

# TB9400 Base Station/Repeater Specifications Manual

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# Preface

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## Scope of Manual

Welcome to the Specifications Manual for the TB9400 base station. This manual provides general, performance, and physical specifications for the TB9400 Rx only (when no PA is available), TB9400 50W and 100W base stations.

In the following, unless mentioned specifically, this manual will use the term “base station” to mean both base station and repeater.

## Document Conventions

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

The following associated documentation for this product is available on the Tait Partner Portal website (<https://partnerinfo.taitradio.com>).

- Tait Core Networks Installation and Configuration Manual (MNB-00012-xx)
- TB9400 Installation and Operation Manual (MBC-00001-xx)
- TN9400 P25 Trunked Network Maintenance Manual (MNC-00001-xx)
- TaitNet P25 Trunked Networks with TB9400 Base Stations System Manual (MBA-00064-xx)
- P25 and AS-IP Channel Group System Manual (MND-00002-xx)
- Safety and Compliance Information (MBA-00012-xx)

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

Technical notes are also 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. For more information contact your regional Tait office.

## Publication Record

Issue	Publication Date	Description
30	December 2023	Updated for release 3.55 and later <ul style="list-style-type: none"> <li>■ Receive only reciter power consumption specifications added to:               <ul style="list-style-type: none"> <li>“120VAC Input” on page 15</li> <li>“230VAC Input” on page 16</li> <li>“12VDC Input” on page 17</li> <li>“24VDC Input” on page 18</li> <li>“48VDC Input” on page 19</li> </ul> </li> </ul>
29	August 2023	Updated for release 3.50 and later <ul style="list-style-type: none"> <li>■ Updated throughout for H/W version 3 PMU</li> <li>■ “Analog Audio - Gating Operation” on page 26 updated</li> <li>■ “External General Purpose Digital Outputs” on page 36 added</li> </ul>
28	May 2023	Updated for release 3.45 and later <ul style="list-style-type: none"> <li>■ “Requirements for Delay, Jitter, Loss and Duplication” on page 33 - minimum bandwidth for P25 user traffic updated</li> <li>■ “Audio Delay” on page 37 updated</li> </ul>
27	December 2022	Updated for release 3.40 and later <ul style="list-style-type: none"> <li>■ “Unbalanced Interface” on page 37 added</li> <li>■ “Connections” on page 49</li> <li>■ “Appendix A Frequency Response Diagrams” updated</li> </ul>

Issue	Publication Date	Description
26	August 2022	Updated for release 3.35 and later <ul style="list-style-type: none"> <li>■ <a href="#">“Regulatory Information” on page 9</a> updated</li> <li>■ <a href="#">“Frequency Bands and Sub-bands” on page 10</a> updated</li> <li>■ <a href="#">“Digital RF (DMR)” on page 21</a> updated</li> <li>■ <a href="#">“Audio Delay” on page 37</a> updated</li> <li>■ <a href="#">“Compliance Standards” B1</a> updated for EN 301 929</li> </ul>
25	April 2022	Updated for release 3.30 and later <ul style="list-style-type: none"> <li>■ <a href="#">“Requirements for Delay, Jitter, Loss and Duplication” on page 33</a> minimum bandwidth updated</li> <li>■ <a href="#">“Channel Group Size” on page 34</a> updated</li> </ul>
24	November 2021	Updated for release 3.25 and later <ul style="list-style-type: none"> <li>■ B1 band replaces B2 and B3</li> <li>■ <a href="#">“Antenna Relay Output” on page 39</a> updated</li> <li>■ <a href="#">“Channel Details” on page 41</a> updated</li> </ul>
23	April 2021	Changes for 3.20 release and later <ul style="list-style-type: none"> <li>■ Receiver <a href="#">“Analog Audio - General” on page 25</a> updated</li> <li>■ Receiver <a href="#">“Analog Audio - CTCSS” on page 25</a> updated</li> <li>■ Transmitter <a href="#">“Analog Audio - Modulation Characteristics” on page 31</a> updated</li> </ul>
22	February 2021	Changes for 3.15 release Minor updates throughout Major updates to compliance table “RX Gate Output” changed to “Antenna Relay Output” and content updated H2, H3 and K4 band compliance content update Updated “Channel Group Size” table RSSI Output added
21	June 2020	Changes for 3.10 release. Minor updates throughout Regulatory Information updated Multiple updates to the Compliance Standards table
20	November 2019	Changes for 3.05 release
19	July 2019	Changes for 3.00 release
18	March 2019	Changes for 2.60 release
17	December 2018	Changes for 2.55 release
16	July 2018	Changes for 2.50 release
15	March 2018	Changes for version 2.45 release

# 1 Base Station Specifications

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The performance figures given in these specifications are applicable only to equipment operating as an integral part of a TB9400 base station. These performance figures are minimum figures, unless otherwise indicated, for equipment operating at standard room temperature (+22 °C to +28 °C [+71.6 °F to +82.4 °F]) and standard test voltages as follows:

- AC power management unit (PMU) - 120 VAC and 230 VAC
- 12 V DC PMU - 12 VDC
- 24 V DC PMU - 24 VDC
- 48 V DC PMU - 48 VDC.

The TB9400 is available in the following configurations:

- 50 W single or dual base station with PMU
- 100 W single base station with PMU
- Rx only base station - up to four receivers (receive-only reciters) with PMU.
- Rx only base station (when no PA is available)

**Notice** The software release notes list known issues or limitations of the base station that may vary from the specifications published in this document. Please refer to the current software release notes for any variations to the specifications in this document.



# 1.1 Regulatory Information

## Test Methods

Where applicable, the test methods used to obtain the specifications in this document are described in the following standards:

- TIA-102.CAAA-D
- TIA-102.CCAA-A
- EN 300 086 (version 2.1.2)
- EN 300 113 (version 2.2.1)
- EN 300 219 (version 2.1.1)
- EN 301 929 Version 2.1.1)
- EN 301 489 (version 1.9.2)
- CFR Title 47 Part 15B
- CFR Title 47 Part 22, 90
- TIA/EIA-603/603-E
- AS/NZS 4295
- RSS-119

## Emission Designators

This equipment is compatible with the emissions listed in the following table.

Emission Designator	Common Name	Modulation Scheme	Operating Modes
11K0F3E	FM	analog FM	analog voice
16K0F3E	Wideband FM	analog FM	analog voice
8K10F1E	P25 Phase 1	C4FM	digital voice
8K10F1D	P25 Phase 1	C4FM	data/control channel
8K10F7W	P25 Phase 1	C4FM	digital voice/data/control channel
8K70D1W	P25 Phase 1 linear simulcast modulation	CQPSK	digital voice
8K70D7W	P25 Phase 1 linear simulcast modulation	CQPSK	digital voice/data/control channel
9K80D7W	P25 Phase 2 linear simulcast and non-simulcast modulation	H-DQPSK	digital voice/data
7K60F2D	MPT Control	FFSK	control channel/traffic channel data
8K00FXD or 7K60FXD	2-slot DMR	4FSK	data/control channel
8K00FXD or 7K60FXW	2-slot DMR	4FSK	digital voice/data/control channel

You can obtain further details on test methodology and conditions of compliance testing in all countries from Tait.

## 1.2 Frequency Bands and Sub-bands

Many of the performance figures in this manual are applicable to all frequency bands. In some cases the figures refer to specific bands or sub-bands, and these are identified with the letters listed in the following table.

This table also indicates which base station configurations are currently available in each frequency band.

Refer to “[Compliance Standards](#)” for details of which bands support which air interfaces.

Frequency Identification	Frequency Band and Sub-band	50W	100W	Receive-only
B band	B1 = 136 MHz to 174 MHz	✓	✓	✓
H band	HH = 378 MHz to 420 MHz <sup>a</sup> H1 = 400 MHz to 440 MHz <sup>a</sup> H2 = 440 MHz to 480 MHz H3 = 470 MHz to 520 MHz	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓
K band	K4 = 762 MHz to 870 MHz <sup>b</sup>	✓	✓	✓

- a. The 406 to 406.1 MHz frequency range is reserved worldwide for use by Distress Beacons. It is not legal to program transmitters to operate in this frequency range.
- b. The actual frequency coverage in this band is:  
Transmit: 762 MHz to 776 MHz, and 850 MHz to 870 MHz  
Receive: 792 MHz to 824 MHz

In Brazil, for K band, the TB9400 is considered to be configured as a base station with retransmission of receive frequencies.

## 1.3 Power Supply

The specifications in this section refer to the TB9400 base station fitted with a PMU.

