XM125 I^{2}C Presence Detector

User Guide

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User Guide

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Contents

1 Acconeer SDK Documentation Overview

To better understand what SDK document to use, a summary of the documents are shown in the table below.

Table 1: SDK document overview.

Name	**Description**	**When to use**
RSS API documentation (html)		
rss_api	The complete C API documentation.	- RSS application implementation - Understanding RSS API functions
User guides (PDF)		
A121 Assembly Test	Describes the Acconeer assembly test functionality.	- Bring-up of HW/SW - Production test implementation
A121 Breathing Reference Application	Describes the functionality of the Breathing Reference Application.	- Working with the Breathing Reference Application
A121 Distance Detector	Describes usage and algorithms of the Distance Detector.	- Working with the Distance Detector
A121 SW Integration	Describes how to implement each integration function needed to use the Acconeer sensor.	- SW implementation of custom HW integration
A121 Presence Detector	Describes usage and algorithms of the Presence Detector.	- Working with the Presence Detector
A121 Smart Presence Reference Application	Describes the functionality of the Smart Presence Reference Application.	- Working with the Smart Presence Reference Application
A121 Sparse IQ Service	Describes usage of the Sparse IQ Service.	- Working with the Sparse IQ Service
A121 Tank Level Reference Application	Describes the functionality of the Tank Level Reference Application.	- Working with the Tank Level Reference Application
A121 Touchless Button Reference Application	Describes the functionality of the Touchless Button Reference Application.	- Working with the Touchless Button Reference Application
A121 Parking Reference Application	Describes the functionality of the Parking Reference Application.	- Working with the Parking Reference Application
A121 STM32CubeIDE	Describes the flow of taking an Acconeer SDK and integrate into STM32CubeIDE.	- Using STM32CubeIDE
A121 Raspberry Pi Software	Describes how to develop for Raspberry Pi.	- Working with Raspberry Pi
A121 Ripple	Describes how to develop for Ripple.	- Working with Ripple on Raspberry Pi
XM125 Software	Describes how to develop for XM125.	- Working with XM125
XM126 Software	Describes how to develop for XM126.	- Working with XM126
I2C Distance Detector	Describes the functionality of the I2C Distance Detector Application.	- Working with the I2C Distance Detector Application
I2C Presence Detector	Describes the functionality of the I2C Presence Detector Application.	- Working with the I2C Presence Detector Application
I2C Breathing Reference Application	Describes the functionality of the I2C Breathing Reference Application.	- Working with the I2C Breathing Reference Application
Handbook (PDF)		
Handbook	Describes different aspects of the Acconeer offer, for example radar principles and how to configure	- To understand the Acconeer sensor - Use case evaluation
Readme (txt)		
README	Various target specific information and links	- After SDK download

2 I^{2}C Presence Detector Application

The I^{2}C Presence Detector is an application that implements the Acconeer Presence Detector with a register based I^{2}C interface.

The functionality of the presence detector is described in *A121 Presence Detector User Guide.pdf* or in Acconeer Docs.

Note: Some of the registers like **start** and **end** have a different unit in the I^{2}C Presence Detector, millimeters instead of meters, to make it easier to handle the register values as integers.

2.1 I^{2}C Address Configuration

The device has a configurable I^{2}C address. The address is selected depending on the state of the **I2C_ADDR** pin according to the following table:

Connected to GND	0x51
Not Connected	0x52
Connected to VIN	0x53

2.2 Usage

The module must be ready before the host starts I^{2}C communication.

The module will enter ready state by following this procedure.

- Set **WAKE_UP** pin of the module HIGH.
- Wait for module to be ready, this is indicated by the **MCU_INT** pin being HIGH.
- Start I^{2}C communication.

The module will enter a low power state by following this procedure.

- Wait for module to be ready, this is indicated by the **MCU_INT** pin being HIGH.
- Set the **WAKE_UP** pin of the module LOW.
- Wait for ready signal, the **MCU_INT** pin, to become LOW.

2.2.1 Read Detector Status

The status of the module can be acquired by reading the *Detector Status* register, The most important bits are the **Busy** and **Error** bits.

The **Busy** bit must not be set when a new command is written. If any of the **Error** bits are set the module will not accept any commands except the **RESET_MODULE** command.

2.2.2 Writing a command

A command is written to the *Command* register. When a command is written the **Busy** bit in the *Detector Status* register is set and it will be cleared automatically when the command has finished.

2.2.3 Setup and Start Detector

Before the module can perform presence detection it must be configured. The following steps is an example of how this can be achieved.

Note: The configuration parameters can not be changed after a **APPLY_CONFIGURATION** command. If reconfiguration is needed the module must be restarted by writing **RESET_MODULE** to the *Command* register.

- Power on module
- Read *Detector Status* register and verify that neither **Busy** nor **Error** bits are set.
- Write configuration to configuration registers, for example *Start* register and *End* register.
- Write **APPLY_CONFIGURATION** to *Command* register.
- Poll *Detector Status* until **Busy** bit is cleared.

