
IMMOBILIZER SYSTEM

Caution: Disconnect the negative battery cable before removing or installing any electrical unit or when a tool or equipment could easily come in contact with exposed electrical terminals. Disconnecting this cable will help prevent personal injury and damage to the vehicle. The ignition must also be in LOCK unless otherwise noted.

TABLE OF CONTENTS

Function Description	2	Gasoline Engine (HFM) Immobilizer	12
System Description	3	Diesel Engine Immobilizer	13
Diagnosis	8	Diesel Engine Immobilizer (Crypto Type)	14
Gasoline Engine	8	Maintenance and Repair	15
Diesel Engine	10	On-Vehicle Service	15
Schematic and Routing Diagrams	12	Immobilizer Antenna	15

FUNCTION DESCRIPTION

Immobilizer is a device disabling vehicle ignition unless a specific key is used and designed to help prevent vehicle theft.

Immobilizer is comprised of two devices, a key with encoded transponder and engine control unit(ECU) with the same encoding of the transponder. When a key is inserted into the key hole to start vehicle and turned to 'ON', the ECU reads and decodes the transponder code and, if the same, starts the engine, it is called immobilizer. It means immobilizer system disables starting by stopping fuel supply if the code in the transponder does not match the code stored in ECU each other.

Notice

- If vehicle is equipped with immobilizer system and the engine cranks normally but not start, check immobilizer system first rather than ignition and other electrical systems because it can be disabled fuel supply of injectors by ECU due to defective immobilizer system.
- Programming of the immobilizer system will be performed by authorized personnel only. If following defective codes for immobilizer system appear during diagnosis of vehicle with SCANNER, ask immobilizer programming to authorized personnel and actual programming should be performed by authorized personnel only.
 - ▶ Display of defectives relevant to immobilizer system : SCANNER
 1. No communication with transponder
 2. No immobilizer programming
- The transponder in the key can be damaged by shocks of dropping or hitting other objectives, so handle it with care.
- Each supplied key has programming of code on its own. Accordingly if ECU needs to be replaced, replace the transponder in the key.
- The vehicle equipped with immobilizer system will never be started with remote ignition device, so do not attempt to install it.
- The immobilizer system will never be removed from the vehicle. So never attempt to remove it to install a remote ignition device or others.
- If engine does not start during service, use every key to start the engine and then check immobilizer system finally.

Cases that requires immobilizer programming

1. Replacement ECU
In this case, replace the every transponder of the key at once.
2. Replacement of the transponder
3. Additional key for lost 1 or 2 keys
 - 1) Clear all codes for current keys from the ECU
 - 2) When using current key : clear code of the transponder and re-program it
 - 3) Additional (purchased) key : perform programming
4. When lost all keys
 - 1) Clear all memorized key codes from the ECU
 - 2) Replace the key and key set
 - 3) Immobilizer programming

SYSTEM DESCRIPTION

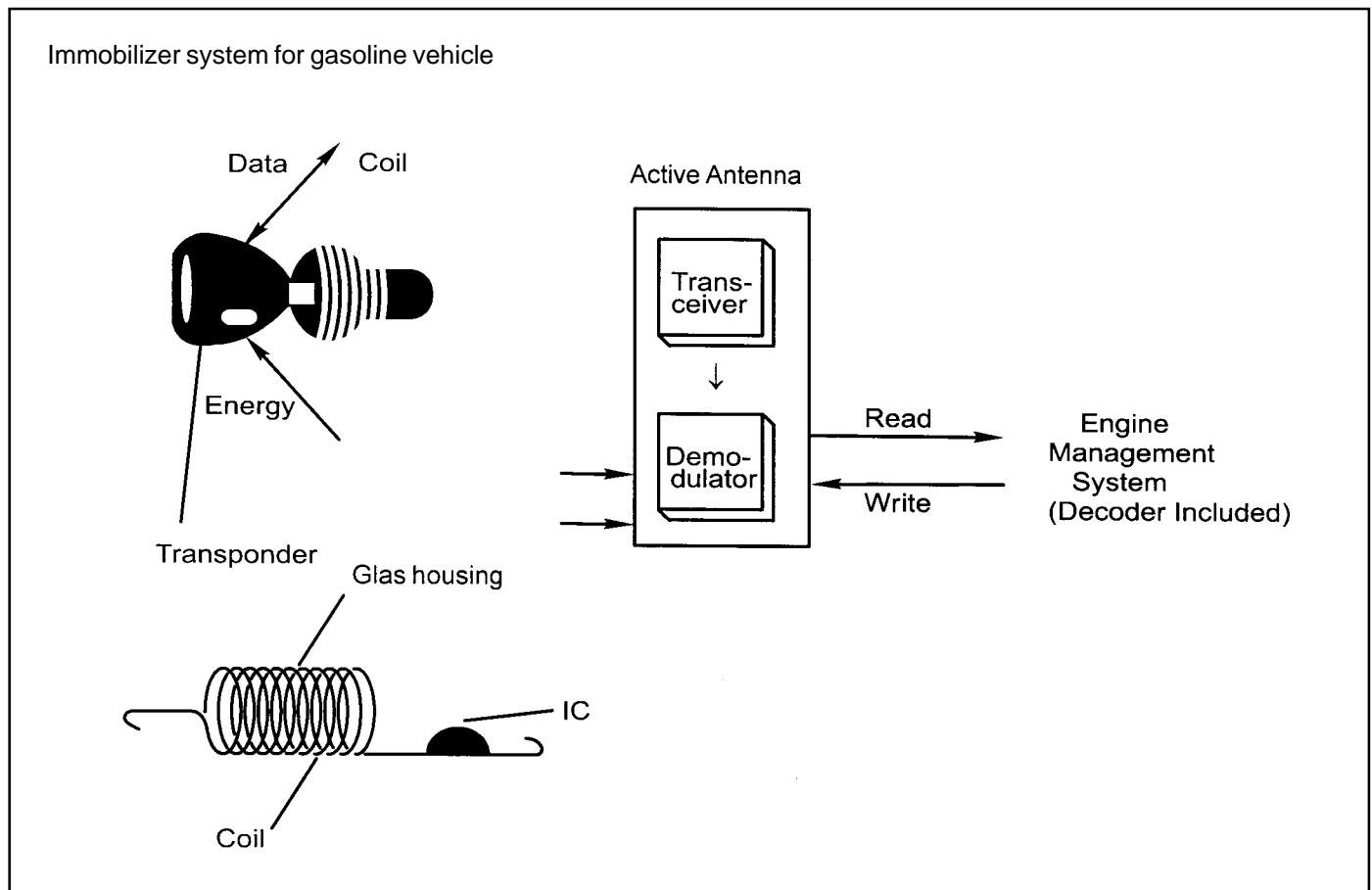
Gasoline Version

The Immobilizer System consists of an electronic device with integrated coil, called 'Active Antenna', the crypto transponder, which is integrated in the ignition key, and the engine management system (EMS).

