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Electromagnetic Compatibility Test Report

Test of: USB Touchscreen Monitor

Model Number: UM-760R

Series Model: UM-760, UM-760RF, UM-760C, UM-760CF, UM-780, UM-780R, UM-780RF, UM-780C, UM-780CF

Applicant: MultimediaLink Inc.

Test Type: Compliance



Test Specification(s): EN 55022: 2010
EN 55024: 2010

Report Number: KTI14EC12002

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Test Engineer J. Y. Shin	Authorized Signatory S.H. Song

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1. Client Information

Company Name:	MultimediaLink Inc.
Address:	#821, DaehyeonTechnoWorld, 174, Ojeon-dong, Uiwang-si, Gyeonggi-do, 437-753, Korea

2. Equipment Under Test (EUT)**2.1 Identification Of EUT**

Model Number:	UM-760R
Unique Identifier:	Sample as supplied by client
Description of EUT:	USB Touchscreen Monitor
Supply Voltage:	AC 220V
Support Equipment or Peripherals Required:	Notebook PC : NT300V5A-A25B

3. Test Specification, Methods and Procedures

3.1 Test Specification(s)

Standard	Title
EN 55022: 2010	Information technology equipment- Radio disturbance characteristics- Limits and methods of measurement
EN 55024: 2010	Information technology equipment- Immunity characteristics- Limits and methods of measurement

3.2 Purpose Of Test

To perform the relevant tests and assess the product for compliance with the above specification.

3.3 Methods and Procedures

The standards Listed on the previous page refer to the following tests:

Basic Standard	Date	Description
EN 55022	2010	Information technology equipment- <i>Conducted Emission</i> <i>Radiated Emission</i>
EN 61000-4-2	2009	Testing and measurement techniques. <i>Electrostatic discharge immunity test.</i>
EN 61000-4-3 +A1 +A2	2006 2008 2010	Testing and measurement techniques <i>Radiated, radio-frequency, electromagnetic field immunity test.</i>
EN 61000-4-4	2012	Testing and measurement techniques. <i>Electrical fast transient/burst immunity test.</i>
EN 61000-4-5	2006	Testing and measurement techniques. <i>Surge immunity test.</i>
EN 61000-4-6	2014	Testing and measurement techniques <i>Immunity to conducted disturbances induced by radio frequency fields</i>
EN 61000-4-8	2010	Testing and measurement techniques. <i>Power frequency magnetic field Immunity test</i>
EN 61000-4-11	2004	Testing and measurement techniques. <i>Voltage dips, short interruptions and voltage variations immunity test.</i>

4. Deviations or Exclusions from the Test Specifications

There were no deviations from the test specifications.

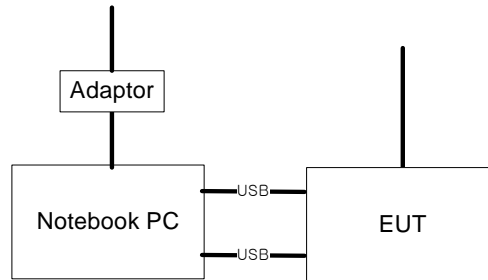
5. Operation of the EUT during testing

5.1 Configuration and Peripherals

Notebook PC was required for the tests.

The following configuration was used:

The configuration used for each individual test is described in the test results section of this report.



— SIGNAL

— POWER

5.2 Monitoring of the EUT

The operating status of EUT was monitored by observation of LCD in normal operating status.

5.3 Operation Mode and Environmental Conditions

The operation modes and environmental conditions used for each individual test are described in the test results section of this report.

5.4 Performance Criteria for Immunity Tests

Criterion A

The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may expect from the apparatus if used as intended.

Criterion B

The apparatus continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. In some cases the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operation state or stored data is allowed. If the minimum performance level or the permissible performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

Criterion C

Temporary loss of function is allowed, provided the function is self recoverable or can be restored by operation of the controls.

6. Test Results

6.1 General Comments

The Equipment does not contain devices susceptible to magnetic fields, so the test was not performed.

6.2 Modifications made to the EUT

No modifications were made to the EUT.

