EMC Technologies (NZ) Ltd

Test Report No **30326.3b**
Report date: 18 July 2003

TEST REPORT

EDiT iD 0101-0000-00 Long Range Race Reader Interface

tested to

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart C – Intentional Radiators

for

Electronic Data Manufacturing 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 **EDiT iD 0101-0000-00 Long Range Race Reader Interface** complies with FCC Part 15 Subpart C as an Intentional Radiator when the methods, as described in ANSI C63.4 - 1992, are applied.

2. RESULTS SUMMARY

Clause	Parameter	Result
15.201	Equipment authorisation requirement	Certification required.
15.203	Antenna requirement	Complies. Antenna connector unique.
15.204	External PA and antenna modifications	Not applicable. No external devices.
15.205	Restricted bands of operation	Complies. Device transmits on 134.2 kHz
15.207	Conducted limits	Complies with a 21.96 dB margin at 17.180 MHz (Average) when using 2 antennas.
15.209	Radiated emission limits - Fundamental	Complies with a 3.7 dB margin when using 2 antennas.
15.209	Radiated emission limits - Spurious emissions <30 MHz	Complies with a 10.9 dB margin at 537 and 1208 kHz.
15.209	Radiated emission limits – Spurious emissions >30 MHz	Complies with a 12.9 margin at 377.955 MHz.

3. INTRODUCTION

This report describes the tests and measurements performed on the **EDiT iD 0101-0000-00 Long Range Race Reader Interface** for the purpose of determining compliance with the specification.

The client selected the test sample.

This report relates only to the sample tested.

This report contains no 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.

This report has been issued in addition to test report number 30326.3a and contains additional test results relating to tests carried out with 2 antennas attached.

4. CLIENT INFORMATION

Company Name	Electronic Data Manufacturing Ltd
Address	PO Box 11017 Ellerslie
City	Auckland
Country	New Zealand
Contact	Ms Ursula Grill

5. DESCRIPTION OF TEST SAMPLE

Brand Name	EDiT iD
Model Number	0101-0000-00
Product	Long Range Race Reader Interface
Manufacturer	Electronic Data Manufacturing Ltd
Country of Origin	New Zealand
Serial Number	OD-062-005

6. RESULTS

Standard

The sample was tested in accordance with 47 CFR Part 15 Subpart C.

Methods and Procedures

The measurement methods and procedures as described in ANSI C63.4 - 1992 were used.

Section 15.201: Equipment authorisation requirement

Certification as detailed in Subpart J of Part 2 is required for this device.

Section 15.203: Antenna requirement

As can be seen from the attached photographs the device has an antenna connector, which would be classed as being unique.

Result: Complies.

Section 15.204: External radio frequency power amplifiers and antenna modifications

From the attached photographs it can be seen that it is not possible to attach an external power amplifier to this transmitter.

Result: Complies.

Section 15.205: Restricted bands of operation

The transmitter transmits on 134.2 kHz.

This falls between the restricted bands of 90 –110 kHz and 495 – 505 kHz.

Result: Complies.

Section 15.207: Conducted limits

Conducted emission testing has been carried out as it is possible that this device could be powered using a 110 Vac to 12 Vdc converter with a single and also two antennas attached.

A converter is not sold with this device so testing has been carried out using a typical AC to DC converter.

Typically the device would be operated in remote locations using a lead acid battery that would not normally have any connection to an AC mains supply

Conducted emissions testing was carried out over the frequency range of 150 kHz to 30 MHz at the Laboratory's MacKelvie Street premises in a 2.4 m x 2.4 m x 2.4 m screened room.