### AC Input

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#### Input

Voltage	88 VAC to 264 VAC
Frequency	50 Hz to 60 Hz
Power factor	> 0.95
Total harmonic distortion (THD)	< 9%
Inrush current	
230VAC	< 40 A @ < 4 ms
115VAC	< 20 A @ < 4 ms
Leakage current	< 3.5 mA / 240 VAC

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#### Protection

Fault current (input)	10 A fuse
Transient suppression	275 V MOV (line-to-line)

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#### General

Input-to-chassis isolation	1500 VAC, 50 Hz, 1 minute
Output-to-chassis isolation	500 VAC, 50 Hz, 1 minute

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## DC Input

Input voltage	12 V PMU	24 V PMU	48 V PMU
User-programmable alarms <sup>a</sup>			
Low battery voltage	10 V to 14 V	20 V to 28 V	40 V to 56V
High battery voltage	14 V to 17.5 V	28 V to 35 V	56V to 70V
User-programmable limits <sup>b</sup>			
Startup voltage (after shutdown)	10.9 V to 15 ±0.3V	21.8 V to 30 V ±0.5V	43.6 V to 60V ±1V
Shutdown voltage	10 V to 13.5 V ±0.3V	20 V to 27 V ±0.5V	40V to 54V ±1V
Battery protection (fail-safe) limits <sup>c</sup>			
Startup voltage	10.8 V ±0.2 V	21.6 V ±0.5 V	43.2 V ±1 V
Undervoltage shutdown	9.5 V ±0.3 V	19 V ±0.5 V	38 V ±1 V
Overvoltage shutdown	18.1 V ±0.3 V	36.2 V ±0.5 V	72.4 V ±1 V
Overvoltage shutdown reset	17.1 V ±0.3 V	34.2 V ±0.5 V	68.4 V ±1 V

a. User-programmable alarms can be set for low or high battery voltage, using the web interface. The alarms will be triggered when the set voltage levels are reached. These limits are subject to the tolerances of the battery protection circuitry, as stated in “Battery Protection (Fail-safe) Limits” above.

b. The user-programmable startup and shutdown limits allow for adjustable startup and shutdown voltages. Using the web interface, these limits can be adjusted for different numbers of battery cells, or for the particular requirements of base station operation. Once the limits are reached, the PMU will shutdown. These limits are subject to the tolerances of the battery protection circuitry.

c. The battery protection limits are set in hardware at the factory and cannot be adjusted by the user. These limits will not be reached under normal operation conditions, but are provided as “fail-safe” measures to protect the battery from deep discharge.

Input current	12 V	24 V	48 V
H/W version 3 PMU	100 mA	100 mA	80 mA
Battery protection startup voltage to user-programmed startup voltage <sup>d</sup>	40 mA typical at 10.8 V	30.1 mA typical at 21.6 V	13.2 mA typical at 43.2 V
Operating current	refer to <a href="#">“Power and Current Consumption” on page 14</a>		

d. At initial power-up; or, after battery protection has occurred, when the input voltage rises above the battery protection startup voltage (with the PMU now under control of its microcontroller), but is still below the user-programmed startup voltage

### Protection

Fault current (input)	circuit breaker or fuse in external wiring <sup>e</sup>
Wrong input voltage	electronic lock-out
Wrong input voltage polarity	shunt diode

e. Provided by user.

## Outputs

### 28 VDC output

Voltage	28 V
Current	14 A maximum
Regulation	±0.5%
Ripple and noise <sup>a</sup>	50 mVpp
Ripple and noise rms	10 mVrms
Transient response on 28 V loadstep <sup>b</sup>	2% overshoot and recover within 0.6 ms

a. 100 MHz bandwidth.

b. 10% to 100% loadstep.

### Protection

Overload	electronic current limit above 16 A
Short circuit	hiccup mode, self-resetting
Overvoltage	
AC module	electronic shutdown latch (33.5 V)
DC module	electronic hysteric control (33.5 V)

## Auxiliary Power Supply

DC input voltage 28 V ±15%

DC output <sup>a</sup>	12 V	24 V	48 V
Voltage	13.65 V	27.3 V	54.6 V
Current	3 A max	1.5 A max	750 mA max
Regulation	±2%	±2%	±2%
Ripple and noise <sup>b</sup>	50 mVpp	50 mV pp	50 mVpp
Ripple and noise rms	10 mVrms	10 mV rms	10 mVrms
Zero load ripple	100 mVpp	100 mVpp	100 mVpp

a. Output voltage is user-selectable on H/W version 3 PMU.

b. 100 MHz bandwidth.

Protection	12 V	24 V	48 V
Overload/short circuit	electronic current limit	electronic current limit	electronic current limit
Overvoltage	16 V Zener diode	32 V Zener diode	62 V Zener diode

### General

Input-to-output isolation	1000 VAC, 50 Hz, 1 minute
Output-to-chassis isolation	500 VAC, 50 Hz, 1 minute

## 1.4 Power and Current Consumption

The specifications in this section refer to the TB9400 base station fitted with a PMU. Listed performance figures are typical.

The transmission measurements were taken when the base station was transmitting at the stated RF output power, with all the front panel fans running.

The standby measurements were taken when the base station was not receiving or transmitting, with no front panel fans running.

All measurements were carried out with no load on the auxiliary power supply.

## 1.4.1 120VAC Input

### Transmit

	<b>A</b>	<b>VA</b>	<b>W</b>
<b>Single 50W base station</b>			
Minimum RF output power (5 W)	1 A	120 VA	117 W
Maximum RF output power (50 W)	1.9 A	238 VA	235 W
<b>Dual 50W base station<sup>a</sup></b>			
Minimum RF output power (5 W)	1.7 A	207 VA	204 W
Maximum RF output power (50 W)	2 A	450 VA	440 W
a. Both channels transmitting.			
<b>100 W base station</b>			
Minimum RF output power (10 W)	1.6 A	192 VA	189 W
50% RF output power (50 W)	2.4 A	295 VA	290 W
Maximum RF output power (100 W)	3.3 A	400 VA	395 W

### Standby

	<b>A</b>	<b>VA</b>	<b>W</b>
Single 50 W and 100 W base station	370 mA	44 VA	30 W
Dual 50 W base station	490 mA	59 VA	50 W

### Receive Only Reciters<sup>a</sup>

<b>Number of Reciters</b>	<b>A</b>	<b>VA</b>	<b>W</b>
1	0.5 mA	54 VA	53 W
2	0.6 mA	62 VA	62 W
3	0.7 mA	73 VA	72 W
4	0.7 mA	80 VA	86 W

a. Power consumption includes fans when running.

## 1.4.2 230VAC Input

### Transmit

	<b>A</b>	<b>VA</b>	<b>W</b>
Single 50 W base station			
Minimum RF output power (5 W)	700 mA	159 VA	108 W
Maximum RF output power (50 W)	1.1 A	250 VA	220 W
Dual 50 W base station <sup>a</sup>			
Minimum RF output power (5 W)	1 A	230 VA	196 W
Maximum RF output power (50 W)	2 A	460 VA	440 W
a. Both channels transmitting.			
100 W base station			
Minimum RF output power (10 W)	970 mA	223 VA	183 W
50% RF output power (50 W)	1.3 A	310 VA	285 W
Maximum RF output power (100 W)	1.7 A	395 VA	375 W

### Standby

	<b>A</b>	<b>VA</b>	<b>W</b>
Single 50 W and 100 W base station	510 mA	117 VA	31 W
Dual 50 W base station	510 mA	117 VA	45 W

### Receive Only Reciters<sup>a</sup>

<b>Number of Reciters</b>	<b>A</b>	<b>VA</b>	<b>W</b>
1	0.5 mA	106 VA	53 W
2	0.5 mA	112 VA	55 W
3	0.6 mA	120 VA	66 W
4	0.6 mA	120 VA	83 W

a. Power consumption includes fans when running.



### 1.4.3 12VDC Input

#### Transmit

	A	W
Single 50 W base station		
Minimum RF output power (5 W)	8.8 A	106 W
Maximum RF output power (50 W)	18 A	216 W
Dual 50 W base station <sup>a</sup>		
Minimum RF output power (5 W)	16 A	192 W
Maximum RF output power (50 W)	36 A	432 W
a. Both channels transmitting.		
100 W base station		
Minimum RF output power (10 W)	14.6 A	176 W
50% RF output power (50 W)	23.6 A	285 W
Maximum RF output power (100 W)	32 A	385 W

#### Standby

	A	W
Single 50 W and 100 W base station	2.0 A	24 W
Dual 50 W base station	3.3 A	39 W

#### Receive Only Reciters<sup>a</sup>

Number of Reciters	A	W
1	3.3 A	40 W
2	4.1 A	50 W
3	5.1 A	62 W
4	6.1 A	73 W

a. Power consumption includes fans when running.

## 1.4.4 24VDC Input

### Transmit

	<b>A</b>	<b>W</b>
Single 50 W base station		
Minimum RF output power (5 W)	4.4 A	106 W
Maximum RF output power (50 W)	9 A	216 W
Dual 50 W base station <sup>a</sup>		
Minimum RF output power (5 W)	7.9 A	190 W
Maximum RF output power (50 W)	17 A	408 W
a. Both channels transmitting.		
100 W base station		
Minimum RF output power (10 W)	7.1 A	171 W
50% RF output power (50 W)	11.8 A	285 W
Maximum RF output power (100 W)	15.5 A	370 W

### Standby

	<b>A</b>	<b>W</b>
Single 50 W and 100 W base station	975 mA	23 W
Dual 50 W base station	1.6 A	39 W

### Receive Only Reciters<sup>a</sup>

<b>Number of Reciters</b>	<b>A</b>	<b>W</b>
1	1.7 A	41 W
2	2.1 A	51 W
3	2.5 A	60 W
4	2.9 A	70 W

a. Power consumption includes fans when running.

