Document No. : H/W(연구)-192- 810

Team	H/W TEAM	Approval Sheet	ISS.	CHK.	APP.
Drafter	Ju Hun Kwon				
Date	2007.03.16				
Code		Axesstel	M007MV14MG0M	Mecha.	
Basic Model Name	MV140	Rev. No.			
Component Name	ANTENNA	Relative Document	Built-in ANTENNA 800/1900, MV140(Main) (PART NO. AINA000003)		

순서승제 2007. 3. 16 AXESSTEL Korea, Inc

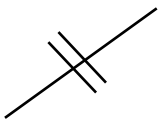
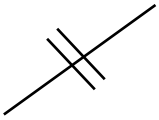
Revision Record	NO.	Date	Summary	CHK.	APP.
	1	2007.12.17	Change manufacture (MRD → DYKTX)		

Main Points to be Item	
Way of Inspection	Inspected in accordance with Imports Inspection Regulation.
Way of Purchase	1. Domastic Demand ( ) 2. LOCAL ( ) 3. Import ( )
Cooperation Company	MRW COMMUNICATIONS, Ltd.
Supplement	1.Approval of Cooperation Company (0) 2. drawing (0) 3. others ( )
Distribute to	1. H/W Team 1 copy
	2. MECHANIC Team 1 copy
	3. Sourcing Team 1 copy
	4. QC/TS Team 1 copy
	5. Cooperation Company 1 Copy

AXESSTEL KOREA Inc.

ANTENNA SPECIFICATIONS

CUSTOMER	:	AXESSTEL KOREA INC.
ITEM	:	MV-140(MAIN)
MODEL NAME	:	AINA000003
CUSTOMER P/NO	:	
DATE	:	2007-12-13

		DRAFTING	CHECK	CHECK	APPROVAL
DYKTX	RF Engineer				
		12/13	12/13	12/13	
	Design Engineer				
				12/13	12/13

#680-9, JAKJEUN-DONG, KYEYANG-GU, INCHON, KOREA

TEL : 82-32-676-9224 FAX : 82-32-546-4797

KTX DAEYOUNG KTX

Table of Contents

1. Document Change Record

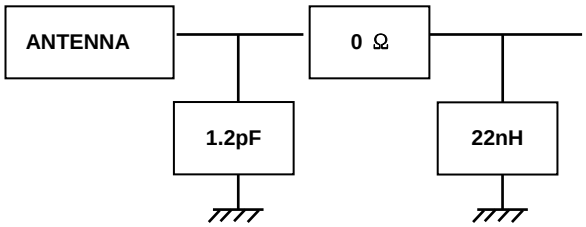
Rev. No	Date	Page	Change Contents	Change Cause	Rev.
1	2007-12-10		Initial Release	N/A	IR
2	-		-	-	

2. List of Material

	Raw Material	Material Supplier	Tooling & Injection	Finishing & Spec.	Remark
Carrier	PC	Cheil Industies	-	-	-
Radiator	STS 301 3/4H (t=0.15)	Pung-San Metal	-	-	-
Assembly	Tolerance of heat staking height should not bk over 0.6mm the surface of pattern				

3. Electrical & Mechanical Specifications

3.1. Electrical Specifications

Frequency	CDMA		US-PCS	
	824MHz	894MHz	1.85GHz	1.99GHz
S.W.R.	(less than) 4.0:1	(less than) 2.3:1	(less than) 3.0:1	(less than) 2.3:1
Frequency Band	Tx (824~849MHz)	Rx (869~894MHz)	Tx (1850~1910MHz)	Rx (1930~1990MHz)
Radiation Gain <Peak, H-plane>	-5.0dBi (over)	-0dBi (over)	-1.5dBi (over)	-1.0dBi (over)
Impedance	50Ω			
Polarization	Vertical			
Radiation pattern	Omni-directional			
Power Handling	2 Watt			
Matching Circuit				

3.2. Mechanical Specifications

Carrier Material	P.C (Polycarbonate)
Size (L x W x H)	48.0 x 23.15 x 10.8(mm)
Weight	5.26g
Radiator Material	SUS (Stainless steel)
Operating Temperature	-30℃ ~ +80℃
Operating Humidity	10~90(%RH)

3.3. Package

Name	Quantity	Material	Remark
Tray	50EA	P.S	N/A
Carton BOX	1,000EA	DW 2 (AB)	N/A

4. Electrical Properties

4.1. Test equipments

The equipment for the antenna measurement we used is as follows.

4.1.1. Agilent 8720 Series Network Analyzer to measure the V.S.W.R and input impedance.

4.1.2. Three-dimensional anechoic chamber to measure the gain

(Standard dipole and horn were used to calibrate the chamber)

