'SMARTLOCK' IMMOBILISATION AND KEYLESS ENTRY SYSTEMS

PART 15-9

DESCRIPTION AND OPERATION

The 'SmartLock' system is a dual function, computer controlled, electronic immobilisation and keyless entry system fitted to the Falcon, Fairlane and LTD range of vehicles. The 'SmartLock' system is designed to enhance the security of the vehicle, and allow remote operation of the door locks and boot. The 'SmartLock' system interacts with a number of vehicle systems, including the EEC IV engine management system, central controller, engine starter motor and central door lock system.

ELECTRONIC IMMOBILISATION SYSTEM

The Electronic Immobilisation System is designed to prevent the theft of the vehicle. The 'SmartLock' system comprises an electronic control unit ('SmartLock' module) and an electronic lock assembly that contains an electronic device with stored security codes.

When the ignition switch is turned on, the 'SmartLock' module asks for three security codes from the electronic lock assembly. If at least two of the three codes are correct, the 'SmartLock' module will enable the starter motor to operate.

The 'SmartLock' module also communicates with the EEC IV engine management system, which only allows the injectors to operate if the 'SmartLock' module receives the correct security codes from the electronic lock assembly. This prevents the engine being started if the starter motor is hot wired.

KEYLESS ENTRY SYSTEM

For the convenience of the car owner, the Keyless Entry System allows remote locking and unlocking of the car's doors, and the unlocking of the boot (or tailgate on wagons). On high series vehicles, remote unlocking of the doors also turns on the dome lamp.

A small radio transmitter with a unique code is used to communicate with the 'SmartLock' module. The 'SmartLock' module can be programmed to recognise 4 keypads.

NOTE that the boot and tailgate cannot be locked by the keyless entry system.

SYSTEM COMPONENTS

The 'SmartLock' system consists of five components:

- 'SmartLock' control module
- electronic lock assembly
- keypad
- a warning jewel displaying "SMARTLOCK".
- boot/tailgate release switch

However, the 'SmartLock' system connects to a number of other systems of the car. These are the:

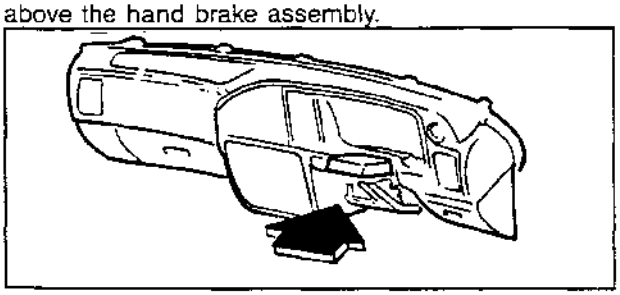
- EEC IV engine management system
- central controller (dome lamp control on high series)
- engine starting system
- central door lock system and boot/tailgate lock
- hazard lamps

'SmartLock' MODULE

The 'SmartLock' module is a computerised security and remote unlocking module. It contains a printed circuit board with a microprocessor and an E^2PROM that stores security and keypad codes. An E^2PROM does not require battery voltage to maintain its memory. This means that the codes are not lost if the battery is disconnected or goes flat.

The 'SmartLock' module can perform a self check to verify the correct functioning of the system and its connections to the rest of the vehicle. The self check is done each time the ignition is turned to the OFF position. The next time the ignition is turned on, results of this self check are displayed by flashing the 'SmartLock' warning Jewel (LED) in the instrument cluster. (refer diagnostic section)

The module is located under the dash, immediately above the hand brake assembly.



'Smartlock' Module Location

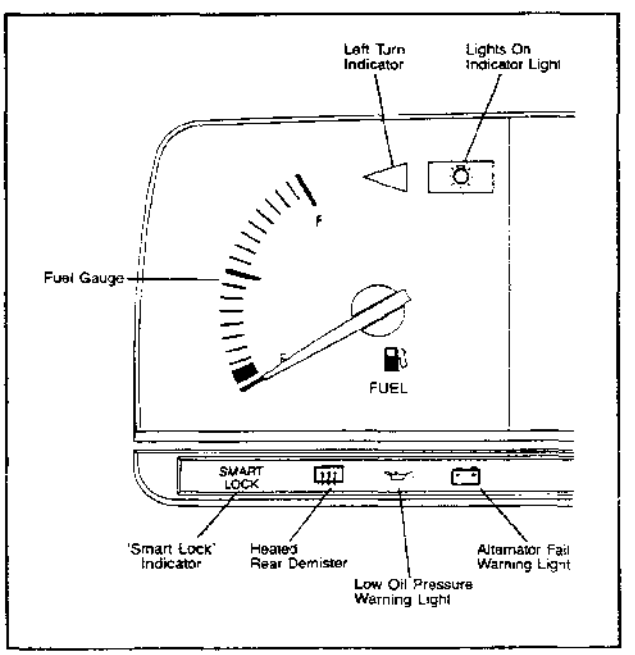
ELECTRONIC IGNITION LOCK ASSEMBLY

The electronic ignition lock assembly contains a lock barrel, a shear shaft, an ignition switch with a vane, and an electronic circuit board. The circuit board contains two infra-red transmitters and receivers, and an E^2PROM that holds the security codes.

When the key is turned, the vane on the ignition switch rotates and reflects the IR beam from one or both of the IR transmitters. This enables the electronic lock assembly to verify that the ignition switch is correctly fitted, and at which position it is in. When the key is turned to the run postition the electronic lock assembly transmits three codes from special memory locations to the 'SmartLock' module.

INSTRUMENT CLUSTER WARNING JEWEL

The warning jewel is used to determine the current state of the system. If a fault should occur, the built-in diagnostic system will display the error when you turn the ignition to the run position. The error is displayed by the flashing sequence of the "SmartLock" warning jewel in the instrument cluster (Ref. Diagnostic Section).



'SmartLock' Warning Jewel

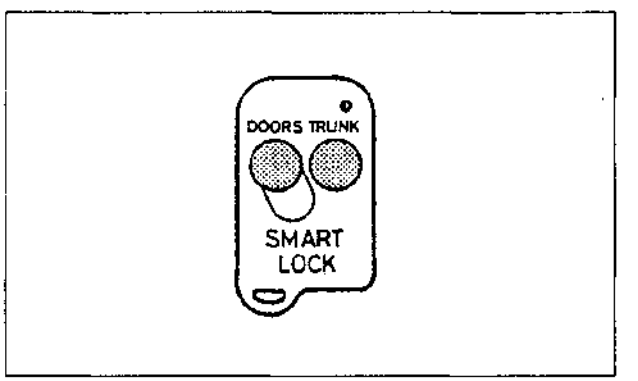
KEYPADS

The keypad is a small radio transmitter that transmits to the 'SmartLock' module a unique code (for security) and a code to either unlock the boot (or tailgate) or to lock/unlock the door locks. Up to four keypads can be programmed to any single 'SmartLock' module.

The transmitter operates at 303.8 MHz, and uses a 12 volt dry cell battery that will last approximately one year. The transmitter has a range of about 10 metres.

When the keypad is used, the 'SmartLock' module operates the hazard warning lamps to indicate a successful operation. The 'SmartLock' module also turns on the dome lamp in high series vehicles when the doors are unlocked.

