FBR-100AN / FBR-100 Modbus TCP Activation: Supported CNC Devices and Collectable Information

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When it **Absolutely Must** Connect

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1. Overview

This document describes what CNC devices are supported and what data can be collected by Modbus TCP Activation for protocol converters for CNC machine tools “FBR-100AN (wireless model) / FBR-100 (wired model)” (referred to as "FBR converter" below).

2. Modbus TCP Activation Specifications

[Modbus TCP Activation Specifications]

- FBR converter runs in Modbus TCP slave mode.
- FBR converter obtains the operation data of a CNC device from the host software or device being the Modbus TCP master.
- A single FBR converter connects to one CNC device.
- The CNC device program information, macro variables, and the PMC information can be collected.[1]
- Modbus TCP works in the exclusive mode with FBR converter’s default MTConnect communication.

3. Supported CNC Devices

FBR converter's Modbus TCP Activation has been confirmed compatible with the following CNC devices.

Maker	How to Connect	Model	FBR Converter Monitoring Data
FANUC	LAN	30i-MODEL A, 30i-MODEL B 31i-MODEL A, 31i-MODEL B 31i-MODEL A5, 31i-MODEL B5 32i-MODEL A, 32i-MODEL B 35i-MODEL B 0i-M/T MODEL F, 0i-M/T MODEL D 16i/18i/21i LAN series	See Chapter "5. Collectable Information with FBR Converter Modbus TCP Activation" in this document.

Activation / Main function	Standard	For Brother Industries	For Muratec	For Shibaura	OPC UA	Modbus TCP
Supported CNC device	FANUC CNC	Brother Industries CNC	Muratec machines & dedicated system	Shibaura TOSNUC CNC	FANUC CNC	FANUC CNC
RS-232C/DPRNT communications[2]	Supported	N/A	N/A	N/A	N/A	N/A
PATLITE AirGRID® Link	Supported	N/A	N/A	N/A	N/A	N/A
Host system communication protocol	MTConnect	MTConnect	MTConnect	OPC UA/umati	OPC UA/umati	Modbus TCP
Number of supported CNCs	Up to 3	Up to 3	Up to 1	Up to 3	Up to 3	Up to 1

Note: Supported CNC devices/equipment and functions vary depending on FBR converter and its activation programs (optional).

[1] See Chapter "5. Collectable Information with FBR Converter Modbus TCP Activation" in this document.

[2] FBR converter's RS-232C/DPRNT communication functions are compatible with Mitsubishi Electric's CNC M600/M700/M800 series.

4. Use of FBR Converter Modbus TCP Activation

4.1. Enable Modbus TCP Activation

- This activation function is a paid option and must be purchased in addition to the FBR converter main unit.
- Refer to the setup guide of FBR converter and register the activation key (alphanumeric characters) you purchased.
- Restart FBR converter after registering the activation key to enable the Modbus TCP settings.

4.2. Modbus TCP Connection Diagram

FBR converter serves as a Modbus TCP slave. Use the device together with a Modbus TCP master.

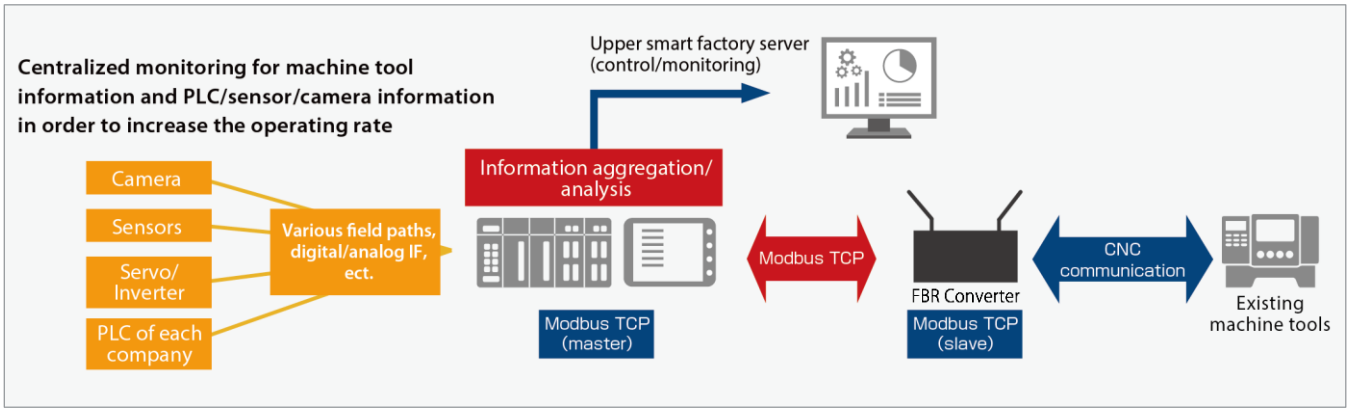
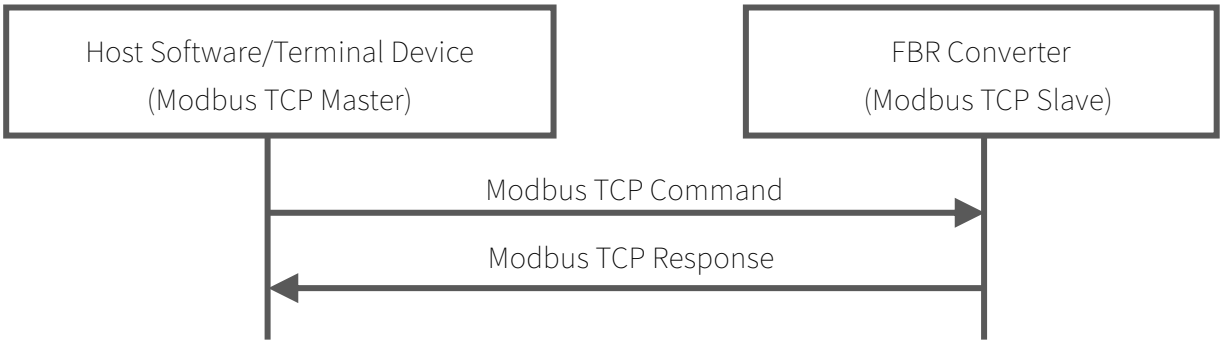


Figure 1: System Configuration for Modbus TCP

4.3. Modbus TCP Communication

The following diagram shows the communication sequence between FBR converter's Modbus TCP slave and the host Modbus TCP master.



- A single FBR converter, a slave unit in Modbus TCP, can connect to a single Modbus TCP master unit.
- The Modbus TCP master can specify up to 125 words, which is the max data size for read and is compliant with the Modbus specifications.
- The supported commands are Function Code 0x03 (holding register) and 0x04 (read of the input register). See Appendix "Collectable CNC Device Information with FBR Converter Modbus TCP Activation" for more details about Function Code.
- The exception code 0x03 (irregular data) will return for the data exceeding 125 words or 0x01 (exception code) for other commands such as write.
- ASCII code is used for any character string. A numeric value is also returned in ASCII code. The PMC information and tool offset are returned in numeric values.
- TCP Keep Alive can be effective under the following settings, which cannot be changed.
  - ✓ Transmission 6 times, transmission interval 10 seconds, time to transmission 60 seconds

4.4. Modbus TCP Settings

[Basic Settings]

- Use FBR converter's setting web page to make the settings. For more details, see the PDF product manual.
- Register Modbus TCP communication's port number, and a CNC device's IP address and the communication port number. Select any CNC information you wish to collect and click the setting update button. The settings will take effect after FBR converter restarts.
- Only one CNC device can be registered to FBR converter.
- The basic settings of Modbus TCP communication are the following three:
  - ✓ Modbus TCP port number: Default (502)
  - ✓ CNC IP address: Default (0.0.0.0)
  - ✓ CNC port number: Default (8193)
- You can select what CNC device information to collect and change the interval (milliseconds) under the CNC information collection settings.

