
Technical Information

Multi-sensing Remote I/O
Analog Sensing Unit VZ20X
Host Device Connection Setup Procedure

TI 77V01B01-11EN

Contents

Introduction	3
1. Unpacking and Setting Up	4
1.1 Outline	5
1.2 Items to Prepare	7
1.3 Wiring (Connection A to Connection D).....	8
1.4 Wiring the Inputs.....	10
1.5 Installing VZ Configurator	11
1.6 Configuring Settings via USB (for Connection A, Connection B).....	12
1.7 Configuring Settings via Ethernet (for Connection C, Connection D).....	14
1.8 Configuring the Network Settings for the PC	18
2. Connecting to SMARTDAC+ GA10 and Monitoring the Data	20
2.1 Outline	20
2.2 VZ20X Time Synchronization Settings.....	21
2.3 Performing Monitoring and Recording with Detail Settings	22
2.4 PC Time Setting Method and Restrictions	25
3. Modbus/TCP Communication - Monitoring the Data Using Exclusive Function Code 70/71 -	26
3.1 Outline	26
3.2 Data Monitoring Procedure	27
3.3 Setting the Time to VZ20X.....	29
3.4 Acquiring the Data	30
3.5 Converting the Acquired Measured Values	33
4. Modbus/TCP Communication - Monitoring the Data Using Function Code 03 -	35
4.1 Outline	35
4.2 Monitoring the Data with GX20	36
4.2.1 Configuring VZ20X Settings	37
4.2.2 Configuring GX20 Settings.....	37
4.2.3 Starting Monitoring and Recording.....	44
4.3 Monitoring the Data with GA10	44
4.3.1 Configuring VZ20X Settings	45
4.3.2 Creating the GA10 Modbus Definition File.....	45
4.3.3 Configuring GA10 Settings.....	47
4.3.4 Starting Monitoring and Recording.....	49
4.4 Monitoring the Data with PC.....	50
4.4.1 Configuring VZ20X Settings	50
4.4.2 Data Monitoring Example	51
Appendix - Installing the Development Environments in Windows and Running Sample Programs -	52
1. Visual Studio 2019 C# Environment	52
2. Python Environment.....	53
Revision Information	31

Introduction

This document describes the host device connection setup procedure for the Analog Sensing Unit VZ20X.

■ Notice

- The contents of this manual are subject to change without notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made to ensure accuracy in the preparation of this manual. Should any errors or omissions come to your attention, however, please inform Yokogawa Electric's sales office or sales representative.
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Contents

1. Unpacking and Setting Up
2. Connecting to SMARTDAC+ GA10 and Monitoring the Data
3. Modbus/TCP Communication
- Monitoring the Data Using Exclusive Function Code 70/71 -
4. Modbus/TCP Communication
- Monitoring the Data Using Function Code 03 -

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1. Unpacking and Setting Up

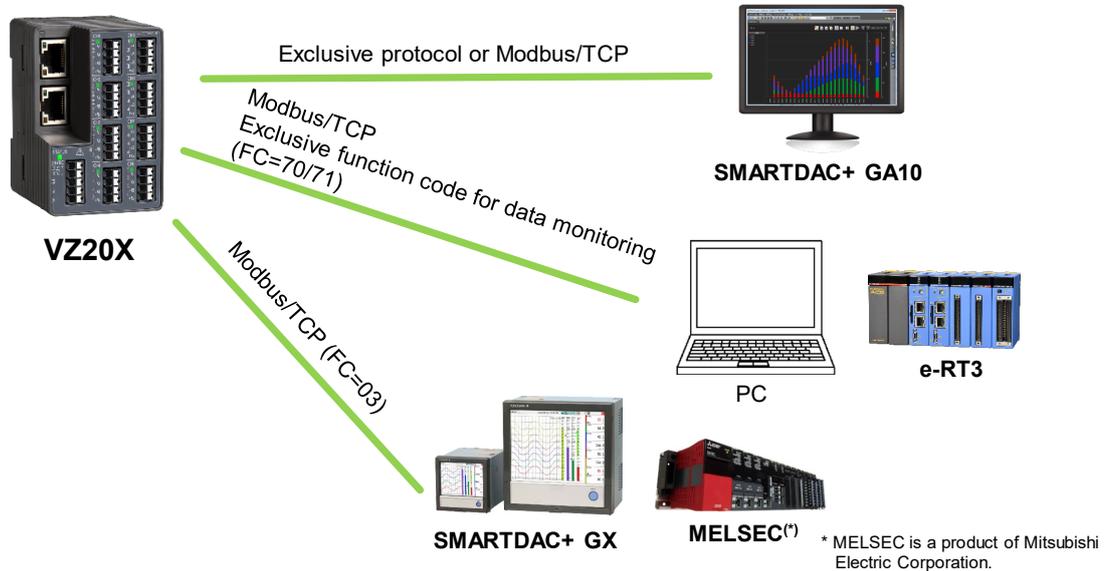
- 1.1 Outline
- 1.2 Items to Prepare
- 1.3 Wiring (Connection A to Connection D)
- 1.4 Wiring the Inputs
- 1.5 Installing VZ Configurator
- 1.6 Configuring Settings via USB (for Connection A, Connection B)
- 1.7 Configuring Settings via Ethernet (for Connection C, Connection D)
- 1.8 Configuring the Network Settings for the PC

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1.1 Outline

Wire the VZ20X, configure the settings, and enable data monitoring.



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1.1 Outline: Related Documents

User's Manual

Title	No.
Model GA10 Data Logging Software User's Manual	IM 04L65B01-01EN
VZ20X Analog Sensing Unit User's Manual	IM 77V01B01-01EN

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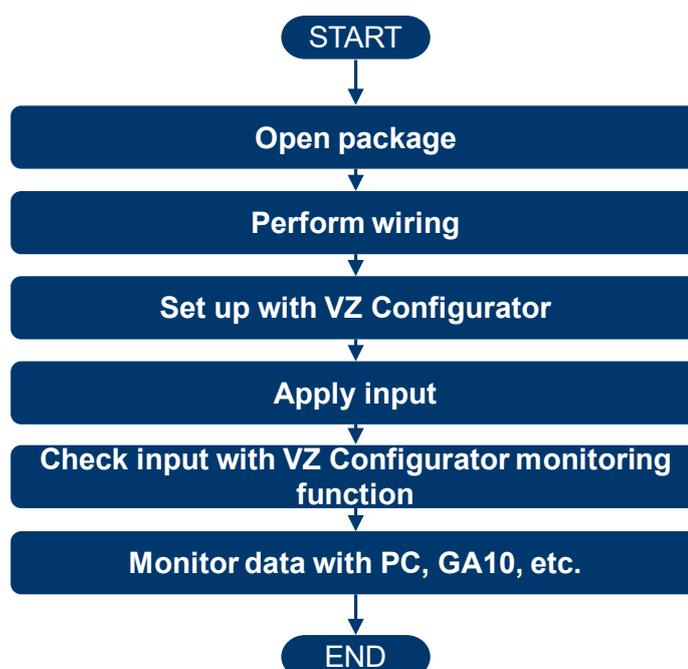
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1.1 Outline: Checking the VZ20X Package Contents

After receiving the product and opening the package, check the items described below. If the wrong items have been delivered, if items are missing, or if there is a problem with the appearance of the items, contact your nearest YOKOGAWA dealer.

Package	
VZ20X body (the model you ordered)	x1
USB connector cap	x1
Ethernet connector cap (attached to product)	x1
TEST CERTIFICATE (QIC)	x1
Precaution on the Use of This Product (IM 77V01B01-11Z1)	x1

1.1 Outline: Work Flow



1.1 Outline: Connection Methods and Functions

Monitoring method	GA10			Modbus/TCP communication	
	With option /DM (Data merge function)	Device time	PC time	Modbus/TCP (Function code 03)	Modbus/TCP (Function code 70/71)
Number of connected units	15 units/120 channels (Use VZ20X time synchronization)	100 units/800 channels without VZ20X time synchronization 15 units/120 channels (*1) with VZ20X time synchronization	100 units/800 channels (*1)	No restrictions (Depends on client)	15 units/120 channels (*1)
GA10 [Monitor] screen	<ul style="list-style-type: none"> Mixed devices Up to 50 channels per screen 	Displayed for each units	<ul style="list-style-type: none"> Mixed devices Up to 50 channels per screen 	-	-
GA10 recording file	1	For each units	1	-	-
Data acquisition interval	VZ20X monitor interval (1 to 100 ms) (*2)	VZ20X monitor interval (1 to 100 ms) (*2)	GA10 monitor interval (100 ms to 1 hour)	Depends on client (*3)	VZ20X monitor interval (1 to 100 ms) (*2)
Time of monitoring data	VZ20X time stamp	VZ20X time stamp	PC time	Client device time or VZ20X time stamp reading is possible	VZ20X time stamp
Input sampling synchronization on between VZ20X units	Without VZ20X time synchronization	Not synchronized	Not synchronized	Not synchronized	Not synchronized
	With VZ20X time synchronization	Synchronized	Synchronized	Not synchronized	Synchronization is possible by using VZ20X measurement time
Programming	Not required	Not required	Not required	Depends on client	Required

(*1) The number of connected units is restricted depending on the data acquisition interval, the performance of the PC (including GA10) or PLC, and the operating environment (OS, CPU, installed software, programming, etc.).

(*2) With VZ20X time synchronization, all VZ20X units have the same data acquisition interval.

(*3) If the VZ20X data acquisition interval is 1 ms, the Modbus register update interval is 10 ms. Otherwise, the data acquisition interval and register update interval are identical.

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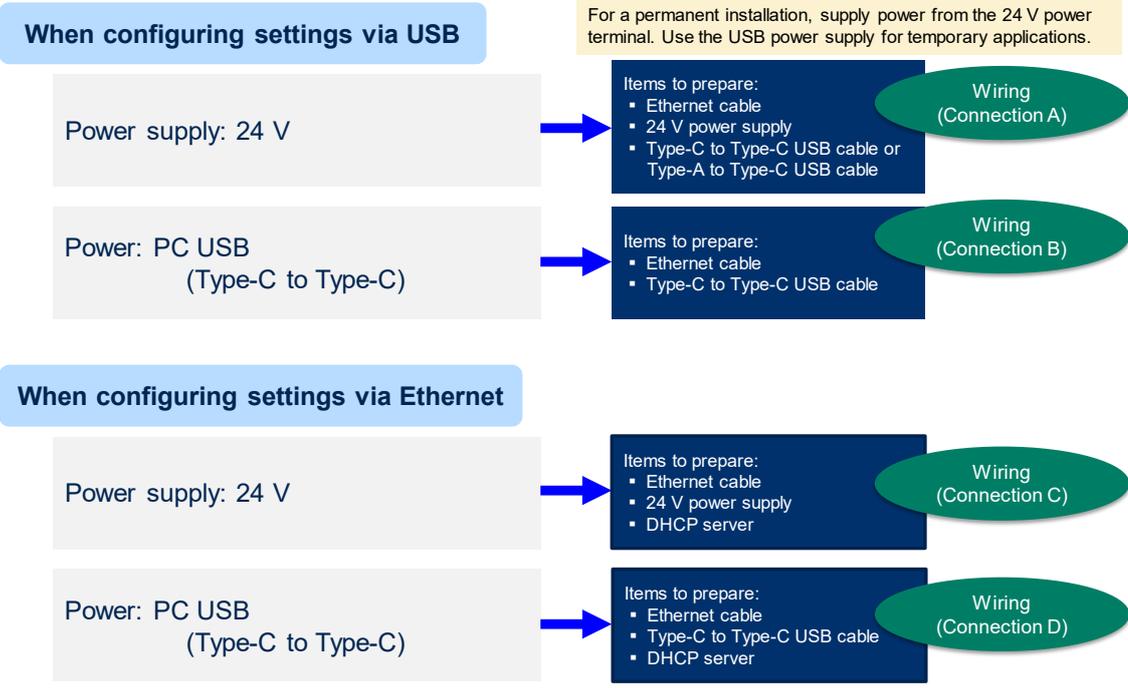
1.2 Items to Prepare

Item	Description
VZ20X Analog Sensing Unit	Purchased product
VZ Configurator	Download from Yokogawa Partner Portal. https://partner.yokogawa.com/global/
Ethernet cable	STP Category 5e or higher recommended. Obtain the required number of cables.
USB cable	Obtain Type-A to Type-C, or Type-C to Type-C, depending on the connection.
24 V power supply	Varies depending on the connection. Use a power supply that satisfies the power supply requirements for the product as follows. <ul style="list-style-type: none"> Power terminal: Rated voltage 24 V DC (+10%/-15%) Power consumption: 4.5 W or less * Power other than 24 V can be supplied via Type-C to Type-C USB cable.
Cables	Obtain the required number of cables for the power supply and input connections. For precautions on wiring the cables, refer to "4. Wiring" in the Model VZ20X Analog Sensing Unit User's Manual.

