Application Note for E909.05 and E909.6 for coordinates 3D 4.0

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Chapter 1

Application Note for E909.05 and E909.6 for coordinates 3D File Index

1.1 Application Note for E909.05 and E909.6 for coordinates 3D File List

Here is a list of all documented files with brief descriptions:

Chapter 2

Application Note for E909.05 and E909.6 for coordinates 3D File Documentation

2.1 main.c File Reference

Application Example to demonstrate the usage of the c3d library (lib_c3d) for the HALIOS IC E909.05 and E909.06.

```
#include "firmware.h"
#include "main.h"
#include "user_space.h"
#include "haliostools.h"
#include "c3d.h"
#include "usb.h"
```

Defines

- #define USB_PIN BIT1

Functions

- const uint16_t gui_applicationVersion __attribute__ ((section(".application_version")))
- void isr_gpio_falling (void)

- void isr_wakeup (void)
- int main (int argc, char ∗argv[ ])

Variables

- volatile uint16_t gui_doUsb = 1
- volatile uint16_t gui_measurment = 0
- const char gArc_project_number [ ] = "0908503"

2.1.1 Detailed Description

Application Example to demonstrate the usage of the c3d library (lib_c3d) for the HALIOS IC E909.05 and E909.06.

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Changed: 2010-05-28 Reworked for firmware V4.0

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Changed: 2010-05-31 Reworked for firmware V4.0

Author:

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Date:

Changed: 2010-09-14 Makro request for __cpluplus added. Firmware now runs with c++.

Id

main.c,v 1.3 2011/03/17 15:38:15 mki Exp

Definition in file main.c.

2.1.2 Define Documentation

2.1.2.1 #define USB_PIN BIT1

Define the hardware input pin which is connected to IC Max3420 for USB-request. For base-board its always GPIO_1

Definition at line 80 of file main.c.

2.1.3 Function Documentation

2.1.3.1 const uint16_t gui_applicationVersion __attribute__ ((section(".application_-version")))

Set a project application version number. Set to a fix area at FLASH to make possible read out in output file and verify the flashed code.

2.1.3.2 void isr_gpio_falling (void)

Interrupt function Falling edge at Pin 1 is a USB-request from Master

```
**/
    if (P0NEDGE_STAT & USB_PIN)
    {
```

```
        gui_doUsb = 1;
        g_status0.wakeupEnd = 1;

    }

    P0NEDGE_CLR = 0x3F;
    /**
```

Definition at line 86 of file main.c.

References gui_doUsb, and USB_PIN.

2.1.3.3 void isr_wakeup (void)

Interrupt function Wakeup occured - Set wukeupEnd and do a measurement

Definition at line 105 of file main.c.

References gui_measurment.

2.1.3.4 int main (int *argc*, char ∗ *argv*[ ])

main

Parameters:

← ***argc*** dummy parameter

← ***argv*** dummy parameter

```
**/
    uint16_t ui_cnt;
    loopConf_t t_loopConf;

    /* variables for filter and calibration functions */
    uint16_t ui_filtervalue, ui_quiescent;
    uint16_t ui_autocatch = 0;
    uint16_t ui_quis_min;
    Calib_Result_t t_calib_result = Calib_Nothing_Done;
    uint16_t ui_lastCalibTimestamp[LOOPMAXCOUNT];
    uint16_t ui_oldCalTime = 0;

    /* variables for c3d */
    int16_t Ari_c3dPos[3] = { 0, 0, 16 };
    uint16_t Arui_loop[4];
    uint16_t Arui_quisLoop[4];

    /**
    * Initializes the HALIOS SFRs and set up the basic functions of hardware.
```

```
* @n It is recommand to call this function as first call.
*
* @post The system is configured:
*  - The trimmvalues are read from InfoBlock and set to
*    mclk and wkclk (only at (E909.05)
*  - Following interrupts are enabled:
*      - HALIOS measurement ready
*      - wakeup timer
*  - Following GPIO settings are used:
*      - The RDY_PIN will set as output,
*          if no readypin is needed set RDY_PIN as 0
*  - Wakup timer enabled and set to 10 ms, used for sample time
*  - One HALIOS loop enabled and set up (one LED against compensator).
*
* @param [in] BIT0 Set a GPIO as trigger pin for measurement, use only one bit.
*              If not needed set to 0.
*/
haliosInitialize(BIT0);

/**
* Set the projectnumber (eight characters) to g_sfr.project_number to make
* readable about the constant reading mechanism @ref paramCheckSfr.
*
* @param[in]   gArc_project_number Pointer to a string. The maximum numbers of eight ch
*/
paramSetProjectNr((uint8_t*)(gArc_project_number));

/** Setup the register of the watchdog timer0.
*
* Configure the watchdog in milliseconds (ms).
*
* @param[in] 500 Watchdogtime in ms.
* @n Must be smaller than 500 seconds (s)!
* @n Higher Values will ignore and set to 500 s
*/
deviceSetWatchdogTime (500UL);

/** set IO port function to GPIO for all pins */
P0CFG = 0;

/**
* Define which communication device will be used and enable or disable the
* related interrupts.
* @n This function is optional. If this function is not called, communication
* devices set all to off.
*
* @param[in] DEVCOM_I2C set communication to I2C
*  - For no communication device use (@ref DEVCOM_NO_COMM)
*  - For I2C (@ref DEVCOM_I2C)
*  - For SPI (@ref DEVCOM_SPI).
*  - For SPI and I2C (@ref DEVCOM_I2C | @ref DEVCOM_SPI)
```

```
 */
 deviceSetCommDevice(DEVCOM_I2C);

 /**
 * Call this function to show the last reset reason at a pin
 * by a significant bit pattern.
 * @n This function is optional. Use only if you don't want to
 * do your own fail state.
 * @n
 * @n Count the blink sequence of the output pin:
 * - 4 times blinking: watchdog reset
 * - 5 times blinking: CPU register parity error
 * - 6 times blinking: FLASH uncorrectable bit error
 * - 7 times blinking: RAM perity error
 * - 8 times blinking: Trap
 * @n @n
 * @param[in] outputPin Define the pin which should do the failState show
 * @param[in] inputPin Define the pin which break the failState show.
 *                           Set to 0 if now break is required
 */
 failState(BIT2, BIT3);

/**
 *  Compute the checksum over all words in "Parameter FLASH Area".
 *  If the Checksum proofs "Valid Data", data is copied from the
 *  "Parameter FLASH Area" into RAM.
 *
 * @return
 *          - -1:   No valid data found.
 *          - else: Number of copied words.
 */
 if (deviceRestore() == -1)
 {
     /**
     *  Set the sample time in milli seconds. The wakeup timer
     *  of the Analog Control Module is used for the timing.
     *  Depending on the communication device the micro-controller
     *  switches to STANDBY or STOP mode.
     *
     * @note time in milli seconds, must be between 2 and 32, only even
     * values are accepted. (See also description of the Analog Control Module).
     */
     paramSetSampleTime(8);

     /**
     * Set the amount of active loops.
     *
     * @param[in] count Amount of active loops. @a count must be less or equal to
     *  @ref LOOPMAXCOUNT.
     * @return An element of the @a HaliosCode enumeration:
     *      - HALIOS_OK: No error occured
```

```
*      - HALIOS_PARAM: Wrong parameter for count passed.
*/
haliosSetLoopCount(4);

/**
* Configuration of the 1st loop.
* This is an example how to use type loopConf_t for loop configuration.
