Ringway Tech(Jiangsu) Co.,Ltd.

DIGITAL PIANO

Main Model: AG-40
Serial Model: AG-28, DG-55

September 24, 2014
Report No.: 14020835-FCC-E
(This report supersedes NONE)

Modifications made to the product : None

This Test Report is Issued Under the Authority of:		
AJ . Chen	Alex . Liu	
AJ Chen **Compliance Engineer**	**Alex Liu** **Technical Manager**	

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Test result presented in this test report is applicable to the representative sample only.

EMC Test Report

To: FCC Part 15 Subpart B Class B: 2013, ANSI C 63.4: 2009

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Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC , RF/Wireless , Telecom
Canada	EMC, RF/Wireless , Telecom
Taiwan	EMC, RF, Telecom , Safety
Hong Kong	RF/Wireless ,Telecom
Australia	EMC, RF, Telecom , Safety
Korea	EMI, EMS, RF , Telecom, Safety
Japan	EMI, RF/Wireless, Telecom
Singapore	EMC , RF , Telecom
Europe	EMC, RF, Telecom , Safety

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1 EXECUTIVE SUMMARY & EUT INFORMATION

The purpose of this test programme was to demonstrate compliance of the Ringway Tech(Jiangsu) Co.,Ltd.. The DIGITAL PIANO and model: AG-40 against the current Stipulated Standards. The DIGITAL PIANO has demonstrated compliance with the FCC Part 15 Subpart B Class B: 2013, ANSI C 63.4: 2009.

EUT Information

EUT Description	**DIGITAL PIANO**
Main Model	**AG-40**
Serial Model	**AG-28, DG-55**
Input Power	**110Vac 60Hz 100W MAX**
Temperature Range	**-10℃~55℃**
Classification Per Stipulated Test Standard	**Class B Emission Product Per FCC Part 15 Subpart B Class B: 2013**

Note: the difference between these models please refer to **Annex E. DECLARATION OF SIMILARITY.**

2 TECHNICAL DETAILS

Purpose	**Compliance testing of DIGITAL PIANO with stipulated standard**
Applicant / Client	**Ringway Tech(Jiangsu) Co.,Ltd. No. 101 West Hanjiang Road, Changzhou,Jiangsu, China**
Manufacturer	**Ringway Tech(Jiangsu) Co.,Ltd. No. 101 West Hanjiang Road, Changzhou,Jiangsu, China**
Laboratory performing the tests	**SIEMIC (Nanjing-China) Laboratories NO.2-1, Longcang Dadao, Yuhua Economic Development Zone,Nanjing, China Tel:+86(25)86730128/86730129 Fax:+86(25)86730127 Email: China@siemic.com.cn**
Test report reference number	**14020835-FCC-E**
Date EUT received	**August 18, 2014**
Standard applied	**FCC Part 15 Subpart B Class B: 2013, ANSI C 63.4: 2009**
Dates of test	**September 10, 2014**
No of Units	**#1**
Equipment Category	**Class B Emission Product**
Trade Name	**RINGWAY**
Highest Operated Frequency (ies)	**12MHz**
Port/Connectors	**USB to Host Port, Power Port, Midi out Port, Bluetooth Port, Input Level Port, Headphone*2 port, Aux In(Out) Port, PEDAL Port**
FCC ID	**OCDAG-40**

3 MODIFICATION

NONE

4 TEST SUMMARY

The product was tested in accordance with the following specifications.
All testing has been performed according to below product classification:

Class B Emission Product

Test Results Summary

Emissions			
Test Standard	**Description**	**Product Class**	**Pass / Fail**
FCC Part 15 Subpart B Class B: 2013, ANSI C 63.4: 2009	Conducted Emissions	See Above	Pass
FCC Part 15 Subpart B Class B: 2013, ANSI C 63.4: 2009	Radiated Emissions	See Above	Pass

All measurement uncertainty is not taken into consideration for all presented test result.

5 MEASUREMENTS, EXAMINATION AND DERIVED RESULTS

5.1 Conducted Emissions Test Result

Note:

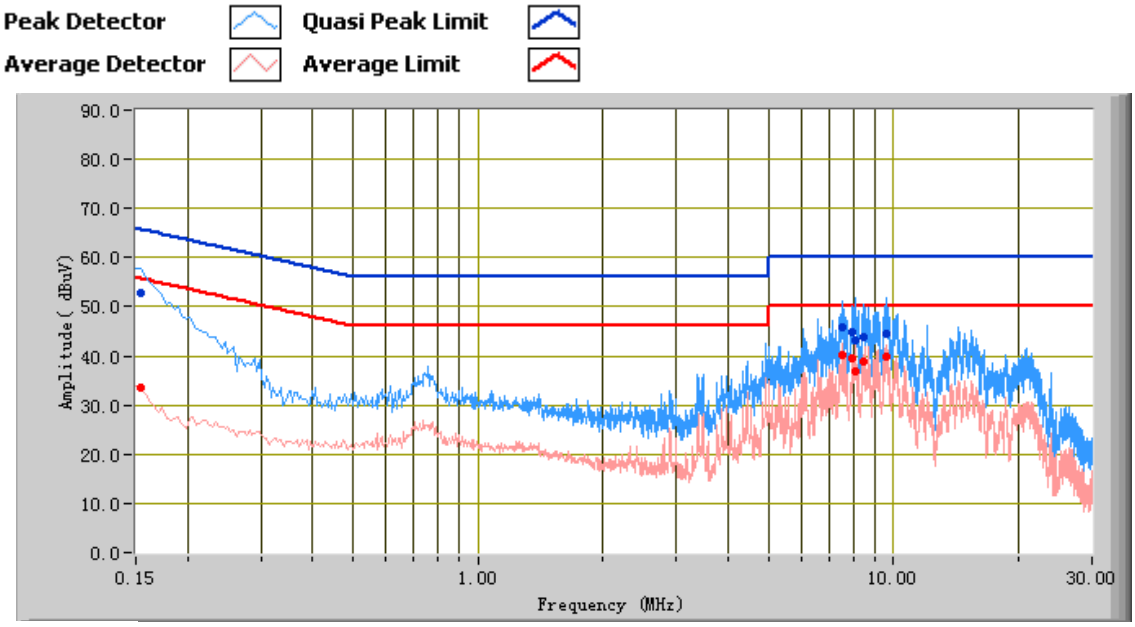
1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is±3.86dB.
4. Environmental Conditions

Temperature	24ºC
Relative Humidity	50%
Atmospheric Pressure	1009 mbar

5. Test date : September 10, 2014
   Tested By : AJ Chen

Test Result: Pass

Test Mode:	Normal working

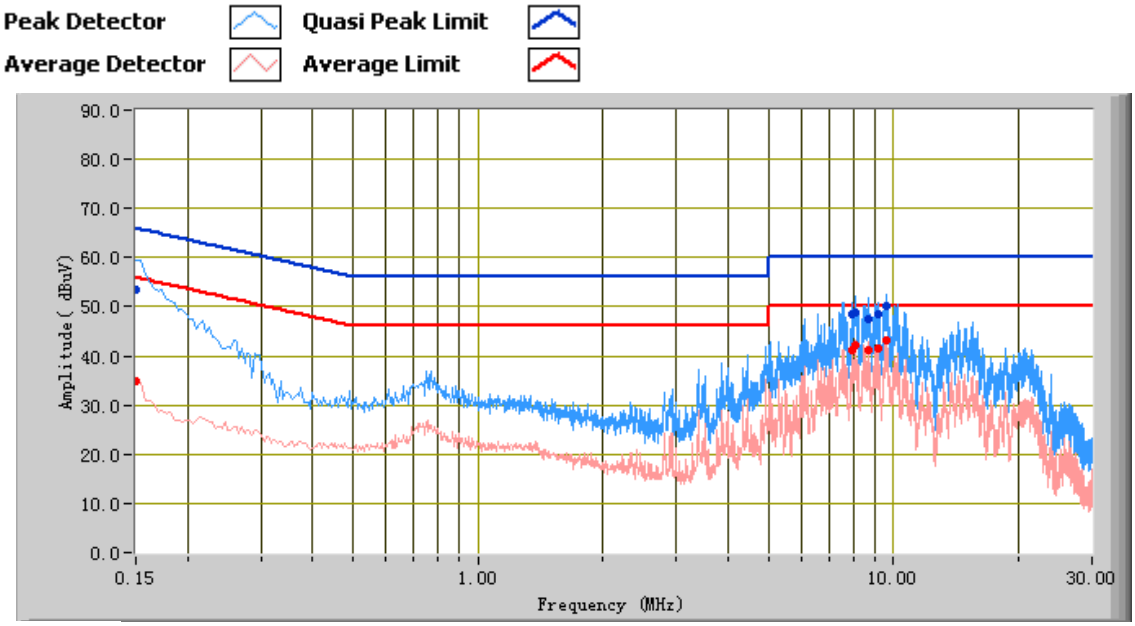


Test Data

Phase Line Plot at 110V AC, 60Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.15	52.97	65.78	-12.81	33.62	55.78	-22.16	12.16
9.61	44.65	60.00	-15.35	39.76	50.00	-10.24	11.09
8.08	43.33	60.00	-16.67	36.96	50.00	-13.04	11.00
7.49	45.95	60.00	-14.05	40.03	50.00	-9.97	10.97
8.43	43.68	60.00	-16.32	38.73	50.00	-11.27	11.02
7.96	44.91	60.00	-15.09	39.42	50.00	-10.58	10.99

Test Mode:	**Normal working**



Test Data

Phase Neutral Plot at 110V AC, 60Hz

Frequency (MHz)	Quasi Peak (dBµV)	Limit (dBµV)	Margin (dB)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Factors (dB)
0.15	53.38	66.00	-12.62	35.00	56.00	-21.00	12.21
9.60	50.29	60.00	-9.71	43.13	50.00	-6.87	11.14
8.09	48.89	60.00	-11.11	42.09	50.00	-7.91	11.04
8.67	47.49	60.00	-12.51	41.31	50.00	-8.69	11.08
7.96	48.38	60.00	-11.62	41.26	50.00	-8.74	11.03
9.14	48.32	60.00	-11.68	41.52	50.00	-8.48	11.11

5.2 Radiated Emissions Test Result

Note:

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Radiated Emissions Measurement Uncertainty
   All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz (QP only @ 3m & 10m) is +5.6dB/-4.5dB (for EUT s < 0.5m X 0.5m X 0.5m), in the range 1GHz – 6GHz (PK & AV only @3m) is +4dB/-4dB (for EUT s < 0.5m X 0.5m X 0.5m).
4. Environmental Conditions

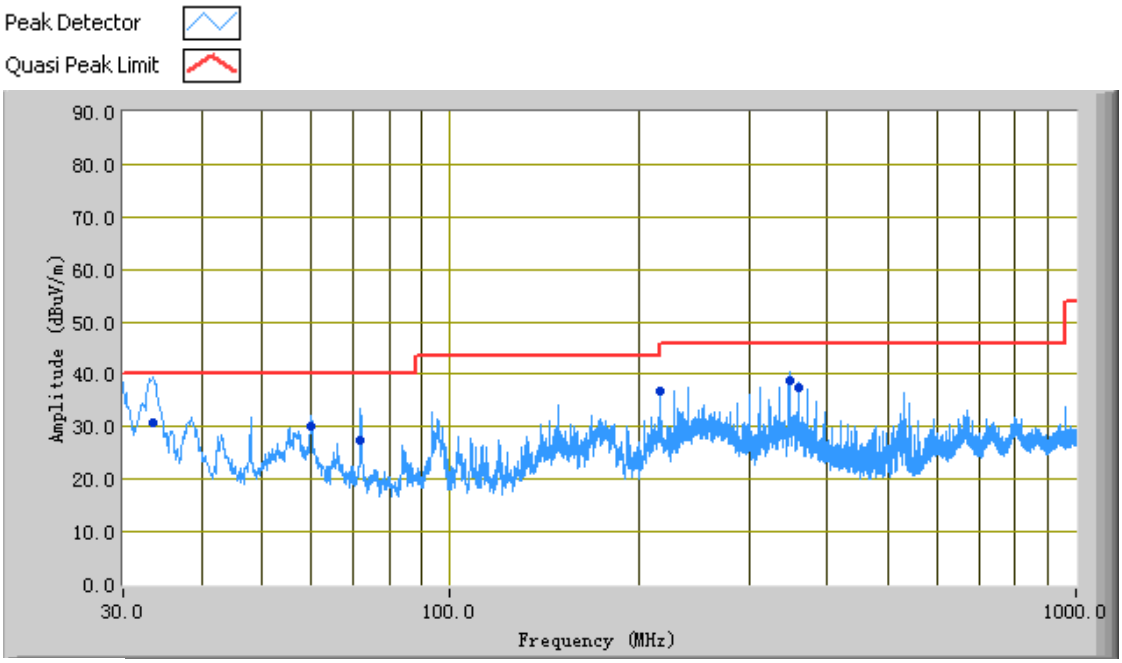
Temperature	24ºC
Relative Humidity	50%
Atmospheric Pressure	1009mbar

5. Test date: September 10, 2014
   Tested By: AJ Chen

Test Result: Pass

Test Mode:	**Normal working**

Below 1GHz

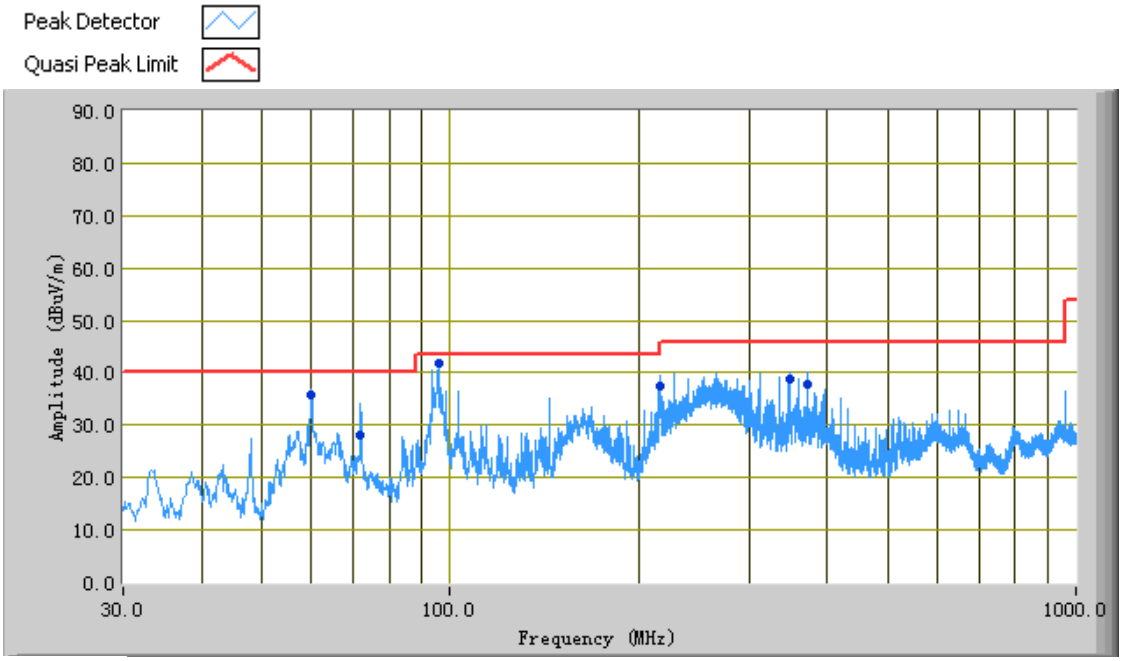


Test Data

Vertical Polarity Plot at 3m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
33.52	30.74	149.00	V	100.00	-25.98	40.00	-9.26
348.00	38.94	107.00	V	192.00	-28.43	46.00	-7.06
216.00	36.86	299.00	V	101.00	-31.18	43.50	-6.64
72.00	27.40	130.00	V	107.00	-37.37	40.00	-12.60
360.04	37.46	120.00	V	158.00	-28.39	46.00	-8.54
59.98	30.00	49.00	V	388.00	-37.42	40.00	-10.00

Test Mode:	**Normal working**



Test Data

Horizontal Polarity Plot at 3m

Frequency (MHz)	Quasi Peak (dBµV/m)	Azimuth	Polarity (H/V)	Height (cm)	Factors (dB)	Limit (dBµV/m)	Margin (dB)
96.01	41.87	185.00	H	216.00	-33.64	43.50	-1.63
60.00	35.69	331.00	H	252.00	-37.65	40.00	-4.31
216.00	37.43	88.00	H	143.00	-30.32	43.50	-6.07
372.02	37.95	314.00	H	109.00	-28.87	46.00	-8.05
348.01	38.88	73.00	H	100.00	-29.76	46.00	-7.12
71.99	28.13	137.00	H	287.00	-37.89	40.00	-11.87

Note: *the highest frequency of the internal sources of the EUT is less than 108MHz, so the measurement shall only be made up to 1GHz.*

Annex A. TEST INSTRUMENT & METHOD

Annex A.i. TEST INSTRUMENTATION & GENERAL PROCEDURES

Instrument	Model	Serial #	Calibration Date	Calibration Due Date
AC Line Conducted Emissions				
R&S EMI Test Receiver	ESPI3	101216	09/27/2013	09/26/2014
ROHDE&SCHWARZ V-LISN	ESH3-Z5	838979/005	09/27/2013	09/26/2014
Com-Power LISN	LI-115	241091	05/25/2014	05/24/2015
Com-Power Transient Limiter	LIT-153	531021	09/27/2013	09/26/2014
SIEMIC Labview Conducted Emissions software	V1.0	N/A	N/A	N/A
Radiated Emissions				
R&S EMI Receiver	ESPI3	101216	09/27/2013	09/26/2014
Antenna (30MHz~6GHz)	JB6	A121411	04/15/2014	04/14/2015
Hp Agilent Pre-Amplifier	8447F	1937A01160	10/27/2013	10/26/2014
Chamber	3m	N/A	04/13/2014	04/12/2015
SIEMIC Labview Radiated Emissions software	V1.0	N/A	N/A	N/A

Annex A.ii. CONDUCTED EMISSIONS TEST DESCRIPTION

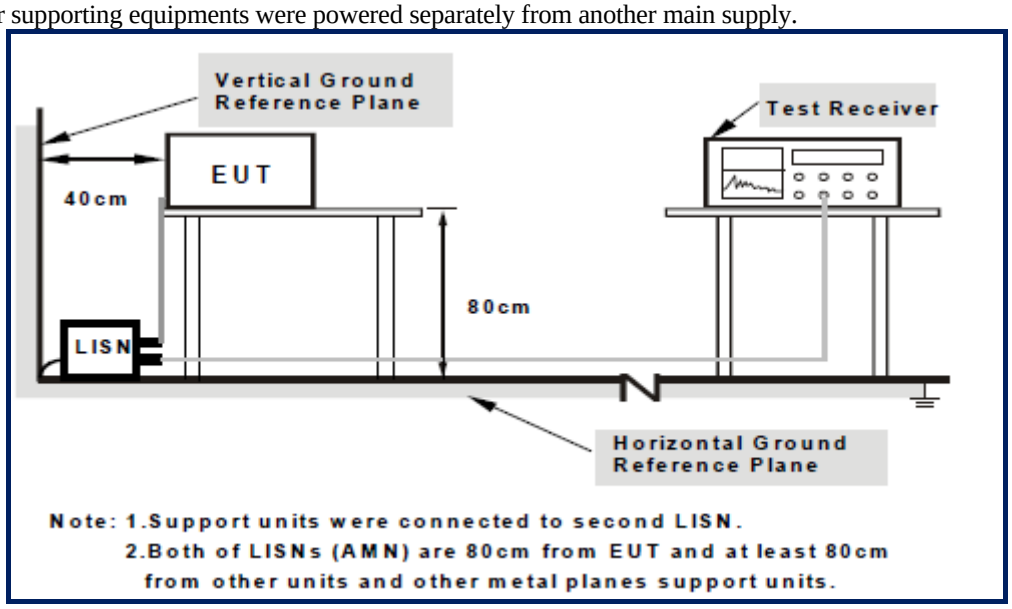
Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B.