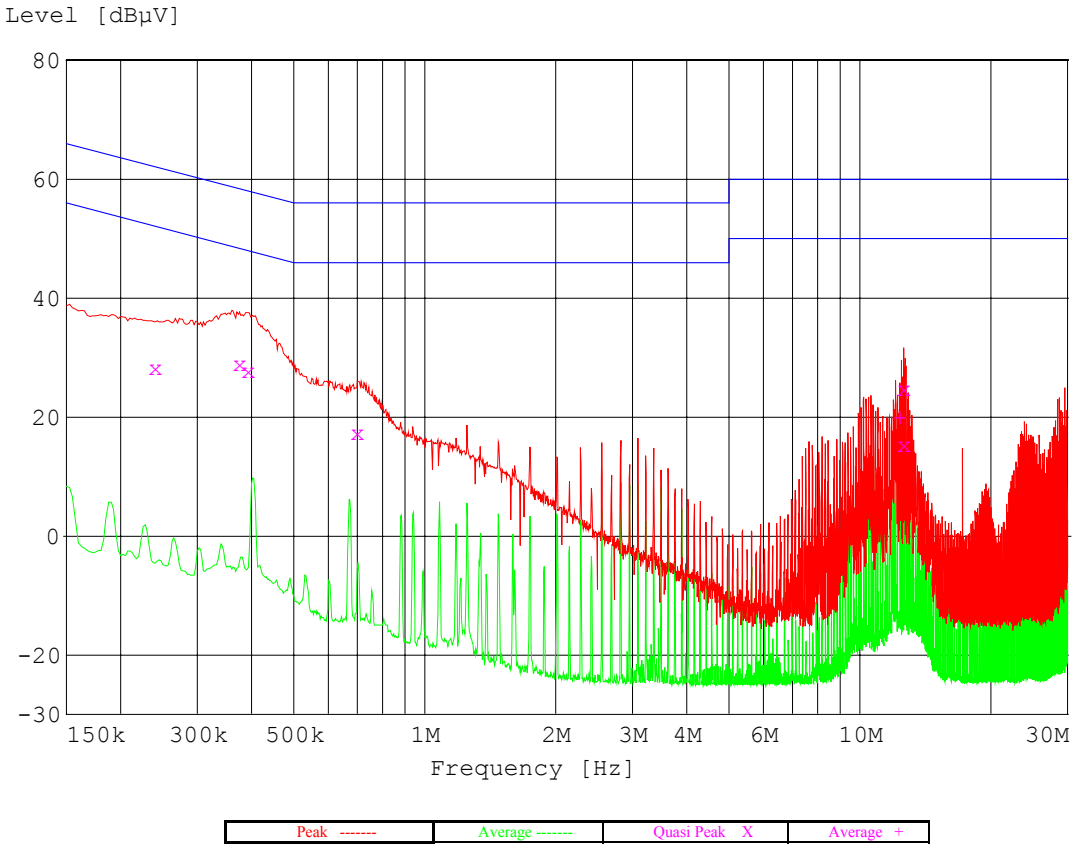
Measurements on both the phase and neutral lines were made using either a Quasi Peak or an Average detector with a 9 kHz bandwidth.

Measurement uncertainty with a confidence interval of 95% is:
- Mains terminal tests (0.15 - 30 MHz) ± 2.2 dB

Result: Complies.

Conducted Emissions

Comments:	Test carried out using a sample 110 Vac to 12 Vdc DC converter when the device was transmitting continuously with a single antenna attached