6.3 Summary of Test Results

Basic Standard	Test	Result
EN 55022	Information technology equipment- <i>Conducted Emission</i> <i>Radiated Emission</i>	Complied
EN 61000-4-2	Testing and measurement techniques. <i>Electrostatic discharge immunity test.</i>	Complied
EN 61000-4-3 +A1 +A2	Testing and measurement techniques <i>Radiated, radio-frequency, electromagnetic field immunity test</i>	Complied
EN 61000-4-4 +A1	Testing and measurement techniques. <i>Electrical fast transient/burst immunity test.</i>	Complied
EN 61000-4-5	Testing and measurement techniques. <i>Surge immunity test.</i>	Complied
EN 61000-4-6	Testing and measurement techniques <i>Immunity to conducted disturbances induced by radio frequency fields</i>	Complied
EN61000-4-8	Testing and measurement techniques. <i>Power frequency magnetic field Immunity test</i>	None
EN 61000-4-11	Testing and measurement techniques. <i>Voltage dips, short interruptions and voltage variations immunity test.</i>	Complied

Result:

In the configuration tested, the EUT complies with the test standards listed above. Full details of all tests can be found in the Test Results section of this report.

6.4 Uncertainty

- 1) Radiated disturbance
 U_c (Combined standard Uncertainty) = $\pm 2.61\text{dB}$
Expanded uncertainty $U = KU_c$
 $K = 2$
 $\therefore U = \pm 5.22\text{dB}$
- 2) Conducted disturbance
 $U_c = \pm 1.40\text{dB}$
 $U = KU_c = 2 \times U_c = \pm 2.8\text{dB}$
 $\therefore U = \pm 2.8\text{dB}$

6.5 Conducted Emission Test Results

Port:	AC Mains
Basic Standard:	EN 55022: 2010
Limit Table:	Class A

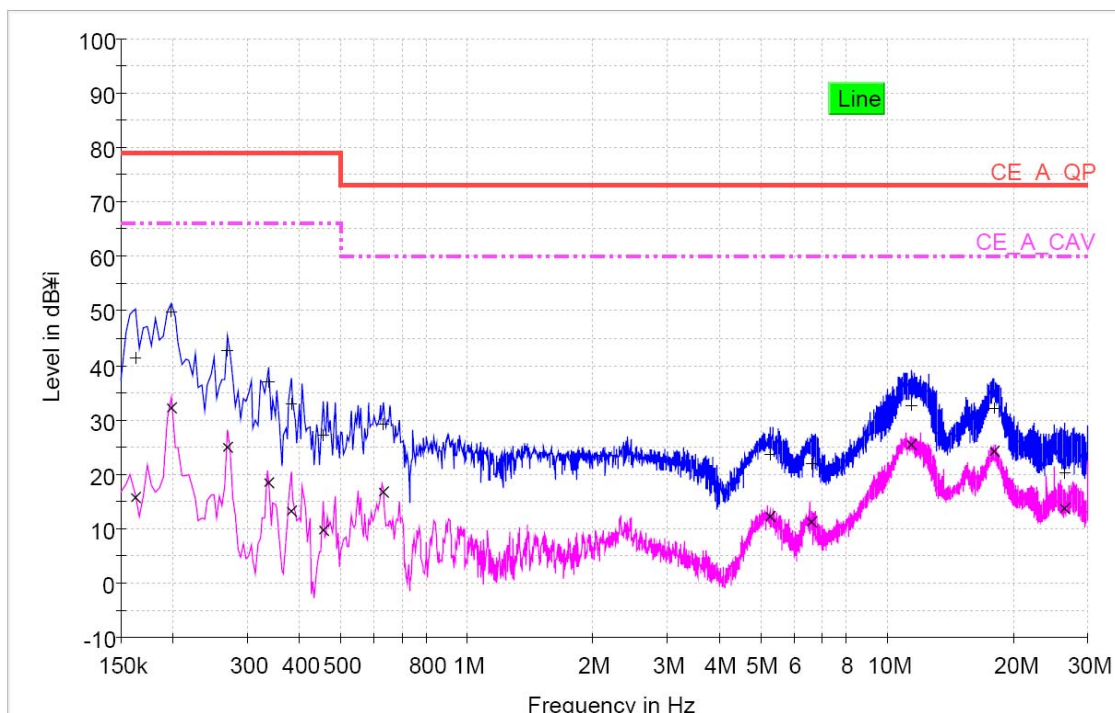
Operation Mode

The EUT was tested in the following modes:

