EMC Technologies (NZ) Ltd

Test Report No **30541.2**
Report date: 5 June 2003

TEST REPORT

Tait TB8100 UHF Base Station Transceiver

tested to

47 Code of Federal Regulations

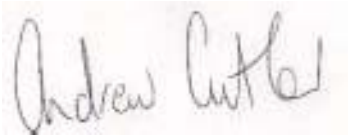
Part 22 – Public Land Mobile Service

Part 90 – Private Land Mobile Service

for

Tait Electronics Ltd

This Test Report is issued with the authority of:



Andrew Cutler - General Manager

Prepared By:

Karen Miller - Office Administrator

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation

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1. STATEMENT OF COMPLIANCE

The **Tait TB8100 UHF Base Station Transceiver** complies with:

- FCC Part 22 Section 22.359 when tested in accordance with FCC Part 2 Section 2.1053
- FCC Part 90 Section 90.210 when tested in accordance with FCC Part 2 Section 2.1053

and when each of the power amplifiers is operated in low power mode.

2. RESULTS SUMMARY

The results from testing are summarised in the following table:

Section	Result
22..359 and 90.210 when tested to 2.1053 – Radiated spurious emissions	**Complies with a 25.7 dB margin at 850.2000 MHz (Vertical) when transmitting on 425.1000 MHz using the 5.0 watt power amplifier set to 1 watt.**

3. CLIENT INFORMATION

Company Name	Tait Electronics Ltd
Address	PO Box 1645
City	Christchurch
Country	New Zealand
Contact	Mr Des Fox

4. DESCRIPTION OF TEST SAMPLE

Brand Name	Tait
Model Number	TB8100
Product	UHF Base Station Transceiver
Manufacturer	Tait Electronics Ltd
Country of Origin	New Zealand

Testing of this base station was originally carried out with each of the power amplifiers operating at full power (100 watts, 50 watts and 5 watts).

At the request of the client testing has now been carried out with each of the power amplifiers operating in low power mode (100 watt power amplifier at 10 watts, 50 watt power amplifier at 5 watts, 5 watt power amplifier operating at 1 watt).

No modifications have been made to the base station apart from the addition of ferrites at each end of the voltage supply cables from the power management module to the power amplifier that is to be used.

The base station is contained within a rack and consists of the following core items:

- Power supply
- Reciter (transmitter exciter and a receiver combined in a single module)
- Power amplifier

The base station is capable of transmitting over the range of 400 – 520 MHz using 3 power amplifiers that are rated at 5, 50 and 100 watts.

Testing has been carried out using a supply voltage of 110 Vac.

The base station was controlled using an external test control box.

The item tested consisted of the following common devices:

- UHF base station rack	TBA2323-A000	Sn# 18001035
- Power supply unit (PMU)	TBA30A1-0000	Sn #18001630
- Test control box	TBA0-ST1	Sn# 18001477
- Control Panel	TBA2020	Sn# 18000971
- Control Panel	TBA2323-A000	Sn# 18001035

Part 22 and Part 90 radiated emission testing was carried out on 425.100 MHz, 460.100 MHz and 495.100 MHz using the following reciters individually inserted into the base station rack previously described and tested with each of the 3 power amplifiers attached:

- 425.1 MHz reciter	TBA40H1-0A00	Sn# 18001559
- 460.1 MHz reciter	TBA40H2-0C01	Sn# 18001111
- 495.1 MHz reciter	TBA40H3-0B00	Sn# 18001468

- 5 watt power amplifier	TBA70H0-0000	Sn# 18001200
- 50 watt power amplifier	TBA80H0-0000	Sn# 18001068
- 100 watt power amplifier	TBA90H0-0000	Sn# 18001053

5. TEST SAMPLE SPECIFICATIONS

Transmit frequencies

425.100 MHz, 460.100 MHz, 495.100 MHz

Band of operation

400 - 520 MHz in 3 sub bands being:

400 – 440 MHz, 440 – 480 MHz, 470 – 520 MHz.

FCC bands

Part 90: 421 – 512 MHz.

Power Supply

110 Vac from the mains supply.

Power Output

5 watts to 100 watts using external power amplifiers.

Testing using power amplifiers with the following power outputs:

5 watt power amplifier with a 1 watt output
50 watt power amplifier with a 5 watt output
100 watt power amplifier with a 10 watt output

6. ATTESTATION

This report describes the tests and measurements performed for the purpose of determining compliance with the specification with the following conditions:

The client selected the test sample.

The report relates only to the sample tested.

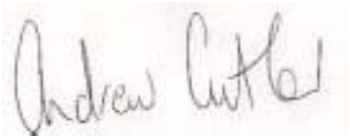
This report does not contain corrections or erasures.

Measurement uncertainties with statistical confidence intervals of 95% are shown below test results. Both Class A and Class B uncertainties have been accounted for, as well as influence uncertainties where appropriate.

In addition this equipment has been tested in accordance with the requirements contained in the appropriate Commission regulations.

To the best of my knowledge, these tests were performed using measurement procedures that are consistent with industry or Commission standards and demonstrate that the equipment complies with the appropriate standards.

I further certify that the necessary measurements were made by EMC Technologies NZ Ltd, 47 MacKelvie Street, Grey Lynn, Auckland, New Zealand.



