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ENGINEERING STATEMENT

IN REGARD TO MEASUREMENTS ON

DESIGNTECH INTERNATIONAL, INC.

Model: Wireless Thermometer

FCC ID: ELGTHERMOTX

A. INTRODUCTION

Hyak Laboratories Inc. has been authorized by Designtech International, Inc., to perform measurements on the Wireless Thermometer transmitter to determine compliance with FCC Rules, Subpart C, Para. 15.201.

The Wireless Thermometer transmitter is a low powered, battery operated transmitter designed to telemeter outside temperatures. It operates at a nominal 433.8 MHz frequency. The transmitter, constructed on an etched circuit card, is powered from a 3 volt lithium battery. An integral, etched-circuit antenna is used.

The device meets the provisions of Para. 15.231(e). Transmission duration is less than one (1) second and the silent period between transmissions is greater than ten (10) seconds.

B. DESCRIPTION OF MEASUREMENT FACILITIES

A description of the Hyak Laboratories Inc. radiation test facility is a matter of record with the FCC. The facility was accepted for radiation measurements on October 1, 1976, and is currently listed as an acceptable site.

C. DESCRIPTION OF MEASUREMENT PROCEDURE: RADIATED MEASUREMENTS

Measurements of transmitter radiation field strength were made using ANSI 63.4 (1992) as the test procedure. Measurements were made with 3 meter spacing between the transmitter under test and the test equipment antenna.

The transmitter under test was placed on a rotatable table approximately one meter in height.

A fresh battery was installed.

C. DESCRIPTION OF MEASUREMENT PROCEDURE: RADIATED MEASUREMENTS (Continued)

Measurement of field strength was made through use of HP 8596E and Tektronix 494P spectrum analyzers in conjunction with a HP 8447D and Avantek wide band, low noise preamplifiers; and an Advantest R3361A spectrum analyzer with quasi-peak detector.

Above 1 GHz the 494P spectrum analyzer, a peak responding device, was used with an Avantek 1-2 GHz amplifier.

Singer DM-105A series calibrated dipoles were used as the test antennas in the 25-1000 MHz range. An EMCO 3115 calibrated horn antenna was used between 1 and 4.4 GHz.

An analysis of time domain measurements (see plots in Figures 1, 2, 3a and 3b) was made to determine average field intensity of the fundamental and any harmonics outside of forbidden bands. Sample calculations are included in Figure 4.

Based on time domain observations, and using the procedures of Figure 4, a -20 dB correction factor for a nominal 100 mS averaging interval was computed.

Data for radiated emissions in Table 1 includes this correction factor. **For emissions that fell in forbidden bands below 1 GHz the CISPR quasi-peak detector was used.**

For each spurious emission identified between 30 MHz to the tenth harmonic the test assembly was rotated for maximum pickup, the test antenna varied in elevation and the test antenna polarization shifted between horizontal to vertical in order to maximize observed signals.

The measurement procedure included recording the worst-case field strength for receiving antenna polarization, test antenna height variation from 3 feet to 10 feet, test sample rotation, and placing the test sample on each of its major planes.

