Function description

The 98 Sephia adopts Texton's Inkey Vehicle
Immobilizer. Inkey Control Unit (ICU) communicates
with the engine management system in order to allow or
not cranking depending the recognition or not of the
transponder inserted in the key. Inkey Vehicle
Immobilizer complies with European directives
applicable on anti-theft systems for vehicles.
The transponder is inserted in the key by the steering
column lock manufacturer, two keys are associated to
vehicle.
The identification of a transponder by ICU is done by
reading the identifier code engraved on the transponder
chip, this procedure is initiated by a rising edge on the
plus ignition input(IG ON).
The recognition of a transponder identifier puts the ICU
in a unlocked state until a falling edge on ignition
input(IG OFF), otherwise it is in the locked state.
The immobilizer answers the requests of engine
management system by giving the ICU state.
The unlocked state allows cranking.

The immobilizer communicates also with a diagnostic
tool in order to :
• proceed with key (transponder) matching at the end of
  vehicle manufacturing line.
• initialize the engine management system.
• proceed with autotest of product (check of antenna
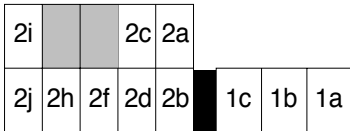 connections and W line output).

In case of transponder failure, the immobilizer can be
unlocked with a procedure called "limphome" procedure
by entering a personal code with the accelerator pedal.

Block diagram
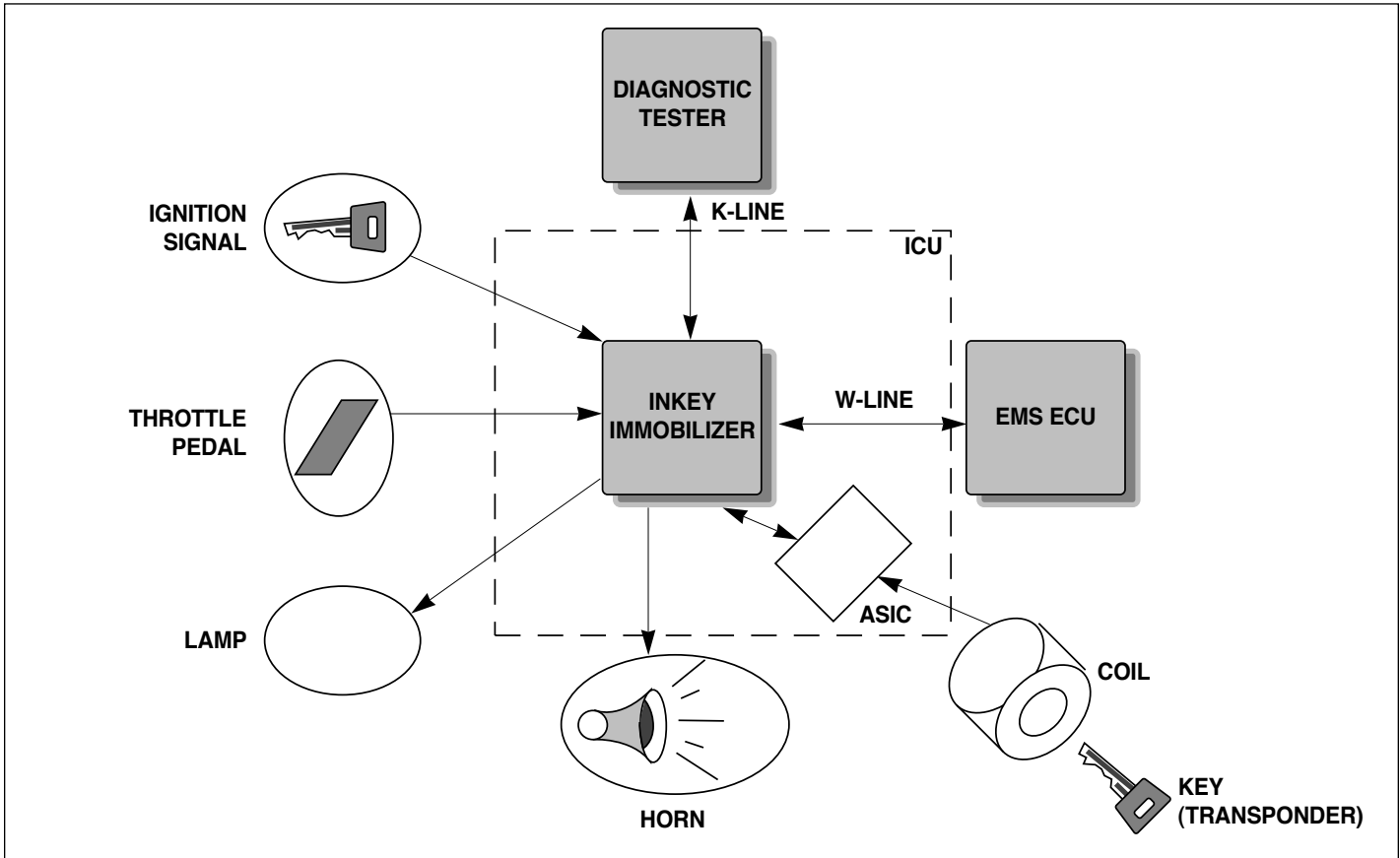
ICU Connector pin
front view of connector (ICU side)

