Test Report

Prepared for: Technologic Systems, Inc.
Model: TS-7970
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
Compliance Testing, LLC
1724 S. Nevada Way
Mesa, AZ 85204
(480) 926-3100 phone / (480) 926-3598 fax
www.compliancetesting.com
Project ID: p1730021

Alex Macon
Project Test Engineer

This report may not be reproduced, except in full, without written permission from Compliance Testing. All results contained herein relate only to the sample tested.
## Test Report Revision History

<table>
<thead>
<tr>
<th>Revision</th>
<th>Date</th>
<th>Revised By</th>
<th>Reason for Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>5/19/17</td>
<td>Alex Macon</td>
<td>Original Document</td>
</tr>
</tbody>
</table>
# Table of Contents

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Test Conditions and Engineering Practices</td>
<td>6</td>
</tr>
<tr>
<td>Test Results Summary</td>
<td>8</td>
</tr>
<tr>
<td>15.107 A/C Powerline Conducted Emissions</td>
<td>9</td>
</tr>
<tr>
<td>15.109 Radiated Emissions</td>
<td>11</td>
</tr>
<tr>
<td>Test Equipment Utilized</td>
<td>16</td>
</tr>
</tbody>
</table>
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)*
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.


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.

<table>
<thead>
<tr>
<th>Name of Test</th>
<th>FCC Section</th>
<th>ICES-003</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/C Powerline Conducted Emissions</td>
<td>15.107</td>
<td>Section 6</td>
</tr>
<tr>
<td>Radiated Emissions</td>
<td>15.109</td>
<td>Section 6</td>
</tr>
</tbody>
</table>

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%.

<table>
<thead>
<tr>
<th>Environmental Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (ºC)</td>
</tr>
<tr>
<td>22.3</td>
</tr>
</tbody>
</table>

EUT Description
Model: TS-7970
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:

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Model</th>
<th>S/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Flash drive</td>
<td>Belkin</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>Monitor</td>
<td>Dell</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>USB Switch</td>
<td>Netgear</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1</td>
<td>Switching Adaptor</td>
<td>N/A</td>
<td>FJ-SW1203000U</td>
<td>N/A</td>
</tr>
</tbody>
</table>

## Cables:

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
<th>Length (M)</th>
<th>Shielding Y/N</th>
<th>Shielded Hood Y/N</th>
<th>Termination</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ethernet</td>
<td>&lt;3m</td>
<td>Y</td>
<td>Y</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Modifications:** None
## Test Results Summary

<table>
<thead>
<tr>
<th>Specification</th>
<th>Test Name</th>
<th>Pass, Fail, N/A</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.107</td>
<td>A/C Powerline Conducted Emissions</td>
<td>Pass</td>
<td></td>
</tr>
<tr>
<td>15.109</td>
<td>Radiated Emissions</td>
<td>Pass</td>
<td></td>
</tr>
</tbody>
</table>
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 1 Peak Plot

Compliance Testing
Conducted Emissions - Class A
Line 2 (Phase)

Operator: AM
EN55022 Class A_7970.til

Job #: p1730021

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

Line 2 Peak Plot

Compliance Testing
Conducted Emissions - Class A
Line 1 (Neutral)

Operator: AM
EN55022 Class A_7970.til

Job #: p1730021
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

![Test Setup Diagram]

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

<table>
<thead>
<tr>
<th>Emission Frequency (MHz)</th>
<th>Measured Level (dBuV/m)</th>
<th>Limit (dBuV/m)</th>
<th>Margin (dB)</th>
<th>Antenna Height (cm)</th>
<th>Antenna Polarity (V/H)</th>
<th>Turntable Position (deg)</th>
<th>Detector (QP,PK,Avg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>34.596</td>
<td>49.5</td>
<td>-14.904</td>
<td>176</td>
<td>V</td>
<td>252</td>
<td>PK</td>
</tr>
<tr>
<td>33.3158</td>
<td>45.566</td>
<td>49.5</td>
<td>-3.934</td>
<td>176</td>
<td>V</td>
<td>252</td>
<td>PK</td>
</tr>
<tr>
<td>35.0922</td>
<td>42.927</td>
<td>49.5</td>
<td>-6.573</td>
<td>176</td>
<td>V</td>
<td>252</td>
<td>PK</td>
</tr>
<tr>
<td>79.1454</td>
<td>32.052</td>
<td>49.5</td>
<td>-17.448</td>
<td>176</td>
<td>V</td>
<td>252</td>
<td>PK</td>
</tr>
<tr>
<td>80.9217</td>
<td>37.183</td>
<td>49.5</td>
<td>-12.317</td>
<td>176</td>
<td>V</td>
<td>252</td>
<td>PK</td>
</tr>
<tr>
<td>84.9481</td>
<td>34.361</td>
<td>49.5</td>
<td>-15.139</td>
<td>176</td>
<td>V</td>
<td>252</td>
<td>PK</td>
</tr>
</tbody>
</table>
Radiated Emissions 1 – 18 GHz

Agilent

Ref 75 dBmU
-10 dBm/10 dB/10 dB

ML S2
S3 FC
A A A

Start 1 GHz  Stop 18 GHz

#Res BW 1 MHz

#Res BW 3 MHz

Sweep 85 ms (601 pts)
A/C Conducted Emissions Test Setup Photos
Radiated Emissions Test Setup Photos
1 – 18 GHz
## Test Equipment Utilized

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

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