



FCC Certification Test Report Addendum
for
Highway Technologies, Inc.
NB31032

April 02, 2002

Prepared for:

Highway Technologies, Inc.
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Mechanicsburg, PA 17050

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FCC Certification Test Program

FCC Certification Test Report Addendum for the Highway Technologies, Inc. AR-103 Wizard NB31032

April 2, 2002

WLL JOB# 6919

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Abstract

This report addendum has been prepared on behalf of Highway Technologies, Inc. to address the FCC issues contained in FCC Correspondence Reference Number: 22257 for the Highway Technologies, Inc. AR-103 Wizard; FCC ID: NB31032.

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1 Introduction

1.1 Compliance Statement

The Highway Technologies, Inc. AR-103 Wizard complies with the limits for a Citizens Band (CB) radio device under Part 95 of the FCC Rules and Regulations.

1.2 Test Scope

This test report addendum provides the test results for frequency stability, modulation characteristics, and calculation of the emission designator.

1.3 Contract Information

Customer:	Highway Technologies, Inc. 81 Texaco Road Mechanicsburg, PA 17050
Purchase Order Number:	1165
Quotation Number:	59604

1.4 Test Dates

Testing was performed from March 22 to April 1, 2002.

1.5 Test and Support Personnel

Washington Laboratories, LTD	Greg Snyder, Santo Lavorata
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2 Test Equipment

Table 1 shows a list of the test equipment used for measurements along with the calibration information.

Table 1: Test Equipment List

Equipment	Serial Number	Date Calibrated	Calibration Due
Hewlett-Packard 8901B Modulation Analyzer	223893	8/27/01	8/27//02
B&K Precision 4040A Sweep/Function Generator	N/A	N/A	N/A
Racal-Dana 1992 Frequency Counter	2894	1/16/02	1/16/03
Tenney Engineering TR64 Temp. Chamber	11128	5/7/01	5/7/02
BK Precision 1610 Power Supply	145-08663	N/A	N/A
Fluke 87 Multimeter	55150371	6/8/01	6/8/02

3 Test Results

3.1 Emission Designation Calculation

The following formula was used to calculate the necessary bandwidth and emission designator for the Wizard.

Necessary Bandwidth:

$$2M + 2D$$

M = Maximum Modulation Frequency

D = Maximum Deviation Frequency

$$M = 2000 \text{ Hz}$$

$$D = 2000 \text{ Hz}$$

$$2(2000) + 2(2000) = 8 \text{ kHz}$$

Type of emission: A3E

Therefore:

$$\text{Emissions Designator} = 8K00A3E$$

3.2 Frequency Stability: (FCC Part §2.1055)

Frequency as a function of temperature and voltage variation shall be maintained within the FCC-prescribed tolerances.

The temperature stability was measured with the unit in an environmental chamber used to vary the temperature of the sample. The sample was held at each temperature step to allow the temperature of the sample to stabilize.

The EUT is powered by DC voltage supplied externally. The power requirements for the EUT include the following:

Low DC Voltage of 10.2 Vdc (85% of 12 Vdc)

High DC Voltage of 13.8 Vdc (115% of 12 Vdc)

The frequency stability of the transmitter was examined at the voltage extremes and for the temperature range of -30°C to +50°C. The carrier frequency was measured while the EUT was in the temperature chamber. The reference frequency of the EUT was measured at the ambient room temperature with the frequency counter. The following are the reference frequencies at ambient for the Low, Middle, and High channels.

Table 2: Frequency Stability Over Temperature

Channel 36

Temperature Degrees C	Frequency (Hz)	Difference (Hz)	Limit 0.005%
Ambient	2.736468E + 07		1368.234
50	2.736486E + 07	-178	1368.234
40	2.736485E + 07	-165	1368.234
30	2.736485E + 07	-169	1368.234
20	2.736487E + 07	-189	1368.234
10	2.736489E + 07	-207	1368.234
0	2.736489E + 07	-209	1368.234
-10	2.736487E + 07	-190	1368.234
-20	2.736487E + 07	-189	1368.234
-30	2.736485E + 07	-170	1368.234

Channel 19

Temperature Degrees C	Frequency (Hz)	Difference (Hz)	Limit 0.005%
Ambient	2.718492E + 07		1359.246
50	2.718512E + 07	-195	1368.234
40	2.718510E + 07	-175	1368.234
30	2.718506E + 07	-138	1368.234
20	2.718510E + 07	-181	1368.234
10	2.718507E + 07	-150	1368.234
0	2.718507E + 07	-145	1368.234
-10	2.718510E + 07	-174	1368.234
-20	2.718506E + 07	-137	1368.234
-30	2.718509E + 07	-170	1368.234

