IR-310-RM

IR Controlled 10-ch High Power Relay Module

User Manual v1.1

www.icpdas.com

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Content

1. Introduction

IR-310-RM is a 10-channel high power relay module designed for the power switching control of the appliances. The relay module can switch up to 10 A loads. There are NO/NC contacts and protection circuit for each channel. The channels can be controlled independently or sequentially by serial communication with Modbus RTU protocol, as well as by wireless IR remote control. There are also maximum 5 interlocked relay pairs for interlocked switching. The application field can be manual/automatic power switch, timer switch, light scenario control and energy conservation etc.

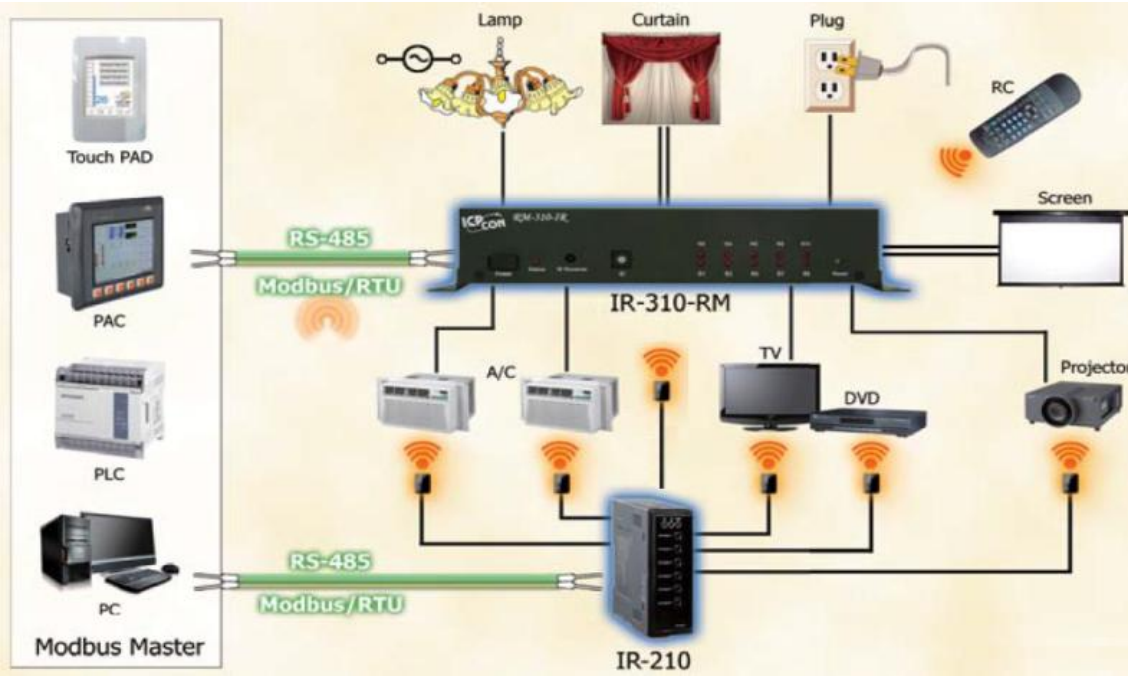


Figure 1-1: The application architecture of IR-310-RM.

1.1 Features

[IR-310-RM]

- 10 channels high power relays: 10A x 4, 5A x 6
- Supports IR commands (custom:64, built-in:32) for relay control.
- NO and NC contacts for each channel.
- Protection circuit for each channel.
- Sequential relay control.
- Supports maximum 5 sets of interlocked relay pairs (e.g. CW/CCW motor control).
- RS-232 and RS-485 serial interface.
- Supports Modbus/RTU protocol.
- Modbus Network IDs: 1 ~ 15 (HW); 1 ~ 247 (SW).

[IR Utility]

IR utility is a configuration tool for the IR series modules of ICP DAS. IR-310-RM utility, as a part of the IR utility, has functions as follows:

- Can get/set separate or all settings from/to IR-310-RM.
- For relay test and relay states indication.
- Command IR-310-RM to emit IR signals corresponding to relay states for an IR learning remote.

1.2 Applications

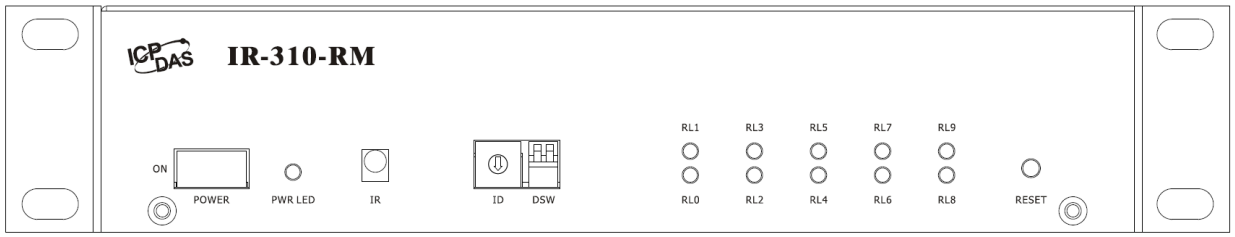
- e-Classroom service
- Lighting Scenario Control
- Home and Building Automation

2. Hardware

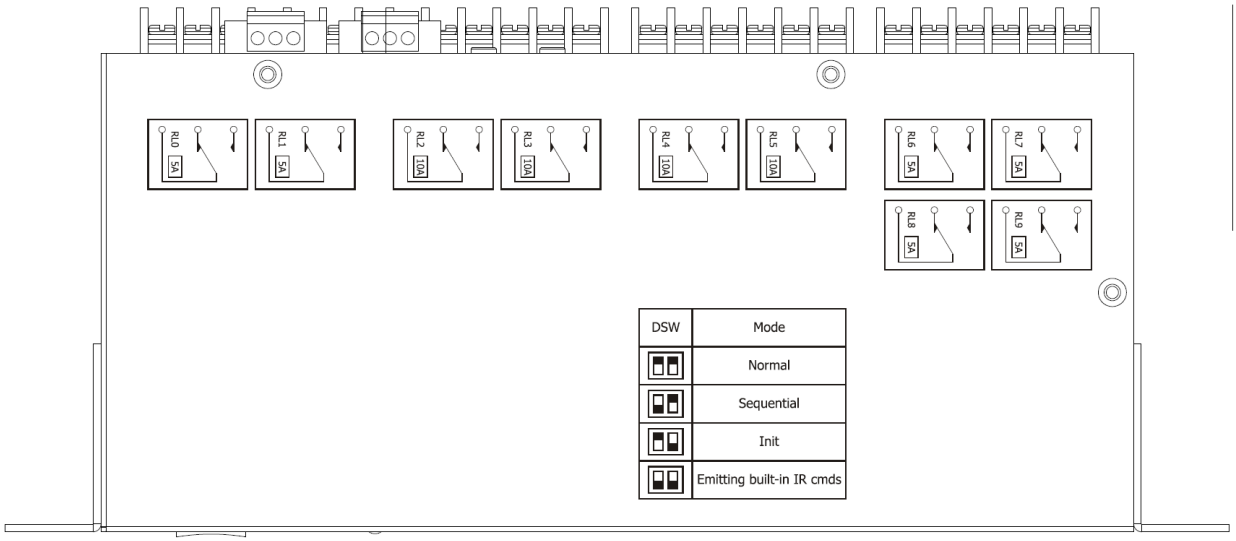
2.1 Specifications

Relay Output		
Number of Outputs	10	
Relay Types	Form C relay SPDT	
Contact Rating	5A@220VAC for RL0, RL1 & RL6~RL9 (Operating temperature: 25°C) 10A@220VAC for RL2 ~ RL5 (Operating temperature: 25°C)	
Operating Time(Max.)	10 ms for RL0, RL1 & RL6 ~ RL9, 15 ms for RL2 ~ RL5	
Release Time(Max.)	5 ms for RL0, RL1 & RL6 ~ RL9 10 ms for RL2 ~ RL5	
Insulation Resistance	100 M Ohm min. at 500 VDC for RL0, RL1 & RL6~RL9 1000M Ohm min. at 500VDC for RL2~RL5	
Dielectric Strength	Open Contact	750VAC for RL0, RL1 & RL6~RL9 1000VAC for RL2 ~ RL5
	Contact & Coil	1500VAC for RL0, RL1 & RL6~RL9 2500VAC for RL2 ~ RL5
Life TIme	Mechanical : 1 × 10^7 OPS Electrical : 1 × 10^5 OPS	
Serial Interface		
COM1	RS-232 (TxD, RxD, GND)	
COM2	RS-485 (DATA+, DATA-)	
Format	Parity: None, Databits: 8, Stopbits: 1	
Baud Rate	9600 ~ 115200 bps	
Protocol	Modbus/RTU (Slave)	
Modbus Net ID	Hardware: 1 ~ 15; Software: 1 ~ 247	
IR interface		
IR input	Onboard IR receiver	
	3.5 mm audio jack for an IR receiver cable	
IR Remote Commands	64 IR commands (#0~#63) corresponding to self-defined relay states. 32 IR commands (#192~#223) corresponding to built-in relay states.	
LED Display		
1 LED as power indication		
10 LEDs as relay output indicators		
Power		
Power Consumption	6.5 W (max)	
Environment		
Operating Temperature	-25 to +75°C	
Storage Temperature	-30 to 80°C	
Humidity	10 to 90%, non-condensing	
Mechanism		
Dimensions(W x H x D)	220 mm x 48 mm x 113 mm	

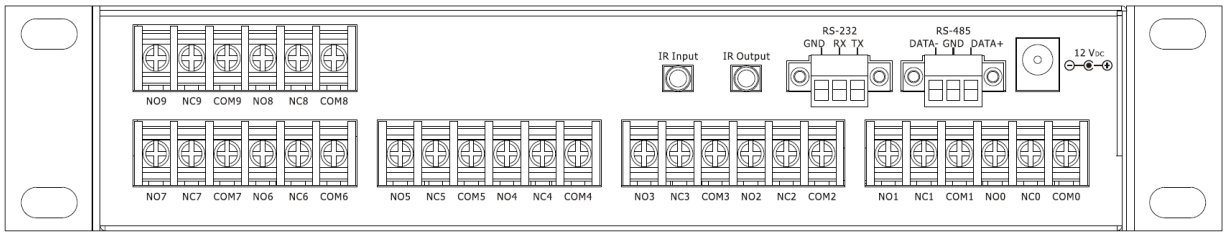
2.2 Appearance



Front



Top



Rear

Figure 2-1: Front, top and rear view of IR-310-RM.