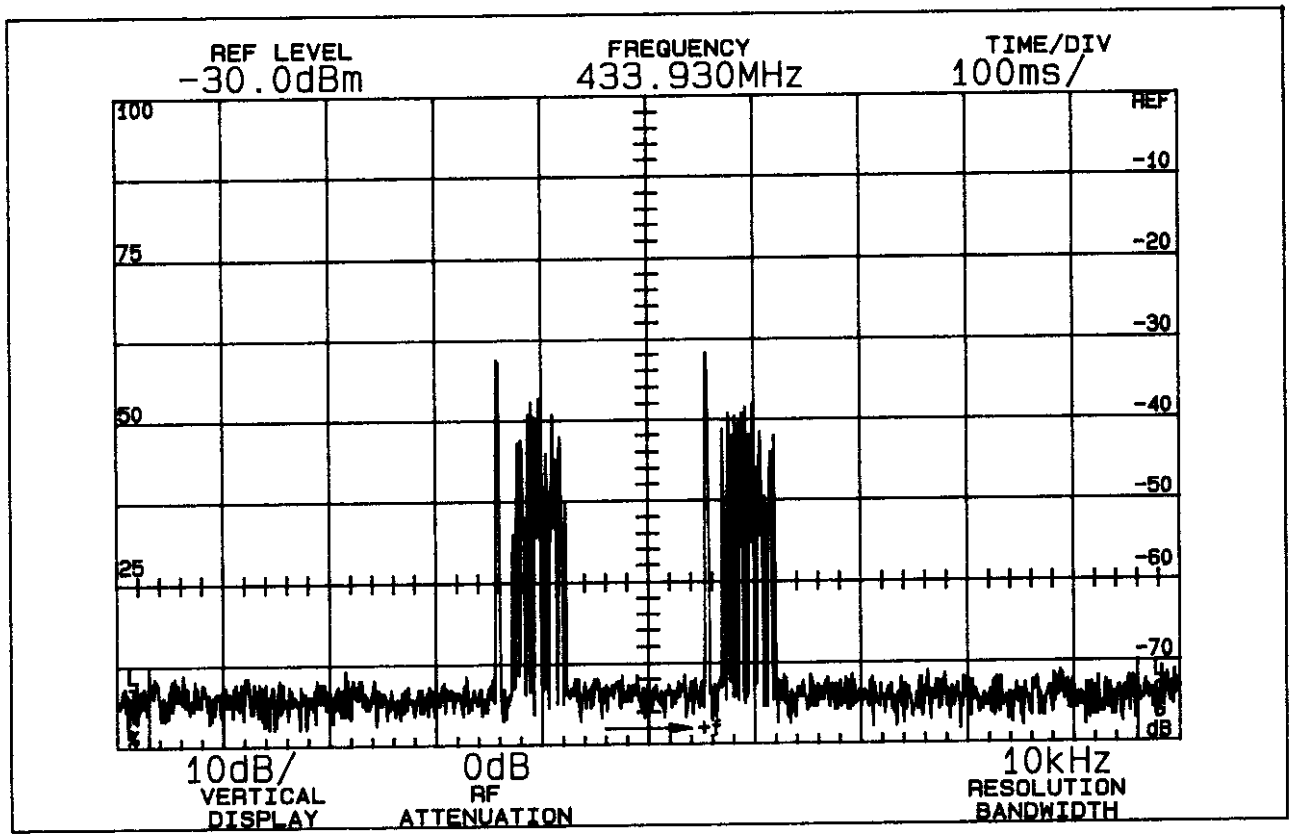
The spectrum was checked from 30 to 4339 MHz. All emissions not reported were more than 20 dB below the permitted level or below FCC limits but in the ambient/system noise floor. Tabulation of the measurements are shown in Table 1.

Specific forbidden band scans were made per Paragraph 15.205 and 15.209.

D. REPORT OF RADIATED MEASUREMENTS

Table 1 lists the frequency and amplitude of all signals observed from 30 to 4339 MHz that were within 20 dB of the limits of FCC Rules. The averaging factor is included as noted.

A: \DEST100.DBW



NOTE: For Measurement purposes the DUT was hard-wired in a repetitive transmit state.