Andrew Cutler
General Manager
EMC Technologies NZ Ltd

7. TEST RESULTS

Field strength of spurious emissions

Frequency: 425.1000 MHz **Power Amplifier:** 5 watts set to 1 watt

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
850.2000	44.6	-50.6	-20.0	Horizontal	30.6
850.2000	49.5	-45.7	-20.0	Vertical	25.7
1275.3000	-	-	-20.0	Horizontal	-
1275.3000	-	-	-20.0	Vertical	-
1700.4000	-	-	-20.0	Horizontal	-
1700.4000	-	-	-20.0	Vertical	-
2125.5000	-	-	-20.0	Horizontal	-
2125.5000	-	-	-20.0	Vertical	-
2550.6000	-	-	-20.0	Horizontal	-
2550.6000	-	-	-20.0	Vertical	-
2975.7000	-	-	-20.0	Horizontal	-
2975.7000	-	-	-20.0	Vertical	-
3400.8000	-	-	-20.0	Horizontal	-
3400.8000	-	-	-20.0	Vertical	-
3825.9000	-	-	-20.0	Horizontal	-
3825.9000	-	-	-20.0	Vertical	-
4251.0000	-	-	-20.0	Horizontal	-
4251.0000	-	-	-20.0	Vertical	-

Frequency: 425.1000 MHz **Power Amplifier:** 50 watts set to 5 watts

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
850.2000	35.6	-59.6	-20.0	Horizontal	39.6
850.2000	36.7	-58.5	-20.0	Vertical	38.5
1275.3000	34.6	-60.6	-20.0	Horizontal	40.6
1275.3000	36.1	-59.1	-20.0	Vertical	39.1
1700.4000	42.1	-53.1	-20.0	Horizontal	33.1
1700.4000	40.1	-55.1	-20.0	Vertical	35.1
2125.5000	-	-	-20.0	Horizontal	-
2125.5000	-	-	-20.0	Vertical	-
2550.6000	-	-	-20.0	Horizontal	-
2550.6000	-	-	-20.0	Vertical	-
2975.7000	-	-	-20.0	Horizontal	-
2975.7000	-	-	-20.0	Vertical	-
3400.8000	-	-	-20.0	Horizontal	-
3400.8000	-	-	-20.0	Vertical	-
3825.9000	-	-	-20.0	Horizontal	-
3825.9000	-	-	-20.0	Vertical	-
4251.0000	-	-	-20.0	Horizontal	-
4251.0000	-	-	-20.0	Vertical	-

Frequency: 425.1000 MHz **Power Amplifier:** 100 watts set to 10 watts

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
850.2000	40.9	-54.3	-20.0	Horizontal	34.3
850.2000	40.6	-54.6	-20.0	Vertical	34.6
1275.3000	38.2	-57.0	-20.0	Horizontal	37.0
1275.3000	37.1	-58.1	-20.0	Vertical	38.1
1700.4000	-	-	-20.0	Horizontal	-
1700.4000	-	-	-20.0	Vertical	-
2125.5000	-	-	-20.0	Horizontal	-
2125.5000	-	-	-20.0	Vertical	-
2550.6000	-	-	-20.0	Horizontal	-
2550.6000	-	-	-20.0	Vertical	-
2975.7000	-	-	-20.0	Horizontal	-
2975.7000	-	-	-20.0	Vertical	-
3400.8000	-	-	-20.0	Horizontal	-
3400.8000	-	-	-20.0	Vertical	-
3825.9000	-	-	-20.0	Horizontal	-
3825.9000	-	-	-20.0	Vertical	-
4251.0000	-	-	-20.0	Horizontal	-
4251.0000	-	-	-20.0	Vertical	-

Field strength of spurious emissions

Frequency: 460.1000 MHz **Power Amplifier:** 5 watts set to 1 watt

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
920.2000	39.5	-55.7	-20.0	Horizontal	35.7
920.2000	37.2	-58.0	-20.0	Vertical	38.0
1380.3000	-	-	-20.0	Horizontal	-
1380.3000	-	-	-20.0	Vertical	-
1840.4000	40.5	-54.7	-20.0	Horizontal	34.7
1840.4000	-	-	-20.0	Vertical	-
2300.5000	44.1	-51.1	-20.0	Horizontal	31.1
2300.5000	-	-	-20.0	Vertical	-
2760.6000	-	-	-20.0	Horizontal	-
2760.6000	-	-	-20.0	Vertical	-
3220.7000	-	-	-20.0	Horizontal	-
3220.7000	-	-	-20.0	Vertical	-
3680.8000	-	-	-20.0	Horizontal	-
3680.8000	-	-	-20.0	Vertical	-
4140.9000	-	-	-20.0	Horizontal	-
4140.9000	-	-	-20.0	Vertical	-
4601.0000	-	-	-20.0	Horizontal	-
4601.0000	-	-	-20.0	Vertical	-

Frequency: 460.1000 MHz **Power Amplifier:** 50 watts set to 5 watts

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
920.2000	38.7	-56.5	-20.0	Horizontal	36.5
920.2000	36.7	-58.5	-20.0	Vertical	38.5
1380.3000	37.5	-57.7	-20.0	Horizontal	37.7
1380.3000	42.4	-52.8	-20.0	Vertical	32.8
1840.4000	40.1	-55.1	-20.0	Horizontal	35.1
1840.4000	-	-	-20.0	Vertical	-
2300.5000	-	-	-20.0	Horizontal	-
2300.5000	-	-	-20.0	Vertical	-
2760.6000	-	-	-20.0	Horizontal	-
2760.6000	-	-	-20.0	Vertical	-
3220.7000	-	-	-20.0	Horizontal	-
3220.7000	-	-	-20.0	Vertical	-
3680.8000	-	-	-20.0	Horizontal	-
3680.8000	-	-	-20.0	Vertical	-
4140.9000	-	-	-20.0	Horizontal	-
4140.9000	-	-	-20.0	Vertical	-
4601.0000	-	-	-20.0	Horizontal	-
4601.0000	-	-	-20.0	Vertical	-

