

NATIONAL CERTIFICATION LABORATORY

**8370 Court Avenue, Suite B-1
Ellicott City MD 21043
(410) 461-5548**

FCC REPORT OF RADIO INTERFERENCE

for

**Probotics, Inc.
Suite 223, 700 River Ave.
Pittsburgh, PA 15212**

FCC ID: N40-CYE1

October 5, 1998

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1.0 Introduction

This report has been prepared on behalf of Probotics, Inc. to support the attached Application for Certification of a Part 15 Class B Digital Device. The Equipment Under Test was the Probotics, Inc. *CYE Robot Base Unit*.

Radio-Noise Emissions tests were performed according to the ANSI C63.4- 1992, Chapter 11 titled "Measurement of Information Technology Equipment". The measuring equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

Testing was performed at National Certification Laboratory in Ellicott City, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch. FCC acceptance was granted on May 26, 1993.

1.1 Summary

The Probotics, Inc. *CYE Robot Base Unit* complies with the limits for a Class B Digital Device.

2.0 Description of Equipment Under Test (EUT)

The EUT Features:

FEATURES

Serial-RS232 Interface

Battery Charger terminals for CYE Robot

Radio Transceiver link to CYE Robot

15 VDC Power from A.C. Adapter

2.1 EMI Countermeasures

No modifications were made to the EUT, by the project engineer to assure compliance to Class B specifications:

3.0 Test Program

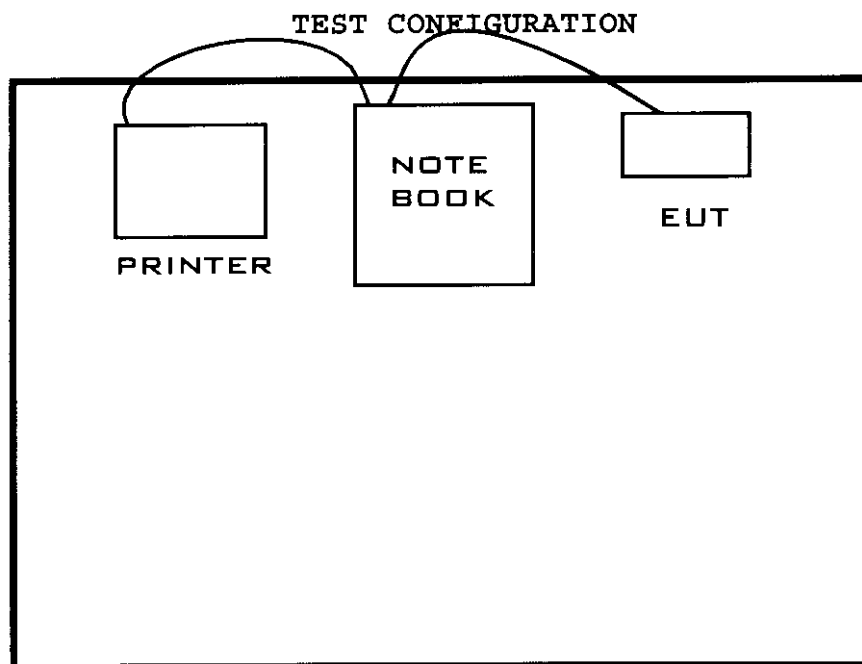
A Windows 95 proprietary software is used to exercise the EUT. The exercise consisted of instructing the remote robot unit to move in a continual circle. The EUT was tested in Serial mode of operation. Worst case emissions are recorded in the data tables.

4.0 Test Configuration

The Host computer system and support equipment were setup on the test table in a manner which follows the general guidelines of ANSI C63.4, Section 6.2.1. The support equipment consisted of a notebook computer, and printer as prescribed in Section 11.2 (ANSI C63.4). The computer was centered on the table with it's rear flush with the rear of the table.

The EUT was placed 10 cm to the right side of the notebook. The printer was placed 10 cm to the left side of the notebook.

Serial and parallel I/O cables were draped over the back edge of the table. Cables were more than 40 cm from the ground plane during radiated and conducted tests.



5.0 Conducted Emissions Scheme

The EUT is placed on an 80 cm high 1 X 1.5 m non-conductive table. Power to the EUT is provided through a Solar Corporation 50 Ω /50 μ H Line Impedance Stabilization Network bonded to a 2.2 X 2 meter horizontal ground plane, and a 2.2 X 2 meter vertical ground plane. The LISN has its AC input supplied from a filtered AC power source. A separate LISN provides AC power to the peripheral equipment. I/O cables are moved about to obtain maximum emissions.

The 50 Ω output of the LISN is connected to the input of the spectrum analyzer and emissions in the frequency range of 450 kHz to 30 MHz are searched. The detector function is set to quasi-peak and the resolution bandwidth is set at 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth for final measurements. All emissions within 20 dB of the limit are recorded in the data tables.