MULTIPLE WORD TRANSMISSION

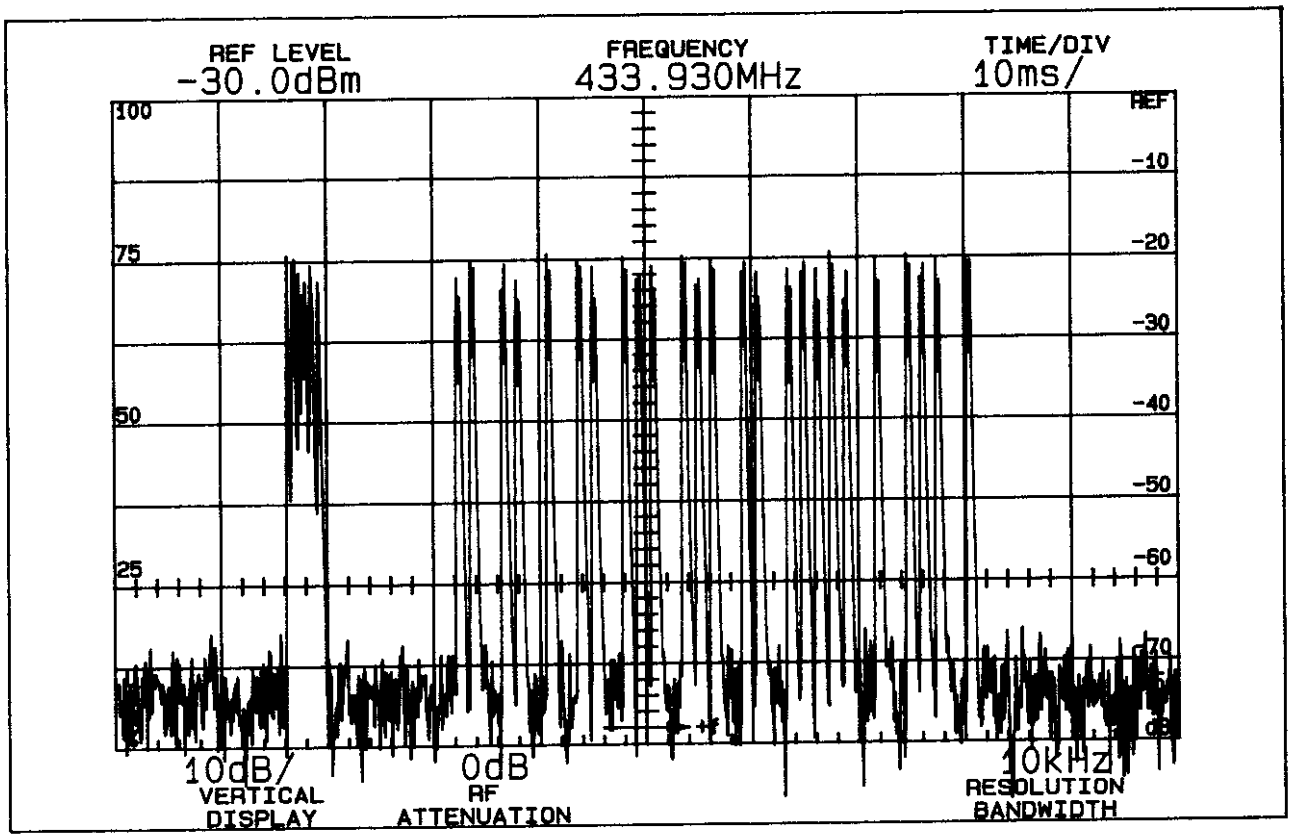
Horizontal: 100 milliseconds/Div
Vertical: 10 dB/Div.
Resolution: 10 kHz

(Time domain)

PULSE CHARACTERISTICS
FCC ID: ELGTHERMOTX

FIGURE 1

A: \DEBTO10.CBW



SINGLE WORD TRANSMISSION

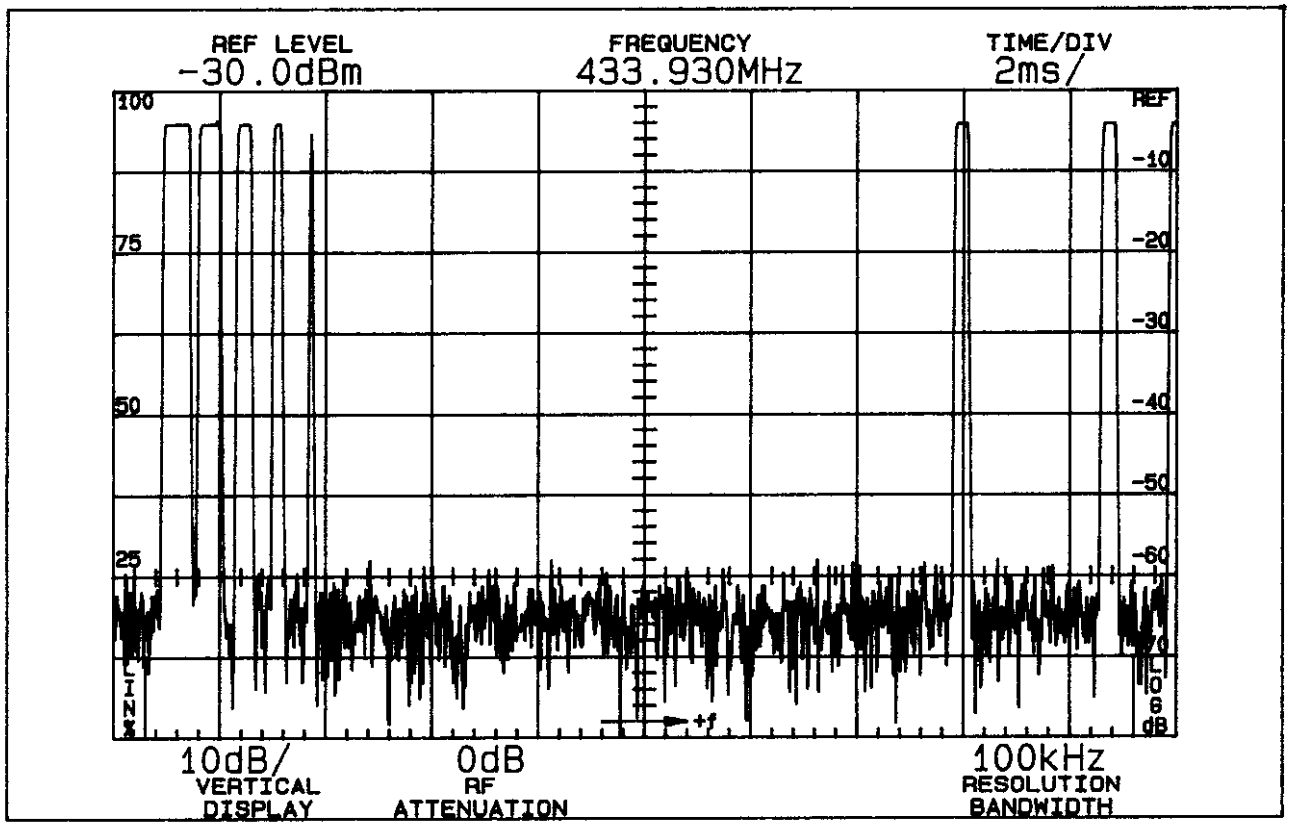
Horizontal: 10 mS/Div.
Vertical: 10 dB/Div.
Resolution: 10 KHz

