

TB7300 Base Station T02-B50 Base Station **Specifications Manual**

MBD-00002 - Issue 27 - April 2026

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Preface

Scope of Manual

This manual provides specifications for TB7300 and T02-B50 base stations.



For known issues and limitations that may cause a radio to perform outside the specifications listed here, see the software release notes for the TB7300 and T02-B50 base stations. Software release notes are available from the [Tait Portal](#).

Alerts

Please follow exactly any instruction that appears in the text as an 'alert'. An alert provides necessary safety information as well as instructions about the proper use of the product. This manual uses the following types of alert:



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



Caution This alert is used when there is a hazardous situation which, if not avoided, could result in minor or moderate injury. Incorrectly performed procedures could result in unexpected equipment behavior, malfunction, or damage.



This alert is used to highlight information that may be required to ensure procedures are performed correctly, or to draw attention to actions that can improve efficiency or effectiveness.

Associated Documentation

The following associated documentation for this product is available on the [Tait Portal](#).

- TB7300 Installation and Operation Manual (MBD-00001-**xx**)
- TN9300 DMR Trunked System Manual (MNB-00003-**xx**)
- Tait Core Networks Installation and Configuration Manual (MNB-00012-**xx**)

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

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

Publication Record

Issue	Publication date	Description
27	April 2026	Updated for release 3.80 and later • This manual now includes the T02-B50 base station. • Updated Table 4.2 on page 27 • Added content to chapter 1 • Revised the structure of the manual to match other Tait specification manuals
26	August 2025	Updated for release 3.75 and later
25	May 2025	Updated for release 3.70 and later
24	August 2024	Updated for release 3.65 and later
23	December 2023	Updated for release 3.55 and later

1 Standards and Regulatory Information

1.1 Test Methods

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

- EN 300 086
- EN 300 113
- EN 300 219
- EN 301 489
- CFR Title 47 Part 15
- TIA/EIA-603/603-D
- AS/NZS 4295

1.2 Compliance Standards

The TB7300 and T02-B50 base station has been tested and approved to appropriate national and international compliance standards. These standards are listed in the sections below.

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

1.2.1 RF and EMC compliance

Note that B3 band base stations are no longer in production.

Table 1.1 RF and EMC compliance

		Frequency bands ^a				
		B1 50 W	B3 50 W	H3 40 W	H5 40 W	K4 35 W
P25	CFR Title 47 Parts 22 and 90 (FCC)	✓	✓	✓	✓	✓
	RSS-119 (IC)	✓	✓		✓	✓
	EN 300 113 (ETSI)	✓	✓	✓	✓	
	AS/NZS 4768 Appendix A	✓	✓	✓	✓	
DMR/MPT	CFR Title 47 Parts 22 and 90 (FCC)	✓	✓	✓	✓	✓
	RSS-119 (IC)	✓	✓		✓	✓
	EN 300 113 (ETSI)	✓	✓	✓	✓	
	AS/NZS 4768 Appendix A	✓	✓	✓	✓	
RF - Analog Narrowband	CFR Title 47 Parts 22 and 90 (FCC)	✓	✓	✓	✓	✓
	RSS-119 (IC)	✓	✓		✓	✓
	EN 300 086 (ETSI)	✓	✓	✓	✓	
	AS/NZS 4295 Appendix B	✓	✓	✓	✓	
RF - Analog Wideband	EN 300 086 (ETSI)	✓	✓	✓	✓	
	CFR Title 47 Part 80 (FCC)	✓	✓			✓
	CFR Title 47 Parts 22 and 90 (FCC)				✓	✓
EMC	CFR Title 47 Part 15 (FCC)	✓	✓	✓	✓	✓
	RSS-Gen (ISED)	✓	✓	✓	✓	✓
	EN 301 489-1, EN 301 489-5 (ETSI)	✓	✓	✓	✓	

^a For frequency codes, see [Frequency Bands on page 10](#)

1.2.2 Safety and environmental compliance

The TB7300 and T02-B50 base stations have been tested and approved to the standard:

- IEC 62368-1.

[Table 1.2 below](#) outlines specific MIL-STD-810G test methods and procedures used to ensure the durability of a radio under various demanding conditions.

Table 1.2 MIL-STD-810G environmental test methods and procedures

Environment	Method	Procedure
Shock	516.6	1

1.3 ISO Standards

Tait is an ISO9001: 2000-, ISO14001: 2004-, and ISO27001-certified supplier.

1.4 Performance Figures

The performance figures in this manual are minimum figures—unless stated as 'typical'—for equipment operating in the temperature range of +71.6°F to +82.4°F (+22°C to +28°C) and standard test voltage.

1.5 Digital Air Interface

Table 1.3 Digital air interface

	Standard
Vocoder for DMR	AMBE+2™
Vocoder for P25 Phase 1	IMBE™
Vocoder for P25 Phase 2	AMBE+2™
Digital protocol	DMR ETSI-TS 102 361 -1,-2,-3,-4

1.6 Frequency Bands

Each frequency band is represented by a unique alpha-numeric code. The codes that are used with TB7300 and T02-B50 base stations are listed below.

Note that B3 band base stations are no longer in production.

Frequency code	Frequency band
B1	136–174 MHz
B3	148–174 MHz
H3	470–520 MHz ^a
H5	400–470 MHz ^b
K4	762–776 MHz (Tx) 850–870 MHz (Tx) 792–824 MHz (Rx)

1.7 Narrow Bandwidth and Wide Bandwidth

Table 1.4 Narrowband and wideband details

Term	Abbreviation	Channel bandwidth	Modulation 100% deviation
Narrowband	NB	12.5 kHz	±2.5 kHz
Wideband	WB	25 kHz	±5 kHz

1.8 FCC Narrowbanding Regulations

Some jurisdictions enforce narrowband operation in certain frequency bands. Where wideband operation is permissible, the TBAS083 20/25 kHz Unrestricted Wideband feature license allows wideband operation.

For more information, contact your sales representative.

