# TEST RESULT SUMMARY

## FCC PART 15 Subpart C
### Section 15.231( c )

| | |
|---|---|
| MANUFACTURER'S NAME | Visteon Asia Pacific, Inc. |
| NAME OF EQUIPMENT | Keyless Entry Transmitter |
| MODEL NUMBER | **41805** |
| MANUFACTURER'S ADDRESS | Hiroshima Sangyo Bunka Center 9F<br>16-35 Hijiyama-honmachi, Minami-ku, Hiroshima<br>732-0816 Japan |
| TEST REPORT NUMBER | NC107912 |
| TEST DATE | 10 & 12 December 2001 |

According to testing performed at TÜV Product Service Inc, the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in FCC Part 15 Subpart C Section 15.231.

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

TÜV Product Service Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the requirements of FCC Part 15 Subpart C Section 15.231.

Date: 18 December 2001

Location: Taylors Falls MN USA

G. S. Jakubowski
Test Engineer

J. T. Schneider
Chief Engineer

**Not Transferable**

# EMC EMISSION - T E S T  R E P O R T

| | | | | |
|---|---|---|---|---|
| Test Report File No. | : | **NC107912** | Date of issue: | 18 December 2001 |

| | | |
|---|---|---|
| Model / Serial No. | : | **41805** |
| Product Type | : | Keyless Entry Transmitter |
| Applicant | : | Visteon Asia Pacific, Inc. |
| Manufacturer | : | Visteon Asia Pacific, Inc. |
| License holder | : | Visteon Asia Pacific, Inc. |
| Address | : | Hiroshima Sangyo Bunka Center 9F |
| | : | 16-35 Hijiyama-honmachi, Minami-ku, Hiroshima 732-0816 Japan |
| Test Result | : | ■ **Positive** ☐ **Negative** |
| Test Project Number Reference(s) | : | **NC107912** |
| Total pages including Appendices | | 50 |

*TÜV Product Service Inc is a subcontractor to TÜV Product Service, GmbH according to the principles outlined in ISO/IEC Guide 25 and EN 45001.*

*TÜV Product Service Inc reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. TÜV Product Service Inc shall have no liability for any deductions, inferences or generalizations drawn by the client or others from TÜV Product Service Inc issued reports.*

*This report is the confidential property of the client. As a mutual protection to our clients, the public and ourselves, extracts from the test report shall not be reproduced except in full without our written approval. This report shall not be used by the client to claim product endorsement by NVLAP or any agency of the US government.*

*TÜV Product Service Inc and its professional staff hold government and professional organization certifications and are members of AAMI, ACIL, AEA, ANSI, IEEE, NVLAP, and VCCI*



TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

# D I R E C T O R Y - EMISSIONS





TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

## EMISSIONS TEST REGULATIONS :

**The emissions tests were performed according to following regulations:**

---

| | | |
|---|---|---|
| ☐ - EN 50081-1 / 1991 | | |
| ☐ - EN 55011 / 1991 | ☐ - Group 1 | ☐ - Group 2 |
| | ☐ - Class A | ☐ - Class B |
| ☐ - EN 55013 / 1990 | | |
| ☐ - EN 55014 / 1987 | ☐ - Household appliances and similar | |
| | ☐ - Portable tools | |
| | ☐ - Semiconductor devices | |
| ☐ - EN 55014 / A2:1990 | | |
| ☐ - EN 55014 / 1993 | ☐ - Household appliances and similar | |
| | ☐ - Portable tools | |
| | ☐ - Semiconductor devices | |
| ☐ - EN 55015 / 1987 | | |
| ☐ - EN 55015 / A1:1990 | | |
| ☐ - EN 55015 / 1993 | | |
| ☐ - EN 55022 / 1987 | ☐ - Class A | ☐ - Class B |
| ☐ - EN 55022 / 1994 | ☐ - Class A | ☐ - Class B |
| ☐ - BS | | |
| ☐ - VCCI | ☐ - Class A | ☐ - Class B |
| ■ - FCC Part 15 Subpart C Section 15.231 | | |
| ☐ - AS 3548 (1992) | ☐ - Class A | ☐ - Class B |
| ☐ - CISPR 11 (1990) | ☐ - Group 1 | ☐ - Group 2 |
| | ☐ - Class A | ☐ - Class B |
| ☐ - CISPR 22 (1993) | ☐ - Class A | ☐ - Class B |
| ■ - RSS-210 Issue 2 Rev. 1 Section 6.1.1 & 7.0 | | |



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## Environmental conditions in the lab:

| | Actual |
|---|---|
| Temperature | : 23 °C |
| Relative Humidity | : 25 % |
| Atmospheric pressure | : 98.1 kPa |
| Power supply system | : Battery |

## Sign Explanations:

☐ - not applicable
■ - applicable



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## Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

**The *CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)* measurements were performed at the following test location:**

**■ - Test not applicable**

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
☐ - Wild River Lab Screen Room
☐ - New Brighton Lab Shielded Room

## Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)

**The *RADIATED EMISSIONS (MAGNETIC FIELD)* measurements were performed at the following test location:**

**■ - Test not applicable**

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)

**at a test distance of :**

☐ - 3 meters
☐ - 30 meters



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## Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

**The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz-1000 MHz, were tested in a horizontal and vertical polarization at the following test location :**

**☐ - Test not applicable**

■ - Wild River Lab Large Test Site (Open Area Test Site) – NSA measurements made 7-01, due 7-02.
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)

**at a test distance of :**

■ - 3 meters
☐ - 10 meters
☐ - 30 meters

**Test equipment used :**

| | TUV ID | Model Number | Manufacturer | Description | Serial Number | Cal Due |
|---|---|---|---|---|---|---|
| ■ - | 3202 | EM-6917B | Electro-Metrics | Biconicalog Periodic | 102 | 9-24-02 |
| ■ - | 3926 | 11867A | Hewlett-Packard | Limiter | 02442 | 3-21-02 |
| ■- | 2665 | ZHL-1042J | Mini-Circuits | Preamplifier | 32296 | 9-12-02 |
| ■- | 2690 | 8566B | Hewlett-Packard | Spectrum Analyzer (Unit F) | 2430A00930 | 11-19-02 |
| ■ - | 2678 | 85662A | Hewlett-Packard | Analyzer Display (Unit F) | 2403A08134 | 11-19-02 |
| ■ - | 2684 | 85650A | Hewlett-Packard | Quasi-Peak Adapter (Unit F) | 2521A01006 | 11-19-02 |

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.

## Emissions Test Conditions: INTERFERENCE POWER

**The *INTERFERENCE POWER* measurements were performed by using the absorbing clamp on the mains and interface cables in the frequency range 30 MHz - 300 MHz at the following test location :**

**■ - Test not applicable**

☐ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
☐ - Wild River Lab Screen Room
☐ - New Brighton Lab Shielded Room



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## Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

**The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range 1 GHz - 3.2 GHz were performed in a horizontal and vertical polarization at the following test location :**

☐ **- Test not applicable**

■ - Wild River Lab Large Test Site (Open Area Test Site)
☐ - Wild River Lab Small Test Site (Open Area Test Site)
☐ - Oakwood Lab (Open Area Test Site)
☐ - Wild River Lab Screen Room

**at a test distance of:**

☐ - 1 meters
■ - 3 meters
☐ - 10 meters

**Test equipment used :**

| | TUV ID | Model Number | Manufacturer | Description | Serial Number | Cal Due |
|---|---|---|---|---|---|---|
| ■ - | 3202 | EM-6917B | Electro-Metrics | Biconicalog Periodic | 102 | 9-24-02 |
| ■ - | 3926 | 11867A | Hewlett-Packard | Limiter | 02442 | 3-21-02 |
| ■- | 2665 | ZHL-1042J | Mini-Circuits | Preamplifier | 32296 | 9-12-02 |
| ■- | 2690 | 8566B | Hewlett-Packard | Spectrum Analyzer (Unit F) | 2430A00930 | 11-19-02 |
| ■ - | 2678 | 85662A | Hewlett-Packard | Analyzer Display (Unit F) | 2403A08134 | 11-19-02 |
| ■ - | 2684 | 85650A | Hewlett-Packard | Quasi-Peak Adapter (Unit F) | 2521A01006 | 11-19-02 |
| ■ - | 2075 | 3115 | Electro-Mechanics (EMCO) | Ridge Guide Ant. 1-18 GHz | 9001-3275 | 10-20-02 |

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST) and is calibrated annually.



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## Equipment Under Test (EUT) Test Operation Mode - Emission tests :

**The device under test was operated under the following conditions during emissions testing:**

☐ - Standby

☐ - Test program (H - Pattern)

☐ - Test program (color bar)

☐ - Test program (customer specific)

☐ - Practice operation

☐ - Normal Operating Mode

■ - Constant transmit.

**Configuration of the device under test:**

☐ - See Constructional Data Form in Appendix B - Page B2

■ - See Product Information Form in Appendix B - Page B2

**The following peripheral devices and interface cables were connected during the measurement:**

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - _____ Type : _____

☐ - unshielded power cable

☐ - unshielded cables

☐ - shielded cables MPS.No.: _____

☐ - customer specific cables

☐ - _____

☐ - _____



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## Emission Test Results:

**Conducted emissions 10/150 kHz - 30 MHz**

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

**Radiated emissions (magnetic field) 10 kHz - 30 MHz**

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

**Radiated emissions (electric field) 30 MHz - 1000 MHz**

The requirements are ■ - MET ☐ - NOT MET

Minimum margin of compliance for fundamental 4 dB at 313.8 MHz

Minimum margin of compliance for spurious 7 dB at 627.6 MHz

Remarks: The fundamental was measured to be 73.9 dBuV/m in peak mode, 70.9 dBuV/m ( 3507 uV/m) in average mode compared to an average limit of 75.5 dBuV/m (5993 uV/m). The 627.6 MHz signal was measured to be 47.7 dBuV/m ( 242 uV/m) in Quasi-peak mode compared to an average limit of 55.5 dBuV/m (599 uV/m). The duty cycle correction factor is calculated by 20 log (50/100 msec) or 6 dB. The measured levels meet the requirements without including the duty cycle correction factor.

**Interference Power at the mains and interface cables 30 MHz - 300 MHz**

The requirements are ☐ - MET ☐ - NOT MET

Minimum limit margin _____ dB at _____ MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: _____

**Equivalent Radiated emissions 1 GHz - 3.2 GHz**

The requirements are ■ - MET ☐ - NOT MET

Minimum limit margin 6 dB at 1569.0 MHz

Maximum limit exceeding _____ dB at _____ MHz

Remarks: At 1569.07 MHz average reading of 47.5 dBuV/m (237 uV/m) compared to an average limit of 54.0 dBuV/m (500 uV/m). The peak reading at this frequency is 49.8 dBuV/m. The 6 dB duty cycle correction factor is not included in the measured levels.

## DEVIATIONS FROM STANDARD:

None.

## GENERAL REMARKS:

The bandwidth of the fundamental must be less than 0.25% of the center frequency, or 784 kHz. Page A6 of A8 shows the bandwidth to be less than 270 kHz. The transmitter is on for 50msec/100msec, so a duty cycle relaxation factor of 20 log 50/100, or 6 dB can be used. Pages A7 and A8 show the on/off times.

## SUMMARY:

The requirements according to the technical regulations are

■ - met

☐ - **not** met.

The device under test does

■ - fulfill the general approval requirements mentioned on page 3.

☐ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date: 10 December 2001

Testing End Date: 12 December 2001

- TÜV PRODUCT SERVICE INC -

J. T. Schneider
Chief Engineer

Tested By:
G. S. Jakubowski



TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

Test-setup photo(s):
Conducted emission 10/150 kHz - 30 MHz

**Not Applicable**



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Test-setup photo(s):
Radiated emission  30 MHz - 3.2 GHz




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# Appendix A

Test Data Sheets

and

Test Setup Drawing(s)



TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

## TEST SETUP FOR EMISSIONS TESTING

WILD RIVER LAB
Large Test Site

Notes:

1. Items shown in dotted lines are located on the floor below the test area. It is 5 meters vertically from the ground floor to the test area.

