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1 GENERAL INFORMATION

1.1 Product Description

Vehicle Access Control System, Model VACS2000

Form

EMC Test Plan and Constructional Data Form



PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE.

Applicant -- NOTE: This information will be input into your test report as shown below.
Press the F1 key at any time to get HELP for the current field selected.

Company: HM Electronics
Address: 6675 MESA RIDGE ROAD
SAN DIEGO, CA 92121
Contact: SETH SCHLAM Position: SUSTAINING ENGINEER
Phone: (858) 535-6063 Fax: (858) 535-6019
E-mail Address: SSchlam@hme.com ATTN: SETH

General Equipment Description -- NOTE: This information will be input into your test report as shown below.

EUT Description: Vehicle Access Control SYSTEM
EUT Name: VACS2000
Model No.: K23735 Serial No.: None
Product Options:
Configurations to be tested: (1) NORMAL CONFIGURATION

Test Objective

- | | |
|--|--|
| ☐ EMC Directive 89/336/EEC (EMC) | ☒ FCC: Class ☐ A ☒ B Part <u>15</u> |
| Std: _____ | ☐ VCCI: Class ☐ A ☐ B |
| ☐ Machinery Directive 89/392/EEC (EMC) | ☐ BCIQ: Class ☐ A ☐ B |
| Std: _____ | ☐ Canada: Class ☐ A ☐ B |
| ☐ Medical Device Directive 93/42/EEC (EMC) | ☐ Australia: Class ☐ A ☐ B |
| Std: _____ | ☐ Other: _____ |
| ☐ Vehicle Directive 72/245/EEC (EMC) | |
| Std: _____ | |
| ☐ FDA Reviewers Guidance for Premarket Notification Submissions (EMC) | |

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Form

EMC Test Plan and Constructional Data Form



TÜV Product Service Certification Requested

- ☐ Attestation of Conformity (AoC) ☐ International EMC Mark (IEM)
☐ Certificate of Conformity (CoC) ☒ Compliance Document → *FC C*
Protection Class (N/A for vehicles) ☐ Class I ☐ Class II ☐ Class III
(Press F1 when field is selected to show additional information on Protection Class.)

Attendance

Test will be: ☒ Attended by the customer ☐ Unattended by the customer

Failure - Complete this section if testing will not be attended by the customer.

If a failure occurs, TÜV Product Service should:

- ☐ Call contact listed above, if not available then stop testing. (After hrs phone): _____
☒ Continue testing to complete test series.
☐ Continue testing to define corrective action.
☐ Stop testing.

EUT Specifications and Requirements

Length: 16" Width: 14" Height: 6" Weight: _____

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 115 VAC (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: 1

Current (Amps/phase(max)): 1A Current (Amps/phase(nominal)): 500mA

Other _____

Other Special Requirements

EXTENSION CORDS

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)

ENTRY GATE IN ROAD

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EUT Power Cable

- | | | |
|---|----|--|
| ☒ Permanent | OR | ☐ Removable |
| ☐ Shielded | OR | ☒ Unshielded |
| ☐ Not Applicable | | |

Length (in meters): AS REQUIRED

The VACS2000 uses AC LINE power that is brought into the unit through standard electrical conduit. There is no power cable, as such, that is part of the unit. The power line/power cable is part of the Installation/building wiring.

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Form

EMC Test Plan and Constructional Data Form

TÜV

PRODUCT SERVICE

EUT Interface Ports and Cables

Interface			Shielding						Length (in meters)	Removable	Permanent
Type	Analog Digital	Qty	Yes	No	Type	Termination	Connector Type	Port Termination			
EXAMPLE: RS232	☐ ☒	2	☒	☐	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	☒	☐
RS232	☐ ☒	1	☒	☐	Foil / shielded cable		WECO Connector PART OF S251B READER			☐	☐
	☐ ☐		☐	☐						☐	☐
ANTENNA Connector	☒ ☐		☐	☒	ANTENNA CABLE	TERMINAL BLOCK No S251B	SPADE LUG			☐	☐
	☐ ☐		☐	☐						☐	☐
DC power Input	☒ ☐	1	☐	☒	AC power cable	Terminal Block	spade lug			☐	☐
	☐ ☐		☐	☐						☐	☐
Relay Output OC1, OC2 Open Collector	☒ ☐		☐	☒	WIRE TO RELAYS		WECO Connector PART OF S251B READER			☐	☐
	☐ ☐		☐	☐						☐	☐
	☐ ☐		☐	☐						☐	☐
	☐ ☐		☐	☐						☐	☐
	☐ ☐		☐	☐						☐	☐

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Form

EMC Test Plan and Constructional Data Form



EUT Software. *

Revision Level: HME P/N 685013

Description: GATE SMART operating software for VACS 2000
* Note; the software is loaded on an IBM PC, which is not part of the EUT, but rather is a peripheral component. The PC is connected to the EUT via an RS232 serial communications link

EUT Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. w/ 4' loop antenna

2.

