

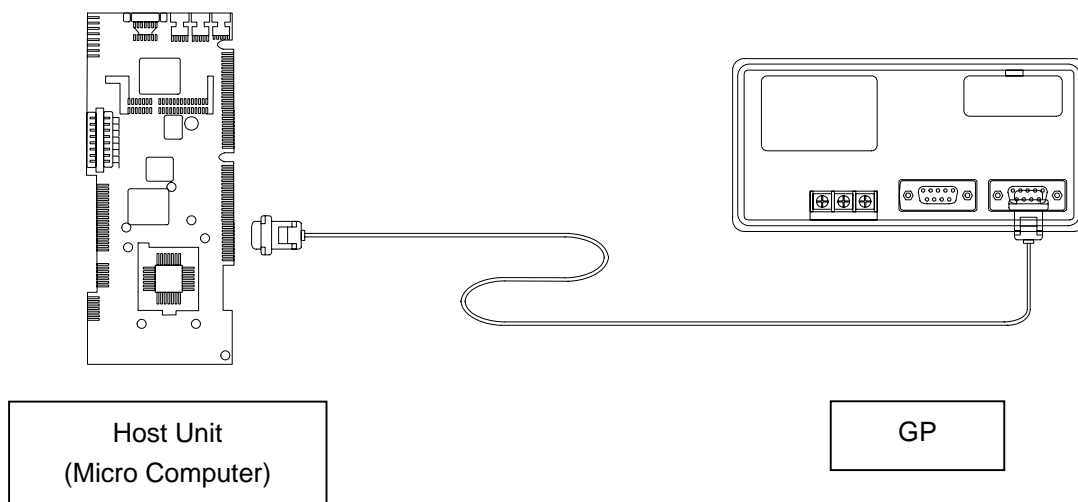
# Universal(General purpose communication) connection

- 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.**

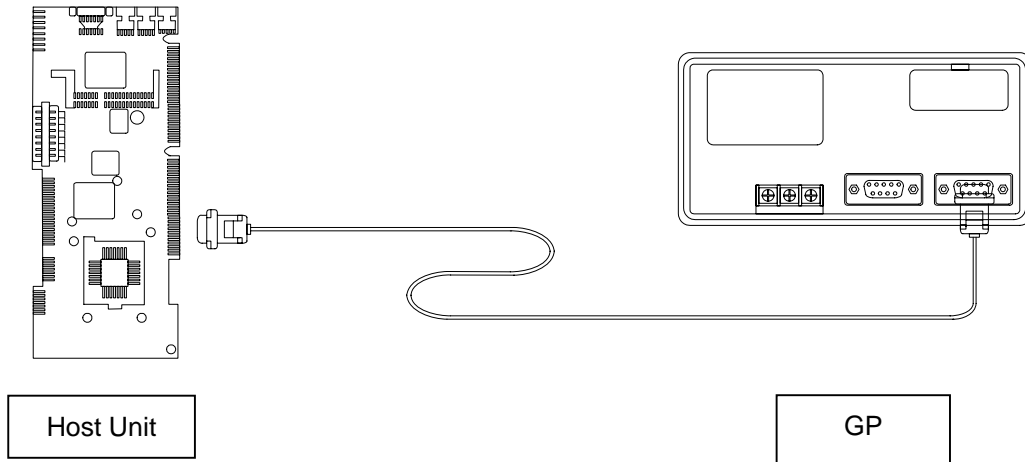


- Refer to the following for Host Unit communication configuration.

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.

The screenshot shows the 'GP Editor' configuration dialog box. It has several sections:

- PLC1 type:** A dropdown menu set to 'UNIVERSAL'.
- GP setting:** Fields for 'GP link device', 'No. of read devices', and 'No. of write devices', all set to '0'.
- PLC2 setting:** A section highlighted with a pink border. It includes:
  - PLC2 group:** A dropdown menu set to 'NO USE'.
  - PLC2 type:** A dropdown menu set to 'NO USE'.
  - PLC2 link device:** A field set to '0'.
  - Station:** A grid of checkboxes for stations 0 through 28. Station 0 is checked, while others are unchecked.