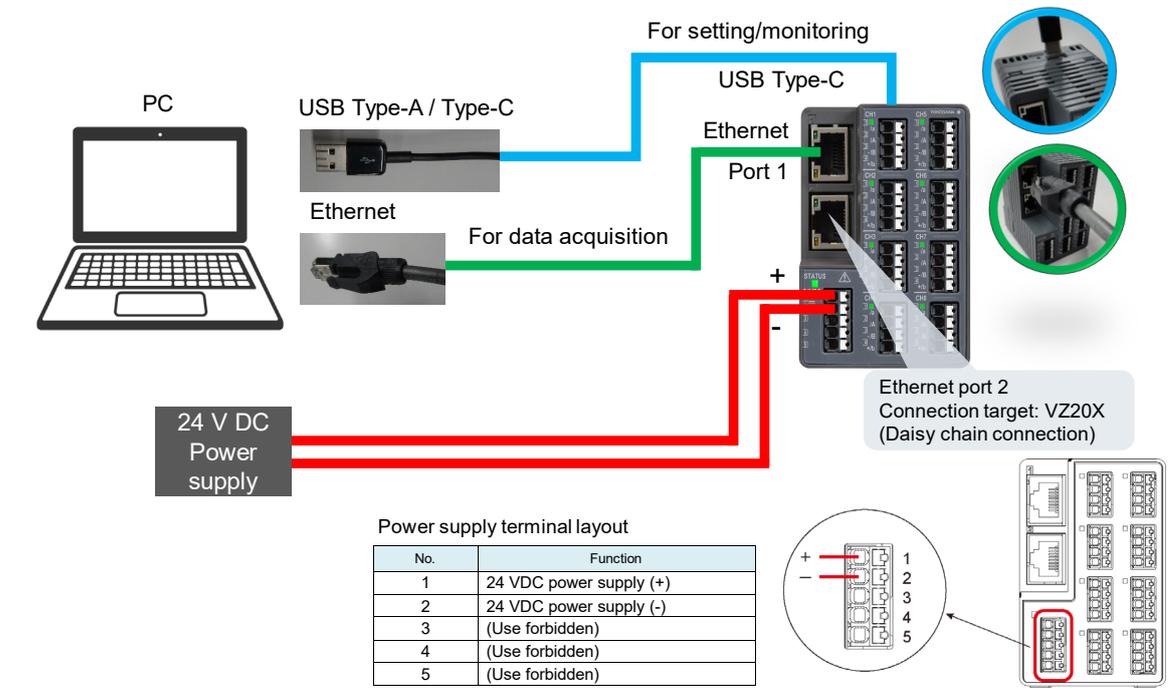
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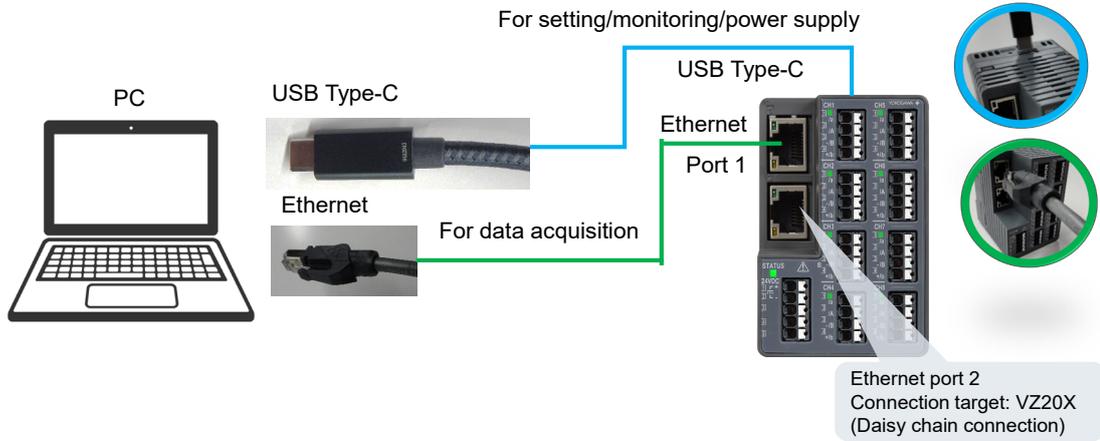
1.2 Items to Prepare: Equipment for Each Setting Method and Power Supply Method



1.3 Wiring (Connection A)



1.3 Wiring (Connection B)

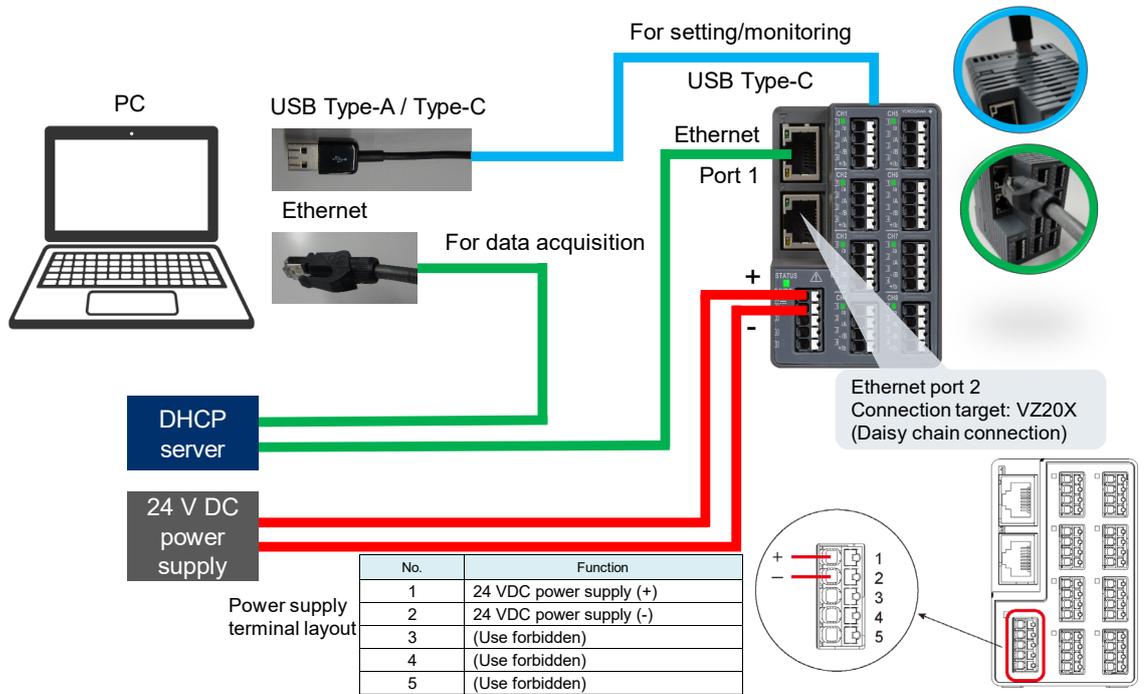


Note: Type-C to Type-A USB cable can not be used.

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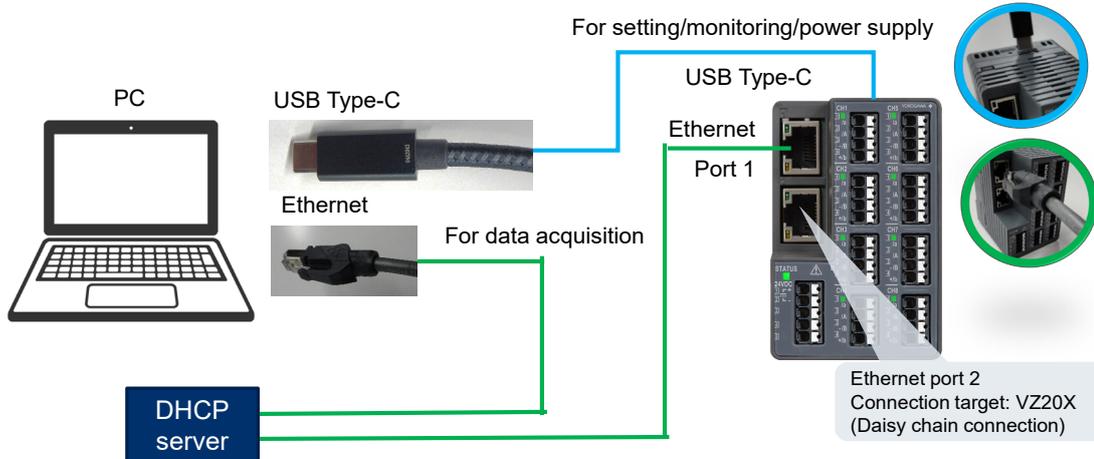
1.3 Wiring (Connection C)



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1.3 Wiring (Connection D)

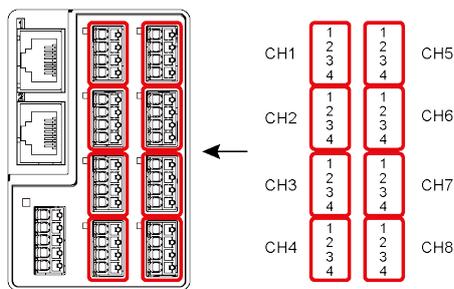


Note: Type-C to Type-A USB cable can not be used.

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1.4 Wiring the Inputs



Channel wiring diagrams

Wiring 1: DC voltage/Standard signal	Wiring 2: Thermocouple
Wiring 3: 3-wire resistance temperature detector	Wiring 4: 4-wire resistance temperature detector/4-wire resistance

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● Precautions

- When connecting cables to both the power terminal and the USB port on the VZ20X, make sure to supply power from the power terminal before connecting the USB cable.
- Power is supplied from both the power terminal and the USB cable. For this reason, make sure to disconnect the USB cable before turning OFF the VZ20X.
- For a permanent installation, supply power from the power terminal. Use the USB power supply for temporary applications.
- When performing transition wiring, take care to prevent short-circuits due to exposed sections of conductive parts (including twin ferrule terminals) and loose strands in twisted wire.

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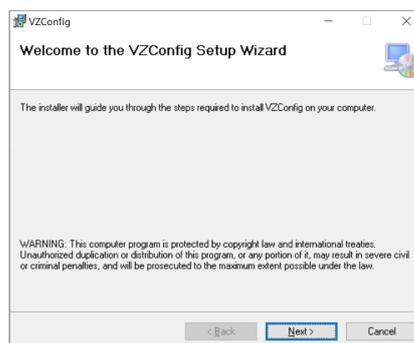
1.5 Installing VZ Configurator

1. Download VZ Configurator.

<https://partner.yokogawa.com/global/>

2. Extract the downloaded ZIP file.

3. Right-click "setup.exe", select "Run as administrator", and install.



4. Download the User's Manual.

<https://partner.yokogawa.com/global/>

5. Rename the downloaded file as "IM.pdf", and place it in the following folder on the PC.

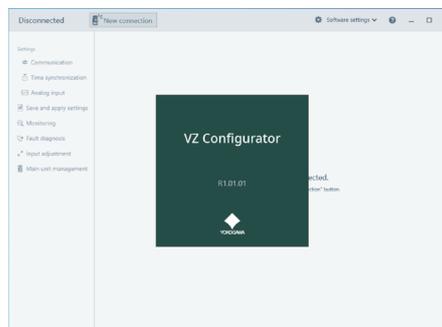
C:\Users\<UserName>\Documents\VZConfig

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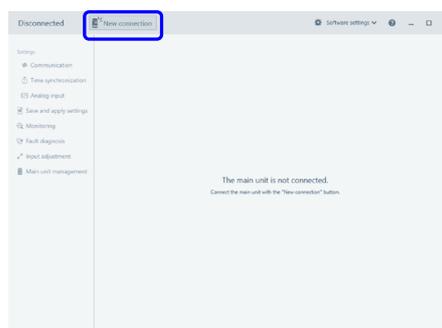
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1.6 Configuring Settings via USB (for Connection A, Connection B)

1. Start VZ Configurator.



2. Click [New connection].



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1.6 Configuring Settings via USB (for Connection A, Connection B)

3. Click the [Direct input] tab.

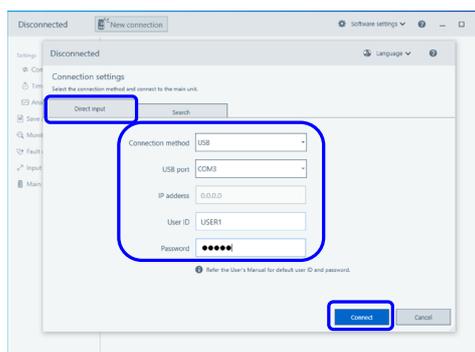
4. Set each item as indicated below.

Connection method: USB

USB port: Select the COM port number to use

User ID: USER1

Password: USER1



5. Click the [Connect] button.

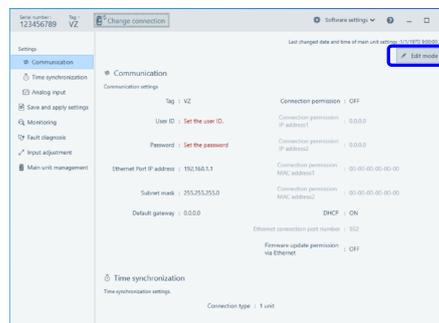
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1.6 Configuring Settings via USB (for Connection A, Connection B)

6. Click each item to configure the settings.

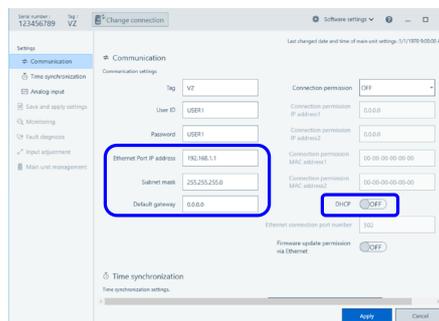
- [Settings] > [Communication]
 - [Settings] > [Time synchronization]
 - [Settings] > [Analog input]
- Next, click the [Edit mode] button.



