1   General Information

This Section introduces the T2000 Series II radio, describing models and features available and their performance.

The following topics are covered in this Section:

1.1   Introduction

The T2000 Series II is a high performance mobile two way radio. It covers ten frequency bands between 66 and 870MHz, and is available in both trunked and conventional models.

Operation of the T2000 is by handheld microphone, a press-to-talk switch and a range of front panel function keys. The T2020 and T2040 models are fitted with an LCD display and alphanumeric keypad.

Most of the functions of the T2000 are microprocessor controlled. The system software is stored in a read only memory (ROM), while the data is stored in a non-volatile memory for ease of programming. Operational parameters can be programmed without opening the radio, via the front panel microphone socket.

The T2000 uses a synthesiser with a single VCO switched between transmit and receive. A plug-in TCXO PCB is used to provide a highly stable reference frequency, and dual point modulation gives a flat modulation response at the synthesiser.

The standard T2000 RF power output is 25W, except in the T2000-800 which delivers 15W. The receiver is electronically tuned across the entire frequency band and contains an IF noise blanker and RSSI facility. A maximum of 4W of audio is delivered to a 4Ω speaker.

The RF and logic PCBs are shielded from each other in a diecast aluminium chassis, and are connected by two plug-in looms. The T2000 top and bottom covers are also diecast aluminium.

There is provision within the radio to mount option PCBs and a 9 or 15 way output connector which is used for options requiring connection to external equipment. Standard options include hands-free operation, line control interface, signalling and data transmission.

The DC supply to the radio must be negative earth and may be between 10.8 and 16V. The T2000 is protected against reversal of the DC supply and is provided with overvoltage protection.

If further information is required about the T2000 or this Manual, it may be obtained from Tait Electronics Ltd or accredited agents. When requesting this information, please quote the equipment product code (e.g. T2010-512-002) and serial number. In the case of the Service Manual, quote the product code (e.g. M2000-00-300), and for circuit diagrams quote the 'Title', 'Internal Part Number' (IPN) and 'Issue'.

1.2   Specifications

1.2.1   Introduction

The performance figures given are typical figures, unless otherwise indicated, for equipment operating at standard room temperature. Where applicable, the test methods used to obtain the following performance figures are those described in the European specification ETS 300-086.

Details of test methods and the conditions which apply for type approval testing in all countries can be obtained from Tait Electronics Ltd.

1.2.2   General

Modulation Type   ..   FM

Frequency Ranges:

T2000-100	.. 220 to 270MHz
T2000-200	.. 66 to 88MHz
T2000-300	.. 136 to 174MHz
T2000-400	.. 175 to 225MHz
T2000-500	.. 400 to 470MHz
T2000-600	.. 450 to 520MHz
T2000-700	.. 330 to 360MHz
T2000-800	.. 800 to 870MHz (Tx)
	.. 851 to 870MHz (Rx)
T2000-900	.. 360 to 400MHz
T2000-000	.. 500 to 530MHz

Frequency Increment:

All Except T2000-800	.. 5 or 6.25kHz
T2000-800	.. 12.5kHz

Number Of Channels:

T2010	.. 4
T2015	.. 24
T2020	.. 100

Bandwidth   ..   7.5, 12 or 15kHz

Switching Range:

T2000-200	.. 22MHz
T2000-300	.. 38MHz
T2000-400, T2000-100	.. 50MHz
T2000-500, T2000-600	.. 70MHz
T2000-700	.. 30MHz
T2000-800	.. 70MHz (Tx)
	.. 19MHz (Rx)
T2000-900	.. 40MHz

Tx/Rx Offset:

    T2000-200 .. 0 to 22MHz
    T2000-300 .. 0 to 38MHz
    T2000-400, T2000-100 .. 0 to 50MHz
    T2000-500, T2000-600 .. 0 to 70MHz
    T2000-700 .. 0 to 30MHz
    T2000-800 .. 0 to 45MHz
    T2000-900 .. 0 to 40MHz

Supply Voltage:

    Operating Range .. 10.8V to 16V DC
    Standard Test Voltage .. 13.8V DC
    Polarity .. negative earth
    Polarity & Overvoltage Protection .. internal transorb crowbar
    Brown-out Recovery .. <2s to full operation following supply fluctuations below 10.8V

Supply Current:

    Economy Mode .. <270mA (T201X/T203X/T2060) or <350mA (T2020/T2040/T2050)

    Receiver:
        Squelched .. 320mA (T201X/T203X/T2060) or 472mA (T2020/T2040/T2050)

        Full Audio .. 1.2A
    Transmit:
    T2000-200, -300, -400, -800 .. 6A
    T2000-500 .. 6.8A
    T2000-600 .. 7A
    T2000-100, -700, -900 .. 6.8A
    T2000-000 .. 7.5A

