

TB7100 base station

Specifications Manual



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To Our European Customers



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Preface

Scope of Manual

Welcome to the TB7100 Specifications Manual. This manual provides general, performance and physical specifications for the TB7100 base station.

Associated Documentation

The following associated documentation is available for this product:

- MBB-00001-**xx** TB7100 Installation and Operation Manual
- MBB-00003-**xx** TB7100 Installation Guide
- MBB-00005-**xx** TB7100 Service Manual

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

All available documentation is provided on the CD (406-00047-**xx**) supplied with the base station. Updates may also be published on the Tait support website.

Technical notes are published from time to time to describe applications for Tait products, to provide technical details not included in manuals, and to offer solutions for any problems that arise.

Publication Record

Issue	Publication Date	Description
1	May 2005	First Release
2	December 2005	Internal AC power supply, A4 and D1 bands added.
3	March 2006	General updates, and G2 band added.

1 System Specifications

This section provides specifications pertaining to the TB7100 base station. You will find the specifications for receiver and transmitter modules in separate chapters in this manual.



Important

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.

The performance figures given in these specifications are applicable to the TB7100 base station. These performance figures are minimum figures, unless otherwise indicated (typical), for equipment operating at standard room temperature (+22°C to +28°C [+71.6°F to +82.4°F]) and standard test voltage (12VDC).

Where applicable, the test methods used to obtain these figures are those described in the ANSI/TIA-603-B-2002 and ETSI-EN specifications. This equipment is compatible with F3E and G3E emissions. You can obtain further details of test methods and the conditions which apply for compliance testing in all countries from Tait Electronics Limited.

Identifying the TB7100 Base Station

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



Note

This explanation of the TB7100 base station product codes is not intended to suggest that any combination of features is necessarily available in any one TB7100 base station. Consult your nearest Tait Dealer or Customer Service Organisation for more information regarding the availability of specific models and options.

Product Code	Description
TBB <u>xxx</u> -xxx	Receive frequency band: A4 = 66 to 88MHz B1 = 136 to 174MHz C0 = 174 to 225MHz (later release) D1 = 216 to 266MHz H5 = 400 to 470MHz H6 = 450 to 530MHz H7 = 450 to 520MHz
TBBxx <u>xx</u> -xxx	Transmit frequency band: A4 = 66 to 88MHz B1 = 136 to 174MHz C0 = 174 to 225MHz (later release) D1 = 216 to 266MHz G2 = 350 to 400MHz H5 = 400 to 470MHz H6 = 450 to 530MHz H7 = 450 to 520MHz
TBBxxx- <u>xxx</u>	Other compliance attributes: A = 25W, level-1 digital architecture B = 35W to 50W, level-1 digital architecture C = 25W, level-2 digital architecture D = 35W to 50W, level-2 digital architecture E = 25W, level-3 digital architecture F = 35W to 50W, level-3 digital architecture
TBBxxx- <u>xxx</u>	Power options: 0 = DC only 1 = AC 115V (preset at factory) 2 = AC 230V (preset at factory)
TBBxxx- <u>xxx</u>	AC power cable: 1 = Australia/New Zealand 2 = United Kingdom 3 = Europe 3 = USA

1.1 General

Power Supply

Supply Voltage

AC Operating Voltage	195VAC to 264VAC or 99VAC to 135VAC via voltage selector switch
DC Operating Voltage	10.5VDC to 16VDC
Standard Test Voltage	12VDC
Polarity	negative earth only
Fuse	20A blade fuse

AC Power Consumption

System Condition	115 V AC		230 V AC	
	Power (W)	Power (VA)	Power (W)	Power (VA)
Transmit 50W VHF	210	270	210	280
Transmit 40W UHF	180	230	180	240
Transmit 25W	145	190	145	200
Receive only with 2W into speaker	25	40	25	65
Receive with no RF signal	15	25	15	50

DC Power Consumption (at 13.8VDC)

System Condition	25W		40W		50W	
	Current (A)	Power (W)	Current (A)	Power (W)	Current (A)	Power (W)
Transmitting into VSWR = 5:1	8.1	112	10.9	150	12.4	171
Receive only with 2W into speaker	0.54	7.45	0.54	7.45	0.54	7.45
Receive RF signal with no audio	0.38	5.24	0.38	5.24	0.38	5.24
Receive with no RF signal	0.28	3.86	0.28	3.86	0.28	3.86
Receive with no RF signal, economy mode, 800 ms cycling	0.14	1.93	0.14	1.93	0.14	1.93