^a H3 band base stations are also approved for operation on the Australia and New Zealand Citizen Band frequencies. (476.425–477.4125 MHz). Citizen Band performance limits apply to radios used in this band.

^b The 406–406.1 MHz frequency range is reserved worldwide for use by distress beacons. It is not legal to program transmitters to operate in this frequency range.

1.9 Emission Designators

Table 1.5 Emission designators

Emission designator	Common name	Modulation scheme	Operating modes
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
11K0F3E	FM	analog FM	analog voice
7K60F2D	MPT Control	FFSK	control channel / traffic channel data
7K60FXD	2-slot DMR	4FSK	data/control channel
7K60FXW	2-slot DMR	4FSK	digital voice/data/control channel

2 General Specifications

2.1 Environmental Operating Conditions

Table 2.1 Environmental specifications

Condition	Specification
Operating temperature range	-22°F to +140°F (-30°C to +60°C) ambient temperature ^a
Level of airborne particulates	Maximum 100 µg/m ³ .
Humidity	Maximum 95% relative humidity through the specified operating temperature range.

2.2 Power Supply

For operating current, see [Power and Current Consumption on the next page](#).

Table 2.2 12 VDC input

Parameter	Value
Input voltage	
Nominal DC input voltage	13.8 V
DC input voltage range	11–16 V
Startup voltage	11.8 V ±0.3 V
Shutdown voltage	10.3 V ±0.3 V
Low supply voltage alarm	10.6 V ±0.3 V
High supply voltage alarm	16.8 V ±0.3 V
Protection	
Fault current (input)	15 A fuse, circuit breaker, or fuse in external wiring ^b
Wrong input voltage	Electronic lock-out
Wrong input voltage polarity	Shunt diode

^aAmbient temperature is defined as the temperature of the air at the intake to the cooling fans.

^b Provided by user.

Table 2.3 48 VDC input

Parameter	Value
Input voltage	
Nominal DC input voltage	48 V fully insulated
DC input voltage range	42–58 V
Startup voltage	47 V $\pm$ 1 V
Shutdown voltage	41 V $\pm$ 1 V
Low supply voltage alarm	44.5 V $\pm$ 1 V
Supply current B1 band	maximum 3.3 A
Supply current H3, H5, K4 band	maximum 3.0 A
Protection	
Fuse	5 A mini blade, must have sufficient voltage rating ($\geq$ 58 V)

Table 2.4 AC input

Parameter	Value
Input voltage	
Operating voltage	100–253 VAC
Standard voltage	120 VAC and 230 VAC
Protection	
Fuse and MOV	—

2.3 Power and Current Consumption

The specifications in this section are typical figures.

- The transmit measurements were carried out with the base station transmitting at the stated RF output power with all front panel fans running.
- The standby measurements were carried out with the base station not receiving or transmitting and no front panel fans running. Note that for the 55.2 VDC (48 V) figures, the power supply fan runs continuously.

2.3.1 12 VDC input

Table 2.5 12 VDC—transmit

Band	RF output power	Current (A)	Power (W)
B	1 W (minimum)	2.9	40
	50 W (maximum)	9.6	133
H	1 W (minimum)	2.8	38
	40 W (maximum)	8.1	112
K	1 W (minimum)	2.6	36
	35 W (maximum)	8.5	118

Table 2.6 12 VDC—standby

Hardware version	Sleep ^a		No sleep	
	Current (A)	Power (W)	Current (A)	Power (W)
6.00	0.47	6.5	0.66	9.1
7.00	0.54	7.5	0.77	10.6

2.3.2 48 VDC input—TB7300 only

Table 2.7 48 VDC—transmit

Band	RF output power	Current (A)	Power (W)
B	1 W (minimum)	0.8	38.4
	50 W (maximum)	2.9	139.2
H	1 W (minimum)	0.8	38.4
	40 W (maximum)	2.4	115.2
K	1 W (minimum)	0.76	36.5
	35 W (maximum)	2.5	120.0

^a Series 2 base stations only.

Table 2.8 48 VDC—standby

Hardware version	Sleep ^a		No sleep	
	Current (A)	Power (W)	Current (A)	Power (W)
7.00	0.34	18.8	0.40	22.0

2.3.3 AC input

Table 2.9 AC input—transmit

Band	Voltage (VAC)	Current (A)	Power (W)	Power (VA)
B, H, K	120	1.67	200	200
B, H, K	230	0.87	200	200

Table 2.10 AC input—standby

Band	Voltage (VAC)	Current (A)	Power (W)	Power (VA)
B, H, K	120	0.20	20	24
B, H, K	230	0.20	20	46

2.4 Channel Details

Number of channels	4000
Channel change time	300 ms

2.5 Duplexer Attenuation Requirements

[Figure 2.1 on the next page](#) 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.

The quoted attenuation will ensure not more than 1 dB receiver desensitization (from the specified sensitivity), and has a 5 dB margin built in.

^a Series 2 base stations only.

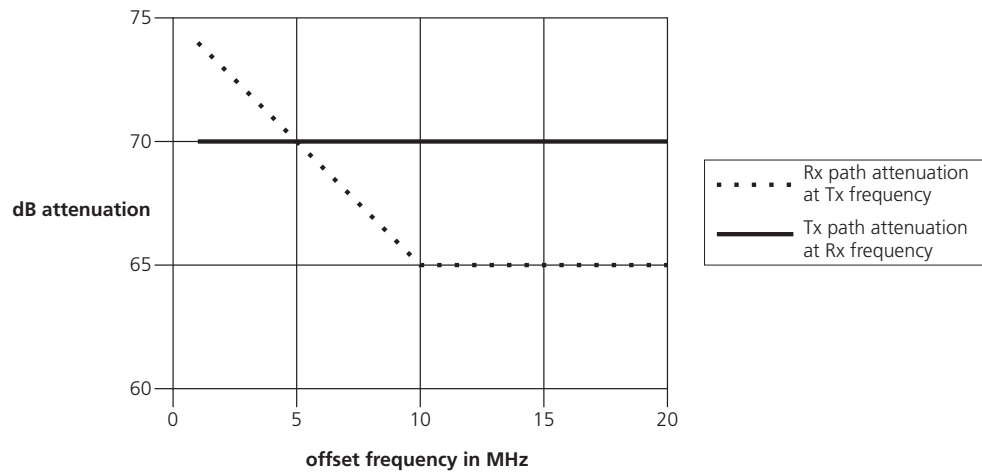


Figure 2.1 Duplexer attenuation

2.6 Reliability

MTBF at $\geq 50,000$ hours (estimated).