Quasi-Peak Measurements

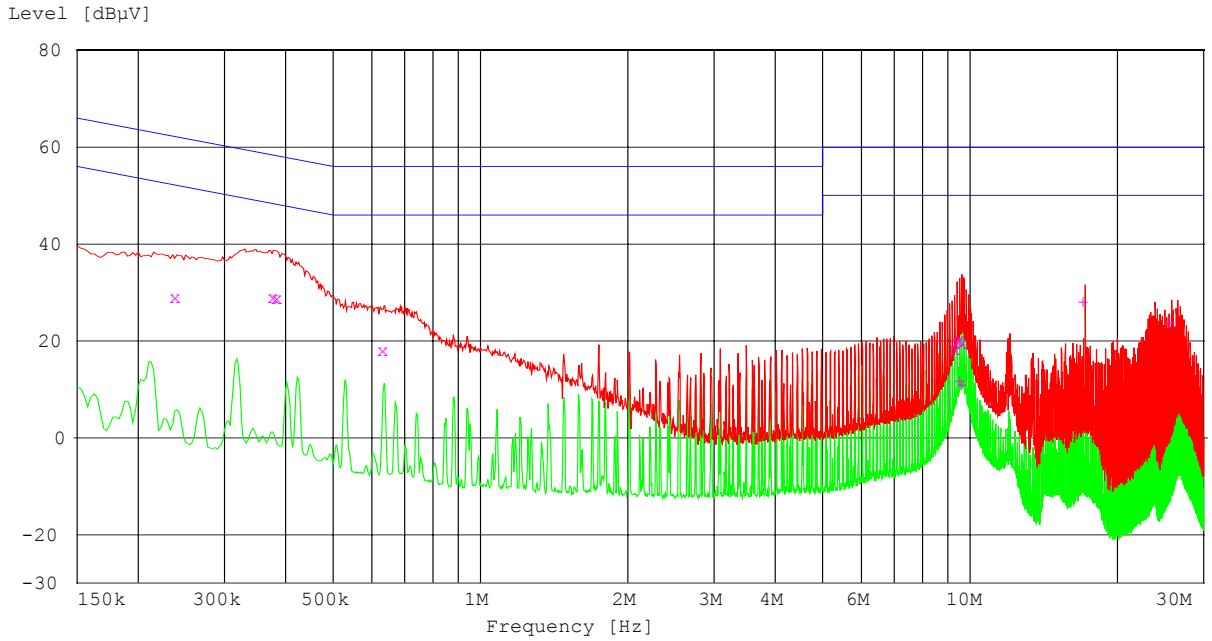
Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Exceed	Phase	Rechecks dBµV
0.240000	28.34	62.10	33.76		L1	
0.375000	29.00	58.39	29.39		L1	28.5
0.392500	27.93	58.01	30.08		N	
0.700000	17.53	56.00	38.47		L1	
12.595000	15.41	60.00	44.59		L1	
12.620000	24.88	60.00	35.12		N	

Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Exceed	Phase	Rechecks dBµV
12.345000	20.02	50.00	29.98		N	20.5

Conducted Emissions

Comments:	Device tested when powered at 110 Vac using a sample converter when transmitting continuously with 2 antennas attached and a tag being continuously read.



Peak -------	Average -------	Quasi Peak X	Average +

Quasi-Peak Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Exceed	Phase	Rechecks dBµV
0.240000	29.10	62.10	33.00		L1	
0.380000	29.21	58.28	29.07		L1	
0.387500	28.89	58.12	29.23		L1	
0.637500	18.17	56.00	37.83		N	
9.405000	18.28	60.00	41.72		N	
9.510000	19.98	60.00	40.02		N	
9.620000	20.49	60.00	39.51		N	
9.720000	19.74	60.00	40.26		N	

Average Measurements

Frequency MHz	Level dBµV	Limit dBµV	Margin dB	Exceed	Phase	Rechecks dBµV
9.615000	11.87	50.00	38.13		N	
9.720000	10.97	50.00	39.03		N	
17.180000	28.04	50.00	21.96		N	27.8
25.770000	23.80	50.00	26.20		L1	

Section 15.209: Radiated emission limits, general requirements

Radiated emissions testing was carried out over the frequency range of 100 kHz to 1000 MHz.

Testing was carried out at the laboratory's open area test site - located at Driving Creek, Orere Point, Auckland, New Zealand.

This site conforms to the requirements of CISPR 16, Part 1, Clause 16, and ANSI C63.4 - 1992.

The device was placed on the test tabletop, which is a total of 0.8 m above the test site ground plane.

When an emission is located, it is positively identified and its maximum level is found by rotating the automated turntable, and by varying the antenna height, where appropriate, with an automated antenna tower.

The emission is measured in both vertical and horizontal antenna polarisations, where appropriate.

The emission level was determined in field strength by taking the following into consideration:

Level (dBμV/m) = Receiver Reading (dBμV) + Antenna Factor (dB) + Coax Loss (dB)

Fundamental emission:

Measurements on this device were carried out using a single antenna and also two antennas

As allowed by section 15.31(f)(2) measurements were made at 10 metres and then 30 metres with the 10 metre measurement being extrapolated to the measurement distance of 300 metres.

