



Nemko

Nemko USA, Inc.
11696 Sorrento Valley Rd., Suite F
San Diego, CA 92121-1024
Phone (858) 793-9911 Fax (858) 793-9914



PART 15227 AND 15:109, SUBPART C AND B, CLASS 'B'

VERIFICATION TEST REPORT

For The **20-00241 Radio Control Center Assembly**

Model: **Rokenbok**

PREPARED FOR:

Rokenbok
725 S. Coast Highway 101
Encinitas, CA 92024

PREPARED ON 3-18-04

REPORT NUMBER 2004 030146 FCC

PROJECT NUMBER: 24-146-ROK

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	2 of 31

DOCUMENT HISTORY

REVISION	DATE	COMMENTS
-	3-18-04	Prepared By: Mark Phillips
-	3-18-04	Initial Release: R. L. Hill

NOTE: Nemko USA, Inc. hereby makes the following statements so as to conform to Chapter 10 (Test Reports) Requirements of ANSI C63.4 (1992) "Methods and Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz":

- The unit described in this report was received at Nemko USA, Inc.'s facilities on March 16, 2004. Testing was performed on the unit described in this report on March 17, 2004.
- The Test Results reported herein apply only to the Unit actually tested, and to substantially identical Units.
- This report does not imply the endorsement of the Federal Communications Commission (FCC), NVLAP or any other government agency.

This Report is the property of Nemko USA, Inc., and shall not be reproduced, except in full, without prior written approval of Nemko USA, Inc. However, all ownership rights are hereby returned unconditionally to Rokenbok, and approval is hereby granted to Rokenbok and its employees and agents to reproduce all or part of this report for any legitimate business purpose without further reference to Nemko USA, Inc.

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	3 of 31

TABLE OF CONTENTS

DOCUMENT HISTORY	2
CERTIFICATION	4
1. ADMINISTRATIVE DATA AND TEST SUMMARY	5
1.1.ADMINISTRATIVE DATA.....	5
1.2.TEST SUMMARY	5
2. SYSTEM CONFIGURATION	6
2.1.DESCRIPTION AND METHOD OF EXERCISING THE EUT	6
2.2.SYSTEM COMPONENTS AND POWER CABLES	6
2.3.DEVICE INTERCONNECTION AND I/O CABLES	6
2.4.DESIGN MODIFICATIONS FOR COMPLIANCE.....	7
3. DESCRIPTION OF TEST SITE AND EQUIPMENT	8
3.1.DESCRIPTION OF TEST SITE.....	8
4. DESCRIPTION OF TESTING METHODS	9
4.1.INTRODUCTION	9
4.2.CONFIGURATION AND METHODS OF MEASUREMENTS FOR CONDUCTED EMISSIONS	11
4.3.CONFIGURATION AND METHODS OF MEASUREMENTS FOR FREQUENCY IDENTIFICATION	13
4.4.CONFIGURATION AND METHODS OF MEASUREMENTS FOR RADIATED EMISSIONS.....	15
5. TEST RESULTS	17
5.1.CONDUCTED EMISSIONS TEST DATA	17
5.2.RADIATED EMISSIONS TEST DATA.....	19

TEST SETUP DIAGRAMS

Figure 1. General EUT Test Setup Diagram	10
Figure 2. Conducted Emissions Test Setup Diagram	12
Figure 3. Frequency ID of Radiated Emissions Test Setup Diagram.....	14
Figure 4. Radiated Emissions Test Setup Diagram	16

TEST CONFIGURATION PHOTOGRAPHS

Photograph 1. Conducted Emissions Test Configuration.....	22
Photograph 2. Radiated Emissions Test Configuration.....	23

APPENDICES

A. CONDUCTED & RADIATED EMISSIONS MEASUREMENT UNCERTAINTIES	24
B. NEMKO USA, INC.'S TEST EQUIPMENT & FACILITIES CALIBRATION PROGRAM.....	26
C. NVLAP ACCREDITATION	28

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	4 of 31

CERTIFICATION

The Radio Frequency Interference (RFI) testing, data evaluation and this report have been prepared by Nemko USA, Inc., an independent electromagnetic compatibility consulting and test laboratory.

The testing and data collection were accomplished in accordance with the requirements of the ANSI, C63.4-1992 standard and the applicable sections of FCC, Part 15, Subpart B for Class "A" equipment. The testing was also accomplished in accordance with Industry Canada's ICES-003 standard for unintentional radiating device per EMCAB-3, Issue 3 (May 1998). Refer to the Administrative Summary for a description of the test sample.

I certify the data, data evaluation and equipment configuration herein to be a true and accurate representation of the sample's radio frequency interference emission characteristics, as of the test date(s), and for the design of the test sample used to compile this report.



Ricky L. Hill

Manager of EMC Operations

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	5 of 31

1. ADMINISTRATIVE DATA AND TEST SUMMARY

1.1. Administrative Data

CLIENT: Rokenbok
725 S. Coast Highway 101
Encinitas, CA 92024
760-632-3580
760-632-3577- fax

CONTACT: Craig Hagen

DATE (S) OF TEST: March 17, 2004

EQUIPMENT UNDER TEST (EUT): 20-00241 Radio Control Center Assembly
Model Rokenbok

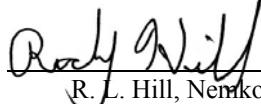
Condition Upon Receipt Suitable for Test

TEST SPECIFICATION: FCC, Part 15, Subpart B, Class "A"

1.2. Test Summary

<i>Specification</i>	<i>Frequency Range</i>	<i>Compliance Status</i>
FCC, CFR 47, Section 15.107 Class "B" Conducted Emissions	0.15 MHz - 30.00 MHz	PASS
FCC, CFR 47, Section 15.109 Class "B" Radiated Emissions	30 MHz - 1000 MHz	PASS
FCC, CFR 47, Section 15.227 Operation within the band 26.96-27.28 MHz	26.96-27.28 MHz	PASS

Test Supervisor:


R. L. Hill, Nemko USA, Inc.

Refer to the test results section for further details.

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	6 of 31

2.SYSTEM CONFIGURATION

2.1. Description and Method of Exercising the EUT

The Rokenbok model 20-00241 Radio Control Center Assembly consists of a central base station transmitter which was connected to four hand held controllers for radio control of battery powered vehicles. The transmit antenna is connected to the RF board via a soldered connection. The base station was fully cabled and powered up via an external AC adapter and placed into continuous transmit mode. The Highest frequency generated by the device is the RF transmit frequency of 27.145MHz. There are also 8 MHz and 4 MHz clocks.

During testing the EUT was evaluated in the worst case emissions mode as determined during pre-evaluations. The emissions profile was checked using battery and AC power. The Voltage of the ac source was varied from 85 to 115% of rated voltage to demonstrate the profile did not change in the range evaluated. Thus demonstrating compliance to 15.31e.