3 Receiver Specifications

3.1 General Receiver Specifications

Table 3.1 Specifications for all frequency bands—receiver

Parameter	Performance
Receiver type	Triple conversion superheterodyne. First conversion is analog, second is hybrid, and third is digital.
Input load impedance	50 Ω nominal (VSWR <2:1)
RF input protection	No degradation after 5 minutes exposure to on-channel signals at +20 dBm (2.2 V)
RSSI	$\leq$ -125 dBm to -30 dBm
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

Note that B3 band base stations are no longer in production.

Table 3.2 Specifications per frequency band—receiver

Parameter	Performance				
	B1	B3	H3	H5	K4
Frequency					
Frequency increments	2.5 kHz and 3.125 kHz		5 kHz and 6.25 kHz		
Switching range	Full range	±2 MHz ^a	Full range		
Frequency stability					
Internal reference	±0.5 ppm over -22°F to +140°F (-30°C to +60°C)				
External reference	±1 Hz ± multiplied accuracy of external reference				
IF stages					
Analog frequency	21.4 MHz	16.9 MHz	70.1 MHz		
Digital frequencies	21.4 MHz and 0 Hz	16.9 MHz and 0 Hz	8.66 MHz and 0 Hz		
Analog IF filtered bandwidth	9 kHz at 3 dB				
Digital IF filtered bandwidth	8.06 kHz at -3 dB				

^a Frequency range, measured from the tuned frequency, that can be used without needing to retune the front end or recalibrate the RSSI.

3.2 Digital RF—TB7300 only

Table 3.3 Receiver—Digital RF (P25)^a

Parameter	Performance
Digital unfaded sensitivity at 25°C	<-120 dBm @ 5% BER
Digital faded sensitivity at 25°C	<-112 dBm @ 5% BER
Digital adjacent channel rejection	60 dB
Digital signal displacement bandwidth	1 kHz
Digital spurious response attenuation	≥100 dB
Digital intermodulation response attenuation	85 dB
Digital blocking rejection 1–10 MHz	100 dB
Digital co-channel rejection	9 dB

^a The test methods used to obtain these figures are those described in TIA-102.CAAA-D for P25 Phase 1.

Table 3.4 Receiver—Digital RF (DMR)

Parameter	Performance
Digital unfaded sensitivity	
Guaranteed	<-120 dBm @ 5% BER (DAQ 2.0) <-118.5 dBm @ 2.6% BER (DAQ 3.0) <-118 dBm @ 2% BER (DAQ 3.4) <-117 dBm @ 1% BER (DAQ 4.0)
Typical	<-122 dBm (0.18 μ V) @ 5% BER <-119 dBm @ 1% BER (ETS 300 113 test method)
Digital selectivity	
B band	≥ 82 dB @ 1% BER
H band	≥ 79 dB @ 1% BER
K band	≥ 77 dB @ 1% BER
Response attenuation	
Digital spurious response attenuation	≥ 90 dB
Digital intermodulation response attenuation	≥ 78 dB @ 1% BER unfaded
Rejection	
Digital blocking rejection >1 MHz	100 dB @ 1% BER
Digital co-channel rejection	12 dB

3.3 Analog RF



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

Table 3.5 Specifications for all frequency bands—analog RF receiver

Parameter	Performance
Sensitivity^a , de-emphasized response	
Center of switching range	< -119 dBm (0.25 μ V) at 25°C
Edge of switching range	< -117 dBm (0.32 μ V) at 25°C
Maximum usable sensitivity ^b	
Center of switching range	<-116 dBm (0.35 μ V) at 25°C (narrowband)
Edge of switching range	<-114 dBm (0.45 μ V) at 25°C (narrowband)
FM quieting ^c	
Narrowband	-113 dBm
Wideband	-113 dBm
Signal displacement bandwidth	≥ 1 kHz
Amplitude characteristic ^d	≤ 3 dB (ETSI)

^a 12 dB SINAD. Up to 2 dB degradation at extremes of temperature.

^b Sensitivity for 20 dB SINAD, psophometrically weighted, RF source modulated at 60% deviation with 1 kHz. Up to 2 dB degradation at extremes of temperature.

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

^d RF Input Level -107 dBm to -13 dBm.

Table 3.6 Specifications per frequency band—analog RF receiver

Parameter	B band	H band	K band
Hum and noise (Ultimate signal-to-noise ratio) (at -47 dBm)^a			
ANSI/TIA	45 dB narrowband 55 dB wideband	45 dB narrowband	43 dB
CEPT – psophometric	50 dB narrowband	50 dB narrowband	
Selectivity^b			
TIA/EIA-603 ^c	85 dB narrowband 90 dB wideband	85 dB narrowband	79 dB
TIA/EIA-603-D ^d	50 dB narrowband 87 dB wideband	50 dB narrowband	45 dB
ETSI	85 dB narrowband	85 dB narrowband	
Response attenuation			
Spurious response attenuation	≥ 100 dB (ANSI/TIA) ≥ 90 dB (ETSI)		
Intermodulation response attenuation ^e	79 dB narrowband (ETSI) 85 dB wideband (ANSI/TIA)	79 dB narrowband (ETSI)	80 dB (ANSI/TIA)

^a Up to 5 dB degradation at extremes of temperature.

^b Up to 5 dB degradation at extremes of temperature.

^c The TIA/EIA-603 is a single tone test method.

^d The TIA/EIA-603-D is a two-tone test method.

^e Up to 5 dB degradation at extremes of temperature.