2.3 Pin assignments

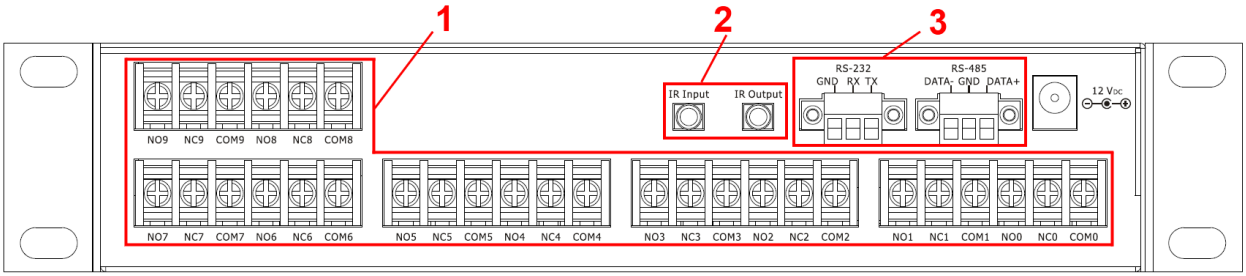


Figure 2-2: Rear view

1. Relay output terminal

Table 2-1: Pin assignments of relays

Pin of Relay	Description
NO#	Normally Open
NC#	Normally Closed
COM#	Common

where # is the relay number (# = 0 ~ 9)

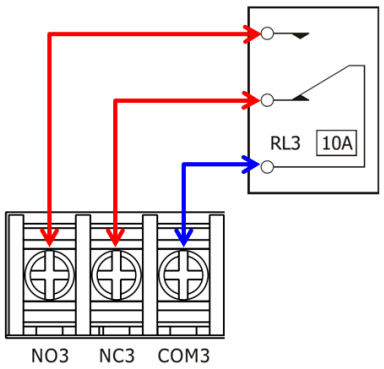


Figure 2-2

2. IR interface

IR Input: 3.5 mm audio jack for the IR receiver cable CA-IR-001.

IR Output: 3.5 mm audio jack for the IR emitter cable CA-IR-SH2251-5.

3. Communication terminal

Table 2-2: Pin assignments of serial port

Serial port	Pin
RS-485	DATA+
	GND
	DATA-
RS-232	TxD
	RxD
	GND

2.4 Wire connection

2.4.1 RS-232 connection

The RS-232 pin assignment of IR-310-RM is depicted as figure 2-4.

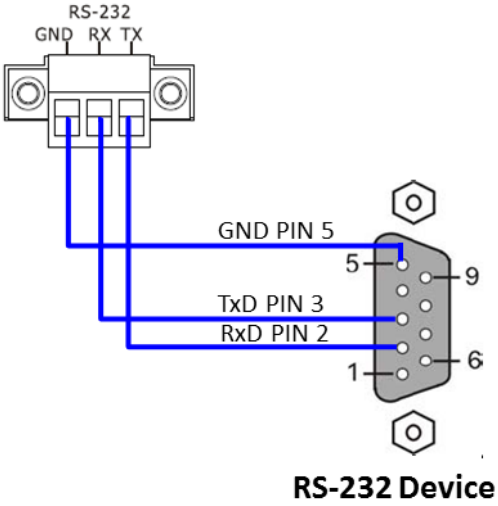


Figure 2-4: RS-232 connection

The accompanied cable CA-0910 can be used for the RS-232 connection to the IR-310-RM. The RS-232 connection using CA-0910 is shown in Figure 2-6.

Figure 2-5: RS-232 connection cable (CA-0910)

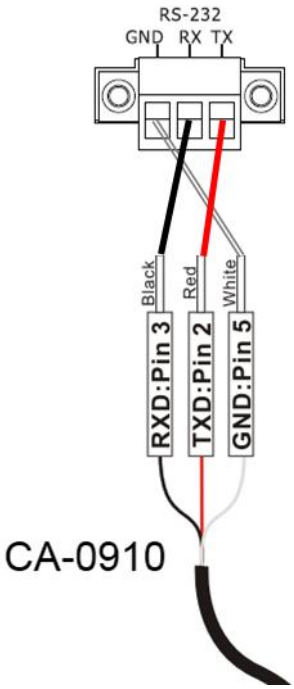


Figure 2-6: The RS-232 connection using CA-0910

2.4.2 RS-485 connection

The RS-485 connection between IR-310-RM and RS-485 host device is shown in the figure 2-7.

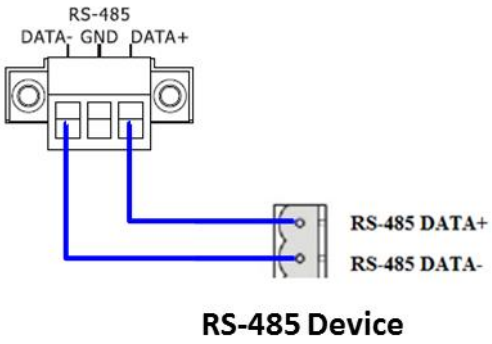


Figure 2-7: RS-485 connection

2.4.3 Relay Terminal

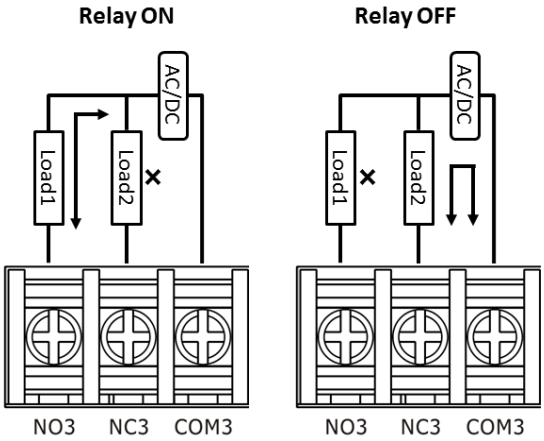


Figure 2-8: Wire connection for relay output

2.4.4 IR Interface

Please use IR receiver cable CA-IR-001 for IR input jack and IR emitter cable CA-IR-SH2251-5 for IR output jack.

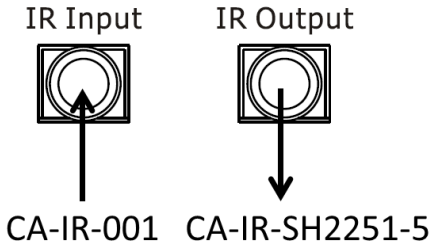


Figure 2-9.

2.4.5 Power connection

The IR-310-RM only supports +12 V_{DC}. FRA05-S12-SU is a recommended power supply with a DC connector which supplys 12 V_{DC}/max.0.58A.

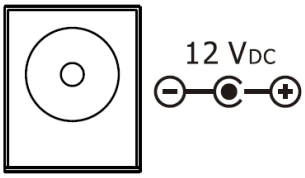


Figure 2-10: DC power jack for +12 V_{DC}

2.5 Watchdog Setting

The watchdog is a timer to reset the hung system due to some fault conditions. The watchdog of the IR-310-RM can be enabled or disabled by JP1 as shown in Figure 2-11. It is necessary to open the case to set JP1. The watchdog is enabled by default.

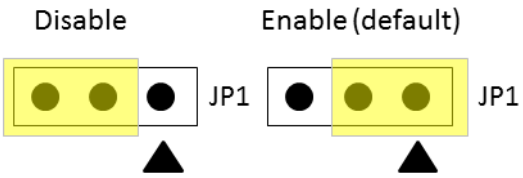


Figure 2-11: JP1setting for Hardware WDT

2.6 Jumper for Firmware Update

There is a jumper JP5 in the case of IR-310-RM for setting the operation mode (OP) or Firmware update mode (FW).

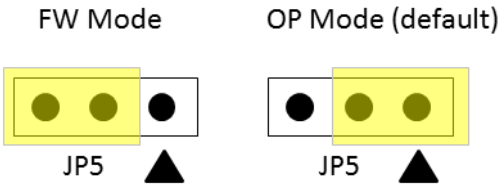


Figure 2-12: JP5 setting for Firmware Update

2.6.1 Update firmware mode

Set the JP5 to “FW” position and power cycle the IR-310-RM to enable the firmware update mode. At the same time the power LED blinks rapidly 4 times per second. In the FW mode, you have to use RS-232 port to update firmware by the Firmware Update Tool. Please click the menu of IR-310-RM utility [Tool] -> [Firmware Update Tool] to launch the firmware update tool. According to the following steps, you can finish the update firmware procedures in the Fig. 2-13.

(1) Select “COM” and “COM Port”

(2) Click “Browser” to select the firmware file (ir310rm_v#_#_#.fw).

(3) Click “Firmware Update” to start the update procedure.

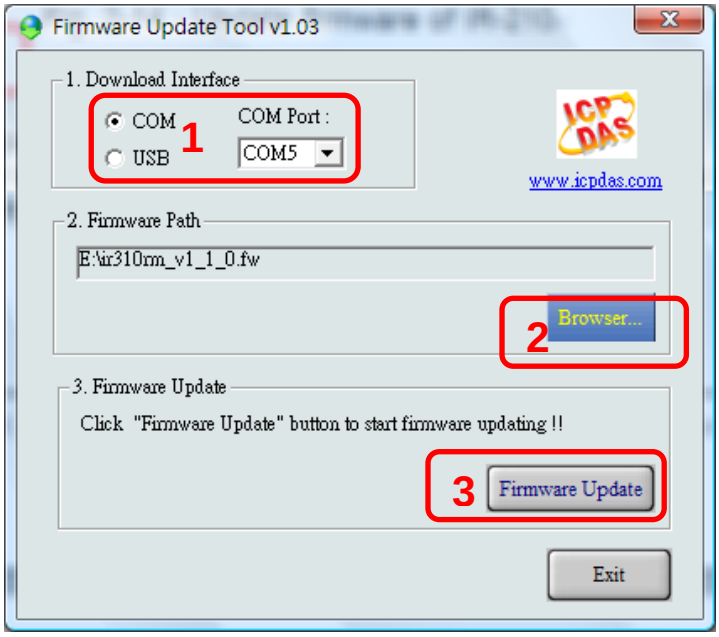


Fig. 2-13: Update firmware Tool for IR-310-RM

Note:
1. Use RS-232 port to update firmware.
2. After updating firmware, remember to change the JP5 to the “OP” position and power cycle the IR-310-RM to run in the operation mode.

