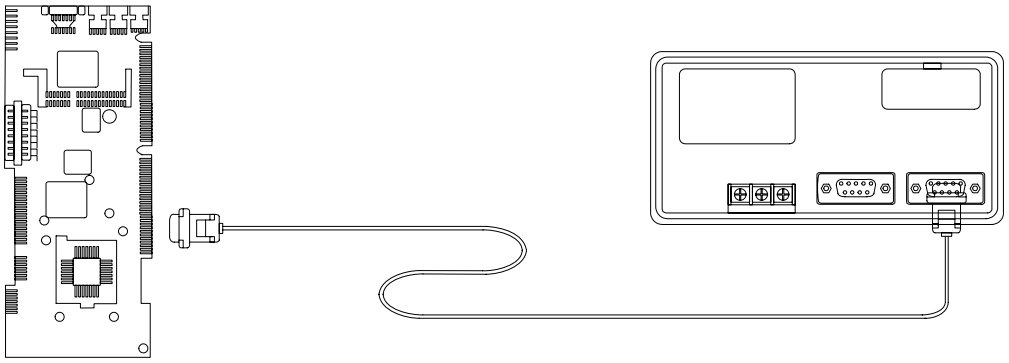
# Universal(General purpose communication) connection

- It is a general-purpose communication enabling to execute Modbus Slave communication in GP.

## 1. SYSTEM ORGANIZATION

- GP executes Slave communication with Host Unit system such as Micro computer can read and write GP register (UB, UW) as a communication command connecting by RS-232C or RS-422(RS-485) communication ports. Host Unit, the Master, transmits the command to GP, the Slave then, it implements the ordered operation and outputs the response.
  The following is system organization between GP and Host Unit and see the 「**1.2 INTERFACE INFORMATION**」**in Communication manual of common configuration for cable.**



Host Unit
(Micro Computer)

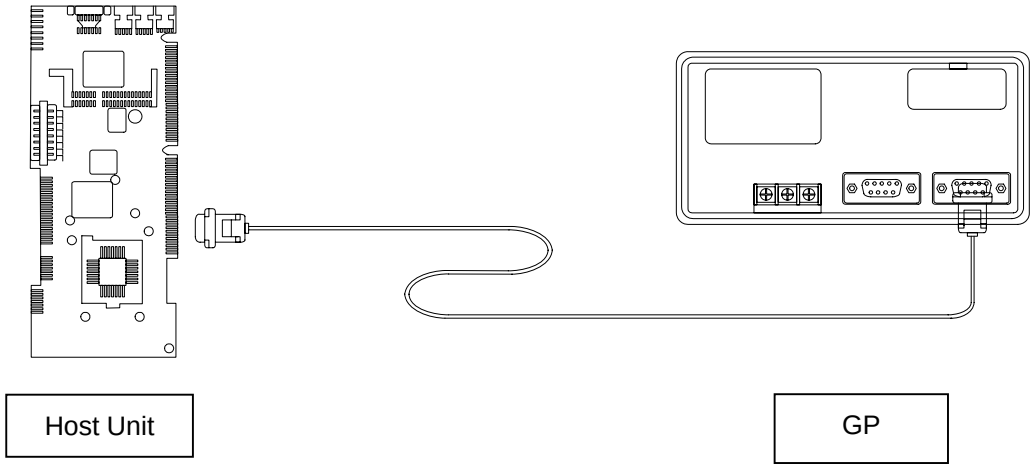
GP

- Refer to the following for Host Unit communication configuration.

| No | Item | Description | | Remark |
|---|---|---|---|---|
| 1 | Communication mode | RTU | | Configurable |
| 2 | Communication speed | 38400 bps | | Fixed |
| 3 | Data type | Data length | 8 bit | Fixed |
| | | Parity | None | Fixed |
| | | Stop bit | 1 bit | Fixed |
| 4 | Station | 0 ~ 31 | | Configurable in main device. |