Power Consumption Band A4, 25W

(transmitting into 50Ω load)

RF Power Setting (W)	Current (A)	Power (W)
26	4.8	67
12	3.0	42
5	2.2	31
1	1.3	18

Power Consumption Band B1, 25W

(transmitting into 50Ω load)

RF Power Setting (W)	Current (A)	Power (W)
26	5.7	79
12	3.9	54
5	2.8	39
1	1.7	23

Power Consumption Band B1, 50W

(transmitting into 50Ω load)

RF Power Setting (W)	Current (A)	DC Power (W)
52	9.9	137
26	6.8	94
15	5.4	75
10	4.6	63

Power Consumption Band D1, 25W

(transmitting into 50Ω load)

RF Power Setting (W)	Current (A)	Power (W)
26	4.6	64
12	3.1	43
5	2.2	31
1	1.3	18

Power Consumption Band G2, 40W

(transmitting into 50Ω load)

RF Power Setting (W)	Current (A)	Power (W)
42	8.6	119
21	6.1	84
15	5.5	76
10	4.4	61

Power Consumption Band H5, 25W

(transmitting into 50Ω load)

RF Power Setting (W)	Current (A)	DC Power (W)
26	6.3	87
12	4.3	59
5	3.1	43
1	1.9	26

Power Consumption Band H5, 40W

(transmitting into 50Ω load)

RF Power Setting (W)	Current (A)	DC Power (W)
42	8.2	113
21	5.6	77
15	4.9	68
10	4.1	57

Power Consumption Band H6, 25W

(transmitting into 50Ω load)

RF Power Setting (W)	Current (A)	DC Power (W)
26	6.5	90
12	4.4	61
5	3.1	43
1	1.9	26

Power Consumption Band H7, 40 W

(transmitting into 50Ω load)

RF Power Setting (W)	Current (A)	DC Power (W)
42	8.2	113
21	5.6	77
15	4.9	68
10	4.1	57

Transmitting into 5:1 VSWR

(worst case phase and frequency)

Power Option	Current (A)	DC Power (W)
25W	8.1	112
40W	10.9	150
50W	12.4	171

Channel Data

System Types	talk through repeater line-controlled base data repeater
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Frequency Range

25W	A4: 66MHz to 88MHz (VHF)
25W or 50W	B1: 136MHz to 174MHz (VHF)
25W	D1: 216MHz to 266MHz (UHF)
40W	G2: 350MHz to 400MHz (UHF)
25W or 40W	H5: 400MHz to 470MHz (UHF)
25W	H6: 450MHz to 530MHz (UHF)
40W	H7: 450MHz to 520MHz (UHF)

Number of Channels	100
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Channel Spacing

Narrow Bandwidth	12.5kHz
Mid Bandwidth	20kHz
Wide Bandwidth	25kHz

Frequency Increment	6.25kHz 5.00kHz
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Frequency Stability	±1.5 ppm
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Environmental

Operating Temperature Range

25W base station	-30°C to +60°C (-22°F to +140°F) ambient temperature*
50W base station	-30°C to +50°C (-22°F to +122°F) ambient temperature*

*ambient temperature is defined as the temperature of the air at the intake to the cooling fan

Cooling forced air over heatsink via fans mounted in tray

Fan Temperature Threshold Range* +40°C to +80°C

*Internally adjusted via potentiometer

Physical

Dimensions

Height	43.5 mm (1U)
Width	436mm (482.6mm with 19" rack mounting bracket)
Depth	400mm (excluding connectors)

Weight*

25W Base Station*	6 kg (13.23lb.)
With Duplexer Fitted**	7 kg (15.43lb.)
With AC Supply***	7 kg (15.43lb.)

