ELECTROMAGNETIC EMISSION COMPLIANCE REPORT FOR LOW POWER TRANSMITTER BELOW 1 705 KHZ

Test Report No.	**: E12OR-022**
AGR No.	**: A12OA-009**
Applicant	**: UNION COMMUNITY Co.,Ltd.**
Address	**: 5F, Hyundai Topics bldg., 44-3, Bangi-dong, Songpa-gu, Seoul, 138-050, Korea**
Manufacturer	**: UNION COMMUNITY Co.,Ltd.**
Address	**: 5F, Hyundai Topics bldg., 44-3, Bangi-dong, Songpa-gu, Seoul, 138-050, Korea**
Type of Equipment	**: Fingerprint Terminal**
FCC ID.	**: XX2-SMART-I**
Model Name	**: Smart-i**
Multiple Model Name	**: AC-F100**
Serial number	**: N/A**
Total page of Report	**: 14 pages (including this page)**
Date of Incoming	**: October 08, 2012**
Date of issuing	**: October 12, 2012**

SUMMARY

The equipment complies with the regulation of **FCC Part 15 Subpart C Section 15.209 and 15.207.**

This test report contains only the result of a single test of the sample supplied for the examination.

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1. VERIFICATION OF COMPLIANCE

Applicant	: UNION COMMUNITY Co.,Ltd.
Address	: 5F, Hyundai Topics bldg., 44-3, Bangi-dong, Songpa-gu, Seoul, 138-050, Korea
Contact Person	: Kyung Wook, Han/ Manager
Telephone No.	: +82-2-6488-3027
FCC ID	: XX2-SMART-I
Model Name	: Smart-i
Serial Number	: N/A
Dare	: October 12, 2012

Equipment Class	**DCD – Part 15, Low Power Transmitter below 1 705 kHz**
Kind of Equipment	Fingerprint Terminal
This Report Concerns	Original Grant
Measurement Procedures	ANSI C63.4: 2009
Type of Equipment Tested	Pre-Production
Kind of Equipment Authorization Requested	Certification
Equipment will be Operated Under FCC Rules Part(s)	FCC PART 15 SUBPART C Section 15.209 and 15.207
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	10 m semi anechoic chamber.

The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

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2. GENERAL INFORMATION

2.1 Product Description

The UNION COMMUNITY Co., Ltd, Model Smart-i (referred to as the EUT in this report) is a Fingerprint Terminal that has a function of RFID and WLAN Module, which was already approved by Compliance Certification Services (FCC ID: XR2WIZFI210). The product specification described herein was obtained from product data sheet or user's manual.

CHASSIS TYPE	Plastic
SYSTEM CONSTRUCTION	Coiled Antenna and Controller
TRANSMITTING FREQUENCY	125 kHz
RECEIVING FREQUENCY	125 kHz
MODULATION	ASK
ANTENNA TYPE	Coiled Antenna
USED WLAN MODULE	Model No: WizFi210, Manufacturer: WIANET Co.,LTD.
LIST OF EACH OSC. OR CRY. FREQ.(FREQ. >= 1 MHz)	125 kHz, 32.768 kHz, 8 MHz, 16.934 MHz
RATED SUPPLY VOLTAGE	DC 12 V (ADAPTOR OUTPUT)
NUMBER OF LAYERS	4 Layers

2.2 Alternative type(s)/model(s); also covered by this test report

-. The following lists consist of the added model and their differences.

Model Name	Differences	Tested
Smart-i	Basic Model	☑
AC-F100	This model is identical to basic model, except for model designation only.	☐

Note: 1. Applicant consigns only basic model to test, therefore this test report just guarantees the units which have been tested.

2. The Applicant/manufacturer is responsible for the compliance of all variants.

2.3 Related Submittal(s) / Grant(s)

Original submittal only

2.4 Purpose of the test

To determine whether the equipment under test fulfills the requirements of the regulation stated in section 15.209 and section 15.207.

2.5 Test Methodology

The radiated testing was performed according to the procedures in ANSI C63.4: 2009 at a distance of 3 m from EUT to the antenna.