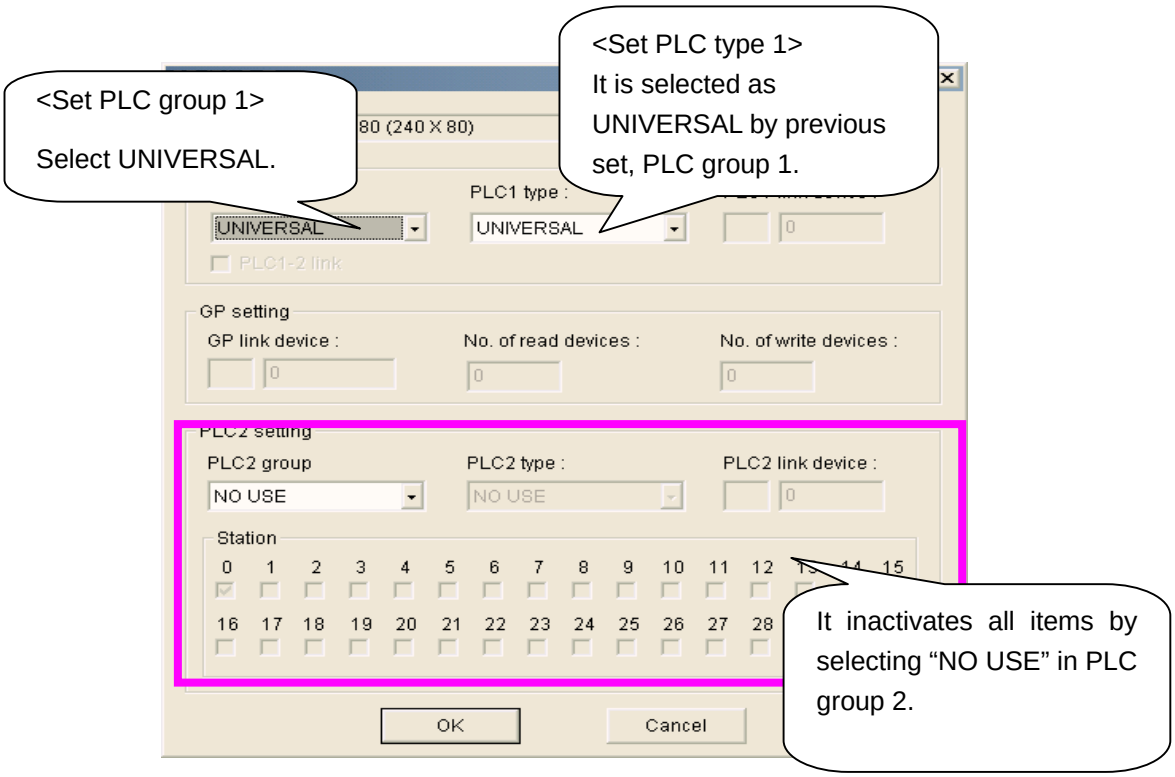
## 2. 1:1 UNIVERSAL COMMUNICATION

• It monitors GP status by communicating between one Host Unit and one GP. (It can be expanded.)




## 2.1. GP Editor communication configuration

• Set the detail of PLC in GP Editor to transmit data to GP as the following, dialog box for [GP/PLC type] and PLC1 is only available for universal communication selecting “UNIVERSAL” in PLC group 1.




**NOTICE**

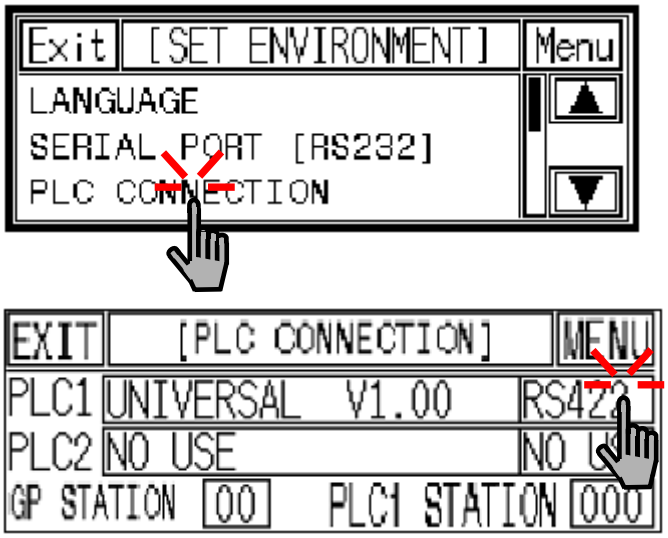
Set the “UNIVERSAL” in GP to use without any additional setup.