6.0 Radiated Emissions Scheme

The EUT was initially scanned in the frequency range 30 to 1000 MHz indoors, at a distance of 1 meter to determine its emissions profile. The EUT was then placed on an 80 cm high 1 X 1.5 meter non-conductive motorized turntable for radiated testing on the 3-meter open area test site. The emissions from the EUT are measured continuously at every azimuth by rotating the turntable. Biconical and log periodic broadband antennas are mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna is varied between 1 and 4 meters. Cables are varied in position to produce maximum emissions. Both the horizontal and vertical field components are measured.

The output from the antenna is connected to the input of the spectrum analyzer. The detector function is set to quasi-peak. The resolution bandwidth of the spectrum analyzer system is set at 120 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth. All emissions within 20 dB of the limit are recorded in the data tables.

To convert the spectrum analyzer reading into a quantified E-field level to allow comparison with the FCC limits, it is necessary to account for various calibration factors. These factors include cable loss (CL) and antenna factors (AF). The AF/CL in dB/m is algebraically added to the Spectrum Analyzer Voltage in $\text{dB}\mu\text{V}$ to obtain the Radiated Electric Field in $\text{dB}\mu\text{V}/\text{m}$. This level is then compared with the FCC limit.

Example:

Spectrum Analyzer Volt: $\text{VdB}\mu\text{V}$

Composite Factor: $\text{AF/CLdB}/\text{m}$

Electric Field: $\text{EdB}\mu\text{V}/\text{m} = \text{VdB}\mu\text{V} + \text{AF/CLdB}/\text{m}$

Linear Conversion: $\text{EuV}/\text{m} = \text{Antilog} (\text{EdB}\mu\text{V}/\text{m}/20)$

FCC CLASS B RADIATED EMISSIONS DATA

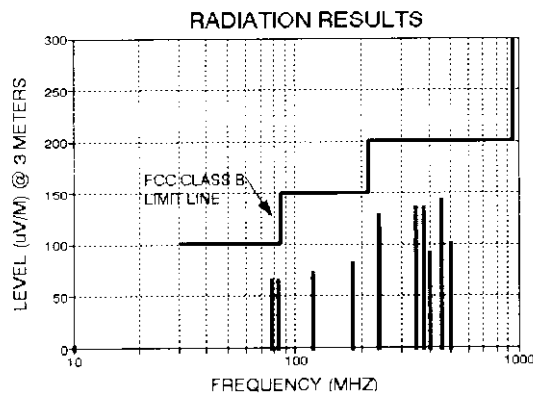
FCC ID: N4O-CYE1

CLIENT: PROBOTICS
EUT: BASE UNIT

3-METER TEST		QP LVL	DATE: 10/01/98				
FREQ MHz	POL H/V	SPEC A dBuV	AF/CL dB/m	E-FIELD dBuV/m	E-FIELD uV/m	LIMIT uV/m	MRG dB
78.39	V	28.0	8.0	36.0	63.1	100.0	-4.0
84.19	H	21.0	15.0	36.0	63.1	100.0	-4.0
120.00	H	28.0	9.0	37.0	70.8	150.0	-6.5
180.00	H	20.0	18.0	38.0	79.4	150.0	-5.5
235.75	H	22.0	20.0	42.0	125.9	200.0	-4.0
241.28	H	21.0	20.0	41.0	112.2	200.0	-5.0
347.95	V	24.5	18.0	42.5	133.4	200.0	-3.5
376.24	V	23.5	19.0	42.5	133.4	200.0	-3.5
401.00	H	22.0	17.0	39.0	89.1	200.0	-7.0
451.08	V	23.0	20.0	43.0	141.3	200.0	-3.0
501.23	V	20.0	20.0	40.0	100.0	200.0	-6.0

TEST ENGINEER

DANIEL OWENS



FCC CLASS B CONDUCTED EMISSIONS DATA

FCC ID: N4O-CYE1

CLIENT: PROBOTICS
EUT: BASE UNIT

LINE 1 - NEUTRAL

FREQ MHz	VOLTAGE dBuV	QP LEVEL	FCC LIMIT uV	MARGIN dB
		VOLTAGE uV		
0.456	42	125.9	250	-6
0.637	37.4	74.1	250	-10.6
1.608	34.8	55.0	250	-13.2
12	25.8	19.5	250	-22.2

