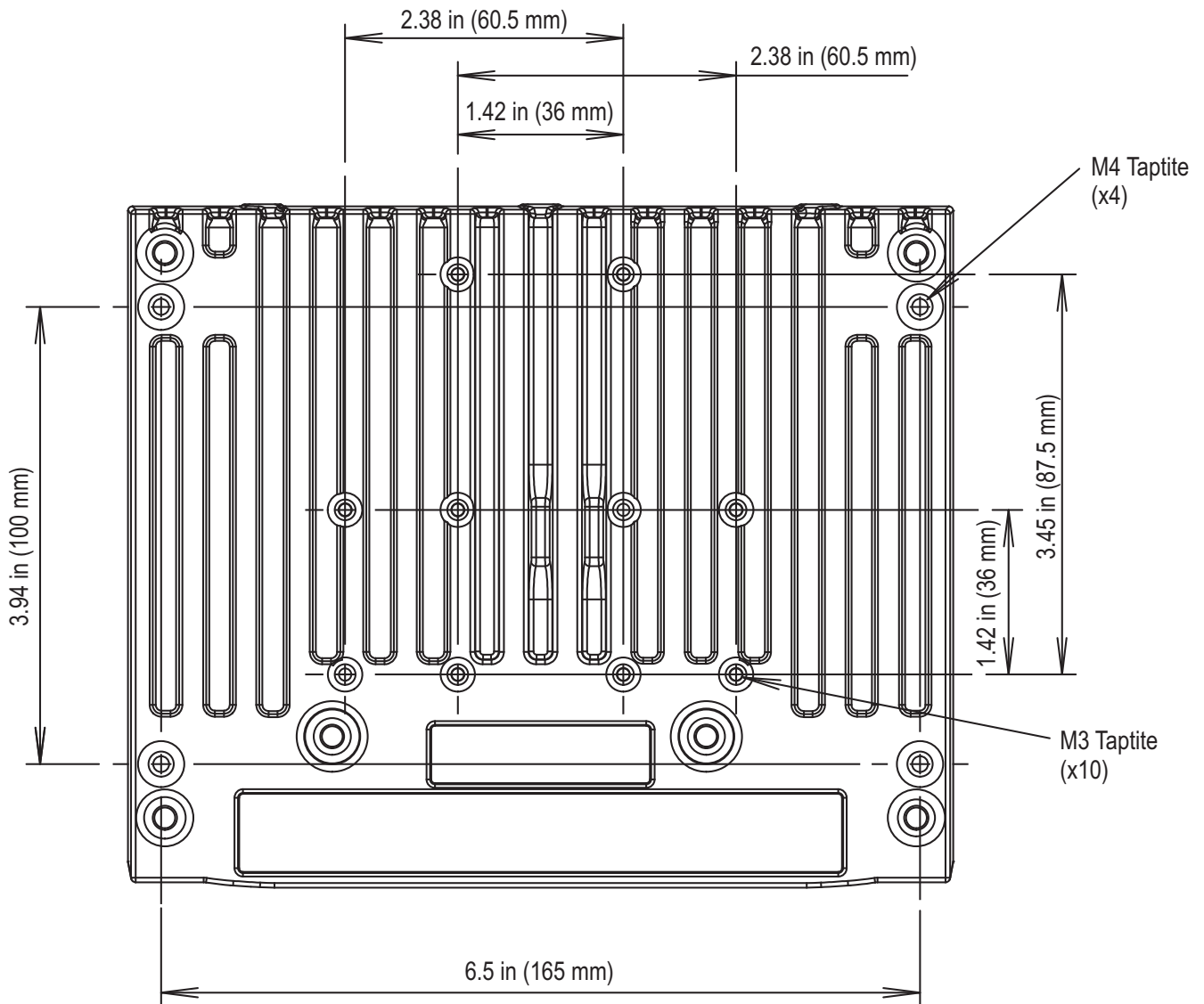


Figure 3.1 Flat mounting



Location of mounting holes in the chassis

Taptite Screws

The mounting holes in the chassis of the TD9300 Data Terminal are designed for use with trilobular thread-rolling screws, such as Taptite – see the second image under "Flat Mounting" on page 28.



Caution! Only use the Taptite screws provided with the TD9300 to mount the unit. Using any other kind of screw risks possible damage to the chassis and mounting the TD9300 insecurely.

IP Rating

The TD9300 Data Terminal has an IP40 rating when mounted in any orientation. It also has an IP41 rating when mounted with the front panel connectors facing down.

4 Connecting to the TD9300

To access the TD9300, you can connect through the Ethernet port using the web interface or an SSH-over-IP application. You can also connect through the SERIAL 2 connection with a terminal emulator application.



You can use a terminal application such as [PuTTY](#) to access the TD9300 via SSH or a serial connection.

To access the TD9300 for monitoring and configuration, you can use a web browser connected via Ethernet. You will also need an Ethernet connection to activate radio programming mode. This is so you can read or program the LMR module in the TD9300 using the Tait DMR Terminals Programming application.

If you are connecting through the Ethernet port and you do not know the TD9300 IP address, you can get the address by connecting to the TD9300 with a serial connection.

Connect using a Serial Connection

Requirements

- PC with serial port – use T04-00088-0004 USB to serial adapter if no serial port is available
- TD9000 serial cable – 219-03609-00 (order as **T04-00088-0005**)
- Terminal application

Connect to the TD9300

1. On the TD9300, connect a TD9000 serial cable between the PC serial port and the SERIAL 2 connector (to the main board).
2. Using the terminal application, connect with the serial parameters set to:
 - 115200 baud
 - 8 data bits
 - 1 stop bit
 - no parity
3. Log in using the default credentials:
 - Username – **tainet**
 - Password – **taid**

Administrator-level Commands

Once you've logged in using SSH or serial, most commands require root level access:

Enter **su** and the root access password **K1w1k1w1**

From TD9300 firmware version 1.04, you can also use the sudo command in front of commands that require root-level access.



Tait networks are deployed with weak passwords by default. Users are responsible for creating stronger passwords.

Connect using the Ethernet Port

Requirements

- PC with Ethernet port
- RJ-45 network cable
- Web browser
- SSH application



Before connecting to the TD9300 using the web browser or an SSH application, you need to configure the PC's IP address. See "Configure the PC's IP Address" on page 34.

Find the TD9300 IP Address and Subnet Mask

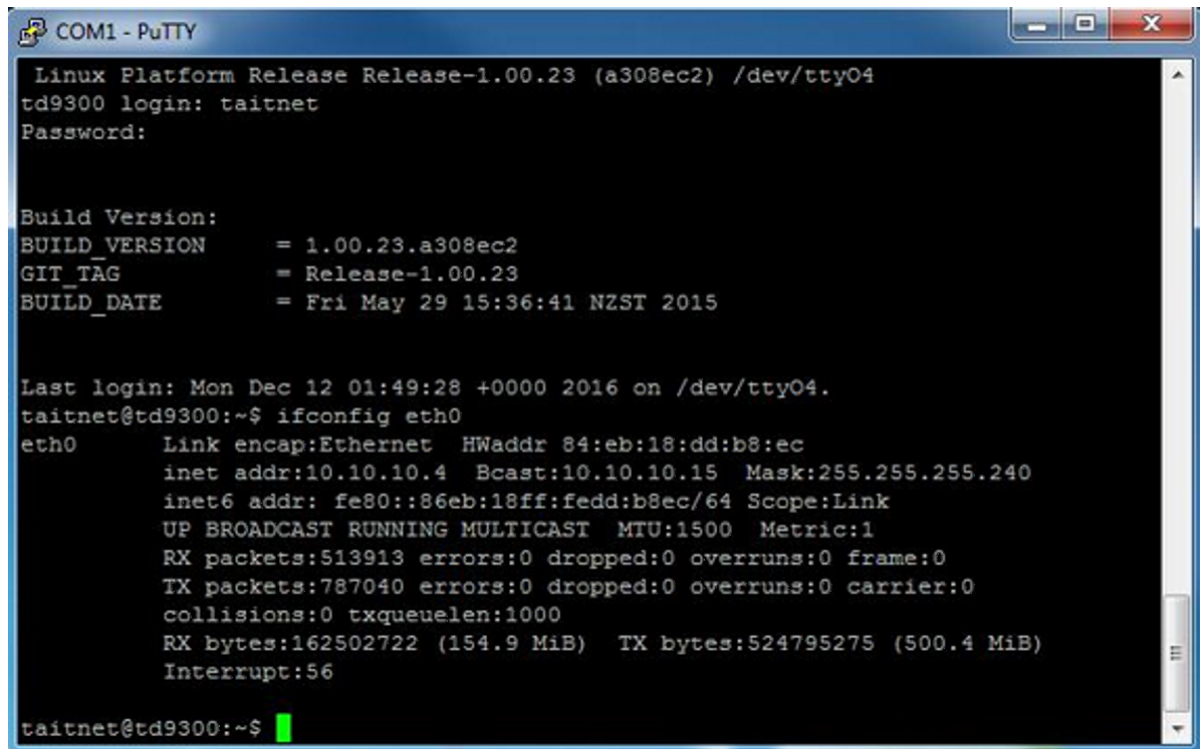
If you are connecting through the Ethernet port and you do not know the TD9300 IP address, you can get it by connecting with a Serial Connection. See "Connect using a Serial Connection" on page 31.

i The default IP address is **192.168.1.1**

1. Enter **ifconfig eth0**

In the example below, the TD9300 IP address and subnet mask are listed as:

