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## TECHNICAL NOTE TN-989

### MTBF Figures for Tait Products

10<sup>th</sup> March 2005

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#### Applicability

This Technical Notes applies to the following product types that have had MTBF figures calculated for them:

- T700 Mobile, T2000 Mobile, TM8000 Mobiles
- T3000 Portable, Tait Orca Handportable, Tait Orca 5000 Handportable
- T800 Infrastructure Modules, TB8000 Infrastructure Modules
- TaitNet Network Equipment

## 1. Introduction

#### What is MTBF?

Literally means "Mean Time Between Failure". Defined as the average time (usually expressed in hours) that a component works without failure. It is calculated by dividing the total number of failures into the total number of operating hours observed. The term can also mean the length of time a user may reasonably expect a device or system to work before an incapacitating fault occurs.

#### The Calculation Method.

The MTBF figures for the offered radio equipment, both fixed and mobile are calculated according to the British Telecom "Handbook of Reliability Data for Components used in Telecommunications Systems" Iss.4 (HRD4).

The **temperature weighting factor,  $\pi_t$** , is used as specified in the above reference.

The **quality factor,  $\pi_q$** , is derived assuming a Quality Level 1, i.e. components manufactured and tested in accordance with generally accepted commercial practices; with no tests, inspection or screening beyond the component manufacturers normal quality control practices.

The **application environment factor,  $\pi_e$** , is assumed to be either ground benign ( $\pi_e=1$ ), ground fixed ( $\pi_e = 1.5$ ) or mobile ( $\pi_e=4$  or 8) depending on the intended use of the equipment.

Central control equipment is often situated in an environmentally friendly equipment room, which may often be air- conditioned and an application environment factor of 1 is appropriate.

Radio equipment may be installed on sites with various environmental conditions, a factor of either 1 or 1.5 may be appropriate.

Please note that all MTBF figures are intended as a guide only and that the actual performance of the equipment experienced in practice will differ from this due to a number of factors that are not accounted for in the prediction method.

The prediction method does not include any factor to account for the duty cycle under which the equipment is operated. The figures given assume the transmitters are operated at their maximum rated RF output power at their maximum duty cycle.

The prediction method also does not take into account the "soak testing" that takes place on completed systems before delivery.

**NOTE**

This document is the culmination of all MTBF figures that have been used in tender responses by the CSO's and Tait Sales Teams over the last several years.

**2. Tait Mobile Radio MTBF****T500 and T700**

No known figures currently exist for these products

**T2000**

TYPE	Total Failure Rate (FITS) Failure in 10 <sup>9</sup> Hours	MTBF (Hrs) in Ground Benign Controlled Environment $\Pi_e = 1$ (Application Environment)	MTBF (Hrs) Ground Fixed Uncontrolled Environment $\Pi_e = 8$ (Application Environment)
T2010-nnn-nnn	16,500 hrs	40,000 hrs ( $\Pi_e = 1.5$ )	7,500 hrs
T2015-nnn-nnn	16,500 hrs	40,000 hrs ( $\Pi_e = 1.5$ )	7,500 hrs
T2020-nnn-nnn	16,500 hrs	40,000 hrs ( $\Pi_e = 1.5$ )	7,500 hrs
T2030-nnn-nnn	16,500 hrs	40,000 hrs ( $\Pi_e = 1.5$ )	7,500 hrs
T2035-nnn-nnn			
T2040-nnn-nnn	20,300 hrs	32,500 hrs ( $\Pi_e = 1.5$ )	6,100 hrs

**TM8000 Series**

Figures are currently under development.

TYPE	Total Failure Rate (FITS) Failure in 10 <sup>9</sup> Hours	MTBF (Hrs) in Ground Stationary, Weather protected & Temperature Controlled. $\Pi_e = 1$ (Application Environment)	MTBF (Hrs) Ground Mobile, protected installations $\Pi_e = 4$ (Application Environment)	MTBF (Hrs) Ground Mobile (perHRD4) $\Pi_e = 8$ (Application Environment)
TM8105	11565 hrs	86,465 hrs	21,616 hrs	10,808 hrs
TM8110	14348 hrs	69,696 hrs	17,424 hrs	8,712 hrs
TM8115	14348 hrs	69,696 hrs	17,424 hrs	8,712 hrs
TM8250	No figures available yet	No figures available yet	No figures available yet	No figures available yet

### 3. Tait Infrastructure Product MTBF

TYPE	Total Failure Rate (FITS) Failure in 10 <sup>9</sup> Hours	MTBF (Hrs) in Ground Benign Controlled Environment $\Pi_e = 1$ (Application Environment)	MTBF (Hrs) Ground Fixed Uncontrolled Environment $\Pi_e = 1.5$ (Application Environment)
T825-nn-nnnn	9,450	105,800	70,500
T826-nn-nnnn	9,750	102,500	68,300
T827-nn-nnnn	9,400	106,300	70,900
T828-nn-nnnn	3,300	303,000	202,000
T835-nn-nnnn	9,450	105,800	70,500
T836-nn-nnnn	9,750	102,500	68,300
T837-nn-nnnn	9,400	106,300	70,900
T838-nn-nnnn	4,510	221,700	147,800
T839-nn-nnnn	6,400	156,200	104,100
T855-nn-nnnn	9,450	105,800	70,500
T856-nn-nnnn	9,750	102,500	68,300
T857-nn-nnnn	9,400	106,300	70,900
T858-nn-nnnn	3,900	256,400	171,000
T859-nn-nnnn	5,510	181,400	120,900
T807-10-0000	4,600	217,000	145,000
T800-23-0011			
T801-00	6,900	144,900	96,600
T801-1n	6,900	144,900	96,600
T805-01	12,000	83,300	55,500
T805-02	12,000	83,300	55,500
T805-03	12,000	83,300	55,500
T805-04	4,900	204,000	136,000
T805-06	12,000	83,300	55,500
T803-00-0000	5220	190,000	126,600
TA087-02-0000	5,221	191,500	127,000
TA136-02-0000	5,050	198,000	132,000
TA703-01-000n	8,500	117,000	78,000

