



EMI TEST REPORT

Test Report No. : 11374628H-B-R1

Applicant : FUJI HEAVY INDUSTRIES LTD.
Type of Equipment : Keyless Access with Push-Button Start System
Model No. : FJ17-1
FCC ID : Y8PFJ17-1
Test regulation : FCC Part 15 Subpart B: 2016 Class B
Test Result : Complied

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the Federal Government.
6. This test report covers EMC technical requirements. It does not cover administrative issues such as Manual or non-EMC test related Requirements. (if applicable)
7. This report is a revised version of 11374628H-B. 11374628H-B is replaced with this report.

Date of test: August 2 and 4, 2016

Representative test engineer:

T. Shimada

Takumi Shimada
Engineer
Consumer Technology Division

Approved by:

M. Imura

Motoya Imura
Engineer
Consumer Technology Division



NVLAP LAB CODE: 200572-0

This laboratory is accredited by the NVLAP LAB CODE 200572-0, U.S.A. The tests reported herein have been performed in accordance with its terms of accreditation.

*As for the range of Accreditation in NVLAP, you may refer to the WEB address,
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13-EM-F0429

REVISION HISTORY

Original Test Report No.: 11374628H-B

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SECTION 1: Customer information

Company Name : FUJI HEAVY INDUSTRIES LTD.
Address : 1-1, Subaru-cho, ota-shi, Gunma-ken, 373-8555, Japan
Telephone Number : +81-276-26-3064
Facsimile Number : +81-276-26-3069
Contact Person : Yuji Kobayashi

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Keyless Access with Push-Button Start System
Model No. : FJ17-1
Serial No. : Refer to Section 4, Clause 4.2
Rating : DC 12.0 V
Receipt Date of Sample : July 21, 2016
Country of Mass-production : Japan
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No Modification by the test lab

2.2 Product description

Model No: FJ17-1 (referred to as the EUT in this report) is the Keyless Access with Push-Button Start System.

General Specification

Clock frequencies in the system : 4.000 MHz (CPU)

Radio Specification

[Transmitter] *4)

Radio Type : Transmitter
Frequency of Operation : 134.2 kHz
Oscillator Frequency : 4.2944 MHz
Type of Modulation : OOK (A1D)
Oscillation circuit : Crystal
Power Supply : DC 12.0 V
Antenna : Antenna (TYPE 1) (*1) (*3) / (TYPE 2) (*2)
*1: Maximum number of this antenna is 2.
*2: Maximum number of this antenna is 4.
Antenna Specification : Ferrite antenna coil

[Receiver]

Radio Type : Receiver
Frequency of Operation : 433.92 MHz
Oscillator frequency : 52.9025 MHz (Crystal)
Intermediate frequency : 10.7 MHz
Type of Modulation : FSK
Type of receiving system : Super-heterodyne
Power Supply : DC 5.0 V
Antenna Type : Internal antenna (Inverted F antenna)

*3) The Antennas (TYPE 1 and TYPE 2) of this system have variations of model 1 and model 2.

The difference of these variations is only the outer shell, and the test was performed with the representative model 1.

*4) The test of transmitter part was performed separately from this test report, and the conformability is confirmed.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test specification : FCC Part 15 Subpart B
FCC part 15 final revised on April 6, 2016.

Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin	Result
Conducted emission	FCC: ANSI C63.4: 2014 7. AC power - line conducted emission measurements	FCC:Part 15 Subpart B 15.107(a)	N/A *1)	N/A	N/A
	IC: RSS-Gen 8.8	IC: RSS-Gen 8.8			
Radiated emission	FCC: ANSI C63.4: 2014 8. Radiated emission measurements	FCC: Part 15 Subpart B 15.109(a)	N/A	22.2 dB 867.840 MHz Horizontal, QP 867.840 MHz Vertical, QP	Complied
	IC: RSS-Gen 7	IC: RSS-Gen 7.1.2			

*Note: UL Japan, Inc's EMI Work Procedure 13-EM-W0420.

*1) The test is not applicable since the EUT is not the device that is designed to be connected to the public utility (AC) power line.

3.3 Addition to standard

No addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor $k = 2$

Polarity	Radiated emission (Below 1GHz)			
	(3 m*)(+/-)		(10 m*)(+/-)	
	30 – 200 MHz	200 – 1000MHz	30 – 200 MHz	200 – 1000MHz
Horizontal	5.0 dB	5.3 dB	5.0 dB	5.0 dB
Vertical	4.7 dB	5.9 dB	5.0 dB	5.1 dB

Radiated emission (Above 1GHz)				
(3 m*)(+/-)		(1 m*)(+/-)		(10 m*)(+/-)
1 – 6GHz	6 – 18GHz	10 – 26.5 GHz	26.5 – 40GHz	1 -18 GHz
5.2 dB	5.4 dB	5.5 dB	5.5 dB	5.4 dB

* Measurement distance

Radiated emission test(3 m)

The data listed in this test report has enough margin, more than the site margin.