3.

EUT System Components -- List and describe all components which are part of the EUT. For FCC testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc.)

Description	Model #	Serial #	FCC ID #
ENCLOSURE, HME P/N 114003		NONE	NONE
READER, RS232, HME P/N 456083			
LKT BREAKER(3A), HME P/N 182007		NONE	NONE
DIODE, 1N4001 50V, HME P/N 205003		"	"
FAN, 24VDC, HME P/N 230013		"	"
FILTER, LINE 3A, HME P/N 241005		"	"
POWER SUPPLY, 24VDC HME P/N 453005		"	"
RELAY, DPDT, HME P/N 482018		"	"

~~Note: A complete BOM (Bill of materials) for the VACS2000 Reader (the EUT) is attached. The major components are listed in the above table~~

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Form

EMC Test Plan and Constructional Data Form



Critical EMI Components (Capacitors, ferrites, etc.)

Description	Manufacturer	Part # or Value	Qty	Component # / Location
1) EMI LINE FILTER	CII CORCOM	3EP1	1	IMMEDIATELY FOLLOWING AC LINE CIRCUIT BREAKER
2) FERRITE BEAD		HMEPN 106010	1	OUTPUT LINE FROM 24VDC POWER SUPPLY

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

(PLEASE INSERT "ELECTRONIC SIGNATURE" BELOW IF POSSIBLE)

Authorization Signatures

Seth Schlam

Customer authorization to perform tests
according to this test plan.

Date

Seth Schlam

Test Plan/CDF Prepared By (please print)

Date

Reviewed by TÜV Product Service Associate

Date

Tests were performed NOV 2000
Additional Info per TÜV Request JAN 2001
LS

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1.2 Related Submittal/Grant

None

1.3 Tested System Details

The FCC IDs for all equipment, plus descriptions of all cables used in the tested system are:

None

1.4 Test Methodology

Purpose of Test: To demonstrate compliance with the ANSI C63.4 setup.

Test Performed: x 1. Conducted Emissions, FCC Part 15.207
 2. Radiated Emissions, EN55022: 1992 Class B limit, 30 - 1,000 MHz, 10 meters
 x 3. Radiated Emission per FCC Part 15.209
 4. Engineering evaluations

1.5 Test Facility

The open area test site and conducted measurement data were tested by:

TÜV PRODUCT SERVICE
10040 Mesa Rim Road
San Diego, CA 92121-2912
Phone: 619 546 3999
Fax: 619 546 0364

The Test Site Data and performance comply with ANSI 63.4 and are registered with the FCC, 7435 Oakland Mills Rd, Columbia Maryland 21046. All Measurement Data is acquired according to the content of FCC Measurement Procedure and ANSI C63.4, unless supplemented with additional requirements as noted in the test report.

1.6 Part 2 Requirements

Direct sequence spread spectrum transmitters under Part 15 - not applicable.
Frequency hopping transmitters under Part 15 - not applicable.
Certification of scanning receivers - not applicable.
Certification of transmitters operating within the 59 to 64 GHz band - not applicable.

2. SYSTEM TEST CONFIGURATION

2.1 Justification

The was initially tested for FCC emission in the following configuration:

See Block Diagram.

2.2 EUT Exercise Software

None

2.3 Special Accessories

None

2.4 Modification

None

2.5 Configuration of Tested System

See Block Diagram.

3 CONDUCTED MEASUREMENT TEST EQUIPMENT

Emissions Test Conditions: CONDUCTED EMISSIONS

The *EQUIVALENT CONDUCTED EMISSIONS* measurements were performed in the following test location :

☐ - Test not applicable

SR-3, Shielded Room, 12' x 20' x 8', Metal Chamber

Test Equipment Used :

Model Number	Prop. No.	Description	Manufacturer	Serial No.	Cal Date
9252-50-R-24-BNC	457	LISN, 50 μ H /250 μ H/50 Ω /0.25 μ F	Solar Electronics Co.	941720	05/01
ESHS 30	459	EMI Test Receiver	Rohde & Schwarz	832354/004	11/01
CAT-20	616	20 dB Attenuator	Mini-Circuits	--	*

Remarks: (*) Verified internally.