*No duplexer or AC supply

**No AC supply

*** No duplexer

Finish powder-coated in black texture (to Tait specification A4M4029)

MTBF ≥20,000 hours (estimated)

Connectors

RF Input	N-type female (removed if duplexer fitted)
RF Output	N-type female
13.8VDC Input	2-way, 25A terminal block
System Interface	25-pin D-range
Serial Interface	9-pin D-range
Microphone/ Programming	8-way RJ45
AC Mains Input	IEC connector

Display 2-digit 7-segment LCD

Isolation

Coaxial Changeover Relay Isolation

when the base station is used in simplex mode using a single antenna with a coaxial changeover relay, the isolation of this relay must be $\geq 40\text{dB}$

1.2 Compliance

RF Compliance	Specification
Europe	EN 300 086-2
Europe	EN 300 113-2
Australia and New Zealand	AS4295
FCC USA	CFR 47 Part:15, 22 and 90
Industry Canada	RSS-119
Hong Kong	HKTA 1002
Hong Kong	HKTA 1004
Singapore	IDA TS101
Singapore	IDA TS107

EMC Compliance	Specification
Emissions	EN 301 489
FCC USA	CFR 47 Part:15

Environmental Compliance	Specification
Humidity	IEC60068-2-30 (Damp Heat)
Vibration	MIL-Std-810F 514.5
Shock	MIL-Std-810F 516.5

Safety Compliance	Specification
Safety	BS EN 60950-1 ANSI/UL Std. 60950 CAN/CSA-C22.2 No. 60950-00 AS/NZS 60950 and ACATS001

1.3 System Interface

General

RSSI Output

Output Impedance	1 k Ω
Output Level Range	offset 600mV, then 25mV/dB from -120dBm to -50dBm
Accuracy	\pm 300mV
Response Time	\leq 10ms
RF Input Range	-115 dBm to -50dBm

Rx Gate Output

Low Voltage Level	<0.4V
High Voltage Level	<30V
Low Level Sink Current	<250mA
High Level Leakage Current	<100 μ A
Activated:	
Open collector, active low	valid carrier received via RF input
Sink up to 250mA	
Deactivated:	
Floating	no carrier received via RF input
Protection	33V zener to ground

Tx Key Input

Low Input Voltage	\leq 2V (TXKEY = activated)
High Input Voltage	\geq 5V (TXKEY = de-activated)
Input Hysteresis	\cong 3V
Input Resistance	\geq 10k Ω
Maximum External Pull-up Voltage	\leq 20V
Internal Pull-up Voltage	9V (via 10k Ω)

Tx Relay Output

Typical On Voltage	< 0.4V
Maximum On Input Current	\geq 250mA
Maximum Off Voltage	< 30V

System Relay output

Internal Bias	none
Drive	open collector active low Z
Peak load current	Sink up to 250mA
Resistance	35 Ω max
Protection	33V zener to ground

Digital Output

High	\geq 3.1V (no load)
Low	<0.6V (10mA sink)
Internal Bias	pull up to 3.3V via 33k Ω
Protection	RC, diode clamps to 3.3V and ground

Digital Input

High Threshold	\geq 2.0V (deactivated)
Low Threshold	\leq 0.8V (activated)
Internal Bias	pull up to 3.3V via 33k Ω
Low-level Output Current	<100 mA
Protection	RC, diode clamps to 3.3V and ground

General (Continued)

Opto-coupler Input

Control Current	>±9mA to 11.8mA
Control Voltage	>±10V
Control Voltage*	<±60V

*with active current regulator

Opto-coupler Output

Peak Voltage	±100V
Resistance (On)	35Ω
Peak Load Current	±120mA

Line Output - Balanced

Output Level Range	-20dBm to +3dBm
Output Impedance	600Ω
Maximum Output Level	+8dBm at 100% system deviation, output level distortion ≥5%

Return Loss ≥20dB

Distortion*

De-emphasised ≤ 2%

Flat ≤ 4% (NB)

*at -70dBm signal level

Adjustable via rear panel potentiometer for 60% system deviation

Line Output - Unbalanced

Output Impedance	220Ω
Output Level Range	220mV peak to peak to 3V peak to peak DC blocked into 10kΩ

Adjustable via rear panel potentiometer for 60% system deviation

Line Input - Balanced

transformer isolated

Input Level Range*	-20dBm to +6dBm (path, Tap R4) -16dBm to -4dBm (path, AUX MIC, used for trunking)
Impedance	600Ω balanced
Return Loss	≥ 20dB

*60% modulation at 1kHz

Adjustable via rear panel potentiometer for 60% system deviation

Line Input - Unbalanced

Input Level Range	220mV peak to peak to 3V peak to peak DC blocked
Impedance	> 10kΩ

*60% modulation at 1kHz

Adjustable via rear panel potentiometer for 60% system deviation

2 Receiver Specifications

This section provides specifications pertaining to the receiver module.



