

Bartec Auto ID Ltd

TPMS PAD

Description and theory of operation

Author C Beal, Bartec Auto Id Ltd

Date 28 July 2011

Version 1.0

Description

The TPMS PAD is a small electronic device which allows a user to test TPMS and also program the Schrader EZSensor. The PAD enclosure is made from ABS plastic approximately 100mm * 100mm * 25mm (4" * 4" * 0.5"). It contains a single PCB containing a 125KHz magnetic field generator and a programmable UHF receiver. It has a flat surface on the top surrounded by a rim upon which a TPM can be placed. There is a marked area on the top surface where a TPM should be placed. The PAD is not guaranteed to work if the TPM is not placed in this area. A TPM is tested by placing it on the pad, and the PAD generates a 125KHz magnetic field which causes the TPM to transmit at UHF. The magnetic field generated is in the range 1nT to 1uT. There are no controls on the PAD. The only indicator on the PAD is a multicolour LED which can illuminate in any combination of red green and blue light.

The PAD uses an ARM Cortex M3 microprocessor running at 72MHz maximum clock rate. This rate is derived from an 8MHz crystal by means of an on-chip PLL. There is 512KB FLASH memory on the processor which is used for storage of program code and data tables.

The LF transmitter uses an H-bridge MOSFET arrangement and two ferrite cored coils which are tuned using a switched capacitor array to resonate at 125KHz. The 125KHz drive signal to the H-bridge comes directly from the microprocessor and is derived from the 8MHz crystal.

The UHF receiver is a programmable multiband single-chip receiver which is programmed using a 3-wire SPI bus. This uses a 26MHz crystal and on-chip PLL to generate its internally used clocks.

The PAD connects to a PC using USB. The connector on the PAD is a miniature B type. The USB 5V power is used by the PAD and the current used is normally less than 100mA. The USB speed is Full Speed i.e. 12Mbps. The communications class is Human Interface Device (HID) so the PAD looks like a keyboard or mouse to the PC. This is so that the PC doesn't require a device driver. The PC runs a program which provides the user interface and tells the PAD what type of TPM to test. The PAD contains a list of available TPMS which the PC program requests when the PC program starts.

Operation

The PAD is connected to the PC using a standard USB cable. When the PC program starts, the user clicks on a button to display the available vehicle makes. This sends a command via USB to the PAD which responds with the available vehicle makes, models and years that the PAD has in its internal data tables.

The user can then choose a make model and year of vehicle which sends a command to the PAD to select the appropriate TPM type.

The user can then choose to test the TPM normally fitted to that vehicle or alternatively to generate a copy of the TPM by programming a Schrader EZSensor.

When the test or program process starts, the LED changes colour to indicate testing is in progress. During testing or programming, the PAD generates a 125KHz magnetic field in order to communicate with the TPM. The PAD sets the UHF receiver parameters to those appropriate to that type of TPM and decodes the received UHF data.

The operation can take up to one or two minutes depending on the TPM type. If the test is successful, the LED illuminates green. If not, the LED illuminates red. At the same time, the PAD sends a response via USB to the PC which displays the results on the screen.