User's Manual

VZ20X Analog Sensing Unit User's Manual

IM 77V01B01-01EN

YOKOGAWA
Yokogawa Electric Corporation

IM 77V01B01-01EN
6th Edition

Introduction

Thank you for purchasing the VZ20X Analog Sensing Unit (simply referred to as "VZ20X" from here on).
This manual describes how to use the VZ20X.

Be sure to read this manual before using the product in order to ensure correct operation.
The following manuals are provided for the product.

■ Paper Manual

Name of Manual	Manual No.	Description
Model VZ20X Analog Sensing Unit Precaution on the Use of VZ20X	IM 77V01B01-11Z1	Describes the precautions on use of the VZ20X.

■ Electronic Manuals and General Specifications

Product user's manuals and general specifications can be downloaded from the following URL. Adobe System's Adobe Acrobat Reader or later (latest version recommended)
URL: https://www.yokogawa.com/ns/vz/

● Electronic Manuals

Name of Manual	Manual No.	Description
Model VZ20X Analog Sensing Unit User's Manual	IM 77V01B01-01EN	Describes how to use the VZ20X. (This manual)
Model VZ20X Analog Sensing Unit Precaution on the Use of VZ20X	IM 77V01B01-11Z1	Describes the precautions on use of the VZ20X. (This is identical to the paper manual.)

● General Specifications

General Specifications	No.
Model VZ20X Analog Sensing Unit	GS 77V01B01-01EN

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■ Target Readers

This guide is intended for the following personnel;

- Engineers responsible for installation, wiring, and maintenance of the equipment
- Personnel responsible for instrumentation or functional development
- Personnel (operators) responsible for operation of equipment on which daily operations are performed after operation of the equipment is started, and personnel responsible for instrumentation that is maintained on a daily basis and for electrical maintenance

■ About This Manual

- Please pass this manual to the end user. We also ask you to store this manual in a safe place.
- Thoroughly read and fully understand the content of this manual before operating this product.
- This manual explains the functions of the product. It does not guarantee that the product will suit a particular purpose of the user.
- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest YOKOGAWA dealer.
- Copying or reproducing all or any part of the contents of this manual without YOKOGAWA's permission is strictly prohibited.

■ Checking the 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.

- 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

The nameplate is located on the case side of the VZ20X body.
Check that the product that you received is what you ordered by referring to the model name and suffix code given on the nameplate.

No. (Instrument number)
When contacting the dealer from which you purchased the product, please give them the instrument number.

■ Model and Suffix Codes

For details of models and suffix codes, refer to General Specifications at the end of this manual.

■ Authorised Representative in the EEA and the Importer into the EU/EEA Market (*)

The Authorised Representative for this product in the EEA and the importer for this product into the EU/EEA market via Yokogawa sale channel is:
Yokogawa Europe B.V.
Euroweg 2, 3825 HD Amersfoort,The Netherlands
*: Support for VZ20X style 2.01 and later.

■ Importer for This Product into the Great Britain Market (*)

In relation to UKCA marking, the importer for this product into the Great Britain market via the YOKOGAWA sales channel is:
Yokogawa United Kingdom Limited
Stuart Road Manor Park Runcorn, WA7 1TR, United Kingdom
*: Support for VZ20X style 2.01 and later.

■ QR Code

The product has a QR Code pasted for efficient plant maintenance work and asset information management. It enables confirming the specifications of purchased products and user's manuals. For more details, please refer to the following URL.
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■ Revisions

October, 2021	1st Edition
June, 2022	2nd Edition
August, 2022	3rd Edition
November, 2022	4th Edition
March, 2023	5th Edition
November, 2023	6th Edition

■ Safety Precautions

The following symbol is used on the product. It indicates the possibility of injury to the user or damage to the product, and signifies that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

WARNING

Calls attention to actions or conditions that could cause serious or fatal injury to the user, and indicates precautions that should be taken to prevent such occurrences.

CAUTION

Calls attention to actions or conditions that could cause injury to the user or damage to the product or property and indicates precautions that should be taken to prevent such occurrences.

Note

Identifies important information required to operate the instrument.

This indicates "DC."

This indicates "DC/AC."

The equipment wholly protected by double insulation or reinforced insulation.

■ Precautions Related to the Protection, Safety, and Alteration of the Product

- This instrument conforms to IEC safety standards IEC61010-1 and IEC61010-2-030, Overvoltage Category I *1, Measurement Category II (CAT II) *2.
  - *1 This product is connected to a circuit in which measures for limiting transient overvoltage to an appropriate low level have been adopted. When power is supplied from fixed equipment such as electric switchboards, connect a transformer between the product and the fixed equipment.
  - *2 Measurement category II (CAT II) applies to test circuits and measuring circuits that are directly connected to locations (e.g. outlets) where low-voltage main power supply equipment is used.

  This instrument complies with EMC standard EN61326-1 Class A Table 2 (For use industrial locations) (*).
  The influence rate (performance criterion A) in the immunity test environment is within ± 5 % of the voltage or resistance range.
  *: Support for VZ20X style 2.01 and later.
  For the protection and safe use of the product and the system in which this product is incorporated, be sure to follow the instructions and precautions on safety that are stated in this manual whenever you handle the product. Take special note that if you handle the product in a manner that violates these instructions, the protection

functionality of the product may be damaged or impaired. In such cases, YOKOGAWA does not guarantee the quality, performance, function, and safety of the product.

- Installation of protection and/or safety circuits with respect to a lightning protector; protective equipment for the system controlled by the product and the product itself; foolproof or fail-safe design of a process or line using the system controlled by the product or the product itself; and/or the design and installation of other protective and safety circuits are to be appropriately implemented as the customer deems necessary.
- Be sure to use the spare parts approved by YOKOGAWA when replacing parts or consumables.
- This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives. Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.
- Modification of the product is strictly prohibited.
- This product is intended to be handled by skilled/trained personnel for electric devices.
- When mounted on a DIN rail, attach the rail to a sufficiently strong steel sheet.
- Install the product at locations away from burnable substances.

WARNING

- Power Supply
  Ensure that the product's supply voltage matches the voltage of the power supply before turning ON the power. Use a power supply that complies with on-site safety standards. Provide a switch or circuit breaker (*1) on the power line for disconnecting the product from the main power supply. Also, attach an ON/OFF indication to the switch or circuit breaker (*1) to indicate that it is a device for shutting off the power supply to the product.
  *1 IEC 60947 compliant product
  For permanent installation, supply power from the power supply terminal. USB power supply can be used for temporary purposes.
- Do Not Operate in an Explosive Atmosphere
  Do not operate the instrument in locations with combustible or explosive gases or dust. Operation in such environments constitutes an extreme safety hazard.
- Do Not Remove Internal Unit
  The internal unit should not be removed by anyone other than YOKOGAWA's service personnel. There are dangerous high voltage parts inside.
- Installation and Wiring
  - To prevent electric shock while wiring, make sure that the power supply is turned off.
  - To prevent electric shock, do not apply voltages that exceed the ratings to the input terminals.

- If hazardous external voltage (30 VAC or 60 VDC or more) is applied to input terminals, provide adequate protection to prevent users or service engineers from inadvertently touching the terminals or tools or the like from coming in contact with the terminals.
- If hazardous external voltage (30 VAC or 60 VDC or more) is applied to input terminals, use twisted wires having an outer diameter of φ3 mm or less for all terminals that are wired with twisted wires.
- If wiring is performed using twisted wires without crimp-on lugs (ferrule terminals), and hazardous external voltage (30 VAC or 60 VDC or more) is applied to the input terminals, install the product in a panel or a locked cabinet to prevent the input terminals from being touched.
- Make sure to use appropriate wires and crimp-on lugs (ferrule terminals). To prevent electric shock due to damage, prevent strong tension from being applied to the cords.
- To prevent fire, use signal wires having a temperature rating of 80°C or higher.
- Do not allow conductive wiring scraps, chips, or the like to enter inside the product. This causes electric shock, fire, failure, or malfunction. Also, note that wiring scraps and chips easily enter the product during wiring when the VZ20X is turned face up.
- When the product is used in China, if hazardous external voltage (30 VAC or 60 VDC or more) is applied to the input terminals from an external source, install the product in a panel or a locked cabinet to prevent the input terminals from being touched.
- Before installation and wiring, be sure to check the Model VZ20X Analog Sensing Unit User's Manual.
  (URL: https://www.yokogawa.com/ns/vz/)

CAUTION

- This instrument is an EMC class A product. In a domestic environment this product may cause radio interference in which case the user needs to take adequate measures.
- Limit the length of USB (Type-C) cables to three meters.
- Ensure that static electricity is not applied to the terminals. When attaching and removing wiring, first discharge static electricity to ensure that static electricity is not applied to the wiring.
- Damage to the Protection
  Operation of the product in a manner not specified in the user's manual may damage its protective construction.
- Do Not Use in a Corrosive Gas
  Use of the product in environments with high concentrations of corrosive gas (H_2S, SOx, etc.) may cause a failure.

■ Exemption from Responsibility

- YOKOGAWA makes no warranties regarding the product except those stated in the WARRANTY that is provided separately.
- The product is provided on an "as is" basis. YOKOGAWA assumes no liability to any person or entity for any loss or damage, direct or indirect, arising from the use of the product or from any unpredictable defect of the product.

■ Product Handling Precautions

- Use care when cleaning the product, especially its plastic parts. To clean the product, wipe lightly with a soft dry cloth moistened with water. Do not use organic solvents, such as benzene or paint thinner. They may cause discoloring or deformation.
- Keep electrically charged objects away from the signal terminals. Failure to do so may damage the product.
- If there are any symptoms of trouble such as strange odors or smoke coming from the product, immediately turn off the power and the power supply source. Then, contact your nearest YOKOGAWA dealer.

■ Handling of Software

- YOKOGAWA makes no warranties regarding the software used for the product except those stated in the Software License Agreement that is provided separately.
- Copying of the software used for the product is strictly prohibited except for the purpose of making a backup.
- Reverse compiling and reverse assembling (reverse engineering) of the software used for the product is strictly prohibited.
- Use of the software used for the product by a third party by transfer, exchange, subleasing or otherwise in whole or in part without the prior approval of YOKOGAWA is strictly prohibited.

■ Protection of Environment

关于产品污染防止管理
Control of Pollution Caused by the Product
製品の汚染防止管理について
根据中华人民共和国电子信息产品的防污染管理办法，对本仪表进行说明。
This is an explanation for the product based on “Control of pollution caused by Electronic Information Products” in the People’ s Republic of China.
中華人民共和国での電子情報製品の汚染防止管理に基づき、製品について説明しています。

产品中有毒有害物质或元素的名称及含量

部件名称	有毒有害物质或元素					
	铅(Pb)	汞(Hg)	镉(Cd)	六价铬(Cr6+)	多溴联苯(PBB)	多溴二苯醚(PBDE)
框架（塑料）	×	×	×	○	×	×
框架（金属）	×	×	×	○	×	×
内部接线材料	×	×	×	○	×	×
电源	×	×	×	○	×	×

○：表示该部件所有基材中所含的有毒有害物质含量均未超过 GB/T26572 标准中规定的限量要求。
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从左数第 3 位数：
生产年份 R：2015, S：2016, T：2017, U：2018, V：2019, W：2020, X：2021, Y：2022, Z：2023, 1：2024, 2：2025, 3：2026, ……
从左数第 4 位数：
生产月份 1：1 月, 2：2 月, 3：3 月 ……9：9 月, A：10 月, B：11 月, C：12 月
示例) T1RA00001：2015 年 10 月__

■ Disposal of the Product

When disposing of the product, appropriately dispose of the product as industrial waste in accordance with regional and local government regulations.

■ Waste Electrical and Electronic Equipment (WEEE) (*)

(Only valid in the EEA for EU WEEE Directive and in the UK for UK WEEE Regulation)
This product complies with the WEEE marking requirement. This marking indicates that you must not discard this electrical/electronic product in domestic household waste.
When disposing of products in the EEA or UK, contact your local Yokogawa office in the EEA or UK respectively.
*: Support for VZ20X style 2.01 and later.

■ Hardware Specifications

● Power Supply Specifications

24 VDC (+10%/-15%) 4.5 W or less or USB power supply

● Rated Voltage (input signal)

±60 VDC (DC voltage 2 V range or higher and standard signal)
±10 VDC (other than DC voltage 2 V range or higher and standard signal)
Voltage between input channels: 300 VAC rms (50 Hz/60 Hz) or 300 VDC
Common mode voltage: 300 VAC rms (50/60 Hz) or 300 VDC (under Measurement Category II conditions)

● Environmental Conditions

Location: Indoors
Altitude: 2,000 m or less
Operating temperature: When mounted on a DIN rail: -10 to 55°C, when installed on desktop: -10 to 50°C
Operating humidity: 5 to 90% RH (condensation not allowed)
Overvoltage Category: I
Measurement Category: II
Pollution Degree: 2

Yokogawa Electric Corporation
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11.1 This Agreement supersedes all prior oral and written understandings, representations and discussions between the parties concerning the subject matter hereof to the extent such understandings, representations and discussions should be discrepant or inconsistent with this Agreement.

11.2 If any part of this Agreement is found void or unenforceable, it shall not affect the validity of the balance of the Agreement, which shall remain valid and enforceable according to its terms and conditions. The parties hereby agree to attempt to substitute for such invalid or unenforceable provision a valid or enforceable provision that achieves to the greatest extent possible the economic, legal and commercial objectives of the invalid or unenforceable provision.

11.3 Failure by either party to insist on performance of this Agreement or to exercise a right does not prevent such party from doing so at a later time, either in relation to that default or any subsequent default.

VZ20X
Analog Sensing Unit
User's Manual

IM 77V01B01-01EN 6th Edition

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1. Outline

1.1 What Is the VZ20X?

The VZ20X Analog Sensing Unit can measure various analog signals at high speed, high accuracy and simultaneously. Isolation between input channels ensures excellent noise resistance. VZ20X measurement data can be acquired on a PC, PLC or other host device via Ethernet. The VZ20X has two Ethernet ports. By making daisy chain connections*1 with multiple VZ20X's, time-synchronized measurement of up to 15 units*2 on 120 channels can be performed.

*1: A "daisy chain connection" refers to a method of connecting multiple electrical and electronic devices in a continuous line.
*2: The number of connected devices may be limited depending on the performance and operating environment (OS, CPU, installation software, programming, etc.) of the PC (including GA10 Data Logging Software) and PLC.

1.2 System Configuration

The following describes the system configuration of the VZ20X.

● Ethernet communication

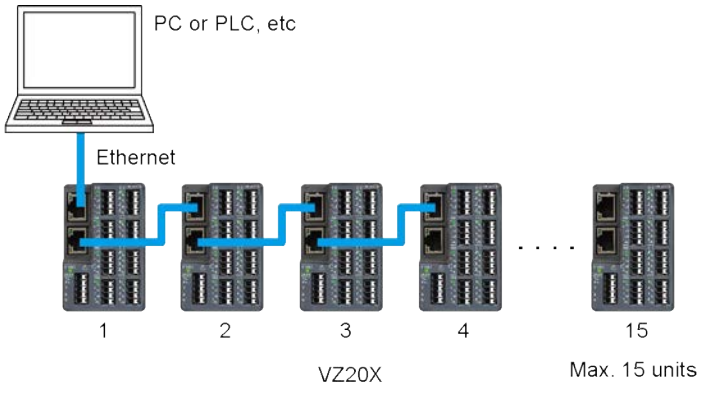
The VZ20X can be used when connected to a host device such as PC/PLC, etc. Data can be acquired in a daisy chain connection regardless of the time synchronization setting. A maximum of 15 units*1 can be connected in a daisy chain connection.
The parameter settings, monitoring and input adjustment can be made by VZ Configurator.

*1: The number of connected devices may be limited depending on the performance and operating environment (OS, CPU, installation software, programming, etc.) of the PC (including GA10 Data Logging Software) and PLC.

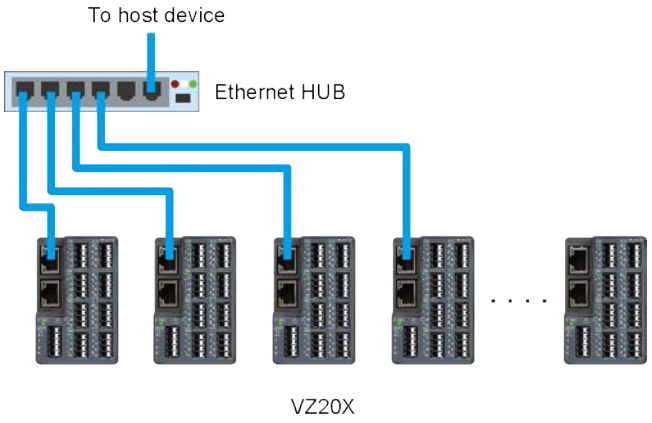
CAUTION

- The VZ20X does not support a circular loop configuration as in a daisy chain connection.
- When connecting in a daisy chain, match the data acquisition interval of the VZ20X in the system.

The figure below shows an example of VZ20X's connected in a daisy chain configuration.



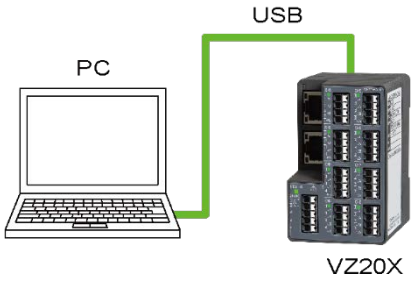
The figure below shows an example of VZ20X's connected in a single straight line to a hub.



● USB communication

The VZ20X can be used when connected to a host device such as PC/PLC, etc. The VZ20X is connected to a PC by USB cable. The parameter settings, monitoring and input adjustment can be made by VZ Configurator.

The figure below shows an example of a VZ20X connected to a PC.



1.3 Specifications

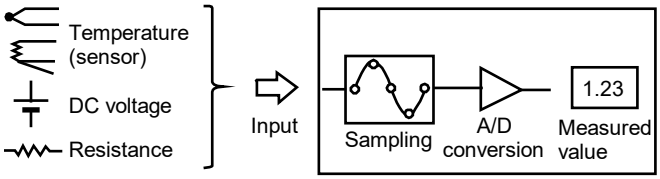
For details of VZ20X specifications, refer to General Specifications at the end of this manual.

1.4 Basic Functions

The following describes the basic functions of the VZ20X.

● Measurement

Inputs from thermocouples, resistance temperature detectors, DC voltage, resistance, and other inputs can be measured at a fast sampling period of 1 ms.
Signals input to the VZ20X are sampled every 1 ms and then A/D conversion is performed. The resulting values then become the measured value of a channel. 10 ms, 50 ms and 100 ms can also be selected as the data acquisition interval for acquiring measured values in addition to 1 ms.



● Communication

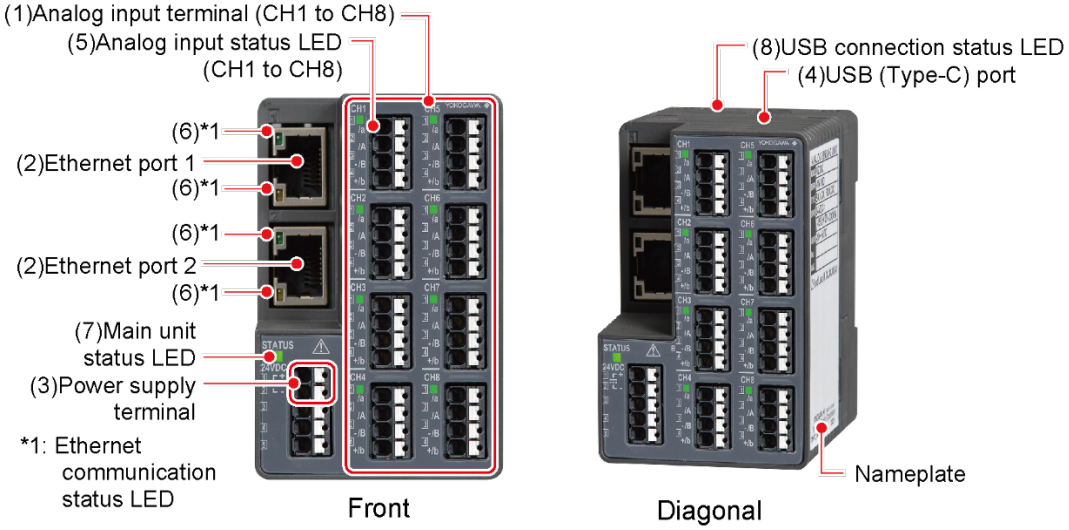
The VZ20X has two Ethernet ports. These are used for connecting to a host device such as PC/PLC, etc which perform data acquisition and for connecting multiple VZ20X's. Multiple VZ20X's can also be connected without the need to use a general-purpose Ethernet hub.
When connected to the GA10, data can be acquired without the need to prepare a special program. When connected to a PC/PLC, data can be acquired by creating a program. In this case, Modbus/TCP is used as the communication protocol.
The parameter settings, monitoring and input adjustment can be made by VZ Configurator via Ethernet communication or USB communication.

● Time synchronization

Time synchronization is performed between VZ20X's connected in a daisy chain configuration. Time synchronization between VZ20X's connected in this way enables measurement values to be acquired on up to 120 channels*1 at the same A/D conversion timing.

*1: The number of connected devices may be limited depending on the performance and operating environment (OS, CPU, installation software, programming, etc.) of the PC (including GA10 Data Logging Software) and PLC.

1.5 Names of Parts

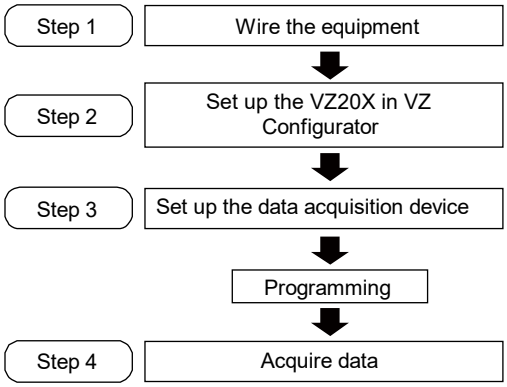


Number in Figure	Name	Description
(1)	Analog input terminals	8 insulated analog inputs. The measuring method is simultaneous measurement. 8 points can be measured simultaneously on a single VZ20X unit, and simultaneous measurement on up to 120 channels is possible when multiple units* are connected. * For daisy chain connections
(2)	Ethernet ports 1, 2	These ports are for performing Ethernet communication. Communication physical layer: IEEE802.3 (100BASE-TX) Protocol: Modbus/TCP for communication with PC/PLC Dedicated protocol for communication with GA10 Baud rate: 100 Mbps Maximum segment length: 100 m Recommended transmission cable: STP category 5e or higher recommended Max. number of daisy chain connections: 15
(3)	Power supply	Connect by 24 VDC.
(4)	USB (Type-C) port	Connect by USB cable (Type-C).
(5)	Analog input status LED	Lights/flashes when the power is turned on, and indicates the operating status of analog inputs. Number of LEDs: 1 per channel LED display color: Green
(6)	Ethernet communication status LED	Lights (green) when an Ethernet link is established. Upper: Indicates the link/active status. Lower: Indicates the transmission speed (100 Mbps) status. Number of LEDs: 2 per port LED display color: Green, orange
(7)	Main unit status LED	Lights/flashes when the power is turned on, and indicates the operating status of the VZ20X. Number of LEDs: 1 LED display color: Red, green, blue (For the unit status, refer to “9.1 Operation When an Error Occurs and Corrective Action!”.)
(8)	USB connection status LED	Lights when the USB cable is connected to the PC, and indicates a USB communication connection status. Number of LEDs: 1 LED display color: Green

2. Operating Procedure

Set up by the following procedure.

● PC / PLC, etc



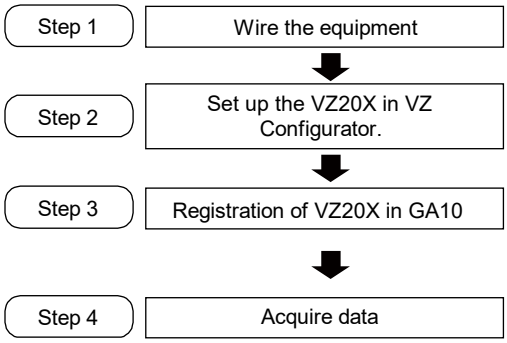
Wire the equipment in keeping with the operating environment.
Refer to User's Manual Chapter 4.

Make the various settings in VZ Configurator.
Refer to User's Manual Chapter 5.

Set up the device that will acquire the data.
Acquire the data using Modbus/TCP.
Refer to User's Manual 7.2.5 and 7.2.6

When everything is ready, start data acquisition.

● GA10



Wire the equipment in keeping with the operating environment.
Refer to User's Manual Chapter 4.

Make the various settings in VZ Configurator.
Refer to User's Manual Chapter 5.

Register VZ20X in GA10.
Refer to GA10 User's Manual (IM 04L65B01-01EN)

When everything is ready, start data acquisition.

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3. Installation

WARNING

Before installing and wiring the VZ20X, be sure to turn the power off.

■ Installation site

Install at a site that meets the following indoor conditions:

- Ambient temperature
  When mounted on a DIN rail: -10 to 55°C
  When installed on a desktop: -10 to 50°C
- Ambient humidity
  5 to 90% RH
  Use the VZ20X in a non-condensation state.

Note

Condensation sometimes forms on the VZ20X when it is moved from a low temperature and humidity site to a high temperature and humidity site, or when temperature changes suddenly. This may also result in a measurement error when thermocouple input is measured. In situations such as this, allow the VZ20X to acclimatize to the surrounding environment for at least one hour.

- Well-ventilated sites
  Install the product in a well-ventilated site to prevent temperature from rising inside.
- Sites with little mechanical vibration
  Choose a site that is subject to little mechanical vibration. Siting the product in a location subject to lots of mechanical vibration may not only adversely affect mechanisms inside the product but also prevent normal measurement.
- Level sites
  When installing the instrument, ensure that the site is level and free of tilting on the front and rear, and left and right.
- Altitude 2,000 m or less

Do not install the instrument in the following kinds of places.

- Outdoors
- In Direct Sunlight or Near Heat Sources
  Install the VZ20X in a place that is near room temperature (23°C) and that is not subject to large temperature fluctuations. Placing the VZ20X in direct sunlight or near heat sources can cause adverse effects on the internal circuitry.
- Where an excessive amount of soot, steam, moisture, dust, or corrosive gases are present
  Soot, steam, moisture, dust, and corrosive gases will adversely affect the VZ20X. Avoid installing the VZ20X in such locations.

- Near Strong Magnetic Field Sources
  Do not bring magnets or instruments that produce electromagnetic fields close to the VZ20X. Operating the VZ20X near strong magnetic fields can cause measurement errors.
- Areas subject to being splashed with water

■ Installation method

The VZ20X can be mounted on a DIN rail or installed on a desktop. In either installation method, make sure that the VZ20X is installed vertically.

● Mounting on DIN rail

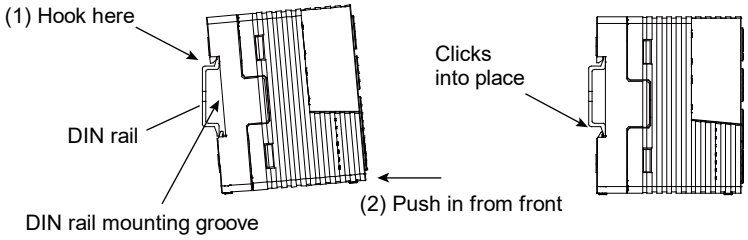
Applicable DIN rails: TH35-7.5Al, TH35-7.5Fe (JIS C 2812 compliant)

CAUTION

- Ensure sufficient space above the VZ20X to allow heat to dissipate. Also, if there is a base plate under the VZ20X when it is mounted on a DIN rail, ensure that there is at least 50 mm between the VZ20X and the base plate.
- When mounting on a DIN rail, attach the fastening plate and mount the main unit firmly so that it does not move on the DIN rail.
- When securing a DIN rail in place, screw the rail in at intervals of less than 100 mm. This is required to ensure the strength of the rail.
- For side-by-side close mounting, remove the VZ20X from the DIN rail when connecting and disconnecting the Ethernet communication cable.
  Install the VZ20X with an appropriate distance between the VZ20Xs when connecting or disconnecting the Ethernet communication cable without removing the VZ20X from the DIN rail.

1 Hook the upper part of the DIN rail mounting groove on the rear of the VZ20X onto the DIN rail.

2 Push the lower part of the VZ20X onto the DIN rail until you hear it click into place. The VZ20X is secured onto the DIN rail by the lever on the rear of the VZ20X.

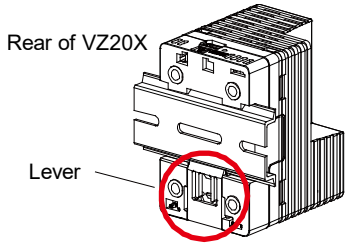


3 After installation on the DIN rail, check that it is securely fixed in place.

● Removal from DIN rail

1 Using a flat-bladed screwdriver, prize the lever on the rear of the VZ20X downwards.
Prize it downwards until you hear a clicking sound. The lever is secured at this position.

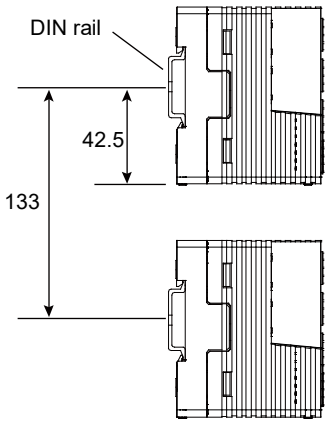
2 In this state, pull the VZ20X towards you and lift up its body to remove the VZ20X from the DIN rail.



Lower the lever to remove

● DIN rail vertical mounting dimensions

Unit: mm



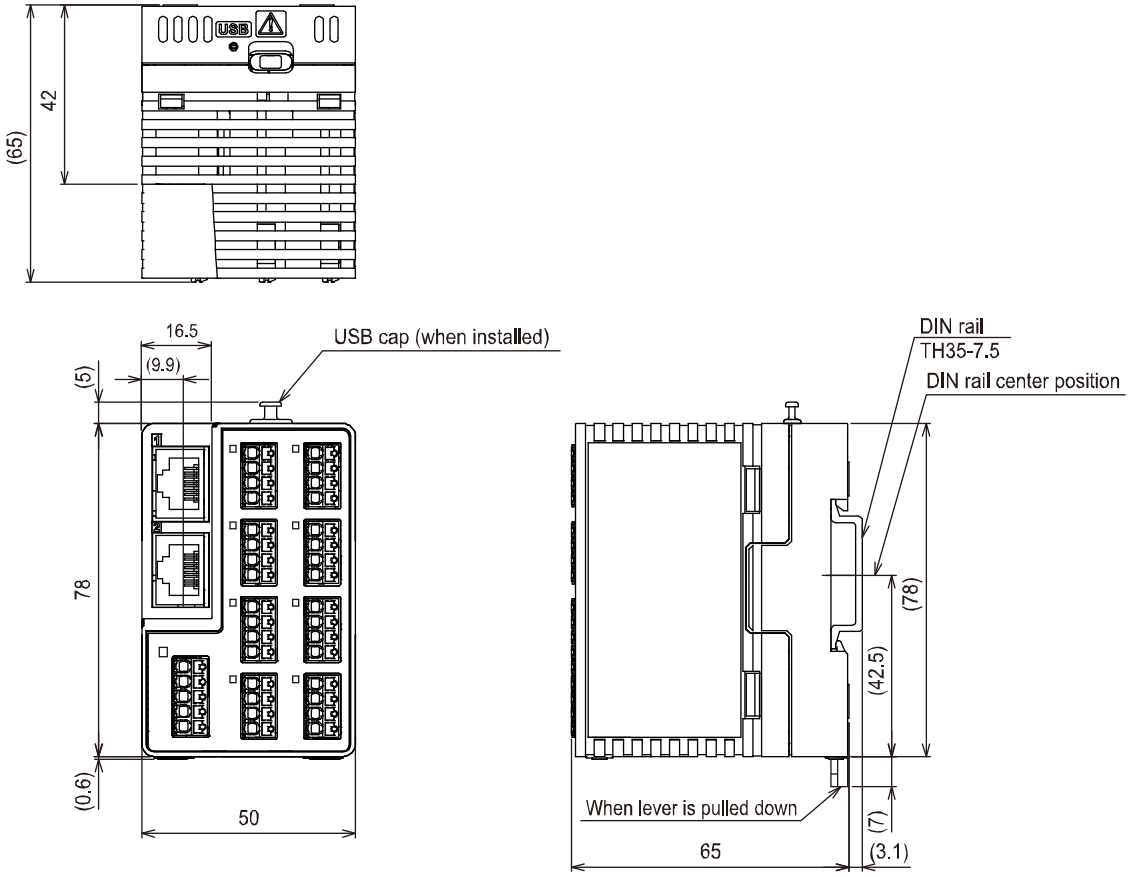
When using a USB cable, consider the bending radius of the USB cable in addition to the above.

● Use on desktop

Install on a flat, level site.

■ External dimensions

Unit: mm
Third angle projection
Normal tolerance = ± (value of JIS B 0401-2016 tolerance class IT18) / 2



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4. Wiring

WARNING

- To prevent electric shock during wiring, make sure that the power supply is turned OFF.
- Large pulling force acting on input signal wires wired to the product may damage the terminals or signal wires of the product. Secure all wiring cables to an installation panel to prevent pulling force from acting directly on the terminals of the product.
- If hazardous external voltage (30 VAC or 60 VDC or more) is applied to input terminals, use twisted wires having an outer diameter of φ3 mm or less for all terminals that are wired with twisted wires.
- If wiring is performed using twisted wires without crimp-on lugs (ferrule terminals), and hazardous external voltage (30 VAC or 60 VDC or more) is applied to the input terminals, install the product in a panel or a locked cabinet to prevent the input terminals from being touched.
- To prevent fire, use cables having a temperature rating of 80°C or more.
- The operating environment specified for the product is pollution degree 2. Do not allow conductive wiring scraps, chips, or the like to enter inside the product. This causes electric shock, fire, failure, or malfunction. Also, note that wiring scraps and chips easily enter the product during wiring when the VZ20X is turned face up.
- Do not apply voltages that exceed the ratings below to the input terminals. Otherwise, the product may be damaged.
  - Allowable input voltage:
    ±60 VDC (DC voltage 2 V range or higher and standard signal)
    ±10 VDC (other than DC voltage 2 V range or higher and standard signal)
  - Voltage between input channels: 300 VAC rms (50 Hz/60 Hz) or 300 VDC
  - Common mode voltage: 300 VAC rms (50/60 Hz) or 300 VDC (under Measurement Category II conditions)

CAUTION

- Wire in an environment having an ambient temperature of -5°C or more.
- When connecting both the power terminal and USB cable to VZ20X, first supply power from the power terminal and then connect the USB cable.
- Power is supplied from both the power terminal and USB cable. For this reason, before turning the VZ20X off, be sure to disconnect the USB cable.
- For wiring onto a push-in terminal, use a cable pre-attached with a ferrule terminal.
- Do not use a ferrule terminal that is bent, crushed or otherwise deformed excluding indentations caused by a crimping tool. Do not use ferrule terminals once they have been deformed by connection. Replace with a newly crimped ferrule terminal. Use of deformed ferrule terminals may result in the terminal getting caught on the terminal block or prevent the terminal from being disconnected.
- When wiring the input signal wires, observe the minimum bending radius value of the electric wire. For the minimum bending radius value, use either an electric wire that satisfies the specification designated by the electric wire manufacturer and an electric wire having six times or more the diameter of the electric wire conductor.
- Prevent static electricity from being applied to terminals.
  - Before wiring to terminals, discharge static electricity from your body and tools to prevent it from being applied to terminals.
- The product might become damaged if static electricity is applied to signal wires or transient noise is applied at a similar high voltage.
- Take measures to prevent noise from entering the measurement circuit.
  - Locate the measurement circuit away from the power supply line (power circuit).
  - Preferably, the measurement target should not be a noise source. However, if this is unavoidable, insulate the measurement target and measurement circuit. Also, ground the measurement target.
  - Shielded wires are effective against noise caused by static induction. Ground shielded leads, as necessary.
  - Wiring the measurement circuit with its wiring twisted at short equal intervals is relatively effective against noise caused by electromagnetic induction.
- When using the reference junction compensation of this product for a thermocouple input, ensure that the temperature of the terminal section is made stable.
  - When wiring, use leads of the specified compatible electric wire size.
  - Prevent changes in the ambient air temperature from occurring. Switching fans nearby on and off, in particular, causes large changes in temperature.
- Connecting input wiring in parallel to other devices may adversely affect measured values. If such a connection is unavoidable,
  - Set burnout detection to OFF.
  - Do not switch one of the devices on and off during operation. Doing so may adversely affect the other device.
  - Resistance temperature detectors or resistor inputs cannot be connected in parallel.
- Do not connect to unused terminals.
- Make sure that the wiring does not block status LEDs.

● Recommended ferrule terminal lug

Manufacturer: PHOENIX CONTACT
Crimping tool: CRIMPFOX 6

Applicable terminal type	Product No.	Applicable electric wire mm² (AWG#)	Recommended stripping length (mm²)
AI 0, 25-8 YE	3203037	0.25 (24)	10
AI 0, 34-8 TQ	3203066	0.3*1, 0.34 (22)	10
AI 0, 5-8 WH	3200014	0.5 (20)	11
AI 0, 75-8 GY	3200519	0.75 (18)	11
AI-TWIN 2X 0,5-10 WH*2	3203309	0.5(20)	13
AI-TWIN 2X 0,75-10 GY*2	3200975	0.75(18)	14

*1 JIS electric wire sizes
*2 Can only be used at the power supply terminal.

