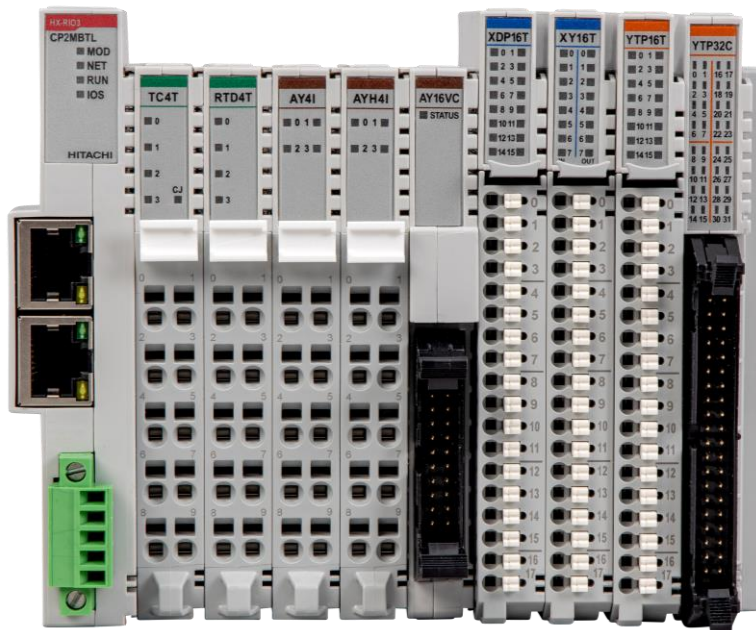


# Modbus Programmable Light I/O

# RIO3-CP2MBTL

## User Manual



Version 2.00

| REVISION HISTORY |      |              |      |        |
|------------------|------|--------------|------|--------|
| REV              | PAGE | REMARKS      | DATE | EDITOR |
| 2.00             | All  | New Document |      | Faber  |
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# 1 Important Notes

Solid state equipment has operational characteristics differing from those of electromechanical equipment.

Safety Guidelines for the Application, Installation and Maintenance of Solid-State Controls describes some important differences between solid state equipment and hard-wired electromechanical devices.

Because of this difference, and because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will HITACHI be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any installation, HITACHI cannot assume responsibility or liability for actual use based on the examples and diagrams.

## Warning!



- ✓ **If you don't follow the directions, it could cause a personal injury, damage to the equipment or explosion**
- ✓ Do not assemble the products and wire with power applied to the system. Else it may cause an electric arc, which can result into unexpected and potentially dangerous action by field devices. Arching is explosion risk in hazardous locations. Be sure that the area is non-hazardous or remove system power appropriately before assembling or wiring the modules.
- ✓ Do not touch any terminal blocks or IO modules when system is running. Else it may cause the unit to an electric shock or malfunction.
- ✓ Keep away from the strange metallic materials not related to the unit and wiring works should be controlled by the electric expert engineer. Else it may cause the unit to a fire, electric shock or malfunction.

## Caution!


- ✓ **If you disobey the instructions, there may be possibility of personal injury, damage to equipment or explosion. Please follow below Instructions.**
- ✓ Check the rated voltage and terminal array before wiring. Avoid the circumstances over 50°C of temperature. Avoid placing it directly in the sunlight.
- ✓ Avoid the place under circumstances over 85% of humidity.
- ✓ Do not place Modules near by the inflammable material. Else it may cause a fire.
- ✓ Do not permit any vibration approaching it directly.
- ✓ Go through module specification carefully, ensure inputs, Output connections are made with the specifications. Use standard cables for wiring.
- ✓ Use Product under pollution degree 2 environment.

## 1.1 Safety Instructions

### 1.1.1 Symbols

|   |   |
|---|---|
| <p><b>DANGER</b></p>     | <p>Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death property damage, or economic loss.</p>                                |
| <p><b>IMPORTANT</b></p>   | <p>Identifies information that is critical for successful application and understanding of the product</p>  |
| <p><b>ATTENTION</b></p>  | <p>Identifies information about practices or circumstances that can lead to personal injury, property damage, or economic loss.</p> <p>Attentions help you to identify a hazard, avoid a hazard, and recognize the consequences</p> |

### 1.1.2 Safety Notes

|   |  |
|---|--|
| <p><b>DANGER</b></p>  | <p>The modules are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the modules, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, GBUS Pin.</p> |
|---|--|

### 1.1.3 Certification

UL Listed Industrial Control Equipment, certified for U.S.

See UL File E196687

CE Certificate

EN 61000-6-2; Industrial Immunity

EN 61000-6-4; Industrial Emissions

Reach, RoHS (EU, CHINA), EAC

## 2 RIO3-CP2MBTL specification

### 2.1 Environmental & Certification specification

| Environmental specification |                                      |
|-----------------------------|--------------------------------------|
| Operating Temperature       | -25°C~60°C                           |
| UL Temperature              | -25°C~60°C                           |
| Storage Temperature         | -40°C~85°C                           |
| Relative Humidity           | 5% ~ 90% non-condensing              |
| Mounting                    | DIN rail                             |
| Vibration Resistance        |                                      |
| Shock Operating             | IEC 60068-2-27                       |
| Vibration Resistance        | IEC 60068-2-6, 4g                    |
| Industrial Emissions        | EN 61000-6-4/A11: 2011               |
| Industrial Immunity         | EN 61000-6-2: 2019                   |
| Installation Position       | Vertical and horizontal installation |
| Product Certification       |                                      |
| Certifications              | CE, UL, EAC                          |

### 2.2 General specification

| General specification            |  |
|----------------------------------|--|
| Items                            | Specification  |
| Power Dissipation                | 50mA typical @ 24Vdc   |
| UL System Power                  | Supply voltage: 24Vdc nominal, Class 2   |
| System Power                     | Supply voltage: 24Vdc nominal<br>Supply voltage range: 15 ~ 28.8Vdc<br>Reverse polarity protection |
| UL Field Power                   | Supply voltage: 24Vdc nominal, Class 2   |
| Field Power*                     | Supply voltage: 24Vdc typical (Max. 30Vdc)   |
| Max. Current Field Power Contact | Max. DC 8A   |
| Wiring                           | I/O Cable Max. 2.0mm <sup>2</sup> (AWG 14)   |
| Torque                           | 0.8 Nm (7 lb-in)   |
| Current for Expansion Module     | 1.0A @ 5Vdc  |
| Isolation                        | System power to internal logic: non-isolation<br>System power I/O driver: Isolation                |
| Weight                           | 84g  |
| Module Size                      | 12mm x 109mm x 70mm  |

## 2.3 Programmable specification

| Programmable Specification      |   |
|---------------------------------|---|
| Items                           | Specification   |
| Programming (CODESYS)           | V3.5.17.3   |
| Program Memory                  | 16 MByte  |
| Data Memory                     | 16 MByte  |
| Non-Volatile Memory             | 32 KByte<br>Retain: 16 KByte<br>Flag: 16 KByte  |
| Run-Time System                 | Multiple PLC Tasks  |
| Program Languages               | IEC 61131-3 (LD, IL, ST, FBD, SFC)  |
| MQTT                            | ✓   |
| MQTT Sparkplug B                | ✓   |
| SSL/TLS                         | X   |
| User Management*                | X   |
| SNMP                            | ✓   |
| OPC DA Server                   | ✓   |
| OPC UA Server & Client          | ✓   |
| Modbus TCP/RTU                  | ✓   |
| Online Change                   | ✓   |
| Source Upload/Download          | ✓   |
| File system                     | ✓   |
| File transmit                   | ✓   |
| TFTP                            | ✓   |
| SQL4CODESYS                     | ✓   |
| Breakpoint                      | ✓   |
| Web visualization**             | X   |
| RTC***                          | Retain Time: < 15 day / Accuracy: < 2min/month<br>(Status: fully recharged battery at room temperature) |
| Max. Task                       | 10  |
| Max. Cycle Task                 | 10  |
| Max. Status Task                | 10  |
| Max. Data Size (Input + Output) | Max. 128Byte each slot  |
| Max. Expansion Module           | 63 Slots  |
| Process Time                    | 0.1440μsec  |

\* Features Deleted from Latest Version.  
In the latest version, security features are enhanced, and encryption must be added to use them. User management features and SSL/TLS are not supported because encryption features are not currently added.

\*\* Web visualization cannot be supported in Internet Explorer.