2.2. System Components and Power Cables

DEVICE	MANUFACTURER	POWER CABLE
	MODEL #	
SERIAL #		
20-00241 Radio Control Center Assembly	Rokenbok Rokenbok	4m, 2 wire, DC jack to wall mount power supply
Power Supply	Rokenbok FLU 9-500F N/A	Wall mounted Class 2 power unit.

2.3. Device Interconnection and I/O Cables

CONNECTION	I/O CABLE
EUT to power supply	4m, unshielded, DC jack to hardwired
EUT to hand controller (1 ea.)	3m, unshielded, hardwired to hardwired
EUT to hand controller (3 ea.)	3m, unshielded, hardwired to male DB9 connector

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	7 of 31

2.4. Design Modifications for Compliance

Device: 20-00241 Radio Control Center Assembly

Model: Rokenbok

No design modifications were made to the EUT during testing.

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	8 of 31

3. DESCRIPTION OF TEST SITE AND EQUIPMENT

3.1. Description of Test Site

The test site is located at 11696 Sorrento Valley Road, Suite F, San Diego, CA 92121. The site is physically located 18 miles Northwest of downtown San Diego. The general area is a valley 1.5 miles east of the Pacific Ocean. This particular part of the valley tends to minimize ambient levels, i.e. radio and TV broadcast stations and land mobile communications. The three and ten-meter Open Area Test Site (OATS) is located behind the office/lab building. It conforms to the normalized site attenuation limits and construction specifications as set in the EN 55022 (1987), CISPR 16 and 22 (1985) and ANSI C63.4-1992 documents. The OATS normalized site attenuation characteristics are verified for compliance every year and the entire measurement facility was last registered with the Federal Communications Commission on December 15, 1999, FCC Registration Number 90579.

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	9 of 31

4. DESCRIPTION OF TESTING METHODS

4.1. Introduction

As required in 47 CFR, Parts 2 and 15, the methods employed to test the radiated and conducted emissions (as applicable) of the EUT are those contained within the American National Standards Institute (ANSI) document C63.4-1992, titled "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz." All applicable FCC Rule Sections that provide further guidance for performance of such testing are also observed.

For General Test Configuration please refer to Figure 1 on the following page.

Digital devices sold in Canada are required to comply with the Interference Causing Equipment Standard for Digital Apparatus, ICES-003. These test methods and limits are specified in the Canadian Standards Association's (CSA) Standard C108.8-M1983 (1-1-94 version) and are "essentially equivalent" with FCC, Part 15 and CISPR 22 (EN55022) rules for unintentional radiators per EMCAB-3, Issue 3 (May 1998). No further testing is required for compliance to ICES-003.

Nemko USA, Inc.	11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810		
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	10 of 31

Figure 1. General EUT Test Setup Diagram



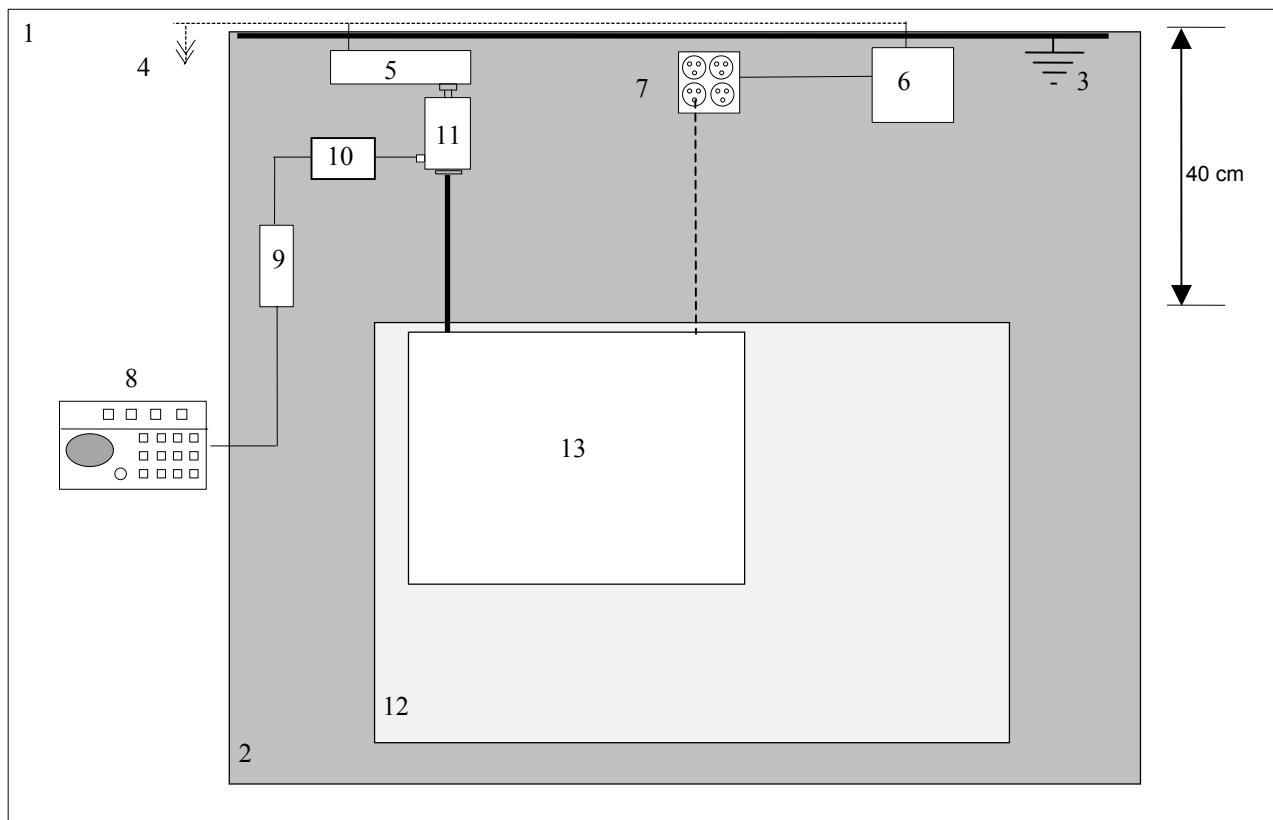
Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	11 of 31

4.2. Configuration and Methods of Measurements for Conducted Emissions

Section 7 of ANSI C63.4 determines the general configuration of the EUT and associated equipment, as well as the test platform for conducted emissions testing. Tabletop devices are placed on a non-conducting surface 80 centimeters above the ground plane floor and 40 centimeters from the ground plane wall. The EUT and associated system are configured to operate continuously, representing a “normally operating” mode. The EUT is powered via a Line Impedance Stabilization Network (LISN). The emissions are recorded using the required bandwidth of 9 kHz in the quasi-peak mode. The average amplitude is also observed employing a 10 kHz bandwidth to determine the presence of broadband RFI. When such interference is caused by broadband sources (as defined by the FCC and ANSI Rules), the deviation guidelines contained in Section 11.3.1 of ANSI C63.4 are employed, which allows a correction factor of 13 dB to be subtracted from the quasi-peak reading. The emission levels are then compared to the applicable FCC limits to determine compliance.