- Verify that no **Error** bits are set in the *Detector Status* register.
- Write **START_DETECTOR** to *Command* register.
- Poll *Detector Status* until **Busy** bit is cleared.
- Verify that no **Error** bits are set in the *Detector Status* register.
- Read *Detector Result* register
  - If **PRESENCE_DETECTED** is set presence is currently detected.
  - If **PRESENCE_DETECTED_STICKY** is set presence has been detected since last read.
  - If **DETECTOR_ERROR** is set an error has occurred, restart module with the **RESET_MODULE** command.
  - If presence was detected, the presence distance can be read in the *Presence Distance* register.

2.2.4 Stop and Restart Detector

The detector can be stopped and restarted.

The following steps is an example of how to stop the detector.

- Read *Detector Status* register and verify that neither **Busy** nor **Error** bits are set.
- Write **STOP_DETECTOR** to *Command* register.
- Poll *Detector Status* until **Busy** bit is cleared.
- Verify that no **Error** bits are set in the *Detector Status* register.

The following steps is an example of how to re-start the detector.

- Read *Detector Status* register and verify that neither **Busy** nor **Error** bits are set.
- Write **START_DETECTOR** to *Command* register.
- Poll *Detector Status* until **Busy** bit is cleared.
- Verify that no **Error** bits are set in the *Detector Status* register.

2.3 Advanced Usage

2.3.1 Debug UART logs

UART logging can be enabled on the DEBUG UART by writing **ENABLE_UART_LOGS** to the *Command* register.

The detector configuration can be logged on the UART by writing **LOG_CONFIGURATION** to the *Command* register.

UART logging can be disabled by writing **DISABLE_UART_LOGS** to the *Command* register.

2.3.2 Reset Module

The module can be restarted by writing **RESET_MODULE** to the *Command* register.

After the restart the detector must be configured again.

2.3.3 Presence Detection on GPIO

The I^{2}C Presence Detector can be configured to set **MISC_GPIO0** pin HIGH when presence is detected, and LOW when presence is not detected. To enable presence detection on GPIO, write 1 to the *Detection On Gpio* register. To disable presence detection on GPIO, write 0 to the *Detection On Gpio* register.

3 Register Protocol

3.1 I^{2}C Slave Address

The default slave address is 0x52.

3.2 Protocol Byte Order

Both register address, 16-bit, and register data, 32-bit, are sent in big endian byte order.

3.2.1 I^{2}C Write Register(s)

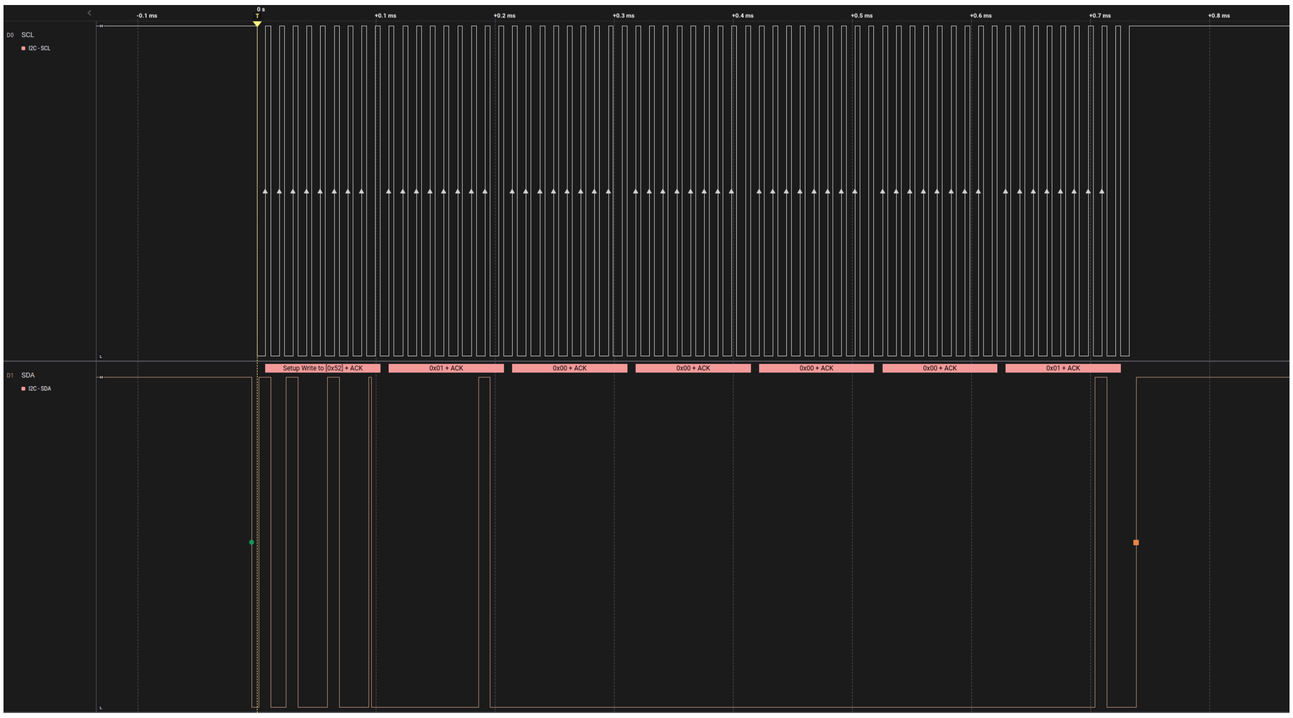
A write register operation consists of an I^{2}C write of two address bytes and four data bytes for each register to write. Several registers can be written in the same I^{2}C transaction, the register address will be incremented by one for each four data bytes.