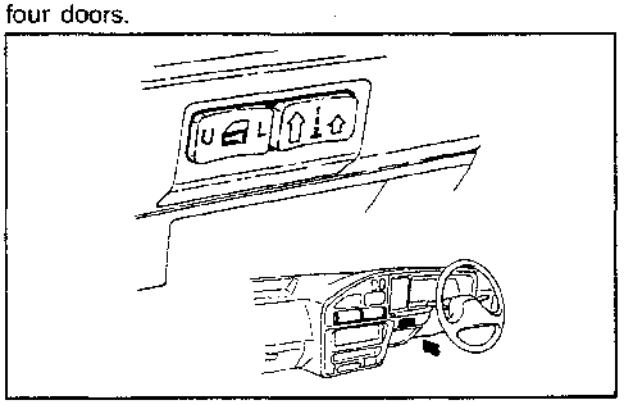
NOTE that keypads will only operate when the ignition switch is in the OFF position. Keypads do not play any part in the electronic immobilisation system.



Keypad

CENTRAL DOOR LOCK/UNLOCK SWITCH

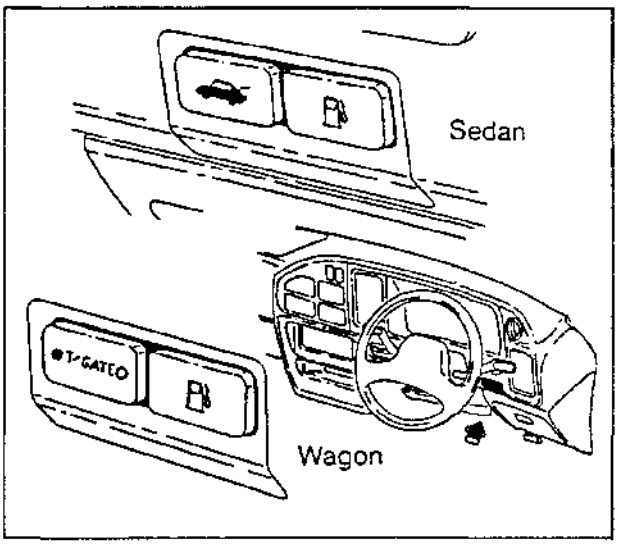
Although not an integral part of the 'SmartLock' system a new central door lock/unlock switch is fitted to all vehicles. This switch enables central activation of all four doors.



Door-Lock/Unlock Switch

BOOT/TAILGATE SWITCH

This switch connects to the 'SmartLock' module. If the switch is operated, the module will see this line go to battery voltage. If the switch is operated in a special sequence, the 'SmartLock' module can be made to enter 'learn' mode. This is used to train keypads.



Boot/Tailgate Switches

'SmartLock' SYSTEM OPERATING MODES AND SYSTEM OPERATION

NORMAL MODE

1. NORMAL STATE

In normal operation, the 'SmartLock' module will allow operation of the starter motor and the EEC IV system.

When you turn the key to the RUN position, the 'SmartLock' module will turn on the warning jewel (LED) for three seconds after which the jewel (LED) goes out. However, if there are any errors in the system, the appropriate error code (refer to Diagnostics Section) will flash three times. The warning jewel (LED) will then stay on or flash the immobilised code, depending on the error.

When you turn the key to the RUN position, the 'SmartLock' module asks the electronic lock assembly for the contents of three specific memory locations. If at least two of the codes the electronic lock assembly answers with are correct, the 'SmartLock' module enables the starter motor, and sends an enable code to the EEC IV processor. The verification of the electronic lock assembly codes takes approximately 400 ms, and you may notice a very short delay in the operation of the starter motor.

Once the 'SmartLock' module verifies the electronic lock assembly codes, the driver can turn the ignition to restart the car for up to 30 seconds without the system needing to verify the codes again (ie, there is no delay period). This will allow immediate operation of the starter motor if the engine stalls, even if the driver turns the ignition key to the OFF position.

2. ARMED STATE

When the ignition key is removed from the ignition switch assembly the 'SmartLock' System enters the Armed State.

The armed state is displayed by the 'SmartLock' warning jewel (LED) as a short flash with a moderately long pause.

In the armed state, the 'SmartLock' module is "listening" for a signal from the keypads.

If the 'SmartLock' module receives the signal to operate the door locks, it will either lock or unlock the car's doors (depending on the current lock state). When the 'SmartLock' module locks the doors, the hazard lamps will flash twice, each time for 0.8 seconds, with an 0.8 second pause between each flash. When the module unlocks the doors, the hazard lamps will flash once for 0.8 seconds, and, in high series cars, the dome lamp turns on.

When the module unlocks the boot or tailgate, the hazard lamps will flash once for 1.6 seconds. **Note that the 'SmartLock' system cannot lock the tailgate or boot.**

3. IMMOBILISED STATE

The immobilised state is indicated by the 'SmartLock' warning jewel (LED) as a rapid flash rate.

The system enters the immobilised state if the 'SmartLock' module receives at least two incorrect codes when the ignition is turned to the RUN position.

When the car is in the immobilised state, you cannot start the engine, as the 'SmartLock' module has disabled both the starter motor and the EEC IV system.

If the cause of the immobilisation is a corruption of the codes during transfer, you should be able to start the car on the second attempt.

NOTE that keypads will still operate on an immobilised car, so long as the key is in the OFF position. However, an immobilised car will not display the immobilised flash with the ignition off, and will display the armed code as normal.

If the cause is an unauthorised attempt to start the car, ie, by hot wiring or the use of another ignition switch, the car will remain unstartable. However, to prevent a vehicle from being completely immobilised (eg, due to damaged electronic lock assembly data), you can start the car by using the method below.

STARTING AN IMMOBILISED CAR

1. Turn all accessories off.
2. Turn the ignition to the RUN position. The warning jewel (LED) will flash the immobilised code (the warning jewel (LED) may flash an error code before the immobilised code).
3. Leave the car for 30 minutes.
4. After 30 minutes, the 'SmartLock' module will attempt to relearn the electronic lock assembly data.

5. If the learning procedure is successful, the warning jewel (LED) will then stop flashing and the door locks will change state twice. You can now start the car and operate it as normal.
6. If the learning procedure is unsuccessful, the warning jewel (LED) will stop flashing and stay on, and you can start the engine. Refer notes below.

NOTES:

1 If the cause of the immobilised state was due to an error in the electronic lock assembly, the ignition can be turned to the OFF or ACCESSORY positions for up to 30 seconds and restart the engine without needing another 30 minute wait.
2. If the fault is due to a complete failure of the 'SmartLock' module, the EEC IV module also has a system over-ride timer. If you leave the ignition switch in the RUN position for 30 minutes, you will be able to start the engine. Note that if you turn the key back to the ACCESSORY or OFF positions, the engine will not restart, and you will have to wait another 30 minutes before restarting.
3. If the courtesy lamp fuse is removed from the fuse panel, the 'SmartLock' module will not operate and the engine will crank but not start. (The EECIV module does not receive the enable code).

LEARNING PROCEDURES

NORMAL MODE DOWNLOADING:

If you have replaced the electronic lock assembly or the 'SmartLock' module in service, you will need to download the electronic lock assembly codes before you can start the car.

Procedure:

1. Turn off all accessories.
2. Ensure that the system is free from error. With the ignition turned to the OFF position, the warning jewel (LED) will be flashing the armed code.
3. Turn the ignition switch to the RUN position. The warning jewel (LED) should display error code 3, then flash the immobilised code. Leave the ignition switch in the RUN position.
4. After 30 minutes, the electronic lock assembly codes will download into the 'SmartLock' module, the door locks will change state twice, and the warning jewel (LED) will go out.
5. Turn the ignition switch to the OFF position for at least 30 seconds, until the warning jewel (LED) displays the armed flash.
6. Verify the system by starting the engine.

KEYPAD TRAINING:

If you have replaced the 'SmartLock' module, or new keypads are being added to the system, you will need to train the keypad codes to the module.