Parameter	B band	H band	K band
Blocking rejection			
1–10 MHz	100 dB (ETSI)		100 dB (ANSI/TIA)
>10 MHz	110 dB (ETSI)		110 dB (ANSI/TIA)
±1, ±2, ±5, and ±10 MHz	100 dB (ANSI/TIA)		100 dB (ANSI/TIA)
Co-channel rejection			
Narrowband	-8 dB		
Wideband	-5 dB		

3.4 Analog audio—Receiver

3.4.1 Analog audio—General

Table 3.7 Frequency response (FM demodulator to G.711)

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

For more information, see [Appendix—Frequency Response Diagrams on page 44](#).

Extended bypass mode response for speech path set to flat (FM demodulator to G.711)

This manual provides the extended bypass path to facilitate a data path only.

Using the extended bypass mode with speech signals risks over-deviation and non-compliant operation. Because users are expected to choose their own external modem, Tait Communications has no intention to apply for regulatory compliance for using the extended bypass path.

Normal voice-type compliances cannot be achieved with extended bypass operation. Please apply to your local regulatory authorities for the appropriate data compliances.

Table 3.8 Extended bypass mode frequency response

Frequency (Hz)	Response (dB) ^a
0–3300	± 1.0
3550	-3
4000	-30

3.4.2 Analog audio—CTCSS

Table 3.9 CTCSS

Parameter	Response
High pass (subaudible) filter	
Hum and noise ^b	30 dB minimum at 250.3 Hz 35 dB typical (67–240 Hz)
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

^a dB compared with 1 kHz

^b 1 kHz at 60% system deviation, CTCSS at 10% system deviation.

3.4.3 Analog audio—Gating operation

Table 3.10 Gating operation

	SINAD gating	RSSI gating
Opening level	6–20 dB SINAD	-117 dBm to -70 dBm
Accuracy	±3 dB	±0.1 dB ^a
RF hysteresis	6.5 dB	4 dB
Opening time	60 ms typical	20 ms maximum
Closing time	60 ms typical	20 ms maximum

Table 3.11 Receiver gate logical combinations

	Description
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

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

4 Transmitter Specifications

4.1 General Transmitter Specifications

Table 4.1 Specifications for all frequency bands—transmitter

Parameter	Performance
Modulation type	11K0F3E, 7K60FXD, 7K60FXW, 7K60F2D, 8K10F1E, 8K10F1D, 8K10F7W.
Output load impedance	50 Ω nominal
Duty cycle ^a	100% at maximum rated output power at +140°F (+60°C) ambient temperature
Mismatch capability ^b Ruggedness Stability	Open and short circuit load at any phase angle for one hour 5:1 load VSWR at all phase angles
Protection Temperature Supply voltage VSWR	Shutdown if PA sensor exceeds 100°C Shutdown if supply is less than 11 V Gradual power foldback as VSWR increases above acceptable operating level
Adjacent channel power Steady state (All modulation types) Steady state (P25) Transient (DMR & P25)	<60 dBc (EN 300 113 & EN 300 086) <-67 dBc (TIA-102.CAAA) <-50 dBc (EN 300 113)
Modulation fidelity DMR P25	<2% (EN 300 113) <2% TIA-102.CAAA

^a Measured directly on PA output. N-type connector at rear of the base station.

^b Under power foldback

Parameter	Performance
Intermodulation (DMR and P25)	-40 dBc with interfering signal at -30 dBc at TB7300 and T02-B50 base station RF output. For Europe, 70 dB ratio is achieved using an external circulator/isolator with a minimum isolation of 30 dB and less than 0.5 dB insertion loss.
Transient behavior	Complies with EN 300 113 v2.2.1

Note that B3 band base stations are no longer in production.

Table 4.2 Specifications per frequency band—transmitter

Parameter	Performance				
	B1	B3	H3	H5	K4
Frequency					
Frequency increments	2.5 kHz and 3.125 kHz		5 kHz and 6.25 kHz		
Frequency stability ^a	±0.5 ppm over -22°F to +140°F (-30°C to +60°C)				
Output power					
Rated power	50 W		40 W		35 W
Range of adjustment	1–50 W in 1 W steps		1–40 W in 1 W steps		1–35 W in 1 W steps
Output power accuracy ^b	±1 dB into a 50 Ω load				
Sideband noise ^c					
±1.5 MHz	<-142 dBc/Hz		<-150 dBc/Hz		
>±4 MHz	<-160 dBc/Hz		<-160 dBc/Hz		

^a For K band (700 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 on page 35](#).

^b Within normal operating voltages and temperatures; measured directly on PA output.

^c No modulation, measured from center frequency at max power.

Parameter	Performance				
	B1	B3	H3	H5	K4
Radiated spurious emissions					
Standby	<-57 dBm to 1 GHz <-47 dBm 1–4 GHz				
Transmit	<-36 dBm 30 MHz–1 GHz < -30 dBm 1–4 GHz	<-36 dBm 30 MHz–1 GHz <-30 dBm 1–4 GHz ^a <-30 dBm 1–12.75 GHz ^b		< -20 dBm to 9 GHz	
Conducted spurious emissions					
Standby	< -57 dBm to 1 GHz < -47 dBm 1–12.75 GHz				
Transmit	<-36 dBm 9 kHz to 1 GHz <-30 dBm 1 GHz to 4 GHz	<-36 dBm 30 MHz to 1 GHz <-30 dBm 1–4GHz ^c <-30dBm 1–12.75 GHz ^d		< -20 dBm to 9 GHz	

^a Transmit frequency below 470 MHz.

^b Transmit frequency above 470 MHz.

^c Transmit frequency below 470 MHz.

^d Transmit frequency above 470 MHz.