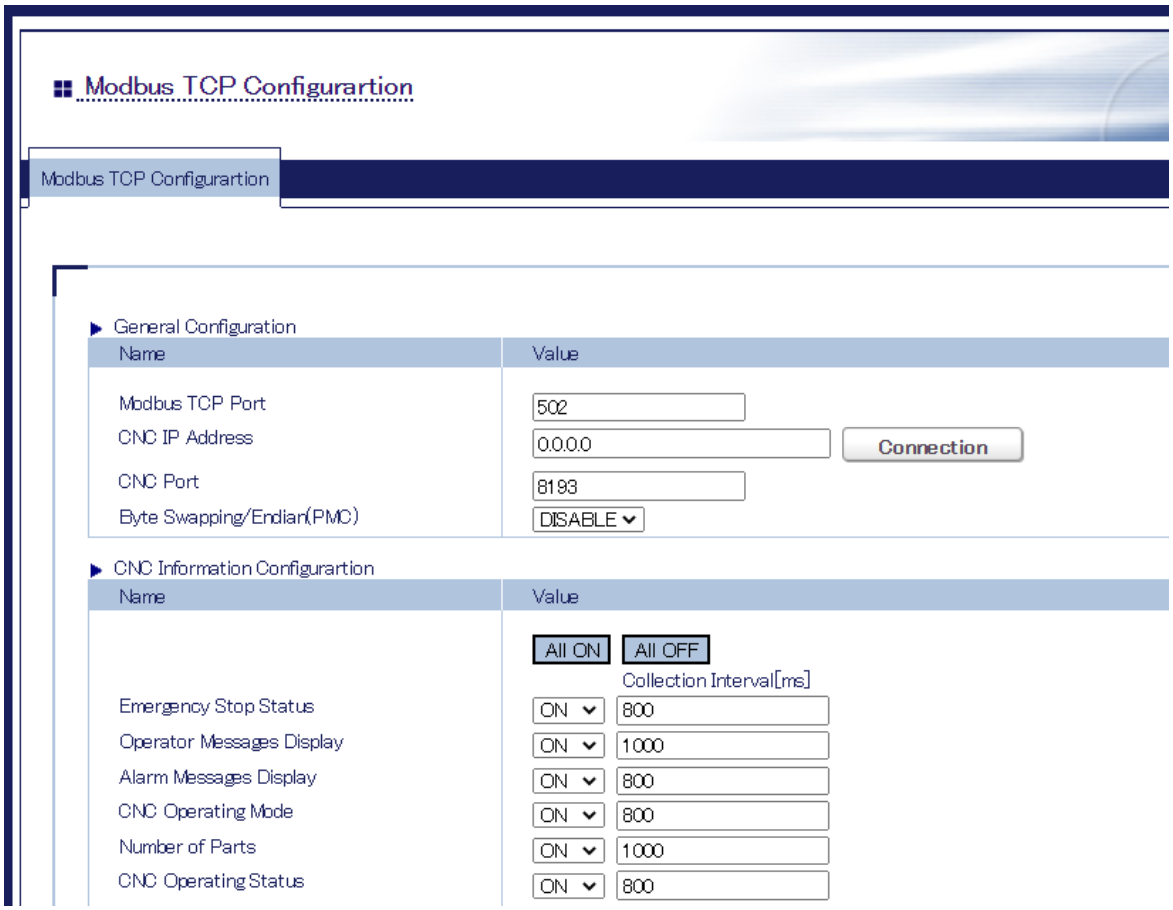


Figure 2: FBR Converter's Setting Web Page (General Configuration)

[Endianness]

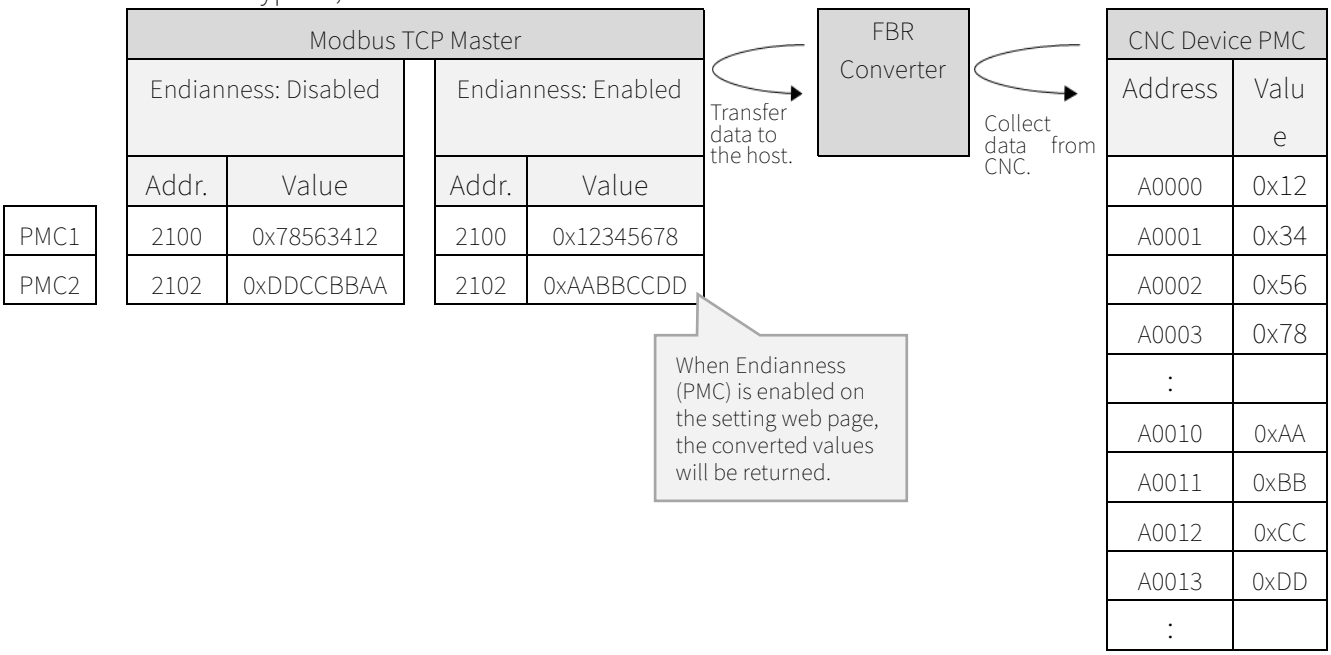
- Modbus TCP processes data by word (2 bytes). FBR Converter converts a character string into Modbus TCP data per byte.
- Modbus TCP uses big-endian byte order. Only the data in the PMC area is read in numerical little-endian format. You can enable/disable (default) PMC little-endian conversion on the FBR Converter's setting web page.