1. Normal operating.

Test Results

< Line >



QP

Frequency (MHz)	MaxPeak (dBμV)	QuasiPeak (dBμV)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBμV)	Comment
0.162000	---	41.4	15.6	1000.0	9.000	L1	10.0	37.6	79.0	
0.198000	---	49.9	32.2	1000.0	9.000	L1	10.0	29.1	79.0	
0.270000	---	42.7	24.8	1000.0	9.000	L1	10.0	36.3	79.0	
0.338000	---	36.9	18.4	1000.0	9.000	L1	10.0	42.1	79.0	
0.382000	---	32.9	13.2	1000.0	9.000	L1	10.0	46.1	79.0	
0.454000	---	27.2	9.7	1000.0	9.000	L1	10.0	51.8	79.0	
0.634000	---	29.3	16.6	1000.0	9.000	L1	10.0	43.7	73.0	
5.278000	---	23.6	12.3	1000.0	9.000	L1	10.2	49.4	73.0	
6.598000	---	21.9	11.2	1000.0	9.000	L1	10.2	51.1	73.0	
11.474000	---	32.7	25.5	1000.0	9.000	L1	10.4	40.3	73.0	
18.038000	---	32.2	24.1	1000.0	9.000	L1	10.6	40.8	73.0	
26.414000	---	20.1	13.6	1000.0	9.000	L1	10.7	52.9	73.0	

CAV

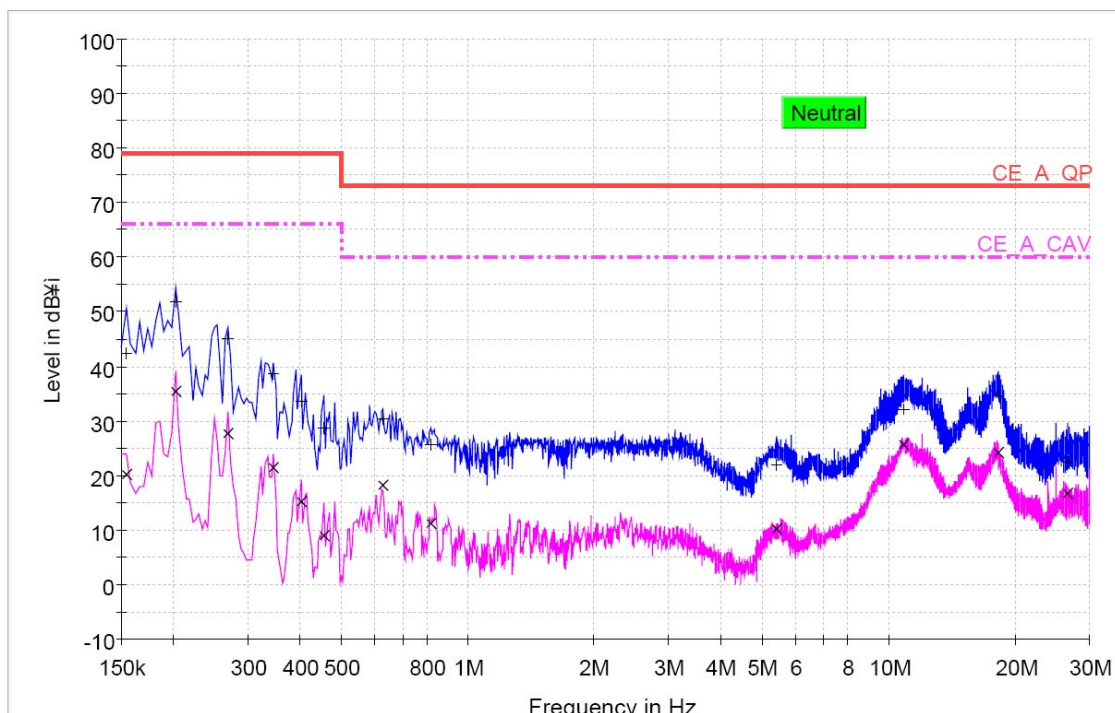
Frequency (MHz)	MaxPeak (dBμV)	QuasiPeak (dBμV)	CAverage (dBμV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBμV)	Comment
0.162000	---	41.4	15.6	1000.0	9.000	L1	10.0	50.4	66.0	
0.198000	---	49.9	32.2	1000.0	9.000	L1	10.0	33.8	66.0	
0.270000	---	42.7	24.8	1000.0	9.000	L1	10.0	41.2	66.0	
0.338000	---	36.9	18.4	1000.0	9.000	L1	10.0	47.6	66.0	
0.382000	---	32.9	13.2	1000.0	9.000	L1	10.0	52.8	66.0	
0.454000	---	27.2	9.7	1000.0	9.000	L1	10.0	56.3	66.0	
0.634000	---	29.3	16.6	1000.0	9.000	L1	10.0	43.4	60.0	
5.278000	---	23.6	12.3	1000.0	9.000	L1	10.2	47.7	60.0	
6.598000	---	21.9	11.2	1000.0	9.000	L1	10.2	48.8	60.0	
11.474000	---	32.7	25.5	1000.0	9.000	L1	10.4	34.5	60.0	
18.038000	---	32.2	24.1	1000.0	9.000	L1	10.6	35.9	60.0	
26.414000	---	20.1	13.6	1000.0	9.000	L1	10.7	46.4	60.0	

