

S-CEM/CSD/2007-2008/L&T-001

**FREQUENCY TOLERANCE TEST REPORT FOR EZ-READER-HF
MANUFACTURED BY M/s. L&T EMSYS, MYSORE**

FCC ID : UL4EZReaderHF

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March 2008

SAMEER - CENTRE FOR ELECTROMAGNETICS
Chennai - 600 113

**ENVIRONMENT TEST REPORT FOR EZ-READER- HF
MANUFACTURED BY M/s. ACCU-SORT SYSTEMS, INC**

Test Request Particulars

01. Test request from : M/s. L&T EmSyS, Mysore.

02. Equipment Under Test (EUT) : EZ-READER- HF(13.56MHz)

03. Number of test sample(s) : One

04. Types of tests requested : 1. Frequency Stability Test as per FCC 15.225(e)

05. Manufacturer : M/s. L&T EmSyS, Mysore.

06. Model Number : 1000065715

07. Test plan concurred by : Mr. S. Ramesh Babu, Project Manager
L&T EmSyS, Mysore

08. EUT Arrived on : 13th March, 2008

09. Test date(s) : 13th March, 2008

10. Test Venue : SAMEER-CEM, Chennai

Certified that the data reported in this report are valid only for the test sample(s) mentioned above at the time of and under the stated conditions of measurement. Particulars on Manufacturer / Supplier, given in this report, are based on the information given by the customer, along with test request and SAMEER-CEM does not assume any responsibility for the correctness of that information for the above mentioned equipment under test.

Test Conducted by:

(J. Gopinathan)
Scientific Assistant-A

Approved by:

(K. Sridhar)
Head, CSD Division

Office Seal

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SUMMARY

Preface

This report documents products testing conducted to verify compliance of the specified EUT with applicable standards and requirements as identified herein. EUT, test instrument configurations, test procedures and recorded data are generally described in this report. The reader is referred to the applicable test standards for detailed procedures. The following table summarizes the test results obtained during this evaluation.

EZ-Reader HF was tested to the standards listed below, and found to have the following characteristics:

Frequency tolerance Tests:

Test Description	FCC Part	Test Range	RESULT
Frequency Tolerance test	15.225 (e)	-20° C to +50° C 85% & 115% of nominal AC voltage	Below Max permissible Limits

Applicable requirements, Methods and procedures

The results of the measurement of the radio disturbance characteristics of the EUT described herein may be applied, and where appropriate provide a presumption of compliance to one or more of the following requirements or to other requirement at the discretion of the client, regulatory agencies or other entities.

47 CFR, Part 15, Subpart C, "Intentional Radiators"

Basic Test Methods and procedures

The applicable regulatory product family or generic standards require that radio disturbance/ interference and immunity tests be performed in accordance with the following:

ANSI C63.4, 2003 "American National Standard for Methods of measurement of Radio-Noise Emissions from low -Voltage Electrical and Electronic Equipment in the range of 9KHz to 40GHz".

Deviations or Exclusions from the requirements and Standards

There were no deviations or exclusions from the specified requirements and standards

1. Description of Equipment Under Test (EUT)

Equipment Identification	EZ-READER-HF
Model No Number	1000065715
Manufacturer	Accu-Sort Systems, Inc
Technical Contact	Ramesh Babu S
Condition Received	Acceptable for test
Date received	13 th March, 2008
Sample Type	Pre-production
Equipment Classification	Non-residential, Information Technology Equipment (ITE)
SAMEER Test Personnel	Mr. Gopinathan

1.1 General Description

The EZ-READER- HF is a RFID reader operating in the 13.56 MHz ISM frequency range. The unit is energized with 24V DC supply.

1.2 Test Configuration:

The EZ-READER- HF is a RFID reader with input power of 24V DC supply. The reader operates in the 13.56 MHz ISM frequency range. The unit has two RS232 ports and one Ethernet link for external interface. An Input/Output port consisting of two Photo eye modules will be used for providing the trigger. The frequency measurements were made with the antenna port terminated with a Frequency counter. One RS232 [Serial host port] was connected to a laptop and the other RS 232 port [Serial setup port] was left open with a hanging cable. The Ethernet port was also connected to the laptop computer.