Callouts provide additional information:

- '<Set PLC group 1> Select UNIVERSAL.' points to the 'UNIVERSAL' dropdown in the PLC1 type section.
- '<Set PLC type 1> It is selected as UNIVERSAL by previous set, PLC group 1.' points to the 'UNIVERSAL' dropdown in the PLC1 type section.
- 'It inactivates all items by selecting “NO USE” in PLC group 2.' points to the 'NO USE' dropdown in the PLC2 group section.

#### NOTICE

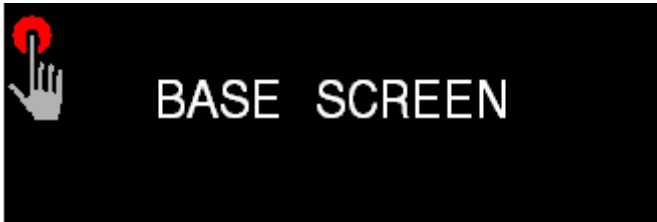
Set the “UNIVERSAL” in GP to use without any additional setup.

## 2.2 GP communication configuration

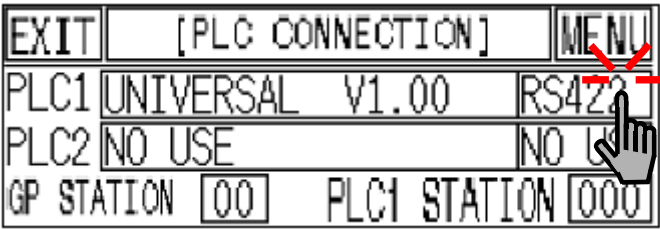
- GP has PLC protocols, "UNIVERSAL" and "MK-200S" basically and user-downloaded PLC configured with data in GP Editor and registered in main PLC group. (See 4.2.2 in Communication manual of common configuration.)

Set PLC1 as "UNIVERSAL" and communication in main device as following.

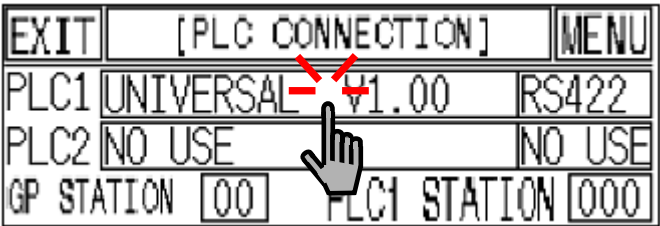
- Produce data and download it from GP Editor.
- Connect into main system of GP by touching top-left point of user screen.



- 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.




- 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.

EXIT	[PLC CONNECTION]	MENU
PLC1	UNIVERSAL V1.00	RS422
PLC2	NO USE	NO USE
GP STATION	00 - PLC1 STATION	000

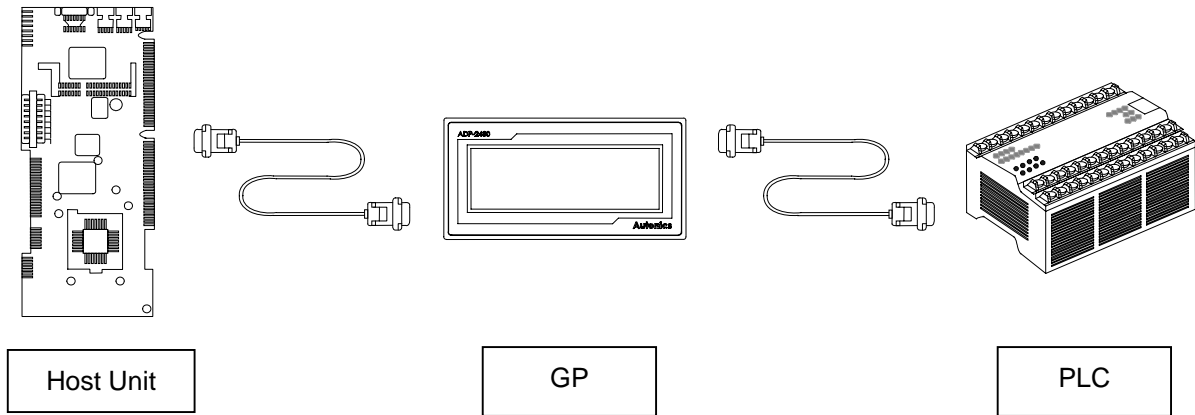


EXIT	[PL		1	CLR
PLC1	UNIVER	0	1	2
PLC2	NO USE	4	5	6
GP STATION	0	8	9	- B S ENT



### 3. 1:1:1 UNIVERSAL COMMUNICATION

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

**GP/PLC Type**

40 X 80)

<Set PLC group 1>  
Select UNIVERSAL.

