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IVTM Integrated Vehicle Tire Monitor
(Tire pressure monitoring system for commercial vehicles)

Electronic Control Unit (ECU) "1B"

Description of modifications in redesign of electronic hardware.
The redesign was necessary to match several OEM and aftermarket requirements and to add some new features connected with the introduction of a new generation of IVTM wheel modules for pressure sensing.

The described changes are valid for all ECU variants based on PCB 446 220 201 4 (-), which are currently:

446 220 012 0	IVTM Truck ECU for aftermarket – FCC Certificate required.
446 220 013 0	IVTM Trailer ECU for aftermarket – FCC Certificate required. the circuitry is identical for both IVTM truck and trailer versions (446 220 012 0 and 446 220 013 0), only difference is the software in the main micro controller, the parameter setting and the product data on the type plate and in EEPROM.
446 220 014 0	IVTM Trailer Train ECU for aftermarket – No FCC Certification required (this version for special vehicles does not use the internal RF transmitter).
446 220 017 0	IVTM Truck ECU for OEM customer – No FCC Certification requested yet.
446 220 022 0	IVTM Truck ECU for aftermarket – FCC Certificate required. (this version is almost identical to 446 220 012 0, only the CAN bus termination resistor is not assembled and the part number is different on type plate and in EEPROM product data). This ECU variant will be released in Q3 / Q4 2007.

the circuitry is identical for both IVTM truck and trailer versions (446 220 012 0 and 446 220 013 0), only the software in the main micro controller is different.

These are the changes for the "1B" generation of the ECU:

- the power supply circuitry has been extended to implement options for some OEM requirements for a wider supply voltage range (e.g. no damage for up to 50V DC supply voltage, called "Jump start", at low ambient temperature).
The devices for FCC certification use the well-known standard power supply circuitry (for up to 36V DC supply voltage), the optional parts are not equipped.
- PCB size and the parts placement is very similar to prior design.
The "standard" power supply parts are located nearly in the same position as before.
The same housing and PCB structure is kept to avoid a complete new qualification.

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<ul style="list-style-type: none"> Some pads for LEDs and current limiting resistors are implemented in the PCB layout, (for simplified visual check of ECU-internal 5V supplies and Rx / Tx activity during development tests) but for series devices those parts are not assembled. some parts on the PCB have been changed to a smaller housing, e.g. some resistors and capacitors are now in 0603 size. All passive parts that connect to external signals remain in 0805 size, some capacitors have been replaced by two parts connected in series. the CAN bus interface has been modified to implement optional split termination circuitry according to OEM requirements - not used in the FCC versions. due to availability, the main micro controller SAK-C164CI-8EM is now used in the "DB" stepping. EMC approval and [e1] certification process has been done with new controller type. EMC tests with both controllers on the same PCB did not show EMC relevant differences. the second micro controller for the RF encoding / decoding is replaced by a pin-compatible version with flash memory and some additional features (e.g. analog input, see below): Microchip PIC16C63A is replaced by PIC 16F76. the bootstrap-plug (in development samples only, not assembled on IVTM series parts) is now used to connect the programming signals for the flash PIC. the new PIC micro controller's program cannot be changed in the field! (bootstrap plug connection and additional wiring would be necessary). the PIC software for RF transmission encoding and decoding was adapted to new PIC type and was optimised to match FCC requirements (e.g. to ensure a <100ms RF pulse train for all standard data telegrams). A detailed description of the communication protocol and timing is available in a separate document. the RF decoding PIC 16F76 micro controller is now used directly to sample an analog value from the RF receiver module, this feature is presently used for diagnostic purposes only. the software in the main micro controller has been updated to include new functions. according to the software developers, the RF transmission protocol was unchanged since WABCO supplied test samples for the FCC measurements to Phoenix Testlab. Parameter setting is updated for series products, transmission in FCC mode is set as a default. 			
F. Hintze, 2007-07-20			