

Advanced Controller for Chiller Units

■ Overview

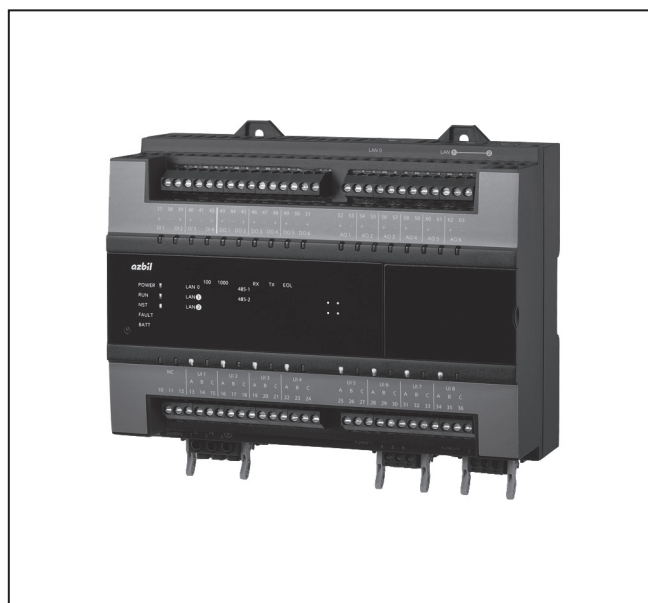
This product (Model WJ-1102Q) is a controller that controls the central plant facilities for buildings.

It uses I/Os that have been built for the central plant instrumentation along with control application programs to provide optimal control.

It can also handle cases where monitoring points, control applications, etc. are added during operation.

It is compatible with various open protocols such as BACnet/IP, BACnet MS/TP, Modbus™ RTU, Modbus ASCII.

With an optional Operator Interface (model QJ-1101D0000), operational status of heat source equipment can be checked. Also, using the Operator Interface allows standalone operation without the central monitoring unit.



■ Features

- Open communication protocol

This product is compatible with BACnet/IP which is an open protocol.

RS-485 communication allows connection of various devices that support BACnet MS/TP, Modbus RTU, or Modbus ASCII.

- Connecting various I/Os

It provides various I/Os such as DI (digital input), DO (digital output), UI (universal input), AO (analog output).

The UI is compatible with the input types, current, voltage, resistance (Pt100, Pt1000), and DI.

Since Advanced Remote I/O Module (RJ-11) can be attached by ETHERNET, it is possible to install the Advanced Remote I/O Module close to the job site equipment that is away from this product to save the labor for construction.

- Visualized I/O statuses

This product uses LEDs for DI, DO, and UI to indicate the status of the feedback input from facility equipment and the ON/OFF output to facility equipment.

- Optimal operation for the central plant system

Depending on the air conditioning load or supply/return water temperature, the product controls the number of operating chillers.

If a chiller breaks down, the product automatically starts the substitute chillers as necessary.

It also supports operation during power failure and power recovery, and even when a power failure occurs, operation can be resumed automatically when power is recovered.

- Online engineering work

If a need to change or add the monitoring points or control applications arises during operation, it is possible to change the controller files without stopping the controller.

- Connection to the building management system

By connecting to the central monitoring unit of the building management system, it is possible to centrally manage each facility from the central monitoring unit.

- Risk distribution

If there is something abnormal occurred in the building management system, the Advanced Controller for Chiller Units independently executes the backup operations.

Thus, the risk can be distributed in case of failure.



Safety Precautions

Please read instructions carefully and use the product as specified in this manual.
Be sure to keep this manual nearby for quick reference.

Restrictions on Use

This product was developed, designed, and manufactured for general air conditioning use.

Do not use the product in a situation where human life may be at risk or for nuclear applications in radiation controlled areas. If you wish to use the product in a radiation controlled area, please contact Azbil Corporation.