● Cable specifications and recommended parts

Wiring	descriptions
Power supply, voltage input, resistance temperature detector	0.2 to 0.82 mm² (AWG24 to 18) *3 Use a rated cable that is matched to the intended application.
Thermocouple	0.2 to 0.5 mm² (AWG24 to 20)
Ethernet communication	100BASE-TX (Category 5e or higher recommended)
USB communication	VZ20X side USB connector shape: Type-C Connection cable: Use a USB cable of USB 2.0 or higher.

*3 If twin ferrule terminals are not used when the power supply is transition-wired, the cable used is 0.2 to 0.5 mm² (AWG24 to 20).

When the ferrule terminal is not used, length of the stripped wire should be 7 to 8 mm. Also, use a power lead having a finished outer diameter of 3 mm or less. Further, if twin ferrule terminals are not used when the power supply is transition-wired, adjust length of the stripped wire so that the power lead is wired to the terminal block.
When transition-wiring the power supply, use power leads having the same cross-sectional area.

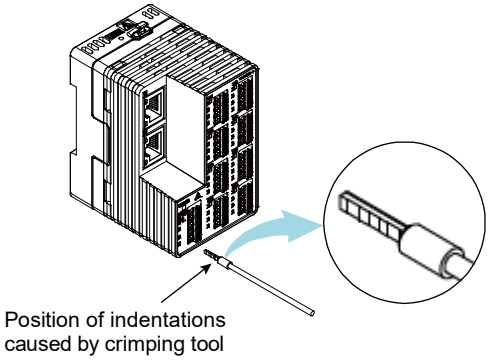
Do not pre-soldering on the conductor when connecting the stranded wire. The contact failure or the decreasing of the wire retention force (pullout force) may cause by connecting the pre-soldered conductor.
In case of stray strands when connecting the stranded wire, twist properly before connecting, but be careful not to twist strongly in order to connect the stranded wire to be evenly.

■ Wiring Method

WARNING

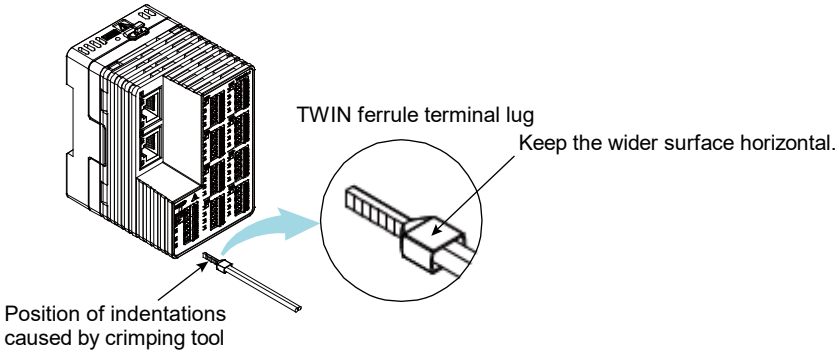
Cautions when wiring

Wire so that the indentation shape on the ferrule terminal caused by the crimping tool comes to the opposite side of the white release button on the terminal block, as shown in the figure below.



Cautions when attaching twin ferrule terminals

When attaching twin ferrule terminals onto the cable with a crimping tool, crimp so that the indentation is formed at the correct position on the ferrule terminal by the crimping tool. If the ferrule terminal is crimped in the wrong direction, the ferrule terminal sometimes cannot be wired or this makes it difficult to remove the wiring.

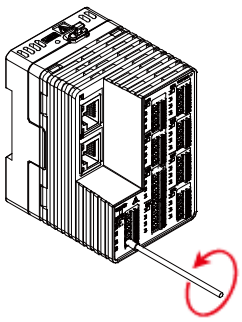


Cautions when removing wiring

In the event that wiring cannot be drawn out, do not exert unnecessary force to draw out the wiring. Rotate the cable to change the orientation of the ferrule terminal while pressing in the white release button using a flat-bladed screwdriver (tip width 2.0 to 2.5 mm), and then try drawing out the wiring again. When twin ferrules are used in the power supply wiring, turn the cables within the range of possible movement as they interfere with adjacent terminals. Also, wiring may get caught on the terminal block and cannot be drawn out if an attempt is made to draw out the wiring before the white release button has been fully pressed in with a flat-bladed screwdriver.

Do not exert a force of 100 N or more on the white release button. Doing so might damage the device.

Push in the electric wire release button vertically using a flat-bladed screwdriver. Note that applying force in a different direction may result in damage to the product or an injury.



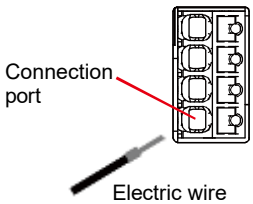
1 Turn the power supply off.

2 Wire the power wire and signal wire to the terminals on the VZ20X.

Wiring of push-in terminals

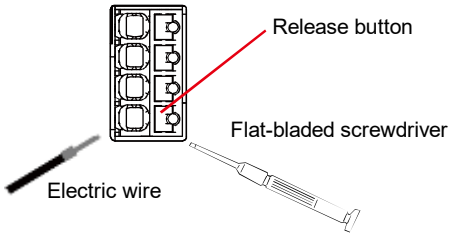
Wiring

When connecting a ferrule terminal and solid-core wire, push the ferrule terminal or the solid-core wire crimped onto the cable into the push-in terminal.



With thin solid-core wire, wiring sometimes bends and cannot be connected simply by pushing it in.
In this case, push the lead into the push-in terminal by pressing in the white release button using a flat-bladed screwdriver (tip width 2.0 to 2.5 mm) in the same way as when connecting twisted wire.

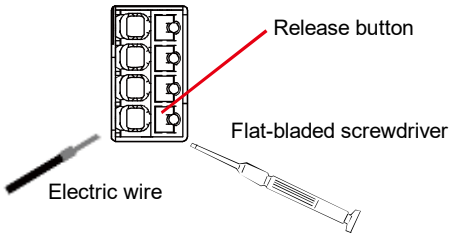
When connecting twisted wire
Push the lead into the push-in terminal by pressing in the white release button using a flat-bladed screwdriver (tip width 2.0 to 2.5 mm). After pushing in the lead, release the flat-bladed screwdriver from the release button.



Check that the cable cannot be drawn out.

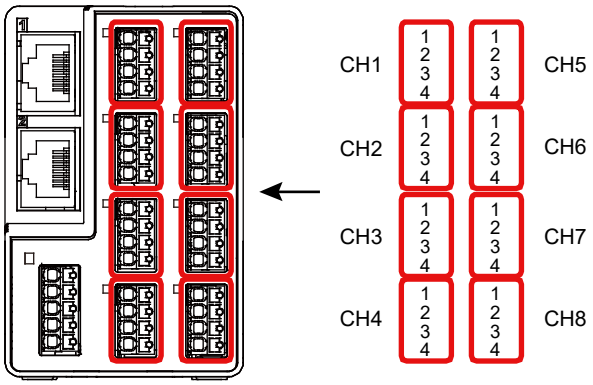
Removal

Press the white release button with a flat-bladed screwdriver (tip width 2.0 mm to 2.5 mm) and draw out the cable.

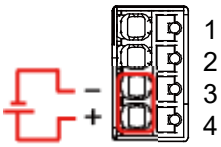
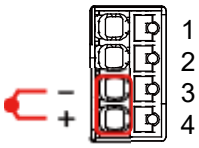
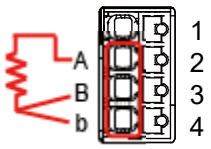
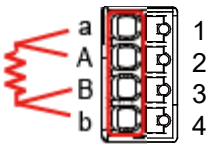


■ Wiring inputs

Terminal diagram



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**
	

Terminal Layout

Analog input channels

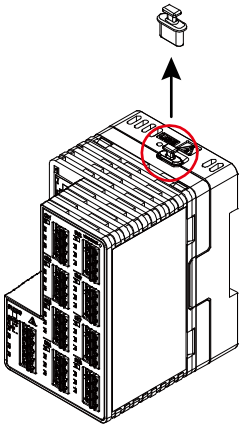
Terminal No.	Voltage/Standard signal	Thermocouple	3-wire resistance temperature detector	4-wire resistance temperature detector/4-wire resistance
1	(Use forbidden)	(Use forbidden)	(Use forbidden)	a
2	(Use forbidden)	(Use forbidden)	A	A
3	V-	V-	B	B
4	V+	V+	b	b

CAUTION

Do not connect to unused terminals.

■ Connection to USB port

When using the USB port, remove the USB connector cap.
When the USB port is not used, attach the USB connector cap to prevent faulty contacts.



USB connector type: Type-C
Connection cable: Use USB2.0 or higher cables.
VZ20X can be set up in VZ Configurator.
Power can also be supplied to VZ20X from the USB port.

Functional limitations differ according to the USB Type on the power supply source.
There are no functional limitations on a Type-C.
If not using Type-C, functionality and operation will vary depending on the firmware version and USB Type-C detection setting.
If the firmware version is R1.01.04 or earlier, parameters can be set. Ethernet usage, monitoring, input adjustment, and firmware updating are not available.
If the firmware version is R1.02.01 or later and USB Type-C detection is "Enable", parameters can be set. Ethernet usage, monitoring, input adjustment, and firmware updating are not available.
If the firmware version is R1.02.01 or later and USB Type-C detection is "Disable", there will be no functional limitations.

USB cable installation image

CAUTION

- When connecting both the power terminal and USB cable to VZ20X, first supply power from the power terminal and then connect the USB cable.
- Power is supplied from both the power terminal and USB cable. For this reason, before turning the VZ20X off, be sure to disconnect the USB cable.
- USB cable handling cautions

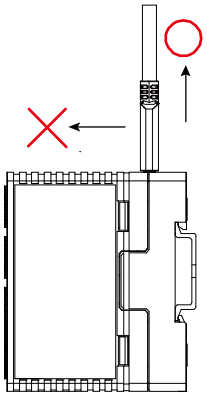
  Limit the length of USB cables to three meters.

  Connect to USB standard compliant parts.

  When the USB cable is connected or when removing the USB cable, prevent a load from being placed on the USB connector in the front direction of the product.

  When disconnecting the USB cable, draw it out towards the top of the product.

  Pulling the USB cable in the front direction of the product with a force of 30 N or more might damage the USB cable connector.



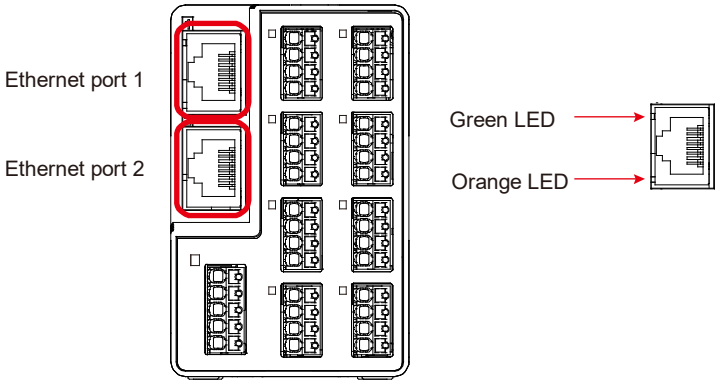
- Firmware version R1.02.01 or later

  If USB Type-C detection is "Disable" and there is insufficient current capacity in the USB specifications of the host, it could result in an operational defect or failure. Confirm the USB specifications of the PC, and use this product with USB Type-C detection set to "Disable".

■ Connection to Ethernet port

● Checking connection/communication status

The connection status of the Ethernet interface can be checked by the LEDs at the Ethernet connectors on VZ20X.



LED	Ethernet interface connection status
Lit (green)	The link to the network has been established.
Out (green)	The link to the network has not been established.
Flashing (green)	Data communication is in progress.
Lit (orange)	Data is being sent and received at 100 Mbps.

● When used as a standalone unit:

Use port 1.

● When used in a daisy chain connection:

Connect the host device (PC/PLC) side of the cable to port 1, and the VZ20X on the slave side to port 2.

Example: Connection of port on 2nd unit when a total of three units are connected in a daisy chain

Port 1 of 2nd unit: Connect to port 2 of 1st unit
Port 2 of 2nd unit: Connect to port 1 of 3rd unit

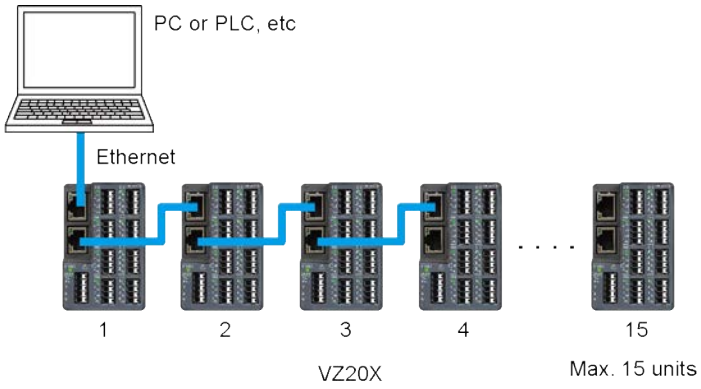
● When connected via an Ethernet hub

Use port 1 on all connected VZ20X's.

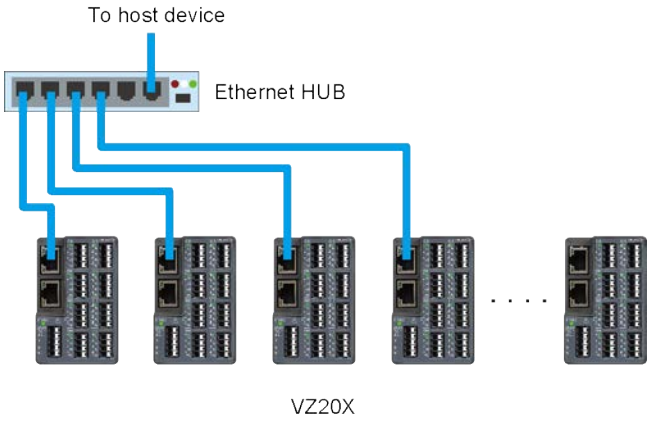
CAUTION

Attach an Ethernet connector cap to unused ports.

The following shows an example of a daisy chain connection.



The following shows an example of a connection via an Ethernet hub.



■ Wiring the Power supply

Use a power supply that satisfies the following power supply conditions for the product.

- Power terminal: Rated voltage 24 VDC (+10%/-15%)
- USB terminal: USB power supply
- Power consumption: 4.5 W or less

WARNING

- To prevent electric shock while wiring, make sure that the power supply is turned off.
- To prevent fire, use cables having a temperature rating of 80°C or more for the electric wire.
- Provide a switch or circuit breaker on the power line for disconnecting the product from the main power supply. Also, attach an ON/OFF indication on the switch or circuit breaker*1 to clearly indicate that it is a device for shutting off the power supply to the product.

  *1 IEC60947 compliant product
- Use of a non-specified electric wire may cause abnormal heating or fire on equipment.
- For permanent installation, supply power from the power supply terminal. USB power supply can be used for temporary purposes.

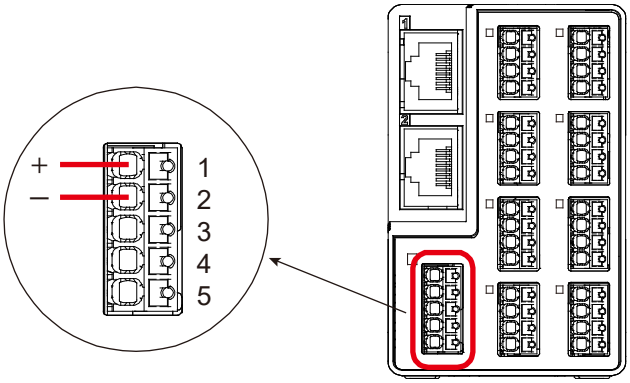
CAUTION

- When connecting both the power terminal and USB cable to VZ20X, first supply power from the power terminal and then connect the USB cable.
- Power is supplied from both the power terminal and USB cable. For this reason, before turning the VZ20X off, be sure to disconnect the USB cable.
- 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.

● Wiring Method

1 Turn the power supply source of the VZ20X off.

2 Connect the power cable to the power supply terminal.



Power supply terminal layout

No.	Function
1	24 VDC power supply (+)
2	24 VDC power supply (-)
3	(Use forbidden)
4	(Use forbidden)
5	(Use forbidden)

5. Setting Up VZ Configurator

Make the various settings for VZ20X in VZ Configurator.

Note

Use the latest version of VZ Configurator. You can download the latest version of VZ Configurator from the following URL.

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

5.1 Outline of VZ Configurator

The VZ Configurator software is for setting up VZ20X parameters and for performing monitoring, fault diagnosis and other operations on a PC.
VZ Configurator is connected to the VZ20X by Ethernet or USB.

The following operations can be performed on VZ Configurator:

- Setting of VZ20X parameters
- Save and apply parameter settings
- Monitoring
- Fault diagnosis
- Input adjustment
- Main unit management

■ Operating environment

Item	Windows 11 *1 Japanese / English	Windows 10 *1 Japanese / English
Edition	Pro/Enterprise 64bit	Pro/Enterprise 64bit
Version *1	21H2 or later	20H2 or later
CPU	Intel processor that supports 64 bit and 1 GHz or faster with 2 or more cores	Intel processor that supports 64 bit and 2 GHz or faster speed(recommended)
Recommended main memory capacity	8 GB or more	8 GB or more
Recommended storage free capacity	32 GB or more	32 GB or more
Display	Display compatible with OS	Display compatible with OS
Communication port	USB port, Ethernet port (100Base-TX)	USB port, Ethernet port (100Base-TX)
Peripheral devices	USB cable, Ethernet connection cable (100BASE-TX or higher)	USB cable, Ethernet connection cable (100BASE-TX or higher)
USB driver	Windows standard driver is used.	Windows standard driver is used.

*1 Yokogawa will also stop supporting OSs that Microsoft Corporation no longer supports.

■ Installing and uninstalling VZ Configurator

- Installing VZ Configurator
  Download VZ Configurator from the following URL. The download file is in zip format.
  Unzip the file, and double-click "setup.exe" to install the program.
  The "User Account Control" screen is displayed. Click [Yes].

  https://www.yokogawa.com/ns/vz/

- Checking installation of VZ Configurator
  For Windows 10
  Check that VZ Configurator is registered by [Start] - Apps - [Yokogawa Electric Corporation] - [VZConfig] in the Windows menu.
  For Windows 11
  Check that VZ Configurator is registered by [Start] - [All apps] - [VZConfig] in the Windows menu.

- Uninstalling VZ Configurator
  To uninstall VZ Configurator, select [VZConfig] from [Start] - [Settings] - [Applications] - [Applications and Functions] in the Windows menu.

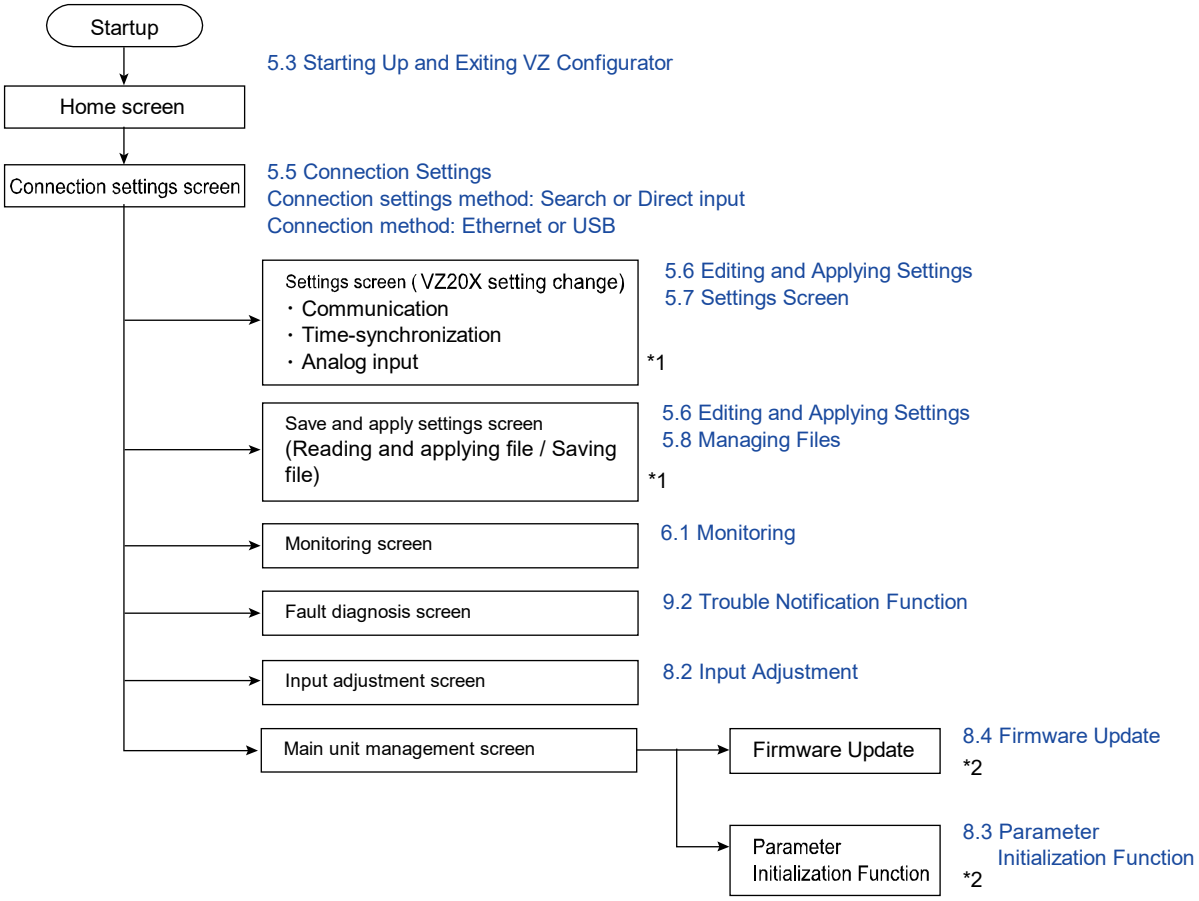
  The "User Account Control" screen is displayed. Click [Yes].
  VZ Configurator is uninstalled.

- Directory

File type	Save directory
User file	C:\Users\<UserName>\Documents\VZConfig

■ Setup flow

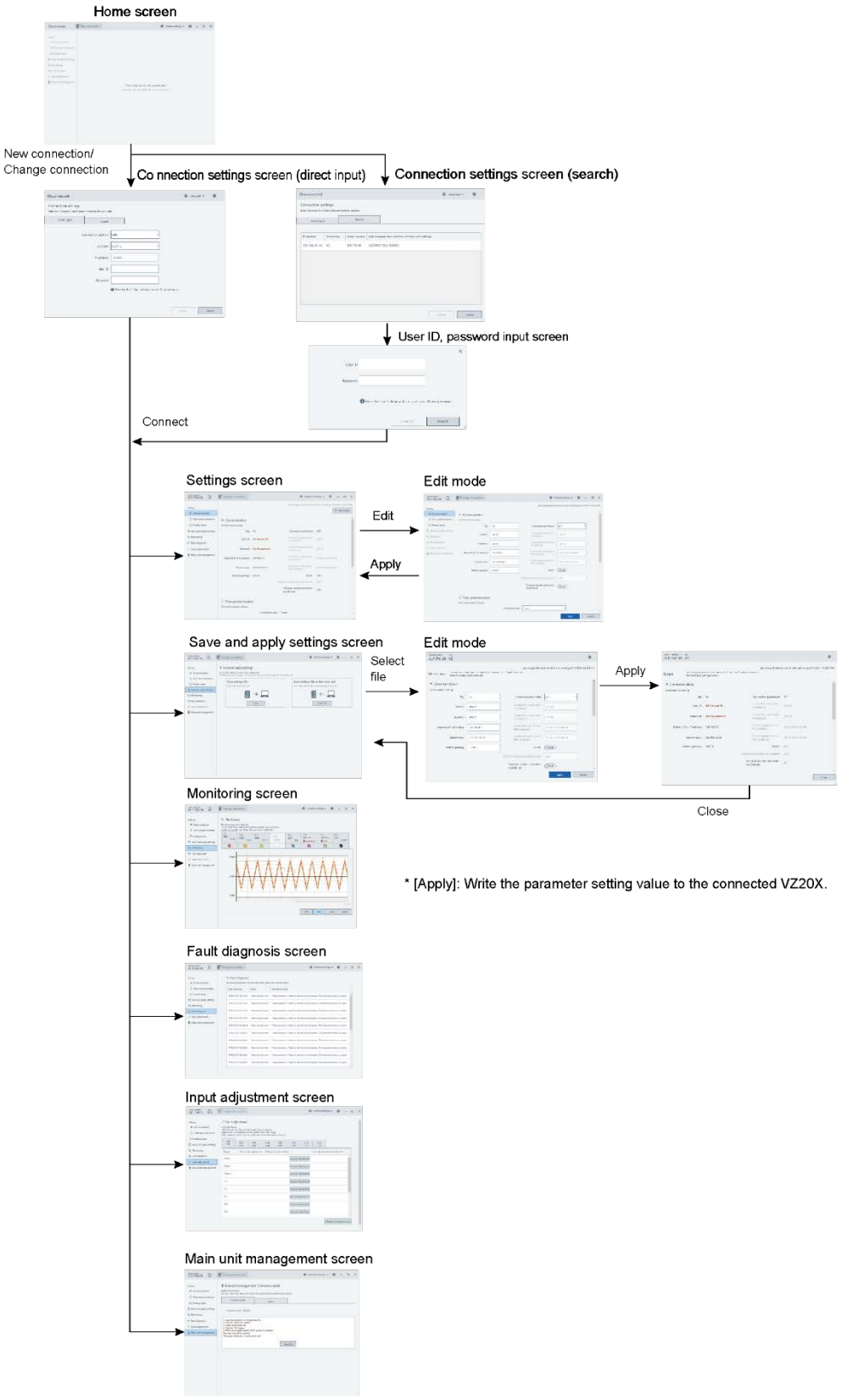
The following shows the flow from starting up VZ Configurator up to exiting the program.



*1: Ethernet connection: Begin with a new connection as communication is turned off.
USB connection: Begin with a new connection as communication is turned off when communication related parameters have been changed.
*2: VZ20X reboots. Begin with a new connection as communication is turned off.

■ Screen hierarchy

The following shows the hierarchy of the screens that expand from the home screen. Screens can expand from the home screen to each respective item after connection operation is completed.



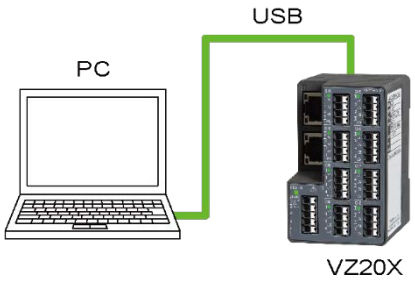
* [Apply]: Write the parameter setting value to the connected VZ20X.

5.2 Preparing to Use VZ Configurator

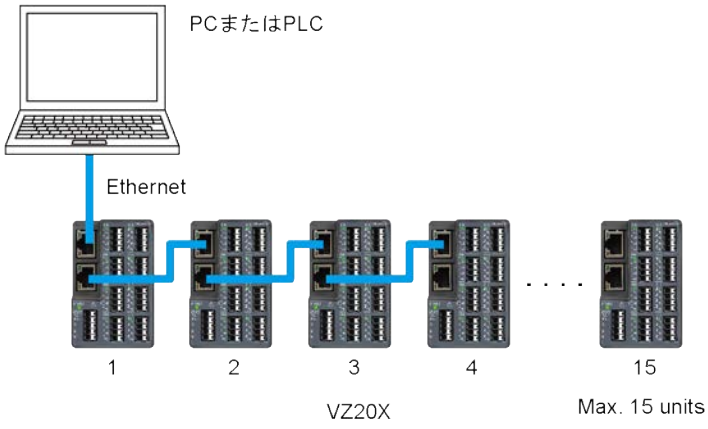
This section describes the settings to make to use VZ Configurator.

5.2.1 Connecting the Hardware

- PC (USB connection)
  Connect the VZ20X to the PC by USB cable. The connector on the VZ20X is a Type-C connector.



- PC (Ethernet connection)
  Connect the Ethernet cable from the network to the Ethernet port on the VZ20X. To connect the VZ20X to Ethernet, the VZ20X must be set up to match the network environment.



5.3 Starting Up and Exiting VZ Configurator

5.3.1 Starting Up VZ Configurator

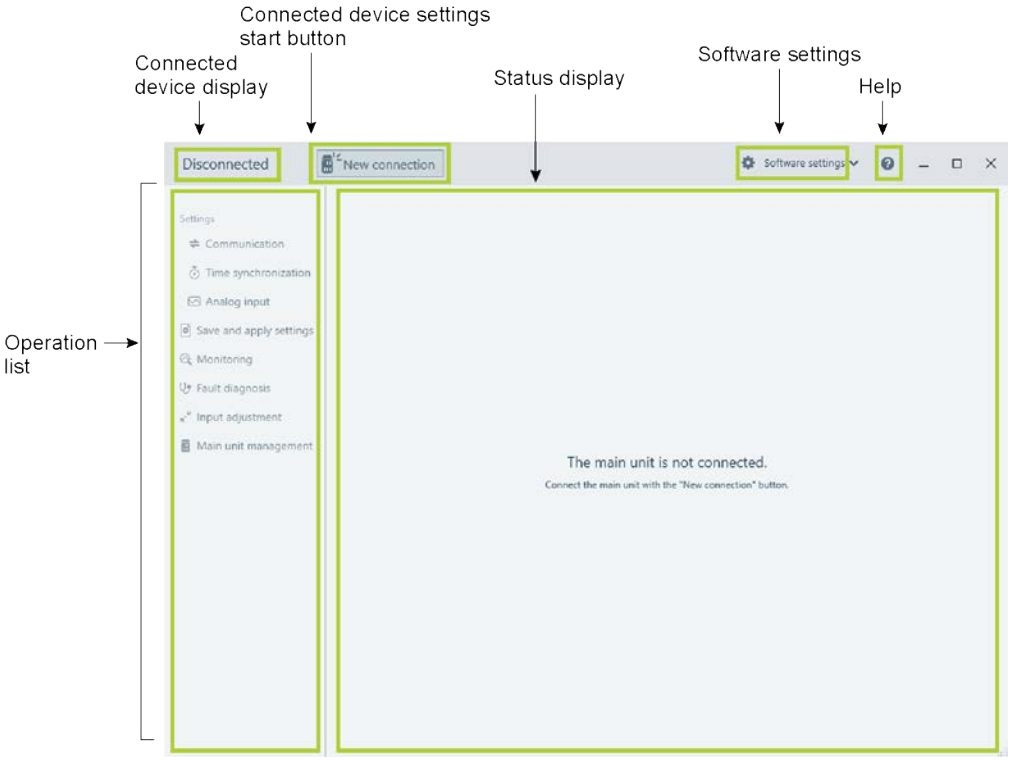
- Windows Start menu
  For Windows 10
  Click [Start] → Apps → [Yokogawa Electric Corporation] → [VZConfig] in the Windows menu on the PC to start up VZ Configurator.
  For Windows 11
  Click [Start] → [All apps] → [VZConfig] in the Windows menu on the PC to start up VZ Configurator.
- Desktop shortcut
  Double-click the VZ Configurator shortcut on the Windows desktop to start up VZ Configurator.
- Configuration file
  Start up VZ Configurator by double-clicking the configuration file (*.vza) from the list of files in Windows Explorer.

5.3.2 Exiting VZ Configurator

- [x] button at top right of window.
  VZ Configurator can be exited by clicking this button.
- Alt key + F4
  VZ Configurator can also be exited by clicking Alt key + F4 at the same time.

5.3.3 Home Screen

After VZ Configurator starts up, the home screen is displayed. To start setting up VZ Configurator, click the [New connection] button at the top left of the screen.



Description	Outline
Connected device settings start button	This determines the connection destination of the PC and VZ20X.
Connected device display	The serial number of the VZ20X and tag names are displayed here. When VZ Configurator is not connected to the VZ20X, "Disconnected" is displayed.
Operation list	Settings, save and apply settings, monitoring, fault diagnosis, input adjustment, and main unit management operations can be performed from this list.
Software settings	This is used to display the software version and switch the display language.
Help	This displays the User's Manual for the VZ20X.

5.4 Setup Guide

Parameter settings on the VZ20X can be read from the VZ20X to VZ Configurator, edited and then written back to the VZ20X after a connection has been made between the VZ20X and the PC.
When using a configuration file, see "5.4.2 Changing Settings from the Configuration File."

5.4.1 Making New VZ20X Settings and Changing VZ20X Settings

After connecting the VZ20X to the PC by Ethernet or USB, start up VZ Configurator and make the settings for the VZ20X in the following sequence.

1 Connection settings (see 5.5)

2 Editing from the settings screen (see 5.6.1)

3 Communication settings (see 5.7.1)

4 Time synchronization settings (see 5.7.2)

5 Analog input settings (see 5.7.3)

5.4.2 Changing Settings from the Configuration File

After connecting the VZ20X to the PC by Ethernet or USB, start up VZ Configurator and make the settings for the VZ20X in the following sequence.

1 Connection settings (see 5.5)

2 Editing settings from the Save and apply screen (see 5.6.2)

3 Communication settings (see 5.7.1)

4 Time synchronization settings (see 5.7.2)

5 Analog input settings (see 5.7.3)

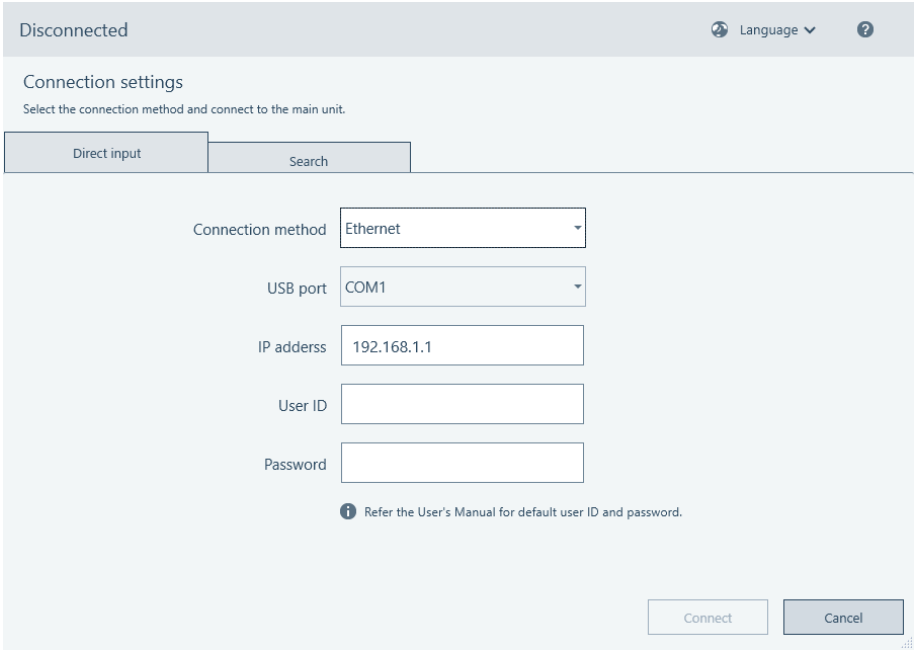
5.5 Connection Settings

In the connection settings, the VZ20X at the connection destination can be determined by either direct input or by selecting the Search function.
In the case of an Ethernet connection, both direct input and the Search function are available. The Search function allows you to search for VZ20X's on the same network.
In the case of a USB connection, though, only direct input is available.

In the case of an Ethernet connection, click the [Connect] button. The main unit status LED on the connected VZ20X flashes blue for ten seconds.

● Direct input procedure

1 Click the [New connection] button on the home screen, and the Connection settings window is displayed. (After connecting, the [Change Connection] button will be displayed.
In the Connection settings window, click the Direct input tab.



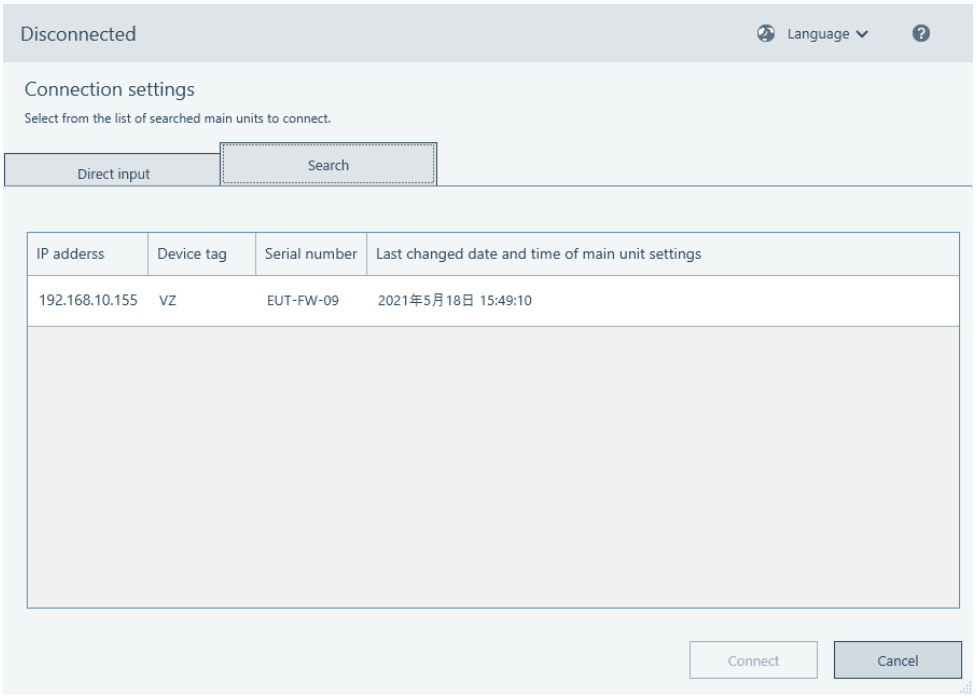
Input item	Input range	Default	Explanation
Connection method	Ethernet, USB	USB	This sets the connection method between the PC and VZ20X.
USB port	1 to 255	Available USB port No.	Select the connection USB port No. in the case of a USB connection.
IP address	0.0.0.0 to 255.255.255.255	0.0.0.0	Enter the IP address of the VZ20X to connect to in the case of an Ethernet connection.
User ID	Max. 16, 1-byte characters (alphanumeric characters and symbols)	USER1	Enter the user ID already set to the VZ20X to connect to.
Password	Max. 16, 1-byte characters (alphanumeric characters and symbols)	USER1	Enter the password already set to the VZ20X to connect to.