2. The power supply for the EUT was fed through a 50Ω/50μH EUT LISN, connected to filtered mains.

3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.

4. All other supporting equipments were powered separately from another main supply.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration1

Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.

2. A scan was made on the NEUTRAL line (for AC mains) or Earth line (for DC power) over the required frequency range using an EMI test receiver.

3. High peaks, relative to the limit line, were then selected.

4. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10kHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made.

5. Steps 2 to 4 were then repeated for the LIVE line (for AC mains) or DC line (for DC power).

Sample Calculation Example

At 20MHz limit = 250μV = 47.96dBμV

Transducer factor of LISN, pulse limiter & cable loss at 20MHz = 11.20dB

Q-P reading obtained directly from EMI Receiver = 40.00dBμV
(Calibrated for system losses)

Therefore, Q-P margin = 40.00-47.96 = -7.96 i.e. **7.96 dB below limit**

Annex A.iii. RADIATED EMISSIONS TEST DESCRIPTION

EUT Characterisation

EUT characterisation, over the frequency range from 30MHz to 10th Harmonic, was done in order to minimise radiated emissions testing time while still maintaining high confidence in the test results.

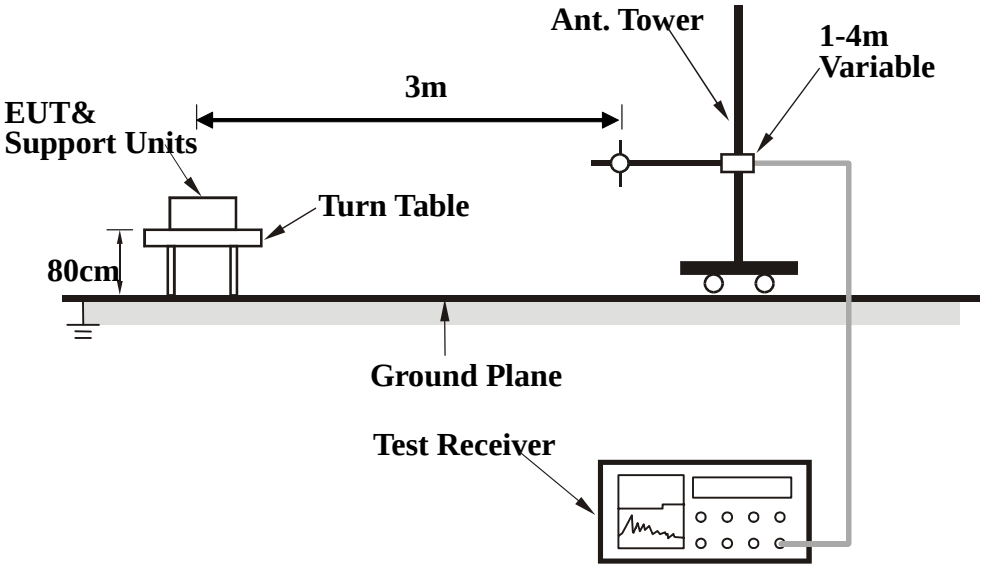
The EUT was placed in the chamber, at a height of about 0.8m on a turntable. Its radiated emissions frequency profile was observed, using a spectrum analyzer /receiver with the appropriate broadband antenna placed 3m away from the EUT. Radiated emissions from the EUT were maximised by rotating the turntable manually, changing the antenna polarisation and manipulating the EUT cables while observing the frequency profile on the spectrum analyzer / receiver. Frequency points at which maximum emissions occurred; clock frequencies and operating frequencies were then noted for the formal radiated emissions test at the Open Area Test Site (OATS) or 3m EMC chamber.

Test Set-up

1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5mX1.0mX0.8m high, non-metallic table.

2. The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.

3. The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration2

Test Method

The following procedure was performed to determine the maximum emission axis of EUT:

1. With the receiving antenna is H polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
2. With the receiving antenna is V polarization, rotate the EUT in turns with three orthogonal axes to determine the axis of maximum emission.
3. Compare the results derived from above two steps. So, the axis of maximum emission from EUT was determined and the configuration was used to perform the final measurement.

Final Radiated Emission Measurement

1. Setup the configuration according to figure 1. Turn on EUT and make sure that it is in normal function.

2. For emission frequencies measured below 1GHz, a pre-scan is performed in a shielded chamber to determine the accurate frequencies of higher emissions will be checked on an open test site. As the same purpose, for emission frequencies measured above 1GHz, a pre-scan also be performed with a 1 meter measuring distance before final test.

3. For emission frequencies measured below and above 1GHz, set the spectrum analyzer on a 100kHz and 1MHz resolution bandwidth respectively for each frequency measured in step 2.

4. The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the azimuth that highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.

5. Repeat step 4 until all frequencies need to be measured was complete.

6. Repeat step 5 with search antenna in vertical polarized orientations.

During the radiated emission test, the Spectrum Analyzer was set with the following configurations:

Frequency Band (MHz)	Function	Resolution bandwidth	Video Bandwidth
30 to 1000	Peak	120kHz	100kHz
Above 1000	Peak	1MHz	1MHz
	Average	1MHz	10Hz

Sample Calculation Example

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. For the limit is employed average value, therefore the peak value can be transferred to average value by subtracting the duty factor. The basic equation with a sample calculation is as follows:

Peak = Reading + Corrected Factor

where

Corr. Factor = Antenna Factor + Cable Factor - Amplifier Gain (if any)

And the average value is

Average = Peak Value + Duty Factor or

Set RBW = 1MHz, VBW = 10Hz.

Note:

If the measured frequencies are fall in the restricted frequency band, the limit employed must be quasi peak value when frequencies are below or equal to 1GHz. And the measuring instrument is set to quasi peak detector function.

