

EMC - TEST REPORT

UNITED STATES STANDARD 47 CFR PART 15, SUBPART B*

Test Report File No. : **SC200610-06** Date of Issue: 12 February 2002

Model / Serial No. : **PF80452 / 100007**

Product Type : **JDLINK**

Applicant : **PHOENIX INTERNATIONAL CORPORATION**

Manufacturer : **PHOENIX INTERNATIONAL CORPORATION**

License holder : **PHOENIX INTERNATIONAL CORPORATION**

Address : **1441 44th Street Northwest**
: **Fargo, ND 58102**

Test Result : ☒ **Positive** ☐ **Negative**

Test Project Number
Reference(s) : **SC200610-06**

Total pages - Test Report : **24**

(*) Conducted Emissions not tested. EUT is DC powered.

NOTE: All test equipment used during testing is calibrated and traceable to NIST.

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TEST REGULATIONS:

The tests were performed according to the following regulations:

- | | | |
|--|---|--|
| ☐ - EN 50081-1 / 1991 | | |
| ☐ - EN 55011 / 1998 | ☐ - Group 1 | ☐ - Group 2 |
| ☐ - EN 55013 / 1990 | ☐ - Class A | ☐ - Class B |
| ☐ - EN 55014 / 1993 | ☐ - Household appliances and similar | |
| | ☐ - Portable tools | |
| | ☐ - Semiconductor devices | |
| ☐ - EN 55022 / 1987 | ☐ - Class A | ☐ - Class B |
| ☐ - EN 55022 / 1998 | ☐ - Class A | ☐ - Class B |
| ☐ - VCCI | ☐ - Class A ITE | ☐ - Class B ITE |
| ☒ - 47 CFR Part 15, Subpart B* | | |
| ☐ - 107(b) | | |
| ☐ - 107(a) | | |
| ☐ - 107(e) | ☐ - Class A | ☐ - Class B |
| ☐ - 109(b) | | |
| ☒ - 109(a) | | |
| ☐ - 109(g) | ☐ - Class A | ☐ - Class B |
| ☐ - AS/NZS 3548: 1995 | ☐ - Class A | ☐ - Class B |
| ☐ - CISPR 11 (1997) | ☐ - Group 1 | ☐ - Group 2 |
| | ☐ - Class A | ☐ - Class B |
| ☐ - CISPR 22 (1997) | ☐ - Class A | ☐ - Class B |

(*) Conducted Emissions not tested. EUT is DC powered.

Environmental Conditions In The Laboratory:

	<u>Actual</u>
Temperature	: 26 °C
Relative Humidity	: 24 %
Atmospheric Pressure	: 100.0 kPa

Power Supply Utilized:

Power supply system	: 12 VDC
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Symbol Definitions:

- - Applicable
- - Not Applicable

Details of Test Procedures:

General Standard Information

The test methods used comply with ANSI C63.4-1992 – "Methods of Measurement of Radio-Noise Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

Conducted Emissions

Conducted emissions on the 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with the a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 MHz to 22 GHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 x 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna polarizations and the EUT are rotated 360 degrees. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions.

Field Strength Calculation:

The field strength is calculated by adding the Antenna and Cable Factor to the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

Where: FS = Field Strength
 RA = Receiver Amplitude
 AF = Antenna Factor
 CF = Cable Attenuation Factor

Assume a receiver reading of 27 dB μ V is obtained. The Antenna and Cable Factor of 14 is added, giving a field strength of 41 dB μ V/m. The 41 dB μ V/m value was mathematically converted to its corresponding level in μ V/m.

$$FS = 27 + 14 = 41 \text{ dB}\mu\text{V/m}$$

$$\text{Level in } \mu\text{V/m} = \text{Common Antilogarithm } [(41 \text{ dB}\mu\text{V/m})/20] = 112 \mu\text{V/m}$$

Test Conditions: RADIATED EMISSIONS (Electric Field)

The RADIATED EMISSIONS (Electric Field) measurements were performed in the following location at the San Diego Testing Facility:

☐ - Test not applicable

■ - Canyon #1 (10- and 30-Meter Open Area Test Site), Carroll Canyon, San Diego
(Calibration Due Date: 17 July 2002)

Testing was performed at a test distance of:

■ - 3 meters

Test Equipment Used:

Model No.	Prop. No.	Description	Manufacturer	Serial No.	Cal Due Date
LPB 2520/A	738	Antenna, Bilog	Antenna Research	1169	04/02
ESVS 30	466	EMI Test Receiver	Rohde & Schwarz	833825/003	02/02

Remarks: One year calibration cycle for all test equipment and sites.