Remark: A.V data was not tested because Q.P data was under the Q.P limits.

Note: The worst case emissions are recorded. Refer to the graph at next page.

※ L1: Phase line, L2: Neutral line

< Neutral >



QP

Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - QPK (dB)	Limit - QPK (dBµV)	Comment
0.154000	---	42.4	20.1	1000.0	9.000	N	10.0	36.6	79.0	
0.202000	---	51.9	35.4	1000.0	9.000	N	10.0	27.1	79.0	
0.270000	---	45.1	27.6	1000.0	9.000	N	10.0	33.9	79.0	
0.346000	---	38.7	21.5	1000.0	9.000	N	10.0	40.3	79.0	
0.402000	---	33.6	15.2	1000.0	9.000	N	10.0	45.4	79.0	
0.454000	---	28.6	8.8	1000.0	9.000	N	10.0	50.4	79.0	
0.630000	---	30.3	18.2	1000.0	9.000	N	10.0	42.7	73.0	
0.818000	---	25.6	11.1	1000.0	9.000	N	10.1	47.4	73.0	
5.406000	---	21.9	10.1	1000.0	9.000	N	10.2	51.1	73.0	
10.886000	---	32.3	25.7	1000.0	9.000	N	10.6	40.7	73.0	
18.186000	---	34.7	24.2	1000.0	9.000	N	11.0	38.3	73.0	
26.778000	---	22.5	16.7	1000.0	9.000	N	11.3	50.5	73.0	

CAV

Frequency (MHz)	MaxPeak (dBµV)	QuasiPeak (dBµV)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)	Margin - CAV (dB)	Limit - CAV (dBµV)	Comment
0.154000	---	42.4	20.1	1000.0	9.000	N	10.0	45.9	66.0	
0.202000	---	51.9	35.4	1000.0	9.000	N	10.0	30.6	66.0	
0.270000	---	45.1	27.6	1000.0	9.000	N	10.0	38.4	66.0	
0.346000	---	38.7	21.5	1000.0	9.000	N	10.0	44.5	66.0	
0.402000	---	33.6	15.2	1000.0	9.000	N	10.0	50.8	66.0	
0.454000	---	28.6	8.8	1000.0	9.000	N	10.0	57.2	66.0	
0.630000	---	30.3	18.2	1000.0	9.000	N	10.0	41.8	60.0	
0.818000	---	25.6	11.1	1000.0	9.000	N	10.1	48.9	60.0	
5.406000	---	21.9	10.1	1000.0	9.000	N	10.2	49.9	60.0	
10.886000	---	32.3	25.7	1000.0	9.000	N	10.6	34.3	60.0	
18.186000	---	34.7	24.2	1000.0	9.000	N	11.0	35.8	60.0	
26.778000	---	22.5	16.7	1000.0	9.000	N	11.3	43.3	60.0	

Remark: A.V data was not tested because Q.P data was under the Q.P limits.

Note: The worst case emissions are recorded. Refer to the graph at next page.

