

Epm - Engine Position Management

1 [Engine Position Management] Engine Position Management

1.1 [Overview]

Figure 1: [Epm Function Overview]

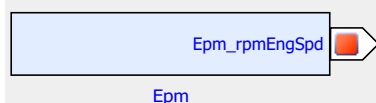


Figure 2: [Epm_dummy.Main]



1.2 [Functionality]

The EPM software module provides the interface to the physical CAM and CRANK position sensors.

The EPM module provides:

- Calculation of the engine speed and acceleration from the crankshaft signal
- Generation of the angle-synchronous interrupts
- Calibration of the crankshaft and camshaft patterns
- Calibration of the actual number of cylinders
- Calibration of the physical firing order of the engine
- Calibration of the orientation between crank, cam, and TDC

1.3 [Reference/Calibrated Position during adaptation and start]

During engine start-up the CAM shafts must be in reference/calibrated (default/un-shifted) position. While minor shifts of the phasing is acceptable, wide variations from the calibrated position may lead to the inability to reach synchronization and run the engine. VVT requires that adaptation is only done while attached CAMs are in the reference/calibrated position.

Hint:

It is strongly recommended to minimize all computations performed by the AppSw until EPM initialization is completed. AppSw can monitor the status of the message EpmSyn_stCasEval for transition to the state "SWTOFF_CASPOS" which indicated plausibility checks of CAM and CRANK have completed.

Similar comment during the initial CAM adaptation after synch is reached if VVT is to be utilized sooner.

2 [C-Code Source]

2.1 [Code Listing]

```

/* BEGIN: ASCET REGION "Generation Information" */
/*****
* BEGIN: Generation Information
*-----
* Component:.....Module
* Name:....."Epm_dummy"
* Implementation:....."Impl"
* Dataset:....."Data"
* Specification:.....Block Diagram
* Version:.....<empty String>
* Library Path:....."smartm160\Project_SmartM160\Component_Moduls"
*-----
* Project Name:....."FlexECU_M160"
* Project Library Path:....."smartm160\Project_SmartM160\"
*-----
* Generation Date:.....03.12.2014
* Generation Time:.....13:41:34
*-----
* ASCET Version:.....V6.1.4 RB-DGS 2.3
* ASCET-MD Version:.....V6.1.4
* ASCET-RP Version:.....V6.1.4
*****/

```

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* ASCET-SE Version:.....V6.1.4.28.19 CID[610]
*-----
* END: Generation Information
*****
/* END: ASCET REGION "Generation Information" */