PIN	Signal
2a	Accelerator Pedal
2b	GND
2c	Lamp driver / Flasher relay driver
2d	Serial communication (Diag)
2f	EMS - ECU
2h	Horn relay driver
2i	B+
2j	+IG1
1a	Coil+
1b	NC (not connected)
1c	Coil-

System components
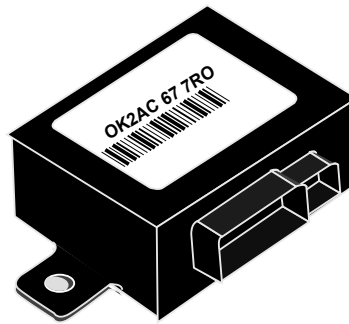
a) ICU (Inkey Control Unit) corresponds to :
   • transponder reader / exciter interface
   • 5V power supply regulation
   • serial communication interface
   • lamp and horn relay drivers
   • micro controller and software

b) Transponder :
   The transponder used is the read only type in glass tube package.
   The transponder is inserted in the key by over molding procedure at the steering lock factory.
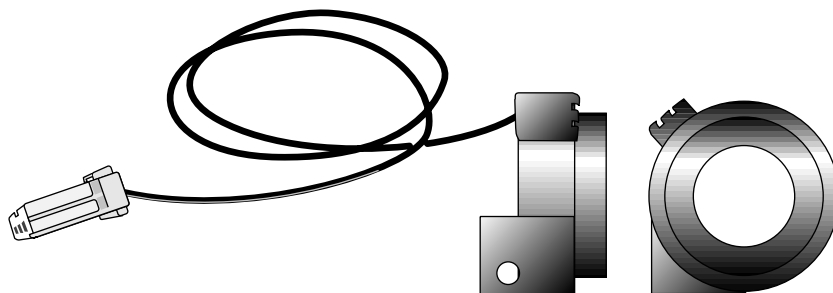
c) Antenna is composed of :
   • Coil
   • Plastic holder for the coil and envelop
   • 1 meter of 1 pair of twisted wires cable
   • AMP 3 position connector

ICU conditions and status

The ICU has two possible conditions : locked and unlocked.
And 3 possible status : Virgin, Learnt and Neutralized.

a) Locked condition
The ICU will stay in the locked condition as long as no valid transponder code has been received. The ICU will automatically go to locked condition a calibratable time after key-off. (passive arming)
As long as the ICU is in the locked condition, engine cranking is impossible, since the ICU answers any ECM request with dummy data.
Exceptions to this rule are made if either the ECM or the ICU are in virgin state.

b) Unlocked condition
Only if the ICU is in the unlocked condition engine cranking is allowed, provided that the coditions MIN (Model Identification Number) and the respective status of ICU and the ECM are verified.

c) Virgin status
This status represents the delivery condition of the ICU. The MIN has been programmed at the factory in EEPROM. The VIN (Vehicle Identification Number) has not been programmed yet, it will be programmed at the car manufacturer's end of line test. In this status, if the ECM is also in virgin state and the MIN of the ECM and the ICU are the same, engine cranking is allowed.

d) Learnt status
This represents the normal operating condition of the ICU, where the VIN has been learned. When the ECM sends a request containing the same MIN, then if the ICU is unlocked, the response to the ECM will contain a code based on VIN. If the ICU is locked, the response will contain dummy data.