Example 1: Writing six bytes will write one register, two address bytes and four data bytes.

Example 2: Writing 18 bytes will write four registers, two address bytes and 16 data bytes.

Example operation, write 0x11223344 to address 0x0025.

Description	Data
I^{2}C Start Condition	
Slave Address + Write	0x52 + W
Address to slave [15:8]	0x00
Address to slave [7:0]	0x25
Data to slave [31:24]	0x11
Data to slave [23:16]	0x22
Data to slave [15:8]	0x33
Data to slave [7:0]	0x44
I^{2}C Stop Condition	



Example Waveform: Write register with address 0x0100, the data sent from the master to the slave is 0x00000001

3.2.2 I^{2}C Read Register(s)

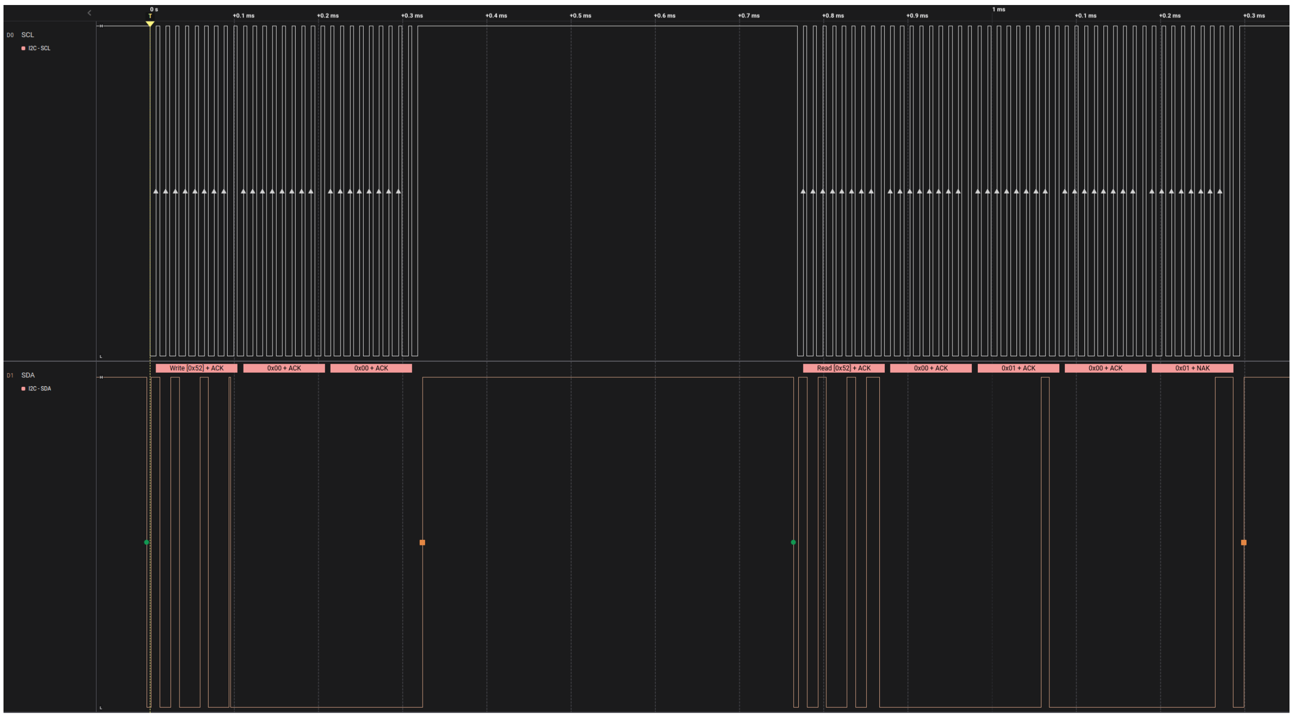
A read register operation consists of an I^{2}C write of two address bytes followed by an I^{2}C read of four data bytes for each register to read. Several registers can be read in the same I^{2}C transaction, the register address will be incremented by one for each four data bytes.

Example 1: Writing two bytes and reading four bytes will read one register.

Example 2: Writing two bytes and reading 16 bytes will read four registers.

Example operation, read 0x12345678 from address 0x0003.