- inet addr – **10.10.10.4**
- Mask – **255.255.255.240**



```
COM1 - PuTTY
Linux Platform Release Release-1.00.23 (a308ec2) /dev/ttyO4
td9300 login: taitnet
Password:

Build Version:
BUILD_VERSION      = 1.00.23.a308ec2
GIT_TAG            = Release-1.00.23
BUILD_DATE         = Fri May 29 15:36:41 NZST 2015

Last login: Mon Dec 12 01:49:28 +0000 2016 on /dev/ttyO4.
taitnet@td9300:~$ ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 84:eb:18:dd:b8:ec
          inet addr:10.10.10.4  Bcast:10.10.10.15  Mask:255.255.255.240
          inet6 addr: fe80::86eb:18ff:fedd:b8ec/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:513913 errors:0 dropped:0 overruns:0 frame:0
          TX packets:787040 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:162502722 (154.9 MiB)  TX bytes:524795275 (500.4 MiB)
          Interrupt:56

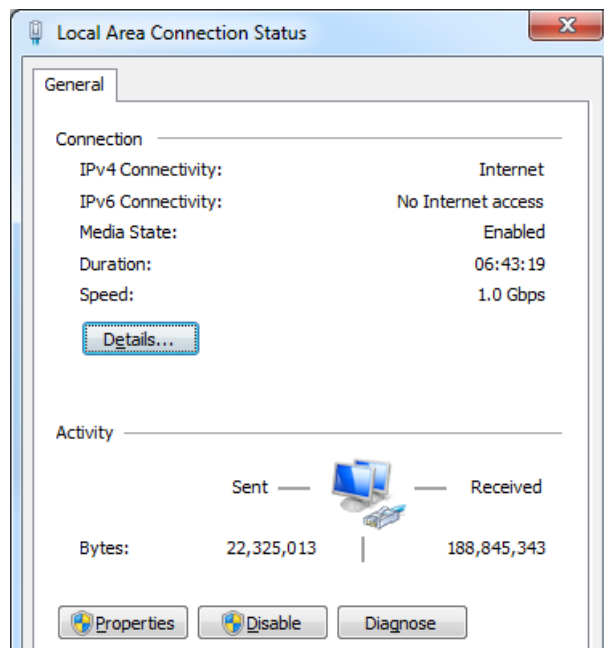
taitnet@td9300:~$
```

i The IP addresses of the TD9300 and the PC need to be in the same subnet but they cannot be the same. You can use a subnet mask calculator to establish the range.

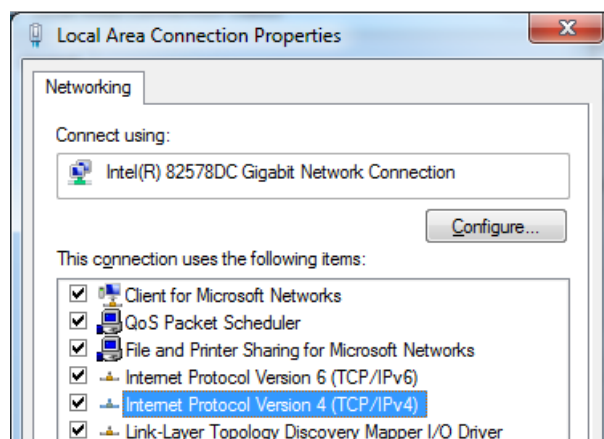
2. Enter **exit** to disconnect from the session.
3. Close the terminal window.

Configure the PC's IP Address

1. Open the **Control Panel** app.
2. Enter **Control panel** in the Windows Search bar.
3. Select **Network and Internet** > Select **Network and Sharing Center**.
4. Select **Change Adapter Settings**.
5. Open **Local Area Connection**.
6. Select **Properties**.

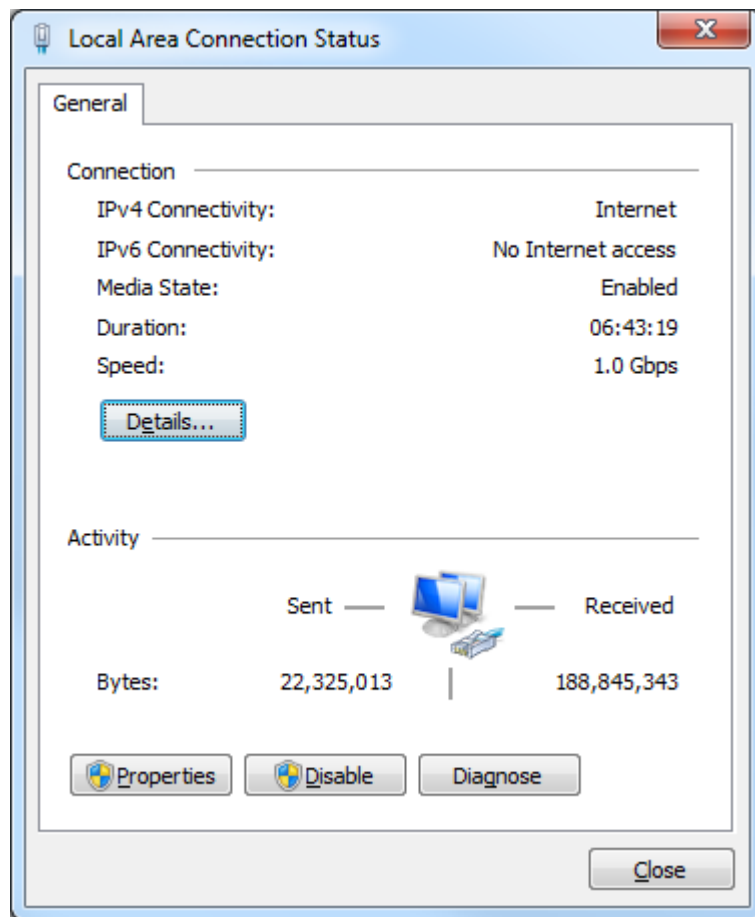


7. Select **Internet Protocol Version 4 (TCP/IPv4)** > Select **Properties**.



The IP addresses of the TD9300 and the PC need to be in the same subnet but they cannot be the same. You can use a subnet mask calculator to establish the range.

8. Select **Use the following IP address** > Enter an IP address in the same subnet as the TD9300.



9. Select **OK** > Select **OK** on the Local Area Connection Properties dialog.

Connecting to the TD9300 Web Interface

You can use the TD9300 web interface to access these menu items:

Monitor	The TD9300 dashboard (under Monitor > Dashboard) shows the current status of the TD9300.
Configure	The terminal configuration page (under Configure > Terminal) lets you configure the Ethernet port, address, and protocol settings.
Files	Lets you delete, upload, and install firmware files. You can also download or delete alarm and log files in this area.



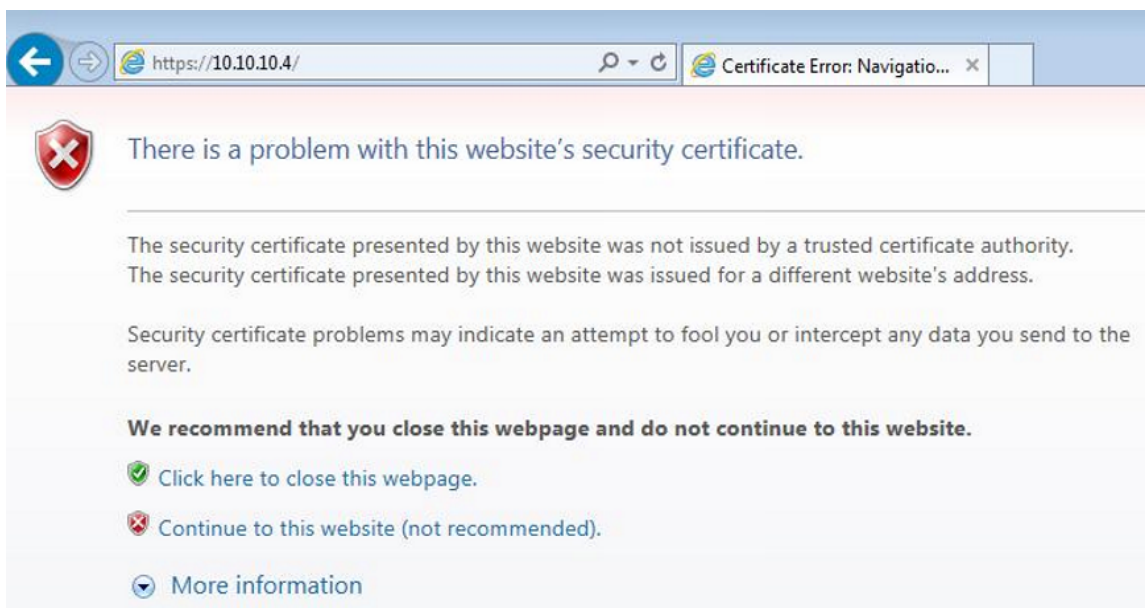
Before connecting to the TD9300 using the web browser or an SSH application, you need to configure the PC's IP address. See "Configure the PC's IP Address" on page 34.

Connect to the TD9300 Web Interface

1. Enter **https://<IP address>**

The default IP address of the TD9300 is **192.168.1.1**


A security certificate warning might appear.



2. Select **Continue to this website**.
3. Select **Continue** on the authorization warning.
4. Log in to the TD9300 Data Terminal web interface with these default credentials:
 - Username – **taitnet**
 - Password – **tait**

Note: After logging into the TD9300 web interface, a mismatch warning might display to show the TD9300 has received a remote applications upgrade. Due to over-air data size limitations, a remote upgrade does not include the TD9300 web interface components. The web interface will still function, but some features might be missing or operate unexpectedly. The TD9300 needs to receive a local firmware upgrade to the same version as


shown in the (app) reference, or a later version. See "Upgrade the Main Board Firmware" on page 60.


**Warning**

Version mismatch detected, please upgrade the firmware.