4.2 Simulcast

Table 4.3 Simulcast

Parameter	Performance		
	DMR	P25	Analog
Accuracy			
Launch time accuracy ^a	±1.5 μs		
Deviation accuracy	0.2 dB		
Frequency accuracy ^b	<1 Hz		
Modulation schemes			
Supported simulcast modulation schemes	4FSK	C4FM	FM
Receive voter limitations			
Maximum marshaling duration (simulcast operation)	300 ms	300 ms	150 ms
Maximum central voter packet arrival time skew	250 ms	100 ms	100 ms

4.3 Simplex Relay

Table 4.4 Simplex relay

Parameter	Performance		
	DMR	P25	Analog
Isolation (off-state)	—	>40 dB	
Coaxial relay operating time	—	30 ms (maximum) ^c	

^aLaunch time offset adjustable in 1 μs increments

^bLaunch time offset adjustable in 0.1 Hz increments

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

4.4 Analog Audio—Transmitter

4.4.1 Analog audio—General

Table 4.5 Deviation

Parameter	Performance
Peak deviation	
Narrowband	≤2.5 kHz
Wideband	≤5 kHz
Nominal deviation selection ^a	55% to 65% of peak deviation
Limiting deviation ^b	94% of maximum system deviation
CWID deviation	40% of peak deviation

Table 4.6 Modulation characteristics

Parameter	Performance
Frequency response (G.711 to FM modulator)^c	
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
Extended bypass mode response^d	
0–3600 Hz	±1.0 dB (compared with 1 kHz)
3600–3760 Hz	+1.0/-3 dB (compared with 1 kHz)
4000 Hz	-10 dB (compared with 1 kHz)

^a For a level of –10 dBm0 applied to the line input.

^b With modulation input driven at a frequency of 1 kHz, and at a level 20 dB above the nominal level of 60% deviation.

^c For more information, see [Appendix—Frequency Response Diagrams on page 44](#).

^d For speech path set to flat (G.711 to FM modulator)

Parameter	Performance
Distortion	
	< 2%
Hum and noise^a	
B and H bands:	
Narrowband	-50 dB typical (ETSI)
Wideband	-55 dB typical (ANSI/TIA)
K band	-43 dB typical (ANSI/TIA)

4.4.2 Analog audio—CTCSS

Table 4.7 Analog audio CTCSS

Parameter	Performance
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 67–250.3 Hz to within 1 dB
Modulation level	Adjustable
Modulated distortion	<5%

^a Up to 5 dB degradation at extremes of temperature.

5 Physical and Electrical Specifications

5.1 Physical Details

Table 5.1 Physical details

Item	Description
Dimensions	
Height	1.73 in. (44 mm)
Width	17.17 in. (436 mm)
Width with 19" rack mounting bracket	19 in. (483 mm)
Length	15.7 in. (400 mm)
Weight	
12 VDC variant	14.8 lb (6.7 kg)
48 VDC variant	16.5 lb (7.5 kg)
AC variant	17.2 lb (7.8 kg)
Cooling	Forced air via front panel fan
Connectors	
RF receiver input	BNC female
RF transmitter output	N-type female
External reference frequency input	BNC female
1PPS input	BNC female
Ethernet	RJ45
Serial	RJ12
System inputs and outputs	DB-25
DC input	Screw terminal

5.2 Product Codes

The product code printed on a base station label identifies both the model and the configuration of that particular base station.

Note that B3 band base stations are no longer in production.

Table 5.2 TB7300 product codes

Product code	xx	Description
TB73 XX xxxxxxxxxxxx	10 60	DMR + analog base station/repeater P25 base station/repeater
TB73xx XX xxxxxxxxxxxx	B1 B3 H3 H5 K4	Frequency band
TB73xxxx X xxxxxxxxxx	B	35/40/50 W
TB73xxxx X xxxxxxxxxx	0 L	Default Limited encryption ^a
TB73xxxx XXXX xxxx	0000	Default
TB73xxxxxxxx X xxx	0 A B	12 VDC input 120 V and 230 VAC input 48 VDC input
TB73xxxxxxxx XX xx	0 1 2 3 4 5	Power cable None (DC versions) Australia, New Zealand UK EU Canada, USA Brazil
TB73xxxxxxxx XX		Software feature license information

^a AES and DES encryption not supported by limited crypto base stations.

Table 5.3 T02-B50 product codes

Product code	xx	Description
TOPEN2-BXXxxxxx	50	50 T02-B Tier 2 DMR conventional
TOPEN2-BxxXXxxx	B1 H3 H5	Frequency band
TOPEN2-BxxxxXxx	0 A	12 VDC AC
TOPEN2-BxxxxXx	0 1 2 3 4 5	Power cable None (DC versions) Australia, New Zealand UK EU Canada, USA Brazil
TOPEN2-BxxxxxxX	0 1	None (Native) Hosted channel controller

5.3 Heat Load Values

These measurements were carried out with the base station transmitting at its rated output power with all front panel fans running.

Table 5.4 Maximum thermal load

	B band	H band	K band
Power (W)	110	95	95
Cooling required (Btu/h)	375	324	324

5.4 Connections

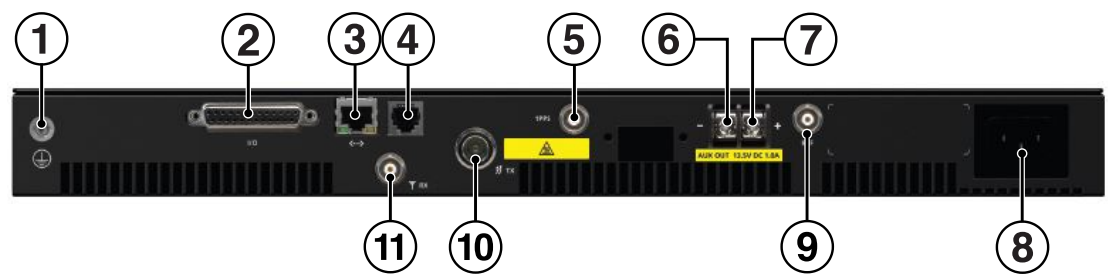


Figure 5.1 Connector locations (TB7300 AC variant shown)

Table 5.5 Connector locations

	Description		Description
1	Ground connector	7	+VDC auxiliary output 13.5 VDC@ 1 A
2	System interface connector	8	AC mains input (IEC connector)
3	Ethernet interface connector	9	External frequency reference input
4	Serial RS-232 connector	10	RF output
5	1PPS input connector (TB7300 only)	11	RF input
6	-VDC auxiliary supply output, 13.5 VDC @ 1 A		

5.4.1 External frequency reference

Table 5.6 External frequency reference input (BNC)

Parameter	Value
Frequencies ^a	10 MHz or 12.8 MHz
Lock range	±50 Hz
Input level	500 mVpp to 5 Vpp
Input impedance	≥1 kΩ

^a Automatically detected by the reciter.