## 1.4.5 48VDC Input

### Transmit

	A	W
Single 50 W base station		
Minimum RF output power (5 W)	2.1 A	101 W
Maximum RF output power (50 W)	4.2 A	202 W
Dual 50 W base station <sup>a</sup>		
Minimum RF output power (5 W)	3.7 A	178 W
Maximum RF output power (50 W)	7.8 A	374 W
a. Both channels transmitting.		
100 W base station		
Minimum RF output power (10 W)	3.2 A	155 W
50% RF output power (50 W)	5.5 A	265 W
Maximum RF output power (100 W)	7.4 A	355 W

### Standby

	A	W
Single 50 W and 100 W base station	480 mA	23 W
Dual 50 W base station	780 mA	38 W

### Receive Only Reciters<sup>a</sup>

Number of Reciters	A	W
1	0.8 A	40 W
2	1.0 A	49 W
3	1.4 A	65 W
4	1.4 A	68 W

a. Power consumption includes fans when running.

# 1.5 Receiver

## General

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### Frequency bands

B1 band	136 MHz to 174 MHz
HH band	378 MHz to 420 MHz
H1 band	400 MHz to 440 MHz
H2 band	440 MHz to 480 MHz
H3 band	470 MHz to 520 MHz
K4 band	794 MHz to 824 MHz

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Type	Triple conversion superheterodyne; first conversion is analog, second is hybrid, and third is digital
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### Frequency increments

B band	2.5 kHz and 3.125 kHz
H and K4 bands	5 kHz and 6.25 kHz

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### Switching range<sup>a</sup>

B1 band	Full band
H1, H2 & H3 bands	±5 MHz
, HH & K4 bands	Full band

a. The frequency range, measured from the tuned frequency, that can be used without needing to retune the front end or recalibrate the RSSI. Bands with full switching range do not require manual tuning.

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Input load impedance	50 Ω nominal (VSWR < 2:1)
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RF input protection	no degradation after 5 minutes exposure to on-channel signals at +20 dBm (2.2 V)
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### Frequency stability

Internal reference	±0.5 ppm –30 °C to +60 °C (–22 °F to +140 °F)
External reference	
B band	±1 Hz ± multiplied accuracy of external reference
H band	±1 Hz ± multiplied accuracy of external reference
K band	±2 Hz ± multiplied accuracy of external reference

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RSSI	≤ –125 dBm to –30 dBm
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### IF stages - B1 band

Frequencies	
Analog	21.4 MHz
Digital	21.4 MHz and 0 Hz

### IF stages - H and K4 bands

Frequencies	
Analog	70.1 MHz
Digital	8.66 MHz and 0 Hz

---

## General (Continued)

---

### Spurious Emissions

Conducted	<-90 dBm 9 kHz to 2 GHz <-70 dBm 2 GHz to 12.75 GHz
Radiated	<-57 dBm 30 MHz to 1 GHz <-47 dBm 1 GHz to 4 GHz

---

## Digital RF (DMR)

---

### Digital unfaded sensitivity<sup>a</sup>

Guaranteed	<-120dBm @ 5% BER (DAQ 2.0) <-118.5dBm @ 2.6% BER (DAQ 3.0) <-118dBm @ 2% BER (DAQ 3.4) <-117dBm @ 1% BER (DAQ 4.0)
------------	--

Typical	<-122dBm (0.18μV) @ 5% BER
---------	----------------------------

a. Center of switching range at 25°C.

---

### Digital selectivity

B and H bands	≥82dB @ 1% BER
G band	≥80dB @ 1% BER
H5 band	≥79dB @ 1% BER
K and L2 bands	≥77dB @ 1% BER

---

Digital spurious response attenuation	≥90dB
---------------------------------------	-------

---

Digital intermodulation response attenuation <sup>b</sup>	≥78dB @ 1% BER unfaded
---	------------------------

b. Up to 5dB degradation at extremes of switching range and temperature.

---

### Digital blocking rejection

> 1MHz	100dB @ 1% BER
--------	----------------

---

Digital co-channel rejection	12dB
------------------------------	------

---

## Digital RF (P25)

---

The test methods used to obtain these figures are those described in TIA-102.CAAA-D for P25 Phase 1, and TIA-102.CCAA-A for P25 Phase 2.

---

Digital unfaded sensitivity <sup>a</sup>	<-120 dBm @ 5% BER
--	--------------------

Digital faded sensitivity <sup>a</sup>	<-112 dBm @ 5% BER
--	--------------------

a. At 25 °C.

---

## Digital RF (P25)

---

Digital adjacent channel rejection	60 dB
------------------------------------	-------

---

Digital signal displacement bandwidth	1 kHz
---------------------------------------	-------

---

Digital spurious response attenuation	$\geq 100$ dB
---------------------------------------	---------------

---

Digital intermodulation response attenuation	85 dB
--	-------

---

Digital blocking rejection	
----------------------------	--

1 to 10 MHz	100 dB
-------------	--------

---

Digital co-channel rejection	9 dB
------------------------------	------

---

---

## Analog RF

	Channel Spacing	Modulation 100% Deviation (Nominal)
Narrow Bandwidth (NB)	12.5 kHz	+/-2.5 kHz
Wideband	25 kHz	+/-5 kHz

### FCC Narrow banding Regulations

The following regulations apply to all base stations, regardless of FCC jurisdiction.

From 1 January 2013 it is an FCC requirement that land mobile radio systems must not operate channels with a bandwidth greater than 12.5 kHz in the 150–174 MHz and 421–470 MHz frequency bands. From this date all base stations will be supplied with firmware that requires a software feature license to operate a wide bandwidth channel in these frequency bands.

The TBAS083 20/25 kHz Unrestricted Wideband feature license is available to any customer not subject to these FCC regulations, or with an FCC waiver. Note that this feature license is also required to operate a wide bandwidth channel on the spot frequencies which are exempt from the FCC requirement. To obtain the feature license, or for more information, contact your regional Tait office.



Unless otherwise noted, specifications in this section apply to narrowband and wideband operation.

---

#### Sensitivity<sup>a,b</sup>

De-emphasized response	
Centre of switching range	<-119 dBm (0.25 $\mu$ V) at 25 °C
Edge of switching range	<-117 dBm (0.32 $\mu$ V) at 25 °C

a. 12 dB SINAD.

b. Up to 2 dB degradation at extremes of temperature.

---

#### Maximum usable sensitivity<sup>c,d</sup>

De-emphasized response	
Centre of switching range	<-116 dBm (0.35 $\mu$ V) at 25 °C (narrowband) <-118 dBm (0.35 $\mu$ V) at 25 °C (wideband)
Edge of switching range	<-114 dBm (0.45 $\mu$ V) at 25 °C (narrowband) <-116 dBm (0.45 $\mu$ V) at 25 °C (wideband)

c. Sensitivity for 20 dB SINAD, psophometrically weighted, RF source modulated at 60% deviation with 1 kHz.

d. Up to 2 dB degradation at extremes of temperature.

---

#### FM quieting<sup>e</sup>

Narrowband	-113 dBm
Wideband	-117 dBm

e. 20 dB FM quieting, measured with de-emphasis on.

---

## Analog RF

---

Hum and Noise (Ultimate signal-to-noise ratio)  
(at -47 dBm)<sup>f</sup>

B and H bands	45 dB (ANSI/TIA) (narrowband) 50 dB (CEPT - psophometric) (narrowband)
B band	55 dB (ANSI/TIA) (wideband)
K4 band	43 dB (ANSI/TIA)

f. Up to 5 dB degradation at extremes of switching range and temperature.

---

Selectivity <sup>g</sup>	EIA-603 <sup>h</sup>	TIA/EIA-603-D <sup>h</sup>	ETSI
B and H bands, narrowband	85 dB	50 dB	85 dB
B band, wideband	90 dB	87 dB	
K4 band	79 dB	45 dB	—

g. Up to 5 dB degradation at extremes of switching range and temperature.

h. The EIA-603 is a single tone test method. The TIA/EIA-603-D is a two-tone test method.

---

Signal displacement bandwidth  $\geq 1$  kHz

---

Spurious response attenuation  $\geq 100$  dB (ANSI/TIA)  
 $\geq 90$  dB (ETSI)

---

Intermodulation response attenuation<sup>i</sup>

B and H bands	80 dB (ETSI) (narrowband)
B band	85 dB (ANSI/TIA) (wideband)
K4 band	80 dB (ANSI/TIA)

i. Up to 5 dB degradation at extremes of switching range and temperature.

---

Blocking rejection

B and H bands	
1–10 MHz	100 dB (ETSI)
>10 MHz	110 dB (ETSI)
$\pm 1, \pm 2, \pm 5$ and $\pm 10$ MHz	100 dB (ANSI/TIA)
K4 band	
1–10 MHz	100 dB (ANSI/TIA)
>10 MHz	110 dB (ANSI/TIA)
$\pm 1, \pm 2, \pm 5$ and $\pm 10$ MHz	100 dB (ANSI/TIA)

---

Co-channel rejection

Narrowband	-8 dB
Wideband	-5 dB

---

Amplitude characteristic<sup>j</sup>  $\leq 3$  dB (ETSI)

j. RF Input Level -107 dBm to -13 dBm.

---



## Analog Audio - General

---

Frequency response (FM demodulator to G.711)

Bandwidth (subaudible signaling enabled)	339Hz - 3kHz
Bandwidth (subaudible signaling disabled)	185Hz - 3kHz
De-emphasis	within +1, -3dB of a -6dB/octave de-emphasis curve (ref 1kHz).
Pre-emphasis	within +1, -3dB of a +6dB/octave pre-emphasis curve (ref 1kHz)
Flat	within +1, -3dB (ref 1 kHz)

For more information, refer to [“Appendix A Frequency Response Diagrams”](#) on page 53.

