

Reading multiple inputs using ADC

1.0.0

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Chapter 1

Data Structure Index

1.1 Data Structures

Here are the data structures with brief descriptions:

ADC_ConfigType	5
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Chapter 2

File Index

2.1 File List

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

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Chapter 3

Data Structure Documentation

3.1 ADC_ConfigType Struct Reference

Data Fields

- ADC_Port_Config **port_config**
a user defined datatype to select the ADC port configuration
- ADC_Prescaler **prescalar**
a user defined datatype to select the ADC prescalar

The documentation for this struct was generated from the following file:

- **ADC.h**

Chapter 4

File Documentation

4.1 ADC.c File Reference

ADC Module Source File for this program.

```
#include <pic16f877a.h>
#include "PORT.h"
#include "ADC.h"
```

Functions

- void **ADC_init** (const **ADC_ConfigType** *Config_Ptr)
Brief: This is ADC Module Initialization Function
- **uint16 ADC_readChannel** (**uint8** channel_num, const **ADC_ConfigType** *Config_Ptr)
Brief: This is function to read the ADC channel

4.1.1 Detailed Description

ADC Module Source File for this program.

Author

Nour

Date

12/8/2020

Version

1.0

4.1.2 Function Documentation

4.1.2.1 ADC_init()

```
void ADC_init (
    const ADC_ConfigType * Config_Ptr )
```

Brief: This is ADC Module Initialization Function

Parameters

<i>Config_Ptr</i>	ADC_ConfigType (p. 5) * <i>Config_Ptr</i> to select <i>Config_Ptr</i>
-------------------	--

Returns

void

4.1.2.2 ADC_readChannel()

```
uint16 ADC_readChannel (
    uint8 channel_num,
    const ADC_ConfigType * Config_Ptr )
```

Brief: This is function to read the ADC channel

Parameters

<i>channel_num</i>	uint8 <i>channel_num</i> to select <i>channel_num</i>
<i>Config_Ptr</i>	ADC_ConfigType (p. 5) * <i>Config_Ptr</i> to select <i>Config_Ptr</i>

Returns

uint16 to get value of ADC channel

References INPUT, PIN0, PIN1, PIN2, PIN3, PIN5, PORTA_CONFIG, PORTE_CONFIG, and set_pin_direction().

4.2 ADC.h File Reference

ADC Module Header File for this program.

```
#include "std_types.h"
```

Data Structures

- struct **ADC_ConfigType**

Enumerations

- enum **ADC_Port_Config** {
 _0, _1, _2, _3,
 _4, _5, _6, _7,
 _8, _9, _10, _11,
 _12, _13, _14, _15 }
- enum **ADC_Prescaler** {
 Fosc_2, Fosc_8, Fosc_32, Frc,
 Fosc_4, Fosc_16, Fosc_64, _Frc }

Functions

ADC_ConfigType

ADC_ConfigType (p. 5) responsible for dynamic configuration of ADC module

- void **ADC_init** (const **ADC_ConfigType** *Config_Ptr)
Brief: This is ADC Module Initialization Function
- uint16 **ADC_readChannel** (uint8 channel_num, const **ADC_ConfigType** *Config_Ptr)
Brief: This is function to read the ADC channel

4.2.1 Detailed Description

ADC Module Header File for this program.

Author

Nour

Date

12/8/2020

Version

1.0

4.2.2 Function Documentation

4.2.2.1 ADC_init()

```
void ADC_init (
    const ADC_ConfigType * Config_Ptr )
```

Brief: This is ADC Module Initialization Function

Parameters

<i>Config_Ptr</i>	ADC_ConfigType (p. 5) * Config_Ptr to select Config_Ptr
-------------------	--

Returns

void

4.2.2.2 ADC_readChannel()

```
uint16 ADC_readChannel (
    uint8 channel_num,
    const ADC_ConfigType * Config_Ptr )
```

Brief: This is function to read the ADC channel

Parameters

<i>channel_num</i>	uint8 channel_num to select channel_num
<i>Config_Ptr</i>	ADC_ConfigType (p. 5) * Config_Ptr to select Config_Ptr

Returns

uint16 to get value of ADC channel

References INPUT, PIN0, PIN1, PIN2, PIN3, PIN5, PORTA_CONFIG, PORTE_CONFIG, and set_pin_direction().

