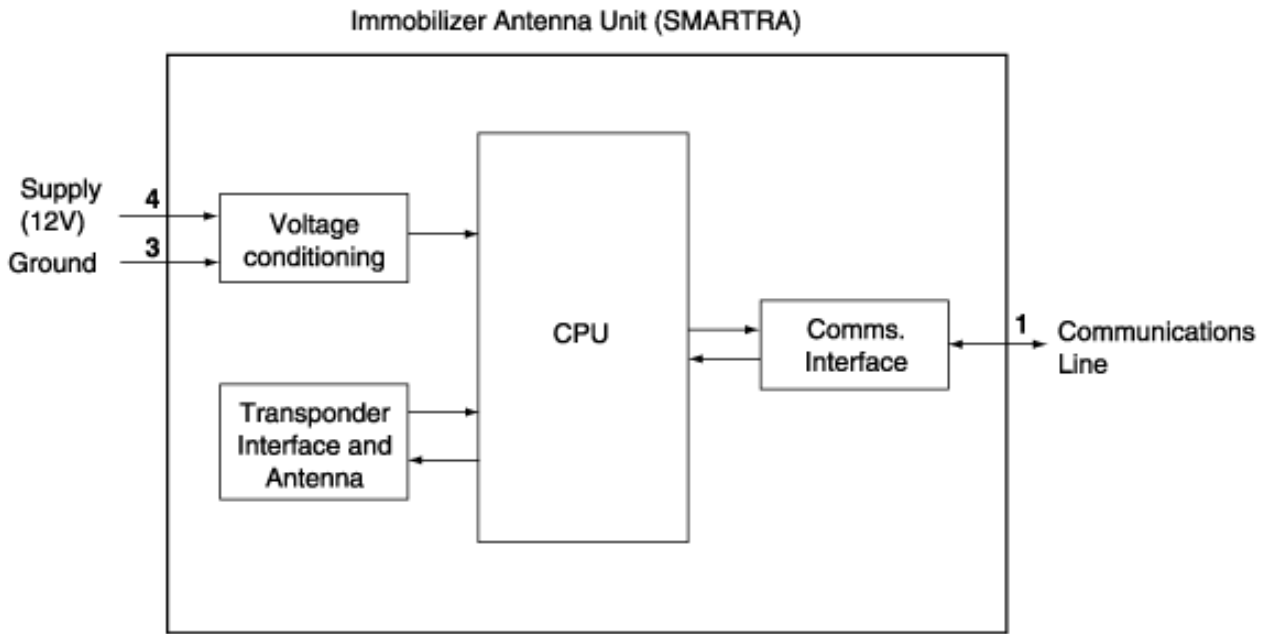


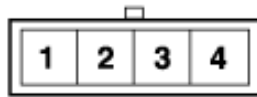


## DESCRIPTION

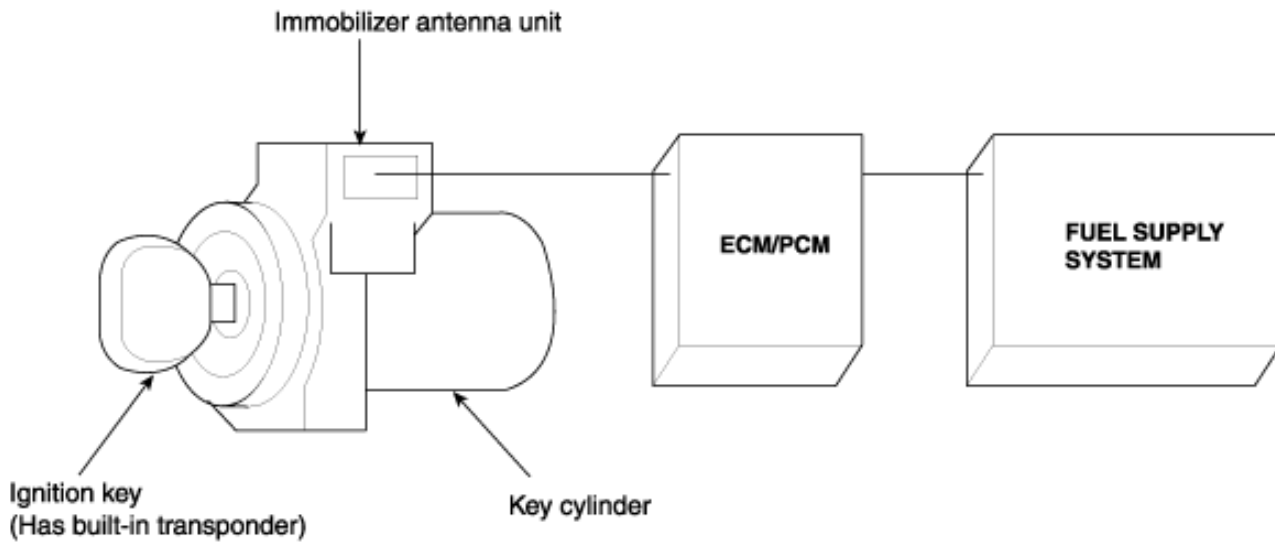
## SYSTEM BLOCK DIAGRAM



[M12]