<Set PLC type 1>  
It is selected as UNIVERSAL by previous, set.

PLC1 type :  
UNIVERSAL UNIVERSAL 0

PLC1-2 link  
Do not check this box.

GP setting  
GP link device : UW 0  
No. of read devices : 0  
No. of write : 0  
Set GP device(UW) to communicate with specified data register of PLC2.

PLC2 setting  
PLC2 group : MITSUBISHI FX  
PLC2 type : FX1S(CPU)  
PLC2 link device : D 0

Station	
0	<input checked="" type="checkbox"/>
1	<input type="checkbox"/>
2	<input type="checkbox"/>
3	<input type="checkbox"/>
4	<input type="checkbox"/>
5	<input type="checkbox"/>
6	<input type="checkbox"/>
7	<input type="checkbox"/>
8	<input type="checkbox"/>
9	<input type="checkbox"/>
10	<input type="checkbox"/>
11	<input type="checkbox"/>
12	<input type="checkbox"/>
13	<input type="checkbox"/>
14	<input type="checkbox"/>
15	<input type="checkbox"/>
16	<input type="checkbox"/>
17	<input type="checkbox"/>
18	<input type="checkbox"/>
19	<input type="checkbox"/>
20	<input type="checkbox"/>
21	<input type="checkbox"/>
22	<input type="checkbox"/>
23	<input type="checkbox"/>
24	<input type="checkbox"/>
25	<input type="checkbox"/>
26	<input type="checkbox"/>
27	<input type="checkbox"/>
28	<input type="checkbox"/>
29	<input type="checkbox"/>
30	<input type="checkbox"/>

Select group, type and address of PLC2.

OK Cancel

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

#### NOTICE

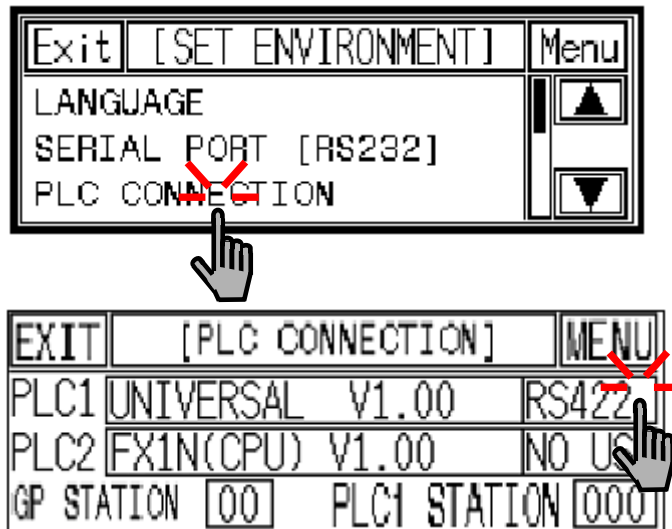
Do not check “PLC1-2 connection.” or it fails to communicate between GP and Host Unit.

### 3.2 GP communication configuration

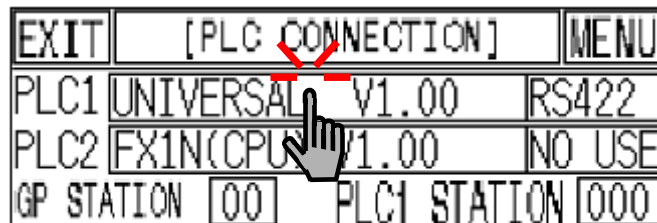
- (1) Program data in GP Editor and download it.
- (2) Connect into main system of GP by touching top-left point of user screen.