Important 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.

The performance figures given in these specifications are applicable only to the receiver module operating as an integral part of a TB7100 base station. These performance figures are minimum figures, unless otherwise indicated (e.g. “typical”), for equipment operating at standard room temperature (+22°C to +28°C [+71.6°F to +82.4°F]) and standard test voltage (12VDC).

Where applicable, the test methods used to obtain these figures are those described in the ANSI/TIA-603-B-2002 and ETSI-EN specifications. This equipment is compatible with F3E and G3E emissions. You can obtain further details of test methods and the conditions which apply for compliance testing in all countries from Tait Electronics Limited.

Bandwidth

The terms “narrow bandwidth”, “mid bandwidth” and “wide bandwidth” used in this chapter are defined in the following table.

	Channel Spacing	Modulation 100% Deviation	Receiver IF Bandwidth
Narrow Bandwidth (NB)	12.5kHz	± 2.5kHz	7.5kHz
Mid Bandwidth (MB)	20kHz	± 4kHz	12kHz
Wide Bandwidth (WB)	25kHz	± 5.0kHz	15.0kHz

Sensitivity and distortion figures are stated for standard operating conditions which includes audio de-emphasis. Note that the sensitivity, distortion and signal-to-noise figures will be degraded when flat audio is selected.

Identifying the Receiver Module

You can identify the model and hardware configuration of a receiver module by referring to the product code printed on a label on the top of the module. The meaning of each character in the product code is explained in the table below.



Note This explanation of receiver product codes is not intended to suggest that any combination of features is necessarily available in any one Receiver. Consult your nearest Tait Dealer or Customer Service Organisation for more information regarding the availability of specific models and options.

Product Code	Description
XMAD <u>a</u> b-cdee	a denotes digital architecture 1 = EP1C6/5402 2 = EP1C12/5409 3 = EP1C12/5509
XMADa <u>b</u> -cdee	b denotes power 2 = 25W 3 = 25W trigger-based 4 = 40W/50W 5 = 40W/50W trigger-based
XMADab- <u>cd</u> ee	cd denotes frequency band A4 = 66MHz to 88MHz B1 = 136MHz to 174MHz C0 = 174MHz to 225MHz (later release) D1 = 216MHz to 266MHz G2 = 350MHz to 400MHz H5 = 400MHz to 470MHz H6 = 450MHz to 530MHz H7 = 450MHz to 520MHz
XMADab-c <u>ee</u>	ee denotes radio options 02 = transmitter 03 = receiver

Receiver RF Section

Frequency Bands

A4 Band	66MHz to 88MHz
B1 Band	136MHz to 174MHz
C0 Band	174MHz to 225MHz (later release)
D1 Band	216MHz to 226MHz
G2 Band	350MHz to 400MHz
H5 Band	400MHz to 470MHz
H6 Band	450MHz to 530MHz
H7 Band	450MHz to 520MHz

Frequency Increments

H Band*	5kHz and 6.25kHz
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*Channel offsets of half these values can be programmed

Switching Range	continuous over full frequency range
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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 +27dBm (2.2V)
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Frequency Stability	± 1.5 ppm -30°C to $+60^{\circ}\text{C}$ (-22°F to $+140^{\circ}\text{F}$)
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RSSI	-115 dBm to -50 dBm 0.5V to 2.5V, approx. 25mV/dB
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Sensitivity^{1,2}

12dB _{SINAD} NBFM, MBFM, WBFM	
Max RF level	-115 dBm
Typical RF level	-116 dBm

20dB _{SINAD} NBFM, MBFM, WBFM ³	
Max RF level	-112 dBm
Typical RF level	-114 dBm

BER $\leq 5\%$, NB FFSK, MB FFSK, WB FFSK	
Max RF level	-115 dBm
Typical RF level	-116 dBm

BER $\leq 1\%$, NB THSD, MB THSD and WB THSD	
Max RF level	-110 dBm
Typical RF level	-112 dBm

¹ At 25°C, 750 μ s de-emphasis, 2 dB degradation at extremes of operational temperature range and frequency band

² For the D1 band these figures are approximately 3db better.

