

**Intertek Testing Services NA Inc.**

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**EXHIBIT 2**

**SYSTEM TEST CONFIGURATION**

## **2.0 System Test Configuration**

### **2.1 Justification**

The transmitter was configured for testing in a typical fashion (as a customer would normally use it). The device was mounted to a cardboard box, which enabled the engineer to maximize emissions through its placement in the three orthogonal axis.

The device was powered from a new, fully charged 3V battery.

For simplicity of testing, the unit was wired to transmit continuously.

The worst case bit sequence was applied during test.

The device is an automatic Transmitter which employed a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

### **2.2 EUT Exercising Software**

There was no special software to exercise the device. Once the button is depressed, the unit transmits the typical signal. For simplicity of testing, the unit was wired to transmit continuously.

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### 2.4 Equipment Modification

Any modifications installed previous to testing by Secure System, Inc. will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services NA Inc.

*Confirmed by:*

*Mr. Andrew J. Bellezza  
Engineering Team Leader, ITE  
Intertek Testing Services NA Inc.  
Agent for Secure System, Inc.*

*Andrew J. Bellezza* \_\_\_\_\_ Signature  
*June 2, 1996* \_\_\_\_\_ Date

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### **2.5 Support Equipment List and Description**

The FCC ID's for all equipment, plus descriptions of all cables used in the tested system (included inserted cards, which have grants) are:

None, standalone unit.

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**EXHIBIT 3**

**EMISSION RESULTS**

### 3.0 **Emission Results**

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs, data tables and graphical representations of the emissions are included.

### 3.1 Field Strength Calculation

The field strength is calculated by adding the reading on the Spectrum Analyzer to the factors associated with preamplifiers (if any), antennas, cables, pulse desensitization and average factors (when specified limit is in average and measurements are made with peak detectors). A sample calculation is included below.

$$FS = RA + AF + CF - AG + PD - AV$$

where

- FS = Field Strength in  $\text{dB}\mu\text{V/m}$
- RA = Receiver Amplitude (including preamplifier) in  $\text{dB}\mu\text{V}$
- CF = Cable Attenuation Factor in dB
- AF = Antenna Factor in dB
- AG = Amplifier Gain in dB
- PD = Pulse Desensitization in dB
- AV = Average Factor in dB

In the radiated emission table which follows, the reading shown on the data table may reflect the preamplifier gain. An example of the calculations, where the reading does not reflect the preamplifier gain, follows:

$$FS = RA + AF + CF - AG + PD + AV$$

Assume a receiver reading of  $62.0 \text{ dB}\mu\text{V}$  is obtained. The antenna factor of  $7.4 \text{ dB}$  and cable factor of  $1.6 \text{ dB}$  is added. The amplifier gain of  $29 \text{ dB}$  is subtracted. The pulse desensitization factor of the spectrum analyzer was  $0 \text{ dB}$ , and the resultant average factor was  $-10 \text{ dB}$ . The net field strength for comparison to the appropriate emission limit is  $32 \text{ dB}\mu\text{V/m}$ . This value in  $\text{dB}\mu\text{V/m}$  was converted to its corresponding level in  $\mu\text{V/m}$ .

$$\begin{aligned} RA &= 52.0 \text{ dB}\mu\text{V/m} \\ AF &= 7.4 \text{ dB} \\ CF &= 1.6 \text{ dB} \\ AG &= 29.0 \text{ dB} \\ PD &= 0 \text{ dB} \\ AV &= -10 \text{ dB} \\ FS &= 52 + 7.4 + 1.6 - 29 + 0 - 10 = 32 \text{ dB}\mu\text{V/m} \end{aligned}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(32 \text{ dB}\mu\text{V/m})/20] = 39.8 \mu\text{V/m}$$

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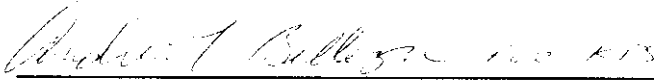
### 3.3 Radiated Emission Data

The data on the following page lists the significant emission frequencies, the limit and the margin of compliance. Numbers with a minus sign are below the limit.

