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Project: MSS54

Module: Injection Diagnosis

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x. Specify I/O status and actuator control

x.1. control injection valves

The injection valve is controlled via the function **ti_write** (unsigned char cylinder number, unsigned char period, unsigned char duty cycle). This function is called by the DS2 software and runs at **DS2 task level**.

Value ranges:

Cylinder number:	1 .. 8 (cfg_cylinder_number)	
Period length:	10 .. 100 [msec]	Resolution: 10msec/bit.
duty cycle:	0 .. 100 [%]	Resolution: 1%/bit.

These functions run on the slave.

This function is not executed with **B_ML**. With **B_ML**, the duty cycle may only be 0%. This is equivalent to switching off the valve.

The function sets the bit (CYLINDER-1) (= **B_EVx_DS2**) in **ti_ev_ds2** for the respective cylinder. This prevents the TPU parameters from being loaded by the function software, configures the TPU channel as LPWM in continuous mode, and writes the period duration and the high time to the TPU RAM.

When the diagnostic mode (**!B_DIAG**) is exited and **B_EVx_DS2** is active, the function **ti_write_undo** is called. This function - deletes the **B_EVx_DS2**

- configures the TPU channels at **B_SSP** as PSP channel (angle-synchronous injection pulse) and at **B_VSP** as PWM channel (pre-injection pulse)

The following is returned as return value:


- 00: Actuator is controlled properly
- 01: Control for this cylinder not provided
- 02: Actuator cannot be controlled because duty cycle is not valid
- 03: Actuator cannot be controlled because period duration is not valid
- 04: Actuator cannot be controlled because control condition is not met

x.2 Reading the injection time

The diagnostic software for "Read injection time" uses the variables **ti1** to **ti8** read out (does not yet contain the UBATT correction).

The injection time has a value range of 0 to 65,535 msec (unsigned short) with a resolution of 1 usec/bit.

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x.3 injector driver diagnosis

The Harris **HIP82** injector driver diagnoses the following errors:

- open load = interruption
- Short circuit to UB
- Short circuit to ground
- overtemperature

The driver status is read out synchronously with the angle (every 720 °KW) and checked for errors in the background task and processed accordingly.

The driver status may only be evaluated if there has been a change in the control signal. This is always the case if new driver status information is available and the channel is not hidden.

The driver status in the background task is evaluated when

- B_START or B_ML and
- B_SSP (sequential injection is active) and - S_KL_15_ROH (KL15 definitely present) and
- ub > K_TI_UB and
- the injection channel is not hidden and
- the injection channel is not controlled via DS2 and
- new driver status information is available

The driver status is in the variables **ti_ed_ev1** to **ti_ed_ev8**.

The routine enters an error into the error memory after a certain error frequency.

The following transfer parameters to the **ed_report** are now possible in total:

- 0x00: no error
- 0x01: short to battery
- 0x02: short to ground
- 0x04: open load
- 0x08: implausible state


Furthermore, a global diagnostic status variable is created for the injection valve drivers => **ti_ed_ev_summe** (the set bit represents an error for the corresponding (cylinder+1))

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- B_START or B_ML - ub and
> K_TI_UB - new and
driver status information is available

error	Effect of lean	measure
open load	exhaust gas rough engine running distorted lambda sensor signal	1. Lock the lambda controller in the bank in which the error occurred ÿ LA adaptation blocked; TE blocked; TE adaptation blocked 2. Error memory entry
short circuit +	lean exhaust gas rough engine running distorted lambda sensor signal Driver switches off automatically	1. Lock the lambda controller in the bank in which the error occurred ÿ LA adaptation blocked; TE blocked; TE adaptation blocked 2. Error memory entry
short circuit -	rich exhaust gas rough engine running distorted lambda sensor signal Injector can constantly be controlled ==> cylinder can fill with fuel	1. Lock the lambda controller in the bank in which the error occurred ÿ LA adaptation blocked; TE blocked; TE adaptation blocked 2. Error memory entry
overtemperature	lean exhaust gas rough engine running distorted lambda sensor signal Driver switches off automatically	1. Lock the lambda controller in the bank in which the error occurred ÿ LA adaptation blocked; TE blocked; TE adaptation blocked 2. Error memory entry

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x. 4 Specify and read idle synchronization values

The idle synchronization offset `ti_ll_zx` can be specified via the DS2 by calling the function **`ti_ll_vorg(unsigned char cylinder, signed short value)`**.

The passed value has its limits (`K_TI_LL_MIN` and `K_TI_LL_MAX`) checked in this function.

The function **`ti_ll_read(unsigned char cylinder)`** returns the idle synchronization value `ti_ll_zx` as return value.

`ti_ll_zx` is a signed short value with a resolution of 1 usec/bit.

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