Functional description

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Document name:	**Functional Description – Homologation Board**
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Table of changes

Version	Date	Responsible	Description/Changes
draft	24.05.07	Uratnik	First draft version
1.0	09.01.08	Reinstein	Dokument based on homologation specification for Honda Smart ECU MY08 (Accord).

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Table of Abbreviations

SKE	Smart Keyless Entry
RKE	Remote Key Entry
PASE	Passive Start and Entry
PATS	Passive Anti Theft System
PEPS	Passive Entry Passive Start
PK	Passive Key
RSSI	Radio Signal Strenght Indication
HWSUR	Hardware Step up Regulator

1 General functional description

The Smart ECU system is equipment which enables comfortable operation of the vehicle. To be able to operate the vehicle the driver only has to take the key with him. The vehicle communicates with the key inductively via ferrite- antennas which are located in the front door handles and in the trunk outside for external access and interior antennas (front, rear and trunk inside). These ferrite antennas are driven by inductance with a frequency of 125 kHz. By damping the body sheet-metal of the car, the system's range is kept in defined limits. This enables the locating of the key. The door handles and the trunk lid have been equipped with contacts for the functions "locking" and "unlocking" the vehicle. Woken up by pulling a door handle the Smart ECU sends a challenge 125 kHz via the corresponding inductive door handle antenna to the key. The data transmitted in the process activate the key. The key sends a code to the radio receiver on the control unit via radio frequency transmission. If it is intended to start the engine of a vehicle, it requires start actuation of a key. The interior inductive antennas are activated in a defined manner to ensure that the key is inside the vehicle. If the valid start code is sent by the key, the engine will start. If the code is invalid, the engine will not start.

1.1 System Description

The Smart ECU system consists of a control unit, the inductive antennas and the key. To activate the system, sensors or capacitive-buttons are located in the door handles, in the trunk lid and in the interior (Rotary switch, Start Stop Button or what ever is used). Interaction with the vehicle is effected via the RF receiver, which receives the messages from the key and transmits them via K-Line to Smart ECU unit.

1.2 List of variants and numbering for the HONDA SMART SYSTEM MY09 (ACURA)
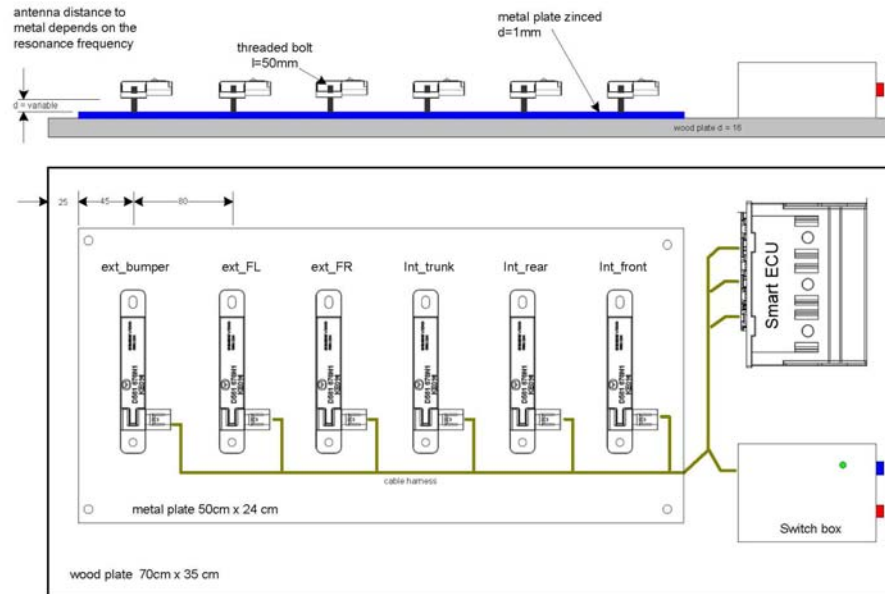
5WK47837 Smart ECU Acura TL for US use
        TK4A US (v07)
5WK49686 Smart ECU Acura TL for CHN use
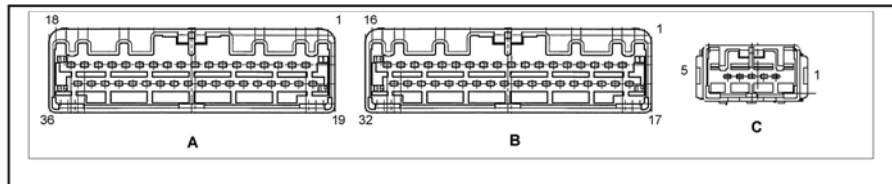   TK4A CHN (v08)

5WK4 3100 LF antennas

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1.4 Blockdiagram Homologation Board

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1.5 Connector and wiring of Smart ECU

