37AS Technical Description

Author: Roger Lee
Date: 13 Apr 2000
Filed as: 37AS Tec Description.doc
Updated: 13/04/00 15:10
Type Designation: 37AS

Declaration of Equipment Characteristics

Type	Immobiliser System
Frequency Range	125kHz ±4%
Method of Carrier Frequency Generation	LC Oscillator
Adjacent Channel Separation	N/A
Class of Emission	14K0W1D
Type of Modulation	Amplitude
Modulation Signal Input Level	N/A
Modulation Input Impedance	N/A
Modulation Bandwidth	N/A
Coupling Methods	Electrical
Number of Channels	1
Utilisation	Mobile (Permanently installed in vehicle)
Duplex operation	No
Antenna	15EC, 24EC or 25EC (part of 37AS) -all coils variants are electrically identical
Alternative Antenna	None
Channel Spacing	N/A

Transmitter

Output Power	200×10^{-6} mW
Voltage supply range	6V → 15.5V DC
Composition of Equipment	See System Description
Temperature Range	Category 1 (-20°C to +55°C)
Channel Spacing	N/A

System Description

The 37AS is a vehicle immobiliser system and has two parts:
1. An immobiliser unit (36AS)
2. An energiser coil

The system can have a 15EC, 24EC or 25EC antenna coil. The coils are electrically identical. However, the coils have different ignition key position labels.

The energiser coil is fitted to the end of the ignition lock key barrel of the vehicle and the immobiliser unit (36AS) is mounted in the vehicle fascia. The energiser coil is connected to the immobiliser unit by twisted pair wiring. The immobiliser unit is connected to the vehicle battery and the vehicle engine management unit. The immobiliser system communicates with a transponder (5TG) which is mounted in the head of the vehicle ignition key. The system coil will work correctly only when its energiser coil is mounted on an ignition lock key barrel

The transponder has no internal power supply and is active only when it is in the electromagnetic field produced by the energiser coil.

System Operation

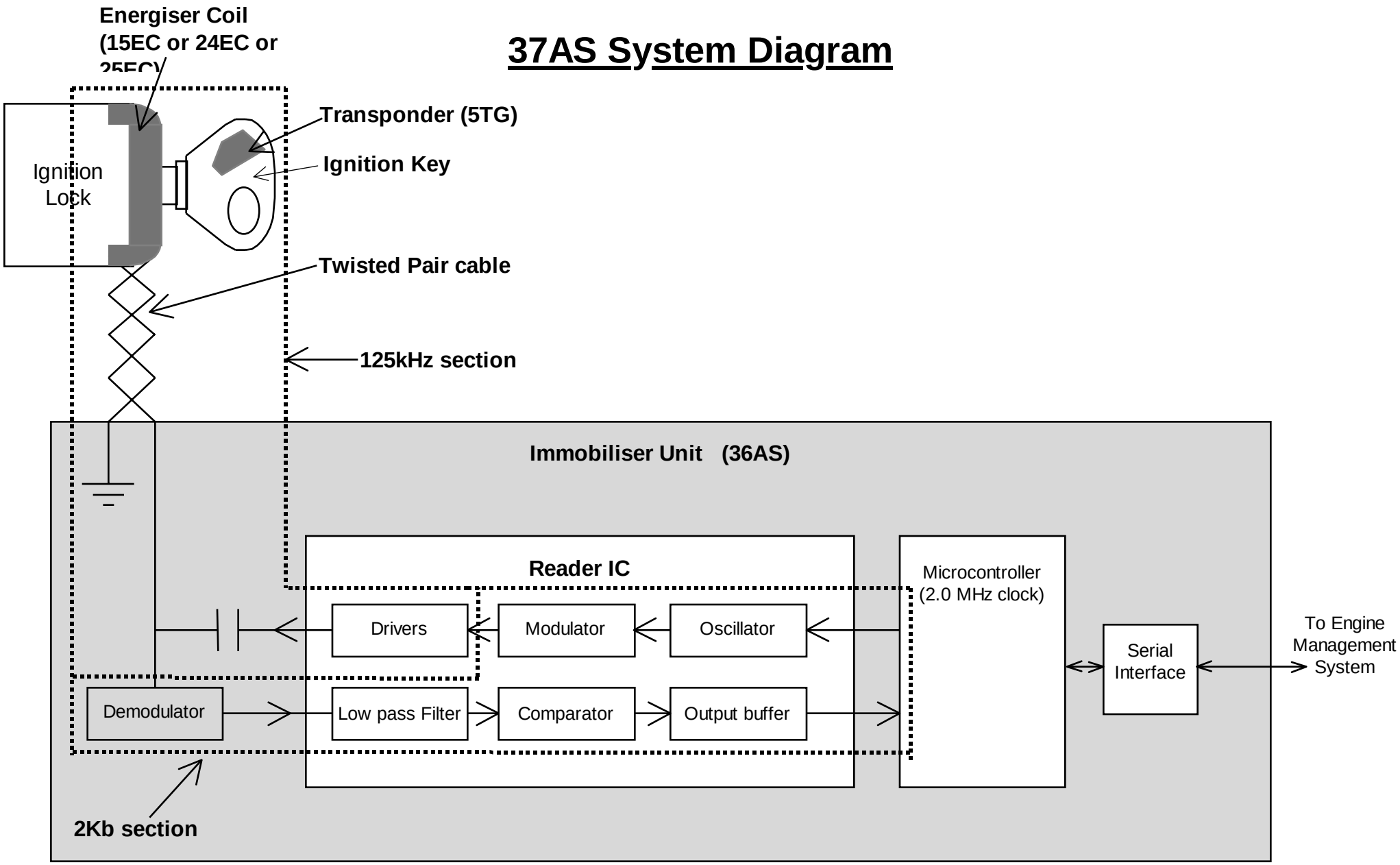
When the vehicle is manufactured:

1. The immobiliser unit stores the unique identity codes for each of the vehicle's transponders in its non-volatile memory

2. The engine management unit stores the identity code for the immobiliser unit in its non-volatile memory

When the ignition is turned on, the oscillator in the immobiliser unit drives the energiser coil to produce a 125kHz electromagnetic field which activates the transponder. The transponder and the immobiliser exchange data by modulating the electromagnetic field, the immobiliser uses 100% modulation and the transponder uses <2% modulation. An encrypted "challenge-response" protocol is used to ensure that the exchange of data is secure. The waveforms generated by the 36AS system are discussed on page 4. The engine management system uses a low frequency serial link to request that the immobiliser unit verifies the identity of the transponder and provide its own identity code. If the transponder identity is recognised by the immobiliser and the immobiliser identity is recognised by the engine management unit the engine is allowed to run, otherwise the engine is stopped.

37AS System Diagram

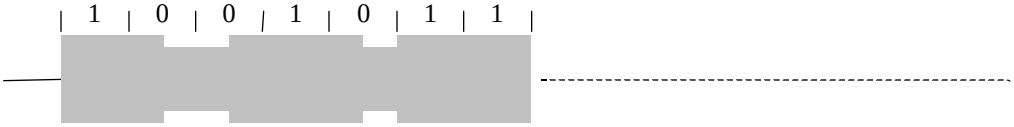


37AS Output Waveform

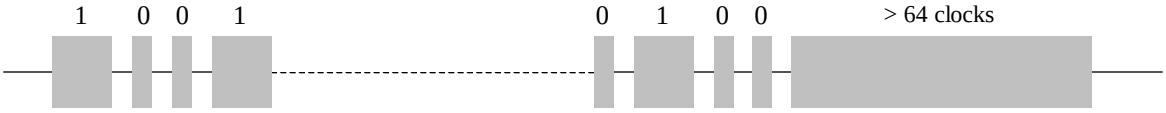
The field observed in the energiser coil goes through four stages: Power, ID, Challenge and Response.

Power Stage
When the vehicle ignition is turned on, the coil generates a cw signal which powers the transponder. This stage lasts 5 to 10 ms.

ID Stage
The transponder then transmits a 64-bit identifying code (ID) at 2 kbits per second by imposing a small (~ 2%) amplitude modulation on to the cw signal generated by the coil. The ID code is repeated for, typically, 80 ms until the immobiliser enters the Challenge mode (see next paragraph). The waveform during the ID stage is:



Challenge Stage
The immobiliser interprets the ID code from the transponder and, when the code is recognised, generates a 100% amplitude modulated signal in the coil, the modulating signal representing a 66-bit challenge code. Pulses representing a '0' are ~ 150µs long and those representing a '1' are ~ 400µs long. The gaps between spaces are ~ 150µs long. The Challenge stage waveform is:



Response Stage
The coil then returns to cw mode and the transponder imposes a small amplitude modulated signal representing a response. The response consists of a 'stand-by' code, which the transponder generates while it is analysing the challenge code it has received, and a 32-bit response code, which is repeated for, typically, 50 ms until the response is recognised by the immobiliser. The waveform generated during the Response stage is similar to that for the ID stage.

If the vehicle immobiliser considers that the communications with the transponder are satisfactory, the vehicle engine is allowed to run. If a valid response is not received by the immobiliser within approximately 300 ms, the immobiliser considers the transponder to be invalid and the engine is stopped.