The Block diagram of the EUT with I/O and Power cable connections is presented on the following diagram:

EZ-Reader-HF Setup

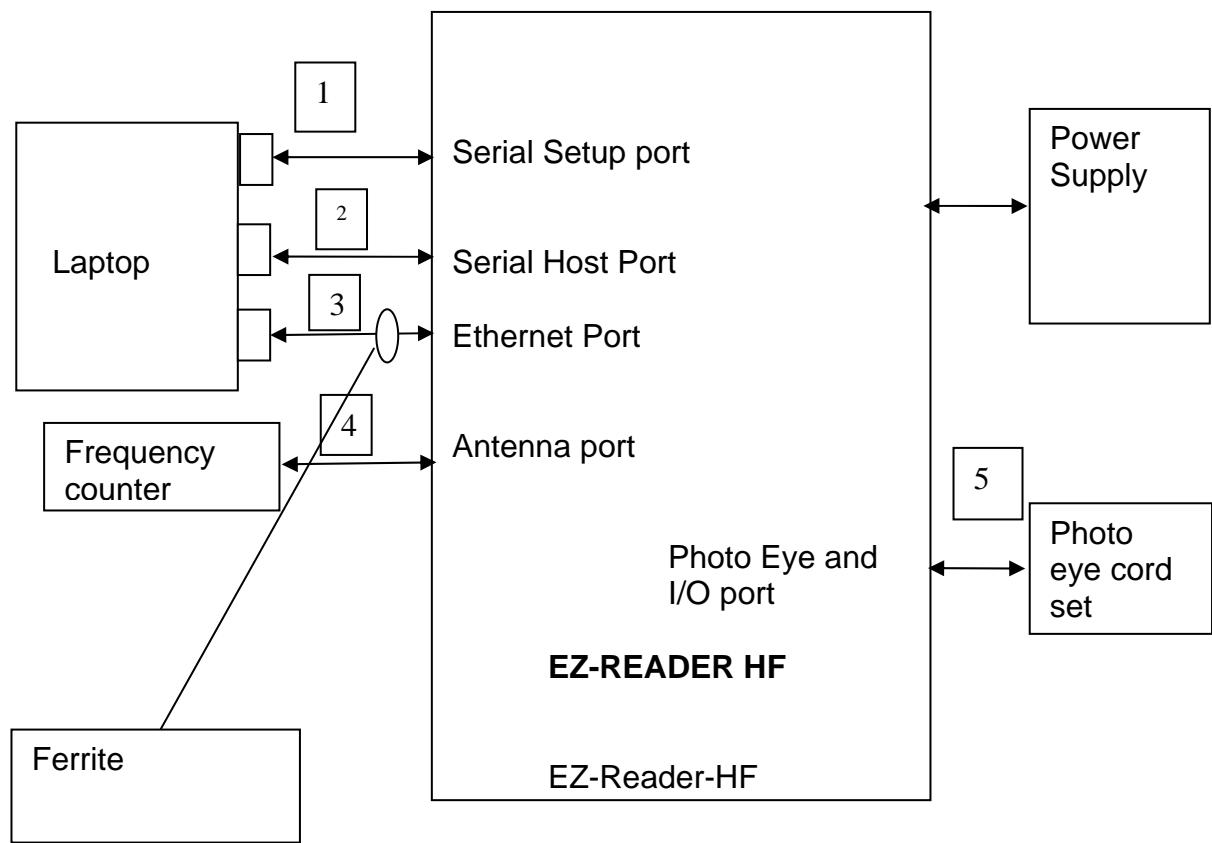


Fig.1

Cable Details:

1. RS232 Serial Cable [Shielded 20']
2. RS232 Serial Cable [Shielded 20']
3. CAT 5 Ethernet cable [Shielded 50'] with a clamp on Ferrite on Ethernet Patch cable: ASI Part # 1000066954, MFG WURTH #742 711 31S
4. 50ohm RF coaxial cable.
5. Photo Eye Cord Set – ASI part # 1000065713
With Photo Eye Kit, part # 1000065571

1.3 Equipment Description:

Description	Manufacturer	Model Description	Accu-sort Part No's
13.56MHz RFID reader	ACCU-SORT SYSTEMS, INC.	EZREADER-HF	1000065715
Power Supply AC-DC Converter	SINPRO	24V DC, 40W	0111020001
Variable AC Power Supply	APLAB	1000VA,CVCF 0201/FC/PG/170	--

1.4 Operation of the EUT under testing

The Unit was set to maximum power using the EZ reader GUI. The Laptop monitors EZ-READER-HF operation and the onboard LEDs provide visual indication of the status of the unit. The antenna port was connected to a frequency counter through an attenuator.

1.5 Selection of AC Power Voltage / Frequencies

The tests were performed with the EUT operating at 24V DC Supply. The DC source was powered by an A/C power of 110V, 60Hz.

1.6 Operating Mode:

1.6.1 Rationale for the chosen mode of operation

The unit was placed inside the environmental simulation chamber, whereas the laptop was placed outside. No modulation was applied on the carrier as it would distort the carrier frequency measurement on the frequency counter.

2. Frequency tolerance Test Results

Test Standard	FCC 15.225 (e)
Frequency	13.56 MHz
Temperature Range	-20° C to +50° C
Normal AC Voltages	120VAC/60 Hz & 240VAC/60 Hz (85% &115%)

2.1 Test Instrumentation & Accessories

Description	Make	Model Number	Serial number
Environmental chamber	Angelantoni	CH600C	41586
Frequency Counter	Agilent	53150A	US40502870
RG 142 SMA(M) to SMA(M) 2mtr Cable	Radiall Protectron	R125076000/RG142/ R125076000	-
BNC(M) to SMA(F)	Radiall Protectron	R191305000	-
40 dB Attenuator 5W	Mini Circuits	BW-N40W5	-

2.2 Test Observation:

2.2.1 Frequency Tolerance [FCC 15.225(e)]

The frequency tolerance test for the EUT was conducted in the Temperature range of -20° C to $+50^{\circ}\text{ C}$, with AC voltage variation from 85 % to 115 %. The measurement was carried out by keeping the EUT inside a Hot & cold chamber. The nominal AC supply voltages of 110 V AC/60Hz & 240 V AC/60Hz were provided using variable AC power supply. The measurement was done in the above temperature range and at both nominal voltages. For each temperature and each of the specified voltages, the frequency reading was taken after the temperature of the chamber was stabilized.