Procedure:

1. The ignition switch should be in the OFF position.
2. Turn the ignition key to the ACCESSORY position, and within 5 seconds, operate the boot release (tailgate unlock for wagon) switch exactly three times.
3. After the five seconds is up, the door locks will change state to indicate the 'SmartLock' module has entered learn mode. All existing keypad codes are immediately erased.
4. Press either of the buttons on the keypad. The door locks will change state twice to indicate the 'SmartLock' module has learnt the keypad.
5. Follow step 4 for each keypad. You can train the 'SmartLock' module to accept up to four keypads. You must teach all keys at the same time.
6. When you have taught all the keys, turn the ignition switch to either the OFF or IGNITION positions to leave 'learn' mode. The door locks will change state to indicate return to normal mode.
7. Check the function of both buttons on each keypad that has been trained.

NOTE: If the owner loses a keypad, follow steps 1, 2, 3 and 6. This will erase the codes from the 'SmartLock' module and prevent unauthorised entry into the car.

SERVICING AND DIAGNOSTICS

The 'SmartLock' system is a maintenance free electronic system. The only serviceable component is the battery of the keypad.

If a fault should occur within the system, the built-in diagnostic procedures will display the error when you turn the ignition to the RUN position. The error is displayed by the 'SmartLock' warning jewel (LED) in the instrument cluster.

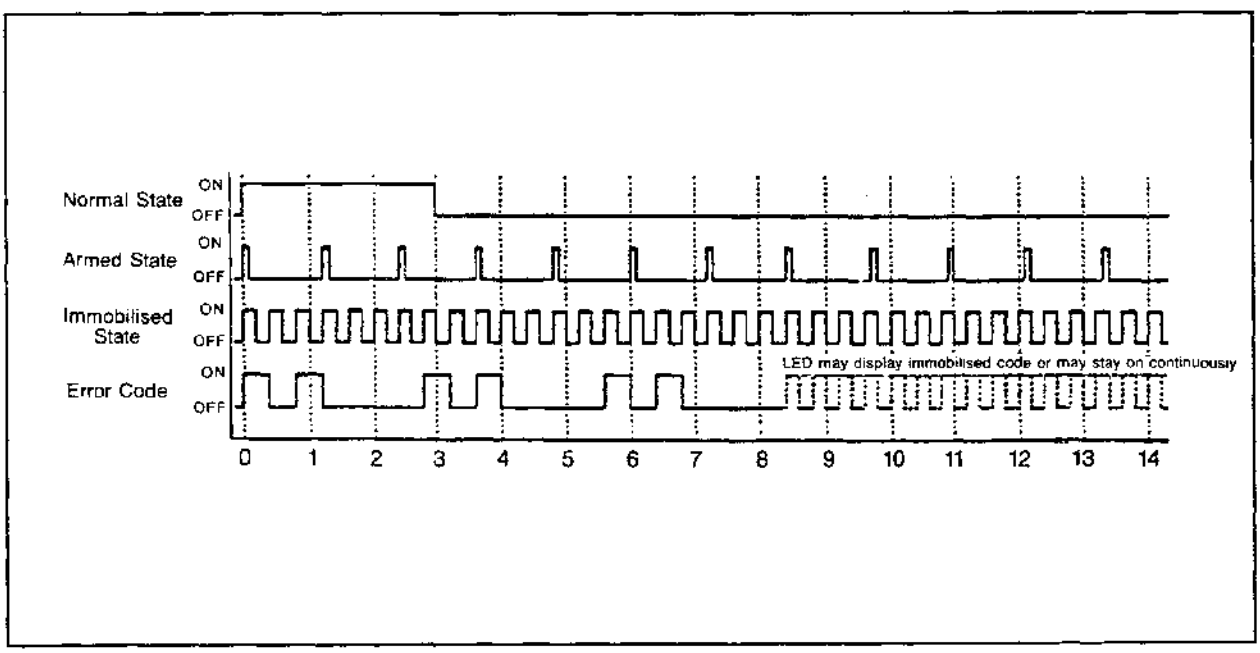
One additional EECIV Self Test Code is available and accessible in the normal manner using the T2100CAM tester and T2100CAMAD2 harness refer to Section 10 of this manual for details of new EECIV module ID codes.

NOTE: Module ID codes are now only displayed during fast test mode.

JEWEL FLASH RATES

By observing the 'SmartLock' warning jewel (LED) in the instrument cluster, you can determine the current state of the system. The chart below gives the flash rates for 'SmartLock' system conditions. A graphic representation of all the flash types is also shown below.

Mode / State	Flash rate in seconds
Normal state	3 on, then remains off, after ignition is turned to RUN
Immobilised state	0.2 on - 0.2 off
Armed state	0.1 on - 1.1 off
Error code	0.4 on - 0.4 off with 1.6 sec pause between each code, then jewel stays on. NOTE: If the fault causes the smartlock system to enter immobilised state, the jewel will display the immobilised code after the error codes.



ERROR CODES

To read the error codes, turn the ignition switch to the RUN position, and observe the 'SmartLock' warning jewel (LED). All error codes are listed in tables 1 and 3 below.

NOTES:

1. Since the 'SmartLock' system performs its diagnostic check when the ignition switch is in the OFF position, after you have completed any corrective work, you will need to turn the ignition switch to RUN, then OFF again for the 'SmartLock' to self test. Then turn the ignition switch to the RUN position to check if the system is serviceable.
2. The 'SmartLock' system is capable of showing only one error code at a time, regardless of the number of faults in the system. The code that will display is dependent on its priority, see table 2 below.

Table 1: 'SmartLock' Error Codes (Displayed by flashing of 'Smartlock' Warning Jewel (LED))

Code	Description
2	Wrong data received (1 or 2 codes incorrect)
3	Wrong data received (all 3 codes received are incorrect)
4	Electronic lock assembly to 'SmartLock' connector open Electronic lock assembly I/O circuit open Electronic lock assembly power supply circuit open
5	Electronic lock assembly clock circuit open Electronic lock assembly ground circuit open
6	Starter motor safety circuit failure (inside 'SmartLock' module)
7	Boot (tailgate) solenoid circuit open Boot (tailgate) switch shorted