5.4.2 1PPS timing reference input—TB7300 only

Table 5.7 1PPS timing reference input (BNC)

Parameter	Value
Input low threshold	$V_{IL} < 0.6 \text{ V}$
Input high threshold	$V_{IH} > 2.3 \text{ V}$
Input termination	470 Ω + 5% (AC terminated)
Transient input voltage	$ V_{in} < 15 \text{ V}$
Frequency	1PPS (required for simulcast and voted DMR channel)
Polarity	Rising edge represents timing reference
Maximum jitter	$\pm 50 \text{ ns}$

5.4.3 Ethernet Interface

Table 5.8 Ethernet interface (RJ45)

Parameter	Value
Transceiver	10/100BASE-TX (Auto-MDI-X)
IEEE-spec	IEEE802.3 and 802.3u

5.4.4 System Interface

Table 5.9 External general purpose digital inputs

Parameter	Value
Input low threshold	$V_{IL} < 0.6 \text{ V}$
Input high threshold	$V_{IH} > 2.2 \text{ V}$
Internal pull-up (5 V)	$\geq 10 \text{ k}\Omega$
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}$ ($t < 1 \text{ s}$)

Table 5.10 External general purpose digital outputs

Parameter	Value
Low level	<0.4 V
High level	<30 V
Low level sink current	<5.0 mA
High level current	<100 μ A

5.4.5 Rx gate output

The Rx gate output indicates a valid analog received signal.

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, if applied directly, can damage the reciter hardware. Tait offers an isolation adapter that provides E&M isolated signaling (order number TBC101A).

Table 5.11 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 μ A at 30 V	

5.4.6 RSSI output

Table 5.12 RSSI output

Parameter	Value
Configurable RF input range	-130 dBm to -60 dBm
Configurable Output range	0–5 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 Ω

5.4.7 Tx Key input

The Tx Key input is a 5 V logic level input that causes the base station to transmit the audio signal presented to the balanced or unbalanced input.

Logic state: Active low.



The Tx Key input is not the same as an E-wire input. Large negative voltages traditionally associated with E&M signaling, if applied directly, can damage the reciter hardware. Tait offers an isolation adapter that provides E&M isolated signaling (order number TBC101A).

Table 5.13 Electrical characteristics

Parameter	Specification	Comments
Low voltage level	$\leq +0.8$ V	Input active
High voltage level	$\geq +2$ V	Input inactive
Input Hysteresis	≥ 0.4 V	
Input resistance	≥ 10 k Ω	To +5 V rail
Maximum external pull up voltage	≤ 20 V	

5.4.8 Antenna relay output

The antenna relay output will be active when the base station transmits, and the antenna relay is enabled in the web user interface.

Logic state: Active low

Logic type: Open drain transistor connection



Antenna relay operation applies to P25/AS-IP, and analog conventional operation when using DMR firmware.



The antenna relay circuitry is not rated for 48 V operation. When powering a base station from 48 VDC, the antenna relay output must be isolated from the supply voltage.

Table 5.14 Electrical characteristics

Parameter	Specification	Comments
Low voltage level	<0.4 V	Antenna relay activated
High voltage level	0–30 V	Protection
Low level output current	<250 mA	
High level output current	<100 μ A at 30 V	

5.4.9 Balanced interface

Table 5.15 Line output—Balanced

Parameter	Value
Audio headroom This is the largest sine-wave signal that meets distortion specifications	+10 dBm
Output Level Range For output signal of 60% deviation at 1 kHz Adjustable over this range	-30 dBm to +0 dBm
Output impedance	600 Ω balanced
Return loss	>20 dB
Impedance balance about earth (ITU-T G.117)	>46 dB
Frequency response (‘speech’ setting)	300 Hz
Passband ripple (compared with 1kHz)	-3 to +1 dB
Distortion (RF to line) Applicable over level adjustment range up to the audio headroom limit Applicable over entire frequency response range	3%

Table 5.16 Line input—Balanced

Parameter	Value
Audio headroom	+10 dBm
Input Level Range For output signal of 60% deviation at 1 kHz. Adjustable over this range	-30 dBm to 0 dBm
Impedance	600 Ω balanced
Return loss	>20 dB
Impedance balance about earth ITU G.117	>46 dB
Frequency response	300 Hz to 2.55 kHz
Distortion (line to RF)	3%

5.4.10 Unbalanced interface

Table 5.17 Line output and input—Unbalanced

	Linear range of operation
Line input	1–3 V_{pp}
Line output	1–3 V_{pp}

5.4.11 Audio delay

Table 5.18 Analog line audio delay

Air interface	Tx direction	Rx direction
P25	130 ms max ^a	90 ms max
Analog FM	70 ms max	70 ms max
Delay distortion ^b relative to 1 kHz	$\leq 40 \mu s_{pp}$ 300 Hz to 3 kHz	

Measured delays between analog balanced/unbalanced and RF interface.



Allow an additional 100 ms for the transmitter to wake when using transmitter sleep power save.

^a Does not meet TIA-102.CAAB 3.1.17 & 3.1.18, which require 125 ms

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

6 Network Performance Requirements

6.1 Delay, Jitter, Loss, and Duplication

Table 6.1 Requirements for delay, jitter, loss, and duplication

Standard requirements	Recommended	Required
Out of order C plane and U plane packets ^a	< 0.01%	
Packet loss	< 0.01%	
Latency	< 40 ms	< 150 ms
Jitter	< 20 ms	< 100 ms
Skew	< 40 ms	< 270 ms
Minimum bandwidth for user traffic (voice, control channel, packet data)	DMR: 64 kbit/s per physical channel P25: 108 kbit/s per physical channel Analog: 108 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 non-fragmenting link	600 kb/s per site up to 5 physical channels	

^a C plane and U plane are references to telco terminology distinguishing call setup and user traffic.