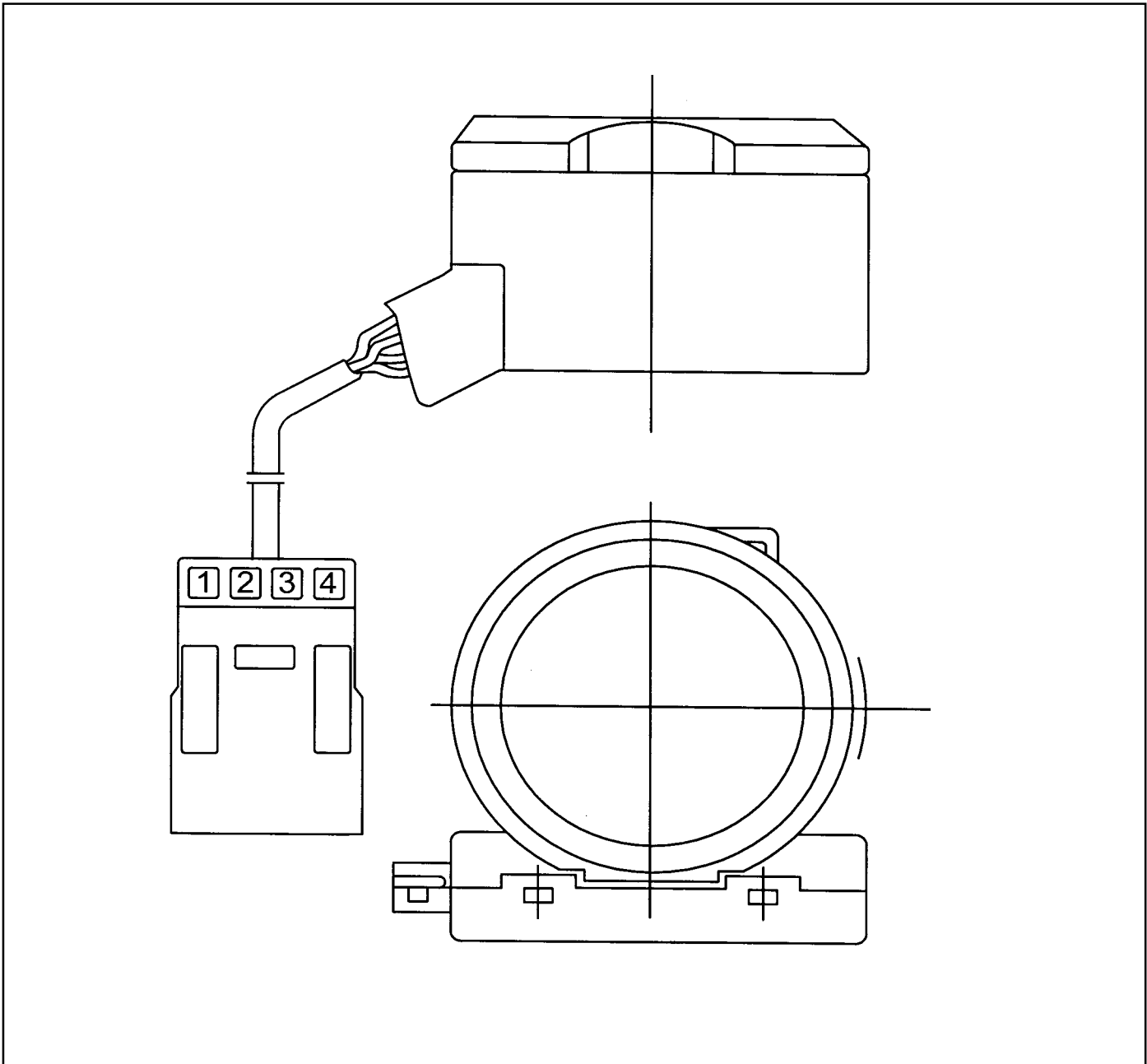
The Active Antenna is mounted at the ignition lock and handles the following tasks :

- To supply the transponder with power
- To receive the data from the EMS and transmit it to the transponder
- To receive and demodulate the data from the transponder and transmit it to the EMS

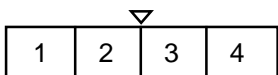
The whole Immobilizer software, the authentication and the management of valid keys is completely managed by the EMS.



Active Antenna



- Connector



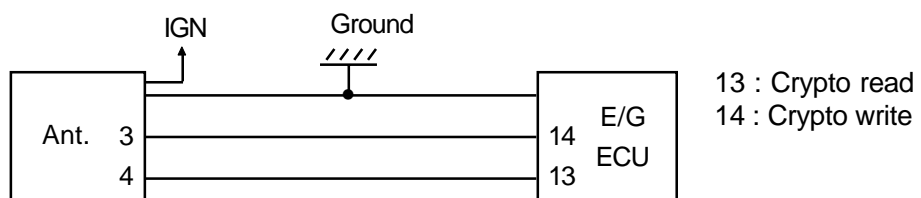
1 : IGN (red)
3 : Data in (yellow)

2 : Ground (brown)
4 : Data Out (green)

Notice

Pin arrangement and spec. of connector is same for gasoline and diesel vehicles.