2.6 Test Facility

The semi anechoic chamber and conducted measurement facilities are located on at 301-14, Daessangnyeong-ri, Chowol-eup, Gwangju-si, Gyeonggi-do, 464-862, Korea. The Onetech Corp. has been accredited as a Conformity Assessment Body (CAB) with designation number KR0013.

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3. SYSTEM TEST CONFIGURATION

3.1 Justification

This device was configured for testing in a typical way as a normal customer is supposed to be used. During the test, the following components were installed inside of the EUT.

DEVICE TYPE	MANUFACTURER	MODEL/PART NUMBER
Main Board	UNION COMMUNITY Co.,Ltd.	PF0100MA01
RF Board	UNION COMMUNITY Co.,Ltd.	PF0100RF01

3.2 Peripheral equipment

The EUT was tested with the following all equipment used in the tested systems are:

Model	Manufacturer	Description	FCC ID	Connected to
Smart-i	UNION COMMUNITY Co.,Ltd.	Fingerprint Terminal	XX2-SMART-I	-

3.3 Mode of operation during the test

The EUT was operated during the test as following operating mode.

-. For RFID Function testing, To get a maximum radiated emission from the EUT, the EUT was continuously transmitted RF carrier and associated passive card shall be used with the EUT and tested with together.

-. The EUT does not have standby mode, so the test was not performed.

.3.4 Equipment Modifications

None

3.5 Configuration of Test System

Line Conducted Emission Test:

The EUT was connected to adaptor and power adaptor was connected to LISN. All supporting equipments were connected to another LISN. Preliminary Power line Conducted Emission tests were performed by using the procedure in ANSI C63.4: 2009 7.3.3 to determine the worse operating conditions.

Radiated Emission Test:

Preliminary radiated emissions tests were conducted using the procedure in ANSI C63.4: 2009, 8.3.1.1 to determine the worse operating conditions. Final radiated emission tests were conducted at 3 meters open area test site.

Occupied Bandwidth Measurement:

This measurement is performed with the antenna located close enough to give a full-scale deflection of the modulated carrier on the spectrum analyzer. The plot is taken at 20 kHz/division frequency span, 10 kHz resolution bandwidth and 5 dB/division logarithmic displays from the spectrum analyzer.

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3.6 Antenna Requirement

According to section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Antenna Construction: The transmitter antenna of the EUT is an internal coil antenna so no consideration of replacement by the user.

4. PRELIMINARY TEST

4.1 AC Power line Conducted Emissions Tests

During Preliminary Tests, the following operating mode was investigated

Operation Mode	The Worse operating condition (Please check one only)
Tx Mode	X
RX modes	-

4.2 Radiated Emissions Tests

During Preliminary Tests, the following operating modes were investigated

Operation Mode	The Worse operating condition (Please check one only)
Tx Mode	X
RX modes	-

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5. FINAL RESULT OF MEASURMENT

Preliminary test was done in normal operation mode. And the final measurement was selected for the maximized emission level.

5.1 Radiated Emission Test below 30 MHz

The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

Humidity Level : 45 % R.H. Temperature : 26 ˚C
Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209
Type of Test : Low Power Transmitter below 1 705 kHz
Result : PASSED BY 35.43 dB at 0.127 MHz

EUT : Fingerprint Terminal Date: October 08, 2012
Distance : 3 m

Frequency (MHz)	Reading (dBμV)	Ant. Pol. (H/V)	Ant. Height (m)	Angle (°)	Ant. Factor (dB/m)	Cable Loss	Emission Level(dBμV/m)	Limits (dBμV/m)	Margin (dB)
0.015	32.72	H	1	180	20.22	0.12	53.06	124.08	71.02
0.025	24.12	H	1	220	19.12	0.12	43.36	119.64	76.28
0.042	23.38	H	1	180	18.39	0.14	41.91	115.13	73.22
0.127	51.89	H	1	360	18.01	0.19	70.09	105.52	35.43
0.179	25.24	H	1	360	18.04	0.21	43.49	102.54	59.05
0.371	18.59	H	1	150	17.99	0.23	36.81	96.21	59.40