(Time domain)

PULSE CHARACTERISTICS
FCC ID: ELGTHERMOTX

FIGURE 2

A: \DEETOOEN.GBW



BIT DETAIL

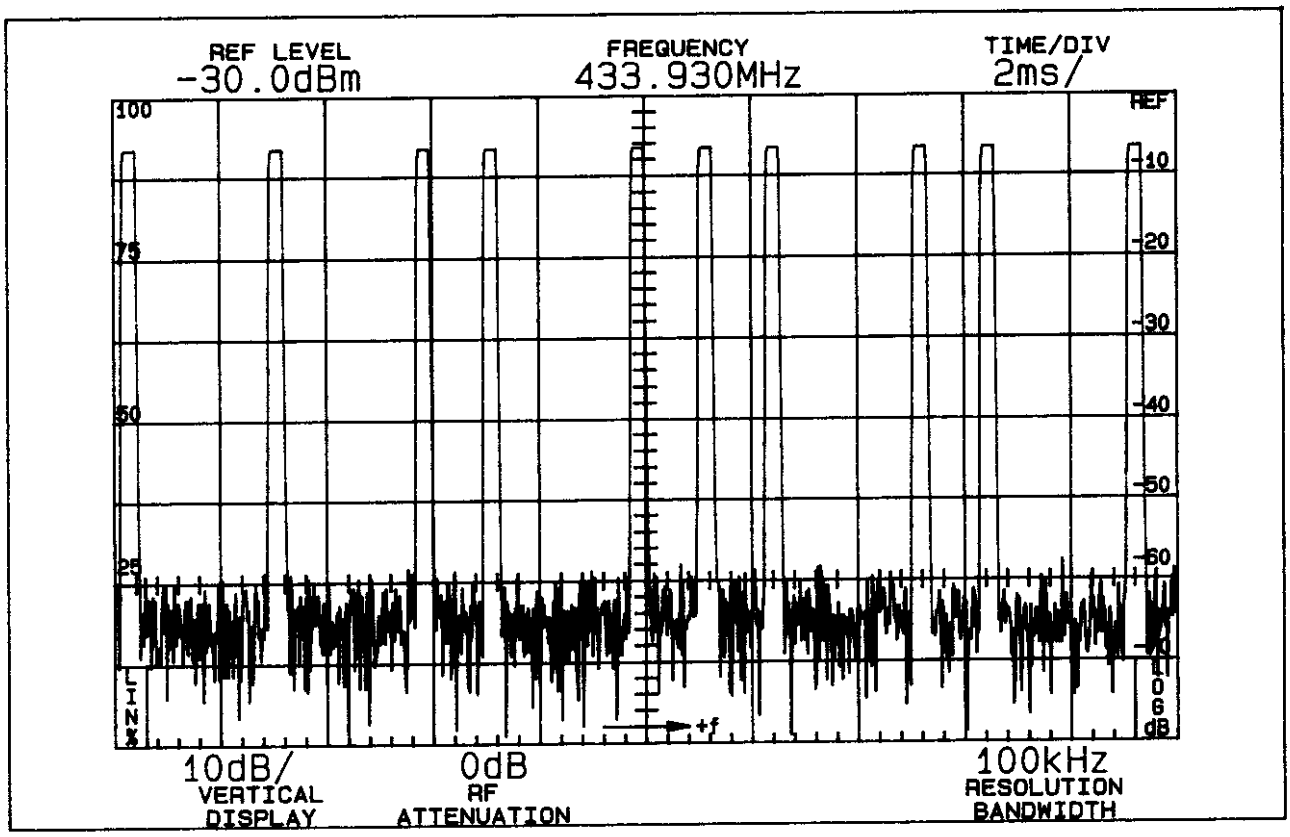
Horizontal: 2 mS/Div.
Vertical: 10 dB/Div.
Resolution: 100 KHz