※ L1: Phase line, L2: Neutral line

Conducted Emission Test Configuration

Conducted Emission Environmental Conditions

Power Supply	AC 220V
Temperature	24 °C
Relative Humidity	36 %
Barometric Pressure	1012 mbar

Test Equipment Used

Equipment Type	Model Number
Receiver	Rohde & Schwarz type ESCI
LISN	AFJ INSTRUMENTS type AFJ LS16C

6.6 Radiated Emission Test Results

Port:	Enclosure
Basic Standard:	EN 55022: 2010
Limit Table:	Class A
Distance between EUT and Antenna:	10 m
Height of antenna:	1 - 4 m

Operation Mode

The EUT was tested in the following modes:

1. Normal operating.

Test Results

Frequency [MHz]	Field Strength Q.P[dB μ V/m]	Polarization	Limit [dB μ V/m]	Margin [dB]
51.40	25.88	V	40.00	14.12
144.00	30.10	V	40.00	9.90
199.20	24.45	V	40.00	15.55
240.00	27.13	H	47.00	19.87
308.24	33.10	V	47.00	13.90
359.60	40.60	V	47.00	6.40

Note: The worst case emissions are recorded. The field strength is calculated by adding the antenna factor and cable factor.

※ H: Horizontal, V: Vertical

Radiated Emission Test Configuration

Radiated Emission Environmental Conditions

Power Supply	AC 220V
Temperature	-6 °C
Relative Humidity	40 %
Barometric Pressure	1012 mbar

Test Equipment Used

Equipment Type	Model Number
Receiver	Rohde & Schwarz type ESIB40
Biconic Logarithmic Periodic Antenna	Schwarzbeck type VULB9163

6.7 Electrostatic Discharge Test Results

Port:	Enclosure
Basic Standard:	EN 61000-4-2: 2009
Performance Criteria:	B
Number of Discharges:	20 per polarity / test point
Test level:	± 4 kV Contact discharge ± 8 kV Air discharge

Operation Mode

The EUT was tested in the following modes:

1. Normal operating.

Monitoring of the EUT

The operating status of EUT was monitored by observation of LCD in normal operating status.

Test Results

Test Point	\pm kV	Air/ contact	Observation
Plastic surface	± 8	Air	Note 1
Metal surface	± 4	Contact	Note 1
LCD	± 8	Contact	Note 1
Port	± 4	Contact	Note 1
HCP/VCP	± 4	Contact	Note 1

Note 1: No degradation in performance was observed during the test.

Electrostatic Discharge Test Configuration

Electrostatic Discharge Environmental Conditions

Power Supply	AC 220V
Temperature	19 °C
Relative Humidity	48 %
Barometric Pressure	1011 mbar

Test Equipment Used

Equipment Type	Model Number
ESD Simulator	NoiseKen type ESS-2000
ESD Mouse	NoiseKen type TC-815R

6.8 Radiated Immunity Test Results

Port:	Enclosure
Basic Standard:	EN 61000-4-3:2006+A1:2010+A2:2010
Performance Criteria:	A
Frequency range:	80 - 1000 MHz
Test Level:	3 V/m
Dwell Time:	3 seconds
Frequency Step Size:	1 %
Modulation:	1 kHz, 80 % amplitude modulated

Operation Mode

The EUT was tested in the following modes:

1. Normal operating.

Monitoring of the EUT

The operating status of EUT was monitored by observation of LCD in normal operating status.

Test Results (Radiated Immunity 80-1000 MHz)

EUT Position	Polarity	Observations
Front	Horizontal	Note 1
	Vertical	Note 1
Rear	Horizontal	Note 1
	Vertical	Note 1
Left side	Horizontal	Note 1
	Vertical	Note 1
Right side	Horizontal	Note 1
	Vertical	Note 1

Note 1: No degradation in performance was observed during both tests.

Radiated Immunity Test Configuration

Radiated Immunity Environmental Conditions

Power Supply	AC 220 V
Temperature	19 °C
Relative Humidity	48 %
Barometric Pressure	1011 mbar

Test Equipment Used

Equipment Type	Model Number
Signal Generator	Hewlett Packard type 8657D
Amplifier	AR type 250W1000AM2
Field Measurement system	AR type FM2000 with FP2080
Biog Antenna	Schaffner type CBL6140A
EUT Monitoring system	KTI type K4010T
Power Meter	AR type PM2002
Power Head Sensor	AR type PH2000

6.9 Fast Transients Test Results

Port:	AC power
Basic Standard:	EN 61000-4-4:2012
Performance Criterion:	B
Test Duration (per cable/line):	1 minute
Burst duration:	15 ms
Spike Frequency:	5 kHz
Test level:	Power Line: ± 2 kV

Operation Mode

The EUT was tested in the following modes:

1. Normal operating.

Monitoring of the EUT

The operating status of EUT was monitored by observation of LCD in normal operating status.