/* BEGIN: ASCET REGION "Project Options" */
/*-----
* BEGIN: Project Options "Build"/"Code"
*-----
*      Build
*-----
* Code Generator:.....Object Based Controller Implementation
* Compiler:.....Microsoft Visual C++ 2008
* Operating System:.....GENERIC_OSEK
* Target:.....ANSI-C
*-----
*      Code
*-----
* Add Comment with Generation Information for each Component [true]: true
* Add Comment with Implementation Information for each Assignment Statement [true]: true
* Add Comment with Specification Source for each Statement [true]:..true
* Add parenthesis for readability [false]:.....false
* Casting [MISRA]:.....MISRA
* Force Parenthesis for Binary Logical Operators [false]:.....false
* Generate Define Directives for Enum Values [false]:.....false
* Prefix for Component Names [<empty String>]:.....<empty String>
* Protected against division by zero [true]:.....true
* Protected Division against Signed Overflow [true]:.....true
* Protected Vector Indices [true]:.....true
*-----
*      Code.Compiler
*-----
* Division truncation direction [Zero (T-division)]:.....Zero (T-division)
* Inline directive [__inline]:.....inline
* Integer Bit Size [32]:.....32
* Private directive [static]:.....static
* Public directive [<empty String>]:.....<empty String>
*-----
*      Code.FixedPoint
*-----
* Allow Double bit Size for Division Numerators [true]:.....true
* Allow Limit Service for Assignment Limitation [true]:.....true
* Arithmetic Service Set [<None>]:.....<None>
* Generate Limiters (may be changed locally) [true]:.....true
* Generate Round Operation on float to integer Assignment [true]:..true
* Maximum bit Length (float) [64]:.....64
* Maximum bit Length (int) [32]:.....32
* Result on Division by Zero [numerator]:.....numerator
* Temp Vars always 32 bit (integer) [false]:.....false
* Use power of 2 approximations of literals [false]:.....false
* Use SHIFT Operation on Signed Values instead of DIV Operation [true]: true
* Use SHIFT Operation on Signed Values instead of MUL Operation [true]: true
*-----
*      Code.Optimizations
*-----
* Auto-inline private methods (Smaller code-size - may be changed locally) [false]: false
* Generate well-formed switch [false]:.....false
* Hierarchical Code-Generation (may be changed locally) [false]:...false
* Initialise history variable with zero [false]:.....false
* Optimize Direct Access Methods (Multiple Levels) [false]:.....false
* Optimize Direct Access Methods (One Level) [false]:.....false
* Optimize Static Actions (Restricted Modelling) [false]:.....false
* Outline Generated Methods (may be changed locally) [false]:.....false
*-----
*      Code.Production
*-----
* Add Implementation Definitions [true]:.....true
* Generate Access Macros for [(variables, messages)]:.....(variables, messages)
* Generate Access Methods for dT (Alternative: use OS dT directly) [true]: true
* Generate Data Structures [USELOCAL]:.....USELOCAL
* Generate Map File [true]:.....true
* Generate OS Configuration [true]:.....true
*-----
*      Station.Build
*-----
* Use Customized Data Type Names [false]:.....false
*-----
* END: Project Options "Build"/"Code"
*****
/* END: ASCET REGION "Project Options" */
/* BEGIN: ASCET REGION "ASCET-SE AddOn Options" */
/*-----
* BEGIN: ASCET-SE AddOn Options
*-----

```

```

*      Code
* -----
* checkMemSectionVolatility [true]:.....false
* checkMultipleSend [false]:.....false
* distribVarMemClass ["DISTRAM"]:....."RAM"
* genAlwaysInitValues [false]:.....true
* genLogicElementsAs [PACKED_BITFIELD]:.....PACKED_BITFIELD
* genObjList [false]:.....false
* implInfoComments [true]:.....true
* initTaskMemClass ["ASD_INIT_TASK_MEM"]:....."ASD_INIT_TASK_MEM"
* isrMemClass ["ASD_ISR_MEM"]:....."ASD_ISR_MEM"
* mainMemClass ["ASD_EXT_CODE_MEM"]:....."ASD_EXT_CODE_MEM"
* optimizeUnusedCode [true]:.....true
* paramAsSysConst [false]:.....false
* pragmaMemClassAtDecl [false]:.....false
* pragmaMemClassEnabled [true]:.....false
* referenceMemClass ["REFRAM"]:....."RAM"
* shortNames [false]:.....false
* taskMemClass ["ASD_TASK_MEM"]:....."ASD_TASK_MEM"
* virtualParameterMemClass ["VIRT_PARAM"]:....."VIRT_PARAM"
* -----
*      Code.Appearance
* -----
* braceLineFeed [true]:.....true
* genDate [<undef>]:.....<undef>
* genTime [<undef>]:.....<undef>
* generateSignatureDecorationComments [true]:.....true
* lineFeedPosition [LEFT]:.....LEFT
* maxIdentLength [0]:.....40
* maxRightLength [60]:.....60
* minLeftLength [8]:.....8
* preventIndentStructInit [true]:.....true
* -----
*      OS
* -----
* Os-Config-C_gen_declaration_alarms [false]:.....false
* Os-Config-C_gen_declaration_appmodes [false]:.....false
* Os-Config-C_gen_dt_calc [false]:.....true
* Os-Config-C_gen_initCOM [false]:.....false
* Os-Config-C_gen_inittask [false]:.....true
* Os-Config-C_gen_main [false]:.....false
* Os-Config-C_gen_process_container [false]:.....true
* Os-Config-C_gen_startuphook [false]:.....false
* asd_exclusive_area ["ASD_EXCLUSIVE_AREA"]:....."ASCET_exclusive_area"
* messageDoInit [false]:.....false
* messageExternalMessageCopies [false]:.....false
* messageGenOSEKDeclarations [true]:.....false
* messageIgnoreUsageInInitTask [false]:.....false
* messageOverloadInitValues [<undef>]:.....<undef>
* messageUsageVariant [OPT_COPY]:.....NON_OPT_COPY
* modularMessageUse [false]:.....false
* osAppModePattern ["%name%"]:....."appmode_%name%"
* osStartupFunction [<undef>]:.....<undef>
* -----
*      OS.OIL
* -----
* OIL-COOP-RESOURCE-name ["ASD_Cooperative_Res"]:....."ASD_Cooperative_Res"
* OIL-outputFile ["temp.oil"]:....."temp.oil"
* -----
*      SERAP
* -----
* SERAPRefPageMemoryClass ["SERAP_REF"]:....."SERAP_REF"
* SERAPWorkPageMemoryClass ["SERAP_WORK"]:....."SERAP_WORK"
* serap [false]:.....false
* serapEmbedded [true]:.....true
* -----
*      Virtual Address Tables
* -----
* addressTable [true]:.....false
* addressTableMemoryClass ["VATROM"]:....."VATROM"
* -----
* END: ASCET-SE AddOn Options
*****/