For Conducted Emissions Test Configuration please refer to Figure 2 on the following page.

DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	12 of 31

Figure 2. Conducted Emissions Test Setup Diagram*NOT TO SCALE***CONFIGURATION LEGEND**

1. Test Laboratory (6 X 6 meters)
2. Ground Plane (15 square meters)
3. Vertical Conducting Wall (Grounded through Ground Plane via 10' ground rod)
4. AC Power for Devices
5. Power Line Filter, Lindgren, 120 dB, 30 amp
6. Line Impedance Stabilization Network (LISN) for peripheral devices
7. Power Distribution Box for peripheral devices
8. Spectrum Analyzer with Quasi-Peak Adapter
9. High Pass Filter
10. Transient Limiter
11. LISN for EUT
12. Non-Conducting table 80 cm above ground plane
13. EUT: 20-00241 Radio Control Center Assembly and Associated System

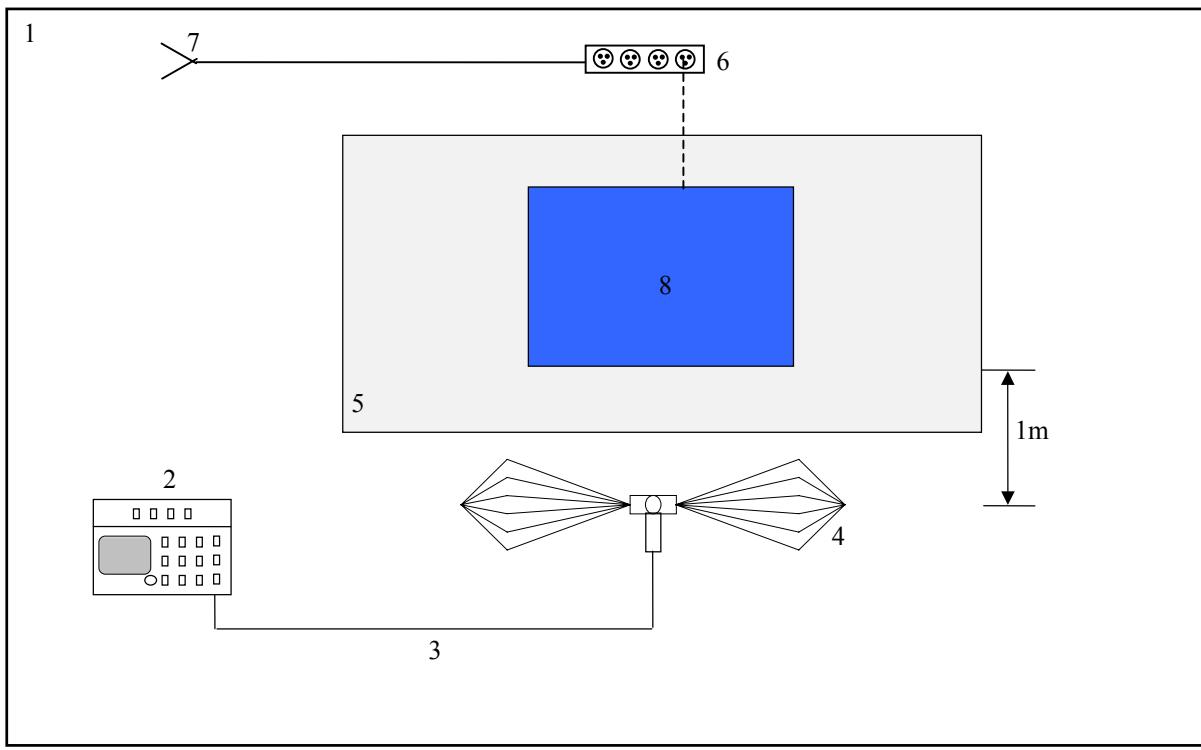
Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	13 of 31

4.3. Configuration and Methods of Measurements for Frequency Identification

When performing all testing of equipment, the actual emissions of the EUT are segregated from ambient signals present within the laboratory or the open-field test range. Preliminary testing is performed to ensure that ambient signals are sufficiently low to allow for proper observation of the emissions from the EUT. Incoming power lines are filtered using a 120 dB, 30-ampere; 115/208-volt filter to assist in reducing ambient signals for tests of levels of conducted emissions. Ambients within the laboratory are compared to those noted at the nearby open-field site to discriminate between signals produced from the EUT and ambient signals. In the event that a significant emission is produced by the EUT at a frequency which is also demonstrating significant ambient signals, the spectrum analyzer is placed in the peak mode, the bandwidth is narrowed, the EUT's signal is centered on the analyzer, the scan width is expanded to 50 kHz while monitoring the audio to ensure that only the EUT signal is present, the analyzer is switched to quasi-peak mode, and the level of the EUT signal is recorded.

For Frequency ID Test Configuration please refer to Figure 3 on the following page.

DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	14 of 31

Figure 3. Frequency ID of Radiated Emissions Test Setup Diagram**CONFIGURATION LEGEND**

1. Test Laboratory
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Antenna to Spectrum Analyzer
4. Receive Antenna (basic relative position)
5. Non-Conducting table 80 cm above ground plane
6. Power strip for EUT and peripherals
7. AC power for devices
8. EUT: 20-00241 Radio Control Center Assembly and Associated System

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	15 of 31

4.4. Configuration and Methods of Measurements for Radiated Emissions

Section 8 of ANSI C63.4 determines the general configuration and procedures for measuring the radiated emissions of equipment under test. Initially, the primary emission frequencies are identified inside the test lab by positioning a broadband receive antenna one meter from the EUT to locate frequencies of significant radiation. Next, the EUT and associated system are placed on a turntable on a ten meter open area test site (registered with the FCC in accord with its Rules and ANSI C63.4) and the receive antenna is located at a distance of ten meters from the EUT.

The EUT and associated system are configured to operate continuously, representing a “normally operating” mode. All significant radiated emissions are recorded when maximum radiation on each frequency is observed, in accordance with part 8 of ANSI C63.4-1992 and Section 15.33 of the FCC Rules. To ensure that the maximum emission at each discrete frequency of interest is observed, the receive antenna is varied in height from one to four meters and rotated to horizontal and vertical polarities, and the turntable is also rotated to determine the worst emitting configuration. The numerical results of the test are included herein to demonstrate compliance.