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3.5 Test Location

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	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	2973C-1	19.2 x 11.2 x 7.7m	7.0 x 6.0m	No.1 Power source room
No.2 semi-anechoic chamber	2973C-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 semi-anechoic chamber	2973C-3	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.3 Preparation room
No.3 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 semi-anechoic chamber	2973C-4	12.0 x 8.5 x 5.9m	6.8 x 5.75m	No.4 Preparation room
No.4 shielded room	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 semi-anechoic chamber	-	6.0 x 6.0 x 3.9m	6.0 x 6.0m	-
No.6 shielded room	-	4.0 x 4.5 x 2.7m	4.0 x 4.5 m	-
No.6 measurement room	-	4.75 x 5.4 x 3.0m	4.75 x 4.15 m	-
No.7 shielded room	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	3.1 x 5.0 x 2.7m	N/A	-
No.9 measurement room	-	8.8 x 4.6 x 2.8m	2.4 x 2.4m	-
No.11 measurement room	-	6.2 x 4.7 x 3.0m	4.8 x 4.6m	-

* Size of vertical conducting plane (for Conducted Emission test): 2.0 x 2.0 m for No.1, No.2, No.3, and No.4 semi-anechoic chambers and No.3 and No.4 shielded rooms.

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

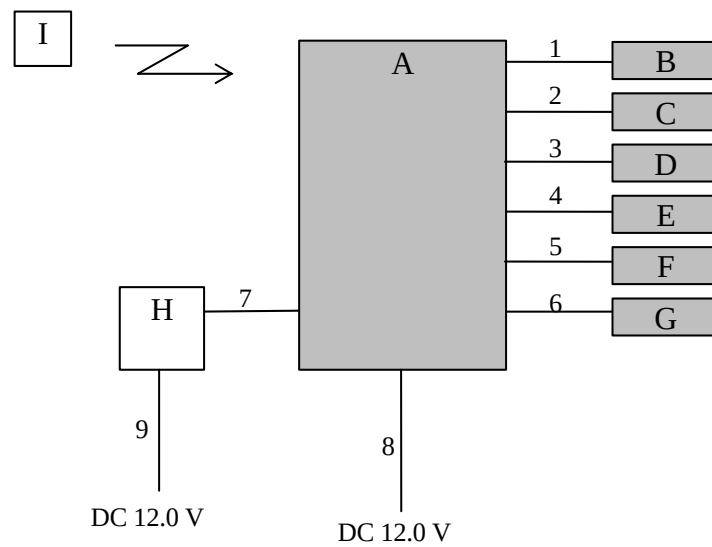
4.1 Operating modes

The mode is used: Receiving mode (Rx) 433.92 MHz

Justification : The system was configured in typical fashion (as a customer would normally use it) for testing.

*It was confirmed by using LED of Jig that the EUT receives the signal from the transmitter (pair of EUT).

4.2 Configuration and peripherals



* Cabling and setup were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Smart ECU	-	001	-	EUT
B	Antenna (TYPE 1)	-	001	-	EUT
C	Antenna (TYPE 1)	-	001	-	EUT
D	Antenna (TYPE 2 INSIDE)	-	001	-	EUT
E	Antenna (TYPE 2 INSIDE)	-	001	-	EUT
F	Antenna (TYPE 2 INSIDE)	-	001	-	EUT
G	Antenna (TYPE 2 OUTSIDE)	-	001	-	EUT
H	Jig	-	-	-	-
I	Smart key	-	001	-	-

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Antenna (TYPE 1) Cable	3.0	Unshielded	Unshielded	-
2	Antenna (TYPE 1) Cable	3.0	Unshielded	Unshielded	-
3	Antenna (TYPE 2 INSIDE) Cable	3.0	Unshielded	Unshielded	-
4	Antenna (TYPE 2 INSIDE) Cable	3.0	Unshielded	Unshielded	-
5	Antenna (TYPE 2 INSIDE) Cable	3.0	Unshielded	Unshielded	-
6	Antenna (TYPE 2 OUTSIDE) Cable	3.0	Unshielded	Unshielded	-
7	Signal Cable	3.0	Unshielded	Unshielded	-
8	DC Cable	3.0	Unshielded	Unshielded	-
9	DC Cable	3.0	Unshielded	Unshielded	-

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SECTION 5: Radiated Emission

5.1 Operating environment

Test place : No.3 and 4 semi anechoic chamber
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.

The EUT was set on the center of the tabletop.

Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.

Photographs of the set up are shown in Appendix 3.