³ Psophometric weighting

Receiver RF Section (Continued)

Ultimate Signal-to-Noise Ratio*

NBFM	40dB
MBFM	41 dB
WBFM	43 dB

*Max RF level -47 dBm (EIA)

Selectivity	ETS 136MHz to 174MHz	ETS 175MHz to 530MHz
Narrow Bandwidth	68dB	68dB
Mid Bandwidth	75dB	73dB
Wide Bandwidth	80dB	75dB

Signal Displacement Bandwidth >40% of the rated system deviation (EIA 603B)

Spurious Response Attenuation ≥ 73 dB (ETSI)
*AGC switched off in H band Receiver

Intermodulation 3rd order immunity*
D1 band: >67 dB (ETSI)
All other bands: >70dB (ETSI)

*Unwanted signals spaced at least 25kHz and 50kHz away

Blocking Rejection (Blocking Ratio)

1 to 10MHz ≥ 84 dB (ETSI)

Co-channel Rejection

Narrow Bandwidth	-12 dB
Mid Bandwidth	-8dB
Wide Bandwidth	-8dB

Amplitude Characteristic* ≤ 3 dB (ETSI)

*RF Input Level -107 dBm to -13dBm

Radiated Spurious Emissions

Transmit	
Radiated	<-36 dBm EIRP to 1 GHz <-30dBm 1 GHz to 4GHz
Standby	
Conducted	<-57dBm 9kHz to 1GHz <-47dBm 1 GHz to 12.75GHz
Radiated	<-57 dBm EIRP to 1 GHz <-47 dBm EIRP 1 GHz to 4 GHz
Transmit and Operating extremes*	<-30dBm 9 kHz to 2.9GHz

*(AS4295)

Receiver Audio Section - Gating Operation

Gating Settings

Country	8dB _{SINAD}
City	12dB _{SINAD}
Hard	20dB _{SINAD}

SINAD Gating

Opening Level	8dB to 20dB _{SINAD}
Accuracy	±2dB (at extremes)
Opening Point SINAD Variation with Receiver Bandwidth	Hard 3dB _{SINAD} , City 2dB _{SINAD} , Country 2dB _{SINAD}
RF Hysteresis	
RF Hysteresis Variation at Extremes	2dB _{RF} (min.)
Modulation Desense No Carrier Offset	2dB _{RF} (min.)
Nominal	70% (min.) full scale deviation
Variation at Extremes	65% (min.) full scale deviation
Modulation Desense with Carrier Offset (NB 1.5kHz, MB 2.0kHz, WB 2.5kHz)	
Nominal	70% (min.) full scale deviation
Variation at Extremes	65% (min.) full scale deviation
Adjacent Channel Selectivity	mute operates as in absence of adjacent channel signal
Susceptibility to Broadband Noise	30dB _{RF} (min.)
Variation at Extremes	25dB _{RF} (min.)
EIA-603 Opening Time ¹	60ms (max.)
Variation at Extremes	75ms (max.)
Noise Mute Opening Time ²	20ms (max.)
Variation at Extremes	25ms (max.)
EIA-603 Closing Time	must not close

¹ EIA times refer to the audio paths

² Noise mute opening times refer to the receiver gate signal

RSSI Gating (RSSI Mute)

Attack Time	<2.5ms (from no signal to the country threshold)
Decay Time	<2.5ms (from -50dBm to no signal)
Settings	Country -115dBm, City -113dBm, Hard -107dBm

Receiver Inhibit

High Level Threshold	≥2.0V (Deactivated)
Low Level Threshold	≤0.8V (Activated)
Internal Bias	pull up to 3.3V via 4.7kΩ
Protection	RC, diode clamps to 3.3V and ground

Rx Gate Relay Output

Internal Bias	none
Drive	opto-isolated, active low Z
Peak Load Current	±120mA
Resistance	35Ω max
Protection	30V zener

Receiver Audio Section - Gating Operation (Continued)

Tone on Idle

Frequency	1.3kHz to 2.5kHz adjustable via internal potentiometer
Level*	-14dB to +3dB relative to the nominal line output level
Activation	Internal jumper settings

* Adjusting nominal line level shall not alter the relative level of the tone

Receiver Audio Section - General

Outputs Available	speaker output via user interface balanced and unbalanced line outputs via system interface board (see " System Interface " on page 15)
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Frequency Response	flat or de-emphasised (750µs) on balanced output flat on unbalanced output
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De-emphasised Response