## 2.2 GP communication configuration

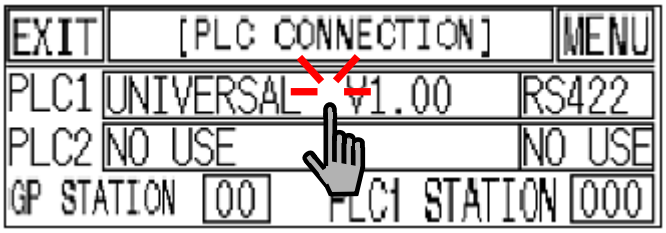
- GP has PLC protocols, “UNIVERSAL” and “MK-200S” basically and user-downloaded PLC configured with data in GP Editor and registered in main PLC group. (See 4.2.2 in Communication manual of common configuration.)
  Set PLC1 as “UNIVERSAL” and communication in main device as following.

(1) Produce data and download it from GP Editor.
(2) Connect into main system of GP by touching top-left point of user screen.

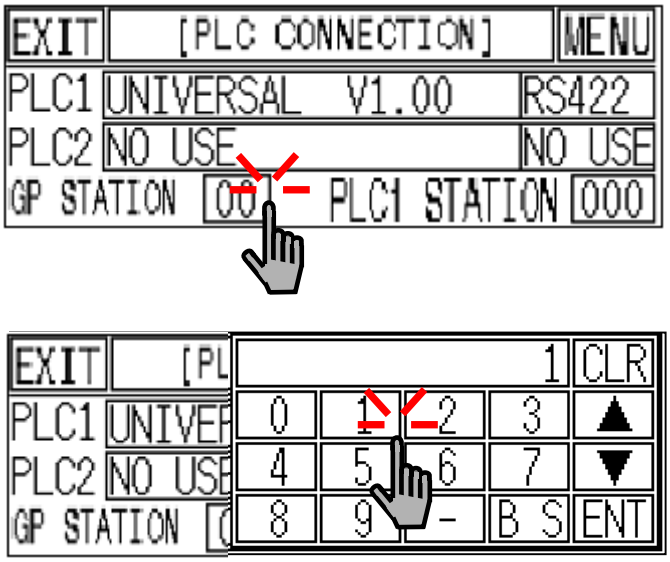

(3) Check the communication connector to be linked with Host Unit after touch PLC connection and adjust properly by touch communication connector of PLC1. Select Preference – Serial port [####] to change PLC1 alternatively between RS232C and RS422.




(4) Check PLC1 type is “UNIVERSAL”in the step (3) and select [UNIVERSAL] and [MK-200S] alternatively by touching it and touch Men or Exit after select.

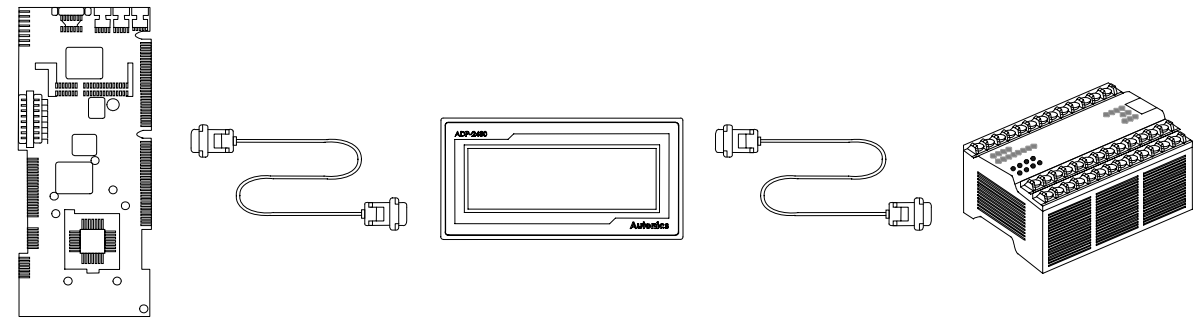


(5) Select proper station to communicate with Host Unit by touching “GP station” ranging 0~31 and 1~31 for “Universal” communication.