Annex B. EUT AND TEST SETUP PHOTOGRAPHS

Annex B.i. Photograph 1: EUT External Photo

Model: AG-40

Front View of EUT

Rear View of EUT

Left View of EUT

Right View of EUT

EUT Port - Front View

Model: AG-28

Front View of EUT

Rear View of EUT

Left View of EUT

Right View of EUT

EUT Port - Front View

Model: DG-55

Front View of EUT

Rear View of EUT

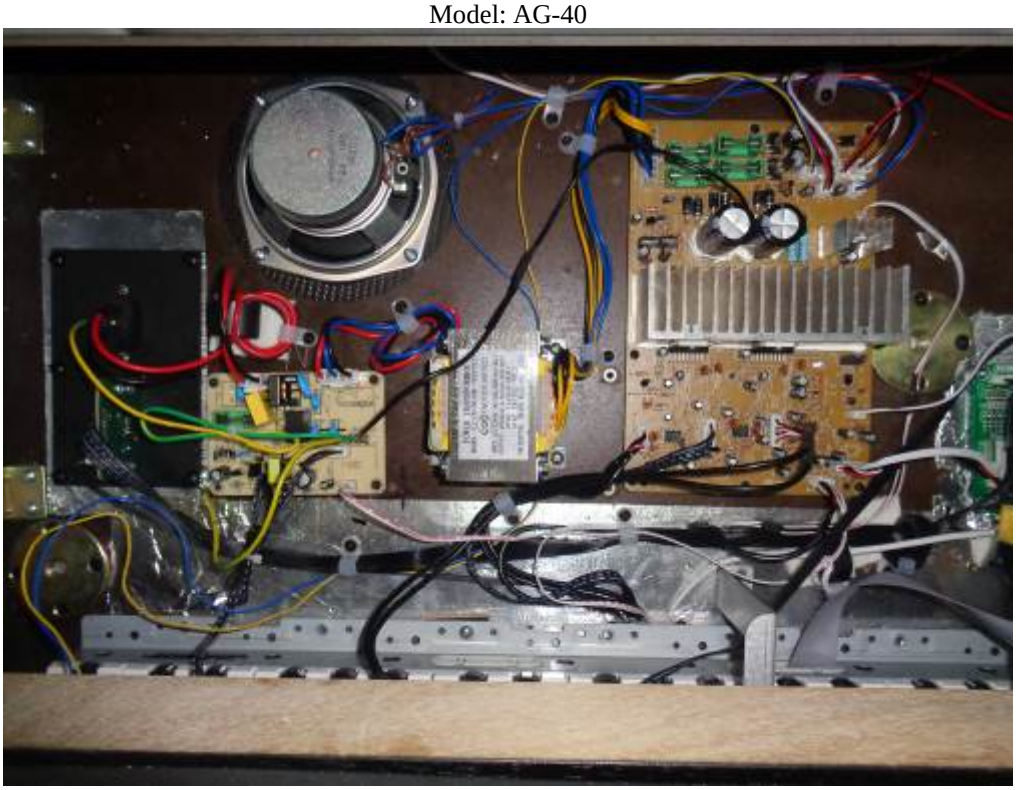
Left View of EUT

Right View of EUT

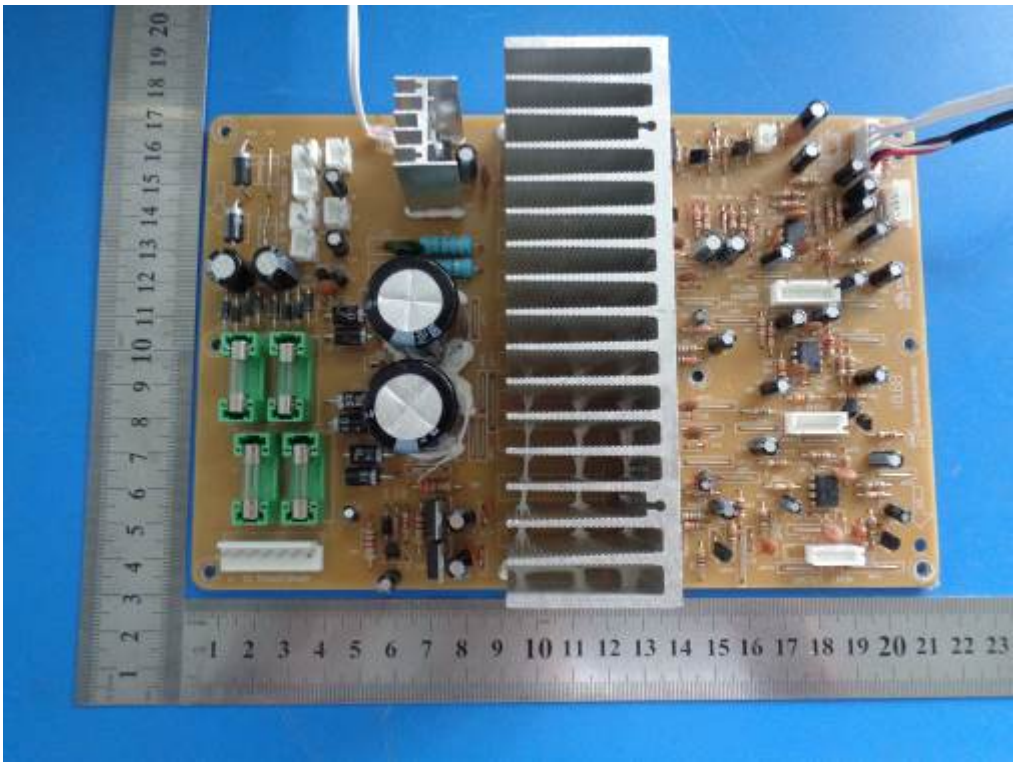
EUT Port - Front View

Annex B.ii. Photograph 2: EUT Internal Photo

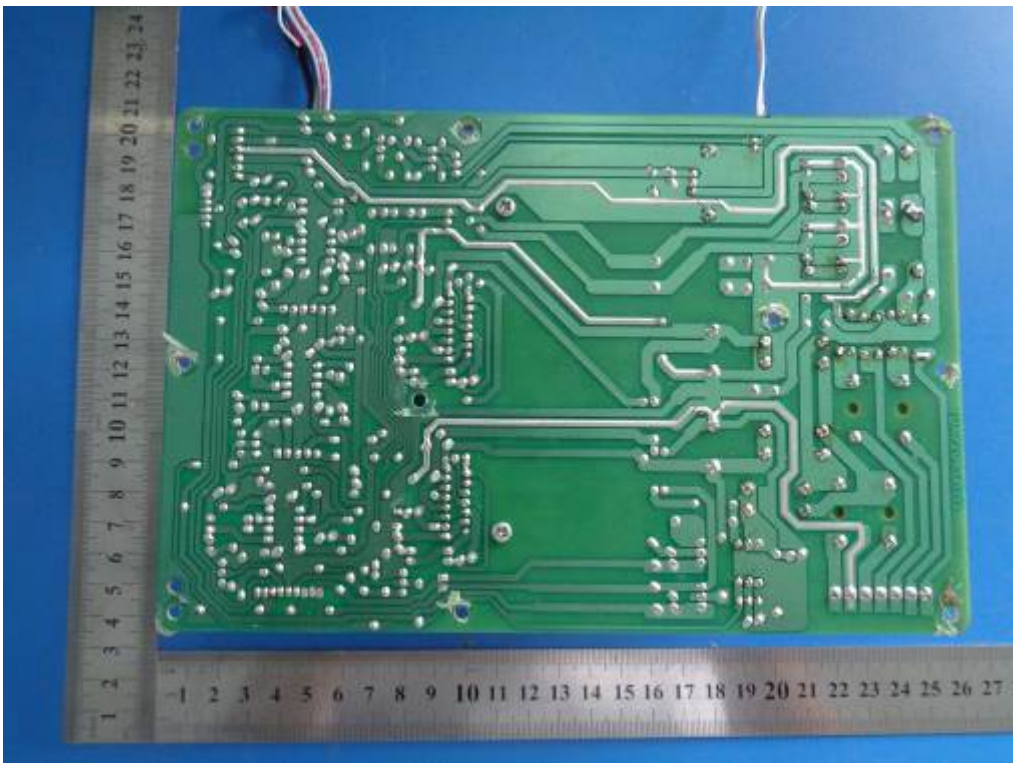
Model: AG-40



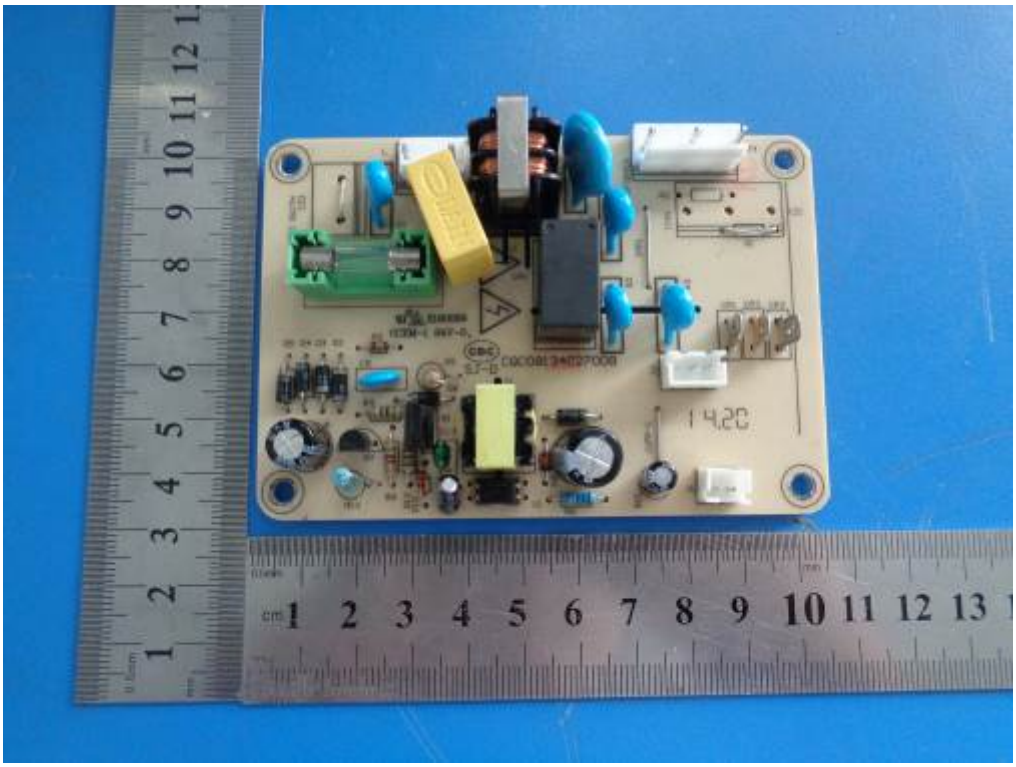
Uncover- Front View



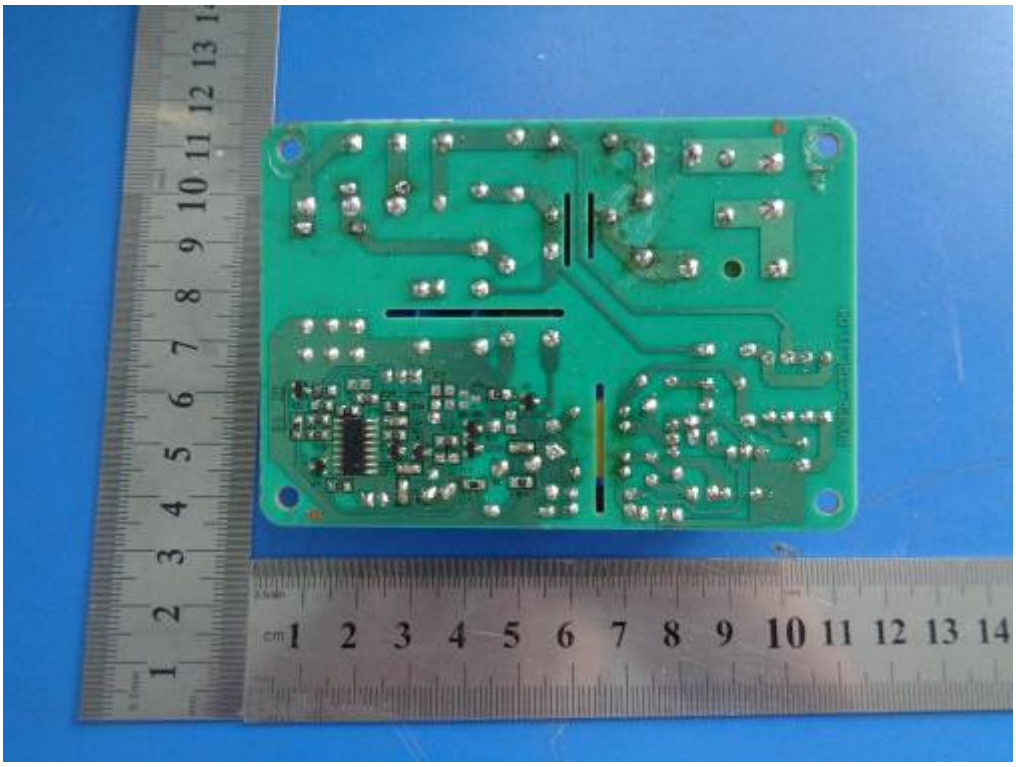
EUT PCB 1– Front View



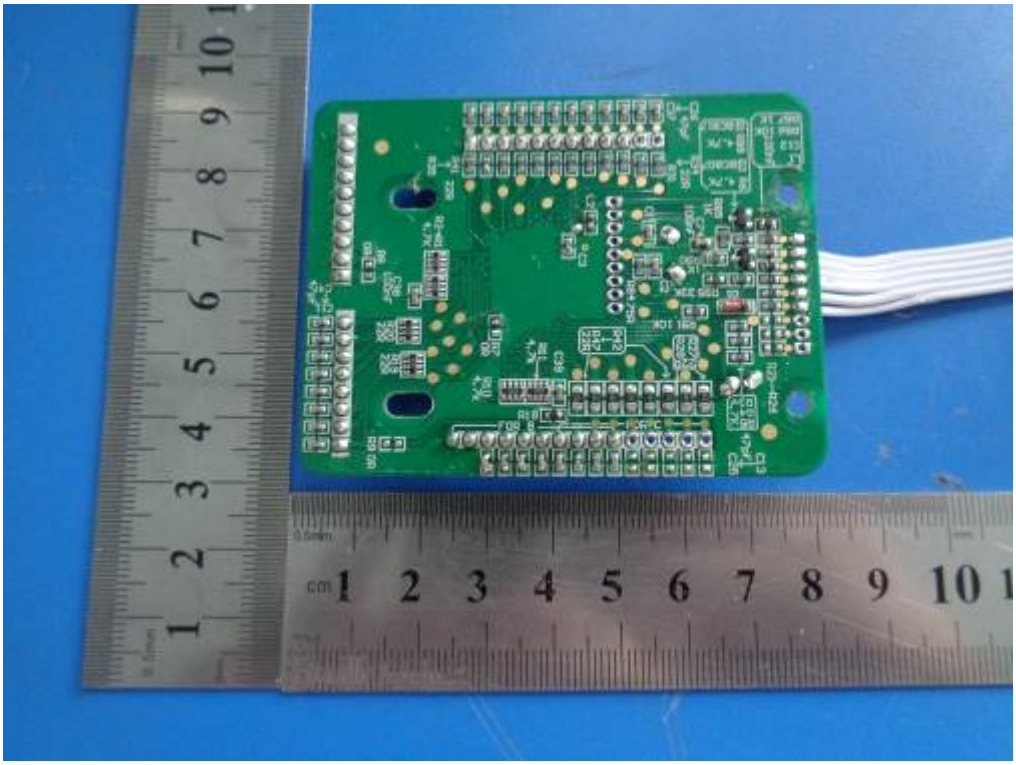
EUT PCB 1– Rear View



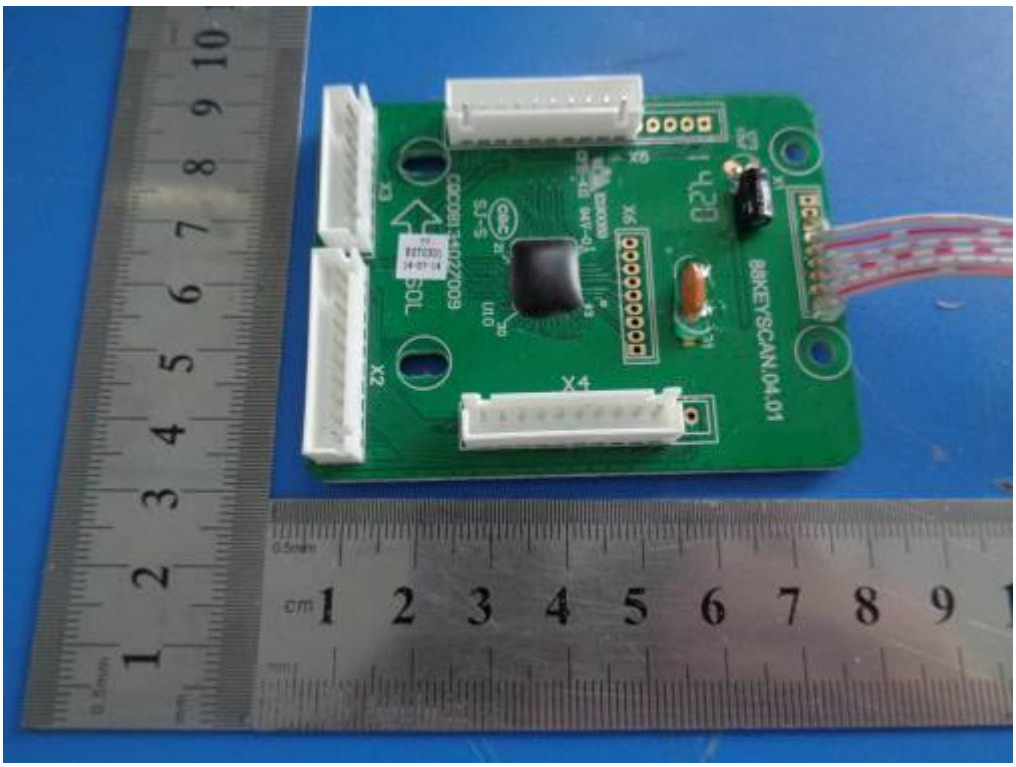
EUT PCB 2– Front View



EUT PCB 2– Rear View

