ADDITIONAL INFORMATION

FANUC Series 0*i*–MODEL D
Modbus/TCP Server function

1. Type of applied technical documents

Name	FANUC FAST Ethernet FANUC FAST Data Server For FANUC Series 0*i*–MODEL D OPERATOR'S MANUAL
Spec.No./Version	B-64414EN/01

2. Summary of change

Group	Name / Outline	New, Add, Correct, Delete	Applicable Date
Basic Function			
Optional Function	Modbus/TCP Server function is added into APPENDIX H.	Add	Immediately
Unit			
Maintenance parts			
Notice			
Correction			
Another			

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H Modbus/TCP Server function

H.1 OVERVIEW

The Server function of Modbus/TCP functions is supported.

NOTE

1 In this function, the client function of Modbus/TCP functions is not supported.

2 The Ethernet function (S707) is necessary to use Modbus/TCP Server function (R968).

Modbus/TCP data model

The following four kinds of data formats are defined as Modbus/TCP data model.

Table name	Object type (Data type)	Type of READ/WRITE
Discrete input	Single bit	READ only
Coils	Single bit	READ-WRITE
Input Registers	16-bit word	READ only
Holding Registers	16-bit word	READ-WRITE

NOTE

1 In FANUC Modbus/TCP Server function, only "Holding Registers" can be used. "Discrete input", Coils", and "Input Registers" cannot be used.

2 "READ" means the input of data from the client, and "WRITE" means the data of output from the client.

Modbus/TCP function code

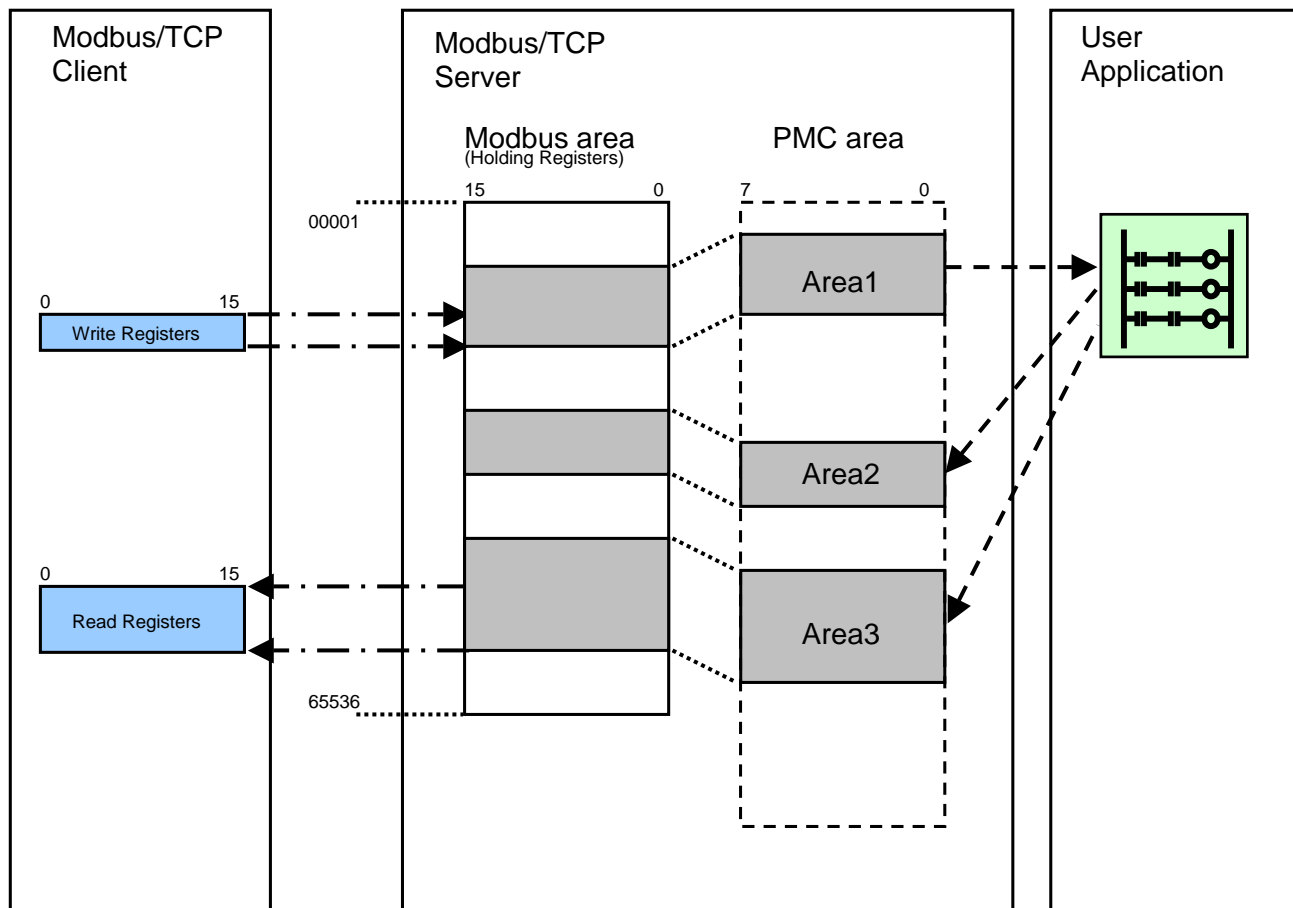In FANUC Modbus/TCP Server function, the following function codes are supported.