7. Configure the communication, time synchronization, and analog input settings.

Set DHCP to OFF, and change the IP address, subnet mask, and default gateway to fixed values.

Check with your network administrator before configuring the IP address, subnet mask, and default gateway settings.

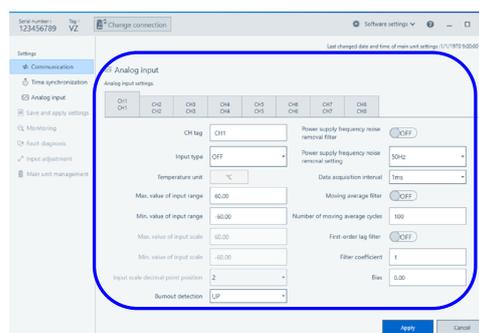


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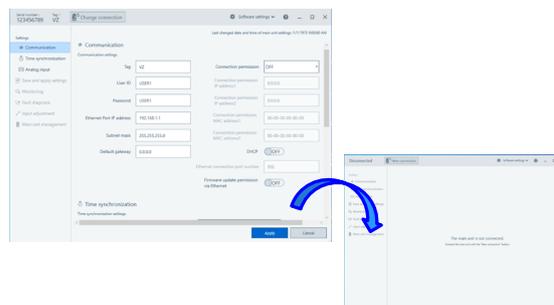
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1.6 Configuring Settings via USB (for Connection A, Connection B)

8. Configure the [Communication], [Time synchronization], and [Analog input] settings.



9. Click the [Apply] button to apply the settings to the VZ20X. Communication is disconnected, and a different screen is displayed.



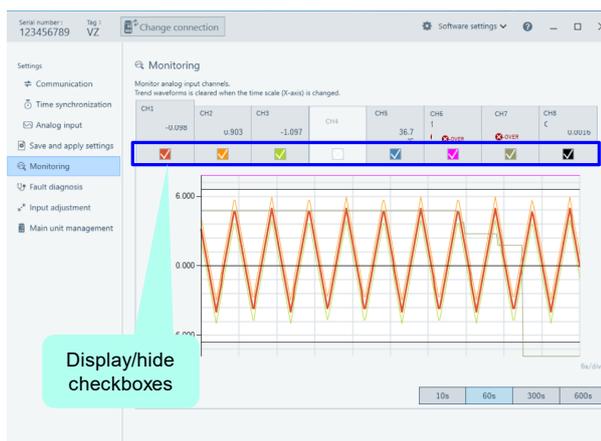
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1.6 Configuring Settings via USB (for Connection A, Connection B)

10. Apply input to the VZ20X, reconnect VZ Configurator from a new connection, and use [Monitoring] to perform a simple check.

* When the [Monitoring] screen is first displayed, the display/hide checkboxes for the channels are not selected. Select the checkbox for each channel that you want to display.



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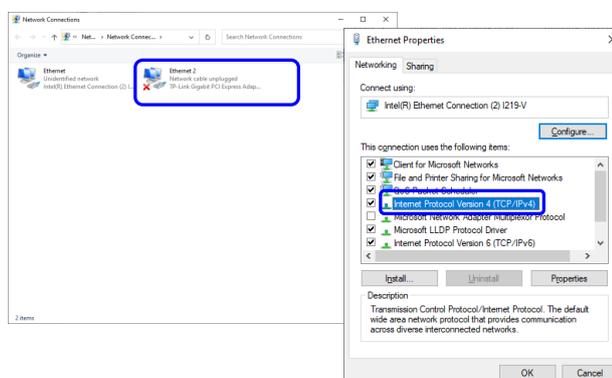
1.7 Configuring Settings via Ethernet (for Connection C, Connection D)

1. Check the network settings of the PC.
Right-click the Windows Start button (Windows logo), then select [Network Connections].



2. Right-click [Ethernet], then select [Properties].

Select [Internet Protocol Version 4], then click the [Properties] button.



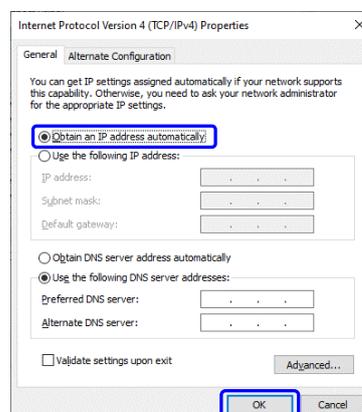
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1.7 Configuring Settings via Ethernet (for Connection C, Connection D)

3. Check that [Obtain an IP address automatically] is selected.

If it is not selected, select it and click the [OK] button.

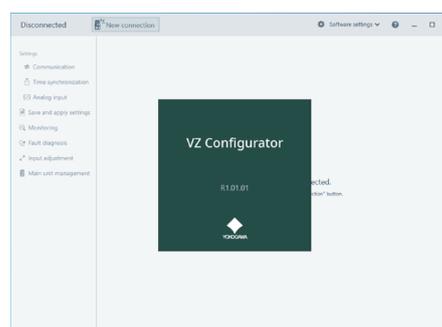


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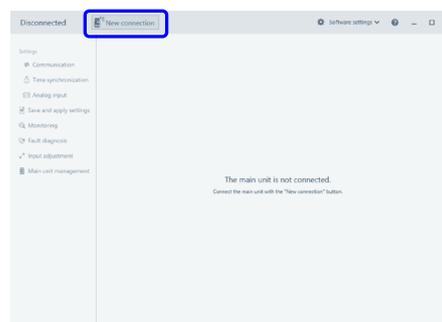
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1.7 Configuring Settings via Ethernet (for Connection C, Connection D)

4. Start VZ Configurator.



5. Click [New connection].

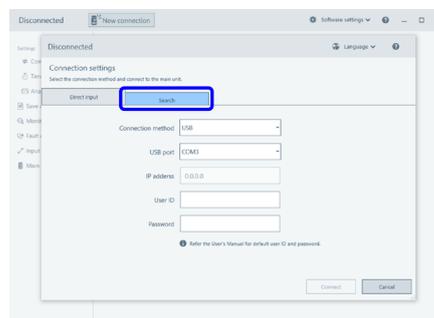


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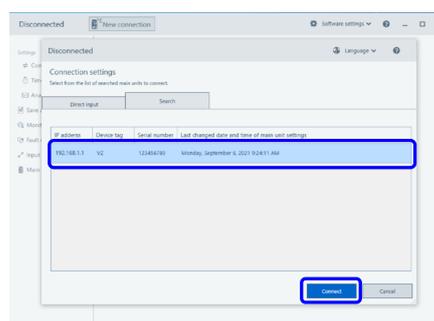
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1.7 Configuring Settings via Ethernet (for Connection C, Connection D)

6. Click the [Search] tab.



7. Select the VZ20X to connect in the list, then click the [Connect] button.



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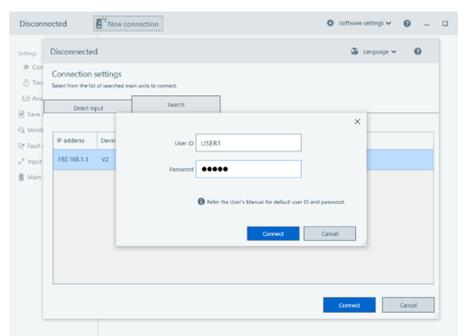
1.7 Configuring Settings via Ethernet (for Connection C, Connection D)

8. Enter the user ID and password.

User ID: USER1

Password: USER1

9. Click the [Connect] button.



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1.7 Configuring Settings via Ethernet (for Connection C, Connection D)

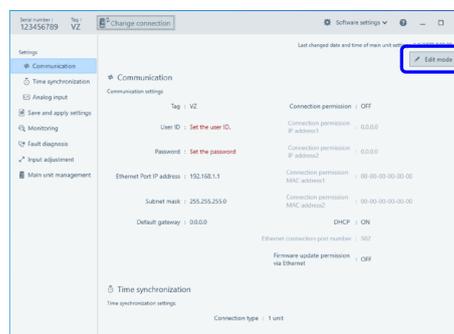
10. Click each item to configure.

[Settings] > [Communication]

[Settings] > [Time synchronization]

[Settings] > [Analog input]

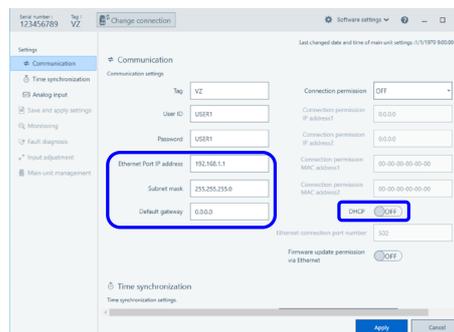
Next, click the [Edit mode] button.



11. Configure the communication, time synchronization, and analog input settings.

Set DHCP to OFF, and change the IP address, subnet mask, and default gateway to fixed values.

Check with your network administrator before configuring the IP address, subnet mask, and default gateway settings.

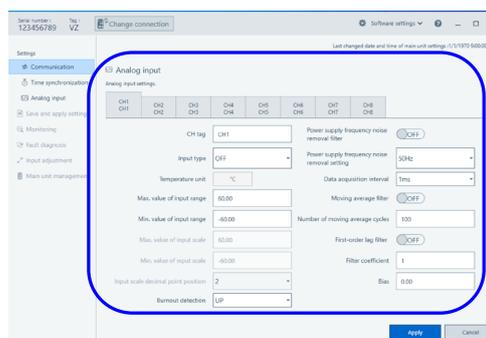


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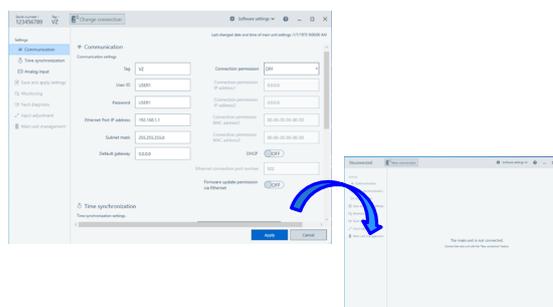
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1.7 Configuring Settings via Ethernet (for Connection C, Connection D)

12. Configure the [Communication], [Time synchronization], and [Analog input] settings.



13. Click the [Apply] button to apply the settings to the VZ20X. Communication is disconnected, and a different screen is displayed.

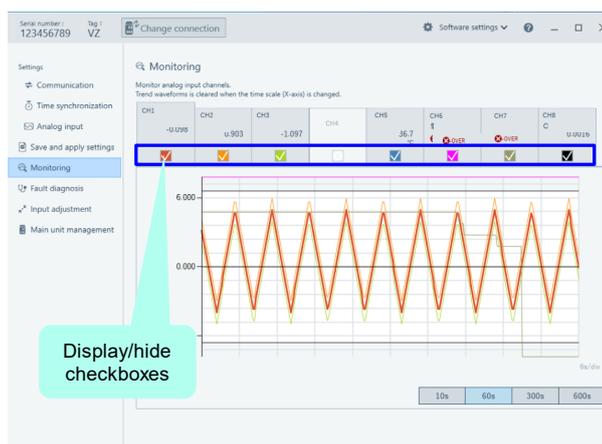


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1.7 Configuring Settings via Ethernet (for Connection C, Connection D)

14. Set a fixed IP address for the PC. (See "1.8 Configuring the Network Settings for the PC".)
15. Apply input to the VZ20X, reconnect VZ Configurator from a new connection, and use [Monitoring] to perform a simple check.



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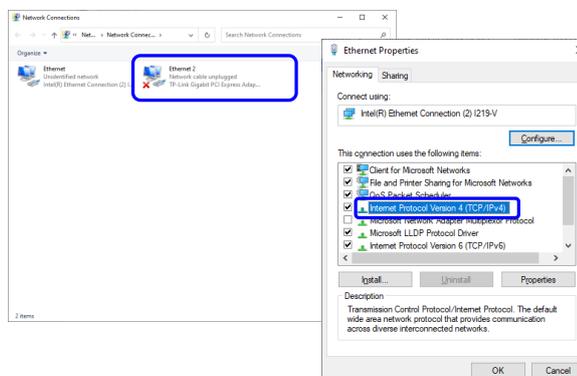
1.8 Configuring the Network Settings for the PC

1. Check the network settings of the PC.
Right-click the Windows Start button (), then select [Network Connections].



2. Right-click [Ethernet], then select [Properties].

Select [Internet Protocol Version 4], then click the [Properties] button.



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1.8 Configuring the Network Settings for the PC

3. Select [Use the following IP address], specify the IP address, subnet mask, and default gateway, and then click the [OK] button.