\*\*\* RTC (Recommend charging for at least 16 hours when the battery is discharge)

| Battery charging time | Retain time (room temperature) |
|-----------------------|--------------------------------|
| 4 hours               | < 2 days                       |
| 12 hours              | < 12 days                      |
| 16 hours              | < 15 days                      |

There are 3 operating problems when the battery is discharged.

- Retain data is not saved.
- RTC data is not stored and is the initial value.
- Reset button does not work. (PLC Reset and Factory Reset cannot be used)

## 2.4 Interface specification

| Interface Specification   |   |
|---------------------------|---|
| <b>RJ45 Ethernet port</b> |   |
| Adapter Type              | Master & Slave node (Modbus TCP, Modbus RTU)  |
| Baud rate                 | 10/100Mbps, Auto-negotiation, Full Duplex   |
| Ethernet Interface        | RJ-45 socket * 1pcs   |
| Ethernet Protocol         | Modbus/TCP, Modbus/UDP, SNTP, SNMP, MQTT, DHCP/BOOTP, HTTP (Webserver), OPC-server  |
| Max. Socket               | UDP: 16, TCP: 64  |
| <b>RJ45 Serial port</b>   |   |
| Serial Interface          | RJ-45 socket * 1pcs   |
| Serial Protocol           | Modbus RTU Baud Rate: 2400~115200 bps, (Default: 115200 bps)  |
| <b>Indicator</b>          |   |
| LED Indicator             | 4 LEDs<br>1 Green/Red, Module Status (MOD)<br>1 Green/Red, Network Status (NET)<br>1 Green/Red, PLC Run/Stop Status (RUN)<br>1 Green/Red, Expansion I/O Module Status (IOS) |

## 2.5 Ethernet connection specification

| Function*         | Model        | Max. number of concurrent communications             |
|-------------------|--------------|--|
| ARTI (OPC-server) | RIO3-CP2MBTL | One for each function are available at the same time |
| CODESYS link      |              |  |
| Network-variable  |              |  |
| Modbus/TCP Master |              | 64 Modbus/TCP Slaves can be connected                |
| Modbus/TCP Slave  |              | 64 Modbus/TCP Masters can be connected               |
| Webserver         |              | 64 clients can be opened                             |

\* While using these features, can use up to a maximum number of sockets (64) at the same time.

## 2.6 Serial connection specification

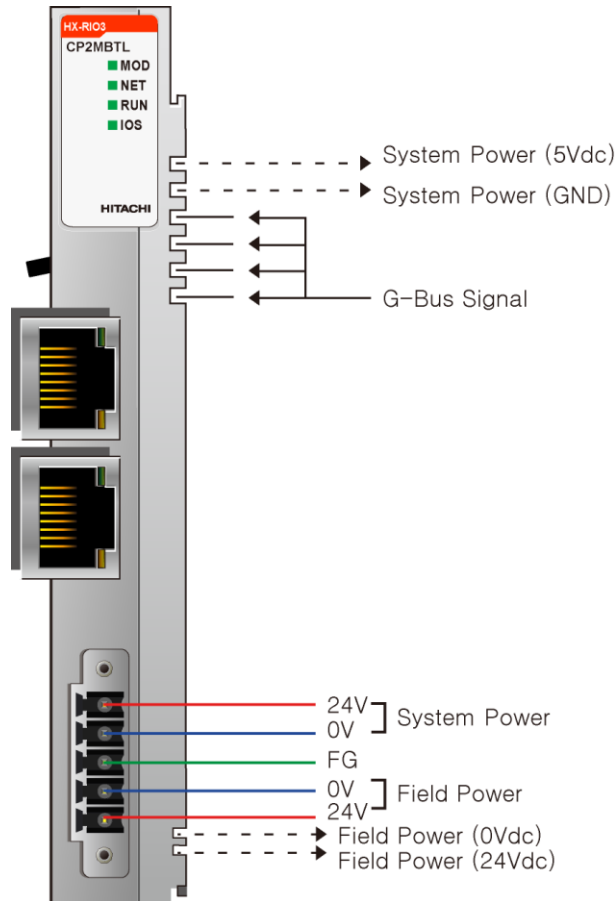
| Function          | Model        | Max. number of concurrent communications |
|-------------------|--------------|--|
| Modbus RTU Master | RIO3-CP2MBTL | RS-232: 1 Slave can be connected         |

---

|  |  |         |                             |
|--|--|---------|-----------------------------|
|  |  | RS-485: | 247 Slaves can be connected |
|--|--|---------|-----------------------------|

### 3 RIO3-CP2MBTL

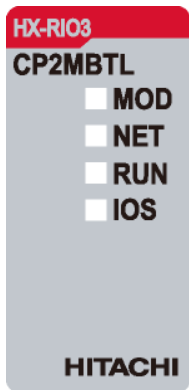
#### 3.1 Wiring Diagram



| Pin No. | Signal Description   |
|---------|----------------------|
| 1       | System Power, 24V    |
| 2       | System Power, Ground |
| 3       | F.G.                 |
| 4       | Field Power, Ground  |
| 5       | Field Power, 24V     |

The system power must not be connected with field power. Use separate voltage supplies.

## 3.2 LED Indicator



| LED | LED Function / Description   | LED Color |
|-----|------------------------------|-----------|
| MOD | Module Status                | Green/Red |
| NET | Current Communication Status | Green/Red |
| RUN | PLC Run / Stop               | Green/Red |
| IOS | Expansion module             | Green/Red |

### 3.2.1 MOD (Module Status LED)

| Status              | LED is               | To indicate  |
|---------------------|----------------------|--|
| Not Powered         | OFF                  | Power is not supplied to the unit.   |
| Normal, Operational | Green                | The unit is operating in normal condition.   |
| IAP Mode*           | Toggling Green & Red | Available for firmware download using Firefox.                                       |
| Firmware Fault      | Red                  | The unit has occurred unrecoverable fault in self-testing.                           |
| Recoverable Fault   | Blinking Red         | The unit has occurred recoverable fault in self-testing.<br>- EEPROM checksum fault. |

\* The IP Address to access IAP web-server during IAP Mode: 192.168.100.10 (Recommended to use Firefox)

### 3.2.2 NET (Network Status LED)

| Status      | LED is | To indicate   |
|-------------|--------|---|
| Not Powered | OFF    | Network off-line.   |
| Link        | Green  | The LAN cable is physically connected to the ethernet port. |

\* Blinking Green MOD & NET LED: BOOTP/DHCP is requesting for new IP address.

### 3.2.3 RUN (PLC Run/Stop Status LED)

| Status         | LED is         | To indicate  |
|----------------|----------------|--|
| None PLC       | OFF            | Device has no program.                                     |
| PLC Run        | Green          | PLC program is running.                                    |
| PLC Stop       | Blinking Green | PLC program stops.   |
| Firmware Fault | Red            | The unit has occurred unrecoverable fault in self-testing. |
| Diagnostic     | Blinking Red   | PLC program and expansion I/O modules do not match.        |

### 3.2.4 IOS LED (Expansion Module Status LED)

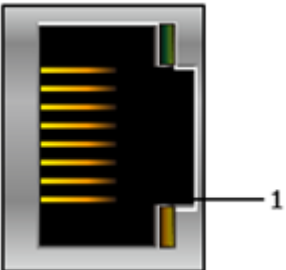
| Status              | LED is       | To indicate  |
|---------------------|--------------|--|
| Expansion I/O       | OFF          | Device has no expansion modules or not powered.  |
| Expansion I/O       | Green        | Device has expansion modules.  |
| Configuration Fault | Red          | Replace expansion modules or fail to initialize. <ul style="list-style-type: none"> <li>- Detect invalid expansion module ID.</li> <li>- Initial protocol failure.</li> <li>- Mismatch vendor code between adapter and expansion module.</li> <li>- Changed expansion module configuration.</li> </ul> |
| Connection Fault    | Blinking Red | One or more expansion module occurred in fault state. <ul style="list-style-type: none"> <li>- Too many expansion modules.</li> <li>- Communication failure.</li> <li>- Overflowed I/O size.</li> </ul>  |