The numerical results that are applied to the emissions limits are arrived at by the following method:

Example: $A = RR + CL + AF$

A = Amplitude dBuV/M

RR = Receiver Reading dBuV

CL = cable loss dB

AF = antenna factor dBm-1

Example Frequency = 110MHz

18.5 dBuV (spectrum analyzer reading)

+3.0 dB (cable loss @ frequency)

21.5 dBuV

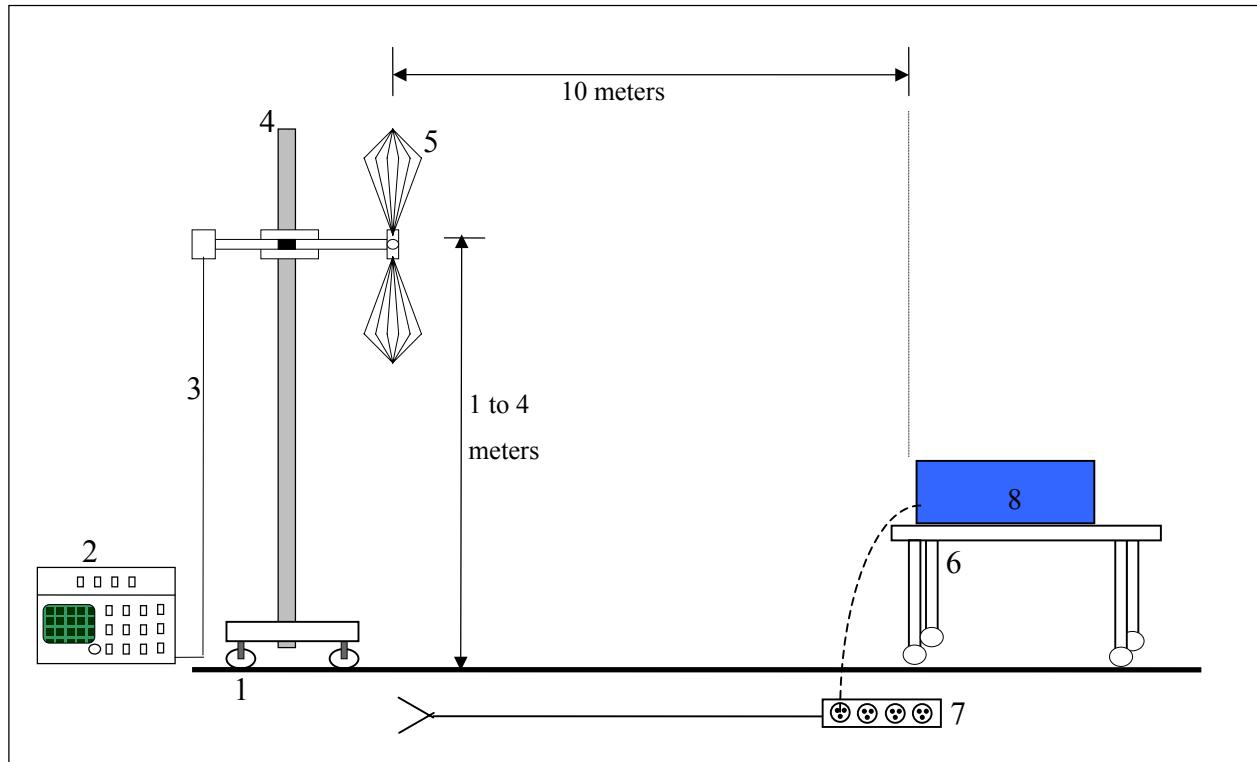
+15.4 dBm-1 (antenna factor @ frequency)

36.9 dBuV/M Final adjusted value

The final adjusted value is then compared to the appropriate emission limit to determine compliance.

For Radiated Emissions Test Configuration please refer to Figure 4 on the following page.

DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	16 of 31

Figure 4. Radiated Emissions Test Setup Diagram**CONFIGURATION LEGEND**

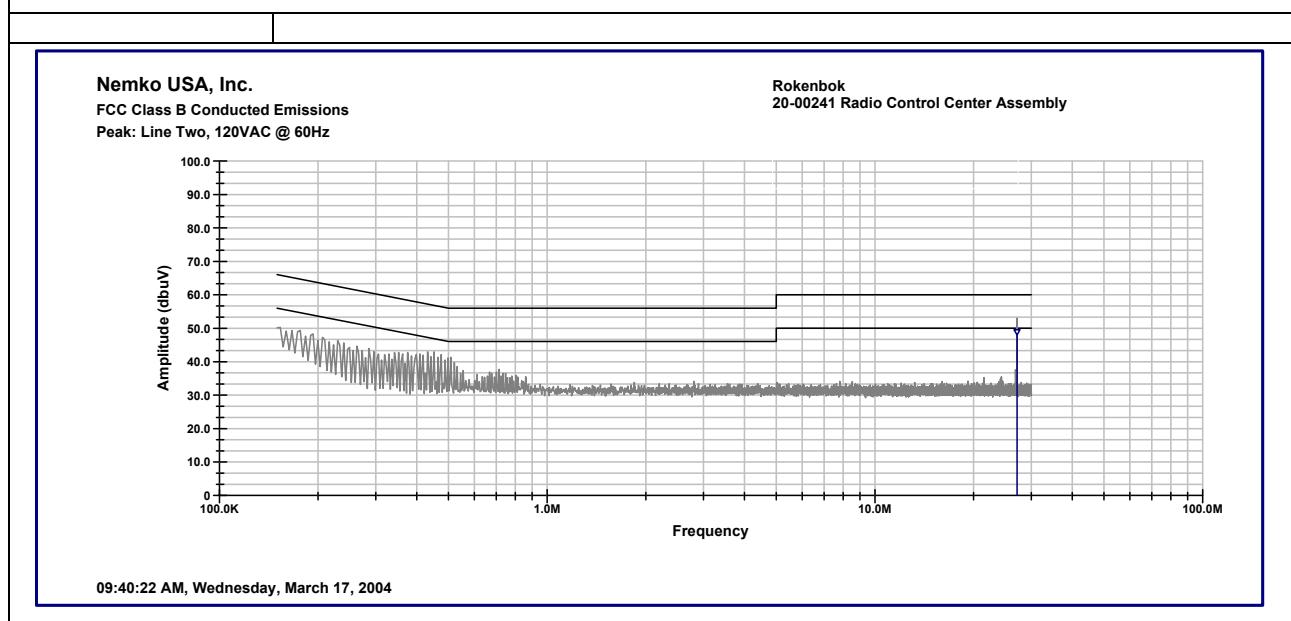
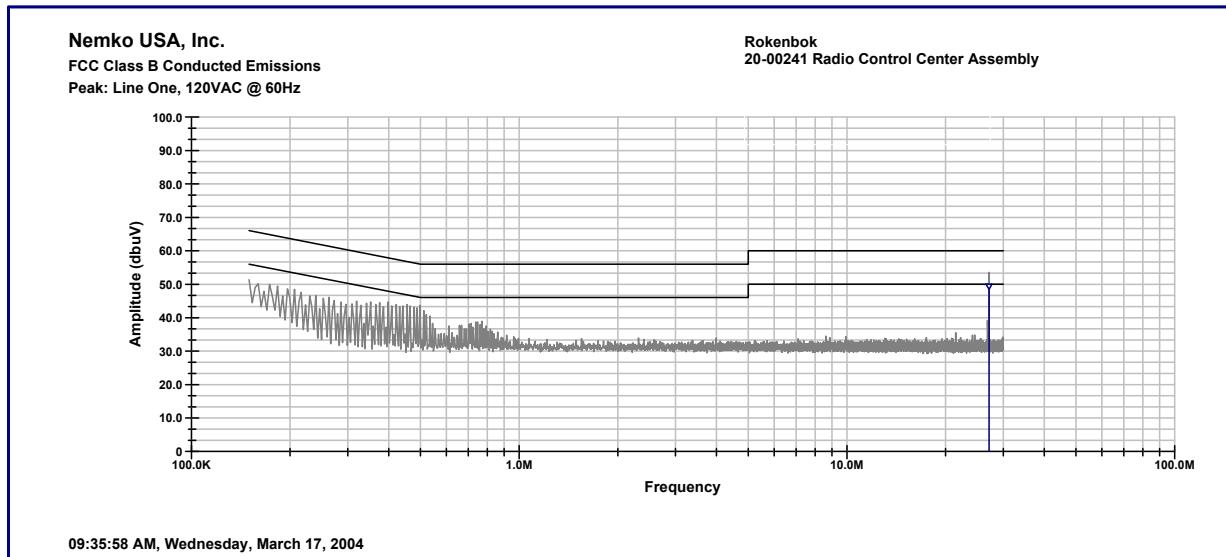
1. Ground plane (11 X 17 meters)
2. Spectrum Analyzer with Quasi-Peak Adapter
3. Coax interconnect from Receive Antenna to Spectrum Analyzer
4. Antenna Mast with motorized mounting assembly
5. Receive Antenna (basic relative position)
6. Non-Conducting table 80 cm above ground plane
7. AC power for devices
8. EUT: 20-00241 Radio Control Center Assembly and Associated System

DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	17 of 31

5. TEST RESULTS

5.1. Conducted Emissions Test Data

Client	Rokenbok	Temperature	72	deg F
PAN #	24-146-ROK	Relative Humidity	42	%
EUT Name	20-00241 Radio Control Center Assembly	Barometric Pressure	30.0	Hg
EUT Model	Rokenbok	Test Location	West Ground Plane	
Governing Doc	CFR 47, Part 15B	Test Engineer	Mark Phillips	
Basic Standard	ANSI C63.4	Date	3-17-04	



Nemko USA, Inc.	11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810		
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	18 of 31

Conducted Emissions Test Equipment

Client	Rokenbok	EUT Name	20-00241 Radio Control Center Assembly			
PAN #	24-146-ROK	EUT Model	Rokenbok			
<i>Device Type</i>		<i>Model #</i>	<i>Asset #</i>	<i>Used</i>	<i>Cal Done</i>	<i>Cal Due</i>
Pre-Amplifier						
Amplifier, HP	8447A	342				
Amplifier, HP	8447F	242				
Amplifier, HP	8447A	166				
Amplifier, HP	8447A	603				

Filter / Limiter

High Pass Filter, Solar	7801-50	564	X	12-09-03	12-09-04
Transient Limiter, HP	11947A	682	X	08-06-03	08-06-04

Transducer

LISN, EMCO	3825/2 – FCC	147			
LISN, Electro-Metrics	LISN – VDE	425			
V-Network LISN, Solar	9348-50-R-24-BNC	384			
V-Network LISN, Solar	9348-50-R-24-BNC	395	X	09-16-03	09-16-04
Voltage Line Probe, EMCO	3701	471			
LISN, Solar	8602-50-TS-50-N	424			
LISN, Solar	8602-50-TS-50-N	423			

Spectrum Analyzer / Receiver

Quasi-Peak Adapter, HP	85650A	533			
Spectrum Analyzer Display, HP	85662A	404			
Spectrum Analyzer, HP	8566B	104			
RF Preselector, HP	85650A	673			
Quasi-Peak Adapter, HP	85650A	438			
Spectrum Analyzer Display, HP	85662A	107	X	10-21-03	04-21-04
Spectrum Analyzer, HP	8568B	422			
Quasi-Peak Adapter, HP	85650A	676			
Spectrum Analyzer Display, HP	85662A	675			
Spectrum Analyzer, HP	8568B	674			
Quasi-Peak Adapter, HP	85650A	421			
Spectrum Analyzer Display, HP	85662A	534			
Spectrum Analyzer, HP	8568B	535			
Quasi-Peak Adapter, HP	85650A	538			
Spectrum Analyzer Display, HP	85662A	537			
Spectrum Analyzer, HP	8568B	711			
RF Preselector, HP	85685A	403			
Spectrum Analyzer, Advantest	R3261	523			

Nemko USA, Inc.	11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810		
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	19 of 31

5.2. Radiated Emissions Test Data

Nemko USA, Inc.
FCC, Part 15B, Class 'B' Radiated Emissions Data Sheet
(3m Open Area Test Site)

Client: **Rokenbok** **Conducted by:** Mark Phillips
EUT: **Radio Control Center Assembly** **Date of Test:** **03/17/04**
Model #: **20-00241** **Frequency Range:** **30-1000MHz**

Frequency (MHz)	Spectrum Analyzer Reading at 3m (dBuV)	Antenna Polarization (vertical or horizontal)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 3m (dB/m)	Total Interference Level at 3 m (dBuV/m)	Emission Spec. Limit at 3 m (dBuV/m)	Difference Margin (dB)
42.940	17.6	v	17.1	34.7	40.0	-5.3
54.285	15.9	v	13.0	28.9	40.0	-11.1
64.430	25.3	v	9.7	35.0	40.0	-5.0
69.800	19.9	v	8.6	28.5	40.0	-11.5
80.500	25.5	v	8.8	34.3	40.0	-5.7
81.430	22.2	h	9.0	31.2	40.0	-8.8
85.400	25.9	v	9.8	35.7	40.0	-4.3
108.575	15.6	h	13.7	29.3	43.5	-14.2
134.230	21.7	v	17.2	38.9	43.5	-4.6
135.720	11.2	v	17.2	28.4	43.5	-15.1
162.865	10.8	v	18.3	29.1	43.5	-14.4
190.014	9.3	v	20.7	30.0	43.5	-13.5
214.155	17.5	v	15.5	33.0	43.5	-10.5
230.327	12.7	v	15.7	28.4	46.0	-17.6
281.930	13.3	h	19.0	32.3	46.0	-13.7

Notes:

1. Chart includes all harmonics of 27.145 and all non-transmitter related emissions
2. Measurements were made using the Quasi-Peak detector
3. Analyzer RBW = 1MHZ, VBW=1MHZ, Quasi-Peak adaptor set to 120kHz.

