1 Device Under Test (DUT)

1.1 Description

1.1.1 Functional Description

1.1.1.1 Overview

The TRM (Transponder Reader Module) is an intelligent sensor which uses RFID (134.2 KHz) technology to communicate with a transponder that is embedded in the electronic ignition key via a separate exciter coil. The TRM communicates with a host ECM (Electronic Control Module) via the CAN datalink using an encrypted J1939 protocol. Upon reception of a request for key ID from the host ECM, the TRM energizes the exciter coil for 50 ms, then reads the 128 bit code that the key transmits. The TRM checks the code to ensure that the received code is from a TIRIS Read-Only Low Frequency transponder. It does not check to see if the key is authorized, but it does use error checking and CRC (Cyclic Redundancy Check) to make sure that the received data is valid, and it checks the format of the signal to make sure that it is in the correct form for such a transponder.

If the received ID is from a valid TIRIS Read-Only transponder, then the 64 bit ID is encrypted and sent via J1939 back to the host computer. If no transponder is present when the key read sequence is initiated, or if a non-TIRIS, or a TIRIS Read/Write transponder is detected, a second attempt to read will be made. If there still is no Read-Only LF TIRIS chip present, then a third read attempt will be made. If there still is no valid R/O LF TIRIS transponder present, then the transponder sends a message to the host ECM via J1939 indicating that it did not find a valid R/O LF TIRIS chip. If it does recognize a R/O LF TIRIS chip, no matter which attempt, it will encrypt that value and send it back to the host ECM via J1939. The TRM will then go back to the dormant state until it receives another request to read the transponder.

1.1.1.2 Operating Modes

The TRM has only one operating mode in normal operation, however given that the vast majority of the time that it is powered it is in the "steady state", or *dormant* mode, we have artificially created two "test" modes to facilitate testing of relevant functions and parameters. These are:

1. Constant Key Read (CKR)
2. Constant RF (CRF)

In the Constant Key Read (CKR) mode the TRM does not accept requests from a host ECM for key reads. Instead it internally initiates a key read sequence every 500 ms. If a valid LF R/O TIRIS transponder is detected, the 64 bit ID is encrypted and sent via J1939 to the host ECM. If none is encountered, a second, and third (if needed) attempt is made to read such a transponder. If none are detected, then a message is sent via J1939 that no valid key was encountered. This mode is used primarily for EMC susceptibility testing.

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In the Constant RF (CRF) mode the TRM never actually reads a key. Instead the exciter coil is constantly energized at 134.2 KHz. This is accomplished by physically grounding pin 13 of the TIRIS transceiver chip. No messages are sent, nor received on J1939. This mode is primarily used for EMC emissions testing since it is considered to be the "worst-case" emissons state.

Note: **All tests should be performed for both 24v NSV and 12v NSV unless it can be clearly shown that the severity of the test performed at one voltage level adequately covers the other and therefore the test need not be performed at the second voltage level. This is true not only on the "high" side, but also on the "low" side.**

Summarizing:

Steady State
Coil is off
TRM is "listening" for request to read on J1939
TRM is not transmitting any data over J1939

Constant RF (CRF)
Coil has 134.2 KHz applied continuously
J1939 requests for key read are ignored by TRM
No J1939 messages are generated

Constant Key Read (CKR)
Coil is excited at 134.2 KHz for 50 ms every 0.5 seconds automatically
Key is read for 20 ms every 0.5 second automatically
Key read sequence may occur up to 3 times to look for LF R/O TIRIS
J1939 requests for key read are ignored by TRM
TRM generates encrypted J1939 after each key read attempt

Emissions testing will be conducted in Steady State and Constant RF modes. Susceptibility testing will be conducted only in Constant Key Read modes. Different pass/fail criteria will be used as described below:

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