

RadioShack, A Division of Tandy Corporation

Application
For
Certification
(FCC ID: AAO6301026R)

Superregenerative Receiver

WO# 9707353
LK/at
October 8, 1998

- The test results reported in this test report shall refer only to the sample actually tested and shall not refer or be deemed to refer to bulk from which such a sample may be said to have been obtained.
- This report shall not be reproduced except in full without prior authorization from Intertek Testing Services Hong Kong Limited

FCC ID: AAO6301026R

INTERTEK TESTING SERVICES

LIST OF EXHIBITS

INTRODUCTION

<i>EXHIBIT 1:</i>	General Description
<i>EXHIBIT 2:</i>	System Test Configuration
<i>EXHIBIT 3:</i>	Emission Results
<i>EXHIBIT 4:</i>	Equipment Photographs
<i>EXHIBIT 5:</i>	Product Labelling
<i>EXHIBIT 6:</i>	Technical Specifications
<i>EXHIBIT 7:</i>	Instruction Manual
<i>EXHIBIT 8:</i>	Miscellaneous Information

INTERTEK TESTING SERVICES

MEASUREMENT/TECHNICAL REPORT

**RadioShack, A Division of Tandy Corporation - MODEL: EMR899
FCC ID: AAO6301026R**

This report concerns (check one):	Original Grant <input checked="" type="checkbox"/>	Class II Change <input type="checkbox"/>
Equipment Type: <u>Superregenerative Receiver</u> (example: computer, printer, modem, etc.)		
<hr/>		
requested per 47 CFR 0.457(d)(1)(ii)?	Yes <input type="checkbox"/>	Deferred <input type="checkbox"/> grant No <input checked="" type="checkbox"/>
If yes, defer until: _____		date
Company Name agrees to notify the Commission by: _____		
date		
of the intended date of announcement of the product so that the grant can be issued on that date.		
<hr/>		
Transition Rules Request per 15.37?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If no, assumed Part 15, Subpart B for unintentional radiator - the new 47 CFR [10-1-96 Edition] provision.		
<hr/>		
Report prepared by:	C. K. Lam Intertek Testing Services Hong Kong Ltd. 2/F., Garment Centre, 576, Castle Peak Road, Kowloon, Hong Kong Phone: 852-2746-8211 Fax: 852-2785-5487	

INTERTEK TESTING SERVICES

Table of Contents

1.0 <u>General Description</u>	2
1.1 Product Description.....	2
1.2 Related Submittal(s) Grants	2
1.3 Test Methodology	3
1.4 Test Facility.....	3
2.0 <u>System Test Configuration</u>	5
2.1 Justification	5
2.2 EUT Exercising Software.....	5
2.3 Support List and Description.....	5
2.4 Equipment Modification	6
2.5 Special Accessories	6
3.0 <u>Emission Results</u>	8
3.1 Field Strength Calculation	9
3.2 Radiated Emission Configuration Photograph.....	10
3.3 Radiated Emission Data	11
4.0 <u>Equipment Photographs</u>	14
5.0 <u>Product Labelling</u>	16
6.0 <u>Technical Specifications</u>	18
7.0 <u>Instruction Manual</u>	20
8.0 <u>Miscellaneous Information</u>	22
8.1 Stabilization Waveform.....	23
8.2 Discussion of Pulse Desensitization	24
8.3 Calculation of Average Factor.....	25
8.4 Emissions Test Procedures.....	26

INTERTEK TESTING SERVICES

List of attached file

Exhibit type	Filename
Test Report	report.doc
Test Setup Photo	radiated.jpg
External Photo	ophoto1.jpg & ophoto2.jpg
Internal Photo	iphoto1.jpg to iphoto3.jpg
Block Diagram	block.pdf
Schematics	circuit.pdf
ID Label	label.pdf
ID Location	location.pdf
User Manual	manual.pdf
Test Report	bw.pdf
Cover Letter	letter.pdf
Operational Description	descri.pdf

INTERTEK TESTING SERVICES

EXHIBIT 1

GENERAL DESCRIPTION

INTERTEK TESTING SERVICES

1.0 **General Description**

1.1 Product Description

The equipment under test (EUT) is a superregenerative receiver portion of a wireless thermometer system. There are three buttons on the front panel (CHANNEL, MEM and CLEAR), five buttons on the back panel (HI/LO, Δ , TEMP AL ON/OFF, RESET AND °C/°F). It is powered by two AA size batteries and operated at 433.92 MHz. It also can be operated with 3 transmitter (3 channels). For electronic filing, the brief circuit description is saved with filename: descri.pdf

1.2 Related Submittal(s) Grants

This is an application for Certification of a receiver. There are two transmitters associated with this receiver. The FCC ID are AAO6301027 and AAO6301026T those have been filed at the same time.