- Wire circuit diagram



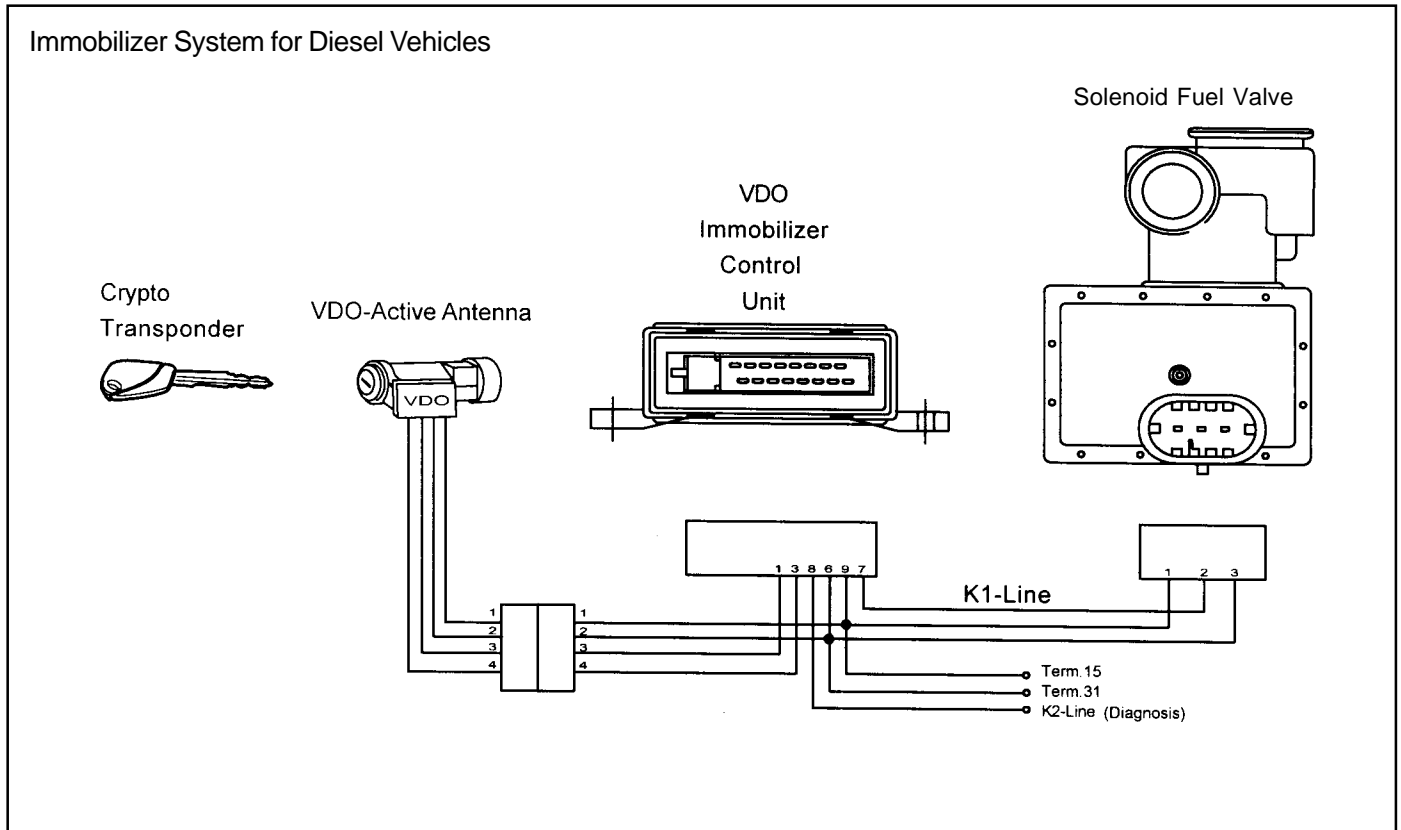
Diesel Version

The Immobilizer System consists of an electronic device with integrated coil, called 'Active Antenna', the crypto transponder, which is integrated in the ignition key, and the Immobilizer-Control-Unit (ICU).

The Active Antenna is mounted at the ignition lock and handles the following tasks :

- to supply the transponder with power
- to receive the data from the ICU and transmit it to the transponder
- to receive and demodulate the data from the transponder and transmit it to the ICU

The whole Immobilizer software, the authentication and the management of valid keys and controlling the fuel valve is managed completely by the ICU.



• Connector

- Immobilizer unit

16	15	14	13	12	11	10	9
8	7	6	5	4	3	2	1

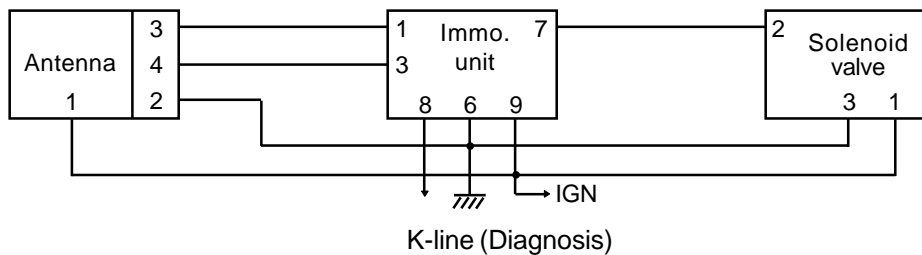
1 : Data out 3 : Data in 6 : Ground
7 : Data line 8 : K-Line 9 : IGN

