Compliance Testing, LLC
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EMI, EMC, RF Testing Experts Since 1963

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Test Report

Prepared for: Technologic Systems, Inc.

Model: TS-7990

Description: Embedded Computer Board

Serial Number: N/A

To

FCC Part 15B
Class A

And

IC ICES-003 Issue 6 (January 2016)

Date of Issue: May 22, 2017

On the behalf of the applicant:	**Technologic Systems, Inc.** **16525 E Laser Drive** **Fountain Hills, AZ 85268**
Attention of:	**Jeff Palmer, Engineer** **Ph: (480)837-5200** **E-Mail: jeff@embeddedarm.com**

Prepared By
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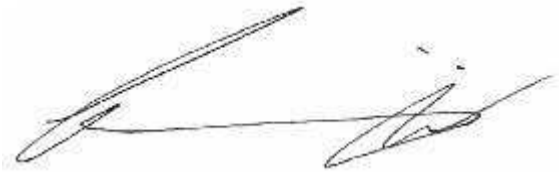
Project ID: p1730021



Alex Macon
Project Test Engineer

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	5/19/17	Alex Macon	Original Document

Table of Contents

The applicant has been cautioned as to the following

FCC

15.21 – Information to user

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) – Special Accessories

Equipment marketed to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in the part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in §2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Industry Canada

Products subject to Industry Canada ICES-003 must be labeled in English and/or French (based on the intended market and any other applicable provincial or federal regulations) as follows:

CAN ICES-3 (A)/NMB-3(A)

ILAC / A2LA

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

Testing Certificate Number: **2152.01**

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Non-accredited tests contained in this report:

N/A

Test and Measurement Data
Subpart 2.1033(b)

All tests and measurement data shown were performed in accordance with FCC Rule Parts: 15.107, 15.109 (Unintentional Radiators).

All tests and measurement data shown are deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003.

Name of Test	FCC Section	ICES-003
A/C Powerline Conducted Emissions	15.107	Section 6
Radiated Emissions	15.109	Section 6

Standard Engineering Practices

Unless otherwise indicated, the procedures contained in ANSI C63.4-2014 were observed during testing.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurement.

Standard Test Conditions and Engineering Practices

Unless otherwise indicated in the specific measurement results, the ambient temperature was maintained within the range of 10º to 40ºC (50º to 104ºF) and the relative humidity levels were in the range of 10% to 90%.

Environmental Conditions	
Temperature (ºC)	Humidity (%)
22.3	28.9

EUT Description
Model: TS-7990
Description: Embedded Computer Board
Firmware: N/A
Software: N/A
Serial Number: N/A
Additional Information: N/A

EUT Operation during Tests
The EUT was placed in an active mode by the manufacturer. The EUT was powered with a manufacturer supplied convertor

Accessories:

Qty	Description	Manufacturer	Model	S/N
1	Flash drive	Belkin	N/A	N/A
1	USB Switch	Netgear	N/A	N/A
1	Switching Adaptor	N/A	FJ-SW1203000U	N/A

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Termination
1	Ethernet	<3m	Y	Y	N/A

Modifications: None

Test Results Summary

Specification	Test Name	Pass, Fail, N/A	Comments
15.107	A/C Powerline Conducted Emissions	Pass	
15.109	Radiated Emissions	Pass	