Particularly when the product is used in the following applications where safety is required, implementation of fail-safe design, redundant design, regular maintenance, etc., should be considered in order to use the product safely and reliably.

- Safety devices for protecting the human body
- Start/stop control devices for transportation machines
- Aeronautical/aerospace machines

For system design, application design, instructions for use, or product applications, please contact Azbil Corporation.

Azbil Corporation bears no responsibility for any result, or lack of result, deriving from the customer's use of the product.

Caution for Instrumentation Design

Considering unexpected failures or contingencies, be sure to design and check safety of the system and equipment.

Recommended Design Life

It is recommended that this product be used within the recommended design life.

The recommended design life is the period during which you can use the product safely and reliably based on the design specifications.

If the product is used beyond this period, its failure ratio may increase due to time-related deterioration of parts, etc.

The recommended design life during which the product can operate reliably with the lowest failure ratio and least deterioration over time is estimated scientifically based on acceleration tests, endurance tests, etc., taking into consideration the operating environment, conditions, and frequency of use as basic parameters.

The recommended design life of this product is 11 years.

Caution for Transporting

Lithium batteries are used in this product.

When this product, which uses lithium batteries, is transported by air or sea, ship it in accordance with IATA-DGR/IMDG-Code regulations.

Please inform your shipping company that lithium batteries are included in the product, and follow the necessary procedures according to the company's instructions.

If the product is shipped by air or sea without the necessary labels, etc., specified by the ordinances, you may be in violation of aviation or maritime safety laws and be subject to punishment.

Warnings and Cautions



WARNING

Alerts users that improper handling may cause death or serious injury.



CAUTION

Alerts users that improper handling may cause minor injury or material loss.

Signs



Electric shock

Alerts users to possible hazardous conditions caused by erroneous operation or erroneous use. The symbol inside \triangle indicates the specific type of danger. (For example, the sign on the left warns of the risk of electric shock.)



Disassemble

Notifies users that specific actions are prohibited to prevent possible danger. The symbol inside \odot graphically indicates the prohibited action. (For example, the sign on the left means that disassembly is prohibited.)



General

Instructs users to carry out a specific obligatory action to prevent possible danger. The symbol inside \bullet graphically indicates the actual action to be carried out. (For example, the sign on the left indicates general instructions.)

 **WARNING**

Electric shock

Install this product in a place, such as a control cabinet, where only the administrator has access to it.
Otherwise there is a danger of electric shock.

 **CAUTION**

General

Take anti-lightning surge measures based on regional and building characteristics. Lightning may cause fire or critical damage to this product if protective measures are not taken.



General

Install, wire, and use this product under the conditions specified by this manual. Failure to do so may cause fire or device failure..



Prohibition

Do not use an uninterruptible power supply (UPS) that outputs rectangular waves. Doing so may cause the device to fail.

System Configuration

System connection

Get connected to the central monitoring unit.