Example:

VZ20X settings

IP address: 192.168.1.1

Subnet mask: 255.255.255.0

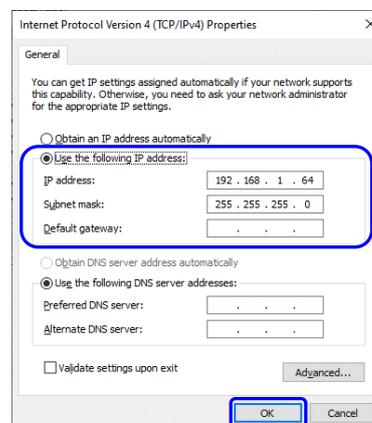
Default gateway: 0.0.0.0

PC settings

IP address: 192.168.1.64

Subnet mask: 255.255.255.0

Default gateway: No setting



2. Connecting to SMARTDAC+ GA10 and Monitoring the Data

- 2.1 Outline
- 2.2 VZ20X Time Synchronization Settings
- 2.3 Performing Monitoring and Recording with Detail Settings
- 2.4 PC Time Setting Method and Restrictions

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2.1 Outline

GA10 Data Logging Software communicates with the VZ20X to acquire data for monitoring and recording on a PC. Ethernet communication is used for the connection to the VZ20X.



**Data Logging Software
(GA10)**

Exclusive communication
protocol

For details on the various settings for the VZ20X, see "1.6 Configuring Settings via USB" and "1.7 Configuring Settings via Ethernet".



VZ20X

A free 60-day trial version of GA10 Data Logging Software is available.
<https://partner.yokogawa.com/global/>

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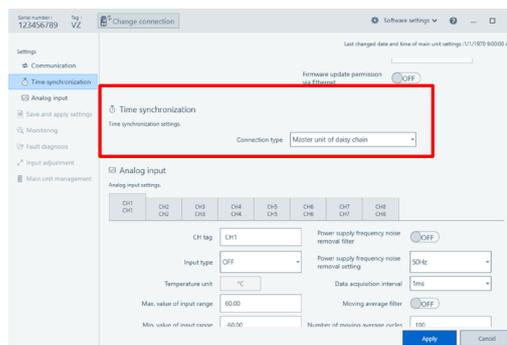
2.1 Outline

■ Settings and Items to Check Before Starting

- Before connecting GA10, use VZ Configurator to configure items such as the VZ20X communication settings. When using multiple VZ20X units and performing time synchronization, configure the settings described in section 2.2.
- Select [Detail Settings] for the GA10 setting mode.
- In the procedure described here, [Device time] is specified for the [Data time] setting in the GA10 data acquisition conditions. When using the data merge function (GA10 with option code /DM), the setting is forcibly set to [Device time]. (See section 2.3.)
For details on using the [PC time] setting and the restrictions that apply, see section 2.4.
- For details on basic operations, refer to the GA10 User's Manual.

2.2 VZ20X Time Synchronization Settings

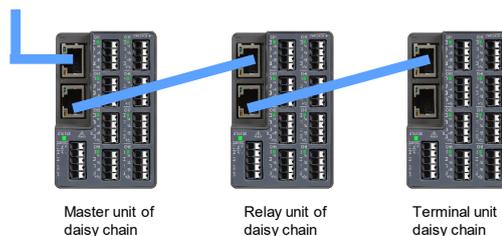
1. For [Connection type] in the VZ20X [Time synchronization] setting, select either [Master unit of daisy chain], [Relay unit of daisy chain], or [Terminal unit of daisy chain].
2. In order to register VZ20X units to GA10 when using time synchronization, the “Main unit status LED” on the VZ20X units must appear as indicated below.
On the master unit, the LED is green when performing GA10 registration. On the relay unit and terminal unit, the LED is green when establishing time synchronization.



Master unit of daisy chain: Blue or green
Relay unit of daisy chain: Green
Terminal unit of daisy chain: Green



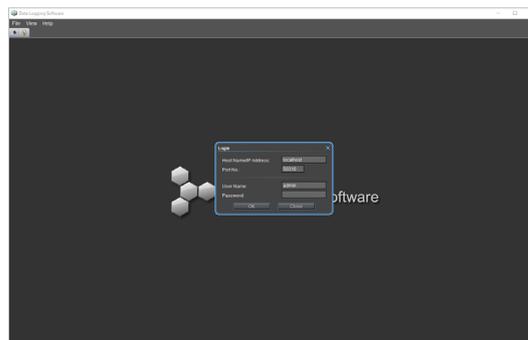
Host device



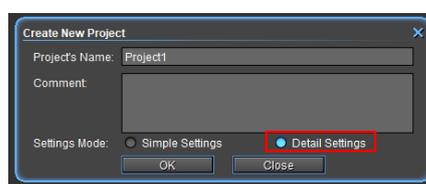
2.3 Performing Monitoring and Recording with Detail Settings

1. Start GA10 and log in.

2. In the [File] menu, select [Create New Project] to create a new project.



3. Select [Detail Settings] for [Settings Mode].
Click the [OK] button.

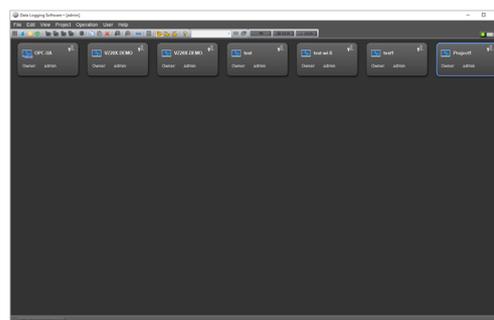


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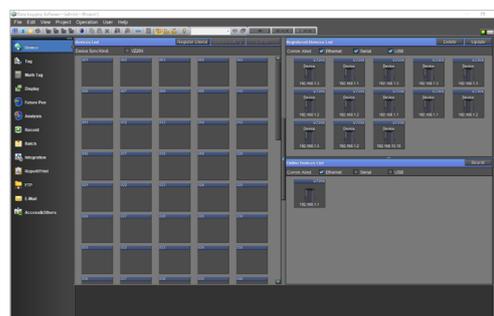
2.3 Performing Monitoring and Recording with Detail Settings

4. Double-click the project that was created, and open the initial settings screen.



5. Select [Ethernet] in [Online Devices List], then click the [Search] button.

A search is performed for connected devices, and the results are displayed in [Online Devices List].



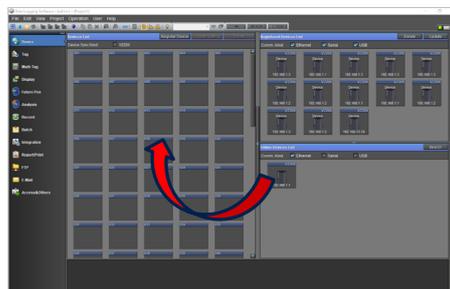
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2.3 Performing Monitoring and Recording with Detail Settings

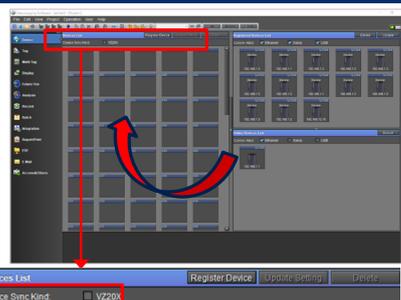
■ When connecting 1 unit

6. Drag and drop the device from [Online Devices List] to [Devices List].
Click the [OK] button in the [Register Device] dialog that is displayed.



■ When using daisy chain connection (time synchronization)

6. Drag and drop the devices from [Online Devices List] to [Devices List].
Click the [OK] button in the [Register Device] dialog that is displayed.



Note: When using a daisy chain connection with time synchronization, if there is no VZ20X master unit of the daisy chain, the VZ20X units specified as relay or terminal units of the daisy chain cannot be registered. Check the VZ20X settings.

If you want to combine the monitoring data from multiple VZ units into one file, select the [Merge synchronization data] checkbox.
* To use this function, GA10 with option code /DM is required.

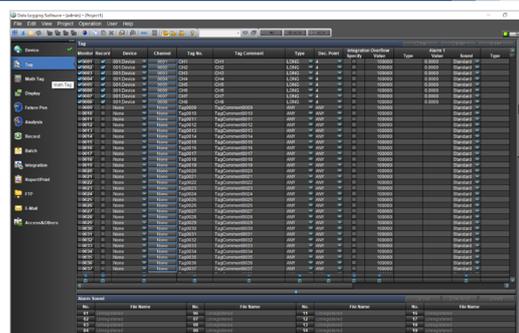
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2.3 Performing Monitoring and Recording with Detail Settings

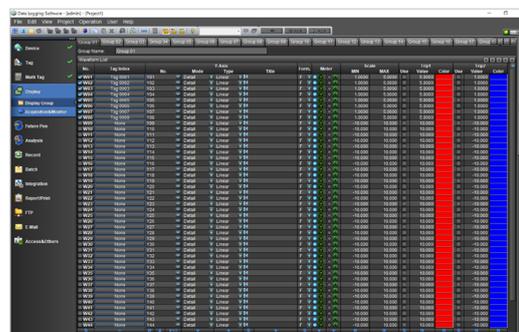
7. Select [Tag].

The channels of the registered devices are automatically set as default values. Edit the settings as necessary.



8. Click [Display] and select [Display Group].

Edit each setting data item as necessary.



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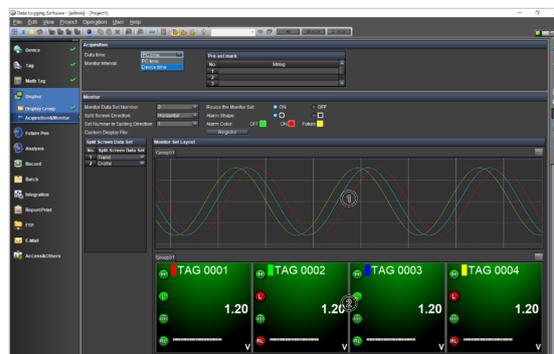
2.3 Performing Monitoring and Recording with Detail Settings

9. Select [Acquisition&Monitor].

10. Set the data acquisition conditions.

Change the [Data time] setting from [PC time] to [Device time]. When using the data merge function (GA10 with option code /DM), the setting is forcibly set to [Device time].

Change the [Monitor] screen settings as necessary.



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2.3 Performing Monitoring and Recording with Detail Settings

11. You can start and stop monitoring or recording by clicking the icons displayed in the tab on the right side of the screen.

Monitoring start  /stop 

Click to start monitoring.

Click again to stop.

Recording start  /stop 

Click to start recording to a data file while monitoring is being performed.

When clicked again, only recording stops.



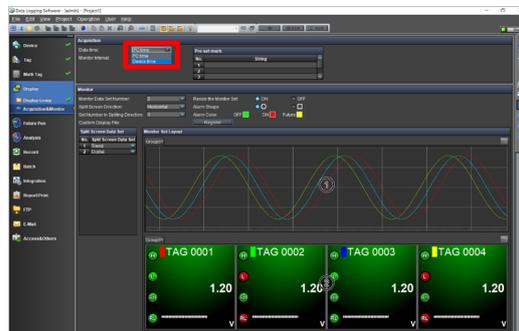
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2.4 PC Time Setting Method and Restrictions

■ Set [PC time] for the data acquisition conditions.

Specify [PC time] for the [Data time] setting. The other steps are the same as those for the [Device time] setting.



■ Restrictions

- The fastest [Monitor Interval] setting is [100 Millisecond].
- The data time is the time that GA10 acquires the data.
- The measurement timing is not synchronized, even when the time synchronization setting has been configured for the VZ20X.

3. Modbus/TCP Communication

- Monitoring the Data Using Exclusive Function Code 70/71 -

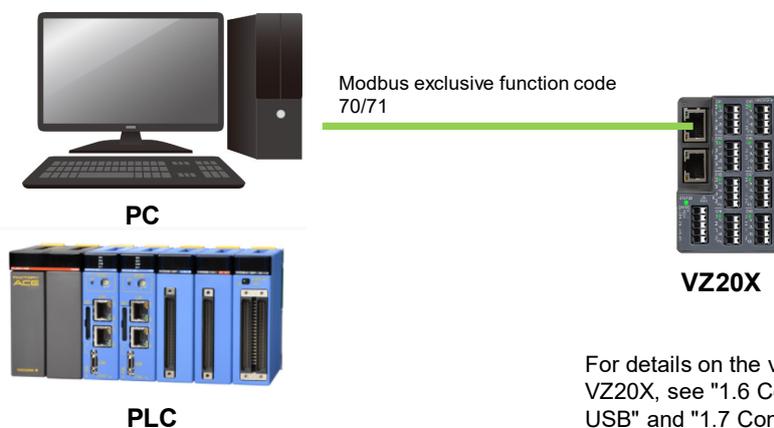
- 3.1 Outline
- 3.2 Data Monitoring Procedure
- 3.3 Setting the Time to VZ20X
- 3.4 Acquiring the Data
- 3.5 Converting the Acquired Measured Values

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3.1 Outline

Ethernet communication is used for the connection to the VZ20X. Programming is required in order to use exclusive function code 70/71 for monitoring the measured values.



For details on the various settings for the VZ20X, see "1.6 Configuring Settings via USB" and "1.7 Configuring Settings via Ethernet".