4.3 DIO.c File Reference

DIO Module Source File for this program.

```
#include "DIO.h"
#include <pic16f877a.h>
```

Functions

- void **write_pin** (uint8 port, uint8 pin, uint8 value)

***Brief:** This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_pin** (uint8 port, uint8 pin)

***Brief:** This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to toggle it*
- uint8 **read_pin** (uint8 port, uint8 pin)

***Brief:** This is function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to get the value*
- void **write_group_value** (uint8 port, uint8 group, uint8 value)

***Brief:** This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set a certain value*
- void **write_port** (uint8 port, uint8 value)

***Brief:** This is a function to select certain port of ports (A,B,C,D,E) to set the value (LOW , HIGH , any value)*
- void **toggle_port** (uint8 port)

***Brief:** This is a function to select certain port of ports (A,B,C,D,E) to toggle it*
- void **write_group** (uint8 port, uint8 group, uint8 value)

***Brief:** This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_group** (uint8 port, uint8 group)

***Brief:** This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to toggle it*

4.3.1 Detailed Description

DIO Module Source File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.3.2 Function Documentation

4.3.2.1 write_pin()

```
void write_pin (
    uint8 port,
    uint8 pin,
    uint8 value )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

<i>port</i>	uint8 port to select port
<i>pin</i>	uint8 pin to select pin
<i>value</i>	uint8 value to select value

Returns

void

References HIGH, LOW, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.3.2.2 toggle_pin()

```
void toggle_pin (
    uint8 port,
    uint8 pin )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to toggle it

Parameters

<i>port</i>	uint8 port to select port
<i>pin</i>	uint8 pin to select pin

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.3.2.3 read_pin()

```
uint8 read_pin (
    uint8 port,
    uint8 pin )
```

Brief: This is function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to get the value

Parameters

<i>port</i>	uint8 port to select port
<i>pin</i>	uint8 pin to select pin

Returns

uint8 to get value of pin

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.3.2.4 write_group_value()

```
void write_group_value (
    uint8 port,
    uint8 group,
    uint8 value )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set a certain value

Parameters

<i>port</i>	uint8 port to select port
<i>group</i>	uint8 group to select group
<i>value</i>	uint8 value to select value

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.3.2.5 write_port()

```
void write_port (
    uint8 port,
    uint8 value )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the value (LOW , HIGH , any value)

Parameters

<i>port</i>	uint8 port to select port
<i>value</i>	uint8 value to select value

Returns

void

References HIGH, LOW, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.3.2.6 toggle_port()

```
void toggle_port (
    uint8 port )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to toggle it

Parameters

<i>port</i>	uint8 port to select port
-------------	---------------------------

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.3.2.7 write_group()

```
void write_group (
    uint8 port,
    uint8 group,
    uint8 value )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

<i>port</i>	uint8 port to select port
<i>group</i>	uint8 group to select group
<i>value</i>	uint8 value to select value

Returns

void

References HIGH, LOW, PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.3.2.8 toggle_group()

```
void toggle_group (
    uint8 port,
    uint8 group )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to toggle it

Parameters

<i>port</i>	uint8 port to select port
<i>group</i>	uint8 group to select group

Returns

void

References PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.4 DIO.h File Reference

DIO Module Header File for this program.

```
#include "std_types.h"
#include "PORT_config.h"
#include "PIN_config.h"
```

Functions

- void **write_pin** (uint8 port, uint8 pin, uint8 value)
***Brief:** This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_pin** (uint8 port, uint8 pin)
***Brief:** This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to toggle it*
- uint8 **read_pin** (uint8 port, uint8 pin)
***Brief:** This is function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to get the value*
- void **write_group_value** (uint8 port, uint8 group, uint8 value)
***Brief:** This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set a certain value*
- void **write_port** (uint8 port, uint8 value)
***Brief:** This is a function to select certain port of ports (A,B,C,D,E) to set the value (LOW , HIGH , any value)*
- void **toggle_port** (uint8 port)
***Brief:** This is a function to select certain port of ports (A,B,C,D,E) to toggle it*
- void **write_group** (uint8 port, uint8 group, uint8 value)
***Brief:** This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)*
- void **toggle_group** (uint8 port, uint8 group)
***Brief:** This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to toggle it*

4.4.1 Detailed Description

DIO Module Header File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.4.2 Function Documentation

4.4.2.1 write_pin()