5.3 Test conditions

Frequency range : 30 MHz - 200 MHz (Biconical antenna) / 200 MHz - 1000 MHz (Logperiodic antenna)
1000 MHz - 2000 MHz (Horn antenna)
Test distance : 3 m
EUT position : Table top
EUT operation mode : See Clause 4.1

5.4 Test procedure

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.

The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.

The radiated emission measurements were made with the following detector function of the Test Receiver and the Spectrum Analyzer.

Frequency	Below 1 GHz	Above 1 GHz
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120 kHz	PK: RBW: 1 MHz / VBW: 3 MHz AV *1): RBW: 1 MHz / VBW: 10 Hz

*1) When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

- The noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

5.5 Test result

Summary of the test results: Pass

Date: August 2 and 4, 2016

Test engineer: Takumi Shimada

APPENDIX 1: Test date

Radiated Emission

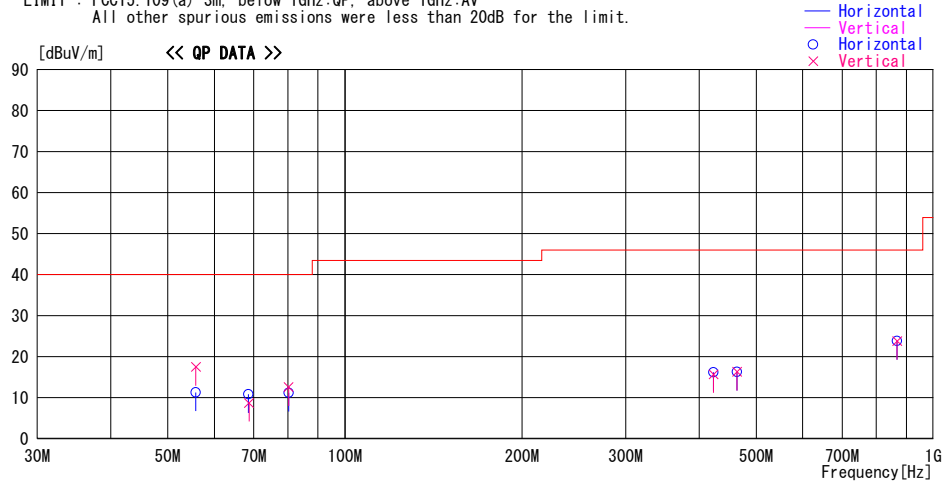
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.4 Semi Anechoic Chamber
Date : 2016/08/02

Report No. : 11374628H
Power : DC 12V
Temp./Humi. : 25deg. C / 62% RH
Engineer : Takumi Shimada

Mode / Remarks : Rx 433.92MHz Worst-Axis X

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV
All other spurious emissions were less than 20dB for the limit.



Frequency	Reading	DET	Antenna	Loss&	Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
55.836	26.9	QP	8.8	-24.4	11.3	359	300	Hori.	40.0	28.7	
55.828	33.1	QP	8.8	-24.4	17.5	143	100	Vert.	40.0	22.5	
68.537	28.7	QP	6.3	-24.2	10.8	203	300	Hori.	40.0	29.2	
68.708	26.6	QP	6.3	-24.2	8.7	270	100	Vert.	40.0	31.3	
80.257	28.7	QP	6.6	-24.1	11.2	41	300	Hori.	40.0	28.8	
80.241	30.1	QP	6.6	-24.1	12.6	262	100	Vert.	40.0	27.4	
423.220	21.6	QP	16.1	-21.5	16.2	0	100	Hori.	46.0	29.8	
423.220	21.1	QP	16.1	-21.5	15.7	0	100	Vert.	46.0	30.3	
463.920	20.7	QP	16.9	-21.3	16.3	0	100	Hori.	46.0	29.7	
463.920	20.7	QP	16.9	-21.3	16.3	0	100	Vert.	46.0	29.7	
867.840	20.7	QP	21.5	-18.4	23.8	0	100	Hori.	46.0	22.2	
867.840	20.7	QP	21.5	-18.4	23.8	0	100	Vert.	46.0	22.2	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE + ATENN- GAIN(AMP))

*The limit is rounded down to one decimal place.

*The test result is rounded off to one or two decimal places, so some differences might be observed.