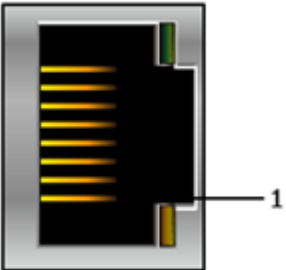
### 3.2.5 Exception indication

| To indicate                    | LED                            |     |                                   |     |
|--------------------------------|--------------------------------|-----|-----------------------------------|-----|
|                                | MOD                            | NET | RUN                               | IOS |
| Program reset                  | -                              | -   | RED/GREEN<br>(Toggle every 0.25s) | -   |
| Factory reset                  | RED/GREEN (Toggle every 0.25s) |     |                                   |     |
| IO Watchdog error              | RED                            | -   | RED                               | -   |
| CODESYS<br>Task Watchdog error | -                              | -   | RED                               | -   |
| CODESYS<br>License error       | -                              | -   | RED/GREEN<br>(Toggle every 2s)    | -   |
| Heap memory overflow           | RED                            | RED | -                                 | -   |
| Stack memory overflow          | RED                            | -   | -                                 | -   |
| Hard Fault                     | RED                            |     |                                   |     |


### 3.3 Electrical Interface


#### 3.3.1 RJ-45 Socket

| Ethernet Socket * 1pcs<br> | RJ-45 | Signal Name | Description |
|---|-------|-------------|-------------|
|   | 1     | TD+         | Transmit +  |
|   | 2     | TD-         | Transmit -  |
|   | 3     | RD+         | Receive +   |
|   | 4     | -           |             |
|   | 5     | -           |             |
|   | 6     | RD-         | Receive -   |
|   | 7     | -           |             |
|   | 8     | -           |             |
|   | Case  | Shield      |             |


| Serial Socket * 1pcs<br> | RJ-45 | Signal Name | Description |
|--|-------|-------------|-------------|
|  | 1     | D+          | RS485 D+    |
|  | 2     | D-          | RS485 D-    |
|  | 3     | GND         |             |
|  | 4     | /ISP        | /ISP        |
|  | 5     | -           |             |
|  | 6     | GND         |             |
|  | 7     | TXD         | RS232 TXD   |
|  | 8     | RXD         | RS232 RXD   |
|  | Case  | Shield      |             |


#### 3.3.2 Toggle Switch and Push Button

|  | Toggle Switch Status | Module is | Description |
|---|----------------------|-----------|-------------|
|   | Up                   | RUN       | PLC Run     |
|   | Down                 | STOP      | PLC Stop    |

|  | Push Button     | Module is                      | Description   |
|---|-----------------|--------------------------------|---|
|   | Push and detach | Reset                          | Reset CODESYS PLC program and make the program be in the stop status. |
|   | Push for 5sec   | PLC Reset                      | Erase CODESYS PLC program and retain memory.                          |
|   | Push for 20sec  | Factory Reset                  | Erase CODESYS PLC program and Network parameter reset.                |
| Push hold and Power Reset   | IAP mode        | Firmware download via Firefox. |   |

### 3.3.3 DIP Switch

|  | DIP Switch Status |     | Description  |
|---|-------------------|-----|--|
|   | 1                 | 2   |  |
|   | ON                | ON  | RS485 terminating resistor enabled (1 k $\Omega$ ) |
|   | OFF               | OFF | RS485 terminating resistor disabled                |

|  | Description            |
|---|------------------------|
|   | No function (Reserved) |

## 4 Web Server

- (1) Main page is showing various information for PIO status.
- (2) To access the webserver, <http://IPAddress/setup.htm> (e.g. "http://192.168.100.100/setup.htm")

The screenshot shows the main page of the Hitachi web server. On the left is a navigation menu with the following items: **HITACHI Inspire the Next**, [Network Adapter](#) (highlighted with a red arrow), [Expansion Module](#), [CodeSys PLC](#), and [Network Setting](#). The main content area is titled "Hitachi Europe GmbH" and "Network Adapter RIO3-CP2MBTL(Programmable IO)". It features a sub-header "Io Input Data / Io Output Data" and lists the following information:

- IP Address : 192.168.100.100
- Subnet Mask : 255.255.255.0
- Gateway : 192.168.100.254
- MAC Address : 00:14:F7:00:00:64
- MODBUS/TCP Connections : Available
- MODBUS/UDP Connections : Available
- CODESYS/UDP Connections : Available
- HTTP(Web Server) Connections : Available
- MODBUS/RTU(RS232) Communication : Available
- MODBUS/RTU(RS485) Communication : Available
- Firmware Revision : 3.000(04/11/2022)
- Expansion Modules : 2 module(s)
- IO Size(Input) : 8 byte(s)
- IO Size(Output) : 8 byte(s)
- CODESYS(IEC61131-3) V3.5 SP17 PLC : Available

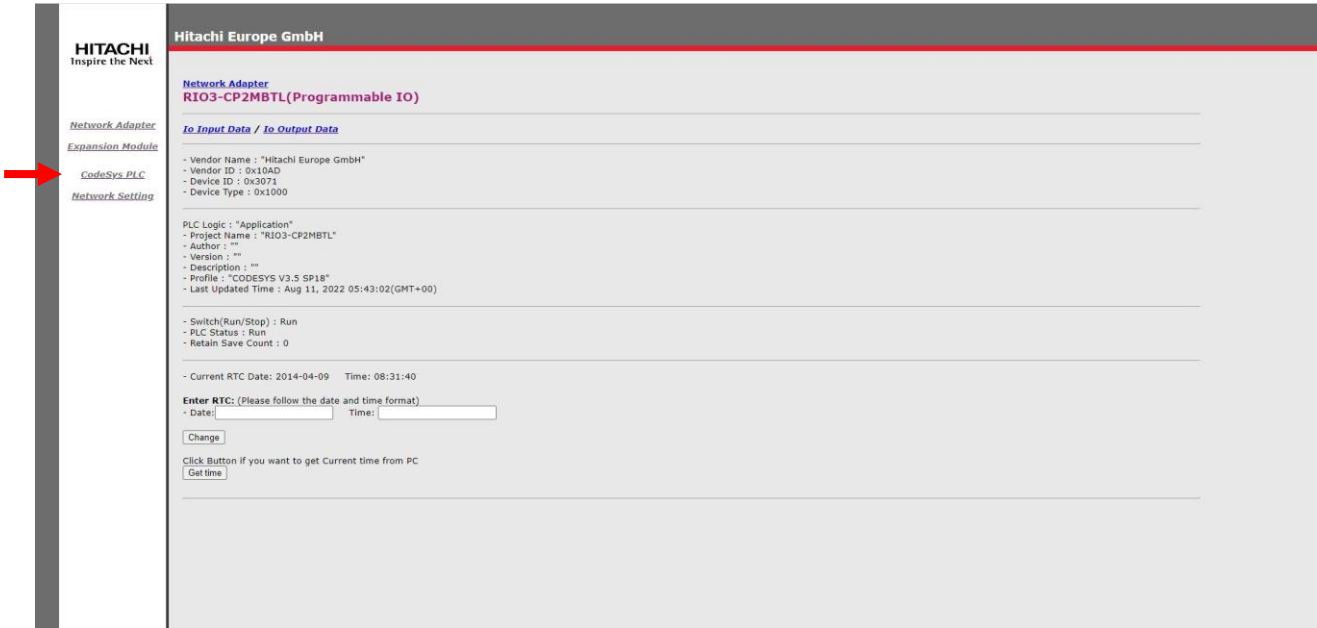
- (3) Click on the expansion menu, user can check the extension module status.

The screenshot shows the "Expansion Module" page of the Hitachi web server. The navigation menu on the left has [Expansion Module](#) highlighted with a red arrow. The main content area is titled "Hitachi Europe GmbH" and "Network Adapter RIO3-CP2MBTL(Programmable IO)". It features a sub-header "Io Input Data / Io Output Data" and displays the following table:

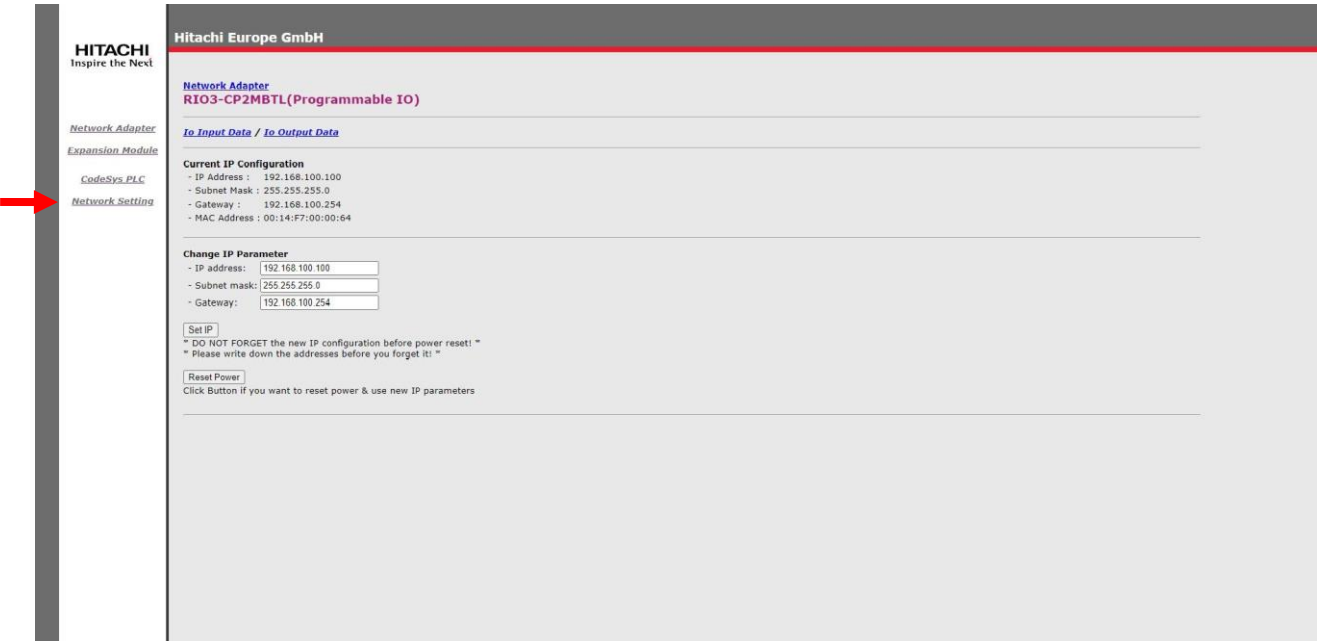
| Slot#   | Descriptions                         | Input Reg. Mapping | Output Reg. Mapping |
|---------|--------------------------------------|--------------------|---------------------|
| Slot#01 | RIO3-AY41, 4AO 4~20mA, 12Bits        |                    | 0x0800/0 (4-word)   |
| Slot#02 | RIO3-AX41, 4AI 0~20mA/4~20mA, 12Bits | 0x0000/0 (4-word)  |                     |



- (4) User can easily change and set the RTC time. If you click the 'Get Time' button, the clock time from PC will be adapted to PIO.



- (5) Using the Network setting, user can set the IP/Subnet mask/Gateway.



## 5 Default Network Setting

When user forget the IP address, after power on the PIO and push the Reset switch in front of PIO.

The switch should be pushed for 20 seconds at least. PIO will be fall into the factory default mode.

All of PIO LED will blink in Green/Red.

| Default Network Setting |                 |
|-------------------------|-----------------|
| IP address              | 192.168.100.100 |
| Subnet Mask             | 255.255.255.0   |
| Gateway                 | 192.168.100.254 |

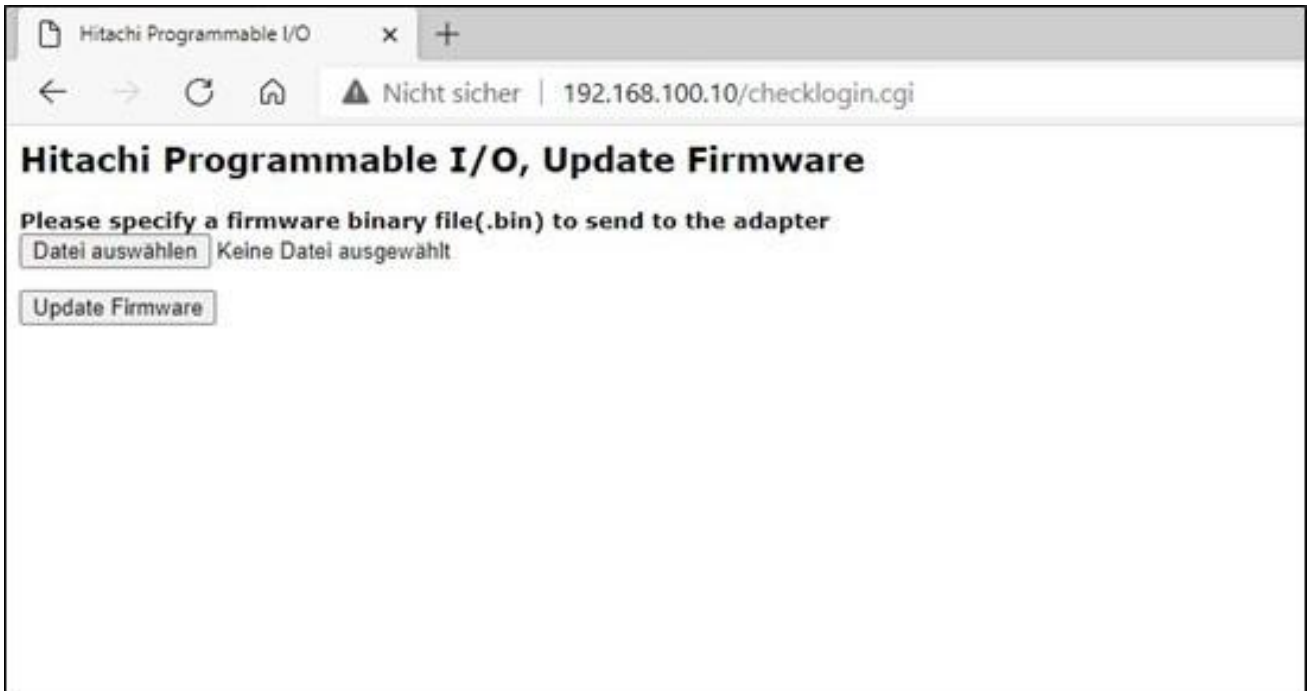
## 6 Upgrade Firmware

### 6.1 Using IAP over Ethernet

- (1) Apply a power with pushing a reset button(Mod LED will blink Green/Red).
- (2) Execute Firefox.(It is recommended to use Firefox)
- (3) Connect to **192.168.100.10** and login (User ID :**Hitachi** / Password : **Hitachi**)



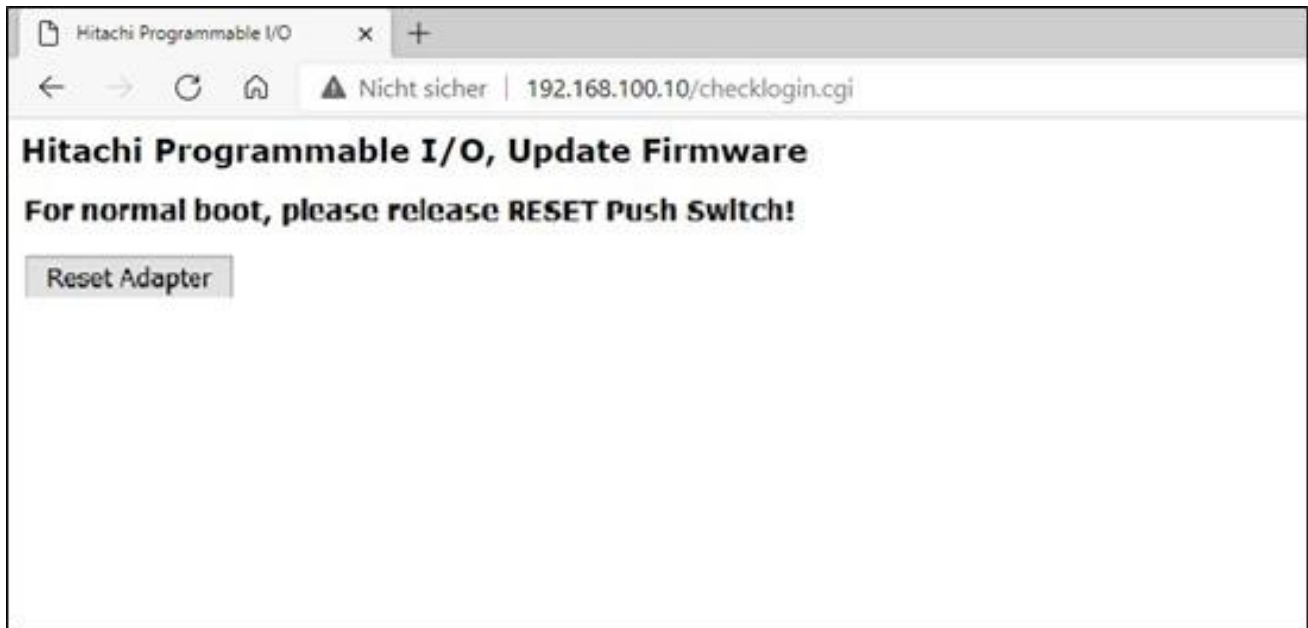
(4) Search the file to download using 'search button'.