- Solenoid valve

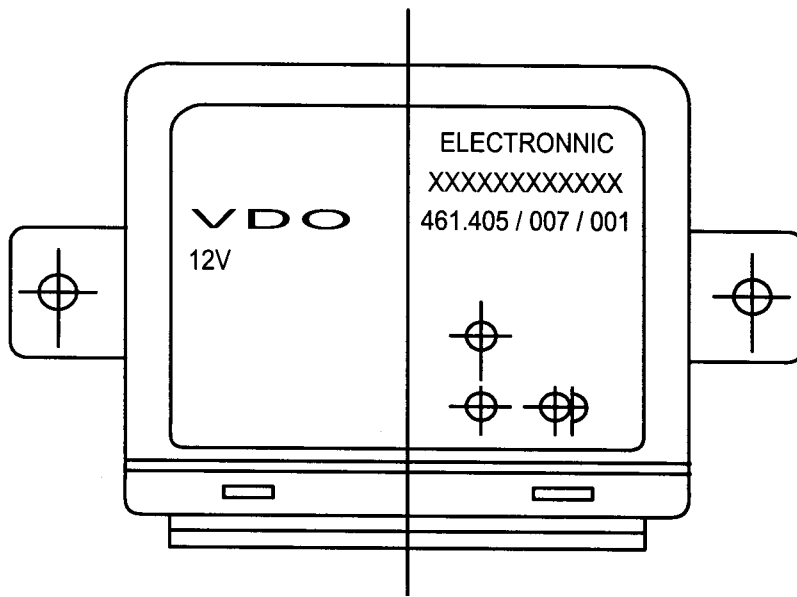
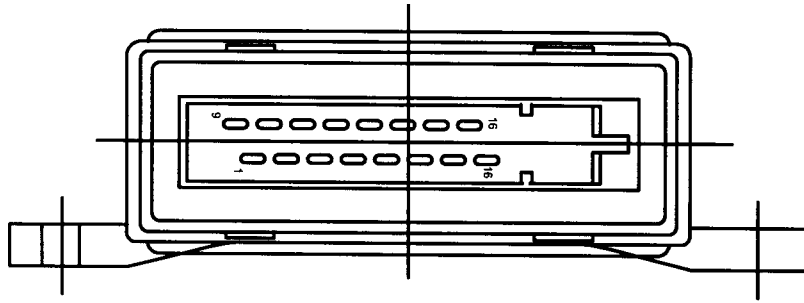
1	2	3
---	---	---

1 : IGN (Brown)
2 : Code (Green)
3 : Ground (Black)

• Wire circuit diagram



9W-6 IMMOBILIZER SYSTEM



System Integration

The med 98.2 immobilizer is an anti-theft protection device allowing the start of the engine only if a specific authorization is obtained during the start up phase. The med 98.2 will allow (prohibit) the start of the engine by driving ON (OFF) an internal solenoid valve.

The med 98.2 is a single unit integrating the following subsystem :

- a valve that allows (valve open) or blocks (valve closed) the fuel flow through the engine fuel system
- a microprocessor control system to control and activate the valve during the start up of the engine, in order to allow the start up only when a specific permission is given

the med 98.2 task is, therefore, to prevent the non authorized start up of the engine.

The functional unit includes also a basic set of electronic components whose function is to reduce its dependence on the microprocessor control system: a part from a short temporarily period, during the start up phase, the electronics allows the control system to excite and open the valve, but it doesn't allow to close it.

The valve can be shut off only after the KL 15 has been deactivated.

The structure allows to obtain the highest degree of safe-operation (functionality fail-start): a failure in the microprocessor unit cannot cause the shut-off of the valve. The main consequence of this type of failure is to prevent the next engine start up.

As a result of the above considerations, the med 98.2 immobilizer can realize its anti-theft functionality only in conjunction with a control device: the ICU.

The ICU, when requested, sends a coded message to med 98.2 according to a settled communication protocol. The med 98.2 will allow the start of the engine based upon this message.

In addition to the basic anti-theft functionality, the 98.2 immobilizer provides a number of diagnostic services when it is connected to an external test instrument (SCAN-100). Those connections are depicted in the following integration diagram (Fig. 1), where the dashed line indicates a temporary link for diagnostic purposes, and the shaded area the med 98.2 system's physical boundaries:

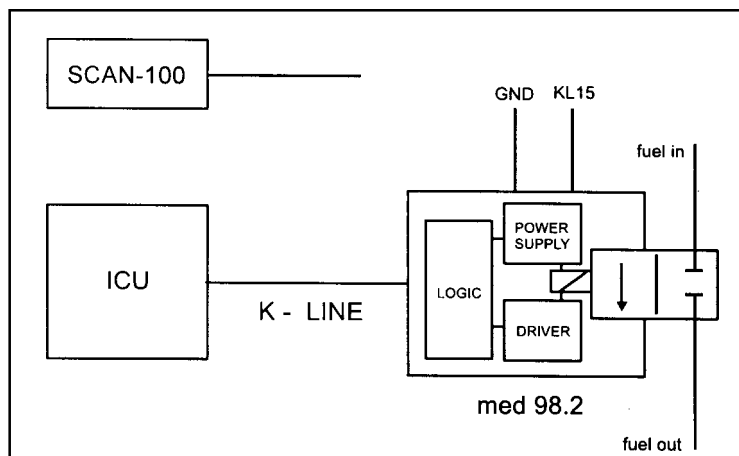


Fig. 1 - System Integration

Explanation of symbols:

med 98.2	Immobilizer
ICU	Immobilizer Control Unit
TESTER	Device that can be connected for diagnostic purposes
K-LINE	Serial line for communication with ICU
KL15	Ignition key (Power supply for med 98.2)
GND	Ground