Equipment Under Test (EUT) Test Operation Mode:

The equipment under test was operated under the following conditions during testing:

- ☐ - Standby
- ☐ - Test Program (H - Pattern)
- ☐ - Test Program (Color Bar)
- ☐ - Test Program (Customer Specified)
- ☐ - Practice Operation
- ☐ - Normal Operating Mode
- ☒ - Receive Mode

Configuration of the equipment under test:

- ☐ - See Constructional Data Form in Appendix B - Page B2
- ☒ - See Product Information Form(s) in Appendix B - Page B2

The following peripheral devices and interface cables were connected during the testing:

- | | |
|---|-----------------|
| ☐ - _____ | Type: _____ |
| ☐ - _____ | Type: _____ |
| ☐ - _____ | Type: _____ |
| ☐ - _____ | Type: _____ |
| ☐ - _____ | Type: _____ |
| ☐ - _____ | Type: _____ |
| ☐ - Unshielded power cable | |
| ☐ - Unshielded cables | |
| ☐ - Shielded cables | MPS. No.: _____ |
| ☐ - Customer specific cables | |
| ☐ - _____ | |
| ☐ - _____ | |

Test Results:

Conducted Emissions, 10/150/450 kHz - 30 MHz

☐ - PASS

☐ - FAIL

☒ - NOT APPLICABLE

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

Radiated Emissions (Electric Field), 30 MHz - 1000 MHz

☒ - PASS

☐ - FAIL

☐ - NOT APPLICABLE

Minimum limit margin _____ 4.5 dB at _____ 326.69 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

GENERAL REMARKS:

NOTE: All photographs are representative of setup for maximum emissions.

(*) Conducted Emissions - not tested. EUT is DC powered.

SUMMARY:

All tests according to the regulations cited on page 3 were

☐ - **Performed**

☒ - Performed with the following **exceptions***

The Equipment Under Test

☒ - **Fulfills** the general approval requirements cited on page 3.*

☐ - **Does not** fulfill the general approval requirements cited on page 3.

Statement of Measurement Uncertainty

The data and results referenced in this document are true and accurate. The measurement uncertainty is calculated to be ± 2 dB for conducted emissions and ± 4 dB for radiated emissions.

Equipment Received Date: 11 February 2002

Testing Start Date: 11 February 2002

Testing End Date: 11 February 2002

- TÜV PRODUCT SERVICE, INC. -

Responsible Engineer:



Jim Owen
(EMC Chief Engineer)

Responsible Technician:



Alan Laudani
(EMC Technician)