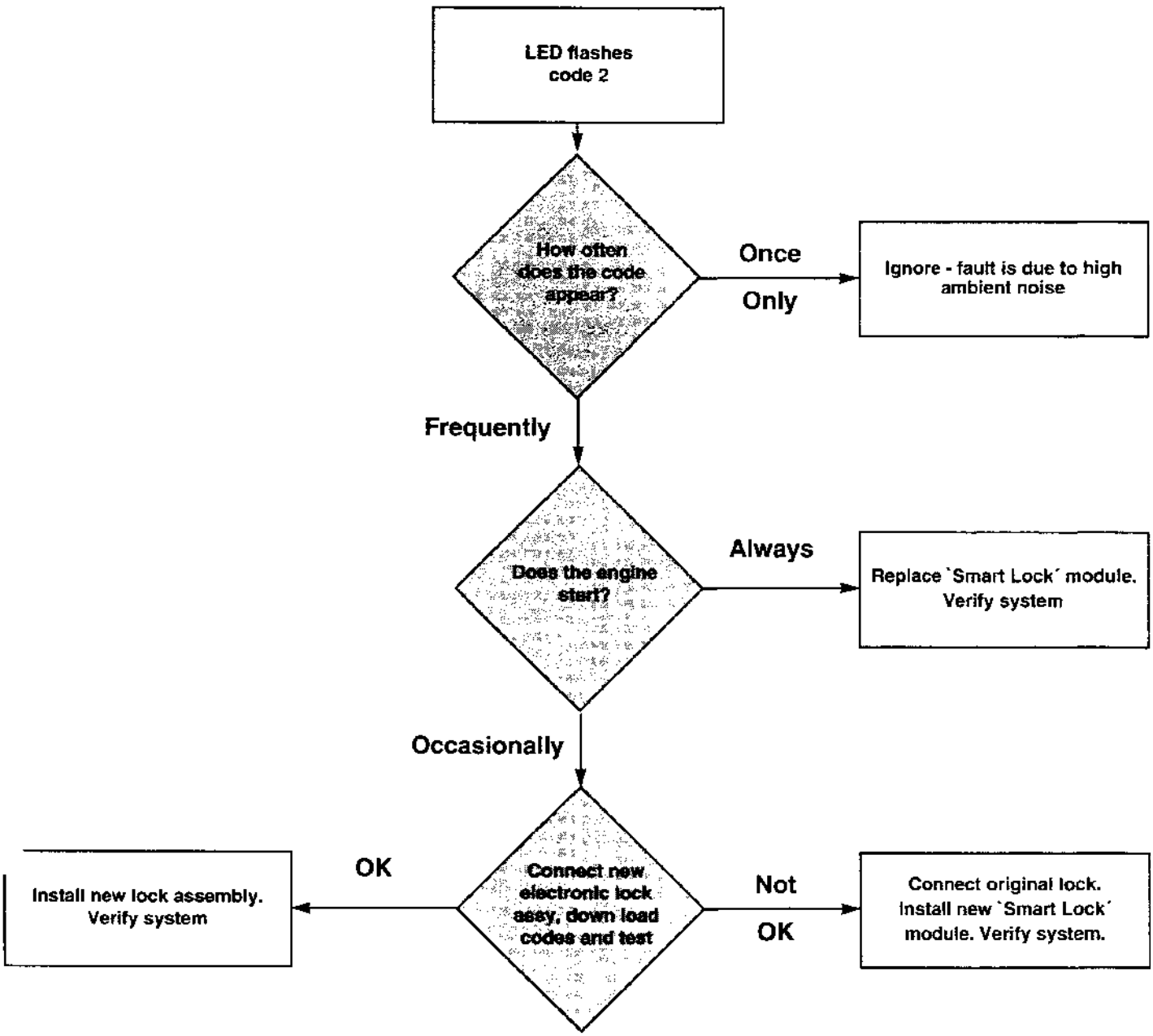
Table 2: 'SmartLock' Error Code Priority

Priority	Code	Remarks
1	2/3/4/5	These codes are mutually exclusive, and have first priority
2	6	
3	7	
4	Mode status	ie, Immobilised state, Armed state

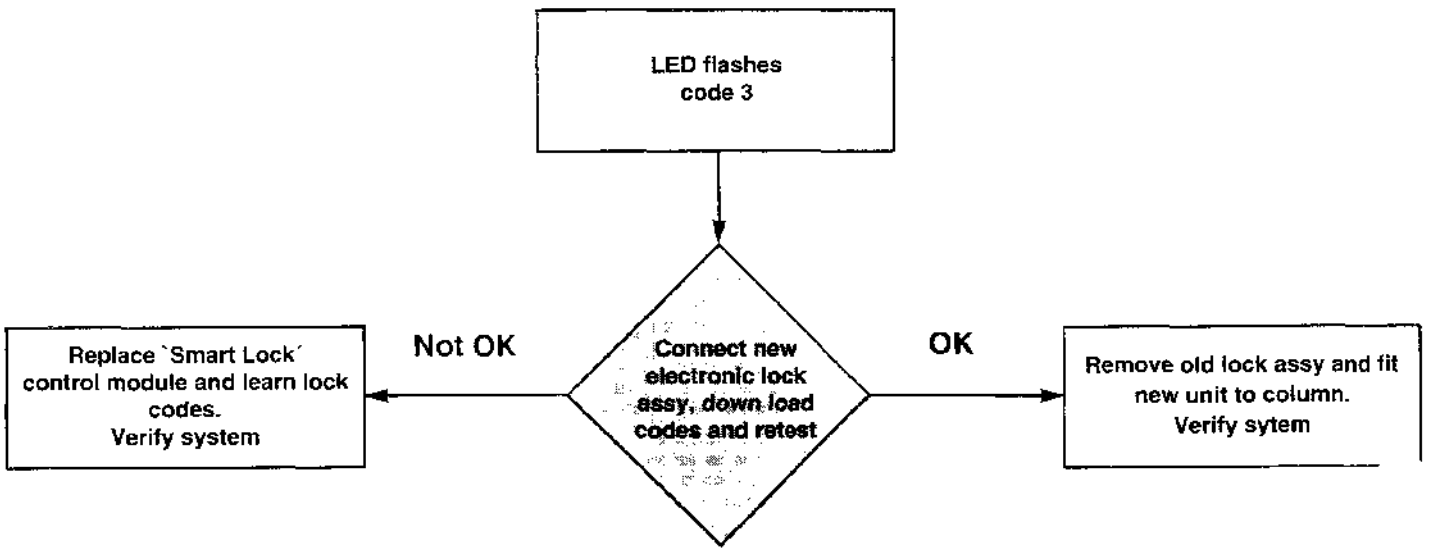
Table 3: EEC IV Diagnostic Codes (obtained using T2100CAM Tester and T2100 CAM AD2 Harness).

Code	Description
44	Enable code from 'SmartLock' module not received

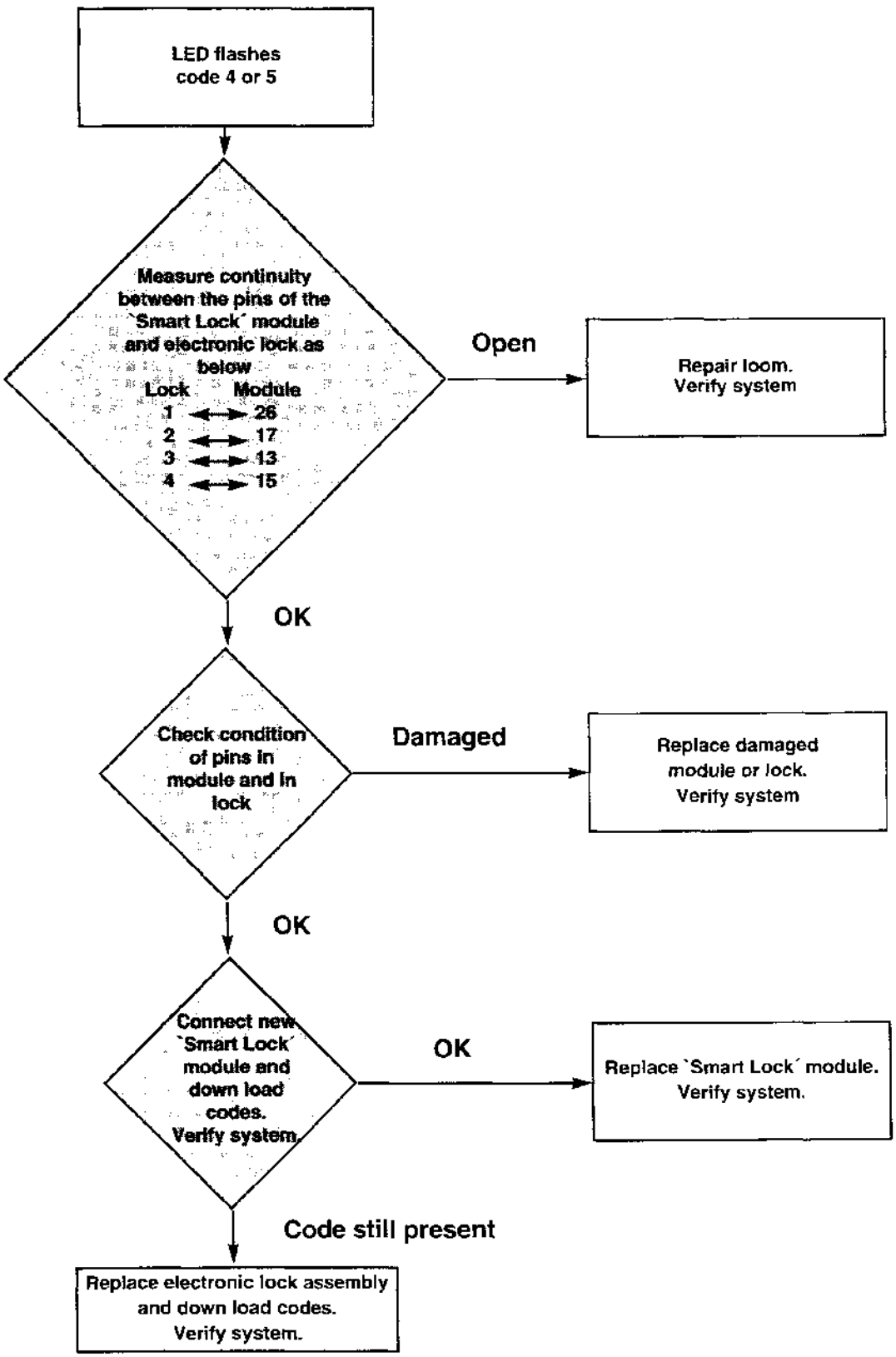
Code 2: Wrong data received (1 or 2 codes incorrect)