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3.1 Outline

■ Settings and Items to Check Before Starting

- Before connecting, use VZ Configurator to configure items such as the VZ20X communication settings.

■ Precautions on the Use of Sample Programs

- Sample programs are helpful tools to refer to when communicating with VZ20X.
- Visual Studio 2019 and Python development environments are required when using sample programs.
- Sample programs are intentionally written to be easy to understand. Perform error processing, array creation, and other tasks as necessary.

3.2 Data Monitoring Procedure

This section describes the work flow for data monitoring.

First, set the time for the VZ20X.

Next, send the monitoring start communication command with FC=70.

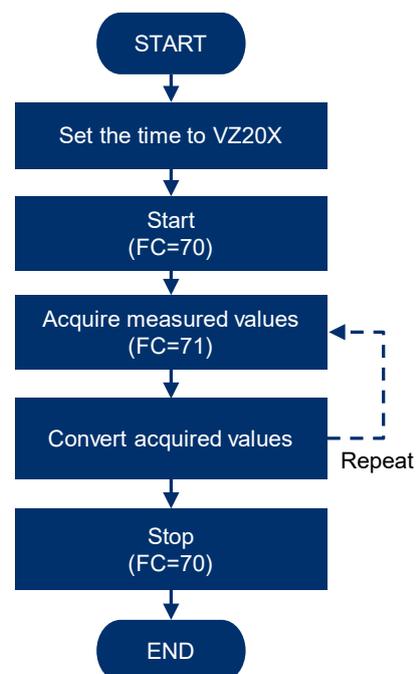
After that, send the measured value acquisition communication command with FC=71. In the case of a 1 ms data acquisition interval, send the first measured value acquisition communication command within 2 seconds of the monitoring start communication command.

Convert the measured values after they are acquired.

Repeat the measured value acquisition and conversion operations the required number of times.

To stop monitoring the measured values, send the FC=70 communication command to terminate the process.

For details, refer to "7.2 Ethernet Communication" in the Model VZ20X Analog Sensing Unit User's Manual.



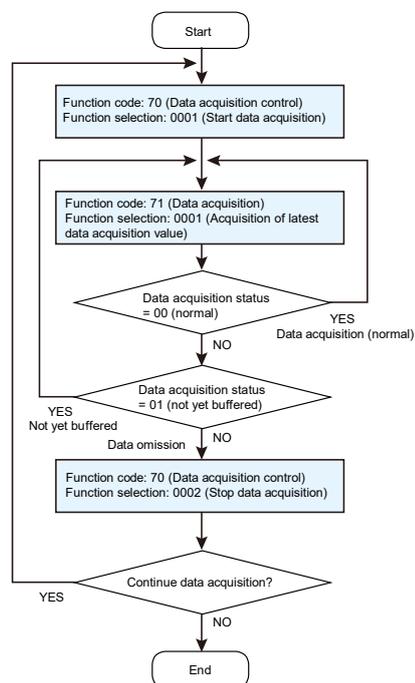
3.2 Data Monitoring Procedure: Details of Data Monitoring with Function Code 70/71

This section describes the flow of operations when using exclusive function code 70/71 for data monitoring.

With each data monitoring response, 4 ms of data consisting of four sets of "date", "time", "measured values for CH1 to CH8", and "measured value status for CH1 to CH8" can be acquired.

Perform data monitoring by continuously repeating communication with data monitoring function code 71.

The data buffer in VZ20X stores 8 channels x 2000 points of data. In the case of a 1 ms interval, 2 seconds of data for 8 channels is stored in the data buffer. Acquire the data by performing communication before the data buffer is overwritten.



3.2 Data Monitoring Procedure: Overview of Monitoring Measured Values

The same request is sent repeatedly when monitoring with exclusive function code 71, but four sets of the latest data can be acquired in each response.

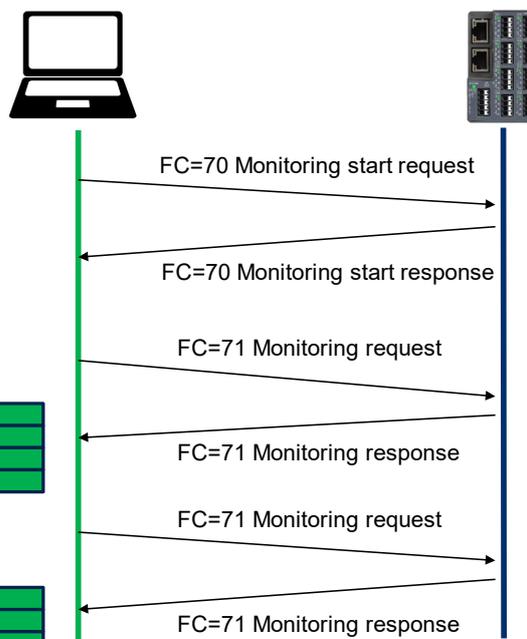
Example:

Data sets No. 1 to No. 4 can be acquired in the first 71 monitoring response.

Data sets No. 5 to No. 8 can be acquired in the second 71 monitoring response.

No.1	DATE	TIME	MES.VAL.1-8CH	STATUS1-8CH
No.2	DATE	TIME	MES.VAL.1-8CH	STATUS1-8CH
No.3	DATE	TIME	MES.VAL.1-8CH	STATUS1-8CH
No.4	DATE	TIME	MES.VAL.1-8CH	STATUS1-8CH

No.5	DATE	TIME	MES.VAL.1-8CH	STATUS1-8CH
No.6	DATE	TIME	MES.VAL.1-8CH	STATUS1-8CH
No.7	DATE	TIME	MES.VAL.1-8CH	STATUS1-8CH
No.8	DATE	TIME	MES.VAL.1-8CH	STATUS1-8CH



3.2 Data Monitoring Procedure: Overview of VZ20X Data Buffer

The data acquisition statuses for exclusive function code 71 are shown here. An example image of the data buffer in the VZ20X is shown below. Gray indicates the invalid state, and the other colors indicate valid data items. Valid data can be read out via communication.

0x00 Data acquisition completed normally

1	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
2	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
3	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
4	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
5	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
6	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
7	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
8	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH



1993	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1994	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1995	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1996	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1997	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1998	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1999	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
2000	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH

0x01 Data buffer incomplete

1	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
2	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
3	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
4	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
5	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
6	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
7	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
8	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH



1993	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1994	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1995	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1996	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1997	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1998	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1999	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
2000	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH

0x02 Data missing due to data overwrite



1	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
2	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
3	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
4	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
5	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
6	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
7	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
8	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH



1993	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1994	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1995	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1996	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1997	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1998	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
1999	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH
2000	DATE	TIME	MES.VAL.1:8CH	STATUS1:8CH

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3.3 Setting the Time to VZ20X

Set the current time for the VZ20X.

Refer to the sample programs shown below to configure the setting.

If no time setting is configured, the time will start elapsing from 1970-01-01 00:00:00.000.

Environment	Language	File name
Windows	Visual C#	VZ20XSample01_EN.zip
Windows, Linux, etc.	Python	VZ20XSample02_EN.zip

* See "Appendix" for details on preparing and running development environments for sample programs.

The sample program can be downloaded from our website after entering customer information.

URL <https://www.yokogawa.com/ns/vz/>

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3.4 Acquiring the Data

Perform data monitoring with exclusive function code 70/71.
Refer to the sample programs when creating the program.

No.	Environment	Language	Number of connected VZ20X units	File name
1	Windows	Visual C#	1	VZ20XSample03_EN.zip
2	e-RT3	C	1	VZ20XSample04_EN.zip

Sample programs No. 1 and No. 2 acquire data with one VZ20X unit connected to Windows or e-RT3 via Ethernet.

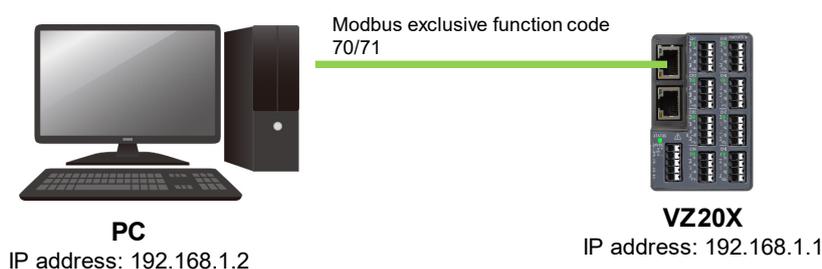
Configure the VZ20X settings before starting data monitoring.

* See "Appendix" for details on preparing and running development environments for sample programs.

The sample program can be downloaded from our website after entering customer information.
URL <https://www.yokogawa.com/ns/vz/>

Data Acquisition Example 1: PC and One VZ20X Unit Programming Language: Visual C#

This configuration consists of a PC and one VZ20X unit.
The sample program performs data acquisition only.

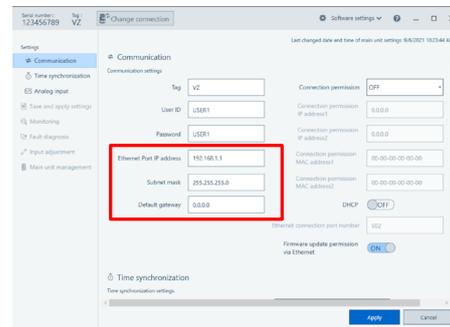


Description	Details
VZ20X connection type	1 unit
Programming language on PC	Visual C#

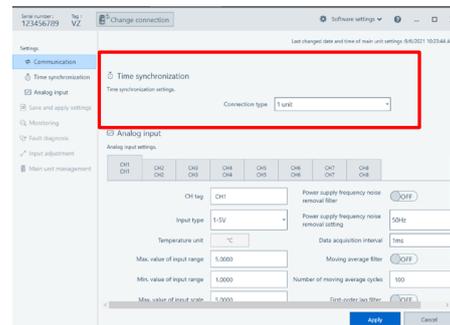
Data Acquisition Example 1: VZ20X Settings When Using PC with One VZ20X Unit

1. Configure the Ethernet settings.

IP address: 192.168.1.1
Subnet mask: 255.255.255.0
Default gateway: 0.0.0.0



2. Select [1 unit] for [Connection type] in [Time synchronization].



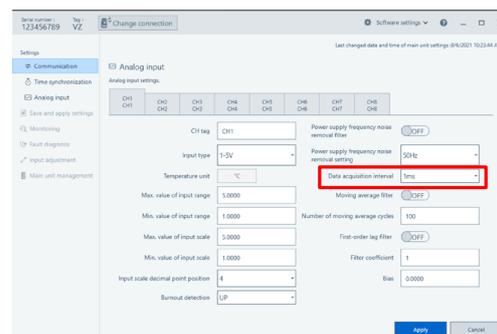
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Data Acquisition Example 1: VZ20X Settings When Using PC with One VZ20X Unit

3. Select [1 ms] for the [Data acquisition interval] setting.

Configure the other analog input settings according to the sensors that are used.



4. Once the VZ20X settings are configured, perform programming and acquire the measured values. Refer to the sample programs when programming.

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Data Acquisition Example 2: e-RT3 and One VZ20X Unit Programming Language: C

This configuration consists of the e-RT3 and one VZ20X unit.
The sample program performs data acquisition only.



e-RT3

IP address: 192.168.1.128

Modbus exclusive function code
70/71



VZ20X

IP address: 192.168.1.1

Description	Details
VZ20X connection type	1 unit
Programming language on PC	C
e-RT3 CPU	F3RP71, F3RP70 (Ubuntu image)

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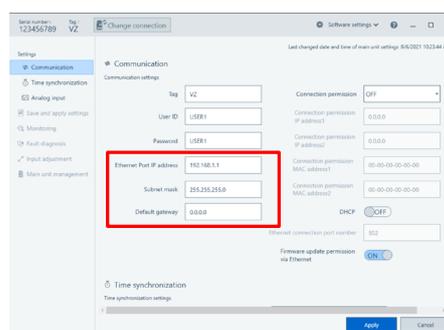
Data Acquisition Example 2: VZ20X Settings When Using e-RT3 with One VZ20X Unit

1. Configure the Ethernet settings.

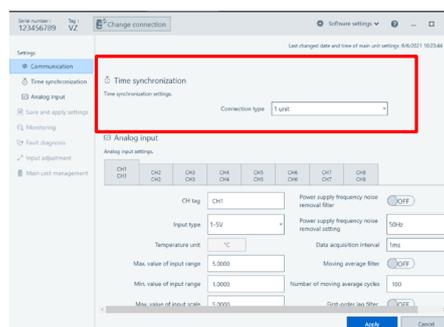
IP address: 192.168.1.1

Subnet mask: 255.255.255.0

Default gateway: 0.0.0.0



2. Select [1 unit] for [Connection type] in [Time synchronization].



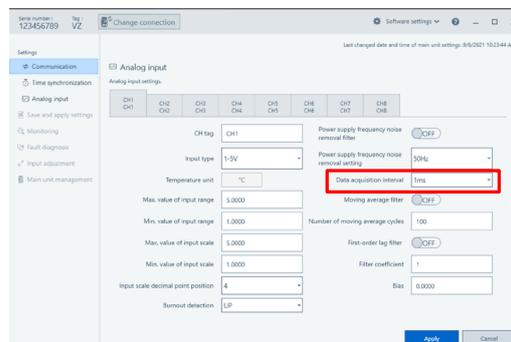
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Data Acquisition Example 2: VZ20X Settings When Using e-RT3 with One VZ20X Unit

3. Select [1 ms] for the [Data acquisition interval] setting.

Configure the other analog input settings according to the sensors that are used.