2 After inputting the respective setting items, click the [Connect] button to execute the connection with the VZ20X at the connection destination.
To return to the home screen without saving the parameter settings, click the [Cancel] button.

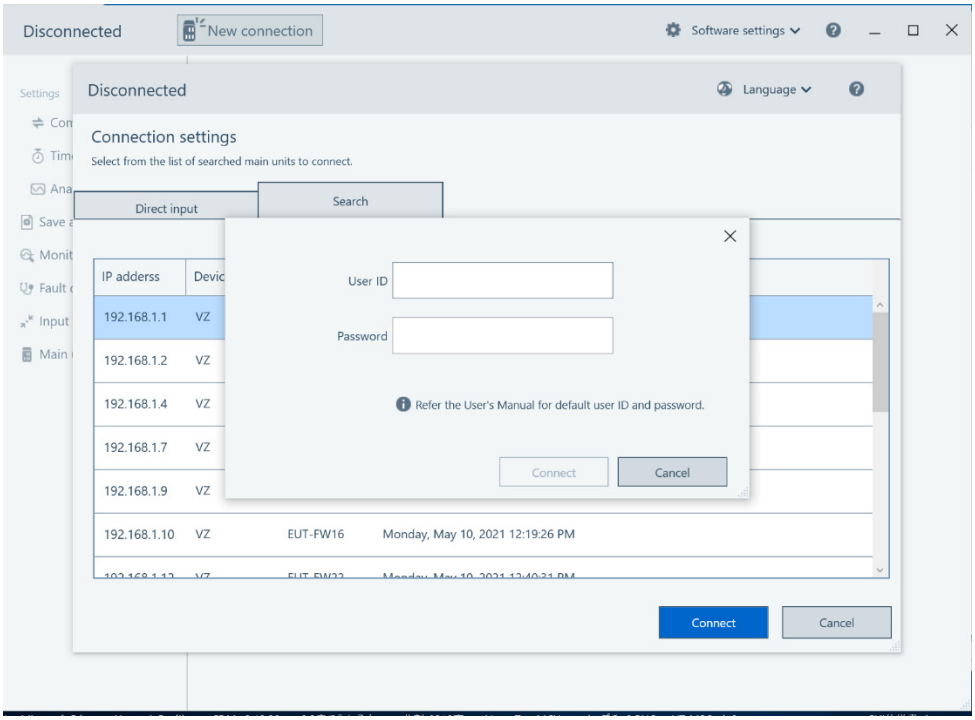
3 The setting values of all parameters on the connected VZ20X are read, and are then reflected in the setting display.

● Search procedure (for Ethernet communication)

1 Click the [New connection] button on the home screen, and the Connection settings window is displayed. (After connecting, the [Change Connection] button will be displayed.
Click the Search tab in the Connection settings window. This starts the search for VZ20X's connected on the same network, and the search results are displayed as a list of VZ20X's.



2 From the search results list, click the VZ20X to set the parameters to and click the [Connect] button.
To return to the home screen without saving the connection settings, click the [Cancel] button.
Enter the user ID and password, and click the [Connect] button. This determines the VZ20X to connect to.



3 The setting values of all parameters on the connected VZ20X are read, and are then reflected in the setting display.

5.6 Editing and Applying Settings

In the Edit mode, parameter setting values can be changed. After settings are changed, the new settings can be written back to the VZ20X.
If there is a difference between the parameters that were written back and the parameters that were read, the parameter name and setting value are displayed underlined in red, and a message is displayed.

Note

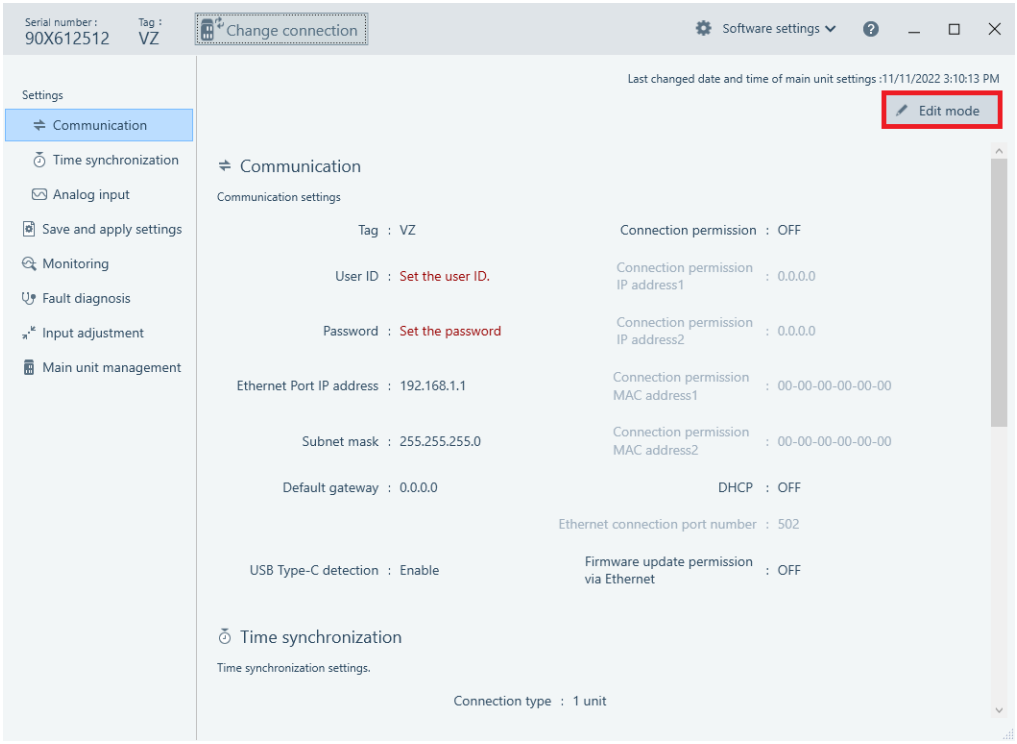
Communication may be disconnected after setting the parameters.
In an Ethernet connection: Communication is disconnected when parameter setting values are changed.
In an USB connection: Communication is disconnected when communication related parameters and time synchronization parameter setting values are changed.

5.6.1 Editing from the Settings Screen

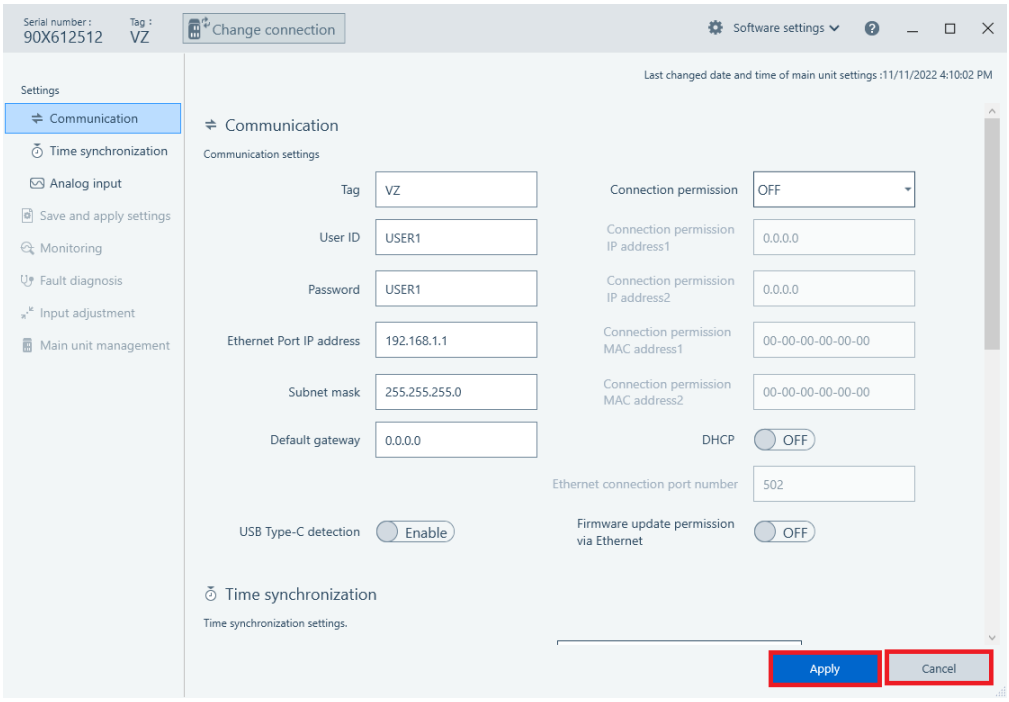
When the connection with VZ20X has been set, edit the parameter settings by following the procedure below.

Procedure

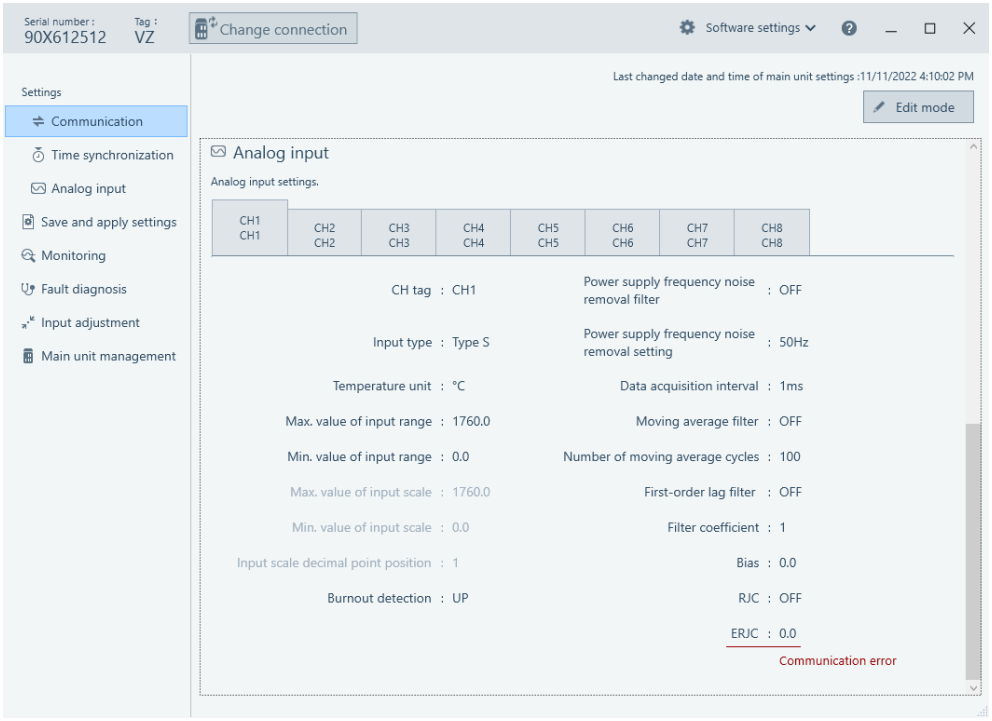
1 In the operation list in the home screen, click the respective setting item (communication, time synchronization, analog input) in Settings. The following screen is displayed. Click the [Edit mode] button



2 The mode changes to the Edit mode, and the setting values of each parameter can be changed.
After changing setting values, click the [Apply] button. Clicking the [Cancel] button while settings are being changing exits the Edit mode and the screen returns to the home screen without saving the settings.



3 The new parameter setting values are written to the VZ20X at the connection destination. After the new parameter setting values are written, all parameters are read from the VZ20X at the connection destination. If there is a difference between the parameters that were written back and the parameters that were read, the parameter name and setting value are displayed underlined in red, and "Communication error" is displayed.



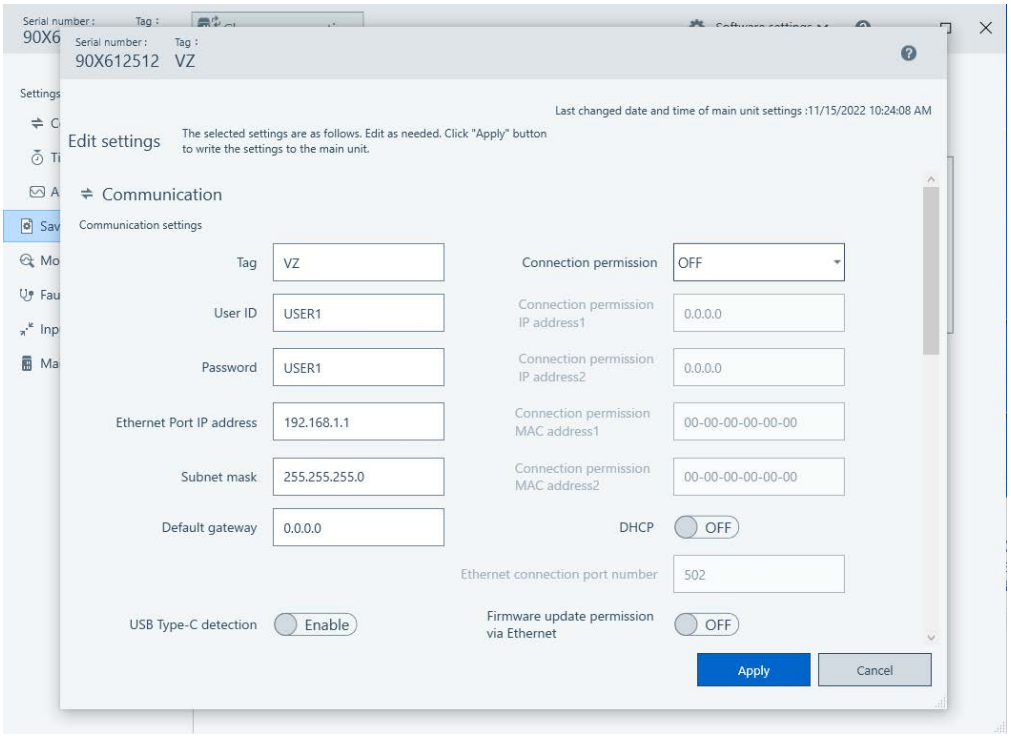
5.6.2 Editing Settings from the Save and apply Screen

When the connection with VZ20X has been set, edit the parameter settings by following the procedure below.

Procedure

1 In the operation list in the home screen, click Save and apply settings, and the [Select file] button. The "Open" window opens. Select the file to apply to the VZ20X.

2 The file opens and the following screen is displayed.



3 The mode changes to the Edit mode, and the setting values of each parameter can be changed. After checking and editing parameter setting values, click the [Apply] button. To not apply setting values, click the [Cancel] button. The screen returns to the save and apply settings screen.

4 The parameter setting values are written to the VZ20X at the connection destination. After parameter setting values are written, all parameters are read from the VZ20X at the connection destination. If there is a difference between the parameters that were written back and the parameters that were read, the parameter name and setting value are displayed underlined in red, and and a message is displayed.

5.7 Settings Screen

The various settings for the VZ20X can be made in the Settings screen. Three setting items are set: communication, time synchronization and analog inputs.

Note

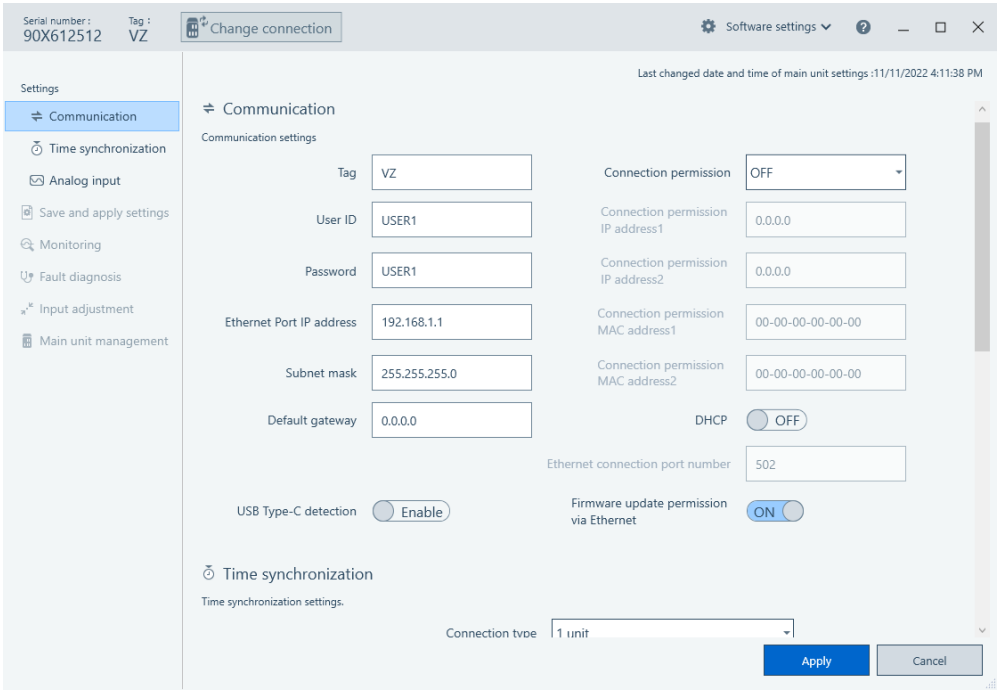
After applying data currently being edited to the VZ20X, save the data by「Save and apply settings」, as necessary.

5.7.1 Communication Settings

Set up communication with the VZ20X.

Communication setup procedure

1 In the operation list in the home screen, click Communication.
Click the [Edit mode] button Also, in the operation list in the home screen, open the file to save at [Select file] from Save and apply settings.



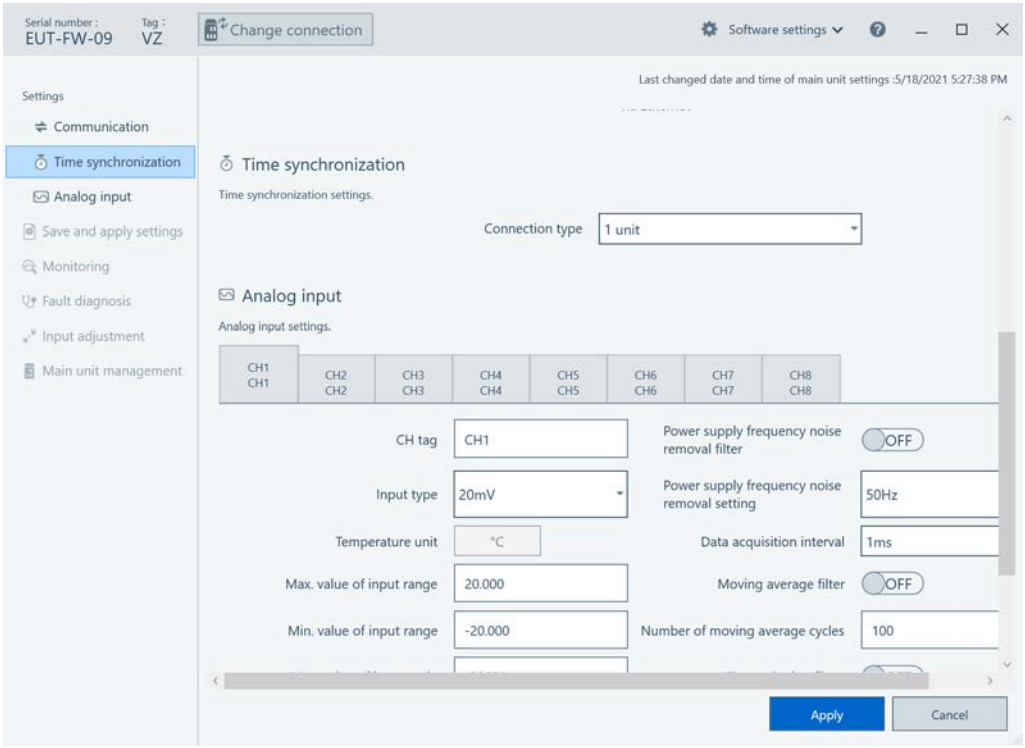
2 After inputting the setting values, click the [Apply] button to execute writing of setting values to the VZ20X at the connection destination.
Clicking the [Cancel] button discards the new setting values and exits the Edit mode, and the screen returns to the home screen.

5.7.2 Time Synchronization Settings

Set up time synchronization with the VZ20X.

Time synchronization settings procedure

1 In the operation list in the home screen, click Time synchronization.
Click the [Edit mode] button Also, in the operation list in the home screen, open the file to save at [Select file] from Save and apply settings.



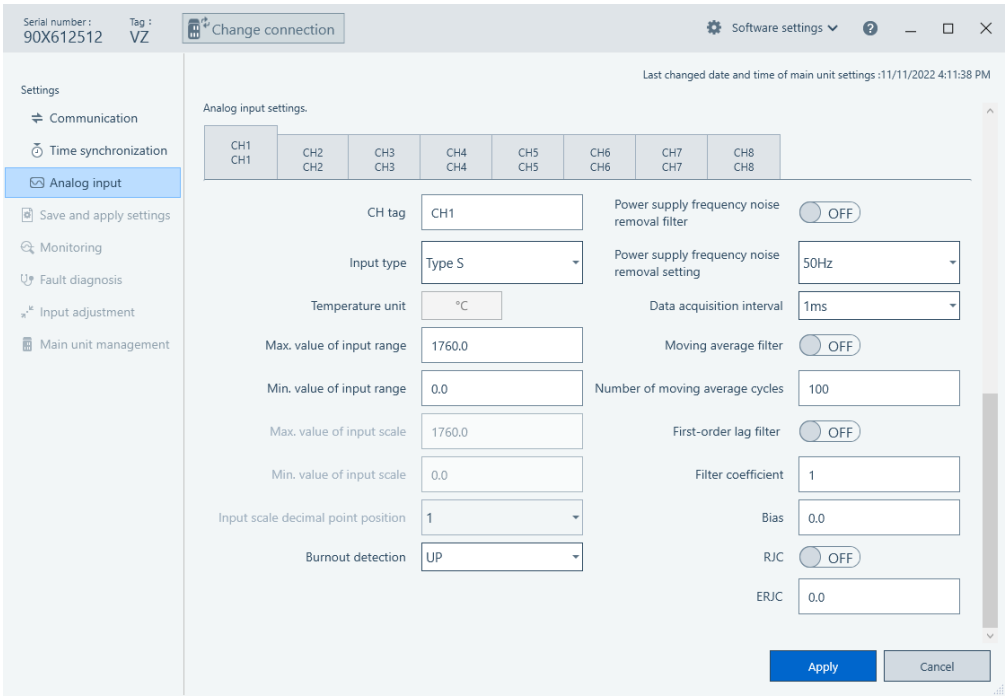
2 After inputting the setting values, click the [Apply] button to execute writing of setting values to the VZ20X at the connection destination.
Clicking the [Cancel] button discards the new setting values and exits the Edit mode, and the screen returns to the home screen.

5.7.3 Analog Input Settings

Set up the analog inputs for the VZ20X.
Channel numbers and CH tags are displayed on the tab panel.
Set analog inputs to each channel. Clicking a channel tab switches the displayed tab panel to the parameters for the selected channel.

Analog input setup procedure

1 In the operation list in the home screen, click Analog input.
Click the [Edit mode] button Also, in the operation list in the home screen, open the file to save at [Select file] from Save and apply settings.
Select the desired channel to set analog inputs to.



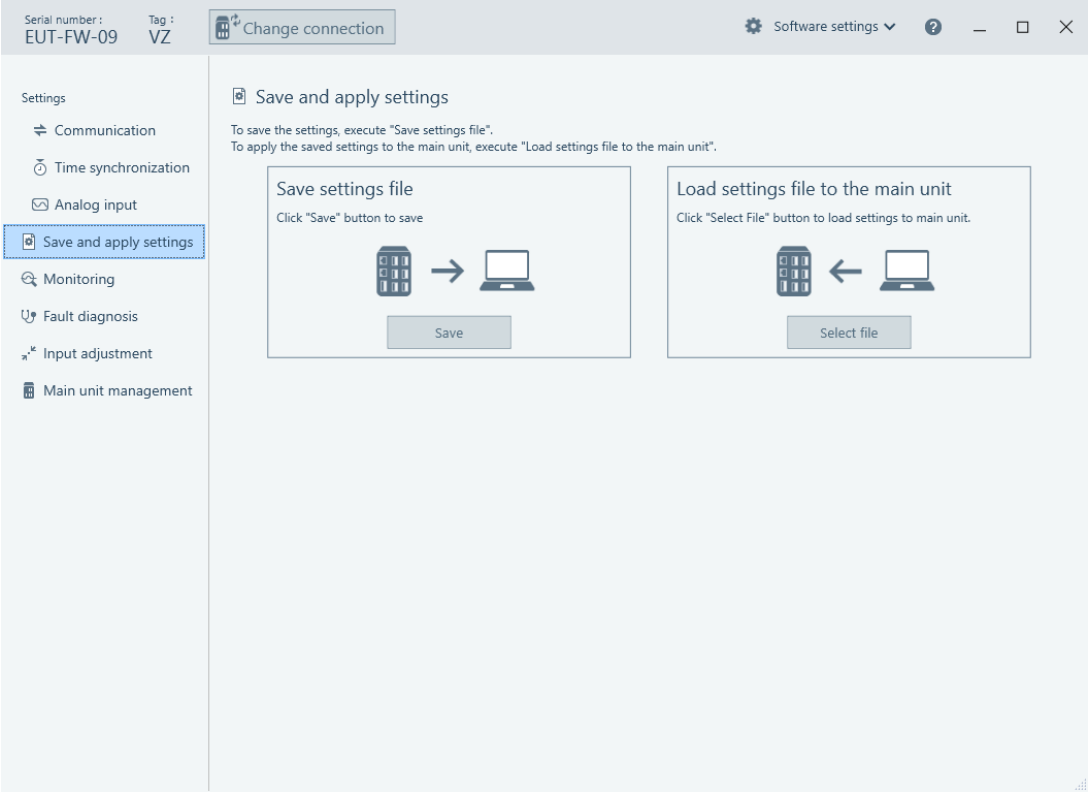
2 After inputting the setting values, click the [Apply] button to execute writing of setting values to the VZ20X at the connection destination.
Clicking the [Cancel] button discards the new setting values and exits the Edit mode, and the screen returns to the home screen.

Note

The data acquisition interval is common to all channels.

5.8 Managing Files

Settings can be saved to configuration files, and settings can be written back to VZ20X from configuration files.
The format of a configuration file is "******.vza" (where, ****** is the file name).



5.8.1 Saving Settings File

● Procedure

1 Click Save and apply settings > [Save] button. The “Save As” window opens. Files can be named and saved in this window.

5.8.2 Loading Settings Files

● Procedure

1 Click Save and apply settings > [Select file] button. The "Open" window opens. Select the file to apply to the VZ20X.
The configuration file can be loaded.

5.8.3 Loading Settings File to the Main Unit

See " 5.6.2 Editing Settings from the Save and apply Screen."

5.9 ID and Password Functions

The VZ20X has a function for setting passwords to restrict reading and writing of setting values.
Using this function allows only specific users who know the user ID and password to access settings on the VZ20X.
Note, however, that this a simplified function. So, care is required with respect to security when configuring the network as use of the VZ20X is assumed on an intranet.

CAUTION

- Please change the user ID and password from their defaults (factory settings).
- Note down the user ID and password as they will be needed when connecting to the VZ20X.

Parameter name	Setting range	Default	Explanation
User ID	Max. 16, 1-byte characters (alphanumeric characters and symbols)	USER1	Sets the user ID.
Password	Max. 16, 1-byte characters (alphanumeric characters and symbols)	USER1	Sets the password.

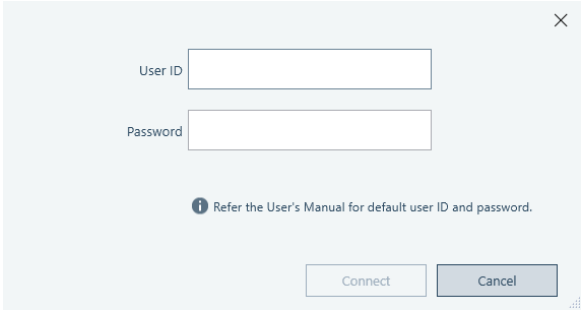
● Input procedure using direct input

1 In the Connection settings window, click the Direct input tab. Enter the user ID and password already set to the VZ20X, input the setting values (connection method etc.), and click the [Connect] button.

2 When the user ID and password match the user ID and password set on the VZ20X, the connection is made to the VZ20X at the connection destination. If they do not match, the connection to the VZ20X cannot be made. Try connecting again.

● Search procedure using the Search function

1 In the Connection settings window, click the Search tab. This starts the search for VZ20X's connected on the same network, and the search results are displayed as a list of VZ20X's. From the search results list, click the VZ20X to set the parameters to and click the [Connect] button. The following screen is displayed.



2 Enter the user ID and password already set to the VZ20X, and click the [Connect] button.

3 When the user ID and password match the user ID and password set on the VZ20X, the connection is made to the VZ20X at the connection destination. If they do not match, the connection to the VZ20X cannot be made. Try connecting again.

Note

The user ID and password already set to the VZ20X can be changed at Settings > Communication.

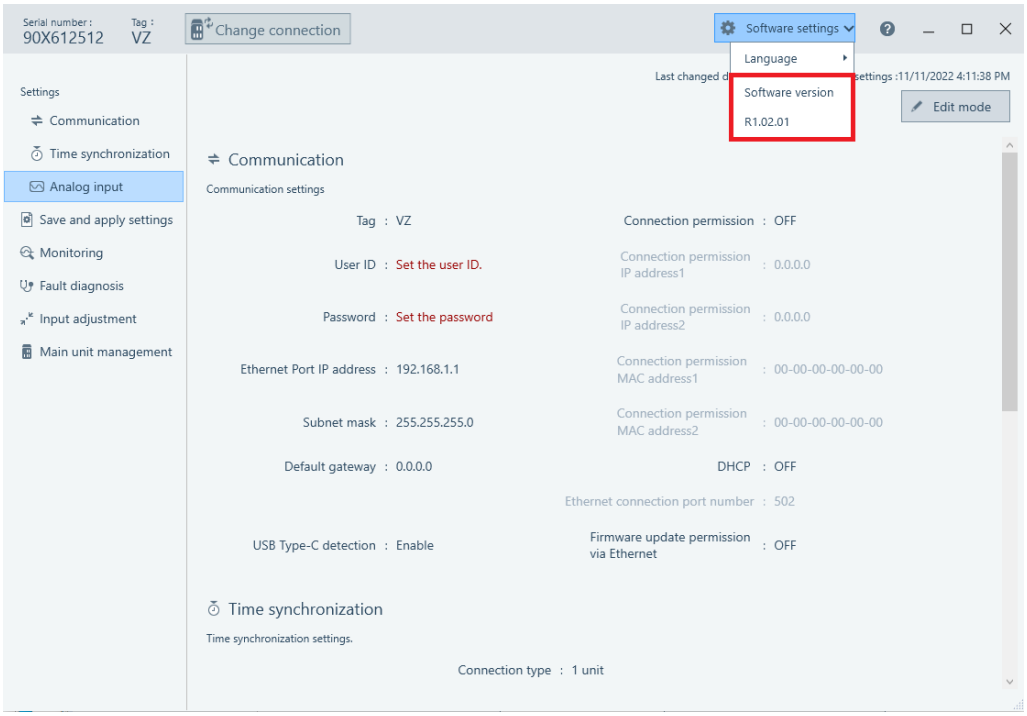
5.10 Software Settings

5.10.1 Software Version

Display the version of VZ Configurator.

● Software version checking procedure

1 Click [Software settings] at the top of the screen. The version of VZ Configurator is displayed.

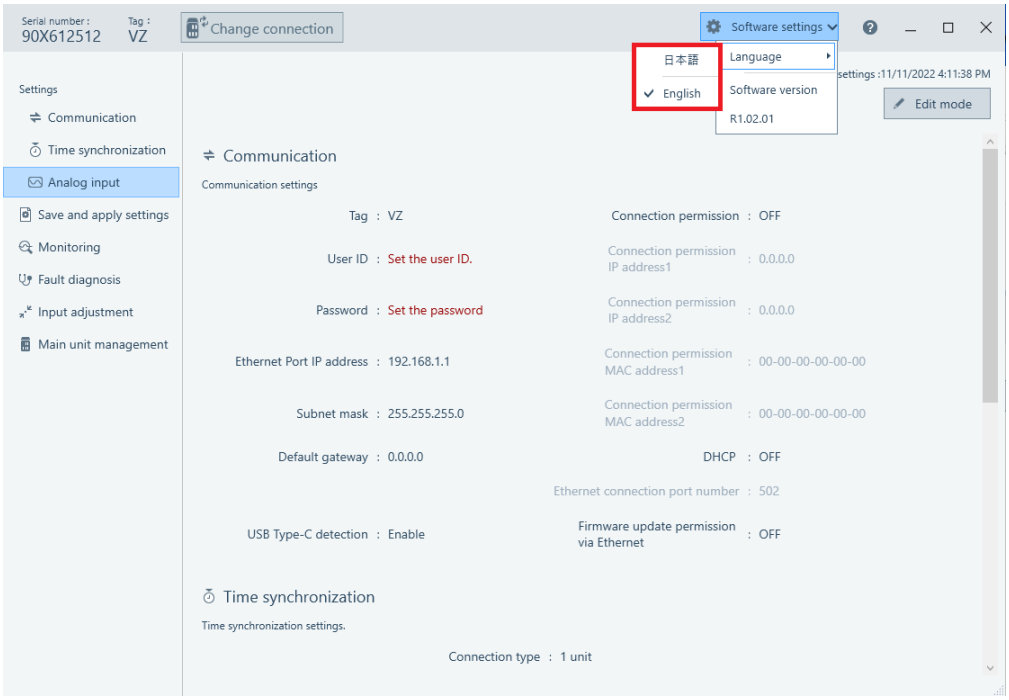


5.10.2 Language Setting

The display language on VZ Configurator can be switched between English and Japanese.

● Display language switching procedure

1 At the top of the screen, click [Software settings] > Language, and then select and click "English " or "日本語". This switches the display language on VZ Configurator.



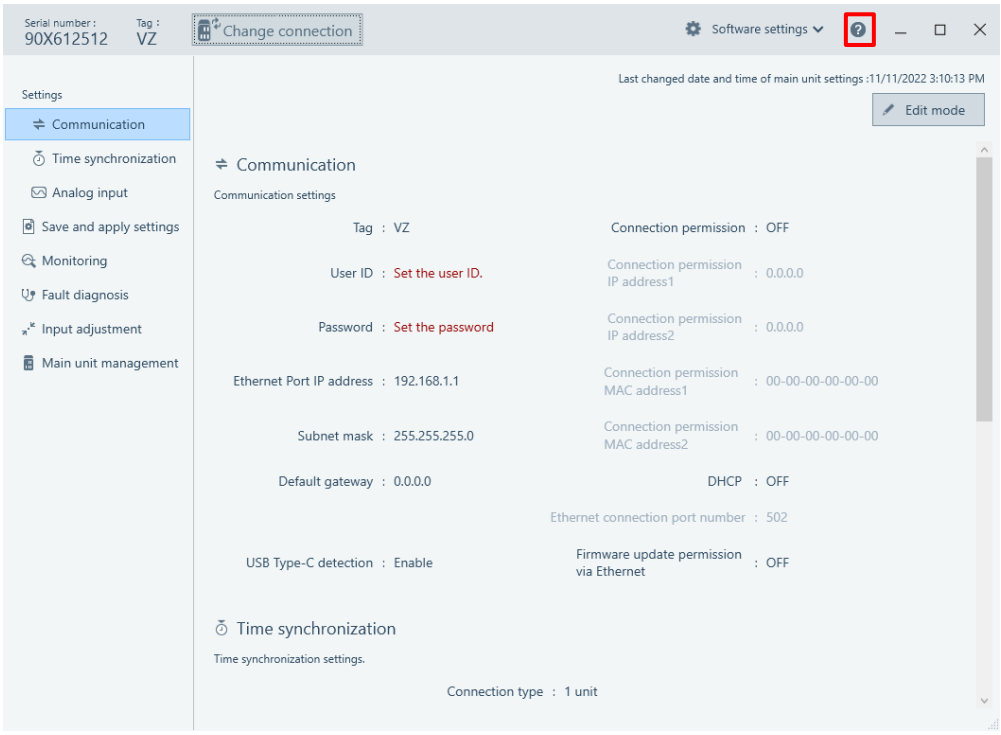
5.11 Help

This function displays the User's Manual for the VZ20X in a separate window.
A User's Manual is not bundled with this software. So, it must be downloaded and imported from our website.
To view the User's Manuals, use Adobe Acrobat Reader of Adobe Systems Incorporated. You need to obtain and install it separately.