01.06.03.433565(app)
01.04.02.423330(ui)

The dashboard shows the current state of the TD9300:



TD9300 Data Terminal

Radio connection  OK Tuesday, May 16, 2023 3:09:36 AM UTC+00:00



- [-] Monitor
 - Dashboard
- [-] Configure
 - Terminal
 - Radio
 - Diagnostics
- [-] Files
 - Firmware files
 - Log files
 - Alarm files

Dashboard

General

RTU	
MAP27	

DMR

Address	0/1 (1)
Channel	100A
Syscode	 5
Service	

Enable or Disable Communication to the RF Board

The firmware version stipulates the method used to enable or disable communication to the RF board:

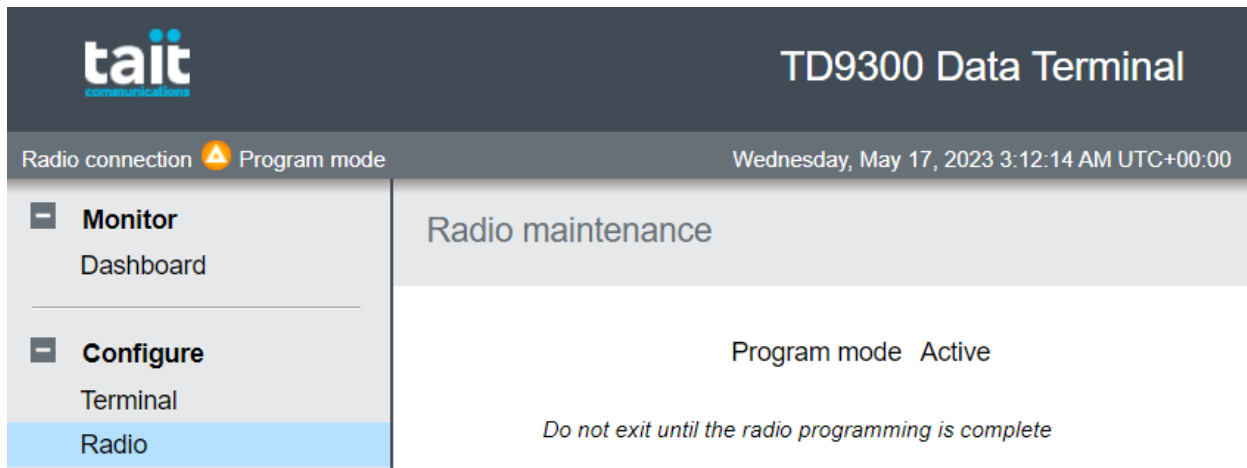
- If you are using firmware version **1.06.xx** or later, you can enable communication using the "Enable or Disable Communication using the Web Interface" below
- If the TD9300 firmware version is **1.05.xx** or earlier, you will need to upgrade it to a later version to activate radio programming mode from the web interface

Enable or Disable Communication using the Web Interface

Enable Communication

Once you've connected to the web interface:

1. Open the web interface.
2. Select **Configure > Radio**.



3. Select **Enter program mode** at the bottom of the page.

Disable Communication

1. Select **Exit program mode**.
2. Select **Log out** in the top-right corner of the web interface.

5 Configuration

Configure the TD9300 Ethernet Port

You can use any of these methods to edit the network configuration of the Ethernet port:

- Use the TD9300 web UI
- Connect to the SERIAL 2 port
- Use SSH over Ethernet

Configure IP Settings using the Web UI

1. Connect to the TD9300 Web Interface.
See "Connect to the TD9300 Web Interface" on page 36.
2. Select **Configure** > **Terminal** to go to the Configuration page.
3. Select **Edit**.
4. Enter an IP address for the TD9300 Ethernet port in the **Address** field.
5. Enter a Netmask
The default is **255.255.255.0**
6. In the **Gateway** field, enter the same IP address used in step 4.
If the TD9300 connects to an Ethernet router (uncommon), enter the router IP address in the **Gateway** field.
7. In the SCADA gateway **IP networks** field, enter the address range of the SCADA master(s) that access the SCADA gateway.
This field is used to determine routing of unsolicited SCADA traffic from the SCADA Gateway to the SCADA Master(s).
CIDR notation is accepted – for example, **172.16.67.0/24**

8. Select **Save**.

The screenshot displays the configuration page for the TD9300 Data Terminal. On the left, a sidebar contains navigation options: 'Monitor' (with sub-items 'Dashboard'), 'Configure' (with sub-items 'Terminal', 'Radio', 'Diagnostics'), and 'Files'. The 'Terminal' option under 'Configure' is highlighted. The main area is titled 'Configuration' and is divided into two sections: 'DMR' and 'Network'. The 'DMR' section has a 'DIP address' field containing '0/21 (21)'. The 'Network' section contains four fields: 'Address' (172.27.2.221), 'Netmask' (255.255.255.0), 'Gateway' (172.27.2.254), and 'SCADA gateway IP networks' (10.100.100.0/24). At the top, the interface shows the 'tait communications' logo, the title 'TD9300 Data Terminal', and a status bar with 'Radio connection OK' and the timestamp 'Wednesday, May 17, 2023 3:26:47 AM UTC+00:00'.

Configure IP Settings with a Direct Connection

You can also configure IP settings for the TD9300 Data Terminal by connecting directly through SERIAL 2, or the Ethernet port:

1. Connect to the TD9300 using a terminal or SSH application.
See "Connect using a Serial Connection" on page 31 and "Connect using the Ethernet Port" on page 32.
2. To change the IP address, Subnet Mask, and Gateway address of the Ethernet port, enter this command:

```
sudo tait-config -A <TD9300-ip-address> -N <subnet-mask> -G <gateway-address>1
```

For example:

```
tait-config -A 192.168.1.1 -N 255.255.255.0 -G 192.168.1.1
```

3. Verify the Ethernet port configuration by connecting a host to the Ethernet port and sending a ping to the TD9300 Data Terminal:

```
ping <TD9300-ip-address>
```

For example:

```
ping 192.168.1.1
```

¹Before v1.04, you could get root user access using the **su** (password **K1w1k1w1**) command, rather than the **sudo** command.

Address and Protocol Configuration Settings

You can configure addressing and protocol settings in the TD9300 web UI. This section explains how to do this and describes the parameters you can configure.

Configure Address or Protocol Settings using the Web UI

1. Connect to the TD9300 Web Interface.
See "Connect to the TD9300 Web Interface" on page 36.
2. Select **Configure** > **Terminal** to open the Configuration page.
3. Select **Edit**.
4. Select a SCADA protocol from the drop-down list.
5. Select a SCADA configuration type from the **Connection** drop-down list:
 - If you select **TCP**, you must enter the RTU IP address and port number (separated by a semicolon) in the IP Address field – for example **172.25.2.101:20000**.
 - If you select **Serial**, you must also select the **Baud**, **Parity**, and **Flow Control** values from the drop-down lists.
6. Select **Save**.

Enable Transportation of Transparent IP Data

1. Connect to the TD9300 Web Interface.
2. Select **Configure** > **Terminal** to go to the Configuration page.
3. Set the SCADA Protocol to **None**.
4. Select **Save**.

Program the RF Board

The RF board must be configured with network and addressing parameters that are compatible with the DMR network and fleet plan.

1. Connect to the TD9300 RF board.
See "Enable or Disable Communication to the RF Board" on page 38.
2. Use the TM9300/TP9300 programming application to read the configuration file from the RF board.
The TD9300 will appear as a TM9300 in the programming application.
3. Configure these fields:

Feature	Form	Field	Setting
Startup Mode	Global Features > Startup	Startup Mode	Trunked
RAP Port	Global Features > Serial Protocol > RAP	RAP Enabled	Enabled
		RAP Port	Mic
		Baud Rate	115200
		Link Layer Type	Full 1.5
Hunting Parameters	Trunked Features > Network Settings > Hunting Params > Common	Background Hunt	Disabled
		Comprehensive Hunt	Enabled
		Site Select and Resuming Hunt	
		Auto Register at Power On	
For isolated TD9300 with External DC-DC Converter	Trunked Features > Network Settings > Trunked Channels	Vote Now Operation	Disabled
		Power	Low (for all channels)



For more information on these fields, see the Help in the TM9300/TP9300 programming application.

4. Program the new configuration into the RF board and save a copy of the configuration file.
5. Disable communication to the RF board.

6 Web Interface Reference

Monitor > Dashboard

The screenshot shows the web interface for the TD9300 Data Terminal. At the top left is the 'tait communications' logo. The title 'TD9300 Data Terminal' is displayed in the top right. Below the header, a status bar shows 'Radio connection' with a green checkmark and 'OK', and the date and time 'Tuesday, May 16, 2023 3:09:36 AM UTC+00:00'. The main content area is divided into a left sidebar and a right main panel. The sidebar has three sections: 'Monitor' (with 'Dashboard' selected), 'Configure' (with sub-items 'Terminal', 'Radio', and 'Diagnostics'), and 'Files' (with sub-items 'Firmware files', 'Log files', and 'Alarm files'). The main panel is titled 'Dashboard' and contains two sections: 'General' and 'DMR'. The 'General' section shows 'RTU' with a red warning icon and 'MAP27' with a green checkmark. The 'DMR' section shows 'Address 0/1 (1)', 'Channel 100A', 'Syscode' with a green checkmark and '5', and 'Service' with a green checkmark.

Section	Item	Status
General	RTU	Warning (Red exclamation mark)
	MAP27	OK (Green checkmark)
DMR	Address	0/1 (1)
	Channel	100A
	Syscode	OK (Green checkmark) 5
	Service	OK (Green checkmark)

RTU

Shows RTU connectivity when a proxied SCADA protocol is used. It is not used when the SCADA protocol is set to **none**.

Status	Meaning
Green	Data has been sent to an outstation device connected to the TD9300. The TD9300 has received a response from the RTU.
Red	Data has been sent to an RTU connected to the TD9300, but the RTU has not replied.
Unknown	There has been no data activity with the RTU.

The RTU indicator on the TD9300 top panel mirrors this indicator:

Status	Meaning
On	Data has been sent to an RTU connected to the TD9300. The TD9300 has received a response from the RTU.
Off	There has been no data activity with the RTU.
Flashing continuous	Data has been sent to an RTU connected to the TD9300, but the RTU has not replied.
Short flash	RTU data received.

MAP27

This shows whether there is correct communication with the radio module inside the TD9300.


If a failed connection is shown, check the configuration of the TM9300 radio module – See "Program the RF Board" on page 42.

For the v1 isolated TD9300, make sure the supply voltage is approximately 24V or the radio module will not be activated.