Function code name	Code
Read Holding Registers	03h
Write Multiple Registers	10h
Read/Write Multiple Registers	17h

Modbus area (Holding Registers)

In Modbus/TCP Server function, the Modbus area (Holding Registers) of 64K words (128K bytes) is prepared.

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And the Modbus area can be allocated to the PMC area.

As a result, the data accessed from the client device to the Modbus area can be notified to the PMC area, and the user application (Ladder program etc.) can be accessed to the Modbus area through the PMC area.

This allocation can be set up to three areas.

The minimum access unit of Modbus area is "a word" and the range of the address is 1- 65536.

Specification of Modbus/TCP Server function

The specification of FANUC Modbus/TCP Server function is shown in the following.

1 "Automatic TCP connection management" is implemented. This means that user application (such as Ladder program) does not need to take care of TCP connection.

2 "Non-priority connection pool" is implemented. This means that the oldest connection is disconnected when the requests from the multiple clients are received and the connections are full, FANUC Modbus/TCP Server function can receive the requests from the maximum 10 clients at the same time. "Priority connection pool" is not implemented.

3 "Access control service" is not implemented. This means that all of device can be accessed without authorization (user name, or password).

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H.2 SETTING THE Modbus/TCP SERVER FUNCTION

This chapter describes the communication setting for the Modbus/TCP Server function.

Notes on using the Modbus/TCP Server function

> **NOTE**
> 1 The client of Modbus/TCP functions is not supported.
> 2 The number of Modbus/TCP clients that can be connected with one CNC is maximum 10 at the same time. When more than ten connections are attempted, the oldest communication is disconnected.
> 3 Please confirm that there is no problem as the entire system when communicating with the device of the other companies.

H.2.1 SETTING THE Modbus/TCP SERVER FUNCTION

This section describes the setting screen for operating the Modbus/TCP Server function.

Procedure

1 Press function key $\boxed{\diamond}$ SYSTEM .

2 Soft key [ETHBRD] appears. (When soft key does not appear, press the continue key.)

3 Press soft key [ETHBRD] to display the Ethernet Setting screen.

4 Press soft keys [COMMON] and [ModSET], and then enter the parameters.

COMMON screen (BASIC)

Press soft key [COMMON] to display the COMMON screen (BASIC).

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```
ETH_BRD SETTING                    O0000 N00000
          COMMON: Setting[BOARD]
 BASIC
  MAC ADDRESS              00E0E4000001
  IP ADDRESS               192. 168. 0. 100
  SUBNET MASK              255. 255. 255. 0
  ROUTER IP ADDRESS        192. 168. 0. 253




                                      1／ 2

 A)_
                                S    0 T0000
 MDI  **** *** ***  │ 12:00:00 │
 (│COMMON  FOCAS2  FTPTRNS│        │(OPRT) │ +
```

COMMON screen (BASIC)

Setting item

Item	Description
IP ADDRESS	Specify the IP address of the Fast Ethernet. (Example of specification format "192.168.0.100")
SUBNET MASK	Specify a mask address for the IP addresses of the network. (Example of specification format "255.255.255.0")
ROUTER IP ADDRESS	Specify the IP address of the router. Specify this item when the network contains a router. (Example of specification format "192.168.0.253")

Display item

Item	Description
MAC ADDRESS	MAC address of the Fast Ethernet

Modbus SERVER screens

Press soft key [ModSET] to display the Modbus SERVER screen.

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```
ETH_BRD SETTING                    O0000 N00000
          Modbus SERVER:Setting[BOARD]
 BASIC
 PORT NUMBER (TCP)                        502

 OPTION1
   RSV  RSV  RSV  RSV  RSV  RSV  RSV  BCE
   0    0    0    0    0    0    0    0

 STATUS  PMC  ADDRESS                   R0100




                                        1/ 4
 A) _

                                S     0 T0000
 MDI    **** *** ***    12:00:00
 ⟨        ModSET  ModMNT           (OPRT)  +
```