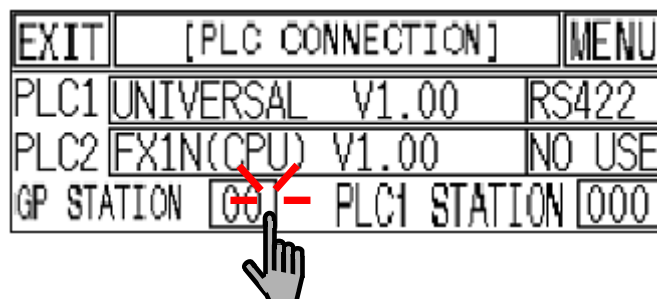
- (3) Check the communication connector status for PLC1 and PLC2 by touching **PLC connection**, [RS422]-[RS232C] are selected alternatively and connection port of PLC2 is reversed by communication configuration of PLC1 and vice versa.



- (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.



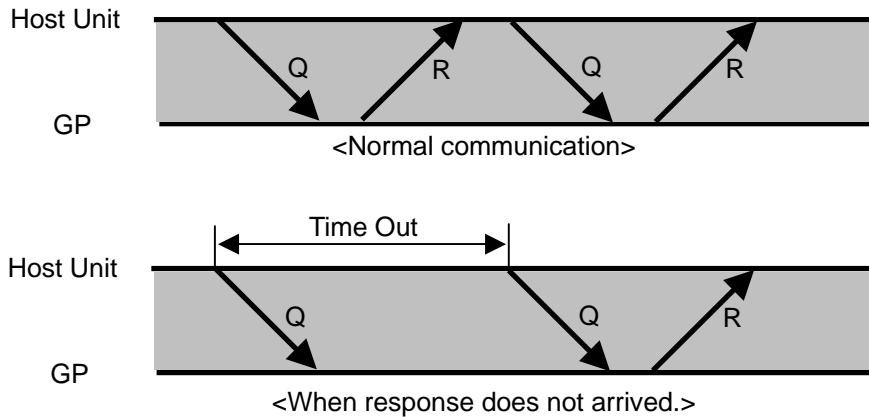
EXIT	[PL			1	CLR
PLC1	UNIVER	0	1	2	3
PLC2	NO USE	4	5	6	7
GP STATION	[C	8	9	-	B S ENT

- (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.

EXIT	[SERIAL PORT]			MENU
CONN	PLC2	B/R	?	
DATA	?	STOP	?	
PARITY	?	F/C	?	

## 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.



※ 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

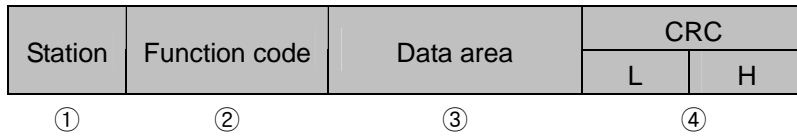
- Universal communication of Autonics GP provide 2 types of functions in Modbus.

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.

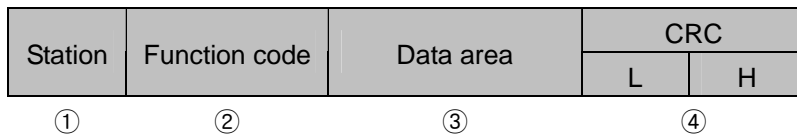
## 4.3 Communication frame

### 4.1.1 Query



- 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



- 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 2byte as (Lower 1byte of CRC) + (Upper 1byte of CRC).

### 4.1.3 Abnormal response



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.

$$100 = \text{Upper (Hex)0x00} + \text{Lower (Hex)0x64}$$

[4] Start address lower byte

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

$$5 = \text{Upper (Hex)0x00} + \text{Lower (Hex)0x05}$$

[6] Number of register in lower byte

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

$$\text{Total number of data to write : 5 word} = 10 \text{ byte. } 10 = (\text{Hex})0x0A$$

[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.

$$100 = \text{Upper (Hex)0x00} + \text{Lower (Hex)0x64}$$

[4] Start address lower byte

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

$$5 = \text{Upper (Hex)0x00} + \text{Lower (Hex)0x05}$$

[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