/* END: ASCET REGION "ASCET-SE AddOn Options" */
/* BEGIN: ASCET REGION "Module Data Definitions" */

/*****
* DEFINITION OF COMPONENT VARIABLE OMITTED
* -----
* memory class:.....'ROM'
* model name:.....'Epm_dummy'
* reason:.....no local elements
* -----*/

```

```

/* END: ASCET REGION "Module Data Definitions" */

/* BEGIN: ASCET REGION "Exported Data Definitions" */
/* END: ASCET REGION "Exported Data Definitions" */

/* BEGIN: ASCET REGION "Component Functions" */
/*****
 * BEGIN: FUNCTIONS OF COMPONENT
 *****/

/* BEGIN: ASCET REGION "Process Definition 'Epm_get'" */
/*****
 * BEGIN: DEFINITION OF PROCESS 'EPM_DUMMY_IMPL_Epm_get'
 * -----
 * model name:.....'Epm_get'
 * memory class:.....'CODE'
 * -----*/
//#if defined(COMPILE_UNUSED_CODE) || defined(COMPILE_UNUSED__EPM_DUMMY_IMPL_Epm_get)
/* messages used by this process */

/* public Epm_get [] */

void EPM_DUMMY_IMPL_Epm_get (void)
{
    /* temp. variables */
    uint16 _tuint16;

    /* define local message copies */
    sint16 Epm_rpmEngSpd__EPM_DUMMY_IMPL_Epm_get;
    uint16 Epm_rpmEngSpd_get__EPM_DUMMY_IMPL_Epm_get;
    /* receive messages implicitly */
    {
        DisableAllInterrupts();
        Epm_rpmEngSpd__EPM_DUMMY_IMPL_Epm_get = Epm_rpmEngSpd;
        Epm_rpmEngSpd_get__EPM_DUMMY_IMPL_Epm_get = Epm_rpmEngSpd_get;
        EnableAllInterrupts();
    }
    /* Epm_get: sequence call #1 */
    _tuint16
        = ((Epm_rpmEngSpd_get__EPM_DUMMY_IMPL_Epm_get <= 16383U) ? (uint16)
(Epm_rpmEngSpd_get__EPM_DUMMY_IMPL_Epm_get << 1) : 32767U);
    /* assignment to Epm_rpmEngSpd: min=0, max=32767, hex=2phys+0, limit=(maxBitLength: true, assign: true), zero
incl.=true */
    Epm_rpmEngSpd__EPM_DUMMY_IMPL_Epm_get = (sint16)_tuint16;
    /* send messages implicitly */
    {
        Epm_rpmEngSpd = Epm_rpmEngSpd__EPM_DUMMY_IMPL_Epm_get;
    }
}
/* -----
 * END: DEFINITION OF PROCESS 'EPM_DUMMY_IMPL_Epm_get'
 *****/
#endif
/* END: ASCET REGION "Process Definition 'Epm_get'" */

/* *****
 * END: FUNCTIONS OF COMPONENT
 *****/
/* END: ASCET REGION "Component Functions" */

```