Measurements were made using a magnetic loop antenna and a receiver with an average detector and a 9 kHz bandwidth.

Measurements were made while the device was being powered using a 110 Vac to 12 Vdc converter and when the 110 Vac supply was varied between 85% and 115%.

Single antenna attached to the device

Field strength variation with supply voltage variation at 10 metres.

Frequency kHz	Voltage Vac	Level dBuV/m
134.240	93.0	98.9
134.240	110.0	99.0
134.240	127.0	99.1

Field strength measurement

Frequency (kHz)	Distance (m)	Level (dBuV/m)	Roll off (dB)	300 m roll off (dB)
134.240	10.0	99.0		
134.240	30.0	73.0	26.0	78.0

10m Level (dBuV/m)	300 m roll off (dB)	300 m Level (dBuV/m)	300 m Limit (dBuV/m)	Margin dB
99.0	78.0	21.0	25.6	-4.6

Two antennas attached to the device

Field strength variation with supply voltage variation at 10 metres.

Frequency kHz	Voltage Vac	Level dBuV/m
134.240	93.0	86.1
134.240	110.0	86.4
134.240	127.0	86.5

Field strength measurement

Frequency (kHz)	Distance (m)	Level (dBuV/m)	Roll off (dB)	300 m roll off (dB)
134.240	10.0	86.4		
134.240	30.0	64.9	21.5	64.5

10m Level (dBuV/m)	300 m roll off (dB)	300 m Level (dBuV/m)	300 m Limit (dBuV/m)	Margin dB
86.4	64.9	21.9	25.6	-3.7

When two antennas were attached, the front good glossy faces faced each other. Both antennas were set up, in line with each other, with a distance of 70 cm between them.

Correct operations were confirmed using a laptop computer running hyper terminal which indicated a factor of 16 and that a sample ear tag could be read continuously. The client advised that a factor of 16 +/- 8 would indicate that the antennas were working correctly.

Measurements were also made with a 12 Vdc lead acid battery which gave the same results as when the device was powered at 110 Vac. All other spurious emission measurements were made using a 12 Vdc lead acid battery.

Result: Complies with a 3.7 dB margin when using 2 antennas

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB

Section 15.209: Spurious Emissions (below 30 MHz)

Single antenna

Frequency kHz	Level dBuV/m	Limit dBuV/m	Margin dB	Result
268.480	43.3	79.0	-35.7	Pass
402.720	36.1	75.5	-39.4	Pass
536.960	less than 42.1	53.0	greater than -10.9	Pass
671.200	30.8	51.1	-20.3	Pass
805.440	37.2	49.5	-12.3	Pass
939.680	less than 34.8	48.1	greater than -13.3	Pass
1073.920	less than 32.0	47.0	greater than -15.0	Pass
1208.160	less than 35.0	45.9	greater than -10.9	Pass
1342.400	less than 29.0	45.0	greater than -16.0	Pass

Two antennas

Frequency kHz	Level dBuV/m	Limit lBuV/m	Margin dB	Result
268.480	41.3	79.0	-37.7	Pass
402.720	34.0	75.5	-41.5	Pass
536.960	less than 42.1	53.0	greater than-10.9	Pass
671.200	28.0	51.1	-23.1	Pass
805.440	33.0	49.5	-16.5	Pass
939.680	less than 34.8	48.1	greater than -13.3	Pass
1073.920	less than 32.0	47.0	greater than -15.0	Pass
1208.160	less than 35.0	45.9	greater than -10.9	Pass
1342.400	less than 29.0	45.0	greater than -16.0	Pass

Magnetic loop measurements were only made at a distance of 10 metres due to the presence of many high ambient emissions (AM broadcast stations).

Measurements were made while the device was being powered using a 12 Vdc lead acid battery.

A receiver with an average detector and a 9 kHz bandwidth was used between 125 – 490 kHz and a quasi peak detector with a 9 kHz bandwidth was used between 490 kHz – 30.0 MHz.