Description	Data
I^{2}C Start Condition	
Slave Address + Write	0x52 + W
Address to slave [15:8]	0x00
Address to slave [7:0]	0x03
I^{2}C Stop Condition	
I^{2}C Start Condition	
Slave Address + Read	0x52 + R
Data from slave [31:24]	0x12
Data from slave [23:16]	0x34
Data from slave [15:8]	0x56
Data from slave [7:0]	0x78
I^{2}C Stop Condition	

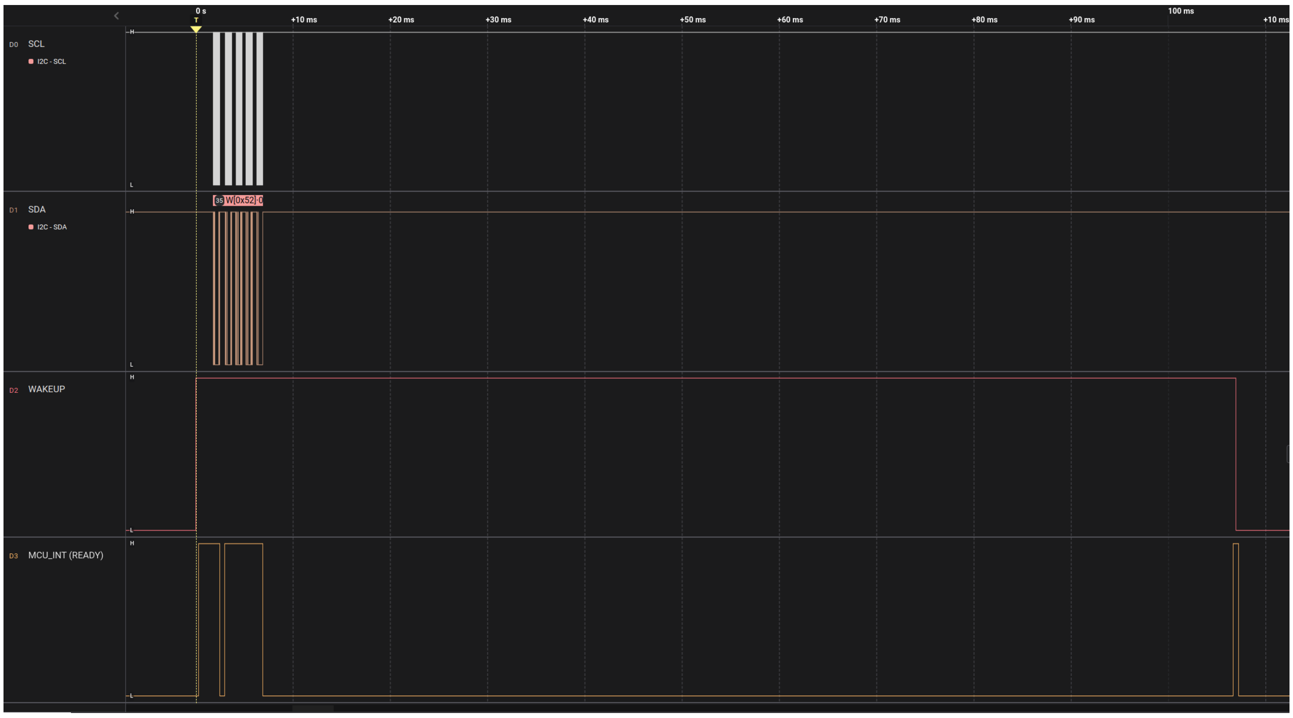


Example Waveform: Read register with address 0, the data sent from the slave to the master is 0x00010001

3.3 Register Protocol - Low Power Mode

3.3.1 I^{2}C Communication with Low Power Mode

Low power example



Low Power Example: Magnification of Wake up, Setup Presence Detector, Power down

4 File Structure

The I^{2}C Presence Detector application consists of the following files.

```
├── Src
│   └── applications
│       └── i2c
│           ├── acc_reg_protocol.c
│           ├── presence_reg_protocol_access.c
│           ├── presence_reg_protocol.c
│           ├── i2c_application_system_stm32.c
│           └── i2c_presence_detector.c
└── Inc
    ├── acc_reg_protocol.h
    ├── presence_reg_protocol.h
    ├── i2c_application_system.h
    └── i2c_presence_detector.h
```

- **acc_reg_protocol.c** A generic protocol handler implementation.
- **presence_reg_protocol.c** The specific register protocol setup for the I^{2}C Presence Detector.
- **presence_reg_protocol_access.c** The register read and write access functions for the I^{2}C Presence Detector.
- **i2c_application_system_stm32.c** System functions, such as I^{2}C handling, GPIO control and low power state
- **i2c_presence_detector.c** The I^{2}C Presence Detector application.

5 Embedded Host Example

This is an example implementation of the host read and write register functions using the STM32 SDK.