4.1.3. Digital caliper to measure the dimensions.

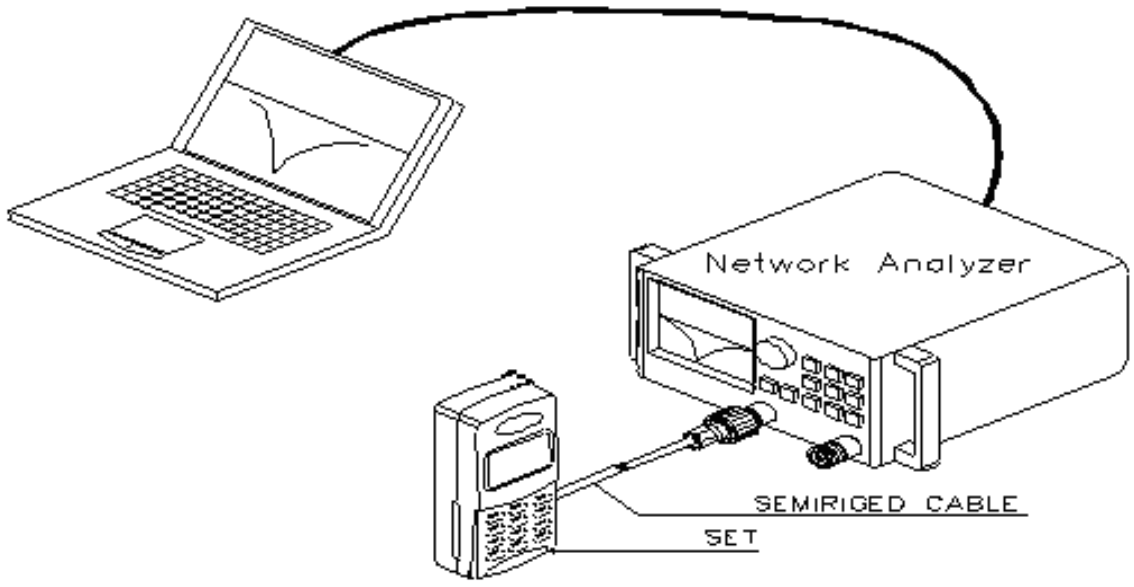
4.1.4. Climatic chamber for mechanical tests.

4.1.5. Push/Pull Gage to measure the contact forces.

4.2. S.W.R

The S.W.R characteristics must satisfy the electrical demands. The VSWR is measured with Agilent 8720 Series network analyzer. All the measurements are performed with the customer provided fixture.

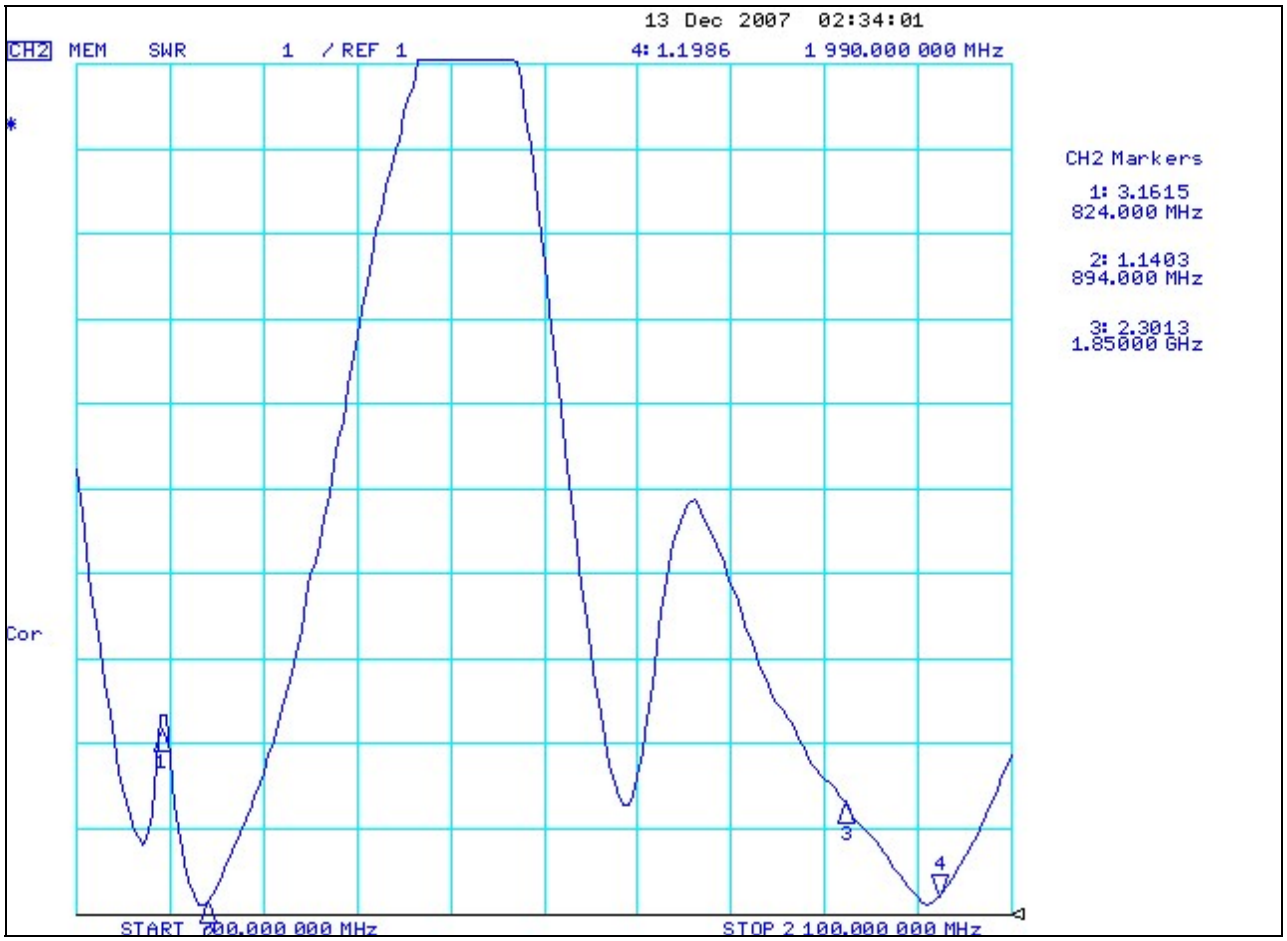
Frequency	CDMA		US-PCS	
	824MHz	894MHz	1.85GHz	1.99GHz
S.W.R.	(less than) 4.0:1	(less than) 2.3:1	(less than) 3.0:1	(less than) 2.3:1