The firmware of IR-310-RM can be downloaded from:
ftp://ftp.icpdas.com/pub/cd/usbcd/napdos/ir-310-rm/firmware/

Firmware_Update_Tool can be downloaded from:
ftp://ftp.icpdas.com/pub/cd/usbcd/napdos/ir-310-rm/software/fw_update_tool/

2.6.2 Normal Operation Mode

Set the JP5 to the “OP” in figure 2-11 and power cycle the IR-310-RM to enable the Normal Operation Mode.

2.7 LED Indicators

There are two kinds of LEDs for IR-310-RM to indicate several states.

(1) Power LED :

The PWR LED is ON to indicate the IR-310-RM is turned on.

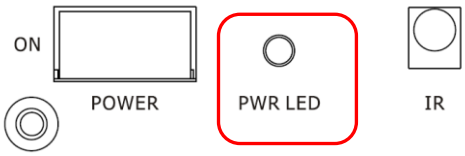


Figure 2-14: Power LED

(2) Relay State LEDs

These 10 LEDs indicate the states of the 10 relays(RL) where:

Table 2-3 Relay LED and Contact Position

Relay State	Contact Position
RL# ON	Normally Open
RL# OFF	Normally Closed

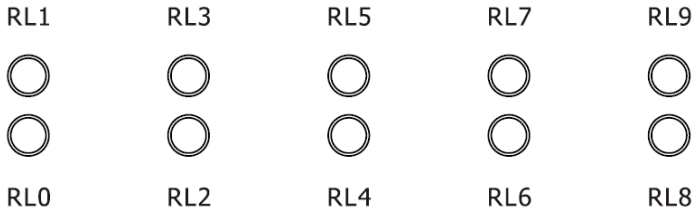


Figure 2-15: Relay States LEDs

(3) List of LED State

Table 2-4: The State List of LEDs for IR-310-RM

LED	State	Comments
PWR	ON	Power ON / Normal operation mode
PWR	OFF	Power OFF
PWR	Blinking 4 times/s	Firmware update mode
PWR	Blink 2 times/sec	Receiving an IR command
PWR	Blink 1 time	Emitting an IR command by the utility
RL0 ~ RL9	ON	Contact in Normally Open
RL0 ~ RL9	ON	Contact in Normally Closed

2.8 DIP Switch

There four states of the 2-pin dip switch which represent four modes for IR-310-RM as shown in table 2-5. To take effect the setting, please power cycle the module after set the dip switch.

Table 2-5: Four states of dip switch.

DSW	Mode
	Normal
	Sequential
	Init
	Emitting built-in IR cmds

(1) Normal Mode

The mode except other three modes.

(2) Sequential mode

In this mode, the 10 relay can be switch forward to NO or backward to NC sequentially.

(3) Init mode

In this initialization mode, IR-310-RM always use the default communication settings.

Table 2-5 Default communication settings

Item	Default value
Baud Rate	9600 bps
Parity/Databits/Stopbtis	None/8/1
Modbus Net ID	1

(4) Emitting built-in IR commands mode (corresponding to built-in IR-Relay-States)

Built-in IR commands are the IR commands corresponding to the built-in 10 relay states (Refer to appendix A). In this mode, IR-310-RM will emit IR commands #192 ~ #203 sequentially from the IR output channel. The flowchart of this process is depicted in figure 2-16. Users can set the IR learning remote control in the learning mode to learn these IR commands for test as shown in figure 2-17.

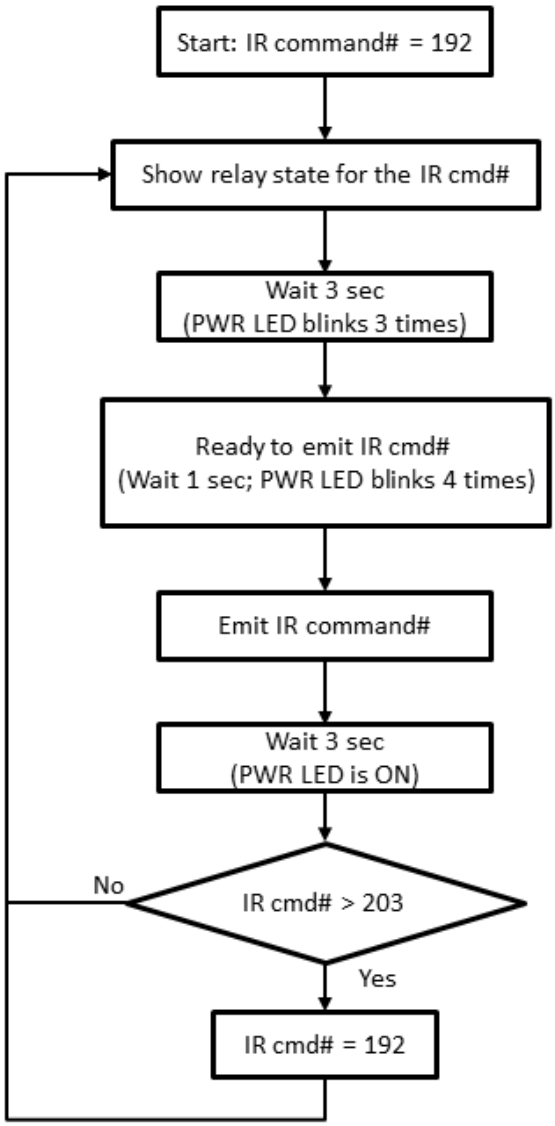


Figure 2-16: The flowchart of emitting built-in IR commands

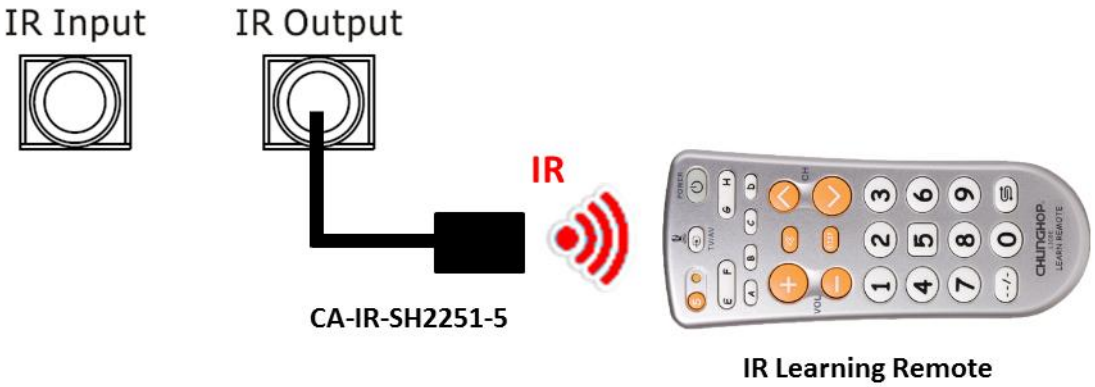


Figure 2-17: Use IR learning remote to learn IR commands.

3. Configuration and Control on IR-310-RM

There are two ways to configure and control IR-310-RM. One is the easy IR-310-RM utility for test and settings and the other is the Modbus/RTU commands for the Modbus master.

Please refer to chapter 4 and 5 to learn the IR-310-RM utility and the Modbus commands.

4.Configuration Utility

4.1 The configuration tool– IR Utility (with IR-310-RM Utility)

The IR Utility is the integration utility for configuration of IR series modules. It needs the environment of the .NET Framework 4 client profile based on Microsoft Windows. Users can download the IR Utility from:

ftp://ftp.icpdas.com/pub/cd/usbcd/napdos/ir-310-rm/software/Utility/

If the environment of .NET Framework 4 client profile is not available on the Microsoft OS, please download and install the redistributable packages as follows:

- Web Installer

http://www.microsoft.com/download/en/details.aspx?id=17113

- Standalone Installer

http://www.microsoft.com/download/en/details.aspx?id=24872

IR-310-RM Utility is a part of the IR Utility. Please select the “IR-310-RM” item in the Module combobox and click the “Connect/Open Interface” button to get the IR-310-RM utility.

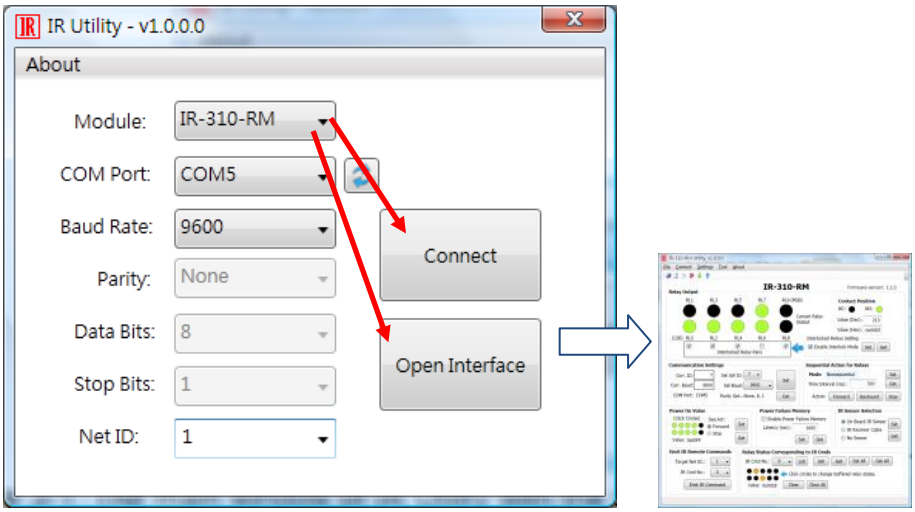


Figure 4-1: The main window of IR Utility with the IR-310-RM selected.