5.1 Register Read/Write functions

```c
#include <inttypes.h>
#include <stdbool.h>
#include <stdint.h>

#include "presence_reg_protocol.h"

// Use 1000ms timeout
#define I2C_TIMEOUT_MS 1000

// The STM32 uses the i2c address shifted one position
// to the left (0x52 becomes 0xa4)
#define I2C_ADDR 0xa4

// The register address length is two bytes
#define REG_ADDRESS_LENGTH 2

// The register data length is four bytes
#define REG_DATA_LENGTH 4


/**
 * @brief Read register value over I2C
 *
 * @param[in] reg_addr The register address to read
 * @param[out] reg_data The read register data
 * @returns true if successful
 */
bool read_register(uint16_t reg_addr, uint32_t *reg_data)
{
    HAL_StatusTypeDef status = HAL_OK;

    uint8_t transmit_data[REG_ADDRESS_LENGTH];

    transmit_data[0] = (reg_addr >> 8) & 0xff;
    transmit_data[1] = (reg_addr >> 0) & 0xff;

    status = HAL_I2C_Master_Transmit(&STM32_I2C_HANDLE, I2C_ADDR,
                                     transmit_data, REG_ADDRESS_LENGTH,
                                     I2C_TIMEOUT_MS);
    if (status != HAL_OK)
    {
        return false;
    }

    uint8_t receive_data[REG_DATA_LENGTH];

    status = HAL_I2C_Master_Receive(&STM32_I2C_HANDLE, I2C_ADDR,
                                    receive_data, REG_DATA_LENGTH,
                                    I2C_TIMEOUT_MS);
    if (status != HAL_OK)
    {
        return false;
    }


    // Convert bytes to uint32_t
    uint32_t val = receive_data[0];
    val = val << 8;
    val |= receive_data[1];
    val = val << 8;
    val |= receive_data[2];
    val = val << 8;
    val |= receive_data[3];
    *reg_data = val;

    return true;
}


/**
 * @brief Write register value over I2C
 *
 * @param[in] reg_addr The register address to write
 * @param[in] reg_data The register data to write
 * @returns true if successful
 */
bool write_register(uint16_t reg_addr, uint32_t reg_data)
{
    HAL_StatusTypeDef status = HAL_OK;

    uint8_t transmit_data[REG_ADDRESS_LENGTH + REG_DATA_LENGTH];

    // Convert uint16_t address to bytes
    transmit_data[0] = (reg_addr >> 8) & 0xff;
    transmit_data[1] = (reg_addr >> 0) & 0xff;
    // Convert uint32_t reg_data to bytes
    transmit_data[2] = (reg_data >> 24) & 0xff;
    transmit_data[3] = (reg_data >> 16) & 0xff;
    transmit_data[4] = (reg_data >> 8) & 0xff;
    transmit_data[5] = (reg_data >> 0) & 0xff;
    status = HAL_I2C_Master_Transmit(&STM32_I2C_HANDLE, I2C_ADDR,
                                     transmit_data,
                                     REG_ADDRESS_LENGTH + REG_DATA_LENGTH,
                                     I2C_TIMEOUT_MS);
    if (status != HAL_OK)
    {
        return false;
    }

    return true;
}
```

5.2 Detector setup functions

```
#include "presence_reg_protocol.h"

/**
 * @brief Test if configuration of detector is OK
 *
 * @returns true if successful
 */
bool configuration_ok(void)
{
    uint32_t status = 0
    if (!read_register(PRESENCE_REG_DETECTOR_STATUS_ADDRESS, &status))
    {
        //ERROR
        return false;
    }

    uint32_t config_ok_mask =
         PRESENCE_REG_DETECTOR_STATUS_FIELD_RSS_REGISTER_OK_MASK |
         PRESENCE_REG_DETECTOR_STATUS_FIELD_CONFIG_CREATE_OK_MASK |
         PRESENCE_REG_DETECTOR_STATUS_FIELD_SENSOR_CREATE_OK_MASK |
         PRESENCE_REG_DETECTOR_STATUS_FIELD_SENSOR_CALIBRATE_OK_MASK |
         PRESENCE_REG_DETECTOR_STATUS_FIELD_DETECTOR_CREATE_OK_MASK |
         PRESENCE_REG_DETECTOR_STATUS_FIELD_DETECTOR_BUFFER_OK_MASK |
         PRESENCE_REG_DETECTOR_STATUS_FIELD_SENSOR_BUFFER_OK_MASK |
         PRESENCE_REG_DETECTOR_STATUS_FIELD_CONFIG_APPLY_OK_MASK;

   if (status != config_ok_mask)
   {
        //ERROR
       return false;
   }

   return true;
}


/**
 * @brief Wait for detector not busy
 *
 * @returns true if successful
 */
bool wait_not_busy(void)
{
    uint32_t status = 0
    do
    {
        if (!read_register(PRESENCE_REG_DETECTOR_STATUS_ADDRESS, &status))
        {
            //ERROR
            return false;
        }
    } while((status & PRESENCE_REG_DETECTOR_STATUS_FIELD_BUSY_MASK) != 0);

    return true;
}


bool example_setup_and_start(void)
{
    // Set start at 1000mm
    if (!write_register(PRESENCE_REG_START_ADDRESS, 1000))
    {
        //ERROR
        return false;
    }
    // Set end at 5000mm
    if (!write_register(PRESENCE_REG_END_ADDRESS, 5000))
    {
        //ERROR
        return false;
    }

    // Apply configuration
    if (!write_register(
            PRESENCE_REG_COMMAND_ADDRESS,
            PRESENCE_REG_COMMAND_ENUM_APPLY_CONFIGURATION))
    {
        //ERROR
        return false;
    }

    // Wait for the configuration to be done
    if (!wait_not_busy())
    {
        //ERROR
        return false;
    }

    // Test if configration of detector was OK
    if (!configuration_ok())
    {
        //ERROR
        return false;
    }

    // Start detector
    if (!write_register(PRESENCE_REG_COMMAND_ADDRESS,
                        PRESENCE_REG_COMMAND_ENUM_START_DETECTOR))
    {
        //ERROR
        return false;
    }

    // Wait for command be done
    if (!wait_not_busy())
    {
        //ERROR
        return false;
    }

    // Read detector result
    uint32_t result;
    if (!read_register(PRESENCE_REG_PRESENCE_RESULT_ADDRESS, &result))
    {
        //ERROR
        return false;
    }

    // Was presence detected?

    bool presence_detected = (result &
       PRESENCE_REG_PRESENCE_RESULT_FIELD_PRESENCE_DETECTED_MASK) != 0;
    bool presence_detected_sticky = (result &
       PRESENCE_REG_PRESENCE_RESULT_FIELD_PRESENCE_DETECTED_STICKY_MASK) !=
       0;

    // Print peak if found
    if (presence_detected || presence_detected_sticky)
    {
        uint32_t presence_distance_mm;
        if (read_register(PRESENCE_REG_PRESENCE_DISTANCE_ADDRESS, &
           presence_distance_mm))
        {
            printf("Presence detected at distance: %" PRIu32 " mm\n",
               presence_distance_mm);
        }
        else
        {
            //ERROR
            return false;
        }
    }
    else
    {
        printf("No presence detected\n");
    }

    return true;
}
```

