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TEST REPORT

Trio Datacom QB450 & QP450 UHF Base Station

tested to

47 Code of Federal Regulations

Part 15 - Radio Frequency Devices

Subpart A + B

for

Trio Datacom Pty Ltd

This Test Report is issued with the authority of:

A handwritten signature in black ink, appearing to read "Andrew Cutler".

Andrew Cutler- General Manager



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

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EMC
Technologies

1. STATEMENT OF COMPLIANCE

The **Trio Datacom QB450 & QP450 UHF Base Station** complies with FCC Part 15 Subpart A + B as a Class A device when the Class B limits are applied and the methods as described in ANSI C63.4 - 2003 are applied.

2. RESULTS SUMMARY

The results of testing carried out in October and November 2014 are summarised below.

Clause	Parameter	Result
15.101	Equipment authorisation requirement.	This device would be classed as a computer peripheral and a receiver. The verification process has been applied as: - the device would be a Class A device as it is marketed for commercial or business environments - the receiver contained within a transceiver.
15.103	Exempted devices.	Device is not exempt as it contains a receiver and a digital device.
15.107	Conducted Emissions 0.15 - 30 MHz	Complies.
15.109	Radiated Emissions 30 - 5000 MHz	Complies.
15.111	Antenna Terminal Disturbance 30 – 950 MHz	Complies.

3. INTRODUCTION

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.

All compliance statements have been made with respect of the specification limit with no reference to the measurement uncertainty.

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

4. CLIENT INFORMATION

Company Name Trio Datacom Pty Ltd

Address 41 Aster Avenue
Carrum Downs 3201
Victoria

Country Australia

Contact Mr David Rowntree

5. TEST SAMPLE DESCRIPTION

Brand Name Trio Datacom

Model Number QB450 & QP450

Product UHF Remote Station

Manufacturer Trio Datacom

Serial Number 700600, 700601

FCC ID NI8QB450QP450

This report covers model numbers QB450 and QP450.

Both models are electrically identical and are configured as follows:

The QB450 uses one remote module for transmit and another module for receive allowing the base station to operate in Full Duplex mode if required.

The QP450 has two modules configured in both transmit and receive mode.

The QP450 uses one module with other module as a backup in case of failure.

The QB450 and QP450 are UHF base stations that can be configured to have an output power between 50 mW to 10.0 W.

The radio has the following ports:

- Three Ethernet ports
- Dual RS232 data port
- USB configuration port
- Transmit Type-N connector
- Receive Type-N connector
- DC power input and output
- Three digital inputs
- Three digital outputs
- Auxiliary port for connection to a Hot Standby Controller

Internally there are five printed circuit boards.

2 radio circuit boards (modules), each of which contains the following sections:

- IQ Modulator
- Two PLL and VCO's for the transmitter and one for the receiver
- Transmitter driver circuitry and PA module
- Transmitter low pass filter and directional coupler for the Cartesian loop
- Single conversion receiver with tracking filter and ADC to digitise the IF
- FPGA to implement modem
- Microprocessor
- Main processor running Linux operating system with LAN interfaces
- 11 – 30 volt switch mode power supply

An I/O printed circuit board which contains the I/O circuitry and provides power to a Hot Standby Controller

A low voltage printed circuit board which contains protection for the input supply rails.

A front panel printed circuit board which contains the following:

- Interface circuitry for the USB, Ethernet and serial connections
- Indicator LEDs
- Signal switching
- An Ethernet switch
- Power supplies
- LED and fan control circuitry

Two samples were tested that cover the receiver range of 400 -520 MHz

Testing was carried out on the following frequencies: 400, 425, 450, 484 and 518 MHz

The receiver has an intermediate frequency of 83.1625 MHz

6. RESULTS

Standard

The sample was tested in accordance with 47 CFR Part 15 Subpart A and B with the Class B limits being applied.