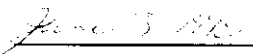
Judgement: Passed by 3 dB

\*All readings are peak unless stated otherwise

#### **TEST PERSONNEL:**

  
Tester Signature

Mr. Kouma Sinn, Compliance Engineer  
Typed/Printed Name

  
Date



# Inchcape Testing Services

## Boxborough, MA

COMPANY: Micrologic, Inc.  
MODEL: Surveillance Pad

TABLE: 1  
Date of Test: 01-07-1997

NOTES: Fundamental and harmonics scan

### Radiated Emissions

Frequency (MHz)	Reading (dBuV)	Distance Factor (dB)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Averaging Factor (dB)	Pulse Desensitization (dB)	Field Strength @ 3 m (dBuV/m)	Field Strength @ 3 m (uV/m)	Limits @ 3 m (uV/m)	Margin (dB)
310.000	65	0	23	16	-9	0	63	1413	5623	-12
620.000	34	0	29	14	-9	0	40	100	562	-15
930.000	19	0	33	14	-9	0	29	28	562	-26
1240.000	32	10	25	0	-9	0	38	79	500	-16
1550.000	32	0	28	0	-9	0	51	355	500	-3
1860.000	34	10	28	0	-9	0	43	141	562	-12
2170.000	25	20	28	0	-9	0	24	16	562	-31
2480.000	22	20	28	0	-9	0	21	11	562	-34
2790.000	10	20	30	0	-9	0	11	4	500	-43
3100.000	10	20	31	0	-9	0	12	4	562	-43

No other harmonic or spurious emissions were detected at a test distance of 0.3 meter.

Test Engineer: Kouma Sinn

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**EXHIBIT 4**

**EQUIPMENT PHOTOGRAPHS**

4.0 **Equipment Photographs**

Photographs of the EUT are attached.