* The values are indices for the LED current of the ASIC.
*/
t_loopConf.loopNr = 0;
t_loopConf.ledConf = H_LED3B| H_LED5A| H_AON | H_ACCON;
t_loopConf.phaseA.range = 10;
t_loopConf.phaseA.offset = 22;
t_loopConf.phaseB.range = 15;
t_loopConf.phaseB.offset = 15;
t_loopConf.iConfC = 0;
t_loopConf.DC_offset = 0;
t_loopConf.PreAmp = 0;
t_loopConf.ClockConf = 0;

/**
* Store the configuration data into the virtuel loops at SFR by using
* a struct @ref LoopConf.
*
* @param[in] t_LoopConfig The LED and current configuration.
*
* @return An element of the @ref HaliosCode enumeration:
*      - HALIOS_OK:    No error occured
*      - HALIOS_PARAM: Wrong parameter in @a t_LoopConfig passed.
*/
haliosLoopInit(t_loopConf);

/**
* Store the configuration data into the virtuel loops at SFR by direct access.
*
* @note No validation check will done. It is recommand to use
* the function @ref haliosLoopInit.
*
* @param[in] loopNr    0 .. @ref LOOPMAXCOUNT
* @param[in] ledConf   LED and measurement configuration.
* @param[in] iClockConf Measurement Configuration HALIOS Clock
* @param[in] iConfA    Current configuration for phase A.
* @param[in] iConfB    Current configuration for phase B.
* @param[in] iConfC    Current configuration for the compensator offset.
* @param[in] iPreAmp   Preamplifier Configuration
*/
haliosLoopInitialize(1, 20993, 0, 875, 495, 27, 0);
haliosLoopInitialize(2, 20996, 0, 810, 495, 25, 0);
haliosLoopInitialize(3, 21056, 0, 908, 495, 29, 0);
haliosLoopInitialize(4, 21077, 0, 3, 1023, 127, 0);
```

```
/**
* Set System Status to be used for @ref deviceWaitForTimer during wait
* until timer has elapsed or a interrupt wakes up the system.
* @n This function is optional. If not called system status is STANDBY.
* @n
* @param[in]   SystemStatus    Selects system mode for deviceWaitForTimer
*  - DEVSET_RUN:        Keep System in RUN Mode in deviceWaitForTimer
*  - DEVSET_STANDBY:    Switch to STANDBY Mode in deviceWaitForTimer
*  - DEVSET_STOP:       Switch to STOP Mode in deviceWaitForTimer
*  - DEVSET_OFF:        Switch to OFF Mode in deviceWaitForTimer
*
* Keep in mind that spi-usb communication only works in RUN and in STANDBY mode.
*/
deviceSetSystemStatus(DEVSET_STANDBY);

/** Settings for filter and calibration in the user space */
paramSetValue(RAM_FILT_BORDER, HALIOS_FILT_8);  /* filter depth */
paramSetValue(RAM_FILT_BREAK, 10);              /* filter break */
paramSetValue(RAM_CAL_TUBE, 32);                /* tube around target value */
paramSetValue(RAM_CAL_TIME, 300);               /* time for calibration */
paramSetValue(RAM_CAL_DCNT, 8);             /* value for movement detection with lo
paramSetValue(RAM_CAL_TARGET_VALUE, 100);       /* target value for calibration */


/** Set quiescent-value for the loops */
for (ui_cnt = 0; ui_cnt < haliosGetLoopCount(); ui_cnt++)
    paramSetValue(RAM_QUIESCENT_LOOP0 + (ui_cnt * BLOCK_SIZE), paramGetValue(RAM_CA

/** Switch Calibration
* Application options are:
* CAL_START - calibration on start up
* CAL_TIME  - calibration for time
* CAL_AUTO_CATCH - enable autocatch function
*/
paramSetValue(RAM_CAL_SETUP, ( CAL_START | CAL_TIME ));

/** Settings for c3d, constants are defined in c3d.h */
paramSetValue(RAM_C3D_X_SCALE, XSCALE);
paramSetValue(RAM_C3D_Y_SCALE, YSCALE);
paramSetValue(RAM_C3D_Z_SCALE, ZSCALE);
paramSetValue(RAM_C3D_X_OFFSET, XOFFS);
paramSetValue(RAM_C3D_Y_OFFSET, YOFFS);
paramSetValue(RAM_C3D_X_FACT, XFACT);
paramSetValue(RAM_C3D_Y_FACT, YFACT);
paramSetValue(RAM_C3D_Z_FACT, ZFACT);
paramSetValue(RAM_C3D_ROT, 0);
paramSetValue(RAM_C3D_FLIP, 0);

/** Set the time (maximum time, some USB controller call more
than this value!) the PC requests for new values. */
paramSetValue(RAM_USB_CALL_TIME, 8);
```

```
    }

    /**
    * Check the contents of SFR and does any special functions.
    * If the content of a SFR register has changed the new values will be copied
    * into the corresponding firmware functions or corresponding hardware registers.
    *   - Set size of SFR and user space to address @ref BUFFSIZE at SFR
    *   - Set constant reading values to SFR controled by @ref READ_CONST_CMD
    *   - Set systemStatus
    *   - Set Communication device
    *   - Set sampletime
    *   - Use spezial functions (use careful)
    *   - Set main clock (ANALOG_MCLK) (Only E909.05)
