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1. Raspberry I/O Mapping
   1. Raspberry IO Definition

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| http://3.bp.blogspot.com/-vjgUXru9jSE/UV-Uqg0nArI/AAAAAAAAAk8/RZEx7a9SfUE/s1600/GPIOs.png | **腳位** | **項目** | **腳位** | **項目** |
| 01 | 3v3 Power | 02 | 5V Power |
| 03 | GPIO 0 (SDA) | 05 | 5V Power |
| 05 | GPIO 1 (SCL) | 06 | Ground |
| 07 | GPIO4 | 08 | GPIO14(TXD) |
| 09 | Ground | 10 | GPIO15(RXD) |
| 11 | GPIO17 | 12 | GPIO18(PCM\_CLK) |
| 13 | GPIO21 (PCM\_DOUT) | 14 | Ground |
| 15 | GPIO22 | 16 | GPIO23 |
| 17 | 3V3 Power | 18 | GPIO24 |
| 19 | GPIO10 | 20 | Ground |
| 21 | GIPO 9 | 22 | GPIO25 |
| 23 | GPIO 11 | 24 | GPIO8(CE0) |
| 25 | Ground | 26 | GPIO7(CE1) |

* 1. Raspberry IO Mapping

|  |  |  |
| --- | --- | --- |
| P0 | GPIO 17 | DO1 |
| P1 | GPIO 18 | DO2 |
| P2 | GPIO 27 | DI1 |
| P3 | GPIO 22 | DI2 |
| P4 | GPIO 23 | AO1 |
| P5 | GPIO 24 | AO2 |
| P6 | GPIO25 | AI1 |
| P7 | GPIO 4 | AI2 |

1. Modbus RTU Protocol

















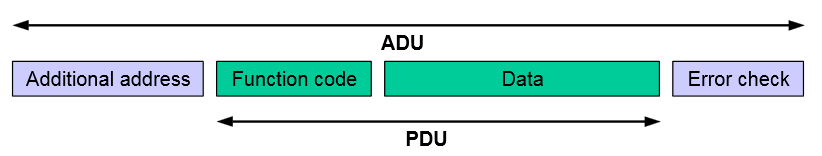









29. 1. Modbus Packet Format



1. Detailed information can be found at <http://www.modbus.org> .
2. If TCP used, then additional address is IP address of fourth filed.
3. If a CRC is error , then it will not respond.
   1. Function Code (0x01) – Read coils
      1. Request

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | 0x01 |
| 02~03 | Start Address | 2bytes | 0x0000 to 0x0001 |
| 04~05 | Quantity of Coils | 2bytes | 1 ~ 2 |

* + 1. Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | 0x01 |
| 02~03 | Byte count | 2bytes | N\* |
| 04~05 | Value | n bytes | n = N or N+1 |

**\*N = Quantity of Outputs / 8, if the remainder is different of 0  N = N+1**

* + 1. Error Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | Function Code + 0x80 = 0x81 |
| 03 | Exception Code | 1bytes | 0x01 to 0x04 |

* 1. Function Code (0x02) – Write a single digital output
     1. Request

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | 0x01 |
| 02~03 | Start Address | 2bytes | 0x0000 to 0x0001 |
| 04~05 | Quantity of Inputs | 2bytes | 1 ~ 2 |

* + 1. Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Byte count | 1byte | N\* |
| 02~03 | Input Status | N\* x 1Byte |  |

* + 1. Error Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Error Code | 1byte | 0x82 |
| 03 | Exception Code | 1bytes | 0x01 to 0x04 |

* 1. Function Code (0x03) – Read Holding Register
     1. Request

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | 0x03 |
| 02~03 | Register Address | 2bytes | [Reference Address mappings](#AddressMappings) |
| 04~05 | Value | 2bytes | 0x01 to 0x7D |

* + 1. Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | 0x03 |
| 02~03 | Byte Count | 1bytes | 2 x N\* |
| 04~05 | Register Value | N\* x 2bytes |  |

* + 1. Error Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x83 |
| 02 | Exception Code | 1bytes | 0x01~0x04 |

* 1. Function Code (0x04) – Read Input Register
     1. Request

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x0000 to 0xFFFF |
| 01 | Function Code | 1byte | 0x04 |
| 02~03 | Start Address | 2bytes | 0x0001 |
| 04~05 | Quantity of Inputs | 2bytes | 1 |

* + 1. Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x0000 to 0xFFFF |
| 01 | Function Code | 1byte | 0x04 |
| 02~03 | Byte Count | 1bytes | 2 x N\* |
| 04~05 | Register Value | N\* x 2bytes |  |

* + 1. Error Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x84 |
| 02 | Exception Code | 1bytes | 0x01~0x04 |

* 1. Function Code (0x05) – Write a single digital output
     1. Request

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | 0x05 |
| 02~03 | Register Address | 2bytes | [Reference Address mappings](#AddressMappings) |
| 04~05 | Value | 2bytes | ON = 0xFF00 ; OFF = 0x0000 |

* + 1. Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | 0x05 |
| 02~03 | Register Address | 2bytes | [Reference Address mappings](#AddressMappings) |
| 04~05 | Value | 2bytes | ON = 0xFF00 ; OFF = 0x0000 |

* + 1. Error Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte |  |
| 01 | Error Code | 1byte | [Reference Address mappings](#AddressMappings) |
| 03 | Exception Code | 1bytes | 0x01~0x04 |

* 1. Function Code (0x06) – Write single Register
     1. Request

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | 0x06 |
| 02~03 | Register Address | 2bytes | [Reference Address mappings](#AddressMappings) |
| 04~05 | Value | 2bytes | 0x0000 to 0xFFFF |

* + 1. Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x00 to 0xFF |
| 01 | Function Code | 1byte | 0x06 |
| 02~03 | Register Address | 2bytes | [Reference Address mappings](#AddressMappings) |
| 04~05 | Value | 2bytes | 0x0000 to 0x00FF (8bit DAC) |

* + 1. Error Response

|  |  |  |  |
| --- | --- | --- | --- |
| Filed | Description | Unit | Comment |
| 00 | Additional Address | 1byte | 0x86 |
| 01 | Error Code | 1byte | [Reference Address mappings](#AddressMappings) |
| 03 | Exception Code | 1bytes | 0x01~0x04 |

1. Address Mappings

|  |  |  |  |
| --- | --- | --- | --- |
| Register Address | Description | Attribute | Comment |
| 0x0001~0x0002 | Digitial output | R/W | DO1、DO2 |
| 0x0001~0x0002 | Digitial Input | R | DI1、DI2 |
| 0x0001 | Analog Input | R/W | AI1 |
| 0x0001 | Analog Output | R | AO1 |