Tx/Rx Changeover Switching .. solid state

Operating Temperature Range .. -30ºC to +60ºC ambient

Programming .. clone or PC program via mic. socket

Antenna:
    Impedance .. 50Ω (nominal)
    Connector .. BNC (UHF optional on VHF radios only)

Power/Speaker Connector .. 7 way automotive type

Options Connector .. 9 or 15 way high density D-range (optional)

Radio Unit Dimensions:
    Depth .. 150mm
    Width .. 150mm
    Height .. 45mm

Front Panel Dimensions:
    Depth .. 25mm
    Width .. 158mm
    Height .. 51mm

Remote Control Head Dimensions:

Length	..	26mm
Width	..	159mm
Height	..	51mm

Weight (radio & control head)   ..   1.2kg

1.2.3   Receiver Performance

Type:

All Except T2000-200	..	triple conversion superheterodyne
T2000-200	..	dual conversion superheterodyne

Sensitivity:

12dB Sinad	..	better than -117dBm
20dB Sinad (psophometric)	..	better than -113dBm
20dB Quieting	..	better than -113dBm

IF Amplifiers:

Frequencies:

T2000-200	..	10.7MHz and 455kHz
T2000-100, -300, -400	..	27.7MHz, 10.7MHz and 455kHz
T2000-500, -600, -700, -900, -000	..	49.1MHz, 10.7MHz and 455kHz
T2000-800	..	61.9MHz, 10.7MHz and 455kHz

First Local Oscillator Injection (with respect to signal):

T2000-200, -300	..	high side
T2000-100, -400, -500, -600, -700, -800, -900, -000	..	low side

Second Local Oscillator Injection (with respect to signal):

T2000-100, -300, -400	..	high side
T2000-200, -500, -600, -700, -800, -900, -000	..	low side

Third Local Oscillator Injection (with respect to signal):

T2000-100, -300, -400	..	low side
T2000-500, -600, -700 -800, -900, -000	..	low side

Bandwidth:

Narrow Band	..	7.5kHz
Medium Band	..	12kHz
Wide Band	..	15kHz

Signal-to-Noise Ratio (with respect to 100% deviation, at RF level of -47dBm):

Narrow Band	..	45dB
Medium Band	..	48dB
Wide Band		
All Except T2000-800	..	50dB
T2000-800	..	45dB

Audio:

Minimum Load Impedance	..	2Ω
Rated Power (into 4Ω)	..	4W (at 1kHz)
Distortion:		
@ Rated Power (1kHz)	..	<5%
@ 0.5W (0.3 to 3.0kHz)	..	<3% (narrow band)
		<2.5% (medium band)
		<2% (wide band)
Response	..	within +1, -3dB of 6dB/octave de-emphasis
Bandwidth	..	300Hz to 3kHz

Selectivity	..	better than 70dB

Spurious Response Attenuation

All Except T2000-000, -800	..	75dB (80dB EIA)
T2000-000	..	60dB
T2000-800	..	70dB (70dB EIA)

Intermodulation Response Attenuation	..	66dB (75dB EIA)

Spurious Emissions (conducted & radiated to 1GHz)	..	better than -57dBm

Spurious Emissions (conducted & radiated 1 to 4GHz)	..	better than -47dBm

Blocking	..	better than -23dBm

Co-channel Rejection:

Narrow Band	..	better than 9dB
Medium Band	..	better than 7dB
Wide Band	..	better than 6dB

Group Delay	..	$\pm50\mu s$ (300Hz to 3kHz)

Squelch:

Preset Level	..	11dB sinad
Ratio	..	>70dB

Voting Levels	..	>20dB sinad (applies to T2020 only)

1.2.4   Transmitter Performance

Power Output:
    Maximum:
        All Except T2000-800   ..   30W
        T2000-8000   ..   25W
    High (high setting):
        All Except T2000-800   ..   25W
        T2000-8000   ..   15W
.   Low (low setting):
        T2000-200, -300, -400   ..   1 to 25W
        T2000-100, -500, -600, -700, -900   ..   5 to 25W
        T2000-800   ..   5 to 15W
    Low Power Version   ..   1 to 7W (T2000-500, -600)

Duty Cycle (33%)   ..   2 minutes Tx, 4 minutes Rx

Lock Up Time (synthesiser)   ..   25ms (from PTT to 90% output power within 2kHz, not including micro. delay)

Spurious Emissions   ..   better than -36dBm
(conducted & radiated to 1GHz)

Spurious Emissions   ..   better than -30dBm
(conducted & radiated to 1 to 4GHz)

Adjacent Channel Power:
    Narrow Band   ..   better than -65dBc
    Medium Band   ..   -70dBc
    Wide Band   ..   -80dBc

Group Delay   .. $+200/-50\mu s$ (300Hz to 3kHz)