Technical Documentation

Test Data Sheets

and

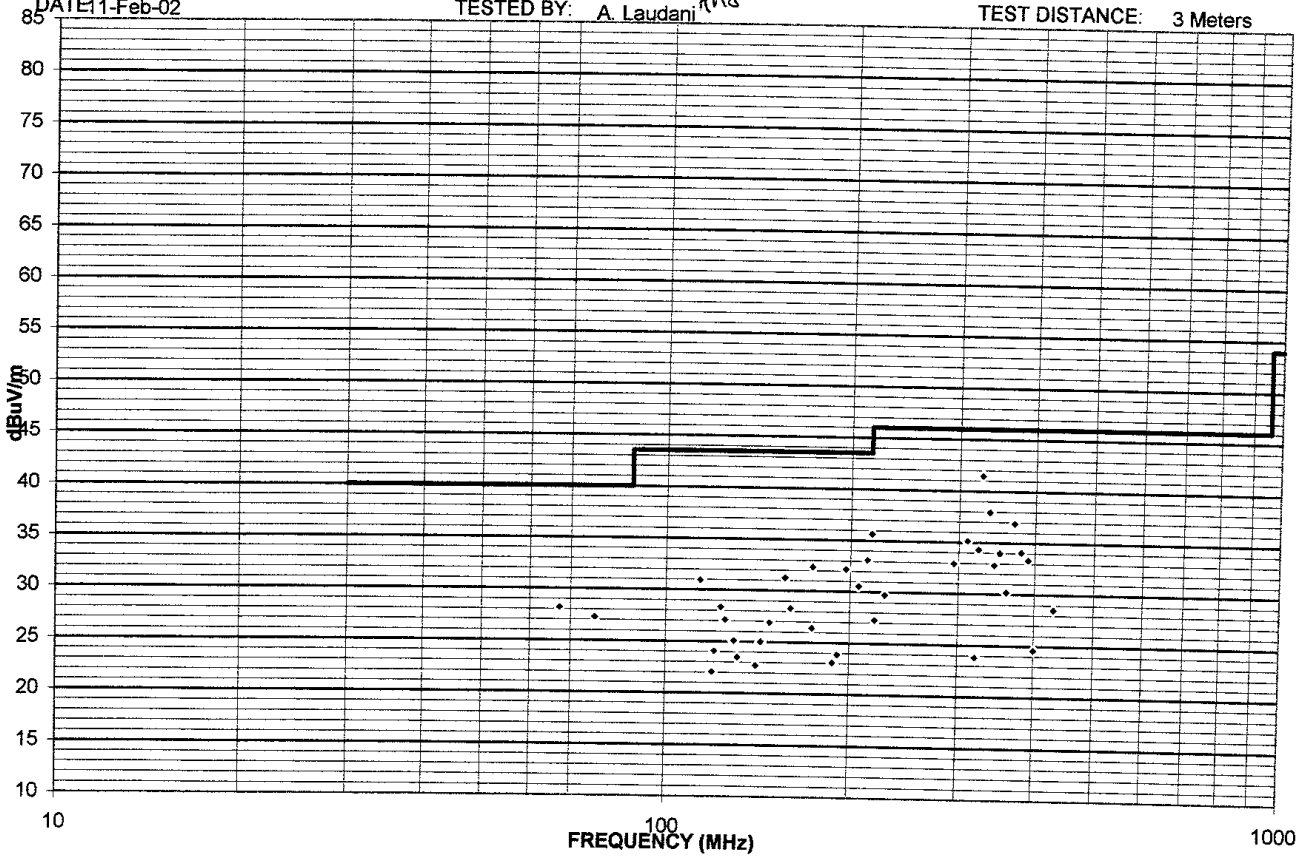
Test Setup Drawing(s)

REPORT NO. SC200610
COMPANY: Phoenix Int'l
EUT: JDLink
EUT MODE: Receive
DATE: 11-Feb-02

SPEC: FCC Part 15 para 15.109(a)

TESTED BY: A. Laudani *AL*

TEST DISTANCE: 3 Meters



REPORT No: SC200610

SPEC: FCC Part 15 para 15.109(a)

CUSTOMER: Phoenix Int'l

TEST DIST: 3 Meters

EUT: JDLINK

TEST SITE: 1

EUT MODE: Receive

BICONICAL: 738

DATE: 11-Feb-02

TESTED BY: A. Laudani *AL*

LOG PERIODIC: 738

NOTES:

Quasi-Peak with 120 KHz measurement bandwidth.