(5) Click 'Upload Button'.



(6) If it finish, you can see a below message (File Upload Done!). Click 'Reset Adapter' button.



## 7 Modbus Interface

### 7.1 Supported Modbus Function Codes

| Function Code | Function                      | Description  |
|---------------|-------------------------------|--|
| 1(0x01)       | Read Coils                    | Read output bit  |
| 2(0x02)       | Read Discrete Inputs          | Read input bit   |
| 3(0x03)       | Read Holding Registers        | Read output word   |
| 4(0x04)       | Read Input Registers          | Read input word  |
| 5(0x05)       | Write Single Coil             | Write one bit output   |
| 6(0x06)       | Write Single Register         | Write one word output  |
| 8(0x08)       | Diagnostics                   | Read diagnostic register                                     |
| 15(0x0F)      | Write Multiple Coils          | Write a number of output bits                                |
| 16(0x10)      | Write Multiple registers      | Write a number of output words                               |
| 23(0x17)      | Read/Write Multiple registers | Read a number of input words /Write a number of output words |

#### 7.1.1 1 (0x01) Read Coils

This function code is used to read from 1 to 2000 contiguous status of coils in a remote device. The Request PDU specifies the starting address, e.g., the address of the first coil specified, and the number of coils. In the PDU Coils are addressed starting at zero. Therefore, coils numbered 1-16 are addressed as 0-15. The coils in the response message are packed as one coil per bit of the data field. Status is indicated as 1= ON and 0= OFF.

##### Request

| Field name             | Example |
|------------------------|---------|
| Function Code          | 0x01    |
| Starting Address Hi    | 0x10    |
| Starting Address Lo    | 0x00    |
| Quantity of Outputs Hi | 0x00    |
| Quantity of Outputs Lo | 0x0A    |

##### Response

| Field name    | Example |
|---------------|---------|
| Function Code | 0x01    |
| Byte Count    | 0x02    |
| Output Status | 0x55    |
| Output Status | 0x02    |

In case of address 0x1015~0x1000 output bit value: 10101010\_01010101

### 7.1.2 2 (0x02) Read Discrete Inputs

This function code is used to read from 1 to 2000 contiguous status of discrete inputs in a remote device. The Request PDU specifies the starting address, e.g., the address of the first input specified, and the number of inputs. In the PDU Discrete Inputs are addressed starting at zero. Therefore, Discrete inputs numbered 1-16 are addressed as 0-15. The discrete inputs in the response message are packed as one input per bit of the data field. Status is indicated as 1= ON; 0= OFF.

#### Request

| Field name            | Example |
|-----------------------|---------|
| Function Code         | 0x02    |
| Starting Address Hi   | 0x00    |
| Starting Address Lo   | 0x00    |
| Quantity of Inputs Hi | 0x00    |
| Quantity of Inputs Lo | 0x0A    |

#### Response

| Field name    | Example |
|---------------|---------|
| Function Code | 0x02    |
| Byte Count    | 0x02    |
| Input Status  | 0x80    |
| Input Status  | 0x00    |

In case of address 0x0015~0x0000 input bit value: 00000000\_10000000

### 7.1.3 3 (0x03) Read Holding Registers

This function code is used to read the contents of a contiguous block of holding registers in a remote device. The Request PDU specifies the starting register address and the number of registers. The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte. For each register, the first byte contains the high order bits and the second contains the low order bits.

#### Request

| Field name              | Example |
|-------------------------|---------|
| Function Code           | 0x03    |
| Starting Address Hi     | 0x08    |
| Starting Address Lo     | 0x00    |
| Quantity of Register Hi | 0x00    |
| Quantity of Register Lo | 0x02    |

**Response**

| Field name           | Example |
|----------------------|---------|
| Function Code        | 0x03    |
| Byte Count           | 0x04    |
| Output Register#0 Hi | 0x11    |
| Output Register#0 Lo | 0x22    |
| Output Register#1 Hi | 0x33    |
| Output Register#1 Lo | 0x44    |

In case of address 0x0800, 0x0801 output register value: 0x1122, 0x3344.

**7.1.4 4 (0x04) Read Input Registers**

This function code is used to read from 1 to approx. 125 contiguous input registers in a remote device. The Request PDU specifies the starting register address and the number of registers. The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte. For each register, the first byte contains the high order bits and the second contains the low order bits. This function code is used to read from 1 to approx. 125 contiguous input registers in a remote device. The Request PDU specifies the starting register address and the number of registers. The register data in the response message are packed as two bytes per register, with the binary contents right justified within each byte. For each register, the first byte contains the high order bits and the second contains the low order bits.

**Request**

| Field name              | Example |
|-------------------------|---------|
| Function Code           | 0x04    |
| Starting Address Hi     | 0x00    |
| Starting Address Lo     | 0x00    |
| Quantity of Register Hi | 0x00    |
| Quantity of Register Lo | 0x02    |

**Response**

| Field name          | Example |
|---------------------|---------|
| Function Code       | 0x04    |
| Byte Count          | 0x04    |
| Input Register#0 Hi | 0x00    |
| Input Register#0 Lo | 0x80    |
| Input Register#1 Hi | 0x00    |
| Input Register#1 Lo | 0x00    |

In case of address 0x0000, 0x0001 input register value: 0x0080, 0x0000.

### 7.1.5 5 (0x05) Write Single Coil

This function code is used to write a single output to either ON or OFF in a remote device. The requested ON/OFF state is specified by a constant in the request data field. A value of FF 00 hex requests the output to be ON. A value of 00 00 requests it to be OFF. All other values are illegal and will not affect the output

#### Request

| Field name        | Example |
|-------------------|---------|
| Function Code     | 0x05    |
| Output Address Hi | 0x10    |
| Output Address Lo | 0x01    |
| Output Value Hi   | 0xFF    |
| Output Value Lo   | 0x00    |

#### Response

| Field name        | Example |
|-------------------|---------|
| Function Code     | 0x05    |
| Output Address Hi | 0x10    |
| Output Address Lo | 0x01    |
| Output Value Hi   | 0xFF    |
| Output Value Lo   | 0x00    |

Output bit of address 0x1001 turns ON

### 7.1.6 6 (0x06) Write Single Register

This function code is used to write a single holding register in a remote device. Therefore, register numbered 1 is addressed as 0. The normal response is an echo of the request, returned after the register contents have been written

#### Request

| Field name          | Example |
|---------------------|---------|
| Function Code       | 0x06    |
| Register Address Hi | 0x08    |
| Register Address Lo | 0x00    |
| Register Value Hi   | 0x11    |
| Register Value Lo   | 0x22    |



**Response**

| Field name          | Example |
|---------------------|---------|
| Function Code       | 0x06    |
| Register Address Hi | 0x08    |
| Register Address Lo | 0x00    |
| Register Value Hi   | 0x11    |
| Register Value Lo   | 0x22    |
| Function Code       | 0x06    |

In case of address 0x0800 output register value: 0x0000 changes to 0x1122.

**7.1.7 8 (0x08) Diagnostics**

Modbus function code 08 provides a series of tests for checking the communication system between a client (Master) device and a server (Slave), or for checking various internal error conditions within a server. The function uses a two-byte sub-function code field in the query to define the type of test to be performed. The server echoes both the function code and sub-function code in a normal response. Some of the diagnostics cause data to be returned from the remote device in the data field of a normal response

**Request**

| Field name      | Example |
|-----------------|---------|
| Function Code   | 0x08    |
| Sub-Function Hi | 0x00    |
| Sub-Function Lo | 0x00    |
| Data Hi         | 0x11    |
| Data Lo         | 0x22    |

**Response**

| Field name      | Example |
|-----------------|---------|
| Function Code   | 0x08    |
| Sub-Function Hi | 0x00    |
| Sub-Function Lo | 0x00    |
| Data Hi         | 0x11    |
| Data Lo         | 0x22    |

**Sub-function 0x0000 (0) Return Query Data**

The data passed in the request data field is to be returned (looped back) in the response. The entire response message should be identical to the request.

| Sub-function | Data Field (Request) | Data Field (Response) | Description |
|--------------|----------------------|-----------------------|-------------|
| 0x0000(0)    | Any                  | Echo Request Data     |             |

**Sub-function 0x0001 (1) Restart Communications Option**

The remote device could be initialized and restarted, and all of its communications event counters are cleared. Especially, data field 0x55AA make the remote device to restart with factory default setup of EEPROM.

| Sub-function | Data Field (Request)      | Data Field (Response) | Description                   |
|--------------|---------------------------|-----------------------|-------------------------------|
| 0x0001 (1)   | 0x0000 or 0xFF00          | Echo Request Data     | Reset                         |
| 0x0001 (1)   | 0x55AA                    | Echo Request Data     | Reset with Default Setting 1) |
| 0x0001 (1)   | 0x55AA+0xAB7B+Sumcheck 4) | Echo Request Data     | Reset with Factory default 2) |
| 0x0001 (1)   | 0x55AA+0xAA55+Sumcheck 4) | Echo Request Data     | Reset with Factory default 3) |

1),2),3) All expansion slot configuration parameters are cleared.