[Example]

The following diagram shows an example of data collection from PMC in a CNC device. FBR converter obtains the value of two words from the PMC area, swaps the bytes (endianness), and transfers the data to the Modbus TCP master.

Example) Giving the following values to collect data from PMC:

- PMC1 Address Type: A, Address: 0
- PMC2 Address Type: A, Address: 10



Go to FBR Converter's web setting page and change the PMC endianness function when Modbus TCP master device/software cannot get the CNC device's values.

The data is read as follows when the parameter is set to:

- Disable (default): Little-endian
- Enable: Big-endian.

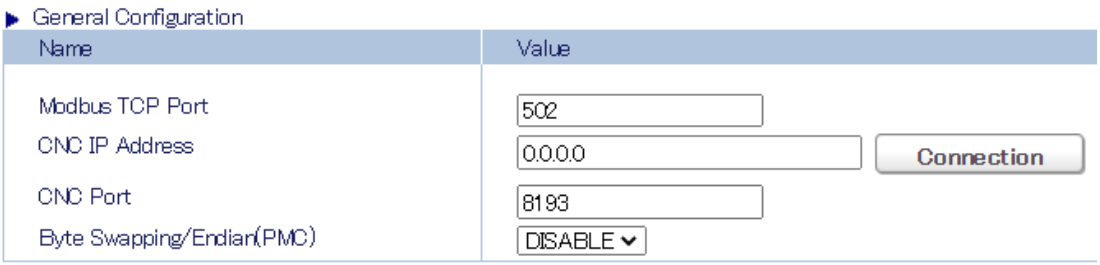


Figure 3: FBR Converter's Setting Web Page (PMC Data Endianness)

[Batch Data Processing]

This function gathers specific CNC data values at once in the following three categories.

- PMC :Up to 3000 Bytes
- Macro :Up to 500 variables
- Tool Offset (TYPE A or B) : Up to 200 values

Note 1) This is only available with the FBR converter firmware version 1.4.4 or later.

Note 2) The tool offset information gathered by the FBR converter requires unit conversion in the host system based on the CNC device's machine parameters to match the information on the CNC screen (e.g. input of linear axes in millimeters or inches and rotation of axes). For more details, see the manuals of your machine tool or CNC device.

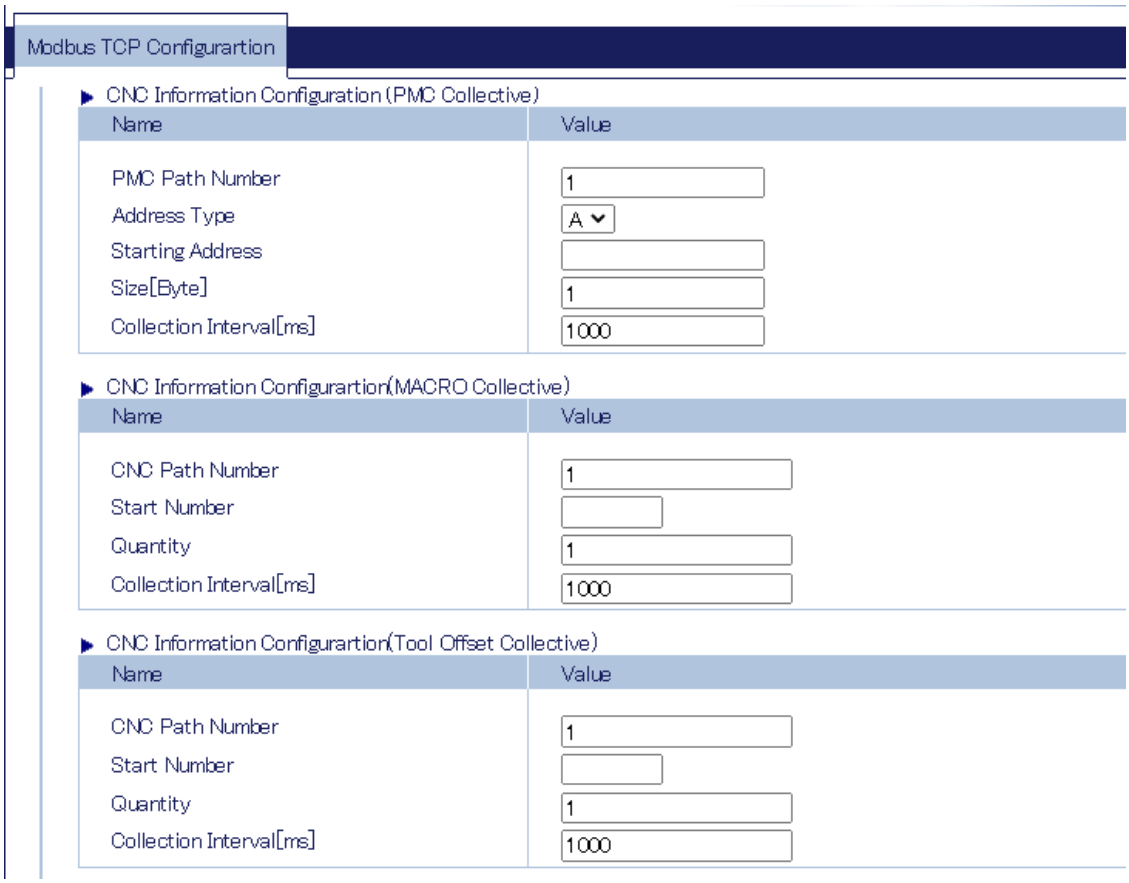


Figure 4: FBR Converter's Web Setting Page (Batch Processing)

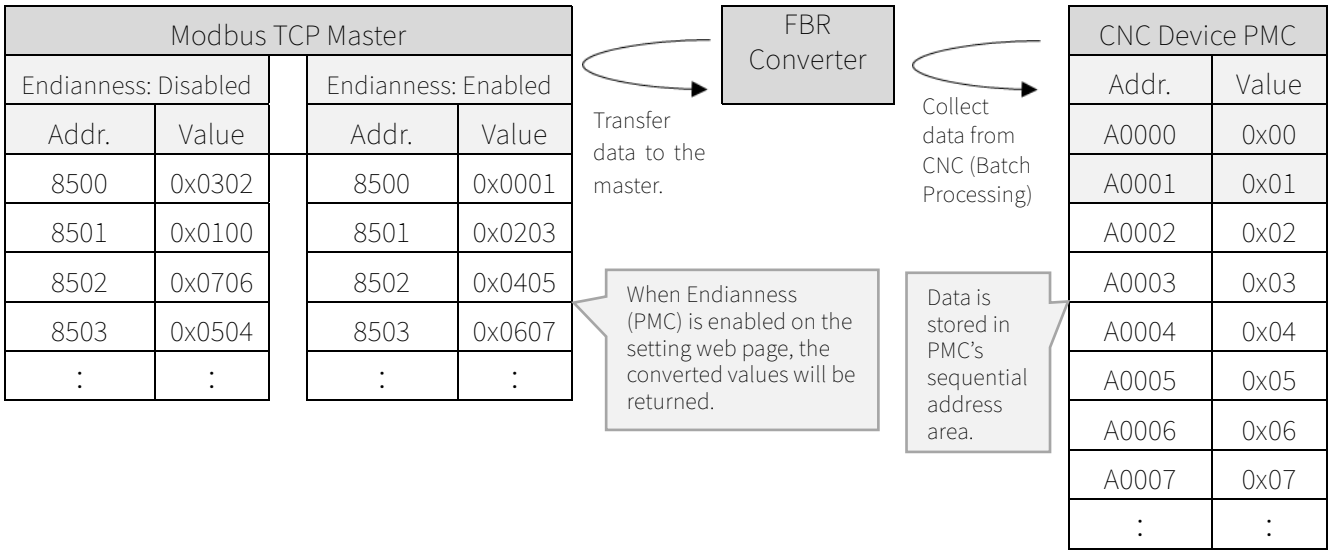
[Point Noted]