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**EXHIBIT 8**

**MISCELLANEOUS INFORMATION**

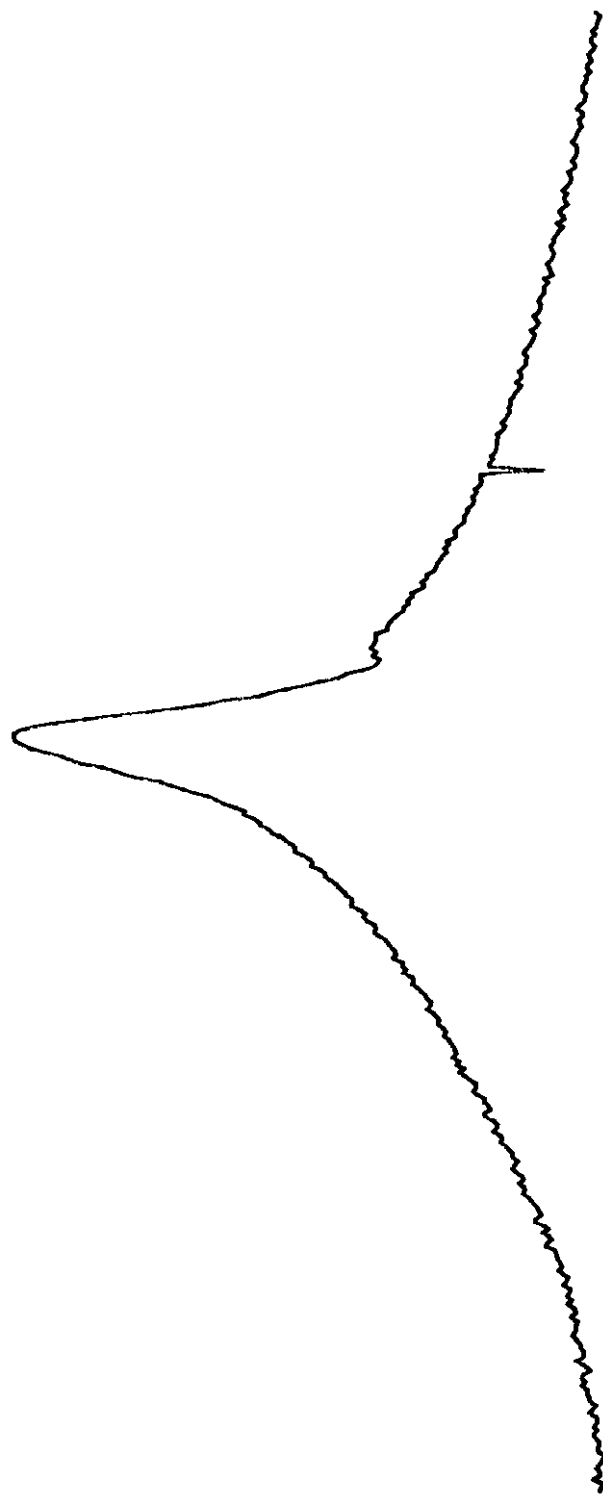
8.0 **Miscellaneous Information**

This miscellaneous information includes details of the measured bandwidth, the test procedure and calculation of factors such as pulse desensitization and average factor.

## 8.1 Measured Bandwidth

The plot on the following page shows the fundamental emission when modulated with a worst-case bit sequence. From the plot, the bandwidth is observed to be 195 kHz, at 20 dBc. The bandwidth limit is 775 kHz. The unit meets the FCC bandwidth requirements.

Figure 8.1 Bandwidth



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## 8.2 Discussion of Pulse Desensitization

The determination of pulse desensitivity was made in accordance with Hewlett Packard Application Note 150-2, *Spectrum Analysis ... Pulsed RF*.

Pulse desensitivity was not applicable for this device. The effective period ( $T_{eff}$ ) was approximately 825  $\mu$ Sec for a digital "1" bit, as shown in the plots of Exhibit 8.3. With a resolution bandwidth (3dB) of 100 kHz, the pulse desensitivity factor was 0 dB.



### 8.3 Calculation of Average Factor

The repetition cycle of the EUT is greater than 100 ms. The averaging factor is determined as follows:

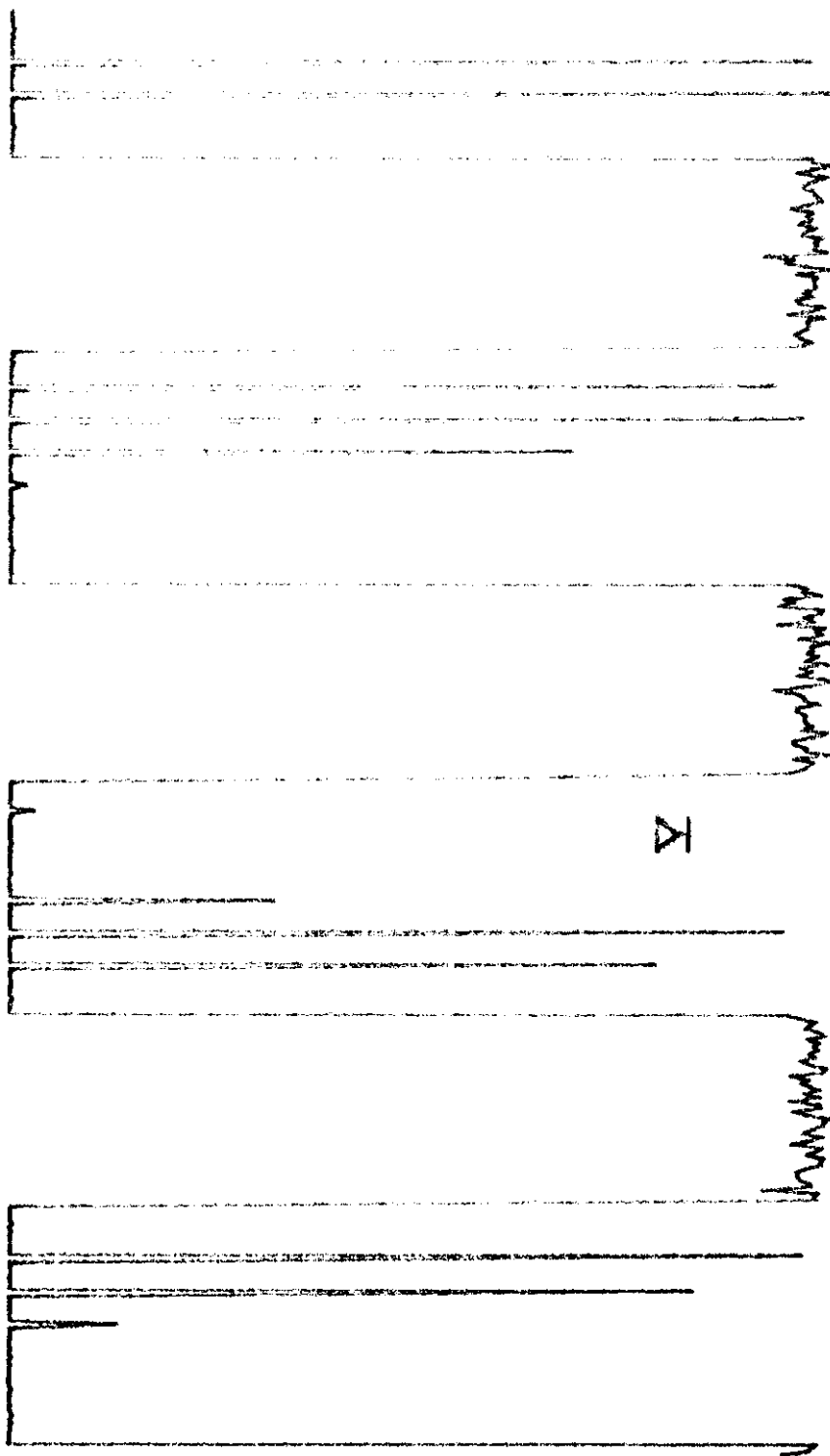
Word Cycle:	58 msec
Effective Period of Word:	32.5 msec
Duty Cycle of Word:	56 %