2),3) IP Address, Subnet Mask Address, Gateway Address, RS232/485 setting, and Bootp/DHCP mode will be the factory defaults value.

3) Mac Address will be the factory default value.

4) Refer to 3.2.2 for Sum check (0x1006)

**Sub-function 0x000A (10) Clear Counters and Diagnostic Register**

The goal is to clear all counters and the diagnostic register. Counters are also cleared upon power-up.

| Sub-function | Data Field (Request) | Data Field (Response) | Description |
|--------------|----------------------|-----------------------|-------------|
| 0x000A (10)  | 0x0000               | Echo Request Data     |             |

**Sub-function 0x000B (11) Return Bus Message Count**

The response data field returns the quantity of messages that the remote device has detected on the communications system since its last restart, clear counters operation, or power-up.

| Sub-function | Data Field (Request) | Data Field (Response) | Description |
|--------------|----------------------|-----------------------|-------------|
| 0x000B (11)  | 0x0000               | Total Message Count   |             |

**Sub-function 0x000D (13) Return Bus Exception Error Count**

The response data field returns the quantity of Modbus exception responses returned by the remote device since its last restart, clear counters operation, or power-up.

| Sub-function | Data Field (Request) | Data Field (Response) | Description |
|--------------|----------------------|-----------------------|-------------|
| 0x000D (13)  | 0x0000               | Exception Error Count |             |

#### Sub-function 0x000E (14) Return Slave Message Count

The response data field returns the quantity of messages addressed to the remote device, or broadcast, that the remote device has processed since its last restart, clear counters operation, or power-up.

| Sub-function | Data Field (Request) | Data Field (Response) | Description |
|--------------|----------------------|-----------------------|-------------|
| 0x000E (14)  | 0x0000               | Slave Message Count   |             |

#### Sub-function 0x000F (15) Return Slave No Response Count

The response data field returns the quantity of messages addressed to the remote device for which it has returned no response (neither a normal response nor an exception response), since its last restart, clear counters operation, or power-up.

| Sub-function | Data Field (Request) | Data Field (Response)   | Description |
|--------------|----------------------|-------------------------|-------------|
| 0x000F (15)  | 0x0000               | Slave No Response Count |             |

#### Sub-function 0x0064 (100) Return Slave Modbus, Expansion Status

The response data field returns the status of Modbus and expansion addressed to the remote device.

This status values are identical with status 1word of input process image.

| Sub-function | Data Field (Request) | Data Field (Response) | Description          |
|--------------|----------------------|-----------------------|----------------------|
| 0x0064 (100) | 0x0000               | Modbus, G-Bus Status  | Same as status 1word |

### 7.1.8 15 (0x0F) Write Multiple Coils

This function code is used to force each coil in a sequence of coils to either ON or OFF in a remote device. The Request PDU specifies the coil references to be forced. Coils are addressed starting at zero. A logical '1' in a bit position of the field requests the corresponding output to be ON. A logical '0' requests it to be OFF. The normal response returns the function code, starting address, and quantity of coils forced.

#### Request

| Field name             | Example |
|------------------------|---------|
| Function Code          | 0x0F    |
| Starting Address Hi    | 0x10    |
| Starting Address Lo    | 0x00    |
| Quantity of Outputs Hi | 0x00    |
| Quantity of Outputs Lo | 0x0A    |
| Byte Count             | 0x02    |
| Output Value#0         | 0x55    |
| Output Value#1         | 0x01    |

#### Response

| Field name             | Example |
|------------------------|---------|
| Function Code          | 0x0F    |
| Starting Address Hi    | 0x10    |
| Starting Address Lo    | 0x00    |
| Quantity of Outputs Hi | 0x00    |
| Quantity of Outputs Lo | 0x0A    |

In case of address 0x1015~0x1000 output bit value: 00000000\_00000000 changes to 00000001\_01010101.

### 7.1.9 16 (0x10) Write Multiple Registers

This function code is used to write a block of contiguous registers (1 to approx. 120 registers) in a remote device. The requested written values are specified in the request data field. Data is packed as two bytes per register. The normal response returns the function code, starting address, and quantity of registers written.

#### Request

| Field name               | Example |
|--------------------------|---------|
| Function Code            | 0x0F    |
| Starting Address Hi      | 0x10    |
| Starting Address Lo      | 0x08    |
| Quantity of Registers Hi | 0x00    |
| Quantity of Registers Lo | 0x02    |
| Byte Count               | 0x04    |
| Register Value#0 Hi      | 0x11    |
| Register Value#0 Lo      | 0x22    |
| Register Value#1 Hi      | 0x33    |
| Register Value#1 Lo      | 0x44    |

#### Response

| Field name               | Example |
|--------------------------|---------|
| Function Code            | 0x0F    |
| Starting Address Hi      | 0x10    |
| Starting Address Lo      | 0x08    |
| Quantity of Registers Hi | 0x00    |
| Quantity of Registers Lo | 0x02    |

In case of address 0x0800, 0x0801 output register value: 0x0000, 0x0000 changes to 0x1122, 0x3344.

### 7.1.10 23 (0x17) Read/Write Multiple Registers

This function code performs a combination of one read operation and one write operation in a single Modbus transaction. The write operation is performed before the read. The request specifies the starting address and number of holding registers to be read as well as the starting address, number of holding registers, and the data to be written. The byte count specifies the number of bytes to follow in the write data field. The normal response contains the data from the group of registers that were read. The byte count field specifies the quantity of bytes to follow in the read data field.

#### Request

| Field name                | Example |
|---------------------------|---------|
| Function Code             | 0x17    |
| Read Starting Address Hi  | 0x08    |
| Read Starting Address Lo  | 0x00    |
| Quantity of Read Hi       | 0x00    |
| Quantity of Read Lo       | 0x02    |
| Write Starting Address Hi | 0x08    |
| Write Starting Address Lo | 0x00    |
| Quantity of Write Hi      | 0x00    |
| Quantity of Write Lo      | 0x02    |
| Byte Count                | 0x04    |
| Write Reg. Value#0 Hi     | 0x11    |
| Write Reg. Value#0 Lo     | 0x22    |
| Write Reg. Value#1 Hi     | 0x33    |
| Write Reg. Value#1 Lo     | 0x44    |

#### Response

| Field name           | Example |
|----------------------|---------|
| Function Code        | 0x17    |
| Byte Count           | 0x04    |
| Read Reg. Value#0 Hi | 0x11    |
| Read Reg. Value#0 Lo | 0x22    |
| Read Reg. Value#1 Hi | 0x33    |
| Read Reg. Value#1 Lo | 0x44    |

In case of address 0x0800, 0x0801 output register value: 0x0000, 0x0000 changes to 0x1122, 0x3344.

### 7.1.11 Error Response

In an exception response, the server sets the MSB of the function code to 1. This makes the function code value in an exception response exactly 80 hexadecimal higher than the value would be for a normal response.

#### Exception Response Example

| Field name     | Example |
|----------------|---------|
| Function Code  | 0x81    |
| Exception Code | 0x02    |

#### Exception Codes

| Field name | Example              | Description  |
|------------|----------------------|--|
| 01         | Illegal Function     | The function code received in the query is not an allowable action for the server (or slave).  |
| 02         | Illegal Data Address | The data address received in the query is not an allowable address for the server (or slave).  |
| 03         | Illegal Data Value   | A value contained in the query data field is not an allowable value for server (or slave).   |
| 04         | Slave Device Failure | An unrecoverable error occurred while the server (or slave) was attempting to perform the requested action.  |
| 06         | Slave Device Busy    | Specialized use in conjunction with programming commands. The server (or slave) is engaged in processing a long-duration program command. The client (or master) should retransmit the message later when the server (or slave) is free. |
| 01         | Illegal Function     | The function code received in the query is not an allowable action for the server (or slave).  |

## 7.2 Modbus Special Register Map

The special register map can be accessed by function code 3, 4, 6 and 16. Also the special register map must be accessed by read/write of each address (one address).