Nemko USA, Inc.	11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810		
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	20 of 31

Nemko USA, Inc.
FCC, Part 15B, Paragraph 15.227, Class 'B' Radiated Emissions Data Sheet
(3m Open Area Test Site)

Client: **Rokenbok** *Conducted by:* Mark Phillips
EUT: **Radio Control Center Assembly** *Date of Test:* **03/17/04**
Model #: **20-00241** *Frequency Range:* **30-1000MHz**

Frequency (MHz)	Spectrum Analyzer Reading at 3m (dBuV)	Antenna Polarization (vertical or horizontal)	Amp. Gain & Cable Loss, Distance & Antenna Factor Correction for 3m (dB/m)	Total Interference Level at 3 m (dBuV/m)	Emission Spec. Limit at 3 m (dBuV/m)	Difference Margin (dB)
27.145	30.1	v	33.0	63.1	80.0	-16.9

NOTES:

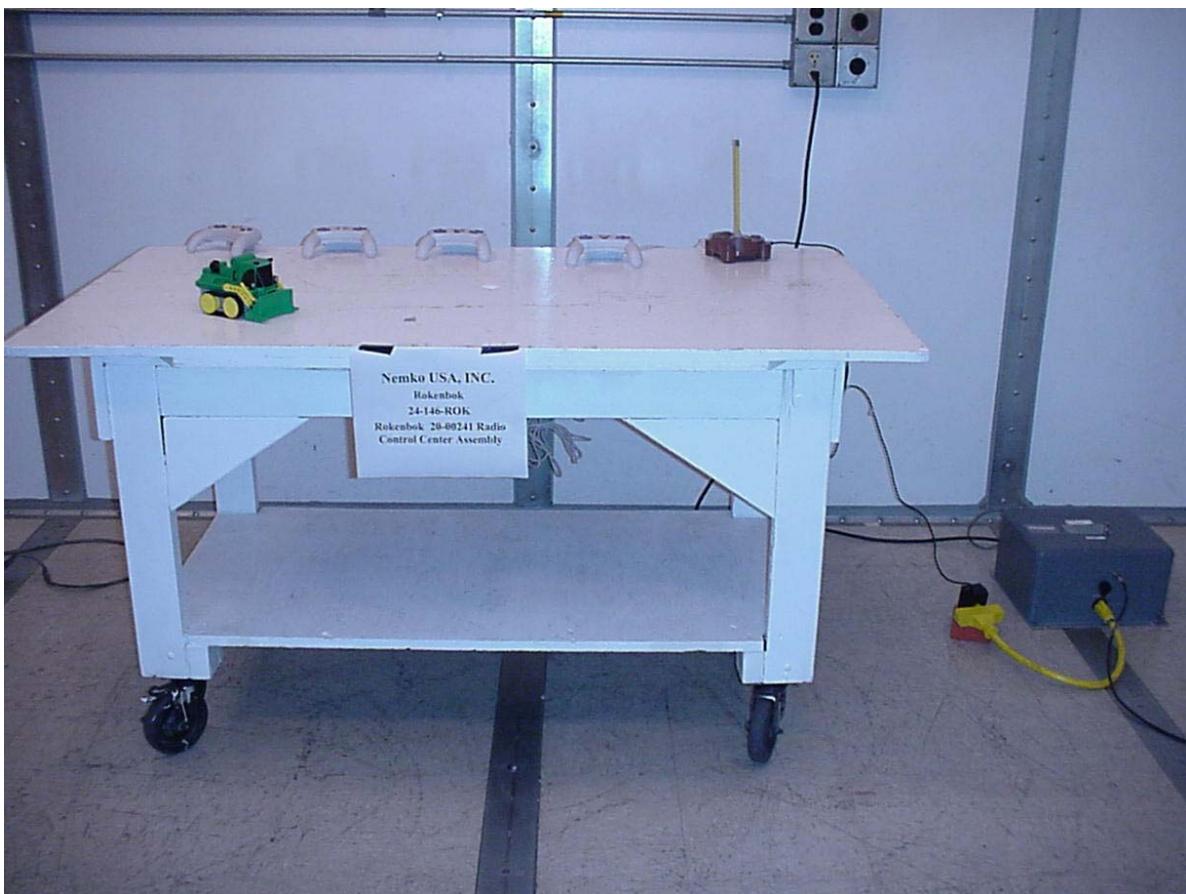
1. Transmit measured using a peak detector. Since the Peak measurement met the required limit no further measurements were required.
2. The loop antenna was used for the measurement of the transmit signal – see page 21.

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810			
DATE	DOCUMENT NAME			DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report			2004 030146 FCC	21 of 31

Radiated Emissions Test Equipment					
Client	Rokenbok	EUT Name	20-00241 Radio Control Center Assembly		
PAN #	24-146-ROK	EUT Model	Rokenbok		
Device Type	Model #	Asset #	Used	Cal Done	Cal Due
Pre-Amplifier					
Amplifier, HP	8447A	342			
Amplifier, HP	8447F	242			
Amplifier, HP	8447A	166			
Amplifier, HP	8447A	603			
Amplifier, HP	8449A	317			
Amplifier, Mini-Circuits	ZHL-1042J	630			
Amplifier, Mini-Circuits	ZHL-2	635			
Amplifier, Com-Power	PA103	826	X	5/21/03	5/21/04
Antenna OATS #1 (North)					
Antenna, Biconical	EMCO				
Antenna, Log Periodic					
Antenna, Ridged Guide	3115				
Antenna, Loop	ALR-25M				
Antenna, Rod	RVR-25M				
Antenna OATS #1 (South)					
Antenna, Biconical	EMCO	116	X	11-19-03	11-19-04
Antenna, Log Periodic	EMCO	112	X	9-19-03	9-19-04
Antenna, Ridged Guide	3115				
Antenna, Loop	ALR-25M	574	X	10-20-03	10-20-04
Antenna, Rod	RVR-25M				
Spectrum Analyzer / Receiver					
Quasi-Peak Adapter, HP	85650A	533			
Spectrum Analyzer Display, HP	85662A	404			
Spectrum Analyzer, HP	8566B	104			
RF Preselector, HP	85650A	673			
Quasi-Peak Adapter, HP	85650A	438			
Spectrum Analyzer Display, HP	85662A	534	X	09-25-03	3-25-04
Spectrum Analyzer, HP	8568B	107			
Quasi-Peak Adapter, HP	85650A	676			
Spectrum Analyzer Display, HP	85662A	675			
Spectrum Analyzer, HP	8568B	674			
Quasi-Peak Adapter, HP	85650A	421			
Spectrum Analyzer Display, HP	85662A	422			
Spectrum Analyzer, HP	8568B	535			
Quasi-Peak Adapter, HP	85650A	538			
Spectrum Analyzer Display, HP	85662A	537			
Spectrum Analyzer, HP	8568B	711			
RF Preselector, HP	85685A	403			
Spectrum Analyzer, Advantest	R3261	523			

Nemko USA, Inc.	11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810		
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	22 of 31

Photograph 1. Conducted Emissions Test Configuration



Nemko USA, Inc.	11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810		
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	23 of 31

Photograph 2. Radiated Emissions Test Configuration



Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE

3-18-04 Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report 2004 030146 FCC 24 of 31

APPENDIX A

A. Conducted & Radiated Emissions Measurement Uncertainties

1. Introduction

ISO Standard 17025 and ANSI/NCSL Z540-1(1994) require that all measurements contained in a test report be “traceable”. “Traceability” is defined in the *International Vocabulary of Basic and General Terms in Metrology* (ISO: 1993) as: “the property of the result of a measurement... whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons, *all having stated uncertainties*”.