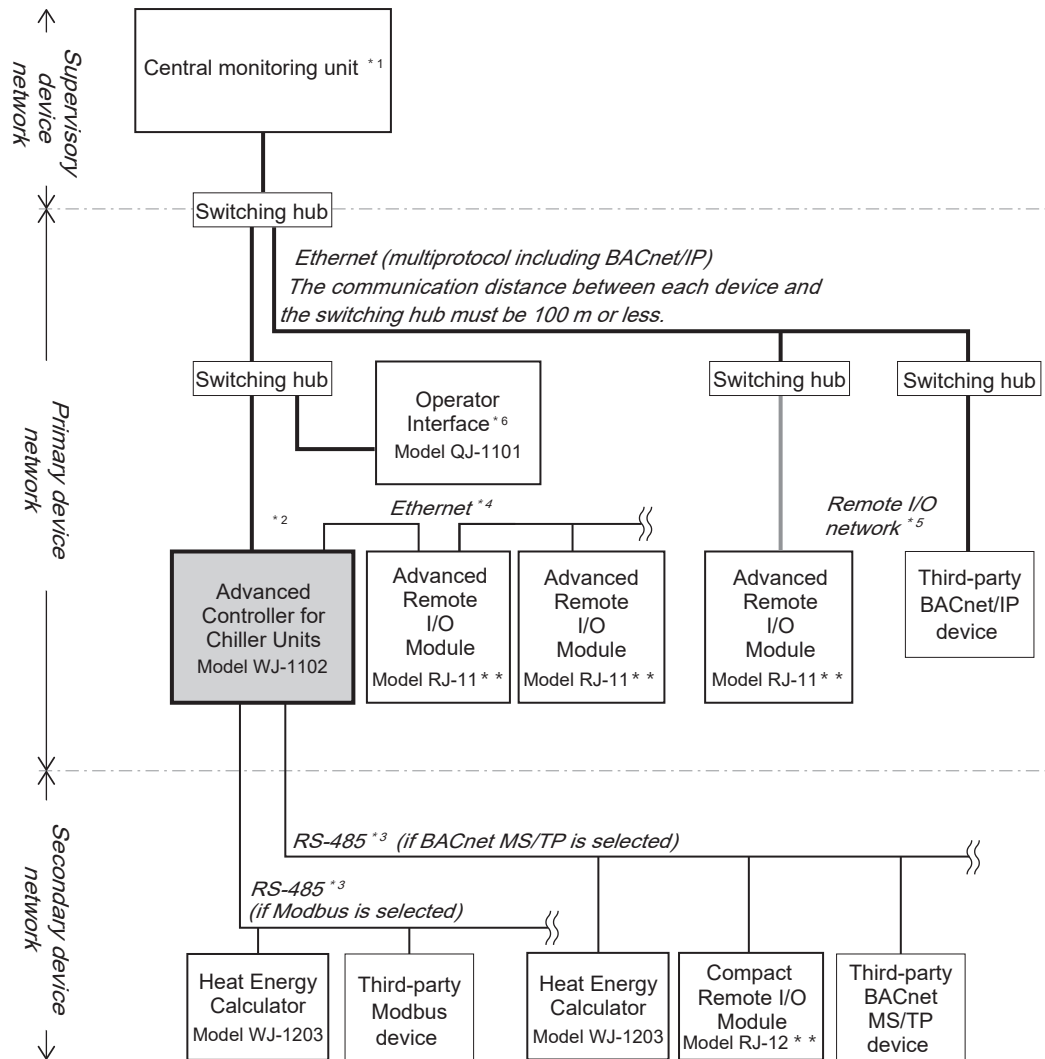


Figure 1. Example system configuration

- *1 The General Controller can be connected to an Azbil Supervisory Controller (Model BH-101J0*0000) or a third-party central monitoring unit using BACnet/IP communications.
- *2 The Advanced Controller for Chiller Units uses BACnet/IPv4 or BACnet/IPv6.
The IPv6 specification is based on BACnet2012 (Institute of Electrical Equipment IEIEJ-G-0006:2017 Standard) with ANNEXU of BACnet2016.
- *3 Advanced Controller for Chiller Units has two RS-485 communication channels.
For each channel, communication protocol can be selected from BACnet MS/TP, Modbus RTU, or Modbus ASCII.
 - The number of devices that can be connected for BACnet MS/TP
 - <If only the Azbil devices are connected>
Compact Remote I/O Module and Heat Energy Calculator, etc.
Number of connected devices: 50 devices/channel
 - <If only the third-party devices are connected>
When transmission speed is 76.8 kbps, 30 objects/device
Number of connected devices: 31 devices/channel
 - The number of devices that can be connected for Modbus (when transmission speed is 76.8 kbps, 30 objects/device)
Number of connected devices: 31 devices/channel