Frequency: 460.100 MHz **Power Amplifier:** 100 watts set to 10 watts

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
920.2000	37.5	-57.7	-20.0	Horizontal	37.7
920.2000	38.9	-56.3	-20.0	Vertical	36.3
1380.3000	-	-	-20.0	Horizontal	-
1380.3000	-	-	-20.0	Vertical	-
1840.4000	-	-	-20.0	Horizontal	-
1840.4000	-	-	-20.0	Vertical	-
2300.5000	-	-	-20.0	Horizontal	-
2300.5000	-	-	-20.0	Vertical	-
2760.6000	-	-	-20.0	Horizontal	-
2760.6000	-	-	-20.0	Vertical	-
3220.7000	-	-	-20.0	Horizontal	-
3220.7000	-	-	-20.0	Vertical	-
3680.8000	-	-	-20.0	Horizontal	-
3680.8000	-	-	-20.0	Vertical	-
4140.9000	-	-	-20.0	Horizontal	-
4140.9000	-	-	-20.0	Vertical	-
4601.0000	-	-	-20.0	Horizontal	-
4601.0000	-	-	-20.0	Vertical	-

Field strength of spurious emissions

Frequency: 495.1000 MHz **Power Amplifier:** 5 watts set to 1 watt

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
990.2000	41.1	-54.1	-20.0	Horizontal	34.1
990.2000	42.1	-53.1	-20.0	Vertical	33.1
1485.3000	38.9	-56.3	-20.0	Horizontal	36.3
1485.3000	38.2	-57.0	-20.0	Vertical	37.0
1980.4000	-	-	-20.0	Horizontal	-
1980.4000	-	-	-20.0	Vertical	-
2475.5000	48.0	-47.2	-20.0	Horizontal	27.2
2475.5000	49.2	-46.0	-20.0	Vertical	26.0
2970.6000	-	-	-20.0	Horizontal	-
2970.6000	-	-	-20.0	Vertical	-
3465.7000	-	-	-20.0	Horizontal	-
3465.7000	-	-	-20.0	Vertical	-
3960.8000	-	-	-20.0	Horizontal	-
3960.8000	-	-	-20.0	Vertical	-
4455.9000	-	-	-20.0	Horizontal	-
4455.9000	-	-	-20.0	Vertical	-
4951.0000	-	-	-20.0	Horizontal	-
4951.0000	-	-	-20.0	Vertical	-

Frequency: 495.1000 MHz **Power Amplifier:** 50 watts set to 5 watts

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
990.2000	39.1	-56.1	-20.0	Horizontal	36.1
990.2000	39.5	-55.7	-20.0	Vertical	35.7
1485.3000	37.2	-58.0	-20.0	Horizontal	38.0
1485.3000	39.1	-56.1	-20.0	Vertical	36.1
1980.4000	-	-	-20.0	Horizontal	-
1980.4000	-	-	-20.0	Vertical	-
2475.5000	-	-	-20.0	Horizontal	-
2475.5000	-	-	-20.0	Vertical	-
2970.6000	-	-	-20.0	Horizontal	-
2970.6000	-	-	-20.0	Vertical	-
3465.7000	-	-	-20.0	Horizontal	-
3465.7000	-	-	-20.0	Vertical	-
3960.8000	-	-	-20.0	Horizontal	-
3960.8000	-	-	-20.0	Vertical	-
4455.9000	-	-	-20.0	Horizontal	-
4455.9000	-	-	-20.0	Vertical	-
4951.0000	-	-	-20.0	Horizontal	-
4951.0000	-	-	-20.0	Vertical	-

Frequency: 495.1000 MHz **Power Amplifier:** 100 watts set to 10 watts

Emission frequency (MHz)	Level (dBuV/m)	Power (dBm)	Limit (dBm)	Polarity	Margin (dB)
990.2000	40.2	-55.0	-20.0	Horizontal	35.0
990.2000	35.2	-60.0	-20.0	Vertical	40.0
1485.3000	-	-	-20.0	Horizontal	-
1485.3000	38.1	-57.1	-20.0	Vertical	37.1
1980.4000	-	-	-20.0	Horizontal	-
1980.4000	-	-	-20.0	Vertical	-
2475.5000	48.9	-46.3	-20.0	Horizontal	26.3
2475.5000	48.5	-46.7	-20.0	Vertical	26.7
2970.6000	-	-	-20.0	Horizontal	-
2970.6000	-	-	-20.0	Vertical	-
3465.7000	-	-	-20.0	Horizontal	-
3465.7000	-	-	-20.0	Vertical	-
3960.8000	-	-	-20.0	Horizontal	-
3960.8000	-	-	-20.0	Vertical	-
4455.9000	-	-	-20.0	Horizontal	-
4455.9000	-	-	-20.0	Vertical	-
4951.0000	-	-	-20.0	Horizontal	-
4951.0000	-	-	-20.0	Vertical	-

All other emissions observed are greater than 20 dB of the –20 dBm limit (ie all are less than –40 dBm) and have therefore not been recorded.

Device was tested on an open area test site at a distance of 3 metres.

Testing was carried out at EMC Technologies NZ Ltd Open Area Test Site, which is located at Driving Creek, Orere Point, Auckland. Details of this site have been filed with the Commission, Registration Number: 90838, which was last updated on May 12th, 2003.

The transmitter was tested with a resistive dummy load attached to the power amplifier antenna terminal and also a separate dummy load was attached to the reciter receiver input terminal.