INTERTEK TESTING SERVICES

1.3 Test Methodology

Radiated emission measurements was performed according to the procedures in ANSI C63.4 (1992). All radiated measurements were performed in an Open Area Test Site. Preliminary scans were performed in the Open Area Test Site only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "**Justification Section**" of this Application.

1.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at Garment Centre, 576 Castle Peak Road, Kowloon, Hong Kong. This test facility and site measurement data have been placed on file with the FCC.

INTERTEK TESTING SERVICES

EXHIBIT 2

SYSTEM TEST CONFIGURATION

INTERTEK TESTING SERVICES

2.0 **System Test Configuration**

2.1 Justification

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

For maximizing emissions, the EUT was rotated through 360°, the antenna height was varied from 1 meter to 4 meters above the ground plane, and the antenna polarization was changed. This step by step procedure for maximizing emissions led to the data reported in Exhibit 3.0.

The EUT was powered by two new, fully charged AA size batteries.

2.2 EUT Exercising Software

There was no special software to exercise the device. Once the unit is powered up, it received continuously.

2.3 Support Equipment List and Description

This product was tested in standalone configuration.

INTERTEK TESTING SERVICES

2.4 Equipment Modification

Any modifications installed previous to testing by RadioShack, A Division of Tandy Corporation will be incorporated in each production model sold/leased in the United States.

No modifications were installed by Intertek Testing Services.

2.5 Special Accessories

There are no special accessories necessary for compliance of this product.

Confirmed by:

*Laurence Kwan
Senior Manager - EMC
Intertek Testing Services
Hong Kong Ltd.
Agent for RadioShack, A Division of Tandy Corporation*


_____ Signature

October 8, 1998. _____ Date

INTERTEK TESTING SERVICES

EXHIBIT 3

EMISSION RESULTS

INTERTEK TESTING SERVICES

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 and data tables of the emissions are included.

INTERTEK TESTING SERVICES

3.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

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

where FS = Field Strength in dB μ V/m

RA = Receiver Amplitude (including preamplifier) in dB μ V

CF = Cable Attenuation Factor in dB

AF = Antenna Factor in dB

AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:

$$FS = RR + LF$$

where FS = Field Strength in dB μ V/m

RR = RA - AG in dB μ V

LF = CF + AF in dB

Assume a receiver reading of 52.0 dB μ V is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB are added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB μ V/m. This value in dB μ V/m was converted to its corresponding level in μ V/m.

$$RA = 52.0 \text{ dB}\mu\text{V/m}$$

$$AF = 7.4 \text{ dB}$$

$$CF = 1.6 \text{ dB}$$

$$AG = 29.0 \text{ dB}$$

$$FS = RR + LF$$

$$FS = 23 + 9 = 32 \text{ dB}\mu\text{V/m}$$

$$RR = 23.0 \text{ dB}\mu\text{V}$$

$$LF = 9.0 \text{ dB}$$

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

INTERTEK TESTING SERVICES

3.2 Radiated Emission Configuration Photograph

Worst Case Radiated Emission

Front View

at 433.683 MHz

For electronic filing, the front view and back view of test configuration are saved with filename: radiated.pdg.

INTERTEK TESTING SERVICES

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 8.7 dB

*All readings are peak unless stated otherwise

TEST PERSONNEL:



Tester Signature

Kenneth H. M. Lam, Electronics Engineer
Typed/Printed Name

October 8, 1998.

Date

INTERTEK TESTING SERVICES

Company: RadioShack, A Division of Tandy Corporation
Model: EMR899

Date of Test: August 29, 1997

Table 1

FCC Class B Radiated Emissions

Polarity	Frequency (MHz)	Reading (dB _μ V)	Antenna Factor (dB)	Pre-Amp Gain (dB)	Net at 3m (dB _μ V/m)	Limit at 3m (dB _μ V/m)	Margin (dB)
H	427.905	21.7	25	16	30.7	46	-15.3
H	429.556	22.4	25	16	31.4	46	-14.6
H	431.183	25.2	25	16	34.2	46	-11.8
H	433.683	28.3	25	16	37.3	46	-8.7
H	435.341	24.2	26	16	34.2	46	-11.8
H	437.048	23.9	26	16	33.9	46	-12.1
H	437.669	20.8	26	16	30.8	46	-15.2

- NOTES:
1. Negative sign in the column shows value below limit.
 2. Peak Detector Data.
 3. All measurements were made at 3 meters. Harmonic emissions not detected at the 3-meter distances were measured at 0.3-meter and an inverse proportional extrapolation was performed to compare the signal level to the 3-meter limit. No other harmonic emissions than those reported were detected at a test distance of 0.3-meter.