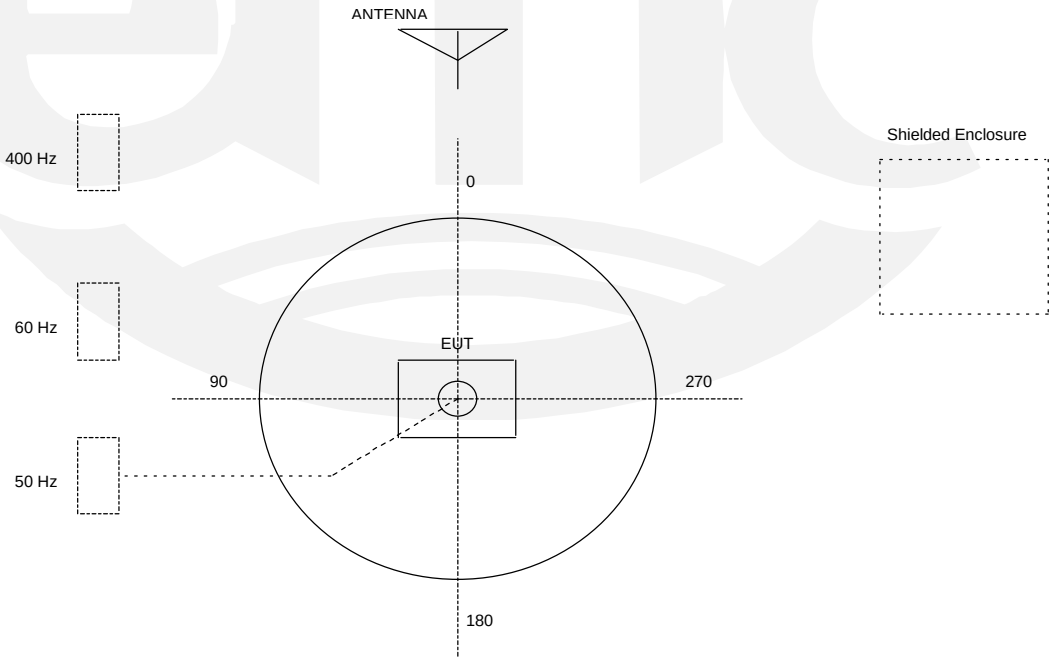
2. 50 Hz, 60 Hz, and 400 Hz are power panels for alternating current.

3. The antenna may be positioned horizontally 3, 10 or 30 meters from the center of the turntable.

4. The circle is a 6.7 meter diameter turntable.

5. A ground plane is in the plane of this sheet.

6. The test sample is shown in the azimuthal position representing zero degrees.



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# Radiated Electromagnetic Emissions

TÜV PRODUCT SERVICE

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Report #: | **7912 Run 1** | Test Area: | LTS 3m | | | |
| Test Method: | N/A | Test Date: | 10-Dec-2001 | | | |
| EUT Model #: | 41805 | EUT Power: | Internal DC | | | |
| EUT Serial #: | n/a | | | Temperature: | 23 | °C |
| Manufacturer: | Visteon | | | Relative Humidity: | 25 | % |
| EUT Description: | Keyless entry transmitter | | | Air Pressure: | 98.1 | kPa |
| Notes: | | | | Page: | 1 of 2 | |

| FREQ (MHz) | LEVEL (dBuV) | CABLE / ANT / PREAMP (dB) (dB/m) (dB) | FINAL (dBuV/m) | POL / HGT / AZ (m) (DEG) | FINAL (dBuV/m) | LIMIT FCC 15.231 |
|---|---|---|---|---|---|---|
| | | | | | | |
| EUT lying on its back | | | | | | |
| Fundamental maximized | | | | | | |
| 313.80 | 82.8 Av | 1.6 / 13.8 / 27.7 | 70.5 | H / 1.0 / 249.0 | 70.5 | 75.5 |
| | | | | | | |
| Preamp removed | | | | | | |
| 313.80 | 55.5 Av | 1.6 / 13.8 / 0.0 | 70.9 | H / 1.0 / 249.0 | 70.9 | 75.5 |
| | | | | | | |
| EUT on its side | | | | | | |
| Max'd | | | | | | |
| 313.80 | 50.3 Av | 1.6 / 13.8 / 0.0 | 65.8 | V / 2.1 / 265.0 | 65.8 | 75.5 |
| | | | | | | |
| EUT upright, button text upside down | | | | | | |
| Max'd | | | | | | |
| 313.80 | 50.9 Av | 1.6 / 13.8 / 0.0 | 66.4 | V / 2.2 / 85.0 | 66.4 | 75.8 |
| | | | | | | |
| Highest emission measured with EUT on its back | | | | | | |
| Following measurements with EUT in this position | | | | | | |
| Preamp replaced, no overload condition detected | | | | | | |
| | | | | | | |
| Max'd | | | | | | |
| 627.60 | 52.7 Qp | 2.4 / 20.1 / 27.5 | 47.7 | H / 1.4 / 133.0 | 47.7 | 55.5 |
| 941.40 | 43.5 Qp | 3.0 / 23.3 / 27.2 | 42.6 | H / 1.0 / 270.0 | 42.6 | 55.5 |
| 1255.28 | 31.5 Av | 3.6 / 24.9 / 27.4 | 32.6 | H / 1.3 / 220.0 | 32.6 | 55.5 |
| 1255.28 | 35.1 Pk | 3.6 / 24.9 / 27.4 | 36.2 | H / 1.3 / 220.0 | 36.2 | N/A |
| 1569.07 | 43.5 Av | 4.1 / 27.4 / 27.5 | 47.5 | H / 1.1 / 42.0 | 47.5 | 54.0 |

Tested by: GSJ

Printed — Signature

Reviewed by: TKS

Printed — Signature

# Radiated Electromagnetic Emissions

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Report #: | **7912 Run 1** | Test Area: | LTS 3m | | | |
| Test Method: | N/A | Test Date: | 10-Dec-2001 | | | |
| EUT Model #: | 41805 | EUT Power: | Internal DC | | | |
| EUT Serial #: | n/a | | | Temperature: | 23 | °C |
| Manufacturer: | Visteon | | | Relative Humidity: | 25 | % |
| EUT Description: | Keyless entry transmitter | | | Air Pressure: | 98.1 | kPa |
| Notes: | | | | Page: | 2 of 2 | |

| FREQ (MHz) | LEVEL (dBuV) | CABLE / ANT / PREAMP (dB) (dB/m) (dB) | FINAL (dBuV/m) | POL / HGT / AZ (m) (DEG) | FINAL (dBuV/m) | LIMIT FCC 15.231 |
|---|---|---|---|---|---|---|
| 1569.07 | 45.8 Pk | 4.1 / 27.4 / 27.5 | 49.8 | H / 1.1 / 42.0 | 49.8 | N/A |
| 1882.87 | 40.1 Av | 4.5 / 28.8 / 27.0 | 46.4 | H / 1.2 / 41.0 | 46.4 | 55.5 |
| 1882.87 | 42.6 Pk | 4.5 / 28.8 / 27.0 | 48.9 | H / 1.2 / 41.0 | 48.9 | N/A |
| 2196.67 | 30.3 Av | 4.9 / 30.0 / 27.0 | 38.2 | V / 1.0 / 248.0 | 38.2 | 55.5 |
| 2196.67 | 34.4 Pk | 4.9 / 30.0 / 27.0 | 42.3 | V / 1.0 / 248.0 | 42.3 | N/A |
| 2510.47 | 35.6 Pk | 5.3 / 30.7 / 26.9 | 44.7 | V / 1.1 / 265.0 | 44.7 | N/A |
| 2824.27 | 27.8 Pk | 5.7 / 31.3 / 27.1 | 37.7 | V / 1.1 / 278.0 | 37.7 | N/A |
| 3138.07 | 29.4 Pk | 6.0 / 32.0 / 28.5 | 38.9 | V / 1.2 / 280.0 | 38.9 | N/A |
| | | | | | | |
| No other emissions detected 30 MHz to 3140 MHz | | | | | | |
| | | | | | | |

Tested by: GSJ

Printed

Signature

Reviewed by: TKS

Printed

Signature

# Radiated Electromagnetic Emissions

| | | | | | | |
|---|---|---|---|---|---|---|
| Test Report #: | **7912 Run 03** | Test Area: | LTS 3m | | | |
| Test Method: | N/A | Test Date: | 12-Dec-2001 | | | |
| EUT Model #: | 41805 | EUT Power: | Internal DC | | | |
| EUT Serial #: | n/a | | | Temperature: | 23 | °C |
| Manufacturer: | Visteon | | | Relative Humidity: | 25 | % |
| EUT Description: | Keyless entry transmitter | | | Air Pressure: | 98.1 | kPa |
| Notes: | | | | Page: | 1 of 1 | |

| FREQ (MHz) | LEVEL (dBuV) | CABLE / ANT / PREAMP (dB) (dB/m) (dB) | FINAL (dBuV/m) | POL / HGT / AZ (m) (DEG) | FINAL (dBuV/m) | LIMIT FCC 15.231 |
|---|---|---|---|---|---|---|
| | | | | | | |
| EUT on its back | | | | | | |
| Fundamental maximized | | | | | | |
| 313.80 | 86.1 Pk | 1.6 / 13.8 / 27.7 | 73.9 | H / 1.0 / 249.0 | 73.9 | N/A |
| | | | | | | |
| Avg measurement with ESVS 20 | | | | | | |
| 313.80 | 81.4 Av | 1.6 / 13.8 / 27.7 | 69.2 | H / 1.0 / 249.0 | 69.2 | 75.5 |
| | | | | | | |