DMR

Address	ID programmed into the radio module in MPT1327 format (and DMR raw format in brackets).
Channel	Current DMR channel number and timeslot (A or B) the radio module is on. This will be a control channel or a traffic channel.
Syscode	The syscode received from the control channel the radio module is registered to.
Service	Shows when the radio module is correctly registered to a DMR site. The DMR LED on the TD9300 top panel mirrors this indicator: <ul style="list-style-type: none">• On indicates DMR service• 1-second flashing means not registered There can be a delay of up to two minutes between the steady and flashing (one-second intervals) states when the radio switches from registered to trying to register.
RSSI	RF signal level received at the TD9300 antenna port on the current DMR channel: <ul style="list-style-type: none">• Green – Signal received is greater than -99dBm• Orange – Signal received is between -100dBm and -109dBm• Red – Signal received is below -109dBm

Terminal state

Supply voltage	The voltage at the TD9300 DC input. The indicator shows red if the DC input is out of the 9-36V input range.  For v1 isolated TD9300s, which need a 24V input, the valid input is still shown as 9-36V.
Temperature	The internal temperature of the TD9300, shown in degrees Celsius. The indicator shows red if the internal temperature is less than -10 degrees C or greater than +70 degrees C.
Disk space	Free space available on the internal solid state storage medium, shown in kilobytes.
Call state	Shows none while idle, or the various states during the setup and activity of a DMR call.


Service states

NTP	Shows whether the Network Time Protocol service is active for the TD9300 to be available as a time server.
SSH	Shows whether the Secure Shell service is active for local SSH login.
DHCP	Shows whether the Dynamic Host Configuration Protocol service is active. This dynamically allocates IP addresses to devices connected to the TD9300 Ethernet port.

DMR Traffic

The counters shown in this section hold volatile data.

Counters reset to **0** when the TD9300 is switched off.

Status messages sent	<p>Number of successful callback request status messages sent to the SCADA Gateway.</p> <p> If Outgoing Data Call is enabled, the TD9300 will generate a data call directly to the SCADA Gateway instead of sending a callback status message.</p>
Status messages failed	Number of callback status messages that failed to reach the SCADA Gateway.
Received packets	<p>Number of data packets (and bytes) received from the DMR network.</p> <p>This includes SCADA traffic and TD9300 control traffic from the SCADA Gateway.</p>
Transmitted packets	<p>Number of data packets (and bytes) sent to the DMR network.</p> <p>This includes SCADA traffic and TD9300 control traffic from the SCADA Gateway.</p>
Transmission retries	Number of data packets resent to the DMR network because the previous packet was not delivered.
Transmission acks lost	Number of data packet acknowledgements not received after transmission of a data packet to the DMR network.
Transmission failures	Number of data packets not successfully sent to the DMR network after transmission retries.
Transmission rate	Effective over-the-air transmission speed of Tait GridLink data over the DMR network.
Transmission performance	<p>Estimated throughput of Tait GridLink data over the DMR network.</p> <p>This is shown as a percentage of the maximum theoretical possible rate.</p>

SCADA Traffic

Received SCADA messages	<p>Number of SCADA messages (and total bytes) received by the TD9300 from a serial or Ethernet connected RTU.</p> <p>This is defined by the configured SCADA protocol.</p>
Transmitted SCADA messages	<p>Number of SCADA messages (and total bytes) sent from the TD9300 to a serial or Ethernet connected RTU.</p> <p>This is defined by the configured SCADA protocol.</p>

IP Traffic

Received packets	Number of IP packets (and total bytes) received on the TD9300 Ethernet interface, excluding proxied SCADA traffic.
Transmitted packets	Number of IP packets (and total bytes) sent from the TD9300 Ethernet interface, excluding proxied SCADA traffic.

Queue

Queue size	Number of messages in the TD9300 message queue waiting to be delivered to the SCADA Gateway.
Messages dropped	Number of messages dropped from the TD9300 message queue that failed to be delivered in the time defined by Queue Message Timeout.

Identity

Radio serial number	Unique serial number of the TD9300 and the internal TM9300 RF module.
ESSN	Encrypted Secret Serial Number unique to the individual TD9300 operating system. This number is required if a new license must be generated.

Versions

Radio firmware version	Firmware version reported by the internal TM9300 RF module
Platform version	Version number of the TD9300 embedded operating system
Application version	Version number of the TD9300 GridLink application

Configure > Terminal

The screenshot shows the 'TD9300 Data Terminal' configuration page. The top bar includes the 'tait' logo, the title 'TD9300 Data Terminal', and the user 'taitnet'. Below the top bar, there's a status bar showing 'Radio connection OK', the date and time 'Tuesday, May 16, 2023 3:21:19 AM UTC+00:00', and 'RTU'. The main content area is split into a sidebar and a main panel. The sidebar has three main sections: 'Monitor' (Dashboard), 'Configure' (Terminal, Radio, Diagnostics), and 'Files' (Firmware files, Log files, Alarm files). The 'Terminal' option is selected. The main panel shows 'Configuration' for 'DMR' with 'DIP address 0/21 (21)'. Below that, the 'Network' section lists: 'IP address 172.27.2.221', 'Netmask 255.255.255.0', 'Gateway 172.27.2.254', and 'SCADA gateway IP networks 10.100.100.0/24'.


DMR

DIP address	Address of the Dispatcher Interface Protocol connection in MPT1327 format (and DMR format) that the TD9300 uses to connect to the SCADA Gateway. This should be the same address (as defined in the SCADA Gateway Division) that the radio address of this TD9300 belongs to.
--------------------	---

Network

IP address	IP address of TD9300 Ethernet interface
Netmask	Filter applied to traffic received on TD9300 Ethernet interface
Gateway	Default network address the TD9300 directs IP traffic to
SCADA gateway IP networks	Defines the networks the data terminal can communicate with through the SCADA gateway

Encryption

Password	<p>If the TD9300 contains an encryption license, or has v1.12 or later of the Tait GridLink application, entering a password will encrypt all over-the-air communications with the SCADA Gateway.</p> <p> For successful remote communication with the TD9300, the SCADA Gateway must have the same password set in the configuration of the same terminal.</p>
-----------------	--

SCADA

Protocol	<p>The proxied SCADA protocol used by the TD9300. This must be the protocol used by the SCADA system.</p> <p>When you select Edit these options display in a drop-down list:</p> <ul style="list-style-type: none">• None – The SCADA gateway sends IP packets transparently across the network. Can be used with any application but adds the overhead of IP headers, compared with the options below.• DNP3• IEC101• Modbus TCP – This protocol uses IP.• Modbus RTU – This protocol is used by SCADA masters that generate data in RS-232 format. It needs a serial encapsulator such as a Digi-TS2 that converts RS-232 to IP, which the SCADA gateway requires. <p>For Protocol = IEC101, the following field applies:</p> <ul style="list-style-type: none">• Link octets – The number of bytes used for IEC101 addressing. Options are 1 or 2 bytes. This is a system-wide parameter. The SCADA Gateway and all Tait GridLink data terminals must have the same setting.
Connection	<p>Specify whether the proxied SCADA data is used on the Ethernet port (TCP) or serial port:</p> <ul style="list-style-type: none">• For Connection = TCP, the following field applies:<ul style="list-style-type: none">• IP address – The IP address and port number of the RTU that received proxied SCADA traffic is sent to, for example 192.168.1.2:20000.• For Connection = Serial, the following fields apply – These need to be set the same as the RTU serial port:<ul style="list-style-type: none">• Baud – The serial speed in bits per second of the TD9300 Serial 1 port.• Parity – Specify whether an odd, even, or no parity bit is used in the serial communication.• Stop bits – Specify whether one or two stop bits is used in the serial communication.• Flow control – Specify whether no flow control or RTS/CTS hardware flow control is used in the serial communication.

DHCP

This enables the Dynamic Host Configuration Protocol server on the TD9300, which enables automatic allocation of an IP address to Ethernet-connected equipment.

NAT

Enables Network Address Translation.

If enabled, the following fields apply:

Enabled


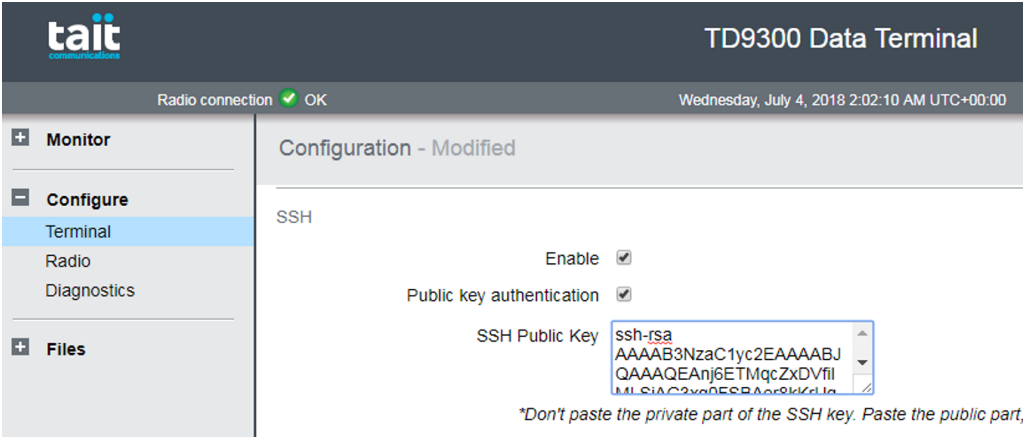
- **WAN IP address** – Wide area network IP address visible from the SCADA Gateway side of the TD9300
 - **RTU IP address** – IP address of the RTU connected to the TD9300
 - **Incoming port** – Listening port on the WAN side which will accept incoming TCP traffic
 - **Destination port** – Port on the RTU side the received data is sent to. This can be the same or different to the incoming port.
-