(SMARTRA side connector)



- The immobilizer system can store up to four key codes.
- If it is necessary to rewrite the ECM/PCM to learn a new key, the dealer needs the customer's vehicle, all its master keys and the Hi-scan(pro) equipped with an immobilizer program card. Any key that is not learned during rewriting will no longer start the engine.
- If the customer has lost his key, and cannot start the engine, contact Hyundai-motor service station.
- If the proper key has been used, the ECM/PCM will energize the fuel supply system. The immobilizer indicator light in the gauge assembly will simultaneously come on for about two seconds, then go off, indicating that the immobilizer antenna unit has recognized the code sent by the transponder.
- If the wrong key has been used and the code was not received or recognized by the ECM/PCM the indicator light will come on for about two seconds, then it will continue blinking until the ignition switch is turned OFF.

**PROBLEMS AND REPLACEMENT PARTS :**

| Problem   | Part set  | Hi-scan (pro) required? |
|---|---|-------------------------|
| Master key has been lost or additional master key is required | Blank key   | YES                     |
| All master keys have been lost                                | Blank key(4)  | YES                     |
| Immobilizer antenna unit does not work                        | Immobilizer antenna unit  | NO                      |
| ECM/PCM does not work   | ECM/PCM   | YES                     |
| Ignition switch does not work                                 | Ignition switch with immobilizer antenna unit.<br>Master key            | YES                     |
| Unidentified vehicle specific data occurs                     | Ignition switch with immobilizer antenna unit.<br>Master key<br>ECM/PCM | YES                     |

**COMPONENTS OPERATIONS**

The vehicle immobilizer system consists of the ECM/PCM, the Immobilizer antenna unit (SMARTRA) and transponder built into the ignition key.

| COMPONENTS | FUNCTION  |
|------------|---|
| ECM        | The ECM carries out a check of the ignition key using a special encryption algorithm, which is programmed into the transponder as well as the ECM simultaneously. Only if the results are equal can the engine be started. The data of all transponders, which are valid for the vehicle, are stored in the ECM.  |
| SMARTRA    | The SMARTRA carries out communication with the built-in transponder in the ignition key. This wireless communication runs on RF(Radio frequency of 125 kHz). The SMARTRA is mounted at the ignition lock close to the antenna coil for RF transmission and receiving. The RF signal from the transponder, received by the antenna coil, is converted into messages for serial communication by the SMARTRA device. And, the received messages from the ECM are converted into an RF signal, which is transmitted to the transponder by the antenna. The SMARTRA does not carry out the validity check of the transponder or the calculation of encryption algorithm. This device is only an advanced interface, which converts the RF data flow of the transponder into serial communication to the ECM and vice versa. |

**TRANSPONDER**  
(built-in keys)

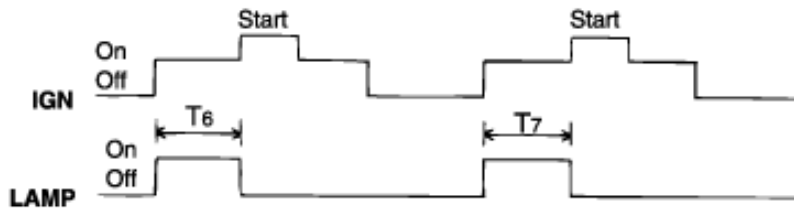
The transponder has an advanced encryption algorithm. During the key teaching procedure, the transponder will be programmed with vehicle specific data. The vehicle specific data are written into the transponder memory. The write procedure is once only; therefore, the contents of the transponder can never be modified or changed.

**TEACHING PROCEDURES**

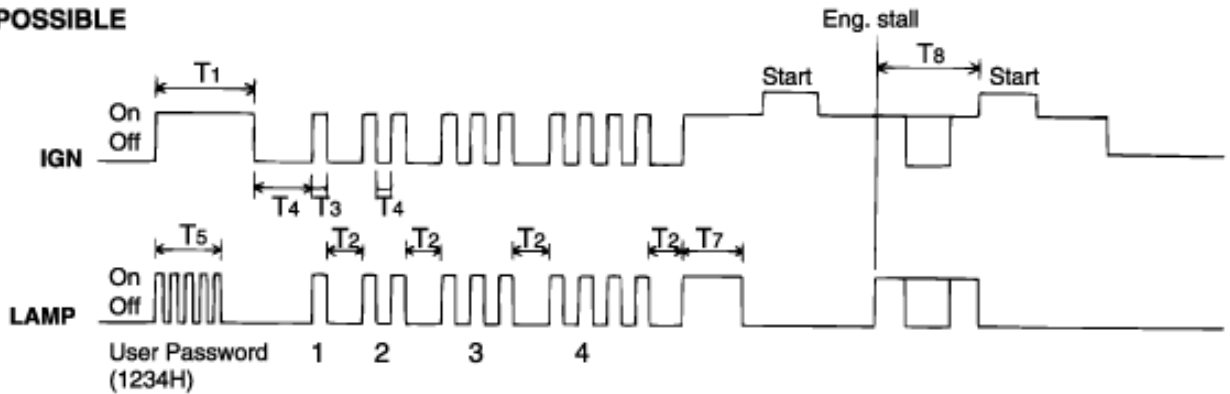
**THE USER PASSWORD CAN BE IN THE STATUS**