4. Once the VZ20X settings are configured, perform programming and acquire the measured values. Refer to the sample programs when programming.

3.5 Converting the Acquired Measured Values

The acquired measured values contain the data of 8 channels x 4 samples (4 ms of data if the sampling interval is 1 ms). The values need to be converted so that they can be understood. See the sample program below for the conversion method.

Environment	Language	File name
Windows	Visual C#	VZ20XSample06_EN.zip

The sample program can be downloaded from our website after entering customer information.
URL <https://www.yokogawa.com/ns/vz/>

3.5 Converting the Acquired Measured Values: Converting Acquired Strings to Readable Format

When measured values are acquired with function code 71, they need to be converted to text strings that can be recognized according to the response described in the User's Manual. Check the sample program for the conversion procedure.

Response

Element	MBAP Header				PDU				
	Number of bytes	2	2	2	1	1	1	10	12
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x47)	Data acquisition status	Year/month /day 1	Time 1	
(Hex)	Arbitrary	0000	00FD	01	47	00			

Continued

PDU							
4	4	4	4	4	4	4	4
CH1 Data1	CH2 Data1	CH3 Data1	CH4 Data1	CH5 Data1	CH6 Data1	CH7 Data1	CH8 Data1

Continued

PDU								
1	1	1	1	1	1	1	10	
CH1 STS1	CH2 STS1	CH3 STS1	CH4 STS1	CH5 STS1	CH6 STS1	CH7 STS1	CH8 STS1	Year/month /day 2

....

PDU									
4	4	1	1	1	1	1	1	1	
CH7 Data4	CH8 Data4	CH1 STS4	CH2 STS4	CH3 STS4	CH4 STS4	CH5 STS4	CH6 STS4	CH7 STS4	CH8 STS4

Continued

PDU
2
UNIT status

4. Modbus/TCP Communication - Monitoring the Data Using Function Code 03 -

- 4.1 Outline
- 4.2 Monitoring the Data with GX20
- 4.3 Monitoring the Data with GA10
- 4.4 Monitoring the Data with PC

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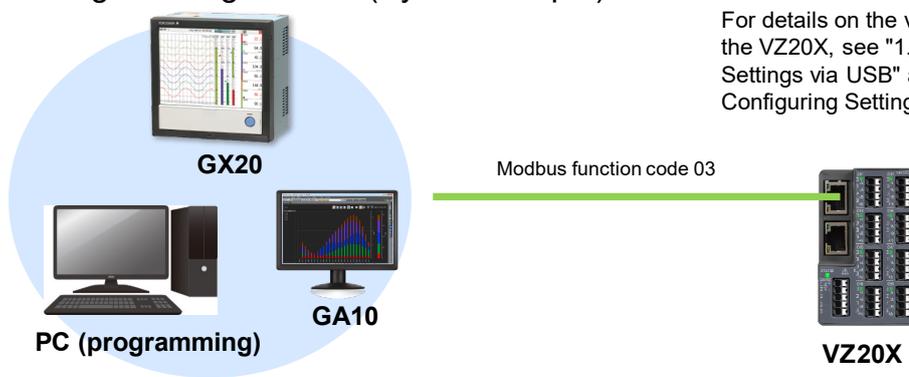
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4.1 Outline

Ethernet communication is used for the connection to the VZ20X. This section describes the procedure for monitoring measured values with Modbus function code 03.

Connection target devices

- Paperless recorder GX20
- GA10
- Programming with PC (Python sample)



For details on the various settings for the VZ20X, see "1.6 Configuring Settings via USB" and "1.7 Configuring Settings via Ethernet".

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4.1 Outline

■ Settings and Items to Check Before Starting

- Before connecting, use VZ Configurator to configure items such as the VZ20X communication settings.

■ Precautions on the Use of Sample Programs

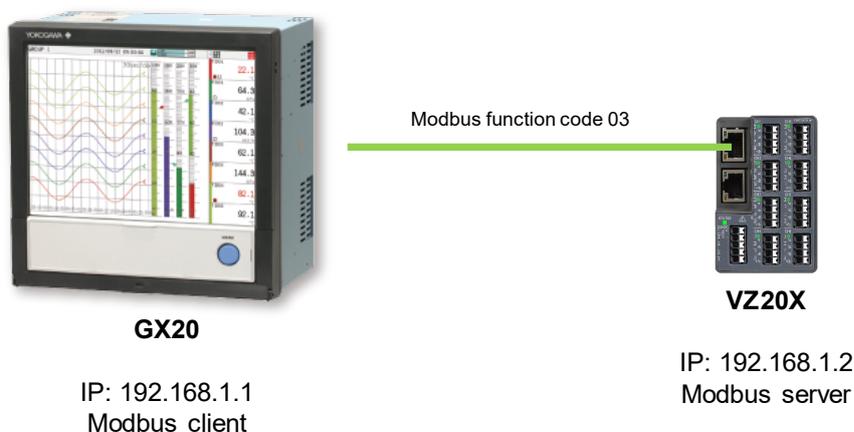
- Sample programs are helpful tools to refer to when communicating with VZ20X.
- Visual Studio 2019 and Python development environments are required when using sample programs.
- Sample programs are intentionally written to be easy to understand. Perform error processing, array creation, and other tasks as necessary.

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4.2 Monitoring the Data with GX20

This section describes how to monitor measured values from a VZ20X unit that uses the Modbus client function of the GX20 paperless recorder. A GX20 with option code /MC is required.



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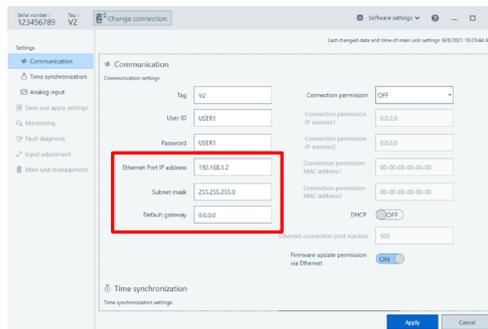
4.2.1 Configuring VZ20X Settings

1. Configure the Ethernet settings.

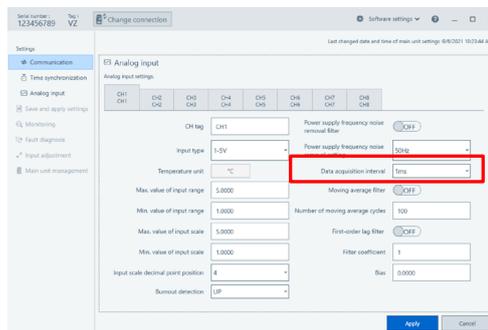
IP address: 192.168.1.2

Subnet mask: 255.255.255.0

Default gateway: 0.0.0.0



2. Although the fastest communication interval setting for the GX20 Modbus client function is 100 ms, specify [1 ms], [10 ms], or [50 ms] for the VZ20X [Data acquisition interval] setting. In this example, [1 ms] is selected.



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4.2.2 Configuring GX20 Settings (1) Modbus Client Function Settings

Basic settings

The menu locations vary depending on the setting method that is used.

- GX/GP unit: MENU key > [Browse] tab > [Setting] > [Communication (Ethernet) settings] in Setting menu > [Modbus client settings] > [Basic settings]
- Web application: [Config.] tab > [Communication (Ethernet) settings] > [Modbus client settings]
- Settings software: [Communication (Ethernet) settings] > [Modbus client settings]

Setting item	Setting value
On/Off	ON
Interval	100 ms
Wait time	2 min
Keep connection	Off
Connection timeout	1

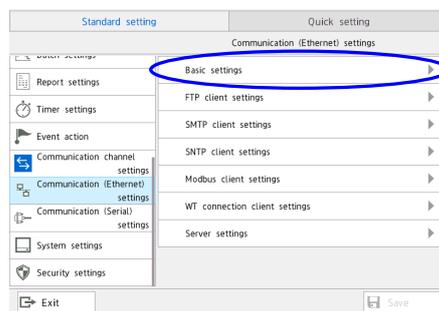
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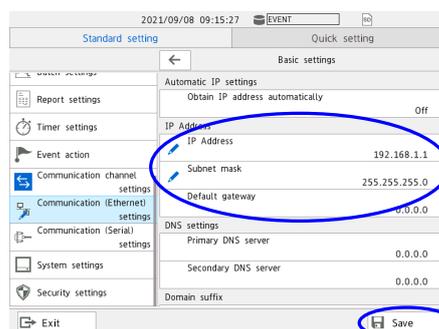
4.2.2 Configuring GX20 Settings

(1) Modbus Client Function Settings

1. In [Communication (Ethernet) settings], select [Basic settings].



2. Specify the IP address, subnet mask, and default gateway, and then click [Save].



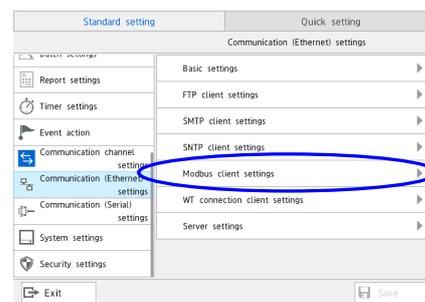
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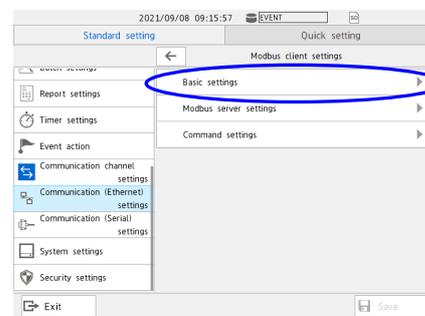
4.2.2 Configuring GX20 Settings

(1) Modbus Client Function Settings

3. Select [Modbus client settings].



4. Select [Basic settings].



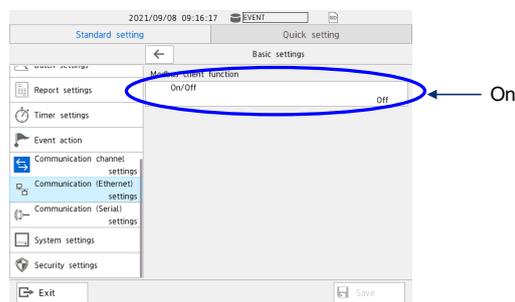
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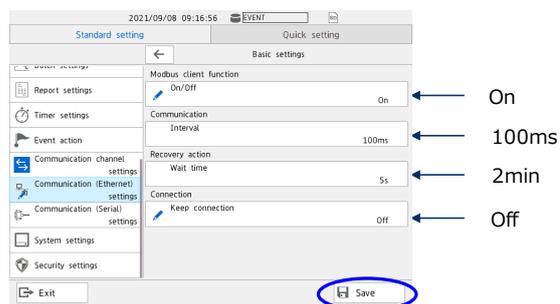
4.2.2 Configuring GX20 Settings

(1) Modbus Client Function Settings

5. Set [Modbus client function] to [On].



6. Configure the settings, then click [Save].



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4.2.2 Configuring GX20 Settings

(2) Modbus Server Settings

Modbus server settings

The menu locations vary depending on the setting method that is used.

- GX/GP unit: MENU key > [Browse] tab > [Setting] > [Communication (Ethernet) settings] in Setting menu > [Modbus client settings] > [Modbus server settings]
- Web application: [Config.] tab > [Communication (Ethernet) settings] > [Modbus server settings]
- Settings software: [Communication (Ethernet) settings] > [Modbus server settings]

Setting item	Setting value
Server name	192.168.1.2
Port number	502

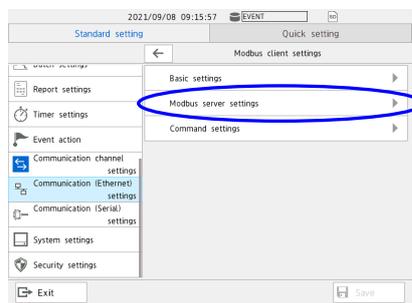
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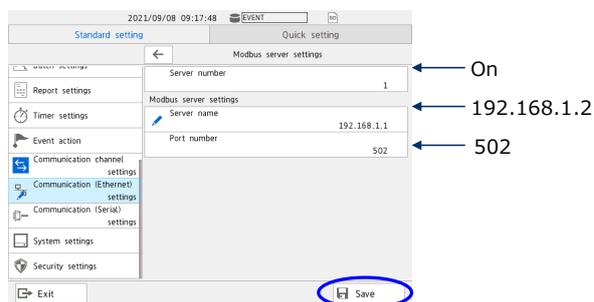
4.2.2 Configuring GX20 Settings

(2) Modbus Server Settings

1. Select [Modbus server settings].



2. Configure the Modbus server settings, then click [Save].



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4.2.2 Configuring GX20 Settings

(3) Command Settings

Command settings

Configure the settings so that VZ20X measured values 1 to 8 are stored in communication channels 1 to 8.