DIAGNOSIS

GASOLINE ENGINE

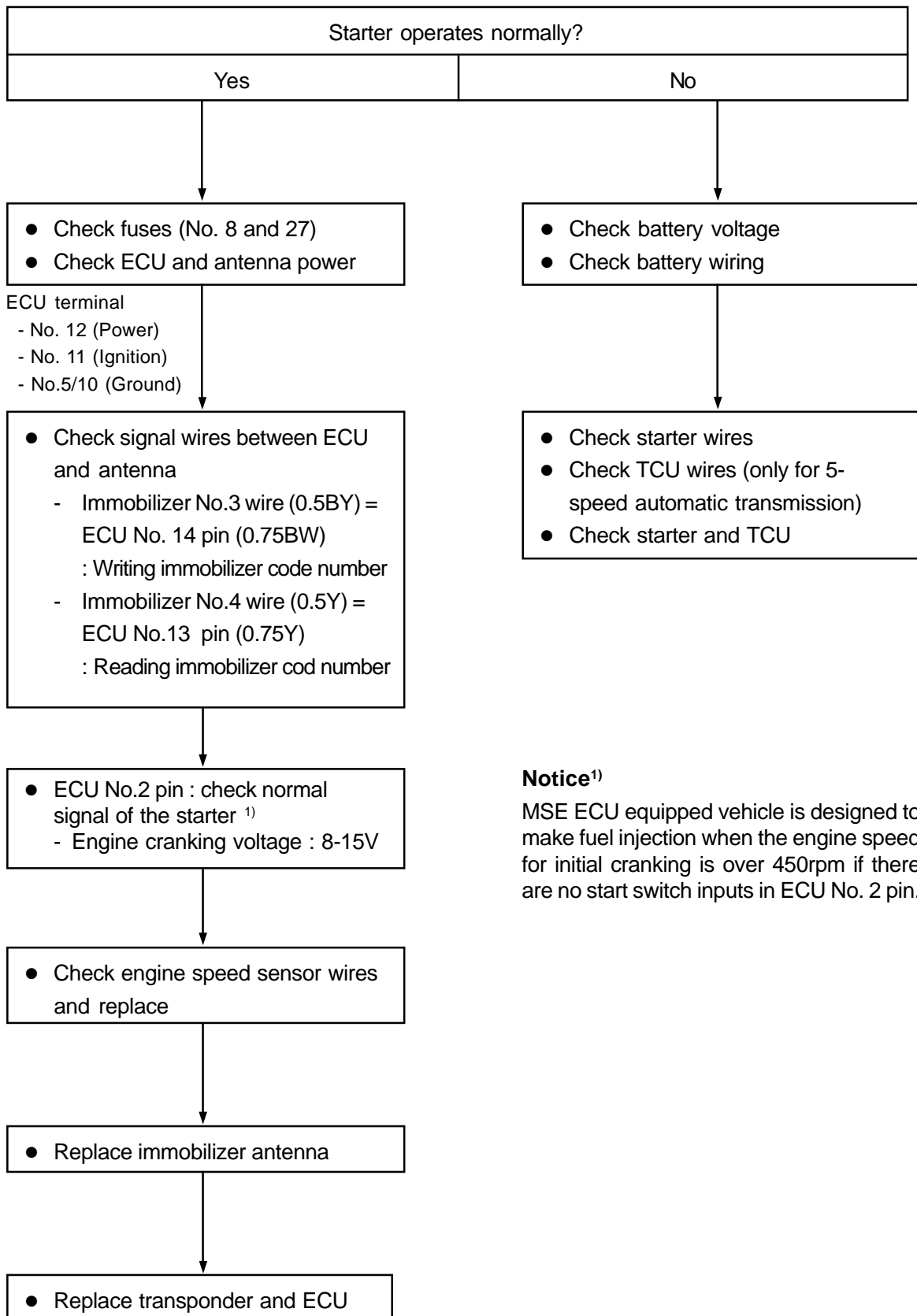
Cause and Remedy for Defective When Diagnosed by Scanner

Defects	Possible cause	Remedy
No communication with transponder	1. Defective wiring harness - Power supply/Open/short of ground - Open/short of signal terminal or mis-conneting(between ECU terminal No. 13 and 14)	1. Connect/replace the wire correctly.
	2. Damaged transponder	2.1 Replace the transponder 2.2 Immobilizer programming
	3. Defective antenna	3. Replace the antenna
	4. Defective ECU	4.1 Replace the ECU 4.2 Replace all transponder of the keys 4.3 Immobilizer programming
No immobilizer programming (Components and wiring harnesses are normal but codes in ECU and transponders are not registered normally)	1. Replace the transponders and ECU with new ; Immobilizer programming is not performed	1. Perform immobilizer programming
	2. Replace transponders only(new) ; Immobilizer programming is not performed	2. Perform immobilizer programming
	3. Replace ECU only(new)	3.1 Replace the transponders with new 3.2 Perform immobilizer programming
	4. Replace the transponder only ; Programmed for other ECU	4.1 Replace the transponders with new 4.2 Perform immobilizer programming
	5. Re-programming is not performed after clearing transponder code stored in ECU that normally used system	5. Immobilizer programming

Notice

1. Application of ex-programmed transponder into other ECUs.
; In this case, it can not be removed for the settled "lock bit" in transponder even though you perform immobilizer problem normally. Moreover it is impossible to start engine, so replace the transponder with new and perform immobilizer programming.

Check and Remedy when Engine Does not Start



Notice¹⁾
 MSE ECU equipped vehicle is designed to make fuel injection when the engine speed for initial cranking is over 450rpm if there are no start switch inputs in ECU No. 2 pin.

If transponder and ECU are replaced, perform programming.