<Picture> S.W.R. Measurement System

ANTENNA SPECIFICATION		DATE	2007-12-13	REV.	IR
MODEL	MV-140(MAIN)	TYPE	BUILT-IN ANTENNA	PAGE	8

S.W.R. Measurement Data

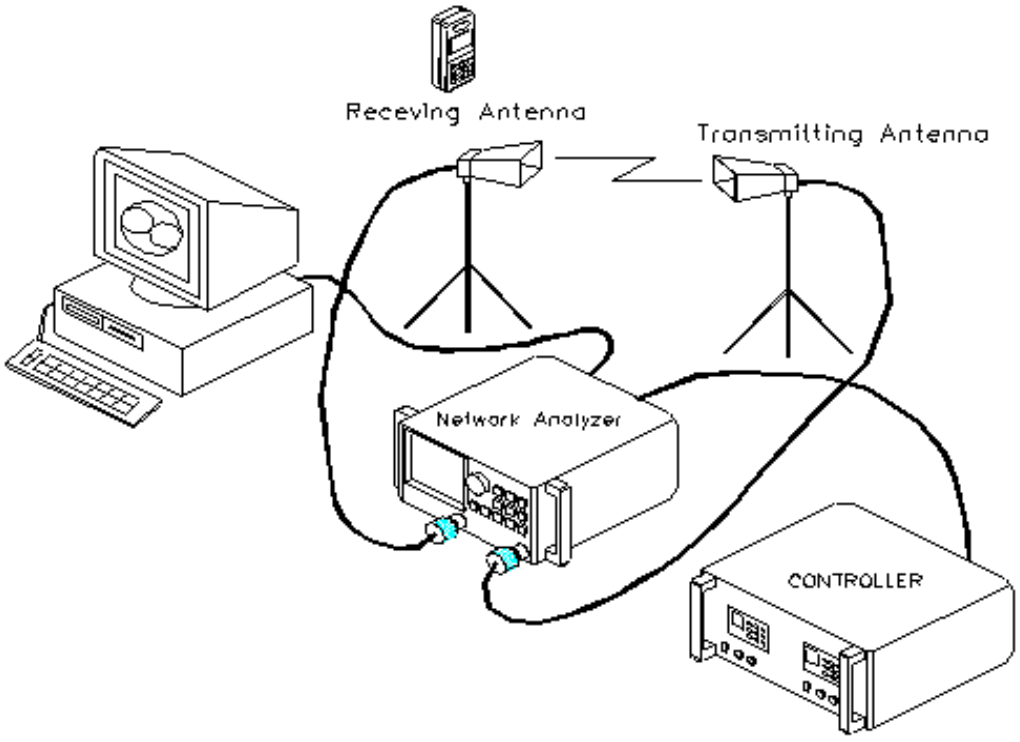


4.3. Radiation Pattern and Gain

The radiation pattern must have the omni-directional characteristic in all of frequency-bands.

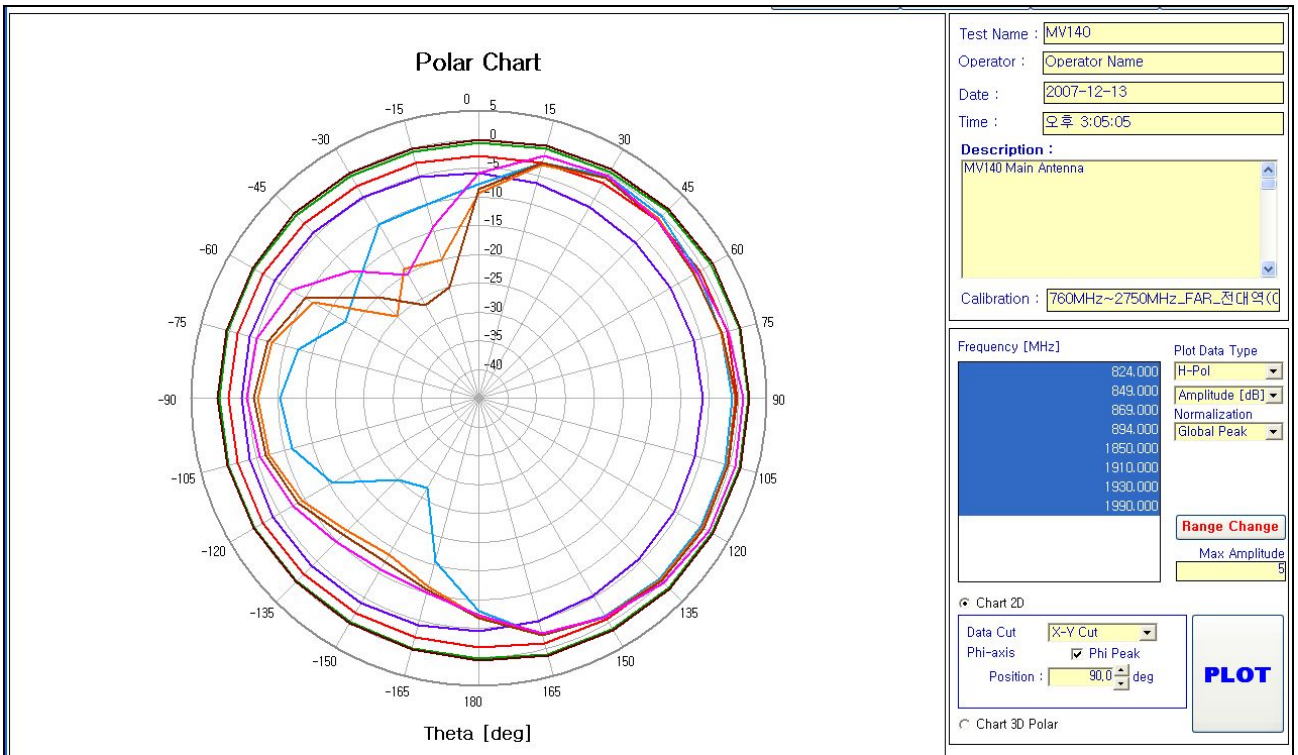
The gain is expressed as dBi on the h-plane, the minimum gain of the antenna must be satisfied with the electrical demands in the below table.