    *   - Set wakeup clock (ANALOG_WKCLK) (Only E909.05)
    *   - Set HALIOS frequency (Only E909.06)
    *   - Set number of Loops to g_sfr.loopCount
    */
    paramCheckSfr();

    /** Set GPIO 2..5 as output pins */
    P0DIR &= ~(BIT2 | BIT3 | BIT4 | BIT5);

    /**
     * @brief Function o init the HALIOS tools
     *
     * Initialize the structures for filterung and calibration.
     */
    init_haliostools();

    /** Initialize module coordinates 3D */
    c3dInitialize(   paramGetValue(RAM_C3D_X_SCALE)
  , paramGetValue(RAM_C3D_Y_SCALE)
      , paramGetValue(RAM_C3D_Z_SCALE) );

    /**
     * @brief Warmup the HALIOS loops.
     *
     * Function from HALIOS Tools. Do some measurements for each loop to ensure
     * that the measuerment counter has reached its actual value.
     *
     * @param[in] times How many times to start an empty measurement to warm up the
     *                  loops:
     *                      - HALIOS_WARMUP_FULL: 6 tines for a full range of 1024 steps
     *                      - HALIOS_WARMUP_HALF: 3 times for a half range of  512 steps
     */
    haliosWarmup(HALIOS_WARMUP_FULL);

    /**
    * Force a calibration for each active loop.
    */
    if (paramGetValue(RAM_CAL_SETUP) & CAL_START)
```

```
    {
        for (ui_cnt = 0; ui_cnt < paramGetSFR(LOOPCOUNT); ++ui_cnt)
        {
            t_calib_result = haliosCompCalib(ui_cnt, haliosGetResult(ui_cnt), \
                paramGetValue(RAM_CAL_TARGET_VALUE),
                paramGetValue(RAM_CAL_TUBE), 0, 1023);
            paramSetValue( ((ui_cnt * BLOCK_SIZE) + RAM_QUIESCENT_LOOP0), g_calib[ui_cnt].
        }
    }

    for(ui_cnt = 0; ui_cnt < LOOPMAXCOUNT; ui_cnt++)
    {
        /* Initialize the last calibration-time-stamp variable for calibration */
        ui_lastCalibTimestamp[ui_cnt] = 0;
    }

#if (USB != USB_OFF)
    /**
    * Initialize the SPI module and the MAX3420E SPI-USB bridge.
    *
    * @post GPIO 2..5 configured for SPI
    */
    usbInitialize(USB_PART_ON, USB_PIN, paramGetValue(RAM_USB_CALL_TIME));

    /* set interrupt for falling signal on the interrupt request pin */
    P0NEDGE_EN |= USB_PIN;
    /* set interrupt mask for falling signal on a GPIO */
    IRQ_MASK_H |= VBH_GPIO_FALLING;
#endif

    /** Set application bit and Version */
    g_sfr.inst_libs |= BIT15;
    deviceCheckVersion(BIT15, gui_applicationVersion);

    /**
    *
    *  Do the measurement in an endless loop
    *
    */
    while (1)
    {
        /**
        * Start and retrigger the watchdog timer. This is an inline function.
        *
        * @note At E909.06: After first call of watchdog it is not possible
        * to disable the watchdog or change the watchdog time.
        *
        */
        KICKDOG();

        /**
```

```
* Check the contents of SFR and does any special functions.
* If the content of a SFR register has changed the new values will be copied
* into the corresponding firmware functions or corresponding hardware registers.
*   - Set size of SFR and user space to address @ref BUFFSIZE at SFR
*   - Set constant reading values to SFR controled by @ref READ_CONST_CMD
*   - Set systemStatus
*   - Set Communication device
*   - Set sampletime
*   - Use spezial functions (use careful)
*   - Set main clock (ANALOG_MCLK) (Only E909.05)
*   - Set wakeup clock (ANALOG_WKCLK) (Only E909.05)
*   - Set HALIOS frequency (Only E909.06)
*   - Set number of Loops to g_sfr.loopCount
*/
paramCheckSfr();


if (gui_measurment == 1)
{
    gui_measurment = 0;

    /**
    * Do the HALIOS measurement of all configurated loops.
    * - Enable the analog part
    * - Start one Warmup to engage the analog part
    * - Start the configured measurements
    * - disable the analog part
    * - count up the @ref TIME_STAMP
    *
    *  When haliosMeasure() is called with parameter HALIOS_RDYON,
    *  the configured PIN in haliosInitialize() will be switched on
    *  when entering the haliosMeasure() function,
    *  and will be switched off when haliosMeasure() is left.
    *
    * @param[in] readyPin @ref HaliosCode
    *              - @ref HALIOS_RDYON GPIO is used as ready pin.
    *              - @ref HALIOS_RDYOFF GPIO is not used as ready pin.
    */
    haliosMeasure(HALIOS_RDYON);

    /**
    * Filter the loops and check the calibration.