Cavity	PIN	Name	Pin function	used in v07/v08
B	1	SLOT_SW_HALF	Signal	X
B	2	RF_GND1	Signal	X
B	3	KEY_SW	Signal	
B	4	SLOT_SW_LOCK	Signal	
B	5	START_STOP_SW_2-	Signal	X
B	6	SCS	Signal	X
B	7	ACC	Signal	X
B	8	CAN_H_Single	CAN	
B	9	B_CAN_H	CAN	X
B	10	B_CAN_L	CAN	X
B	11	IGN_TRX	Signal	X
B	12	VOUT_RF1	Signal	X
B	13	K_LINE	Signal	X
B	14	RFDATA1	Signal	X
B	15	+B_Smart	Power	
B	16	+B_Backup	Power	X
B	17	LG2	Power	X
B	18	RF_GND2	Signal	X
B	19	SG_(Shield_GND)	Signal	
B	20	unused		
B	21	TS_TG	Signal	X
B	22	SLOT_SW_FULL	Signal	X
B	23	DL_FRDR	Signal	X
B	24	TS_FRDR	Signal	X
B	25	H_BRAKE_SW	Signal	X
B	26	DL_FRAS	Signal	X
B	27	TS_FRAS	Signal	X
B	28	S-NET	Signal	X
B	29	VOUT_RF2	Signal	X
B	30	ELEKEY_SW	Signal	X
B	31	RFDATA2	Signal	X
B	32	IG1	Power	X
A	1	SOL+	Power	
A	2	TS_RRDR	Signal	
A	3	DL_TG	Signal	
A	4	EXT_F+	Antenna	X
A	5	EXT_F-	Antenna	X
A	6	EXT_R+	Antenna	X
A	7	EXT_R-	Antenna	X
A	8	DL_RRAS	Signal	
A	9	KEYOUT	Signal	
A	10	VOUT_HALL	Signal	X
A	11	BUZZ	Signal	X
A	12	EXT_SLOT+	Antenna	
A	13	EXT_M+_TI+	Antenna	X
A	14	EXT_RRDR+	Antenna	
A	15	EXT_FRDR+	Antenna	X
A	16	EXT_RRAS+	Antenna	
A	17	EXT_FRAS+	Antenna	X
A	18	EXT_TR+	Antenna	X

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A	19	LG1	Power	X
A	20	SOL-	Power	
A	21	TS_RRAS	Signal	
A	22	SLOT_SW_FULL2	Signal	X
A	23	VOUT_FRDR	Signal	X
A	24	VOUT_RRDR	Signal	
A	25	VOUT_TG	Signal	
A	26	VOUT_FRAS	Signal	X
A	27	DL_RRDR	Signal	
A	28	MTRCONT	Signal	X
A	29	IGNCONT	Signal	
A	30	SLOT-	Signal	
A	31	EXT_M+_TI-	Antenna	X
A	32	EXT_RRDR-	Antenna	
A	33	EXT_FRDR-	Antenna	X
A	34	EXT_RRAS-	Antenna	
A	35	EXT_FRAS-	Antenna	X
A	36	EXT_TR-	Antenna	X
C	1	Start_Stop_SW_1+	Signal	X
C	2	ESL_SW_B	Signal	X
C	3	SMARTOUT	Signal	
C	4	METEROUT	Signal	
C	5	VOUT_RRAS	Signal	

Use twisted pair for all antenna connections. 2 x 0,35mm²

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1.6 Functional description of Homologation Board

The Homologation board is performed to activate either internal or external antennas by the SMART ECU. The board must be connected via the red and blue banana jacks to any power supply or battery (normal operating voltage is Vbat = 12V ± 0.2 V). After battery voltage is applied to the board, the test setup can be switched on via main switch to ON state (red LED is ON). The internal antennas (F, R and M) can be acitvated via switching to Internal position, external antennas (FRDR, FRAS, TR) activation accordingly to External position.

The FobSlot is mounted close to the steering wheel of the vehicle. When a fob is inserted into the Fobslot the communication with the Fob is done with an antenna inside of the FobSlot. The LF field overrange at the front of the FobSlot is less than 10cm and therefore the magnetic field is much weaker than when sending via the six other antennas (ext_bumper, ext_FL, ext_FR, int_trunk, int_rear or int_front). Thererfore the FobSlot is not part of the setup.

The homologation test will be done with 5WK47837, Smart ECU Acura TL for US use (v07)

2 Technical description

Carrier frequency: 125kHz ± 5kHz
Field strength: <42 dµA/m in 10 m
Modulation: ASK
Supply voltage: 13.5 V
Type of battery: car battery
Range: < 2.0 m

2.1 Averaging factor

The period length T Period is 600ms. The data length T_o is 35ms manchester coded, due to this the averaging factor [1] in this case is – 9.12dB.

1) Averaging factor = $20 * LOG(10) * (T_{on}/100ms)$

3 Functional description of the measurement system

The test setup comprises the following components:
- Smart ECU Control unit
- 6 induktive ferrite antennas
- Board for radio homologation measurements (including Wiring harness)
- Key (normal Mode) to verify the function (if attached/required)
- Test box

3.1 Functional description of the measurement system

The entire setup is supplied with power via the two banana jacks on the test box:
Banana jack, red : +12V DC
Banana jack, blue : GND (ground)
The current input (in case of operation) is
min 0,3A/ max 0,8A av. (min 1,5App/max 8App)
"Main" switch:
"Main" switch on: control unit is powered and the red LED is lighting
"Main" switch off: control module is unpowered
Switches "External" and "Internal"
"External" on, "Internal" off: selects functional test and test of emission of external antenna
"External" off, "Internal" on: selects test of emission of internal antenna
"External" off, "Internal" off: no mode selected
"External" on, "Internal" on: no operation is possible when both switches are turned on

3.2 Test of emission of the exterior antenna

1. Select "main" switch on
2. Red LED is lighting
3. Turn the switch to "External"
4. The control module sends typically every 600ms an inductive telegram via the exterior antenna
5. Measure the emission
6. After the test switch the switch "External" and the main switch off.

3.3 Test of emission of the interior antennas

1. Select "main" switch on
2. Red LED is lighting
3. Switch the switch to "Internal"
4. The control module sends every 600ms an inductive telegram via the interior antenna
5. Measure the emission
6. After the test switch the switch "Internal" and the "main" switch off.

Label Canada, USA:

Siemens VDO
5WK47837

FCC ID: KR55WK47837
IC:267T-5WK47837

Owner Manual Canada:

Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interferenc e received, including interference that may cause undesired operation.

Owner Manual USA:

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, an d (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equ ipment.