Frequency	CDMA		US-PCS	
	Tx (824~849MHz)	Rx (869~894MHz)	Tx (1850~1910MHz)	Rx (1930~1990MHz)
Radiation Gain <Peak, H-plane>	-5.0dBi (over)	-0dBi (over)	-1.5dBi (over)	-1.0dBi (over)



<Picture> Gain Measurement System

Gain Measurement Data



Freq. [MHz]	Polarization	Axis	Beam Peak		Beam Null		SideLobe			Beam Width	Average	Normalize Facto
			Value	[deg]	Value	[deg]	Value	Pos1 [deg]	Pos2 [deg]			
824,000			-3,699	-105,000	-6,717	45,000				37,01	-4,945	38,73
849,000			-0,245	90,000	-2,936	0,000				0,00	-1,379	38,61
869,000			1,739	90,000	-0,593	-15,000				0,00	0,585	38,74
894,000			1,994	75,000	-0,053	-15,000				0,00	0,893	38,22
1850,000			-0,264	45,000	-27,028	-150,000				180,97	-4,091	50,73
1910,000			-0,112	120,000	-24,913	-45,000				182,21	-3,879	48,41
1930,000			0,098	120,000	-26,356	-30,000				181,31	-3,740	47,96
1990,000			1,045	120,000	-20,166	-30,000				170,72	-2,958	48,80

5. Mechanical Demands

5.1. Drop Test

The antenna is attached to the handset. The handset is dropped with the antenna downward onto a concrete surface at 1.5 m height and angle D(45˚). The number of drop is 2 times.

After the test, the original shape shall be possible to restore. The antenna shall satisfy the electrical demands.

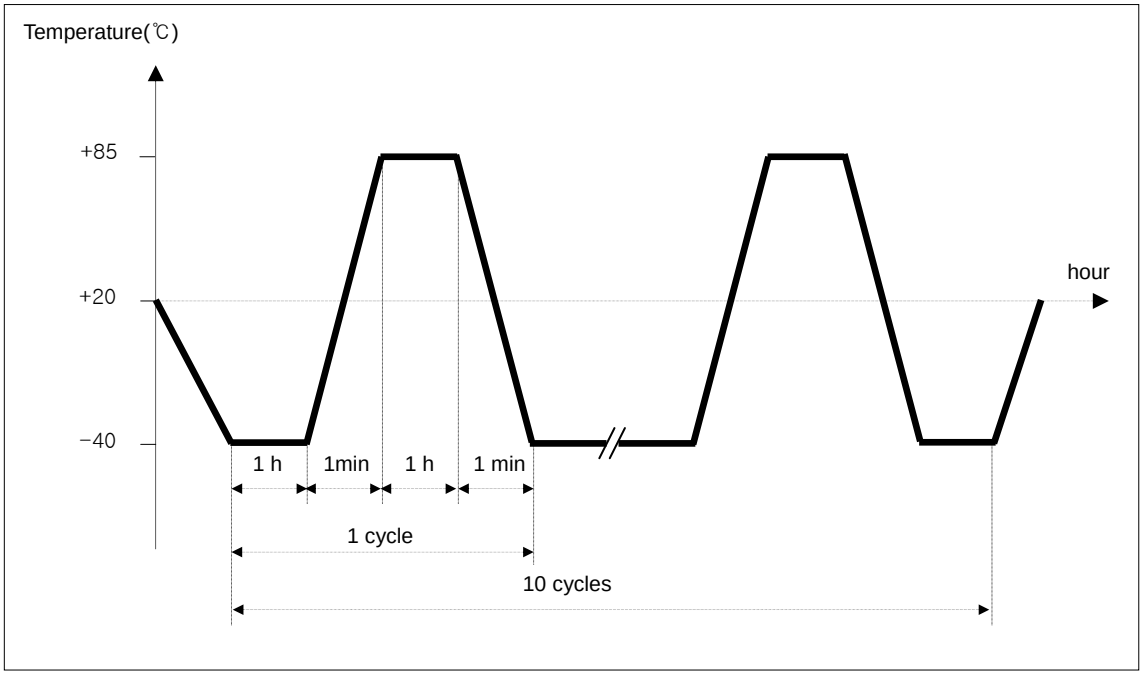
6. Environmental Demands

6.1. Thermal Shock Test

- High Temperature : +85℃
- Low Temperature : -40℃

First place antenna in a Low temperature chamber and keep for an hour, then move it to a High temperature chamber in 60 seconds, also keep for an hour. This procedure should be repeated 10 times.
After this test, antenna's performance should not be changed in electrical specifications. Also there is no mechanical damage.

(Cycle : 10 cycles , Temperature : -40℃ ↔ +85℃)



Thermal (temperature) Shock Test

6.2. Humidity Test

- Humidity : 95%RH
- Temperature : +55℃

Antenna is placed in a climatic chamber (95%RH, +55℃) for 48 hours, then take it out and place normal environment (50%RH, +20℃) for 4 hours. Its performance should not be changed in electrical specifications. Also there is no mechanical damage.