15.107 A/C Powerline Conducted Emissions

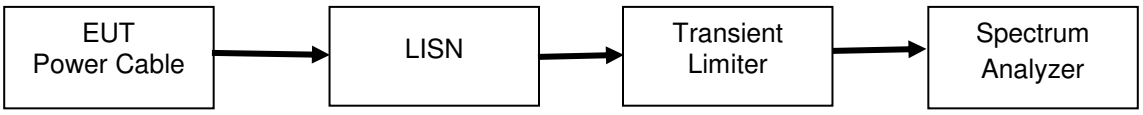
Engineer: Alex Macon

Test Date: 5/18/17

Test Procedure

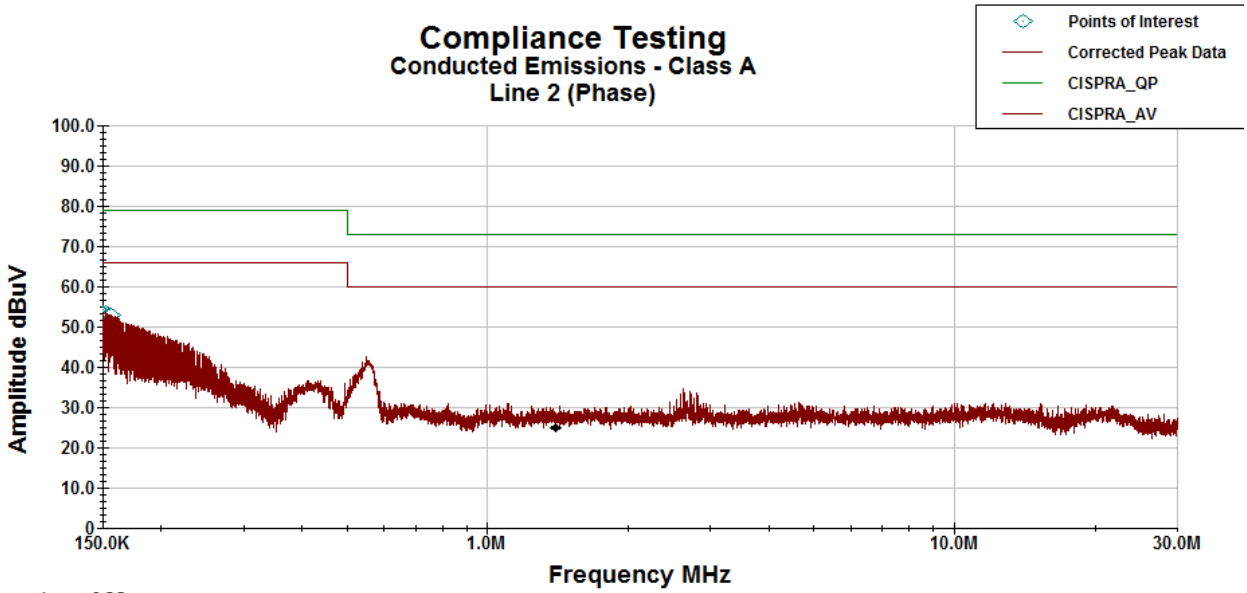
The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