4 CONDUCTED EMISSION DATA

HME ELECTRONICS

See following page(s).

TUV Product Service, San Diego
POWERLINE CONDUCTED EMISSIONS

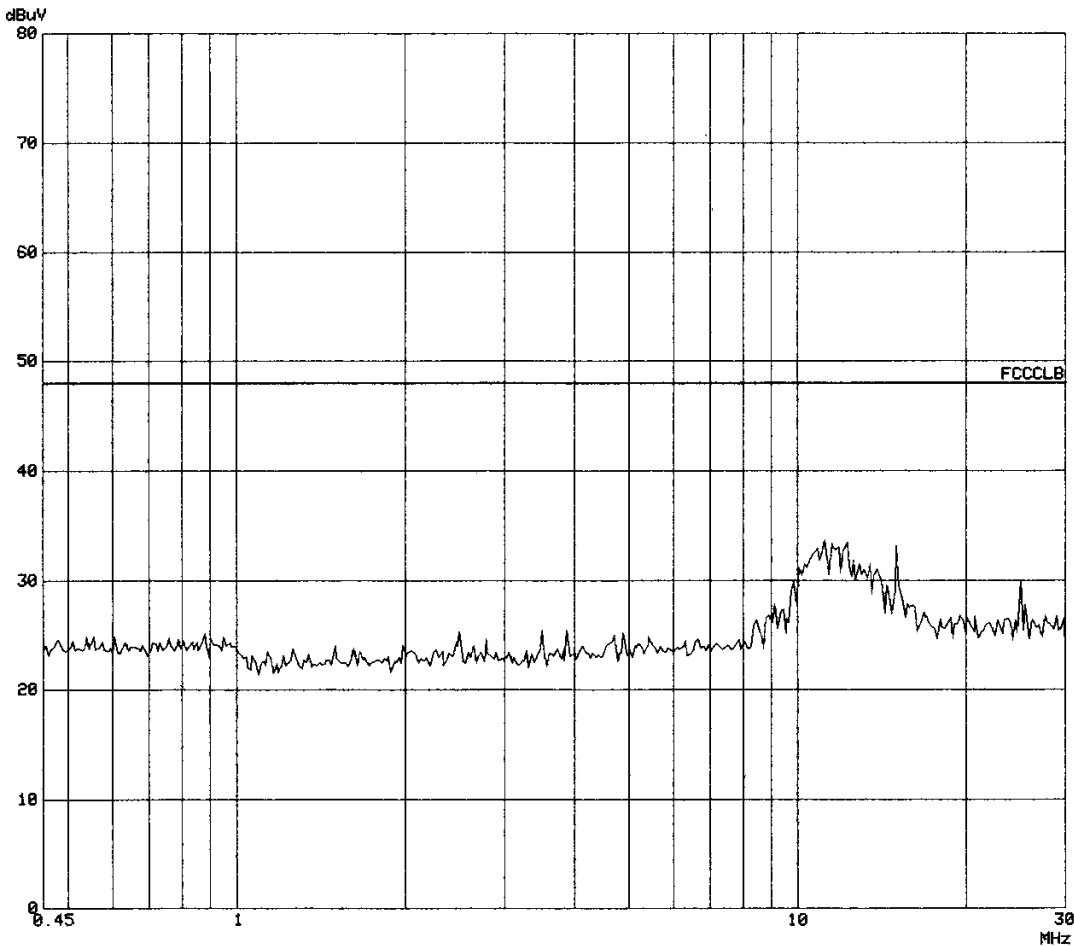
EUT: VACS 2000
 Manuf: HM Electronics
 Op Cond: 18 uH load / transmit at 134.5 kHz
 Operator: Jim Owen
 Test Spec: FCC 15.207
 Comment: 115 Vac 60 Hz Line 2add torroid on dc line to transceiver
 S0466
 Date: 07. Nov 00 11:17

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	1M	5k	10k	PK	100ms	AUTO	LN OFF	60dB
1M	30M	5k	10k	PK	2ms	AUTO	LN OFF	60dB

Transducer No.	Start	Stop	Name
1	10k	30M	20dBLISN

Final Measurement: x QP
 Meas Time: 1 s
 Subranges: 25
 Acc Margin: 10dB



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**TUV Product Service, San Diego
POWERLINE CONDUCTED EMISSIONS**