- The max size of gathering PMC data is 3000 bytes (750 x 4 bytes). Modbus TCP communications, due to the specifications, must be made 12 times to collect the data of 3000 bytes (1500 words).
- The size must be a multiple of 4, otherwise, a setting error will occur.

Note 3) The CNC device's PMC must secure an area that stores the data addresses in serial order for batch data processing. Inquire your machine tool maker about the storage.

Note 4) Modbus TCP addresses for PMC batch processing are available with the FBR converter's firmware version 1.4.3 or older when CNC path/channel 5 is not in use, but NOT with the firmware ver. 1.4.4 or later. See the Appendix: Address list.

The following diagram shows an example of data collection from PMC in a CNC device. FBR converter obtains the values from the PMC area at once and transfers the data to the Modbus TCP master.



[Tool Offset Batch Configuration]

This function supports TYPE A and TYPE B tool offset functions for FANUC CNC devices. There are two types of tool offset information: Machining Center and Lathe. The FBR Converter reads the information of the connected CNC device and automatically identifies whether it belongs to the Machining Center or Lathe category. The Modbus TCP status on the FBR Converter's web setting page indicates the category of the monitoring device.

Note 5) To match the tool compensation information collected by the FBR Converter with the information displayed on the CNC screen, the host system must convert the information based on the machine parameter settings on the CNC device. (This applies to units such as millimeter/inch input of linear axes and units of rotating axis information). Please refer to the manuals for the processing machine and the CNC device.

Note 6) TYPE A and TYPE B are specifications of the CNC's tool offset function. To determine which offset function your monitoring CNC device uses, please refer to the manuals of your machine tool or contact the manufacturer. Note that TYPE B can be used with FBR Converter firmware version 1.5.1 or later.

[Modbus TCP Status]

You can look at the following information on the setting web page of FBR converter. See the PDF product manual for more details on the web page.

- ✓ CNC series (version)
- ✓ Number of PMC paths/channels
- ✓ Number of CNC paths/channels
- ✓ Status (shows the CNC communication status, error codes and their meaning when a communication error occurs, and the Help screen.)

Determine the category by examining the last two characters of the Series Name (Version).

- M (Machining Center), MM (Machining Center: two channels control)
- T (Lathe), TT (Lathe: 2/3 channel control), MT (Lathe: compound processing function)
- P (Punch Press), L (Laser), W (Wire cut) * FBR converter does not support P, L, and W.

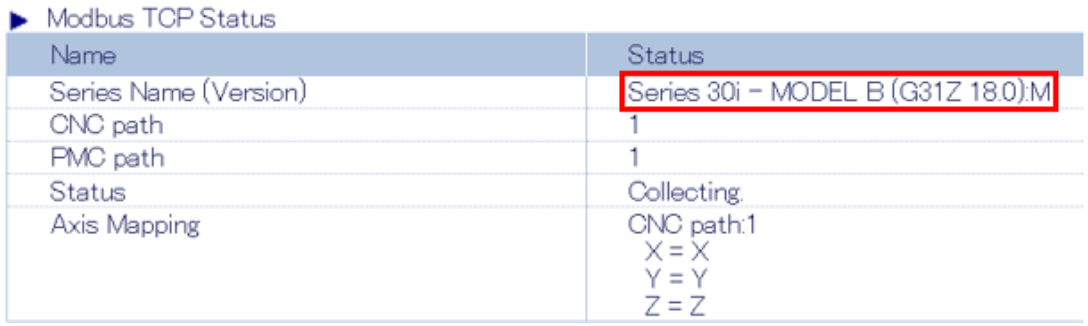


Figure 5：FBR Converter's Web Setup page (Modbus TCP Status)

5. Collectable Information with FBR Converter Modbus TCP Activation

The information listed in Appendix can be collected by connecting FBR converter and a supported CNC device explained in this document.

For more details of the information, see the Appendix in this document.

6. Operation Note

- Return values: when CNC data acquisition is OFF for particular information
  FBR converter returns the following values to the Modbus TCP server.
  - Alarm #1 to #32 : Empty
  - PMC1 to PMC20 : 0
  - Others : UNAVAILABLE

- Addresses out of the range
  When FBR converter receives an address out of the range, it will return an exception code 0x02 (Illegal address).

- Commands for un-supported code
  FBR converter returns an exceptional code 0x01 (illegal code).

- Functions available with specific machine tools
  - Spindle speed monitoring change
    The machine tool manufacturer's CNC device setting may not allow the FBR converter to collect data with the default setting. This function changes settings for data collection and applies to all the spindles that exist.
    - Setting Page URL: http://*(FBR Converter's IP Address)*/option.htm?lang=eng

Note7) This function is available with the FBR Converter's firmware ver. 1.4.4 or later.

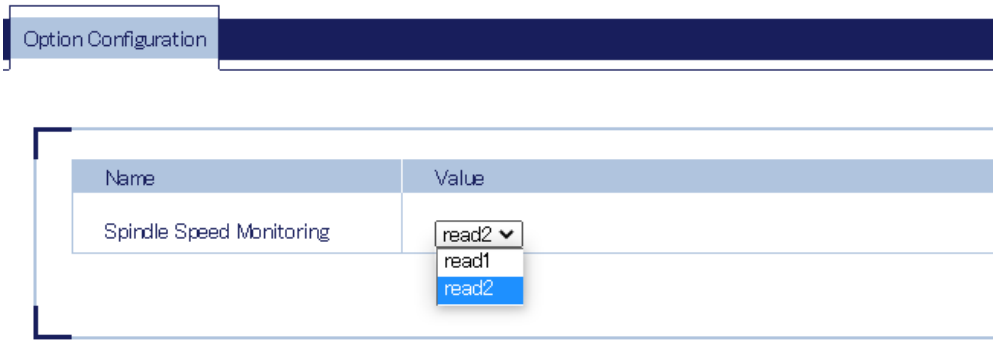


Figure 6: FBR Converter's Web Setting Page (Optional Setting)

- Cycle to get information from CNC device
  - It can be manually set by millisecond (ms).
  - The recommended cycle is per between 800 ms and 1,000 ms due to the communication loads on the CNC device.
  - FBR converter may not collect the information in the specified cycle (communication delay) because of the number of collecting CNC information categories, the communication loads of the CNC device, or the network environment. If this is the case, check and change your network environment (for example, try to use a wired LAN) or reduce the number of collecting CNC information categories. You can choose CNC information categories by changing each setting (ON/OFF) as mentioned in "4.4 Modbus TCP Settings".