The default communication settings of IR-310-RM are listed in table 4-1.

Table 4-1 Default communication settings

Item	Default value
Baud Rate	9600 bps
Parity/Databits/Stopbtis	None/8/1
Modbus Net ID	1

4.2 IR-310-RM Utility

4.2.1 Main Window of IR-310-RM Utility

IR-310-RM Utility is a part of the IR Utility. IR-310-RM Utility gives an easy interface to configure IR-310-RM. Users can also refer to **chapter 5** for the control and settings on IR-310-RM by the Modbus commands.

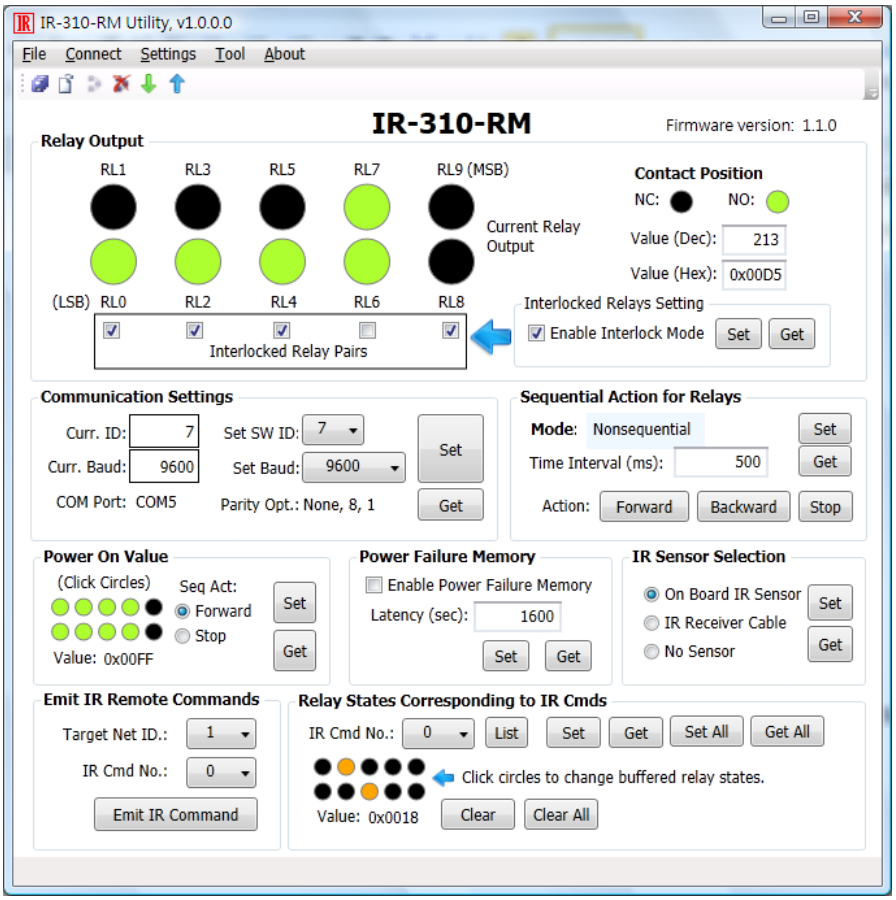


Figure 4-2: The main window of IR-310-RM Utility connecting to an IR-310-RM.

4.2.2 Menu

Table 4-2 explains the menu of the IR-310-RM Utility.

Table 4-2: Items of the menu

Item	Sub item	Description
File	Save Settings to File	Save all settings to a file (for IR-310-RM).
	Load Settings from File	Load all settings from a file (for IR-310-RM).

	Close IR-310-RM Utility	Close IR-310-RM Utility.
Connect	Connect IR-310-RM	Connection of serial port to IR-310-RM.
	Disconnect IR-310-RM	Disconnection of serial port from IR-310-RM.
Settings	Download Settings to IR-310-RM	Download settings from utility to IR-310-RM.
	Load Settings from IR-310-RM	Get settings from IR-310-RM to utility.
Tool	Firmware Update Tool	Tool for updating firmware.
About	About IR-310-RM Utility	Show version of the IR-310-RM utility.

(1) File

- **Save Settings to File**

  Save all settings buffered in the IR-310-RM utility to a file with the filename extension ".ird".

- **Load Settings from File**

  Load all settings from the ird file of IR-310-RM and put them in the IR-310-RM utility.

- **Close IR-310-RM Utility**

  Close IR-310-RM utility and back to the main window of IR utility.

(2) Connect

- **Connect IR-310-RM**

  Open the dialog to connect IR-310-RM. Please refer to table 4-1 for default communication settings. After connection is established, the current states of the 10 relays are always displayed in the utility.

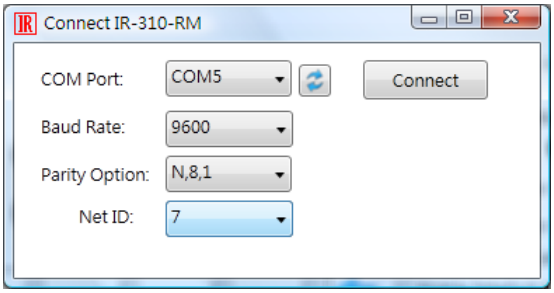


Figure 4-3: Dialog of connecting IR-310-RM.

- **Disconnect IR-310-RM**

Disconnect the connection between the utility and IR-310-RM.

(3) Setting

- **Download Settings to IR-310-RM**

a. All Settings:
Download all settings from utility to IR-310-RM.
b. Only IR-Relay-States:
Only download the IR-Relay-States from utility to IR-310-RM.

- **Load Settings from IR-310-RM**
  When the communication connection is established, utility does not load settings from IR-310-RM. Users have to click “get” buttons to get setting values in each section or click this menu item to load all setting values from IR-310-RM.

a. All Settings:
Load all settings from IR-310-RM to utility.
b. Only IR-Relay-States:
Only load the IR-Relay-States from IR-310-RM to utility.

(4) Tool

- **Firmware Update Tool**
  Launch the firmware update tool. Please refer to 2.6 for firmware update procedure.

“”

4.2.3 Relay Output Section

- **Current 10 relay states indication**

This section (figure 3-8) shows the current 10 relay output states after connection between utility and IR-310-RM is established. Relay ON and OFF means the normally open (NO) and normally closed (NC) of the relay’s contact.

- **Control 10 relay states for test**

Change the ON/OFF state of relays by clicking the circles.

- **Interlocked mode**

There are maximum 5 interlocked relay pairs which can be set on IR-310-RM. They are RL0/RL1, RL2/RL3, RL4/RL5, RL6/RL7, and RL8/RL9. The interlocked relay pairs are effective when the “Enable Interlocked Mode” checkbox is checked and set.

There are three states for an interlocked relay pairs (e.g. for RL0/RL1):
(1) RL0 is OFF; RL1 is OFF.
(2) RL0 is ON; RL1 is OFF.
(3) RL0 is OFF; RL1 is ON.
Being ON state of both relays is not allowed in a relay pair.

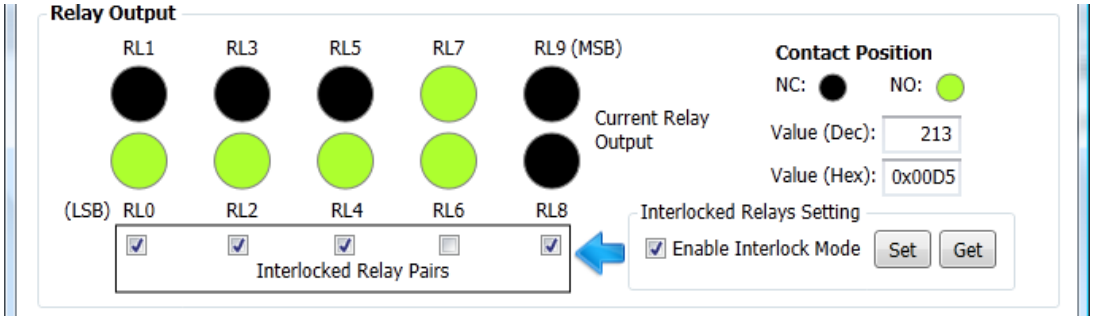


Figure 4-4: Relay output section

4.2.4 Communication Settings Section

This section can set the software Modbus Net ID and baud rate of the COM port. **Please reset the module to make the change effective.**

The “Curr. ID” and “Curr. Baud” represent the current Modbus Net ID and current baud rate of the IR-310-RM.

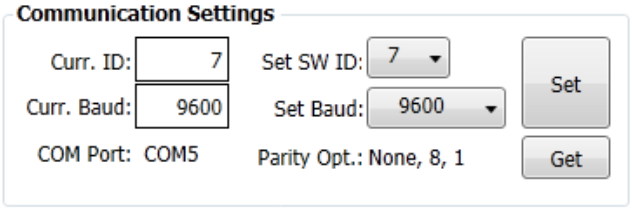


Figure 4-5: Communication settings section

4.2.5 Sequential Action for Relays Section

To enable/disable the sequential mode, please refer to previous section 2.8 to adjust the DIP switch. This section shows current state of the sequential mode and time interval (ms) for sequential action of relays after clicking the get buttons. The range of the time interval is 0 to 65535 ms.

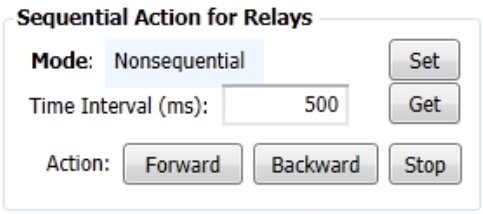


Figure 4-6: Settings of sequential relay action.

4.2.6 Power on value and power failure memory section

If the “Enable Power Failure Memory” is not set, IR-310-RM applies the Power On Value settings of 10 relay states. Otherwise, the 10 relay states of power failure memory are used when power is on.