(Duration : 48 hours , Temperature : +55℃ , Humidity : 95%RH)

Humidity Test

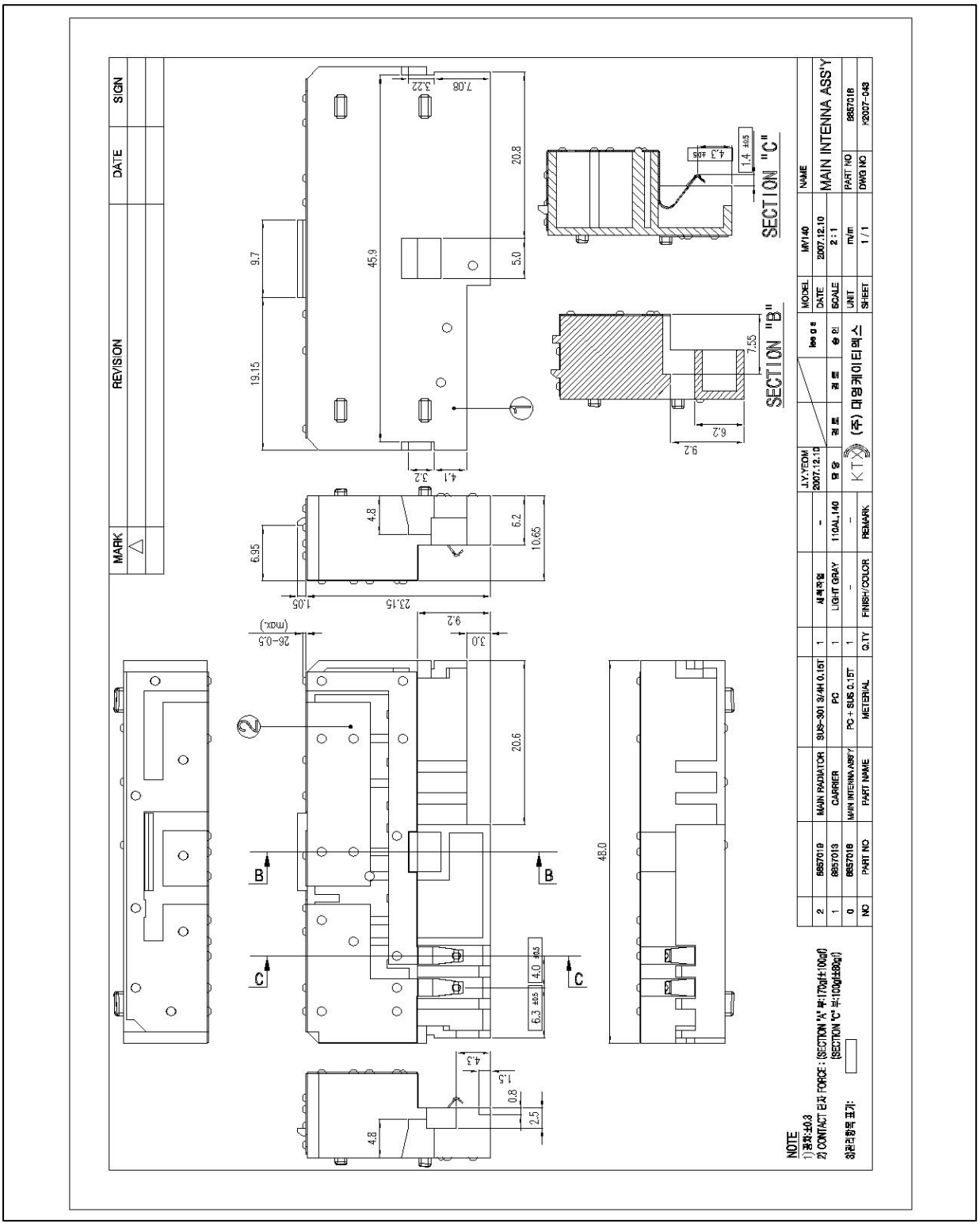
6.3 Salt Spray Test

- Sodium : 5%
- Temperature : +35℃

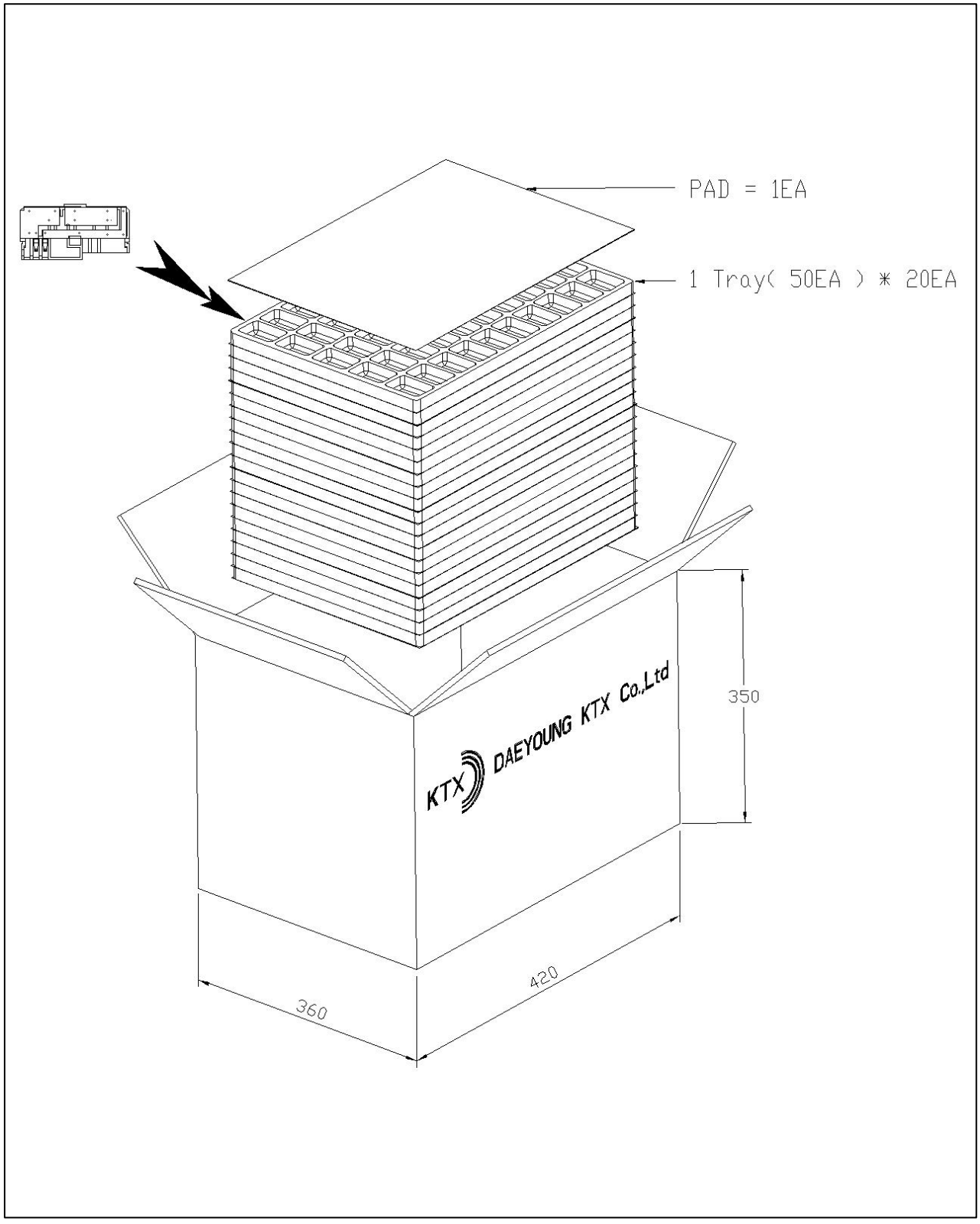
The antenna shall be exposed for 48 hours at +35ºC to a 5% Sodium Chloride fog and have no appearance or function changes after the test.