---

Extended bypass mode response for speech path set to flat (FM demodulator to G.711)	Frequency range (Hz)	Response (dB compared with 1kHz)
	0 - 3300	+/- 1.0
	3550	-3
	4000	-30

---

## Analog Audio - CTCSS

---

High pass (subaudible) filter

Hum and noise <sup>a</sup>	30 dB minimum at 250.3 Hz 35 dB typical (67 Hz to 240 Hz)
----------------------------	--

a. 1 kHz at 60% system deviation, CTCSS at 10% system deviation.

Tone detect

Tone squelch opening	better than 6 dB SINAD
Tone detect bandwidth	
Accept	±2 Hz typical
Reject	±3.6 Hz typical
Response time (open)	≤150 ms typical

---

## Analog Audio - Gating Operation

---

### SINAD gating

Opening level	6 dB to 20 dB SINAD
Accuracy	±3 dB
RF hysteresis	6.5 dB
Opening time	60 ms typical
Closing time	60 ms typical

---

### RSSI gating

Opening level	-117 dB to -70 dBm
Accuracy <sup>a</sup>	± 0.1 dB
RF hysteresis	4 dB
Opening time	20 ms maximum
Closing time	20 ms maximum

a. Assumes that RSSI has been calibrated (WebUI) at the receiver frequency


---

### Receiver gate logical combinations:

SINAD gating only	Provides for robust operation
RSSI gating only	Provides for rapid operation
SINAD OR RSSI gating	Gate operates rapidly and provides robust operation while SINAD condition is met
SINAD AND RSSI gating	Can reject low level interfering signals

---

## 1.6 Transmitter

-  The specifications in this section pertain only to the combination of a TB9400 reciter with a 50 W or 100 W power amplifier.

### FCC Narrow banding Regulations

The following regulations apply to all base stations, regardless of FCC jurisdiction.

From 1 January 2013 it is an FCC requirement that land mobile radio systems must not operate channels with a bandwidth greater than 12.5 kHz in the 150–174 MHz and 421–470 MHz frequency bands. From this date all base stations will be supplied with firmware that requires a software feature license to operate a wide bandwidth channel in these frequency bands.

The TBAS083 20/25 kHz Unrestricted Wideband feature license is available to any customer not subject to these FCC regulations, or with an FCC waiver. Note that this feature license is also required to operate a wide bandwidth channel on the spot frequencies which are exempt from the FCC requirement. To obtain the feature license, or for more information, contact your regional Tait office.

Unless otherwise noted, specifications in this section apply to narrow-band and wideband operation.

### General

---

#### Frequency bands

B1 band	136 MHz to 174 MHz
HH band	378 MHz to 420 MHz
H1 band	400 MHz to 440 MHz
H2 band	440 MHz to 480 MHz
H3 band	470 MHz to 520 MHz
K4 band	762 MHz to 776 MHz and 850 MHz to 870 MHz

---

#### Frequency increments

B band	2.5 kHz and 3.125 kHz
H and K4 bands	5 kHz and 6.25 kHz

---

Frequency stability<sup>a</sup> ±0.5 ppm –30 °C to +60 °C (–22 °F to +140 °F)

- a. For K4 band (762 MHz to 776 MHz) the internal frequency reference accuracy is inadequate, and an external reference must be used. The stability of this reference should be better than 100 parts per billion. See [“External Frequency Reference Input \(BNC\)” on page 35](#).
- 

Output load impedance 50 Ω nominal

---

## General (Continued)

---

### Output power

50 W PA	
Rated Power	50 W
Range of Adjustment	5 W to 50 W in 1 W steps
100 W PA	
Rated power	100 W
Range of adjustment	10 W to 100 W in 1 W steps

---

### Output power accuracy<sup>b</sup>

Within normal operating voltages and temperatures	+0.5 / -0.2 dB into a 50 $\Omega$ load
At extremes of temperature and altitude	+0.5 / -1.5 dB into a 50 $\Omega$ load

b. Measured directly on PA output.

---

Peak-to-average power level<sup>c</sup> peak power is +2.7 dB above average rated power

c. LSM and P25 Phase 2 only.

---

### Duty cycle

Up to 3600 m (11810 ft) altitude	100% at maximum rated output power <sup>d</sup> at +60 °C (+140 °F) ambient temperature
Above 3600 m (11810 ft) altitude	100% at maximum rated output power <sup>d</sup> at +50 °C (+122 °F) ambient temperature, or output power derated by 1.5 dB at +60 °C (+140 °F)

d. Measured directly on PA output.

---

### Mismatch capability

Ruggedness	open and short circuit load at any phase angle for one hour <sup>e</sup>
Stability	5:1 load VSWR at all phase angles <sup>e</sup>

e. Under power foldback.

---

### Protection<sup>f</sup>

Temperature	power foldback to 35 W if RF power devices exceed safe operating conditions
Current	power foldback and shutdown if RF power devices exceed safe operating currents for more than 5 seconds
Supply voltage	power foldback to 35 W when supply voltage is 24 V to 26 V and 30 V to 32 V; shutdown when supply voltage is <24 V and >32 V
VSWR	power foldback to 25 W to 35 W when VSWR >3:1
Feedback loop instability	power reduces to maintain loop stability within safe margins

f. Power foldback only occurs if the set power is higher than the foldback power level.

---

## General (Continued)

---

### Adjacent channel power (K4 bands)

Steady State (All modulation types ETSI)	< -60dBc (EN 300 113 & EN 300 086)
Steady State (P25 - TIA)	< -67dBc (TIA-102.CAAA)
Steady State (DMR)	< -60dBc (EN 300 113)
Transient (P25 & DMR - ETSI)	< -50dBc (EN 300 113)

---

### Adjacent Channel Power (B3 and H bands only)

All modulation types	
Steady State	< -60 dBc (EN 300 113 & EN 300 086)
Transient	< -60 dBc (EN 300 113)

g. 762-776 MHz band complies with FCC 47 CFR 27.53(e)(6) and 47 CFR 90.543(a).

---

### Modulation fidelity

DMR	<2% (EN 300 113)
P25	<2% TIA-102.CAAA and TIA-102.CCAA

---

### Intermodulation

P25/DMR	-40dBc with interfering signal at -30dBc at TB9400 base station RF output. For Europe, 70dB ratio is achieved using an external circulator/isolator with a minimum isolation of 30dB and less than 0.5dB insertion loss.
---------	--

---

Tait recommends that an external isolator should always be connected to the output of the VHF transmitter.

---

### Sideband noise<sup>h</sup>

±12.5 kHz	< -120 dBc/Hz
±100 kHz	< -130 dBc/Hz
≥±1.5 MHz	< -154 dBc/Hz at 50 W
	< -157 dBc/Hz at 100 W

h. No modulation, measured from center frequency.

---

### Radiated spurious emissions

Transmit - B band	< -36 dBm 30 MHz to 1 GHz
	< -30 dBm 1 GHz to 4 GHz
Transmit - H band	< -36 dBm 30 MHz to 1 GHz
	< -30 dBm 1 GHz to 4 GHz <sup>i</sup>
	< -30 dBm 1 GHz to 12.75 GHz <sup>j</sup>
Transmit - K4 band	< -20 dBm to 9 GHz
Standby	< -57 dBm to 1 GHz
	< -47 dBm 1 GHz to 4 GHz

i. Transmit frequency below 470 MHz.

j. Transmit frequency above 470 MHz.

---

## General (Continued)

---

### Conducted spurious emissions

Transmit - B band	< -36 dBm 9 kHz to 1 GHz < -30 dBm 1 GHz to 4 GHz
Transmit - H band	< -36 dBm 30 MHz to 1 GHz < -30 dBm 1 GHz to 4 GHz <sup>k</sup> < -30 dBm 1 GHz to 12.75 GHz <sup>l</sup>
Transmit - K4 band	< -20 dBm to 9 GHz
Standby	< -57 dBm to 1 GHz < -47 dBm 1 GHz to 12.75 GHz

k. Transmit frequency below 470 MHz.

l. Transmit frequency above 470 MHz.

---

Transient behavior - B and H bands	complies with EN 300 113 v2.2.1
------------------------------------	---------------------------------

---

## Simulcast

---

Launch time accuracy <sup>a</sup>	± 1.5 µs
-----------------------------------	----------

a. Launch time offset, adjustable in 1 µs increments.

---

Deviation accuracy	0.2 dB
--------------------	--------

---

Frequency accuracy <sup>b</sup>	< 1 Hz
---------------------------------	--------

b. Carrier frequency offset, adjustable in 0.1 Hz increments.

### Supported simulcast modulation schemes

P25	C4FM LSM H-DQPSK
DMR	4FSK
Analog	FM

---

### Receive voter limitations<sup>c</sup>

Maximum number of receivers	10 (Conventional) 14 (Trunked)
Maximum marshaling duration:	
P25	300 ms (simulcast operation)
DMR	300 ms (simulcast operation)
Analog	150 ms (simulcast operation)
Maximum central voter speech packet arrival time skew	100 ms

c. For a discussion of the significance of these limitations, see the System Manual.

---

## Simplex

---

Coaxial relay operating time	30 ms (maximum) <sup>a</sup>
------------------------------	------------------------------

---

## Simplex

---

Isolation (off-state)	> 40 dB
-----------------------	---------

---

- a. **Warning:** A coaxial relay that takes longer than 30 ms to operate risks damage to the PA.