Code 3: Wrong data received (all 3 codes received incorrect)



Codes 4 & 5: Open circuit between 'SmartLock' module and electronic lock assembly

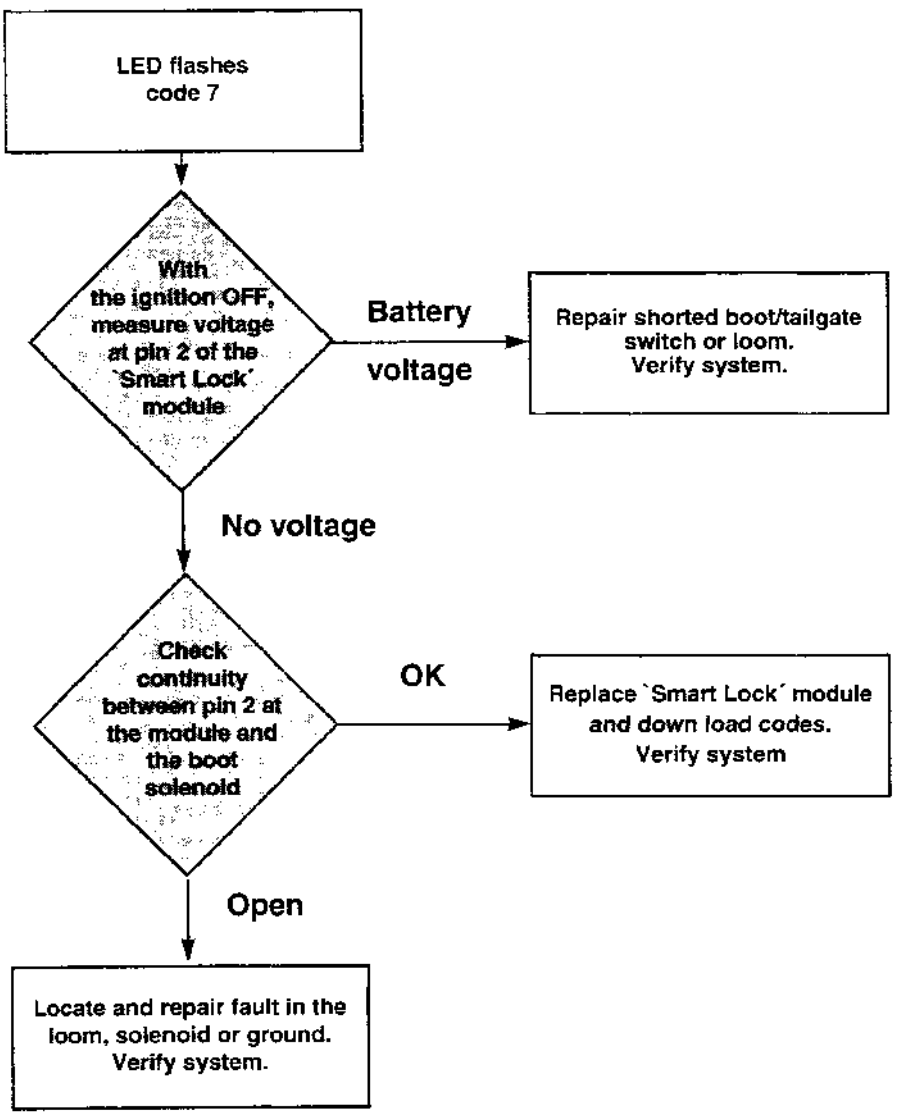


Code 6: Starter motor safety circuit faulty

A code 6 indicates that the 'smartLock' module is internally faulty. Replace the module, download codes and verify the system.

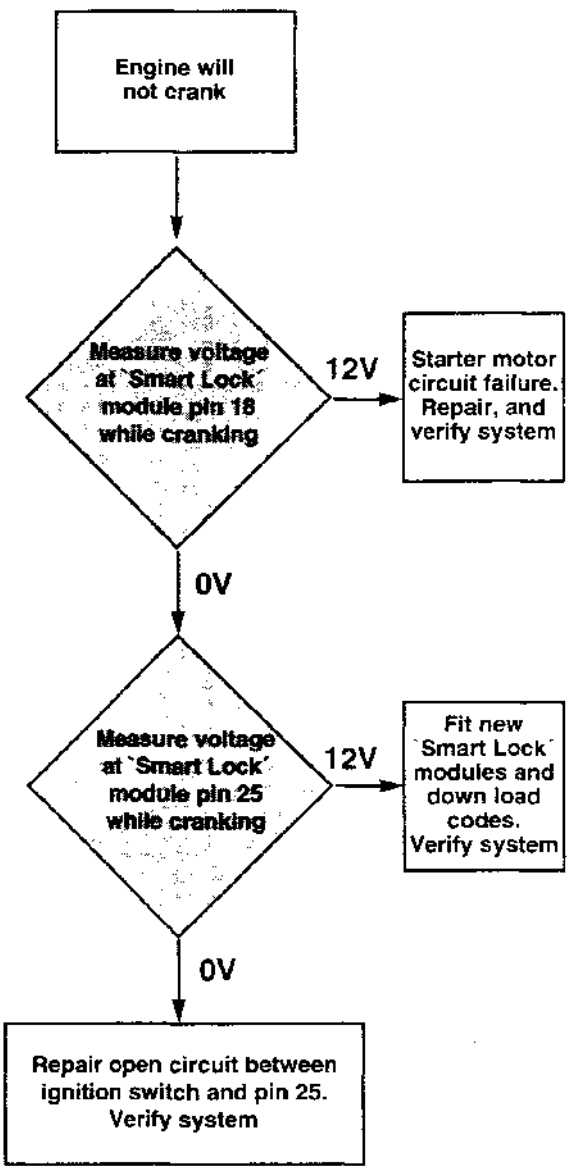
Code 7: Boot (tailgate) circuit open or switch shorted

NOTE: If you press the boot/tailgate switch immediately after you turn the ignition to OFF (ie, while the 'SmartLock' module is performing its diagnostic procedure), the module will see 12 V at pin 2, which the module will interpret as a shorted boot/tailgate switch. The module will then display a code 7 next time you turn the ignition to RUN.