EUT: VACS 2000
Manuf: HM Electronics
Op Cond: 18 uH load / transmit at 134.5 kHz
Operator: Jim Owen
Test Spec: FCC 15.207
Comment: 115 Vac 60 Hz Line 2add torroid on dc line to transceiver
S0466
Date: 07. Nov 00 11:17

Final Measurement Results:

no Results

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TUV Product Service, San Diego
POWERLINE CONDUCTED EMISSIONS

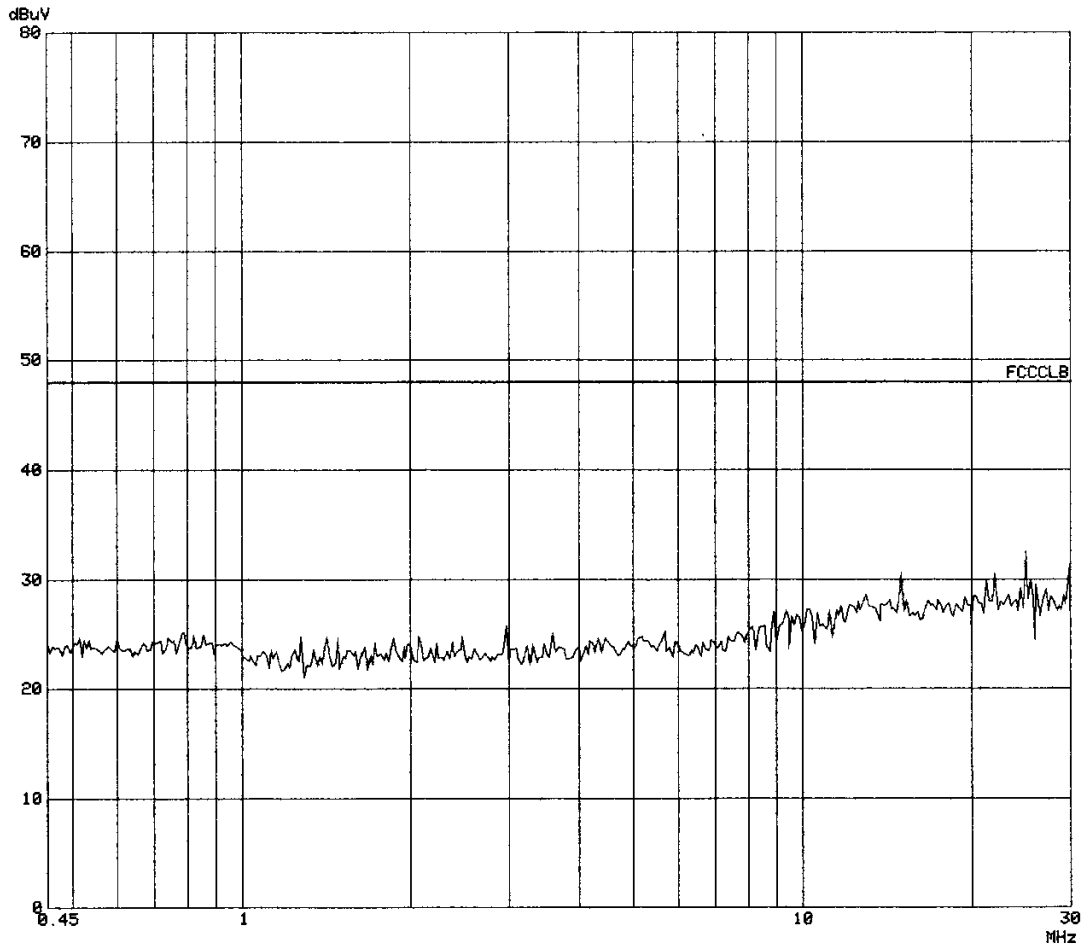
EUT: VACS 2000
 Manuf: HM Electronics
 Op Cond: 18 uH load / transmit at 134.5 kHz
 Operator: Jim Owen *950*
 Test Spec: FCC 15.207
 Comment: 115 Vac 60 Hz Line ladd torroid on dc line to transceiver
 S0466
 Date: 07. Nov 00 11:11

Scan Settings (2 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
450k	1M	5k	10k	PK	100ms	AUTO	LN OFF	60dB
1M	30M	5k	10k	PK	2ms	AUTO	LN OFF	60dB