Radiated Emission Tabulated Data below 30 MHz

Note: According to the distance of measurements was reduced to 3 m, the limit was extrapolated by using the square of an inverse linear distance extrapolation factor (40 dB/decade) as follows.
Limit calculation: Limit at specified distance + 40log (300/3) = Limit + 80 dB for up to 0.49 MHz
Limit at specified distance + 40log (30/3) = Limit + 40 dB for above 0.49 MHz

Tested by: Hong-Kyu, Lee/ Engineer

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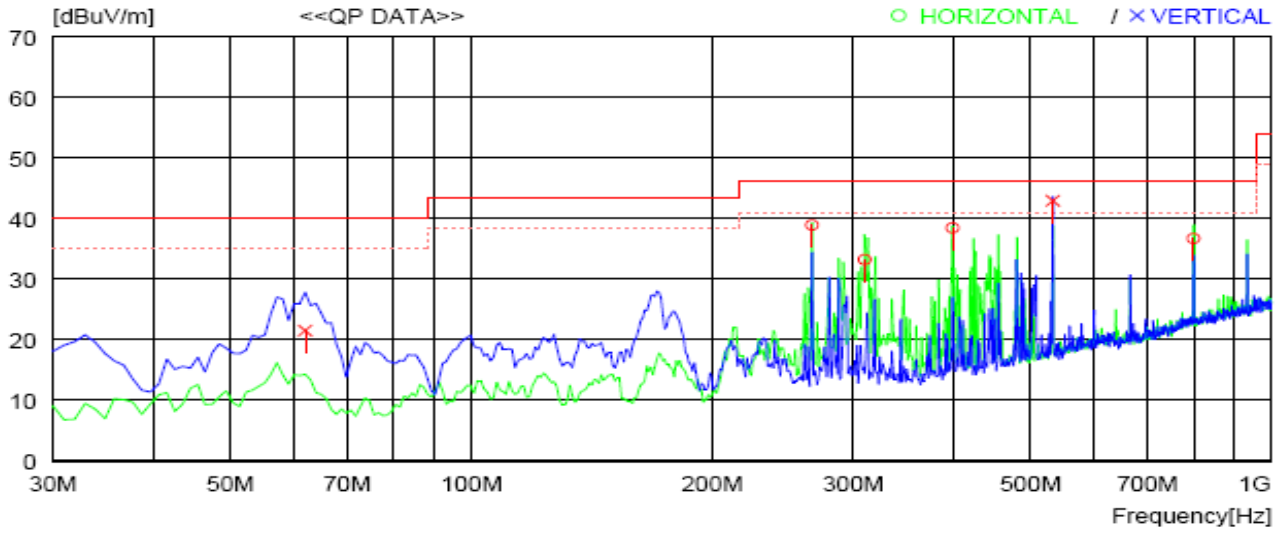
5.2 Radiated Emission Test above 30 MHz

The following table shows the highest levels of radiated emission on both polarizations of horizontal and vertical.

Humidity Level	: 45 % R.H.	Temperature :26 ˚C
Limits apply to	: FCC CFR 47, PART 15, SUBPART C, SECTION 15.209	
Detector	: CISPR Quasi-Peak (6 dB Bandwidth: 120 kHz)	
Type of Test	: Low Power Transmitter below 1 705 kHz	
Result	: PASSED BY 3.10 dB at 533.43 MHz	

EUT : Fingerprint Terminal Date: October 08, 2012

Distance : 3 m



No.	FREQ	READING QP	ANT FACTOR	LOSS	GAIN	RESULT	LIMIT	MARGIN	ANTENNA	TABLE
	[MHz]	[dBuV]	[dB]	[dB]	[dB]	[dBuV/m]	[dBuV/m]	[dB]	[cm]	[DEG]
----- Horizontal ------										
1	266.680	54.8	14.0	3.0	32.9	38.9	46.0	7.1	111	359
2	310.330	47.8	15.0	3.3	32.9	33.2	46.0	12.8	100	19
3	399.570	50.7	16.9	3.8	33.0	38.4	46.0	7.6	100	170
4	799.202	41.2	22.2	5.8	32.5	36.7	46.0	9.3	100	273
----- Vertical ------										
5	62.010	39.9	13.3	1.3	33.0	21.5	40.0	18.5	127	0
6	533.430	52.4	19.1	4.5	33.1	42.9	46.0	3.1	127	0