6 Registers

6.1 Register Map

Address	Register Name	Type
0x0000	Version	Read Only
0x0001	Protocol Status	Read Only
0x0002	Measure Counter	Read Only
0x0003	Detector Status	Read Only
0x0010	Presence Result	Read Only
0x0011	Presence Distance	Read Only
0x0012	Intra Presence Score	Read Only
0x0013	Inter Presence Score	Read Only
0x0020	Presence Actual Frame Rate	Read Only
0x0040	Sweeps Per Frame	Read / Write
0x0041	Inter Frame Presence Timeout	Read / Write
0x0042	Inter Phase Boost Enabled	Read / Write
0x0043	Intra Detection Enabled	Read / Write
0x0044	Inter Detection Enabled	Read / Write
0x0045	Frame Rate	Read / Write
0x0046	Intra Detection Threshold	Read / Write
0x0047	Inter Detection Threshold	Read / Write
0x0048	Inter Frame Deviation Time Const	Read / Write
0x0049	Inter Frame Fast Cutoff	Read / Write
0x004a	Inter Frame Slow Cutoff	Read / Write
0x004b	Intra Frame Time Const	Read / Write
0x004c	Intra Output Time Const	Read / Write
0x004d	Inter Output Time Const	Read / Write
0x004e	Auto Profile Enabled	Read / Write
0x004f	Auto Step Length Enabled	Read / Write
0x0050	Manual Profile	Read / Write
0x0051	Manual Step Length	Read / Write
0x0052	Start	Read / Write
0x0053	End	Read / Write
0x0054	Reset Filters On Prepare	Read / Write
0x0055	Hwaas	Read / Write
0x0056	Automatic Subsweeps	Read / Write
0x0057	Signal Quality	Read / Write
0x0080	Detection On Gpio	Read / Write
0x0100	Command	Write Only
0xffff	Application Id	Read Only

6.2 Register Descriptions

6.2.1 Version

Address	0x0000
Access	Read Only
Register Type	field
Description	Get the RSS version.

Bitfield	Pos	Width	Mask
MAJOR	16	16	0xffff0000
MINOR	8	8	0x0000ff00
PATCH	0	8	0x000000ff

MAJOR - Major version number

MINOR - Minor version number

PATCH - Patch version number

6.2.2 Protocol Status

Address	0x0001
Access	Read Only
Register Type	field
Description	Get protocol error flags.

Bitfield	Pos	Width	Mask
PROTOCOL_STATE_ERROR	0	1	0x00000001
PACKET_LENGTH_ERROR	1	1	0x00000002
ADDRESS_ERROR	2	1	0x00000004
WRITE_FAILED	3	1	0x00000008
WRITE_TO_READ_ONLY	4	1	0x00000010

PROTOCOL_STATE_ERROR - Protocol state error

PACKET_LENGTH_ERROR - Packet length error

ADDRESS_ERROR - Register address error

WRITE_FAILED - Write register failed

WRITE_TO_READ_ONLY - Write to read only register

6.2.3 Measure Counter

Address	0x0002
Access	Read Only
Register Type	uint
Description	Get the measure counter, the number of measurements performed since restart.

6.2.4 Detector Status

Address	0x0003
Access	Read Only
Register Type	field
Description	Get detector status flags.