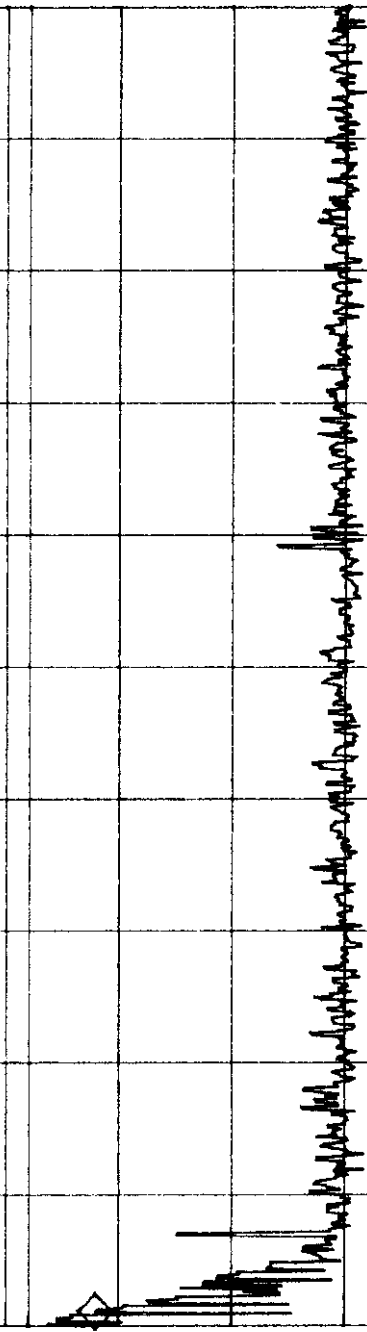
LINE 2 - PHASE

FREQ MHz	VOLTAGE dBuV	QP LEVEL	FCC LIMIT uV	MARGIN dB
		VOLTAGE uV		
0.456	38.4	83.2	250	-9.6
0.637	35.1	56.9	250	-12.9
1.608	43.6	151.4	250	-4.4
12	26.8	21.9	250	-21.2

Combustion - 21

70dBuV

MK 0.4MHz 20MHz
42.0dBuV 10dB/
10kHzW



DL 48dBuV

AFC

ST 50ms/ VF 100kHz ATT 10dB

Continued - 42
70dBuV

20MHz

10.2MHz

10dB/
10kHzW

1.6MHz
43.6dBuV

MK

DL 48dBuV

AFC

ST 50ms/

ATT 10dB

VF 100kHz

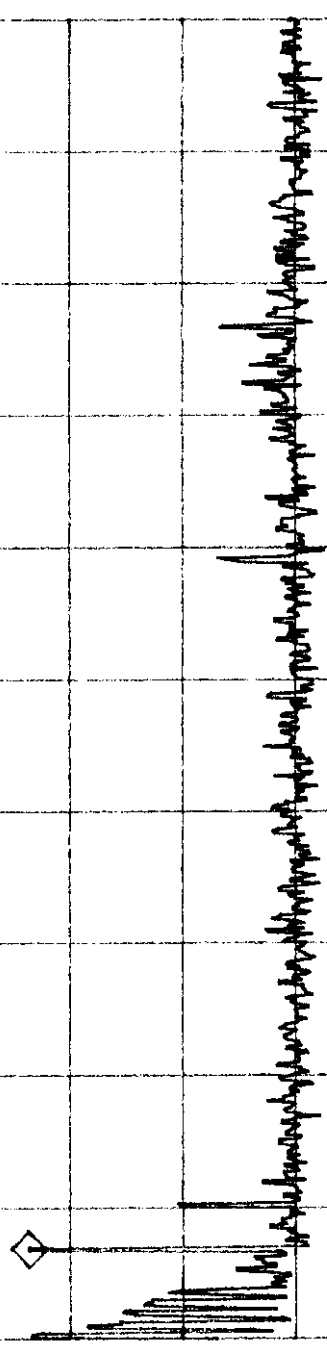


Table 1**Support Equipment**

MANUFACTURER	FCC ID #	SERIAL #
SERIAL DEVICE: EUT Probotics RobotBase	N40-CYE1	None
PARALLEL DEVICE: Epson T-1000 Printer	BKM9A8P7ORA	OAO059174
HOST COMPUTER: Kapok Computers Notebook	L4PK5000T2	NISD617017853

Note: There are no ferrite beads attached to any I/O cables for this test.	
All other I/O cables such as monitor, keyboard are permanently attached to the peripherals - presume shielded.	
EUT Power	Unshielded 15 VDC power cord from AC adapter
HOST to EUT	3.2 meters bundled to 1 meter in length - unshielded
HOST to Printer	1.5 meters bundled to 1 meter in length - shielded

Interface Cables Used

Table 2

Table 3

Measurement Equipment Used

The following equipment is used to perform measurements:

EQUIPMENT	SERIAL NUMBER
Wavetek 2410A 1100 MHz Signal Generator	1362016
EMCO Model 3110 Biconical Antenna	1619
EMCO Model 3146 Log Periodic Antenna	1222
Solar 8012-50-R-24-BNC LISN	924867
Advantest Model R4131D Spectrum Analyzer	54378A
Solar 8012-50-R-24-BNC LISN	927230
4 Meter Antenna Mast	None
Motorized Turntable	None
RG-233U 50 ohm coax Cable	None