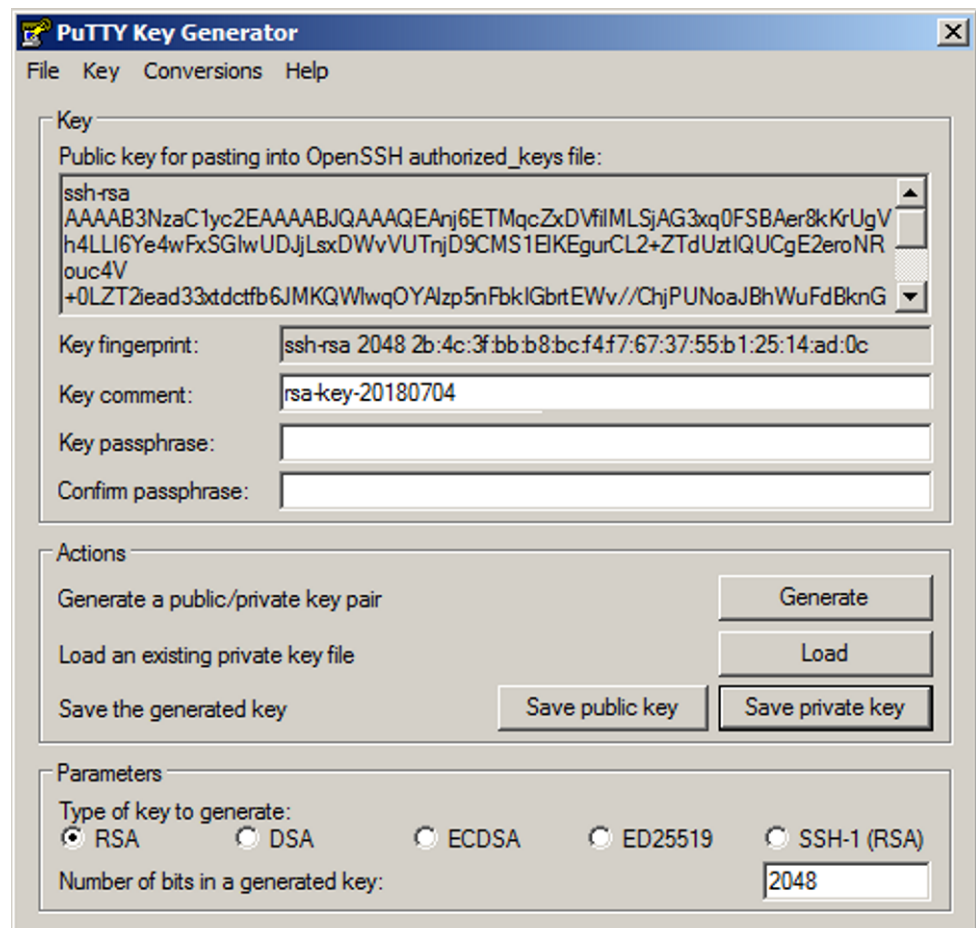
NTP

Enabled

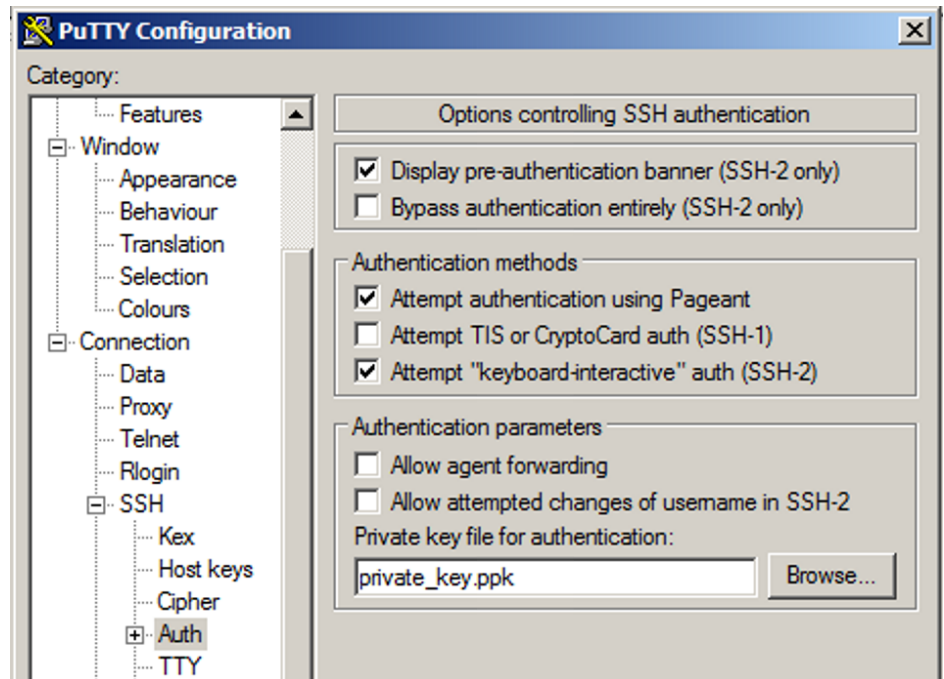
Enables the Network Time Protocol server on the TD9300 to allow Ethernet-connected equipment to synchronise time from the TD9300.

SSH

Enabled	Enables local and remote SSH access to the TD9300.
Public key authentication	<p>Enabled – Enables passwordless SSH login to the TD9300 using a public key uploaded from authorized access.</p> <p>Disabled – Disables passwordless SSH login and falls back to regular username and password-based SSH login.</p> <p> If Public Key Authentication is enabled, SSH access is disabled.</p>
SSH Public Key	<p>Public key generated by an authorized computer is added to the Data Terminal using this field.</p>  <p>To generate a public key using PuTTY Keygen utility and start a passwordless SSH login:</p> <ol style="list-style-type: none">1. In the Actions section, select Generate to generate a new public/private key pair. Entering a passphrase is optional. Alternatively, if you already have a private key file, you can upload it using the Load option. Once successfully generated, a valid public key will display. Alternatively, when an existing private key file is loaded successfully, the public key will show.



2. Copy the whole public key contents from **ssh-rsa** to the end of the key.
3. In the TD9300 web interface, paste this in **SSH Public key entry** field.
4. Save the configuration in **TD9300 WebUI**.
5. To establish an SSH session with the TD9300 with public key authentication enabled:
 - a. Run PuTTY > Enter the IP address of the TD9300 in the Session window > Select **Connection Type SSH**.
 - b. Select **PuTTY Connection > SSH > Auth**.
 - c. Select **Browse** to find the private key file of the authorized computer.



d. Select **Open**.

e. At the login prompt, enter **taitnet** for the username.



If a key passphrase was defined when the public/private key pair was generated, a prompt will request this passphrase.

If no passphrase was used, the SSH session will be available once you enter the username.


Call Management

Time synchronisation interval	<p>The duration at which the TD9300 does a time/date synchronisation with the SCADA Gateway.</p> <p>This happens asynchronously to any SCADA traffic.</p>
Queue message timeout	<p>How long an outgoing message to the SCADA Gateway can remain in the TD9300 message queue before being automatically dropped.</p>
Response delay	<p>The maximum time the data terminal will wait for data from the RTU.</p> <p>If there is no data from the RTU in this time, it assumes there is no more data to send and floor control is passed back to the SCADA Gateway.</p> <p>The default response delay is set to 500ms.</p> <p>A non-optimal setting will have a negative impact on system throughput:</p> <ul style="list-style-type: none"> • If the value is too short, SCADA transactions will be split over multiple DMR radio calls • If the value is too large, the DMR call will be held up longer than necessary at the end of the SCADA transaction <p>A value that is too small will have a larger impact, so it is better to err slightly on the large side for this setting.</p> <p>For serial-connected RTUs, this setting needs to consider the possible packet serialization latency over the serial line (to and from the RTU) and any processing delay expected in the RTU.</p> <p>We recommend tuning this value on the bench when initially integrating with an RTU.</p>
Receive timeout	<p>The maximum time the data terminal should wait for a response from the gateway before closing the current call.</p> <p>The default value is 15 seconds.</p> <p>This timeout is only used if something goes wrong with the communication between the SCADA Gateway and the data terminal.</p> <p>In most cases the default value is acceptable.</p>
Inactivity timeout	<p>This is how long to wait before power cycling the radio if no internal communication has been received from the radio in the data terminal.</p>
Status NACK retry interval	<p>This is the delay (in milliseconds) between sending status messages if a status message fails to send (request is rejected by the radio).</p>
Outgoing data call enable	<p>When enabled, the TD9300 can generate a data call directly to the SCADA Gateway to send unsolicited traffic.</p> <p>When disabled, if the TD9300 has unsolicited traffic to send, it sends a call-back status call to the SCADA Gateway and waits for an incoming data call.</p>

License

Status	Shows whether the TD9300 application license is valid.
Expiry	Shows whether the TD9300 application license is permanent or has an expiry date.
AES 256 encryption	Shows if the TD9300 contains a license to use over-the-air data encryption.  From TD9300 v1.12 the AES 256 encryption license is always valid.
Upload License	This field on the Edit page lets you upload a license file to the TD9300.  Caution! Any file uploaded will replace the existing license. If the new file is not a valid license, the TD9300 will not be able to operate.

Configure > Radio

Enter program mode	This button takes the radio connection offline and activates the TD9300 Serial 1 port for programming the internal TM9300 RF module.  A TD9300 serial programming cable is required – Tait part number 219-03609-00 (order code T04-00088-0005).
Exit program mode	Returns the TD9300 to normal operating condition with the radio connection online and the Serial 1 port carrying serial SCADA traffic.
Power cycle	This button powers the internal TM9300 RF module off for two seconds. It is used for fault-finding and analysis.


Configure > Diagnostics

This screen lets you test whether the TD9300 is working properly within the Tait GridLink system.



To learn how to carry out the procedures, see "Confirm Operation" on page 61.