Testing was carried out at 110 Vac from the AC mains. In addition a 13.8 Vdc back up supply, in the form of a DC battery, was attached to the device.

The emission levels did not vary when indicative tests were carried out using only the 13.8 Vdc supply. Therefore, all tests were carried out at 110 Vac from the AC mains.

The power level of each emission was determined by replacing the transmitter with a dipole antenna that was connected to a signal generator.

The signal generator output level was increased until the same field strength level was observed at each emission frequency.

The level recorded is the signal generator output level in dBm less any gains / losses due to the coax cable and the dipole antenna.

Limit:
All spurious emissions are to be attenuated by at least 50 + 10 log (P).

This gives a limit of –20 dBm.

No measurements were made above the 10^{th} harmonic.

Result: Complies

Measurement Uncertainty: *±4.1 dB*

8. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial #	Asset
Aerial Controller	EMCO	1090	9112-1062	RFS 3710
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612
Log Periodic Antenna	Schwarzbeck	UHALP 9107	-	RFS 3702
UHF Dipole Antenna	Schwarzbeck	UHA 9105	-	RFS 3679
Horn Antenna	EMCO	3115	9511-4629	E1526
Horn Antenna	Electrometrics	RGA-60	6234	E1494
Coax Cable	Sucoflex	104PA	2736/4PA	-
Signal Generator	Rohde & Schwarz	SMHU.58	838923/028	E1493
Measurement Receiver	Rohde & Schwarz	ESCS 30	839873/1	
Measurement Receiver	Rohde & Schwarz	ESHS 10	828404/005	RFS 3728
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	3776
Artificial Mains Network	Rhode & Schwarz	ESH 2-Z5	881362/034	RFS 3628
Variac	General Radio	1592	-	RFS 3690

9. ACCREDITATIONS

Testing was carried out in accordance with EMC Technologies NZ Ltd registration with the Federal Communications Commission as a listed facility, Registration Number: 90838, which was last updated on May 12th, 2003.

The tests were carried out in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025: 1999.

All measurement equipment has been calibrated in accordance with the terms of EMC Technologies (NZ) Ltd's International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025: 1999.

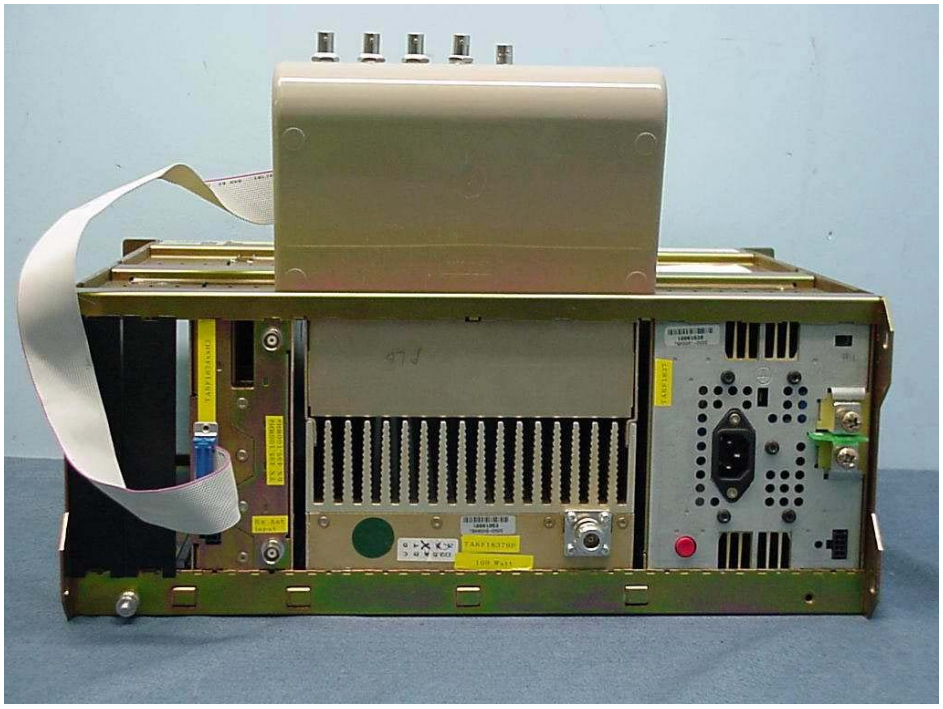
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with 46 accreditation bodies in 34 economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

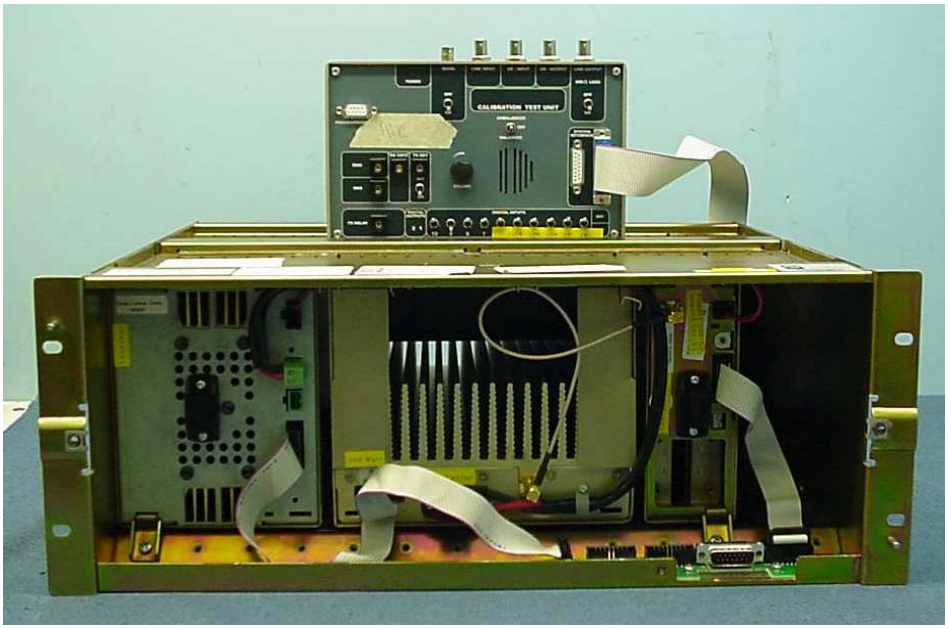
10. PHOTOGRAPH(S)