Methods and Procedures

The following measurement methods and procedures have been applied:

- ANSI C63.4 – 2003

Section 15.101: Equipment authorisation requirement

The device tested is a receiver contained within a transceiver that has an Ethernet Port.

The verification process has been applied to this device because:

- the receiver is contained within a transceiver
- the device has an Ethernet port that contains a digital device
- the device is marketed for use in a commercial, industrial or business environment and would there for be classed a Class A digital device

Section 15.107: Conducted limits

Conducted emission testing has been carried out when the device was powered at 120 Vac 60 Hz using a representative AC power supply.

Conducted emission 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.

Testing was carried out in accordance with section 15.107(a) using a measuring receiver and a 50 uH / 50 ohm artificial mains network which is also known as a line impedance stabilisation network (LISN).

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

The supplied conducted emission plot is a combined plot showing the worst case of the Peak, Quasi Peak and Average levels for both phase and neutral.

The Class B conducted limits have been applied.

Result: Complies

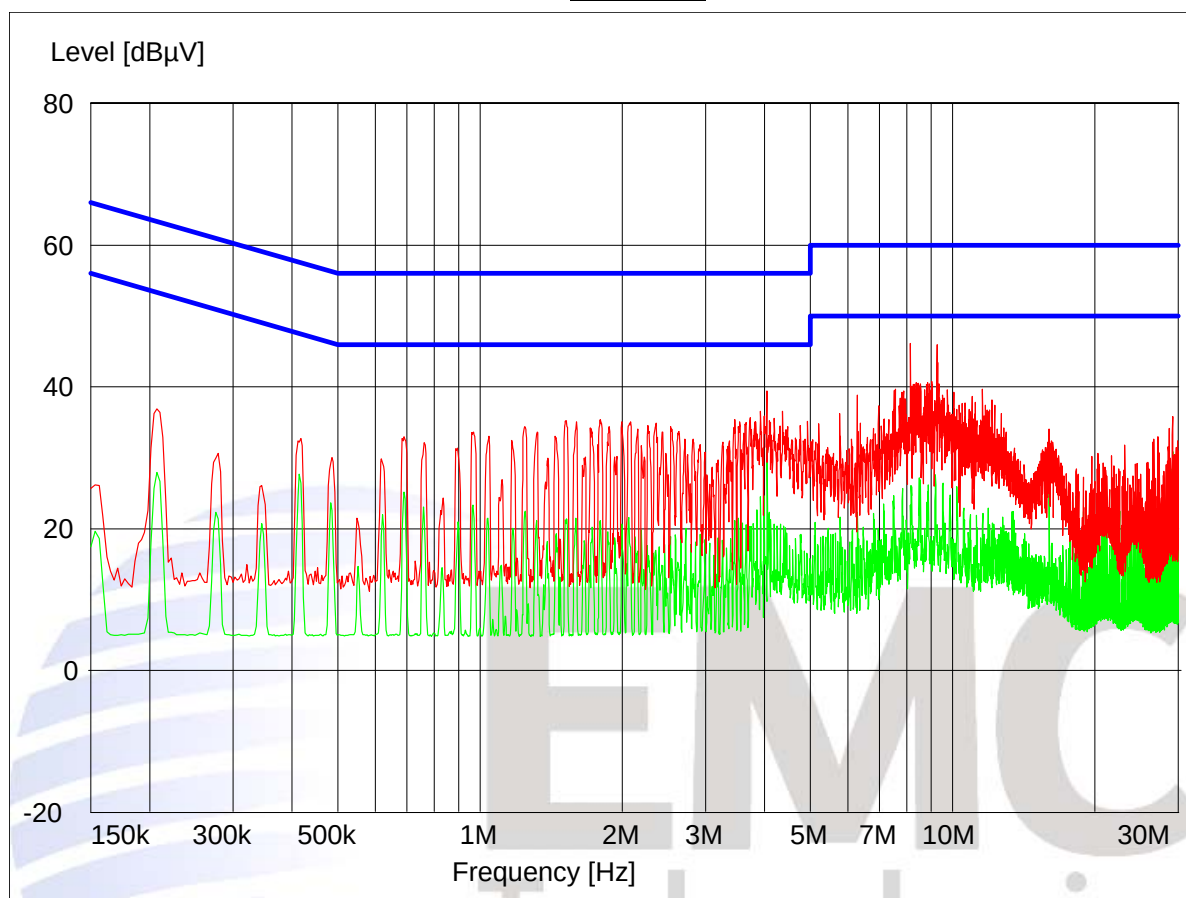
Measurement uncertainty with a confidence interval of 95% is:

Conducted emissions tests (0.15 - 30 MHz) ± 2.2 dB

Conducted Emissions – AC Input Power Port

Setup: Device tested in standby / receive mode when powered at 120 Vac 60 Hz when using a representative AC power supply.

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



Final Quasi-Peak Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
No emissions detected within 15 dB of the limit					

Final Average Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
No emissions detected within 15 dB of the limit					

Conducted Emissions – AC Input Power Port

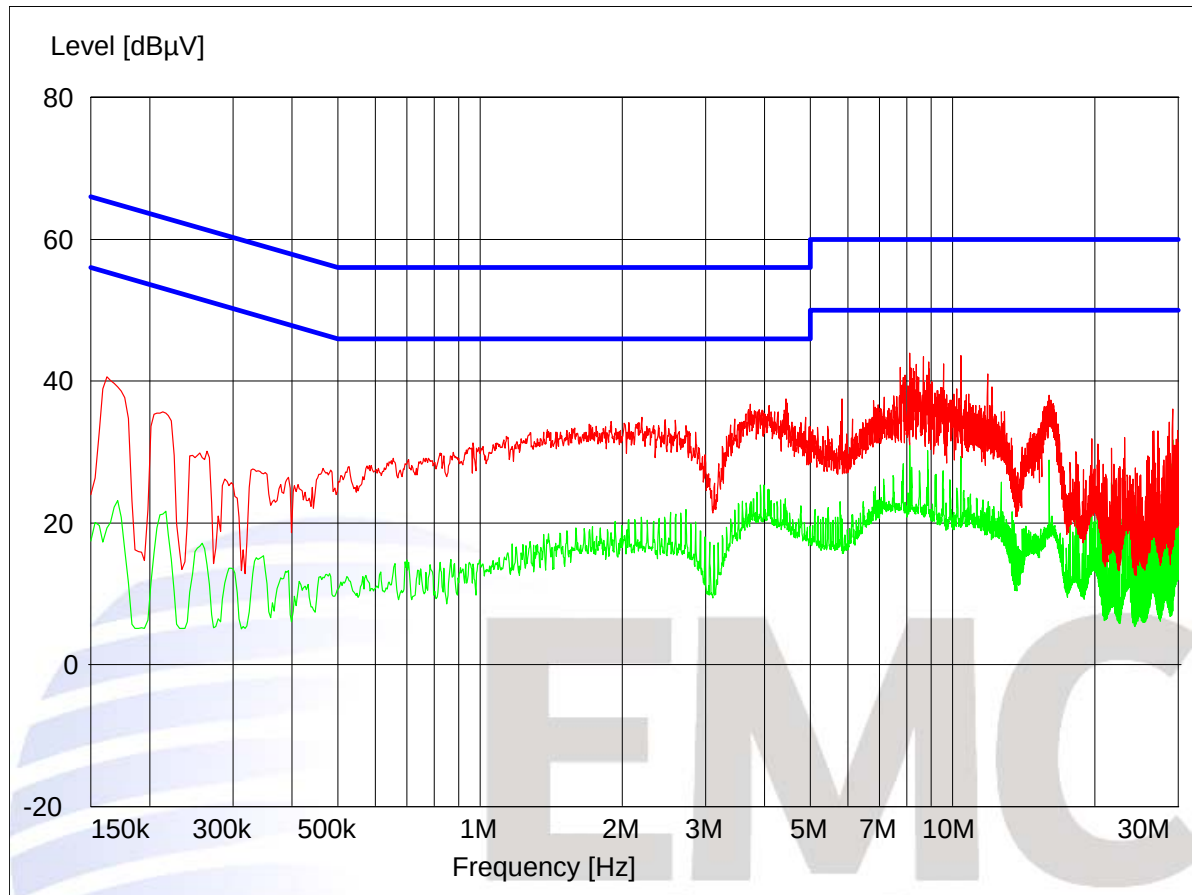
Setup:	Device tested in transmit mode when powered at 120 Vac 60 Hz when using a representative AC power supply.
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Peak ---