- Use the latest version of User's Manual. You can download the latest version of the User's Manual from the following website:
  URL: https://www.yokogawa.com/ns/vz/
- Rename the User's Manual acquired from the website to "IM.pdf", and place the file in the following folder:
  C:\Users\<UserName>\Documents\VZConfig\IM.pdf

● User's Manual display procedure

1 Click [?] at the top of the screen. This displays the VZ20X User's Manual.



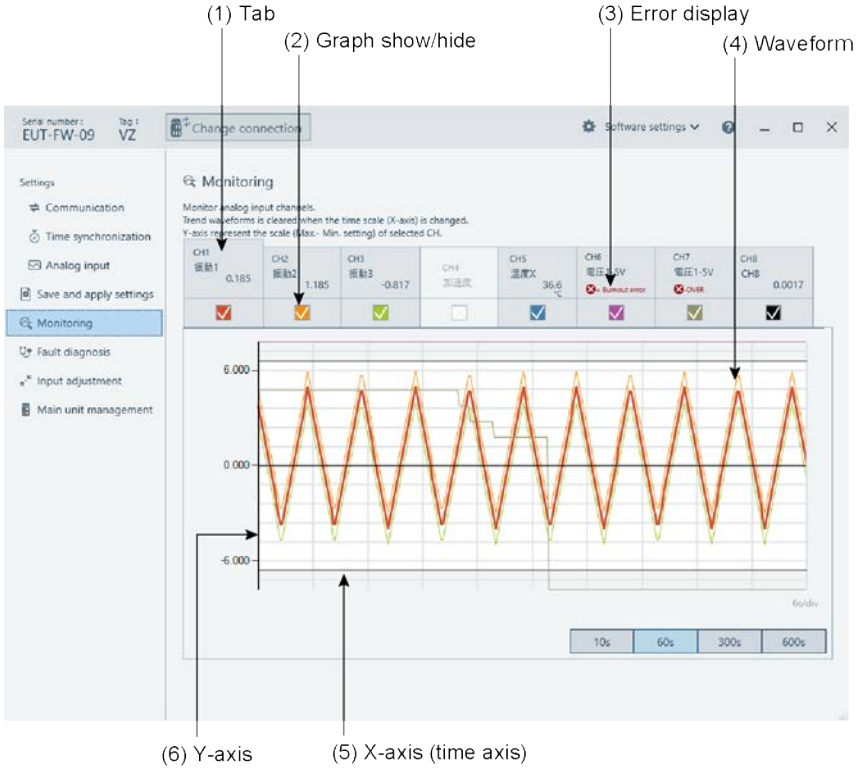
6. VZ Configurator Operations

6.1 Monitoring

Analog inputs to VZ20X can be monitored.

6.1.1 Display Content

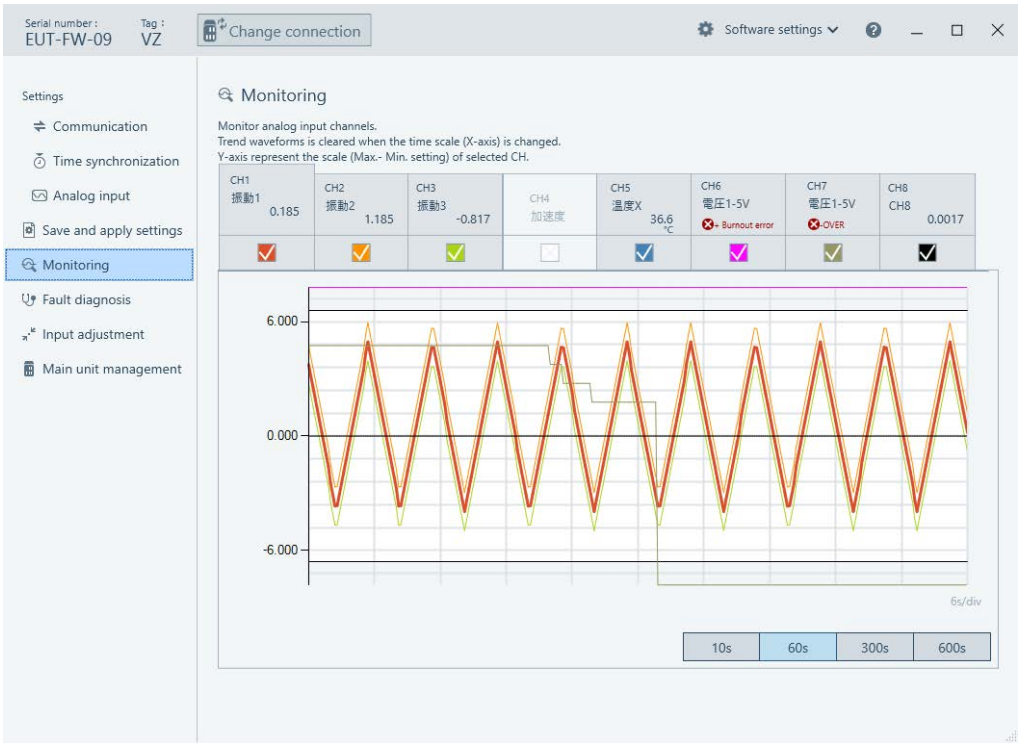
Once the monitoring screen is opened, analog inputs start to be plotted as a graph. All eight channels of analog inputs are plotted on the same graph. A time range of 10, 60, 300 or 600 seconds can be selected as the X-axis (time axis.) If the time range is changed midway during plotting, the graph plotted so far is cleared.



Number in Figure	Name	Description
(1)	Tab	Channel No. CH1 to CH8 This tab panel display tags, measured values and temperature unit.
(2)	Show/hide graph	Checking this toggles graph display between show and hide. Even when graph display is set to hide, measurement values are displayed as digital values inside the tab panel.
(3)	Error display	This displays error information. When an error occurs, error content is displayed in red. Error content: Adjustment value error/A/D error/RJC error/+ Burnout error/- Burnout error/+OVER/-OVER
(4)	Waveform	Analog inputs are displayed by the respective display color of each channel.
(5)	X-axis (time axis)	A time range of 10, 60, 300 or 600 seconds can be selected as the time axis for displaying the oldest data up to the latest data. The rightmost data is the latest data.
(6)	Y-axis	Draws up to -5 to 105% of the input range or scale.

● Monitoring procedure

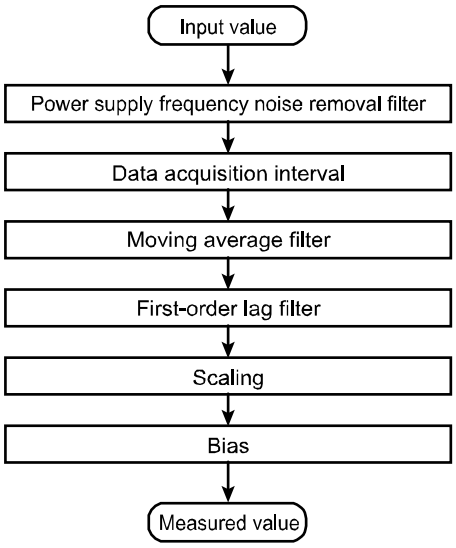
1 Click Operation list > Monitoring and the following screen appears.
Select the display channel to monitor.



7. Explanation of Functions

7.1 Measurement

On the VZ20X, DC voltage, standard signal, resistance, thermocouple, and resistance temperature detector can be measured. Signals input to the VZ20X are sampled at a sampling period of 1 ms, and undergo A/D conversion and various input operations to be converted to the measured values.
The following input calculation processing shows how input values are processed on the VZ20X.



7.1.1 Input Type

The following table summarizes the types and ranges of the measurement inputs (DC voltage, standard signal, 4-wire resistance, thermocouple, 3-wire resistance temperature detector and 4-wire resistance temperature detector) to the VZ20X.

Input type		Measurement range		Unit
		Lower limit value	Upper limit value	
OFF (default)	60 V	-60.00	60.00	V
DC voltage	20 mV	-20.000	20.000	mV
	60 mV	-60.00	60.00	mV
	200 mV	-200.00	200.00	mV
	1 V	-1.0000	1.0000	V
	2 V	-2.0000	2.0000	V
	6 V	-6.000	6.000	V
	20 V	-20.000	20.000	V
	60 V	-60.00	60.00	V
Standard signal	0.4 to 2 V	0.4000	2.0000	V
	1 to 5 V	1.0000	5.0000	V
4-wire resistance	200Ω 4-wire	0.00	200.00	Ω
	2000Ω 4-wire	0.0	2000.0	Ω
Thermocouple	R	0.0	1760.0	°C
	S	0.0	1760.0	°C
	B	0.0	1820.0	°C
	K	-270.0	1370.0	°C
	E	-270.0	800.0	°C
	J	-200.0	1000.0	°C
	T	-270.0	400.0	°C
	N	-270.0	1300.0	°C
	C	0.0	2315.0	°C
3-wire resistance temperature detector	Pt100 3-wire	-200.0	850.0	°C
	Pt100-H (3-wire)	-100.00	100.00	°C
4-wire resistance temperature detector	Pt100 4-wire	-200.0	850.0	°C
	Pt100-H (4-wire)	-100.00	100.00	°C

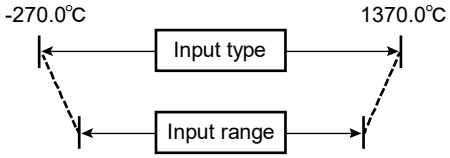
7.1.2 Temperature Unit

When the input type is a thermocouple or resistance temperature detector, the temperature unit used is °C.

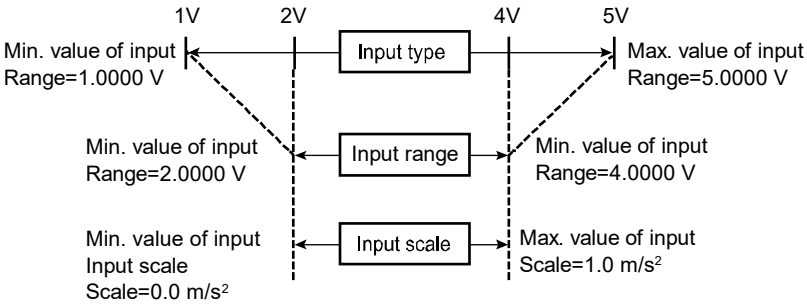
Parameter name	Contents
Temperature Unit	°C

7.1.3 Scaling

Scaling can be applied to DC voltage, standard signal or resistor inputs.



Min. value of input Range=0.0°C Max. value of input Range=800.0°C



Parameter Name	Setting Range	Default	Explanation
Max. value of input range	According to input type Min. value of input range < Max. value of input range Min. value of input range + 1 digit to upper limit value of measurement range	The default follows the upper limit value of each input type in the input type table.	This sets the maximum measurement value of the input.
Min. value of input range	According to input type Min. value of input range < Max. value of input range Lower limit value of measurement range to max. value of input range - 1 digit	The default follows the lower limit value of each input type in the input type table.	This sets the minimum measurement value of the input.
Max. value of input scale	-99999 to 99999 Min. value of input scale < Max. value of input scale Min. value of input scale + 1 digit to 99999	The default follows the upper limit value of each input type in the input type table.	This sets the maximum value to be used in scaling calculation.
Min. value of input scale	-99999 to 99999 Min. value of input scale < Max. value of input scale -99999 to max. value of input scale - 1 digit	The default follows the lower limit value of each input type in the input type table.	This sets the minimum value to be used in scaling calculation.
Input scale decimal point position	0 to 4	The default follows the decimal point position of the input scale the input type table.	This sets the decimal point position after scaling.

7.1.4 Range Over Detection

When -5.0 to 105.0% of the input range is exceeded, the state becomes "over range" and the analog input status LED flashes (green).
Also, error information "+OVER/−OVER" is displayed on the monitoring screen on VZ Configurator.

7.1.5 Burnout Detection

UP or DOWN can be selected as the measured value when the burnout error occurs. When a burnout is detected, the measured value becomes 105.0% of the input range when up scale is set and -5.0% of the input range when down scale is set.
The burnout operation function is active when the input type is thermocouple, resistance temperature detector and standard signal.
It is not active for DC voltage and resistance inputs.
When the input type is standard signal, a burnout is judged at a voltage of 0.1 V or less.

Parameter Name	Setting Range	Default	Explanation
Burnout detection	OFF, UP, DOWN	UP	This parameter is for setting burnout detection.

7.1.6 Data Acquisition Interval

Analog inputs are sampled at a sampling period of 1 ms. However, the data acquisition interval can be changed to one of 1 ms, 10 ms, 50 ms, or 100 ms. This setting is common to all channels.

Parameter Name	Setting Range	Default	Explanation
Data acquisition interval	1 ms, 10 ms, 50 ms, 100 ms	1 ms	Values input at the sampling interval of 1 ms can be acquired at a preset interval and set as the measured value.

7.1.7 Bias

The result of adding the bias setting value to the value after scaling is taken to be the measured value.

Parameter Name	Setting Range	Default	Explanation
Bias	The default follows each input type in the input type table. ±99999 range.	0	The decimal point position follows the decimal point position set for scaling or the measured value.

7.1.8 Power Supply Frequency Noise Removal Filter

Set the power supply frequency noise removal filter.

Parameter Name	Setting Range	Default	Explanation
Power supply frequency noise removal filter	OFF, ON	OFF	This toggles the power frequency noise removal filter setting between disabled/enabled.
Power supply frequency noise removal setting	50 Hz, 60 Hz, COMMON	50 Hz	Set the power frequency noise removal filter. 50 Hz: Filters out 50 Hz noise. 60 Hz: Filters out 60 Hz noise. COMMON: Filters out noise both 50 Hz and 60 Hz.

When the measurement environment causes drift to increase, noise of power frequency can be filtered out by setting the power supply frequency noise removal filter to ON.
For details on measurement accuracy, noise reduction ratio, and the filter time constant when the power supply frequency noise removal filter is enabled/disabled, see General Specifications at the end of this manual.

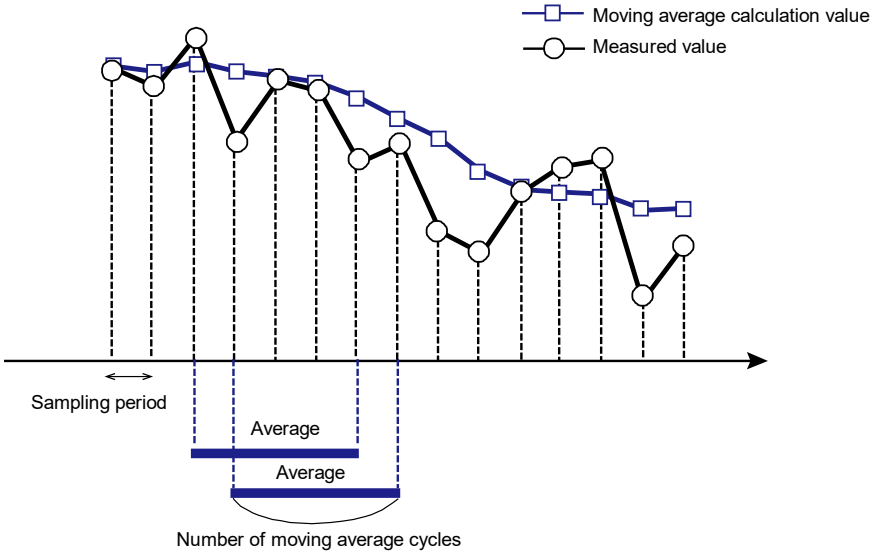
7.1.9 Moving Average Filter

Set filtering of measured data.

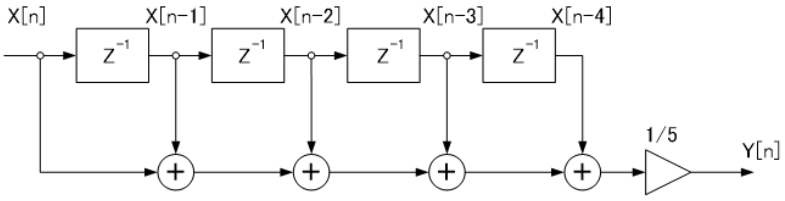
Parameter Name	Setting Range	Default	Explanation
Moving average filter	OFF, ON	OFF	This toggles the moving average filter setting between use/non-use.
Number of moving average cycles	2 to 100	100	Set the number of times in which the moving average is calculated.

● Explanation

Moving average is performed on measured values for the preset number of times to reduce the affect of noise on the measured value readout.
When the number of data to undergo moving average processing has not reached the preset number of moving average cycles immediately after calculation is started, the average of the currently acquired data is calculated.
When measured values are in error (range over, burnout, A/D error), the moving average calculation is initialized, and moving average is restarted from the beginning when values have returned to normal.



Moving average processing functions in the same way as an FIR low pass filter. The following block diagram shows how moving average processing is performed when sampling is performed with the moving average number of times set to "5". In this example, input is expressed as "X" and output is expressed as "Y". Z^{-1} is one sample delay.



Formula of above block diagram: $$Y[n] = \frac{X[n] + X[n-1] + X[n-2] + X[n-3] + X[n-4]}{5}$$

7.1.10 First-order Lag Filter

Set filtering of measured data.

Parameter Name	Setting Range	Default	Explanation
First-order lag filter	OFF, ON	OFF	Toggles between use/non-use of the first-order lag filter.
Filter coefficient	1 to 100	1	The filter time constant changes according to the data acquisition interval. Filter time constant = data acquisition interval x filter coefficient When the filter coefficient is 5 and the data acquisition interval is 50 ms, the primary delay filter becomes 5 x 50 = 250 ms.

● Explanation

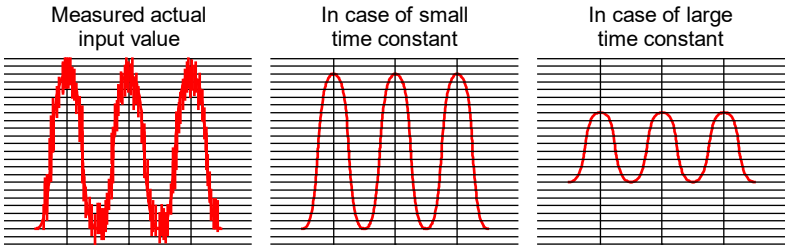
First-order lag filter processing is performed on measured values to reduce the affect of noise on the measured value readout.
When measured values are in error (range over, burnout, A/D error), the data of those measured values is removed from the filter calculation.

The table below shows the relationship between the filter coefficient and filter time constant. The filter time constant can be found by the following calculation formula.
Example)

Data acquisition interval	Filter time constant [s]			
	a = 1	a = 10	a = 50	a = 100
1 ms	0.001	0.010	0.050	0.100
10 ms	0.010	0.100	0.500	1.000
50 ms	0.050	0.500	2.500	5.000
100 ms	0.100	1.000	5.000	10.000

a: Filter coefficient

When the input signal appears to contain noise, insertion of the first-order lag filter is effective in removing noise from the input signal. The larger the time constant that is set, the more effective it is in removing noise. However, setting too large a time constant might result in the waveform becoming distorted.



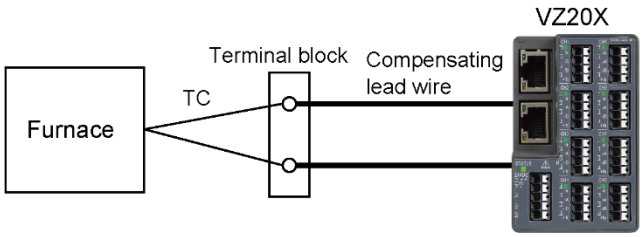
7.1.11 Synchronization of Input Sampling

The synchronization accuracy of input sampling is less than ±100 µs.

In a daisy chain connection, input sampling between units can be synchronized.
In a connection other than a daisy chain, input sampling between units cannot be kept synchronized though input sampling in each individual unit can be kept synchronized.

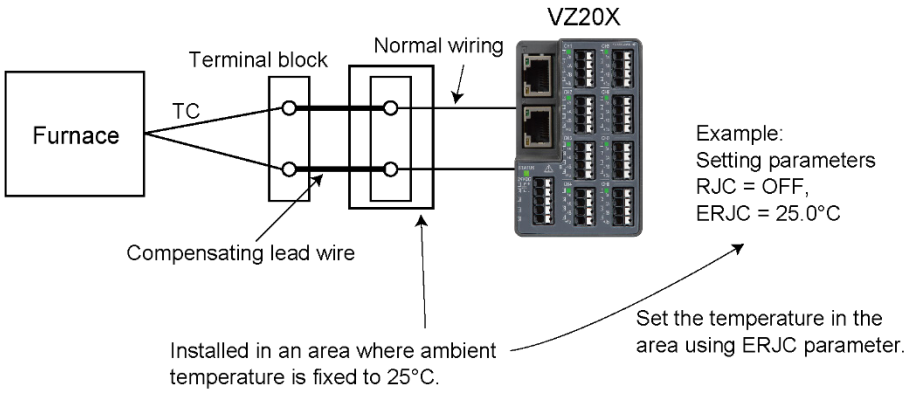
7.1.12 RJC (Reference Junction Compensation)

This function is enabled with firmware version R1.02.01 or later.
If thermocouple input is selected, RJC can be turned OFF/ON.
Normally, input compensation is performed using the VZ20X RJC function. However, the VZ20X RJC function can be turned OFF in order to use a zero controller or other external device to perform strict compensation.



7.1.13 ERJC (External Reference Junction Compensation)

This function is enabled with firmware version R1.02.01 or later.
During thermocouple input, a temperature compensation value can be set on an external device.
However, this is enabled only when RJC is OFF.
Type B external reference junction compensation is fixed to 0°C.



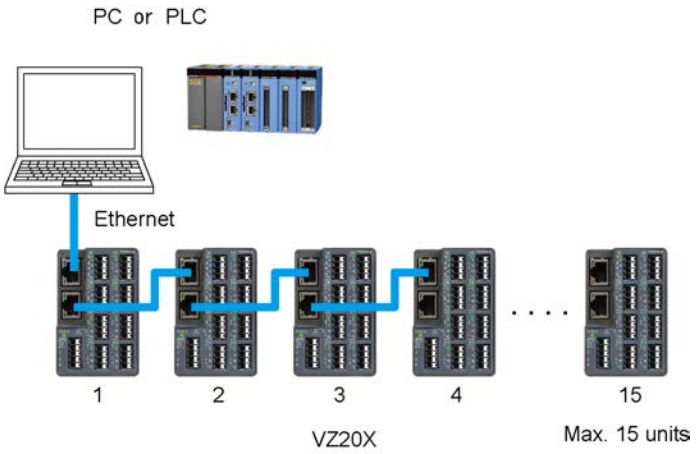
7.2 Ethernet Communication

7.2.1 Outline

The VZ20X has two Ethernet ports.
The measured values can be acquired by a dedicated communication protocol or Modbus/TCP. For details on data formats that can be acquired, see "7.2.6 Details of Commands/Responses."
Ports have a hub function that allows multiple VZ20X's to be connected.
Also, on an Ethernet connection, not only can data be acquired but settings can be made and monitoring can be performed on VZ Configurator.

Note

Stop data acquisition before changing settings. Monitoring can be carried out during data acquisition.



● Communication specifications

Item	Specifications
Standard	Ethernet IEEE802.3 compliant
Interface	RJ45 (100BASE-TX)
Transmission speed	100 Mbps
Max. segment length	100 m
Max. number of daisy chain connections	15 units (*1)
Communication method	TCP/IP
Data type	Binary
Max. number of connections	1
Max. number of transactions	1

*1 The number of connected devices may be limited depending on the performance and operating environment (OS, CPU, installation software, programming, etc.) of the PC (including GA10) and PLC.

● Communication settings

IP addresses can be set either by automatic acquisition or manually.
Three settings can be set for connection permission on the VZ20X: OFF, IP address and MAC address. When connection permission is set, up to two units can be connected.

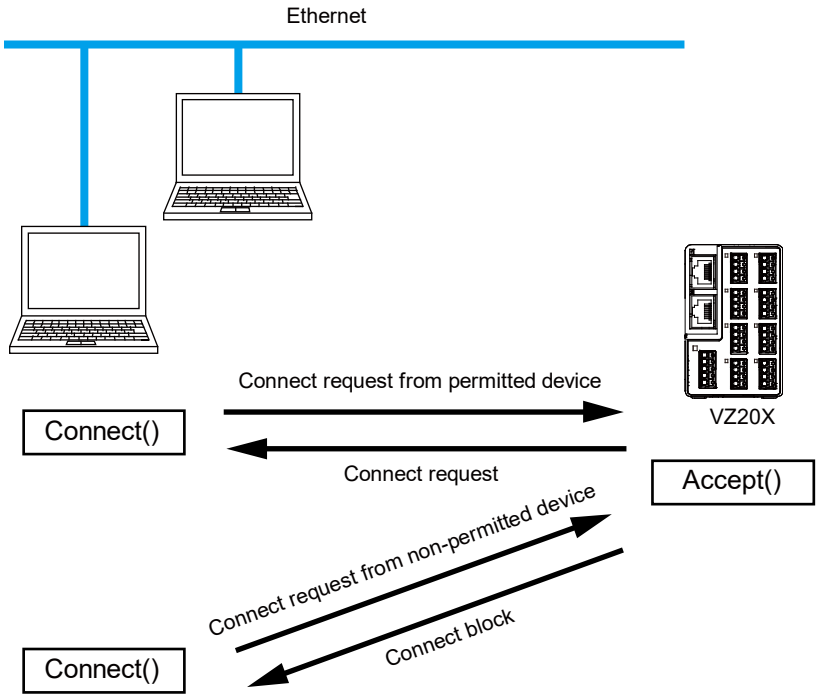
Note

- Communication is not possible when two VZ20X's having the same IP address exist on the same network. When two or more VZ20X's have been set with the same IP address by mistake, change the IP address settings on VZ Configurator via the USB port.
- Use DHCP only at initial setup.
  When DHCP is used in actual operation, the IP address sometimes changes and data can no longer be acquired.
- The Ethernet keepalive judgment time is set to 25 seconds.
- The DHCP client function is not supported in lease extension requests. For this reason, automatic changing of IP addresses based on time elapsed from the first acquired IP address is not preformed.
- Consult with the administrator of the network before determining the IP address, subnet mask and default gateway settings.
- Firmware version R1.02.01 or later
  - If USB Type-C detection is "Disable" and there is insufficient current capacity in the USB specifications of the PC, it could result in an operational defect or failure. Confirm the USB specifications of the PC, and use this product with USB Type-C detection set to "Disable".
  - If the USB Type-C detection setting is changed, turn the VZ20X OFF and then turn it back ON again.

Parameter Name	Setting Range	Default	Explanation
Tag	Max. 16, 2- or 1-bytes characters (alphanumeric characters, symbols and Chinese character)	VZ	Sets the tag name of the VZ20X.
User ID	Max. 16, 1-byte characters (alphanumeric characters and symbols)	USER1	Sets the user ID.
Password		USER1	Sets the password.
Ethernet Port IP address	0.0.0.0 to 255.255.255.255	192.168.1.1	Sets the IP address of the VZ20X.
Subnet mask	0.0.0.0 to 255.255.255.255	255.255.255.0	Sets the subnet mask of the VZ20X.
Default gateway	0.0.0.0 to 255.255.255.255	0.0.0.0	Sets the default gateway of the VZ20X.
Connection permission	OFF, IP address, MAC address	OFF	Sets the connection permission of the device. Connection permission can be set on up to two devices.
Connection permission IP address 1	0.0.0.0 to 255.255.255.255	0.0.0.0	Sets the connection permission IP address 1.
Connection permission IP address2	0.0.0.0 to 255.255.255.255	0.0.0.0	Sets the connection permission IP address 2.
Connection permission MAC address1	00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF	00-00-00-00-00-00	Sets the connection permission MAC address 1.
Connection permission MAC address2	00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF	00-00-00-00-00-00	Sets the connection permission MAC address 2.
DHCP	OFF, ON	ON	Sets the DHCP function. Use this function only at initial setup. During actual use, set DHCP to OFF and fix the IP address.
Ethernet connection port number	Fixed to 502	502	The port number is used for communication with the VZ configurator and for communication using Modbus/TCP function codes 03 and 16.
Firmware update permission via Ethernet	OFF, ON	OFF	Sets permission to update firmware over Ethernet.
USB Type-C detection	Enable, Disable	Enable	Enables/disables USB Type-C detection. If set to "Disable", VZ20X functionality can be used without any limitations, even if power is supplied by the PC over USB Type-A. This function is enabled with firmware version R1.02.01 or later.

7.2.2 Connection Permission Function

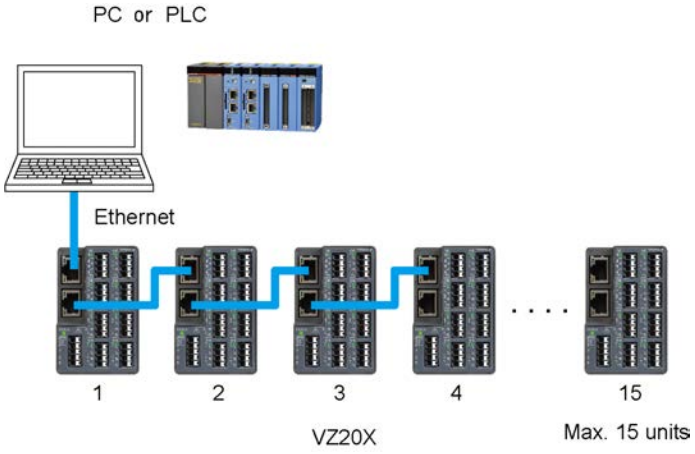
The VZ20X has a connection permission function for permitting accessing from only registered IP addresses or MAC addresses, and for blocking accessing from non-registered IP addresses and MAC addresses. This function prevents unauthorized accessing and heightens security.



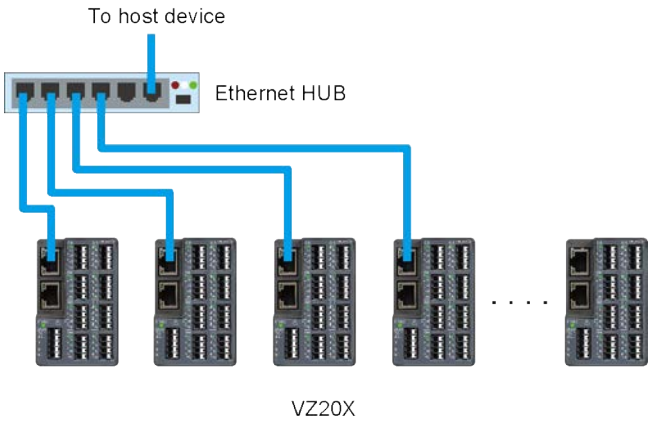
7.2.3 Time Synchronization Function

The time synchronization function can be used when two or more VZ20X's are connected in a daisy chain configuration. This function enables inputs to be measured on a maximum of 120 channels at the same A/D conversion timing.

Parameter Name	Setting Range	Default	Explanation
Connection type	1 unit Master unit of daisy chain Relay unit of daisy chain Terminal unit of daisy chain	1 unit	This sets the connection method between the PC and the VZ20X.



Time synchronization supported in this configuration (daisy chain connection, excluding when Connection type is "1 unit")



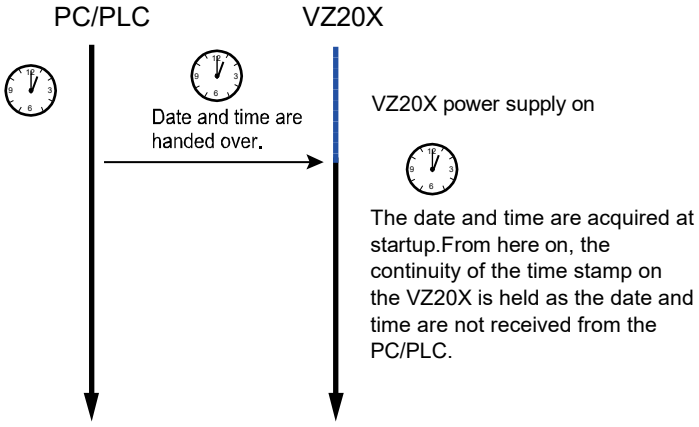
Time synchronization not supported in this configuration

● Acquisition of time

- GA10
  The time is acquired automatically only once from the GA10 when the connection is made.
  Set the setting value of GA10 setting item "Data time" to "Device time".

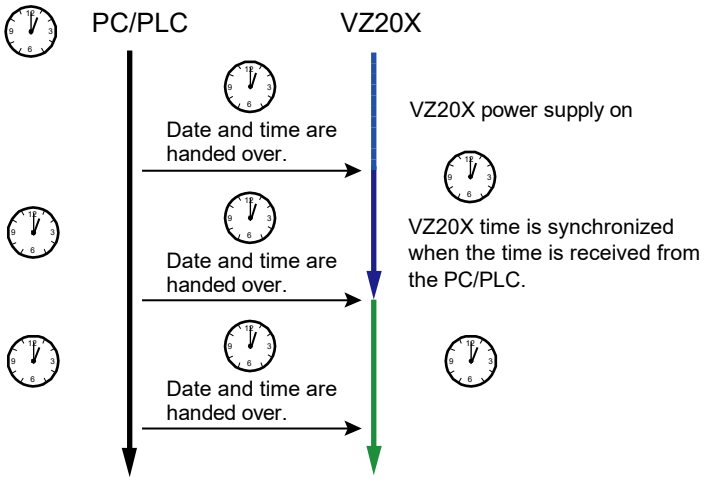
- Other than GA10 (PC/PLC)
  Write the time of the PC/PLC via Modbus/TCP communication after the VZ20X is started up.
  Write the time also when the power supply is turned off midway.
  At writing of the time, the time stamp is omitted or set in duplicate.

  Device targeted for writing of time: VZ20X, Connection type setting value: 1 unit, master unit of daisy chain



Note

To synchronize the time on the PC and PLC
The date and time on the VZ20X can be synchronized with the date and time on the PC/PLC by periodically writing the time.
The accuracy of the time on the VZ20X is ±5 ppm. To resolve time differences with the PC/PLC, write the time to the VZ20X whenever required.
Note, however, that the time stamp is omitted or set in duplicate when the time has been acquired from the PC/PLC.



● Connection type

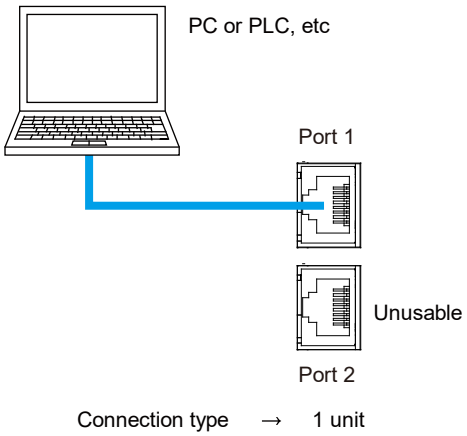
Sets the connection type. When performing time synchronization, correctly set the connection type.

Connection type	Descriptions	Port 1 connection destination	Port 2 connection destination
1 unit	Time synchronization between VZ20X's is not performed.	Connection with a host device such as PC/PLC, etc.	Connection with port 1 of VZ20X Connection type is "1 unit."
Master unit of daisy chain	This is used as the master of the time internally on the VZ20X when time synchronization is performed. The master is one VZ20X unit in the daisy chain connection.	Connection with a host device such as PC/PLC, etc.	VZ20X relay unit of daisy chain or terminal unit of daisy chain. Connection with port 1.
Relay unit of daisy chain	Relaying is performed between the master and terminal unit in a daisy chain connection. Time follows the time setting of the master unit in the daisy chain.	VZ20X Master unit of daisy chain or VZ20X Relay unit of daisy chain. Connection with port 2.	VZ20X Relay unit of daisy chain or VZ20X Terminal unit of daisy chain. Connection with port 1.
Terminal unit of daisy chain	The terminal unit functions as the final unit at the end of a daisy chain connection. Time follows the time setting of the master unit in the daisy chain.	VZ20X Master unit of daisy chain or VZ20X Relay unit of daisy chain. Connection with port 2.	Unusable

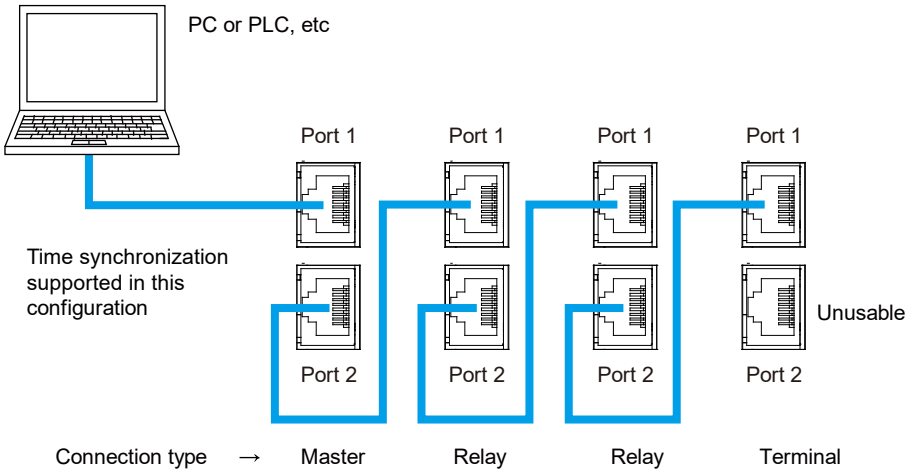
Note

- When a mistake is made in the wiring and connection type, the time will be acquired at startup though time synchronization will not be performed, and time is generated on each VZ20X.
- Do not connect port 2 as it does not function on 1 unit or on the terminal unit in a daisy chain connection.