Tested by: GSJ

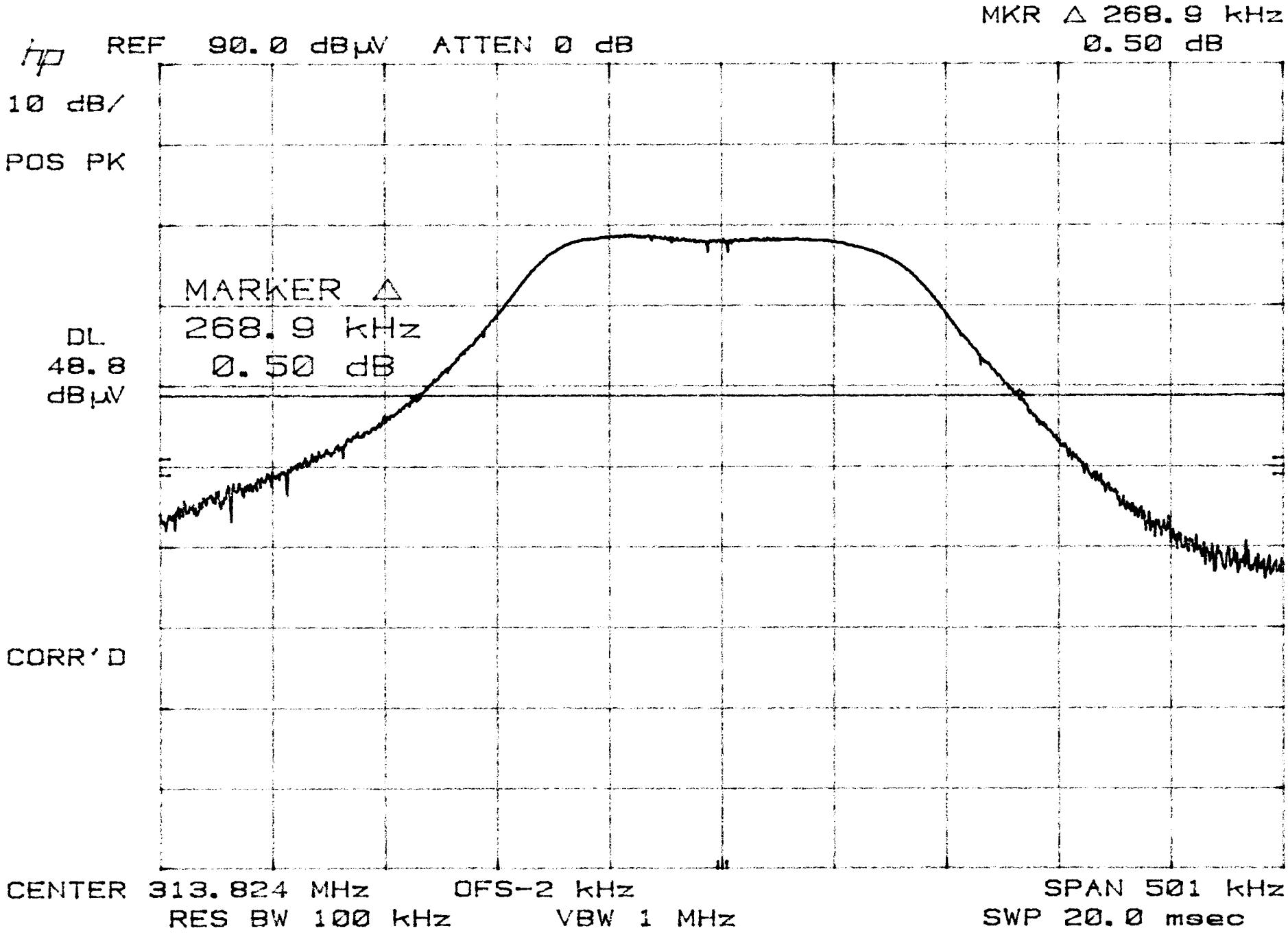
Printed

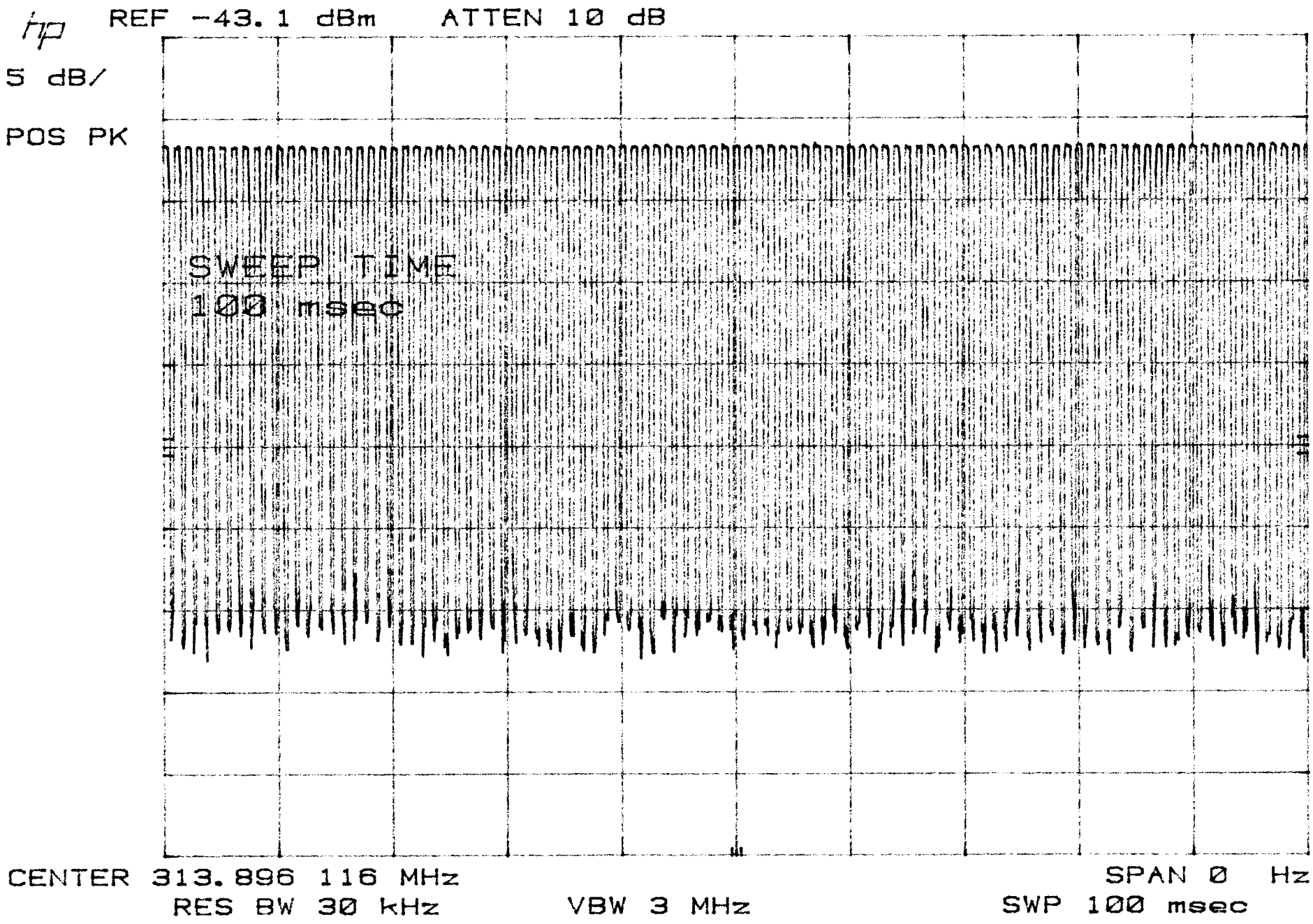
Signature

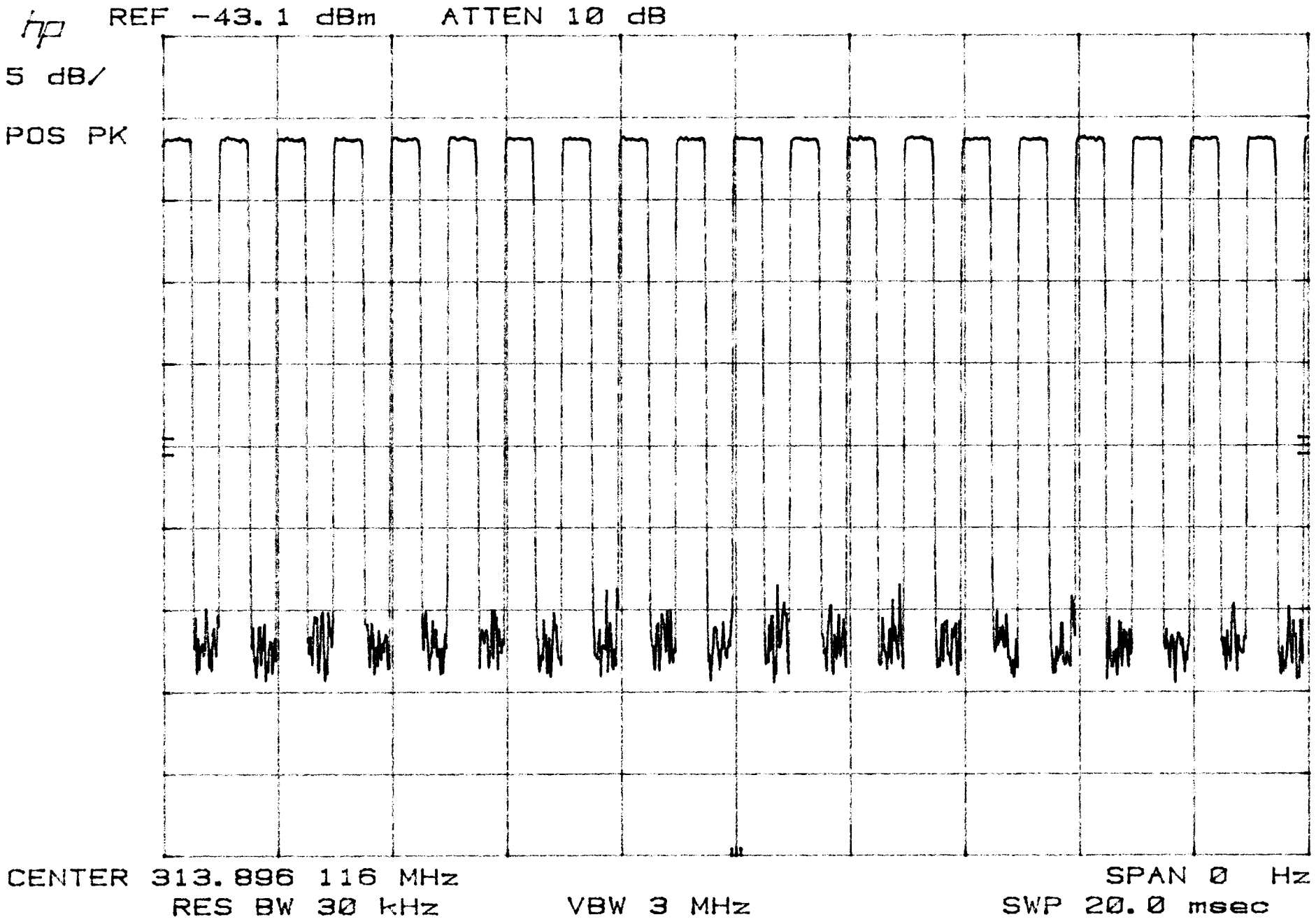
Reviewed by: TKS

Printed

Signature


MKR Δ 268.9 kHz
0.50 dB
REF 90.0 dBμV
ATTEN 0 dB
10 dB/
POS PK
MARKER Δ
268.9 kHz
0.50 dB
DL
48.8
dBμV
CORR'D
CENTER 313.824 MHz
OFS-2 kHz
SPAN 501 kHz
RES BW 100 kHz
VBW 1 MHz
SWP 20.0 msec


REF -43.1 dBm
ATTEN 10 dB
5 dB/
POS PK
SWEEP TIME
100 msec
CENTER 313.896 116 MHz
SPAN 0 Hz
RES BW 30 kHz
VBW 3 MHz
SWP 100 msec


REF -43.1 dBm
ATTEN 10 dB
5 dB/
POS PK
CENTER 313.896 116 MHz
SPAN 0 Hz
RES BW 30 kHz
VBW 3 MHz
SWP 20.0 msec

# Appendix B

Constructional Data Form



TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

# Technical Construction File

Transmitter Model 41805

Receiver Model 41808

Nov 22, 2001

## Visteon Asia Pacific, Inc.

# 1. Directory

I) Applicant ;

Visteon Asia Pacific, Inc.