- Time Setting
  When the NTP (time setting) client of the FBR Converter is enabled, the Modbus TCP function will start after time synchronization with the NTP server. If the time does not synchronize with the NTP server within 120 seconds after the FBR Converter starts up, the Modbus TCP function will start without waiting for time synchronization.

  - If the NTP server cannot be connected, the FBR Converter will attempt to reconnect every 60 seconds.
  - When the FBR converter is powered by the processing machine, turning off the machine power will also turn off the FBR Converter. In such cases, Modbus TCP may be slow to start collecting operation information after the power is restored. If this occurs, please check the NTP settings and the factory's network connection.

- Disabling Modbus TCP Activation
  - You can disable it by using FBR converter's DIP switch as explained in the setup guide. (Restart FBR converter after the change.)
  - Although the Activation is disabled, you can establish the default MTConnect communications.
  - FBR converter will keep the setting values in the Activation mode, even though the Activation is disabled and then enabled again.[3]

- How to check CNC device's communication settings
  In order to set the CNC device's network information (IP addresses and communication ports) on FBR converter, go through the following steps to find the necessary information.

[3] To initialize the settings in the Activation mode, refer to the PDF manual and go to FBR converter's web setting page.

FANUC CNC Devices:

- Press the [SYSTEM] key on the control panel of the CNC device. -> Press the soft key [EMBED PORT]. -> Press the soft key [COMMON] -> Find its IP address and subnet mask.
- Press the soft key [FOCAS] -> Find the TCP port number. It is typically 8193, but is not always assigned.

Note 8) To connect FBR converter with FANUC fast Ethernet board, press [ETHER BOARD] instead of [EMBED PORT].

Note 9) When no IP address, subnet mask or port number is assigned, set up the CNC device according to the manual. CNC devices usually require a restart (power OFF/ON) to apply changes.

- Modbus TCP simulator mode

FBR converters lent by system integrators or distributors as samples are sometimes set in Modbus TCP simulator mode. FBR converters in this mode do not gather data from CNC devices. The firmware version 1.4.4 or later shows the following message on the Modbus TCP Status webpage. If you want to have the FBR converter get data, please request your system integrator or distributor to disable the simulator mode (set to OFF).

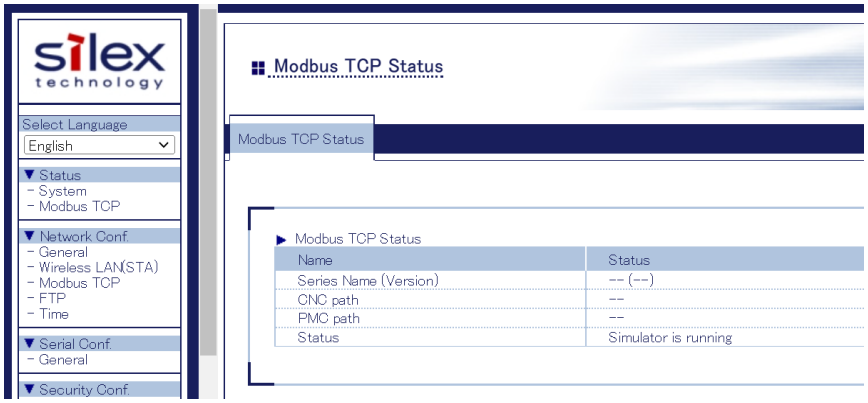


Figure 7: FBR Converter's Web Setting Page (Simulator Mode Message)

- How to check CNC information with FBR converter

  The gathered CNC information will be checked with the host Modbus TCP master device or PC application in Modbus TCP communications. If you want to check the CNC information temporarily with an FBR converter separately for on-site installation evaluation, upgrade the firmware version to ver. 1.4.4 or later to see the information on the web page.

  How to check the CNC information:

  - Step 1: Log in to the FBR converter's webpage and enter the following URL in your web browser's address bar.
    http://(FBR converter's IP address)/mtconnect_start.htm
  - Step 2: Click the "Confirm" button on the webpage and then the link to the CNC information page.

  The web page shows the CNC information converted into text in MTConnect format. For details, see the MTConnect application note.

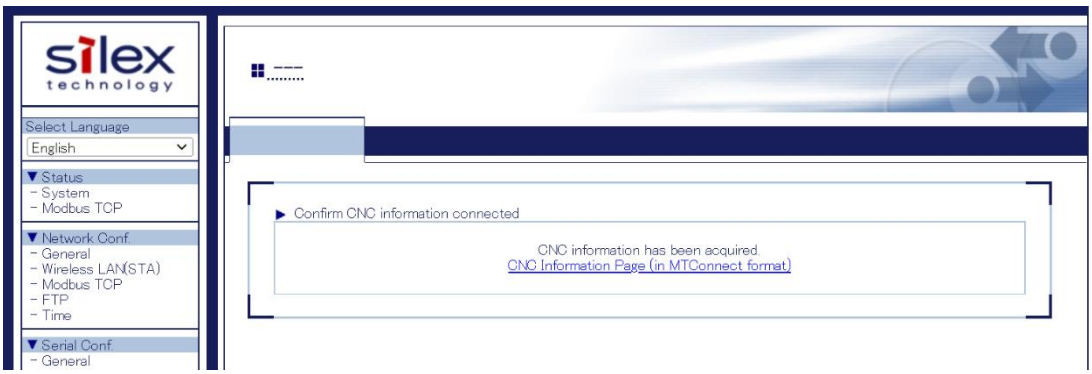


Figure 8: FBR Converter's Web Setting Page (Link to CNC Information)

- How to Obtain Axis Information

  To collect information from each axis using Modbus TCP, register the Modbus TCP address with the Modbus master according to the axis names listed in the Appendix. In the FBR setup web page, under Status > Modbus TCP, check which axis of the machine tool is assigned to which axis name of Modbus TCP.

Revision History

Ver.	Revision	Date
AN20210901	New issue	Sep 1, 2021
AN20210901XA	Added CNC information configurations on FBR-100AN	Sep 13, 2021
AN20210901XB	・ Included FBR-100 wired LAN model. ・ 4.3. Modbus TCP Communication: Added an example of PMC data acquisition from CNC machine. ・ 5. Collectable Information with FBR Converter Modbus TCP Activation: Added more information that can be monitored with the latest firmware ver. 1.4.3 and more remarks in the Appendix. ・ 6. Operation Note: Added the following: ➢ Values to be returned when FBR converter's CNC data acquisition is OFF for specific information. ➢ How to find FANUC CNC devices' IP address and communication port number.	Feb 09, 2022
AN20210901XC	・ 4.4 Modbus TCP Settings: Added the PMC collective processing function. ・ Added some restrictions to " Appendix: Collectable Information with FBR Converter Modbus TCP Activation.	Mar 22, 2022
AN20210901XD	Added the following explanations of new functionality available with the firmware ver. 1.4.4: 4.4 Modbus TCP Settings ・ [Endianness] ・ [Batch Processing] ・ [Points Noted] 6. Operation Note ・ Commands for un-supported code ・ Functions available with specific machine tools ・ Modbus TCP simulator mode ・ How to check CNC information with FBR converter	Jan 16, 2023
AN20210901XE	Added the following descriptions along with the new functions in the firmware ver.1.5.0. 3. Supported CNC Devices ・ Shibaura TOSNUC Activation 6. Operation Note ・ How to Obtain Axis Information	Mar 15, 2024

AN20210901XF	Added the following descriptions along with new functions in the firmware ver. 1.5.1. 4.4 Modbus TCP Settings ・Tool offset batch setting ・CNC series name for Modbus TCP Status 6. Operation Note ・ Time setting Appendix: List of Information Added the following: ・ Explanation for CNC status and operation mode ・ Tool offset to batch configuration	May 26, 2025

Appendix: Collectable CNC Device Information with FBR-100AN/FBR-100 ModbusTCP Activation

● Address Map of CNC Device Basic Information

Can be collected by specifying ModbusTCP Function code 0x04 (input register).