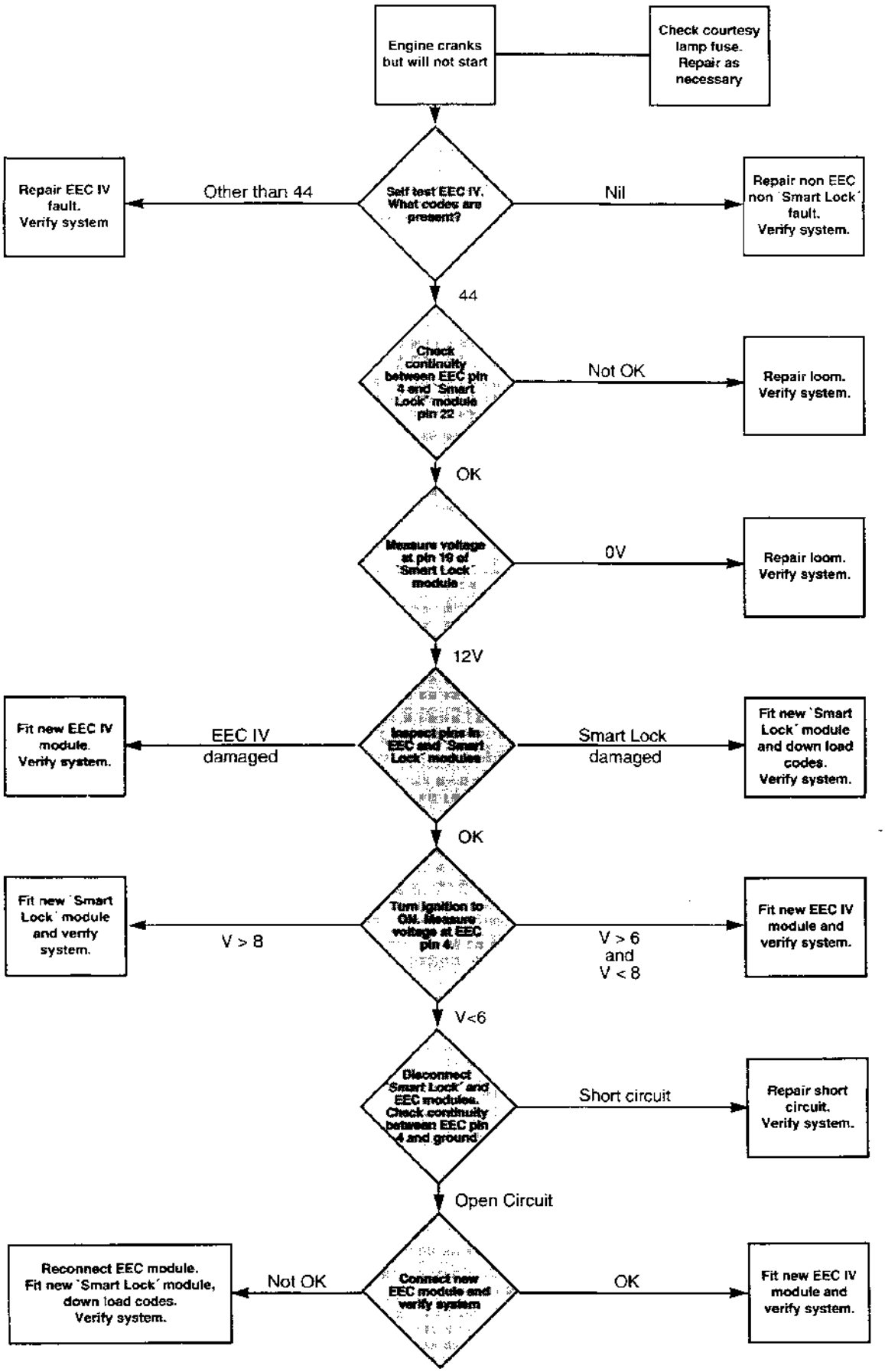


Engine will not crank

This procedure assumes that the 'SmartLock' warning jewel (LED) is not displaying any error codes, and the system is not immobilised.



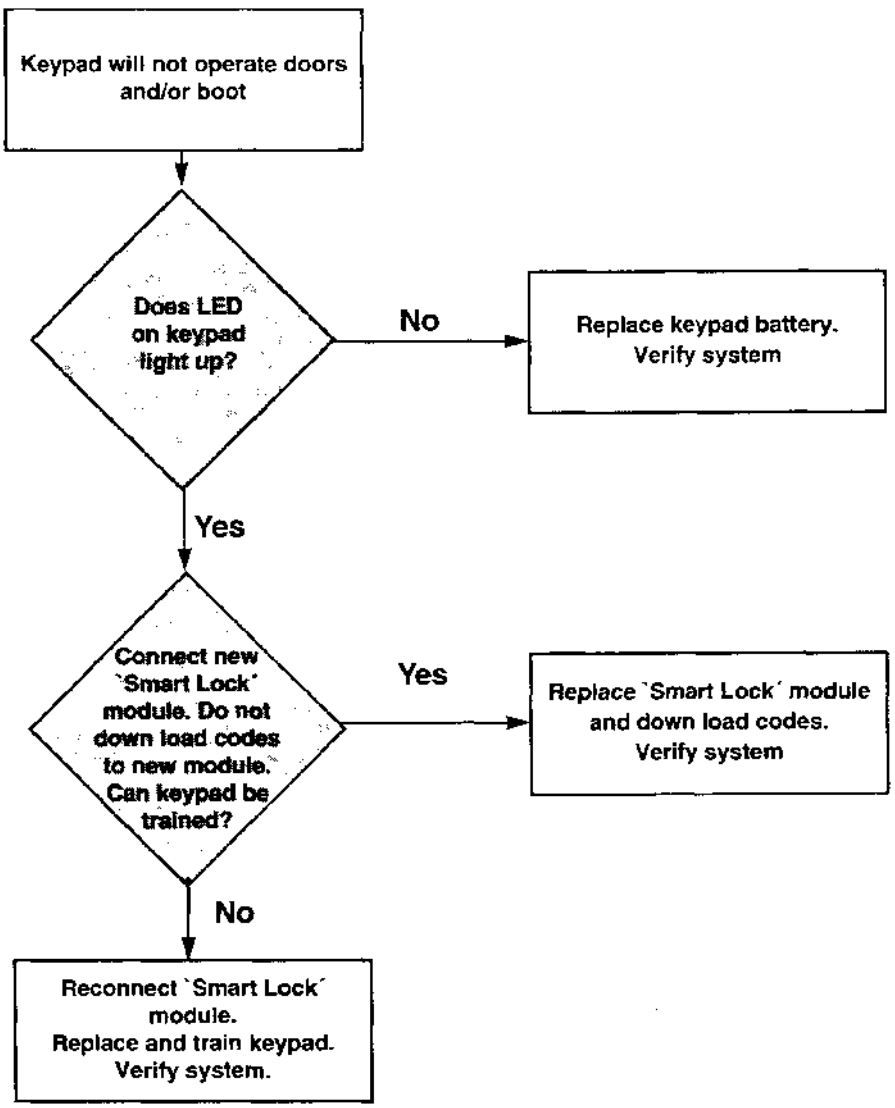
Engine will not start



Keypad will not operate doors and/or boot (tailgate)