## Analog Audio - General

### Peak deviation

Narrowband	≤2.5 kHz
Wideband	≤5 kHz

Nominal deviation selection <sup>a</sup>	55% to 65% of peak deviation
--	------------------------------

Limiting deviation <sup>b</sup>	94% of maximum system deviation
---------------------------------	---------------------------------

---

CWID deviation	40% of peak deviation
----------------	-----------------------

---

- a. For a level of -10 dBm0 applied to the line input.  
b. With modulation input driven at a frequency of 1 kHz, and 20 dB above the nominal level of 60% deviation.

## Analog Audio - Modulation Characteristics

### Frequency Response (G.711 to FM modulator)

Bandwidth (subaudible signaling enabled)	307 Hz - 3 kHz
Bandwidth (subaudible signaling disabled)	134 Hz - 3 kHz
Pre-emphasized response	within +1, -3 dB of a 6 dB/octave pre-emphasis curve (ref. 1 kHz)
Flat response	within +0.5, -1.5 dB of output level at 1 kHz

For more information, refer to [“Appendix A Frequency Response Diagrams” on page 53](#).

---

Extended bypass mode response for speech path set to flat (G.711 to FM modulator)	Frequency range (Hz)	Response (dB compared with 1 kHz)
	0 - 3600	+/- 1.0
	3600 - 3760	+1.0 / -3
	4000	-10

---

Distortion	<2%
------------	-----

---

## Analog Audio - Modulation Characteristics (Continued)

---

Hum and noise<sup>d</sup>

Narrowband	-50 dB typical (ETSI)
Wideband	-55 dB typical (ANSI/TIA)

d. Up to 5 dB degradation at extremes of switching range and temperature.

---

## Analog Audio - CTCSS

---

Standard tones	all 37 ANSI/TIA group A, B and C tones plus 13 commonly used tones
Frequency error (from ANSI/TIA tones)	0.08% maximum
Generated tone distortion	1.2% maximum
Generated tone flatness	flat across 67 Hz to 250.3 Hz to within 1 dB
Modulation level	Adjustable
Modulated distortion	<5%

---



## 1.7 Network

### 1.7.1 Requirements for Delay, Jitter, Loss and Duplication

Standard Requirements	Recommended	Required
Out of order C plane and U plane packets <sup>a</sup>	Less than 0.01%	
Packet Loss	Less than 0.01%	
Latency	Less than 40 ms	< 150 ms
Jitter	Less than 20 ms	< 100 ms
Skew	Less than 80 ms	
Minimum bandwidth for user traffic (voice, control channel, packet data)	P25: 50 kbit/s per physical channel Analog: 108 kbit/s per physical channel DMR: 64 kbit/s per physical channel	
Minimum bandwidth to carry management traffic (web, logs, SNMP).	100 kb/s per site	
Minimum bandwidth to meet jitter requirements on a non-fragmenting link	600 kb/s per site up to 5 physical channels	

a. 'C plane' and 'U plane' are telco terms for distinguishing between call setup and user traffic.

## 1.7.2 Channel Group Size

The table below defines vote contributors and channel group size for each channel type:

‘Channel group size’ is the number of receivers and transceivers in a channel group.

‘Vote contributors’ are the number of active receivers that will contribute to a voted output.

		Series 1	Series 2
Channel Type	Vote Contributors	Channel Group Size	Channel Group Size
P25 failsoft (trunking)	all base stations	14	28
P25 trunked control channel	all base stations	14	28
P25 trunked traffic channel Phase 1 and Phase 2	all base stations	14	28
P25 conventional <sup>a</sup>	10	20	28
P25 dual mode <sup>a</sup>	10	20	28
AS-IP conventional <sup>a</sup>	10	20	28
All DMR (trunked and conventional)	all base stations	10	28

a. P25/AS-IP conventional channel groups with more than 10 base station receivers automatically restrict the number of voting contributors to the best 10 receivers. This is to maintain responsiveness of management operations such as the web user interface.



In systems with a mixture of Series 1 and Series 2 base stations, the channel group sizes in the above table will depend on whether the channel group master is a Series 1 or Series 2 base station.

## 1.8 System Connections

### 1.8.1 External Frequency Reference Input (BNC)

Frequencies <sup>a</sup>	10 MHz or 12.8 MHz
Lock range	± 50 Hz
Input level	500 mV <sub>pp</sub> to 5 V <sub>pp</sub>
Input impedance	≥ 1 kΩ

a. Automatically detected by the reciter.

### 1.8.2 Ethernet Interface (RJ45)

Transceiver	10/100 Base-Tx/Rx (Auto-MDIX)
IEEE-spec	IEEE 802.3 and 802.3u

### 1.8.3 System Interface (DB-25)

#### External General Purpose Digital Inputs

Input low threshold	$V_{IL} < 0.6 \text{ V}$
Input high threshold	$V_{IH} > 2.3 \text{ V}$
Internal pull-up (5V)	≥ 10 kΩ
Input source current	$I_{IL} < 1 \text{ mA}$ ( $V_{IL} = 0 \text{ V}$ )
Continuous input voltage	$ V_{IN}  < 30 \text{ V}$
Transient input voltage	$ V_{IN}  < 35 \text{ V}$ ( $t < 1 \text{ s}$ )

## External General Purpose Digital Outputs

---

Low level	< 0.4 V
High level	< 30 V
Low level sink current	< 5.0 mA
High level current	< 100 $\mu$ A

---

## 1.8.4 Balanced Interface

### Line Output - Balanced

---

Audio Headroom	+10 dBm
----------------	---------

The largest sine-wave signal that meets distortion specifications

---

Input Level Range	-30 dBm to +0 dBm
-------------------	-------------------

For an output signal of 60% deviation at 1 kHz  
Adjustable over this range

---

Output impedance	600 $\Omega$ balanced
------------------	-----------------------

---

Return loss	> 20 dB
-------------	---------

---

Impedance balance about earth (ITU-T G.117)	> 46 dB
--	---------

---

Frequency response (‘speech’ setting)	300 Hz to 3 kHz
--	-----------------

---

Passband ripple (compared with 1 kHz)	-3 dB to +1 dB
--	----------------

---

Distortion (RF to line)	3 %
-------------------------	-----

---

Applicable over a level adjustment range up to the audio headroom limit

Applicable over the entire frequency response range

---

## Line Input - Balanced

Audio headroom	+10 dBm
Input Level Range	-30 dBm to 0 dBm
For an output signal of 60% deviation at 1kHz Adjustable over this range	
Impedance	600 $\Omega$ balanced
Return loss	>20 dB
Impedance balance about earth	>46 dB
ITU G.117	
Frequency response	300 Hz to 3 kHz
Distortion (line to RF)	3%

## 1.8.5 Unbalanced Interface

### Line Output - Unbalanced

Linear range of operation	1 to 3 V
---------------------------	----------

### Line Input - Unbalanced

Linear range of operation	1 to 3 V
---------------------------	----------

## 1.8.6 Audio Delay

**Transmit direction:** 70 ms max (signal applied to a balanced/unbalanced input)

**Transmit direction (analog audio to P25 RF):** 130 ms max

**Receive direction:** 70 ms max (signal sampled on a balanced/unbalanced output)

**Receive direction (P25 RF to analog audio):** 90 ms max

**Delay distortion:**  $\leq 40 \mu\text{spp}$  300 Hz to 3 kHz (relative to 1 kHz)



Delay distortion is the pulse distortion that arises because different frequency components have different delays.

## 1.8.7 Rx Gate Output

**Logic state:** Active low

**Logic type:** Open drain transistor connection



The Rx Gate output is not the same as an M-wire output:

Large negative voltages (traditionally associated with E&M signaling) can damage the reciter hardware when applied directly.

Tait offers an isolation adapter that provides E&M isolated signaling (order number TBC101A).

### Electrical Characteristics

Parameter	Specification	Comments
Low voltage level	<0.4 V	Rx gate activated
High voltage level	0 to 30 V	Protection
Low level output current	<250 mA	
High level output current	<100 $\mu$ A at 30 V	

## 1.8.8 RSSI Output

Parameter	Value	Unit
Configurable RF input range	-120 .. -60	dBm
Configurable output range	1 .. 4.5	V
Maximum output range Series 1	0.8 .. 4.6	V
Maximum output range Series 2	0.5 .. 4.9	V
Accuracy	+/- 300	mV
Response time	< 70	ms
Output impedance	100	Ohm

## 1.8.9 Antenna Relay Output

The antenna relay output will be active when the base station transmits, if the antenna relay is enabled in the WebUI.

**Logic state:** Active low

**Logic type:** Open drain transistor connection




Antenna relay operation applies to P25, and analog conventional mode when using DMR firmware.

### Electrical Characteristics

Parameter	Specification	Comments
Low voltage level	< 0.4 V	Antenna relay activated
High voltage level	0 to 30 V	Protection
Low level output current	< 250 mA	
High level output current	< 100 $\mu$ A at 30V	

## 1.8.10 Tx Key Input

 The Tx Key input is not the same as an E-wire input:

Large negative voltages (traditionally associated with E&M signaling) can damage the reciter hardware if applied directly.

Tait offers an isolation adapter that provides E&M isolated signaling (order number TBC101A).