Modbus/TCP Server screen 1 (BASIC)

```
ETH_BRD SETTING                    O0000 N00000
          Modbus SERVER:Setting[BOARD]
 AREA1
 DATA Modbus ADDRESS                       1

 DATA PMC  ADDRESS                      R0124

 DATA SIZE(WORD)                          100




                                        2/ 4
 A) ^

                                S     0 T0000
 MDI    **** *** ***    12:00:00
 ⟨        ModSET  ModMNT           (OPRT)  +
```

Modbus/TCP Server screen 2 (AREA1-3)

Setting item

Item	Description
PORT NUMBER (TCP)	Specify the port number for using Modbus/TCP Server function. The input range is from 0 to 65535. Usually, set 502. When 0 is set, the Modbus/TCP Server function is not operated.

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Item	Description
OPTION1	Bit 0 : BCE Byte arrangement in the Modbus area is assumed to be 0 : a little endian 1 : a big endian Bit 1 – 7 : RSV Be sure to set 0.
STATUS PMC ADDRESS	The top address in the E/R area of PMC that stores status is set. The setting range depends on an effective PMC area. This status is occupied by one byte. Specify a space (blank) when not using this status. In this case, "---" is displayed.
DATA Modbus ADDRESS	The top address in Modbus area (Holding registers) where I/O is exchanged for the Modbus/TCP client is set. The setting range is 1 – 65536.
DATA PMC ADDRESS	The top address in E/R/D area of PMC that exchanges I/O for the Modbus/TCP client is set. The setting range depends on an effective PMC area. Only the even-numbered address can be set. Specify a space (blank) when not exchanging I/O. In this case, "---" is displayed.
DATA SIZE	The data size (unit: word size) that exchanges I/O for the Modbus/TCP client is set. The setting range depends on an effective PMC area. Set 0 when not exchanging I/O.

NOTE

1 Be careful not to cause an overlap between an area such as the input data area of the user program and a PMC area used for other purposes.

2 This parameter is backed up and stored with Fast Ethernet.
When backing up or storing the parameter, please execute it by the common screen of Fast Ethernet.

3 The changed parameter is effective by turning the power off and on.

4 Please set not to overlap the Modbus area in area 1-3. When the overlapping setting is done, operation is different in READ/WRITE as follows.
In case of READ, the data in area n (n is the biggest number) is read.
In case of WRITE, the same data as all the overlapping areas is written.

Byte arrangement of Modbus area (Holding Registers)

The byte arrangement in Modbus area is normally a little endian.

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On Ethernet line | Modbus area (Holding Registers) | PMC area

On Ethernet line
0 ... 15
+00	12h	34h
+01	56h	78h

Modbus area (Holding Registers)
15 ... 0
+00	34h	12h
+01	78h	56h

PMC area
7 ... 0
+00	34h
+01	12h
+02	78h
+03	56h

When Bit0 of OPTION1 is "1", byte arrangement of data becomes a big endian.

On Ethernet line
0 ... 15
| +00 | 12h | 34h |
| +01 | 56h | 78h |

Modbus area (Holding Registers)
0 ... 15
| +00 | 12h | 34h |
| +01 | 56h | 78h |

PMC area
7 ... 0
+00	12h
+01	34h
+02	56h
+03	78h

Status

The status detected by Modbus/TCP Server function

STATUS PMC ADDRESS	STATUS							
	Bit7	Bit6	Bit5	Bit4	Bit3	Bit2	Bit1	Bit0

Modbus status

Bit0	: The serious error was detected.
Bit1 - Bit5	: Reserved.
Bit6	: The initialization was completed.
Bit7	: Under communicating with one Modbus/TCP client or more.

H.2.2   MAINTENANCE SCREENS OF Modbus/TCP SERVER FUNCTION

The connection status of the client of Modbus/TCP can be confirmed on this screen.