Bandwidth	300Hz to 2.55kHz (NB) 300Hz to 2.8kHz (MB) 300Hz to 3kHz (WB)
Response	within ±3dB of a -6dB / octave de-emphasis curve (ref. 1kHz)

Flat Response	Balanced Audio	Unbalanced Audio
Bandwidth	300Hz to 2.55kHz (NB) 300Hz to 2.8kHz (MB) 300Hz to 3kHz (WB)	300Hz to 2.55kHz (NB) 300Hz to 2.8kHz (MB)* 300Hz to 3kHz (WB)
Response	within ±3dB of output level at 1kHz	within ±3dB of output level at 1kHz

Bulk Delay

Receiver*	
Audio Tap Out R2	≤2.5ms
Audio Tap Out R4	≤7.5ms
Talk Through Repeater**	≤20ms

*from antenna to audio output

**from antenna input to antenna output

Group Delay / Variation*

Receiver	≤ 10µs peak to peak 300Hz to 3.4kHz (WB) ≤ 10µs peak to peak 300Hz to 2.25kHz (NB)
Talk Through Repeater	≤ 50µs peak to peak 300Hz to 3.4kHz (WB) ≤ 50µs peak to peak 300Hz to 2.25kHz (NB)

*at -70dBm, 60% deviation flat full band response, applies to balanced and unbalanced audio and is at Tap in T12 and Tap out R2

Receiver Audio Section - General (Continued)

Speaker Output (via User Interface)

Power	4W maximum
Speaker Impedance	16 Ω nominal
Distortion*	$\leq 3\%$ total harmonic distortion at 1 kHz, 0.35W, 16 Ω
Signal to Noise Ratio**	≥ 35 dB
Mute Ratio**	> 60 dB

* at -70 dBm signal level, de-emphasis selected

** WRT 60% system deviation at 50% rated speaker output power setting

Line Output - Balanced

Output Level Range	-20 dBm to $+6$ dBm
Output Impedance	600 Ω
Distortion (@ -70 dBm in, de-emphasized, 1 kHz tone, 60% modulation)	$< 3\%$

Hum and Noise:

Narrow Bandwidth	> 40 dBm
Mid Bandwidth	> 41 dBm
Wide Bandwidth	> 43 dBm

Receiver Audio Section - CTCSS

Tone Detect

Tone Squelch Opening	4 dB _{SINAD} (typical)
Response Time	220 ms open and close (typical)

3 Transmitter Specifications

This section provides specifications pertaining to the transmitter module.



Important 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.

The performance figures given in these specifications are applicable only to the transmitter module operating as an integral part of a TB7100 base station. These performance figures are minimum figures, unless otherwise indicated (*typical*), for equipment operating at standard room temperature (+22°C to +28°C [+71.6°F to +82.4°F]) and standard test voltage (12VDC).

Where applicable, the test methods used to obtain these figures are those described in the ANSI/TIA-603-B-2002 and ETSI-EN specifications. This equipment is compatible with F3E and G3E emissions. You can obtain further details of test methods and the conditions which apply for compliance testing in all countries from Tait Electronics Limited.

Bandwidth

The terms “narrow bandwidth”, “mid bandwidth” and “wide bandwidth” used in this chapter are defined in the following table.

	Channel Spacing	Modulation 100% Deviation	Receiver IF Bandwidth
Narrow Bandwidth (NB)	12.5kHz	± 2.5kHz	7.5kHz
Mid Bandwidth (MB)	20kHz	± 4kHz	12 kHz
Wide Bandwidth (WB)	25kHz	± 5.0kHz	15.0kHz

Identifying the Transmitter Module

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



Note This explanation of transmitter product codes is not intended to suggest that any combination of features is necessarily available in any one transmitter. Consult your nearest Tait Dealer or Customer Service Organisation for more information regarding the availability of specific models and options.