The 300 metre limit between 125 – 490 kHz has been scaled by a factor of 40 dB per decade, as per section 15.31 (f) (2) and the 30 metre limit between 490 – 1705 kHz has been scaled by a factor of 40 dB per decade, as per section 15.31 (f) (2).

The spurious emissions observed do not exceed the level of the fundament emission.

Result: Complies.

Measurement uncertainty with a confidence interval of 95% is:
- Free radiation tests (100 kHz – 30 MHz) ± 4.8 dB

Section 15.209: Spurious Emissions (above 30 MHz)

Measurements between 30 –1000 MHz have been made at a distance of 3 metres.

Measurements were made while the device was being powered using a 12 Vdc lead acid battery.

A receiver with a quasi peak detector with a 120 kHz bandwidth was used between 30 – 1000 MHz.

No transmitter spurious emissions were observed.

Measurements were carried out as the device contains a digital device.

Measurements were made with a single antenna and 2 antennas attached with the observed levels remaining the same.

The limits as described in Section 15.209 have been applied as follows:

30.0 – 88.0 MHz	100 uV/m	40 dBuV/m
88.0 – 216.0 MHz	150 uV/m	43.5 dBuV/m
216.9 – 960.0 MHz	200 uV/m	46.0 dBuV/m

Result: Complies with a 12.9 dB margin at 377.955 MHz.

Measurement uncertainty with a confidence interval of 95% is:

- Free radiation tests (30 – 1000 MHz) ± 4.1 dB

Spurious Emissions

Frequency	Level		Recheck	Limit	Margin	Result	Worst Case
	Vertical	Hort					Antenna
MHz	dBuV/m	dBuV/m	dBuV/m	dBuV/m	dB		
42.945	21.1			40.0	18.9	Pass	Vertical
51.535	18.0			40.0	22.0	Pass	Vertical
85.898	12.5			40.0	27.5	Pass	Vertical
103.075	19.1	17.0		43.5	24.4	Pass	Vertical
120.257	15.5	15.1		43.5	28.0	Pass	Vertical
128.847	15.2			43.5	28.3	Pass	Vertical
137.438	21.0			43.5	22.5	Pass	Vertical
154.618	19.3	15.6		43.5	24.2	Pass	Vertical
171.795	19.1			43.5	24.4	Pass	Vertical
188.978	21.3	19.1		43.5	22.2	Pass	Vertical
206.158	26.6	23.4		43.5	16.9	Pass	Vertical
223.338	26.4			46.0	19.6	Pass	Vertical
240.515		19.0		46.0	27.0	Pass	Horizontal
257.695		21.2		46.0	24.8	Pass	Horizontal
309.235	20.5			46.0	25.5	Pass	Vertical
343.595	25.8			46.0	20.2	Pass	Vertical
360.775	25.3	25.0		46.0	20.7	Pass	Vertical
377.955	33.1	28.6	33.1	46.0	12.9	Pass	Vertical
395.135	25.0			46.0	21.0	Pass	Vertical
326.415		22.7		46.0	23.3	Pass	Horizontal

7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial No	Asset Ref
Aerial Controller	EMCO	1090	9112-1062	RFS 3710
Aerial Mast	EMCO	1070-1	9203-1661	RFS 3708
Biconical Antenna	Schwarzbeck	BBA 9106	-	RFS 3612
2m Triple Antenna	Rohde & Schwarz	HM020	843885/004	-
Log Periodic Antenna	Schwarzbeck	UHALP 9107	-	RFS 3702
Measurement Receiver	Rohde & Schwarz	ESCS 30	847124/020	E1595
Measurement Receiver	Rohde & Schwarz	ESHS 10	828404/005	RFS 3728
2m Triple Loop Antenna	Rohde & Schwarz	HM020	843885/004	-
Loop Antenna	Schwarzbeck	FMZ 1514	-	RFS 3602
Magnetic Loops	Schwarzbeck	FMZ 15141	-	RFS 3653
Magnetic Loops	Schwarzbeck	FMZ 15142	-	RFS 3654
Artificial Mains Network	Rohde & Schwarz	ESH2-Z5	881362/034	RFS 3628
Variac	General Radio	1592	-	RFS 3690
Turntable	EMCO	1080-1-2.1	9109-1578	RFS 3709
VHF Balun Antenna	Schwarzbeck	VHA 9103		RFS 3603

