PEPS System in Application of the Automotive

tutongfei

Research scholar in Department of Automotive engineering major Shanghai University of Engineering Science

Abstract:

Keyless Entry and Passive Start System is the automotive development tendency. The author designed the system structure and control strategy, applied to a new self-developed passenger car; Analyzed the principium of PEPS and System frame. Chiefly introduced the main function and application by giving an example.

Keywords-*intelligent-keyless Entry; Engine Start System;*

I. INTRODUCTION

With the progress of digital technology, cars began to become electronic, multi-media and intelligent. In the direction of development, more and more electronic technology is applied to the automotive system. The level of the electric in a car is an important indicator of the development of new models and improvements. The most important technical measures for vehicle performance. In many new car electronic equipment, intelligence key-The ability to enter and boot the system is very eye-catching and the remote control enters the system. The replacement of keyless access system has become an inevitable trend.

II. KEYLESS ACCESS AND ONE-BUTTON START SYSTEM PRINCIPLE

Passive keyless enter system pass low and high frequencies between the vehicle and the key Signal communication is used for user identification by triggering the sensor switch on the door handle, controller Send a low frequency inquiry signal to verify the smart key that the driver is carrying. Intelligent key joint Send an RF(315/433 MHz) feedback to the control after receiving the inquiry signal Device. Once the match is legal, it will be automatically unlocked. When the owner enters the car, step on the brake pedal and press the start switch, the controller will be sent Send low frequency (125

MHz) to ask the signal to verify the smart key that the driver is carrying. Smart key The key receives the query signal and sends an RF (433 MHz or 315 MHz) information backwards Feed to the controller, the controller validates the intelligent key position and the engine information, verify Perform the boot operation after work. The car owner does not need to take out the key.If the owners go When entering the auto signal receiving range, the owner needs to touch the induction switch on the door handle, door Unlocking, unlocking. This induction switch generally has the main auxiliary driving door, if not driving The car lock will not open automatically. The owner left the car In a state of theft. Only when the sensing switch is activated, the lock is unlocked. It's keyless access, meaning that the car owner does not need to unlock the door with the remote control like a traditional model Liberate your hands. The work scope and system architecture of the smart key is shown in figure 1

Figure1 Work Scope and System Architecture of the Smart Key

III. KEYLESS ENTRY AND ONE-BUTTON START S-YSTEM

Keyless access and one-button starter system are usually controlled by remote control keys (RKE), without keys Enter and start (PEPS), electronic steering lock (ESCL), anti-theft coil (IMMO), inception The Switch and Antenna, inductive Switch
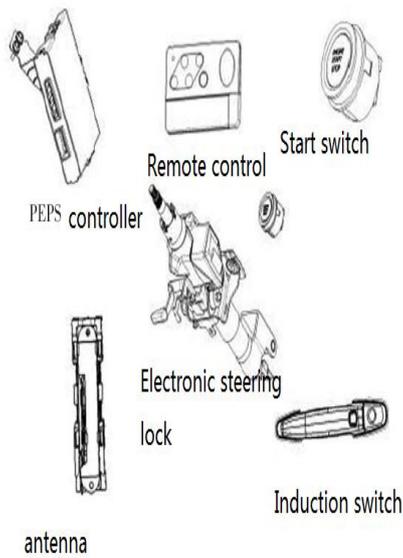
and other components are made, as shown in figure 2.

Figure2 Keyless Entry and Button Start System

The whole system usually adopts CAN bus and BCM, ECM, instrument, door lock mechanism And ESCL communication, save wiring, reduce cost.(some models use the LIN line communication)

IV. SYSTEM SCHEMATIC DIAGRAM

The diagram shows the schematic diagram of the PEPS system of an autonomous vehicle, which adopts the LIN line Communications. The whole PEPS system takes control unit (PEPS controller), smart key and BCM is the core component. The PEPS controller is responsible for identifying the smart key (remote controller), right The legality of smart key is judged, and BCM receives from the LIN line from PEPS control Related operation instructions of the device to complete the control of the door lock and window/skylight. PEPS controller and BCM joint control electronic steering lock (ESCL), PEPS control The power supply time for ESCL is only in the execution of ESCL solution blocking actions and the need for ES-In the case of CL, the PEPS controller only supplies the ESCL and other time is not available The electricity. ON the ON file, the ESCL is forbidden to be charged, and through the LIN bus and ESCL Communication, complete lock/unlock operation.BCM is responsible for controlling the ground connection of ESCL Communication, complete lock/unlock operation.BCM is responsible