Test Setup



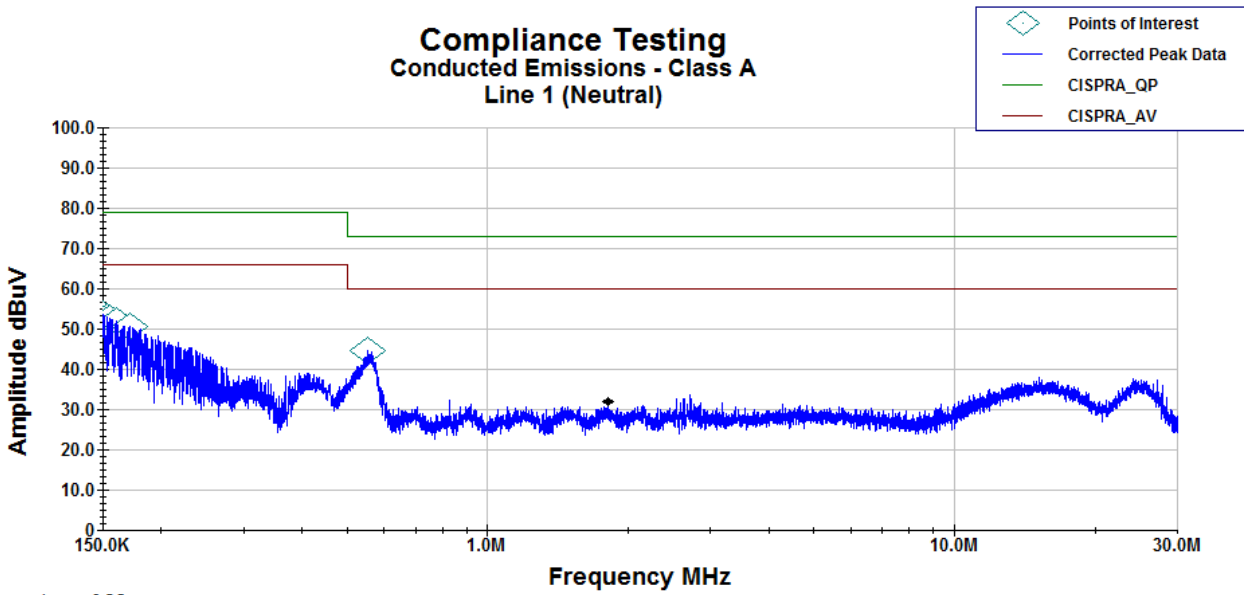
Conducted Emissions Test Results

Line 2 Peak Plot



Operator: AM
EN55022 Class A_7990.til **Job #: p1730021**

Line 1 Peak Plot



Operator: AM
EN55022 Class A_7990.til **Job #: p1730021**

All peak readings are below the quasi peak and average limits, therefore no tabular data was recorded.

15.109 Radiated Emissions

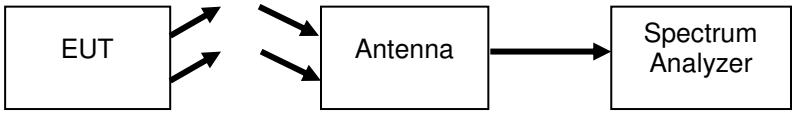
Engineer: Alex Macon

Test Date: 5/18/17

Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions. The EUT was tested by rotating it 360 degrees with the antennas in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the signal levels were maximized. All emissions from 30 MHz to 1 GHz were examined.

Test Setup



Settings

RBW = 120 KHz

VBW = 300 KHz

Detector – Quasi Peak

Sample Calculations

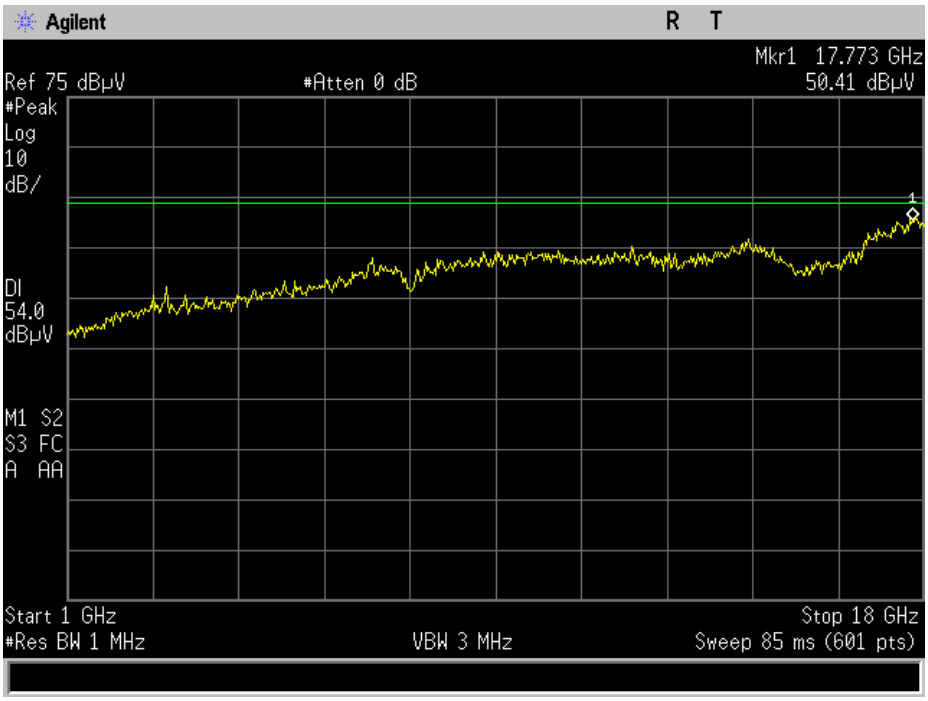
Corrected Value = Measured Value + Correction factor