**Logic state:** Active low.

### Electrical Characteristics

Parameter	Specification	Comments
Low voltage level	$\leq +0.8\text{ V}$	Input active
High voltage level	$\geq +2\text{ V}$	Input inactive
Input hysteresis	$\geq 0.4\text{ V}$	
Input resistance	$\geq 10\text{ k}\Omega$	To +5 rail
Maximum external pull up voltage	$\leq 20\text{ V}$	

## 1.8.11 1PPS Timing Reference Input (BNC)

Input low threshold	$V_{IL} < 0.6\text{ V}$
Input high threshold	$V_{IH} > 2.3\text{ V}$
Input termination	$470\ \Omega + 5\%$ (AC terminated)
Transient input voltage	$ V_{IN}  < 15\text{ V}$
Frequency	1 PPS
Polarity	rising edge represents a timing reference
Maximum jitter	$\pm 50\text{ ns}$



## 1.9 Miscellaneous

### 1.9.1 Channel Details

---

Number of channels	4000
--------------------	------

---

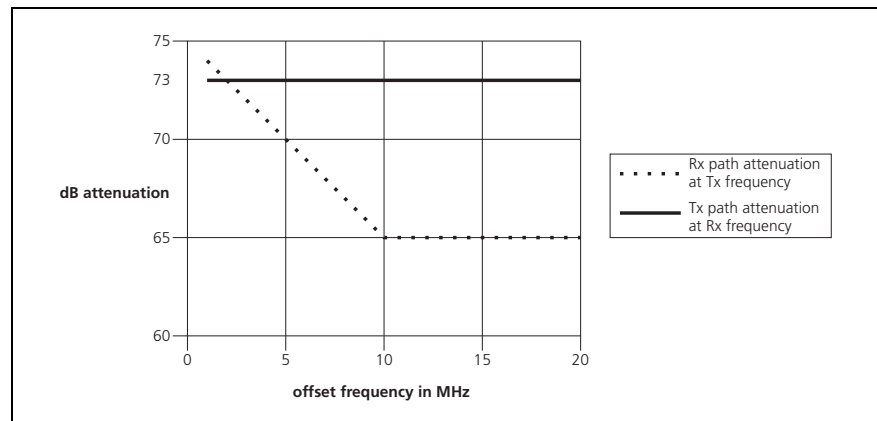
Channel change time	300 ms
---------------------	--------

---

### 1.9.2 Duplexer Attenuation Requirements

The following graph shows the attenuation requirements for duplexers used with the base station. The dotted plot represents the attenuation required in the Rx path at the Tx frequency, while the continuous plot shows the attenuation required in the Tx path at the Rx frequency.

A 100 W transmitter is assumed. The quoted attenuation will ensure no more than 1 dB of receiver desensitization (from the specified sensitivity), with a 5 dB margin built in.



### 1.9.3 Operating Temperature Range

---

Operating temperature range	-30 °C to +60 °C (-22 °F to + 140 °F) ambient temperature <sup>a</sup>
-----------------------------	--

---

a. Ambient temperature is defined as the temperature of the air at the intake to the cooling fans.

---

## 1.9.4 Heat Load Values

These measurements were carried out with the base station transmitting at its rated output power with all front panel fans running. All measurements were carried out with no load on the auxiliary power supply.

---

	<b>W</b>	<b>Btu/h</b>
Base station <sup>a</sup>		
Single 50 W	185 W	631 Btu/h
Dual 50 W	340 W	1160 Btu/h
100 W	295 W	1007 Btu/h

a. Transmitting at rated output power.

---

## 1.9.5 Dimensions and Weight

### Dimensions

---

Height	176.8 mm (7 in)
Width	482.6 mm (19 in)
Length	
Subrack only	385 mm (15.2 in)
Including front panel	400.5 mm (15.8 in)

---

### Weight<sup>a</sup>

---

	H/W version 1 and 2 PMU	H/W version 3 PMU
Single 50W Base Station	19.6 kg (43.2 lb)	16.6 kg (36.6 lb)
Dual 50W Base Station	24.8 kg (54.7 lb)	21.8 kg (48.1 lb)
100W base station	21.1 kg (46.5 lb)	18.1 kg (40.0 lb)
Receive-only		
1 receiver	16.9 kg (37.3 lb)	13.9 kg (30.7 lb)
2 receivers	19.3 kg (42.5 lb)	16.3 kg (36.0 lb)
3 receivers	21.7 kg (47.8 lb)	18.7 kg (41.3 lb)
4 receivers	24.1 kg (53.1 lb)	21.1 kg (46.5 lb)

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a. With AC and DC PMU.

## 1.9.6 Reliability

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MTBF	140,000 hours minimum (based on field returns)
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## 2 Module Specifications

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This chapter provides hardware specifications for the individual modules used in the TB9400 base station:

- Reciter and receiver
- PA
- PMU

**Notice** The software release notes list known issues or limitations of the base station that may vary from the specifications published in this document. Please refer to the current software release notes for any variations to the specifications in this document.

## 2.1 Reciter and Receiver

### 2.1.1 Identifying the Reciter and Receiver

You can identify the model and hardware configuration of a reciter and receiver by referring to the product code printed on labels on the front and rear panels. The meaning of each character in the product code is explained in the table below.

**Notice** This explanation of reciter and receiver product codes is not intended to suggest that any combination of features is necessarily available in any one reciter or receiver. Consult your regional Tait office for more information regarding the availability of specific models and options.

Product Code	Description
T01-0110 <u>X</u> -XXXX	3 = reciter 4 = receiver
T01-0110X- <u>X</u> XXX	<b>Frequency Band and Sub-band</b> B = 136 MHz to 174 MHz (B1 band) J = 378 MHz to 420 MHz (HH band) K = 400 MHz to 440 MHz (H1 band) L = 440 MHz to 480 MHz (H2 band) M = 470 MHz to 520 MHz (H3 band) N = 762 MHz to 870 MHz (K4 band) <sup>a</sup>
T01-0110X-X <u>X</u> XX	A = standard
T01-0110X-XX <u>X</u> X	A = default
T01-0110X-XXX <u>X</u>	A = default

- a. The actual frequency coverage in this band is:  
Transmit: 762 MHz to 776 MHz and 850 MHz to 870 MHz  
Receive: 792 MHz to 824 MHz

## 2.1.2 Physical Details

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Cooling	forced air via front panel fan
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### Connectors

RF input	BNC female
Transmit forward RF output	SMA female
Transmit reverse RF input	SMA female
Recommended SMA torque	0.6 N·m (5 lbf·in)
Control, alarm and 28 VDC input	20-way IDC male
External reference frequency input	BNC female
1PPS input	BNC female
Ethernet	RJ45
System inputs and outputs	DB-25 connector

---

### Dimensions

Height	144 mm (5.7 in)
Width	54.6 mm (2.1 in)
Length	321.5 mm (12.7 in)

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Weight	2.4 kg (5.3 lb)
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## 2.2 PA

### 2.2.1 Identifying the PA

You can identify the model and hardware configuration of a PA by referring to the product code printed on labels on the front and rear panels. The meaning of each character in the product code is explained in the table below.

**Notice** This explanation of PA product codes is not intended to suggest that any combination of features is necessarily available in any one PA. Consult your regional Tait office for more information regarding the availability of specific models and options.

Product Code	Description
T01-01121- <u>X</u> XXX	<b>Frequency Band and Sub-band</b> B = 136 MHz to 174 MHz (B1 band) J = 378 MHz to 420 MHz (HH band) K = 400 MHz to 440 MHz (H1 band) L = 440 MHz to 480 MHz (H2 band) M = 470 MHz to 520 MHz (H3 band) N = 762 MHz to 870 MHz (K4 band) <sup>a</sup>
T01-01121- <u>X</u> <u>X</u> XX	A = 50 W B = 100 W
T01-01121- <u>X</u> XX <u>X</u>	A = default
T01-01121- <u>X</u> XXX	A = default
T01-01121-XXXX	A = default B = no internal Isolator

a. The actual frequency coverage in this band when used with a K4-band TB9400 reciter is 762 MHz to 776 MHz and 850 MHz to 870 MHz.

## 2.2.2 Physical Details

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Cooling	forced air over heatsink via front panel fan
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### Connectors

28 VDC input	Phoenix MSTBA2.5HC/2-G-5.08 male
Transmit forward RF input	SMA female
Transmit reverse RF output	SMA female
Recommended SMA torque	0.6 N·m (5 lbf·in)
RF output	N-type female
Control and alarm	8-way IDC male

---

### Dimensions - 50 W PA

Height	144 mm (5.7 in)
Width	54.6 mm (2.1 in)
Length	320.6 mm (12.6 in)

### Dimensions - 100 W PA

Height	
With duct	144 mm (5.7 in)
Without duct	60 mm (2.4 in)
Width	177 mm (7.0 in)
Length	321.8 mm (12.7 in)

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### Weight

50 W PA	2.7 kg (6.0 lb)
100 W PA	4.2 kg (9.3 lb)

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## 2.3 PMU

### 2.3.1 Identifying the PMU

You can identify the model and hardware configuration of a PMU by referring to the product code printed on labels on the front and rear panels. The meaning of each character in the product code is explained in the table below.

**Notice** This explanation of PMU product codes is not intended to suggest that any combination of features is necessarily available in any one PMU. Consult your regional Tait office for more information regarding the availability of specific models and options.