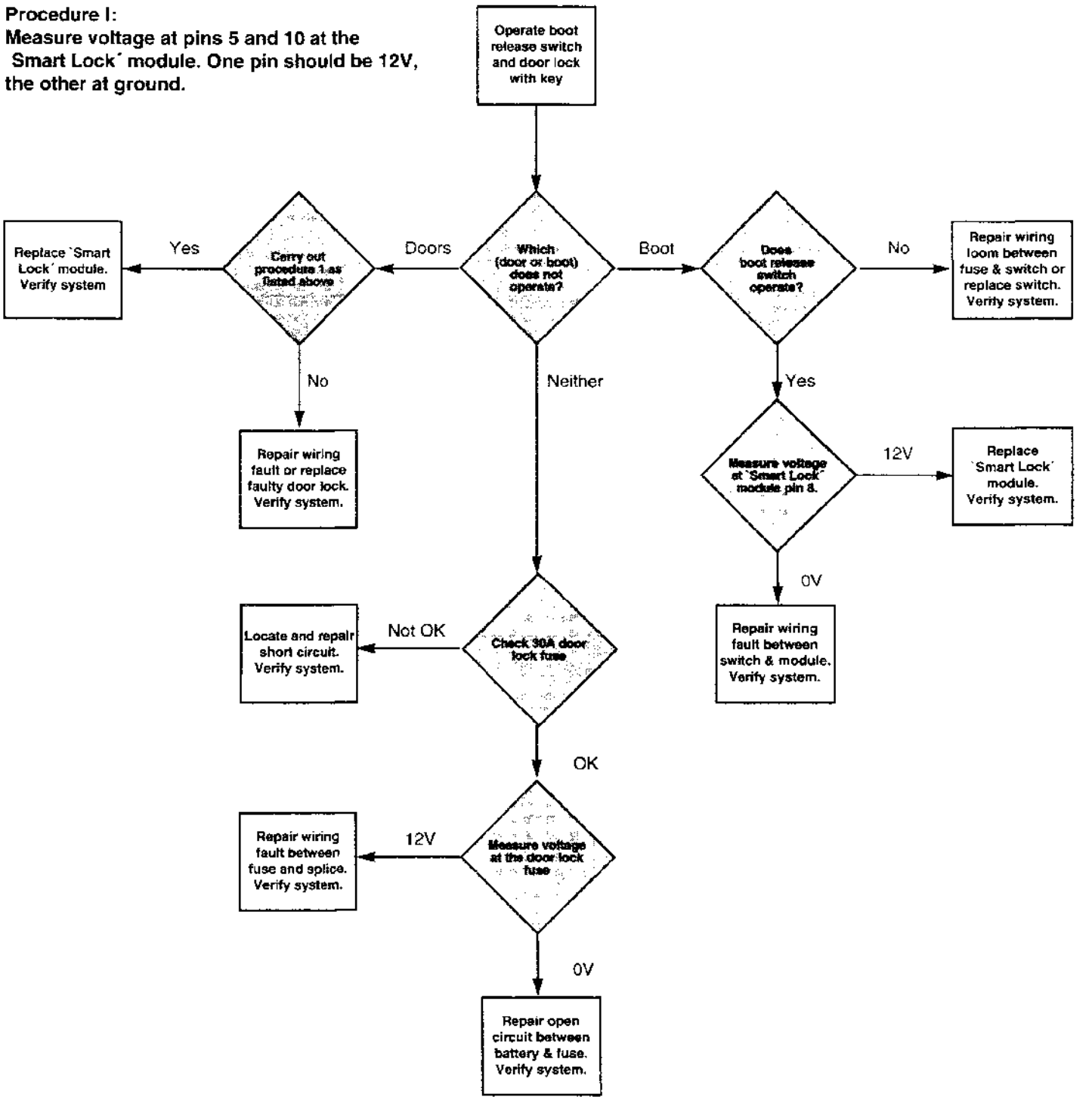
NOTES:

1. This procedure assumes that you can open the doors with the key, and the boot/tailgate with the release switch.
2. The keypad will only operate with the ignition switch in the OFF position.