Radiated Emission Tabulated Data

Tested by: Hong-Kyu, Lee/ Engineer

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5.3 Bandwidth of the operating frequency

Humidity Level : 45 % R.H. Temperature: 24 °C

Limits apply to : FCC CFR 47, PART 15, SUBPART C, SECTION 15.209

Type of Test : Low Power Transmitter below 1 705 kHz

EUT : Fingerprint Terminal Date: October 08, 2012

Resolution Bandwidth : 0.3 kHz

Video Bandwidth : 1.0 kHz

SPAN : 10.00 kHz

Carrier Freq. (kHz)	Bandwidth of the emission. (kHz)	Limit (kHz)	Remark
125	7.67	None	The point 20 dB down from the modulated carrier

Remark: Please refer to Photo Data for bandwidth for test data.

Tested by: Hong-Kyu, Lee/ Project Engineer

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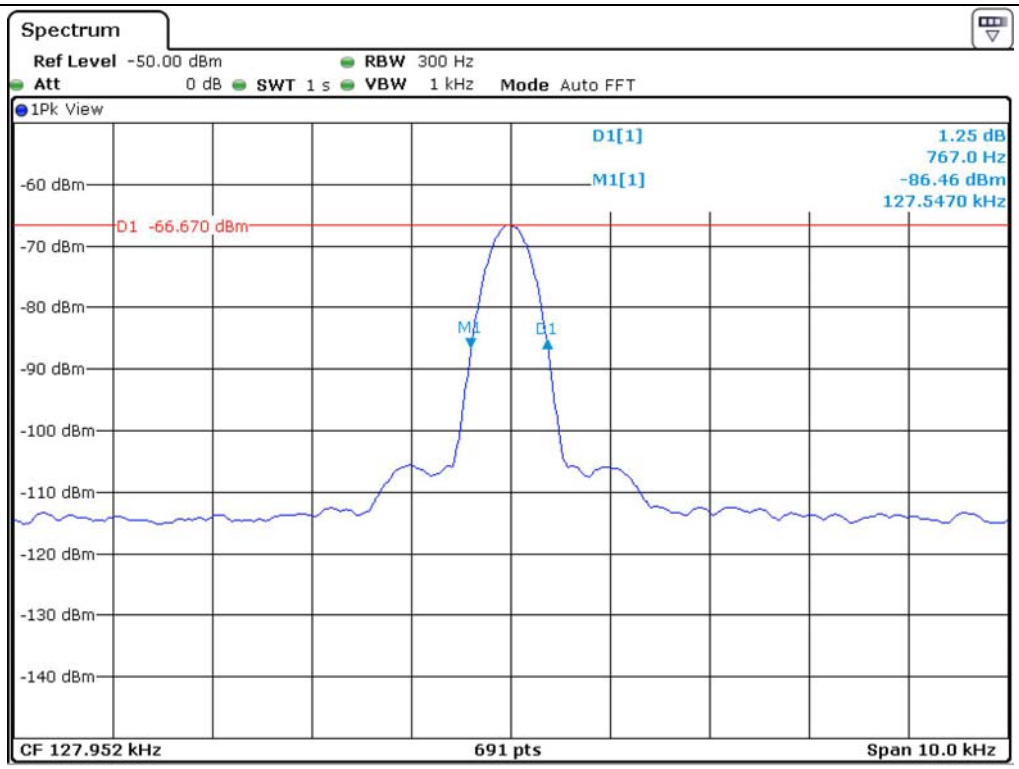
Photo Data for bandwidth



5.4 Conducted Emission Test

Humidity Level : 43 % R.H. Temperature: 21 ºC

Limits apply : FCC CFR 47, PART 15, SUBPART C, SECTION 15.207

Type of Test : Low Power Transmitter below 1 705 kHz

Result : PASSED BY 4.30 dB at 0.39 MHz with average detector

EUT : Fingerprint Terminal Date: October 09, 2012

Detector : CISPR Quasi-Peak (6 dB Bandwidth: 9 kHz)

