

## **FUNCTIONAL DESCRIPTION OF THE DaimlerChrysler SKIM 2**

### **System Components**

The DaimlerChrysler SKIS (Sentry Key Immobilizer System) is a vehicle immobilization system. The electronic devices in the SKIS are the SKIM 2 and a Cryptographic Transponder. The SKIM 2 is located near the vehicle's ignition lock. The Transponder is located within the ignition key. The Transponder is magnetically coupled to the SKIM 2. The Control Module is connected via a wire harness to vehicle power, vehicle ground, vehicle ignition, and a J1850 vehicle communications bus. The J1850 communications bus is a single line 0V to 7.5V wave-shape controlled interface. This bus allows communications between the SKIM 2 and other vehicle controllers such as the Engine Management System and Body Controller.

### **System Operation**

The SKIS is a passive immobilization system. The SKIM 2 uses a magnetic couple to read the Transponder's identification code. The SKIM 2 compares the identification code received from the Transponder with identification codes stored in its non-volatile memory. If the identification code from the Transponder matches one of the identification codes stored in memory, the SKIM 2 sends a "Valid Key" message to the Engine Management System controller. If there is no match, the SKIM 2 sends an "Invalid Key" message to the Engine Management System controller. This causes the Engine Management System to turn off the engine.

The SKIM 2 remains in a low-power "sleep" mode while vehicle ignition is off. When vehicle ignition is turned on, the SKIM 2 wakes up, runs some internal diagnostics, and then attempts to communicate with the Transponder. Once the results of the Transponder communications have been sent to the Engine Management System, the SKIM 2 goes into an idle mode. Twice per second it will send a status message on the vehicle communications bus. It will also respond to commands and message sent by other modules on the communications bus. The SKIM 2 remains in this mode until ignition is turned off. The SKIM 2 will perform some internal clean-up operations, delay for several seconds, and then go into the low-power "sleep" mode.

The SKIM 2 will attempt to communicate with the Transponder eight times. Once successful communications have occurred the SKIM 2 stops communicating with the Transponder. Each attempt consists of the following steps:

1. Charge mode,
2. Transmit mode,
3. Receive mode,
4. Delay for internal processing.

**EXHIBIT 12**

Page 1 Of 2

U of Mich file 415031 - 013

### Charge Mode

The charge mode provides an initial surge of power to the Transponder. The Transponder wakes up, performs an internal reset sequence, then waits for a command from the SKIM 2. Charge mode is similar to transmit mode. However, rather than modulated data only one long burst of oscillation occurs. Total charge time is 50mS.

### Transmit Mode

In transmit mode, a pair of drivers is used to drive a series resonant circuit. When resonating, the circuit generates a 134.2kHz magnetic field which is coupled with the Transponder in the nearby key. Transmit data modulates the magnetic field by turning the drivers on or off. Data consists of commands to the Transponder. Total transmit time varies from 4mS to 100mS.

### Receive Mode

A few milliseconds after the SKIM 2 stops transmitting energy to the Transponder, the Transponder starts sending data back to the Control Module. The Transponder sends Frequency Shift Keyed (FSK) encoded binary data at 130kHz to 139.5kHz for a low bit and 118kHz to 128kHz for a high bit. The SKIM 2's antenna is magnetically coupled with the Transponder. The SKIM 2's series resonant circuit is excited by the Transponder's signal. The data received in the resonant circuit is amplified. Then the SKIM 2's logic uses a digital sampling technique to decode and demodulate the data. Data consists of responses to the commands sent in transmit mode. Total response time is always under 25mS.

**EXHIBIT 12**

Page 2 Of 2

U of Mich file 415031 - 013