Bitfield	Pos	Width	Mask
RSS_REGISTER_OK	0	1	0x00000001
CONFIG_CREATE_OK	1	1	0x00000002
SENSOR_CREATE_OK	2	1	0x00000004
SENSOR_CALIBRATE_OK	3	1	0x00000008
DETECTOR_CREATE_OK	4	1	0x00000010
DETECTOR_BUFFER_OK	5	1	0x00000020
SENSOR_BUFFER_OK	6	1	0x00000040
CONFIG_APPLY_OK	7	1	0x00000080
RSS_REGISTER_ERROR	16	1	0x00010000
CONFIG_CREATE_ERROR	17	1	0x00020000
SENSOR_CREATE_ERROR	18	1	0x00040000
SENSOR_CALIBRATE_ERROR	19	1	0x00080000
DETECTOR_CREATE_ERROR	20	1	0x00100000
DETECTOR_BUFFER_ERROR	21	1	0x00200000
SENSOR_BUFFER_ERROR	22	1	0x00400000

CONFIG_APPLY_ERROR	23	1	0x00800000
DETECTOR_ERROR	28	1	0x10000000
BUSY	31	1	0x80000000

RSS_REGISTER_OK - RSS register OK

CONFIG_CREATE_OK - Configuration create OK

SENSOR_CREATE_OK - Sensor create OK

SENSOR_CALIBRATE_OK - Sensor calibrate OK

DETECTOR_CREATE_OK - Detector create OK

DETECTOR_BUFFER_OK - Detector get buffer size OK

SENSOR_BUFFER_OK - Memory allocation of sensor buffer OK

CONFIG_APPLY_OK - Detector configuration apply OK

RSS_REGISTER_ERROR - RSS register error

CONFIG_CREATE_ERROR - Configuration create error

SENSOR_CREATE_ERROR - Sensor create error

SENSOR_CALIBRATE_ERROR - Sensor calibrate error

DETECTOR_CREATE_ERROR - Detector create error

DETECTOR_BUFFER_ERROR - Detector get buffer size error

SENSOR_BUFFER_ERROR - Memory allocation of sensor buffer error

CONFIG_APPLY_ERROR - Detector configuration apply error

DETECTOR_ERROR - Detector error occured, restart necessary

BUSY - Detector busy

6.2.5 Presence Result

Address	0x0010
Access	Read Only
Register Type	field
Description	The result from the presence detector.

Bitfield	**Pos**	**Width**	**Mask**
PRESENCE_DETECTED	0	1	0x00000001
PRESENCE_DETECTED_STICKY	1	1	0x00000002
DETECTOR_ERROR	15	1	0x00008000
TEMPERATURE	16	16	0xffff0000

PRESENCE_DETECTED - Presence detected

PRESENCE_DETECTED_STICKY - Presence detected, sticky bit with clear on read

DETECTOR_ERROR - The presence detector failed

TEMPERATURE - Temperature in sensor during measurement (in degree Celsius). Note that it has poor absolute accuracy and should only be used for relative temperature measurements.

6.2.6 Presence Distance

Address	0x0011
Access	Read Only

Register Type	uint
Unit	mm
Description	The distance, in millimeters, for the detected presence

6.2.7 Intra Presence Score

Address	0x0012
Access	Read Only
Register Type	uint
Description	A measure of the amount of fast motion detected.

6.2.8 Inter Presence Score

Address	0x0013
Access	Read Only
Register Type	uint
Description	A measure of the amount of slow motion detected.

6.2.9 Presence Actual Frame Rate

Address	0x0020
Access	Read Only
Register Type	uint
Unit	mHz
Description	The actual frame rate of the presence detector.

6.2.10 Sweeps Per Frame

Address	0x0040
Access	Read / Write
Register Type	uint
Description	The number of sweeps that will be captured in each frame (measurement).
Default Value	16

6.2.11 Inter Frame Presence Timeout

Address	0x0041
Access	Read / Write
Register Type	uint
Description	Number of seconds the inter-frame presence score needs to decrease before exponential scaling starts for faster decline. Should be between 0 and 30 where 0 means no timeout. Note:
Default Value	3

6.2.12 Inter Phase Boost Enabled

Address	0x0042
Access	Read / Write
Register Type	bool
Description	Enable to increase detection of slow motions by utilizing the phase information in the Sparse IQ data.
Default Value	False

6.2.13 Intra Detection Enabled

Address	0x0043
Access	Read / Write
Register Type	bool
Description	Enable to detect faster movements inside frames.
Default Value	True

6.2.14 Inter Detection Enabled

Address	0x0044
Access	Read / Write
Register Type	bool
Description	Enable to detect slower movements between frames.
Default Value	True

6.2.15 Frame Rate

Address	0x0045
Access	Read / Write
Register Type	uint
Unit	mHz
Description	The presence detector frame rate. Note: This value is a factor 1000 larger than the RSS value.
Default Value	12000

6.2.16 Intra Detection Threshold

Address	0x0046
Access	Read / Write
Register Type	uint
Description	The threshold for detecting faster movements inside frames. Note: This value is a factor 1000 larger than the RSS value.
Default Value	1300

6.2.17 Inter Detection Threshold

Address	0x0047
Access	Read / Write
Register Type	uint
Description	This is the threshold for detecting slower movements between frames. Note: This value is a factor 1000 larger than the RSS value.
Default Value	1000