Hiroshima Sangyo Bunka Center 9F

16-35, Hijiyama-honmachi, Minami-ku, Hiroshima 732-0816, JAPAN

TEL: +81- 82- 250- 6600 FAX: +81-82- 250- 6809

II) Manufacturer ;

Visteon Electronics Fudian Plant

300 Minolta Road, Songjiang country Shanghai, China 201600

TEL: +86- 21- 5774- 1278 FAX: +86- 21- 5774- 1271

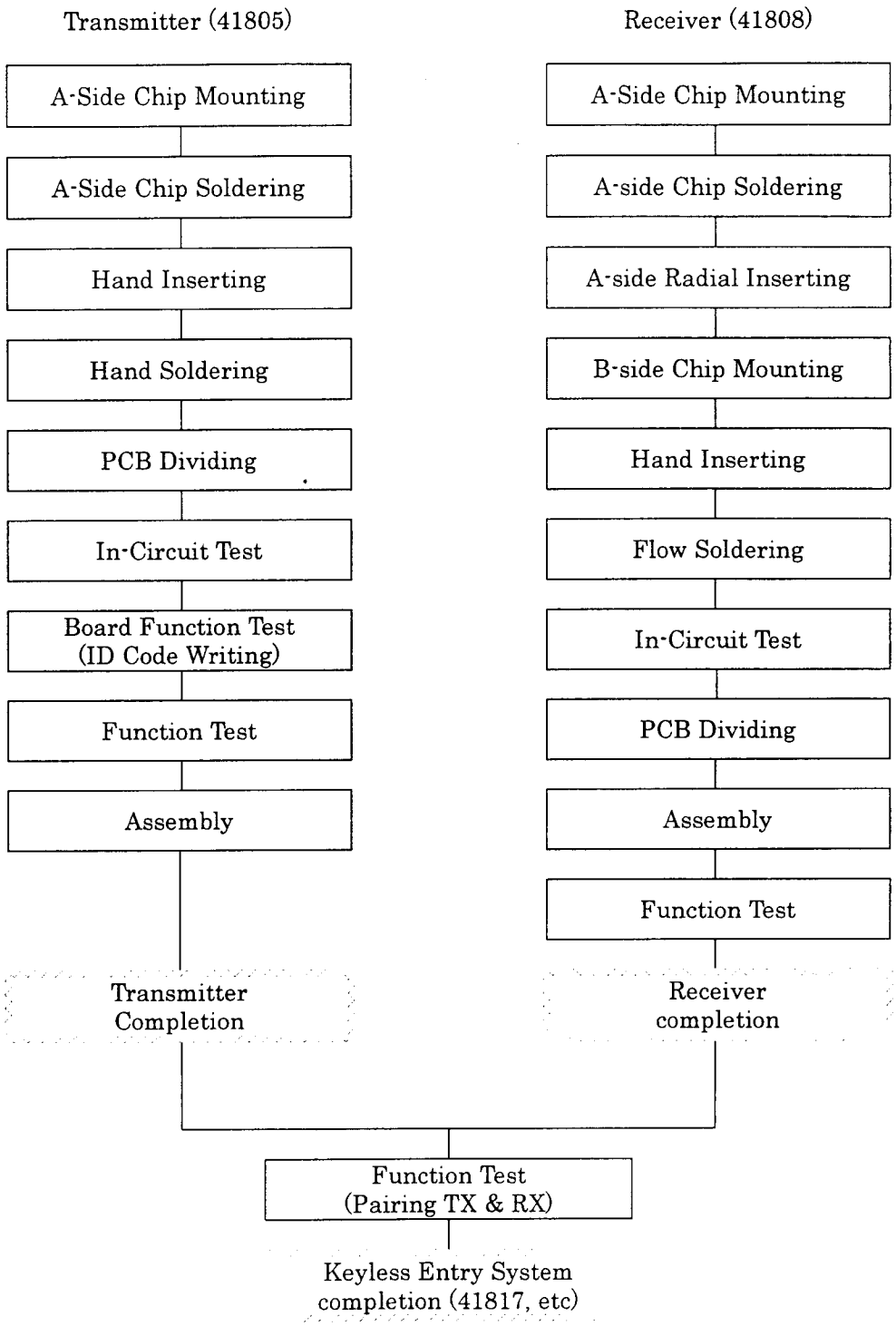
III) Visteon delivers products to ;

MAZDA Motor Corporation

3-1, Shinchi, Fuchu-cho, Aki-gun, Hiroshima 730-8670, JAPAN

TEL: +81- 82- 282- 1111 (; representative)

## 2. Progress of Work



# 3. Transmitter (41805)

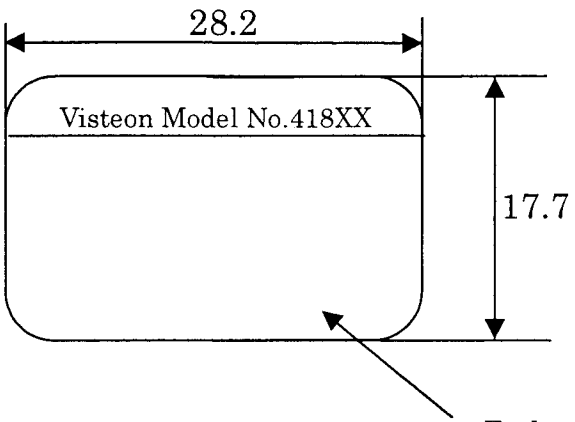
## 3-1. Model Name:

Transmitter

## 3-2. Product Number:

41805

3-3. Label Art-Work




Each countries' approval numbers will be displayed.

The following countries will be delivered.

| | | |
|---|---|---|
| USA | Canada | Guam |
| Saipan | Puerto Rico | |

## 3-4. System Description

Transmitter contains of 4 buttons.

- Door Lock button
- Door Unlock button
- Trunk button
- Panic Alarm button

There is no difference among LOCK, UNLOCK TRUNK and PANIC conditions regarding the electrical and mechanical function of a transmitter. Also there is no difference on each condition regarding the frequency of radiated emissions. The only difference is a transmission code.

Transmitter operation with a lithium battery (: CR2025)

Radio frequency Oscillator: Carrier: 313.85 MHz
Frequency Modulation: ±40 kHz

Action principle of Transmitter of Keyless Entry System is written below:

Transmitter can transmit signals by button operation, when all circuits are in stop condition, inclusive of microcomputer.
(: Stop condition means the condition of waiting for button switch input.)
Even if Transmitter is in stop condition, as soon as one of two buttons is pressed, microcomputer starts to operate.

Microcomputer reads ID code, which was memorized before, from the EEPROM. EEPROM set up with in microcomputer. When the read is over, data is transmitted according to transmission format for each button switch. The transmission time is 314.0millisecond.

Microcomputer communicates with oscillator. When output of microcomputer is "HIGH", oscillator frequency is shifted HIGH side, and when output of microcomputer is "LOW", oscillator frequency is shifted LOW side.

When transmission of all data is over, oscillator stops and microcomputer returns to be in stop condition (; waits for button switch input again).

AS concerns Transmitter for test sample, the software program is modified to continue to transmit data "0" after a battery is set in.

## 3-5. Data Format

【 Data Format 】

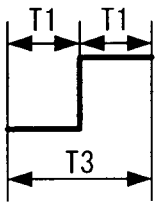
| Pri.header | Frame1 | Frame2 | Stop |
|---|---|---|---|
| 180 bit | 71 bit | 71 bit | 1 bit |

*Frame2 is the same code of Frame1.

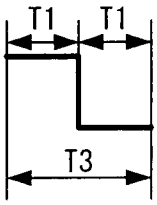
| Header | Synch -ronize | Function | ID code | Synch -ronize | Counter | CRC data |
|---|---|---|---|---|---|---|
| 5 bit | 1 bit | 8 bit | 24 bit | 1 bit | 16 bit | 16 bit |

※ Pri.hedder : Tuner wake up pulse
※ Header : Head sign of the each frame
※ Synchronize : For synchronize bit
※ Function code : Information of operated switch
※ ID code : When the receiver's ID code and the transmitter's ID code (received ID code) is same, receiver operate the function, and the code is not same, receiver not operate.
※ Counter : Rolling code
※ CRC data : CRC calculation data by ID code and Counter.
※ Stop : End sign, the final bit of frame2 counter

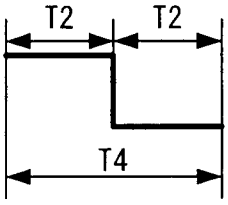
【 Data Type 】



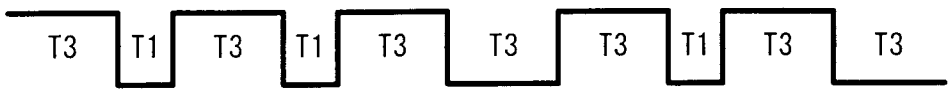
"0" and "Stop" pulse



"1" pulse



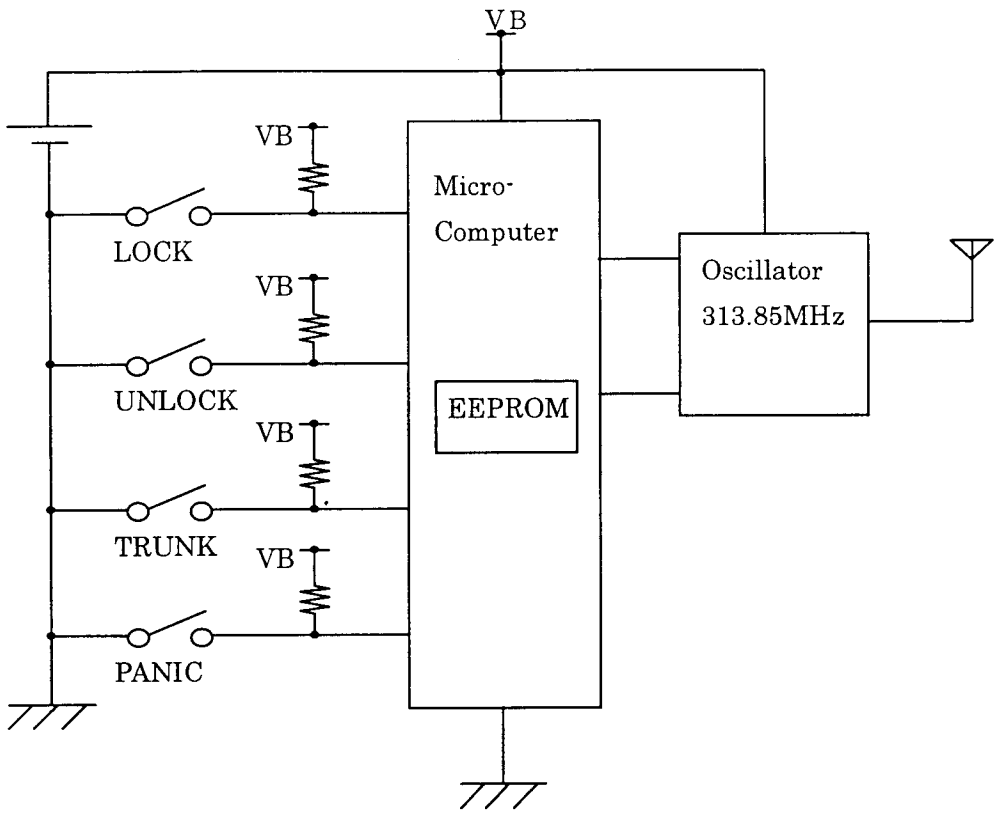
"Synchronize" pulse



"Header" pulse

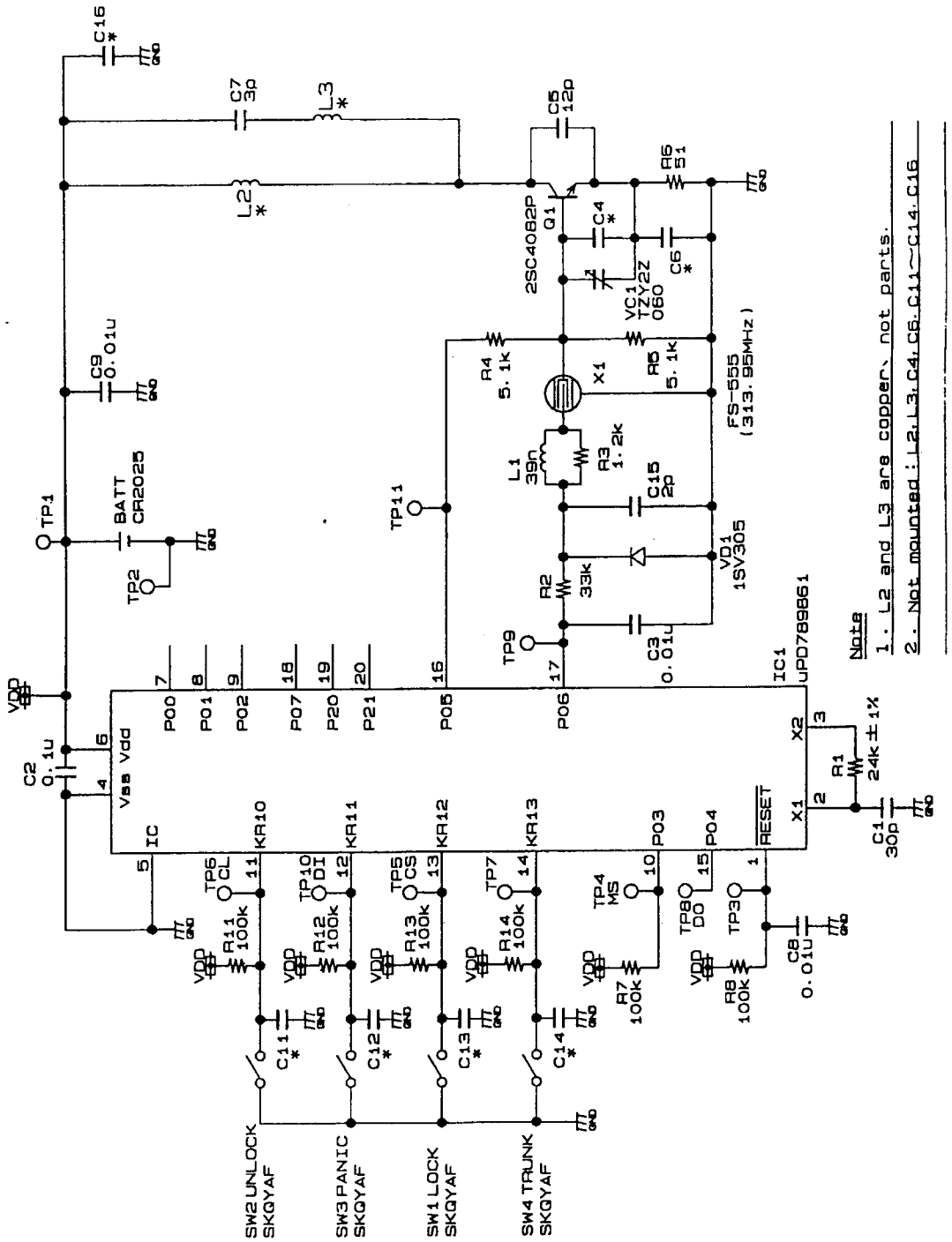
| | Period (milliseconds) |
|---|---|
| T1 | 0.5 |
| T2 | 0.75 |
| T3 | 1.0 |
| T4 | 1.5 |