for the control of the ESCL ground wire connecting ESCL power and the ground wire is also controlled by IGN1, when the dielectric state is ON The ESCL is not allowed to connect the power, and the ESCL and ON file are mutually exclusive to the hardware circuit. PEPS controller integrates power distribution circuit, LF antenna drive circuit, IMMO certification Circuit, RF receiving circuit, LIN bus circuit and other hard line input/output circuits. The system principle frame is shown in figure 3
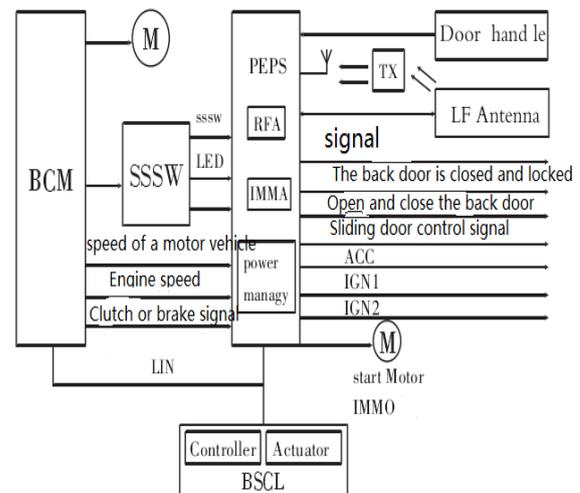
FIG. 3 Stem Principle Framework

V. MAIN FUNCTIONS AND CORRESPONDING SPECIFICATIONS OF THE SYSTEM

A. The Defense is the Lock

Conditions: ACC OFF, IGN OFF and four trunk are closed (BCM only)The status of the test.Trigger and processing:

(1) PEPS wake up BCM;

(2) PEPS send a set of instructions: in ACC OFF, IGN OFF and four backup When the box has been closed, BCM receives the PEPS directive. A first receives the hardness The line fortification instruction is immediately set up and feedback to PEPS; Then receive the fortification The LIN message is ignored. B receives the fortification when the hard line is not received The LIN message is immediately set up and feedback is given to PEPS, then the hard line is received Instructions are ignored.(if PEPS receives the defensive feedback, it does not send the

fortification To make. Otherwise send it again until three times.

B. *Dissolving or Opening Locks*

Conditions: ACC OFF, IGN OFF (only in the condition of BCM detection).

Trigger and processing:

(1) PEPS wake up BCM;

(2) PEPS delivery of the antiphatic orders: under the ACC OFF, IGN OFF state, BCM receives PEPS solution instruction. A first receives the hard line solution instruction, then immediately To resolve and feedback the message to PEPS; Then you receive ananti-lin message and ignore it. bIf you receive an anti-lin message when you do not receive an instruction to the hard line, you will immediately set up a defense. And feed back the message to PEPS, then receive the hard line to solve the instruction, then ignore.(if PEPS receives the feedback of the solution and nolonger sends out the instructions. Otherwise send it again, straight To send 3 times.)Unlocking operation flow Closed operation procedure.
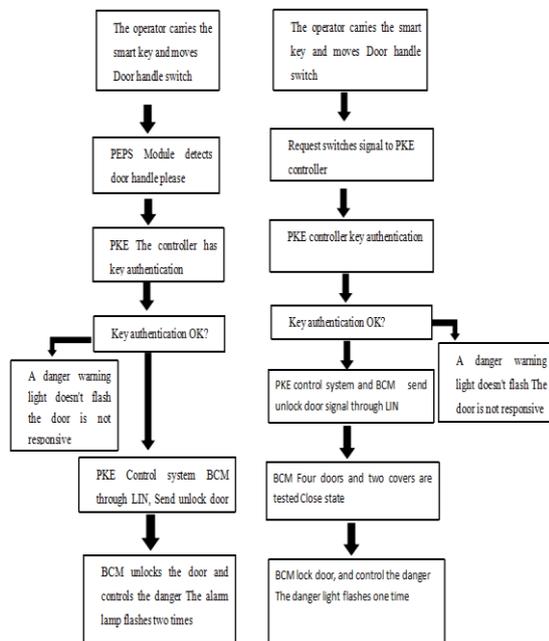
A) unlock the operation flow

B) the closed operation process

Figure 4 Unlock Operation Flow

C. *ECSL is Locked up to Enable Power*

Upper lock: ACC OFF and IGN OFF, door lock is locked PEPS send status and BCM detection status. When the fire is out, such as the ignition switch In the ON file, the ESCL is unlocked. When the ignition is OFF, the ignition switch is OFF. If you press the lock button or the door handle button on the remote control, the ESCL is locked.

Table1 PEP Swith ESCL the Signal List

Signal name	Signal length	Init value	PEPS	ESCL	FUNCTION CODE	Value description
PEPS_ESCL _LOCK/UN-LOCK_Enable	1	n.a	T	R	X	00= ESCL Lock your solution The lock ceases to power
						01= ESCL The electricity stopped
	1	n.a	T	R	X	10= ESCL Unlock the power to enable

Trigger and processing:

(1) PEPS wake up BCM;

(2) ignition lock to OFF file, PEPS to send ESCL to ESCL, At the same time, the power can be sent to the BCM to solve the high level signal, BCM detection door lock Whether to lock the car state (only through LIN).BCM makes state judgment: if The state of PEPS sending is consistent with the state of BCM detection, and PEPS hard wire is given to ESCL Output low edge drive; At the same time, BCM low side drive ESCL lock tongue motor relay, feedback I'm going to pay PEPS. When the ESCL is locked up, the reverse feed latch is given to PEPS.PEPS sends LIN message to BCM to stop power.BCM stops the power feedback The LIN message to PEPS.(if the output is low edge drive 5 seconds (tentative), no PEPS is received Stop the power dissipation, and then stop the power after 5 seconds) like the shape of the fruit PEPS The status of the BCM detection is inconsistent and no action is performed.(if PEPS receives it In response to feedback, the cable is no longer sent; Otherwise, send it again until you send 3So far.