6.2.18 Inter Frame Deviation Time Const

Address	0x0048
Access	Read / Write
Register Type	uint
Unit	ms
Description	The time constant of the low pass filter for the inter-frame deviation between fast and slow. Note: This value is a factor 1000 larger than the RSS value.
Default Value	500

6.2.19 Inter Frame Fast Cutoff

Address	0x0049
Access	Read / Write
Register Type	uint
Unit	mHz
Description	The cutoff frequency of the low pass filter for the fast filtered absolute sweep mean. Note: This value is a factor 1000 larger than the RSS value.
Default Value	6000

6.2.20 Inter Frame Slow Cutoff

Address	0x004a
Access	Read / Write
Register Type	uint
Unit	mHz
Description	The cutoff frequency of the low pass filter for the slow filtered absolute sweep mean. Note: This value is a factor 1000 larger than the RSS value.
Default Value	200

6.2.21 Intra Frame Time Const

Address	0x004b
Access	Read / Write
Register Type	uint
Unit	ms
Description	The time constant for the depthwise filtering in the intra-frame part. Note: This value is a factor 1000 larger than the RSS value.
Default Value	150

6.2.22 Intra Output Time Const

Address	0x004c
Access	Read / Write
Register Type	uint
Unit	ms
Description	The time constant for the output in the intra-frame part. Note: This value is a factor 1000 larger than the RSS value.
Default Value	300

6.2.23 Inter Output Time Const

Address	0x004d
Access	Read / Write
Register Type	uint
Unit	ms
Description	The time constant for the output in the inter-frame part. Note: This value is a factor 1000 larger than the RSS value.
Default Value	2000

6.2.24 Auto Profile Enabled

Address	0x004e
Access	Read / Write
Register Type	bool

Description	Enable/Disable automatic selection of profile based on start point of measurement.
Default Value	True

6.2.25 Auto Step Length Enabled

Address	0x004f
Access	Read / Write
Register Type	bool
Description	Enable/Disable automatic selection of step length based on the profile.
Default Value	True

6.2.26 Manual Profile

Address	0x0050
Access	Read / Write
Register Type	enum
Description	The profile to use. The profile will only be used if profile auto selection was disabled.
Default Value	PROFILE4

Enum	Value
PROFILE1	1
PROFILE2	2
PROFILE3	3
PROFILE4	4
PROFILE5	5

PROFILE1 - Profile 1

PROFILE2 - Profile 2

PROFILE3 - Profile 3

PROFILE4 - Profile 4

PROFILE5 - Profile 5

6.2.27 Manual Step Length

Address	0x0051
Access	Read / Write
Register Type	uint
Description	The number of steps between each data point. The manual step length will only be used if step length auto selection was disabled.
Default Value	72

6.2.28 Start

Address	0x0052
Access	Read / Write
Register Type	uint
Unit	mm
Description	The start point of measurement interval in millimeters. Note: This value is a factor 1000 larger than the RSS value.
Default Value	300

6.2.29 End

Address	0x0053
Access	Read / Write
Register Type	uint
Unit	mm
Description	The end point of measurement interval in millimeters. Note: This value is a factor 1000 larger than the RSS value.
Default Value	2500

6.2.30 Reset Filters On Prepare

Address	0x0054
Access	Read / Write
Register Type	bool
Description	Enable/Disable reset of the presence filters during start/restart.
Default Value	True

6.2.31 Hwaas

Address	0x0055
Access	Read / Write
Register Type	uint
Description	The hardware accelerated average samples (HWAAS).
Default Value	32

6.2.32 Automatic Subsweeps

Address	0x0056
Access	Read / Write
Register Type	bool
Description	Enable/Disable use of subsweeps.
Default Value	True

6.2.33 Signal Quality

Address	0x0057
Access	Read / Write
Register Type	uint
Description	Signal quality.
Default Value	15000

6.2.34 Detection On Gpio

Address	0x0080
Access	Read / Write
Register Type	bool
Description	Output presence detection on generic gpio
Default Value	False

6.2.35 Command

Address	0x0100
Access	Write Only

Register Type	enum
Description	Execute command.

Enum	Value
APPLY_CONFIGURATION	1
START_DETECTOR	2
STOP_DETECTOR	3
ENABLE_UART_LOGS	32
DISABLE_UART_LOGS	33
LOG_CONFIGURATION	34
RESET_MODULE	1381192737

APPLY_CONFIGURATION - Apply the configuration

START_DETECTOR - Start the presence detector

STOP_DETECTOR - Stop the presence detector

ENABLE_UART_LOGS - DEBUG: Enable UART Logs

DISABLE_UART_LOGS - DEBUG: Disable UART Logs

LOG_CONFIGURATION - DEBUG: Print detector configuration to UART

RESET_MODULE - Reset module, needed to make a new configuration

6.2.36 Application Id

Address	0xffff
Access	Read Only
Register Type	enum
Description	The application id register.

Enum	Value
DISTANCE_DETECTOR	1
PRESENCE_DETECTOR	2
REF_APP_BREATHING	3

DISTANCE_DETECTOR - Distance Detector Application

PRESENCE_DETECTOR - Presence Detector Application

REF_APP_BREATHING - Breathing Reference Application

7 Disclaimer