# 3. 1:1:1 UNIVERSAL COMMUNICATION

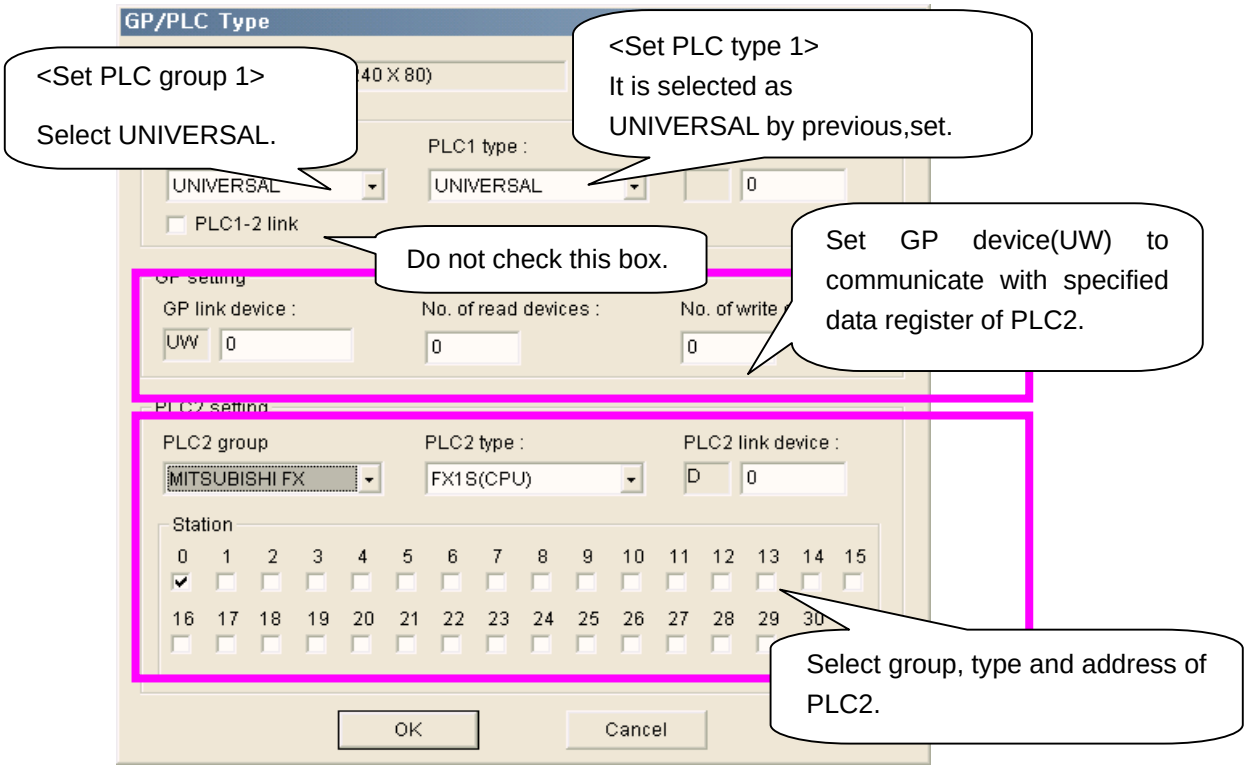
- It monitors the status of PLC and GP by communicating among Host Unit, GP and PLC.



Host Unit | GP | PLC

## 3.1. GP Editor communication configuration

- When select “UNIVERSAL” in PLC group1, “PLC Type” is set as “UNIVERSAL” automatically. and detail of PLC in GP Editor to transmit data to GP as the following, dialog box for [GP/PLC type] and PLC1 is only available for universal communication selecting “UNIVERSAL” in PLC group 1.
- Set group and type connected with GP in PLC group2 and check the proper station when PLC2 has the station or any station to communicate with GP and PLC. (Default value is No.0.)
- Do not check “PLC1-2 connection”.