```
void write_pin (
    uint8 port,
    uint8 pin,
    uint8 value )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

<i>port</i>	uint8 port to select port
<i>pin</i>	uint8 pin to select pin
<i>value</i>	uint8 value to select value

Returns

void

References HIGH, LOW, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.4.2.2 toggle_pin()

```
void toggle_pin (  
    uint8 port,  
    uint8 pin )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to toggle it

Parameters

<i>port</i>	uint8 port to select port
<i>pin</i>	uint8 pin to select pin

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.4.2.3 read_pin()

```
uint8 read_pin (  
    uint8 port,  
    uint8 pin )
```

Brief: This is function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to get the value

Parameters

<i>port</i>	uint8 port to select port
<i>pin</i>	uint8 pin to select pin

Returns

uint8 to get value of pin

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.4.2.4 write_group_value()

```
void write_group_value (
    uint8 port,
    uint8 group,
    uint8 value )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set a certain value

Parameters

<i>port</i>	uint8 port to select port
<i>group</i>	uint8 group to select group
<i>value</i>	uint8 value to select value

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.4.2.5 write_port()

```
void write_port (
    uint8 port,
    uint8 value )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the value (LOW , HIGH , any value)

Parameters

<i>port</i>	uint8 port to select port
<i>value</i>	uint8 value to select value

Returns

void

References HIGH, LOW, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.4.2.6 toggle_port()

```
void toggle_port (
    uint8 port )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to toggle it

Parameters

<i>port</i>	uint8 port to select port
-------------	---------------------------

Returns

void

References PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.4.2.7 write_group()

```
void write_group (
    uint8 port,
    uint8 group,
    uint8 value )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the value (LOW , HIGH)

Parameters

<i>port</i>	uint8 port to select port
<i>group</i>	uint8 group to select group
<i>value</i>	uint8 value to select value

Returns

void

References HIGH, LOW, PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.4.2.8 toggle_group()

```
void toggle_group (
    uint8 port,
    uint8 group )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to toggle it

Parameters

<i>port</i>	uint8 port to select port
<i>group</i>	uint8 group to select group

Returns

void

References PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.5 main.c File Reference

main Module Source File for this program

```
#include <xc.h>
#include "ADC.h"
#include "PORT.h"
#include "DIO.h"
```

Functions

- void **main** (void)

4.5.1 Detailed Description

main Module Source File for this program

Author

Nour

Date

21/9/2020

Version

1.0

4.6 PIN_config.h File Reference

PIN_config Module Header File for this program.

Macros

- `#define PIN0 0x01`
a preprocessor to define pin0
- `#define PIN1 0x02`
a preprocessor to define pin1
- `#define PIN2 0x04`
a preprocessor to define pin2
- `#define PIN3 0x08`
a preprocessor to define pin3
- `#define PIN4 0x10`
a preprocessor to define pin4
- `#define PIN5 0x20`
a preprocessor to define pin5
- `#define PIN6 0x40`
a preprocessor to define pin6
- `#define PIN7 0x80`
a preprocessor to define pin7
- `#define FIRST_GROUP 0x0F`
a preprocessor to define first group
- `#define SECOND_GROUP 0xF0`
a preprocessor to define second group

4.6.1 Detailed Description

PIN_config Module Header File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.7 PORT.c File Reference

PORT Module Source File for this program.

```
#include "PORT.h"
#include <pic16f877a.h>
```

Functions

- void **set_pin_direction** (uint8 port, uint8 pin, uint8 direction)
***Brief:** This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)*
- void **set_port_direction** (uint8 port, uint8 direction)
***Brief:** This is a function to select certain port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)*
- void **set_group_direction** (uint8 port, uint8 group, uint8 direction)
***Brief:** This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)*

4.7.1 Detailed Description

PORT Module Source File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.7.2 Function Documentation

4.7.2.1 set_pin_direction()

```
void set_pin_direction (
    uint8 port,
    uint8 pin,
    uint8 direction )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

<i>port</i>	uint8 port to select port
<i>pin</i>	uint8 pin to select pin
<i>direction</i>	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

Referenced by ADC_readChannel().

4.7.2.2 set_port_direction()

```
void set_port_direction (
    uint8 port,
    uint8 direction )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

<i>port</i>	uint8 port to select port
<i>direction</i>	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORTE_CONFIG.