7. Mechanical Drawing

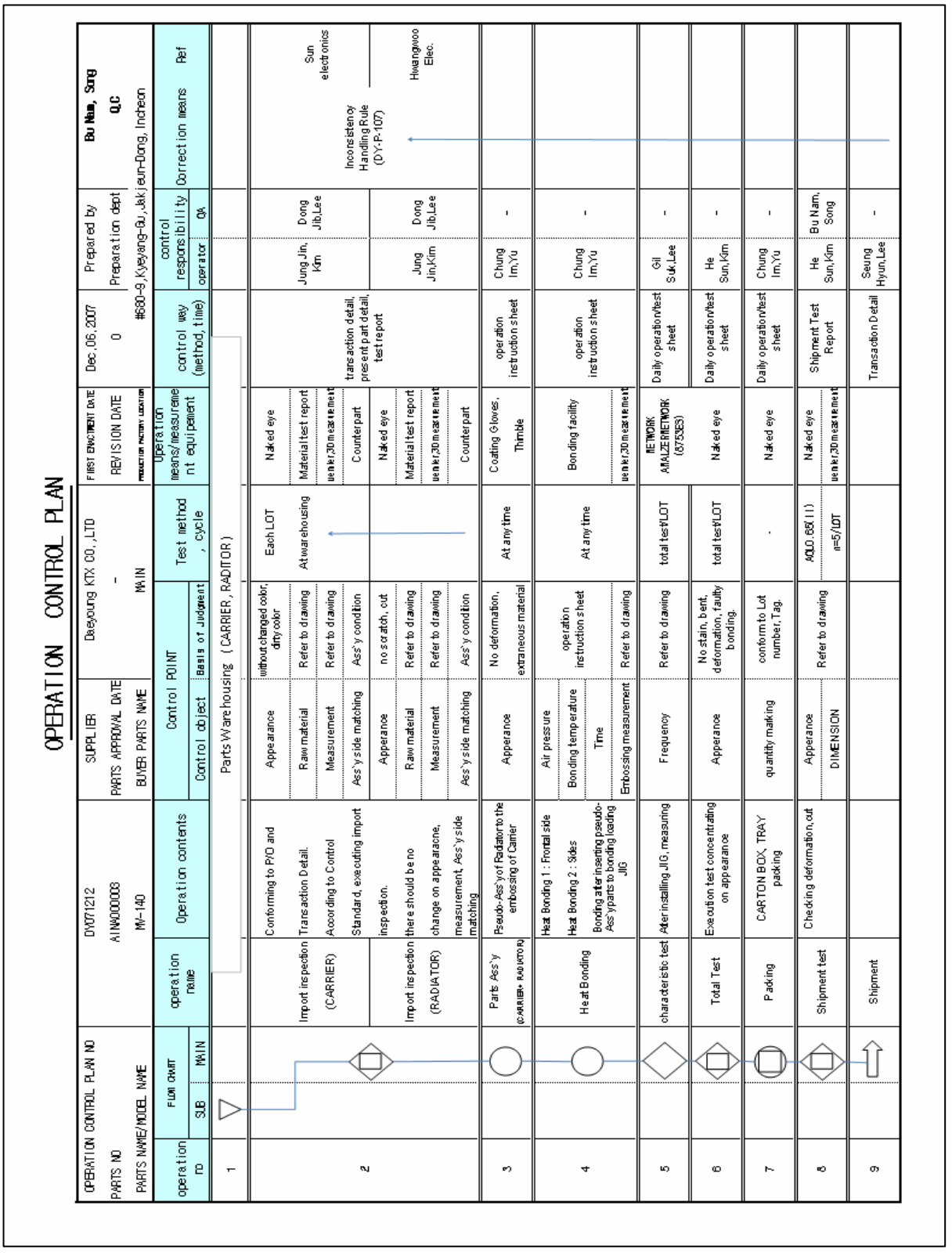
7.1. Assembly



7.2. Package



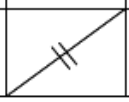
<Appending> A. QC Flow Chart



<Appending> B. Reliability Test Report

ANTENNA SPECIFICATION		Date	2007-12-13	Rev.	IR
Model	MV-140(Main)	Type	Built-in Antenna	Page	