Rack Identification

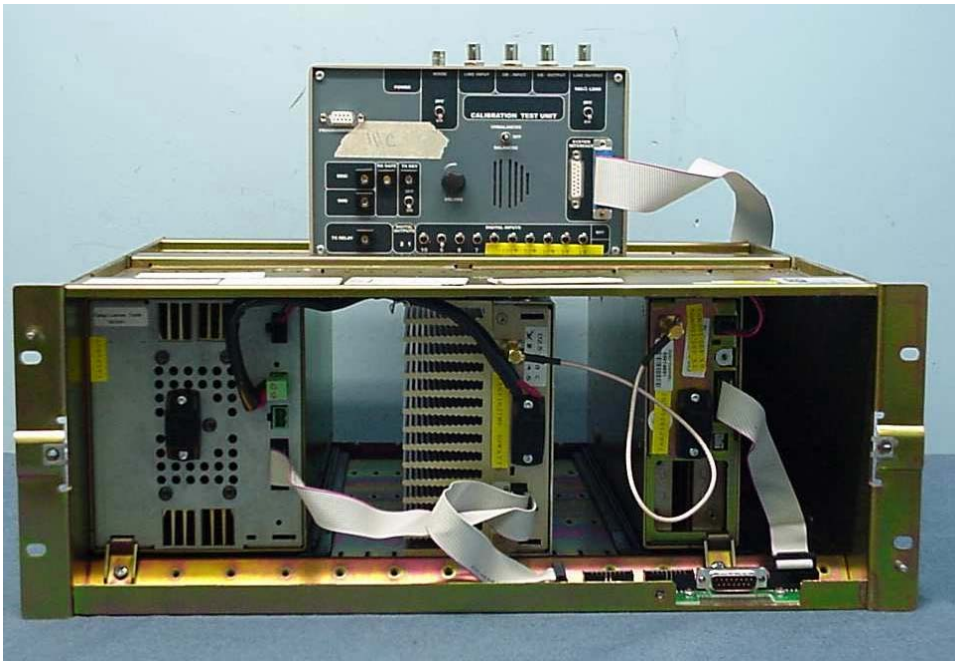
Rack overall front view

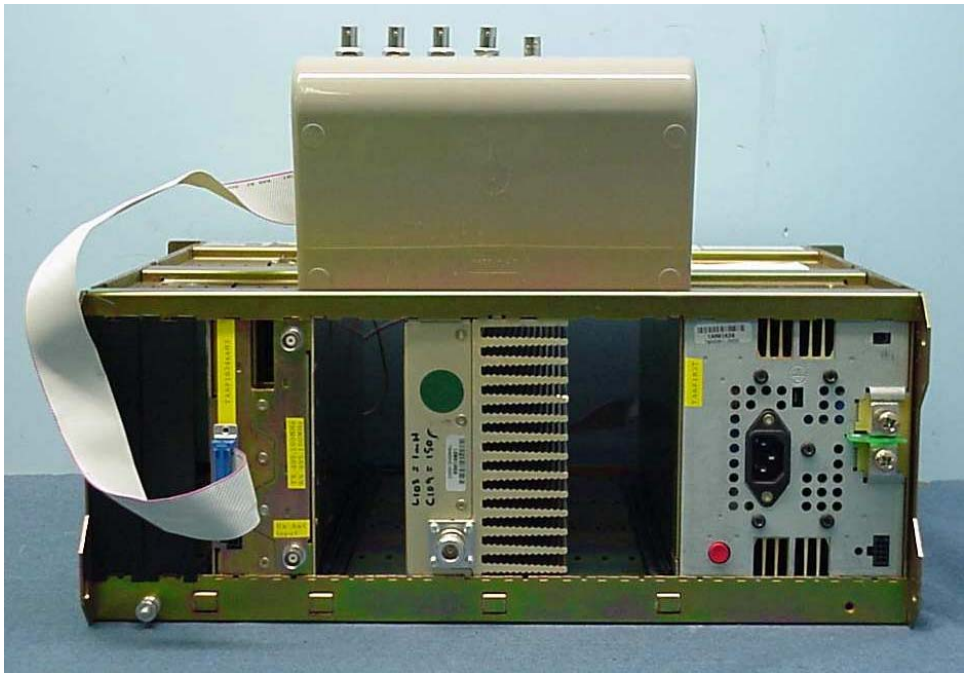
100 watt power amplifier stet up



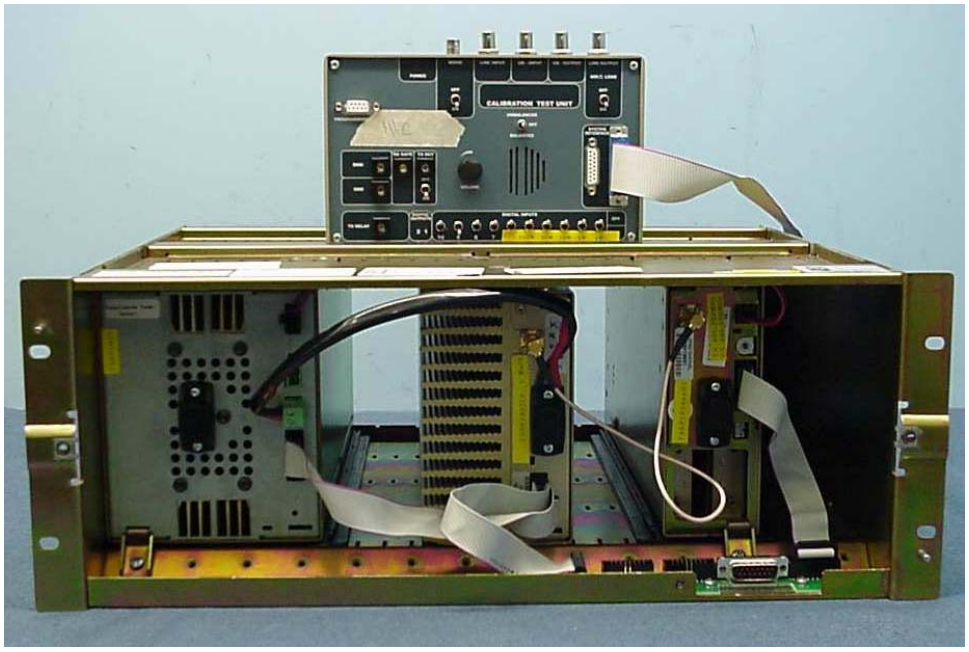


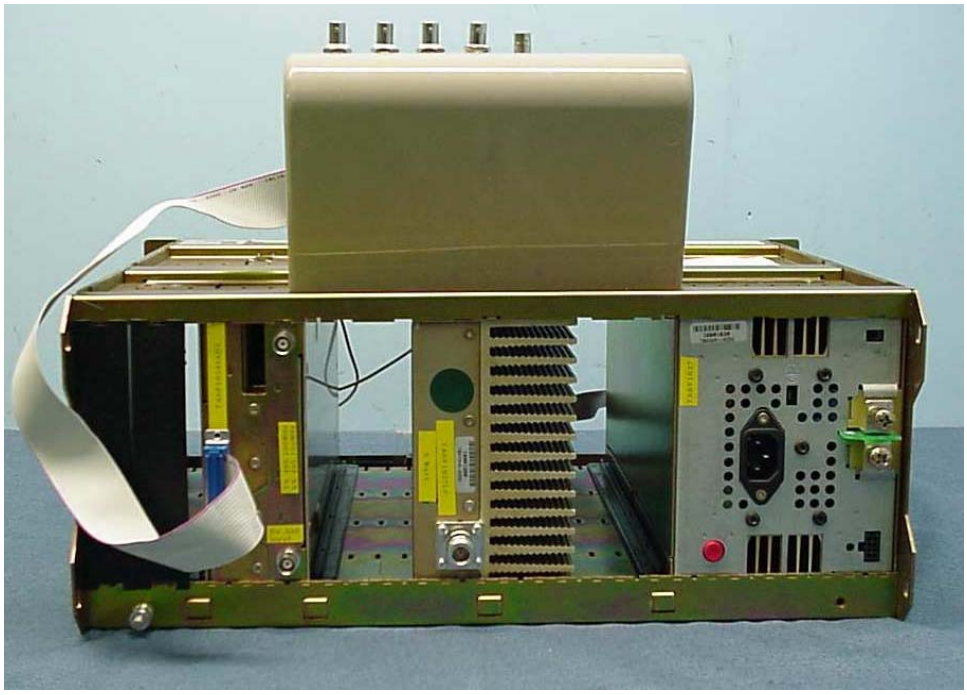