The purposes of this Appendix are to “state the *Measurement Uncertainties*” of the conducted emissions and radiated emissions measurements contained in Section 5 of this Test Report, and to provide a practical explanation of the meaning of these measurement uncertainties.

2. Statement of the Worst-Case Measurement Uncertainties for the Conducted and Radiated Emissions Measurements Contained in This Test Report

Table 1: Worst-Case Expanded Uncertainty "U" of Measurement for a k=2 Coverage Factor

Conducted Emissions Measurement Detection Systems	Applicable Frequency Range	"U" for a k=2 Coverage Factor
HP8568B Spectrum Analyzer with QPA and HP8447F Preamplifier	150 kHz - 30 MHz	+/- 3.0 dB
HP8566B Spectrum Analyzer with QPA and Preselector	9 kHz - 30 MHz	+/- 2.9 dB
Radiated Emissions Measurement Detection Systems	Applicable Frequency Range	"U" for a k=2 Coverage Factor
HP8568B Spectrum Analyzer with QPA & HP8447F Preamplifier	30 MHz - 200 MHz	+4.0 dB, -4.1 dB
HP8568B Spectrum Analyzer with QPA & HP8447F Preamplifier	200 MHz-1000 MHz	+/- 3.5 dB
HP8566B Spectrum Analyzer with QPA & Preselector	30 MHz - 200 MHz	+3.9 dB, -4.0 dB
HP8566B Spectrum Analyzer with QPA & Preselector	200 MHz-1000 MHz	+/- 3.4 dB
HP8566B Spectrum Analyzer with QPA & HP 8449A Preamplifier	1 GHz - 18 GHz	+2.5 dB, -2.6 dB
HP8566B Spectrum Analyzer with QPA & HP8449A Preamplifier	18 GHz - 40 GHz	+/- 3.4 dB

NOTES:

1. Applies to 3 and 10 meter measurement distances
2. Applies to all valid combinations of Transducers (i.e. LISNs, Line Voltage Probes, and Antennas, as appropriate)
3. Excludes the Repeatability of the EUT

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE

3-18-04 Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report

2004 030146 FCC

25 of 31

3. Practical Explanation of the Meaning of the Conducted and Radiated Emissions Measurement Uncertainties

In general, a “Statement of Measurement Uncertainty” means that with a certain (specified) confidence level, the “true” value of a measurand will be between a (stated) upper bound and a (stated) lower bound.

In the specific case of EMC Measurements in this test report, the measurement uncertainties of the conducted emissions measurements and the radiated emissions measurements have been calculated in accordance with the method detailed in the following documents:

- *ISO Guide to the Expression of Uncertainty in Measurement* (ISO, 1993)
- *NIS 81:1994, The Treatment of Uncertainty in EMC Measurements* (NAMAS, 1994)
- *NIST Technical Note 1297(1994), Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results* (NIST, 1994)

The calculation method used in these documents requires that the stated uncertainty of the measurements be expressed as *an “expanded uncertainty”, U, with a k=2 coverage factor*. The practical interpretation of this method of expressing measurement uncertainty is shown in the following example:

EXAMPLE: Assume that at 39.51 MHz, the (measured) radiated emissions level was equal to +26.5 dBuV/m, and that the +/- 2 standard deviations (i.e. 95% confidence level) measurement uncertainty was +/- 3.4 dB.

In the example above, the phrase “k = 2 Coverage Factor” simply means that the measurement uncertainty is stated to cover +/- 2 standard deviations (i.e. a 95% confidence interval) about the measurand. The measurand is the radiated emissions measurement of +26.5 dBuV/m at 39.51 MHz, and the 95% bounds for the uncertainty are -3.4 dB to + 3.4 dB. One can thus be 95% confident that the “true” value of the radiated emissions measurement is between +23.1 dBuV/m and +29.5 dBuV/m. *In effect, this means that in the above example there is only a 2.5% chance that the “true” radiated emissions value exceeds +29.5 dBuV/m.*

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE

3-18-04 Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report 2004 030146 FCC 26 of 31

APPENDIX B

B. Nemko USA, Inc.'s Test Equipment & Facilities Calibration Program

Nemko USA, Inc. operates a comprehensive Periodic Calibration Program in order to ensure the validity of all test data. Nemko USA's Periodic Calibration Program is fully compliant to the requirements of NVLAP Policy Guide PG-1-1988, ANSI/NCSL Z540-1 (1994), ISO 10012-1 (1993-05-01), ISO Standard 17025, ISO-9000 and EN 45001. Nemko USA, Inc.'s calibrations program therefore meets or exceed the US national commercial and military requirements [N.B. ANSI/NCSL Z540-1 (1994) replaces MIL-STD-45662A].

Specifically, all of Nemko USA's *primary reference standard devices* (e.g. vector voltmeters, multimeters, attenuators and terminations, RF power meters and their detector heads, oscilloscope mainframes and plug-ins, spectrum analyzers, RF preselectors, quasi-peak adapters, interference analyzers, impulse generators, signal generators and pulse/function generators, field-strength meters and their detector heads, etc.) and certain *secondary standard devices* (e.g. RF Preamplifiers used in CISPR 11/22 and FCC Part 15/18 tests) are periodically recalibrated by:

- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratories by NIST; or,
- A Nemko USA-approved independent (third party) metrology laboratory that uses NIST-traceable standards and that is ISO Guide 25-accredited as a calibration laboratory by another accreditation body (such as A2LA) that is mutually recognized by NIST; or,
- A manufacturer of Measurement and Test Equipment (M&TE), if the manufacturer uses NIST-traceable standards and is ISO Guide 25-accredited as calibration laboratory either by NIST or by another accreditation body (such as A2LA) that is mutually recognized by NIST; or
- A manufacturer of M&TE (or by a Nemko USA-approved independent third party metrology laboratory) that is not ISO Guide 25-accredited. (In these cases, Nemko USA conducts an annual audit of the manufacturer or metrology laboratory for the purposes of proving traceability to NIST, ensuring that adequate and repeatable calibration procedures are being applied, and verifying conformity with the other requirements of ISO Guide 25).

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	27 of 31

In all cases, the entity performing the Calibration is required to furnish Nemko USA with a calibration test report and/or certificate of calibration, and a “calibration sticker” on each item of M&TE that is successfully calibrated.

Calibration intervals are normally one year, except when the manufacture advises a shorter interval (e.g. the HP 8568B Spectrum Analyzer is recalibrated every six months) or if US Government directives or client requirements demand a shorter interval. Items of instrumentation/related equipment which fail during routine use, or which suffer visible mechanical damage (during use or while in transit), are sidelined pending repair and recalibration. (Repairs are carried out either in-house [if minor] or by a Nemko USA-approved independent [third party] metrology laboratory, or by the manufacturer of the item of M&TE).