DMR

Address	The ID programmed into the radio module in MPT1327 format and DMR raw format in brackets.
Channel	The current DMR channel number and timeslot (A or B) the radio module is on. This will be a control channel or a traffic channel.
Syscode	The syscode received from the control channel the radio module is registered to.
In Service	Shows whether the radio module is correctly registered to a DMR site. The DMR LED on the TD9300 top panel mirrors this indicator: <ul style="list-style-type: none">• on indicates DMR service• 1-second flashing means not registered  There can be a delay of up to two minutes between the steady and flashing (1-second intervals) states when the radio switches from registered to trying to register.
RSSI	The RF signal level received at the TD9300 antenna port on the current DMR channel: <ul style="list-style-type: none">• Green – The received signal is greater than -99dBm• Orange – The received signal is between -100dBm and -109dBm• Red – The received signal is below -109dBm
Call state	Shows none while idle, or the various states during the setup and activity of a DMR call.

Files

Files > Firmware files

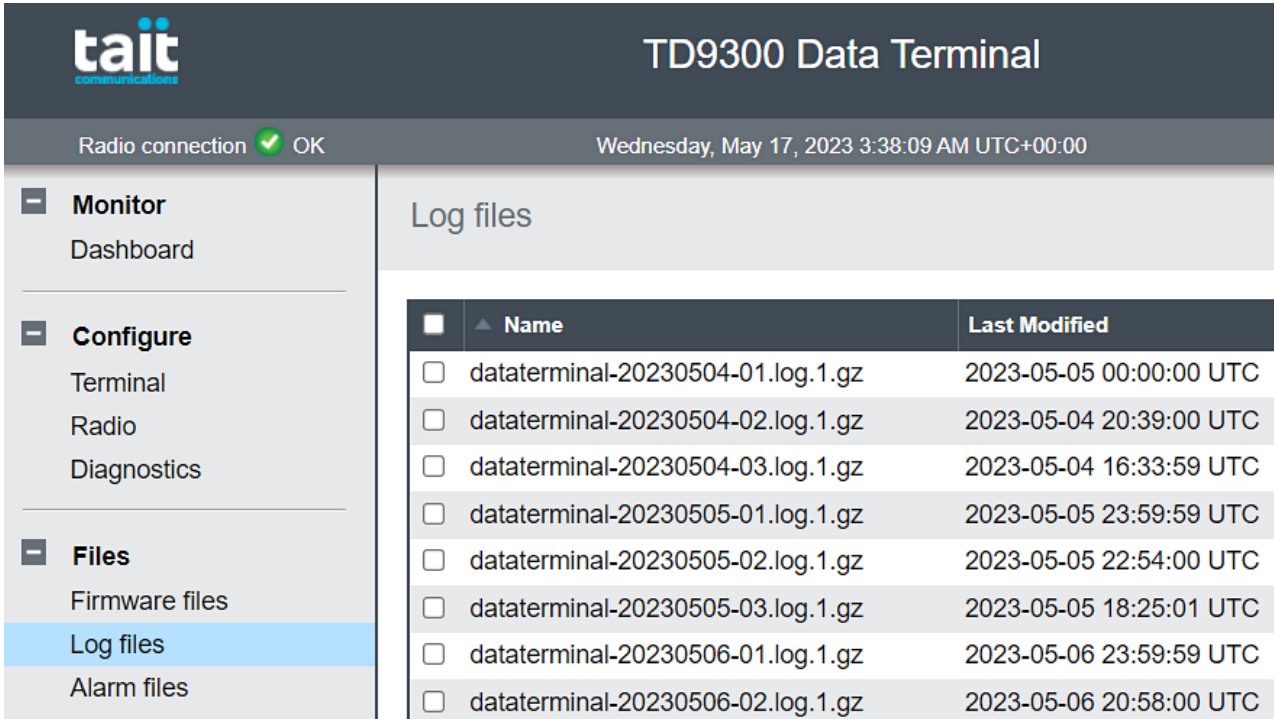
Lists files in the TD9300 firmware directory.

Delete	<ol style="list-style-type: none">1. Check the box next to the files to delete.2. Select Delete to remove files that are no longer required.
Validate	<ol style="list-style-type: none">1. Check the box next to one file to verify.2. Select Validate to check if the file is a valid TD9300 firmware file.  If installation is started for any file, it is automatically verified before installation begins.
Install	<ol style="list-style-type: none">1. Check the box next to one file to install.2. Select Install to start the TD9300 firmware installation.  Firmware files are automatically validated before installation.
Upload	Selects a file to be uploaded to the TD9300 firmware directory.

Files > Log files

Lists system log files in the TD9300 logs directory. Old files are automatically removed to prevent all disk space being used.

The files contain detail used for debugging. Tait Technical Support might ask you to send files when they investigate a problem. Select a file name to download a copy of a file.



The screenshot shows the TD9300 Data Terminal interface. At the top left is the Tait Communications logo. The title "TD9300 Data Terminal" is centered at the top. Below the title, it shows "Radio connection" with a green checkmark and "OK", and the date and time "Wednesday, May 17, 2023 3:38:09 AM UTC+00:00". On the left side, there is a navigation menu with sections: "Monitor" (containing "Dashboard"), "Configure" (containing "Terminal", "Radio", "Diagnostics"), and "Files" (containing "Firmware files", "Log files", and "Alarm files"). The "Log files" option is highlighted in blue. The main content area is titled "Log files" and contains a table with the following data:

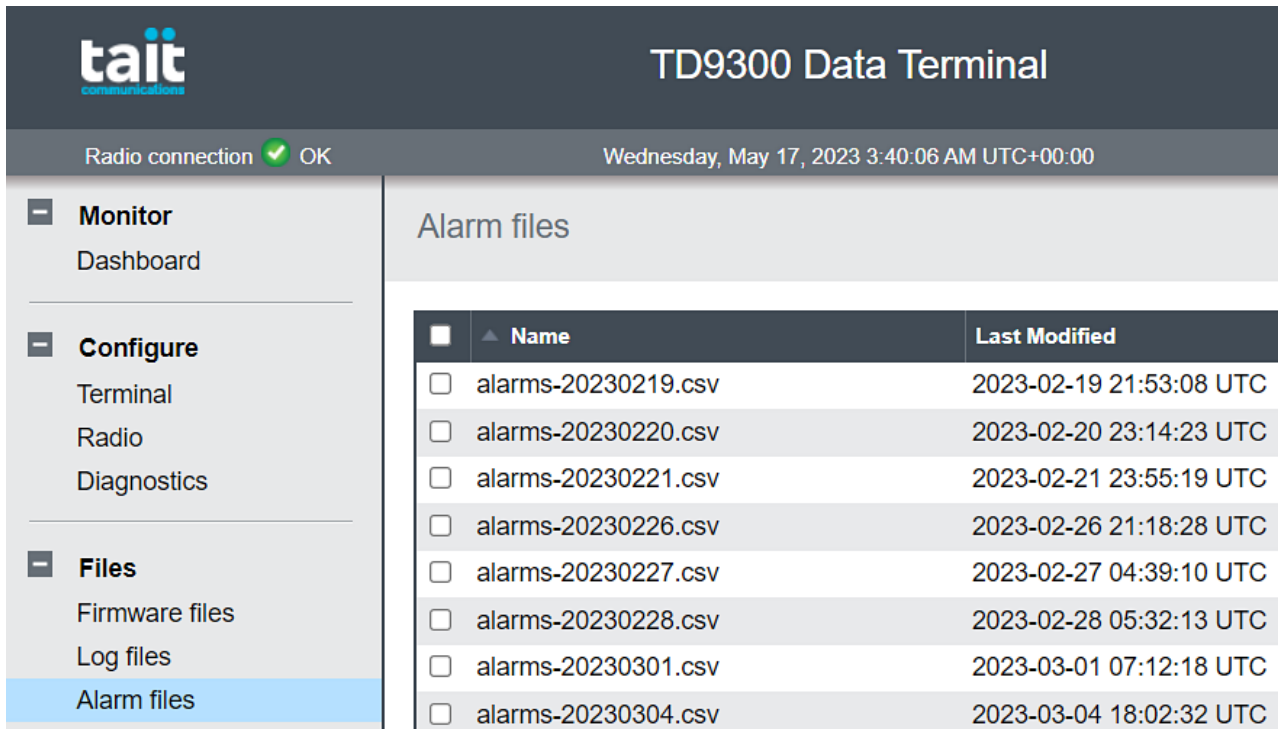
<input type="checkbox"/>	Name	Last Modified
<input type="checkbox"/>	dataterminal-20230504-01.log.1.gz	2023-05-05 00:00:00 UTC
<input type="checkbox"/>	dataterminal-20230504-02.log.1.gz	2023-05-04 20:39:00 UTC
<input type="checkbox"/>	dataterminal-20230504-03.log.1.gz	2023-05-04 16:33:59 UTC
<input type="checkbox"/>	dataterminal-20230505-01.log.1.gz	2023-05-05 23:59:59 UTC
<input type="checkbox"/>	dataterminal-20230505-02.log.1.gz	2023-05-05 22:54:00 UTC
<input type="checkbox"/>	dataterminal-20230505-03.log.1.gz	2023-05-05 18:25:01 UTC
<input type="checkbox"/>	dataterminal-20230506-01.log.1.gz	2023-05-06 23:59:59 UTC
<input type="checkbox"/>	dataterminal-20230506-02.log.1.gz	2023-05-06 20:58:00 UTC

Files > Alarm files

Lists alarm files in the TD9300 logs directory. Old files are automatically removed to prevent all disk space being used.

The files contain detail used for debugging. Tait Technical Support might ask you to send files when they investigate a problem.

To download a copy of a file, select a file name.



The screenshot shows the TD9300 Data Terminal interface. At the top left is the Tait Communications logo. The title bar reads "TD9300 Data Terminal". Below the title bar, it shows "Radio connection" with a green checkmark and "OK", and the date and time "Wednesday, May 17, 2023 3:40:06 AM UTC+00:00". On the left side, there is a navigation menu with three main sections: "Monitor" (containing "Dashboard"), "Configure" (containing "Terminal", "Radio", and "Diagnostics"), and "Files" (containing "Firmware files", "Log files", and "Alarm files", which is currently selected and highlighted in blue). The main content area is titled "Alarm files" and displays a table of files.