50 watt power amplifier set up





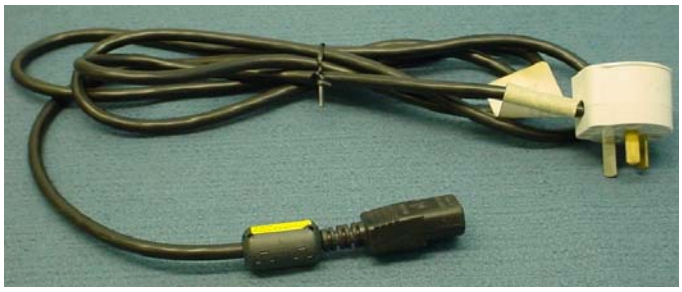
5 watt power amplifier set up





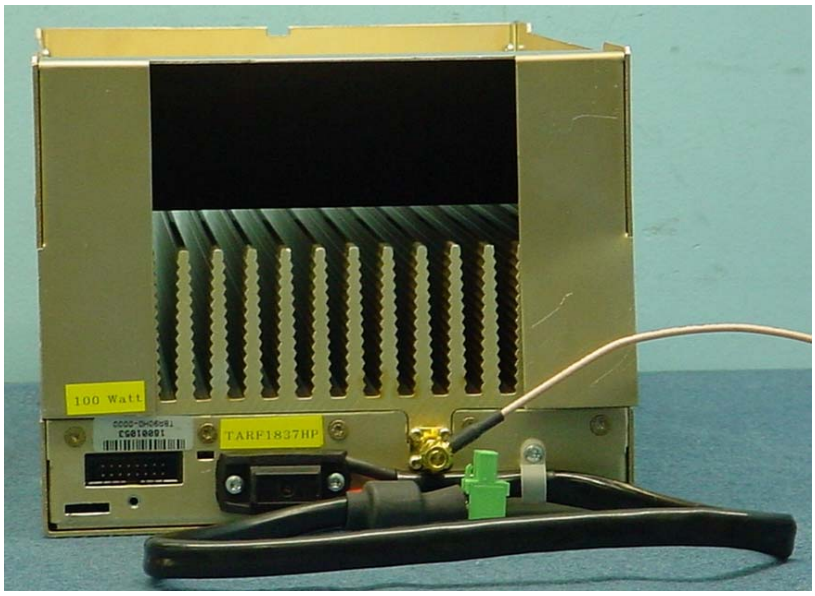
Power supply input ports

Mains Cable with Ferrite Clamps