8. ACCREDITATIONS

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

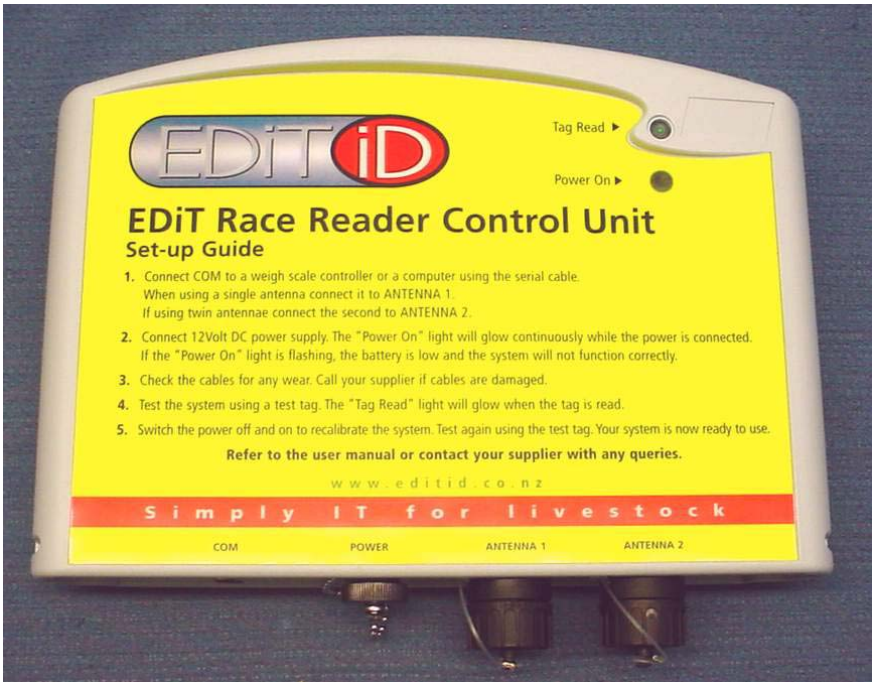
All testing was carried out in accordance with the terms of EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.1999.

All measurement equipment has been calibrated in accordance with the terms of the EMC Technologies (NZ) Ltd International Accreditation New Zealand (IANZ) Accreditation to NZS/ISO/IEC 17025.1999.

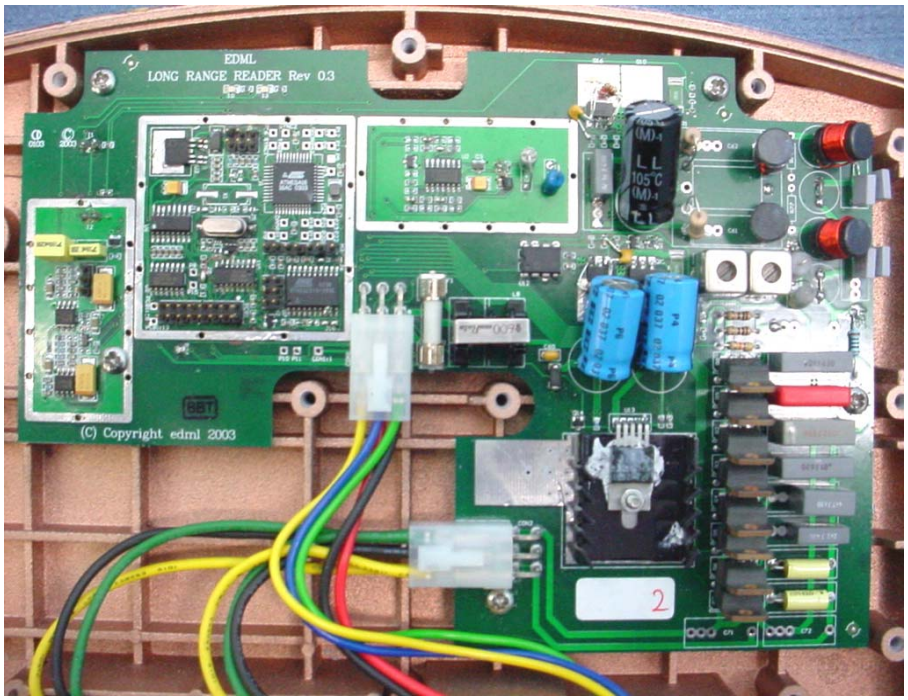
International Accreditation New Zealand has Mutual Recognition Arrangements for testing and calibration with 46 accreditation bodies in 34 economies. This includes NATA (Australia), UKAS (UK), SANAS (South Africa), NVLAP (USA), A2LA (USA), SWEDAC (Sweden). Further details can be supplied on request.