Radio buttons Forward/Stop of power on value are for the forward/stop action in sequential mode.

Latency (sec) is the delay time to record the 10 relay states after the relay states are changed. The default is 1800 sec (30 min) and the minimum is 5 sec.

Figure 4-7: Power on value and power failure memory section.

4.2.7 IR Sensor Selection section

There are three selections of IR sensor sources can be set.
(1) On-board IR sensor: The sensor is located in the front panel.
(2) IR Receiver Cable: Use “IR Output” channel. CA-IR-001 needs to be plugged into the “IR Output” jack (3.5 mm audio jack).
(3) No sensor: Disable the IR remote function.

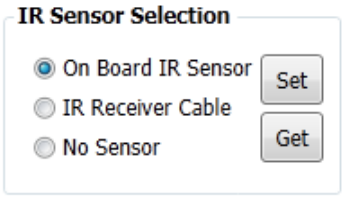


Figure 4-8: Source of IR sensor.

4.2.8 Emit IR Commands section

Custom and built-in IR commands are available for IR remote control on the IR-310-RM. Each IR command is for an IR-310-RM with specific Modbus Net ID and the corresponding IR-relay-state configured in the section of Relay States Corresponding to IR cmds (Section 4.2.9).

Plug the IR emitter cable CA-IR-SH2251-5 in the jack of IR Output at the rear of the IR-310-RM. Click the “Emit IR Command” button will emit an IR command. Users can aim the head of the IR emitter cable to the IR receiver of the IR-310-RM for test. This function is for the IR learning remote to learn the IR commands for the IR-310-RM module.

(1) Custom IR commands

・Nons equential mode

IR cmd #	Description
0 ~ 63	The IR commands corresponding to customizable 10 relays states. (Refer to 4.2.9)
192 ~ 223	32 IR commands corresponding to the built-in relay states. (Appendix A)

・Sequential mode

IR cmd #	Description
0	Stop the forward/backward sequential action.
1	Have 10 relays move forward to NO sequentially.
2	Have10 relays move backward to NC sequentially.
3 ~ 63	IR commands corresponding to customizable 10 relays states. (Refer to 4.2.9)
192 ~ 223	IR commands corresponding to the built-in relay states. (Appendix A)

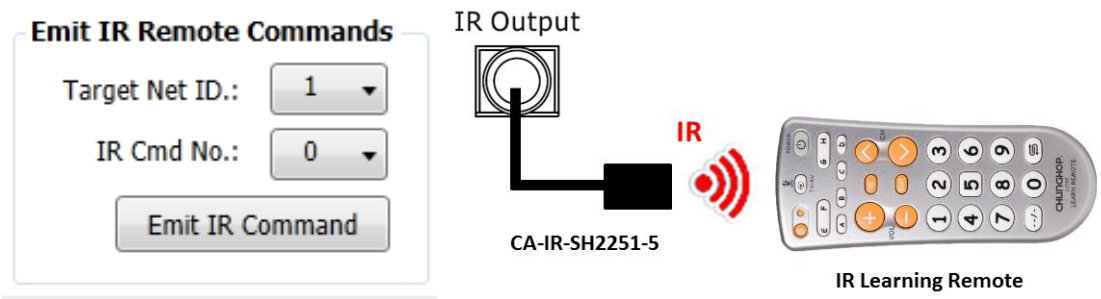


Figure 4-9: Emit IR commands for learning..

4.2.9 Relay States Settings Corresponding to IR Cmds

IR-relay-state can be buffered in each item (#=0~63) of the “IR Cmd No.” combobox by clicking the circles representing the 10 relays RL0 ~ RL9. Click a circle ON means the relay ON (Normally open). The circle OFF means the relay OFF (Normally closed).

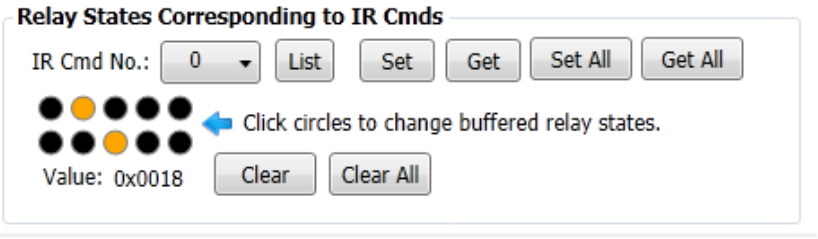
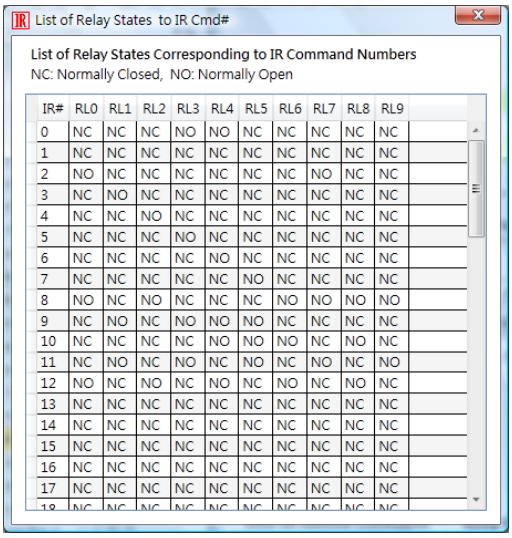


Figure 4-10: Source of IR sensor.

- **List button**
  List all IR-relay-states of IR command# 0 ~ 63 buffered in the utility by a sheet.



IR#	RL0	RL1	RL2	RL3	RL4	RL5	RL6	RL7	RL8	RL9
0	NC	NC	NC	NO	NO	NC	NC	NC	NC	NC
1	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
2	NO	NC	NC	NC	NC	NC	NC	NO	NC	NC
3	NC	NO	NC	NC	NC	NC	NC	NC	NC	NC
4	NC	NC	NO	NC	NC	NC	NC	NC	NC	NC
5	NC	NC	NC	NO	NC	NC	NC	NC	NC	NC
6	NC	NC	NC	NC	NO	NC	NC	NC	NC	NC
7	NC	NC	NC	NC	NC	NO	NC	NC	NC	NC
8	NO	NC	NO	NC	NC	NC	NO	NO	NO	NO
9	NC	NO	NC	NO	NO	NO	NC	NC	NC	NC
10	NC	NC	NC	NC	NO	NO	NO	NC	NO	NC
11	NC	NO	NC	NO	NC	NO	NC	NO	NC	NO
12	NO	NC	NO	NC	NO	NC	NO	NC	NO	NC
13	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
14	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
15	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
16	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
17	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC

Figure 4-11: List of IR-relay-states in the utility.

- **Clear button**
  Change 10 relay states to OFF state for the item of the IR cmd No combobox.

- **Clear All button**
  Change 10 relay states to OFF state for all the items (0 ~ 63) of the IR cmd No combobox..

- **Set button**
  Set the IR-relay-state for the item of the IR cmd No combobox to the connected IR-310-RM.

- **Get button**
  Get the IR-relay-state for the item of the IR cmd No combobox from the connected IR-310-RM.

- **Set All button**
  Equivalent to Menu [Settings] => [Download Settings to IR-310-RM]=>[Only IR-Relay-States].

- **Get All button**
  Equivalent to Menu [Settings] => [Load Settings from IR-310-RM]=>[Only IR-Relay-States].

5. Modbus Commands for IR-310-RM

The following Function Code commands are provided for a Modbus master to control and configure IR-310-RM. **It is necessary to append 2 bytes of CRC16 to the tail of each Modbus command.**

FC01, 05, and 15 are the standard Modbus commands for Modbus masters to access the relay outputs of IR-310-RM. Sub-FC commands of FC100 are specific to the settings and control on IR-310-RM.

Table 5-1: Modbus Function Calls for IR-310-RM

Function Code	Description	Section
01 (0x01)	Read coils (relay output states)	5.1
05 (0x05)	Write single coil (single relay output)	5.2
15 (0x0F)	Write multiple coils (multiple relay outputs)	5.3
100 (0x64)	Commands for the settings of the IR-310-RM.	5.4

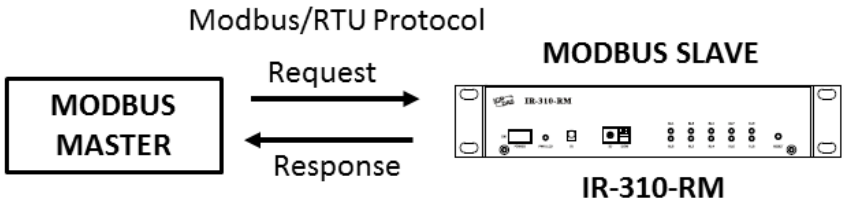


Figure 5-1

5.1 FC01 (0x01) Read Coils

This FC01 can read multiple relay states (ON/OFF, i.e. NO/NC). It is necessary to append 2 bytes of CRC16 to the tail of each Modbus command.

・Request

Byte order	Item	Size	Value
00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x01
02 ~ 03	Starting channel numbers	2 Bytes	0x0000 ~ 0x000A
04 ~ 05	Output channel quantity	2 Bytes	0x0000 ~ 0x000A

・Response

Byte order	Item	Size	Value
00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x01
02	Byte count	1 Bytes	1 or 2
03	Relay status (low byte)	1 Byte	0x00 ~ 0xFF. (*)
04	Relay status (high byte)	1 Byte	0x00 ~ 0x03. (*)

* It depends on start channel number and output channel quantity.
Bit 0 is the ON/OFF state of the relay 0 where value = 1 means ON and value = 0 means OFF.

Example:

Read the state of the RL0 ~ RL9.

Request (hex): 01 01 00 00 00 0A BC 0D (“BC 0D” is CRC16)

where 00 00: Starting channel number is relay **0**.

00 0A: Output channel quantity is 10. Get states of 10 relays.

Response (hex): 01 01 02 D5 00 E7 6C (“E7 6C” is CRC16)

where 02: Byte count is 2. 10 relay states need 2 bytes to get back the states.