Frequency (MHz)	Line	Peak (dBµV)		Margin (dB)
		Emission level	Q.P Limits	
0.24	H	40.30	62.27	21.97
0.39	H	50.80	58.17	7.37
0.51	H	35.21	56.00	20.79
10.65	H	38.22	60.00	21.78
11.50	H	38.78	60.00	21.22
23.99	H	39.94	60.00	20.06
Frequency (MHz)	**Line**	**Average (dBµV)**		**Margin (dB)**
		Emission level	**Limits**	
0.39	H	43.87	48.17	4.30
0.51	H	28.41	46.00	17.59
11.50	H	33.28	50.00	16.72
23.99	H	38.37	50.00	11.63

Line Conducted Emissions Tabulated Data

Remark : "H": Hot Line, "N": Neutral Line

See next page for an overview sweep performed with peak and average detector mode.

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Tested by: Hong-Kyu, Lee/ Engineer

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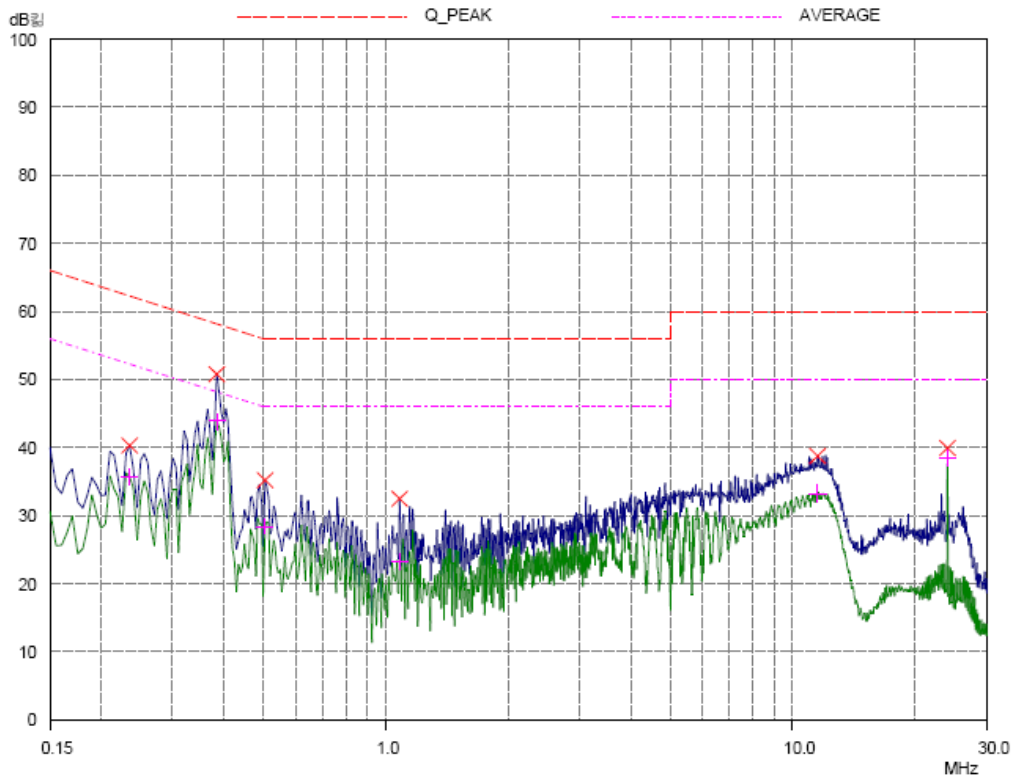
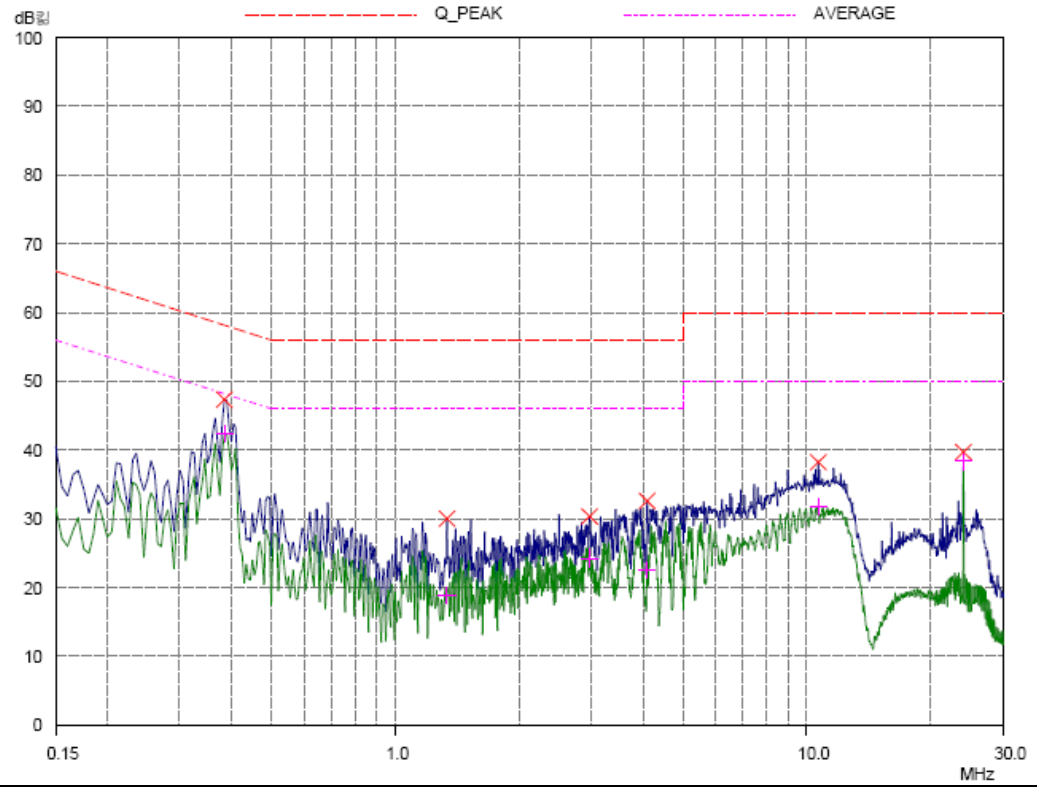