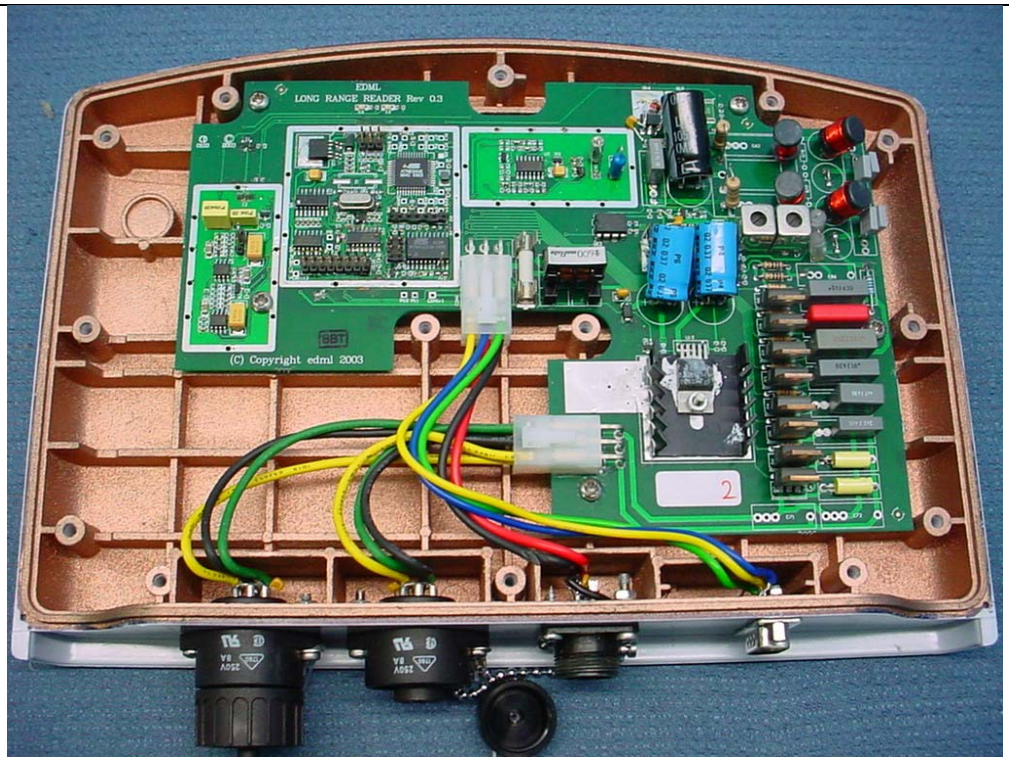
9. PHOTOGRAPH (S)