3-6. Block Diagram




| BUTTON OPERATION | FUNCTION CODE |
|---|---|
| LOCK | 10000001B |
| UNLOCK | 10000010B |
| TRUNK | 10000100B |
| PANIC | 10001000B |

3-7. Circuit Diagram





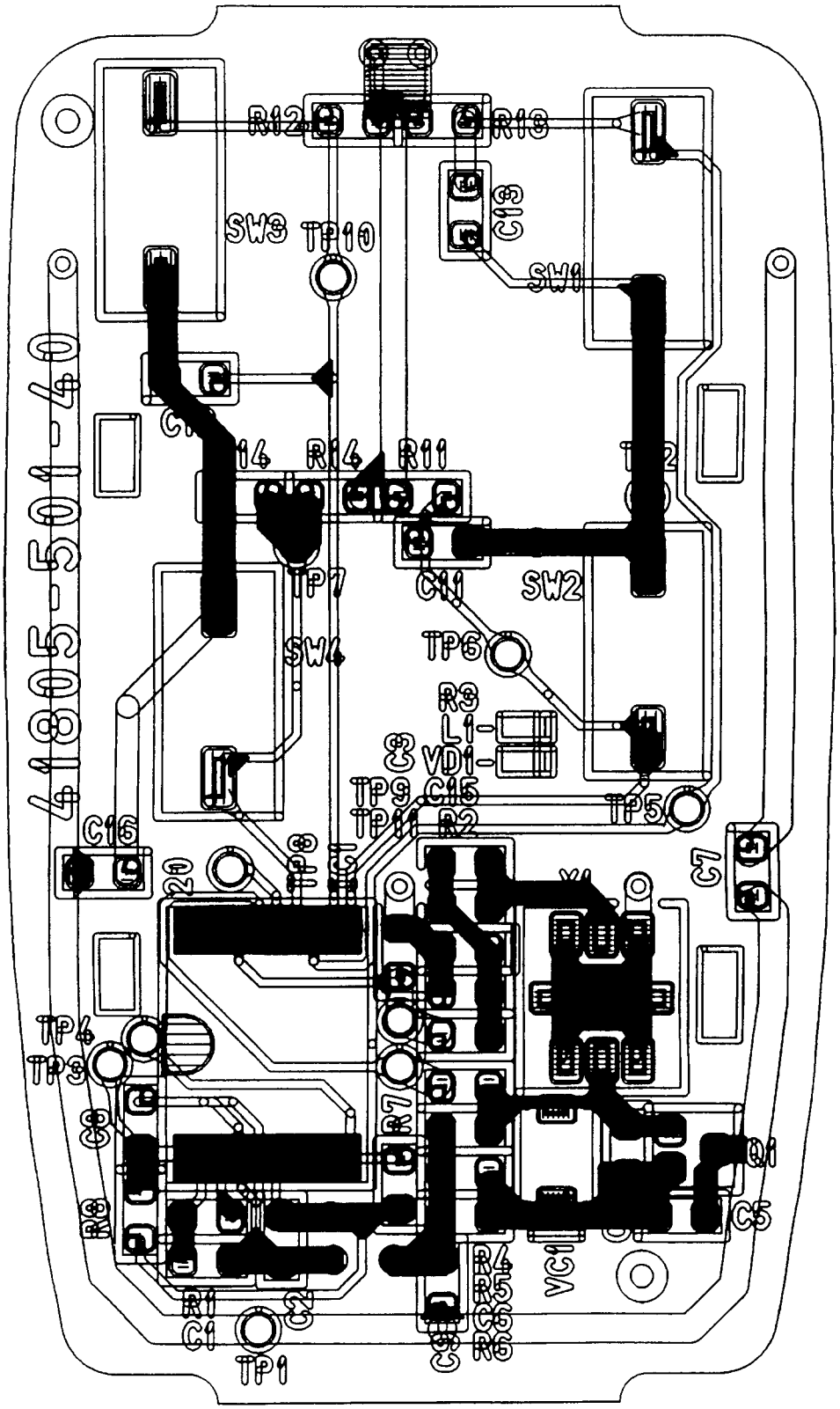

| | | | SHT | 9/27 |
|---|---|---|---|---|

## 3-8. Parts List

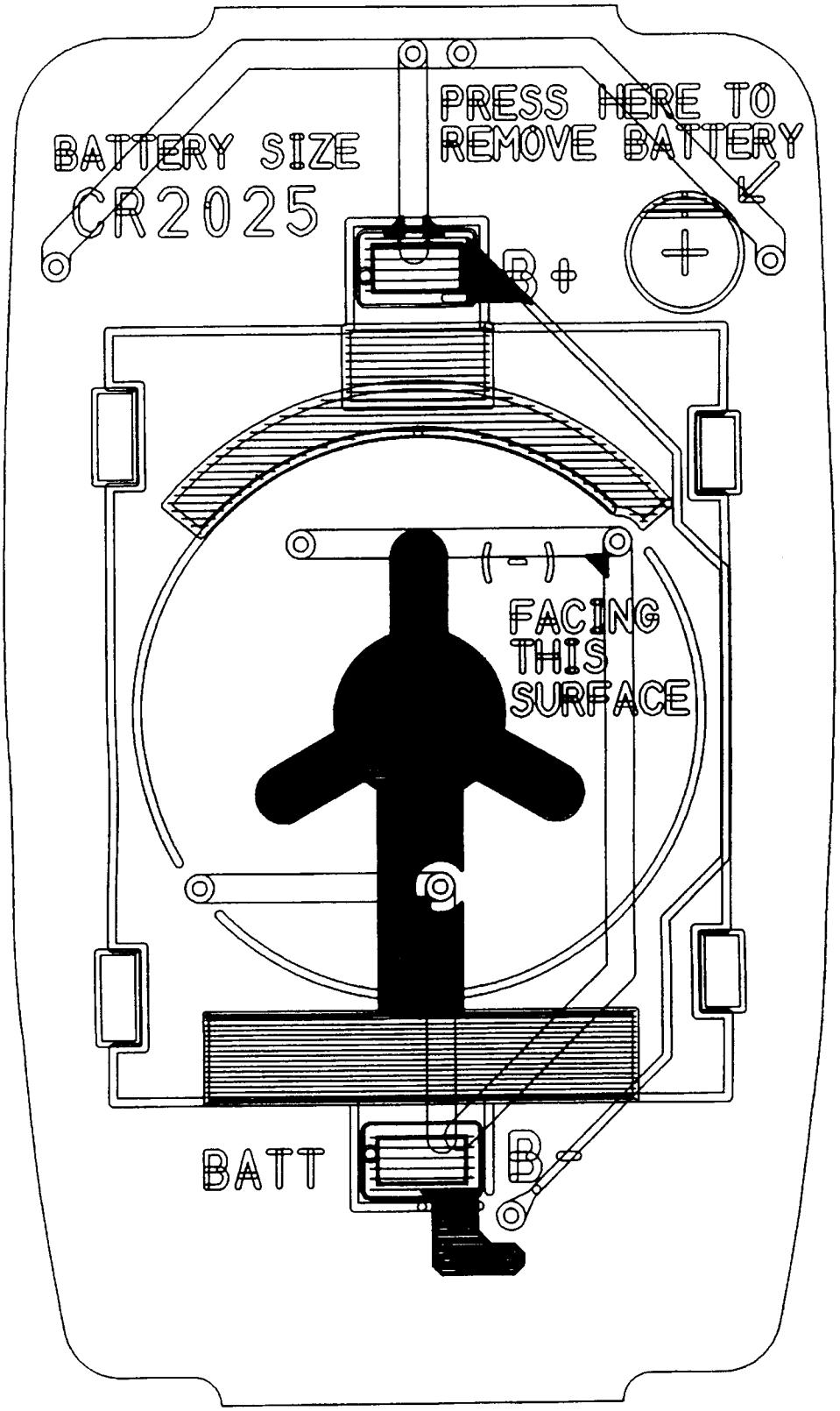
| Item | Part Name | Quantity | Part No. |
|---|---|---|---|
| Micro-computer | μPD789861 | 1 | IC1 |
| NPN-Transistor | 2SC4082P | 1 | Q1 |
| Capacitor (Ceramic) | 30pF | 1 | C1, |
| | 0.1μF | 1 | C2 |
| | 0.01μF | 3 | C3, C8, C9 |
| | 12pF | 1 | C5 |
| | 3pF | 1 | C7 |
| | 2pF | 1 | C15 |
| Resister | 24kΩ 1/16W, J | 1 | R1 |
| | 33 kΩ 1/16W, J | 1 | R2 |
| | 1.2 kΩ 1/16W, J | 1 | R3 |
| | 5.1 kΩ 1/16W, J | 2 | R4, R5 |
| | 51 Ω 1/16W, J | 1 | R6 |
| | 100 kΩ 1/16W, J | 6 | R7, R8, R11, R12, R13, R14 |
| Coil | 39 nH 5% | 1 | L1 |
| Diode-variable capacitor | 1SV305 | 1 | VD1 |
| Capacitor-Ceramic trimmer | TZY2Z060 | 1 | VC1 |
| SAW-Resonator | 313.95 MHz | 1 | X1 |
| Tactile Switch | SKQAF | 4 | SW1, SW2, SW3, SW4 |
| Battery | CR2025 | 1 | B1 |
| Batter-Terminal | Plus | 1 | B+ |
| | Minus | 1 | B− |
| Printed Writing Board | | 1 | |
| Upper - Case | | 1 | |
| Lower - Case | | 1 | |
| Switch-Rubber | | 1 | |