RCVR: 466

12 Vdc powered by Battery With Production Harness

Temperature: 26		Relative Humidity: 24						
EUT MARGIN		-4.5 dB at 326.69 MHz		ver 1.8a				
FREQUENCY (MHz)	VERTICAL measured (dBuV)	HORIZONTAL measured (dBuV)	CORRECTION FACTOR (dB/m)	MAXIMUM CORRECTED (dBuV/m)	SPECIFIED LIMIT (dBuV/m)	EUT MARGIN (dB)	EUT ROTATION (degrees)	ANTENNA HEIGHT (meters)
67.00	17.8	12.5	10.4	28.2	40	-11.8		
76.67	18	16	9.3	27.3	40	-12.7	315	1
113.83	17	11	14.0	31.0	43.5	-12.5	240	1
119.67	7.2	7.5	14.6	22.1	43.5	-21.4	80	1
120.44	9.5	9.3	14.6	24.1	43.5	-19.4	90	1
123.34	13.2	14	14.4	28.4	43.5	-15.1	90	2
125.36	12.1	12.9	14.2	27.1	43.5	-16.4	110	3
129.65	9.4	11.2	13.9	25.1	43.5	-18.4	120	2
131.50	8.5	9.8	13.7	23.5	43.5	-20.0	129	3
140.72	8.5	10.4	12.3	22.7	43.5	-20.8	100	2
143.28	13	13	12.0	25.0	43.5	-18.5	120	2
148.09	14.6	15.4	11.5	26.9	43.5	-16.6	100	1
156.67	20	10	11.3	31.3	43.5	-12.2	150	1
160.01	17	8.4	11.3	28.3	43.5	-15.2	130	1
173.35	20.1	17	12.2	32.3	43.5	-11.2	340	1
173.35	14.2	4.8	12.2	26.4	43.5	-17.1	160	1
188.00	10	6.7	13.1	23.1	43.5	-20.4	130	1
191.11	10.5	2.1	13.4	23.9	43.5	-19.6	70	1
196.68	18.1	18.5	13.7	32.2	43.5	-11.3	40	1
206.68	16.2	9	14.4	30.6	43.5	-12.9	0	1
213.33	18.3	8.9	14.8	33.1	43.5	-10.4	30	1
216.68	20.6	7.1	15.1	35.7	46	-10.3	330	1
220.01	12	3.4	15.3	27.3	46	-18.7	30	1
228.31	11.9	14	15.8	29.8	46	-16.2	50	2
294.64	7.6	15.4	17.6	33.0	46	-13.0	80	1
310.02	16	17.2	18.0	35.2	46	-10.8	250	1
321.03	2.8	5.7	18.1	23.8	46	-22.2	250	1
323.35	9.8	16.1	18.2	34.3	46	-11.7	260	1
326.69	15.4	23.1	18.4	41.5	46	-4.5	260	1
336.69	5.9	19.2	18.8	38.0	46	-8.0	250	1
343.36	2	13.8	19.0	32.8	46	-13.2	260	1
350.03	7.4	14.7	19.3	34.0	46	-12.0	250	1

SPEC: FCC Part 15 para 15.109(a)