Average --

Quasi Peak X

Average +



Final Quasi-Peak Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
No emissions detected within 15 dB of the limit					

Final Average Measurements

Frequency MHz	Level dBμV	Limit dBμV	Margin dB	Phase	Rechecks dBμV
No emissions detected within 15 dB of the limit					

Section 15.109: Radiated spurious emissions

Radiated emission testing was carried out over the frequency range of 30 to 5000 MHz as the receiver operates between 400 - 520 MHz with the highest local oscillator frequency being 603.1625 MHz.

Testing was carried out at the laboratory's open area test site - located at 670 Kawakawa Orere Rd, RD3, Papakura, New Zealand.

Before testing was carried out, a receiver Self Test and Internal Calibration was undertaken along with a check of all connecting cables and programmed antenna factors.

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

Measurements below 1000 MHz were made using a Quasi Peak Detector with a bandwidth of 120 kHz.

Above 1000 MHz measurements were made using a Peak Detector and an Average Detector with a bandwidth of 1 MHz

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 with an automated antenna tower.

All emissions were measured in both vertical and horizontal antenna polarisations.

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

Level (dB μ V/m) = Receiver Reading (dB μ V) + Antenna Factor (dB/m) + Coax Loss (dB) – Amplifier Gain (dB)

The Class B limits have been applied.

Receiver spurious Emissions 30-5000 MHz

The receiver has an intermediate frequency of 83.1625 MHz

Receive Frequency 400.000 MHz

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Polarity	Margin (dB)	Result
483.1625	25.1	46.0	Vertical	20.9	Pass
483.1625	22.5	46.0	Horizontal	23.5	Pass

Receive Frequency 425.000 MHz

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Polarity	Margin (dB)	Result
508.1625	24.8	46.0	Vertical	21.2	Pass
508.1625	22.5	46.0	Horizontal	23.5	Pass

Receive Frequency 450.000 MHz

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Polarity	Margin (dB)	Result
533.1625	24.6	46.0	Vertical	21.4	Pass
533.1625	22.8	46.0	Horizontal	23.2	Pass

Receive Frequency 484.000 MHz

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Polarity	Margin (dB)	Result
567.1625	24.0	46.0	Vertical	22.0	Pass
567.1625	22.5	46.0	Horizontal	23.5	Pass

Receive Frequency 518.000 MHz

Frequency (MHz)	Level (dB μ V/m)	Limit (dB μ V/m)	Polarity	Margin (dB)	Result
601.1625	25.1	46.0	Vertical	20.9	Pass
601.1625	23.0	46.0	Horizontal	23.0	Pass

No other emissions observed within 20 dB of the limits.

Result: Complies

Measurement Uncertainty: ± 4.1 dB

General standby emissions 30-5000 MHz

The receiver was tested when a dummy load was attached to the antenna port and an Ethernet cable was attached to the Ethernet port.