#### H/W version 1 and 2 PMU

Product Code	Description
TBA <u>X</u> XXX-XXXX	3 = PMU
TBA3 <u>X</u> XX-XXXX	0 = default
TBA3X <u>X</u> -XXXX	0 = AC module not fitted A = AC module fitted
TBA3XX <u>X</u> -XXXX	0 = DC module not fitted 1 = 12 V DC module fitted 2 = 24 V DC module fitted 4 = 48 V DC module fitted
TBA3XXX- <u>X</u> XXX	0 = standby power supply card not fitted 1 = 12 VDC standby power supply card fitted 2 = 24 VDC standby power supply card fitted 4 = 48 VDC standby power supply card fitted
TBA3XXX-X <u>X</u> XX	0 = auxiliary power supply board not fitted 1 = 12 VDC auxiliary power supply board fitted 2 = 24 VDC auxiliary power supply board fitted 4 = 48 VDC auxiliary power supply board fitted
TBA3XXX-XX <u>X</u>	0 = default
TBA3XXX-XXX <u>X</u>	0 = default

#### H/W version 3 PMU

Product Code	Description
T01-01140- <u>X</u> XAA	A = AC module B = DC module
T01-01140-X <u>X</u> AA	A = AC only B = 12 V DC C = 24 V DC D = 48 V DC



## 2.3.2 Physical Details

Cooling	forced air over heatsink via front panel fan	
Dimensions		
Height	143.5 mm (5.6 in)	
Width	121.4 mm (4.8 in)	
Length		
AC PMU	324 mm (12.8 in)	
DC PMU	337 mm (13.3 in)	
AC and DC PMU	337 mm (13.3 in)	
Weight		
	H/W version 1 and 2 PMU	H/W version 3 PMU
AC PMU	4.8 kg (10.6 lb)	3.2 kg (7.1 lb)
DC PMU	5.1 kg (11.2 lb)	3.0 kg (6.6 lb)
AC and DC PMU	7.0 kg (15.4 lb)	4.0 kg (8.8 lb)

## 2.3.3 Connections

The following specifications refer to the external wiring and connectors that are connected to the PMU. They do not refer to the wiring and connectors built into the PMU itself.

### AC input

Connector type	IEC female
Current rating	6 A

### DC input<sup>a</sup>

Connector type	M6 screw into threaded fitting on bus bar		
Recommended screw torque	2–2.5 N·m (18–20 lbf·in)		
	12 V	24 V	48 V
Connector current rating	50 A	25 A	12 A
Flexible wire size <sup>b</sup>	8 AWG	10 AWG	12 AWG
Flexible wire cross section <sup>b</sup>	10 mm <sup>2</sup>	6 mm <sup>2</sup>	4 mm <sup>2</sup>

a. Battery.

b. For a length of 4.6 m (15 ft), the DC input leads should be of a suitable gauge to ensure no more than a 3% drop in voltage at the PMU input over the required length of lead.

### DC output - low current (from auxiliary power supply)

Connector type	Phoenix MVSTBR2.5HC/2-ST/5.08 female
Flexible wire size	20 AWG to 11 AWG

# 3 Compliance Standards

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The TB9400 base station has been tested and approved for the national and international compliance standards that are listed on the following page. These standards only apply to equipment operating as an integral part of a TB9400 base station.

You can obtain further details of test methods and the conditions that apply for compliance testing in all countries from Tait.

**Notice** The software release notes list known issues or limitations of the base station that may vary from the specifications published in this document. Please refer to the current software release notes for any variations to the specifications in this document.

**RF and EMC  
Compliances**

The following tables show which variants of the TB9400 have been tested and approved to the listed standards.

A tick indicates the compliance has been received, a date indicates when the compliance is expected to be received, and a blank cell indicates there are currently no plans to apply for this compliance.

		B1 Band			HH Band			H1 Band		
		50 W	100W	Rx only	50 W	100W	Rx only	50 W	100W	Rx only
<b>RF - P25 Phase 1 and Phase 2</b>	CFR Title 47 Parts 22 and 90 (FCC)	✓	✓		✓	✓		✓	✓	
	P25 CAP (P25-CAB-CAI_TEST_REQ July 2017)									
	RSS-119 (IC)	✓	✓		✓	✓		✓	✓	
	EN 300 113 (ETSI)	✓	✓					✓	✓	
	AS/NZS 4768 Appendix A	✓	✓					✓	✓	
	Anatel Act #944:2018									
<b>RF DIMR/MPT</b>	CFR Title 47 Parts 22 and 90 (FCC)	✓	✓					✓	✓	
	RSS-119 (IC)	✓	✓					✓	✓	
	EN 300 113 (ETSI)	✓	✓					✓	✓	
	AS/NZS 4768 Appendix A	✓	✓					✓	✓	
<b>RF - Analog</b>	CFR Title 47 Parts 22 and 90 (FCC)	✓	✓		✓	✓		✓	✓	
	EN 300 086 (ETSI)	✓ <sup>e</sup>	✓					✓	✓	
	AS/NZS 4295 Appendix B	✓	✓					✓	✓	
<b>RF - Analog WB</b>	EN 300 086 (ETSI)	✓	✓							
	EN 301 929 (ETSI) (maritime)	✓	✓							
<b>EMC</b>	CFR Title 47 Part 15 (FCC) / RSS-Gen (ISED)	✓	✓	✓	✓	✓	✓	✓	✓	✓
	EN 301 489-1, EN 301 489-5 (ETSI)	✓	✓					✓	✓	
	Anatel Act #952:2018									

		H2 Band			H3 Band			K4 Band		
		50 W	100W	Rx only	50 W	100W	Rx only	50 W	100W	Rx only
RF - P25 Phase 1 and Phase 2	CFR Title 47 Parts 22 and 90 (FCC)	✓	✓		✓	✓		✓	✓	
	P25 CAP (P25-CAB-CAI_TEST_REQ July 2017)									
	RSS-119 (IC)	✓	✓					✓	✓	
	EN 300 113 (ETSI)	✓	✓		✓	✓				
	AS/NZS 4768 Appendix A	✓	✓		✓	✓				
	Act #944:2018 ANATEL								✓	
RF DMR/MPPT	CFR Title 47 Parts 22 and 90 (FCC)	✓	✓		✓	✓		✓	✓	
	RSS-119 (IC)	✓	✓					✓	✓	
	EN 300 113 (ETSI)	✓	✓		✓	✓				
	AS/NZS 4768 Appendix A	✓	✓		✓	✓				
RF - Analog	CFR Title 47 Parts 22 and 90 (FCC)	✓	✓		✓	✓		✓	✓	
	EN 300 086 (ETSI)	✓ <sup>a</sup>	✓ <sup>a</sup>		✓ <sup>a</sup>	✓ <sup>a</sup>			✓ <sup>a</sup>	
	AS/NZS 4295 Appendix B	✓	✓		✓	✓				
RF - Wideband	CFR Title 47 Parts 22 and 90 (FCC)				✓	✓				
EMC	CFR Title 47 Part 15 (FCC) / RSS-Gen (ISED)	✓	✓	✓	✓ <sup>b</sup>	✓ <sup>b</sup>	✓ <sup>b</sup>	✓	✓	✓
	EN 301 489-1, EN 301 489-5 (ETSI)	✓	✓		✓	✓				
	Anatel Act #952:2018								✓	

a. RF - Analog Wideband for EN 300 086

b. FCC only

### Safety and Environmental Compliances

The TB9400 base station has been tested and approved to the following standards.

Safety	EN62368	
	UL 60950-1 (E223047) <sup>a</sup>	
	AS/NZS 60950-1, Q090114 <sup>a</sup>	
	UL62368 (E252373) <sup>b</sup>	
	A/SNZS 623368 <sup>b</sup>	
Environmental	Low Pressure (Altitude) <sup>c</sup>	MIL-STD-810G Method 500.5 Procedure 2
	Humidity	MIL-STD-810G Method 507.5 Procedure 2
	Vibration	MIL-STD-810G Method 514.6 Procedure 1
	Shock	MIL-STD-810G Method 516.6 Procedure 1

a. H/W version 1 and 2 PMUs only

b. H/W version 3 PMU only

c. 15000 ft (4572 m)

# Appendix A Frequency Response Diagrams

This appendix shows the transmitter and receiver frequency response diagrams.