TEST DIST: 3 Meters

TEST SITE: 1

BICONICAL: 738

LOG PERIODIC: 738

RCVR: 466

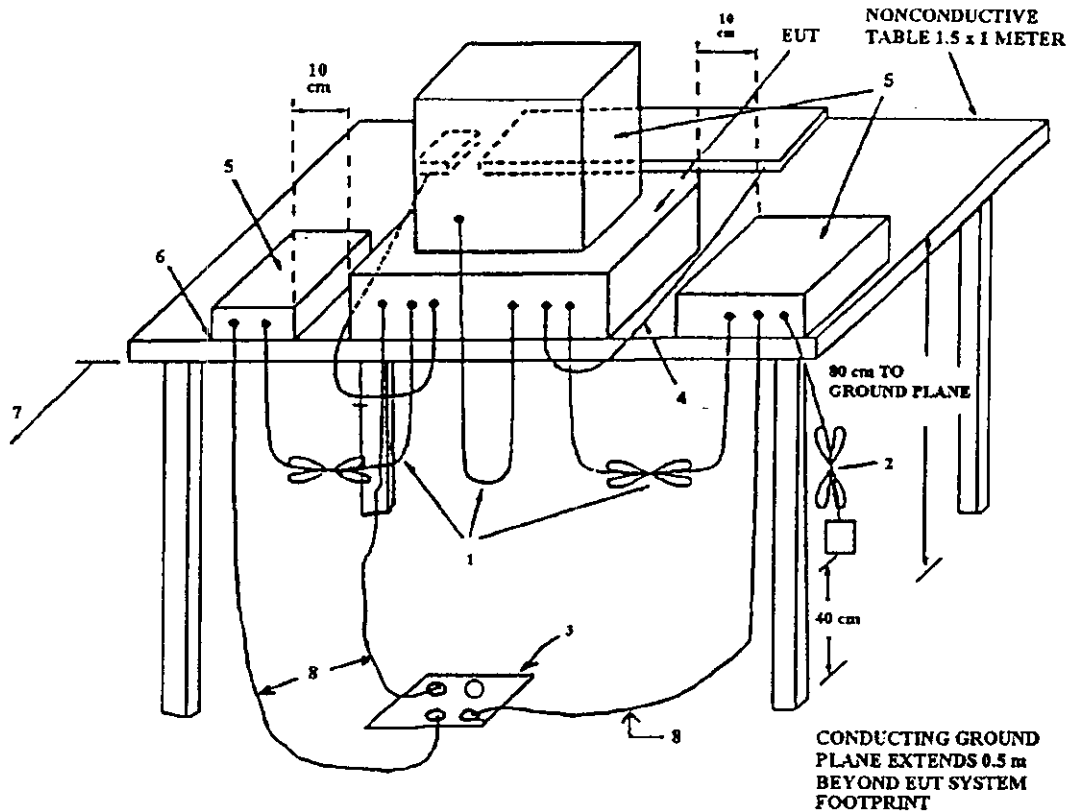
EUT MARGIN

-4.5 dB at 326.69 MHz

ver 1.8a

Rev.No 1.0

Radiated Emissions Test Setup, 30 to 1000 MHz



LEGEND:

1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between ground plane and table.
2. I/O cables that are connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1 m.
3. If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground plane with the receptacle flush with the ground plane.
4. Cables of hand-operated devices, such as keyboards, mouses, etc., have to be placed as close as possible to the controller.
5. Non-EUT components of EUT system being tested.
6. The rear of all components of the system under test shall be located flush with the rear of the table.
7. No vertical conducting wall used.
8. Power cords drape to the floor and are routed over to receptacle.

Appendix A

Test Setups (Photographs)

NOTE: All photographs are representative of setup for maximum emissions.

Photograph of Test Setup:
Radiated Emissions



Photograph of Test Setup:
Radiated Emissions



Appendix B

Product Information Form(s)

General Equipment Description -- NOTE: This information will be input into your test report as shown below.

EUT Description: Amps Communication Module

EUT Name: JDLink

Model No.: PF80452 Serial No.: 100007

Product Options: --

Configurations to be tested: Standard Configuration

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: +13.2 VDC (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: --

Current (Amps/phase(max)): 1.2 A Current (Amps/phase(nominal)): 250 mA

Other: --

Other Special Requirements

--

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

Off-highway agricultural vehicles (tractors, combines, etc.)

EUT Power Cable

☐ Permanent OR ☒ Removable Length (in meters): 3

☐ Shielded OR ☒ Unshielded

☐ Not Applicable

EUT Interface Ports and Cables											
Interface				Shielding							
Type	Analog	Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination	Length (in meters)	Removable Permanent
EXAMPLE: RS232	☐	☒	2	☒	☐	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	☒ ☐
CAN (Controller Area Network) Serial Interface	☐	☒	2	☐	☒	--	--	6 Pin Metripak PN 12052848	Characteristic Impedance	3	☒ ☐
CCD (Chrysler Collision Detection) Serial Interface	☐	☒	2	☐	☒	--	--	6 Pin Molex PN 430250600	Characteristic Impedance	3	☒ ☐

EUT Software.

Revision Level: 2.30

Description: --

EUT Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Receive Mode (Ears-on)

EUT System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #
JDLINK	PF80452	100007	OV5-PF80452

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)

Description	Model #	Serial #	FCC ID #
CAN Laptop Computer	HP Omnibook 6000	TW03809540	--
CCD Laptop Computer	Compaq Armada 7400	7922CH810479	--

Oscillator Frequencies

Frequency	Derived Frequency	Component # / Location	Description of Use
4 MHz	16 MHz	Y4	Microprocessor
1.8432 MHz	--	Y1	UART
32.768 MHz	--	Y3	Real Time Clock

Power Supply

Manufacturer	Model #	Serial #	Type
--			☐ Switched-mode (Frequency) ☐ Linear ☐ Other

Power Line Filters

Manufacturer	Model #	Location in EUT
--		

Critical EMI Components (Capacitors, ferrites, etc.)				
<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>
30-pin Connector with Integrated Ferrite Blocks	Cinch	581-01-30-001	1	J1

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

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Appendix C

Change History

Not Applicable

Appendix D

Supplemental Information

Not Applicable