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Radiated Emission

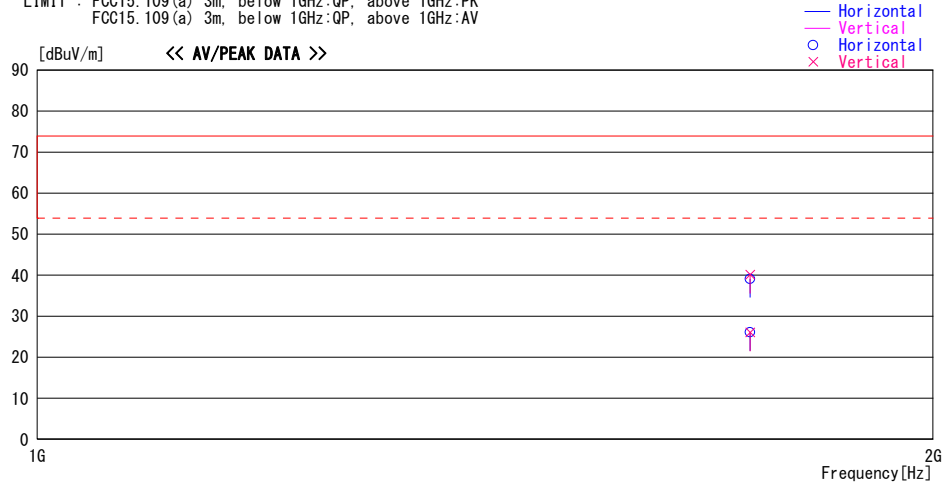
DATA OF RADIATED EMISSION TEST

UL Japan, Inc. Ise EMC Lab. No.3 Semi Anechoic Chamber
Date : 2016/08/04

Order No. : 11374628H
Power : DC 12V
Temp./Humi. : 24deg. C / 62% RH
Engineer : Takumi Shimada

Mode / Remarks : Rx 433.92MHz Worst-axis (Hor:X Ver:X)

LIMIT : FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:PK
FCC15.109(a) 3m, below 1GHz:QP, above 1GHz:AV



Frequency	Reading	DET	Antenna		Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
1735.680	42.2	PK	25.7	-28.8	39.1	0	100	Hori.	73.9	34.8	
1735.680	43.2	PK	25.7	-28.8	40.1	0	100	Vert.	73.9	33.8	
1735.680	29.1	AV	25.7	-28.8	26.0	0	100	Vert.	53.9	27.9	
1735.680	29.2	AV	25.7	-28.8	26.1	0	100	Hori.	53.9	27.8	

CHART:WITH FACTOR ANT TYPE: -30MHz:LOOP, 30-200MHz:BICONICAL, 200MHz-1000MHz:LOGPERIODIC, 1000MHz-:HORN
CALCULATION : RESULT = READING + ANT FACTOR + LOSS & GAIN(CABLE + ATTEN - GAIN(AMP))

*The limit is rounded down to one decimal place.

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APPENDIX 2: Test instruments

EMI test equipment

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
MAEC-04	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/02 * 12
MOS-15	Thermo-Hygrometer	Custom	CTH-180	1501	RE	2016/01/21 * 12
MJM-26	Measure	KOMELON	KMC-36	-	RE	-
COTS-MEMI	EMI measurement program	TSJ	TEPTO-DV	-	RE	-
MTR-10	EMI Test Receiver	Rohde & Schwarz	ESR26	101408	RE	2016/01/29 * 12
MBA-05	Biconical Antenna	Schwarzbeck	BBA9106	1302	RE	2015/11/02 * 12
MLA-23	Logperiodic Antenna(200-1000MHz)	Schwarzbeck	VUSLP9111B	911B-192	RE	2016/01/30 * 12
MCC-50	Coaxial Cable	UL Japan	-	-	RE	2016/06/20 * 12
MAT-68	Attenuator	Anritsu	MP721B	6200961025	RE	2015/11/12 * 12
MPA-14	Pre Amplifier	SONOMA INSTRUMENT	310	260833	RE	2016/03/18 * 12
MMM-10	DIGITAL HiTESTER	Hioki	3805	051201148	RE	2016/01/18 * 12
MAEC-03	Semi Anechoic Chamber(NSA)	TDK	Semi Anechoic Chamber 3m	DA-10005	RE	2015/10/01 * 12
MOS-13	Thermo-Hygrometer	Custom	CTH-180	1301	RE	2016/01/21 * 12
MJM-16	Measure	KOMELON	KMC-36	-	RE	-
MSA-03	Spectrum Analyzer	Agilent	E4448A	MY44020357	RE	2016/05/19 * 12
MHA-20	Horn Antenna 1-18GHz	Schwarzbeck	BBHA9120D	258	RE	2016/05/29 * 12
MCC-167	Microwave Cable	Junkosha	MWX221	1404S374(1m) / 1405S074(5m)	RE	2016/05/20 * 12
MPA-11	MicroWave System Amplifier	Agilent	83017A	MY39500779	RE	2016/03/24 * 12
MMM-08	DIGITAL HiTESTER	Hioki	3805	051201197	RE	2016/01/13 * 12

The expiration date of the calibration is the end of the expired month.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test Item:

RE: Radiated emission

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