Test Engineer: Kenneth H. M. Lam

INTERTEK TESTING SERVICES

EXHIBIT 4

EQUIPMENT PHOTOGRAPHS

INTERTEK TESTING SERVICES

4.0 Equipment Photographs

For electronic filing, photographs of the tested EUT are saved with filename: ophoto1.jpg and ophoto2.jpg for external photo, iphoto1.jpg to iphoto3.jpg for internal photo.

INTERTEK TESTING SERVICES

EXHIBIT 5

PRODUCT LABELLING

INTERTEK TESTING SERVICES

5.0 **Product Labelling**

For electronic filing, the FCC ID label and label location are saved filename: label. pdf and location.pdf respectively.

INTERTEK TESTING SERVICES

EXHIBIT 6

TECHNICAL SPECIFICATIONS

INTERTEK TESTING SERVICES

6.0 **Technical Specifications**

For electronic filing, the block diagram and schematic of the EUT are saved with filename: block.pdf and circuit.pdf respectively.

INTERTEK TESTING SERVICES

EXHIBIT 7

INSTRUCTION MANUAL

INTERTEK TESTING SERVICES

7.0 **Instruction Manual**

For electronic filing, a preliminary copy of the instruction manual is saved with filename: manual.pdf.

And the FCC information to user can be found in page 21.

This manual will be provided to the end-user with each unit sold/leased in the United States.

INTERTEK TESTING SERVICES

EXHIBIT 8

MISCELLANEOUS INFORMATION

INTERTEK TESTING SERVICES

8.0 Miscellaneous Information

This miscellaneous information includes details of the stabilizing process (including a plot of the stabilized waveform), the test procedure and calculation of factors such as pulse desensitization and averaging factor.

INTERTEK TESTING SERVICES

8.1 Stabilization Waveform

Previous to the testing, the superregenerative receiver was stabilized as outlined in the test procedure. The plot on the filename: bw.pdf shows the fundamental emission when a signal generator was used to stabilize the receiver. Please note that the antenna was placed as close as possible to the EUT for clear demonstration of the waveform and that accurate readings are not possible from this plot.

INTERTEK TESTING SERVICES

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*.

This device is a superregenerative receiver. The stabilized signals are continuous, and no desensitization of the measurement equipment occurs.

INTERTEK TESTING SERVICES

8.3 Calculation of Average Factor

The emission limits are specified using spectrum analyzers or receivers which incorporate quasi-peak detectors. Typical measurements are made using peak detectors, however, emissions which approach the respective emission limit are measured using a quasi-peak detector.

For measurements above 1 GHz, spectrum analyzers or receivers using average detectors are employed, or the appropriate average factor can be applied.

Measurements using spectrum analyzers with filters other than peak detectors are recorded in the data table section of this report.

This device is a superregenerative receiver.

It is not necessary to apply average factor to the measurement results.

INTERTEK TESTING SERVICES

8.4 Emissions Test Procedures

The following is a description of the test procedure used by Intertek Testing Services Hong Kong Ltd. in the measurements of superregenerative receivers operating under the Part 15, Subpart B rules.

The test set-up and procedures described below are designed to meet the requirements of ANSI C63.4 - 1992. Superregenerative receivers are stabilized prior to measurement by generating a signal well above the receiver threshold whose frequency is tuned until the emissions stabilize into a line spectrum. The signal is usually generated as CW with a Marconi 2022D signal generator and a short whip antenna and is at a level of several hundred to several thousand mV/m. Plots of the stabilized signal will be shown. If a modulated signal is used, it will be noted.

The 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 axis 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.

INTERTEK TESTING SERVICES

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.

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.

Measurements are normally conducted at a measurement distance of three meters. All measurements are extrapolated to three meters using inverse scaling, unless otherwise reported. Measurements taken at a closer distance are so marked.