    */
    ui_autocatch = 0;
    for (ui_cnt = 0; ui_cnt < paramGetSFR(LOOPCOUNT); ++ui_cnt)
    {
        /**
         * @brief Filter the loop with a low pass filter.
         *
         * @param[in]  loopNr       Number of the loop (0 .. LOOPCOUNT).
         * @param[in]  border3db    The 3dB border of the low pass filter.
```

```
 * @param[in]  filterBreak  If the derivation of the raw loop value is high
 *                          than filterBreak the filtered value is omitted
 *                          the raw loop value will be written to loopFilt
 *                          negative value for filterBreak disables the fi
 *                          break mechanism.
 *
 * @return      filter_value the software filtered value
*/
ui_filtervalue = haliosFilterLoop(ui_cnt, \
    (HALIOS_FILT)paramGetValue(RAM_FILT_BORDER), \
        paramGetValue(RAM_FILT_BREAK));

/** Set filtervalue to user space */
paramSetValue( (RAM_FILT_LOOP0 + (ui_cnt * BLOCK_SIZE)) , ui_filtervalue);

if (paramGetValue(RAM_CAL_SETUP) & CAL_TIME)
{
    /**
     * When the autocatch function cause a calibration it sets the time for
     * So this forces a calibration immediately.
     * The variable ui_lastCalibTimestamp prevents that autocatch enforces
     * That's necessary because if no sensor is connected or the optical co
     * value is below quiescent value and probably around zero.
     */
    if (paramGetValue(RAM_CAL_SETUP) & CAL_AUTO_CATCH)
    {
        if ( paramGetValue(RAM_QUIESCENT_LOOP0 + (ui_cnt * BLOCK_SIZE)) <=
        {
            ui_quis_min = paramGetValue(RAM_QUIESCENT_LOOP0 + (ui_cnt * BLO
        }
        else
        {
            ui_quis_min = paramGetValue(RAM_QUIESCENT_LOOP0 + (ui_cnt * BLO
        }

        /**
        * Force calibration when current value
        * is below saved quiescent value
        */
        if ((ui_autocatch == 0) && ((ui_filtervalue < ui_quis_min) || (ui_c
            && (ui_lastCalibTimestamp[ui_cnt] > 50))
        {
            ui_autocatch = 1;
            ui_oldCalTime = paramGetValue(RAM_CAL_TIME);
            paramSetValue(RAM_CAL_TIME, 0);
            ui_lastCalibTimestamp[ui_cnt] = 0;
        }
        else if ((ui_lastCalibTimestamp[ui_cnt] <= 50) \
            && ((ui_filtervalue < ui_quis_min) || (ui_quis_min == 0)))
        {
            ui_lastCalibTimestamp[ui_cnt]++;
```

```
    }
    else if ((ui_lastCalibTimestamp[ui_cnt] != 0) && (ui_filtervalue >
    {
        ui_lastCalibTimestamp[ui_cnt] = 0;
    }
}

/**
 * @brief
 * Calibrate the passed loop. This function counts the calls for each
 * The function checks if a movement can be detected. In case of a move
 * counter will reset. If no movement for countEnd has been detected th
 * checks if the loop is in the tube around the target value (target va
 * If the loop is outside the tube the compensator offset will be chang
 * to reach the target value again. In case of a balanced loop the
 * offset from both sender will be influenced.
 * This is important when a static object has been detected or the opti
 * of the sensor has changed.
 *
 * @param[in]  nr           number of the loop (0 .. LOOPCOUNT)
 * @param[in]  loopValue    actual value of the signal
 * @param[in]  target       target value for the idle loop
 * @param[in]  tube         If the loop is within the tube borders (tar
 *                          < loopValue < target+tube) then the actual
 *                          value is fetched as the new reference value
 *                          derivation is smaller than maxDCnt. If the
 *                          value is outside the calibration tube the
 *                          compensator offset current is calibrated.
 * @param[in]  countEnd     If the loop value is count times between th
 *                          calibTube then a new reference value is det
 *                          If count is zero the function immediatly st
 *                          calibration.
 * @param[in]  maxDCnt      If the derivation is greater than maxDCnt t
 *                          calibration is aborted and counter gets a r
 */
t_calib_result = haliosCompCalib(ui_cnt, ui_filtervalue, \
    paramGetValue(RAM_CAL_TARGET_VALUE),
    paramGetValue(RAM_CAL_TUBE), \
        ((uint32_t)(paramGetValue(RAM_CAL_TIME)) * 100), \