※ See the「**4. PLC COMMUNICATION CONFIGURATION**」**in Communication manual of common configuration for data connection with PLC2.**

**NOTICE**

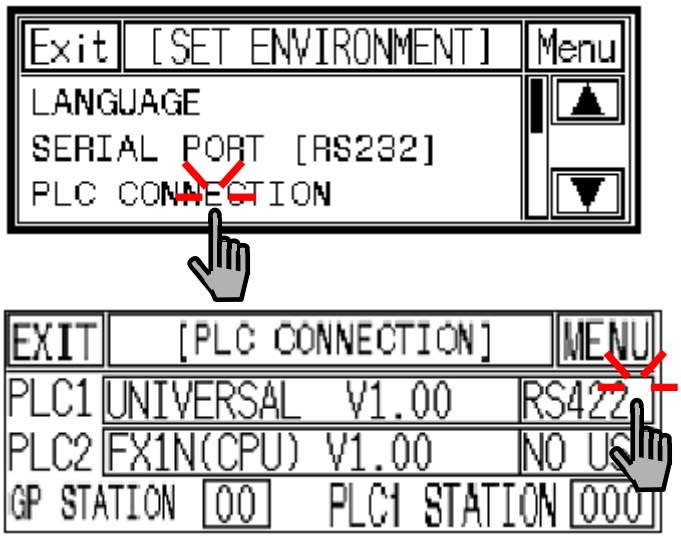
Do not check “PLC1-2 connection.”or it fails to communicate between GP and Host Unit.

## 3.2 GP communication configuration

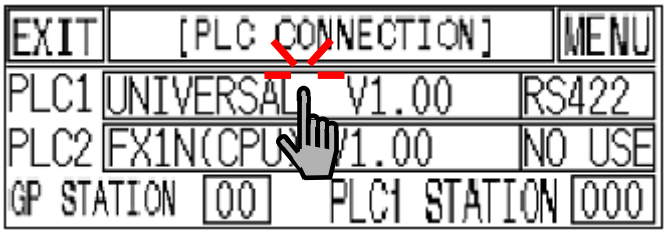
(1) Program data in GP Editor and download it.

(2) Connect into main system of GP by touching top-left point of user screen.

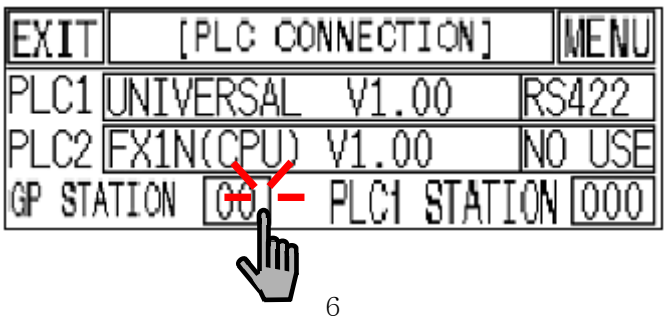

(3) Check the communication connector status for PLC1 and PLC2 by touching PLC connection, [RS422]-[RS232C] are selected alternatively and connection port of PLC2 is reversed by communication configuration of PLC1 and vice versa.

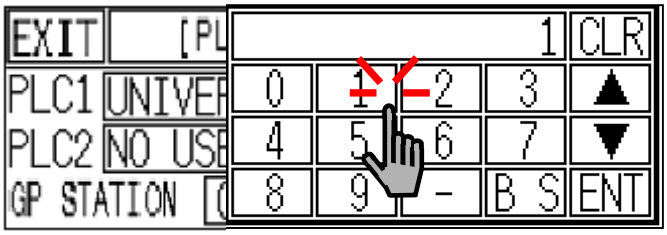



(4) Check whether it is “UNIVERSAL” for PLC1 in previous step (3) and [UNIVERSAL] and [MK-200S] are selected alternatively by touching.

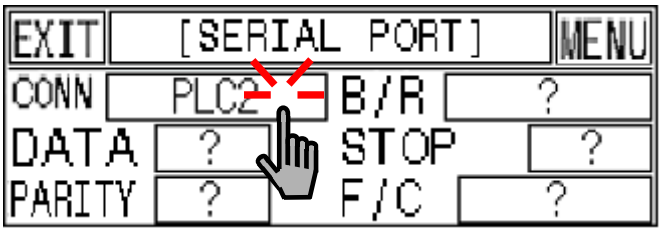



(5) Select proper station to communicate with Host Unit by touching “GP station” ranging 0~31 and 1~31 for “Universal” communication.