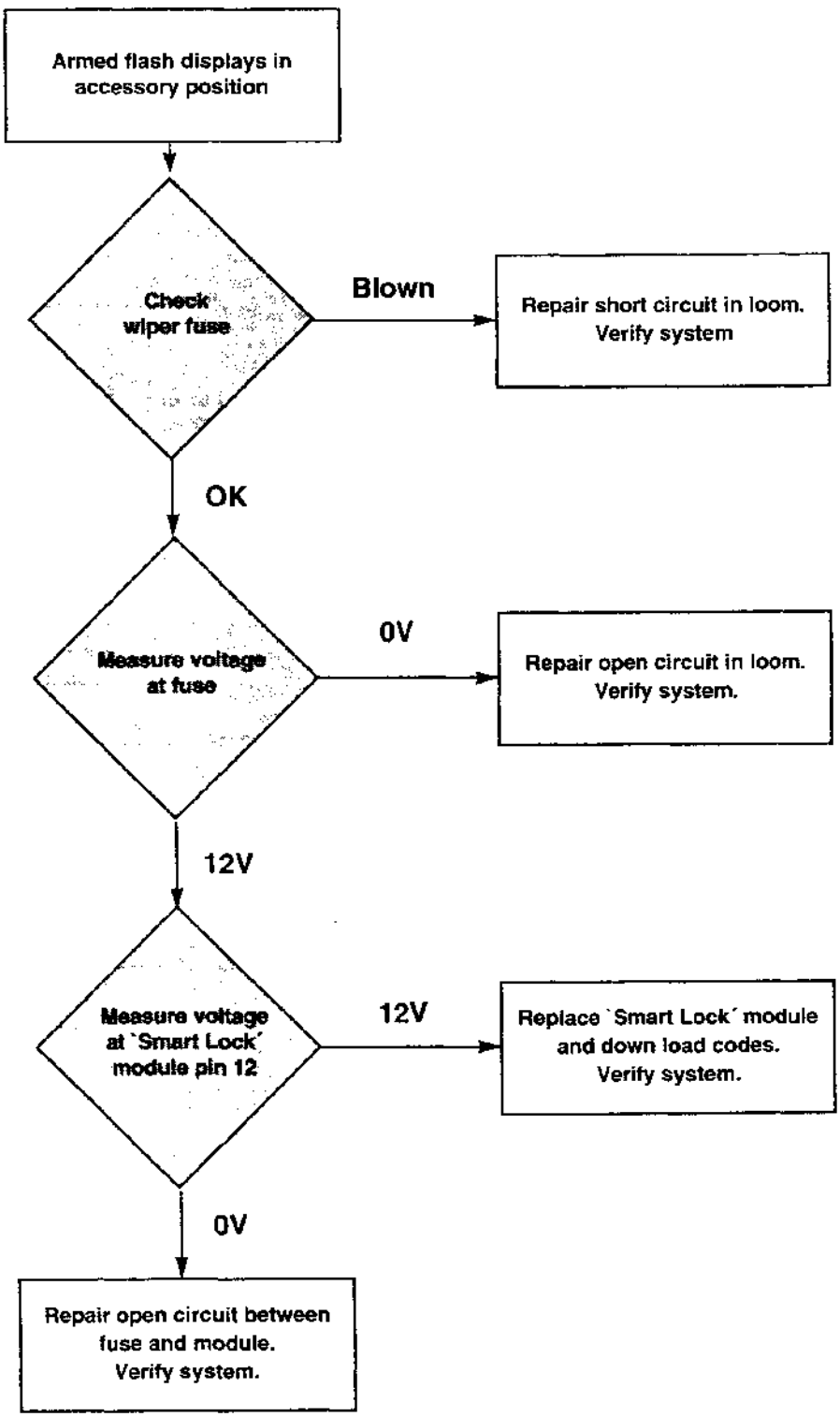


Doors and/or boot will not operate

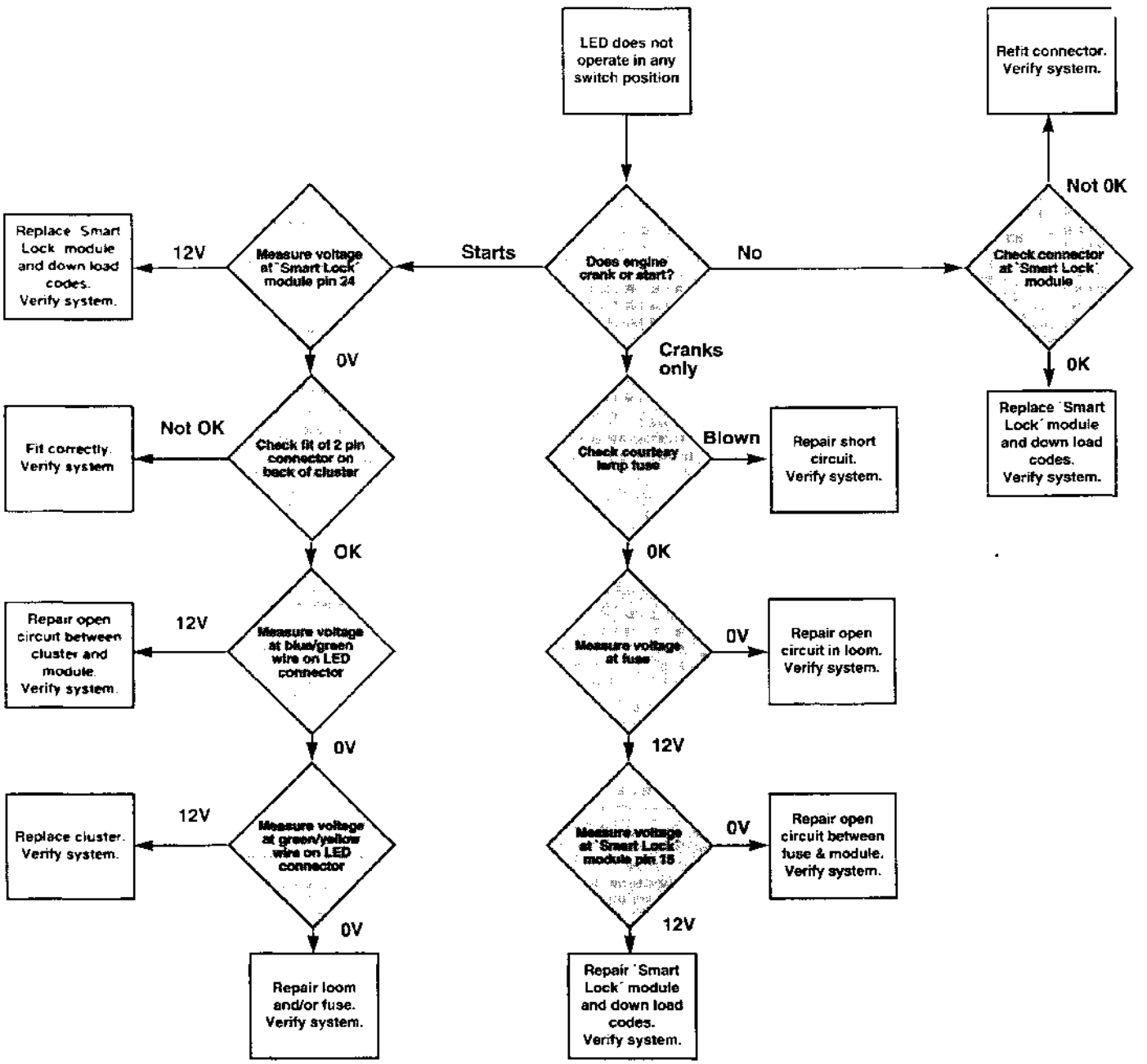
Procedure I:
Measure voltage at pins 5 and 10 at the 'Smart Lock' module. One pin should be 12V, the other at ground.



Armed flash displays in accessory position



Warning Jewel (LED) does not operate



SCHEMATICS

Table 4: 'Smart Lock' Module Pin Numbers, Circuit and Colour ID

Pin	Circuit	Colour	Function
1	383B	Yellow	Hazard lamp power supply
2	84A	Violet	Boot/tailgate release out
5	118	Red/yellow	Door unlock from door motors
6	3C	Green	Left hazard lamps out
7	2C	Green/blue	Right hazard lamps out
8	134	White	Boot/tailgate power in
9	57II	Black	Module to body ground
10	117	Yellow/black	Door lock from door motors
12	298D	Violet/yellow	Accessory power in
13	24	Blue/orange	Electronic lock assembly clock circuit
14	465B	Violet/white	Courtesy lamp signal to central controller
15	25	Green/purple	Electronic lock assembly data circuit
16	54I	Green/yellow	Battery power in
17	23	Brown/green	Electronic lock assembly power circuit
18	32A	Red/blue	Starter motor signal out
19	361A	Red	Ignition power in
22	342	Green/purple	EEC IV enable signal
24	343	Blue/green	Instrument cluster Warning Jewel (LED)
25	32	Red/blue	Starter motor signal in
26	57C	Black	Electronic lock assembly

SPECIFICATIONS

'Smart Lock' Module

Normal operating voltage	6 - 16 V
Reverse polarity protection	up to 14 V
Ignition off current	5 mA
Ignition on current	12 mA

Electronic lock assembly

Operating voltage	5 V
Codes	8 random security codes

Remote Key

Frequency	303.8 MHz
Range	approx. 10 m
Battery	Energizer A23 12V or equivalent
Battery life	approx. 1 year

Instrument Cluster Warning Jewel (LED) Flash Rates (in seconds)

Immobilised:	0.1 on - 0.1 off
Armed:	0.1 on - 1.1 off
Error code:	0.4 on - 0.4 off **Note:** Each code is separated with a 1.6 sec pause. Then LED stays on.

REMOVAL AND INSTALLATION

'SMARTLOCK' MODULE

REMOVAL

1. Disconnect the wiring connector from the module.
2. Remove the two retaining screws attaching the module to the centre finishing panel immediately above the park brake assembly and remove from the vehicle.

INSTALLATION

1. Positively engage the wiring connector into the 'SmartLock' module.
2. Mount the module to the centre finishing panel and securely attach via the two retaining screws.

IGNITION LOCK ASSEMBLY

REMOVAL

1. Remove the upper and lower shrouds from the steering column (refer section 3 of this manual).
2. Remove the two shear head bolts attaching the steering lock clamp with a hammer and centre punch.
3. Disconnect the wiring and remove the lock from the column.

INSTALLATION

1. Place the ignition lock assembly onto the steering column.
2. Engage new shear head clamp bolts and tighten till the heads shear off.
3. Assemble and fit the upper and lower shrouds to the steering column.

NOTE:

THE IGNITION SWITCH IS NOT SERVICED AS A SEPARATE COMPONENT AND IS ONLY AVAILABLE AS PART OF A COMPLETE IGNITION LOCK ASSEMBLY. THE IGNITION BARREL AND KEYS ARE SERVICEABLE AS DETAILED IN SECTION 17-3 OF THIS MANUAL.