            paramGetValue(RAM_CAL_DCNT));

/** Save the new quiescent value to user space */
if (t_calib_result != Calib_Nothing_Done)
{
    paramSetValue(RAM_QUIESCENT_LOOP0 + (ui_cnt * BLOCK_SIZE), g_calib
}

/** Set calibTime to old value */
if (ui_oldCalTime != 0)
{
    paramSetValue(RAM_CAL_TIME, ui_oldCalTime);
```

```
                    ui_oldCalTime = 0;
                }
            } /* calibration time */

/** Compute amplitude for the loop */
ui_quiescent = paramGetValue(RAM_QUIESCENT_LOOP0 + (ui_cnt * BLOCK_SIZE));
if (ui_filtervalue > ui_quiescent)
{
    paramSetValue( RAM_AMPLITUDE_LOOP0 + (ui_cnt * BLOCK_SIZE)
  , (ui_filtervalue - ui_quiescent) );
}
else
{
    paramSetValue( RAM_AMPLITUDE_LOOP0 + (ui_cnt * BLOCK_SIZE) , 0);
}

        }/* filter loops and check calibration */

    /** Set loop- and quiescent-array for C3D */
    for (ui_cnt = 0; ui_cnt < 4; ui_cnt++)
    {
/** Set filtered values to an array of for loops */
Arui_loop[ui_cnt] = paramGetValue(RAM_FILT_LOOP0 + (ui_cnt * BLOCK_SIZE));

/** Set the quiescent values to an array */
Arui_quisLoop[ui_cnt] = paramGetValue(RAM_QUIESCENT_LOOP0 + (ui_cnt * BLOCK_SIZE));
    }

        /*
    * This function calculates three dimensional
    *   coordinates { x, y, z }.
    *
    * @pre - loop 0 and loop 1 are used to calculate the x coordinate.
    *      - loop 2 and loop 3 are used to calculate the y coordinate.
    *      - loop 0 .. loop3 are used to calculate the z coordinate.
    *      - Loop 0 .. loop 3 should be configured in a way, that
    *          one LED in phase B adjusts against the compensator in
    *          phase A.
    *
    * @param[in]  loop      pointer to an array of loop values
    *
    * @param[in]  quis_loop pointer to an array of quiescent values
    *                        for the corresponding loop values
    *
    * @param[in]  xFact     multiply the found x position (-1 .. 1)
    *                        with xFact.
    * @param[in]  yFact     multiply the found y position (-1 .. 1)
    *                        with yFact.
    * @param[in]  zFact     multiply the found z position (0 .. 1)
    *                        with zFact.
    *
```

```
    * @param[in]  xOffs     add xOffs to the computed
    *                        x position value.
    * @param[in]  yOffs     add yOffs to the computed
    *                        y position value.
    *
    * @param[out] *pos      pointer to an array where the three
    *                        computed coordinates { x, y, z } are
    *                        saved.
    *
    */
            c3d(Arui_loop, Arui_quisLoop, Ari_c3dPos, paramGetValue(RAM_C3D_X_OFFSET), \
paramGetValue(RAM_C3D_Y_OFFSET), paramGetValue(RAM_C3D_X_FACT), \
                    paramGetValue(RAM_C3D_Y_FACT), paramGetValue(RAM_C3D_Z_FACT));

            /*
    * Rotate the position and mirror it on the determined axis.
    *
    * @note    *pos    The postion to rotate, the rotated value is also
    *                  stored there.
    * @note    rot     The angle to rotate the position counter clock
    *                  wise. Only the following angle values are
    *                  supported:
    *                  0, 45, 90, 135, 180, 225, 270, 315.
    * @note    flip    Determine how to mirror the position on the axis.
    *                  Only the following values are supported:
    *                  M3D_FLIP_OFF, M3D_FLIP_X, M3D_FLIP_Y
    */
            c3dRotFlip(Ari_c3dPos, paramGetValue(RAM_C3D_ROT), paramGetValue(RAM_C3D_FLIP)

            /** Store the data in the user space */
            paramSetValue(RAM_C3D_X, Ari_c3dPos[0]);
            paramSetValue(RAM_C3D_Y, Ari_c3dPos[1]);
            paramSetValue(RAM_C3D_Z, Ari_c3dPos[2]);

        } /* if measuerment */

#if (USB != USB_OFF)

        /**
        * If Interrupt falling edge was caused by Pin 1 do a USB transfer
        */
        if (gui_doUsb == 1)
        {
            /**
            *  If USB-request occured during a measurement
            *  clear the wakeupEnd flag
            */
            g_status0.wakeupEnd = 0;

            gui_doUsb = 0;
```

```
            /** Do transmission */
            usbHacoHandleIrqs();
        }
#endif

        /**
        *  Wait until the timer has elapsed.
        */
        deviceWaitForTimer();

        /**
```