Frequency MHz	Vertical dBμV/m	Horizontal dBμV/m	Limit dBμV/m	Margin dB	Result	Antenna
30.000	26.1		40.0	13.9	Pass	Vertical
30.600	30.5		40.0	9.5	Pass	Vertical
32.600	29.6		40.0	10.4	Pass	Vertical
33.400	23.8		40.0	16.2	Pass	Vertical
35.400	23.0		40.0	17.0	Pass	Vertical
37.500	23.5		40.0	16.5	Pass	Vertical
39.500	21.5		40.0	18.5	Pass	Vertical
43.800	27.3		40.0	12.7	Pass	Vertical
45.500	21.1		40.0	18.9	Pass	Vertical
47.800	23.0		40.0	17.0	Pass	Vertical
49.000	19.0		40.0	21.0	Pass	Vertical
51.500	19.0		40.0	21.0	Pass	Horizontal
54.000	23.0		40.0	17.0	Pass	Vertical
56.000	27.1		40.0	12.9	Pass	Horizontal
56.600	24.0		40.0	16.0	Pass	Vertical
68.500	21.8		40.0	18.2	Pass	Horizontal
71.000	23.4		40.0	16.6	Pass	Vertical
73.200	24.1		40.0	15.9	Pass	Horizontal
76.000	22.0		40.0	18.0	Pass	Vertical
78.000	25.6		40.0	14.4	Pass	Horizontal
79.600	23.8		40.0	16.2	Pass	Vertical
81.000	22.0		40.0	18.0	Pass	Horizontal
238.400	22.6		46.0	23.4	Pass	Vertical
238.600	28.0	24.1	46.0	18.0	Pass	Horizontal
238.800	29.1	24.0	46.0	16.9	Pass	Vertical
239.000	30.4	21.0	46.0	15.6	Pass	Horizontal
239.200	29.3	22.0	46.0	16.7	Pass	Vertical
239.600	29.8	23.1	46.0	16.2	Pass	Horizontal
239.800	31.3	19.0	46.0	14.7	Pass	Vertical

Result: Complies

Measurement Uncertainty: ±4.1 dB

Section 15.111: Receiver spurious emissions at antenna terminals

Testing was carried out at the antenna port.

The receiver has an intermediate frequency of 83.1625 MHz

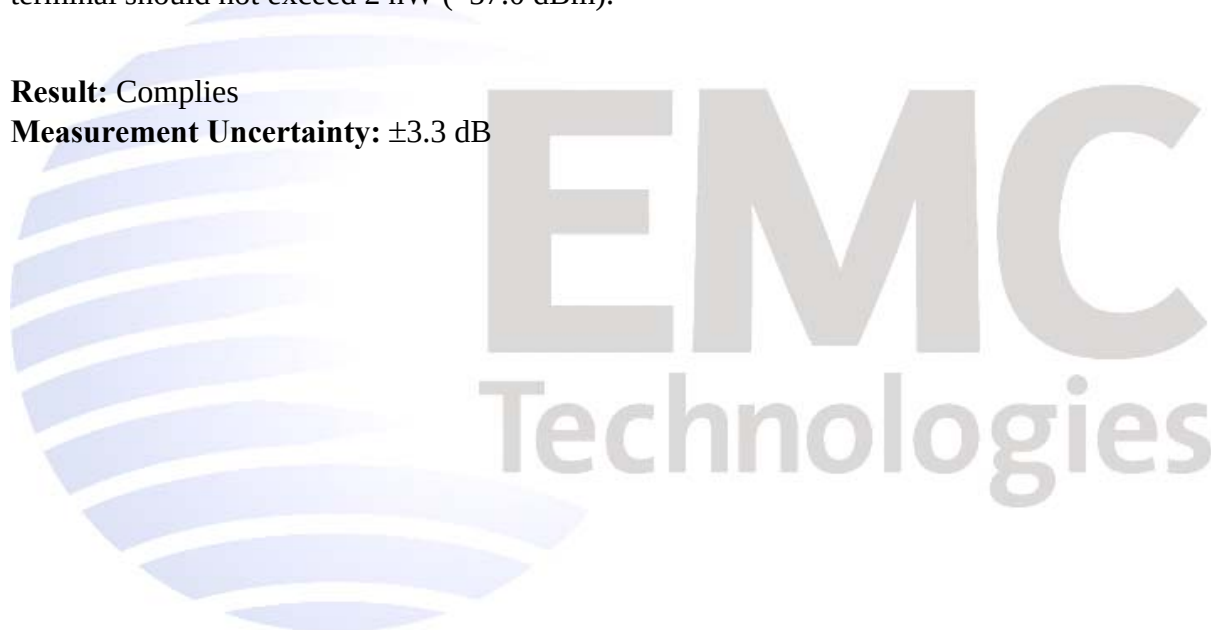
Receive (MHz)	Emission (MHz)	Level (dBm)	Limit (dBm)
400.000	483.163	-97.3	-57.0
425.000	508.163	-95.8	-57.0
450.000	533.163	-91.5	-57.0
484.000	567.153	-99.8	-57.0
518.000	601.153	-100.4	-57.0