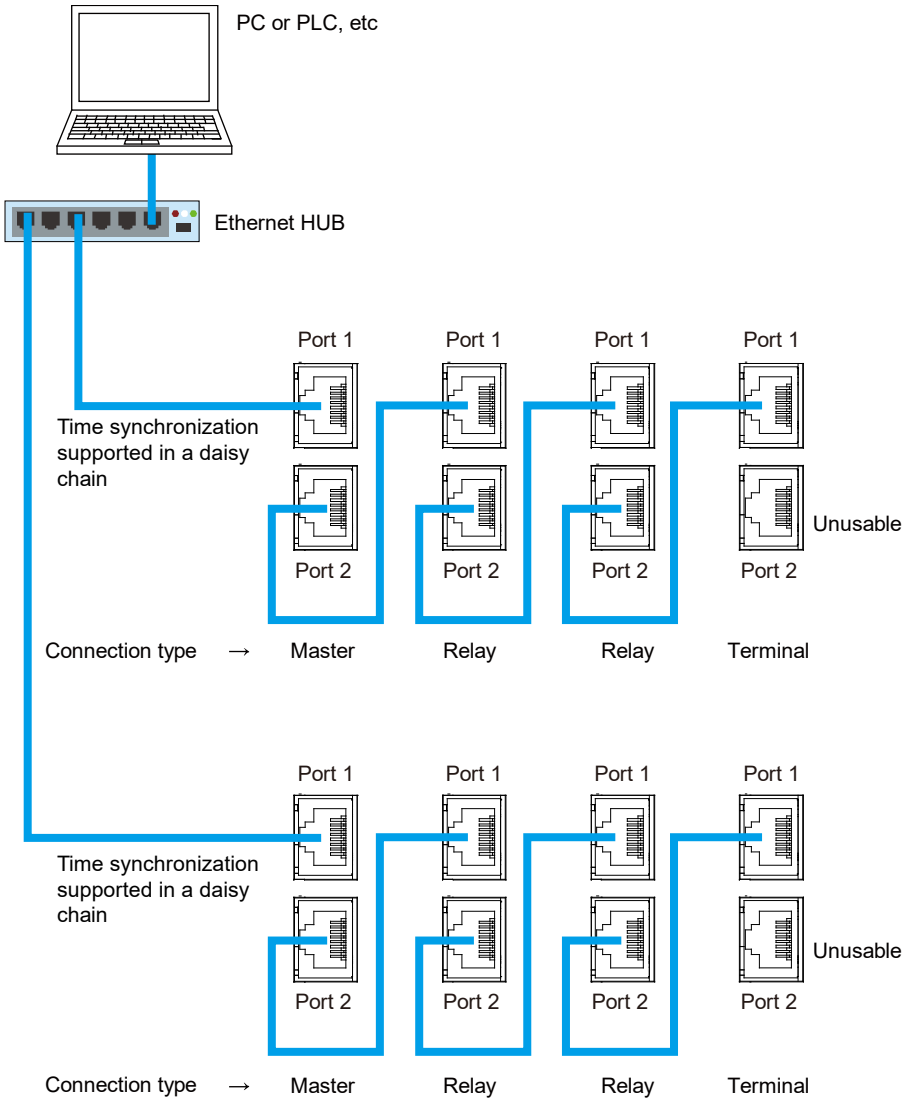
- Connection example (1 unit)



- Connection example (multiple units)
  When increasing the number of connected units, increase relay units.

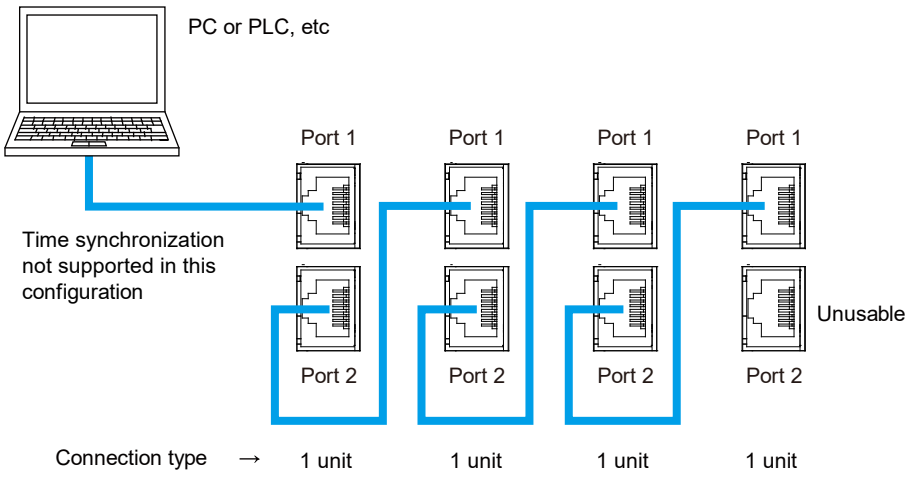


- Connection example (multiple units, time synchronization, daisy chain connections)

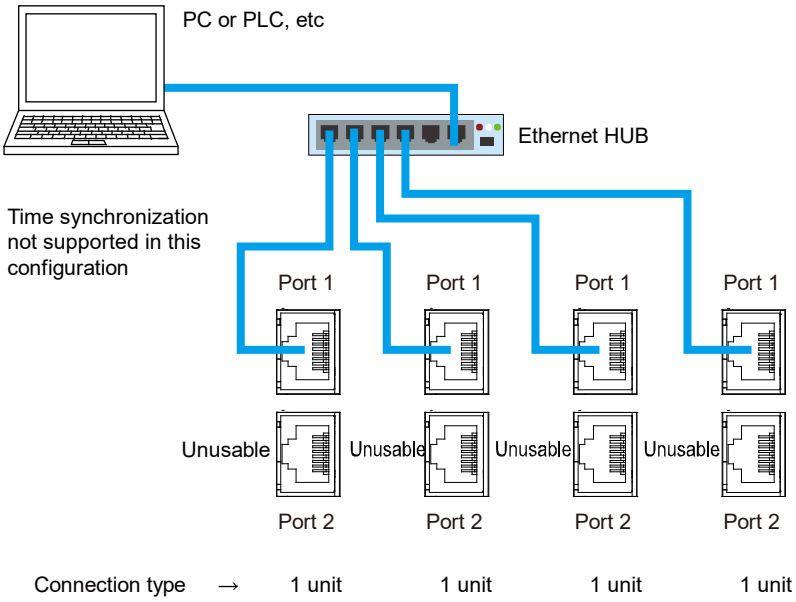


* Time synchronization is not possible via Ethernet HUB.

- Connection example (multiple units, w/o time synchronization)



- Connection example (multiple units, w/o time synchronization)



● Clock Functions

The clock function has a date (Western calendar.) Time is not backed up when the power supply is shut off. Clock accuracy is ±5 ppm.
Time on the VZ20X is not backed up. Set the date and time of the PC/PLC via Modbus/TCP. If the date and time are not set from the PC/PLC, the date and time start from 1970-01-01 00:00:00.000.
At writing of the time, the time stamp is omitted or set in duplicate.
In a daisy chain connection, set the date and time to the master unit of the daisy chain VZ20X from the PC/PLC.
In the case of a GA10, the date and time are set automatically.
Leap seconds are not compensated for when time is are not periodically acquired from the PC/PLC. Leap years are compensated for.

The date format is YYYY-MM-DD hh:mm:ss.nnn.

7.2.4 List of Register Assignments

Registers are used in Modbus communication. A host device (e.g. PC) can be accessed by using Modbus/TCP read and write commands.
VZ20X time data, measured value data, status data, parameter data, and other data are stored in registers.

● Conventions Used in D Register Tables

The following explains how to view register map tables.
Numerical values arranged vertically in the left side column of the table are (1) register numbers (reference Nos.).
The second column from the left side column is the (2) Hex number (hexadecimal). This is obtained by subtracting 40001 from the register number and converting the result to hexadecimal. (3) R/W indicates reading and writing by Modbus communication.
Operation becomes not fixed when a register other than a register number given in this table is read. Writing is not possible when writing to a register other than a register number given in this table is performed.

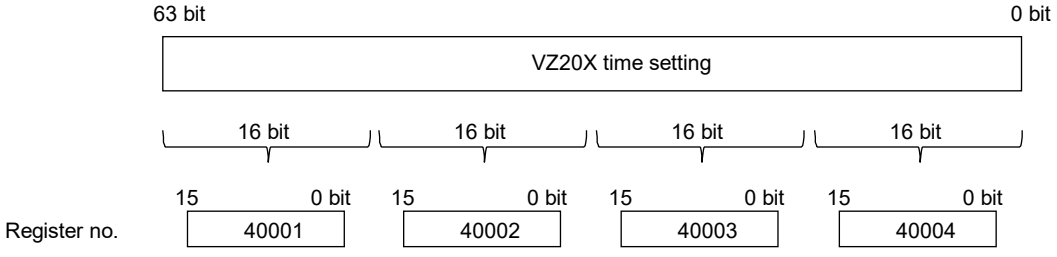
(1) Register number (Reference no.)	(2) Hex number (hexadecimal)	Register name	(3) R/W
40001	0000	VZ20X time setting	R/W
40002	0001		R/W
40003	0002		R/W
40004	0003		R/W
40005	0004	VZ20X system clock	R
40006	0005		R
40007	0006		R
40008	0007		R

R: Read only, R/W: Read/Write

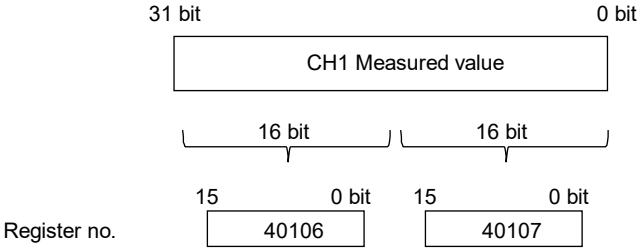
Specifying a register number
When communicating with the paperless recorder GX20 or other Modbus devices, specify the register number (reference number).
When using a communication program created by the user to perform communication, specify the Hex number (hexadecimal).

Registers are read and written in big-endian bit order.
The following shows the bit arrangement when bits are assigned to four registers and two registers. When bits are assigned to multiple registers, perform communication by continuous reading or writing.

- 4 registers and 64 bits (example: register numbers 40001 to 40004)



- 2 registers and 32 bits (example: register numbers 40106 to 40107)



■ List of register assignments

● Time

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
40001	0000	VZ20X time setting	R/W	Time setting values to VZ20X. Time is held once it is written. Time is not backed up when the power supply is turned off. This is enabled when Connection type is "1 unit" or "Master unit of daisy chain". The written time is reflected as the system time.
40002	0001		R/W	
40003	0002		R/W	
40004	0003		R/W	
40005	0004	VZ20X system clock	R	The current time of the VZ20X can be read. The update interval is 100 ms. The date and time operate from the value written to the "VZ20X time setting" register. At startup or when the time has not been set, the date and time operate from 1970-01-01 00:00:00.000.
40006	0005		R	
40007	0006		R	
40008	0007		R	

Register numbers to write the time to first from the PC/PLC are the 64 bits of registers 40001 to 40004.
When the time has not been written, the default date and time (1970-01-01 00:00:00.000) of the internal clock are used.
Write coordinated universal time or UTC as a 64-bit unsigned integer.
As the minimum resolution of the time that is written is 1 ms, one count of a 64-bit unsigned integer is 1 ms.
Internally on the VZ20X, time is handled as the time elapsed from January 1, 1970.
For details on Modbus/TCP function codes, see "7.2.6 Details of Commands/Responses."

Example of writing the time

Set date and time : 2021/7/20 12:12:12.123
UNIX time default : 1970/1/1 0:0:0.000

(1) Find the difference between the current time and the UNIX time default (Find the difference by using the functions for handling time that are available in each programming environment.)

Day difference	18828
Hour difference	12
Minute difference	12
Second difference	12
Millisecond difference	123

(2) Convert the differences to milliseconds

	Before conversion	Conversion formula	Result of conversion calculation
Day difference	18828	18828×24×60×60×1000	1626739200000
Hour difference	12	12×60×60×1000	43200000
Minute difference	12	12×60×1000	720000
Second difference	12	12×1000	12000
Millisecond difference	123	123	123
Total millisecond value			1626783132123

(3) Convert the total millisecond value to 64-bit unsigned hexadecimal

1626783132123 → 0000017AC3D4A9DB

(4) Write by Modbus

Send command [PDU] 01100000000404800000017AC3D4A9DB

Function code	10
Register start No.	0000
Number of registers	0004
Byte count	08
Write data	0000017AC3D4A9DB

● Measured value, measured value time stamp, device status, measured value status

The registers for storing the measured value, measured value time stamp, device status, and measured value status are shown below.
The values of these registers are updated according to the data acquisition interval.

Data acquisition interval	Register update interval
1 ms	10 ms
10 ms	10 ms
50 ms	50 ms
100 ms	100 ms

Two types of register assignments are available to simplify accessing of accessing registers.

- Continuous reading of measured values (Table 1): Placement of registers by which measured values and statuses are respectively continuous.
- Reading of measured values and statuses by individual channel (Table 2): Placement of registers by which measured values and statuses can be acquired as a set.

Table 1. Continuous reading of measured values

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. The coordinated universal time or UTC can be read as a 64-bit unsigned integer.
40102	0065		R	
40103	0066		R	
40104	0067		R	
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	

Table 2. Reading of measured values and statuses by individual channel

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
40151	0096	Measured value time stamp	R	The time of measured values can be read. This setting is common to all channels. The coordinated universal time or UTC can be read as a 64-bit unsigned integer.
40152	0097		R	
40153	0098		R	
40154	0099		R	
40155	009A	Device status	R	The device status of the VZ20X can be read.
40156	009B	CH1 measured value	R	Measured values can be read as 32-bit signed integers. The range changes depending on the input range.
40157	009C		R	
40158	009D	CH1 measured value status	R	The status of measured values can be read.
40159	009E	CH2 measured value	R	Same as CH1 measured value
40160	009F		R	
40161	00A0	CH2 measured value status	R	Same as CH1 measured value status
40162	00A1	CH3 measured value	R	Same as CH1 measured value
40163	00A2		R	
40164	00A3	CH3 measured value status	R	Same as CH1 measured value status
40165	00A4	CH4 measured value	R	Same as CH1 measured value
40166	00A5		R	
40167	00A6	CH4 measured value status	R	Same as CH1 measured value status
40168	00A7	CH5 measured value	R	Same as CH1 measured value
40169	00A8		R	
40170	00A9	CH5 measured value status	R	Same as CH1 measured value status
40171	00AA	CH6 measured value	R	Same as CH1 measured value
40172	00AB		R	
40173	00AC	CH6 measured value status	R	Same as CH1 measured value status
40174	00AD	CH7 measured value	R	Same as CH1 measured value
40175	00AE		R	
40176	00AD	CH7 measured value status	R	Same as CH1 measured value status
40177	00B0	CH8 measured value	R	Same as CH1 measured value
40178	00B1		R	
40179	00B2	CH8 measured value status	R	Same as CH1 measured value status

Reading of values appended with decimal point

When values with decimal points are read from a host device, values (hexadecimal) after removal of the decimal point can be read.

Example: When the measured value "12.3" is read from the host device, the value "123" after removal of the decimal point (same applies to value "1.23", "123 is read) is converted to hexadecimal. Therefore, "7B" can be read.

In this case, the register for the decimal point position is "Decimal position (n=1 to 8) of CHn measured value" and the register numbers are 40301 to 40308.

In the case of measured value "1.23": Decimal point position of measured value = 2

VZ20X device status

Code	Descriptions
0x0000	No error
0x2000	Parameter error
0x0100	System error
0x0200	Memory device (FRAM) error
0x0400	Input hardware no response

CHn measured value status (n=1 to 8)

This is the measured value status of each input channel. This displays the error information of measured values as a single byte. The 0 to 5th bits are handled as numerical values. The 6th and 7th bits express errors in bits. Error status is expressed in the numerical values of the 0 to 5th bits as the logical sum of the 6th and 7th bits.
When +overscale, measured value error and RJC error occur simultaneously, the values are as follows:

+overscale: 1
Adjustment value error: 64
RJC error: 128
Error status = 1 (+overscale) + 64 (Adjustment value error) + 128 (RJC error) = 193

Measured values corresponding to the status are displayed as shown in the table below.

Bit	Error	Measured value
0 to 5bit	0: No error	Normal
	1: +overscale	105.0 % of input range
	2: -overscale	-5.0 % of input range
	3: Input type OFF data	0
	6: No data	0
	7: Not fixed data (during range changing)	0
	8: +burnout error	105.0 % of input range
	9: -burnout error	-5.0 % of input range
	10: ADC error	0
	16: Time retrieval error	Normal
	17: Time synchronization error	Normal
06bit	Adjustment value error	0
7bit	RJC error	Normal, operation without RJC compensation

* The 8th to 15th bits are 0.

● Measured value decimal point position

The decimal point position can be checked by reading the decimal point position of each measured value.

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
40301	012C	Decimal point position of CH1 measured value	R	0: No decimal place 1: One decimal place 2: Two decimal places 3: Three decimal places 4: Four decimal places
40302	012D	Decimal point position of CH2 measured value	R	
40303	012E	Decimal point position of CH3 measured value	R	
40304	012F	Decimal point position of CH4 measured value	R	
40305	0130	Decimal point position of CH5 measured value	R	
40306	0131	Decimal point position of CH6 measured value	R	
40307	0132	Decimal point position of CH7 measured value	R	
40308	0133	Decimal point position of CH8 measured value	R	

● Parameters

These parameters are enabled with firmware version R1.02.01 or later.

Note

If any communication related parameters (indicated with an asterisk (*) next to the register name in the table below) are changed, set the Ethernet switch (register number 41161) to 1. Setting this value to 1 will apply the settings to the VZ20X.

Table 3. Communication setting parameters

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
41001	03E8	Tag name	R/W	Set using UTF16.
41002	03E9		R/W	
41003	03EA		R/W	
41004	03EB		R/W	
41005	03EC		R/W	
41006	03ED		R/W	
41007	03EE		R/W	
41008	03EF		R/W	
41009	03F0		R/W	
41010	03F1		R/W	
41011	03F2		R/W	
41012	03F3		R/W	
41013	03F4		R/W	
41014	03F5		R/W	
41015	03F6		R/W	
41016	03F7		R/W	
41017	03F8		R/W	
41101	044C	IP address setting 1(*)	R/W	0 to 255 IP address setting 1.IP address setting 2.IP address setting 3.IP address setting 4
41102	044D	IP address setting 2(*)	R/W	
41103	044E	IP address setting 3(*)	R/W	
41104	044F	IP address setting 4(*)	R/W	
41105	0450	Subnet mask setting 1(*)	R/W	0 to 255 Subnet mask setting 1.Subnet mask setting 2.Subnet mask setting 3.Subnet mask setting 4
41106	0451	Subnet mask setting 2(*)	R/W	
41107	0452	Subnet mask setting 3(*)	R/W	
41108	0453	Subnet mask setting 4(*)	R/W	
41109	0454	Default gateway setting 1(*)	R/W	0 to 255 Default gateway setting 1.Default gateway setting 2.Default gateway setting 3.Default gateway setting 4
41110	0455	Default gateway setting 2(*)	R/W	
41111	0456	Default gateway setting 3(*)	R/W	
41112	0457	Default gateway setting 4(*)	R/W	
41121	0460	Connection permission setting(*)	R/W	0: IP address 1: MAC address
41122	0461	Connection permission IP address 1 setting 1(*)	R/W	0 to 255 Connection permission IP address 1 setting 1.Connection permission IP address 1 setting 2.Connection permission IP address 1 setting 3.Connection permission IP address 1 setting 4
41123	0462	Connection permission IP address 1 setting 2(*)	R/W	
41124	0463	Connection permission IP address 1 setting 3(*)	R/W	
41125	0464	Connection permission IP address 1 setting 4(*)	R/W	

Table 3. Communication setting parameters (continued)

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
41126	0465	Connection permission IP address 2 setting 1(*)	R/W	0 to 255 Connection permission IP address 2 setting 1.Connection permission IP address 2 setting 2.Connection permission IP address 2 setting 3.Connection permission IP address 2 setting 4
41127	0466	Connection permission IP address 2 setting 2(*)	R/W	
41128	0467	Connection permission IP address 2 setting 3(*)	R/W	
41129	0468	Connection permission IP address 2 setting 4(*)	R/W	
41131	046A	Connection permission MAC address 1 setting 1(*)	R/W	0 to 255 (displayed in hexadecimal (00 to FF) in VZ Configurator) Connection permission MAC address 1 setting 1-Connection permission MAC address 1 setting 2-Connection permission MAC address 1 setting 3-Connection permission MAC address 1 setting 4-Connection permission MAC address 1 setting 5-Connection permission MAC address 1 setting 6
41132	046B	Connection permission MAC address 1 setting 2(*)	R/W	
41133	046C	Connection permission MAC address 1 setting 3(*)	R/W	
41134	046D	Connection permission MAC address 1 setting 4(*)	R/W	
41135	046E	Connection permission MAC address 1 setting 5(*)	R/W	
41136	046F	Connection permission MAC address 1 setting 6(*)	R/W	
41137	0470	Connection permission MAC address 2 setting 1(*)	R/W	0 to 255 (displayed in hexadecimal (00 to FF) in VZ Configurator) Connection permission MAC address 2 setting 1-Connection permission MAC address 2 setting 2-Connection permission MAC address 2 setting 3-Connection permission MAC address 2 setting 4-Connection permission MAC address 2 setting 5-Connection permission MAC address 2 setting 6
41138	0471	Connection permission MAC address 2 setting 2(*)	R/W	
41139	0472	Connection permission MAC address 2 setting 3(*)	R/W	
41140	0473	Connection permission MAC address 2 setting 4(*)	R/W	
41141	0474	Connection permission MAC address 2 setting 5(*)	R/W	
41142	0475	Connection permission MAC address 2 setting 6(*)	R/W	
41151	047E	DHCP setting(*)	R/W	0: OFF 1: ON
41152	047F	Connection type setting(*)	R/W	0: 1 unit 1: Master unit of daisy chain 2: Relay unit of daisy chain 3: Terminal unit of daisy chain
41161	0488	Ethernet switch	R/W	0: OFF 1: ON
41162	0489	USB Type-C detection function	R/W	0: Enable 1: Disable

Communication parameters used by the VZ20X can be read and confirmed during communication.

Table 4. Communication parameters used

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
41201	04B0	IP address used 1	R	0 to 255 IP address used 1.IP address used 2.IP address used 3.IP address used 4
41202	04B1	IP address used 2	R	
41203	04B2	IP address used 3	R	
41204	04B3	IP address used 4	R	
41205	04B4	Subnet mask used 1	R	0 to 255 Subnet mask used 1.Subnet mask used 2.Subnet mask used 3.Subnet mask used 4
41206	04B5	Subnet mask used 2	R	
41207	04B6	Subnet mask used 3	R	
41208	04B7	Subnet mask used 4	R	
41209	04B8	Default gateway used 1	R	0 to 255 Default gateway used 1.Default gateway used 2.Default gateway used 3.Default gateway used 4
41210	04B9	Default gateway used 2	R	
41211	04BA	Default gateway used 3	R	
41212	04BB	Default gateway used 4	R	
41221	04C4	Connection permission used	R	0: IP address 1: MAC address
41222	04C5	Connection permission IP address 1-1 used	R	0 to 255 Connection permission IP address 1 used 1.Connection permission IP address 1 used 2.Connection permission IP address 1 used 3.Connection permission IP address 1 used 4
41223	04C6	Connection permission IP address 1-2 used	R	
41224	04C7	Connection permission IP address 1-3 used	R	
41225	04C8	Connection permission IP address 1-4 used	R	
41226	04C9	Connection permission IP address 2-1 used	R	0 to 255 Connection permission IP address 2 used 1.Connection permission IP address 2 used 2.Connection permission IP address 2 used 3.Connection permission IP address 2 used 4
41227	04CA	Connection permission IP address 2-2 used	R	
41228	04CB	Connection permission IP address 2-3 used	R	
41229	04CC	Connection permission IP address 2-4 used	R	
41230	04CD	Connection permission MAC address 1-1 used	R	0 to 255 (displayed in hexadecimal (00 to FF) in VZ Configurator) Connection permission MAC address 1 used 1-Connection permission MAC address 1 used 2-Connection permission MAC address 1 used 3-Connection permission MAC address 1 used 4-Connection permission MAC address 1 used 5-Connection permission MAC address 1 used 6
41231	04CE	Connection permission MAC address 1-2 used	R	
41232	04CF	Connection permission MAC address 1-3 used	R	
41233	04D0	Connection permission MAC address 1-4 used	R	
41234	04D1	Connection permission MAC address 1-5 used	R	
41235	04D2	Connection permission MAC address 1-6 used	R	
41236	04D3	Connection permission MAC address 2-1 used	R	0 to 255 (displayed in hexadecimal (00 to FF) in VZ Configurator) Connection permission MAC address 2 used 1-Connection permission MAC address 2 used 2-Connection permission MAC address 2 used 3-Connection permission MAC address 2 used 4-Connection permission MAC address 2 used 5-Connection permission MAC address 2 used 6
41237	04D4	Connection permission MAC address 2-2 used	R	
41238	04D5	Connection permission MAC address 2-3 used	R	
41239	04D6	Connection permission MAC address 2-4 used	R	
41240	04D7	Connection permission MAC address 2-5 used	R	
41241	04D8	Connection permission MAC address 2-6 used	R	

Table 4. Communication parameters used (continued)

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
41251	04E2	DHCP setting used	R	0: OFF 1: ON
41252	04E3	Connection type setting used	R	0: 1 unit 1: Master unit of daisy chain 2: Relay unit of daisy chain 3: Terminal unit of daisy chain

Note

- If the input type is changed, the max./min. value of input range, max./min. value of input scale, and input scale decimal point position will be initialized.
- Configure settings in the following order: max. value of input range, min. value of input range, max. value of input scale, and then min. value of input scale.
- If using a thermocouple or resistance temperature detector, do not change the max. value of input scale, min. value of input scale, or decimal point position.

Table 5. Analog input setting parameters (channel 1 (CH1))

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
41501	05DC	CH1 tag	R/W	Set using UTF16.
41502	05DD		R/W	
41503	05DE		R/W	
41504	05DF		R/W	
41505	05E0		R/W	
41506	05E1		R/W	
41507	05E2		R/W	
41508	05E3		R/W	
41509	05E4		R/W	
41510	05E5		R/W	
41511	05E6		R/W	
41512	05E7		R/W	
41513	05E8		R/W	
41514	05E9		R/W	
41515	05EA		R/W	
41516	05EB		R/W	
41517	05EC		R/W	
41518	05ED	CH1 input type	R/W	0: SKIP 1: 20 mV 2: 60 mV 3: 200 mV 4: 1 V 5: 2 V 6: 6 V 8: 20 V 9: 60 V 10: 0.4 to 2 V 11: 1 to 5 V 14: 200Ω 4-wire 15: 2000Ω 4-wire 16: Type R 17: Type S 18: Type B 19: Type K 21: Type E 22: Type J 23: Type T 24: Type N 25: Type C 26: Pt100 3-wire 27: Pt100-H 3-wire 28: Pt100 4-wire 29: Pt100-H 4-wire

Table 5. Analog input setting parameters (channel 1 (CH1)) (continued)

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
41519	05EE	Max. value of CH1 input range	R/W	-99999 to 99999
41520	05EF			
41521	05F0	Min. value of CH1 input range	R/W	-99999 to 99999
41522	05F1			
41523	05F2	Max. value of CH1 input scale	R/W	-99999 to 99999
41524	05F3			
41525	05F4	Min. value of CH1 input scale	R/W	-99999 to 99999
41526	05F5			
41527	05F6	CH1 input scale decimal point position	R/W	0 to 4
41528	05F7	CH1 burnout detection	R/W	0: OFF 1: UP 2: DOWN
41529	05F8	CH1 power supply frequency noise removal filter	R/W	0: OFF 1: ON
41530	05F9	CH1 power supply frequency noise removal setting	R/W	0: Common 1: 50 Hz 2: 60 Hz
41531	05FA	CH1 moving average filter	R/W	0: OFF 1: ON
41532	05FB	CH1 number of moving average cycles	R/W	2 to 100
41533	05FC	CH1 first-order lag filter	R/W	0: OFF 1: ON
41534	05FD	CH1 first-order lag filter coefficient	R/W	1 to 120
41535	05FE	CH1 bias	R/W	±99999
41536	05FF			
41537	0600	CH1 RJC	R/W	0: OFF 1: ON
41538	0601	CH1 ERJC	R/W	-10.0 to 60.0

Example: When reading measured values from a host device with the following settings.
Input type: 11 (1-5V)
Maximum value of input range: 5.0000
Minimum value of input range: 1.0000
Maximum value of input scale: 100.0
Minimum value of input scale: 0.0
Input scale decimal point position: 1

The scaled value can be read from the host device.
When reading the scaled value "90.0" from the host device, "900" without the decimal point is converted to hexadecimal number "0384" can be read.
The decimal point position register is "Decimal point position of CHn measured value (n=1 to 8)" and register numbers are 40301 to 40308.
When the measured value is "90.0": "1" can be read for the decimal point position of the measured value.

The register numbers and corresponding hex numbers for channel 2 (CH2) through channel 8 (CH8) are shown below. The names are the same as for channel 1, although the channel numbers differ. Other details (R/W and descriptions) are the same as for channel 1.

Table 6. Analog input setting parameters (channel 2 (CH2) to channel 8 (CH8))

Channel 2 (CH2)	
Register number (Reference no.)	Hex number (hexadecimal)
41551	060E
41552	060F
41553	0610
41554	0611
41555	0612
41556	0613
41557	0614
41558	0615
41559	0616
41560	0617
41561	0618
41562	0619
41563	061A
41564	061B
41565	061C
41566	061D
41567	061E
41568	061F
41569	0620
41570	0621
41571	0622
41572	0623
41573	0624
41574	0625
41575	0626
41576	0627
41577	0628
41578	0629
41579	062A
41580	062B
41581	062C
41582	062D
41583	062E
41584	062F
41585	0630
41586	0631
41587	0632
41588	0633

Channel 3 (CH3)	
Register number (Reference no.)	Hex number (hexadecimal)
41601	0640
41602	0641
41603	0642
41604	0643
41605	0644
41606	0645
41607	0646
41608	0647
41609	0648
41610	0649
41611	064A
41612	064B
41613	064C
41614	064D
41615	064E
41616	064F
41617	0650
41618	0651
41619	0652
41620	0653
41621	0654
41622	0655
41623	0656
41624	0657
41625	0658
41626	0659
41627	065A
41628	065B
41629	065C
41630	065D
41631	065E
41632	065F
41633	0660
41634	0661
41635	0662
41636	0663
41637	0664
41638	0665

Table 6. Analog input setting parameters (channel 2 (CH2) to channel 8 (CH8)) (continued)

Channel 4 (CH4)	
Register number (Reference no.)	Hex number (hexadecimal)
41651	0672
41652	0673
41653	0674
41654	0675
41655	0676
41656	0677
41657	0678
41658	0679
41659	067A
41660	067B
41661	067C
41662	067D
41663	067E
41664	067F
41665	0680
41666	0681
41667	0682
41668	0683
41669	0684
41670	0685
41671	0686
41672	0687
41673	0688
41674	0689
41675	068A
41676	068B
41677	068C
41678	068D
41679	068E
41680	068F
41681	0690
41682	0691
41683	0692
41684	0693
41685	0694
41686	0695
41687	0696
41688	0697

Channel 5 (CH5)	
Register number (Reference no.)	Hex number (hexadecimal)
41701	06A4
41702	06A5
41703	06A6
41704	06A7
41705	06A8
41706	06A9
41707	06AA
41708	06AB
41709	06AC
41710	06AD
41711	06AE
41712	06AF
41713	06B0
41714	06B1
41715	06B2
41716	06B3
41717	06B4
41718	06B5
41719	06B6
41720	06B7
41721	06B8
41722	06B9
41723	06BA
41724	06BB
41725	06BC
41726	06BD
41727	06BE
41728	06BF
41729	06C0
41730	06C1
41731	06C2
41732	06C3
41733	06C4
41734	06C5
41735	06C6
41736	06C7
41737	06C8
41738	06C9

Table 6. Analog input setting parameters (channel 2 (CH2) to channel 8 (CH8)) (continued)

Channel 6 (CH6)	
Register number (Reference no.)	Hex number (hexadecimal)
41751	06D6
41752	06D7
41753	06D8
41754	06D9
41755	06DA
41756	06DB
41757	06DC
41758	06DD
41759	06DE
41760	06DF
41761	06E0
41762	06E1
41763	06E2
41764	06E3
41765	06E4
41766	06E5
41767	06E6
41768	06E7
41769	06E8
41770	06E9
41771	06EA
41772	06EB
41773	06EC
41774	06ED
41775	06EE
41776	06EF
41777	06F0
41778	06F1
41779	06F2
41780	06F3
41781	06F4
41782	06F5
41783	06F6
41784	06F7
41785	06F8
41786	06F9
41787	06FA
41788	06FB

Channel 7 (CH7)	
Register number (Reference no.)	Hex number (hexadecimal)
41801	0708
41802	0709
41803	070A
41804	070B
41805	070C
41806	070D
41807	070E
41808	070F
41809	0710
41810	0711
41811	0712
41812	0713
41813	0714
41814	0715
41815	0716
41816	0717
41817	0718
41818	0719
41819	071A
41820	071B
41821	071C
41822	071D
41823	071E
41824	071F
41825	0720
41826	0721
41827	0722
41828	0723
41829	0724
41830	0725
41831	0726
41832	0727
41833	0728
41834	0729
41835	072A
41836	072B
41837	072C
41838	072D

Table 6. Analog input setting parameters (channel 2 (CH2) to channel 8 (CH8)) (continued)

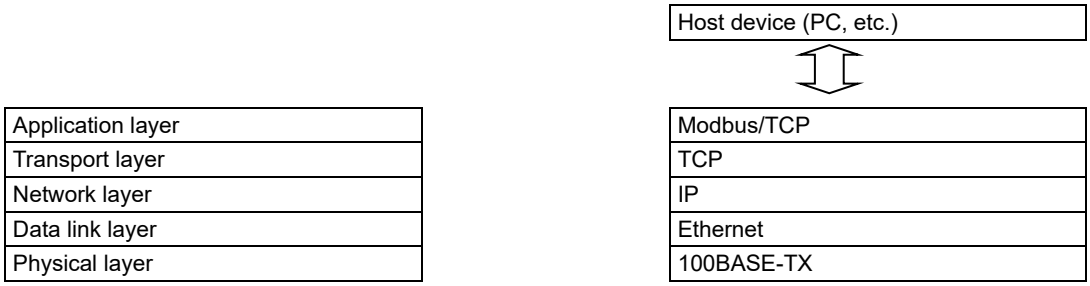
Channel 8 (CH8)	
Register number (Reference no.)	Hex number (hexadecimal)
41851	073A
41852	073B
41853	073C
41854	073D
41855	073E
41856	073F
41857	0740
41858	0741
41859	0742
41860	0743
41861	0744
41862	0745
41863	0746
41864	0747
41865	0748
41866	0749
41867	074A
41868	074B
41869	074C
41870	074D
41871	074E
41872	074F
41873	0750
41874	0751
41875	0752
41876	0753
41877	0754
41878	0755
41879	0756
41880	0757
41881	0758
41882	0759
41883	075A
41884	075B
41885	075C
41886	075D
41887	075E
41888	075F

Table 7. Data acquisition interval parameters

Register number (Reference no.)	Hex number (hexadecimal)	Register name	R/W	Descriptions
41901	076C	Data acquisition interval	R/W	0: 1 ms 1: 10 ms 2: 50 ms 3: 100 ms

7.2.5 Outline of Modbus/TCP Protocol

Modbus/TCP is a communication protocol that is used when performing communication with a general-purpose PC or PLC using TCP/IP protocol over a network such as Ethernet.
Communication is performed via this communication protocol to read and write registers on the VZ20X and exchange data between connected devices. The VZ20X can be connected to IEEE802.3-compatible networks by a 100BASE-TX Ethernet connection.