Product Code	Description
XMAD <u>a</u> b-cdee	a denotes digital architecture 1 = EP1C6/5402 2 = EP1C12/5409 3 = EP1C12/5509
XMADa <u>b</u> -cdee	b denotes power 2 = 25W 3 = 25W trigger-based 4 = 40W/50W 5 = 40W/50W trigger-based
XMADab- <u>cd</u> ee	cd denotes frequency band A4 = 66MHz to 88MHz B1 = 136MHz to 174MHz C0 = 174MHz to 225MHz (later release) D1 = 216MHz to 266MHz G2 = 350MHz to 400MHz H5 = 400MHz to 470MHz H6 = 450MHz to 530MHz H7 = 450MHz to 520MHz
XMADab-c <u>ee</u>	ee denotes radio options 02 = transmitter 03 = receiver

Transmitter RF Section

Frequency Bands

A4 Band	66MHz to 88MHz
B1 Band	136MHz to 174MHz
C0 Band	174MHz to 225MHz (later release)
D1 Band	216MHz to 226MHz
G2 Band	350 MHz to 400 MHz
H5 Band	400MHz to 470MHz
H6 Band	450MHz to 530MHz
H7 Band	450MHz to 520MHz

Output Power*

Low Power Option		
Rated Power	25W	
Range of Adjustment	1W to 25 W	
Level 1 Very Low	1W	
Level 2 Low	5W	
Level 3 Medium	12W	
Level 4 High	26W	
High Power Option		
	VHF	UHF
Rated Power	50W	40W
Range of Adjustment	10W to 50W	10W to 40W
Level 1 Very Low	10W	10W
Level 2 Low	15W	15W
Level 3 Medium	26W	21W
Level 4 High	52W	42W

*Variation under environmental extreme +2 dB, -3 dB
 Variation under VSWR not exceeding 1.6:1 \pm 1 dB
 Variation across the RF frequency band \pm 1 dB

Output Power Accuracy* \pm 0.5dB into a 50 Ω load

*within normal operating voltages and temperatures

Duty Cycle 100% at maximum rated output power* at +60°C (+140°F) ambient temperature, for low power option
 100% at maximum rated output power* at +50°C (+122°F) ambient temperature, for high power option
 *measured directly on TB7100 RF output

Output Load Impedance 50 Ω nominal (VSWR <2:1)

Mismatch Capability

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

Transmitter RF Section (Continued)

Frequency Range

25W	A4: 66MHz to 88MHz (VHF)
25W or 50W	B1: 136MHz to 174MHz (VHF)
25W	D1: 216MHz to 226MHz (VHF)
40W	G2: 350MHz to 400MHz (UHF)
25W or 40W	H5: 400MHz to 470MHz (UHF)
25W	H6: 450MHz to 530MHz (UHF)
40W	H7: 450MHz to 520MHz (UHF)

Protection

Refer to www.taitworld.com

Number of Channels

100

Channel Spacing

NB	12.5kHz
MB	20kHz
WB	25kHz

Modulation Scheme*

Analogue NBFM	--, 11K0F3E, 11 kHz
Analogue MBFM	--, 14K0F3E, 14 kHz
Analogue WBFM	--, 16K0F3E, 16 kHz
CP4GFSK	12 kbps, 12K0F1D, 12 kHz
CP4GFSK	19.2 kbps, 19K6F1D, 19.6 kHz
NB FFSK	1.2 kbps, 7K2F2D, 7.2 kHz
MB FFSK	1.2 kbps, 9K36F2D, 9.36 kHz
WB FFSK	1.2 kbps, 10K8F2D, 10.8 kHz

* Raw Data Rate, Emission Designator, Bandwidth

Frequency Increments

H Bands* 5kHz and 6.25kHz

*Channel offsets of half these values can be programmed

Frequency Accuracy

±1.5 ppm -30°C to +60°C (-22°F to +140°F)

Adjacent Channel Power

Steady State (Full Deviation)	
Narrow Bandwidth	<-60dBc (ETS 300 086, EIA)
Mid and Wide Bandwidth	<-70dBc (ETS 300 086, EIA)
Transient (Unmodulated)	
Narrow Bandwidth	<-50dBc (ETS 300 113)
Mid and Wide Bandwidth	<-60dBc (ETS 300 113)

Wideband Noise*

±1MHz <-100dBc

**no modulation, measured from centre frequency, measured in 15kHz bandwidth

Transmitter RF Section (Continued)