<input type="checkbox"/>	Name	Last Modified
<input type="checkbox"/>	alarms-20230219.csv	2023-02-19 21:53:08 UTC
<input type="checkbox"/>	alarms-20230220.csv	2023-02-20 23:14:23 UTC
<input type="checkbox"/>	alarms-20230221.csv	2023-02-21 23:55:19 UTC
<input type="checkbox"/>	alarms-20230226.csv	2023-02-26 21:18:28 UTC
<input type="checkbox"/>	alarms-20230227.csv	2023-02-27 04:39:10 UTC
<input type="checkbox"/>	alarms-20230228.csv	2023-02-28 05:32:13 UTC
<input type="checkbox"/>	alarms-20230301.csv	2023-03-01 07:12:18 UTC
<input type="checkbox"/>	alarms-20230304.csv	2023-03-04 18:02:32 UTC

7 Firmware Upgrades

The TD9300 Data Terminal uses separate firmware for the main board and the RF board.



Tait recommends you always use the latest firmware versions.

To access updated firmware versions:

1. Connect to the TD9300.
See "Connecting to the TD9300" on page 31.
2. To see the firmware versions, select **Monitor > Dashboard > Versions**:
 - The RF board firmware version shows as **Radio firmware version**
 - The main board firmware version shows as **Application version**

Upgrade the RF Board Firmware

The RF board uses the firmware of the TM9300 mobile radio.

To upgrade the database or firmware for the RF board:

1. Contact Tait Technical Support for the latest TM9300 firmware.
2. Save a copy to the PC you plan to use for the upgrade.
3. Enable communication to the RF board.
See "Enable or Disable Communication to the RF Board" on page 38.
4. Make sure the TD9300 Data Terminal programming cable is connected to the SERIAL 1 connector (RF board).

Note: You **must** complete the following two steps:

5. Use the DMR terminals calibration application to read and save the radio's calibration database.
6. Use the TM9300 programming application to read and save the radio's programming database.



The TD9300 will appear as a TM9300 in the programming application.

7. From the TM9300/TP9300 programming application, select **Tools > Firmware Upgrade** to upgrade the firmware as described in the Help of the programming application.
8. Program the calibration and configuration files you saved.



If a database incompatibility message appears during programming, you will need to use a newer version of the programming and calibration applications. Load the calibration and programming files you saved with the new application and program into the RF board.

9. Disable communication to the RF board.

Upgrade the Main Board Firmware

To upgrade the firmware for the main board, you need physical access to the terminal.

1. Contact Tait Technical Support for the latest TD9300 firmware.
2. Save a copy to the PC you will use for the upgrade.
3. Connect to the TD9300 Web Interface.
See "Connect to the TD9300 Web Interface" on page 36.
4. Select **Files > Firmware Files**.
5. Select **Upload >** Select the firmware file to upload.
6. Once the upload is complete, select the checkbox beside the firmware file.
7. Select **Install**.



The firmware installation process might cause the TD9300 to restart and log you out. If this happens, wait until installation is complete and log back in.

8 Confirm Operation

This section describes how to check whether the TD9300 is working properly in the GridLink system.

1. Make sure the TD9300 is connected to the correct supply voltage.

See "DC Connector" on page 22.

To troubleshoot the supply voltage, see "Troubleshooting" on page 66.

2. Make sure the TD9300 is connected to an outstation device (RTU/IED).

3. Check whether the LEDs show normal operation.

See "LEDs" on page 19.

If they do not, see "Troubleshooting" on page 66.

With TD9300 firmware version 1.10 or later, the Web UI Diagnostics menu provides test functions for installation and commissioning.

The screenshot shows the 'TD9300 Data Terminal' web interface. At the top left is the 'tait communications' logo. The top right displays the title 'TD9300 Data Terminal'. Below the header, a status bar shows 'Radio connection' with a green checkmark and 'OK', and the date/time 'Wednesday, May 17, 2023 3:42:27 AM UTC+00:00'. A left-hand navigation menu is visible, with categories: 'Monitor' (Dashboard), 'Configure' (Terminal, Radio, Diagnostics), and 'Files' (Firmware files, Log files, Alarm files). The 'Diagnostics' menu item is highlighted in blue. The main content area is titled 'Diagnostics' and shows 'DMR' settings: Address 0/1 (1), Channel 100A, Syscode 5 (with a green checkmark), In service (with a green checkmark), RSSI -64 dBm (with a green checkmark), and Call state None. At the bottom, there is a 'Site select' section with a 'Physical channel' input field containing the value '100'.

Site Select

1. Force the TD9300 to a specific DMR control channel to compare signal strength (RSSI) measurements between sites.
2. Enter the channel number.
3. Select the Logical channel (DMR slot) > Click **Select**.

After 10 minutes, the TD9300 will automatically exit Site Select mode.

Alternatively, select **Cancel** to resume Automatic Hunt mode.



To use Site Select you need the Site Select and Resuming Hunt feature enabled in the TM9300 RF board configuration. This setting is under **Trunked Features > Network Settings > Hunting Params > Common**.

Data Call Test

Data Call Test checks whether the TD9300 can:

- place a data call on the DMR network to its own address
- send and receive data on the traffic channel

If Data Call Test fails, the node unit profile might have packet data calls disabled. Alternatively, there might be communication problems on one or more traffic channels at the current site.

Make sure the base station parameter is set higher than 30ms. This setting is under **Configure > Network Interfaces > DMR Network > Data Delay**.

Note: If you're using radio module firmware version 2.19 or later, the Data Call Test will always fail. The Data Call Test function will be removed in a later version of the TD9300 application.

SCADA Gateway Communications Test

If **Outgoing data call enabled** is selected in the configuration, the TD9300 places a data call to the SCADA Gateway and checks communication over a traffic channel.

If this option is not selected, the TD9300 sends a call-back status message to the SCADA Gateway and waits for an incoming data call from the SCADA Gateway.

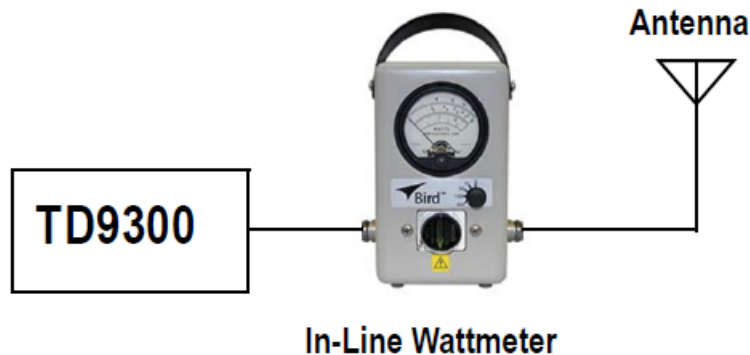
Here are some reasons why this test might fail:

- The TD9300 might be disabled in the SCADA Gateway
- An incorrect DIP address might be configured in the TD9300
- There might be problems communicating on one or more traffic channels at the current site

Test Transmitter Power

You can use Test Transmitter Power with an in-line RF power meter to:

- Measure the forward-to-reflected power ratio of the TD9300 antenna
- Verify antenna performance



To test transmitter power:

1. Select **TX On**.

This activates the transmitter by raising a data call on the DMR network to its own address and sending continuous data packets.

Due to the nature of TDMA transmission, where the transmitter is rapidly switched on and off, the RF power from the transmitter might seem to be pulsating when viewed on an analog meter.

2. To end test transmission, select **TX Off**.

Alternatively, the test transmission will automatically end after a maximum of two minutes.

Note: Load transients (switching or removing the load) can damage the transmitter! Do not disconnect the antenna from the TD9300 while it is transmitting.

3. Ask the dispatcher to poll the outstation device from the SCADA software.

If a valid reply is returned to the SCADA software, the TD9300 operation and connectivity to the outstation device is good and operating as expected.

4. If a valid reply is **not** returned, check if the TD9300 terminal is visible from the SCADA Gateway:

Do a remote status read from the SCADA Gateway.

- a. To ask the dispatcher to read the terminal's remote status, select **Divisions > Terminals > Select the radio address from the list > Select the Remote Status tab > Select Read**.

If the TD9300 replies with valid data, it is working properly.

If it is not working, continue to the next step.

5. Ask the dispatcher to poll the radio from the DMR Node.
6. Log in to the Node web user interface.
7. Select **Subscribers > Fleets > Select the correct fleet from the list > Select the Units tab > Select the radio unit from the list > Select **Authenticate**.**

If the result is **Passed Authentication**, the TD9300 is operating correctly on the DMR network.

If the TD9300 is operating correctly on the DMR network but the SCADA Gateway Remote Status read fails, replace the TD9300.



Poor communication with a DMR traffic channel, such as a low RF signal or interference on the channel, might have the same failure symptom.

If the SCADA Gateway Remote Status read is successful but the SCADA software fails to poll the outstation device, it suggests a problem with one or more of these devices or settings:

- The outstation device connected to the TD9300
- A cabling issue between the TD9300 and the outstation device
- A configuration issue with the TD9300
- A configuration issue with the outstation device
- A configuration issue with the SCADA system software

9 Troubleshooting

This chapter describes what you can do in the field to restore a faulty TD9300.

If the following procedures are not successful, the TD9300 needs to be replaced – See:

- "Check the Power Supply" below
- "Check the LEDs" on the next page
- "Check the Antenna and Signal Path" on the next page
- "Confirm Operation" on page 61

Check the Power Supply

Steps "Measure the input voltage to the isolated TD9300:" below and "Measure the input voltage to the external DC/DC converter:" below only apply to the isolated v1 (T04-00002-xAxx¹).

For all other models, go to "Measure the input voltage to the TD9300:" below.