Reliability Test Report

Reliability Test Report				Signature	prepared by	checked by	approved by
							

MODEL	MV-140(Main)	Date of recording	Dec. 13. 2007	Date	Dec. 10. 2007~Dec. 13. 2007
CUSTOMER	Axesstel	Test contents	product/function reliablity	Tested by	Dong Jib, Lee in Q.C dept
PART NAME	Internal Antenna	PART NO.	AINA000003	Test Usage	Approval

* TEST contents and result

NO	Test Contents	SPEC	Measurement Data					Average	Judgment	Ref
			X1	X2	X3	X4	X5			
1	Contact Pin Force (section "A")	70~270 gf	180	181	177	176	180	178.8	OK	
			Force to the contact side of PCB (upper part:Signal, lower part:Groung)							
2	Contact Pin Force (section "C")	20~180 gf	175	172	171	170	176	172.8	OK	
			Force to the contact side of PCB (upper part:Signal, lower part:Groung)							
3	Contact Pin operation repetition	70~270 gf after repeating durability test 500 times	OK	OK	OK	OK	OK	-	OK	
			Force to the contact side of PCB after repeating durability test (upper part:Signal, lower part:Groung)							
4	Drop test	1.5m free falling test 5 times	OK	OK	OK	OK	OK	-	OK	
			There is no break in the bonded side							
5	Humidity test	+60℃, 90%RH 24hours	OK	OK	OK	OK	OK	-	OK	
			There is no break in the bonded side							
6	Thermal shock test	-40℃ ~ +80℃, 30minutes 10cycle	OK	OK	OK	OK	OK	-	OK	
			There is no break in the bonded side							
7	Salt spray test	exposed for 48hours in salt solution of 5% at +35℃	OK	OK	OK	OK	OK	-	OK	
			There is no corrosion.							

※REMARK,

Comprehensive Judgment: Passed

S.W.R Test Data

MV-140(Main) Internal ass'y 전기적 특성 Data

Data: 2007-12-13

	Electrical(S,W,R)				Remark
	824 MHz less than 3.5	849 MHz less than 2.3	1850 MHz less than 3.0	1990 MHz less than 2.3	
1	2.75	1.16	2.18	1.42	
2	2.74	1.12	2.15	1.35	
3	2.86	1.14	2.16	1.32	
4	2.76	1.12	2.15	1.36	
5	2.88	1.19	2.15	1.42	
6	2.87	1.12	2.24	1.35	
7	2.77	1.14	2.21	1.37	
8	2.65	1.15	2.29	1.34	
9	2.76	1.11	2.29	1.41	
10	2.72	1.13	2.15	1.36	
11	2.82	1.16	2.24	1.32	
12	2.75	1.12	2.23	1.41	
13	2.77	1.14	2.15	1.42	
14	2.74	1.15	2.24	1.4	
15	2.74	1.08	2.14	1.36	
16	2.76	1.13	2.26	1.39	
17	2.83	1.1	2.27	1.28	
18	2.88	1.06	2.21	1.44	
19	2.84	1.15	2.15	1.42	
20	2.84	1.14	2.15	1.35	
21	2.69	1.19	2.24	1.37	
22	2.7	1.16	2.24	1.36	
23	2.74	1.12	2.28	1.39	
24	2.76	1.15	2.29	1.42	
25	2.83	1.13	2.26	1.31	
26	2.74	1.09	2.21	1.36	
27	2.81	1.14	2.16	1.41	
28	2.88	1.08	2.29	1.34	
29	2.64	1.13	2.21	1.41	
30	2.69	1.13	2.3	1.32	
USL	3.5	2.3	3	2.3	
LSL	-	-	-	-	
Xbar	2.773666667	1.131	2.216333333	1.372666667	
Max	2.88	1.19	2.3	1.44	
Min	2.64	1.06	2.14	1.28	
R	0.24	0.13	0.16	0.16	
StDev	0.067542239	0.029519135	0.054739719	0.040678159	
Cp	8.636570887	12.98592719	9.13413539	9.423566355	
k	0.584952381	0.016521739	0.477555556	0.193623188	
Cpk	3.584588183	12.77137709	4.772078289	7.598945391	

Dimension Test Data

MV-140(Main) Internal ass'y Dimension Check Data

Data: 2007-12-13

	① Carrier full lenth 48±0.3mm	② Carrier height 10.65±0.9mm	③ Contact Pin distance 4.0±0.5mm	④ Contact Pin distance 6.3±0.5mm	⑤ Contact Pin distance 4.3±0.5mm	⑥ Contact Pin height 1.4±0.5mm				Remark
1	47.93	10.63	4.04	6.29	4.50	1.53				
2	47.95	10.65	4.02	6.32	4.49	1.56				
3	47.96	10.64	3.99	6.34	4.51	1.4				
4	47.93	10.63	3.98	6.35	4.47	1.41				
5	47.89	10.62	3.97	6.35	4.46	1.13				
6	47.95	10.64	3.94	6.34	4.48	1.47				
7	47.96	10.59	3.97	6.32	4.52	1.52				
8	47.98	10.64	4.05	6.31	4.49	1.45				
9	47.95	10.68	4.05	6.38	4.45	1.46				
10	47.86	10.64	3.95	6.31	4.52	1.52				
11	47.87	10.63	3.96	6.35	4.46	1.46				
12	47.86	10.64	3.98	6.34	4.48	1.39				
13	47.83	10.65	4.02	6.35	4.47	1.47				
14	47.94	10.62	3.97	6.32	4.51	1.38				
15	47.95	10.63	4.02	6.31	4.48	1.53				
16	47.96	10.61	4.03	6.35	4.49	1.55				
17	47.95	10.64	3.97	6.31	4.48	1.48				
18	47.95	10.65	3.89	6.35	4.52	1.46				
19	47.96	10.66	3.85	6.34	4.48	1.47				
20	47.95	10.63	4.03	6.35	4.47	1.43				
21	47.94	10.62	4.01	6.31	4.45	1.35				
22	47.86	10.61	4.02	6.32	4.46	1.39				
23	47.88	10.63	3.95	6.33	4.49	1.52				
24	47.96	10.64	3.96	6.33	4.52	1.53				
25	47.94	10.65	4.02	6.32	4.53	1.47				
26	47.85	10.64	3.96	6.31	4.51	1.45				
27	47.96	10.65	3.97	6.38	4.53	1.43				
28	47.91	10.63	4.05	6.35	4.52	1.52				
29	47.86	10.62	3.95	6.34	4.51	1.43				
30	47.86	10.64	3.91	6.35	4.51	1.48				
USL	48.3	10.95	4.5	6.8	4.8	1.9				
LSL	47.7	10.35	3.5	5.8	3.8	0.9				
Xbar	47.92	10.64	3.98	6.33	4.49	1.45				
Max	47.98	10.68	4.05	6.38	4.53	1.56				
Min	47.83	10.59	3.85	6.29	4.45	1.13				
R	0.15	0.09	0.20	0.09	0.08	0.43				
StDev	0.04	0.02	0.05	0.02	0.02	0.08				
Cp	2.26	5.89	3.44	7.84	6.83	2.04				
k	0.27	0.05	0.03	0.07	0.38	0.11				
Cpk	1.65	5.60	3.32	7.30	4.21	1.82				