**T800 MTBF (cont)**

## Third party products

TYPE	Total Failure Rate (FITS) Failure in 10 <sup>9</sup> Hours	MTBF (Hrs) in Ground Benign Controlled Environment $\Pi_e = 1$ (Application Environment)	MTBF (Hrs) Ground Fixed Uncontrolled Environment $\Pi_e = 1.5$ (Application Environment)
DC/DC Converter PV12i (24/12V)			162 Years (HRD4)
DC/DC Converter PV24i (24/12V)			162 Years (HRD4)
HC100			157,700 (manufacturers est)
HC250			78,900 (manufacturers est)
OCXO (HCD660SC)		1,000,000(Calc MIL 217C iss E)	
TS4013	11,000		91,000 ( $\Pi_e = 8$ )
TS4014	10,976		91,000 ( $\Pi_e = 8$ )
TS5042	9,896		101,000 ( $\Pi_e = 8$ )
TS5043	10,256		97,500 ( $\Pi_e = 8$ )

## Please Note:

- The above figures for T800 equipment were calculated for the VHF T830 series. They are also considered to be applicable to the VHF T820 and UHF T850 series as the component counts and component types are essentially the same
- The figures exclude the cooling fans. The fans used on the 100W power amplifiers are quoted by the supplier as having MTBF 70,000 hours at 40degC . The fan used in the T808 is also quoted by its supplier at the same figure.

**TB8000 Series**

No figures are currently available for the individual modules of a TB8100 system.

The complete system (rack) has an MTBF of **25000 hours**.

## 4. Tait Hand Portable Radio MTBF

### T3000 Series

TYPE	Total Failure Rate (FITS) Failure in $10^9$ Hours	MTBF (Hrs) in Ground Benign Controlled Environment $\Pi_e = 1$ (Application Environment)	MTBF (Hrs) Ground Fixed Uncontrolled Environment $\Pi_e = 8$ (Application Environment)
T3010-XXXX-XXX	14,00		8700

### Tait Orca 'E' Series

TYPE	Total Failure Rate (FITS) Failure in $10^9$ Hours	MTBF (Hrs) in Ground Benign Controlled Environment $\Pi_e = 1$ (Application Environment)	MTBF (Hrs) Ground Fixed Uncontrolled Environment $\Pi_e = 2.5$ (Application Environment)
TOP-H2110 (PCB rev 1)	95850		10433

### Tait Orca 5000 Series

TYPE	Total Failure Rate (FITS) Failure in $10^9$ Hours	MTBF (Hrs) in Ground Benign Controlled Environment $\Pi_e = 1$ (Application Environment)	MTBF (Hrs) Ground Fixed Uncontrolled Environment $\Pi_e = 2.5$ (Application Environment)
TOP-H2610-T0 (PCB rev 13)	57104		17512

## 5. Tait Network Product MTBF

### Liberty Trunked System Components

Model Number <i>(where applicable)</i>	MTBF (Hrs)
Channel Management Module (CMM)	Greater than 25,000
Site Management Module (SMM)	Greater than 25,000
Network Management Module (NMM)	Greater than 25,000
2W PSTN Card	Greater than 25,000

### T1541 Trunked System Components

Model Number <i>(where applicable)</i>	MTBF (Hrs)
T1511-00 Channel Control Module (CCM)	Greater than 25,000
T1520-40 Site Control Unit (SCU)	Greater than 25,000
T1556-02 Modem inter site	Greater than 25,000
T1541-00 Node Computer	Greater than 25,000
T1561-15 Embedded Controller Card	Greater than 25,000
T1561-02 Audio I/O	Greater than 25,000
T1561-03 PSTN 2 wire E&M DTMF	Greater than 25,000
T1561-08 PSTN 4 wire E&M	Greater than 25,000
Channel Management Module (CCM)	Greater than 25,000
Site Management Module (SSM)	Greater than 25,000
Network Management Module (NMM)	Greater than 25,000

#### Please Note:

These figures are based on actual field testing in various environments. Burn-in procedures are carried out on each module at the production stage and again as part of the pre-delivery testing.

**Compliance Issues**

MTBF figures are a subjective value sometimes required by RFP's / Tenders. They do not tie into governmental compliances or regulations.

**CSO Instruction**

Please use this document to respond to all tender responses requiring MTBF information. If you find the information lacking in anyway, please contact the author.

## 6. Issuing Authority

**Name and Position of Issuing Officer**

Barry Crates  
Technical Support Team Leader

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