3-9. PWB pattern

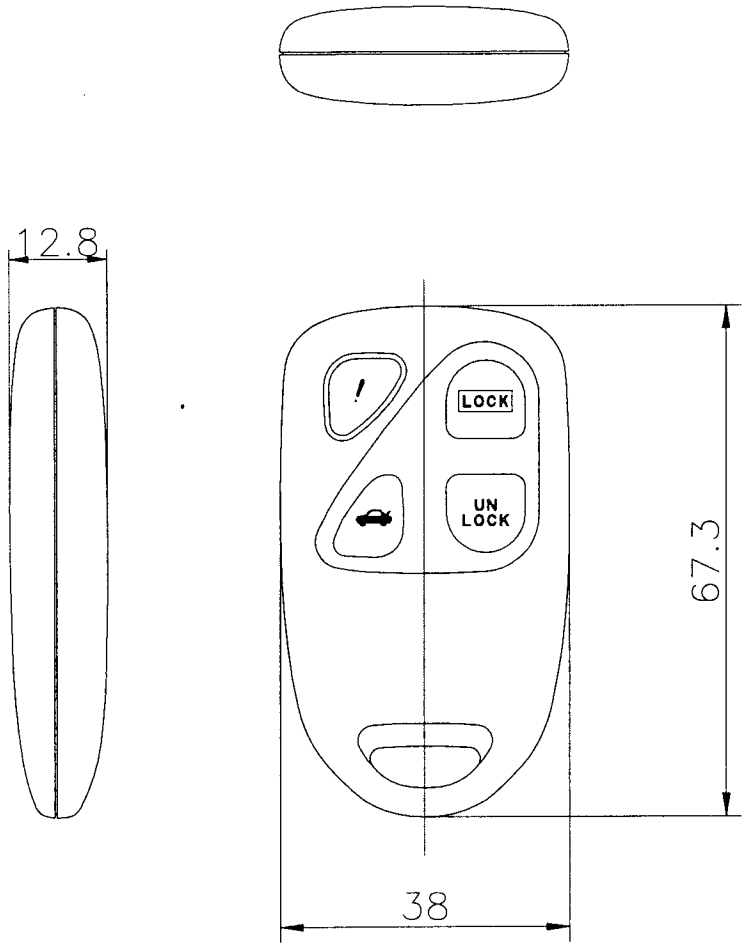
(1) A-side



(2) B-side


BATTERY SIZE
CR2025
PRESS HERE TO
REMOVE BATTERY
B+
(-)
FACING
THIS
SURFACE
BATT
B-

3-10. Appearance



# 4. Receiver (41808)

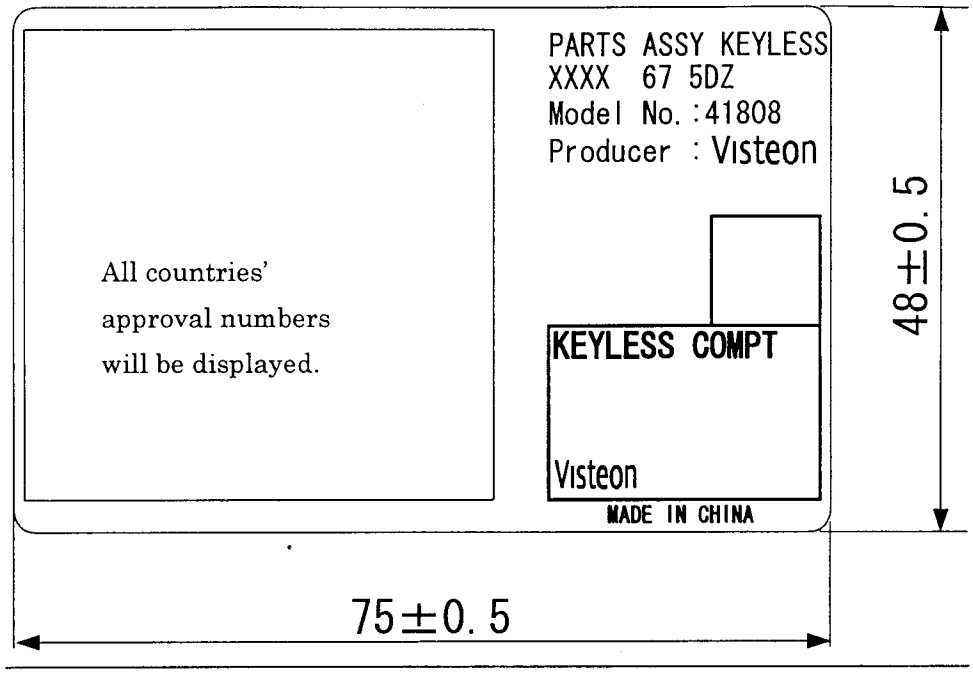
## 4-1. Model Name:

Receiver

## 4-2. Product Number:

41808

4-3. Label Art-Work




The following countries will be delivered.

| | | |
|---|---|---|
| USA | Canada | Guam |
| Saipan | Puerto Rico | |

## 4-4. System Description

★ Architecture

- Receiver constitutes

  Regulator / Tuner unit / Micro-computer /

  Electrically erasable read only memory (EEPROM) / and Driver

- Respective functions are as follows.

| | | | |
|---|---|---|---|
| A: | Regulator | : | This device converts the power to 5V from 12V car-battery, and supply 5V power to receiver. |
| B: | Tuner unit | : | Transform modulated electric wave to detected signal. The tuner unit is designed for super-heterodyne form.<br>Frequency carrier : 313.85MHz<br>Secondary oscillator : 324.55MHz<br>Intermediate frequency : 10.7MHz |
| C: | Micro-computer | : | Control receiver. |
| D: | EEPROM | : | Be able to memorize three kind of ID code for Three Transmitters, and if power supply of receiver is off, its information is maintained. |
| E: | Driver | : | Output in answer to information to transmitted from transmitter. |

★ Principle of action

When signals are transmitted from transmitter, detected signals are input to microcomputer from tuner. All signals transmitted in succession from transmitter are detected, and when data is complete, it is memorized temporary to RAM set up with in microcomputer. Then, compare ID codes for three transmitters, memorized beforehand to EEROM with ID codes included in data transmitted at present, and according as its result acts as is shown below.

Ⅰ) In case each ID code agree.

In accordance with information of function code included in data of transmission, transmit each output signal to outside unit from microcomputer through part of driver.

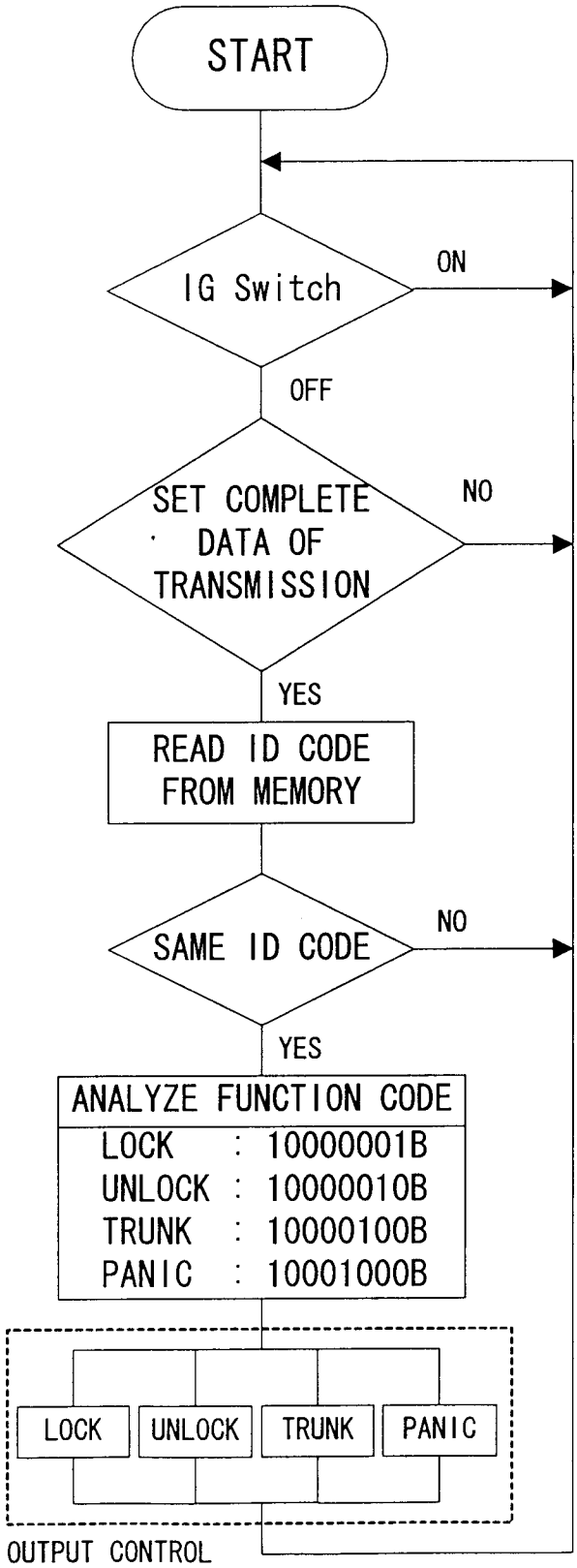
Ⅱ) In case each ID code do not agree.

Output signal is not transmitted at all.

After the control above-state Ⅰ) or Ⅱ) is acted, data of transmission memorized temporary to RAM of micro-computer is erased, and receiver return to acting as usual again.

The subject memorized above is a series of acting of receiver, and receiver does these acting repeatedly.

Flow Chart


START
IG Switch
ON
OFF
SET COMPLETE DATA OF TRANSMISSION
NO
YES
READ ID CODE FROM MEMORY
SAME ID CODE
NO
YES
ANALYZE FUNCTION CODE
LOCK : 10000001B
UNLOCK : 10000010B
TRUNK : 10000100B
PANIC : 10001000B
LOCK
UNLOCK
TRUNK
PANIC
OUTPUT CONTROL

## 4-5. Receiver Output Function

(1) Door Lock Function

LOCK: When "LOCK" command is received, Output "LOCK" command to DOORLOCK OUTPUT terminal.

UNLOCK: When "UNLOCK" command is received, Output "UNLOCK" command to DOORLOCK OUTPUT terminal.

(2) Trunk Opener Function

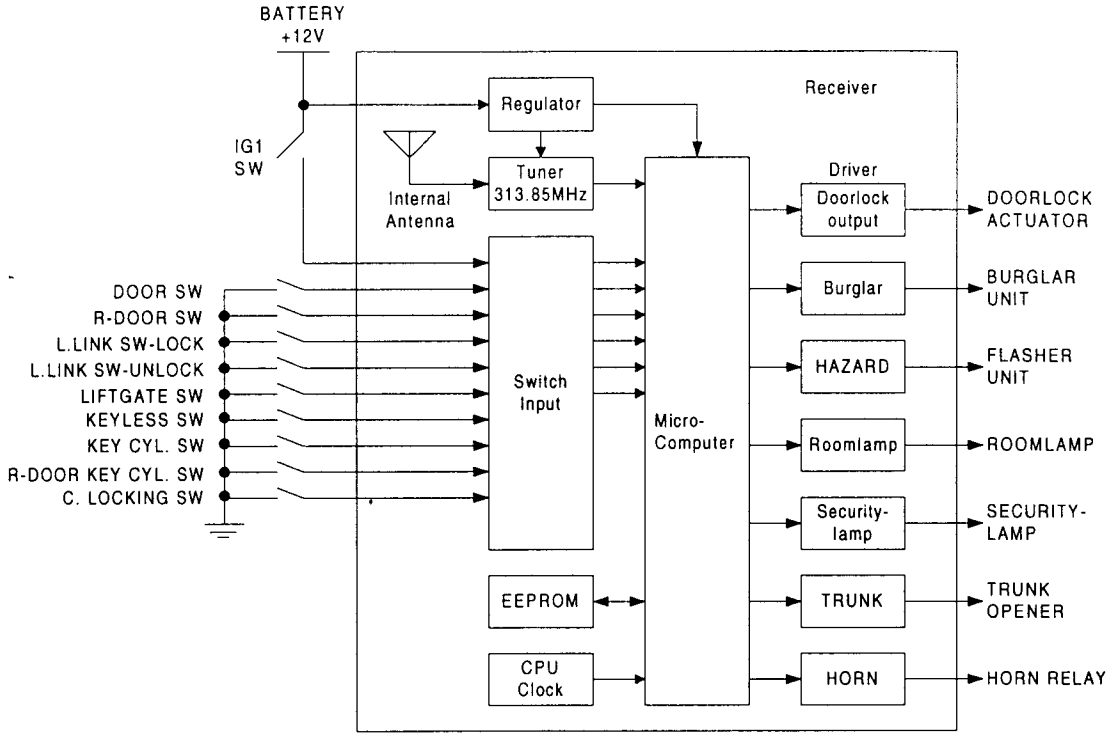
TRUNK: When "TRUNK" command is received, Output "TRUNK" command to TRUNK OUTPUT terminal.