Test measurement setup is as shown in Fig-2

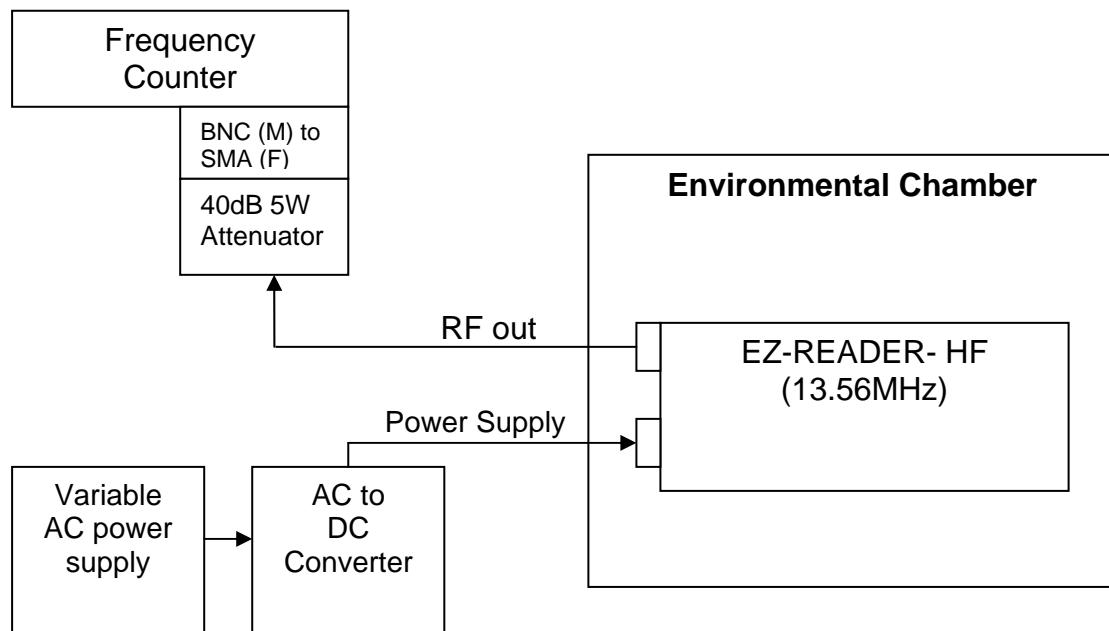


Fig .2

2.2.1.1 Frequency Readings over Temperature and nominal Voltages

The Frequency tolerance of the EUT with different temperatures and voltages as specified by FCC 15.225(e) was found to be within the limits. The readings were tabulated and given below:

i) Input AC Voltage Variation Test at ambient Temperature

Test Condition: +25° C, 102 V AC/60Hz

Elapsed Time in Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,321	0	0
2	13,560,320	-1	0.000007
5	13,560,321	0	0
10	13,560,321	0	0

Test Condition: +25° C, 120 V AC/60Hz

Elapsed Time in Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,326	0	0
2	13,560,321	-5	0.00003
5	13,560,321	-5	0.00003
10	13,560,320	-6	0.00004

Test Condition: +25° C, 138 V AC/60Hz

Elapsed Time Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,320	0	0
2	13,560,320	0	0
5	13,560,321	1	0.000007
10	13,560,321	1	0.000007

Test Condition: +25° C, 204 V AC/60Hz

Elapsed Time Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,322	0	0
2	13,560,320	-2	0.00001
5	13,560,320	-2	0.00001
10	13,560,321	-1	0.000007

Test Condition: +25° C, 240 V AC/60Hz

Elapsed Time Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,322	0	0
2	13,560,322	0	0
5	13,560,321	-1	0.000007
10	13,560,321	-1	0.000007

Test Condition: +25° C, 276 V AC/60Hz

Elapsed Time Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,321	0	0
2	13,560,322	1	0.000007
5	13,560,321	0	0
10	13,560,322	1	0.000007

ii) Temperature Variation Test at nominal voltages

Test Condition: -20° C, 120 V AC/60Hz

Elapsed Time in Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,589	0	0
2	13,560,587	-2	0.00001
5	13,560,587	-2	0.00001
10	13,560,587	-2	0.00001

Test Condition: -20° C, 240 V AC/60Hz

Elapsed Time in Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,583	0	0
2	13,560,586	3	0.00002
5	13,560,587	4	0.00003
10	13,560,588	5	0.000035

Test Condition: 0° C, 120 V AC/60Hz

Elapsed Time in Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,475	0	0
2	13,560,474	-1	0.000007
5	13,560,475	0	0
10	13,560,473	-2	0.00001

Test Condition: 0° C, 240 V AC/60Hz

Elapsed Time in Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,321	0	0
2	13,560,322	1	0.000007
5	13,560,321	0	0
10	13,560,322	1	0.000007

Test Condition: +50° C, 120 V AC/60Hz

Elapsed Time in Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,260	0	0
2	13,560,259	-1	0.000007
5	13,560,260	0	0
10	13,560,257	-3	0.00002

Test Condition: +50° C, 240 V AC/60Hz

Elapsed Time in Minutes	Frequency (Hz)	Deviation (Hz)	Deviation (%)
0	13,560,265	0	0
2	13,560,262	-3	0.00002
5	13,560,261	-4	0.00003
10	13,560,260	-5	0.000037