Definition at line 118 of file main.c.

References CAL_AUTO_CATCH, CAL_START, CAL_TIME, gArc_project_number, gui_doUsb, gui_measurment, and USB_PIN.

2.1.4 Variable Documentation

2.1.4.1 volatile uint16_t gui_doUsb = 1

Global variable for communication between Interrupt and USB-Part in main

Definition at line 52 of file main.c.

2.1.4.2 volatile uint16_t gui_measurment = 0

Global variable for synchronize the measueremt with configured sample time

Definition at line 58 of file main.c.

2.2 main.h File Reference

Defines

- #define APPLICATION_VERSION 103UL
- #define USB_OFF 1
- #define USB_HACO 2
- #define USB_MOUSE 3
- #define USB_KEYB 4
- #define USB USB_HACO
- #define LIN_OFF 0
- #define LIN_ON 1
- #define LIN LIN_OFF
- #define CAL_OFF 0
- #define CAL_START BIT0
- #define CAL_TIME BIT1
- #define CAL_AUTO_CATCH BIT2

2.2.1 Detailed Description

Header file for the example application.

Author:

Miroslav Ostric, Mechaless Systems GmbH

Date:

Created: 2007-03-13

Author:

Roland Muenzer, Media System Consulting

Date:

Changed: 2008-11-26 added comments, added missing include "firmware.h"

Author:

Florian Degler, Mechaless Systems GmbH

Date:

Changed: 2010-05-28 Reworked for firmware V4.0

Author:

Markus Kilian, Mechaless Systems GmbH

Date:

Changed: 2010-05-31 Reworked for firmware V4.0 added comments, removed obsolete include "firmware.h"

Author:

Markus Kilian, Mechaless Systems GmbH

Date:

Changed: 2010-07-13 Due to compatibility for GCC firmware library 4.01 available. Application version set to 1.01.

Author:

Markus Kilian, Mechaless Systems GmbH

Date:

Changed: 2010-08-12 Application version set to 1.02 Firmware library updated to 4.03 HALIOS tools library updated to 4.01

Author:

Markus Kilian, Mechaless Systems GmbH

Date:

Changed: 2011-03-17 Application version set to 1.03 Firmware library updated to 4.05 HALIOS tools library updated to 4.04 USB library updated to 4.01

Definition in file main.h.

2.2.2 Define Documentation

2.2.2.1 #define APPLICATION_VERSION 103UL

Version number for the application.
Definition at line 38 of file main.h.

2.2.2.2 #define USB_OFF 1

Standalone application, no USB support.
Definition at line 41 of file main.h.

2.2.2.3 #define USB_HACO 2

USB support for the MAX3420E USB-SPI bridge, e.g. like on the E909.05A baseboard.
Definition at line 47 of file main.h.

2.2.2.4 #define USB USB_HACO

Software switch to choose between standalone mode and USB support.
Definition at line 52 of file main.h.

2.2.2.5 #define LIN_OFF 0

Definitions for LIN module
Keep in mind: LIN can only be used with E909.06
Definition at line 60 of file main.h.

2.2.2.6 #define CAL_OFF 0

Bit definitions for calibration
Definition at line 68 of file main.h.

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