(3) Panic Alarm Function

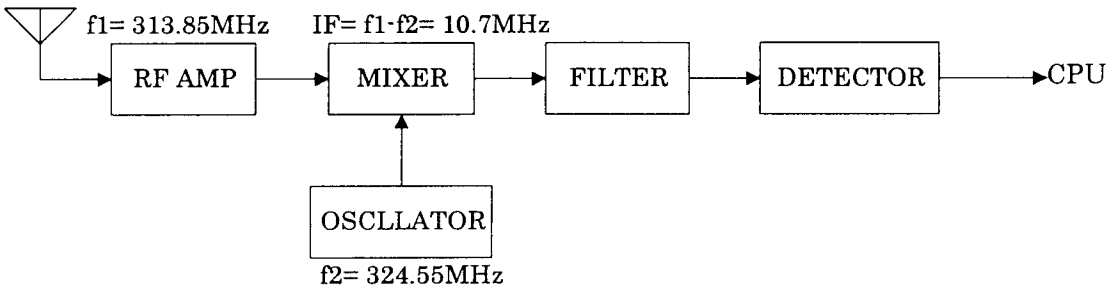
PANIC: When "PANIC" command is received, Output "Horn" and "Hazard" commands to each output terminal.

## 4-6. Block Diagram

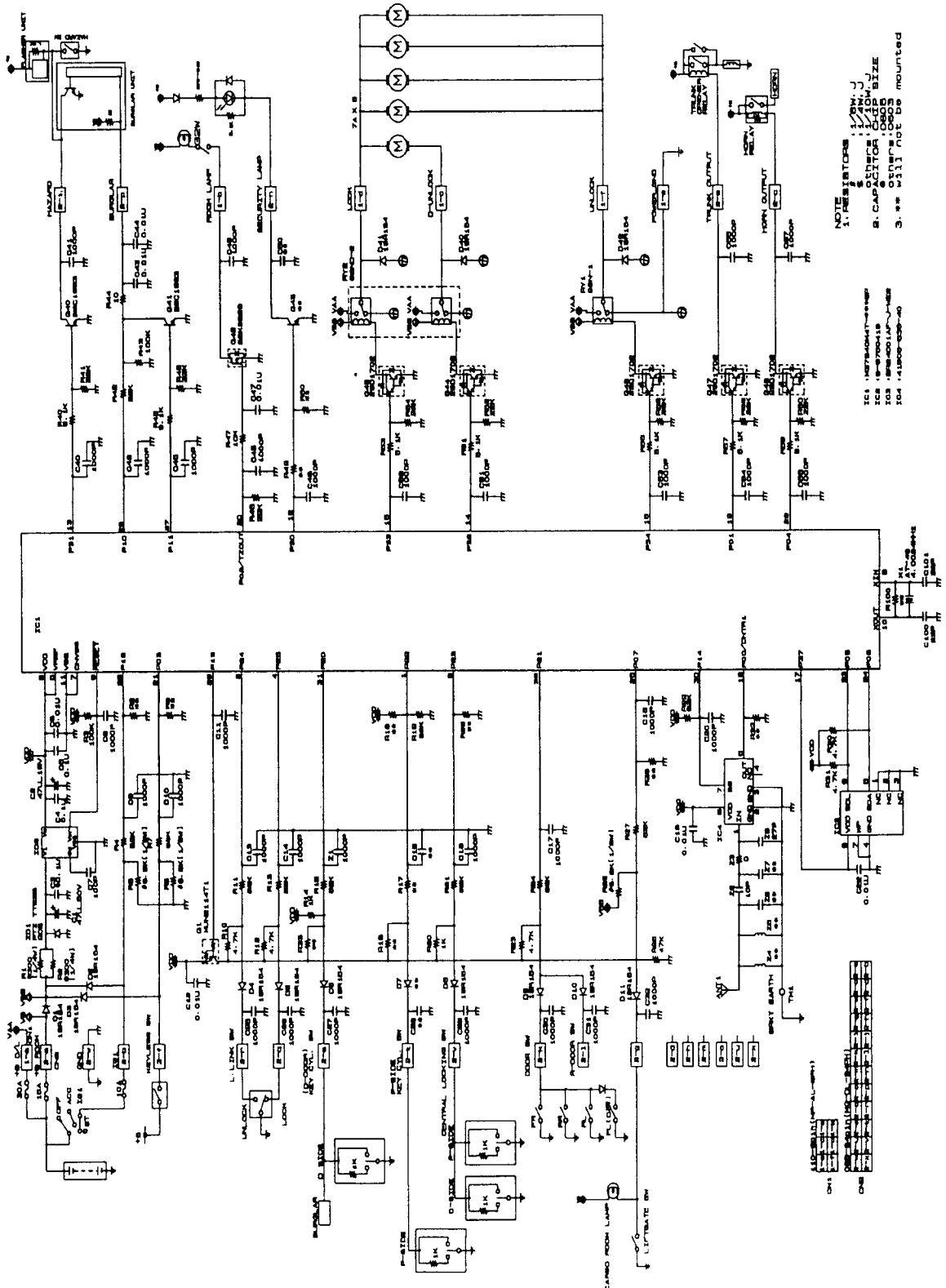
· Receiver




· Tuner Unit



## 4-7. Circuit Diagram



Parts List

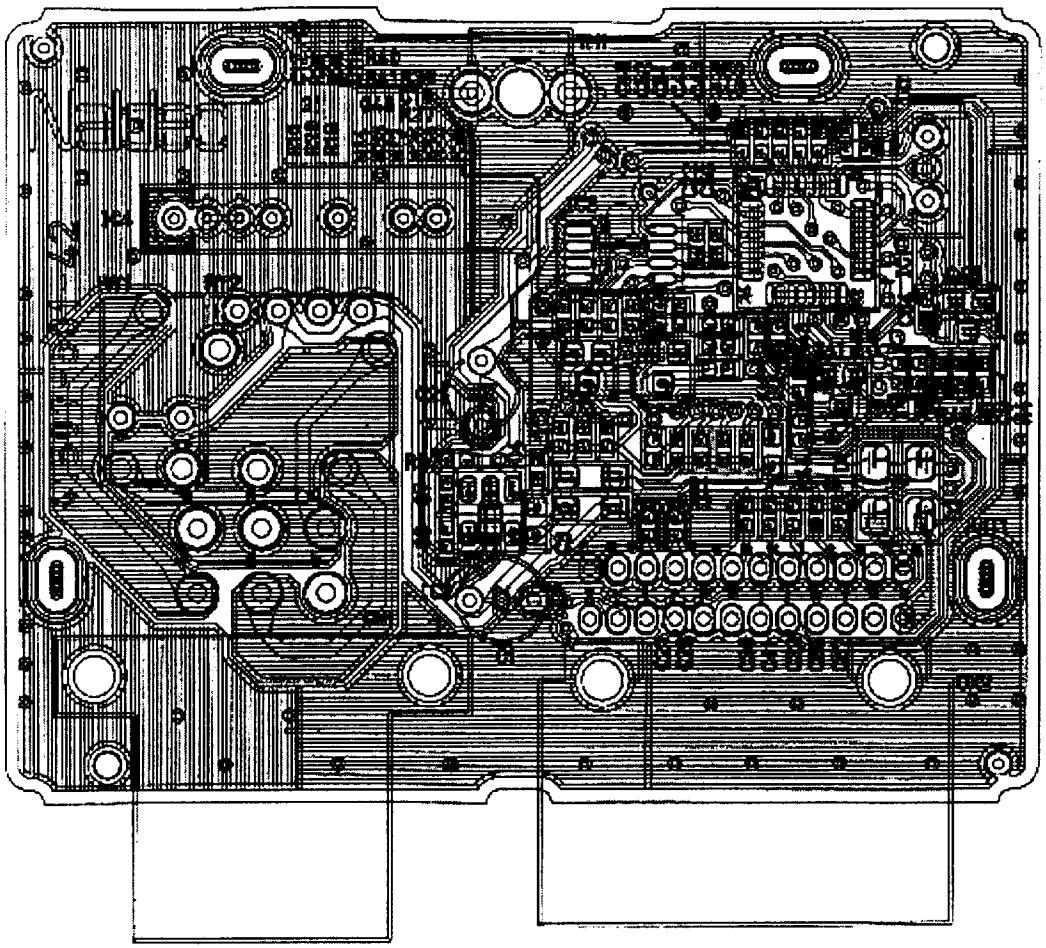
| Item | Part Name | Quantity | Part No. |
|---|---|---|---|
| Micro-computer | M37540M4T | 1 | IC1 |
| Tuner unit | G8X-28RX | 1 | IC4 |
| IC (Regulator) | S-875041BUP-ABC | 1 | IC2 |
| IC (EEPROM) | BR24C01AF-J-WE2 | 1 | IC3 |
| PNP-Transistor | MUN2114 | 1 | Q1 |
| NPN-Transistor | 2SC1623 | 2 | Q40, Q41 |
| | 2SD1702 | 5 | Q44, Q45, Q46, Q47, Q48 |
| N-MOS FET | 2SK2869-92STR | 1 | Q42 |
| Diode | 1SR154-400 | 13 | D1, D2, D3, D4, D5, D6, D8, D9, D10, D11, D40, D41, D42 |
| Zener Diode | PTZ TTE25 | 1 | ZD1 |
| Capacitor (Electrolytic) | 47μ/50V | 1 | C1 |
| | 47μ/16V | 1 | C2 |
| Capacitor (Ceramic) | 10pF | 1 | Z2 |
| | 27pF | 1 | Z8 |
| | 0.01μF | 7 | C6, C12, C19, C22, C43, C44, C47 |
| | 100pF | 1 | C7 |
| | 1000pF | 32 | C8, C9, C10, C11, C13, C14, C16, C17, C18, C20, C25, C26, C27, C29, C30, C31, C32, C40, C41, C42, C45, C46, C48, C49, C51, C52, C53, C54, C55, C56, C57, Z1 |
| | 0.1μF | 1 | C3 |
| | 0.1μF | 2 | C4, C5 |
| | 22pF | 2 | C100, C101 |
| Resister | 6.8kΩ 1/8W, J | 3 | R5, R8, R26 |
| | 300Ω 1/4W, J | 2 | R1, R2 |
| | 0Ω 1/10W, J | 1 | Z3 |
| | 10Ω 1/10W, J | 1 | R44 |
| | 1kΩ 1/10W, J | 1 | R14, R20 |
| | 10kΩ 1/10W, J | 1 | R47 |
| | 100kΩ 1/10W, J | 2 | R3, R43 |
| | 22kΩ 1/10W, J | 9 | R19, R41, R46, R48, R52, R54, R56, R58, R60 |
| | 47kΩ 1/10W, J | 1 | R25 |
| | 4.7kΩ 1/10W, J | 5 | R10, R12, R23, R30, R31 |
| | 5.1kΩ 1/10W, J | 7 | R40, R45, R51, R53, R55, R57, R59 |
| | 82kΩ 1/10W, J | 10 | R4, R7, R11, R13, R15, R21, R24, R27, R29, R42 |
| Oscillator (Crystal) | 4.0024MHz | 1 | X1 |
| Relay | G8N-1 | 1 | RY1 |
| Relay | G8ND-2 | 1 | RY2 |
| Antenna | | 1 | ANT1 |
| Earth terminal | TM0708-M | 1 | TM1 |
| Connector | 7382-4048(6P) | 1 | CN1 |
| Connector | 7382-6485(24P) | 1 | CN2 |
| Screw | M3×6 | 4 | |
| Printed Writing Board | | 1 | |
| Main housing | | 1 | |
| Cover housing | | 1 | |

Note: The following parts are not mounted on PWB.