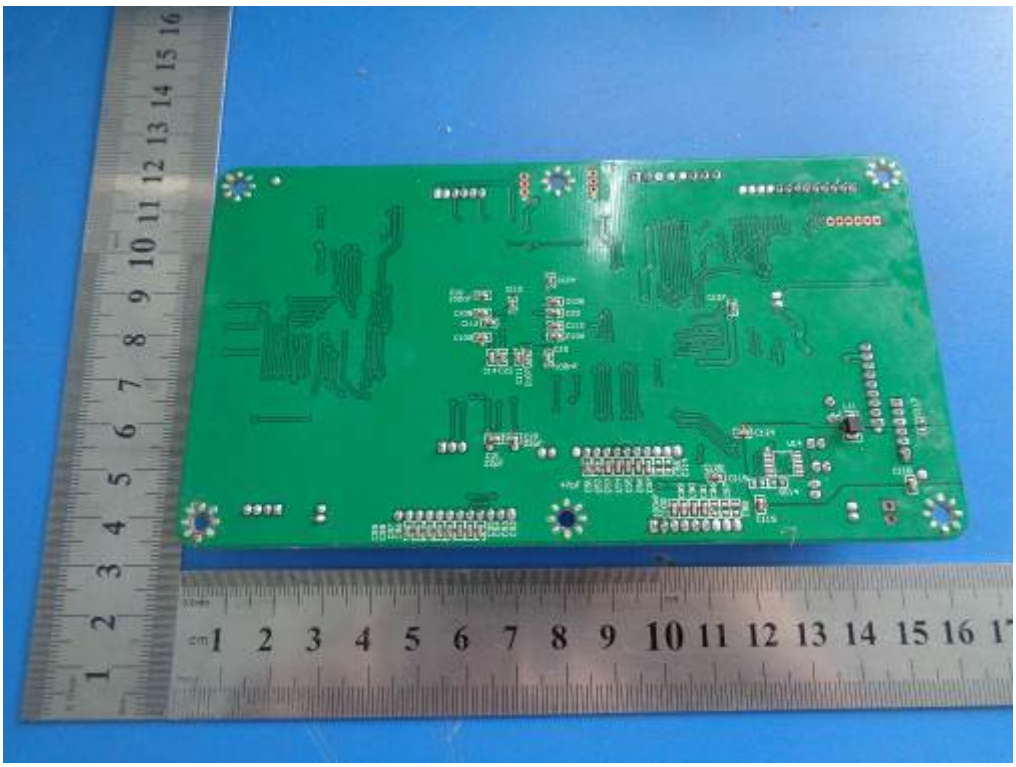


EUT PCB 3– Front View

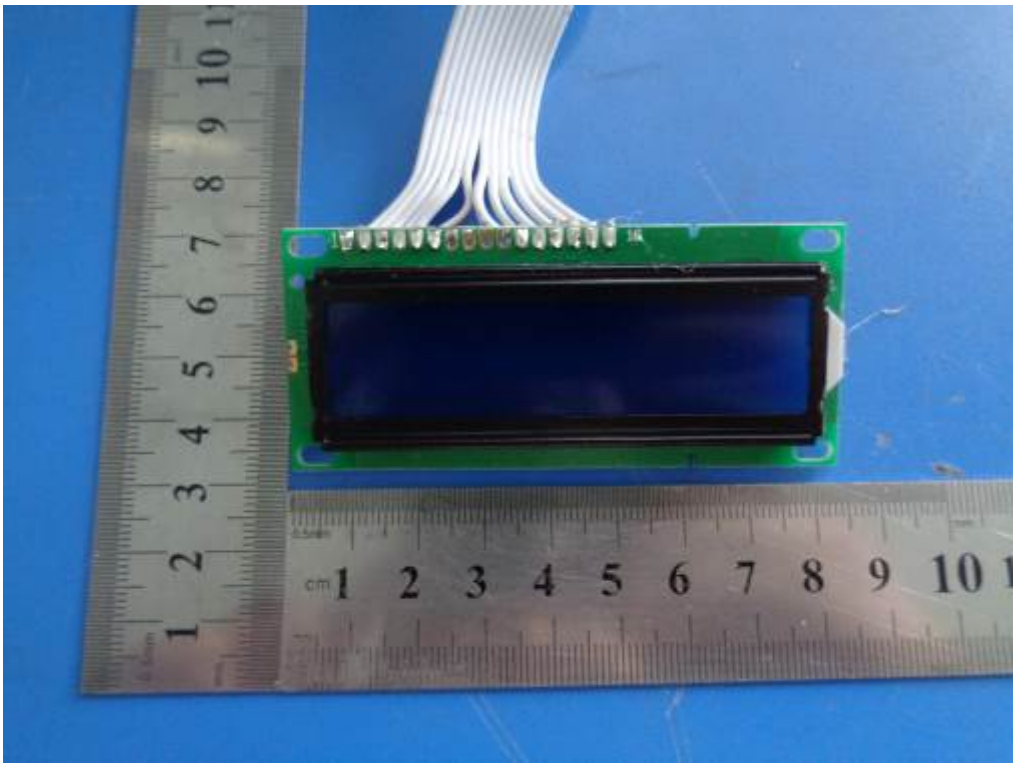


EUT PCB 3– Rear View

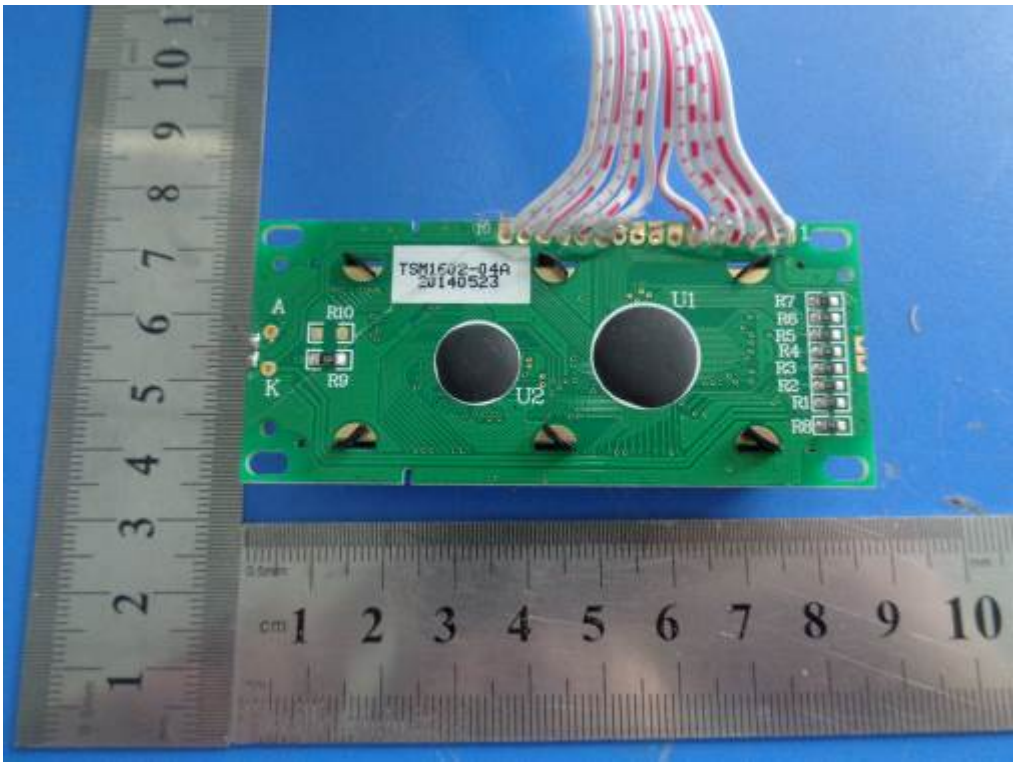
EUT PCB 4– Front View



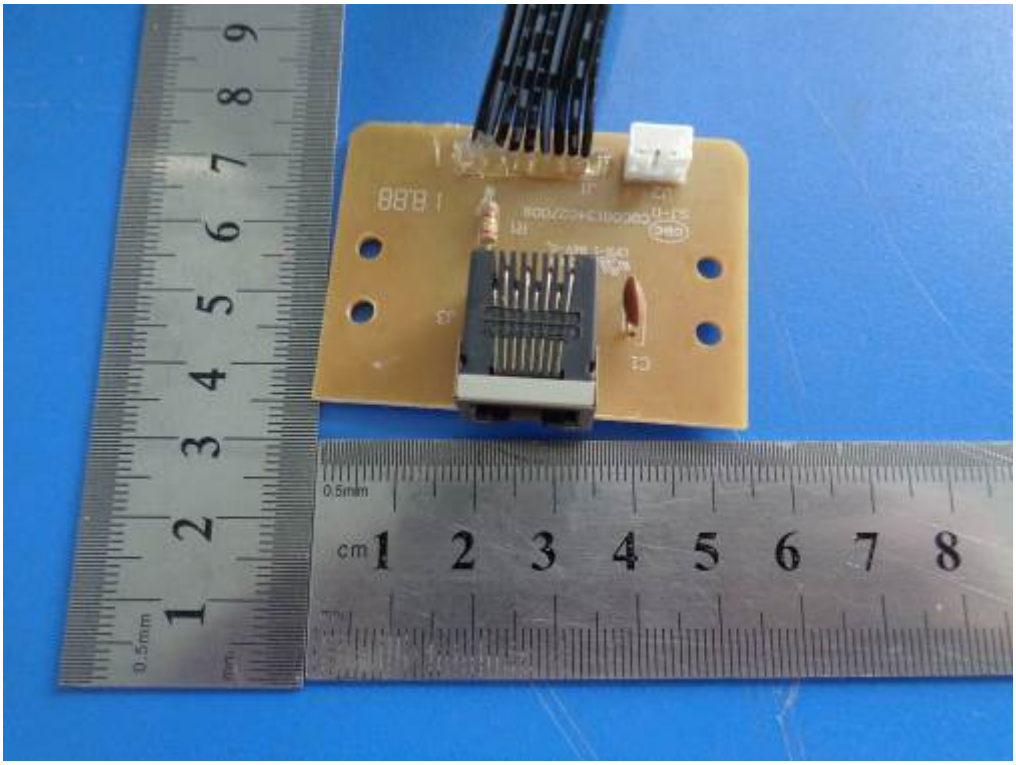
EUT PCB 4– Rear View



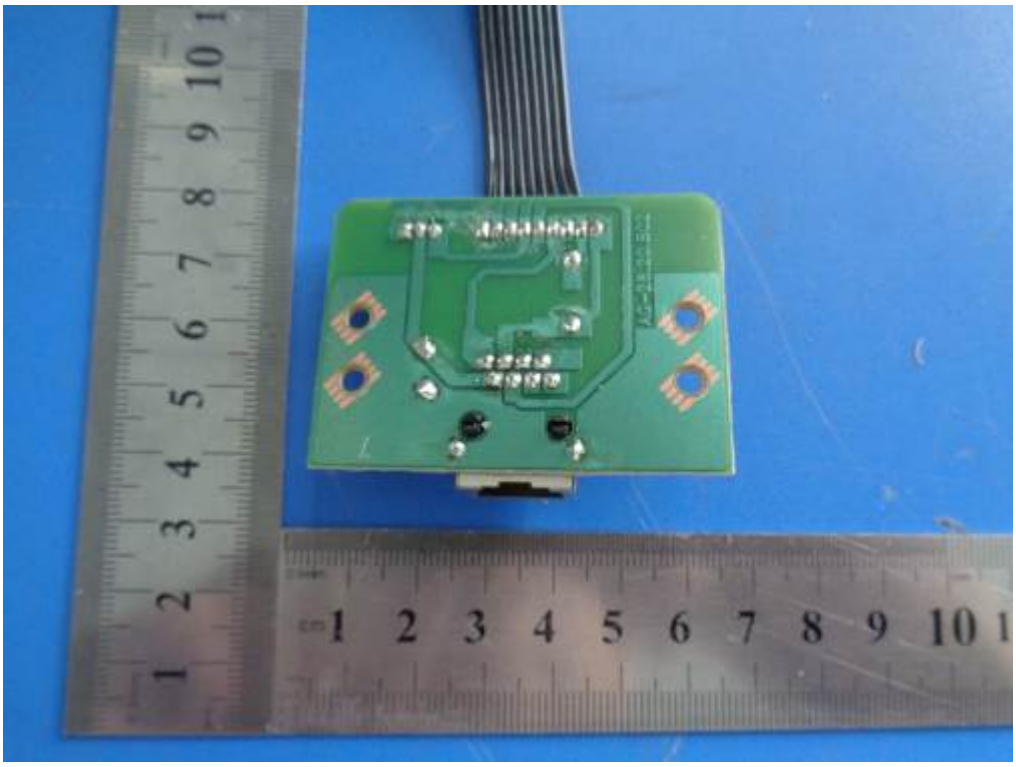
EUT PCB 5– Front View



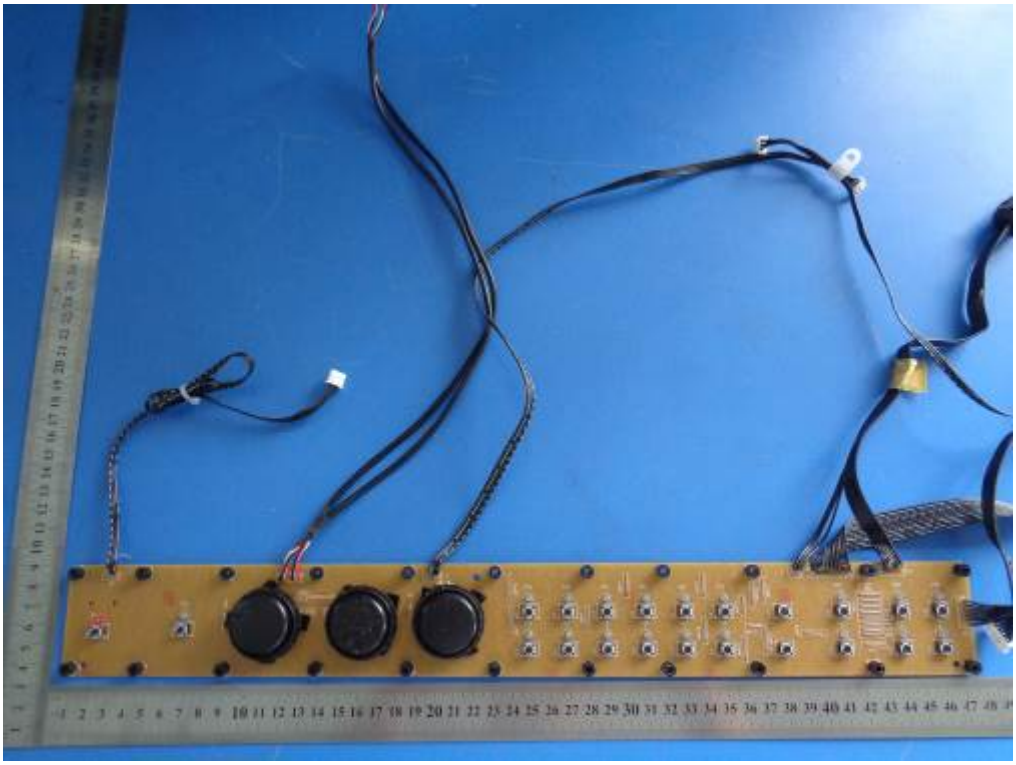
EUT PCB 5– Rear View



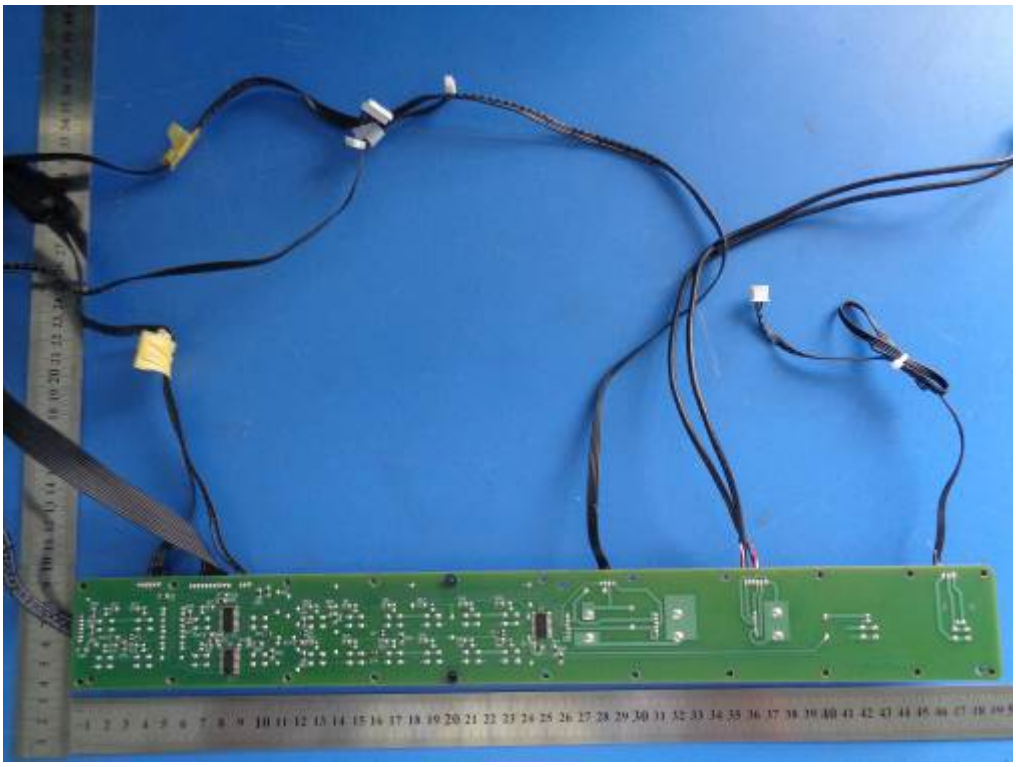
EUT PCB 6– Front View



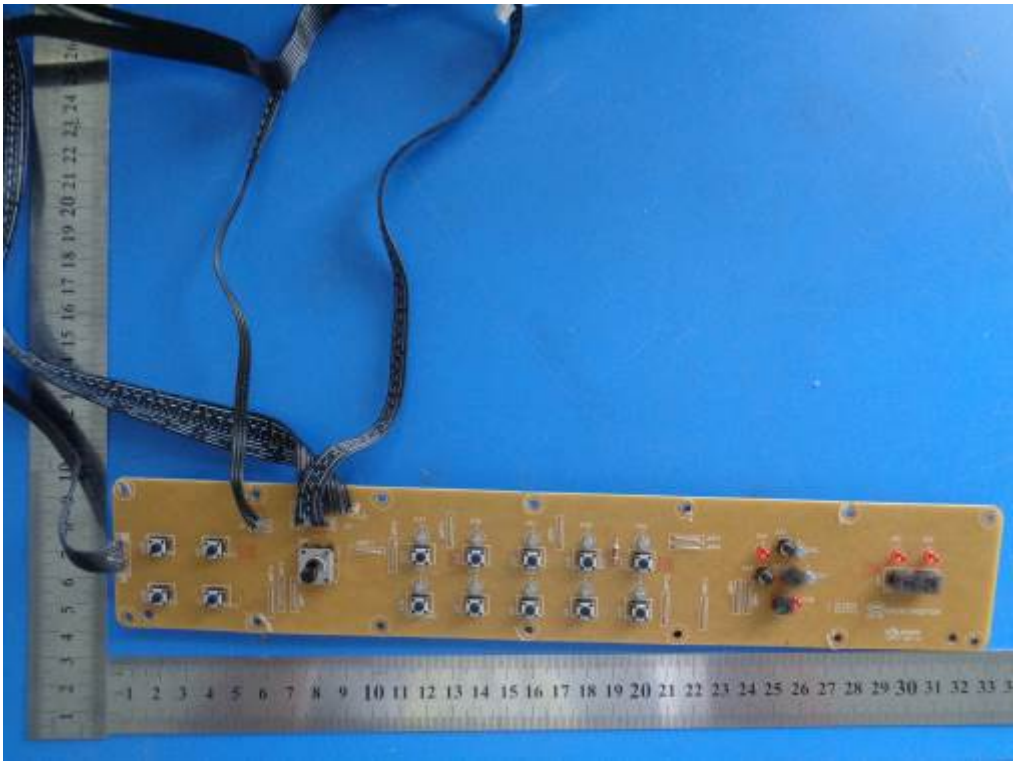
EUT PCB 6– Rear View



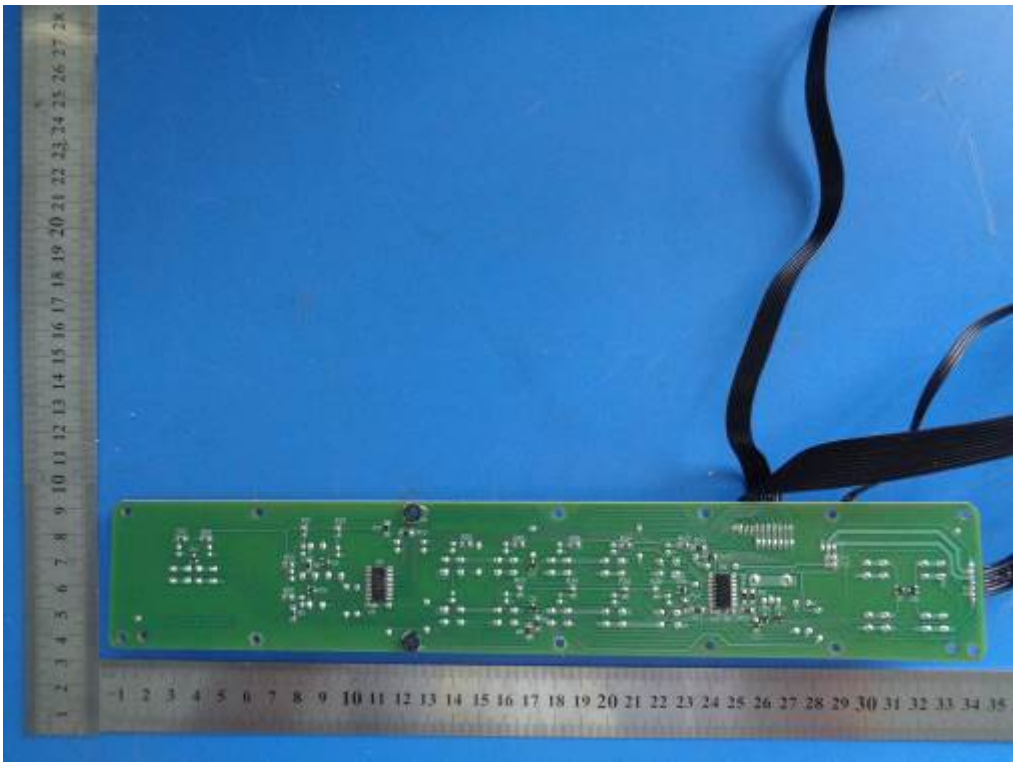
EUT PCB 7– Front View



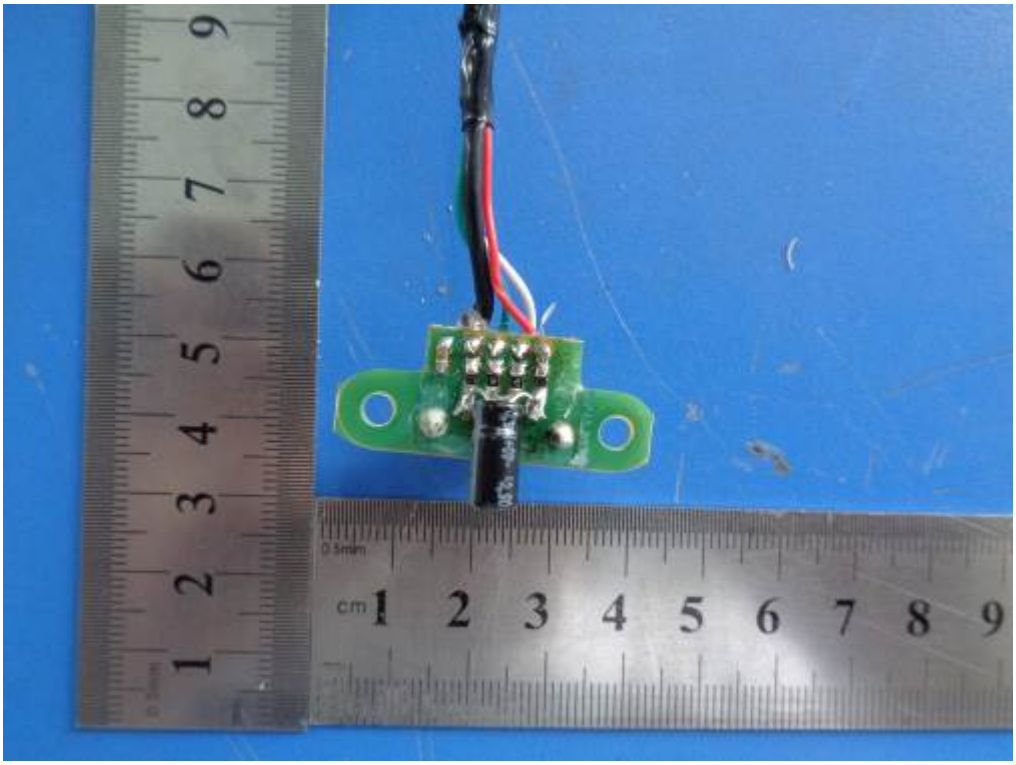
EUT PCB 7– Rear View



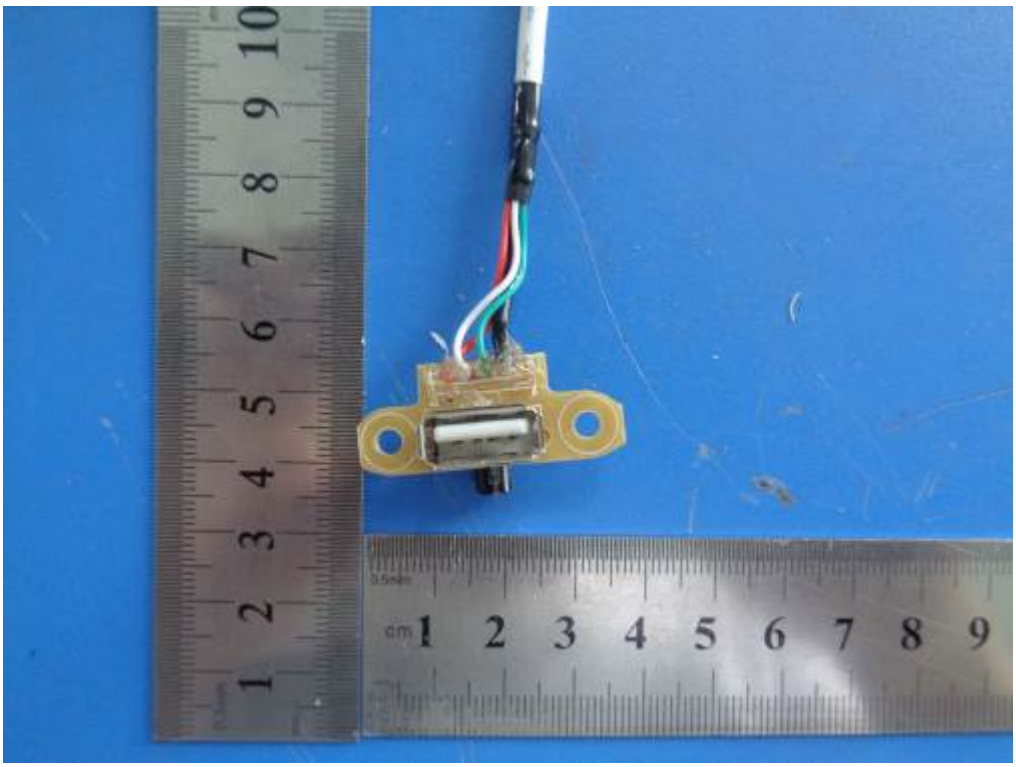
EUT PCB 8– Front View



EUT PCB 8– Rear View

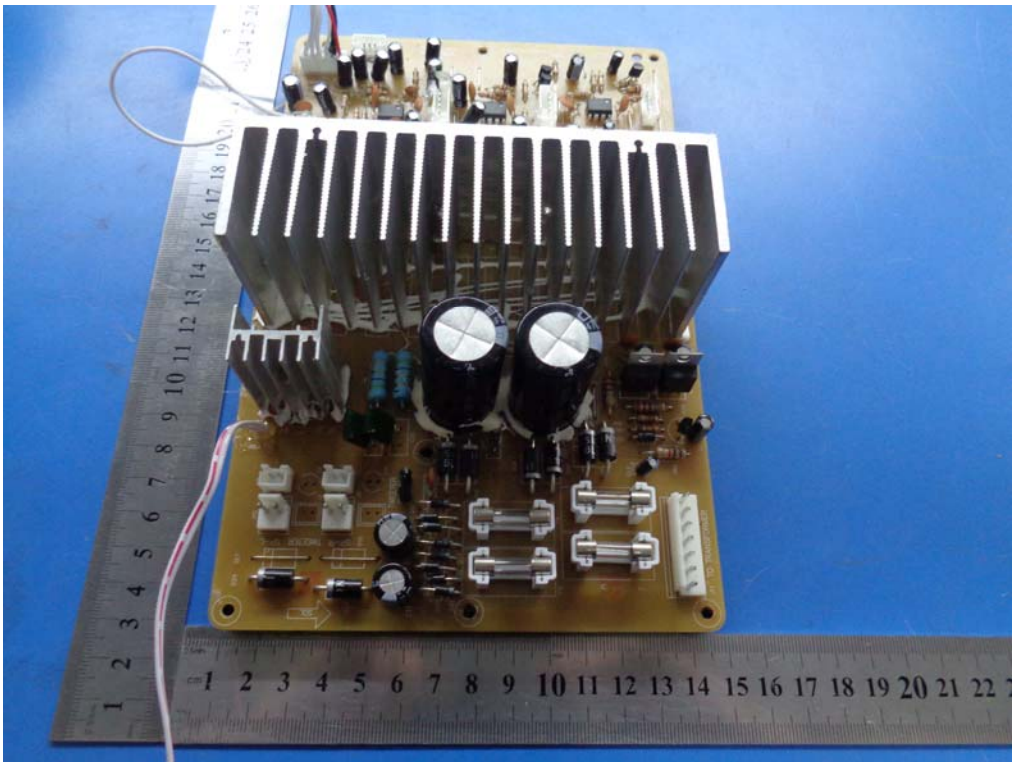


EUT PCB 9– Front View

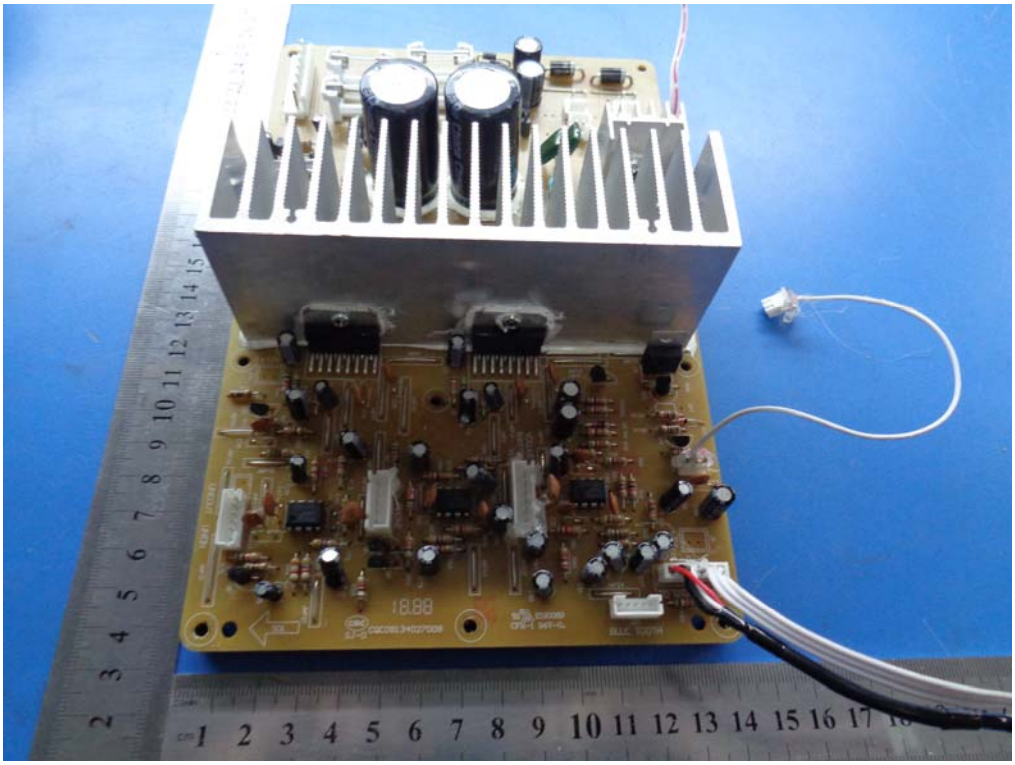


EUT PCB 9– Rear View

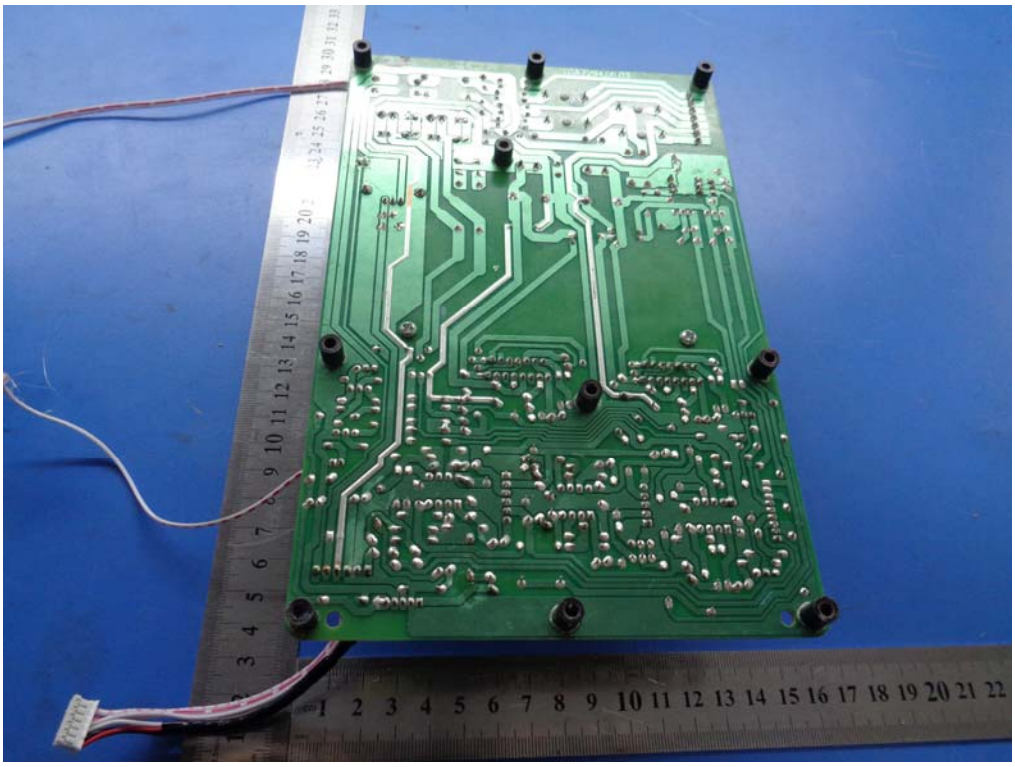