D5 00: Relay status. D5 is the low byte for RL0 to RL7. 00 is the high byte for RL8 and RL9.

5.2 FC05 (0x05) Write Single Coil

For single relay control.

・Request

Byte order	Item	Size	Value
00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x05
02 ~ 03	Output channel number	2 Bytes	0x0000 ~ 0x0009 for single relay status value.
04 ~ 05	Output value	2 Bytes	ON: 0xFF00 OFF: 0x0000

・Response

Byte order	Item	Size	Value
00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x05
02 ~ 03	Output channel number	2 Bytes	The same as byte 02~03 of the request.
04~05	Output value	2 Bytes	The same as byte 04~05 of the request.

Example:

Command the RL8 change to ON.

Request (hex): 01 05 00 08 FF 00 0D F8 (“0D F8” is CRC16)

Response (hex): 01 05 00 08 FF 00 0D F8 (“0D F8” is CRC16)

5.3 FC15 (0x0F) Write Multiple Coils

For multiple relays control.

・Request

Byte order	Item	Size	Value
00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x0F
02 ~ 03	Starting channel number	2 Bytes	0x0000 ~ 0x0009 for relay status.
04 ~ 05	Output channel number	2 Bytes	0x0000 ~ 0x000A
06	Byte count	1 Bytes	1 or 2
07	Output value	1 Bytes	A bit corresponding to a channel. Bit value 1 => ON; Bit value 0 => OFF.

・Response

Byte order	Item	Size	Value
00	Address	1 Byte	1 ~ 247
01	Function code	1 Byte	0x0F
02 ~ 03	Starting channel number	2 Bytes	The same as byte 02~03 of the request.
04~05	Input channel number	2 Bytes	The same as byte 04~05 of the request.

Example:

Command the RL1 and RL8 change to ON.

Request (hex): 01 05 00 08 FF 00 0D F8 (“0D F8” is CRC16)

Response (hex): 01 05 00 08 FF 00 0D F8 (“0D F8” is CRC16)

5.4 FC100 (0x64) Read/Write Module Settings

This section describes all sub function calls (sub-FC) of FC100 (0x64) for the settings on IR-310-RM. It is necessary to append 2 bytes of CRC16 to the tail of each Modbus command.

Table 5-2: Sub-FCs of FC100 for IR-310-RM

Sub-FC	Description	Section
00 (0x00)	Read the module name.	5.4.1
03 (0x04)	Read the software Modbus address (Net ID) of the module.	5.4.2
04 (0x04)	Set the software Modbus address (Net ID) of the module.	5.4.3
05 (0x05)	Read the communication settings.	5.4.4
06 (0x06)	Set the communication settings.	5.4.5
07 (0x07)	Read module response delay time.	5.4.6
08 (0x08)	Set module response delay time.	5.4.7
32 (0x20)	Read the firmware version.	5.4.8
35 (0x23)	Read Power-on value/Power failure memory mode.	5.4.9
36 (0x24)	Set Power-on value/Power failure memory mode.	5.4.10
37 (0x25)	Read the latency for power failure memory.	5.4.11
38 (0x26)	Set the latency for power failure memory.	5.4.12
39 (0x27)	Read the preset power-on values.	5.4.13
40 (0x28)	Set the preset power-on values.	5.4.14
64 (0x40)	Read the time interval of the sequential mode.	5.4.15
65 (0x41)	Set the time interval of the sequential mode.	5.4.16
66 (0x42)	Read the independent/interlocked mode.	5.4.17
67 (0x43)	Set the independent/interlocked mode.	5.4.18
68 (0x44)	Read IR-relay-states.	5.4.19
69 (0x45)	Set IR-relay-states.	5.4.20
70 (0x46)	Read the source of IR sensor.	5.4.21
71 (0x47)	Set the source of IR sensor.	5.4.22
72 (0x48)	Read Non-sequential/Sequential mode.	5.4.23
74 (0x4A)	Read relay pairs for interlocked mode.	5.4.24
75 (0x4B)	Set relay pairs for interlocked mode.	5.4.25
76 (0x4C)	Read the DIP switch state	5.4.26
90 (0x5A)	Emit IR remote commands for the IR-310-RM.	5.4.27
91 (0x5B)	Set Forward/Backward sequential relay action.	5.4.28

5.4.1 Sub-FC 00 (0x00): Read module name

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x00

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x00
03~14	Module name	12 Bytes	Hex ASCII code of characters. 0x00 is none. “IR310RM”=> 0x49,0x52,0x33,0x31,0x30,0x52,0x4D

5.4.2 Sub-FC 03 (0x03): Get the software Modbus address of the module.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247 (Net ID)
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x03

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	0x0 ~ 0xF7 (1 ~ 247) (Net ID)
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x03
03	SW Net ID	1 Byte	0x0 ~ 0xF7 (1 ~ 247) (Net ID)
04	Reserved	1 Byte	0x00

Note:

1. Rotary switch position 0x01~0x0F is for setting the hardware Modbus address (Net ID) = 0x01 ~ 0x0F.

2. Rotary switch position 0x00 is for software Modbus address (Net ID) = 1 ~ 247.

3. If hardware Modbus addresses are applied, software Modbus addresses are ineffective.

5.4.3 Sub-FC 04 (0x04): Set the software Modbus address of the module.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247 (Net ID)
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x04
03	New addr.	1 Byte	1 ~ 247(Net ID)
04	reserved	1 Byte	0x00

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247 (Net ID)
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x04
03	Set result	1 Byte	0=>OK; 1=>OK, but HW Net ID is used now; others=>error.
04	Reserved	1 Byte	0x00

Note:

1. Rotary switch position 0x01~0x0F is for setting the hardware Modbus address (Net ID) = 0x01 ~ 0x0F.

2. Rotary switch position 0x00 is for software Modbus address (Net ID) = 1 ~ 247 configured by this Sub-FC.

3. The priority of the hardware Modbus addresses are higher than that of software Modbus addresses.

5.4.4 Sub-FC 05 (0x05) Read the communication settings

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x05
03	reserved	1 Byte	0x00

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x05
03	Baud rate	1 Byte	Index = 3 ~ 10 3=>1200 bps, 4=>2400, 5=>4800, 6=>9600, 7=>19200, 8=>38400, 9=>57600, 10=>115200
04	Reserved	1 Byte	0x00
05	Reserved	1 Byte	0x00
06	Reserved	1 Byte	0x00

5.4.5 Sub-FC 06 (0x06): Set the communication settings

• Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x06
03	Baud rate	1 Byte	Index = 3 ~ 10 3=>1200 bps, 4=>2400, 5=>4800, 6=>9600, 7=>19200, 8=>38400, 9=>57600, 10=>115200
04	Reserved	1 Byte	0x00
05	Reserved	1 Byte	0x00
06	Reserved	1 Byte	0x00

• Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x06
03	Baud rate	1 Byte	0=>OK, 0xFF=>error
04	Reserved	1 Byte	0x00
05	Reserved	1 Byte	0x00
06	Reserved	1 Byte	0x00

5.4.6 Sub-FC 07 (0x07): Read module response delay time

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x07

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x07
03	MB resp. delay time	1 Byte	0 ~ 60 ms, default: 1ms

5.4.7 Sub-FC 08 (0x08): Set module response delay time

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x08
03	MB resp. delay time	1 Byte	0x00~0x3C(0 ~ 60 ms), default: 1ms

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x08
03	MB resp. delay time	1 Byte	0=>OK, 0xFF=>error

5.4.8 Sub-FC 32 (0x20): Read the firmware version

• Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x20

• Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x20
03	Major Ver.	1 Byte	0x00 ~ 0xFF
04	Minor Ver.	1 Byte	0x00 ~ 0xFF
05	Build Ver.	1 Byte	0x00 ~ 0xFF

5.4.9 Sub-FC 35 (0x23): Read Power-on value/Power failure memory mode

There are “preset power-on values” mode and “power failure memory” mode to set relay states after power restoration. Power failure memory mode records the 10 relay states after the change of the relay states occurs and the latency is up. This is useful for some application such as lighting control after the power restoration.

One of the two modes used by IR-310-RM can be read by this sub-FC. Only one of the two modes can be used at the same time.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x23

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x23
03	Mode	1 Byte	0=>Apply “preset power-on values”. 1=>Apply “power failure memory values”.

5.4.10 Sub-FC 36 (0x24): Set Power-on value/Power failure memory mode

There are “preset power-on values” mode and “power failure memory” mode to set relay states after power restoration. Power failure memory mode records the 10 relay states after the change of the relay states occurs and the latency is up. This is useful for some application such as lighting control after the power restoration.

Only one of the two modes can be set to IR-310-RM by this sub-FC.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x24
03	Relay value setting	1 Byte	0=>Apply “preset power-on values”. 1=>Apply “power failure memory values”.

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x24
03	Set result	1 Byte	0=>OK, 0xFF=>Error.

5.4.11 Sub-FC 37 (0x25): Read the latency for power failure memory

As soon as the relay states changed, IR-310-RM will record the 10 relay states until the PFM latency (ms) passed. Read the PFM latency by the following command.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x25

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x25
03	Latency byte0	1 Byte	0x00~0xFF. LSB of Latency.
04	Latency byte1	1 Byte	0x00~0xFF
05	Latency byte2	1 Byte	0x00~0xFF
06	Latency byte3	1 Byte	0x00~0xFF. MSB of Latency.