Modulation System:
    Type   ..   direct FM
    Deviation Limiting:
        Narrow Band   ..   ±2.5kHz (peak) max.
        Medium Band   ..   ±4kHz (peak) max.
        Wide Band   ..   ±5kHz (peak) max.
    Bandwidth:
        Narrow Band   ..   300Hz to 2.55kHz below limiting or 450Hz to 2.55kHz in limiting
        Medium & Wide Band   ..   300Hz to 3kHz below limiting or 450Hz to 3kHz in limiting

Responses:
    In Limiting   ..   within +0dB, -4dB of maximum system deviation
    Below Limiting   ..   within +1, -3dB of 6dB/octave pre-emphasis
    Above 3kHz   ..   greater than 25dB/octave roll-off

Audio:
        Microphone Type   .. dynamic or electret
        Input For 60% Deviation   .. 1.5mVrms maximum (at 1kHz)

Distortion   .. 5%

Hum & Noise:
        All Except T2000-800:
                Narrow Band   .. 39dB
                Medium Band   .. 43dB
                Wide Band   .. 45dB
        T2000-800:
                Wide Band   .. 40dB

Mismatch Capability:
        Ruggedness   .. 2 minutes transmission into infinite
                                                    VSWR
        Stability   .. VSWR 5:1 (all phase angles)

Transmit Timer (non-trunking models)   .. programmable up to 4 minutes, or
                                                    continuous.

1.2.5   Frequency Reference

Oscillator Frequency   .. 12.8MHz

Crystal Stability And Source Details   .. see table below:

Product Code	Frequency Tolerance (ppm)	Temperature Range (ºC)	Frequency Source
T2XX-XX1	±5	-10 to +60	TE/45 xtal
T2XX-XX3[*]	±3	-30 to +60	VXO-2605A Module
T2XX-XX5	±2.5	-30 to +60	VXO-2605A-1 Module[†]
T2XX-XX6	±2.0	-30 to +60	TDC 60281 Module[†]

*. Not fitted to T2000-200 due to low modulatibility.
†. Fitted only to 400MHz versions and above, due to low modulatibility.

1.2.6   Trunking

1.2.6.1   T2030, T2035, T2040 & T2050 Models

Data Modulation   ..   as per MPT1317

Data Deviation (Tx: 60% full system deviation):
    Narrow Band   ..   1.5kHz
    Medium Band   ..   2.4kHz
    Wide Band   ..   3kHz

1.2.6.2   T2060 Model

System   ..   LTR® trunked[1], systems x groups = 24

Data Deviation (Tx)   ..   1kHz

1.3   Operating Instructions

Refer to the User's Guide supplied with the radio. These are also available separately under the following IPNs:

T2010/T2015   459-20100-0X
T2020   459-20200-0X
T2030/T2035   459-20300-0X
T2040   459-20400-0X
T2060   459-20600-0X

Comprehensive Operator's Manuals are also available for T2020 and T2040 radios. These Manuals cover such topics as advanced user operations and the use of trunked radios for data applications. These are available under the following IPNs:

T2020   409-20200-0X
T2040   409-20400-0X

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1. LTR® is a trademark of E F Johnson & Co.

1.4   Product Codes

The 3 groups of digits in a T2000 product code provide information about the radio's model, RF type and options fitted, according to the conventions described below.

The following explanation of the T2000 product codes is not intended to suggest that any combination of features is necessarily available in any one radio. For details regarding availability of specific T2000 radios, consult your nearest Tait dealer or subsidiary.

Model

The Model group indicates the basic features of the radio, as follows:

T20XX-XXX-XXX
T2010	4 channels	
T2015	24 channels	
T2020	100 channels	
T2030	4 calls, all preset	trunked
T2035	1000 calls, including 20 preset	trunked
T2040	dialled calls	trunked
T2050	dual mode T2040 or T2020 operation	trunked, non-trunked
T2060	LTR$^{®}$, systems x groups = 24	trunked

RF Type

RF Type group uses 3 digits to indicate the basic RF configuration of the radio.

The first digit in the RF Type group designates frequency band.

T20XX-**X**XX-XXX
- '1' for 220 to 270MHz
- '2' for 66 to 88MHz
- '3' for 136 to 174MHz
- '4' for 175 to 225MHz
- '5' for 400 to 470MHz
- '6' for 450 to 520MHz
- '7' for 330 to 360MHz
- '8' for 800 to 870MHz transmit
        851 to 870MHz receive
- '9' for 360 to 400MHz
- '0' for 500 to 530MHz

The second digit in the RF Type group designates radio IF bandwidth.

T20XX-X**X**X-XXX
- '1' for wide band (15kHz)
- '2' for narrow band (7.5kHz)
- '3' for medium band (12.5kHz)

The third digit in the RF Type group designates frequency stability.

T20XX-XX**X**-XXX   refer to "Frequency Reference" on page 1.8.

Options

T20XX-XXX-**XXX**   The third group of digits covers a wide range of software and market specific options. The large number of options and their frequent changes preclude listing them here.