Limit:

In accordance with CFR 47 Part 15, section 15.111 the power of any emission at the antenna terminal should not exceed 2 nW (-57.0 dBm).

Result: Complies

Measurement Uncertainty: ± 3.3 dB



7. TEST EQUIPMENT USED

Instrument	Manufacturer	Model	Serial #	Asset	Cal Due	Interval
Aerial Controller	EMCO	1090	9112-1062	3710	N/a	N/a
Aerial Mast	EMCO	1070-1	9203-1661	3708	N/a	N/a
Turntable	EMCO	1080-1-2.1	9109-1578	3709	N/a	N/a
VHF Balun	Schwarzbeck	VHA9103	-	3603	12/01/2015	3 years
Biconical Antenna	Schwarzbeck	BBA 9106	-	3612	12/01/2015	3 years
Log Periodic Antenna	Schwarzbeck	VUSLP 91111	9111-228	3785	12/01/2015	3 years
Horn Antenna	EMCO	3115	9511-4629	E1526	04/06/2017	3 years
Receiver	Rohde & Schwarz	ESIB-40	100171	4003	29/01/2015	1 year
Spectrum Analyzer	Hewlett Packard	E7405A	US39150142	3776	26/02/2015	1 year
Receiver	R & S	ESHS 10	828404/005	3728	27/06/2015	2 year
Mains Network	R & S	ESH2-Z5	881362/032	3628	23/10/2016	2 year

At the time of testing all test equipment was within calibration.