1. Measure the input voltage to the isolated TD9300:
 - If it is between 23.5 and 24.5 V DC, check the LEDs.
See "Check the LEDs" on the next page.
 - If it is not, go to the next step.
2. Measure the input voltage to the external DC/DC converter:
 - If it is between 9 and 36V DC, replace the external DC/DC converter.
 - If it is not, fault-find the external power supply, then make sure it's working.
See "Confirm Operation" on page 61



Check the isolated v1 TD9300 is programmed for low transmit power operation when the external DC-DC converter is used or the TD9300 might behave unexpectedly.

3. Measure the input voltage to the TD9300:
 - If it is between 9 and 36 V DC, check the LEDs.
 - If it is not, fault-find the external power supply, then make sure it's working.

¹Signal ports isolated only.

Check the LEDs

1. If the POWER LED is off, replace the TD9300.
2. Check the DMR LED. It can have four states:
 - If the LED is off, replace the TD9300.
 - If the LED is on (not flashing) but the TD9300 is not performing as expected, check the TD9300 configuration. It might have been changed remotely. Once you have corrected the configuration, "Confirm Operation" on page 61. If correcting the configuration does not fix the problem, replace the TD9300.
 - If the LED is flashing in 2-second intervals (to show there is no communication with the RF board), check the RF board is programmed correctly and try again. If this does not work, replace the TD9300.
 - If the LED is flashing in 1-second intervals (to show the TD9300 is not registered on the network¹), "Check the Antenna and Signal Path" below.

Check the Antenna and Signal Path

1. Connect the antenna to an antenna analyzer.
2. Repair or replace the antenna, feed cable, or BNC connector (if necessary).
3. Connect a portable radio to the antenna to check the signal strength:

Make sure the RSSI display is set to display values.

- If the RF level is lower than -100dBm, check and clear the signal path (if possible).
- If the level is higher than -100dBm, see "Confirm Operation" on page 61.

¹There can be a delay of up to two minutes between the steady and flashing states (1-second intervals) when the radio switches from registered to trying to register.

10 Specifications

This chapter provides general and physical specifications for the TD9300 Data Terminal.

Note: The TD9300 Data Terminal's RF capability is provided by a TM9300 RF board. See the TM9300 Specifications Manual (MMB-00005-xx) for RF performance specifications.

Unless otherwise shown, the performance figures given in these specifications are **typical** figures for equipment operating at standard room temperature:

(+71.6°F to +82.4°F [+22°C to +28°C])

standard test voltage (24VDC)

For system design purposes, a de-rating of 10% is typical for sites. This is to allow for more current under poor VSWR conditions.

Operating Specifications

Operating	T04-00002-xCxx (non-isolated)	T04-00002-xAxx (isolated v1)	T04-00002-xDxx T04-00002-xExx(isolated v2)
Supply Voltage			
Operating Voltage	9VDC to 36VDC	24VDC nominal	9VDC to 36VDC
Polarity	negative earth	positive or negative earth	
Protection	active isolation (rated to 36VDC)		
Standard Test Voltage	24VDC		
Power Consumption (24VDC)			
Standby (avg)	5.3W	5.6W	7.5W
Tx Current Peak	1.0A @ 1W RF 1.6A @ 5W RF 3.1A @ 25W RF	1.1A @ 1W RF 1.7A @ 5W RF	1.2A @ 1W RF 1.8A @ 5W RF 3.2A @ 25W RF
Max Peak Current ^a	15A	4.5A	15A
Tx Power Consumption (average, single slot)	15W @ 1W RF 22W @ 5W RF 40W @ 25W RF	16W @ 1W RF 23W @ 5W RF (Includes external DC-DC converter)	18W @ 1W RF 24W @ 5W RF 42W @ 25W RF

^aunder worst-case conditions: voltage, RF power, temperature, frequency, VSWR.

General Specifications

General	T04-00002-xCxx (non-isolated)	T04-00002-xAxx (isolated v1)	T04-00002-xDxx T04-00002-xExx (isolated v2)
Height	2.4in (61mm)		
Width	7.1in (180mm)		
Depth	6.1in (156mm)		
Weight	4.2lb (1.9kg)		
Mounting	DIN rail clip or panel mount bracket		
Operating Temperature Range	-22°F to +140°F (-30°C to +60°C) ambient temperature		
Altitude	15000 feet/4570 meters as per Mil-Std-810G 500.5, proc 2		
Packet Data Forward Error Correction (FEC)	½ Rate, >4 Rate, Full Rate		
Air Interface	DMR: ETSI TS 102 361		
Frequency Stability	±0.5ppm (-22°F to +140°F / -30°C to +60°C)		
Channel Spacing	12.5kHz spacing 2.5/3.125/5/6.25kHz increment/channel step		
Voltage and Current Monitoring Accuracy	±10%		

Transmitter Specifications

Transmitter	VHF 136-174MHz	UHF 400-470MHz	VHF 174 - 225MHz
RF Output Power (configurable)	T04-00002-xCxx and T04-00002-xDxx (non-isolated/isolated v2)	25W, 12W, 5W, 1W	
	T04-00002-xExx	Note: T04-00002-xAxx is limited to 5W and 1W	
	T04-00002-xAxx (isolated v1)		
	FM Hum and Noise (TIA-603-D)	12.5kHz: 40dB	
Adjacent Channel Power Ratio (DMR) (EN 300 113)	60dBc		
Conducted Emissions <1GHz	-37dBm		
>1GHz	-36dBm		

Receiver Specifications

Receiver	VHF 136-174MHz	UHF 400-470MHz	VHF 174 - 225MHz
Sensitivity (DMR) (EN 300 113) (1% BER)	-119dBm (0.25 μ V)	-120dBm (0.22 μ V)	-119dBm (0.25 μ V)
Intermodulation rejection (12.5kHz) (TIA-603-D)	81dB	76dB	78dB
Intermodulation rejection (DMR) (EN 300 113)	72dB	66dB	71dB
Spurious response rejection (DMR) (EN 300 113)	72dB	76dB	70dB
Hum and Noise (12.5kHz) (TIA-603-D)	45dB	45dB	45dB
Adjacent Channel Selectivity (TIA/EIA one-tone test method)	65dB	64dB	60dB
Adjacent Channel Selectivity (DMR) (EN 300 113)	62dB	61dB	63dB

Digital I/O Specifications

Digital I/O	T04-00002-xCxx (non-isolated)	T04-00002-xAxx (isol-ated v1)	T04-00002-xDxx T04-00002-xExx (isolated v2)
Digital Inputs	Opto-isolated		
Input Voltage Range	0-18VDC		0-50VDC
Input Current (max)	1.8mA per channel		5mA per channel
Input Low Threshold	V_{IL} 1.0V		
Input High Threshold	$V_{IH} \leq 3.5V$		
Input Impedance	10k Ω (typical)		
Protection	Reverse Polarity		
Digital Outputs	Optically isolated solid state relay contacts		
Maximum Voltage across Contacts	18VDC		50VDC
Maximum Current	170mA continuous		
Relay Interface	Normally open or normally closed contacts		
On-state Output Impedance	20 Ω (max)		
Off-state Leakage Current	1 μ A (max)		

Compliance Standards

Where applicable, this equipment has been tested and approved to the standards specified in this table.

Compliance Standards	T04-00002-xCxx (non-isolated)	T04-00002-xAxx (isolated v1)	T04-00002-xDxx T04-00002-xExx (isolated v2)
EMC / RF	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		
Isolation and Immunity	N/A	EN 60255-5 Impulse 2kV (Serial, Ethernet, GPIO), Dielectric 2kVac (Serial, Ethernet, GPIO) EN 61000-4-2 (ESD) Enclosure ±6kV Contact, ±8kV Air, Criteria A EN 61000-4-3 (Rad. Imm.) Enclosure 10V/m, Cri- teria A EN 61000-4-4 (EFT) Serial and Ethernet ±1kV, Criteria A EN 61000-4-5 (Surge) Serial and Ethernet ±1kV LE, Cri- teria A EN 61000-4-6 (Cond. Imm.) Serial and Ethernet, 10V, Cri- teria A EN 61000-4-17 (Ripple) DC 10% @ 24V, 10% @ 9V, Cri-	EN 60255-5 Impulse 2kV (Serial, Ethernet, GPIO) 2.5kV (DC), Dielectric 2kVac (Serial, Ethernet, GPIO) 2.5kVDC (DC) EN 61000-4-2 (ESD) Enclosure ±6kV Contact, ±8kV Air, Cri- teria A EN 61000-4-3 (Rad. Imm.) Enclosure 10V/m, Criteria A EN 61000-4-4 (EFT) Serial and Ethernet ±1kV, DC ±2kV ^a , Cri- teria A EN 61000-4-5 (Surge) Serial and Ethernet ±1kV LE, DC ±2kV a LE, Criteria A EN 61000-4-6 (Cond. Imm.) Serial, Ethernet and DC 10V, Criteria A EN 61000-4-12 (R.Wave) DC ±1kV a CM, ±0.5kV a DM, Cri- teria A EN 61000-4-16 (CM.

^aTest conditions apply

Compliance Standards	T04-00002-xCxx (non-isolated)	T04-00002-xAxx (isolated v1)	T04-00002-xDxx T04-00002-xExx (isolated v2)
		criteria A EN 61000-4-29 (V.Int./Dip) DC 60% @ 9V 100ms, 0% @ 9V 50ms, Criteria A	Imm.) DC 30V/300V, Cri- teria A EN 61000-4-17 (Ripple) DC 10% @ 24V, 10% @ 9V, Criteria A EN 61000-4-29 (V.Int./Dip) DC 60% @ 9V 100ms, 0% @ 9V 50ms, Criteria A
Ingress Protection	IP40 – all orientations IP41 – front panel connector facing down		
Environmental			
Low Pressure (Altitude)	MIL-STD-810G 500.5, Proc 2		
High Temperature	MIL-STD-810G 501.5, Proc 1,2		
Low Temperature	MIL-STD-810G 502.5, Proc 1,2		
Temperature Shock	MIL-STD-810G 503.5, Proc 1		
Humidity	MIL-STD-810G 507.5, Proc 2		
Vibration	MIL-STD-810G 514.6, Proc 1		
Shock	MIL-STD-810G 516.6, Proc 1		