Note:

Unit of Latency: ms

Minimum of Latency = 5000 ms

LSB: Least Significant Byte

MSB: Most Significant Byte

Latency => byte3(MSB) byte2 byte1 byte0(LSB)

5.4.12 Sub-FC 38 (0x26): Set the latency for power failure memory

As soon as the relay states changed, IR-310-RM will record the 10 relay states until the PFM latency (ms) passed. Set the PFM latency by the following command.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x26
03	Latency byte0	1 Byte	0x00~0xFF
04	Latency byte1	1 Byte	0x00~0xFF
05	Latency byte2	1 Byte	0x00~0xFF
06	Latency byte3	1 Byte	0x00~0xFF

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x26
03	Set result	1 Byte	0=>OK, 0xFF=>Error

Note:

Unit of Latency: ms

Minimum of Latency = 5000 ms

LSB: Least Significant Byte

MSB: Most Significant Byte

Latency => byte3(MSB) byte2 byte1 byte0(LSB)

5.4.13 Sub-FC 39 (0x27): Read the preset power-on values

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x27

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x27
03	Power-on value byte0	1 Byte	0x00~0xFF. Bit 0 ~ bit 7 => RL0 ~ RL7 Bit# = 1 / 0 means RL# ON / OFF.
04	Power-on value byte1	1 Byte	0x00~0x03. Bit 0 & bit 1 => RL8 & RL9 Bit# = 1 / 0 means RL# ON / OFF.
05	Reserved	1 Byte	0x00
06	Reserved	1 Byte	0x00
07	Sequential action	1 Byte	0=>stop, 1=>forward

Note:

1. For “Power-on value byte0 and byte1”, byte0 represents the state of RL0~RL7 and the least two bits of byte 1 are the state of RL8 and RL9.
The binary representation of the byte1 and byte 0 is 0000 00## #### #### where the least significant bit# (the rightest) is RL0 and the most significant bit# is RL9.

Bit# = 1 => Relay# is ON (at NO contact)

Bit# = 0 => Relay# is OFF (at NC contact)

2. Sequential action” is only effective in sequential mode.

5.4.14 Sub-FC 40 (0x28): Set the preset power-on values

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x28
03	Power-on value byte0	1 Byte	0x00~0xFF. Bit 0 ~ bit 7 => RL0 ~ RL7 Bit# = 1 / 0 means RL# ON / OFF.
04	Power-on value byte1	1 Byte	0x00~0x03. Bit 0 & bit 1 => RL8 & RL9 Bit# = 1 / 0 means RL# ON / OFF.
05	Reserved	1 Byte	0x00
06	Reserved	1 Byte	0x00
07	Sequential action	1 Byte	0=>stop, 1=>forward

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x28
03	Setting result	1 Byte	0x00 => OK, 0xFF=>Error.

Note:

1. For “Power-on value byte0 and byte1”, byte0 represents the state of RL0~RL7 and the least two bits of byte 1 are the state of RL8 and RL9.
The binary representation of the byte1 and byte 0 is 0000 00## #### #### where the least significant bit# (the rightest) is RL0 and the most significant bit# is RL9.

Bit# = 1 => Relay# is ON (at NO contact)

Bit# = 0 => Relay# is OFF (at NC contact)

2. Sequential action” is only effective in sequential mode.

5.4.15 Sub-FC 64 (0x40): Read the time interval of the sequential mode

The time interval is the gap time between adjacent relays during forward sequential ON and backward sequential OFF.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x40

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x40
03	Time interval byte0 (LSB)	1 Byte	0x00~0xFF.
04	Time interval byte1 (MSB)	1 Byte	0x00~0xFF.
05	Reserved	1 Byte	0x00
06	Reserved	1 Byte	0x00

Note:

1. The range of the “Time interval” is 0 ~ 65535 ms. (0x0000 ~ 0xFFFF)

5.4.16 Sub-FC 65 (0x41): Set the time interval in the sequential mode

The time interval is the gap time between adjacent relays during forward sequential ON and backward sequential OFF.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x41
03	Time interval byte0 (LSB)	1 Byte	0x00~0xFF. (low byte)
04	Time interval byte1 (MSB)	1 Byte	0x00~0xFF. (high byte)
05	Reserved	1 Byte	0x00
06	Reserved	1 Byte	0x00

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x41
03	Setting result	1 Byte	0=>OK, 0xFF=>error

Note:

1. The range of the “Time interval” is 0 ~ 65535 ms. (0x0000 ~ 0xFFFF)

5.4.17 Sub-FC 66 (0x42): Read the independent/interlocked mode

• Request

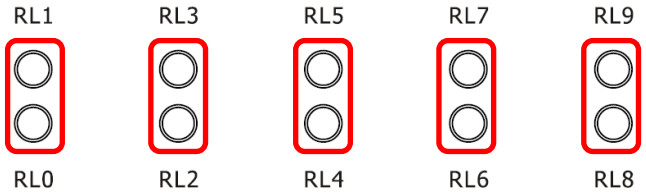
Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x42

• Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x42
03	Mode	1 Byte	0=>independent, 1=>interlocked.

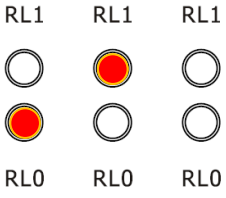
Note:

1. For the interlocked mode, please refer to Sub-FC 75 and 76 for the settings of the relay pairs. Maximum **5** relay pairs can be set.



2. For an interlocked relay pair, e.g. RL0 and RL1, three statuses are allowed:

Interlocked Status	Relay 0	Relay 1
1	ON (NO contact)	OFF (NC contact)
2	OFF (NC contact)	ON (NO contact)
3	OFF (NC contact)	OFF (NC contact)



5.4.18 Sub-FC 67 (0x43): Set the independent/interlocked mode

• Request

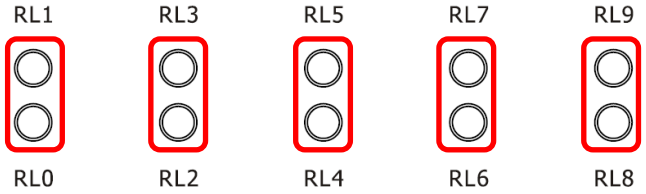
Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x43
03	Mode	1 Byte	0=>independent, 1=>interlocked.

• Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x43
03	Setting result	1 Byte	0=>OK, 0xFF=>Error.

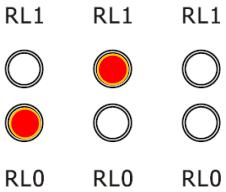
Note:

1. For the interlocked mode, please refer to Sub-FC 75 and 76 for the settings of the relay pairs. Maximum **5** relay pairs can be set.



2. For an interlocked relay pair, e.g. RL0 and RL1, three statuses are allowed:

Interlocked Status	Relay 0	Relay 1
1	ON (NO contact)	OFF (NC contact)
2	OFF (NC contact)	ON (NO contact)
3	OFF (NC contact)	OFF (NC contact)



5.4.19 Sub-FC 68 (0x44): Read IR-relay-states

Read 10 relays' states corresponding to IR command numbers.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x44
03	IR command number	1 Byte	0 ~ 63 (0x00 ~ 0x3F) for custom. 192 ~ 223 (0xC0 ~ 0xDF) for built-in.
04	Reserved	1 Byte	0x00

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x44
03	IR command number	1 Byte	0 ~ 63 (0x00 ~ 0x3F) for custom. 192 ~ 223 (0xC0 ~ 0xDF) for built-in.
04	Relay status byte0	1 Byte	0x00~0xFF. Bit 0 ~ Bit 7 => RL0 ~ RL7
05	Relay status byte1	1 Byte	0x00~0x03. Bit 0 & Bit 1 => RL8 & RL9
06~07	reserved	2 Bytes	0x00, 0x00

Note:

1. For "Relay status byte0 and byte1", byte0 represents the state of RL0~RL7 and the least two bits of byte 1 are the state of RL8 and RL9.

The binary representation of the byte1 and byte 0 is 0000 00## #### #### where the least significant bit# (the rightest) is RL0 and the most significant bit# is RL9.

Bit# = 1 => Relay# is ON (at NO contact)

Bit# = 0 => Relay# is OFF (at NC contact)

5.4.20 Sub-FC 69 (0x45): Set IR-Relay-States

Set 10 relays' states corresponding to IR command numbers.

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x45
03	IR command number	1 Byte	0 ~ 63 (0x00 ~ 0x3F)
04	Relays status byte0	1 Byte	0x00~0xFF. Bit 0 ~ bit 7 => RL0 ~ RL7
05	Relays status byte1	1 Byte	0x00~0x03. Bit 0 & bit 1 => RL8 & RL9
06~07	reserved	2 Bytes	0x00, 0x00

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x45
03	IR command number	1 Byte	0 ~ 63 (0x00 ~ 0x3F)
04	Setting result	1 Byte	0x00=>OK, 0xFF=>Error

Note:

1. For "Relay status byte0 and byte1", byte0 represents the state of RL0~RL7 and the least two bits of byte 1 are the state of RL8 and RL9.

The binary representation of the byte1 and byte 0 is 0000 00## #### #### where the least significant bit# (the rightest) is RL0 and the most significant bit# is RL9.

Bit# = 1 => Relay# is ON (at NO contact)

Bit# = 0 => Relay# is OFF (at NC contact)

5.4.21 Sub-FC 70 (0x46): Read the source of IR sensor

• Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x46

• Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x46
03	Source of the IR sensor	1 Byte	0 => None, 1 => Onboard IR receiver, 2 => IR receiver cable.

5.4.22 Sub-FC 71 (0x47): Set the source of IR sensor

• Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x47
03	Source of the IR sensor	1 Byte	0 => None, 1 => Onboard IR receiver, 2 => IR receiver cable.

• Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x47
03	Setting result	1 Byte	0 => OK, Others => Error

5.4.23 Sub-FC 72 (0x48): Read Non-sequential/Sequential mode

• Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x48

• Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x48
03	Mode	1 Byte	0=>Non-sequential, 1=>Sequential.

5.4.24 Sub-FC 74 (0x4A): Read relay pairs for interlocked mode

• Request

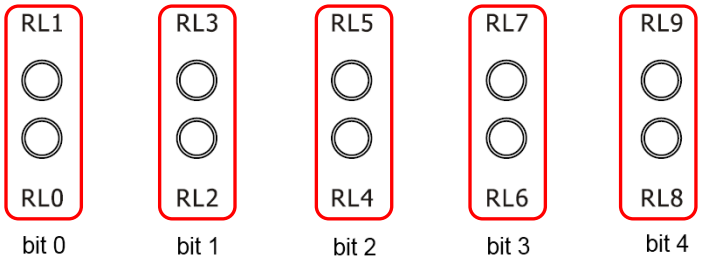
Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x4A

• Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x4A
03	Interlocked relay pairs	1 Byte	0x00 ~ 0x1F.