(Time domain)

PULSE CHARACTERISTICS
FCC ID: ELGTHERMOTX

FIGURE 3a Leading

A: \DEBTOOBZ.DBM



BIT DETAIL

Horizontal: 2 mS/Div.
Vertical: 10 dB/Div.
Resolution: 100 KHz

(Time domain)

PULSE CHARACTERISTICS
FCC ID: ELGTHERMOTX

FIGURE 3b Trailing

SAMPLE COMPUTATIONS

Using the time domain plots of Figures 1 through 3, maximum "on" time over any 100 mS interval is:

"On" Pulses:

"Long"	(0.6 mS) x 2	= 1.2
"Short"	(0.3 mS) x 25	= 7.5
	Total	8.7

Duty Cycle: 8.7/100 = 0.087

20 Log 0.087 = -21.2 dB

NOTE: Per Para. 15.35, averaging was limited to -20 dB.

SAMPLE COMPUTATIONS
FCC ID: ELGTHERMOTX

FIGURE 4

TABLE 1

RADIATED FIELD INTENSITY
Measured at 3 meters
15.231(e)

Frequency (MHz)	Meter[1] Reading (dBm)	Antenna Factor (dB)	Field[2] Intensity uV/m @ 3m	Calc. Field[3] Intensity uV/m @ 3m	FCC Limit uV/m @ 3m	dB to Limit
433.678	-39.7	24.9	40785.0	4078.5	4396.1	- 0.7
867.345	-67.7	31.7	3544.1	354.4	439.6	- 1.9
1302.993	-74.8	25.2	741.3	74.1	500.0*	-16.6
1734.665	-64.7	26.9	2884.0	288.4	439.6	- 3.7
2168.333	-74.8	28.7	1110.5	111.1	439.6	-11.9
2601.778	-86.1	29.8	342.7	34.3	439.6	-22.2
3035.325	-92.3	30.9	191.2	19.1	439.6	-27.2
3468.945	-96.8	32.2	131.8	13.2	439.6	-30.5

Note 1: Peak detector reading without averaging.

Note 2: $uV/m = Log^{-1}\frac{dBu/m}{20}$

$dBu = dBm + antenna\ factor + 107$

Note 3: Field Intensity calculated from peak value and -20 dB peak/average factor.

*Forbidden Band

All other emissions to the tenth harmonic were below FCC limits.

(Unit was measured on 3 major planes)

D. FORBIDDEN BAND MEASUREMENTS

Any spurious signals from the transmitter that fell in a forbidden band are identified in Table 1. All forbidden bands, per Paragraph 15.205, from 73 MHz to 3.13 GHz were searched and any applicable emissions above noise or interference levels are shown in Table 1.

E. OCCUPIED BANDWIDTH

A plot of occupied bandwidth is shown in Figure 5. The device meets bandwidth restriction of Paragraph 15.231(c); 20 dB points are less than 200 kHz with worst-case modulation. (Limit is 0.25% of 312 MHz or 780 kHz).

F. POWER LINE CONDUCTED MEASUREMENTS

AC line conducted spurious measurements were not made since the device does not use the public power supply system.

G. EXHIBITS

Label; Exhibit 1.
Photographs; Exhibit 2.
Schematic Diagrams; Exhibit 3.
User Instructions; Exhibit 4.
Circuit Description; Exhibit 5.