DIESEL ENGINE

Cause and Remedy for Defective When Diagnosed by Scanner

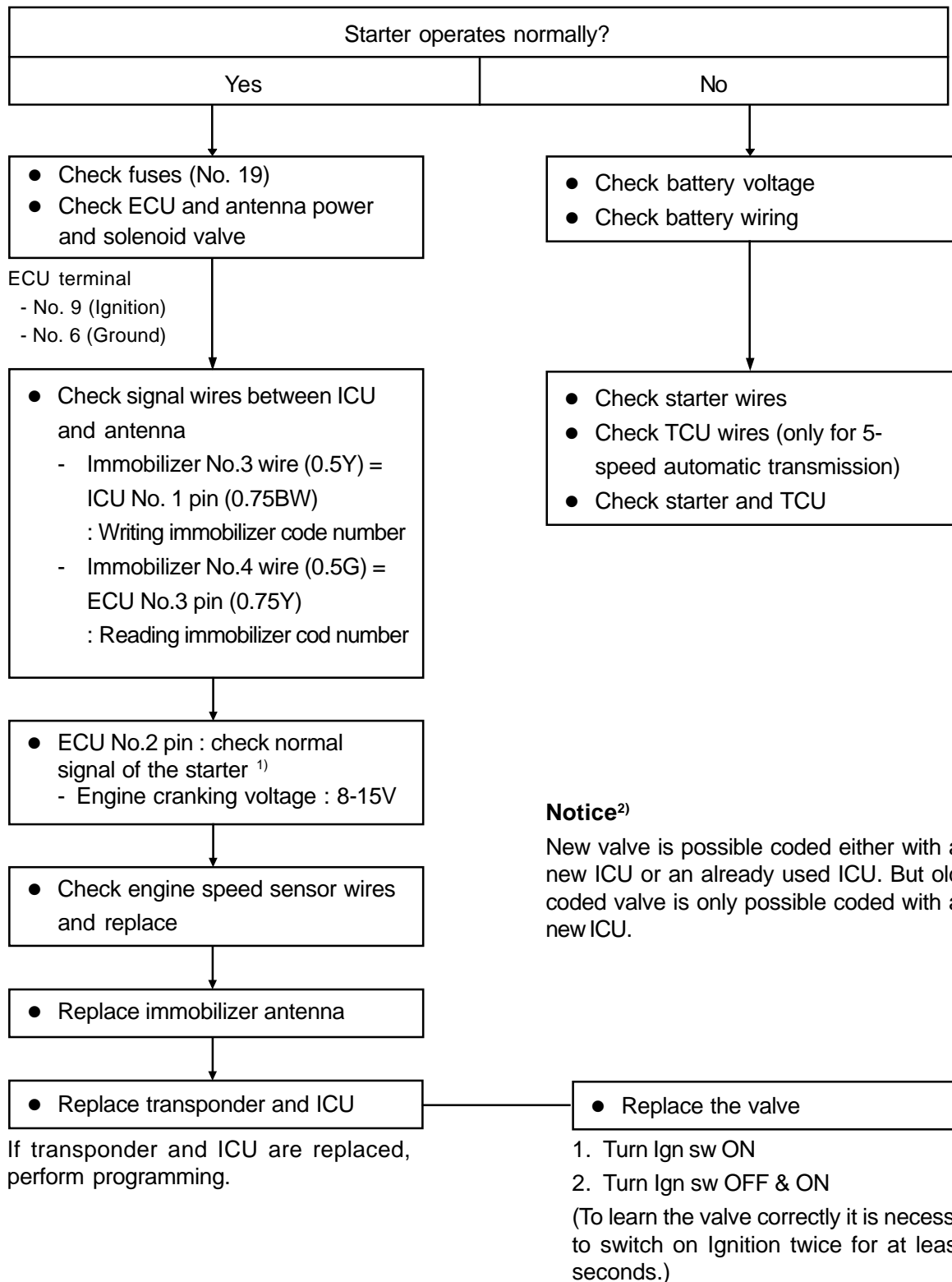
Defects	Possible cause	Remedy
No communication with transponder	1. Defective wiring harness - Power supply/Open/short of ground - Open/short of signal terminal or mis-connecting(between ICU terminal No. 13 and 14)	1. Connect/replace the wire correctly.
	2. Damaged transponder	2.1 Replace the transponder 2.2 Immobilizer programming
	3. Defective antenna	3. Replace the antenna
	4. Defective ICU	4.1 Replace the ICU 4.2 Replace all transponder of the keys 4.3 Immobilizer programming
No immobilizer programming (Components and wiring harnesses are normal but codes in ICU and transponders are not registered normally)	1. Replace the transponders and ICU with new ; Immobilizer programming is not performed	1. Perform immobilizer programming
	2. Replace transponders only(new) ; Immobilizer programming is not performed	2. Perform immobilizer programming
	3. Replace ICU only(new)	3.1 Replace the transponders with new 3.2 Perform immobilizer programming
	4. Replace the transponder only ; Programmed for other ICU	4.1 Replace the transponders with new 4.2 Perform immobilizer programming
	5. Re-programming is not performed after clearing transponder code stored in ICU that normally used system	5. Immobilizer programming
No communication with valve	1. Defective wiring harness - Power supply/Open/short of ground - Open/short of signal terminal or mis-connecting(between ICU terminal No. 13 and 14) 2. Defective ICU 3. Defective valve	1. Connect/replace the wire correctly 2. Replace the transponder 3.1 Replace the valve 3.2 Turn Ign sw on 3.3 Turn Ign sw OFF & ON

Notice

1. Application of ex-programmed transponder into other ICUs.

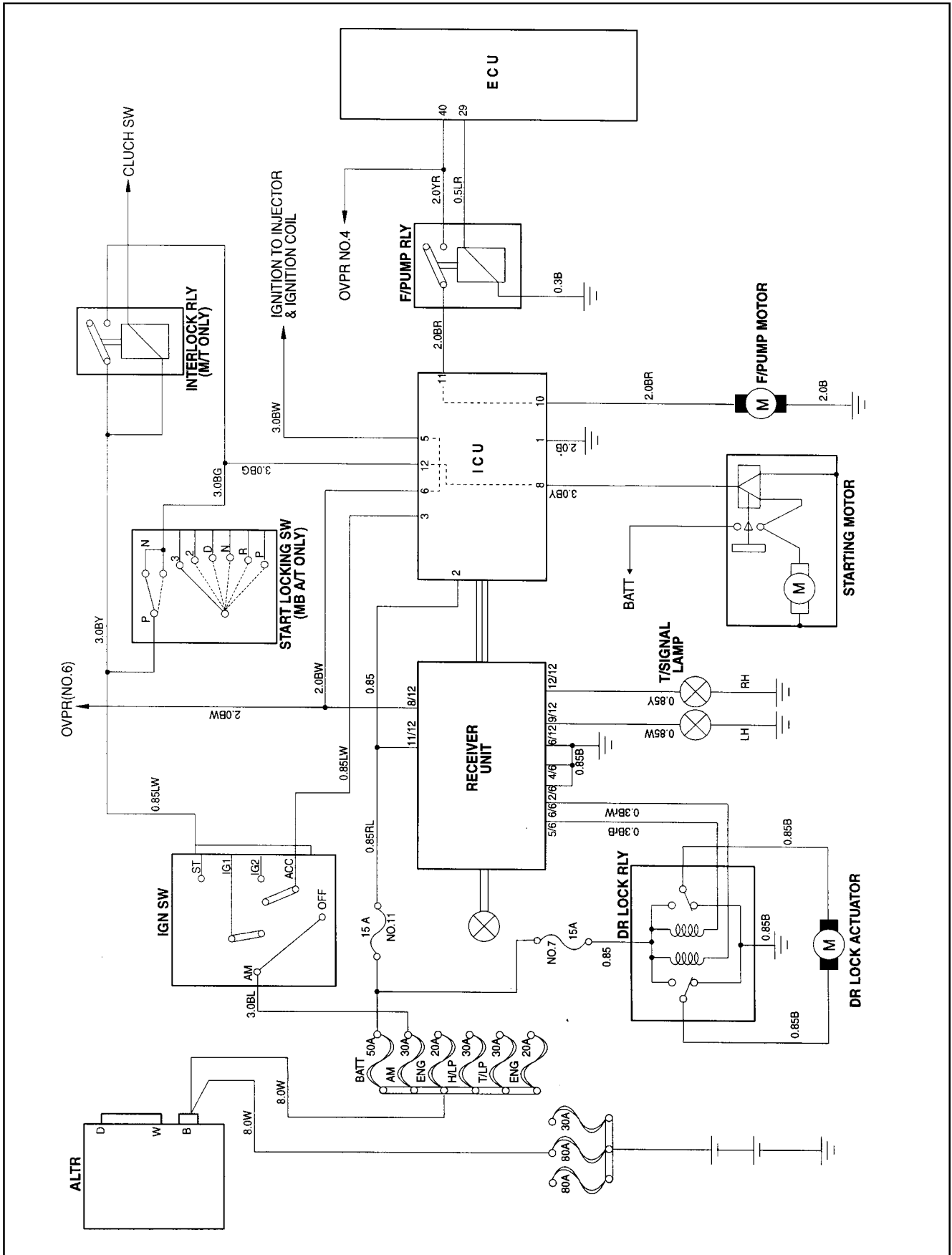
; In this case, it can not be removed for the settled "lock bit" in transponder even though you perform immobilizer problem normally. Moreover it is impossible to start engine, so replace the transponder with new and perform immobilizer programming.