Note:

1. For the byte of “Interlocked relay pairs”, bit 0 means the pair of relay 0 & relay 1 and bit 4 means the pair of relay 8 & relay 9. If bit 0 is set to 1, relay 0 and relay 1 is an interlocked relay pair.



2. The interlocked relay pairs are effective in the interlocked mode. To set the interlocked mode, please refer to Sub-FC 67.

3. For an interlocked relay pair, e.g. RL0 and RL1, three statuses are allowed:

Interlocked Status	Relay 0	Relay 1
1	ON (NO contact)	OFF (NC contact)
2	OFF (NC contact)	ON (NO contact)
3	OFF (NC contact)	OFF (NC contact)

5.4.25 Sub-FC 75 (0x4B): Set relay pairs for interlocked mode

• Request

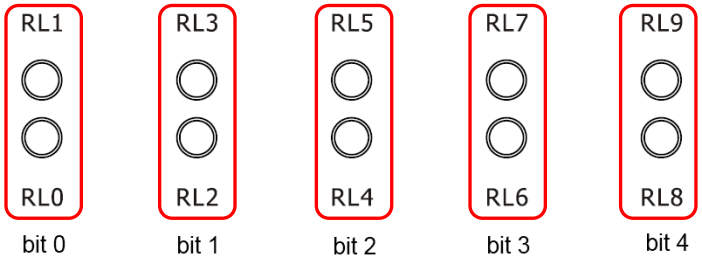
Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x4B
03	Interlocked relay pairs	1 Byte	0x00 ~ 0x1F.

• Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x4B
03	Setting result	1 Byte	0x00 => OK, 0xFF=>Error.

Note:

1. For the byte of “Interlocked relay pairs”, bit 0 means the pair of relay 0 & relay 1 and bit 4 means the pair of relay 8 & relay 9. If bit 0 is set to 1, relay 0 and relay 1 is an interlocked relay pair.



2. The interlocked relay pairs are effective in the interlocked mode. To set the interlocked mode, please refer to Sub-FC 67.

3. For an interlocked relay pair, e.g. RL0 and RL1, three statuses are allowed:

Interlocked Status	Relay 0	Relay 1
1	ON (NO contact)	OFF (NC contact)
2	OFF (NC contact)	ON (NO contact)
3	OFF (NC contact)	OFF (NC contact)

5.4.26 Sub-FC 76 (0x4C): Read the DIP switch state

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x4C

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x4C
03	Dip switch state	1 Byte	0x00 ~ 0x03.

Note:

1. DIP switch state values:

DIP switch state values		Mode
0		Normal
1		Sequential
2		Init
3		Auto-emitting 12 built-in IR commands (IR cmd# 192 ~ 203)

5.4.27 Sub-FC 90 (0x5A): Emit IR remote commands for the IR-310-RM

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	0x01~0xF7 (1 ~ 247)
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x5A
03	Modbus Addr. of the target IR-310-RM	1 Byte	0x01~0xF7 (1 ~ 247)
04	IR command number	1 Byte	0 ~ 63 (custom); 192~223 (built-in)

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	0x01~0xF7 (1 ~ 247)
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x5A
03	Setting result	1 Byte	0=>OK, Others=>Error

Note:

1. Please plug in the IR emitter cable and prepare a universal IR learning remote when using this Sub-FC.

2. Please refer to Sub-FC 69 to set relays' states corresponding to IR command numbers.

3. Two IR commands with the same IR cmd number but different Modbus Addresses (Net ID) are different commands which can only control the IR-310pRM with the same Modbus address.

5.4.28 Sub-FC 91 (0x5B) Set Forward/Backward sequential action

・Request

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x5B
03	Sequential action	1 Byte	0=>Stop, 1=>forward (turn ON sequentially), 2=>backward (turn OFF sequentially).

・Response

Byte order	Description	Size	Value
00	Address	1 Byte	1 ~ 247
01	FC	1 Byte	0x64
02	Sub-FC	1 Byte	0x5B
03	Setting result	1 Byte	0x00 => OK, 0xFF=>Error.

Note:

1. This sub-FC is only effective in the sequential mode.

6. Technical support

Please contact us if you have any questions about products.

ICP DAS website: http://www.icpdas.com
Email: service@icpdas.com

Appendix A: Built-in IR-Relay-States

Table A-1 Built-in IR-Relay-States

IR command number	Corresponding built-in IR-relay-state
192	10 relays ON
193	10 relays OFF
194	RL0 ON, others OFF
195	RL1 ON, others OFF
196	RL2 ON, others OFF
197	RL3 ON, others OFF
198	RL4 ON, others OFF
199	RL5 ON, others OFF
200	RL6 ON, others OFF
201	RL7 ON, others OFF
202	RL8 ON, others OFF
203	RL9 ON, others OFF
204	RL0 ON (others not influenced)
205	RL0 OFF (others not influenced)
206	RL1 ON (others not influenced)
207	RL1 OFF (others not influenced)
208	RL2 ON (others not influenced)
209	RL2 OFF (others not influenced)
210	RL3 ON (others not influenced)
211	RL3 OFF (others not influenced)
212	RL4 ON (others not influenced)
213	RL4 OFF (others not influenced)
214	RL5 ON (others not influenced)
215	RL5 OFF (others not influenced)
216	RL6 ON (others not influenced)
217	RL6 OFF (others not influenced)
218	RL7 ON (others not influenced)
219	RL7 OFF (others not influenced)
220	RL8 ON (others not influenced)
221	RL8 OFF (others not influenced)
222	RL9 ON (others not influenced)
223	RL9 OFF (others not influenced)

Appendix B: INIT Mode

If users forget the communication settings (e.g. baud rate, software Net ID) of IR-310-RM, push the DIP switch to the “Init” position and reset the module to run the Init mode. In this mode, IR-310-RM applies the default communication settings.

Table B-1

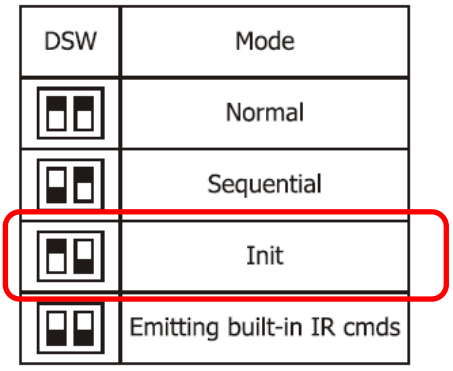


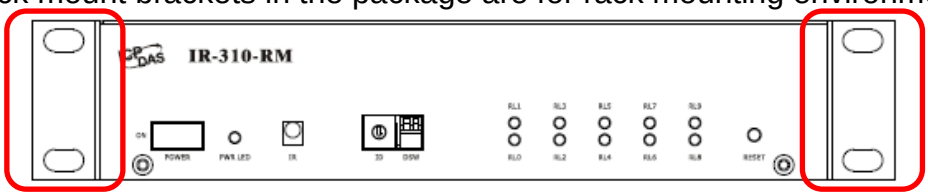
Table B-1: Default communication settings

Item	Default value
Baud Rate	9600 bps
Parity/Databits/Stopbtis	None/8/1
Modbus Net ID	1 (RSW ID = 1)

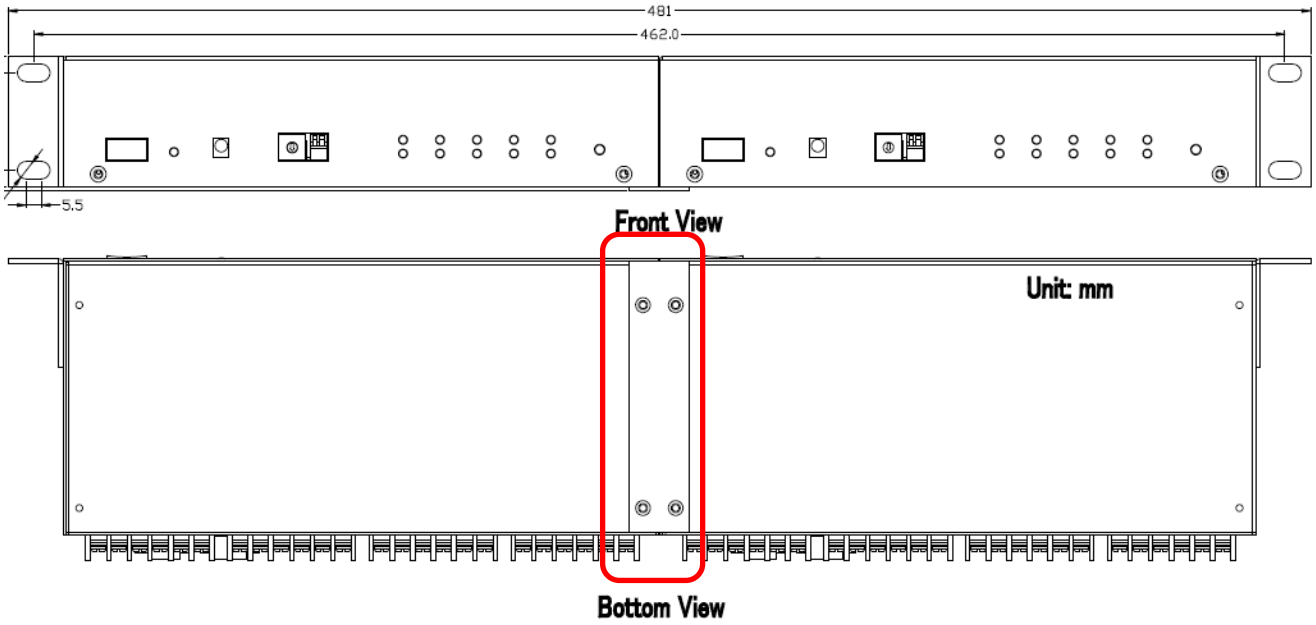
Appendix C: Rack and Wall Mounting

➢ Rack Mounting

The two rack mount brackets in the package are for rack mounting environment.



The steel joint plate is for joining two IR-310-RMs as a length of 19“ (1U).



➢ Wall Mounting

The two wall mount brackets in the package are installed on the case as follows.