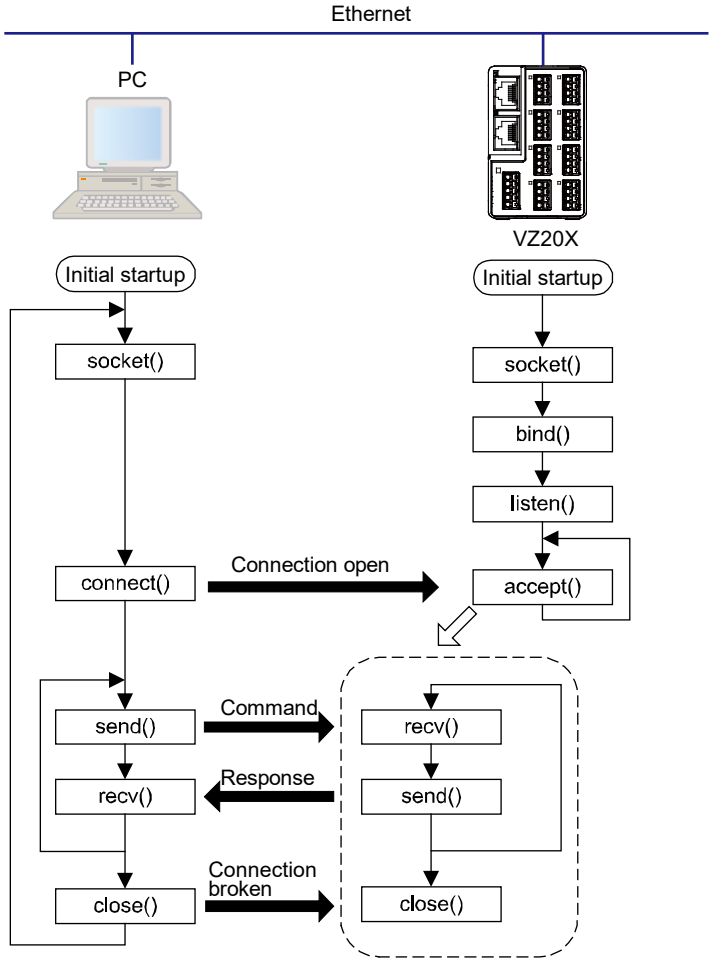


Host device and port number

Function	Connection	Protocol	Port No.
VZ Configurator	Ethernet	Modbus TCP	502
PC/PLC (Function code: 03, 16)	Ethernet	Modbus TCP	502
PC/PLC (Function code:70, 71)	Ethernet	Modbus TCP	34596

● Communication by TCP/IP

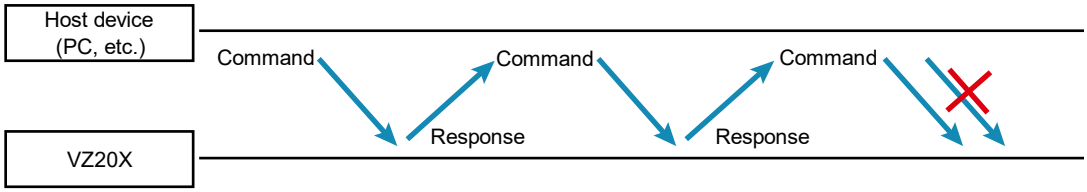
Modbus/TCP uses the TCP/IP socket interface to perform data exchange by the procedure in the figure below.



Note

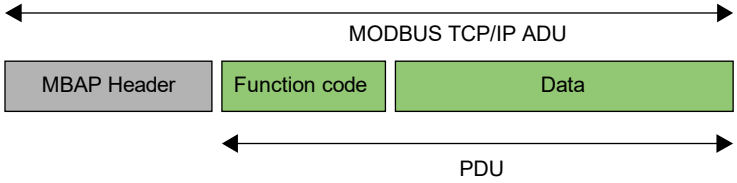
When there is no request for 60 seconds or more from the host device after a connection is established, VZ20X breaks the connection.

The max. number of transactions on VZ20X is "1." When sending commands continuously, check the response from the VZ20X and then send the next command.



● Network frame configuration

The Modbus/TCP frame configuration is as follows.



MBAP Header (Modbus Application Protocol Header): Header for identifying that the protocol is Modbus/TCP
PDU (Protocol Data Unit): Body of data communication

● MBAP Header configuration

The MBAP Header comprises the following seven bytes.

Byte No.	0	1	2	3	4	5	6
Description	Transfer ID		Protocol ID		Number of bytes		Unit ID

Transfer ID: Specify any value for identifying transactions on the host device. The VZ20X returns the value received from a PC/PLC as the response.
Protocol ID: Specify "0" in the case of the Modbus/TCP protocol.
Number of bytes: The number of bytes from the unit ID (byte No.6) onwards.
Unit ID: Specify "1" on the host device. "1" is returned from the VZ20X, too, as the response.

● PDU configuration

The PDU (Protocol Data Unit) comprises the following n bytes.

Byte No.	0	1 to (n-1)
Description	Function code	Data

Function code: Specify the command from the host device.
Data: Specify the register No. and number of internal registers, parameter values, etc. according to the function code.

The following example explains action for function code 03.

(Example) Function code 03 Read multiple registers

For details on the response format when an error occurs, refer to the response error code.

● Request (during normal operation) Read n items of data

	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code	Register start No. (Hex number)	Number of registers
(Hex)	Arbitrary	0000	0006	01	03		n

The register start no. is the value obtained by subtracting 40001 from the register number (reference number).

● Response (during normal operation)

	MBAP Header			
Number of bytes	2	2	2	1
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID
(Hex)	Arbitrary	0000	2n+3	01

Continuation of response

PDU				
1	1	2		2
Function code	Byte count	Register content	...	Register content n
03	2n			

■ Response error code

● When a response is returned to a request

- When there is a nonconformity in the PDU in the request, VZ20X performs no processing, and returns the following request.

	MBAP Header				PDU	
Number of bytes	2	2	2	1	1	1
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code*	Error Code
(Hex)	Arbitrary	0000	03	01		

*The number of the function code (Hex) + 80 (Hex) is input to the function code.

● Response error code

Error Code	Meaning	Cause
01	Function code error	The function code does not exist.
02	Register No. error	A No. out of range was specified.
03	Number of registers error	A number of registers out of range was specified.

● When a response is not returned to a request

In the following cases, VZ20X performs no processing and does not return a response.

- When a connection has not been established on the TCP/IP socket interface
- When there is a nonconformity in the MBAP Header in the request

Note: As a countermeasure for the above, perform timeout processing by the communication function on the host device or by the communication program.

7.2.6 Details of Commands/Responses

These are commands that are used by the PC/PLC for obtaining the information in registers on the VZ20X or for acquiring data.

Function code	Description
03	Read multiple registers
06	Write single register(*)
16	Write multiple registers
70	Data acquisition control
71	Acquire data

*: Function code 06 is enabled with firmware version R1.02.01 or later.

■ 03 Read multiple registers

● Function

The content of registers is read continuously for the number of specified points from the specified register No.

- The maximum number of registers that can be read in a single operation is 100.
- For details on the response format when an error occurs, refer to the response configuration.

● Message (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x03)	Register start No. (Hex number)	Read Number of registers
(Hex)	Arbitrary	0000	0006	01	03		n

● Response (during normal operation)

Element	MBAP Header			
Number of bytes	2	2	2	1
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID
(Hex)	Arbitrary	0000	2n+3	01

Continuation of response

PDU				
1	1	2		2
Function code (0x03)	Byte count (Note 1)	Register content	...	Register content n
03	2n			

Note 1: Byte count = 2 x number of read registers

■ 06 Write single register

● Function

Data is written to the specified register number.

- The maximum number of registers that can be written in a single operation is one.
- For details on the response format when an error occurs, refer to the response configuration.
- When data outside the parameter setting range is set, a normal response is returned though data is not written.

● Message (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x06)	Register number	Write data
(Hex)	Arbitrary	0000	0006	01	06		

● Response (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x06)	Register number	Write data
(Hex)	Arbitrary	0000	0006	01	06		

■ 16 Write multiple registers

● Function

Data is written to continuous registers for the number of specified points from the specified register No.

- The maximum number of registers that can be written in a single operation is 50.
- For details on the response format when an error occurs, refer to the response configuration.
- When data outside the parameter setting range is set, a normal response is returned though data is not written.

● Message (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x10)	Register start No. (Hex number)	Number of registers
(Hex)	Arbitrary	0000	2n+7	01	10		n

Continuation of request

PDU			
1	2		2
Byte count (Note 1)	Write data	...	Write data n
2n			

Note 1: Byte count = 2 x number of write registers

● Response (during normal operation)

Element	MBAP Header				PDU		
Number of bytes	2	2	2	1	1	2	2
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x10)	Register start No. (Hex number)	Number of registers
(Hex)	Arbitrary	0000	0006	01	10		n

■ 70 Data acquisition control

● Function

- This command starts and stops data acquisition.

Function selection

Function selection code	Description
0001	Start data acquisition
0002	Stop data acquisition

● Message (during normal operation)

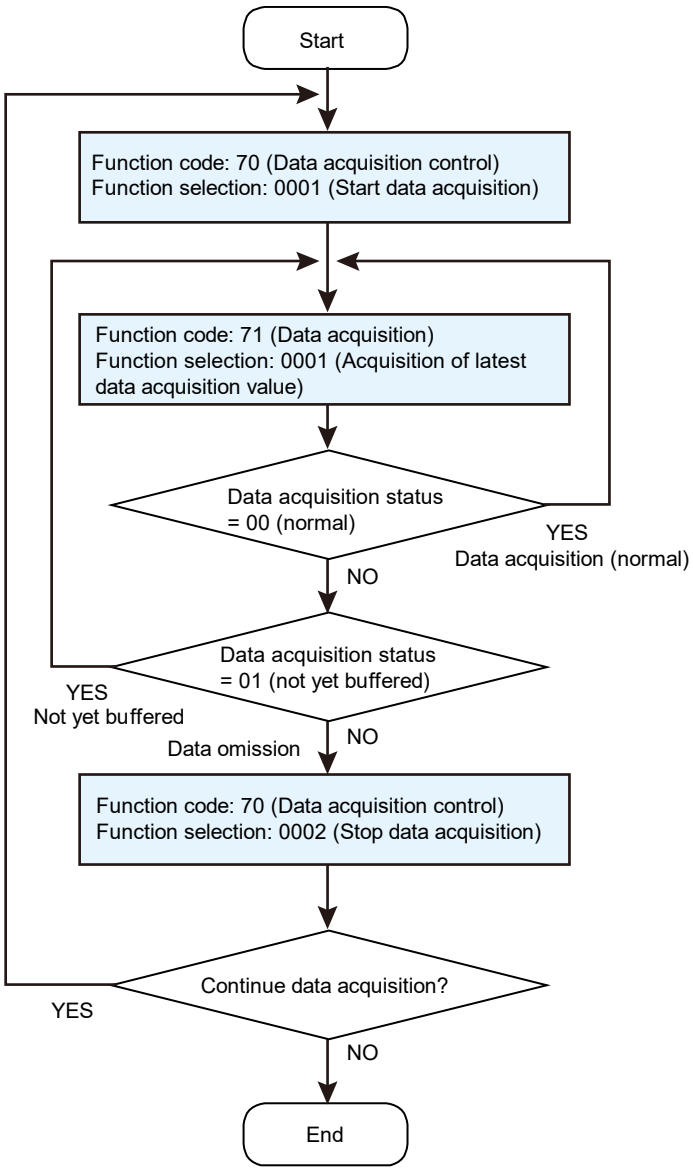
Element	MBAP Header				PDU	
Number of bytes	2	2	2	1	1	2
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x46)	Function selection
(Hex)	Arbitrary	0000	0004	01	46	0001 or 0002

● Response (during normal operation)

Element	MBAP Header				PDU	
Number of bytes	2	2	2	1	1	2
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x46)	Function selection
(Hex)	Arbitrary	0000	0004	01	46	0001 or 0002

Note 1: Byte count = 2 x number of read registers

● Flow of data acquisition



● Data acquisition interval and Data retention time

Acquire data by communication while data is still held on the VZ20X. The data retention time on the VZ20X differs according to the data acquisition interval. The following shows the relationship between the data acquisition interval and data retention time.

Data acquisition interval	Data retention time
1 ms	2 s
10 ms	20 s
50 ms	100 s
100 ms	200 s

■ 71 Acquire data

This command can acquire "4 data acquisition intervals' worth of data x data of 8 channels".

● Function

- Acquisition of latest data acquisition value
- Acquisition of data previous access value (the same data is acquired again when a communication error occurs at acquisition of the latest value)

● Function selection

Function selection code	Description
0001	Acquisition of latest data acquisition value
0002	Acquisition of data previous access value

The response is the same whichever function selection code is set.

● Data acquisition error status

Error Code	Description
00	No error
01	Buffer is not full.
02	Data omission occurred.

● CHn STS (n=1 to 8)

This is the measured value status of each input channel. This displays the error information of measured values as a single byte. The 0 to 5th bits are handled as numerical values. The 6th and 7th bits express errors in bits. Error status is expressed in the numerical values of the 0 to 5th bits as the logical sum of the 6th and 7th bits.
When +overscale, measured value error and RJC error occur simultaneously, the values are as follows:

+overscale: 1
Adjustment value error: 64
RJC error: 128
Error status = 1 (+overscale) + 64 (Adjustment value error) + 128 (RJC error) = 193

Measured values corresponding to the status are displayed as shown in the table below.

Bit	Error	Measured value
0 to 5bit	0: No error	Normal
	1: +overscale	105.0 % of input range
	2: -overscale	-5.0 % of input range
	3: Input type OFF data	0
	6: No data	0
	7: Not fixed data (during range changing)	0
	8: +burnout error	105.0 % of input range
	9: -burnout error	-5.0 % of input range
	10: ADC error	0
	16: Time retrieval error	Normal
	17: Time synchronization error	Normal
06bit	Adjustment value error	0
7bit	RJC error	Normal, operation without RJC compensation

* The 8th to 15th bits are 0.

● UNIT status

Code	Descriptions
0x0000	No error
0x2000	Parameter error
0x0100	System error
0x0200	Memory device (FRAM) error
0x0400	Input hardware no response

● Message (during normal operation)

Element	MBAP Header				PDU	
Number of bytes	2	2	2	1	1	2
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x47)	Function selection
(Hex)	Arbitrary	0000	0004	01	47	0001 or 0002

● Response (during normal operation)

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	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	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

Data is arranged in the following order when it is acquired: data acquisition status, year/month/day 1, time 1, CH1-Data1, CH2-Data1, CH3-Data1, CH4-Data1, CH5-Data1, CH6-Data1, CH7-Data1, CH8-Data1, CH1-STS1, CH2-STS1, CH3-STS1, CH4-STS1, CH5-STS1, CH6-STS1, CH7-STS1, CH8-STS1, year/month/day 2, time 2, ·····, UNIT status.
*Data: Measured value

Measured values are time-stamped. The format of the time stamp is as follows:
Year/month/day: yyyy-mm-dd
Time: hh:mm:ss.nnn

● Response (during an error)

Element	MBAP Header				PDU	
Number of bytes	2	2	2	1	1	1
Command elements	Transfer ID	Protocol ID	Number of bytes	Unit ID	Function code (0x47)	Data acquisition status
(Hex)	Arbitrary	0000	0003	01	47	01 or 02

■ Details of error code

Error Code	Meaning	Cause
01	Function code error	The function code does not exist.
02	Register	A No. out of range was specified.
03	Register	A number of registers out of range was specified.

7.3 USB Communication

The VZ20X has a USB port exclusively for VZ Configurator. VZ20X parameter settings can be setup up or monitoring can be performed using VZ Configurator.

7.3.1 Specification

The PC uses the Windows standard USB driver.
USB connector type: Type-C
Cable: 3 m or less, USB2.0 or higher

8. Maintenance

Periodically inspect the operating status of the VZ20X to make sure that it is being used in a good condition at all times.

- Check to see if LED displays, analog inputs and communication are being performed normally.
  If an abnormality occurs, see "9 Troubleshooting."

8.1 Input Calibration

Calibration once every year is recommended to maintain measurement accuracy.

By calibration, corresponding inputs are applied to each of the 0, 50, 100% points on the measurement input range, and the error is calculated based on the difference with the actual measured value. If the error is not within accuracy specifications, inputs must be adjusted. See "8.2 Input Adjustment."

■ Required equipment

The following calibration equipment is required for calibration.

● Recommended equipment

- DC voltage generator: ADC 6166 or equivalent
- Resistor: Alpha Electronics ADR-3204GRV or ADR-6103M or equivalent
- 0°C reference temperature unit: ZC-114/ZA-10 made by Coper Electronics Co., Ltd. or equivalent

1 Wire the VZ20X to the calibration equipment as shown in the figure on the next page, and sufficiently warm up each of the equipment. (Warm up the VZ20X for at least 40 minutes.)
For precautions in wiring, see "Chapter 4 Wiring."

2 Check that the ambient temperature, humidity and other operating environment conditions are within specification (23±2°C, 55±10% RH).

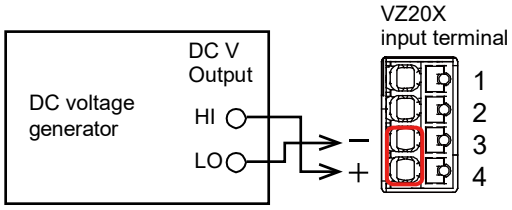
3 Corresponding inputs are applied to each of the 0, 50, 100% points on the measurement input range, and the error is calculated based on the difference with the actual measured value and the reference value. Each channel on the VZ20X must be calibrated. If the error is not within accuracy specifications, inputs must be adjusted to within specification according to the description in “8.2 Input Adjustment.”

Note

With thermocouple input, the temperature of the input terminal must be measured and a voltage must be added that takes into consideration the reference junction compensation temperature.

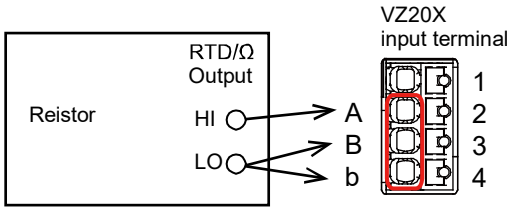
● DC voltage

0%, 50%, 100% input



● 3-wire resistance temperature detector

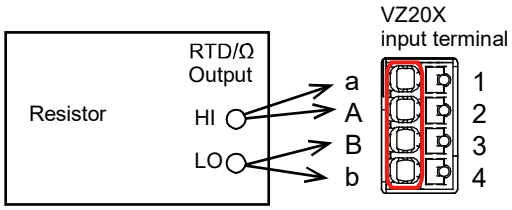
0%, 50%, 100% input



* Ensure that the resistance of 3 conductors is the same value.

● 4-wire resistance temperature detector

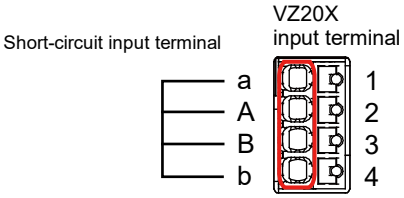
0%, 50%, 100% input



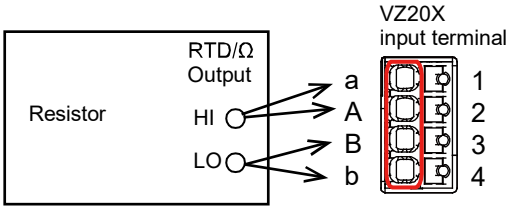
* Ensure that the resistance of 4 conductors is the same value.

● 4-wire resistance

0% input

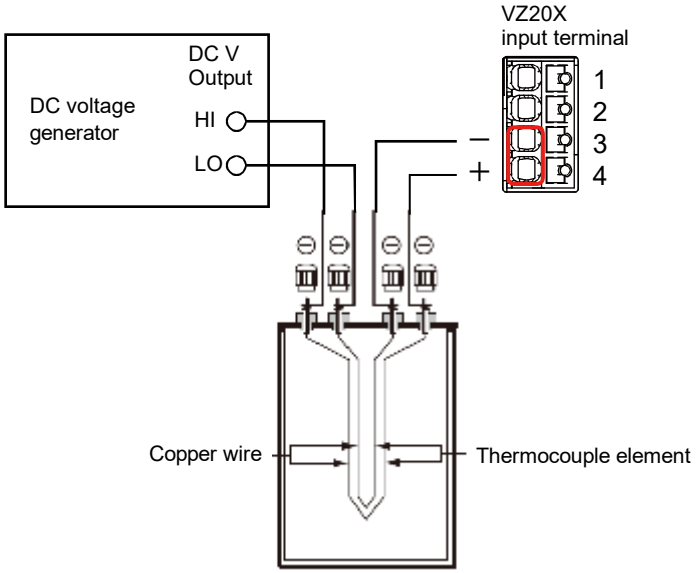


50%, 100% input



* Ensure that the resistance of 4 conductors is the same value.

● Thermocouple



(0°C reference temperature unit made by Coper Electronics Co., Ltd., model: ZC-114/ZA-10)

● Reference junction compensation of thermocouple input

As the temperature of the input terminal section on the VZ20X is close to regular room temperature, the actual output of the thermocouple differs from the value in the thermo-electromotive force table at the reference temperature of 0°C. The VZ20X compensates for this difference by measuring the temperature of the input terminals and adding the thermo-electromotive force of that amount to the actual output of the thermocouple. Accordingly, when the measurement terminal is short-circuited (equivalent to an instance where the temperature of the probe is 0°C), the temperature of the input terminal is indicated as the measured value.
When calibrating the VZ20X, input obtained by subtracting this compensation voltage (thermo-electromotive force of reference temperature 0°C that is equivalent to the temperature of the input terminal) must be applied from a standard temperature generator. As shown in the figure, when reference contact compensation is performed at 0°C by using the 0°C reference temperature unit, calibration can be performed by inputting the thermo-electromotive force of reference temperature 0°C from the DC voltage generator.

8.2 Input Adjustment

Input on each channel of the VZ20X must be adjusted. Input adjustment is performed by selecting the channel (CH) to adjust, executing zero-point adjustment on each range, and then executing full-point adjustment.
After input adjustment, click the [Apply and close] button to reflect the adjustment values in the VZ20X.
To restore the adjusted values to their defaults, click the [Initialize the adjusted value] button.

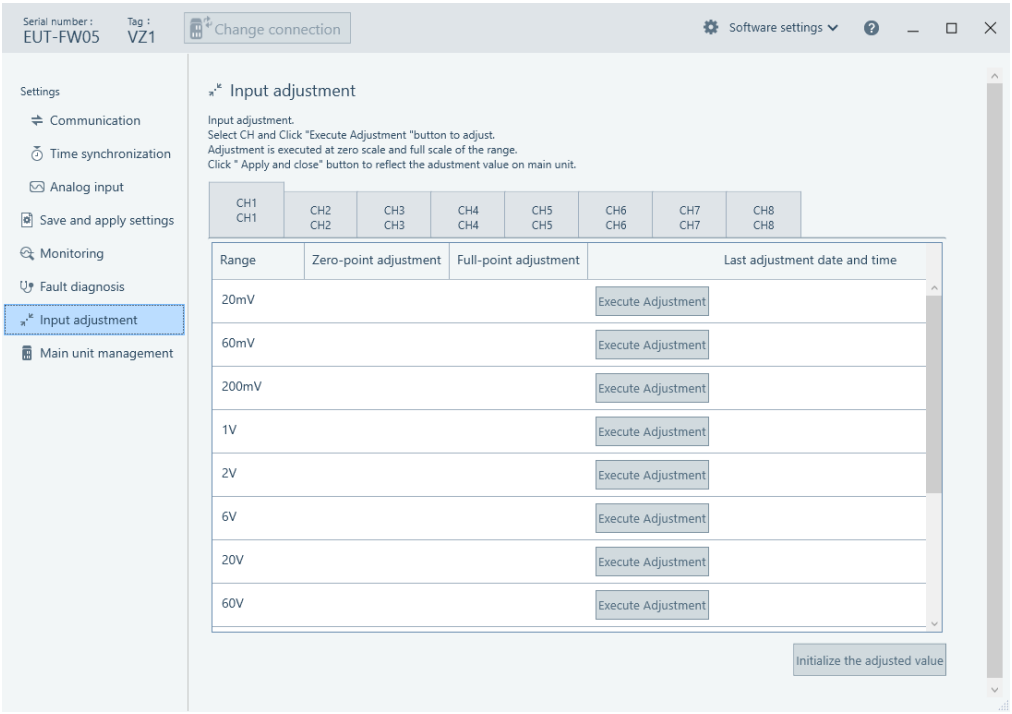
Input adjustment mode: Input adjustment is executed in this mode.
To enter the input adjustment mode, click the [Execute Adjustment] button in the input adjustment screen, and click the [Start Zero-point Adjustment] button.
Normal mode: Mode other than input adjustment mode

CAUTION

During input adjustment, do not turn the VZ20X off. Doing so might cause the VZ20X to no longer operate normally.

Note

- To enter the input adjustment mode. click the [Execute Adjustment] button in the input adjustment screen at the operation list, and click the [Start Zero-point Adjustment] button. After this, if any item in the operation list other than [Input adjustment] is clicked, the input adjustment mode is exited and the VZ20X automatically reboots.
- When the VZ20X reboots, the connection between the PC and the VZ20X is broken, so begin operations by establishing a new connection with the PC.
- If input adjustment fails, an error message (error code) is displayed. Repeat input adjustment.
- When the input adjustment mode is exited without completing input adjustment normally, the VZ20X operates by the previous adjustment values.
- If the VZ20X is turned off or communication is interrupted during input adjustment, input adjustment is not performed normally. Follow the on-screen message, turn the VZ20X on again and reboot the VZ20X.



The following table summarizes the ranges that can be adjusted.

Range	Types of Input That Use Adjustment Values
20 mV	DC voltage 20mV, thermocouples T, B, S, R
60 mV	DC voltage 60mV, thermocouples K, J, N, E, C
200 mV	DC voltage 200mV
1 V	DC voltage 1V
2 V	DC voltage 2V、Standard signal 0.4-2V
6 V	DC voltage 6V、Standard signal 1-5V
20 V	DC voltage 20V
60 V	DC voltage 60V
200Ω-3 wire	Resistance temperature detector Pt100-H 3-wire
400Ω-3 wire	Resistance temperature detector Pt100 3-wire
200Ω-4 wire	4-wire resistance 200Ω, Resistance temperature detector Pt100-H 4-wire
400Ω-4 wire	Resistance temperature detector Pt100 4-wire
2000Ω-4 wire	4-wire resistance 2000Ω

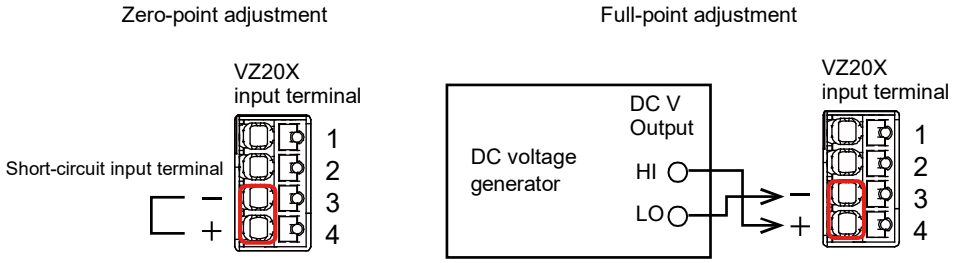
■ Required equipment

For details on the equipment required for adjustment, check "Required equipment" at "8.1 Input Calibration."

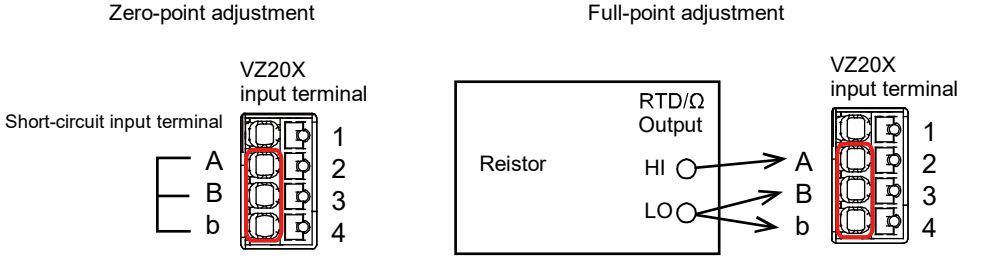
■ Adjustment procedure

1 Wire the VZ20X to the calibration equipment as shown in the figure below, and sufficiently warm up each of the equipment. (Warm up the VZ20X for at least 40 minutes.)
For precautions in wiring, see "Chapter 4 Wiring."

- Wiring for DC voltage range

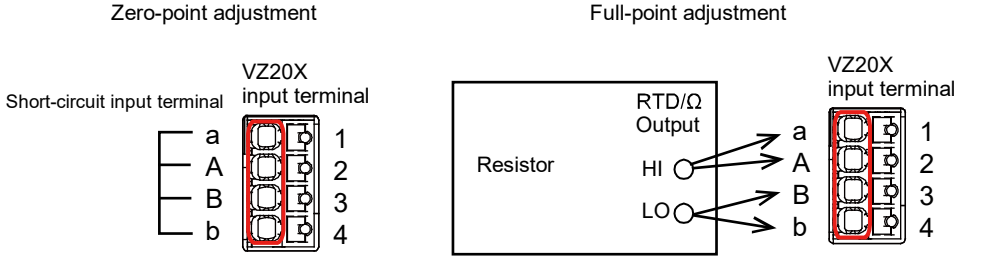


- Wiring for 3-wire resistance temperature detector range



* Ensure that the resistance of 3 conductors is the same value.

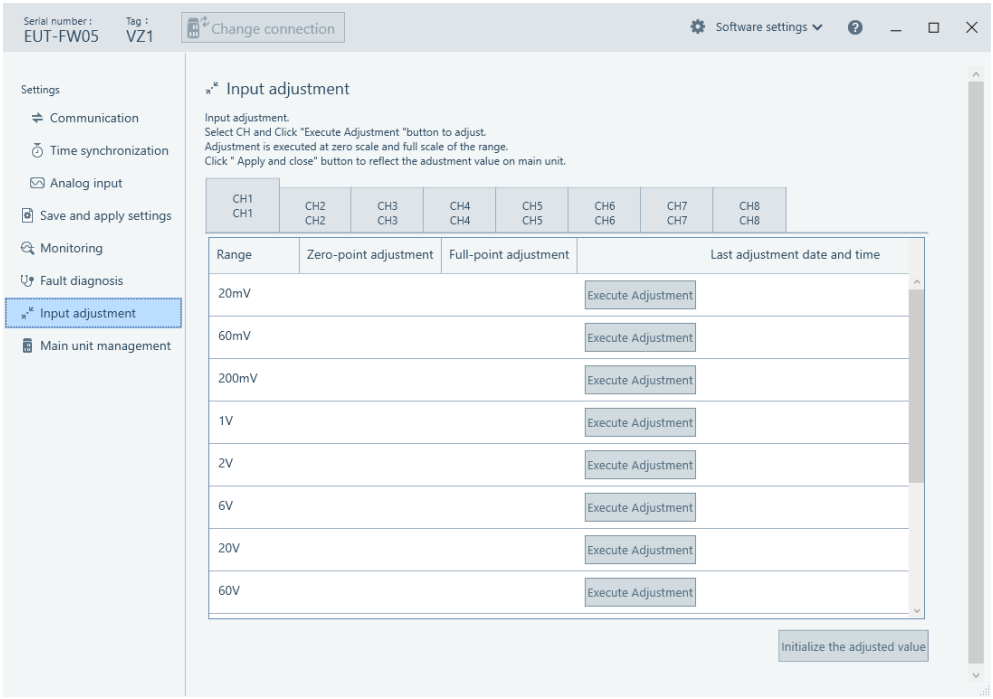
- Wiring 4-wire resistance temperature detector/4-wire resistance range



* Ensure that the resistance of 4 conductors is the same value.

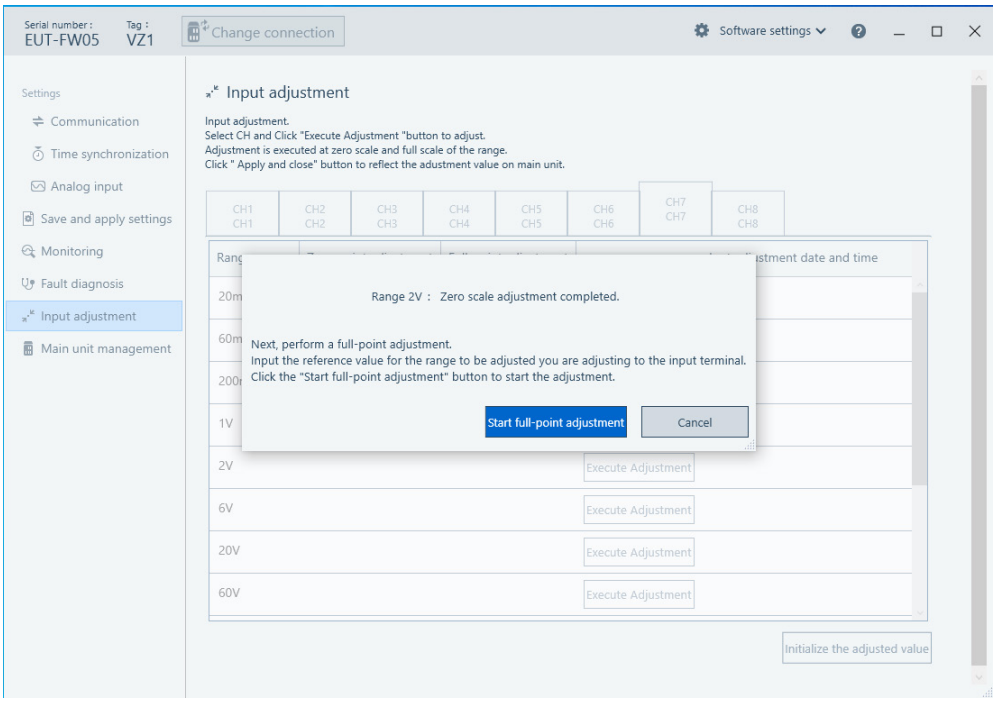
2 Check that the ambient temperature, humidity and other operating environment conditions are within specification (23±2°C, 55±10% RH).

3 Start up VZ Configurator, and connect to the target VZ20X.
Click the [Input adjustment] button in the operation list.

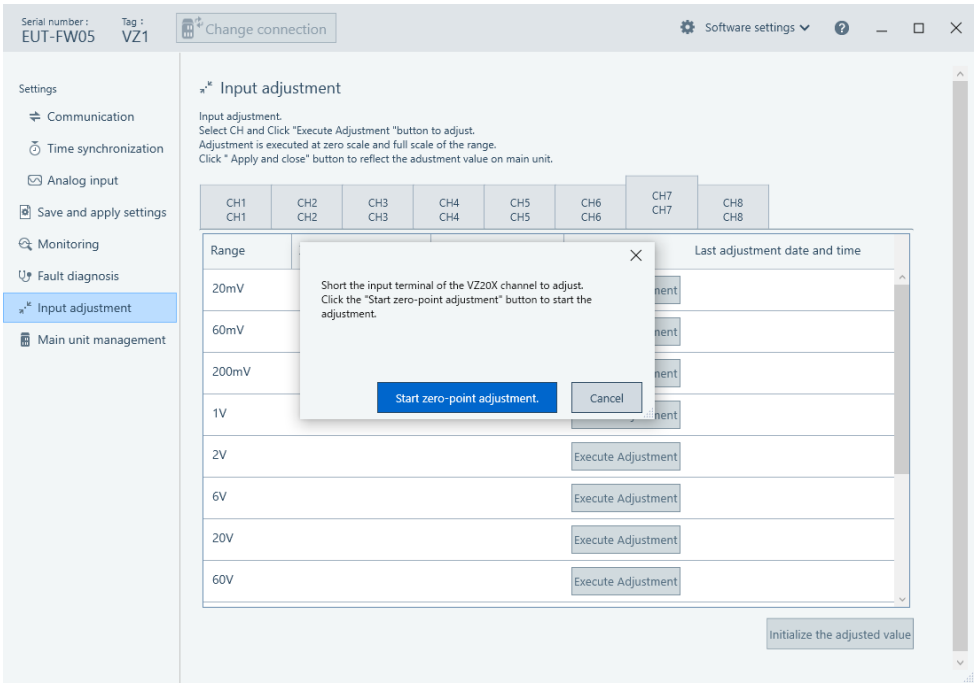


4 Select the channel on which to perform input adjustment. Click the [Execute Adjustment] button for the range to be adjusted.

5 Short-circuit the respective input channel for the analog input to adjust.



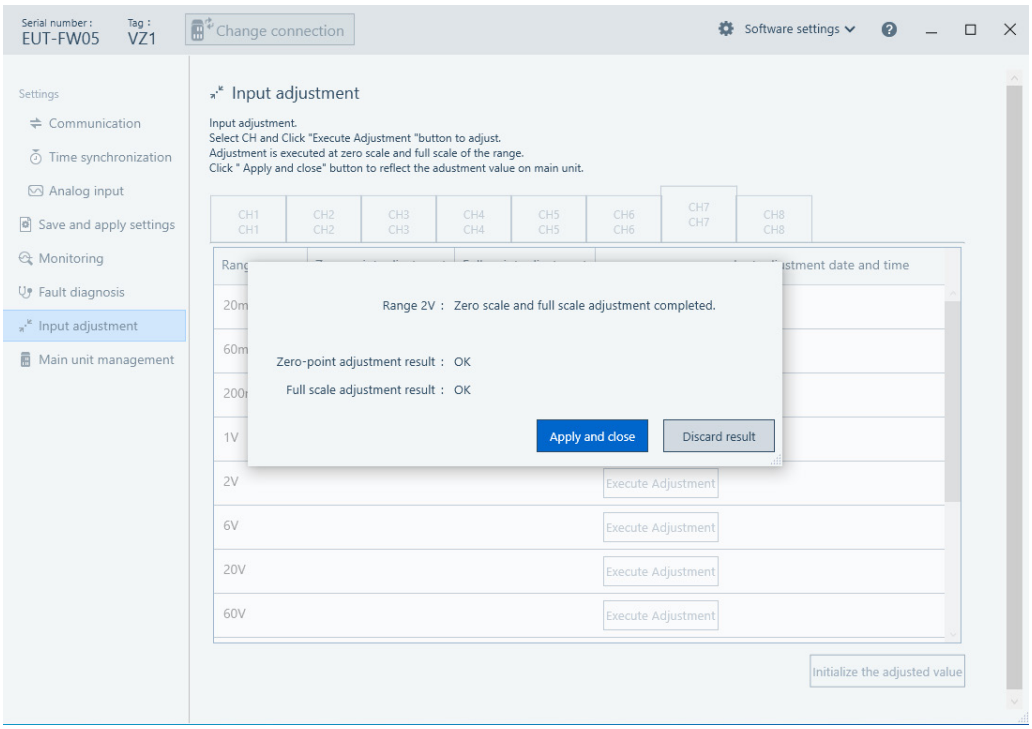
6 Click the [Start Zero-point Adjustment] button. The mode transitions to the input adjustment mode.
Adjustment takes up to 30 seconds.
When zero-point adjustment is completed, the following dialog is displayed.