HOT LINE



NEUTRAL LINE

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6. FIELD STRENGTH CALCULATION

Meter readings are compared to the specification limit correcting for antenna and cable losses

+	Meter reading	(dBμV)
+	Cable Loss	(dB)
+	Antenna Factor	(dB/m)
-	Pre-amplifier Gain	(dB)
=	Corrected Reading	(dBμV/m)

	Specification Limit	(dBμV/m)
-	Correct Reading	(dBuV/m)
=	dB Relative to Spec.	(+/- dB)

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7. LIST OF TEST EQUIPMENT

No.	EQUIPMENTS	MFR.	MODEL	SER. NO.	LAST CAL	DUE CAL	USE
1.	Test receiver	R/S	ESCI	101013	OCT/11	12MONTH	■
2.			ESU	100261	SEP/12	12MONTH	■
3.			ESiB26	100296	APR/12	12MONTH	■
4.			ESHS 10	834467/007	JUN/12	12MONTH	
5.	Amplifier	Sonoma Instrument	310N	312544	MAY/12	12MONTH	■
6.			310N	312545	MAY/12	12MONTH	■
7.	TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-420	MAR/12	24MONTH	■
8.			VULB9163	9163-419	MAR/12	24MONTH	■
9.	LISN	EMCO	3825/2	9109-1867	MAY/12	12MONTH	
10.				9109-1869	MAY/12	12MONTH	■
11.		Schwarzbeck	NSLK 8126	8126-404	JUN/12	12MONTH	
12.			NSLK 8128	8128-216	JUN/12	12MONTH	■
13.	Controller	Innco System	CO2000	619/27030611/L	N/A	N/A	■
14.	Turn Table	Innco System	DT3000	930611	N/A	N/A	■
15.	Antenna Master	Innco System	MA4000-EP	3320611	N/A	N/A	■
16.			MA4000-EP	3350611	N/A	N/A	■

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