The menu locations vary depending on the setting method that is used.

- GX/GP unit: MENU key > [Browse] tab > [Setting] > [Communication (Ethernet) settings] in Setting menu > [Modbus client settings] > [Command settings]
- Web application: [Config.] tab > [Communication (Ethernet) settings] > [Modbus client command settings] > [Client command number]
- Settings software: [Communication (Ethernet) settings] > [Modbus client command settings] > [Client command number]

Setting item	Setting value
Type	Read
Server	1
Unit No.	1
Data type	INT32_B
Register	40106
Channel type	Communication channel
First-CH	0001
Last-CH	0008

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4.2.2 Configuring GX20 Settings (3) Command Settings

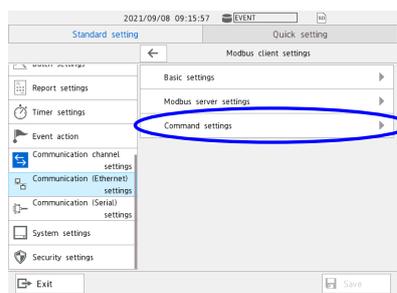
Use a register in which the measured values of VZ20X CH1 to CH8 are continuous. Store reference numbers 40106 to 40121 in communication channels 1 to 8.

CH1 measured value -> Communication channel C001
 CH2 measured value -> Communication channel C002
 CH3 measured value -> Communication channel C003
 CH4 measured value -> Communication channel C004
 CH5 measured value -> Communication channel C005
 CH6 measured value -> Communication channel C006
 CH7 measured value -> Communication channel C007
 CH8 measured value -> Communication channel C008

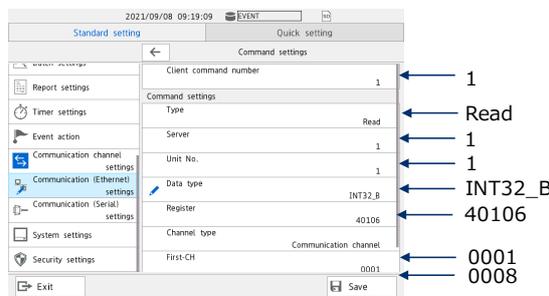
Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
40101	0064	Measured value time stamp	R	The time of measured values can be read. This setting is common to all channels.
40102	0065		R	
40103	0066		R	
40104	0067		R	The coordinated universal time or UTC can be read as a 64-bit unsigned integer.
40105	0068	Device status	R	The device status of the VZ20X can be read.
40106	0069	CH1 measured value	R	Measured values can be read as 32-bit signed integers. The range changes depending on the input range.
40107	006A		R	
40108	006B	CH2 measured value	R	
40109	006C		R	
40110	006D	CH3 measured value	R	
40111	006E		R	
40112	006F	CH4 measured value	R	
40113	0070		R	
40114	0071	CH5 measured value	R	The status of measured values can be read.
40115	0072		R	
40116	0073	CH6 measured value	R	
40117	0074		R	
40118	0075	CH7 measured value	R	
40119	0076		R	
40120	0077	CH8 measured value	R	
40121	0078		R	
40122	0079	CH1 measured value status	R	
40123	007A	CH2 measured value status	R	
40124	007B	CH3 measured value status	R	
40125	007C	CH4 measured value status	R	
40126	007D	CH5 measured value status	R	
40127	007E	CH6 measured value status	R	
40128	007F	CH7 measured value status	R	
40129	0080	CH8 measured value status	R	

4.2.2 Configuring GX20 Settings (3) Command Settings

1. Select [Command settings].



2. Configure the command settings, then click [Save].



4.2.2 Configuring GX20 Settings

(4) Communication Channel Span Settings, Display Channel Settings, and Recording Settings

Configure the communication channel span settings, display channel settings, and recording settings.

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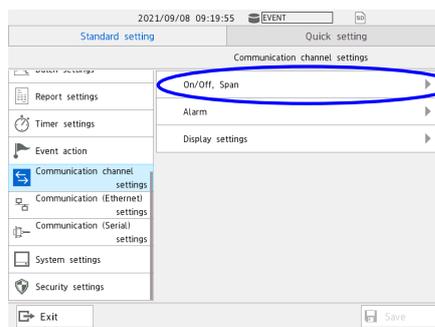
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4.2.2 Configuring GX20 Settings

(4) Communication Channel Span Settings, Display Channel Settings, and Recording Settings

1. Select [Communication channel settings].

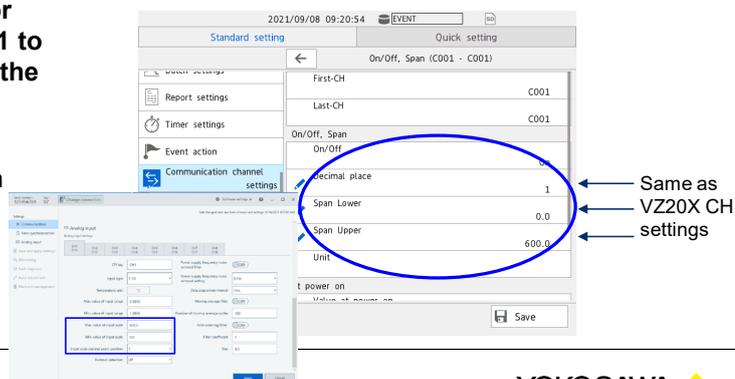
Click [On/Off, Span].



2. Configure the span settings for communication channels C001 to C008 to match the settings of the VZ20X.

The settings for C001 are shown here as an example.

After configuring the settings, click [Save].



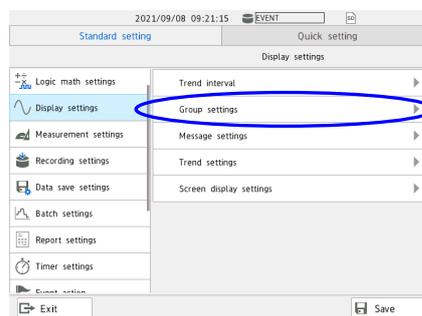
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4.2.2 Configuring GX20 Settings

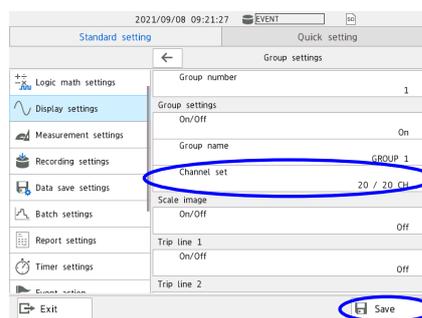
(4) Communication Channel Span Settings, Display Channel Settings, and Recording Settings

1. Select [Display settings], then click [Group settings].



2. Click [Channel set] on the [Group settings] screen.

3. Select communication channels C001 to C008 on the [Channel set] screen, click [OK], and then click [Save].



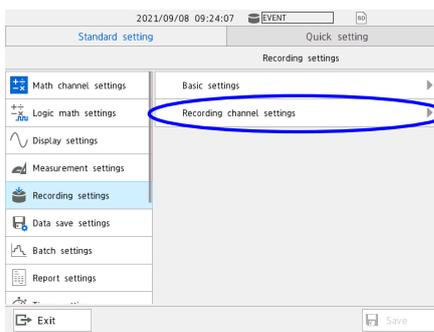
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4.2.2 Configuring GX20 Settings

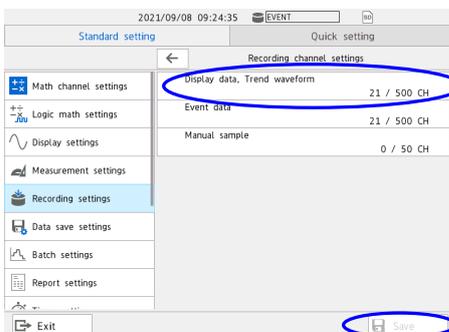
(4) Communication Channel Span Settings, Display Channel Settings, and Recording Settings

1. Select [Recording settings], then click [Recording channel settings].



2. Click [Display data, Trend waveform] on the [Recording channel settings] screen.

3. Select communication channels C001 to C008 on the [Channel set] screen, click [OK], and then click [Save].



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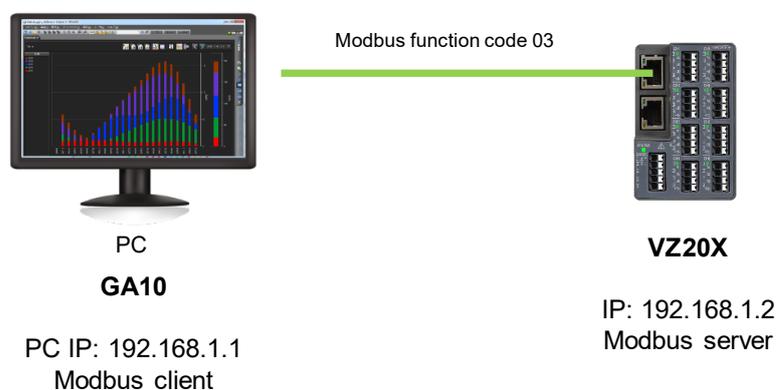
4.2.3 Starting Monitoring and Recording

1. The GX20 setting procedure is complete.

Start the recording and calculation operations, and check that the measured values can be read out to the recording screen.

4.3 Monitoring the Data with GA10

This section describes how to monitor measured values from a VZ20X unit that uses the Modbus client function of GA10. To use the Modbus client function with GA10, create a definition file with the Modbus device type definition file creation tool, and register the device.

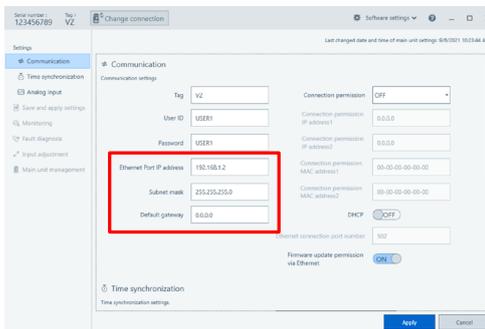


A free 60-day trial version of GA10 Data Logging Software is available.
<https://partner.yokogawa.com/global/>

4.3.1 Configuring VZ20X Settings

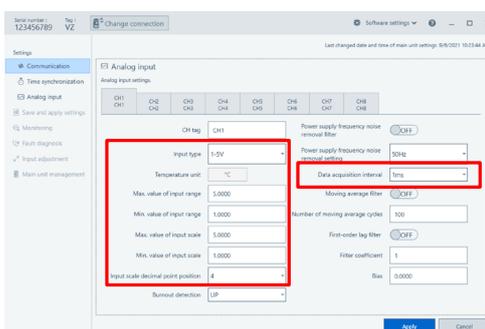
1. Configure the Ethernet settings.

IP address: 192.168.1.2
Subnet mask: 255.255.255.0
Default gateway: 0.0.0.0



2. Although the fastest communication interval setting for the GX20 Modbus client function is 100 ms, specify [1 ms], [10 ms], or [50 ms] for the VZ20X [Data acquisition interval] setting.

In this example, [1 ms] is selected.
Also, select [1-5 V] for [Input type], enter "5.0000" for [Max. value of input scale], enter "1.0000" for [Min. value of input scale], and select [4] for [Input scale decimal point position].



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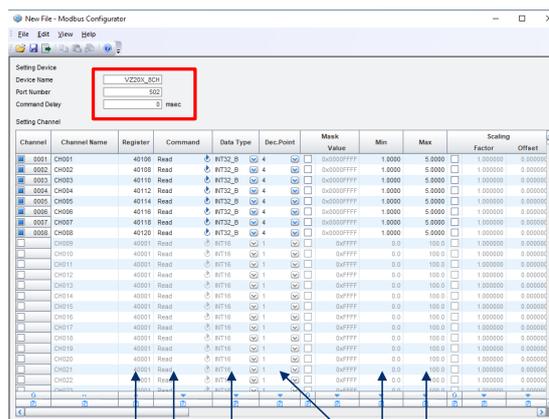
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4.3.2 Creating the GA10 Modbus Definition File

1. Create the GA10 Modbus definition file.

Specify the [Device Name], [Port number], [Command Delay], [Channel name], [Register], [Command], [Data type], [Dec. Point], [MIN], and [MAX] settings.

Setting item	Setting value	Remarks
Device Name	VZ20X_8CH	This is the name displayed in GA10.
Port number	502	
Command Delay	0	
Register	See the next page when setting this item.	
Command	Read	
Data type	INT32_B	
Dec. Point	4	Set the VZ20X input scale decimal point position.
MIN	1.0000	Set the VZ20X input scale minimum value.
MAX	5.0000	Set the VZ20X input scale maximum value.



Set the VZ20X register number, Read

INT32_B

Set the decimal point position, minimum value, and maximum value according to the scale settings for each channel on the VZ20X.

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4.3.2 Creating the GA10 Modbus Definition File

Use a register in which the measured values of VZ20X CH1 to CH8 are continuous.