#	CNC Information	Address	# of words (2 Bytes)	Value to be stored	Frequency (Default)	Remarks
1	CNC Series	0	64	Character string	Only at boot-up	Model information of the CNC device
2	Number of PMC paths/channels	64	8	Character string (integer)	Only at boot-up	How many PMC paths/channels exist.
3	Number of CNC paths/channels	72	8	Character string (integer)	Only at boot-up	How many CNC paths/channels exist. (Generally, same as the number of spindles)
4	Status	80	8	AVAILABLE*1 UNAVAILABLE*2	800 ms	Showing communications are dead or alive.
5	All Servo and Spindle power consumption (0.001kWh)	88	8	Character string (integer)	5000 ms	Integrated value of the power of all the servos and spindles. This will visualize all the power consumed by the machine tools as an approximation, and can be used to check CO2 emissions/carbon footprints. Note: This value is only obtained from 30i/0i series.

*1: It shows that the information is being collected from the CNC device.
*2: The exception code 0x06 (Slave Busy) is returned as a response for UNAVAILABLE.

● Address Map of CNC Device Information

Can be collected by specifying ModbusTCP Function code 0x04 (input register).
According to "Address Map of CNC Device Basic Information" above, the information can be collected:
- When the Status is AVAILABLE.
- Per CNC path/channel.

#	CNC Information	Address	# of words (2 Bytes)	Value to be stored	Remarks
1	CNC path/channel 1	1000	1500	Refer to "CNC Detailed Information" below.	Modbus TCP master can specify up to 125 words, which is the max data size for read compliant with the Modbus specifications. (1500 words cannot be read at once.) When CNC path/channel 5 is not in use, its address can be exclusively used for PMC batch processing. Use the batch process function to collect more than 20 pieces of PMC information (up to 750 pieces).
2	CNC path/channel 2	2500	1500		
3	CNC path/channel 3	4000	1500		
4	CNC path/channel 4	5500	1500		
5	CNC path/channel 5 (Can be used for PMC batch processing when not in use.)	7000	1500		

● Address Map of CNC Device Detailed Information

Can be collected by specifying ModbusTCP Function code 0x04 (input register).
- The information listed below can be collected per CNC path/channel. The addresses in this list are for CNC path/channel 1.
- Each address includes the start address of the path/channel specified in the "Address Map of CNC Device Information" above.

#	CNC Information	Address	# of words (2 Bytes)	Value to be stored	Frequency (Default)	Remarks
1	Emergency stop status	1000	8	ARMED (The emergency stop state is cancelled.) TRIGGERED (It is in the emergency stop state.)	800 ms	Only CNC path/channel 1's emergency stop state can be collected. For others, UNAVAILABLE is returned. [Meaning of Values] -ARMED: Release, reset or wait -TRIGGERED: Stop
2	CNC operation mode	1008	16	MANUAL__DATA__INPUT AUTOMATIC EDIT MANUAL	800 ms	Shows the current operation mode of the machine tool. [Meaning of Values] -MANUAL DATA INPUT: MDI opr -AUTOMATIC: Memory or DNC opr -EDIT: Memory edit -MANUAL: JOG feed, manual incremental feed, manual reference position return, or manual handle feed

3	Number of processed parts	1024	8	Character string (integer)	1000 ms	Shows the number of manufacturing processes done by the machine tool.
4	CNC operating status	1032	8	READY STOPPED INTERRUPTED ACTIVE	800 ms	Shows the current operation status of the machine tool. [Meaning of Values] -READY: Reset or manual numerical command start or tool retract/return starting state -STOPPED: Automatic opr stopped -INTERRUPTED: Automatic opr paused -ACTIVE: Automatic opr
5	Sequence number of the program in operation	1040	8	Character string (integer)	800 ms	Shows the execution sequence of the process programs.
6	Main program name	1048	64	Character string	2000 ms	Name of the process program. This can be used in the host monitoring software to check work categories. Example: //CNC_MEM/USER/PATH1/O4947

#	CNC Information	Address	# of words (2 Bytes)	Value to be stored	Frequency (Default)	Remarks
7	Main program comment	1112	64	Character string	2000 ms	Supplemental information that is added to each process program. This can be used in the host monitoring software to check work categories. Example: XH4947 HD1 18-01-05
8	Tool number	1176	8	Character string (integer)	800 ms	ID of a tool added to the machine tool. Machine tools that have automatic tool changer (ATC) may use the PMC address specified by the machine tool builder to obtain the tool number in use.
9	Feed rate override	1184	8	Character string (integer)	1000 ms	Shows the work speed of the machine tool (percentage %, approximately equal to the efficiency). Set or change this, if necessary, to check process programs or tune process conditions.
10	Block of the program in operation	1192	64	Character string	800 ms	Shows information of each block in the current process program. Use this to debug or check programs. Example: O4947(XH4947 HD1 18-01-05)
11	Operation mode of spindle 1	1256	8	SPINDLE INDEX CONTOUR	800 ms	Shows the spindle's operation mode. [Meaning of Values] -SPINDLE: Normal opr or sync control or rigid tapping or others -INDEX: Orientation -CONTOUR: Cs continuous path control
12	Operation mode of spindle 2	1264	8		800 ms	Same as above.
13	Operation mode of spindle 3	1272	8		800 ms	Same as above.
14	Operation mode of spindle 4	1280	8		800 ms	Same as above.
15	Reserved area					
16	Fast forward override	1300	8	Character string (integer)	1000 ms	Shows the work speed of the machine tool (percentage %, approximately equal to the efficiency). Set or change this, if necessary, to check process programs or tune process conditions.
17	Spindle override	1308	8	Character string (integer)	1000 ms	Same as above.
18	Active axis name	1316	16	Axis name character string (e.g. X1, Z1, C1)	5000 ms	Present axis information available in the machine tool. Total 9: Linear axes (X, Y, Z, U, V, W) and Rotating axes (A, B, C)
19	Dry run	1332	8	ENABLED DISABLED	800 ms	This is a mode to be used for NC program functional tests, and will be useful for screening operating hours of machine tools by using the host monitoring software. Note: This value is only obtained from 30i/0i series.
20	Cutting feed	1340	8	ENABLED DISABLED	800 ms	Indicates cutting feed orders issued by the NC program. This value will be useful for screening operation hours of machine tools by using the host monitoring software. Note: This value is only obtained from 30i/0i series.
21	M00	1348	8	ENABLED DISABLED	800 ms	This will be useful for screening operation hours of machine tools by using the host monitoring software. You can also use this to check dimensions and tool conditions when you stop the machine in the middle of manufacturing. Note: This value is only obtained from 30i/0i series.