External Views



Internal Photographs

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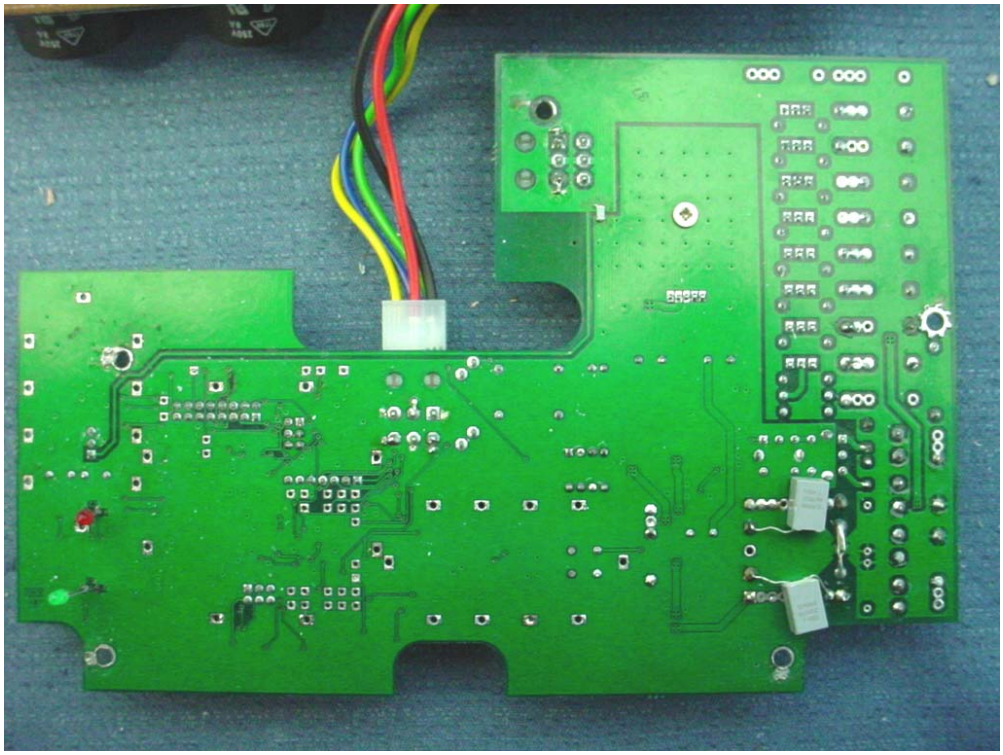
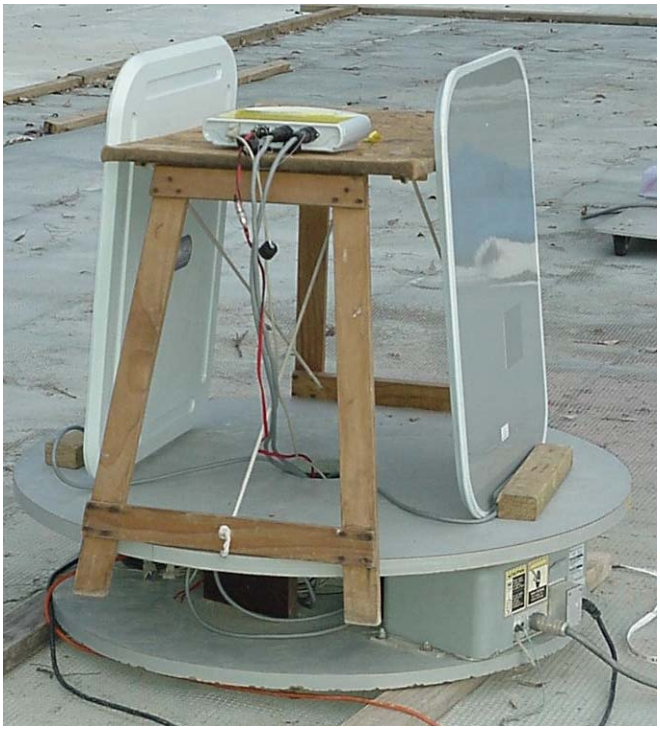


Label Details

Radiated Emissions Test Set Up – Single antenna

Radiated Emissions Test Set Up – Two antennas



Conducted Emissions Test Set Up Single Antenna

Conducted Emissions Test Set Up Two Antennas