Procedure

1 Press function key [SYSTEM] .

2 Soft key [ETHBRD] appears. (When soft key does not appear, press the continue key.)

3 Press soft key [ETHBRD] to display the Ethernet Setting screen.

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4   Press soft key [ModMNT], and then Modbus SERVER MAINTENANCE screen (CLIENT LIST) is displayed.

```
ETH_BRD SETTING                    O0000 N00000
    Modbus  SERVER  MAINTENANCE  [BOARD]
CLIENT LIST
NO. CLIENT                           TIME
  1 192. 168. 0. 200               000:05:30
  2 192. 168. 0. 201               000:00:22
  3
  4
  5
  6
  7
  8
  9
 10

A ) _

                                 S       0 T0000

MDI   ****  ***  ***  |    12:00:00  |
(            ModSET  ModMNT                    +
```

Modbus/TCP SERVER MAINTENANCE screen (CLIENT LIST)

Display item

Item	Description
CLIENT	IP address of the Modbus/TCP client communicating with this Modbus/TCP Server is displayed. (Example of display form "192.168.0.200") It is displayed in order of communicating with this Server.
TIME	The connecting time of the Modbus/TCP client communicating with this Server is displayed. The displayed time is updated automatically. The display form displays hour (hhh), minute (mm) and second (ss) in the form of "hhh:mm:ss". When the maximum value is exceeded by "999: 59:59", the maximum value is not updated from "999: 59:59".

H.2.3   LOG SCREEN OF Modbus/TCP SERVER FUNCTION

The communication log related to Modbus/TCP Server function is displayed.

LOG screen for Modbus/TCP Server function

Procedure

1   Press function key ⌨ ? MESSAGE .

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2   Press soft key [BRD LOG] to display the Ethernet log screen. (When soft key does not appear, press the continue key.)

3   Press soft key [Modbus], and then the information related to the Modbus/TCP Server function is displayed.

```
ETH_BRD LOG                        O0000 N00000
              ETHERNET LOG [BOARD]
Modbus SERVER
E-041B Frame reception failed (TCP) [2
60]                          Dec.09 11:22:22




                                    PAGE: 1/30
A) _
                                S    0 T0000
MDI   **** *** ***    | 12:00:00 |
(|Modbus    |         |         |       |(OPRT) |+|
```

Modbus/TCP LOG screen

The latest log information is displayed at the top of the screen. At the right end of a log item, the occurrence date and time of the log item is indicated. Date and time data is indicated in the format "MMM.DD hh:mm:ss", where MMM represents a month, DD represents a day, hh represents hour, mm represents minute, and ss represents second.

The top item in the example above indicates "11:22:22 on December 9".

To clear the log information, press soft key [(OPRT)] then soft key [CLEAR].

> **NOTE**
>   The Modbus/TCP Server log information is stored in volatile memory and it is lost
>   when the power of CNC is turned off. Check the log information when an error
>   occurs.

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The following lists major log message:

Error Code	Log message	Meaning and action to be taken
E-0B47	TCP port number of Modbus/TCP Server is wrong	A value outside the valid setting range might be set.
E-0B48	Status PMC address of Modbus/TCP Server is out of range	A value outside the valid setting range might be set.
E-0B49	Data PMC address of Modbus/TCP Server is wrong	The odd address might be set.
E-0B4A	Data PMC address of Modbus/TCP Server is out of range	A value outside the valid setting range might be set.
E-0B4B	Modbus area of Modbus/TCP Server is out of range	A value outside the valid setting range might be set.
E-1001	All Modbus communication paths are busy	The communication destination (Modbus/TCP client) exceeded 10 nodes. For a new communication destination (Modbus/TCP client), the oldest connection is disconnected.
E-1003	Version number of Modbus packet is wrong	Please specify a correct version number according to the protocol of Modbus/TCP.
E-1004	Length of Modbus packet is wrong	Please specify a correct size according to the protocol of Modbus/TCP.
E-100B	Function code of Modbus packet is wrong	The specified function code might not be supported. Please refer to "1. Modbus/TCP SERVER FUNCTION" about the supported function code.
E-1015 E-1016	Data address of Modbus packet is wrong	Please specify a correct data address according to the protocol of Modbus/TCP.
E-1017 E-1018 E-1019	Data value of Modbus packet is wrong	Please specify a correct data value according to the protocol of Modbus/TCP.
E-XXXX	(No message)	Internal error Report the error number to FANUC.

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