22	M01	1356	8	ENABLED DISABLED	800 ms	This will be useful for screening operation hours of machine tools by using the host monitoring software. This is used when you do not need to check the second and subsequent work because you have checked the first work quality. Note: This value is only obtained from 30i/0i series.
23	Cycle time (sec)	1364	8	Character string (decimal)	800 ms	This is the time duration from the start of cutting work to the end (integrated value of automatic operation hours in one cycle). This is used to optimize the manufacturing hours and identify a cause of work variation.

#	CNC Information	Address	# of words (2 Bytes)	Value to be stored	Frequency (Default)	Remarks
24	Reserved area					
25	Spindle 1 load (%)	1400	8	Character string (decimal)	800 ms	Show the load (approximately equal to the cutting torque) and the rotational speed of each spindle. These can be reference values when you set processing conditions or estimate the lifetime of tools. The optimal value will vary by work category/hardness. Note: For machines not equipped with a position coder, NC parameters may need to be changed (change the bit in No. 3118 to 1).
26	Spindle 1 speed (rotation/min)	1408	8	Character string (integer)	800 ms	
27	Spindle 2 load (%)	1416	8	Character string (decimal)	800 ms	
28	Spindle 2 speed (rotation/min)	1424	8	Character string (integer)	800 ms	
29	Spindle 3 load (%)	1432	8	Character string (decimal)	800 ms	
30	Spindle 3 speed (rotation/min)	1440	8	Character string (integer)	800 ms	
31	Spindle 4 load (%)	1448	8	Character string (decimal)	800 ms	
32	Spindle 4 speed (rotation/min)	1456	8	Character string (integer)	800 ms	
33	Spindle insulation resistance value of Spindle 1 (MΩ)	1464	8	Character string (decimal)	5000 ms	These insulation resistance values of spindle motors can be used as reference values for preventive maintenance. These values generally vary from 0 to around 100. (A value of 10 or below indicates that the associated parts should be replaced.) These values will be updated when the CNC device's emergency stop button is pressed. Some of the emergency stop buttons need to be pressed before the machine tool is powered off. Note: These value are only obtained from 30i/0i series.
34	Spindle insulation resistance value of Spindle 2 (MΩ)	1472	8	Character string (decimal)	5000 ms	
35	Spindle insulation resistance value of Spindle 3 (MΩ)	1480	8	Character string (decimal)	5000 ms	
36	Spindle insulation resistance value of Spindle 4 (MΩ)	1488	8	Character string (decimal)	5000 ms	

#	CNC Information	Address	# of words (2 Bytes)	Value to be stored	Frequency (Default)	Remarks
37	Reserved area					
38	Feed rate (mm/sec)	1500	8	Character string (integer)	800 ms	Move speed of the feed rod.
39	Absolute position of X axis (mm)	1508	8	Character string (decimal)	800 ms	Obtained depending on axis names. Refer to "Active axis name" for the axis name. Note: The moving axis load current values are only obtained from 30i/0i series. If you use an axis not named X, Y, Z, U, V, W, A, B, or C, the value of the axis will be stored in an unused reserved area, which will be selected in order of this list. Example: 1: When CNC axes were named X, Y, and T, the value of T will be stored in Z's area (The axis "Z" has not been used.) 2: When CNC axes were named A, B, and T, the value of T will be stored in X's area. (The axis "X" has not been used.) The electric load current value of each axis (approximately same as the load information) can be used as a reference value when you set processing conditions or estimate the lifetime of tools. (The load current value, due to the accuracy, should rather be used as a trend value of moving average.) The optimal value will vary by work category/hardness.
40	Moving X axis load (%)	1516	8	Character string (decimal)	800 ms	
41	Moving X axis load current value (%)	1524	8	Character string (decimal)	800 ms	
42	Moving X axis load current value (A)	1532	8	Character string (decimal)	800 ms	
43	Absolute position of Y axis (mm)	1540	8	Character string (decimal)	800 ms	
44	Moving Y axis load (%)	1548	8	Character string (decimal)	800 ms	
45	Moving Y axis load current value (%)	1556	8	Character string (decimal)	800 ms	
46	Moving Y axis load current value (A)	1564	8	Character string (decimal)	800 ms	
47	Absolute position of Z axis (mm)	1572	8	Character string (decimal)	800 ms	
48	Moving Z axis load (%)	1580	8	Character string (decimal)	800 ms	
49	Moving Z axis load current value (%)	1588	8	Character string (decimal)	800 ms	
50	Moving Z axis load current value (A)	1596	8	Character string (decimal)	800 ms	
51	Absolute position of U axis (mm)	1604	8	Character string (decimal)	800 ms	
52	Moving U axis load (%)	1612	8	Character string (decimal)	800 ms	
53	Moving U axis load current value (%)	1620	8	Character string (decimal)	800 ms	
54	Moving U axis load current value (A)	1628	8	Character string (decimal)	800 ms	
55	Absolute position of V axis (mm)	1636	8	Character string (decimal)	800 ms	
56	Moving V axis load (%)	1644	8	Character string (decimal)	800 ms	
57	Moving V axis load current value (%)	1652	8	Character string (decimal)	800 ms	
58	Moving V axis load current value (A)	1660	8	Character string (decimal)	800 ms	
59	Absolute position of W axis (mm)	1668	8	Character string (decimal)	800 ms	
60	Moving W axis load (%)	1676	8	Character string (decimal)	800 ms	
61	Moving W axis load current value (%)	1684	8	Character string (decimal)	800 ms	
62	Moving W axis load current value (A)	1692	8	Character string (decimal)	800 ms	
63	Absolute position of A axis (mm)	1700	8	Character string (decimal)	800 ms	
64	Moving A axis load (%)	1708	8	Character string (decimal)	800 ms	
65	Moving A axis load current value (%)	1716	8	Character string (decimal)	800 ms	
66	Moving A axis load current value (A)	1724	8	Character string (decimal)	800 ms	
67	Absolute position of B axis (mm)	1732	8	Character string (decimal)	800 ms	
68	Moving B axis load (%)	1740	8	Character string (decimal)	800 ms	
69	Moving B axis load current value (%)	1748	8	Character string (decimal)	800 ms	
70	Moving B axis load current value (A)	1756	8	Character string (decimal)	800 ms	
71	Absolute position of C axis (mm)	1764	8	Character string (decimal)	800 ms	
72	Moving C axis load (%)	1772	8	Character string (decimal)	800 ms	
73	Moving C axis load current value (%)	1780	8	Character string (decimal)	800 ms	
74	Moving C axis load current value (A)	1788	8	Character string (decimal)	800 ms	
75	Reserved area					
76	Alarm #1 to Alarm #32[*3]	1800 to 2048	8	Character string (e.g. SW100)	800 ms	When an alarm(s) and an operation message(s) occur at the same time, each information will be stored in the corresponding alarm number.[*4] The operation messages are stored only in CNC path/channel 1 because they are independent of the CNC paths/channels.
77	Reserved area					
78	PMC 1 to PMC 20	2100 to 2138	2	Integer number	1000 ms	Register up to 20 PMC as needed depending on the machine tool builder and the users.