Correction factor = ACF + Cable loss

Radiated Emissions

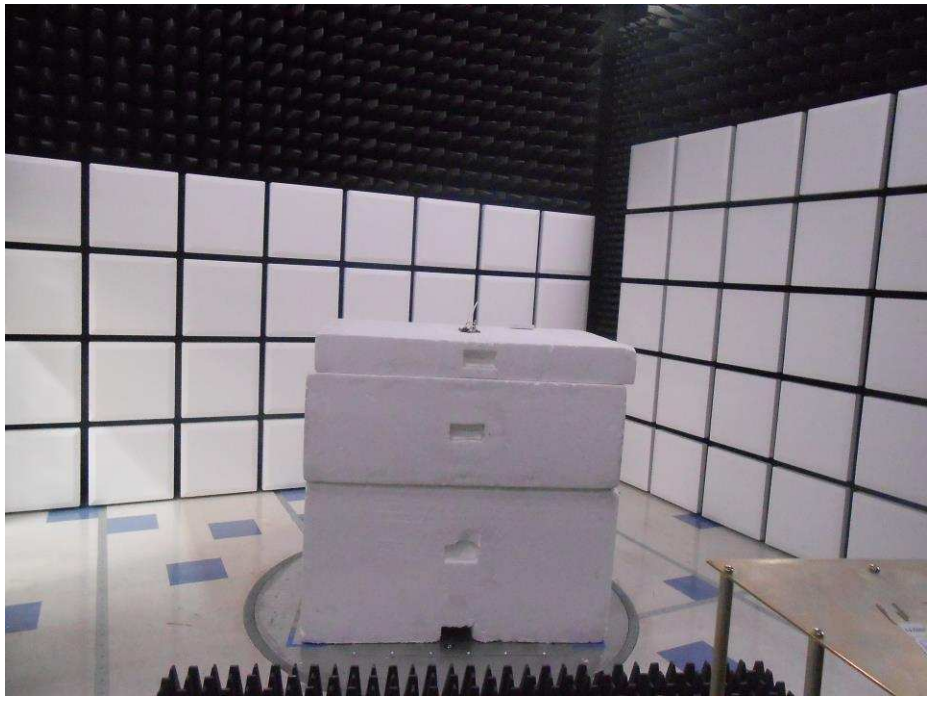
Emission Frequency (MHz)	Measured Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Antenna Polarity (V/H)	Turntable Position (deg)	Detector (QP,PK,Avg)
31.7763	31.357	49.5	-18.143	100	V	167	PK
82.9349	34.843	49.5	-14.657	100	V	167	PK
91.5798	34.591	54	-19.409	100	V	38	PK
507.0065	37.806	56.9	-19.094	100	V	105	PK
585.047	36.49	56.9	-20.41	100	V	72	PK
951.4467	36.279	56.9	-20.621	250	V	154	PK

Radiated Emissions 1 – 18 GHz



A/C Conducted Emissions Test Setup Photos

Radiated Emissions Test Setup Photos



Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
EMI Receiver	HP	8546A	i00033	3/28/17	3/28/18
Transient Limiter	Com-Power	LIT-153	i00123	Verified on: 5/18/17	
Horn Antenna	ARA	DRG-118/A	i00271	6/16/16	6/16/18
Humidity / Temp Meter	Newport	IBTHX-W-5	i00282	5/26/16	5/26/17
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	8/3/16	8/3/18
AC Power Source	Behlman	BL 6000	i00362	Verified on: 5/18/17	
EMI Analyzer	Agilent	E7405A	i00379	2/22/17	2/22/18
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	8/15/16	8/15/19
LISN	COM-Power	LI-125A	i00446	4/29/16	4/29/18
LISN	COM-Power	LI-125A	i00448	4/29/16	4/29/18
Preamplifier for 1-18GHz horn antenna	Miteq	AFS44 00101 400 23-10P-44	i00509	N/A	N/A

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

END OF TEST REPORT