4.7.2.3 set_group_direction()

```
void set_group_direction (
    uint8 port,
    uint8 group,
    uint8 direction )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

<i>port</i>	uint8 port to select port
<i>group</i>	uint8 group to select group
<i>direction</i>	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.8 PORT.h File Reference

PORT Module Header File for this program.

```
#include "std_types.h"
#include "PORT_config.h"
#include "PIN_config.h"
```

Functions

- void **set_pin_direction** (uint8 port, uint8 pin, uint8 direction)
Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)
- void **set_port_direction** (uint8 port, uint8 direction)
Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)
- void **set_group_direction** (uint8 port, uint8 group, uint8 direction)
Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

4.8.1 Detailed Description

PORT Module Header File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.8.2 Function Documentation

4.8.2.1 set_pin_direction()

```
void set_pin_direction (
    uint8 port,
    uint8 pin,
    uint8 direction )
```

Brief: This is a function to select certain pin of pins (0->7) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

<i>port</i>	uint8 port to select port
<i>pin</i>	uint8 pin to select pin
<i>direction</i>	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORT_E_CONFIG.

Referenced by ADC_readChannel().

4.8.2.2 set_port_direction()

```
void set_port_direction (
    uint8 port,
    uint8 direction )
```

Brief: This is a function to select certain port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

<i>port</i>	uint8 port to select port
<i>direction</i>	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTA_CONFIG, PORTB_CONFIG, PORTC_CONFIG, PORTD_CONFIG, and PORT_E_CONFIG.

4.8.2.3 set_group_direction()

```
void set_group_direction (
    uint8 port,
    uint8 group,
    uint8 direction )
```

Brief: This is a function to select certain group of groups (FIRST_GROUP , SECOND_GROUP) of port of ports (A,B,C,D,E) to set the direction (INPUT , OUTPUT)

Parameters

<i>port</i>	uint8 port to select port
<i>group</i>	uint8 group to select group
<i>direction</i>	uint8 direction to select direction

Returns

void

References INPUT, OUTPUT, PORTB_CONFIG, PORTC_CONFIG, and PORTD_CONFIG.

4.9 PORT_config.h File Reference

PORT_config Module Header File for this program.

Macros

- **#define PORTA_CONFIG 1**
a preprocessor to define portA
- **#define PORTB_CONFIG 2**
a preprocessor to define portB
- **#define PORTC_CONFIG 3**
a preprocessor to define portC
- **#define PORTD_CONFIG 4**
a preprocessor to define portD
- **#define PORTE_CONFIG 5**
a preprocessor to define portE

4.9.1 Detailed Description

PORT_config Module Header File for this program.

Author

Nour

Date

27/7/2020

Version

1.0

4.10 std_types.h File Reference

Standard Types Header File for this program.

Macros

- `#define LOW 0u`
a preprocessor to define low
- `#define HIGH 1u`
a preprocessor to define high
- `#define FALSE 0u`
a preprocessor to define false
- `#define TRUE 1u`
a preprocessor to define true
- `#define INPUT 1u`
a preprocessor to define input
- `#define OUTPUT 0u`
a preprocessor to define output
- `#define NULL_PTR (void *)0`
a preprocessor to define null pointer

Typedefs

- `typedef unsigned char uint8`
a user defined datatype to define uint8
- `typedef unsigned short uint16`
a user defined datatype to define uint16
- `typedef unsigned long uint32`
a user defined datatype to define uint32

4.10.1 Detailed Description

Standard Types Header File for this program.

Author

Nour

Date

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Version

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