Hum and Noise:		
Narrow Bandwidth		-35 dBm (300Hz to 3kHz [ANSI/TIA])
Mid Bandwidth		-39 dBm (300Hz to 3kHz [ANSI/TIA])
Wide Bandwidth		-41 dBm (300Hz to 3kHz [ANSI/TIA])
Intermodulation		
		-40 dBc with interfering signal at -30 dBc at TB7100 base station RF output
Radiated Spurious Emissions		
Transmit - B, C and H Bands		<-36 dBm EIRP to 1 GHz <-30 dBm 1 GHz to 4 GHz
Standby		<-57 dBm EIRP to 1 GHz <-47 dBm 1 GHz to 4 GHz <-47 dBm 1 GHz to 12.75 GHz
Conducted Spurious Emissions		
Transmit - B, C and H Bands		<-36 dBm to 1 GHz <-30 dBm 1 GHz to 12.75 GHz
Standby		<-50 dBm discrete emissions <700 Hz bandwidth <-57 dBm to 1 GHz <-47 dBm 1 GHz to 12.75 GHz
Voltage and Temperature Extremes*		<-30 dBm 9 kHz to 2.9 GHz
*(AS4295)		
TXKEY Input Transmit Key Time		
Key Up		
25W to 90% full power		≤8ms
25W to mod path*		≤18ms
Key Down		
25W release to -10dBm		≤6ms
*T8 enabled		
Talk Through Repeater Transmit Key Time*		
Opening time		
Noise mute (SINAD gating applied)		≤40ms
Closing time		
Noise mute (SINAD gating applied)		≤31ms
*Receive antenna to Transmit antenna		
Microphone PTT Transmit Key Time		
Key Up		
25W to 90% full power		≤20ms
Key Down		
25W to 10% full power		≤20ms

Transmitter RF Section (Continued)

Continuous Repetitive Key Rate	24Hz maximum
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Transmitter Audio Section - Modulation Characteristics

Inputs Available	microphone input via user interface balanced and unbalanced line inputs via system interface board (see " System Interface " on page 15)
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Frequency Response*	flat or pre-emphasised**
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*below limiting	**microphone input via control panel, balanced and unbalanced line inputs via system interface board
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Microphone Input

Bandwidth	300Hz to 3kHz
Impedance	600Ω
Distortion	≤3%

*60% modulation at 1kHz

Microphone PTT

Deactivated state	V input <0.5V
Activated state	V input >2V
Hookswitch active state	5Ω to 22Ω to ground

Line and Microphone Inputs

Pre-emphasised Response	Bandwidth	
	300Hz to 2.55kHz (NB) 300Hz to 3kHz (MB) 300Hz to 3kHz (WB)	
Below Limiting	within ±3dB of a 6dB/octave pre-emphasis curve (ref. 1kHz)	
	Balanced Audio	Unbalanced Audio
Flat Response	Bandwidth	
	300Hz to 2.55kHz (NB) 300Hz to 3kHz (MB) 300Hz to 3kHz (WB)	67Hz to 2.55kHz (NB) 67Hz to 3kHz (MB) 67Hz to 3kHz (WB)
Response	within ±3dB of output level at 1kHz	

Limiting Deviation (Modulation Limiting)

NBFM	<±2.5kHz
MBFM	<±4.0kHz
WBFM	<±5.0kHz

Distortion*	<3%
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*60% modulation at 1kHz

Transmitter Audio Section - Modulation Characteristics (Continued)

Bulk Delay

Transmitter*	
Audio Tap in T12	≤ 2.5 ms
Audio Tap in T8	≤ 10 ms
Talk Through Repeater**	≤ 20 ms

*from audio input to antenna

**from antenna input to antenna output, -70dBm, 60% deviation for a 1kHz tone, flat response any output power

Group Delay*

Transmitter	≤ 40 μs peak to peak 300Hz to 3.4kHz (WB) ≤ 40 μs peak to peak 300Hz to 2.25kHz (NB)
Talk Through Repeater	≤ 50 μs peak to peak 300Hz to 3.4kHz (WB) ≤ 50 μs peak to peak 300Hz to 2.25kHz (NB)

*at 60% deviation flat full band response, applies to balanced and un balanced audio and is at Tap in T12 and Tap out R2

Transmitter Audio Section - CTCSS

Standard Tones	all 37 ANSI/TIA group A, B and C tones plus 13 commonly used tones
Modulation Level	adjustable
Modulated Distortion	<5%