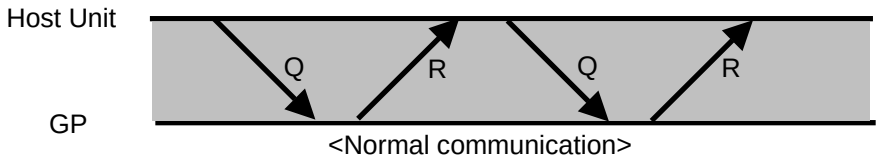



(6) Set communication type of PLC2 by touching Preference - Serial port [####] as port is set reversely by communication configuration of PLC1 and set as [Editor]→[Printer]→[Barcode]→[Monitor]→[PLC2] in sequence by touching “Connection” and select “PLC2” to communicate between GP and PLC2. Touch Menu or End after finish to select.

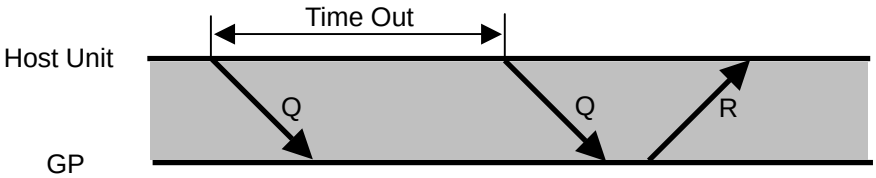


# 4. UNIVERSAL COMMUNICATION PROTOCOL

- It is based on Modbus RTU.
- Host Unit communicates as Master and Slave for GP.
- It transmits query to GP in Host Unit, GP installs designated operation depending on transmitted order and send response. If it do not get any response from Slave by error including parity, CRC or communication error, Master transmits query regarding as time out.



<Normal communication>



<When response does not arrived.>

※ See the Modbus Protocol manual for more details.

## 4.1 Address

- Use GP memory UB, UW device and see the article (2) of 「**4. PLC COMMUNICATION CONFIGURATION**」 **in Communication manual of common configuration for GP memory.**

| Type | Device | Range | | Read/Write |
|---|---|---|---|---|
| | | Start | End | |
| Bit | Coil | UB150 | UB6047F | Write |
| | Input status | UB0 | UB6047F | Read |
| Word | Input register | UW0 | UW6047 | Read |
| | Holding register | UW15 | UW6047 | Write |

## 4.2 Functional code

- Universal communication of Autonics GP provide 2 types of functions in Modbus.

| Code | Function | Read/Write | Description |
|---|---|---|---|
| 03 | Read Holding Register | Read | Read the address |
| 16 | Force Multiple Register | Write | Write the address |

- Additional function codes will be upgraded continuously.

## 4.3 Communication frame

### 4.1.1 Query

| Station | Function code | Data area | CRC | |
|---|---|---|---|---|
| | | | L | H |
| ① | ② | ③ | ④ | |

① Station
- Slave station (HEX) when Master transmits the message.
- Setting range : 0~31
- Broadcast Query transmitted to all Slave in case of 0.

② Function code (HEX)
- Slave installs designated operation by function code.
- Settable codes are 03(Read Holding Register) and 16(Force Multiple Register)

③ Data area (HEX)
- It transmits related data with function code.
- It consists of (Upper 1byte)+(Lower 1byte) of the address.
- The length is variable and it is able to communicate without data.

④ CRC (HEX)
- Error check area
- It is calculated with CRC-16 code.
- It consists of 2byte as (Lower 1byte of CRC)+(Upper 1byte of CRC).

### 4.1.2 Response

| Station | Function code | Data area | CRC | |
|---|---|---|---|---|
| | | | L | H |
| ① | ② | ③ | ④ | |

① Station
- Slave station (HEX)
- Check for the Query.

② Function code (HEX)
- It transmits function code same with Master.
- Check of the Query.

③ Data area (HEX)
- It transmits related data with function code.
- The area length is variable.

④ CRC (HEX)
- Error check area
- It is calculated with CRC-16 code.
- It consists of 2btye as (Lower 1byte of CRC) + (Upper 1byte of CRC).

### 4.1.3 Abnormal response

| Station | Function code | Error code | CRC | |
|---|---|---|---|---|
| | | | L | H |
| ① | ② | ③ | ④ | |

① Station

- Slave station (HEX)

② Function code (HEX)

- It transmits function code same with Master.