CH1 measured value -> Channel 0001
 CH2 measured value -> Channel 0002
 CH3 measured value -> Channel 0003
 CH4 measured value -> Channel 0004
 CH5 measured value -> Channel 0005
 CH6 measured value -> Channel 0006
 CH7 measured value -> Channel 0007
 CH8 measured value -> Channel 0008

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
40101	0064	Measured value time stamp	R	The time of measured values can be read. This setting is common to all channels.
40102	0065		R	
40103	0066		R	
40104	0067		R	The coordinated universal time or UTC can be read as a 64-bit unsigned integer.
40105	0068	Device status	R	The device status of the VZ20X can be read.
40106	0069	CH1 measured value	R	Measured values can be read as 32-bit signed integers. The range changes depending on the input range.
40107	006A		R	
40108	006B	CH2 measured value	R	
40109	006C		R	
40110	006D	CH3 measured value	R	
40111	006E		R	
40112	006F	CH4 measured value	R	
40113	0070		R	
40114	0071	CH5 measured value	R	
40115	0072		R	
40116	0073	CH6 measured value	R	
40117	0074		R	
40118	0075	CH7 measured value	R	
40119	0076		R	
40120	0077	CH8 measured value	R	
40121	0078		R	
40122	0079	CH1 measured value status	R	The status of measured values can be read.
40123	007A	CH2 measured value status	R	
40124	007B	CH3 measured value status	R	
40125	007C	CH4 measured value status	R	
40126	007D	CH5 measured value status	R	
40127	007E	CH6 measured value status	R	
40128	007F	CH7 measured value status	R	
40129	0080	CH8 measured value status	R	

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4.3.2 Creating the GA10 Modbus Definition File

2. Save the GA10 Modbus definition file.

Click  for the Modbus definition file, then enter a name and save it.

3. Output the GA10 Modbus definition file.

Click  for the created Modbus definition file to output it.
 "VZ20X_8CH" is used here as an example.

The file output path is as follows:

C:\Program Files\Yokogawa Electric Corporation\SMARTDAC+ Data Logging Software\Modbus

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4.3.3 Configuring GA10 Settings

1. Start the GA10 Data Logging Software.

2. Enter the required information, then click [OK] to log in.



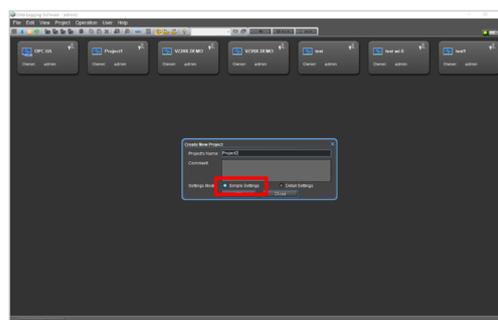
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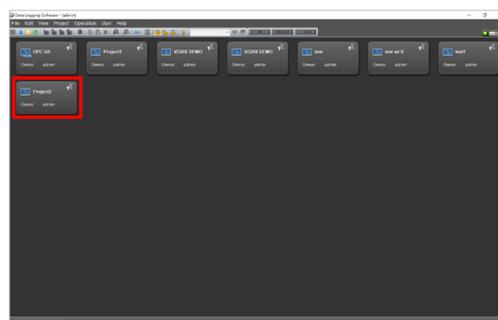
4.3.3 Configuring GA10 Settings

3. Select [File] > [Create New Project] to create a new project.
Enter the required information, then click [OK].

Select [Simple Settings] for [Settings Mode].



4. Double-click the project that was created to open it.

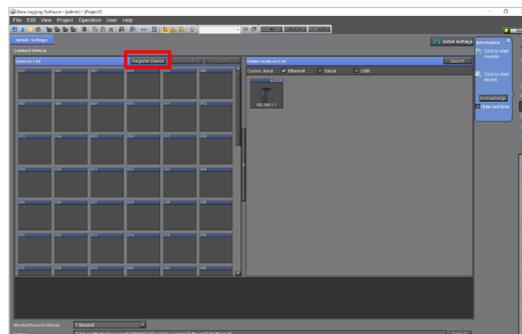


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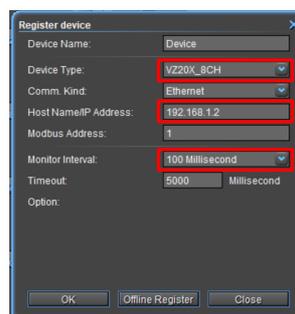
4.3.3 Configuring GA10 Settings

5. Click the [Register Device] button.



6. For the [Device Type] setting, select the [VZ20X_8CH] Modbus definition file.

Enter "192.168.1.2" for [Host Name/IP Address], select [100 Millisecond] for [Monitor Interval], and then click the [OK] button.

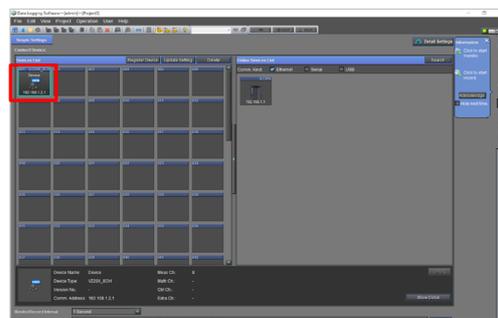


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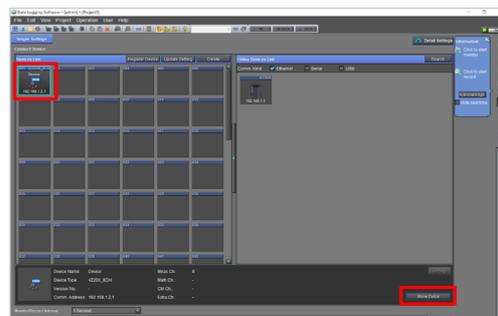
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4.3.3 Configuring GA10 Settings

7. Registration is complete.



8. Click the registered Modbus device, then click the [ShowDetail] button.

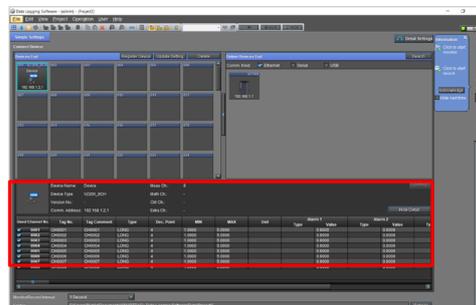


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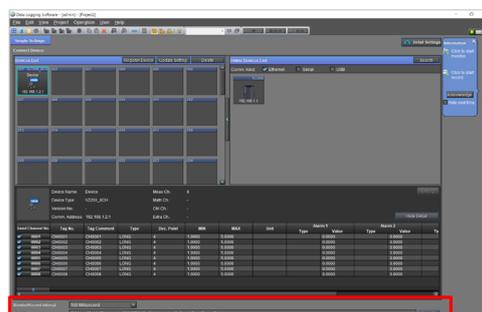
4.3.3 Configuring GA10 Settings

9. Check that the values are the same as those that were configured in the Modbus definition file.



10. Specify the [Monitor/Record] interval setting and the [Folder] save destination setting.

In this example, the fastest setting of [100 ms] is selected for [Monitor/Record].



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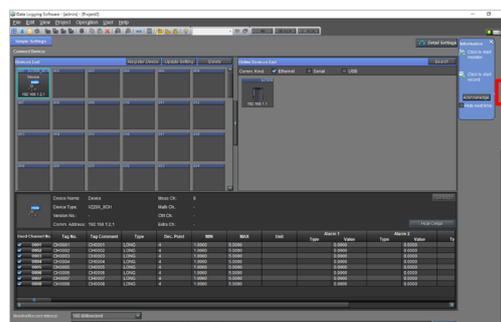
4.3.4 Starting Monitoring and Recording

11. You can start and stop monitoring or recording by clicking the icons displayed in the tab on the right side of the screen.

Monitoring start  /stop 

Click to start monitoring.

Click again to stop.



Recording start  /stop 

Click to start recording to a data file while monitoring is being performed.

When clicked again, only recording stops.



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4.4 Monitoring the Data with PC and FA-M3

This section describes how to monitor measured values from a VZ20X unit that uses PC and FA-M3 programming. The sample program reads out reference numbers 40106 to 40121 continuously.



PC



FA-M3

PC IP: 192.168.1.1
Modbus client

Modbus function code 03



VZ20X

IP: 192.168.1.2
Modbus server

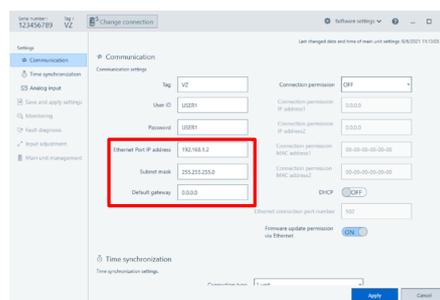
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4.4.1 Configuring VZ20X Settings

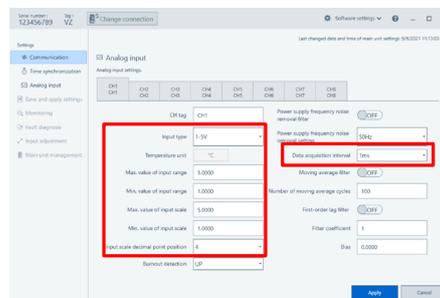
1. Configure the Ethernet settings.

IP address: 192.168.1.2
Subnet mask: 255.255.255.0
Default gateway: 0.0.0.0



2. Specify the VZ20X [Data acquisition interval] setting.

In this example, [1 ms] is selected.
Also, select [1-5 V] for [Input type], enter "5.0000" for [Max. value of input scale], enter "1.0000" for [Min. value of input scale], and select [4] for [Input scale decimal point position].



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4.4.2 Data Monitoring Example

Refer to the sample programs when writing a program to monitor measured values using function code 03.

No.	Environment	Language	File name
1	Windows, Linux, etc.	Python	VZ20XSample07_EN.zip
2	FA-M3	Ladder	VZ20XSample08_EN.zip

The sample programs continuously read the CH1 to CH8 data of 40106 to 40121 from the VZ20X that is connected via Ethernet, by using a PC with Modbus function code 03.

* See "Appendix" for details on preparing and running development environments for sample programs.

The sample program can be downloaded from our website after entering customer information.
URL <https://www.yokogawa.com/ns/vz/>

4.4.2 Data Monitoring Example

Specify a register in which the measured values of VZ20X CH1 to CH8 are continuous, and read out the data.

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
40101	0064	Measured value time stamp	R	The time of measured values can be read. This setting is common to all channels.
40102	0065		R	
40103	0066		R	
40104	0067		R	The coordinated universal time or UTC can be read as a 64-bit unsigned integer.
40105	0068	Device status	R	The device status of the VZ20X can be read.
40106	0069	CH1 measured value	R	Measured values can be read as 32-bit signed integers. The range changes depending on the input range.
40107	006A	CH2 measured value	R	
40108	006B	CH3 measured value	R	
40109	006C	CH4 measured value	R	
40110	006D	CH5 measured value	R	
40111	006E	CH6 measured value	R	
40112	006F	CH7 measured value	R	
40113	0070	CH8 measured value	R	
40114	0071	CH1 measured value status	R	
40115	0072	CH2 measured value status	R	
40116	0073	CH3 measured value status	R	
40117	0074	CH4 measured value status	R	
40118	0075	CH5 measured value status	R	
40119	0076	CH6 measured value status	R	
40120	0077	CH7 measured value status	R	
40121	0078	CH8 measured value status	R	
40122	0079	CH1 measured value status	R	The status of measured values can be read.
40123	007A	CH2 measured value status	R	
40124	007B	CH3 measured value status	R	
40125	007C	CH4 measured value status	R	
40126	007D	CH5 measured value status	R	
40127	007E	CH6 measured value status	R	
40128	007F	CH7 measured value status	R	
40129	0080	CH8 measured value status	R	

Appendix

- Installing the Development Environments in Windows and Running Sample Programs -

1. Visual Studio 2019 C# Environment
2. Python Environment

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1. Visual Studio 2019 C# Environment

1. Obtain Visual Studio 2019 and install it on your Windows PC.
2. Extract the downloaded sample program ZIP file.
3. Double-click the SLN file in the extracted file. The solution file opens.
4. Click [Build] in the menu bar, then select [Build Solution] and check that no errors occur.
5. Click the [Start] button to run the sample program.

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2. Python Environment

1. Download the Python package from the Python website.
<https://www.python.org/>
2. Install the downloaded Python package.
3. Extract the downloaded sample program file. Rename the extracted folder ("TEST" is used here as an example) and place it directly in the C drive folder.
 The full path is "C:¥TEST". A sample file name of "sample_python.py" is used here as an example.
4. Click the Windows Start button, then select [Command Prompt] in the [Windows System] folder.
5. Type the command shown below in the Command Prompt window, then press the "Enter" key.
 Command: `cd C:¥TEST`
6. Enter the command shown below in the Command Prompt window to run the Python program.
 Command: `python sample_python.py`
7. The results of the sample program are displayed in the Command Prompt window.

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Environment for e-RT3 development

■ Related Document

Device	Title	No.
e-RT3	Ubuntu Image for F3RP70 User's Guide	TI 34M06T02-02E

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Revision Information

Title : Multi-Sensing Remote I/O Analog Sensing Unit VZ20X
Host Device Connection Setup Procedure
Manual number : TI 77V01B01-11EN

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