### 7.2.1 Adapter Register Mapping

| Address       | IEC Address    | Contents   |
|---------------|----------------|--|
| 0x0000~0x07FF | %IW0 ~ %IW2047 | 2048 words Input and Internal memory (Area is write-protected) |
| 0x0800~0x0FFF | %QW0 ~ %QW2047 | 2048 words Output and Internal memory (Area is write-enabled)  |
| 0x1000~0x1FFF | -              | Special Function Register (PIO Information)                    |
| 0x2000~0x2FFF | -              | Special Function Register (Slot Information)                   |
| 0x4000~0x5FFF | %MW0 ~ %MW8191 | 8192 words Internal memory (Area is write-enabled)             |

### 7.2.2 Adapter Identification Special Register (0x1000, 4096)

| Address       | Access | Type, Size           | Description   |
|---------------|--------|----------------------|---|
| 0x1000 (4096) | Read   | 1word                | Vendor ID = 0x10AD, Hitachi Europe GmbH   |
| 0x1001 (4097) | Read   | 1word                | Device type = 0x1000, Network Adapter   |
| 0x1002 (4098) | Read   | 1word                | Product Code  |
| 0x1003 (4099) | Read   | 1word                | Firmware revision, if 0x0101, revision 1.001  |
| 0x1005 (4101) | Read   | String up to 34bytes | Product name string<br>First 1word is length of valid character string<br>Example) response as following<br>"00 0c 52 49 4f 33 2d 43 50 32 4d 42 54 4c 00 00 00<br>00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00"<br>Valid character size = 0x000C = 12 characters<br>"RIO3-CP2MBTL"  |
| 0x1006 (4102) | Read   | 1word                | Sum check of EEPROM   |
| 0x1010 (4112) | Read   | 2words               | Firmware release date   |
| 0x1013 (4115) | Read   | 1word                | Module ID   |
| 0x101E (4126) | Read   | 15words              | Composite Id of following address<br>0xA8C0(Lo_IP Addr), 0x3264(Hi_IP Addr),<br>0xFFFF(Lo_NetMask),<br>0x00FF(Hi_NetMask), 0xA8C0(GateWay),<br>0xFE64(GateWay), 0x1400(MacAddr),<br>0x00F7(MacAddr), 0xBA83(MacAddr),<br>0x02E5(VendorCode), 0x000C(DeviceType),<br>0x91F0(ProductCode),<br>0x0203(FW_Rev), 0x0510(FW_ReleasData),<br>0x2021(FW_ReleasYear) |

String Type consists of valid string length (first 1word) and array of characters



### 7.2.3 Adapter Information Special Register (0x1100, 4352)

| Address       | Access | Type, Size    | Description  |
|---------------|--------|---------------|--|
| 0x1102(4354)  | Read   | 1word         | Start address of input image word register.=0x0000   |
| 0x1103 (4355) | Read   | 1word         | Start address of output image word register. =0x0800   |
| 0x1104 (4356) | Read   | 1word         | Size of input image word register.   |
| 0x1105 (4357) | Read   | 1word         | Size of output image word register.  |
| 0x1106(4358)  | Read   | 1word         | Start address of input image bit. = 0x0000   |
| 0x1107 (4359) | Read   | 1word         | Start address of output image bit. =0x1000   |
| 0x1108 (4360) | Read   | 1word         | Size of input image bit.   |
| 0x1109(4361)  | Read   | 1word         | Size of output image bit.  |
| 0x110D (4365) | Read   | 1word         | Switch State (Run, Stop, Reset)<br>*Default: 0x0000<br>*Stop: 0x0000 / Run: 0x0001 / Reset Switch: 0x0002<br>ex) 0x0003: Run + Reset Switch On |
| 0x110E (4366) | Read   | Up to 63words | Expansion slot's RIO3-number   |
| 0x1110 (4368) | Read   | 1word         | Number of expansion slot.  |
| 0x1113 (4371) | Read   | Up to 63words | Expansion slot module id. First 1word is product code  |
| 0x111E (4382) | Read   | 1word         | Reserved. Adapter IO identification vendor code.   |

### 7.2.4 Adapter Setting Special Register (0x1600, 5632)

| Address        | Access     | Type, Size | Description   |
|----------------|------------|------------|---|
| 0x1600 (5632)  | Read       | 2words     | IP Address (C0A8 6464 = 192.168.100.100)  |
| 0x1602 (5634)  | Read       | 2words     | Subnet Mask (FFFF 0000 = 255.255.0.0)   |
| 0x1604(5636)   | Read       | 2words     | Gateway (C0A8 0001 = 192.168.0.1)   |
| 0x1606 (5638)* | Read/Write | 1word      | RS-232C Baud rate. (2400bps~115200bps)<br>0 : 115200 (default)<br>1 : 2400<br>2 : 4800<br>3 : 9600<br>4 : 19200<br>5 : 38400<br>6 : 57600<br>7 : 115200   |
| 0x1607 (5639)* | Read/Write | 1word      | *RS-232C Setting.<br>1 nibble : Data bit(0 : 8bit(default), 1 : 9bit)<br>2 nibble : Stop bit(0 : 1bit(default), 1 : 2bit)<br>3 nibble : Parity bit(0 : none(default), 1: odd, 2 : even)<br>4 nibble : Reserve |
| 0x1608 (5640)* | Read/Write | 1word      | RS-485 Baud rate. (2400bps~115200bps)<br>0 : 115200 (default)<br>1 : 2400<br>2 : 4800<br>3 : 9600   |

|                |            |        |  |
|----------------|------------|--------|--|
|                |            |        | 4 : 19200<br>5 : 38400<br>6 : 57600<br>7 : 115200  |
| 0x1609 (5641)* | Read/Write | 1word  | RS-485 Setting.<br>1 nibble : Data bit(0: 8bit(default), 1: 9bit)<br>2 nibble : Stop bit(0: 1bit(default), 1: 2bit)<br>3 nibble : Parity bit(0: none(default), 1: odd, 2: even)<br>4 nibble : Reserve  |
| 0x160A (5642)* | Read/Write | 1word  | **Modbus Station.<br>High 1byte : Station No. of RS-232C (default: 1)<br>Low 1byte : Station No. of RS-485 (default: 1)  |
| 0x160B (5643)  | Read/Write | 1word  | IP Setting Method.<br>BootP/DHCP disable 0x0000<br>BootP: 0x8000 (default)<br>DHCP: 0x8001   |
| 0x1610 (5648)  | Read       | 3words | Mac Address (1400 00F7 0101 = 00.14.F7.00.01.01)   |
| 0x1614 (5652)* | Read       | 1word  | Serial connection Method<br>0x0000 : Crevis Modbus/RTU (default)<br>0x8000 : RS232 Enable for CODESYS Function block / RTU Master. CODESYS Serial Port Configuration Setting: COM Port 1<br>0x8001 : RS485 Enable for CODESYS Function block / RTU Master: CODESYS Serial Port Configuration Setting: COM Port 2 |
| 0x1620 (5664)  | Read/Write | 4words | RTC<br>1 word : 00ss (ss : sec)<br>2 word : hhmm (hh : hour, mm : min)<br>3 word : mmdd (mm : month, dd : day)<br>4 word : yyyy (yyyy : year)<br>(0010 0F28 0317 07E0 = 2016 - 03.23 - 15:40 - 16)   |

\* **RS-232C/485 Setting:** This description for 0x1607 / 0x1609 register with bit.

|          |    |    |    |          |    |   |   |            |   |   |   |          |   |   |     |
|----------|----|----|----|----------|----|---|---|------------|---|---|---|----------|---|---|-----|
| MSB      |    |    |    |          |    |   |   |            |   |   |   |          |   |   | LSB |
| 15       | 14 | 13 | 12 | 11       | 10 | 9 | 8 | 7          | 6 | 5 | 4 | 3        | 2 | 1 | 0   |
| Data Bit |    |    |    | Stop Bit |    |   |   | Parity Bit |   |   |   | Reserved |   |   |     |

\*\* **Modbus Station:** This description for 0x160A register with bit.