Model: AG-28



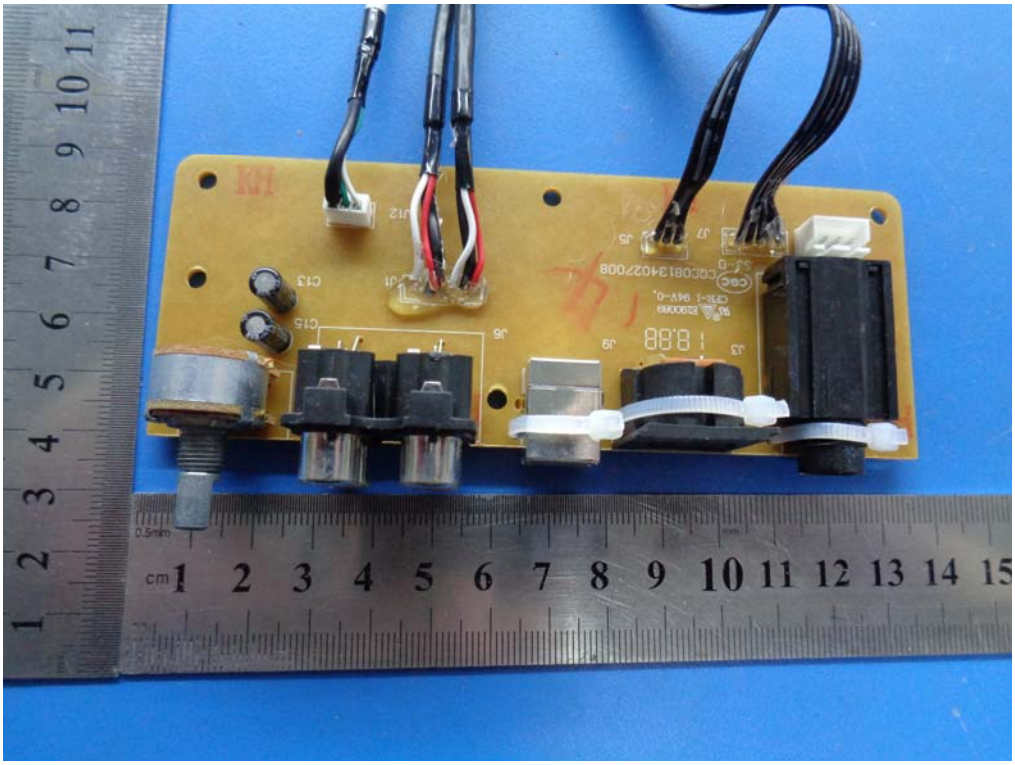
EUT PCB 1– Front View 1



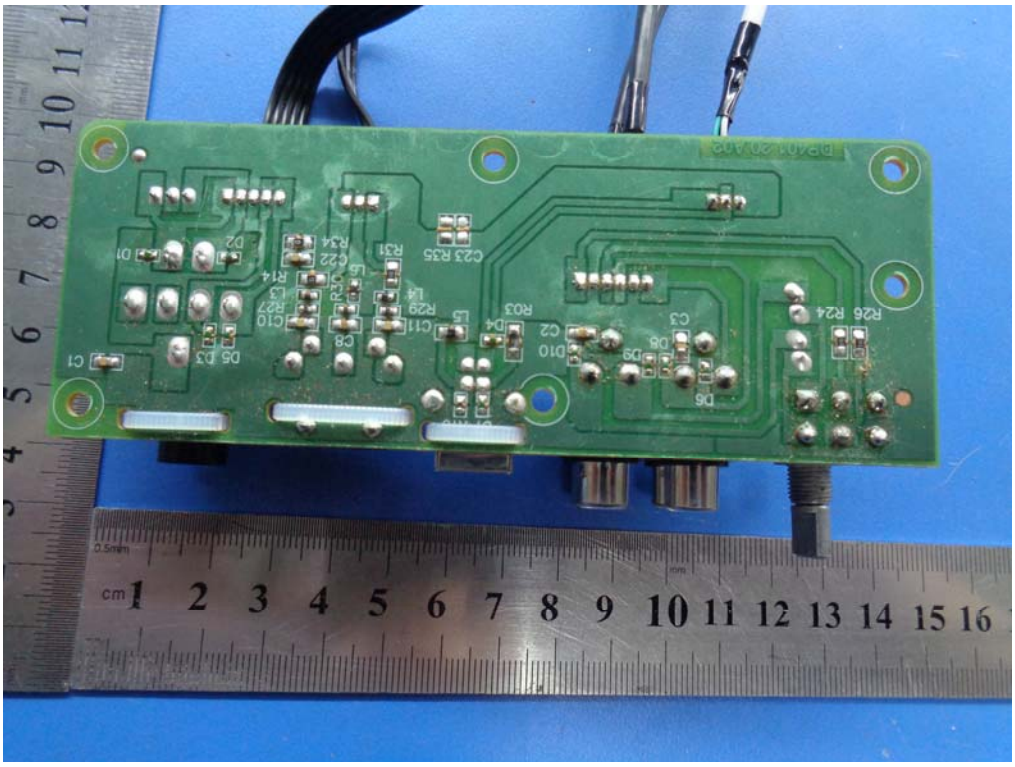
EUT PCB 1– Front View 2



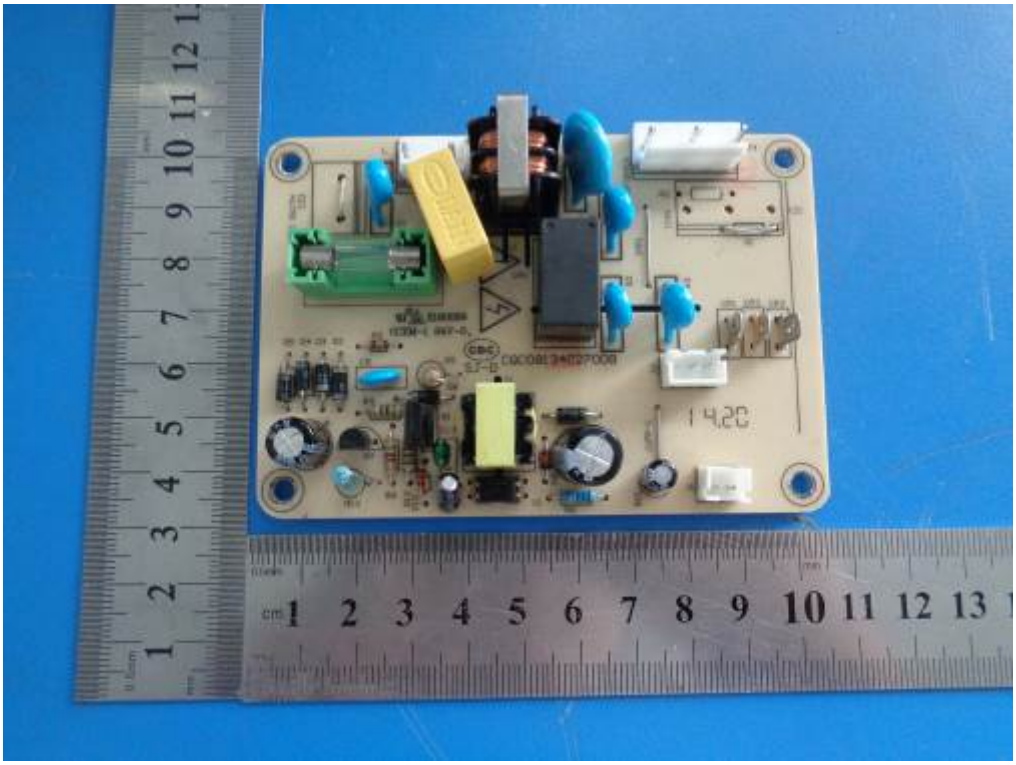
EUT PCB 1– Rear View



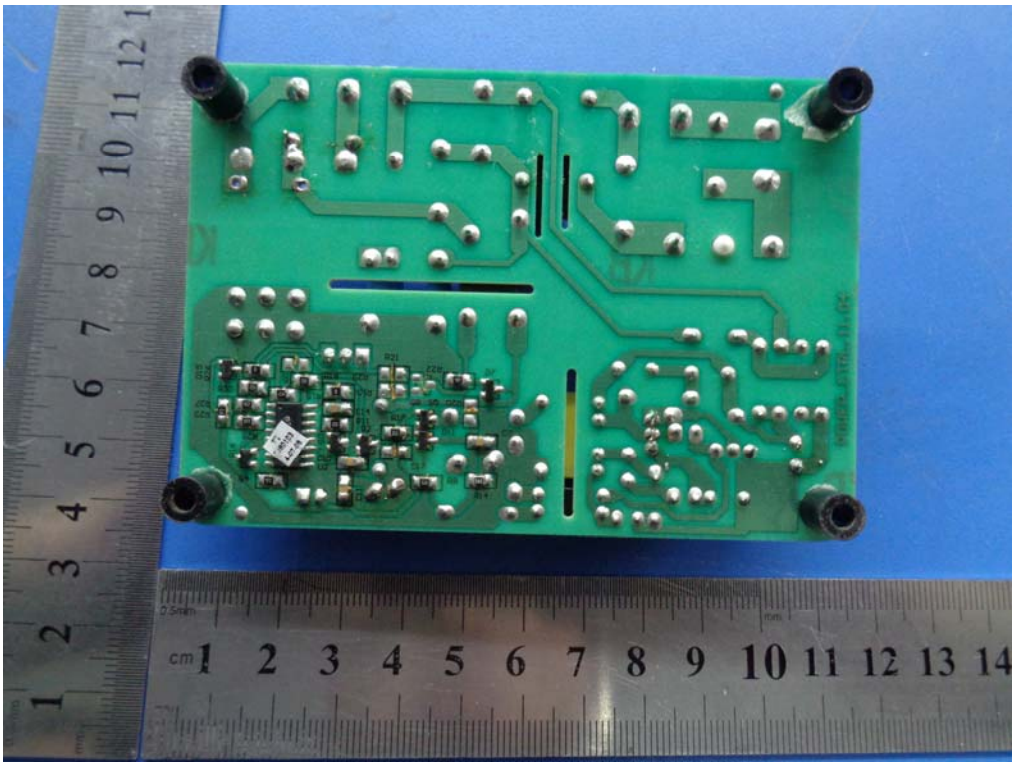
EUT PCB 2– Front View



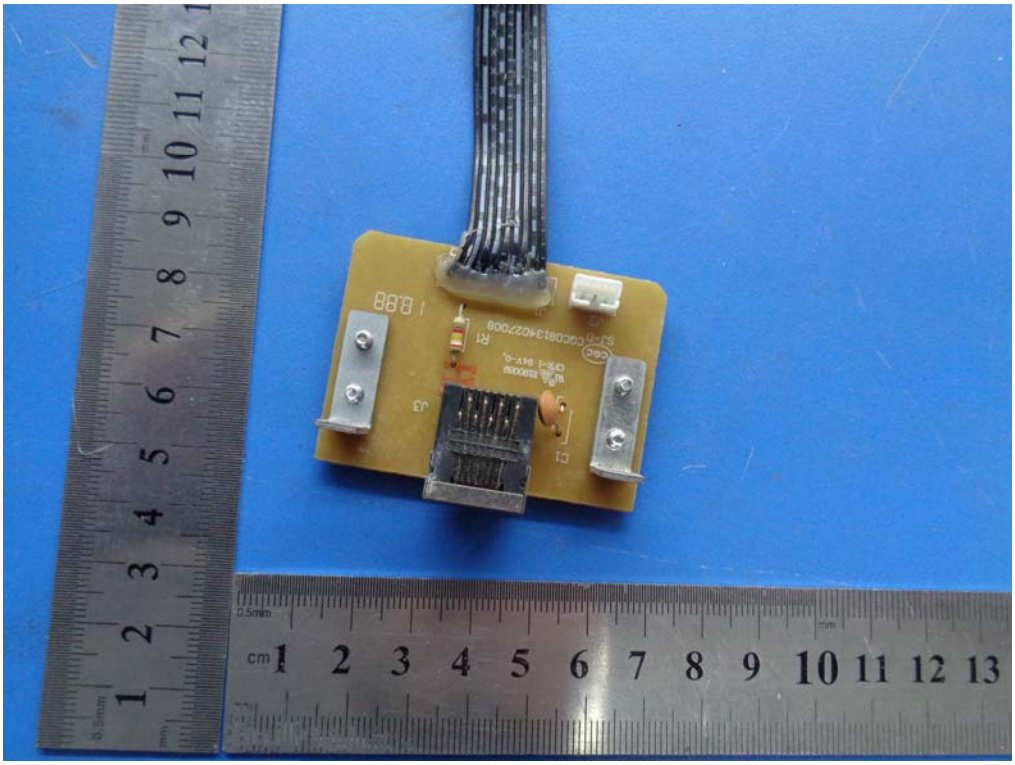
EUT PCB 2– Rear View



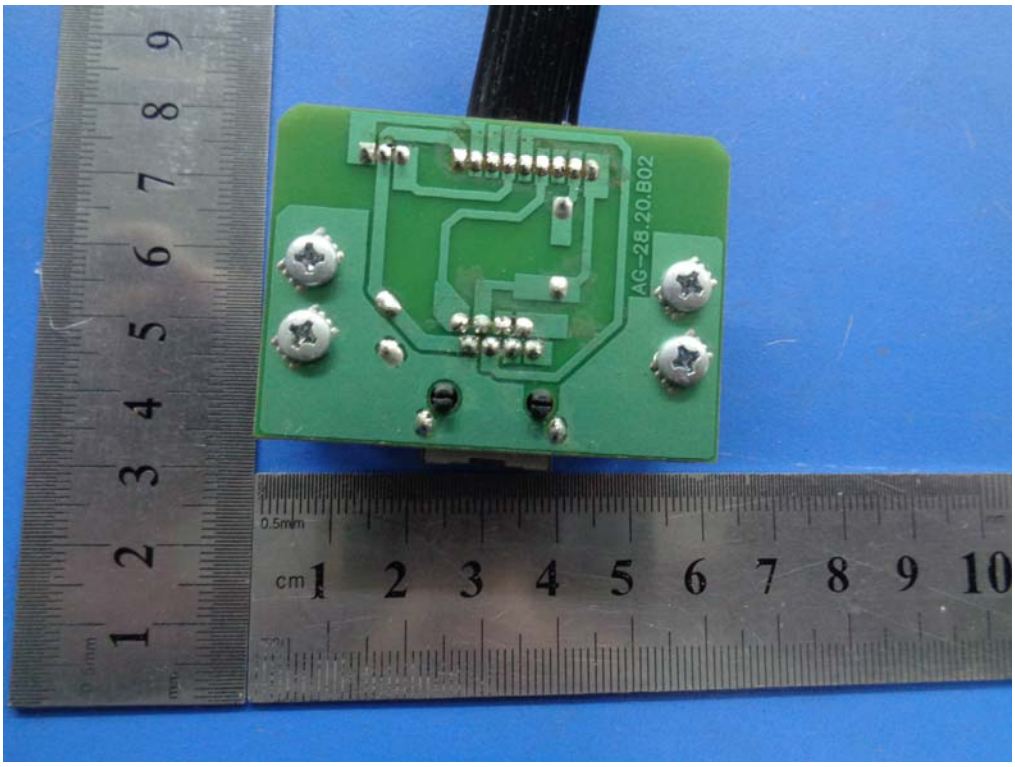
EUT PCB 3– Front View



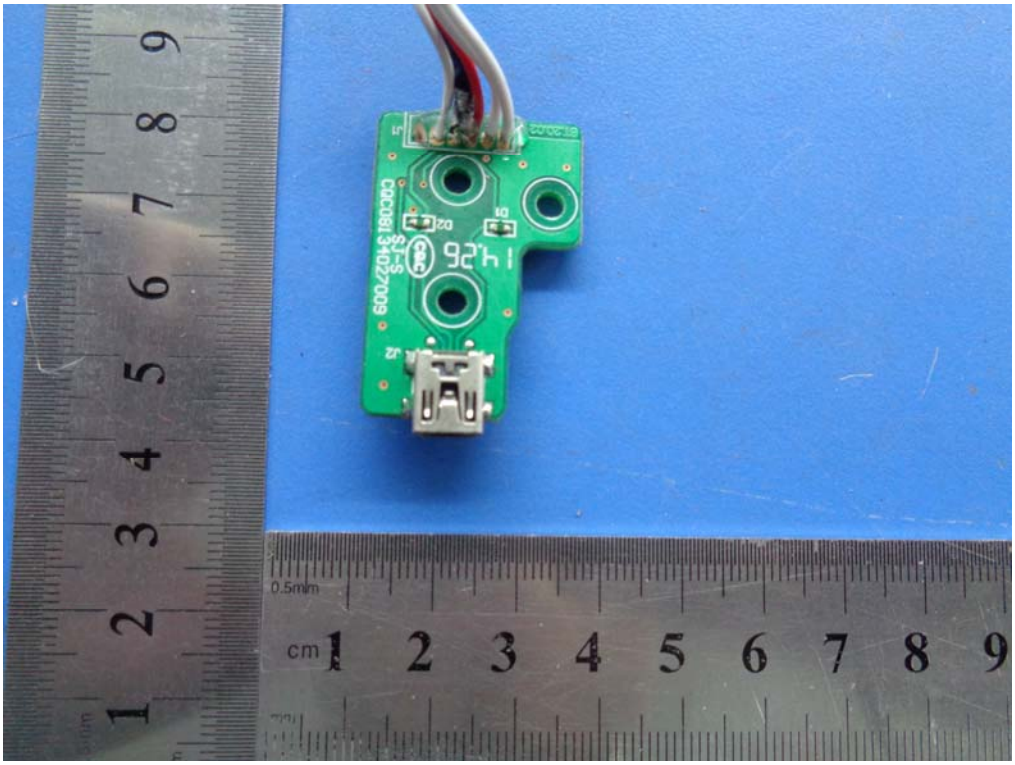
EUT PCB 3– Rear View



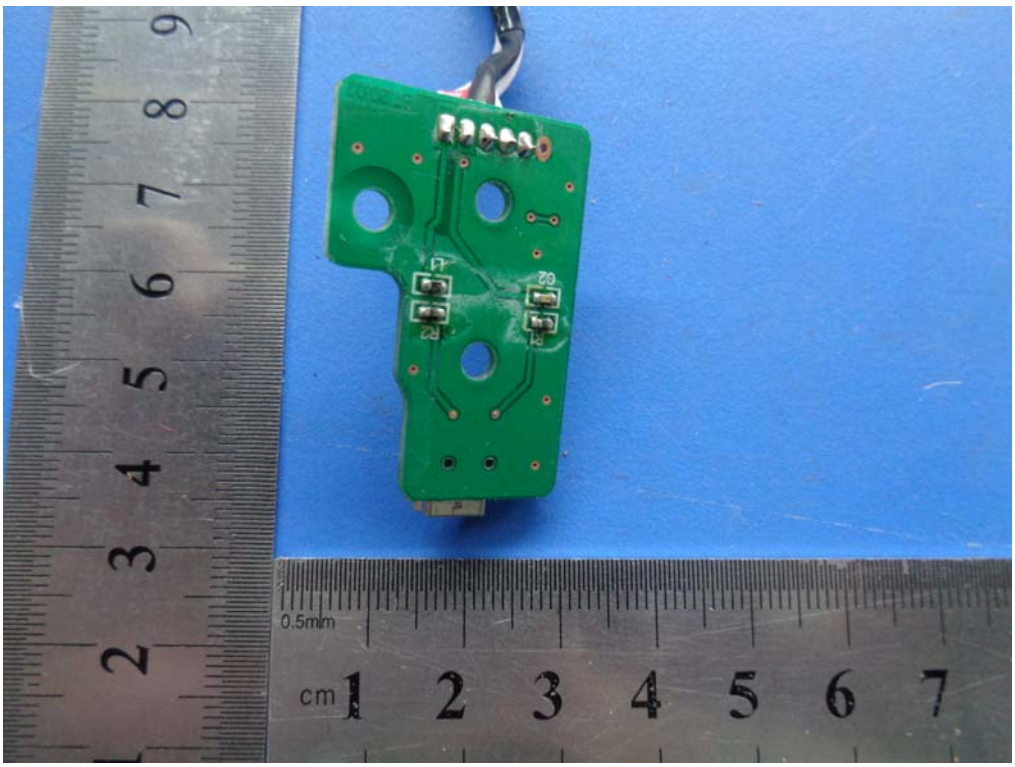
EUT PCB 4– Front View



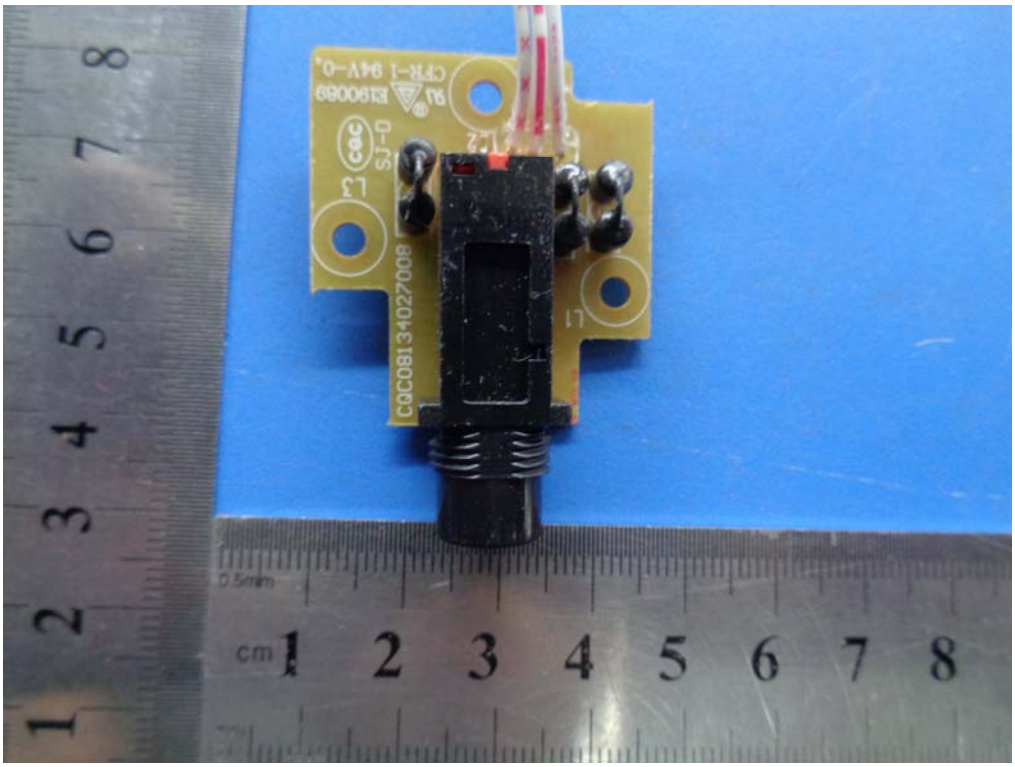
EUT PCB 4– Rear View



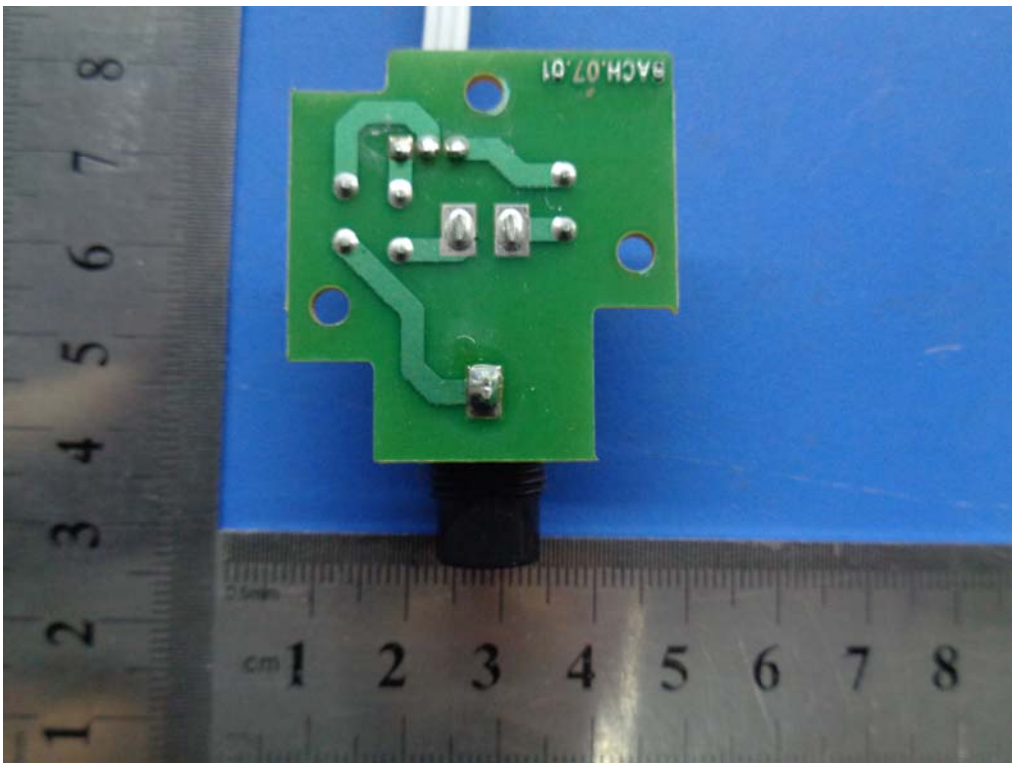
EUT PCB 5– Front View



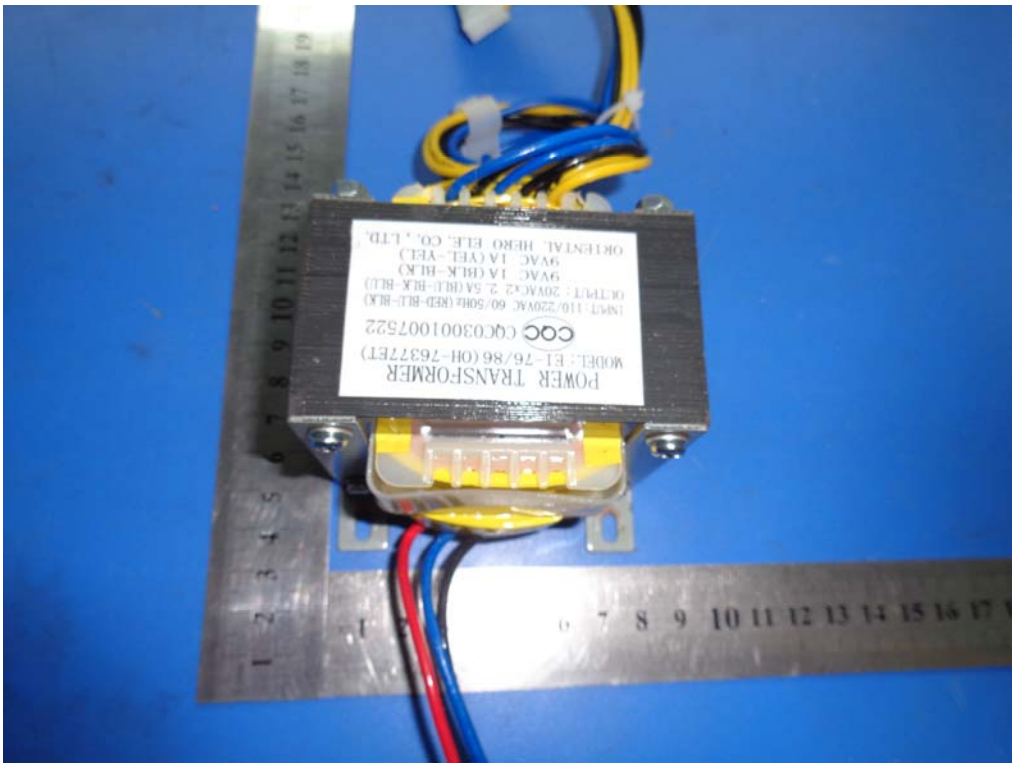
EUT PCB 5– Rear View



EUT PCB 6– Front View

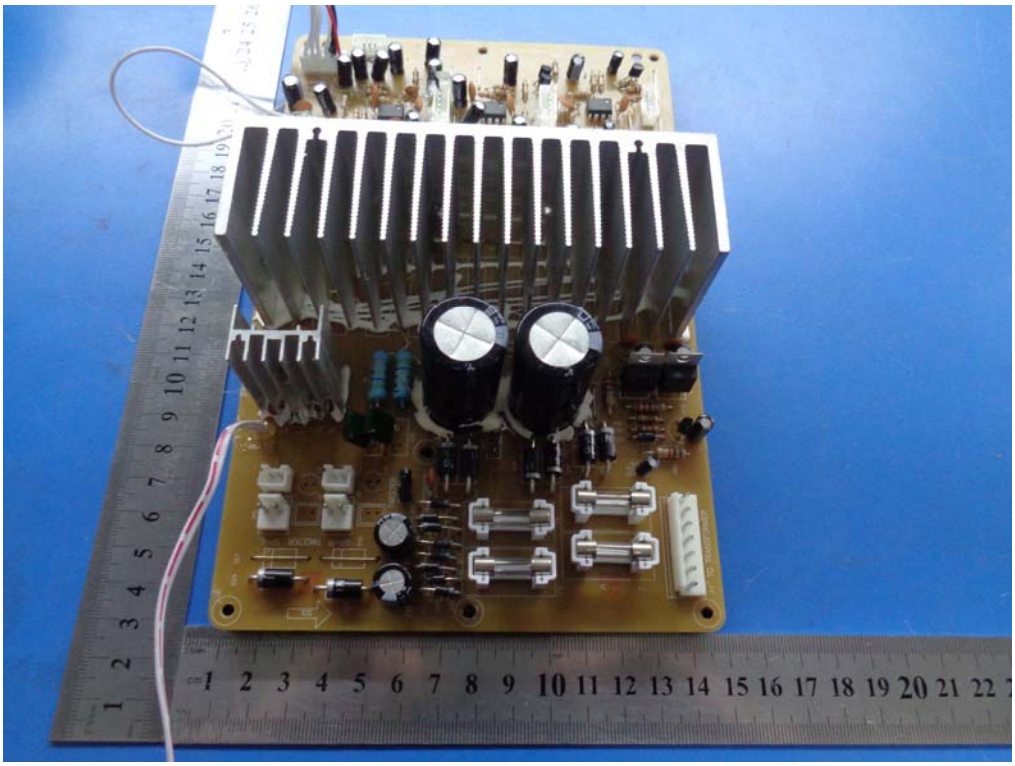


EUT PCB 6– Rear View

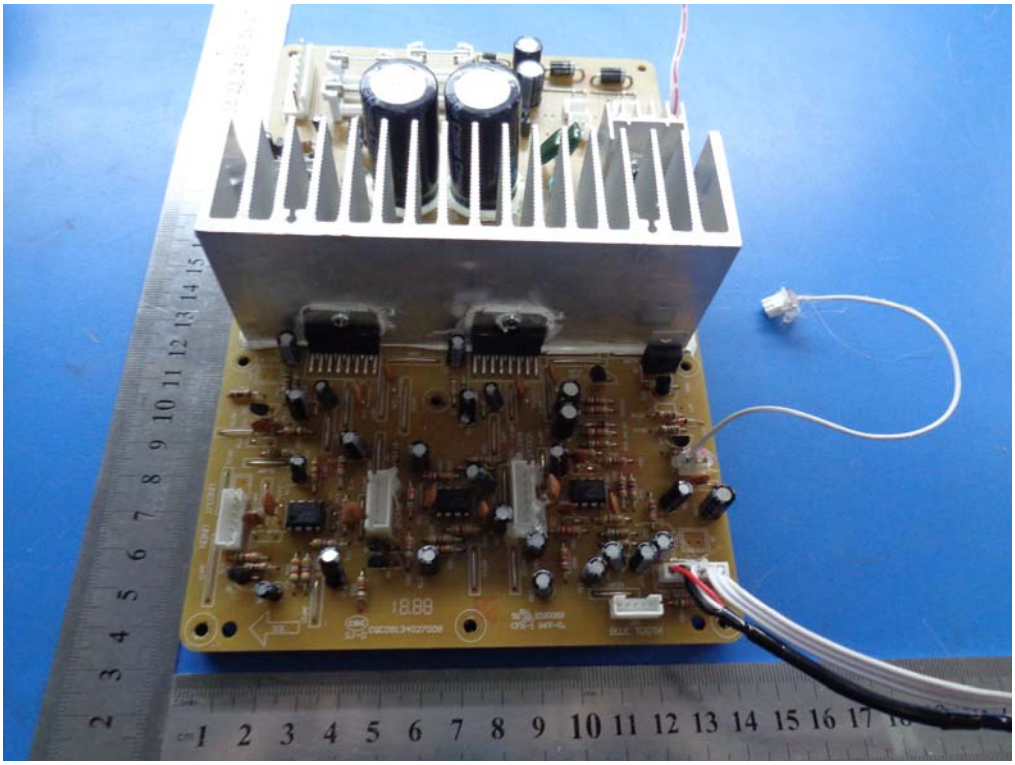


EUT POWER TRANSFORMER– Front View