Figure A.1 Receiver frequency response de-emphasized

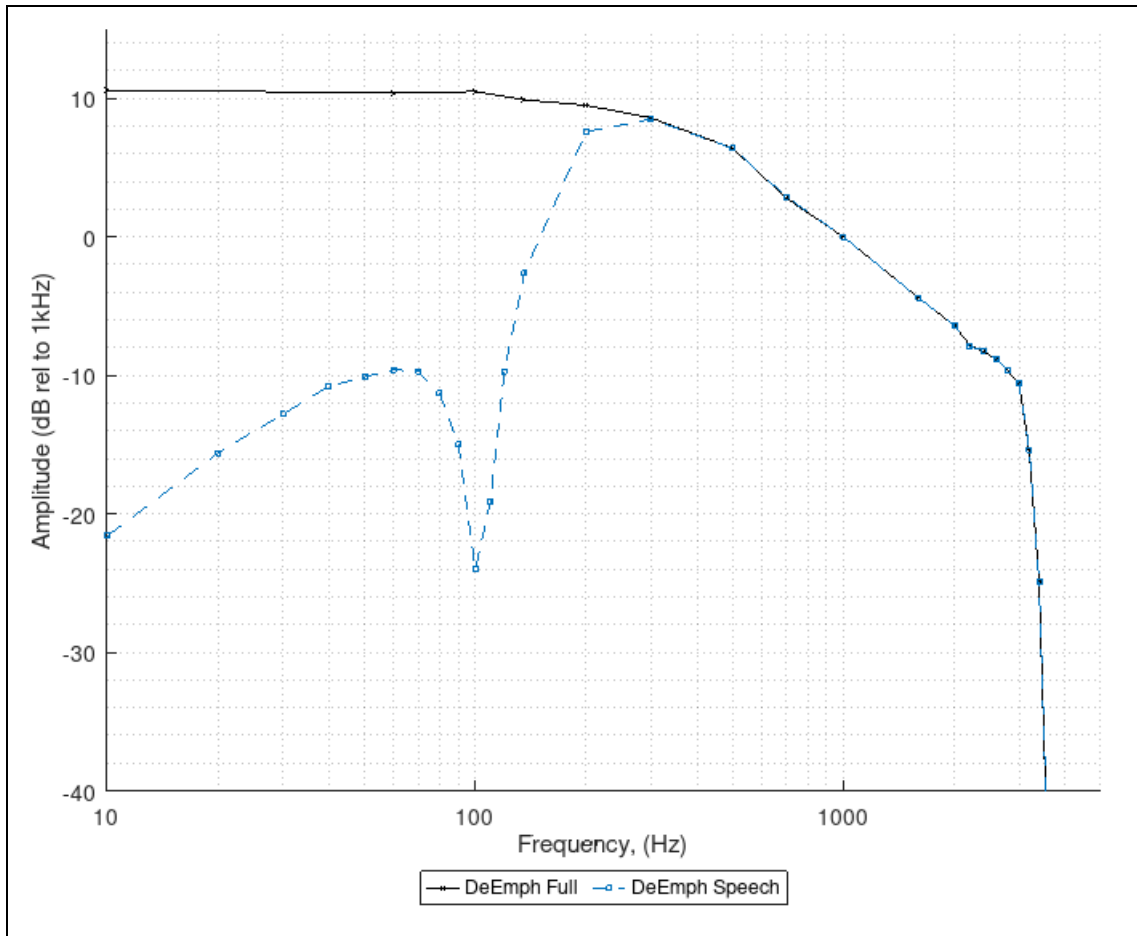


Figure A.2 Receiver frequency response flat

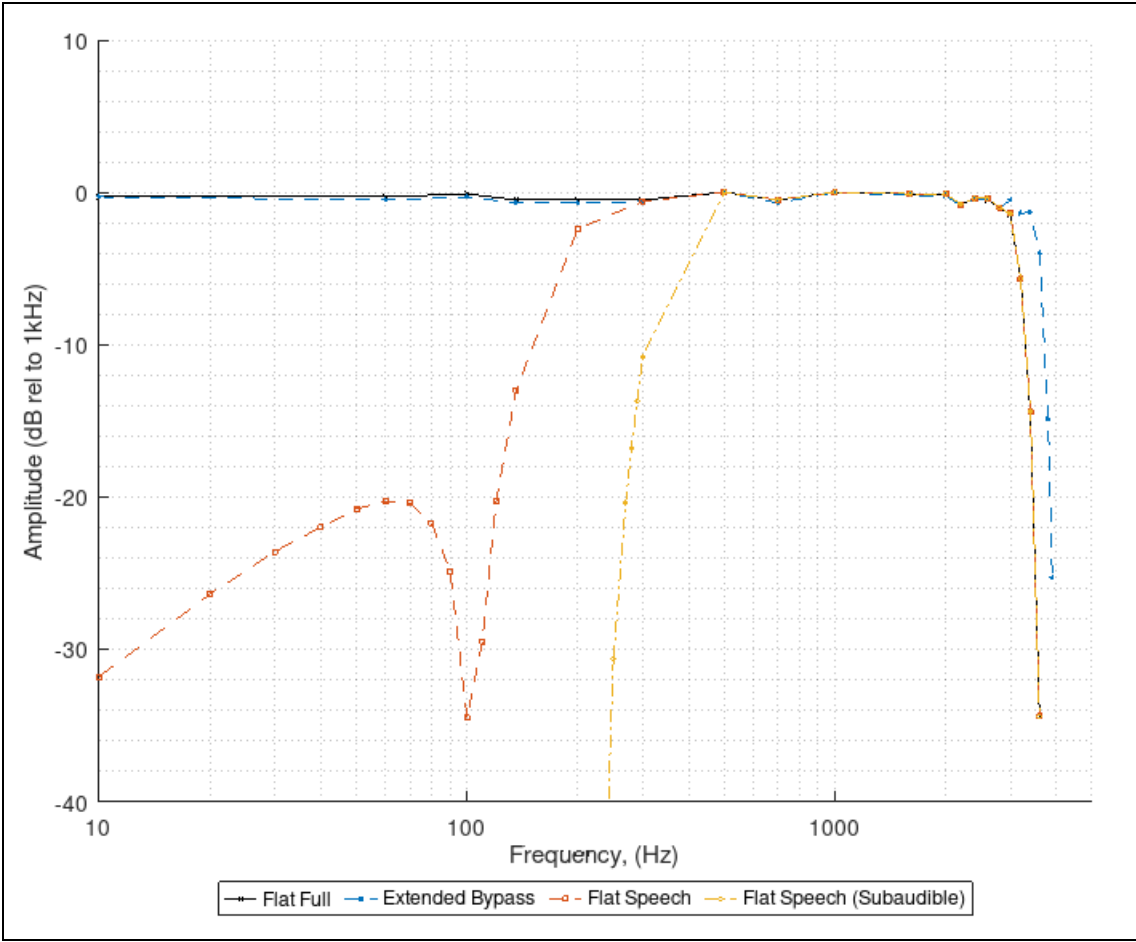


Figure A.3 Transmitter frequency response pre-emphasized

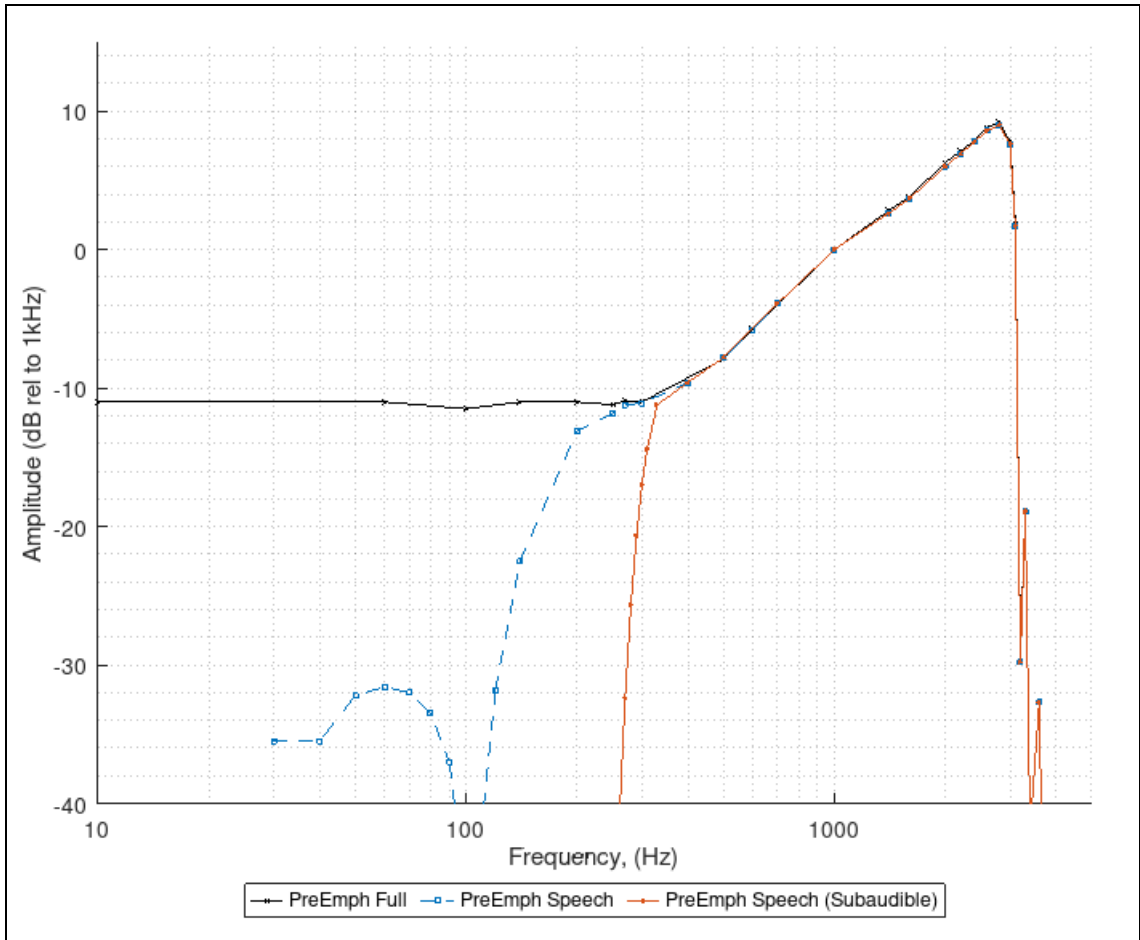


Figure A.4 Transmitter frequency response flat