Table 2 The List of Signals Between BCM and ESCL

Signal name	Value description
BCM_ESCL_LOCK_State	1 = Upper lock (BCM has been charged to ESCL) 0 = Locking (BCM has been stopped on ES- CL)

 3) when the ignition switch is ON, the ESCL is unlocked; When the ignition is OFF, the ignition switch is OFF and the side presses the lock key or door knob on the remote control, and ESCL is locked.

D. ECSL Unlocking the Power Enabling Conditions:

ACC ON and IGN ON (according to the status bit of PEPS and BCM bit detected).

Table 3 PEPS and ESCL Signal Lists

Signal name	Signal length	Init value	PEPS	ESCL	FUNCTION CODE	Value description
PEPS_ESCL_LOCK/UN-LOCK_Enable	1	n.a	T	R	X	00= ESCL Lock unlocked to stop power to power 01= ESCL Lock up the electricity to enable
	1	n.a	T	R	X	10= ESCL Unlock the power to enable

Trigger and processing:

(1) PEPS wake up BCM;

(2) ignition lock hits IGN ON file, PEPS sends ESCL to unlock instructions to ESCL, while sending power to BCM (transmitted only through LIN), BCM for state judgment. If the state of PEPS is consistent with the state of BCM detection, the output of ESCL is low Edge drive; And feedback the LIN message to PEPS. After the ESCL is unlocked, feedback to PEPS,PEPS sends LIN message to BCM Stop the electricity.BCM stops the power and feedback LIN message to PEPS.(if the output low side drivers is not received within 5 seconds (tentative) PEPS stop on electricity, then stop after 5 seconds to electricity) if PEPS sent do not match the state with BCM detection, it does not perform any action.(if PEPS receives feedback, it will

no longer send unlocking instructions; Otherwise send it again until three times.

Table 4 the List of Signals Between BCM and ESCL

Signal name	Value description
BCM_ESCL_LOCK_State	1 = Upper lock (BCM has been charged toESCL) 0 = Locking (BCM has been stopped on ES- CL)

E. The Back Door Opens

Under the state of fortification, the back door is also locked:

(1) without the back door opening instruction, open the back door, BCM trigger the alarm, and Feedback the LIN message to PEPS.

(2) PEPS awaken BCM;BCM receives the back door to open the instruction and opens the back The BCM does not trigger the alarm, but the current state of the feedback car gives PEPS solution. Before and after the fortification, the back door has not been locked (closed only), in Open the back door when the back door is open, and BCM does not trigger the alarm.

Table 5 BCM Alarm Signal List

Signal name	Signal length	Value description
BCM_Alarm_State	1	00 =unwarning 01 =Security state 10 =Alarm status

Arousal and sleep

Wake up: send wakeup instruction from the main node. Sleep: the main node sends a sleep instruction or a node over 4 + or 10% s

The activity goes into sleep mode.

F. Passive Lock and Unlock

Condition: check the four state (unrelated to the back door).Passive locking: in the case of four

closed doors, BCM receives the PEPS passive lock instruction, and the four locks are locked, and the BCM feedback is locked. If the passive lock is successful and then the passive lock instruction is received, the lock action is no longer performed, and the feedback is locked. Any door is open and BCM receives the PEPS passive lock instruction, then the four locks are first locked and the four unlocked.BCM feedback is not locked, and if PEPS receives feedback, it will no longer send passive locking instructions (even if BCM feedback is not locked, because only)The door state changes only to successfully lock, otherwise lock and unlock again.Otherwise, it will be sent again until three times.(PEPS is transmitted only through the LIN message, otherwise the hard line will be confused with the fortifications.) the passive locking is triggered by the induction switch on the door handle Low frequency induction to close the lock. Passive unlocking: in the condition of the four locks, BCM receives the PEPS passive unlock instruction, then the four unlock and the BCM feedback has been unlocked. If the passive unlocking is successful, then the passive unlock command is received, the unlock action is no longer performed, and the feedback has been unlocked.(e.g.If PEPS receives feedback, it will no longer send passive unlock instructions. Otherwise send it again until three times. Unlock the door by unlocking the induction switch and low frequency induction on the door handle.

G. The Other

The PEPS system can be used to alert users when remote keys are forgotten inside the car while the sound light (this feature is implemented by the body controller).Monitor whether the battery voltage is close to the end of life, timely remind users to do battery replacement. Each car can be equipped with up to five launchers (the remote control).

REFERENCES

[1]   Toyota motor control system maintenance manual [M] champion. Beijing: machinery industry press, 2002.

[2]   new car anti-theft system overhaul, remote control setting and maintenance zeros manual (second edition) Chen yu-bin. Beijing: mechanical industry press, 2011.

[3]   automotive electronics and electronics. Sun ren yun. Beijing: mechanical industry press, 2011.