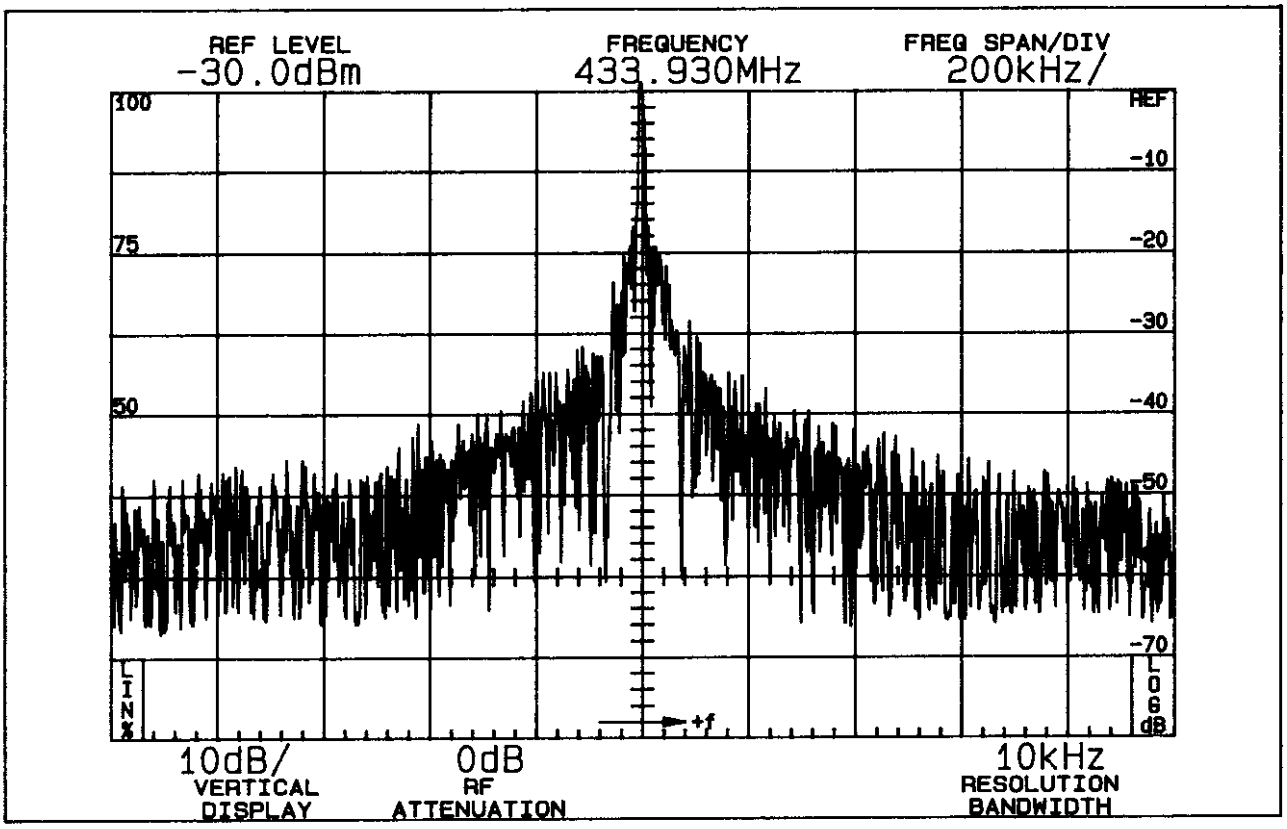
H. STATEMENT

Technical test data are from tests performed by me or under my supervision. My qualifications are a matter of record with the Federal Communications Commission. I personally attest to the accuracy of the test data submitted as a part of this engineering statement.

Rowland S. Johnson

Dated: July 6, 1998

A: \DEBTKTMP.DBN



Center Frequency 433.935 MHz

Horizontal: 200 kHz
Vertical: 10 dB/Div.
Resolution: 10 kHz (Max. Hold)

No video filtering.

OCCUPIED BANDWIDTH
FCC ID: ELGTHERMOTX

FIGURE 5

LIST OF EXHIBITS

1. FCC ID LABEL
2. PHOTOGRAPHS
3. SCHEMATIC DIAGRAM
4. USER INSTRUCTIONS
5. CIRCUIT DESCRIPTION

EXHIBIT 2

PHOTOGRAPHS

FOUR (4) PHOTOGRAPHS, SUPPLIED BY THE APPLICANT, FOLLOW THIS SHEET