#	CNC Information	Address	# of words (2 Bytes)	Value to be stored	Frequency (Default)	Remarks
79	Reserved area					
80	Macro 1 to Macro 10	2200 to 2272	8	Character string (decimal)	1000 ms	Register up to 10 Macro as needed depending on the machine tool builder and the users.
81	Moving axis insulation resistance value of X axis (MΩ)	2280	8	Character string (decimal)	5000 ms	Obtained depending on axis names. Refer to "Active axis name" for the axis name. Note: These values are only obtained from 30i/0i series. Each spindle motor's insulation resistance value and axis travel amount can be used as reference values for preventive maintenance. The insulation resistance values generally vary from 0 to around 100. (A value of 10 or below indicates that the associated parts should be replaced.) These values will be updated when the CNC device's emergency stop button is pressed. Some of the emergency stop buttons need to be pressed before the machine tool is powered off.
82	Moving axis insulation resistance value of Y axis (MΩ)	2288	8	Character string (decimal)	5000 ms	
83	Moving axis insulation resistance value of Z axis (MΩ)	2296	8	Character string (decimal)	5000 ms	
84	Moving axis insulation resistance value of U axis (MΩ)	2304	8	Character string (decimal)	5000 ms	
85	Moving axis insulation resistance value of V axis (MΩ)	2312	8	Character string (decimal)	5000 ms	
86	Moving axis insulation resistance value of W axis (MΩ)	2320	8	Character string (decimal)	5000 ms	
87	Moving axis insulation resistance value of A axis (MΩ)	2328	8	Character string (decimal)	5000 ms	
88	Moving axis insulation resistance value of B axis (MΩ)	2336	8	Character string (decimal)	5000 ms	
89	Moving axis insulation resistance value of C axis (MΩ)	2344	8	Character string (decimal)	5000 ms	
90	X axis total travel amount	2352	8	Character string (integer)	800 ms	Obtained depending on axis names. Refer to "Active axis name" for the axis name. These values can be used as reference values for preventive maintenance and life management of the feed rod. Note: Legacy CNC devices including 16i series require an optional function to show the total travel amount.
91	Y axis total travel amount	2360	8	Character string (integer)	800 ms	
92	Z axis total travel amount	2368	8	Character string (integer)	800 ms	
93	U axis total travel amount	2376	8	Character string (integer)	800 ms	
94	V axis total travel amount	2384	8	Character string (integer)	800 ms	
95	W axis total travel amount	2392	8	Character string (integer)	800 ms	
96	A axis total travel amount	2400	8	Character string (integer)	800 ms	
97	B axis total travel amount	2408	8	Character string (integer)	800 ms	
98	C axis total travel amount	2416	8	Character string (integer)	800 ms	
99	Real speed for servo adjustment of X axis (rotation/min)	2424	8	Character string (integer)	800ms	Shows the real speed of each axis for servo adjustment. It can be used as a reference value to detect abnormalities by comparing it with the following values: - Spindle speed (rotation), load, and load current values obtained by FBR converter - Position deviation of the servo obtained by other devices.
100	Real speed for servo adjustment of Y axis (rotation/min)	2432	8	Character string (integer)	800ms	
101	Real speed for servo adjustment of Z axis (rotation/min)	2440	8	Character string (integer)	800ms	
102	Real speed for servo adjustment of U axis (rotation/min)	2448	8	Character string (integer)	800ms	
103	Real speed for servo adjustment of V axis (rotation/min)	2456	8	Character string (integer)	800ms	
104	Real speed for servo adjustment of W axis (rotation/min)	2464	8	Character string (integer)	800ms	
105	Real speed for servo adjustment of A axis (rotation/min)	2472	8	Character string (integer)	800ms	
106	Real speed for servo adjustment of B axis (rotation/min)	2480	8	Character string (integer)	800ms	
107	Real speed for servo adjustment of C axis (rotation/min)	2488	8	Character string (integer)	800ms	

*3: For the details about Alarm, please contact makers of your machine tool or CNC device.

*4: When an alarm(s) and an operation message(s) occur at the same time, the alarm information will be as follows.

E.g. When the alarms are "SW100 and PW100" and the operation message is "1000":

- Alarm #1: SW100
- Alarm #2: PW100
- Alarm #3: 1000

● **Address Map of "PMC Collective" Detailed Information**

Can be collected by specifying ModbusTCP Function code 0x04 (input register).

#	CNC Information	Address	# of words (2 Bytes)	Value to be stored	Frequency (Default)	Remarks
108	PMC(Collective)	8500 ～10000	2	Integer number	1000ms	Up to 3,000 bytes can be registered. Set as necessary for each machine tool builder and user.

● **Address Map of "Macro & Tool Offset Collective" Detailed Information**

Can be collected by specifying ModbusTCP Function code 0x03 (holding register).

#	CNC Information	Address	# of words (2 Bytes)	Value to be stored	Frequency (Default)	Remarks
109	Macro(Collective)	0 ～3992	8	Character string	1000ms	Up to 500 macro numbers can be registered. Set as necessary for each machine tool builder and user.
110	Reserved area					
111	Tool offset(Type A or Type B/Collective)*5	5000 ～5798	2	Integer number	1000ms	Tool offset Type A or B can be obtained. This supports machining center and lathe.

*5: For tool offset information, each Type listed below is stored as one set of ModbusTCP data per setting number.

Example 1) Tool offset Type A for Machining Center: These numbers indicate the number code of tool offset settings configured on the CNC device.
Geometry 1 -> Wear 1 -> Tip direction 1 -> Geometry 2 -> Wear 2 -> Tip direction 2 … Geometry 130 -> Wear 130 -> Tip direction 130

Example 2) Tool offset Type A for Lathe

X-axis compensation amount 1 -> Y-axis compensation amount 1 -> Z-axis compensation amount 1 -> Tool nose radius compensation amount 1 -> Tip direc
X-axis compensation amount 2 -> Y-axis compensation amount 2 -> Z-axis compensation amount 2 -> Tool nose radius compensation amount 2 -> Tip direc

Machining Center and Lathe Information by Tool Offset Typ	Max Values Stored	Start Address	End Address
Machining Center			
TYPEA	200	5000	5798
Offset amount			
Tip direction			
TYPE B	130	5000	5778
Geometry			
Wear			
Tip direction			
Lathe			
TYPE A	80	5000	5798
X-axis compensation amount			
Y-axis compensation amount			
Z-axis compensation amount			
Tool nose radius compensation amount			
Tip direction			
TYPE B	40	5000	5718
X-axis geometry compensation amount			
Y-axis geometry compensation amount			
Z-axis geometry compensation amount			
Tool nose radius geometry compensation amount			
X-axis wear compensation amount			
Y-axis wear compensation amount			
Z-axis wear compensation amount			
Tool nose radius wear compensation amount			
Tip direction			

● CNC information configurations on FBR converter

- Use FBR converter's setting web page to make the settings. For more details, see the PDF product manual.
- To collect PMC information (1 to 20) and Macro information (1 to 10) in this document, set the number of paths/channels and the address information manually from FBR converter's setting web page.