8. ACCREDITATIONS

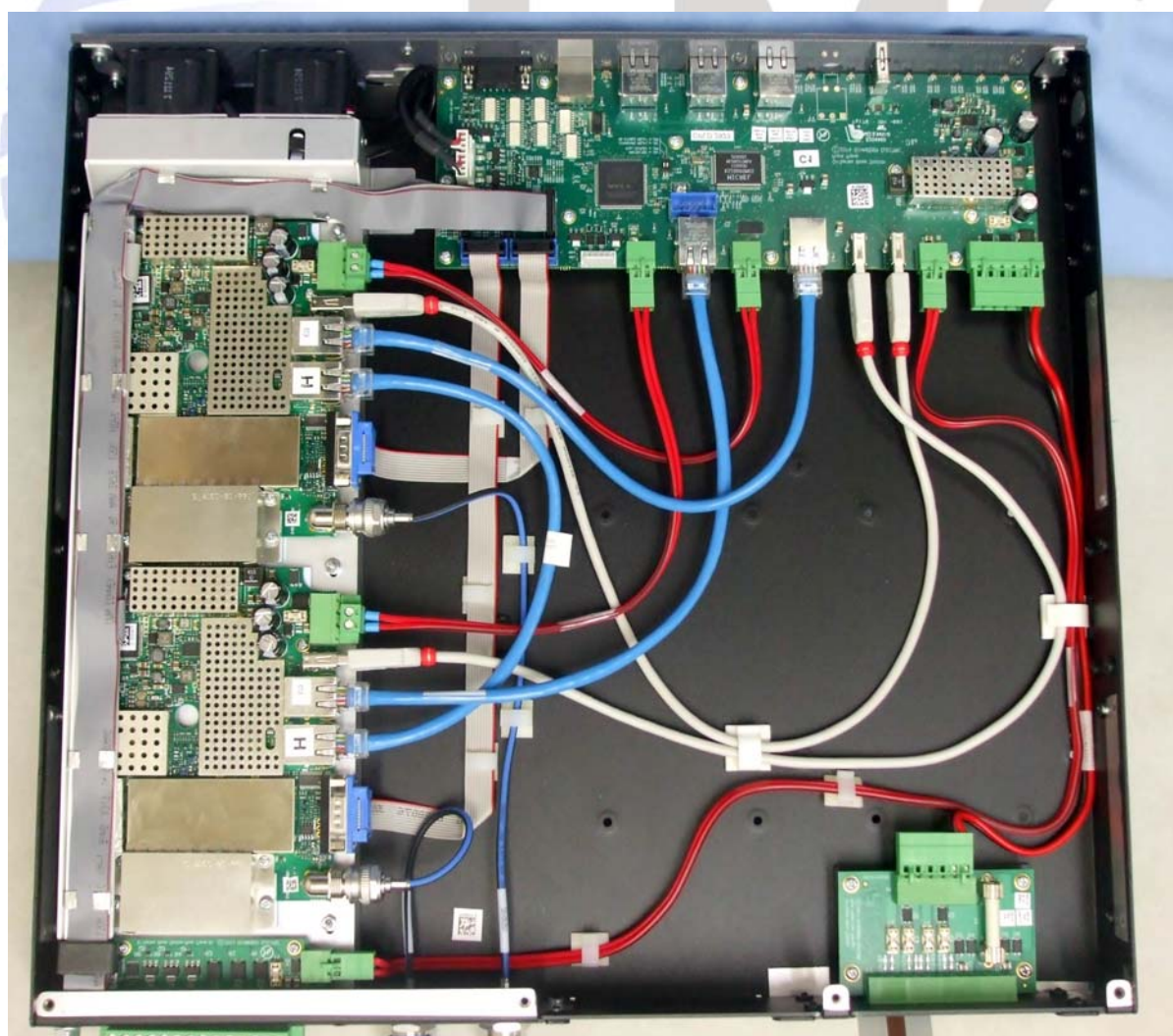
Testing was carried out in accordance with EMC Technologies Ltd registration with the Federal Communications Commission as a listed facility, registration number: 90838, which was updated in June 2014.

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.

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.

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

9. PHOTOGRAPHS



TBURQB4LN-F00E1L00

Model: QB450

ACMA: N76

FCC ID: NI8QB450QP450

RSM (NZ): Z216

IC: 4630A- QB450QP450

Input Power: 11-30VDC  11A max

Operating Temp: -40 to 70 deg. C



WARNING: Risk of death, serious injury or equipment damage. Refer to user manual for installation procedure and safety advice.

Substitution of components may void approval or warranty.



0891



SN:700600



TBURQB4HN-F00E1L00

Model: QB450

ACMA: N76

FCC ID: NI8QB450QP450

RSM (NZ): Z216

IC: 4630A- QB450QP450

Input Power: 11-30VDC  11A max

Operating Temp: -40 to 70 deg. C

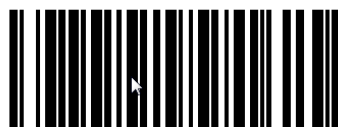


WARNING: Risk of death, serious injury or equipment damage. Refer to user manual for installation procedure and safety advice.

Substitution of components may void approval or warranty.



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SN:700601



Conducted emissions test setup





Radiated emissions setup