Channel 3

Temperature Degrees C	Frequency (Hz)	Difference (Hz)	Limit 0.005%
Ambient	2.698945E + 07		1349.473
50	2.698962E + 07	-168	1368.234
40	2.698961E + 07	-157	1368.234
30	2.698959E + 07	-139	1368.234
20	2.698961E + 07	-159	1368.234
10	2.698961E + 07	-156	1368.234
0	2.698963E + 07	-180	1368.234
-10	2.698963E + 07	-173	1368.234
-20	2.698961E + 07	-155	1368.234
-30	2.698961E + 07	-158	1368.234

Table 3: Frequency Stability Over Voltage

Channel 3

Temperature Vdc	Frequency (Hz)	Difference (Hz)	Limit 0.005%
12	2.698949E + 07		1349.474
13.8	2.698962E + 07	-134	1368.234
10.2	2.698957E + 07	-88	1368.234

Channel 19

Temperature Vdc	Frequency (Hz)	Difference (Hz)	Limit 0.005%
12	2.718451E + 07		1359.225
13.8	2.718458E + 07	-71	1368.234
10.2	2.718459E + 07	-87	1368.234

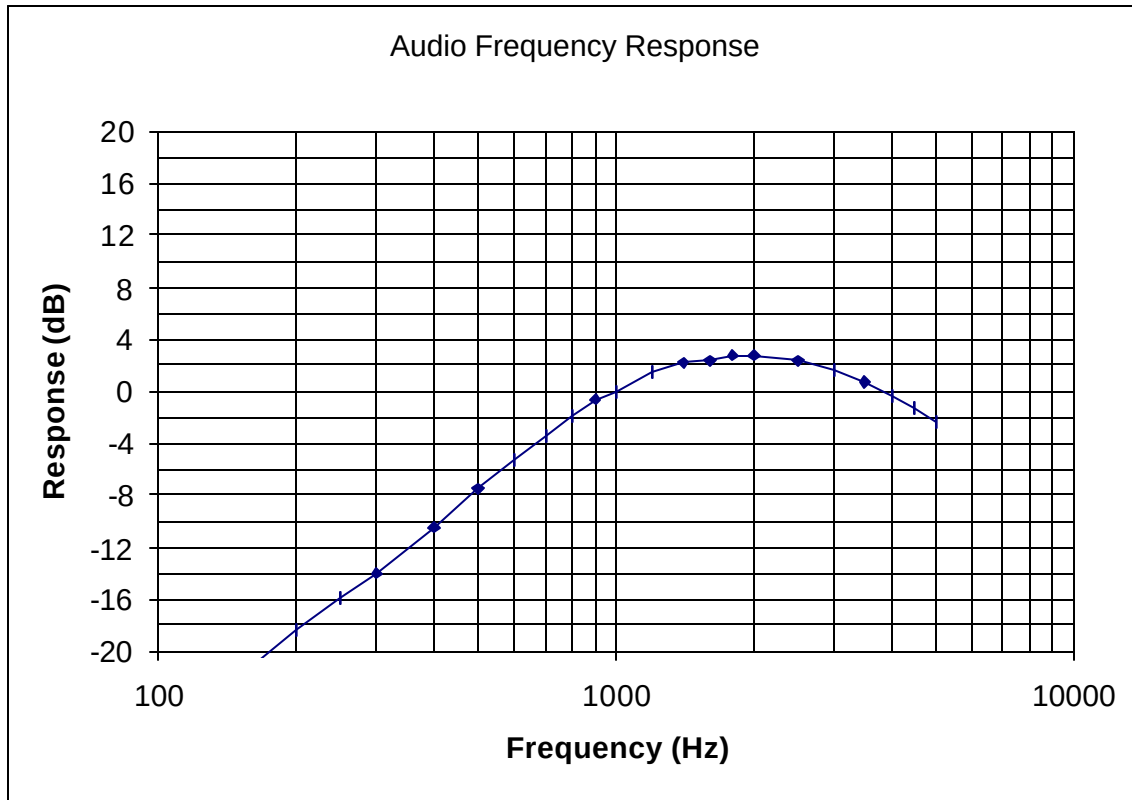
Channel 36

Temperature Vdc	Frequency (Hz)	Difference (Hz)	Limit 0.005%
12	2.736471E + 07		1368.236
13.8	2.736484E + 07	-129	1368.234
10.2	2.736465E + 07	67	1368.234

3.3 Modulation Characteristics: (FCC Part §2.1047); Audio Frequency Response

The audio Frequency Response was measured and recorded. A plot of the response is shown in the following figure. The 0 dB reference level on the figure is the audio level needed to produce 50% modulation at 1000 Hz.

Figure 1: Audio Frequency Response



3.4 Modulation Characteristics: (FCC Part §2.1047); Modulation Limiting

Modulation limiting curves were obtained for the EUT. The audio level was adjusted to produce 50% modulation at 1000 Hz. This level was used as the reference point. The audio input level was then adjusted from -20 dB to 20 dB at modulation frequencies of 300, 1000, and 2500 Hz. The modulation level was recorded as a function of input level for both positive and negative peaks.

Figure 2. Modulation Limiting