Transducer No.	Start	Stop	Name
1	10k	30M	20dBLISN

Final Measurement: x QP
 Meas Time: 1 s
 Subranges: 25
 Acc Margin: 10dB



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**TUV Product Service, San Diego
POWERLINE CONDUCTED EMISSIONS**

EUT: VACS 2000
Manuf: HM Electronics
Op Cond: 18 uH load / transmit at 134.5 kHz
Operator: Jim Owen
Test Spec: FCC 15.207 *Joe*
Comment: 115 Vac 60 Hz Line ladd torroid on dc line to transceiver
S0466
Date: 07. Nov 00 11:11

Final Measurement Results:

no Results

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5 RADIATED MEASUREMENT EQUIPMENT LIST

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *EQUIVALENT RADIATED EMISSIONS* measurements were performed at the following test location :

☐ - Test not applicable

Test Site:

Canyon Site Parking Lot, Carroll Canyon, San Diego

Test Equipment Used :

Model No.	Property No.	Description	Manufacturer	Serial Number	Cal Date
ESHS 30	459	EMI Test Receiver	Rohde & Schwarz	832354/004	11/01
HFH2-Z2	208	Loop Antenna	Rohde & Schwarz	880	*

Remarks: (*) Verified prior to use.

6 RADIATED EMISSION DATA

The following data lists the significant emission frequencies, measured levels, correction factor (which includes cable and antenna corrections), the corrected reading, and the limit.

See following page(s).

REPORT NO: 50466 DATE: 11-7-00
TEST: Radiated Emissions - FCC Part 15.209
CUSTOMER: HM Electronics
EUT: VACS 2000 w/ 4 ft. loop ant. at max. xmt level
SPECIFICATION: FCC Part 15.209

[illegible]

NOTES:

1. RBW = _____; VBW = _____
2. Receive antenna = R4S Loop Ant
3. Amplifier
4. 200 Hz BW 9 kHz $\rightarrow$ 150 kHz; 10 kHz BW 150 kHz $\rightarrow$ 30 MHz

Avg Detector

92C

20

[illegible]

Avg Detector

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6.1 Field Strength Calculation

If a preamplifier was used during the Radiated Emission Testing, it is required that the amplifier gain must be subtracted from the Spectrum Analyzer (Meter) Reading. In addition, a correction factor for the antenna, cable used and a distance factor, if any, must be applied to the Meter Reading before a true field strength reading can be obtained. In the automatic measurement, these considerations are automatically presented as a part of the print out. In the case of manual measurements and for greater efficiency and convenience, instead of using these correlation factors for each meter reading, the specification limit was modified to reflect these correlation factors at each frequency value so that the meter readings can be compared directly to the modified specification limit. This modified specification limit is referred to as the "Corrected Meter Reading Limit" or simply the CMRL, which is the actual field strength present at the antenna. The quantity can be derived in the following manner:

$$\text{Corrected Meter Reading Limit (CMRL)} = \text{SAR} + \text{AF} + \text{CL} - \text{AG} - \text{DC}$$

Where, SAR = Spectrum Analyzer Reading

AF = Antenna Factor

CL = Cable Loss

AG = Amplifier Gain (if any)

DC = Distance Correction (if any)

Assume the following situation: A meter reading of 29.4 dBuV was obtained from a Class A computing device measured at 83 MHz. Assume an antenna factor of 9.2 dB, a cable loss of 1.4 dB and amplifier gain of 20.0 dB at 83 MHz. The final field strength would be determined as follows:

$$\text{CMRL} = 29.4 \text{ dBuV} + 9.2 \text{ dB} - 1.4 \text{ dB} - 20 \text{ dB/M} - 0.0 \text{ dB}$$

$$\text{CMRL} = 20.0 \text{ dBuV/M}$$

This result is well below the FCC and CSA Class A limit of 29.5 dbuV/m at 83 MHz.

For the manual mode of measurement, a table of corrected meter reading limit was used to permit immediate comparison of the meter reading to determine if the measure emission amplitude exceeded the specification limit at that specific frequency.

7 SUMMARY:

All tests according to *CFR 47, Part 15, Paragraphs 15.207 and 15.209* were

■ - Performed

The Equipment Under Test

■ - **Fulfills** the general requirements of *CFR 47, Part 15, Paragraphs 15.207 and 15.209*.

- TÜV PRODUCT SERVICE, INC. -

Responsible Engineer:



Jim Owen
(EMC Engineer)