③ Error code (HEX)

- It is transmitted when Slave can not operate the request from Master.
- Transmit the code after set the highest bit of function code from Master as 1.

| Code | Name | Description |
|---|---|---|
| 01 | Unavailable function | Out of the function code in Slave |
| 02 | Unavailable address | Out of the address in Slave |
| 03 | Unavailable data | Data can not be written in Slave |

④ CRC (HEX)

- Error check area
- It is calculated with CRC-16 code.
- It consists of 2byte as (Lower 1byte of CRC)+(Upper 1byte of CRC).

※See the **<Appendix>** for example of Universal function.

# ◆APPENDIX◆

## Example of Universal function

### 1. 03 (Read Holding Register)

- It reads successive holding register.
- There is not Broadcast(Slave station is 0).
- Applicable address are ranged 00000~06047 and it is equivalent to GP UW0000~UW6047.

Ex

When read 5 register data from UW0000 to UW0004 of GP with station number is 31.

| GP | | |
|---|---|---|
| UW area | Data (DEC) | Data (HEX) |
| UW0030 | 10 | H000A |
| UW0031 | 20 | H0014 |
| UW0032 | 30 | H001E |
| UW0033 | 40 | H0028 |
| UW0034 | 50 | H0032 |

- Query

| Station | Function code | Start address | | Number of Read register | | CRC | |
|---|---|---|---|---|---|---|---|
| 0x1F | 0x03 | 0x00 | 0x1E | 0x00 | 0x05 | 0xE6 | 0x71 |
| [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |

[1] Station : Slave station is 31, 31 = (Hex)0x1F

[2] Function code : 03

[3] Start address upper byte : 0030.

[4] Start address lower byte

[5] Number of read register in upper byte : Total 5. 5 = Upper (Hex)0x00 + Lower (Hex)0x05

[6] Number of read register of lower byte

[7] CRC lower byte

[8] CRC upper byte

- Response

| Station | Function code | Number of data byte | Data 1 | | Data 2 | | Data 3 | | Data 4 | |
|---|---|---|---|---|---|---|---|---|---|---|
| 0x1F | 0x03 | 0x0A | 0x00 | 0x0A | 0x00 | 0x14 | 0x00 | 0x1E | 0x00 | 0x28 |
| [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] | [10] | [11] |

| Data 5 | | CRC | |
|---|---|---|---|
| 0x00 | 0x32 | 0x8F | 0xD6 |
| [12] | [13] | [14] | [15] |

[1] Station : Slave station
[2] Function code : 03
[3] Number of data byte : Total number of byte in data area, 10 byte for 5 words.
[4] Data 1 upper byte : Upper byte of UW0030
[5] Data 1 lower byte : Lower byte of UW0030
[6] Data 2 upper byte : Upper byte of UW0031
[7] Data 2 lower byte : Lower byte of UW0031
[8] Data 3 upper byte : Upper byte of UW0032
[9] Data 4 lower byte : Lower byte of UW0032
[10] Data 4 upper byte : Upper byte of UW0033
[11] Data 4 lower byte : Lower byte of UW0033
[12] Data 5 upper byte : Upper byte of UW0034
[13] Data 5 lower byte : Lower byte of UW0034
[14] CRC lower byte
[15] CRC upper byte

## 2. 16 (Force Multiple Register)

- It writes successive holding register.
- When designate Slave station as 0(Broadcast), it is applied to write in same address of all Slave.
- Applicable address are ranged 00015~06047, it is equivalent to GP UW0015~UW6047.

Ex

When write the following data in UW100~UW104 of GP successively with station number is 05.

| Data (DEC) | Data (HEX) |
|---|---|
| 123 | H007B |
| 234 | H00EA |
| 345 | H0159 |
| 456 | H01C8 |
| 567 | H0237 |

- Query

| Station | Function code | Start address | | Number of register | | Number of data byte | Alternation data 1 | |
|---|---|---|---|---|---|---|---|---|
| 0x05 | 0x10 | 0x00 | 0x64 | 0x00 | 0x05 | 0x0A | 0x00 | 0x7B |
| [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] | [9] |

| Alternation data 2 | | Alternation data 3 | | Alternation data 4 | | Alternation data 5 | | CRC | |
|---|---|---|---|---|---|---|---|---|---|
| 0x00 | 0xEA | 0x01 | 0x59 | 0x01 | 0xC8 | 0x02 | 0x37 | 0xA6 | 0xC9 |
| [10] | [11] | [12] | [13] | [14] | [15] | [16] | [17] | [18] | [19] |

[1] Station : Slave station is 05, 05 = (Hex)0x05

[2] Function code : 16. 16 = (Hex)0x10

[3] Start address upper byte : Start address is UW100.