|                        |    |    |    |    |    |   |   |                       |   |   |   |   |   |   |     |
|------------------------|----|----|----|----|----|---|---|-----------------------|---|---|---|---|---|---|-----|
| MSB                    |    |    |    |    |    |   |   |                       |   |   |   |   |   |   | LSB |
| 15                     | 14 | 13 | 12 | 11 | 10 | 9 | 8 | 7                     | 6 | 5 | 4 | 3 | 2 | 1 | 0   |
| RS-232C Modbus station |    |    |    |    |    |   |   | RS-485 Modbus station |   |   |   |   |   |   |     |

### 7.2.5 Expansion Slot Information Special Resistor (0x2000, 8192)

| Adr Offset  | Exp. Slot#1  | Exp. Slot#2  | Exp. Slot#3  | Exp. Slot#4  | ..... | Exp. Slot#63  |
|-------------|--------------|--------------|--------------|--------------|-------|---------------|
| 0x00(+0)    | 0x2000(8192) | 0x2020(8224) | 0x2040(8256) | 0x2060(8288) | ..... | 0x27C0(10176) |
| 0x01(+1)    | 0x2001(8193) | 0x2021(8225) | 0x2041(8257) | 0x2061(8289) | ..... | 0x27C1(10177) |
| 0x02(+2)    | 0x2002(8194) | 0x2022(8226) | 0x2042(8258) | 0x2062(8290) | ..... | 0x27C2(10178) |
| 0x03(+3)    | 0x2003(8195) | 0x2023(8227) | 0x2043(8259) | 0x2063(8291) | ..... | 0x27C3(10179) |
| 0x04(+4)    | 0x2004(8196) | 0x2024(8228) | 0x2044(8260) | 0x2064(8292) | ..... | 0x27C4(10180) |
| 0x05(+5)    | 0x2005(8197) | 0x2025(8229) | 0x2045(8261) | 0x2065(8293) | ..... | 0x27C5(10181) |
| 0x06(+6)    | 0x2006(8198) | 0x2026(8230) | 0x2046(8262) | 0x2066(8294) | ..... | 0x27C6(10182) |
| 0x07(+7)    | 0x2007(8199) | 0x2027(8231) | 0x2047(8263) | 0x2067(8295) | ..... | 0x27C7(10183) |
| 0x08(+8)    | 0x2008(8200) | 0x2028(8232) | 0x2048(8264) | 0x2068(8296) | ..... | 0x27C8(10184) |
| 0x09(+9)    | 0x2009(8201) | 0x2029(8233) | 0x2049(8265) | 0x2069(8297) | ..... | 0x27C9(10185) |
| 0x0A(+10)   | 0x200A(8202) | 0x202A(8234) | 0x204A(8266) | 0x206A(8298) | ..... | 0x27CA(10186) |
| 0x0B(+11)   | 0x200B(8203) | 0x202B(8235) | 0x204B(8267) | 0x206B(8299) | ..... | 0x27CB(10187) |
| 0x0C(+12)   | 0x200C(8204) | 0x202C(8236) | 0x204C(8268) | 0x206C(8300) | ..... | 0x27CC(10188) |
| 0x0D(+13)   | 0x200D(8205) | 0x202D(8237) | 0x204D(8269) | 0x206D(8301) | ..... | 0x27CD(10189) |
| 0x0E(+14)   | 0x200E(8206) | 0x202E(8238) | 0x204E(8270) | 0x206E(8302) | ..... | 0x27CE(10190) |
| 0x0F(+15)   | 0x200F(8207) | 0x202F(8239) | 0x204F(8271) | 0x206F(8303) | ..... | 0x27CF(10191) |
| 0x10(+16)   | 0x2010(8208) | 0x2030(8240) | 0x2050(8272) | 0x2070(8304) | ..... | 0x27D0(10192) |
| 0x11(+17)   | 0x2011(8209) | 0x2031(8241) | 0x2051(8273) | 0x2071(8305) | ..... | 0x27D1(10193) |
| + 0x12(+18) | 0x2012(8210) | 0x2032(8242) | 0x2052(8274) | 0x2072(8306) | ..... | 0x27D2(10194) |
| + 0x13(+19) | 0x2013(8211) | 0x2033(8243) | 0x2053(8275) | 0x2073(8307) | ..... | 0x27D3(10195) |
| + 0x14(+20) | 0x2014(8212) | 0x2034(8244) | 0x2054(8276) | 0x2074(8308) | ..... | 0x27D4(10196) |
| + 0x15(+21) | 0x2015(8213) | 0x2035(8245) | 0x2055(8277) | 0x2075(8309) | ..... | 0x27D5(10197) |
| + 0x16(+22) | 0x2016(8214) | 0x2036(8246) | 0x2056(8278) | 0x2076(8310) | ..... | 0x27D6(10198) |
| + 0x17(+23) | 0x2017(8215) | 0x2037(8247) | 0x2057(8279) | 0x2077(8311) | ..... | 0x27D7(10199) |
| + 0x18(+24) | 0x2018(8216) | 0x2038(8248) | 0x2058(8280) | 0x2078(8312) | ..... | 0x27D8(10200) |
| + 0x19(+25) | 0x2018(8217) | 0x2038(8249) | 0x2058(8281) | 0x2078(8313) | ..... | 0x27D9(10201) |
| 0x1A(+26)   | 0x201A(8218) | 0x203A(8250) | 0x205A(8282) | 0x207A(8314) | ..... | 0x27DA(10202) |
| 0x1B(+27)   | 0x201B(8219) | 0x203B(8251) | 0x205B(8283) | 0x207B(8315) | ..... | 0x27DB(10203) |
| 0x1C(+28)   | 0x201C(8220) | 0x203C(8252) | 0x205C(8284) | 0x207C(8316) | ..... | 0x27DC(10204) |
| 0x1D(+29)   | 0x201D(8221) | 0x203D(8253) | 0x205D(8285) | 0x207D(8317) | ..... | 0x27DD(10205) |
| 0x1E(+30)   | 0x201E(8222) | 0x203E(8254) | 0x205E(8286) | 0x207E(8318) | ..... | 0x27DE(10206) |
| 0x1F(+31)   | 0x201F(8223) | 0x203F(8255) | 0x205F(8287) | 0x207F(8319) | ..... | 0x27DF(10207) |

| Adr Offset    | Access     | Type, Size           | Description   |
|---------------|------------|----------------------|---|
| 0x02 (+2) **  | Read       | 1 word               | Input start register address of input image word this slot.   |
| 0x03 (+3) **  | Read       | 1 word               | Input word's bit offset of input image word this slot.  |
| 0x04 (+4) **  | Read       | 1 word               | Output start register address of output image word this slot.   |
| 0x05 (+5) **  | Read       | 1 word               | Output word's bit offset of output image word this slot.  |
| 0x06 (+6) **  | Read       | 1 word               | Input bit start address of input image bit this slot.   |
| 0x07 (+7) **  | Read       | 1 word               | Output bit start address of output image bit this slot.   |
| 0x08 (+8) **  | Read       | 1 word               | Size of input bit this slot   |
| 0x09 (+9) **  | Read       | 1 word               | Size of output bit this slot  |
| 0x0A (+10) ** | Read       | n word               | Read input data this slot   |
| 0x0B (+11) ** | Read/Write | n word               | Read/write output data this slot  |
| 0x0E (+14)    | Read       | 1 word               | RIO3-number   |
| 0x0F (+15)    | Read       | String up to 72bytes | First 1word is length of valid character string.<br>If RIO3-YTP8, returns<br>"00 15 52 49 4F 33 2D 59 54 50 38 2C 20 38 44 4F 2C 20 32 34 56 64 63 00 00 00 00 00 00 00 00 00 00"<br>Valid character size = 0x001E =21 characters,<br>"RIO3-YTP8, 8DO, 24Vdc" |
| 0x10 (+16)    | Read       | 1 word               | Size of configuration parameter byte  |
| 0x11 (+17) ** | Read/Write | n word               | Read/write Configuration parameter data,<br>Refer to each IO parameter Specification.   |
| 0x17 (+23)    | Read       | 2 words              | Firmware Revision<br>0x00010010 (Major revision 1 / Minor revision 2, Rev 1.02)   |
| 0x19 (+25)    | Read       | 2 words              | Firmware release data.  |

\* After the system is reset, the new "Set Value" action is applied.

\*\* Nothing of output, input, memory or configuration parameter corresponding slot returns Exception 02.

## A APPENDIX - Modbus Reference

Modbus Reference Documents

<http://www.modbus.org>

Modbus Tools

<http://www.modbustools.com>, modbus poll

<http://www.win-tech.com>, modscan32

## B APPENDIX - Product List

Please refer the separate HX-RIO3 product list document