Test Results

Line	Test Voltage [\pm kV]	Coupling (Direct/Clamp)	Observations
Phase (L1)	2	Direct	Note 1
Neutral (L2)	2	Direct	Note 1
PE	2	Direct	Note 1
L1 - L2	2	Direct	Note 1
L1-PE	2	Direct	Note 1
L2-PE	2	Direct	Note 1
L1-L2-PE	2	Direct	Note 1

Note 1: No degradation in performance was observed during the test.

Fast Transients Test Configuration

Fast Transients Environmental Conditions

Power Supply	AC 220 V
Temperature	19 °C
Relative Humidity	48 %
Barometric Pressure	1011 mbar

Test Equipment Used

Equipment Type	Model Number
EFT Generator	Thermo Key Type PK1001D

6.10 Surge immunity Test Results

Port:	AC power
Basic Standard:	EN 61000-4-5: 2006
Performance Criteria:	B
Test times:	5 times per each polarity / angle
Repetition rate:	1 per minute
Synchro angle:	0 ° , 90 ° , 180 ° , 270 °
Test level:	Line to Line: ± 1 kV Line to earth: ± 2 kV

Operation Mode

The EUT was tested in the following modes:

1. Normal operating.

Monitoring of the EUT

The operating status of EUT was monitored by observation of LCD in normal operating status.

Test Results

Line	Test Voltage [\pm kV]	Observations
Phase (L1) - Neutral (L2)	1	Note 1
L1-PE	2	Note 1
L2-PE	2	Note 1

Note 1: No degradation in performance was observed during the test.

Surge Test Configuration

Surge test Environmental Conditions

Power Supply	AC 220 V
Temperature	19 °C
Relative Humidity	48 %
Barometric Pressure	1011 mbar

Test Equipment Used

Equipment Type	Model Number
Surge Generator	Thermo Key Type PK1001D

6.11 Conducted Immunity Test Results

Port:	AC power
Basic Standard:	EN 61000-4-6:2014
Performance Criteria:	A
Frequency range:	0.15 to 80 MHz
Test Level:	3 V
Dwell Time:	3seconds
Frequency Step Size:	1 %
Modulation:	1 kHz, 80% amplitude modulated

Operation Mode

The EUT was tested in the following modes:

1. Normal operating.

Monitoring of the EUT

The operating status of EUT was monitored by observation of LCD in normal operating status.

Test Results

Cable Tested	Test Voltage	Frequency Range	Observation
Supply	3 V	0.15 – 80 MHz	Note 1

Note 1: No degradation in performance was observed during the test.

Conducted Immunity Test Configuration

Conducted Immunity Environmental Conditions

Power Supply	AC 220 V
Temperature	19 °C
Relative Humidity	48 %
Barometric Pressure	1011 mbar

Test Equipment Used

Equipment Type	Model Number
Signal Generator	HP type 8657D
Amplifier	IFI type M75
Coupling / Decoupling Network	Fisher type FCC-801-M3-16A
Power Meter	AR type PM2002
Power Head Sensor	AR type PH2000

6.12 Voltage Dips and Interruptions Test Results

Port:	AC power
Basic Standard:	EN 61000-4-11: 2004
Test level and Performance criteria:	0%, 1 Cycle: B 40%, 10 Cycle: C 70%, 25 Cycle: C 0%, 250 Cycle: C

Operation Mode

The EUT was tested in the following modes:

1. Normal operating.

Monitoring of the EUT

The operating status of EUT was monitored by observation of LCD in normal operating status.

Test Results

Test level %U _T	Duration (Cycle)	Observation
Dips 0	1	Note 1
40	10	Note 1
70	25	Note 1
Interruptions 0	250	Note 1

Note 1: No degradation in performance was observed during the test.

Voltage dips Test Configuration

Voltage dips Environmental Conditions

Power Supply	AC 220 V
Temperature	19 °C
Relative Humidity	48 %
Barometric Pressure	1011 mbar

Test Equipment Used

Equipment Type	Model Number
Dips & Interruption Generator	Thermo Key Type PK1001D

7. Product Photo**External Photo (Front)****External Photo (Rear)**

Internal Photo