6.2 Channel Group Size

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

- 'Channel group size' is the number of members (transceivers or receivers) in a channel group.
- 'Vote contributors' are the number of active receivers that will contribute to the voted output.

Table 6.2 Channel group size

Channel type	Vote contributors	Channel group size Series 1	Channel group size Series 2
P25 failsoft (trunking)	All base stations	14	28
P25 trunked control channel	All base stations	14	28
P25 trunked traffic channel Phase 1	All base stations	14	28
P25 conventional	10	20	28
P25 dual mode	10	20	28
AS-IP conventional	10	20	28
DMR (trunked and conventional)	All base stations	10	28

Appendix—Frequency Response Diagrams

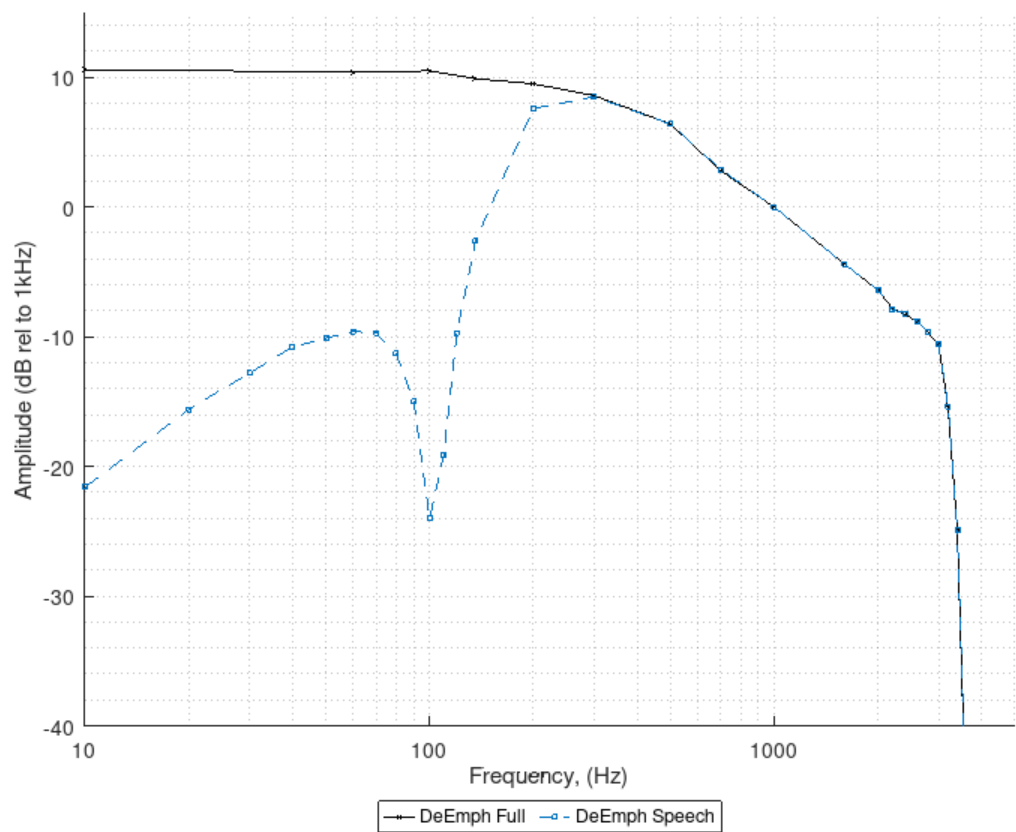


Figure A.1 Receiver frequency response de-emphasized

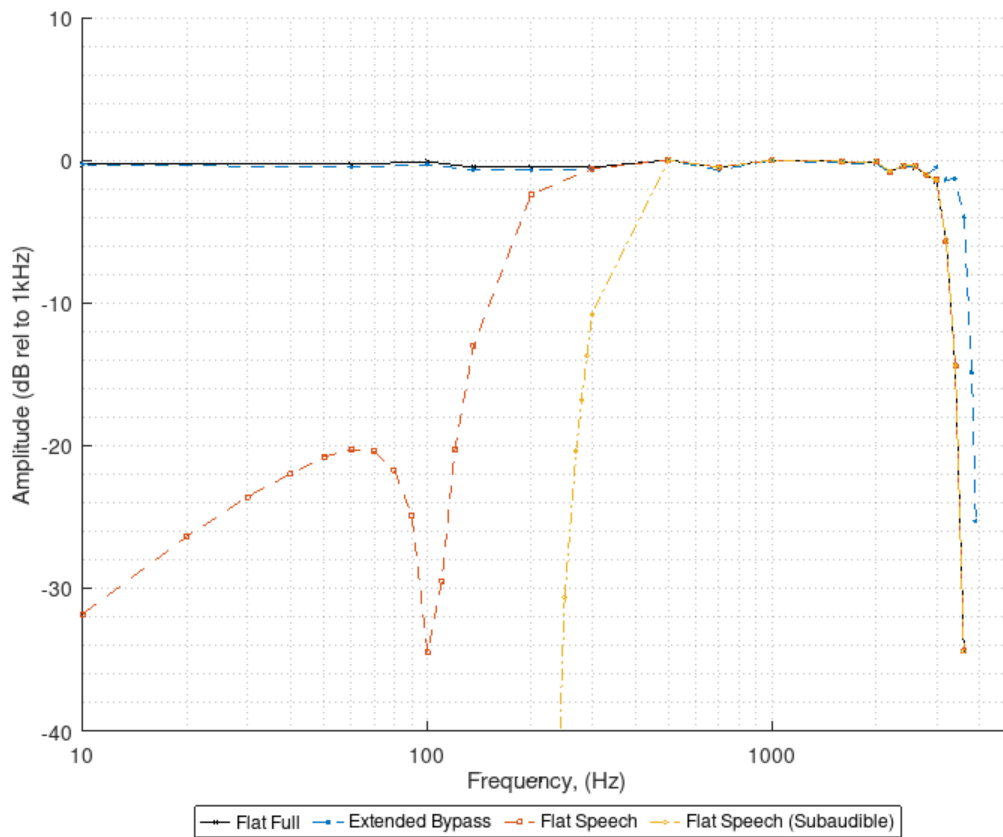


Figure A.2 Receiver frequency response flat

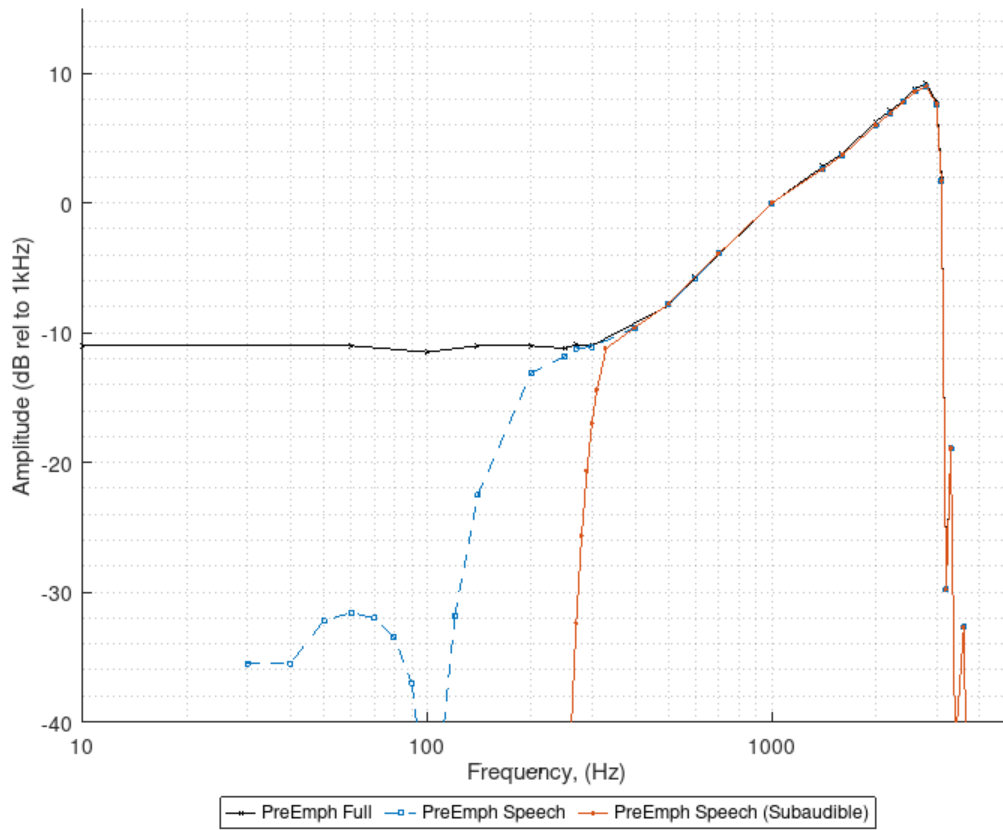


Figure A.3 Transmitter frequency response pre-emphasized

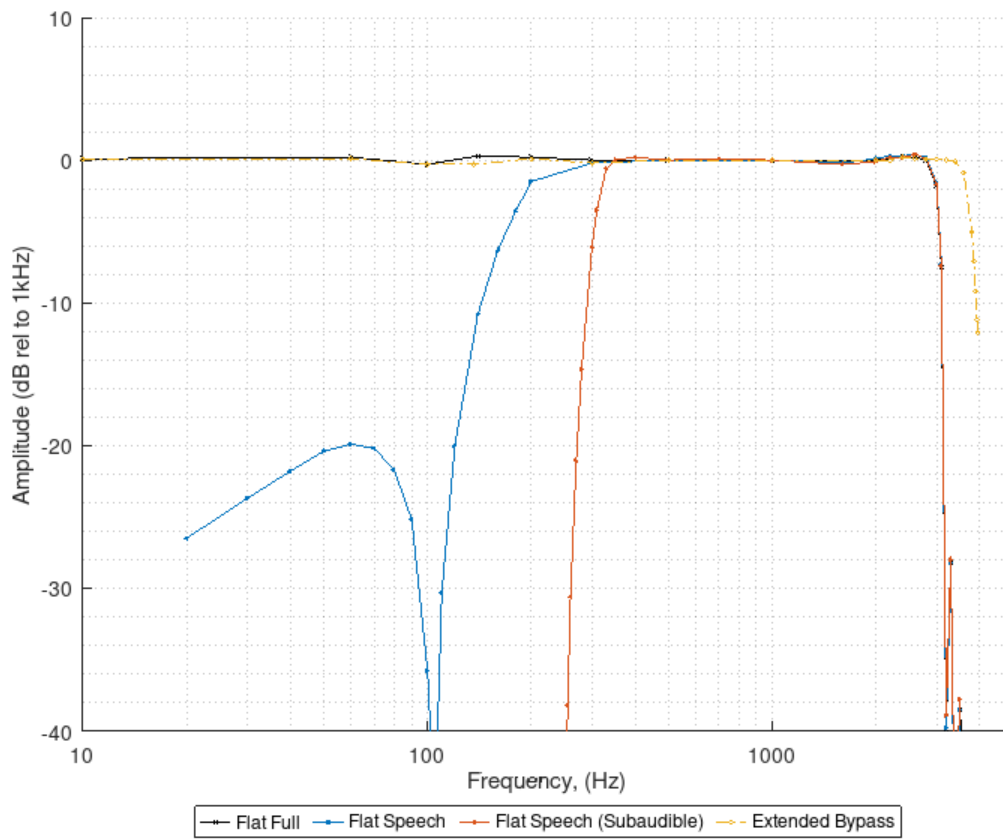


Figure A.4 Transmitter frequency response flat