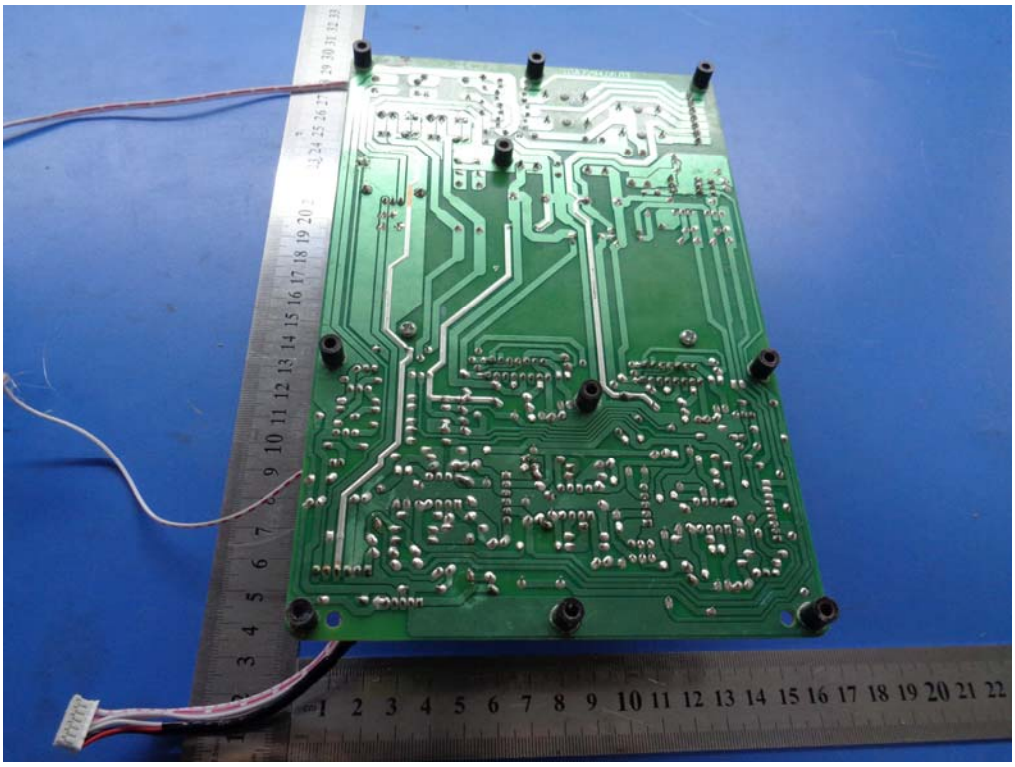
Model: DG-55



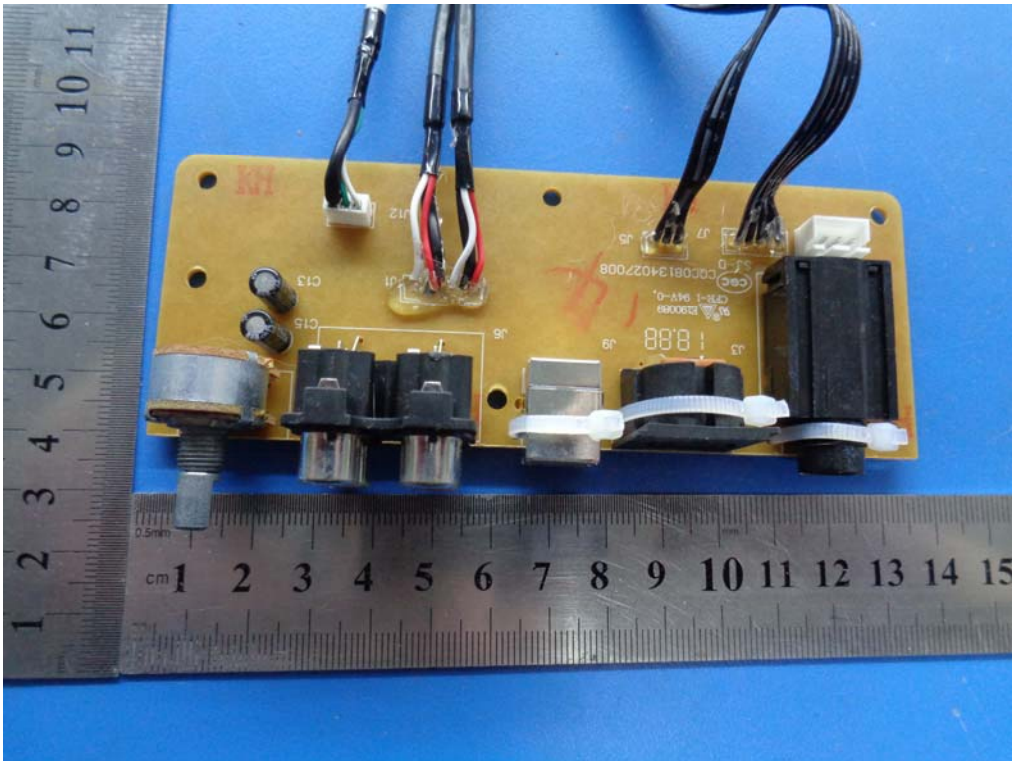
EUT PCB 1– Front View 1



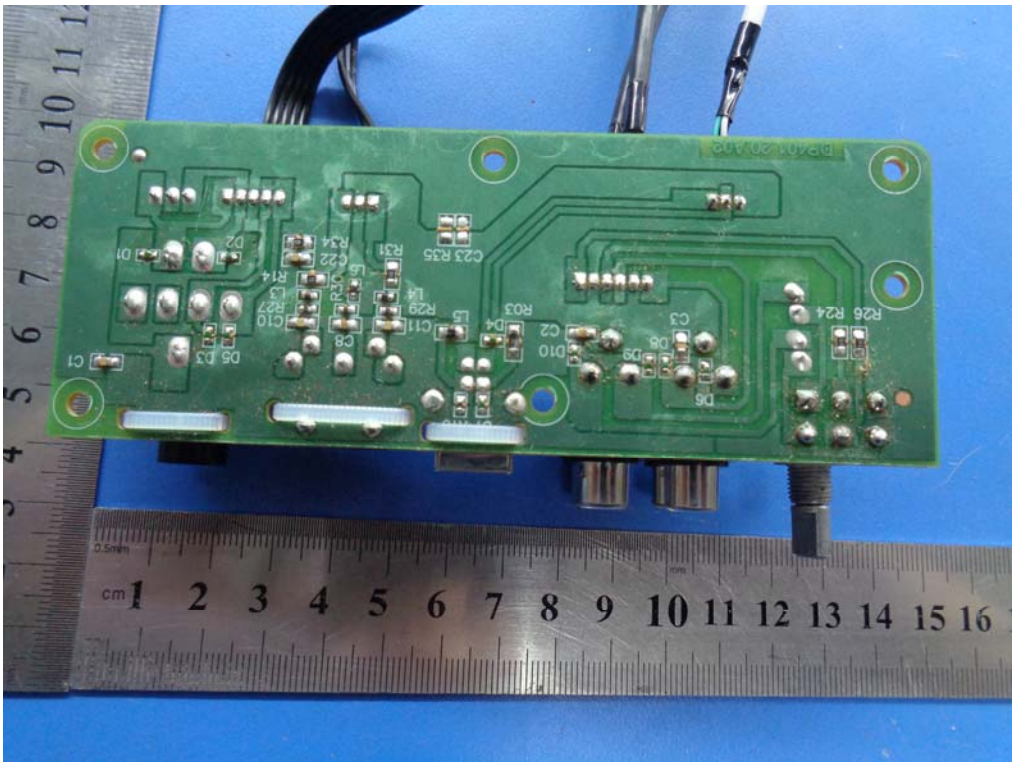
EUT PCB 1– Front View 2



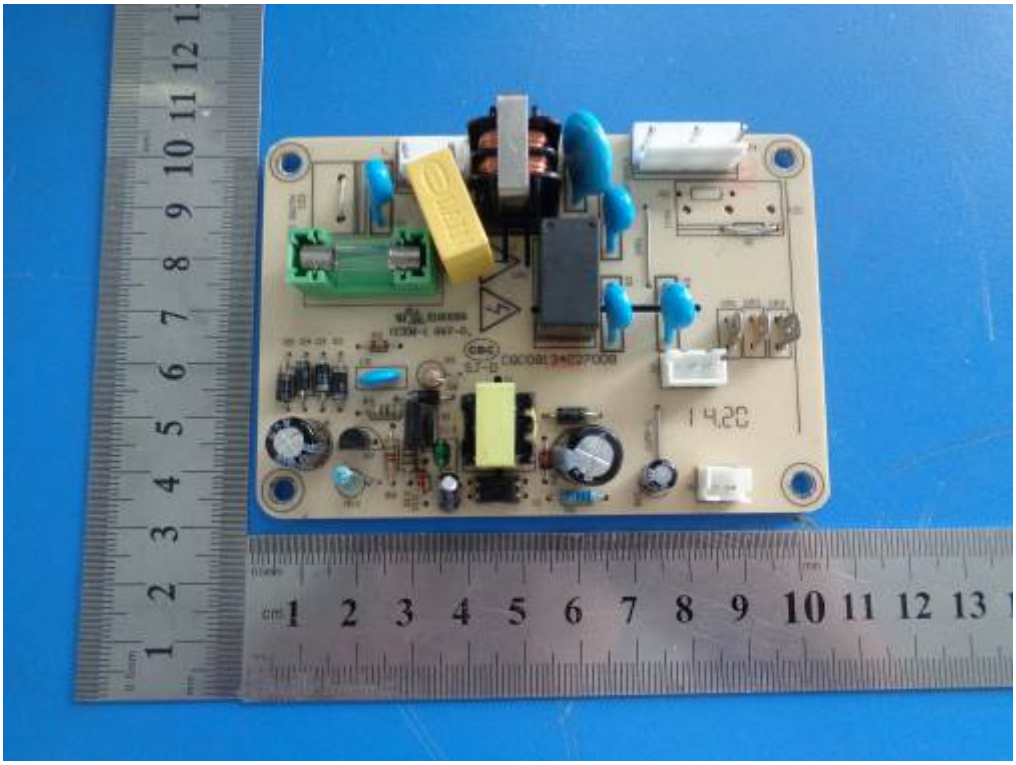
EUT PCB 1– Rear View



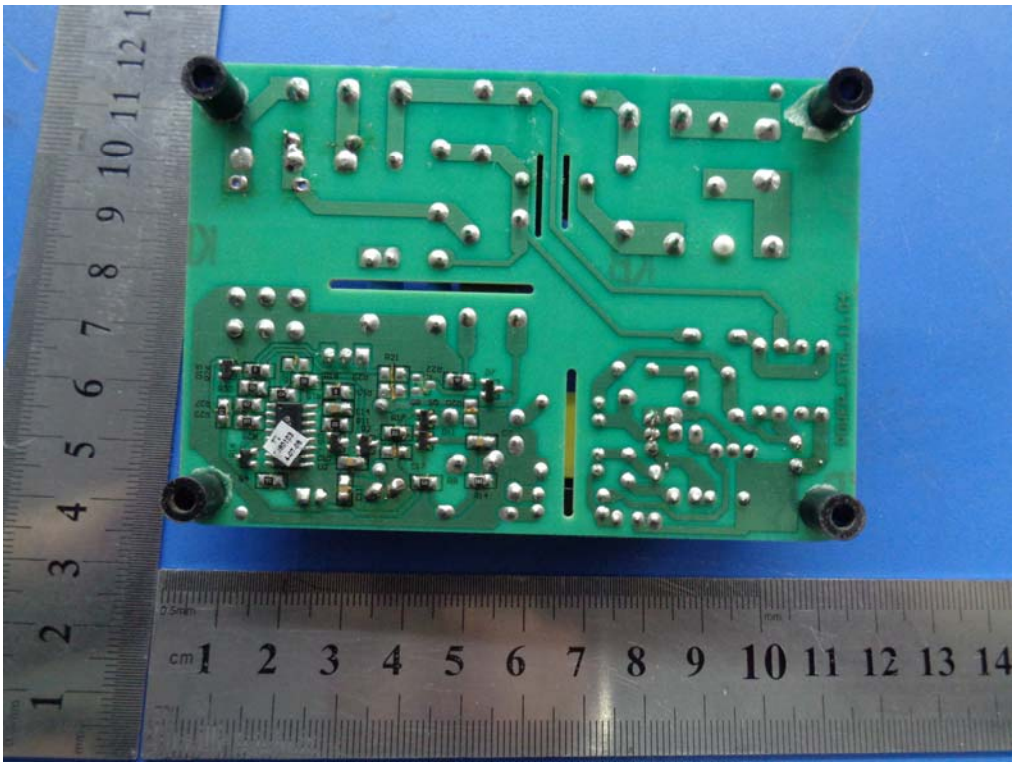
EUT PCB 2– Front View



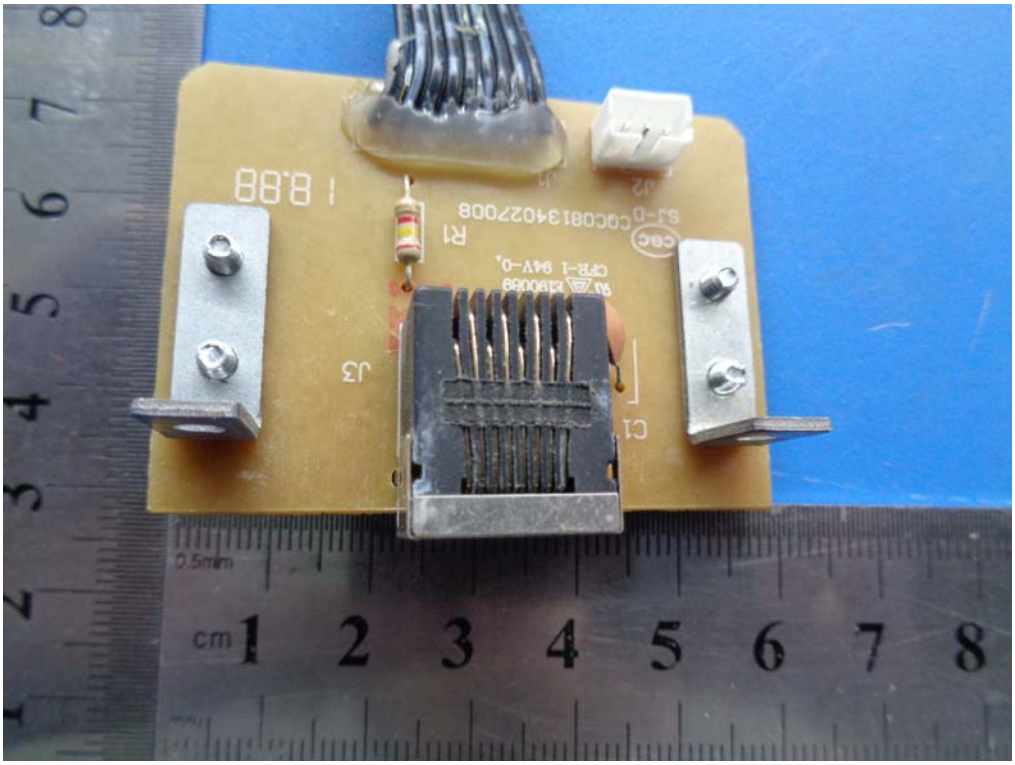
EUT PCB 2– Rear View



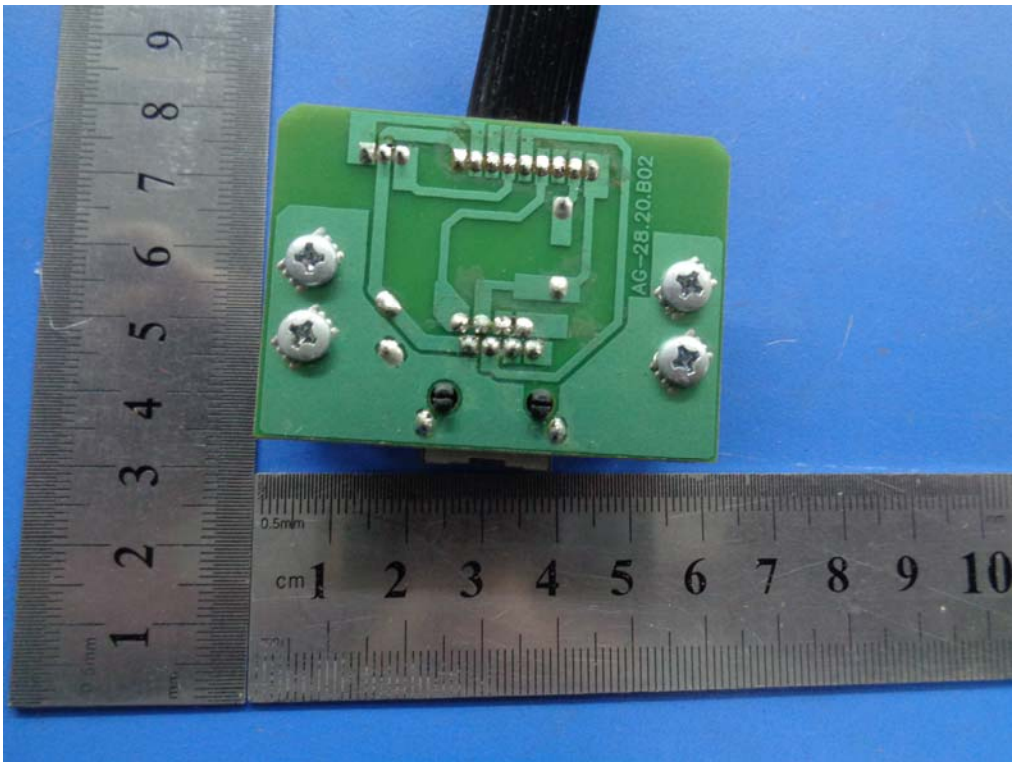
EUT PCB 3– Front View



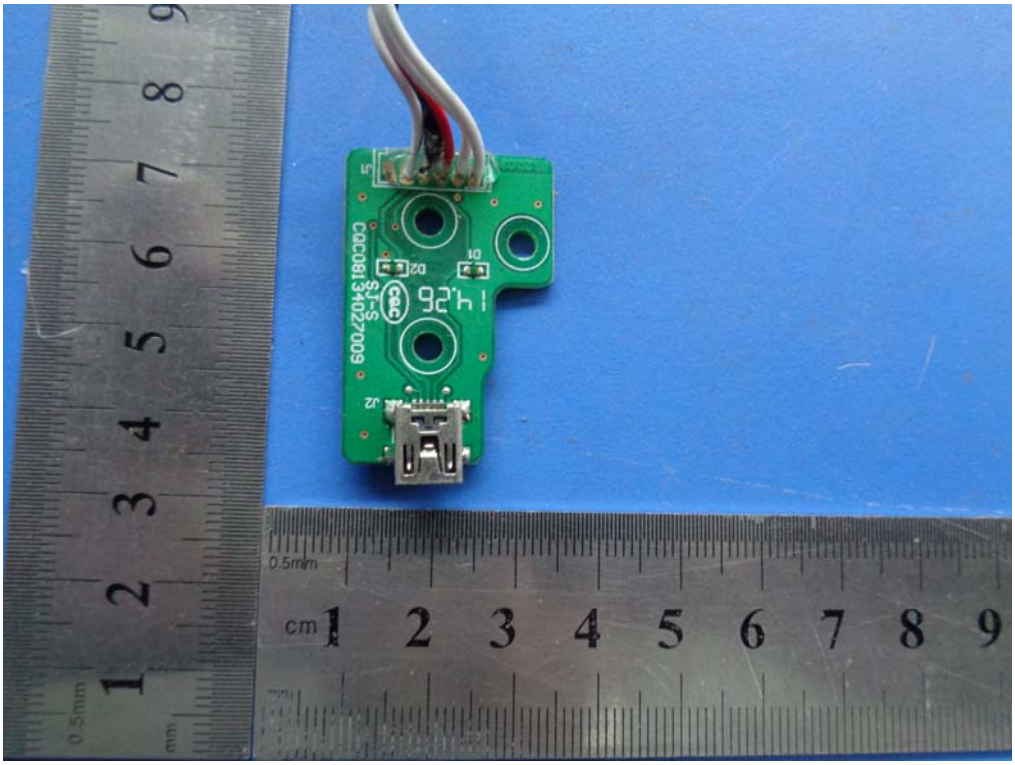
EUT PCB 3– Rear View



EUT PCB 4– Front View

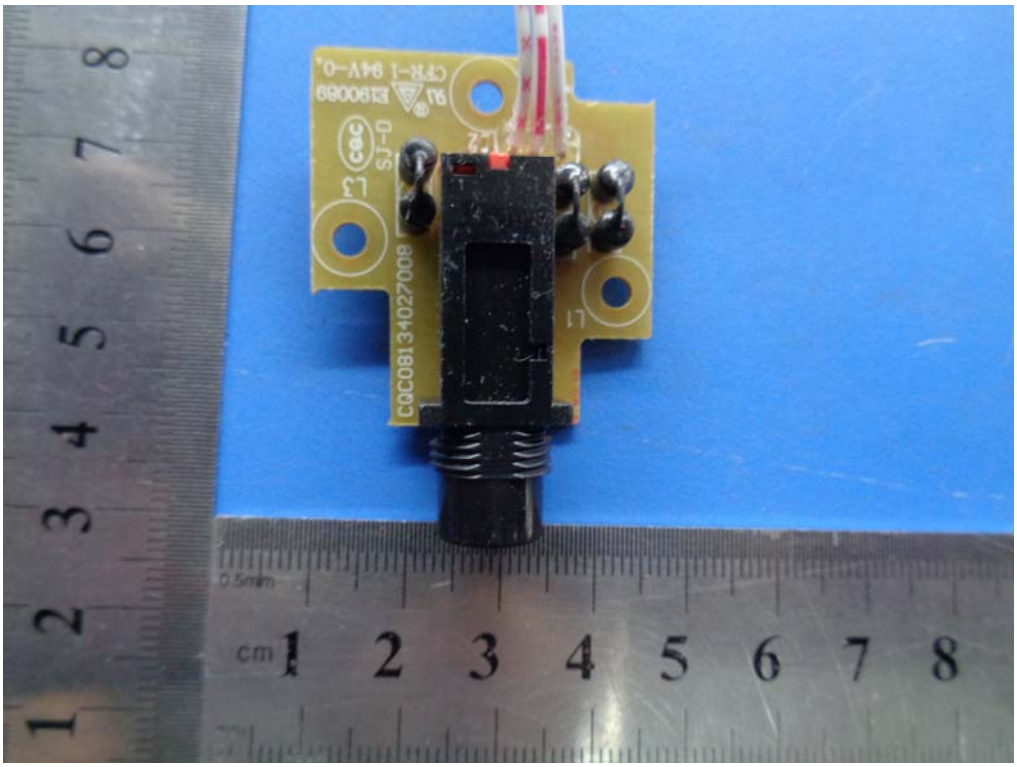


EUT PCB 4– Rear View

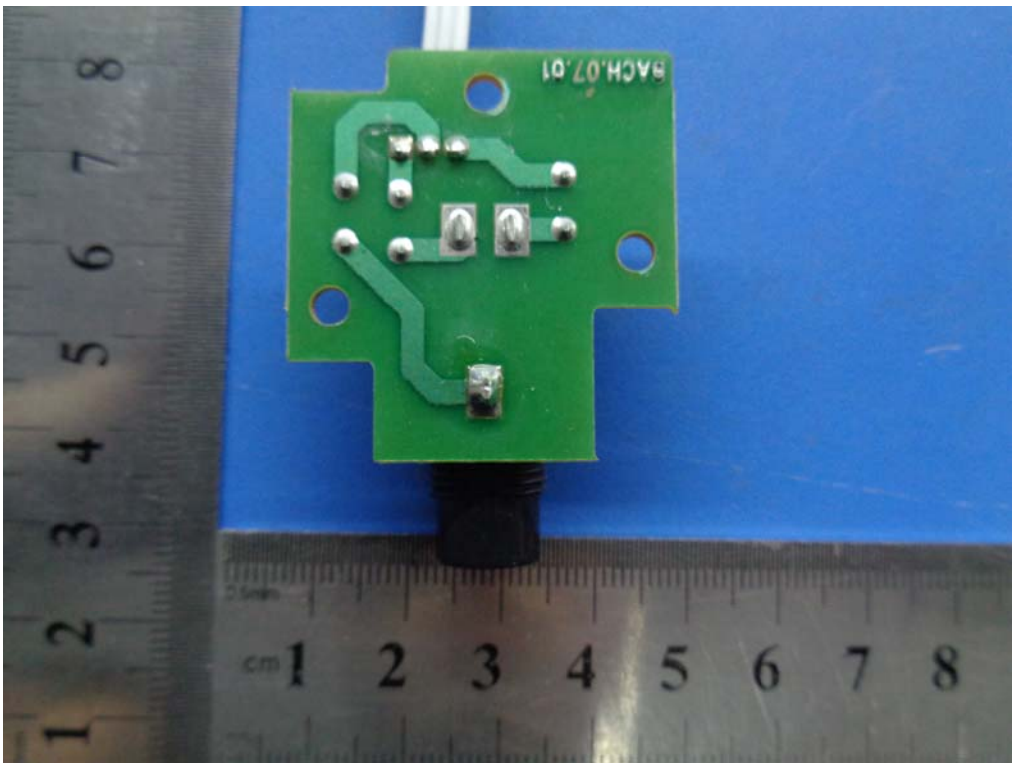


EUT PCB 5– Front View

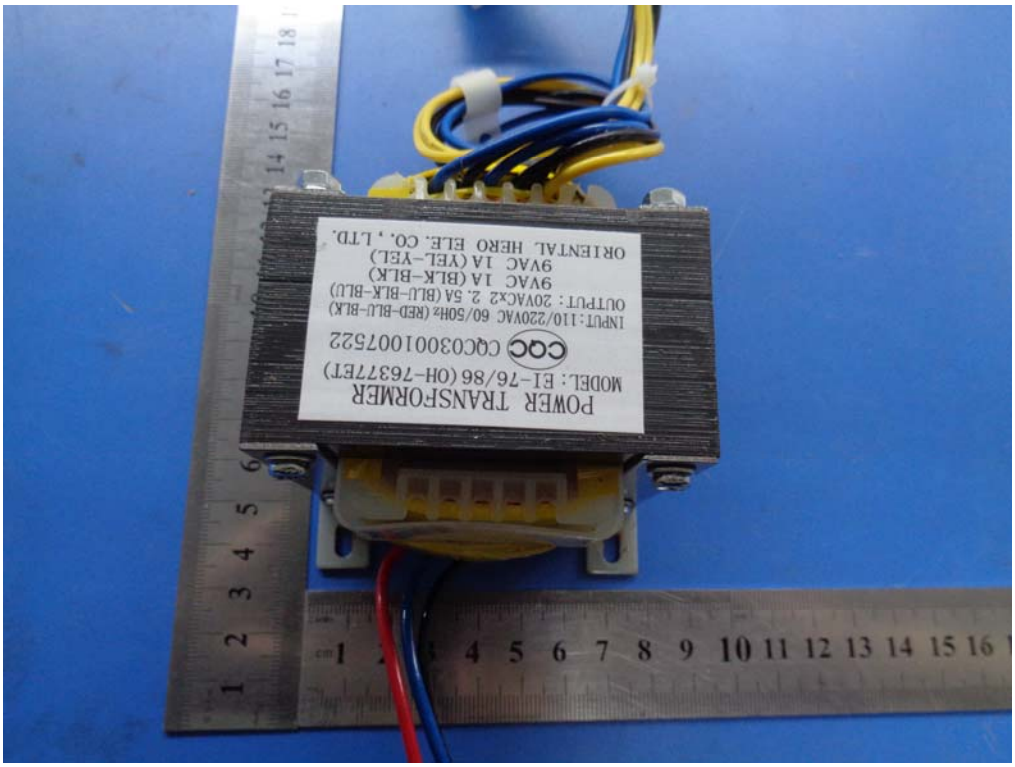
EUT PCB 5– Rear View



EUT PCB 6– Front View



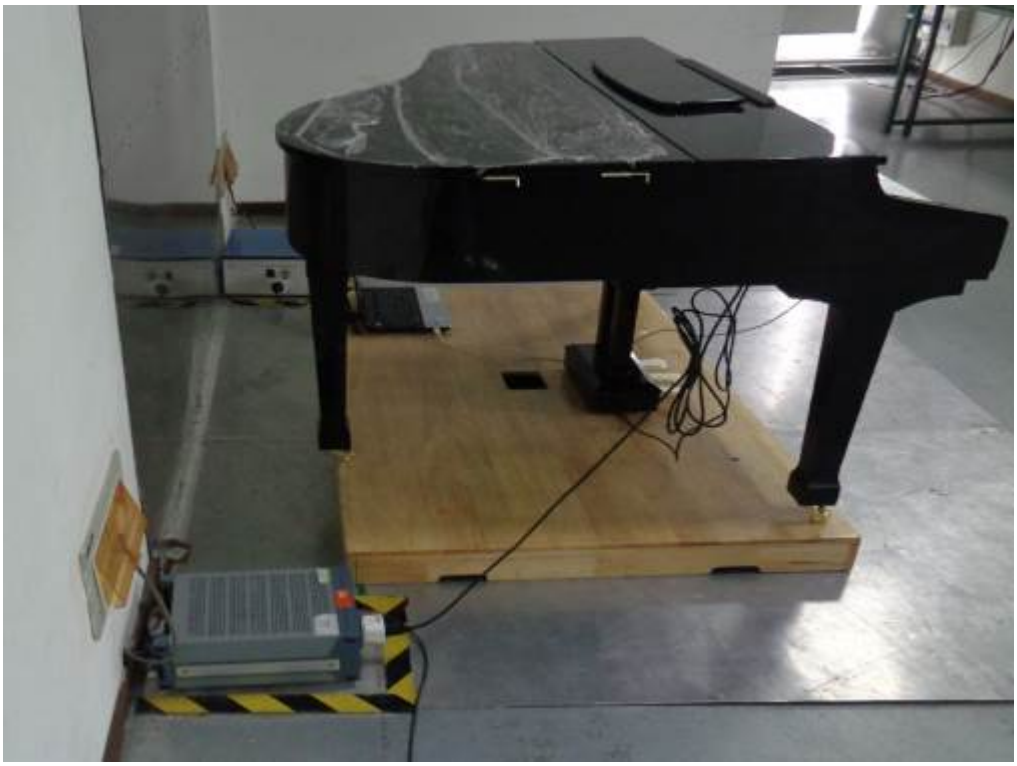
EUT PCB 6– Rear View



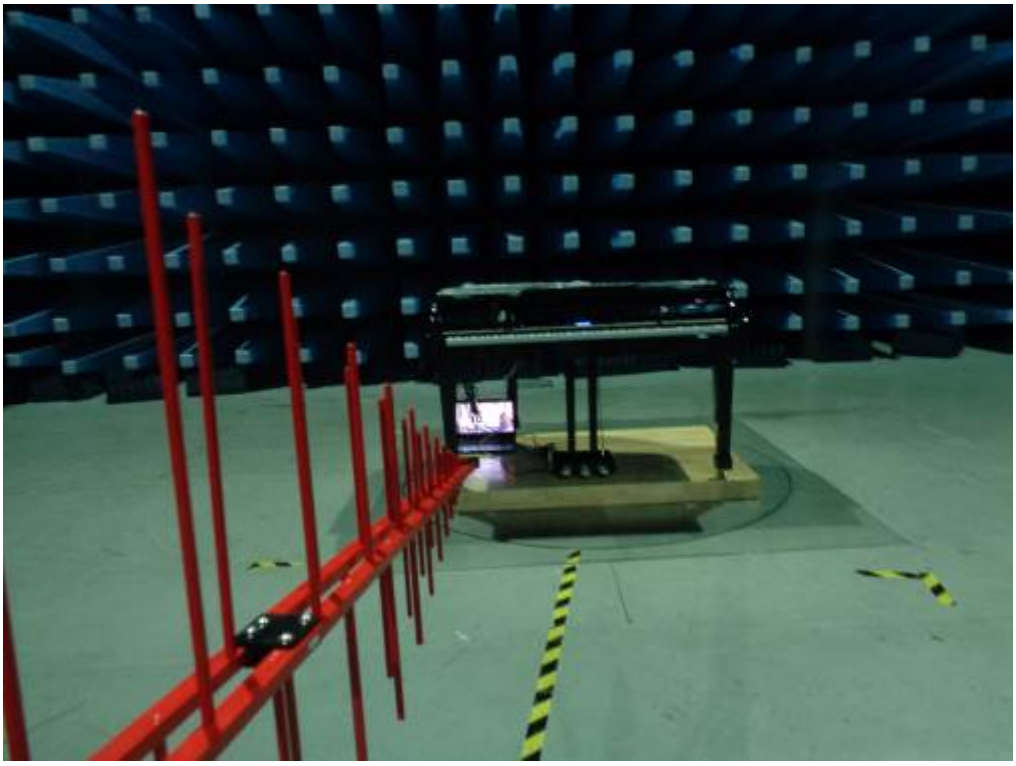