<Appending> C. RoHS (SGS Test Report)

-Carrier <1/3>

SGS

Test Report No. F690501/LF-CTSGP06-28241 Date: November 10, 2006 Page 1 of 3

To: **MRW COMMUNICATIONS**
29-24 samjung-dong
Ohjung-gu
Buchon-si
KYUNGGI-DO
KOREA

The following merchandise was submitted and identified by the client as :

Commodity	: P.C(HI-1004ML.ER51P) CARRIER
SGS File No.	: GP06-28241
Received Date	: November 03, 2006
Test Performing Date	: November 06, 2006
Test Performed	: SGS Testing Korea tested the sample(s) selected by applicant with following results
Test Results	: For further details, please refer to following page(s)
Buyer(s)	: LGE, PANTECH

SGS Testing Korea Co. Ltd.

Pluto Kim
Monet Jeong
Jully Oh
Jerry Jung
/Testing Person

Jeff Jang / Chemical Lab Mgr

-Carrier <2/3>

SGS

Test Report No. F690501/LF-CTSGP06-28241 Date: November 10, 2006 Page 2 of 3

Sample No. : GP06-28241.001
Sample Description : P.C(HI-1004ML ER51P) CARRIER
Item No./Part No. : N/A

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium(Cd)	mg/kg	EN 1122(2001), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI)	mg/kg	US EPA 3060A(1996), US EPA 7196A(1992), UV	1	N.D.

Flame Retardants-PBBs/PBDEs

Test Items	Unit	Test Method	MDL	Results
Monobromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromobiphenyl	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Monobromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Dibromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tribromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Tetrabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Pentabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Hexabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Heptabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Octabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Nonabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.
Decabromodiphenyl ether	mg/kg	US EPA 3540C, GC/MS	5	N.D.

NOTE: (1) N.D. = Not detected.(<MDL)
(2) ppm = mg/kg
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) "" = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable

-Carrier <3/3>

SGS

Test Report No. FG90501/LF-CTSGP06-28241 Date: November 10, 2006 Page 3 of 3

Picture of Sample as Received:

*** End ***

NOTE: (1) N.D. = Not detected.(<MDL)
(2) ppm = mg/kg
(3) MDL = Method Detection Limit
(4) - = No regulation
(5) "" = Qualitative analysis (No Unit)
(6) Negative = Undetectable / Positive = Detectable

-Radiator <1/3>

SGS

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To: **MRW COMMUNICATIONS**
29-24 samjung-dong
Ohjung-gu
Buchon-si
KYUNGGI-DO
KOREA

The following merchandise was submitted and identified by the client as :

Commodity	: SUS301(3_4H) Radiator
SGS File No.	: GP06-28226
Received Date	: November 03, 2006
Test Performing Date	: November 06, 2006
Test Performed	: SGS Testing Korea tested the sample(s) selected by applicant with following results
Test Results	: For further details, please refer to following page(s)
Buyer(s)	: LGE, PANTECH

SGS Testing Korea Co. Ltd.

Pluto Kim
Monet Jeong
Jully Oh
Jerry Jung
/Testing Person

Jeff Jang / Chemical Lab Mgr

-Radiator <2/3>

SGS

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Sample No. : GP06-28226.001

Sample Description : SUS301(3_4H) Radiator

Item No./Part No. : N/A

Heavy Metals

Test Items	Unit	Test Method	MDL	Results
Cadmium (Cd)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	0.5	N.D.
Lead (Pb)	mg/kg	US EPA 3050B(1996), US EPA 6010B(1996), ICP	5	N.D.
Mercury (Hg)	mg/kg	US EPA 3052(1996), US EPA 6010B(1996), ICP	2	N.D.
Hexavalent Chromium (Cr VI), IEC 62321	mg/kg	Ed.1 111/54/CDV, Spot test/Colorimetric Method	*	Negative

NOTE: (1) N.D. = Not detected.(<MDL)
(2) ppm = mg/kg
(3) MDL = Method Detection Limit
(4) N.A. = Not available.(No Unit)
(5) * = Spot-test:
Negative = Absence of CrVI coating, Positive = Presence of CrVI coating;
(The tested sample should be further verified by boiling-water-extraction method if the spot test result cannot be confirmed.)

Boiling-water-extraction:
Negative = Absence of CrVI coating
Positive = Presence of CrV coating; the detected concentration in boiling-water-extraction solution is equal or greater than 0.02 mg/kg with 50 cm2 sample surface area.

-Radiator <3/3>

SGS

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Picture of Sample as Received:

*** End ***