Period of Single Bit:	1.2375 msec
Effective Period of a Digital "1":	.825 msec
Duty Cycle of a Digital "1":	66.7 %

Total Duty Cycle:	$(0.56) \times (0.667) = 37 \%$
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Average Factor =  $20 \text{ Log (total duty cycle) } = -9 \text{ dB}$

Plots of duty cycle are included in the following pages.



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[illegible]

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#### 8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services NA Inc. in the measurements of transmitters operating under Part 15, Subpart C rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4(1992).

The transmitting equipment under test (EUT) is attached to a cardboard box and placed on a wooden turntable which is four feet in diameter and approximately one meter in height above the groundplane. During the radiated emissions test, the turntable is rotated and any cables leaving the EUT are manipulated to find the configuration resulting in maximum emissions. The cardboard box is adjusted through all three orthogonal axes to obtain maximum emission levels. The antenna height and polarization are also varied during the testing to search for maximum signal levels. The height of the antenna is varied from one to four meters.

Detector function for radiated emissions is in peak mode. Average readings, when required, are taken by measuring the duty cycle of the equipment under test and subtracting the corresponding amount in dB from the measured peak readings. A detailed description for the calculation of the average factor can be found in Exhibit 8.3.

The frequency range scanned is from the lowest radio frequency signal generated in the device which is greater than 9 kHz to the tenth harmonic of the highest fundamental frequency or 40 GHz, whichever is lower. For line conducted emissions, the range scanned is 450 kHz to 30 MHz.

#### 8.4 Emissions Test Procedures (cont)

The EUT is warmed up for 15 minutes prior to the test.

AC power to the unit is varied from 85% to 115% nominal and variation in the fundamental emission field strength is recorded. If battery powered, a new, fully charged battery is used.

Conducted measurements were made as described in ANSI C63.4(1992). An IF bandwidth of 10 kHz is used, and peak detection is employed.

The IF bandwidth used for measurement of radiated signal strength was 100 kHz or greater below 1000 MHz. Where pulsed transmissions of short enough pulse duration warrant, a greater bandwidth is selected according to the recommendations of Hewlett Packard Application Note 150-2. A discussion of whether pulse desensitivity is applicable to this unit is included in this report (See Exhibit 8.2). Above 1000 MHz, a resolution bandwidth of 1 MHz is used.

Transmitter measurements are normally conducted at a measurement distance of three meters. However, to assure low enough noise floor in the forbidden bands and above 1 GHz, signals are acquired at a distance of one meter or less. All measurements are extrapolated to three meters using inverse scaling, but those measurements taken at a closer distance are so marked.