Check and Remedy when Engine Does not Start

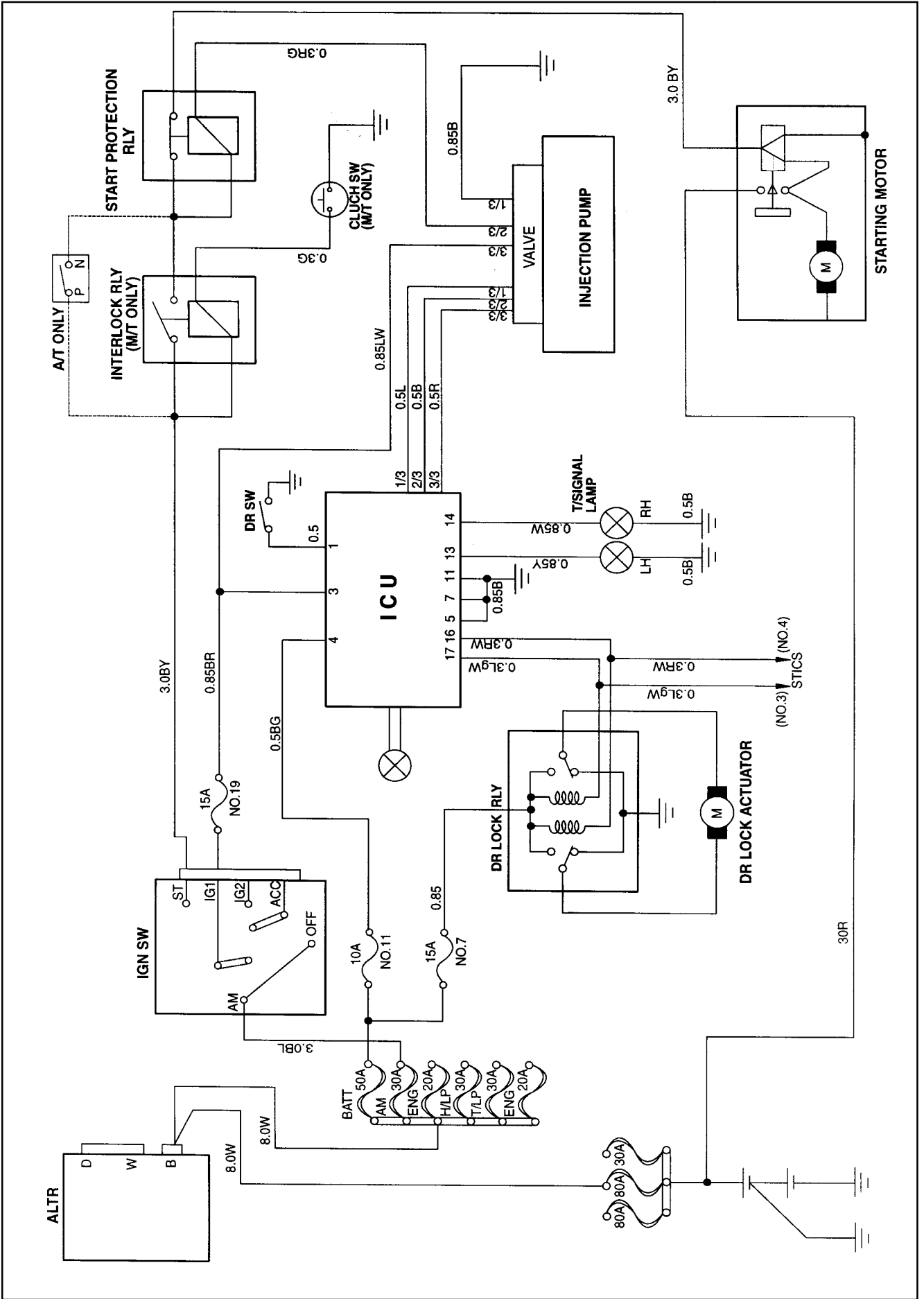


SCHEMATIC AND ROUTING DIAGRAMS

GASOLINE ENGINE (HFM) IMMOBILIZER



DIESEL ENGINE IMMOBILIZER



MAINTENANCE AND REPAIR

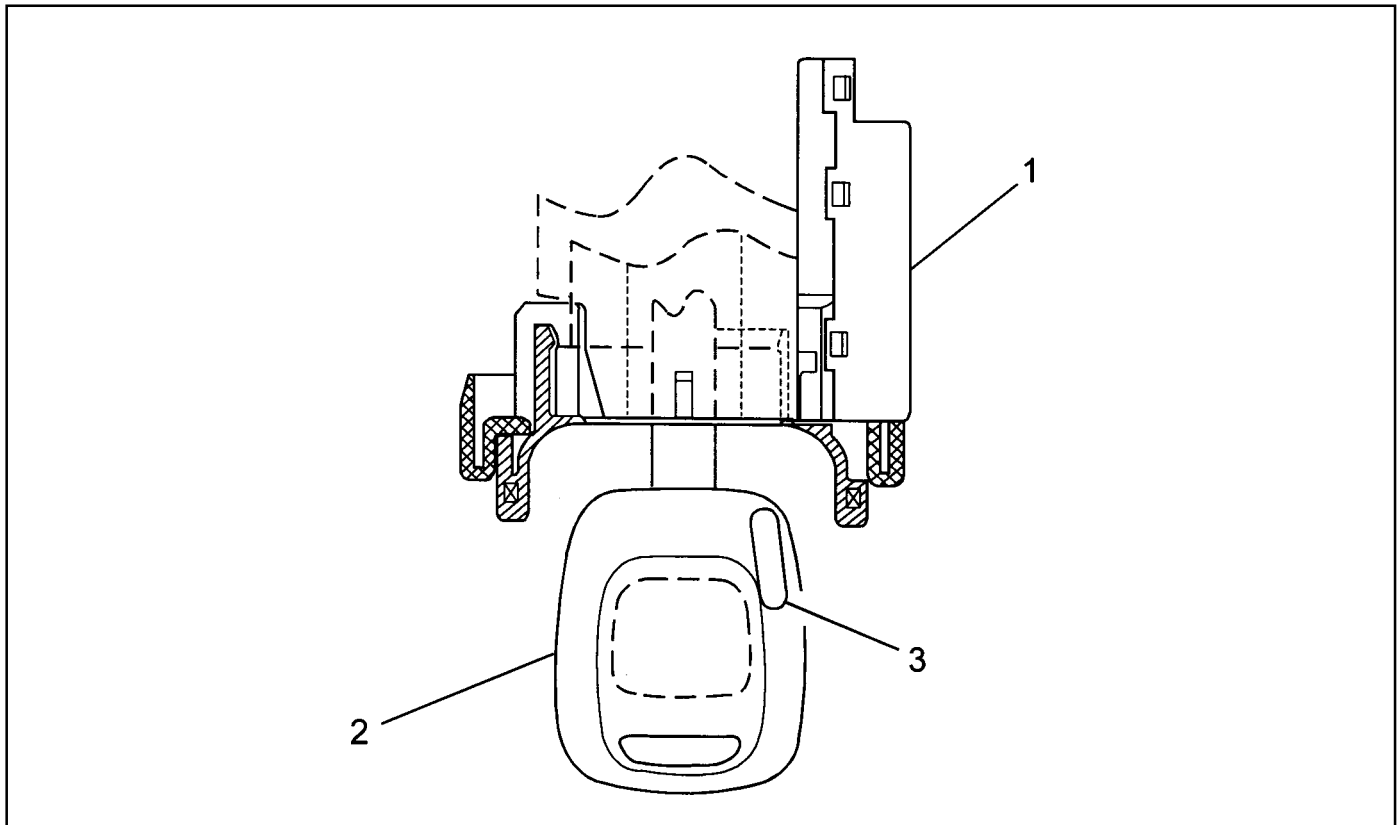
ON-VEHICLE SERVICE

Notice

For circuit diagram of gasoline vehicle, refer to the ECU diagram.

IMMOBILIZER ANTENNA

Immobilizer antenna is installed in key set outer surface (it is installed in the location of key hall illumination).(see the figure)

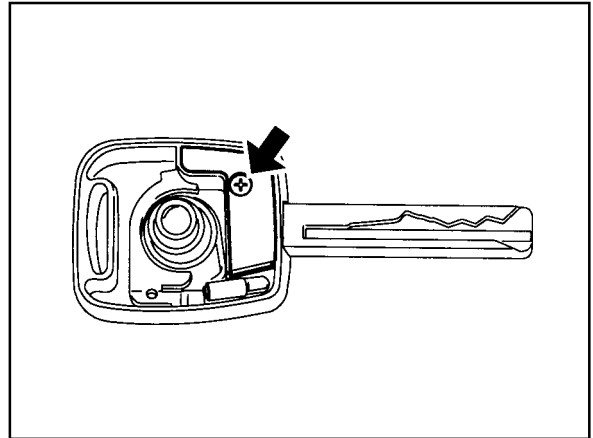