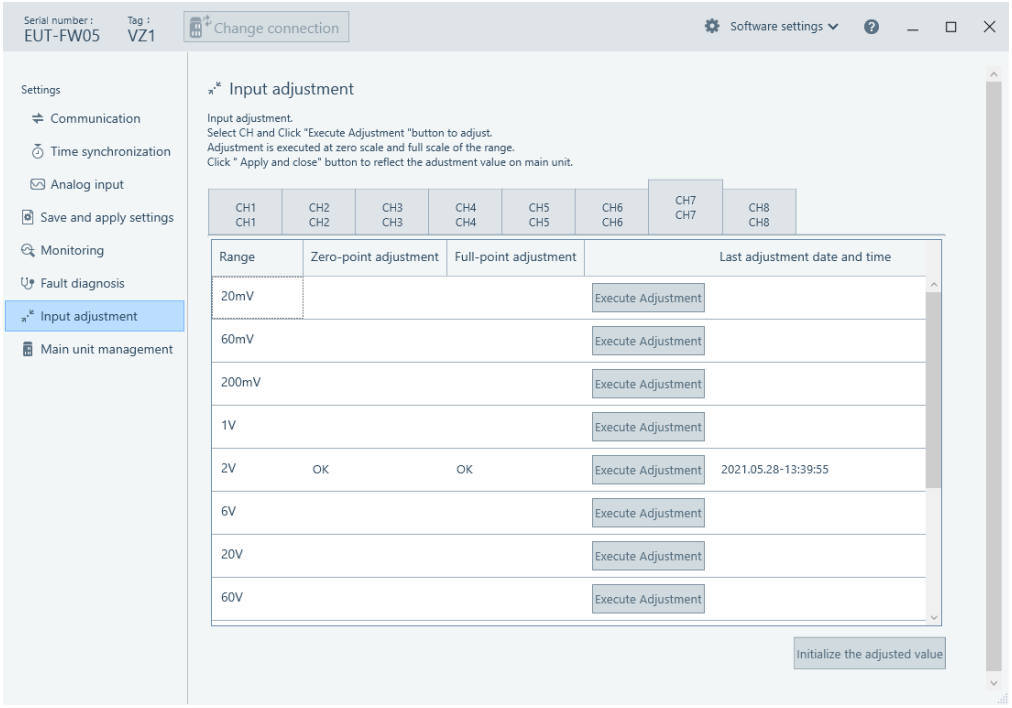
7 Connect the calibration equipment to the channel for the analog input to adjust. Input the reference value for the range to be adjusted according to the table below, and click the [Start full-point adjustment] button.

Range	Reference value
20 mV	20 mV
60 mV	60 mV
200 mV	200 mV
1 V	1 V
2 V	2 V
6 V	6 V
20 V	20 V
60 V	60 V
200Ω-3 wire	200Ω
400Ω-3 wire	400Ω
200Ω-4 wire	200Ω
400Ω-4 wire	400Ω
2000Ω-4 wire	2000Ω

8 When full-point adjustment is completed, the following dialog is displayed.
To return to the input adjustment screen without saving the adjustment results, click the [Discard result] button.



9 When zero-point adjustment and full-point adjustment are completed, click the [Apply and close] button.
This writes the adjustment values to the VZ20X.



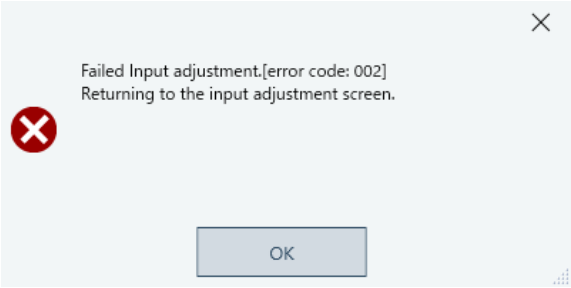
10 Repeat steps 5 to 9 for each individual range to be adjusted.

11 To adjust another channel, select the channel to be adjusted, and repeat steps 5 to 9 for that channel.

12 To return to the normal mode from the input adjustment mode, click another operation list.
VZ20X reboots in the normal mode.

■ Error code list

During input adjustment of the VZ20X, error messages and error codes are sometimes displayed. The following table summarizes a list of error codes.



Error Code	Description	Corrective action
001	Input error	Input is not correct Check the input type.
002	Outside adjustment value range	The adjustment value is outside the allowable range. Check the input value, and check the input to see if it is not an open circuit.

8.3 Parameter Initialization Function

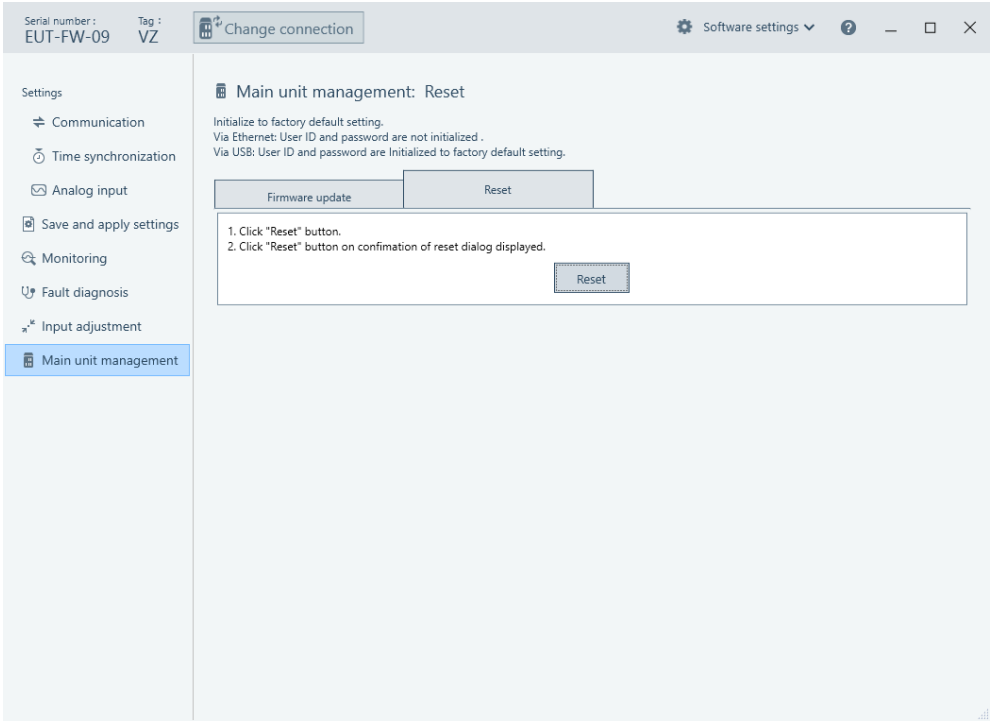
Parameter initialization resets the VZ20X settings to their defaults.
Parameter initialization can be executed from VZ Configurator.
When the VZ20X is connected to the PC via an Ethernet connection, the user ID and password cannot be initialized by parameter initialization.
However, in a USB connection, the user ID and password are reset to their defaults.

Note

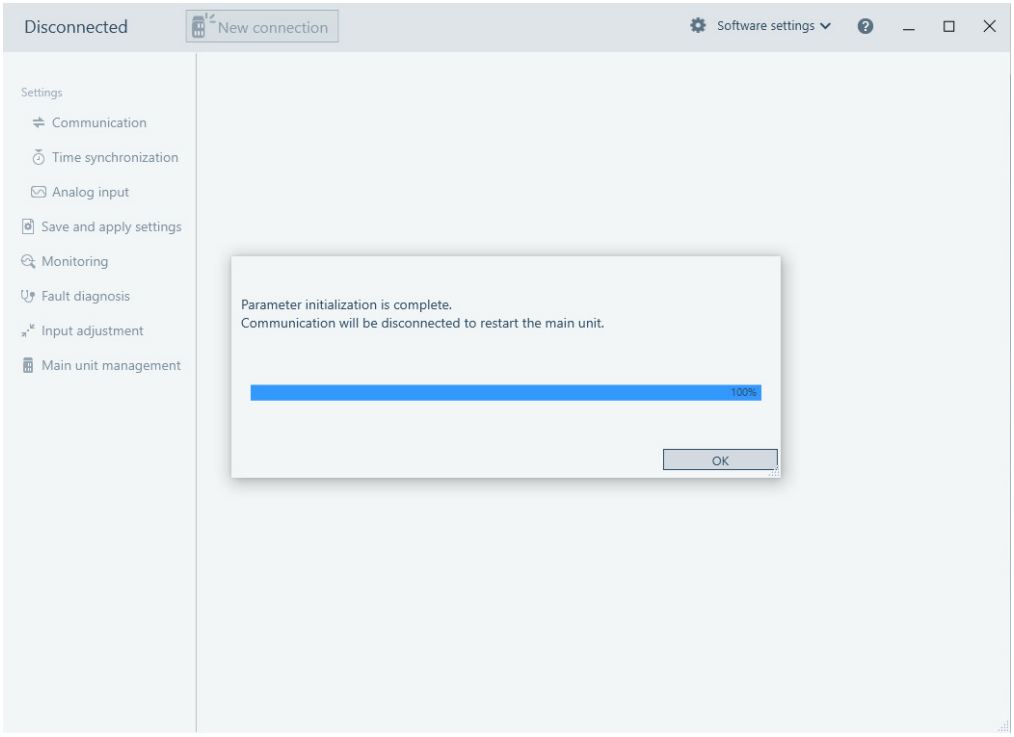
- Before performing parameter initialization, back up parameter settings to the configuration file, as necessary.
- If the VZ20X is turned off or communication is interrupted during initialization of parameters, initialization is not performed successfully. Initialization must be executed again after rebooting VZ20X.
- The VZ20X reboots after parameter initialization is completed. Parameter initialization breaks the connection between the PC and the VZ20X, so begin operations by establishing a new connection with the PC.
- Parameter initialization also initializes communication related parameters. So, initially, set up communication related parameters by a USB connection. (See Chapter 5.)
- If the USB Type-C function is set to "Disable", turn the power OFF and then ON again after parameters have been initialized.

● Initialization procedure

1 Click Main unit management > Reset tab and the following screen appears. Click the [Reset] button.



2 This starts parameter initialization.
When parameter initialization is completed, the following screen appears.



3 Click the [OK] button. VZ20X reboots.

This completes the operation.

8.4 Firmware Update

Firmware update is the operation of overwriting the firmware with the latest version via an Ethernet or USB connection in VZ Configurator.
Download the latest version of the VZ20X firmware from the following website, and execute the firmware update.
URL: https://myportal.yokogawa.com/
Note, however, that to rewrite the firmware via an Ethernet connection, the [Firmware update permission via Ethernet] parameter in VZ Configurator must be set to ON.

CAUTION

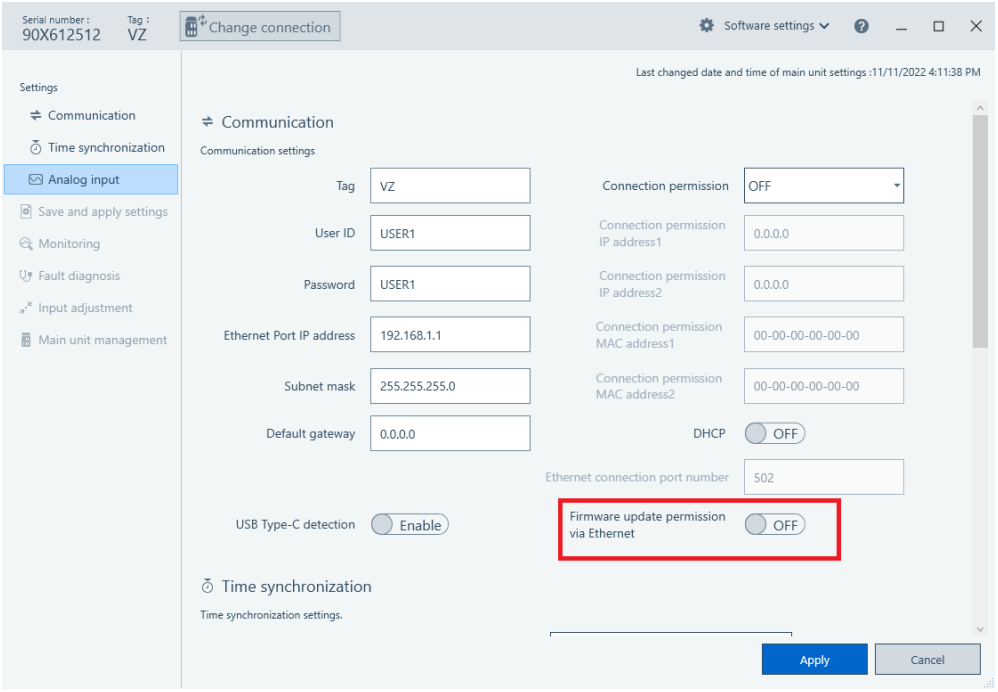
- Do not turn the VZ20X off during a firmware update.
- During execution of a firmware update, perform only firmware update operation. Do not perform other operations.
- Please use VZ Configurator R1.01.02 or later when updating the firmware.
- Do not update the modified firmware file to VZ20X. If done, the operation of VZ20X is not guaranteed.
- The firmware of VZ20X cannot be downgraded.

Note

- Before performing a firmware update, back up parameter settings.
- Parameters are sometimes initialized by a firmware update. So, check the parameter settings.
- Parameter initialization also initializes communication related parameters. So, initially, set up communication related parameters by a USB connection. (See Chapter 5.)
- If firmware update fails, please reboot VZ20X. The VZ20X runs using the previous version of the firmware.
- VZ20X reboots after a firmware update is completed. Parameter initialization breaks the connection between the PC and the VZ20X, so begin operations by establishing a new connection with the VZ20X.

● Procedure for enabling firmware update from Ethernet

1 Click Settings > Communication and the following screen appears.
Click the [Edit mode] button

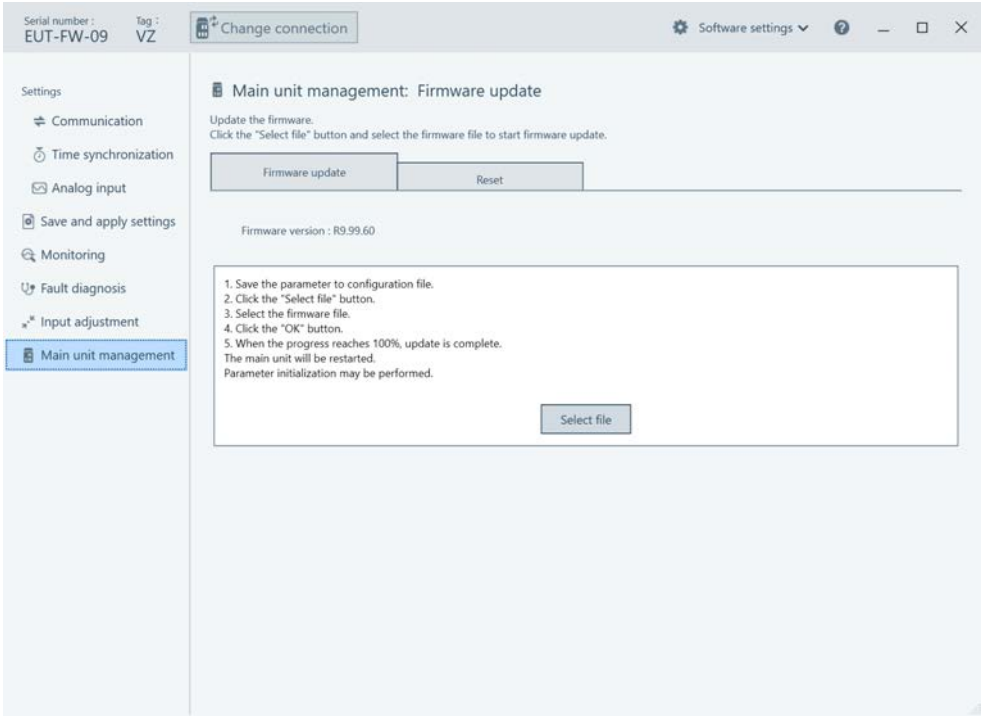


2 Check the setting of the "Firmware update permission via Ethernet" parameter.
Change the setting value to "ON" and click the [Apply] button.
This writes the setting value to the VZ20X at the connection destination.

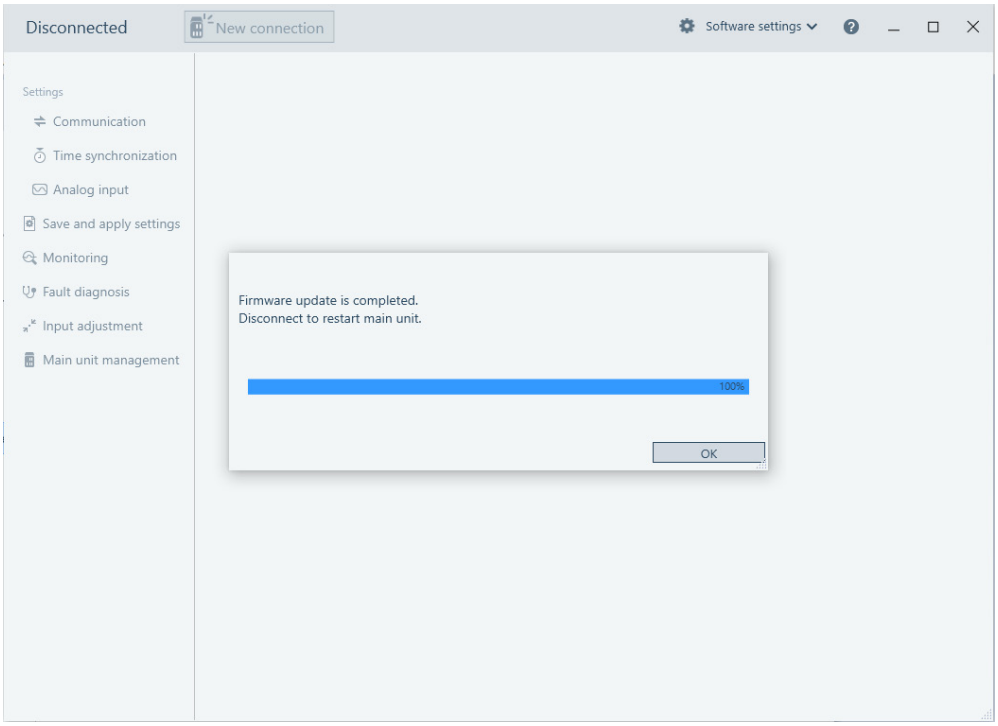
This completes the operation.

● Firmware update procedure (Common to Ethernet and USB)

1 Click Main unit management > Firmware Update tab and the following screen appears. Click the [Select file] button.



2 Select the firmware file.
When the firmware update is completed, the following screen appears.
The LED on the unit changes as follows:
During firmware update: Flashing (green) or flashing alternately (green/blue)
Completion of firmware update: Lights (blue) after the unit is rebooted



3 Click the [OK] button.

4 The firmware update is completed.

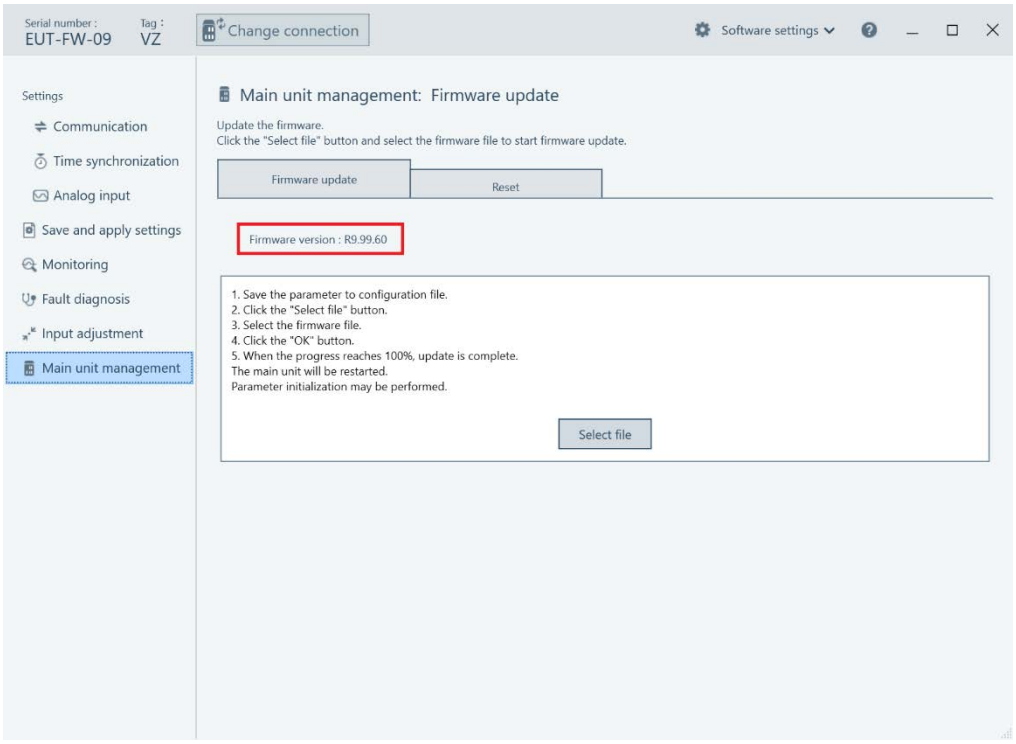
This completes the operation.

● Checking the firmware version

Check to see if the firmware has been successfully updated.

1 Begin operations by establishing a new connection with the VZ20X.

2 Click Main unit management > Firmware Update tab and check the firmware version.



9. Troubleshooting

9.1 Operation When an Error Occurs and Corrective Action

The following describes the device status when an error occurs and the corrective action to take.

LEDs do not light simultaneously. They light according to the following order of priority.
ROM/RAM error > system error > memory device error > input hardware error > analog input ADC error > analog input RJC sensor error > input adjustment value error > parameter error > time retrieval error / time synchronization error > analog input burnout error > analog input overscale/underscale

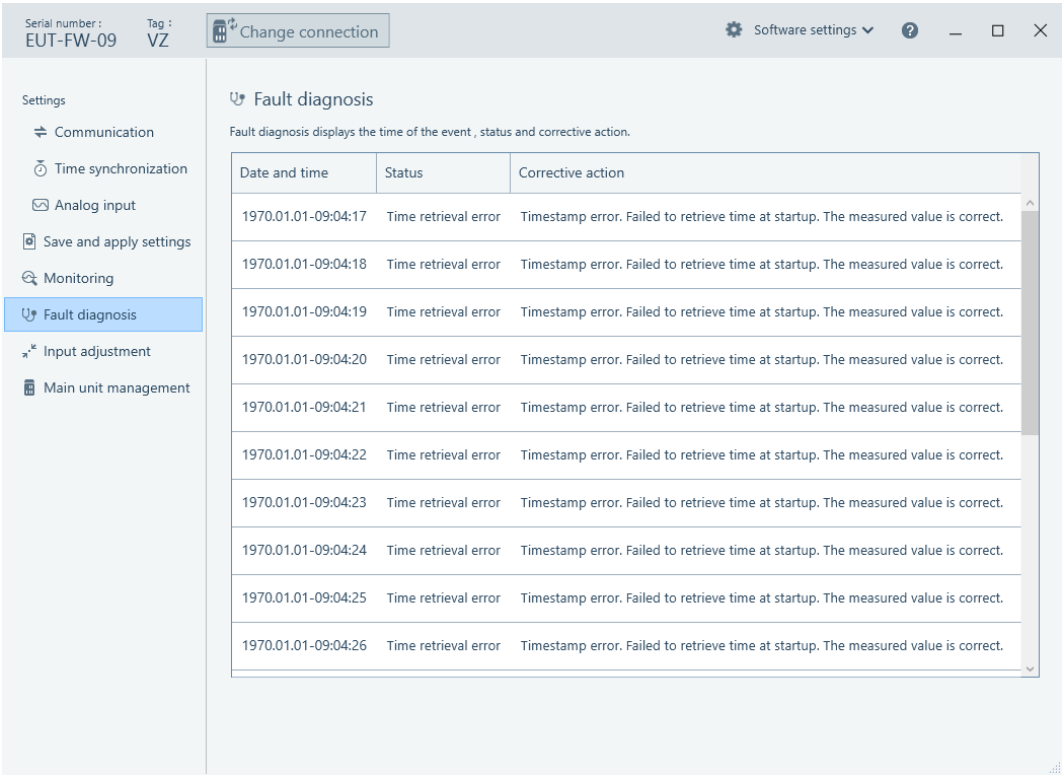
Main unit status LED	Analog input status LED	VZ Configurator		Device Status	Analog input operation	Ethernet communication operation	USB communication operation	Corrective action	Timing of error occurrence
		Fault diagnosis display	Monitoring display						
Lights (green)	Lights (green)	-	-	Normal	Normal operation	Normal operation	Normal operation	-	-
Lights (blue)	Light out	-	-	R1.01.04 or earlier: Normal (USB on the PC side is Type-A) R1.02.01 or later: Normal (USB on the PC side is Type-A, and USB Type-C detection setting is "Enable")	Stop	Stop	Normal operation	-	-
Flashes (green)	Lights (green)	-	-	Firmware update mode	Stop	Only firmware update is valid.	Only firmware update is valid.	-	-
Flashes (green) Flashes (blue)	Lights (green)	-	-	During firmware update	Stop			-	-
All out	Not fixed	Display not possible	-	ROM/RAM error	Not fixed	Stop	Stop	Failure. Ask for repair.	At power supply on During operation
Lights (red)	Not fixed	System error	-	System error	Not fixed	Stop	Stop	Failure. Ask for repair.	At power supply on
Lights (red)	Lights (green)	Memory device error	-	Memory device error	Normal operation	Not fixed	Not fixed	Failure. Ask for repair.	At power supply on During operation
Flashes (red)	Lights out at abnormal input channel Lights (green) at normal input	Display not possible Analog input hardware error	-	Input hardware error	Input channel in error not fixed	Normal operation	Normal operation	Failure. Ask for repair.	At power supply on During operation
Flashes (red)	Flashes (green).	-	AD error	Analog input ADC error	Input channel in error is 105.0%	Normal operation	Normal operation	Failure. Ask for repair.	During operation
Flashes (red)	Flashes (green).	RJC error	RJC error	Analog input RJC sensor error	Normal operation. Operation without RJC compensation	Normal operation	Normal operation	Failure. Ask for repair.	During operation
Flashes (red)	Flashes (green).	Adjustment value error	Adjustment value error	Input adjustment value error	Not fixed	Normal operation	Normal operation	Failure. Ask for repair.	At power supply on
Flashes (green)	Lights (green)	Parameter error	-	Parameter error	Normal operation	Not fixed	Normal operation	Parameter is initialized. Reset communication parameters.	At power supply on
Lights (blue)	Lights (green) (Flashes (green) when burnout or OVER)	Time retrieval error	-	Time retrieval error	Normal operation	Normal operation	Normal operation	Time has not been retrieved. Time stamp starts from the default time. Please set the time. For the time setting, see “7.2.4 List of Register Assignments” and “7.2.5 Outline of Modbus/TCP Protocol.”	At power supply on
Lights (blue)	Lights (green) (Flashes (green) when burnout or OVER)	Time synchro-nization error	-	Time synchro-nization error	Normal operation	Normal operation	Normal operation	Time has not been synchronized. Check the wiring and parameter settings. When time can be synchronized, the LED goes out and control returns.	During operation

Continued

Main unit status LED	Analog input status LED	VZ Configurator		Device Status	Analog input operation	Ethernet communication operation	USB communication operation	Corrective action	Timing of error occurrence
		Fault diagnosis display	Monitoring display						
Lights (green)	Flashes (green)	-	+Burnout/-Burnout	Analog input burnout error	Up scale 105% Down scale -5%	Normal operation	Normal operation	Check wiring and sensors. When values become normal, the LED display state returns to lit (green) state.	During operation
Lights (green)	Flashes (green)	-	+OVER/-OVER	Analog input overscale/ underscale	Normal operation	Normal operation	Normal operation	Check input values. When values become normal, the LED display state returns to lit (green) state.	During operation
Lights (blue)	Lights (green)	Time retrieval error	-	-	Stop	Stop	Normal operation	Turn the power supply OFF and then ON.	When USB Type-C detection is set to "Disable", initialize parameters.

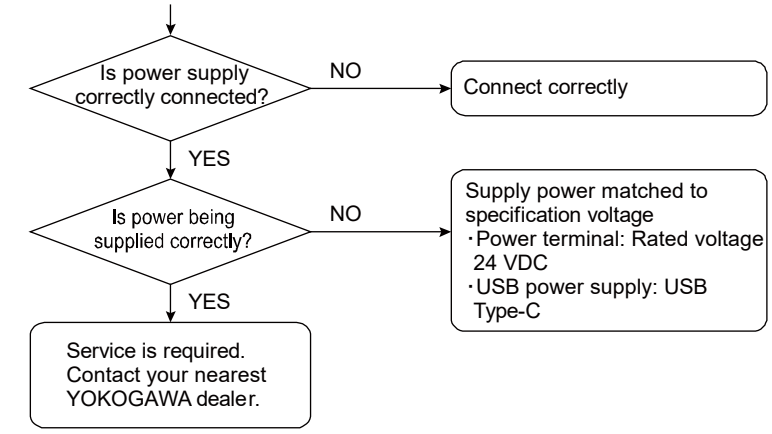
9.2 Trouble Notification Function

The details of errors can be checked using VZ Configurator via Ethernet or USB communication.
Click [Fault diagnosis] and the following screen that displays the error details appears.
Fault diagnosis information shows the date and time, status and corrective action.
The content displayed is for the latest 30 errors that have occurred.
The display is refreshed every ten seconds.

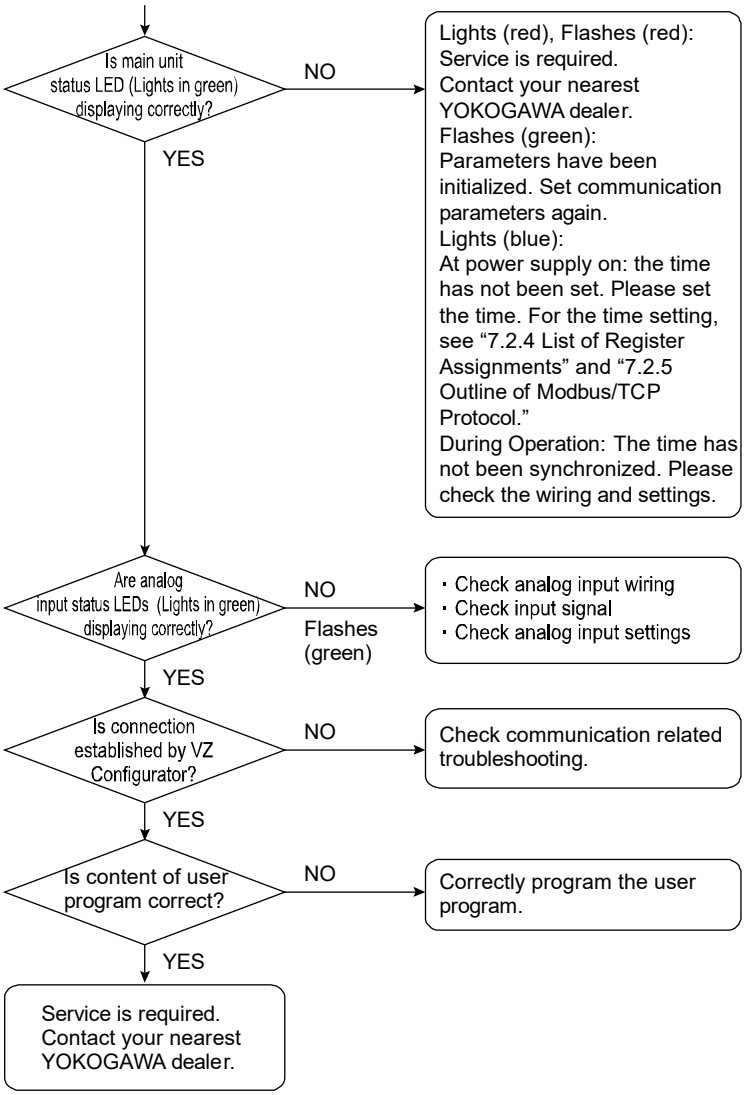


9.3. Troubleshooting Methods

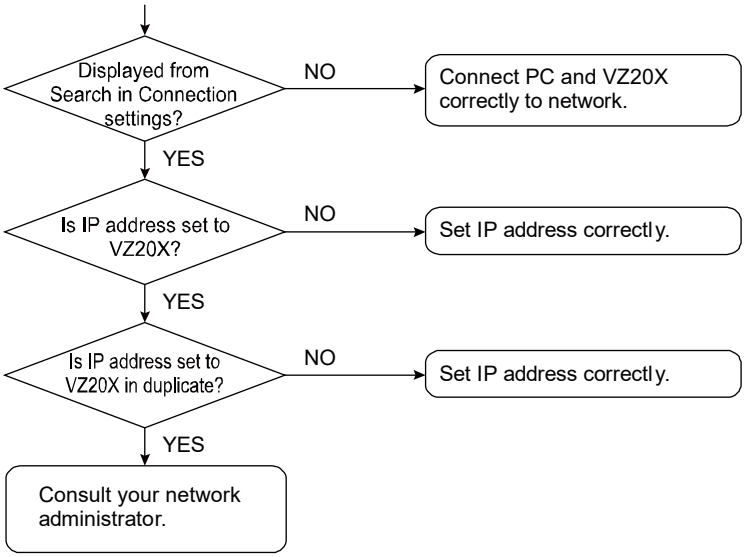
Main unit status LED does not light



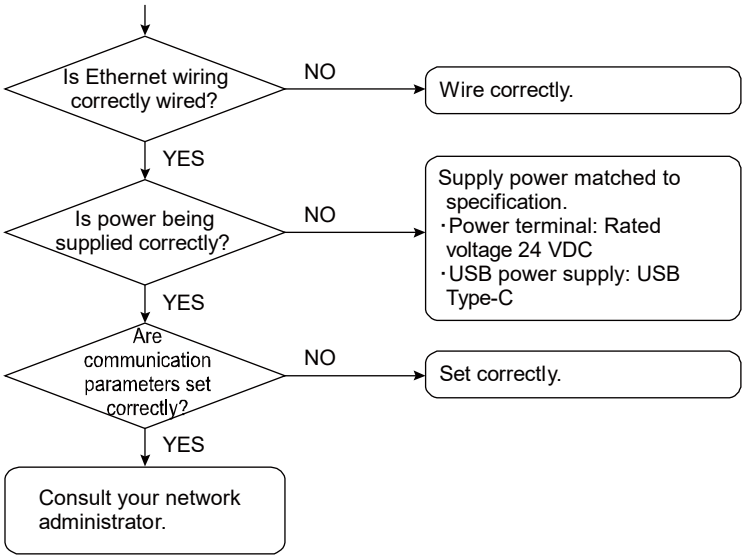
Device does not operate correctly



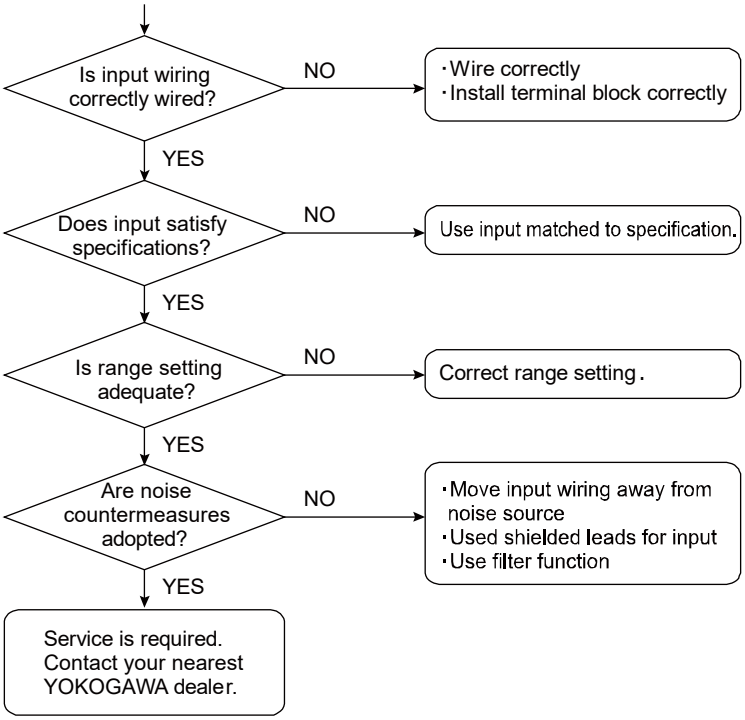
Cannot search VZ20X by VZ Configurator



Ethernet communication is not possible



・Large error
・Waveform or digital values fluctuate
・Waveform swings to either 0% side or 100% side



9.4. FAQ

Q1 I have set the IP address correctly but Ethernet communication is not possible. What is the cause of this?