100 = Upper (Hex)0x00 + Lower (Hex)0x64

[4] Start address lower byte

[5] Number of register in upper byte : Total number of data to write

5 = Upper (Hex)0x00 + Lower (Hex)0x05

[6] Number of register in lower byte

[7] Number of data byte : Total number of byte of data area.

Total number of data to write : 5 word = 10 byte. 10 = (Hex)0x0A

[8] Upper byte of alternation data 1 : Upper byte of data to be written on UW100.

[9] Lower byte of alternation data 1: Lower byte of data to be written on UW100.

[10] Upper byte of alternation data 2 : Upper byte of data to be written on UW101.

[11] Lower byte of alternation data 2 : Lower byte of data to be written on UW101.

[12] Upper byte of alternation data 3 : Upper byte of data to be written on UW102.

[13] Lower byte of alternation data 3 : Lower byte of data to be written on UW102.

[14] Upper byte of alternation data 4 : Upper byte of data to be written on UW103.

[15] Lower byte of alternation data 4 : Lower byte of data to be written on UW103.

[16] Upper byte of alternation data 5 : Upper byte of data to be written on UW104.

[17] Lower byte of alternation data 5 : Lower byte of data to be written on UW104.

[18] CRC lower byte

[19] CRC upper byte

• Response

| Station | Function code | Start address | | Number of register | | CRC | |
|---|---|---|---|---|---|---|---|
| 0x05 | 0x10 | 0x00 | 0x64 | 0x00 | 0x05 | 0x40 | 0x51 |
| [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |

[1] Station : Slave station is 0, 05 = (Hex)0x05

[2] Function code : 16. 16 = (Hex)0x10

[3] Start address upper byte : Start address is UW100.

100 = Upper (Hex)0x00 + Lower (Hex)0x64

[4] Start address lower byte

[5] Number of register in upper byte : Total number of data to be written

5 = Upper (Hex)0x00 + Lower (Hex)0x05

[6] Number of register in lower byte

[7] CRC lower byte

[8] CRC upper byte

# 3. Abnormal response

• Slave transmits an error code when it cannot operate the request from Master.

| Code | Name | Description |
|---|---|---|
| 01 | Unavailable function | Out of the function code in Slave |
| 02 | Unavailable address | Out of the address in Slave |
| 03 | Unavailable data | Data can not be written in Slave |

- It transmits the response function code after set the highest bit of Master-transmitted function code as 1.

Ex

When read 5 data from UW0000 to UW0004 of GP input register with station number is 5.

- Query

| Station | Function code | Start address | | Number of Read register | | CRC | |
|---|---|---|---|---|---|---|---|
| 0x05 | 0x04 | 0x00 | 0x00 | 0x00 | 0x05 | 0x31 | 0x8D |
| [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |

[1] Station : Slave station is 5, 5 = (Hex)0x05

[2] Function code : 04. **Unavailable code at the moment.**

[3] Start address upper byte : 30001 is applicable to address 0000.

[4] Start address lower byte

[5] Number of read register in upper byte

[6] Number of read register in lower byte

[7] CRC lower byte

[8] CRC upper byte

- Response

| Station | Function code | Error code | CRC | |
|---|---|---|---|---|
| 0x05 | 0x84 | 0x01 | 0x83 | 0x06 |
| [1] | [2] | [3] | [4] | [5] |

[1] Station : Slave station

[2] Function code : 84. The highest bit is 1 in function code 04 transmitted from Master.

[3] Error code : 01. Out of the operation function code error in Slave

[4] CRC lower byte

[5] CRC upper byte

# Revision History

* The revision date is mentioned in bottom right of the last page.

| Revised | Contents of revision |
|---|---|
| 2005.05.07 | The initial editing. |
| 2005.06.08 | Change CRC structure : H+L → L+H |