Each antenna used for CISPR 11 and CISPR 22 and FCC Part 15 and Part 18 radiated emissions testing (and for testing to the equivalent European Norms) is calibrated annually by either a NIST (or A2LA) ISO Standard 17025-Accredited third-party Antenna Calibration Laboratory or by the antenna’s OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory. The antenna calibrations are performed using the methods specified in Annex G.5 of CISPR 16-1(1993) or ANSI C63.5-1991, including the “Three-Antenna Method”. Certain other kinds of antennas (e.g. magnetic-shielded loop antennas) are calibrated annually by either a NIST (or A2LA) ISO Standard 17025-accredited third-party antenna calibration laboratory, or by the antenna’s OEM if the OEM is NIST or A2LA ISO Standard 17025-accredited as an antenna calibration laboratory using the procedures specified in the latest version of SAE ARP-958.

In accordance with FCC and other regulations, Nemko USA recalibrates its suite of antennas used for radiated emissions tests on an annual basis. These calibrations are performed as a precursor to the FCC-required annual revalidation of the Normalized Site Attenuation properties of Nemko USA’s Open Area Test Site. Nemko USA, Inc. uses the procedures given in both Subclause 16.6 and Annex G.2 of CISPR 16-1 (1993), and, ANSI C63.4-1992 when performing the normalized site attenuation measurements.

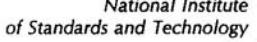
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	28 of 31

APPENDIX C

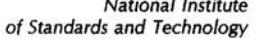
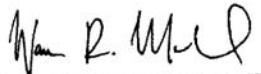
C. NVLAP Accreditation

<p>United States Department of Commerce National Institute of Standards and Technology</p> <p>NVLAP[®]</p> <p>ISO/IEC 17025:1999 ISO 9002:1994</p>	<p>DEPARTMENT OF COMMERCE * AMERICA * UNITED STATES OF</p> <p>Certificate of Accreditation</p> <p>NEMKO USA, INC. - SAN DIEGO EMC DIVISION SANDIEGO, CA</p> <p>is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for: ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS</p> <p>December 31, 2004 Effective through <i>P. W.</i></p> <p>For the National Institute of Standards and Technology NVLAP Lab Code: 200116-0</p> <p>NVLAP-01C (06-01)</p>
--	--

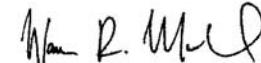
Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	29 of 31

 NVLAP [®] <i>National Voluntary Laboratory Accreditation Program</i>	Scope of Accreditation	 Page: 1 of 3
ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS		NVLAP LAB CODE 200116-0
NEMKO USA, INC. - SAN DIEGO EMC DIVISION 11696 Sorrento Valley Road, Suite F San Diego, CA 92121 Mr. Ricky Hill Phone: 858-755-5525 x207 Fax: 858-793-9914 E-Mail: rick.hill@nemko.com URL: http://www.nemko.com		
NVLAP Code Designation / Description		
Emissions Test Methods:		
12/CIS14	CISPR 14-1 (March 30, 2000): Limits and Methods of Measurement of Radio interference Characteristics of Household Electrical Appliances, Portable Tools and Similiar Electrical Apparatus - Part 1: Emissions	
12/CIS14a	EN 55014-1 (1993) with Amendments A1 (1997) & A2 (1999)	
12/CIS14b	AS/NZS 1044 (1995)	
12/CIS14c	CNS 13783-1	
12/CIS22	IEC/CISPR 22 (1997) and EN 55022 (1998): Limits and methods of measurement of radio disturbance characteristics of information technology equipment	
12/CIS22a	IEC/CISPR 22 (1993): Limits and methods of measurement of radio disturbance characteristics of information technology equipment, Amendment 1 (1995) and Amendment 2 (1996)	
December 31, 2004 <hr/> Effective through <hr/> <i>Wm R. McJ</i> For the National Institute of Standards and Technology		

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	30 of 31

 NVLAP [®] <i>National Voluntary Laboratory Accreditation Program</i>	Scope of Accreditation  Page: 2 of 3
ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS	
NEMKO USA, INC. - SAN DIEGO EMC DIVISION	
NVLAP Code Designation / Description	
12/CIS22b CNS 13438 (1997): Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment	
12/EM02a IEC 61000-3-2, Edition 2.1 (2001-10), EN 61000-3-2 (2000), and AS/NZS 2279.1 (2000): Electromagnetic compatibility (EMC) Part 3-2: Limits - Limits for harmonic current emissions (equipment input current <= 16 A)	
12/EM03b IEC 61000-3-3 (2002-03), edition 1.1: EMC - Part 3-3: Limits - Limitations of voltage changes, voltage fluctuations and flicker, in public low-voltage supply-systems, for equipment with rated current <=16 A per phase and not subject to conditional connections	
12/F18 FCC OST/MP-5 (1986): FCC Methods of Measurement of Radio Noise Emissions for ISM Equipment (cited in FCC Method 47 CFR Part 18 - Industrial, Scientific, and Medical Equipment)	
12/FCC15b ANSI C63.4 (2001) with FCC Method - 47 CFR Part 15, Subpart B: Unintentional Radiators	
12/T51 AS/NZS CISPR 22 (2002) and AS/NZS 3548 (1997): Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment	
December 31, 2004	
Effective through	
 <i>For the National Institute of Standards and Technology</i>	

Nemko USA, Inc.		11696 Sorrento Valley Road, Suite F, San Diego, CA 92121 Phone (858) 755-5525 Fax (858) 452-1810	
DATE	DOCUMENT NAME	DOCUMENT #	PAGE
3-18-04	Rokenbok 20-00241 Radio Control Center Assembly FCC Test Report	2004 030146 FCC	31 of 31

 <i>National Institute of Standards and Technology</i>	<i>National Voluntary Laboratory Accreditation Program</i>
Scope of Accreditation	
<small>ISO/IEC 17025:1999 ISO 9002:1994</small>	
<small>DEPARTMENT OF COMMERCE UNITED STATES OF AMERICA</small>	
<small>Page: 3 of 3</small>	
ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS	
NEMKO USA, INC. - SAN DIEGO EMC DIVISION	
NVLAP Code Description / Description	
Immunity Test Methods:	
12/I01	IEC 61000-4-2, Edition 2.1 (2001) including Amds. 1 & 2 and EN 61000-4-2: Electrostatic Discharge Immunity Test
12/I02	IEC 61000-4-3 (2002) and EN 61000-4-3: Radiated Radio-Frequency Electromagnetic Field Immunity Test
12/I03	IEC 61000-4-4 (1995) + Amd. 1 (2000) & Amd. 2 (2001) and EN 61000-4-4: Electrical Fast Transient/Burst Immunity Test
12/I04	IEC 61000-4-5 (1995) + Amd. 1 (2000) and EN 61000-4-5: Surge Immunity Test
12/I05	IEC 61000-4-6, Edition 2.0 (2003) and EN 61000-4-6: Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields
12/I06	IEC 61000-4-8, Edition 1.1 (2001) and EN 61000-4-8: Power Frequency Magnetic Field Immunity Test
12/I07	IEC 61000-4-11 (1994) + Amd. 1 (2000) and EN 61000-4-11: Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests
December 31, 2004	
<u>Effective through</u>	
	
<i>For the National Institute of Standards and Technology</i>	