e) Neutralized status
To replace a part of the system (ICU or ECM), the ICU and the ECM have to be set to neutralized state by a <read passcode> request from the diagnostic tool. In this status engine start is never possible.
Following flow diagram shows the possible transition between status :
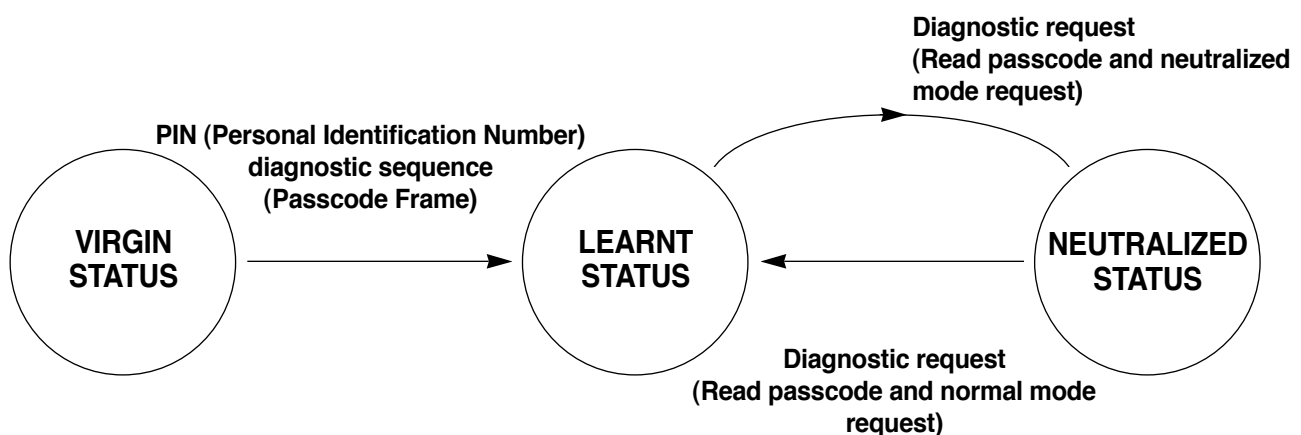
The following table shows the possible conditions according to the different possible status of the ICU :

Status	Condition	Condition for locked / unlocked	Remark
Virgin	unlocked	always	cranking is allowed provided the ECU is virgin
Neutralized	unlocked	ignition ON with a known key or override procedure	ICU may neutralize an ECM provided they both have similar MIN and VIN
	locked	ignition ON with an unknown key	
Learnt	unlocked	ignition ON with a known key or override procedure	cranking is allowed provided ICU and ECM have similar MIN and VIN
	locked	ignition ON with an unknown key	

* When Virgin, the ICU can never be in locked condition.

Limphome (Override) procedure

This procedure allows the unlocking of the ICU by entering the PIN (Personal Identification Number) via the accel pedal, in case the transponder code can not be read or is unknown.
200 ms after ignition - ON, a valid transponder code must have been received, otherwise the ICU will remain "locked" and the lamp will start blinking at 2 Hz.
This can happen through a malfunction of the transponder, the reading device or an unknown transponder code.

ICU Status	Is override procedure possible?
Learnt	yes
Neutralized	yes
Virgin	no

Signalization Modes By The Lamp

Operating mode	Lamp	Frequency	Duty - Cycle ON / OFF	Duration
ICU locked IGN OFF	OFF	–	–	Permanent
ICU unlocked IGN OFF	OFF	–	–	Permanent
ICU locked IGN ON	Blinking	2Hz	1	until pedal pressed
ICU unlocked IGN ON	ON (the lamp is turned OFF by the ECU, no action is required from the ICU)	–	–	Permanent
Override procedure : digit entry	Blinking	0.6 Hz	0.2	Pedal released or 10 blinks
After PIN entry (correct code)	Blinking	0.5 Hz	7	20 s maximum (or until ignition is turned OFF)
After PIN entry (incorrect code)	OFF	–	–	Permanent

1. Start of Limphome procedure : when ignition ON with no key or unknown key found

2. ICU drives the lamp blinking 2 Hz

3. Depress the accel pedal

4. Enter the 5 digits by releasing the accel pedal within 1.65 sec time-out.

The ECM sets the lamp ON

waiting for the pedal to be pressed. No time-out is initiated.

The pedal is pressed

1,375 ms   275 ms   1,375 ms   275 ms   etc...

wait state   **"1"**   **"2"**

IGN is ON with an unknown/ bad key

The ECU receives OCh and turns the lamp OFF. The ICU starts blinking the lamp at 2 Hz.

When the pedal is released during this wait state, the limphome procedure is aborted and the lamp is turned OFF.

The pedal is released : "n" is validated as 1st digit for the PIN...

The pedal is pressed

start of entry for the second digit of the PIN

"n"   **wait state** (same as above)   **"1"**   **"2"**

waiting for the pedal to be pressed. A 5-s time-out is set. If the pedal is not pressed within this time-out, the limphome procedure is aborted and the lamp is turned OFF.

5. After correct code entry the lamp blinks (0.5 Hz) to indicate to the user to switch the ignition off and on again, so that the ICU and ECM can communicate and "unlock" the engine.
   (If the ignition is switched off for more than the passive arming delay (20 sec) the ICU is locked again.)