**LIMP HOME FUNCTION**

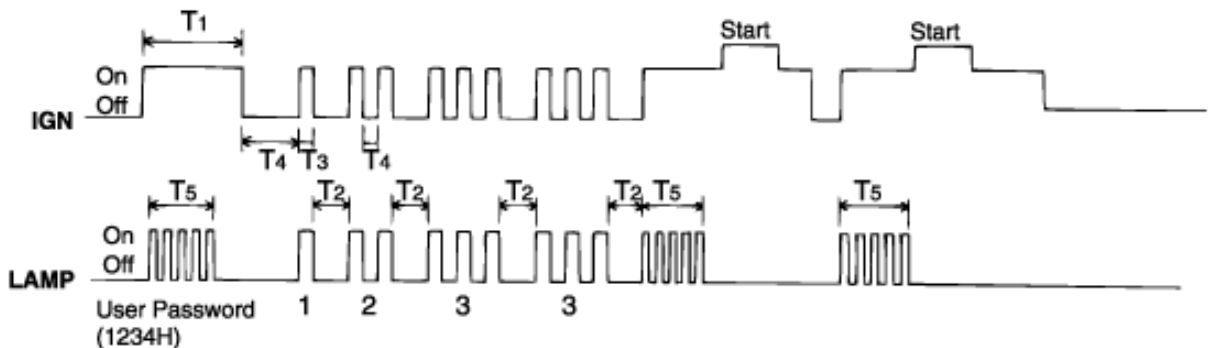
o **NORMAL CONDITION**



o **START POSSIBLE**



o **START IMPOSSIBLE**



**NOTE**

- T1 > 5 sec
- 3 sec < T2 < 10 sec
- 0.2 sec < T3 < 5 sec
- 0.2 sec < T4 < 3 sec
- T5 = 5 sec

T5 = 5 sec

T6 < 5 sec

T7 < 30 sec

T8 < 8 sec

### 1. LIMP HOME BY TESTER

If the ECM detects the fault of the SMARTRA or transponder, the ECM will allow limp home function of the immobilizer. Limp home is only possible if the user password (4 digits) has been given to the ECM before. This password can be selected by the vehicle owner and is programmed at the service station.

The user password can be sent to the ECM via the special tester menu.

Only if the ECM is in status "learnt" and the user password status is "learnt" and the user password is correct, the ECM will be unlocked for a period of time (30 sec.). The engine can only be started during this time. After the time has elapsed, engine start is not possible.

If the wrong user password is sent, the ECM will reject the request of limp home for one hour. Disconnecting the battery or any other action cannot reduce this time. After reconnecting the battery to the ECM, the timer starts again for one hour.

### 2. LIMP HOME BY IGNITION KEY

The limp home can be activated also by the ignition key. The user password can be input to the ECM by a special sequence of ignition on/off.

Only if the ECM is in status "learnt" and the user password status is "learnt" and the user password is correct, the ECM will be unlocked for a period of time (30 sec.). The engine can be started during this time. After the time has elapsed, engine start is not possible. After a new password has been input, the timer (30 sec.) will start again.

After ignition off, the ECM is locked if the timer has elapsed 8 seconds. For the next start, the input of the user password is requested again.

## DIAGNOSIS OF IMMOBILIZER FAULTS

### THE DIAGNOSIS MONITORS :

- Communication between the ECM and the SMARTRA.
- Function of the SMARTRA and the transponder.
- Data (stored in the ECM) related to the immobilizer function.

There are four different faults that are assigned to the immobilizer system. Every fault is broken down into four different types (circuit malfunction, circuit range / performance problem, low input, high input). The following table shows the assignment of immobilizer related faults to each type :

| Immobilizer Related Faults | Fault types   | Diagnostic codes |
|----------------------------|---|------------------|
| Transponder Fault          | Invalid transponder data  | P1801            |
|                            | Transponder not in password mode or transport data has been changed |                  |
|                            | Programming error   |                  |
| SMARTRA Fault              | Antenna error   | P1800            |
|                            | Invalid request from ECM or corrupted data                          | P1803            |
|                            | No answer from SMARTRA  | P1610            |
|                            | Invalid message from SMARTRA to ECM                                 |                  |

|  |   |       |
|--|---|-------|
| EEPROM                                 | Inconsistent data of EEPROM                             | P1805 |
|  | Invalid write operation to EEPROM                       |       |
| Immobilizer indicator or ECM<br>Faults | Not plausible immobilizer indicator stored at ECM       | P1805 |
|  | No valid data from SMARTRA after 3 attempts by ECM      |       |
|  | Invalid tester message or unexpected requests by tester |       |

**REPLACEMENT OF ECM AND SMARTRA**

**NEUTRALIZING OF ECM**