A1
The following is a probable cause.
The DHCP function on the VZ20X is set to ON. →Use VZ Configurator to change the DHCP function setting to OFF via a USB connection. When the setting is ON, the IP address sometimes changes and communication is no longer possible.

Q2 I cannot search for VZ20X by searching connecting settings in VZ Configurator. What is the corrective action for this?

A2
Check the following.
- Check the setting of the DHCP function on the VZ20X. Use VZ Configurator to change the DHCP function setting to OFF via a USB connection. When the setting is ON, the IP address sometimes changes and communication is no longer possible.
- Use ping to check the internet connection status. If ping is not returned, probable causes are problems in the cables and hub and IP address settings.
- If firewall functions are enabled, VZ20X is sometimes not recognized in searches. For details on changing settings, check in the support website.

Q3 I lost my user ID and password. What is the corrective action for this?

A3
If user ID and password are lost, there is no way to recover.
Contact your nearest YOKOGAWA dealer.

Q4 The time cannot be written. What is the cause of this?

A4
The following is a probable cause.
The connection type is set to [Relay unit of daisy chain] or [Terminal unit of daisy chain].

Q5 A communication error is displayed. What is the cause of this?

A5
The following are probable causes.
・An illegal value has been set.
→Set the input scale so that the following relationship is satisfied:
Min. value of input scale < Max. value of input scale
→Set the input range to satisfy the following conditions:
Max. value of input range: (min. value of input range + 1 digit) to upper limit value of measurement range
Min. value of input range: lower limit value of measurement range to (upper limit value of input range - 1 digit)
・There is a difference between written parameters and read parameters.
→A communication error sometimes occurs if a different VZ20X is connected after the configuration file is written and then reading of parameters on the unit is performed. After writing parameters, re-connect by beginning with a new connection before reading the parameters on the unit. Then, connect the other VZ20X and execute reading of parameters.

Q6 Is it possible to check the content of backed up configuration files?

A6
Content cannot be checked offline by VZ Configurator.
The configuration file can be checked only when there are one or more VZ20X units. Backed up configuration settings can be checked by connecting VZ Configurator to VZ20X, and then specifying the file at "Load settings file to the main unit".

Q7 Input adjustment was performed in an Ethernet connection. After adjustment ended, VZ20X was rebooted and the connection could no longer be made by the Ethernet connection. What is the cause of this?

A7
Check the following.
Check the setting of the DHCP function on the VZ20X. Use VZ Configurator to change the DHCP function setting to OFF via a USB connection. When the setting is ON, the IP address sometimes changes and communication is no longer possible.

Q8 In a USB connection, VZ Configurator can be connected but monitoring, input adjustments and firmware update are not possible. What is the corrective action for this?

A8
Check the power supply method.
When the shape of the USB connector on the PC side is other than a Type-C, supply power from the power terminal.

Q9 Communication was disconnected when parameters were set. Is this normal operation?

A9
Yes, this is normal operation.
In an Ethernet connection: Communication is disconnected when parameter setting values are changed. Begin with a new connection.
In an USB connection: Communication is disconnected when communication related parameters and time synchronization parameter setting values are changed. Begin with a new connection.

Q10 Is there a way of making an Ethernet connection immediately after purchase?

A10
Communication by an Ethernet connection is immediately possible if there is a DHCP server in the network.
When there is no DHCP server, set Ethernet related parameters by a USB connection. When setting is completed, try communication by an Ethernet connection.

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Appendix.

Appendix.1 List of Parameters

Setting > Communication

Parameter Name	Setting Range	Default	Explanation
Tag	Max. 16, 2- or 1-bytes characters (alphanumeric characters, symbols and Chinese character)	VZ	Sets the tag name of the VZ20X.
User ID(*1)	Max. 16, 1-byte characters (alphanumeric characters and symbols)	USER1	Sets the user ID.
Password(*1)	Max. 16, 1-byte characters (alphanumeric characters and symbols)	USER1	Sets the password.
Ethernet Port IP address(*1)	0.0.0.0 to 255.255.255.255	192.168.1.1	Sets the IP address of the VZ20X.
Subnet mask(*1)	0.0.0.0 to 255.255.255.255	255.255.255.0	Sets the subnet mask of the VZ20X.
Default gateway(*1)	0.0.0.0 to 255.255.255.255	0.0.0.0	Sets the default gateway of the VZ20X.
Connection permission(*1)	OFF, IP address, MAC address	OFF	Sets the connection permission of the device. Connection permission can be set on up to two devices.
Connection permission IP address 1(*1)	0.0.0.0 to 255.255.255.255	0.0.0.0	Sets the connection permission IP address 1.
Connection permission IP address2(*1)	0.0.0.0 to 255.255.255.255	0.0.0.0	Sets the connection permission IP address 2.
Connection permission MAC address1(*1)	00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF	00-00-00-00-00-00	Sets the connection permission MAC address 1.
Connection permission MAC address2(*1)	00-00-00-00-00-00 to FF-FF-FF-FF-FF-FF	00-00-00-00-00-00	Sets the connection permission MAC address 2.
DHCP(*1)	OFF, ON	ON	Sets the DHCP function. Use this function only at initial setup. During actual use, set DHCP to OFF and fix the IP address.
Ethernet connection port number	Fixed to 502	502	The port number is used for communication with the VZ configurator and for communication using Modbus/TCP function codes 03 and 16.
Firmware update permission via Ethernet	OFF, ON	OFF	Sets permission to update firmware over Ethernet.

Setting > USB Type-C Detection

Parameter Name	Setting Range	Default	Explanation
USB Type-C detection	Enable, Disable	Enable	Sets USB Type-C detection. This function is enabled with firmware version R1.02.01 or later.

*1: Communication is turned off, and these parameters require beginning with a new connection when setting values were changed in a USB connection.

Setting > Time Synchronization

Parameter Name	Setting Range	Default	Explanation
Connection type(*1)	1 unit Master unit of daisy chain Relay unit of daisy chain Terminal unit of daisy chain	1 unit	This sets the connection method between the PC and the VZ20X.

*1: Communication is turned off, and these parameters require beginning with a new connection when setting values were changed in a USB connection.

Setting > Analog Input

Parameter Name	Setting Range	Default	Explanation
CH tag	Max. 16, 2- or 1-bytes characters (alphanumeric characters, symbols and Chinese character)	CHn n=1 to 8	This sets the tag name of channel.
Input type	See table of input type. (Sub section 7.1.1)	OFF	This sets input type.
Temperature Unit	Fixed to °C	°C	The temperature unit is used for thermocouples and resistance temperature detectors.
Max. value of input range	According to input type Min. value of input range < Max. value of input range Min. value of input range + 1 digit to upper limit value of measurement range	The default follows the upper limit value of each input type in the input type table.	This sets the maximum measurement value of the input.
Min. value of input range	According to input type Min. value of input range < Max. value of input range Lower limit value of measurement range to max. value of input range - 1 digit	The default follows the lower limit value of each input type in the input type table.	This sets the minimum measurement value of the input.
Max. value of input scale	-99999 to 99999 Min. value of input scale < Max. value of input scale Min. value of input scale + 1 digit to 99999	The default follows the upper limit value of each input type in the input type table.	This sets the maximum value to be used in scaling calculation.
Min. value of input scale	-99999 to 99999 Min. value of input scale < Max. value of input scale -99999 to max. value of input scale - 1 digit	The default follows the lower limit value of each input type in the input type table.	This sets the minimum value to be used in scaling calculation.
Input scale decimal point position	0 to 4	The default follows the decimal point position of the input scale the input type table.	This sets the decimal point position after scaling.
Burnout detection	OFF, UP, DOWN	UP	This parameter is for setting burnout detection.
Power supply frequency noise removal filter	OFF, ON	OFF	This toggles the power frequency noise removal filter setting between disabled/enabled.
Power supply frequency noise removal setting	50 Hz, 60 Hz, COMMON	50 Hz	Set the power frequency noise removal filter. 50 Hz: Filters out 50 Hz noise. 60 Hz: Filters out 60 Hz noise. COMMON: Filters out noise both 50 Hz and 60 Hz.
Data acquisition interval	1 ms, 10 ms, 50 ms, 100 ms	1 ms	Input value can be acquired at a set interval and used as a measured value.
Moving average filter	OFF, ON	OFF	This toggles the moving average filter setting between use/non-use.
Number of moving average cycles	2 to 100	100	Set the number of times in which the moving average is calculated.

Setting > Analog Input (continued)

Parameter Name	Setting Range	Default	Explanation
First-order lag filter	OFF, ON	OFF	Toggles between use/non-use of the first-order lag filter.
Filter coefficient	1 to 100	1	This port number is used for communication with the VZ configurator and for communication using Modbus/TCP function codes 03 and 16.
Bias	The default follows each input type in the input type table. ±99999 range.	0	The decimal point position follows the decimal point position set for scaling or the measured value.
RJC	OFF, ON	ON	Turns internal RJC OFF/ON during thermocouple measurement. This function is enabled with firmware version R1.02.01 or later.
ERJC	-10.0 to 60.0	0.0	Sets the external RJC temperature when RJC is OFF. If RJC is set to ON, the setting value is invalid. This function is enabled with firmware version R1.02.01 or later.

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General Specification

Model VZ20X
Analog Sensing Unit

GS 77V01B01-01EN

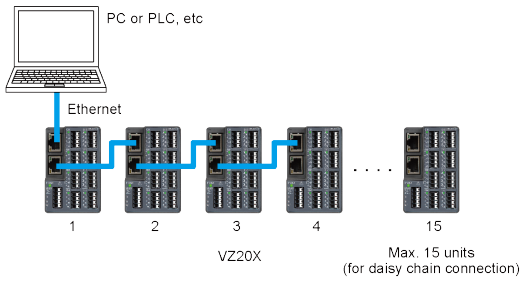
■ Outline

The VZ20X Analog Sensing Unit can measure various analog signals at high speed, high accuracy and simultaneously. Isolation between input channels ensures excellent noise resistance.
VZ20X measurement data can be acquired on a PC, PLC or other host device via Ethernet.

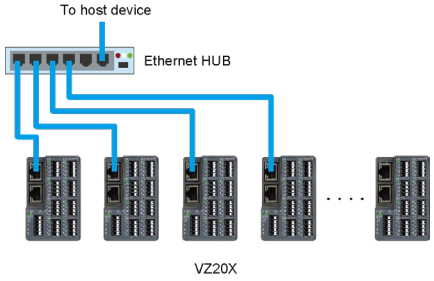
■ Features

- Reliable Sensing
  A single unit can measure analog inputs on 8 channels at high accuracy and at a high-speed sampling (1ms).
  Multiple channels (a maximum of 120 channels on 15 units) can be measured simultaneously.
  (See "■ Communication Specifications")
  Isolation is provided between input channels to make it less susceptible to noise in the installation environment.
- Smallest In Its Class In the Word, Compact and Savings in Wiring Used
  Its compact size (external dimensions: 50 (width) x 78 (height) x 65 (depth)) ensures that it takes up a small footprint in manufacturing facilities.
  Adoption of a push-in type connection allows the product to be mounted simply by inserting a ferrule terminal.
- Various Analog Sensors Supported
  DC voltage, standard signal, resistance, thermocouple, and resistance temperature detector can be measured on a single unit.

■ System Configuration (example)



Time synchronization supported in this configuration (daisy chain connection, excluding when Connection type is "1 unit")

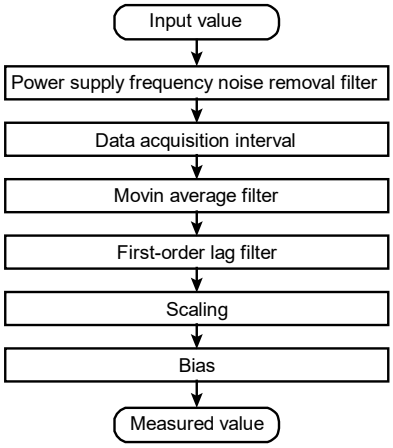


Time synchronization not supported in this configuration

■ Input Functions

- Data acquisition interval
  Selectable from 1 ms, 10 ms, 50 ms, 100 ms
  Settings common to all channels
- Power supply frequency noise removal filter
  Can be switched ON/OFF for each individual channel
  Filter selectable from 50 Hz, 60 Hz, Common
  Filter time constant
  50 Hz: Approx. 25 ms
  60 Hz: Approx. 32 ms
  Common: Approx. 63 ms
- Moving average filter
  Can be switched ON/OFF for each individual channel
  Moving average count selectable in range 2 to 100 times
- First-order lag filter
  Can be switched ON/OFF for each individual channel
  Filter time constant is data acquisition interval x N (where, N is selectable in range 1 to 100)
- Scale
  Voltage, standard signal, and resistance signal input can be scaled
  Settable on each individual channel
- Bias
  Bias value to add to value after scaling can be set
  Settable on each individual channel

- Input calculation processing



■ Time Synchronization Functions

With a daisy chain connection (up to 15 units), it is possible to perform measurement on a maximum of 120 channels at the same A/D conversion timing. However, the same data acquisition interval needs to be set for the channels.

- Clock: With date (western calendar)
  Clock setting is not backed up when the power is turned off. The date and time are acquired and set from the host device (GA10, PC, etc.) at startup.
  Accuracy: ±5 ppm
- Synchronization accuracy of input sampling (in daisy chain connection): Less than ±100 µs
  (across VZ20X channels and units)
- Time setting: Not backed up. The date and time are acquired from the host device (GA10, PC, etc.) at startup.
  When the host device is the GA10, the date and time are acquired only once when the VZ20X is connected from the GA10.
  When the host device is a PC or PLC, the date and time must be written to registers by Modbus/TCP. When the time is set, the time stamp is omitted or set in duplicate.
  If the date and time are not set, the default date and time (1970-01-01 00:00:00.000) of the internal clock are used.
- Date format: YYYY-MM-DD
- Time format: hh:mm:ss.nnn

■ LED Display

LEDs are located at the Ethernet connector, near the USB connector, near the main unit power supply and to the side of the analog input terminals.

Name	Description
Analog input status LED	Lights when the power is turned on, and indicates the operating status of analog inputs. Number of LEDs: 1 per channel LED display color: Green
Ethernet communication status LED	Lights (green) when an Ethernet link is established. Upper: Indicates the link/active status. Lower: Indicates the transmission speed (100 Mbps) status. Number of LEDs: 2 per port LED display color: Green, orange
Main unit status LED	Lights (green) when the power is turned on, and indicates the operating status of the VZ20X. Number of LEDs: 1 LED display color: Red, green, blue
USB connection status LED	Lights when the USB cable is connected to the PC, and indicates a USB connection status. Number of LEDs: 1 LED display color: Green

■ Communication Specifications

- Ethernet

Communication physical layer	IEEE802.3 (100BASE-TX)
Protocol	Modbus/TCP server GA10 dedicated protocol
Baud rate	100 Mbps
Maximum segment length	100 m
Recommended transmission cable	STP Category 5e or higher recommended
Max. number of daisy chain connections	15 units *1

*1: The number of connected devices may be limited depending on the performance and operating environment (OS, CPU, installation software, programming, etc.) of the PC (including GA10) and PLC.

- Modbus/TCP server:
  Can be read measurement data and read or write the date, time and parameters through register access (function code 03/06/16).

Data acquisition interval	Data update period
1 ms	10 ms
10 ms	10 ms
50 ms	50 ms
100 ms	100 ms

  Can be acquired measurement data in batches of 8 channels at a time (1 unit) (function code 70/71).
  Acquire data by communication while data is still held on the VZ20X. The data retention time on the VZ20X differs according to the data acquisition interval. The following shows the relationship between the data acquisition interval and data retention time.

Data acquisition interval	Data retention time
1 ms	2s
10 ms	20 s
50 ms	100 s
100 ms	200 s

- GA10 dedicated protocol:
  Can be connected to GA10 and acquired measurement data without creating a program.
- Connection Permission Function:
  Can be permitted access from only registered IP addresses or MAC addresses.
- Ethernet Factory Defaults

Setting	Default
DHCP	ON
Ethernet Port IP address	192.168.1.1
Subnet mask	255.255.255.0
Default gateway	0.0.0.0

● USB

Perform setup by connecting the PLC to the PC by a USB cable.
Connector type: Type-C
Cable: 3 m or less, USB2.0 or higher
Power can also be supplied to the VZ20X from the USB port.
When the USB type on the power supply source is Type-C, Ethernet communication can be used.
When the USB type is other than Type-C, Ethernet communication can be used by setting. Please refer to "■ VZ20X Function List".

■ Other Functions

• Firmware update function: VZ20X firmware can be updated
Be sure to use the latest firmware.
https://myportal.yokogawa.com/

■ Hardware Specifications

● Analog Measurement Input Specifications

• Number of input points: 8
• Input format: Floating unbalanced input, isolation between input channels, simultaneous sampling
• Input sampling period: 1 msec
• Input type, measurement range and measurement accuracy: See Table 1
The accuracy is that in the standard operating conditions: 23±2°C, 55±10% RH, warm-up time of 40 minutes or more
With the filter (Power supply frequency noise removal, moving average, first-order lag) OFF, the effect of the measurement environment sometimes causes drift to increase.
• Measurement current:
Resistance temperature detector. Approx. 0.4 mA
Resistance: Approx. 0.4 mA (200 Ω range), approx. 0.05 mA (2000 Ω range)
• Allowable input voltage:
±60 VDC (DC voltage 2 V range or higher and standard signal)
±10 VDC (other than DC voltage 2 V range or higher and standard signal)
• Max. voltage between input chanels:
300 VAC rms (50 Hz/60 Hz) or 300 VDC
• Max. common mode voltage:
300 VAC rms (50/60 Hz) or 300 VDC (under Measurement Category II conditions)
• Input resistance:
Approx. 1 MΩ (DC voltage 2 V range or higher and standard signal)
10 MΩ or more (other than DC voltage 2 V range or higher and standard signal)
• Allowable signal source resistance:
2 kΩ or less (DC voltage 2 V range or higher and standard signal)
250 Ω or less (DC voltage 1 V range or lower and thermocouple)
• Effect of signal source resistance:
Input burnout detection OFF
5 μV/250 Ω or less (thermocouple, DC voltage 60 mV range or less)
10 μV/250 Ω or less (200 mV range)
30 μV/250 Ω or less (1 V range)
0.25%/2kΩ or less (DC voltage 2 V range or higher and standard signal)
Input burnout detection upscale or downscale
30 μV/250 Ω or less (thermocouple)
• Allowable wiring resistance:
Max. 10 Ω per line (thermocouple, resistance temperature detector)
Conductor resistance between the three lines in a 3-wire connection shall be equal
• Effect of wiring resistance:
Input burnout detection OFF
Measurement accuracy specifications satisfied within allowable wiring resistance
Input burnout detection UP or DOWN
0.05 °C/10 Ω or less (resistance temperature detector)
• Input bias current:
±10 nA or less (input burnout detection OFF)
• Input burnout detection:
UP or DOWN, or OFF selectable
Functions at thermocouple and resistance temperature detector (RTD), and standard signal.
For standard signal, 0.1 V or less is judged as a burnout.
• Reference junction compensation error (thermocouple):
・ When temperature measurement is 0°C or higher, when ferrule terminal crimping is used, and when input terminal temperature is balanced
(The reference junction compensation error range may be exceeded when single-wire or twisted-wire connection is used.)
±2 °C (ambient temperature 23±2 °C)
±3 °C (ambient temperature -10 to 55 °C, Type C 0 to 55 °C)
For Type B, reference junction compensation is fixed to 0°C.
• Noise rejection ratio: 50 Hz/60 Hz±0.1 % rejection ratio
In case Power supply frequency noise removal filter is enabled
Normal mode: 40 dB or more
Common mode: 120 dB or more
In case Power supply frequency noise removal filter is disabled
Common mode: 80 dB or more

Table 1 Measurement Accuracy

Input type			Measurement range			Measurement accuracy	
						Power supply frequency noise removal filter: ON	Power supply frequency noise removal filter: OFF
DC voltage		20 mV	-20.000	to	20.000 mV	±10 µV	±20 µV
		60 mV	-60.00	to	60.00 mV	±0.03 mV	±0.06 mV
		200 mV	-200.00	to	200.00 mV	±0.1 mV	±0.2 mV
		1 V	-1.0000	to	1.0000 V	±0.5 mV	±1 mV
		2 V	-2.0000	to	2.0000 V	±1 mV	±2 mV
		6 V	-6.000	to	6.000 V	±3 mV	±6 mV
		20 V	-20.000	to	20.000 V	±10 mV	±20 mV
		60 V	-60.00	to	60.00 V	±0.03V	±0.06V
Standard signal		0.4-2 V	0.4000	to	2.0000 V	±1 mV	±2 mV
		1-5 V	1.0000	to	5.0000 V	±3 mV	±6 mV
4-wire resistance		200	0.00	to	200.00 Ω	±0.1 Ω	±0.2 Ω
		2000Ω	0.0	to	2000.0 Ω	±1 Ω	±2 Ω
Thermocouple*		R	0.0	to	1760.0 °C	±1.5 °C	±3 °C
		S	0.0	to	1760.0 °C	±1.5 °C	±3 °C
		B	0.0	to	1820.0 °C	0 to 300 °C: Accuracy not guaranteed 300 to 400 °C: ±3 °C 400 to 800 °C: ±2 °C 800 to 1820 °C: ±1.5 °C	0 to 300 °C: Accuracy not guaranteed 300 to 400 °C: ±6 °C 400 to 800 °C: ±4 °C 800 to 1820 °C: ±3 °C
		K	-270.0	to	1370.0 °C	-270 to -200 °C: Accuracy not guaranteed -200 to 0 °C: ±0.8 °C 0 to 500 °C: ±0.4 °C 500 to 1370 °C: ±0.7 °C	-270 to -200 °C: Accuracy not guaranteed -200 to 0 °C: ±1.6 °C 0 to 500 °C: ±0.8 °C 500 to 1370 °C: ±1.4 °C
		E	-270.0	to	800.0 °C	-270 to -200 °C: Accuracy not guaranteed -200 to 0 °C: ±0.5 °C 0 to 800 °C: ±0.3 °C	-270 to -200 °C: Accuracy not guaranteed -200 to 0 °C: ±1 °C 0 to 800 °C: ±0.6 °C
		J	-200.0	to	1000.0 °C	-200 to 0 °C: ±0.6 °C 0 to 1000 °C: ±0.5 °C	-200 to 0 °C: ±1.2 °C 0 to 1000 °C: ±1 °C
		T	-270.0	to	400.0 °C	-270 to -200 °C: Accuracy not guaranteed -200 to 0 °C: ±0.6 °C 0 to 400 °C: ±0.2 °C	-270 to -200 °C: Accuracy not guaranteed -200 to 0 °C: ±1.2 °C 0 to 400 °C: ±0.4 °C
		N	-270.0	to	1300.0 °C	-270 to -200 °C: Accuracy not guaranteed -200 to 0 °C: ±1.2 °C 0 to 1300 °C: ±0.7 °C	-270 to -200 °C: Accuracy not guaranteed -200 to 0 °C: ±2.4 °C 0 to 1300 °C: ±1.4 °C
		C	0.0	to	2315.0 °C	0 to 1500 °C: ±1 °C 1500 to 2315 °C: ±2 °C	0 to 1500 °C: ±2 °C 1500 to 2315 °C: ±4 °C
Resistance temperature detector	Pt100 3-wire 4-wire	Pt100 3-wire Pt100 4-wire	-200.0	to	850.0 °C	-200 to 200 °C: ±0.3 °C 200 to 400 °C: ±0.4 °C 400 to 600 °C: ±0.5 °C 600 to 850 °C: ±0.6 °C	-200 to 200 °C: ±0.7 °C 200 to 400 °C: ±0.8 °C 400 to 600 °C: ±1.0 °C 600 to 850 °C: ±1.2 °C
		Pt100-H 3-wire Pt100-H 4-wire	-100.00	to	100.00 °C	±0.2°C	±0.5°C

* Excluding reference junction compensation error
Thermocouple: JIS C 1602-2015, IEC 60584-1:2013
Resistance temperature detector: JIS C 1604-2013, IEC 60751:2008

- Safety and EMC Standards

  • Safety standards:
  Measurement category II. overvoltage category I, pollution degree 2
  IEC 61010-1, IEC 61010-2-030 compliant
  CE/Low voltage directives: EN 61010-1, EN 61010-2-030 compliant (*1)
  CSA: CAN/CSA-C22.2 No.61010-1, CAN/CSA-C22.2 No.61010-2-030 compliant (*2)
  UL: UL 61010-1, UL 61010-2-030 (CSA NRTL/C) compliant (*2)
  • EMC standards:
  CE/EMC directives:
  EN 61326-1 Class A Table 2 (For use in industrial locations) compliant (*1)
  EN 55011 Class A Group1 compliant (*1)
  KC marking: KS C9811, KS C9610-6-2 compliant
  • CE/RoHS directives:
  EN IEC 63000 (*1)

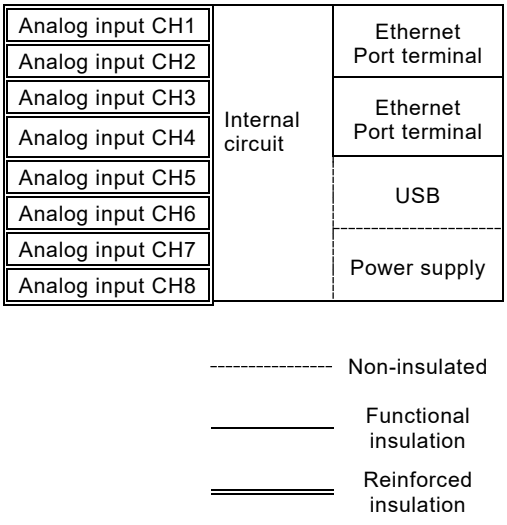
  *1: Support for VZ20X style 2.01 and later.
  *2: Support for VZ20X style 2.02 and later.

- Power Supply Specifications

  • Power supply:
  Rated voltage 24 VDC (+10 %/-15 %)
  USB power supply
  • Power consumption:
  4.5 W or less

- Isolation

  • Withstanding voltage:
  Between analog input channels, between analog inputs and internal circuit:
  3000 V RMS (50 Hz/60 Hz), for 1 minute
  • Insulation resistance
  Between analog input channels, between analog inputs and internal circuit, between Ethernet terminal and internal circuit, between Ethernet port 1 and Ethernet port 2 terminals
  20 MΩ or more, (500 VDC)
  • Isolation



- Environmental Conditions

Normal operating conditions:
• Ambient temperature: DIN rail mounting -10 to 55 °C, desktop installation -10 to 50 °C
• Ambient humidity: 5 to 90 % RH (condensation not allowed)
• Operating environment: Sites not subjected to hydrogen sulfide and other corrosive gases, or dust, and sites not subjected to sea breeze or direct sunlight
• Warm-up time: 40 minutes or more after the power is turned on
• Installation altitude: 2,000 m or less above sea level
• Installation location: Indoors
• Continuous vibration*2: JIS C60068-2-6 compliant
(at 5 to 8.4 Hz) half amplitude of 3.5 mm or less
(at 8.4 to 150 Hz) 9.8 m/s^2 or less, 1 oct/min for 10 cycles each in the three axis directions
• Impact*2: JIS C60068-2-27 compliant
147 m/s^2 or less, 11 ms 3 times each in 6 directions on the three axis directions
*2: When mounting on a DIN rail, attach the fastening plate and mount the main unit firmly so that it does not move on the DIN rail.

Transportation and Storage Conditions:
• Temperature: -25 to 70 °C
• Humidity: 5 to 95 % RH (condensation not allowed)

Effect of Operating Conditions:
• Effect of ambient temperature:
DC voltage 1 V range or less, resistance
1x of measurement accuracy added to 10°C change
Other than DC voltage 1 V range or less and resistance
1.2x of measurement accuracy added to 10°C change
• Effect of power supply fluctuation: Measurement accuracy specifications satisfied within rated voltage range

■ Construction and Mounting

• Material: Case: Polycarbonate resin
• Case color: Black (charcoal gray, light)
• Weight: 200 g or less
• External dimensions (mm): 50 (width) x 78 (height) x 65 (depth) (not including protrusions)
• Mounting: DIN rail*1 (in panel, on rack), desktop installation
*1: Applicable DIN rails: TH35-7.5Al, TH35-7.5Fe (JIS C 2812 compliant)
• Mounting position: Front and back horizontal, left and right horizontal *Stacking not allowed
• Wiring method: Main unit side: Push-in terminal
Cable side: Ferrule termina, Solid wire, stranded wire

■ Terminal Layout

Power supply terminal

Terminal No.	Function
1	24 VDC power supply (+)
2	24 VDC power supply (-)
3	(Use forbidden)
4	(Use forbidden)
5	(Use forbidden)

Analog input terminal (CH1 to CH8)

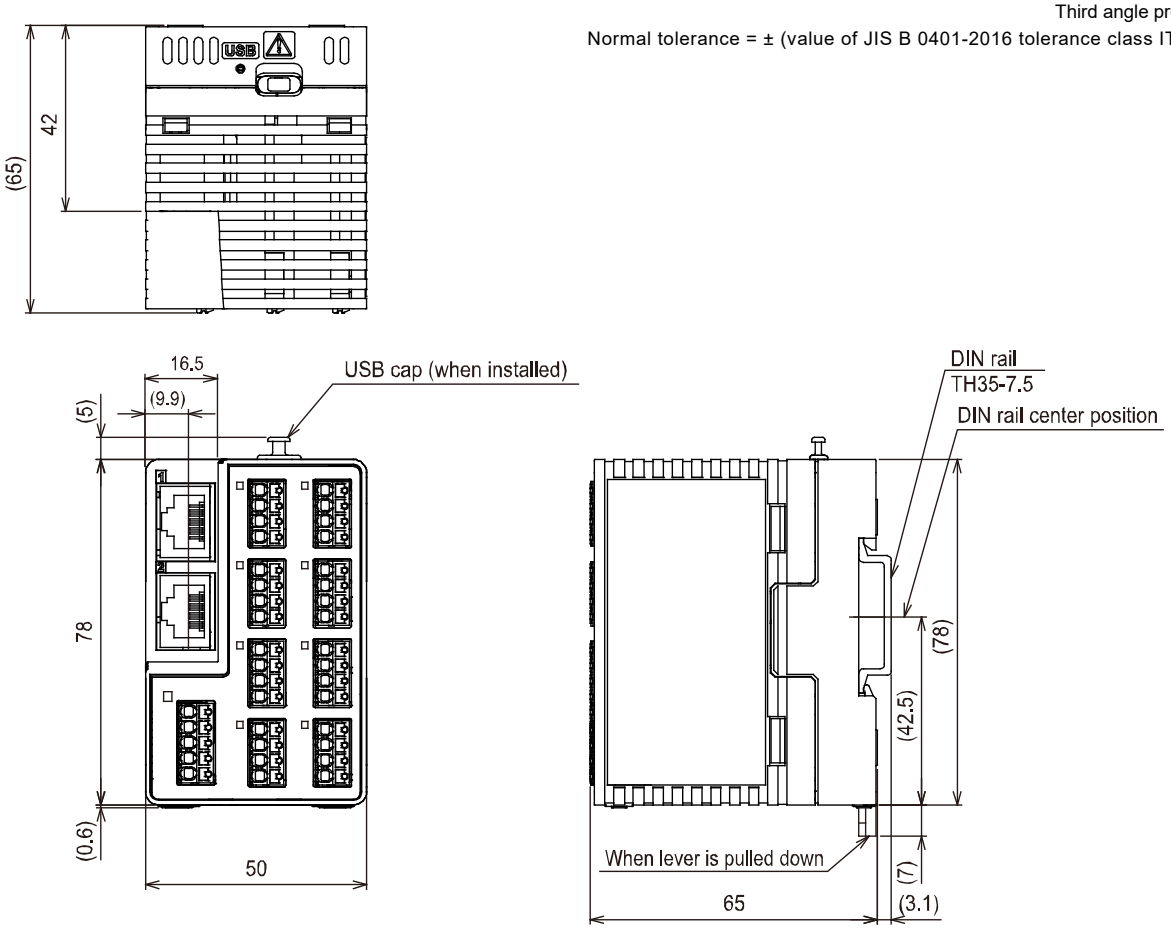
Terminal No.	DC voltage/standard signal	Thermocouple	3-wire resistance temperature detector	4-wire resistance temperature detector/ 4-wire resistance
1	(Use forbidden)	(Use forbidden)	(Use forbidden)	a
2	(Use forbidden)	(Use forbidden)	A	A
3	V-	V-	B	B
4	V+	V+	b	b

Ethernet port

No.	Function
1	Host communication (connection target: PC, PLC, VZ20X)
2	Slave communication (connection target: VZ20X)

■ External Dimensions

Unit: mm
Third angle projection
Normal tolerance = ± (value of JIS B 0401-2016 tolerance class IT18) / 2



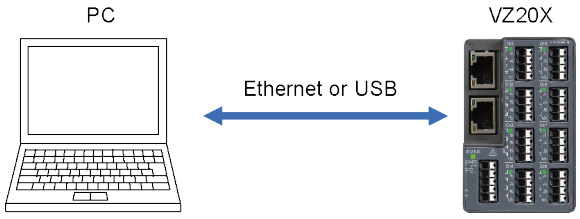
■ VZ Configurator

Set up VZ20X parameters over Ethernet or USB using VZ Configurator.

- Functions
  - Parameter settings
  - Monitoring
  - Fault diagnostics
  - Input adjustment
  - Parameter initialization
  - Firmware update
  - File management

- Connection

Connect the main unit to the PC using an Ethernet or USB cable.



* A USB Type-C cable or Ethernet cable is required for making the connection.

- Operating environment (PC)

Item	Windows 11 *1 Japanese / English	Windows 10 *1 Japanese / English
Edition	Pro/Enterprise 64bit	Pro/Enterprise 64bit
Version *1	21H2 or later	20H2 or later
CPU	Intel processor that supports 64 bit and 1 GHz or faster with 2 or more cores	Intel processor that supports 64 bit and 2 GHz or faster speed (recommended)
Recommended main memory capacity	8 GB or more	8 GB or more
Recommended storage free capacity	32 GB or more	32 GB or more
Display	Display compatible with OS	Display compatible with OS
Communication port	USB port, Ethernet port (100Base-TX) For the details, refer to the communication specifications.	USB port, Ethernet port (100Base-TX) For the details, refer to the communication specifications.

*1 YOKOGAWA also has ended support for OS's that Microsoft Corporation no longer supports.

■ Model and Suffix Codes

Model VZ20X: Analog Sensing Unit

Model	Suffix Codes	Description
VZ20X	-1N1ND	• 8 Universal inputs (DC voltage, Standard signal, Resistance, Thermocouple (TC), Resistance Temperature Detector (RTD)) • Ethernet communication 2-port • 24 VDC power supply

■ Standard Accessories

Part Name	Q'ty
USB connector cap	1
Ethernet connector cap (attached to product)	1
TEST CERTIFICATE (QIC)	1
User's Manual (Precaution on the Use of This Product)	1

■ Special Order Items

- Application Software

Model	Name	GS No.
GA10	Data logging software	GS 04L65B01-01EN

When creating a single data file from data acquired or recorded from multiple units (VZ20X), or when monitoring the trend display on a single screen, specify the data merge function (option code /DM). For details, refer to the GA10 General Specifications (GS 04L65B01-01JA).

■ VZ20X Function List

Yes: Available, No: Not available

Application	Communication connection type	VZ20X Functions	Power supply source			
			Power Supply terminal	USB(PC side, Type-C)	USB(PC side, other than Type-C)	
					USB Type-C detection "Enabled"	USB Type-C detection "disabled"
GA10, Modubs device (PC/PLC, etc)	Ethernet communication	Measurement + data acquisition	Yes	Yes	No	Yes
VZ Configurator	Ethernet communication	Parameter settings	Yes	Yes	No	Yes
		Monitoring	Yes	Yes	No	Yes
		Fault diagnostics	Yes	Yes	No	Yes
		Input adjustment	Yes	Yes	No	Yes
		Firmware update	Yes	Yes	No	Yes
		Parameter initialization	Yes	Yes	No	Yes
	USB communication	Parameter settings	Yes	Yes	Yes	Yes
		Monitoring	Yes	Yes	No	Yes
		Fault diagnostics	Yes	Yes	Yes	Yes
		Input adjustment	Yes	Yes	No	Yes
		Firmware update	Yes	Yes	No	Yes
		Parameter initialization	Yes	Yes	Yes	Yes

■ Basic Conditions and Individual Contracts at the Time of Purchase

The warranty for this product is defined in the basic conditions and individual contracts at the time of purchase. The individual conditions are as follows.

● Warranty period of firmware

The firmware warranty period is one year.
Please refer to the following URL for the procedure to update the firmware and the method to download the firmware.
https://myportal.yokogawa.com/

● Handling of non-conforming products

If Yokogawa verifies a non-conformity of the product that is attributable to Yokogawa within the warranty period, we will deliver an equivalent product.
Yokogawa can not provide a free evaluation of non-conforming products.
The investigation of the non-conforming products will be performed at the expense of the customer.

Revision Information

Title : VZ20X Analog Sensing Unit User's Manual
Manual No. : IM 77V01B01-01EN

October 12, 2021/1st Edition
Newly published

July 25, 2022/2nd Edition
Windows 11 support

August 30, 2022/3rd Edition
CE/UKCA safety and EMC standards compliant

November 11, 2022/4th Edition
CSA/UL safety standard compliant

March 7, 2023/5th Edition
Functionality improved when power supplied over USB, register access function added, RJC/ERJC parameters added

November 1, 2023/6th Edition
Correction of errors and improvement of explanations.

Written by Yokogawa Electric Corporation

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