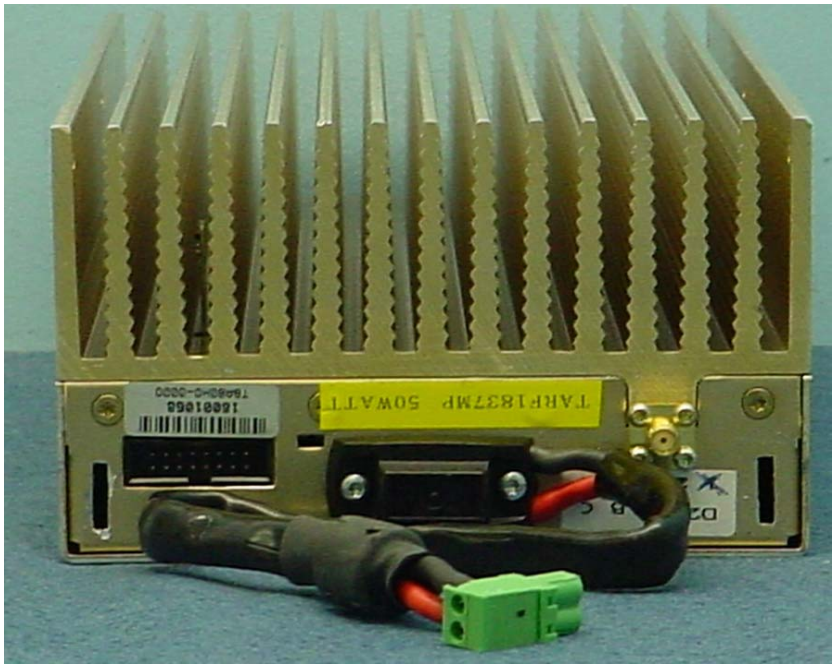


Reverse view of the front indicator panel

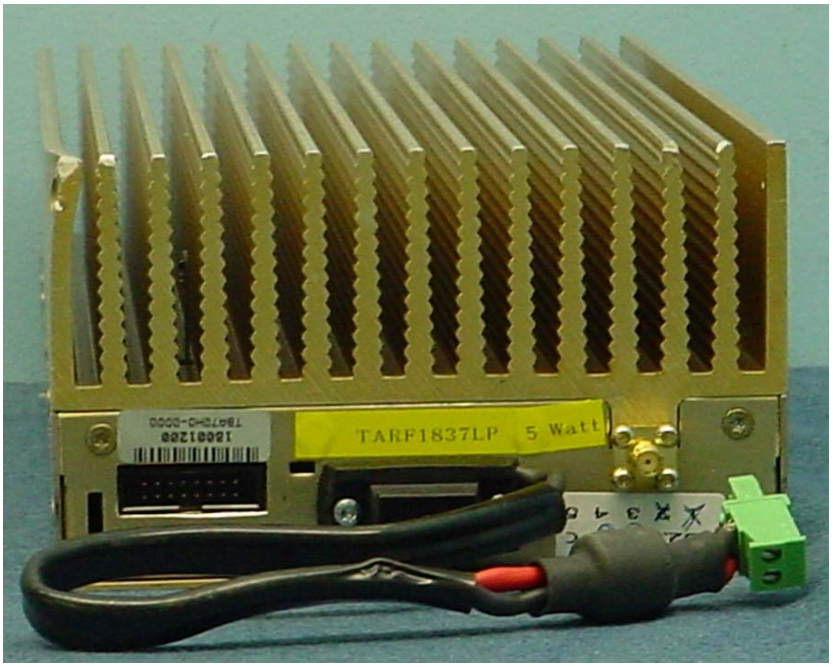
100 watt power amplifier



50 watt power amplifier



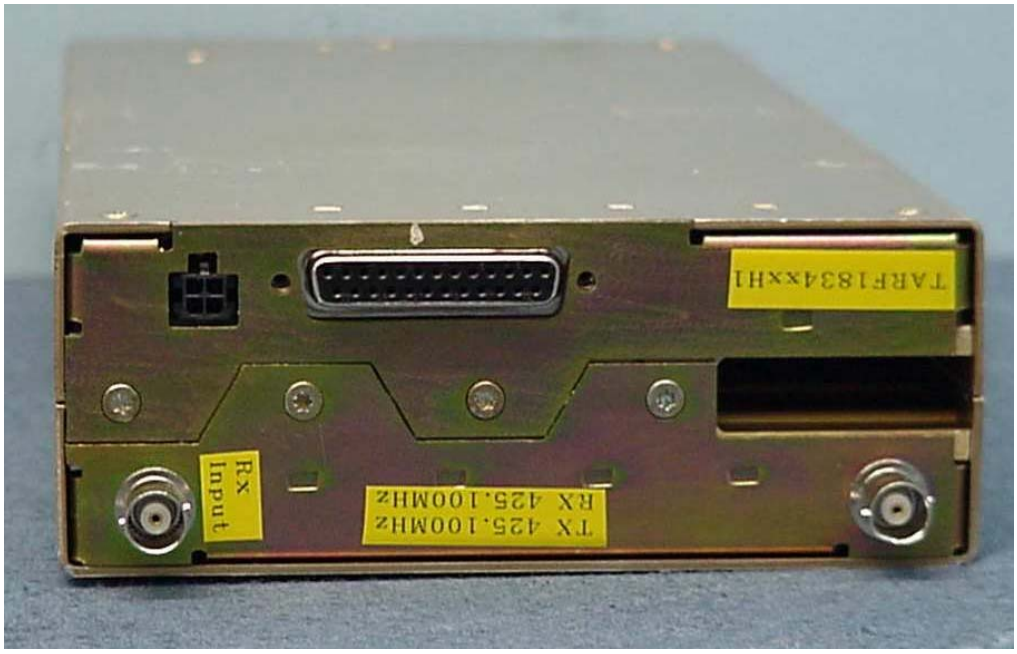