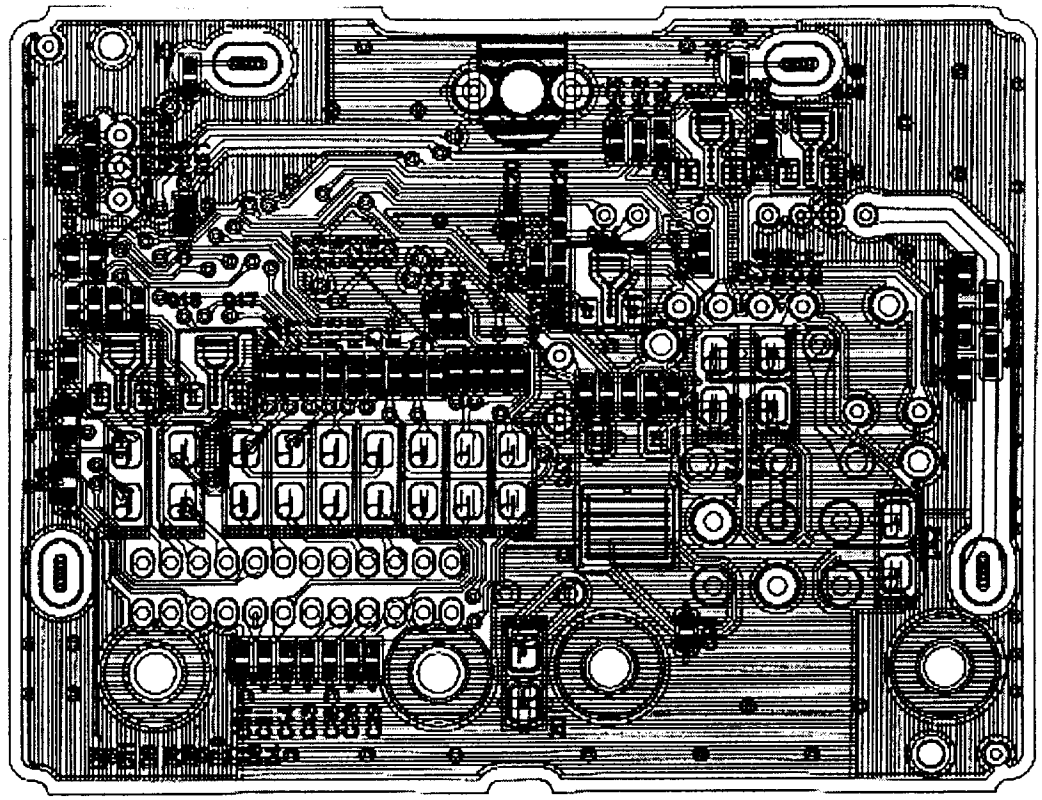
Q43, D7, R6, R9, R16, R17, R18, R22, R28, R32, R33, R49, R50, R100, C15, C28, C50, Z4, Z5, Z6, Z7

PWB pattern

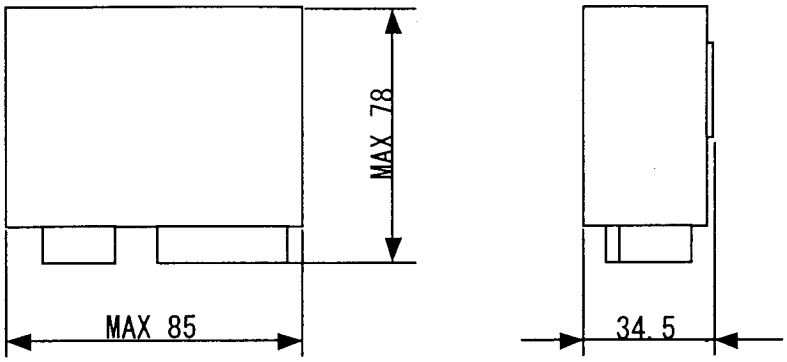
(1) A-side



(2) B-side



4.10 Appearance



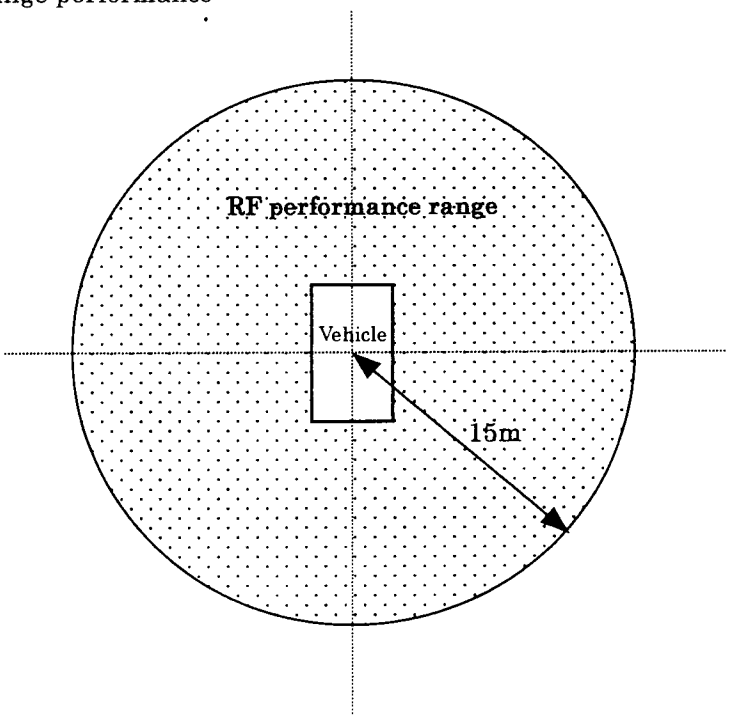
# 5. Keyless Entry System (41817)

## 5-1. About Keyless Entry System

User can control vehicle's door lock (LOCK & UNLOCK) and Trunk opener by only pressing a button of RF transmitter instead of using the vehicle's key.
And also you can control vehicle's alarm, which are Flashing headlamps & Turn indicators and Sounding Horn by pressing a button.

## 5-2. How to Use Keyless Entry System

1. Press the appropriate button on Transmitter which you want to control
< RF Range performance >



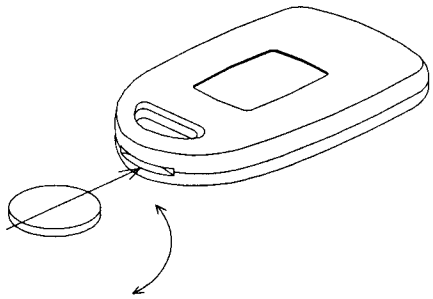

※ RF range performance changes a little by surrounding situation.

2. Remote Control

| | |
|---|---|
| LOCK | When LOCK button is pressed, all doors are locked. |
| UNLOCK | When UNLOCK button is pressed, all doors are unlocked. |
| TRUNK | When TRUNK "🚗" button is pressed, Trunk lid are opened. |
| PANIC | When PANIC "!" button is pressed, Headlamps and Turn indicators will be flashed, and also Horn will be sounded intermittently. |

■ Battery Replacement

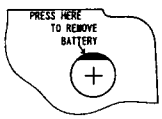
- When operation range goes narrow, or when switch doesn't work, battery may be dead. So please replace battery with new one (:CR2025).
- Replacement Procedure:

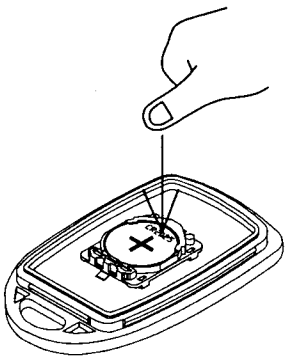


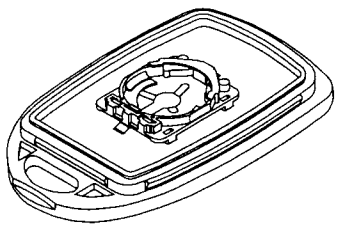
① Insert a coin to the slot, then turn it. The housings will be disassembled.

② Push the battery and remove it.

(How to remove the battery is written on the back of the lower case.)

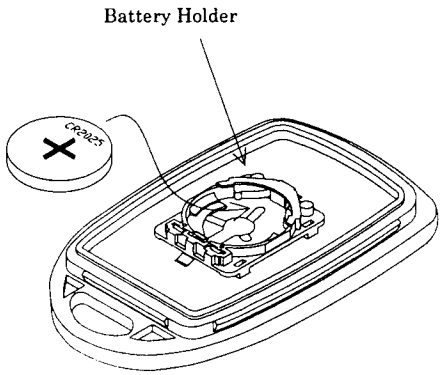




Battery was removed.

③ Put in the new battery.




④ After replacement, reassemble the housings.

■ Caution:

- As Transmitter is precisely designed, handle with care:
  - Don't give Transmitter a strong shock.
  - Don't leave Transmitter under high temperature. (more than 70℃)
  - Don't analyze Transmitter.

■ Notes:

- As Transmitter is designed to conform to radio wave law, do not analyze absolutely. Incorrect reassemble can cause not only wrong action of Transmitter's own but also a violation of radio wave law.
- If your Transmitter has a problem or is lost/stolen, consult an Authorized Mazda Dealer.

## Keyless Entry System

This system locks and unlocks the doors.
It can also help you signal for attention.

| NOTE |
| --- |
| The keyless entry system is designed to operate up to 49 feet (15 meters) from the receiver, but this may vary because of local conditions. |

■ Transmitter

| ⚠ CAUTION |
| --- |
| Pressing the transmitter buttons excessively beyond the range of the system will cause the keyless entry system to malfunction. |

▼ " LOCK " button
To lock all the doors, press the LOCK button.

▼ " UNLOCK " button
To unlock all the doors, press the UNLOCK button.

▼ TRUNK " " button
To open the trunk lid, press the TRUNK button.

▼ PANIC " ! " button
To start alarms (Flash headlamps & Turn indicators, Horn chirp), press the PANIC button.

## Appendix C

# MEASUREMENT PROTOCOL

### GENERAL INFORMATION

**Measurement Uncertainty**

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. These test systems have a measurement uncertainty of ±4.5 dB. The equipment comprising the test systems are calibrated on an annual basis.

**Justification**

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into it's characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

### CONDUCTED EMISSIONS

The final level, expressed in dBµV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit.

To convert between dBµV and µV, the following conversions apply:

dBµV = 20(log µV)
µV = Inverse log(dBµV/20)

### RADIATED EMISSIONS

The final level, expressed in dBµV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBµV) and adding the antenna correction factor and cable loss factor (Factor dB) to it. This result then has the FCC limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets in Attachment B. The amplifier gain is automatically accounted for by using an analyzer offset.

Example:

| FREQ (MHz) | LEVEL (dBuV) | | CABLE (dB) | | ANT/PREAMP (dB) | | FINAL (dBuV/m) | POL | HGT (m) | AZ (deg) | | DELTA1 LIMIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 60.80 | 42.5Qp | + | 1.2 | + | 10.9 | - 25.5 = | 29.1 | V | 1.0 | 0.0 | - | -10.9 |



TÜV PRODUCT SERVICE INC 19333 Wild Mountain Road Taylors Falls MN 55084-1758 Tel: 651 638 0297 Fax: 651 638 0298 Rev.No 1.0

## DETAILS OF TEST PROCEDURES

### General Standard Information

The test methods used comply with ANSI C63.4-1992 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz."

### Conducted Emissions

Conducted emissions on the 60 Hz power interface of the EUT are measured in the frequency range of 450 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection, and a Line Impedance Stabilization Network (LISN), with 50 Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. In some cases, a pre-scan using a spectrum analyzer is initially performed on the units comprising the system under test to locate the highest emissions. If the minimum passing margin appears to be less than 20 dB with a peak mode measurement, the emissions are re-measured using a tuned receiver or spectrum analyzer with quasi-peak and average detection and recorded on the data sheets.

### Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 3140 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth and peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimeters above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. Interface cables that are closer than 40 centimeters to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimeters from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna is positioned 3 meters horizontally from the EUT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarizations and the EUT are rotated 360 degrees. Intentional radiators are rotated through three orthogonal axes to determine the attitude that maximizes the emissions.



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