EUT POWER TRANSFORMER– Front View

Annex B.iii. Photograph 3: Test Setup Photo

Conducted Emissions Setup Front View



Conducted Emissions Setup Side View



Radiated Emissions Setup Below 1GHz Front View

Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

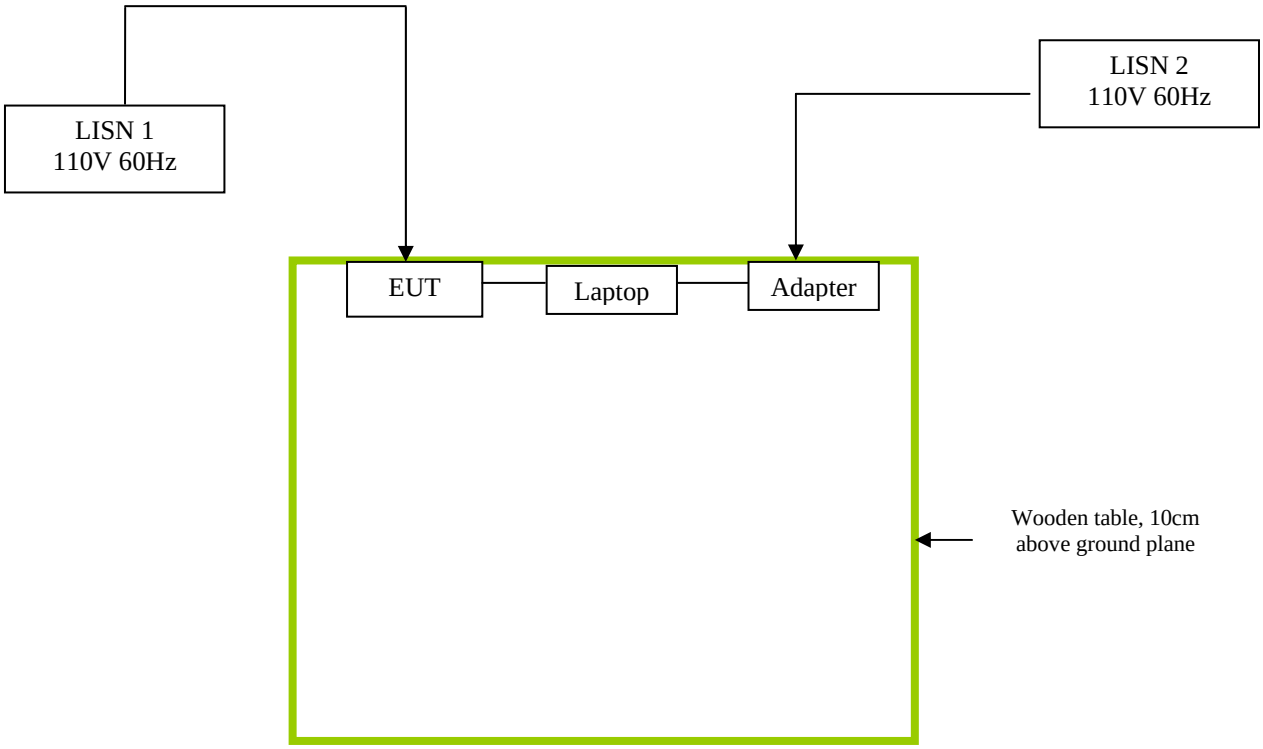
EUT TEST CONDITIONS

Annex C. i. SUPPORTING EQUIPMENT DESCRIPTION

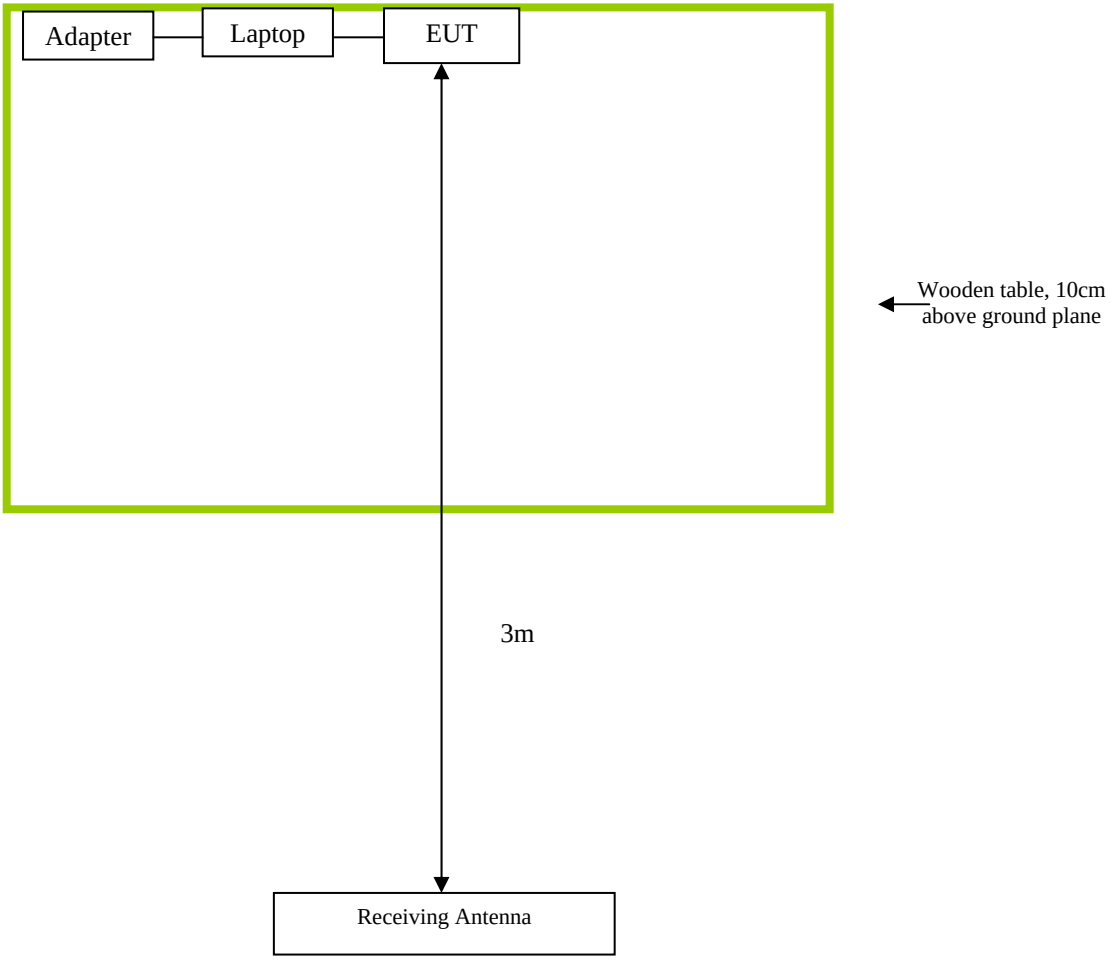
The following is a description of supporting equipment and details of cables used with the EUT.

Equipment Description (Including Brand Name)	Model & Serial Number	Cable Description (List Length, Type & Purpose)
Acer Laptop	ZQT & N/A	N/A

Block Configuration Diagram for Conducted Emissions



Block Configuration Diagram for Radiated Emissions



Annex C.ii. EUT OPERATING CONDITIONS

The following is the description of how the EUT is exercised during testing.

Test	Description Of Operation
Emissions Testing	Normal Working

Annex D. USER MANUAL / BLOCK DIAGRAM / SCHEMATICS / PART LIST

Please see attachment

Annex E. DECLARATION OF SIMILARITY

Ringway Tech(Jiangsu) Co.,Ltd.

To: SIEMIC(Nanjing-China) Laboratories

Declaration letter

Dear Sir,

For our business issue and marketing requirement, we would like to list different models numbers on the CE\FCC certificates and reports, as following:

Model No.: AG-40, AG-28, DG-55
FCC ID : OCDAG-40

The difference between the three models AG-40, AG-28, DG-55 are as follows:

1. The shape of the wooden parts is different.
2. The main control board, power amplifier, power and other electric circuit of DG-55 are the same as AG-28.
3. The main control board, power amplifier, power and other electric circuit of DG-55 are the same as AG-40.

Thank you!

Signature:

Printed name/title:

Address: No. 101 West Hanjiang Road, Changzhou,Jiangsu, China