5 watt power amplifier

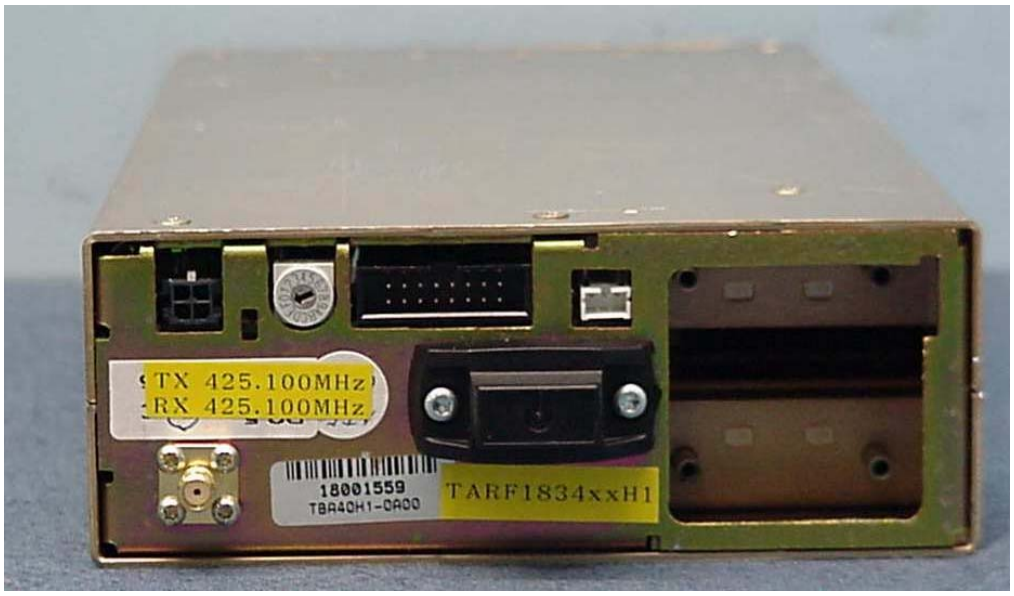


495.100 MHz Reciter

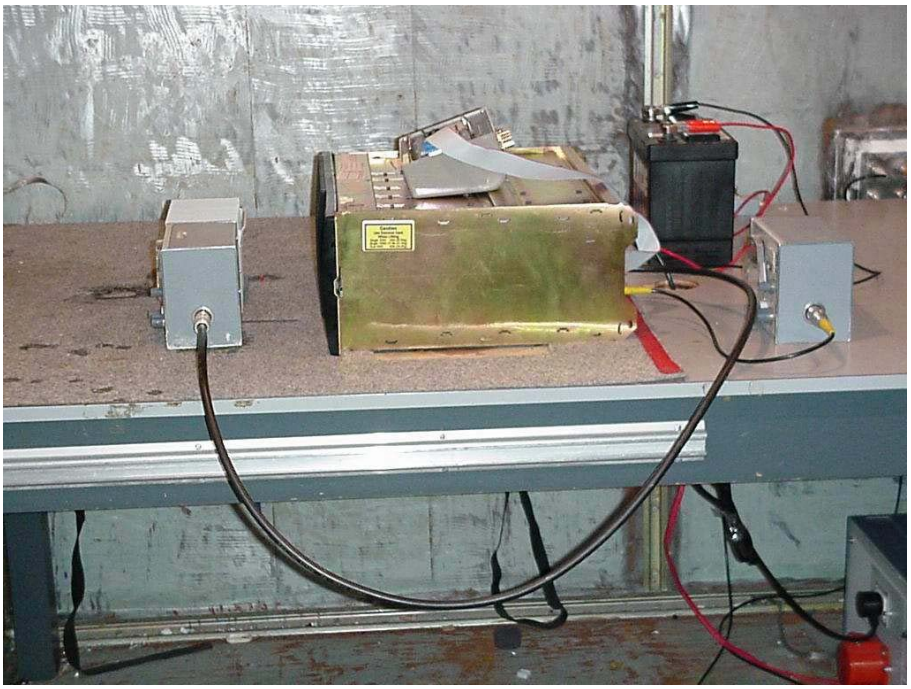
460.100 MHz Reciter

425.100 MHz Reciter





Conducted emissions test set up



Radiated emissions test set up