1 Immobilizer Antenna
2 Key

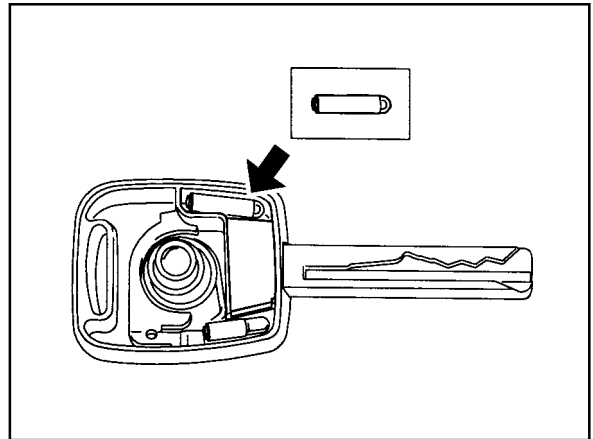
3 Transponder

Replacement Procedure

1. Open the cover on key handle.
2. Remove the small screw in symmetrical position of key illumination.
3. Remove the cover.



4. Remove the transponder. Carefully remove the old shock absorbing sealant with a razor blade if applied.
5. Replace the transponder with new one, and apply the small amount of shock absorbing sealant.
6. Installation should follow the removal procedure in the reverse order.



1 Transponder