If the transmission speed and the number of objects are different among the third-party devices, or if the Azbil devices and third-party devices coexist on the same channel, the number of connected devices will vary. For details, please contact one of Azbil salespersons.
- *4 A network that connects the Advanced Controller for Chiller Units and Advanced Remote I/O Modules under its control is referred to as a local I/O network.
A switching hub is not required for the local I/O network since a daisy chain Ethernet is used between the Advanced Controller for Chiller Units and the Advanced Remote I/O Modules under its control, as well as between the Advanced Remote I/O Modules.
- *5 A network that connects the Advanced Controller for Chiller Units and Advanced Remote I/O Modules through a host network is referred to as a remote I/O network.
A switching hub is required to connect the Advanced Remote I/O Modules to the remote I/O network.
The maximum number of the Advanced Remote I/O Modules connected to this network is 3 per Advanced Controller for Chiller Units.
When using IPv6 for BACnet communication, the Advanced Remote I/O Module cannot be connected via a remote I/O network.
- *6 The Operator Interface (Model QJ-1101D0000) can manage a maximum of four controllers (Model WJ-1102).

● Standalone

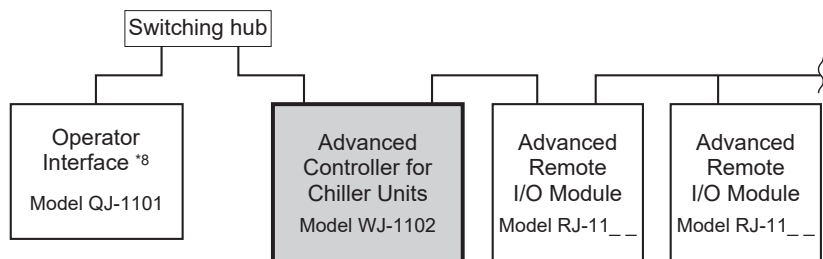


Figure 2. Example system configuration

Model Numbers

WJ-1102Q123456 / WJ-1102Q123456-U*¹

1 Instrumentation type		2 Number of chillers		3 Sequence control		4 Pressure control / primary pump variable water volume control		5 Language		6 Power specification	
1	Single-pump system	2	2	3	1 system flow (with energy monitoring)	0	None	1	English	W	100–240 V AC
		4	4	4	4 systems flow (with energy monitoring, 4 systems totalization)	1	Proportional bypass valve(current/voltage)	2	Chinese (Simplified)		
		8	8			3	Primary pump variable water volume control (All inverters + propor- tional bypass valve (current/voltage))	3	Chinese (Traditional)		
2	Dual-pump system	2	2	2	1 system flow (with energy monitoring)	0	None	1	English	W	100–240 V AC
		4	4	6	4 systems flow (with energy monitoring, 4 systems totalization)	1	Primary pump variable water volume control (Proportional distribution of load)	2	Chinese (Simplified)		
		8	8					3	Chinese (Traditional)		

*1 The model number WJ-1102Q_ _ _ _ 4_ -U cannot be selected because the UL-certified models do not have Korean language support.

Optional parts

Model number	Description
83104567-001	DIN rail clamp
83172137-001	RS-485 terminators (x 10), 120 Ω
83173763-001	4–20 mA 250 Ω resistors (x 8)

Replacement parts

Model number	Description	Remarks
83173707-001	Power connector (x 1)	
83173708-001	RS-485 connectors (RS-485-1 x 1, RS-485-2 x 1)	
83170639-001	Lithium battery (x 1)	Replacement cycle: 5 years
83170639-005	Lithium batteries (x 5)	
83170639-010	Lithium batteries (x 10)	

■ Specifications

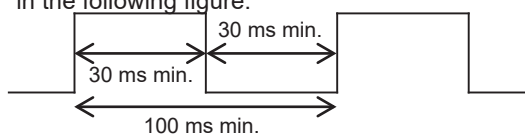
● Basic specifications

Item		Specification		
Power supply	Input voltage	100–240 V AC (or 100–264 V AC)		
	Power frequency	50/60 Hz ± 3 Hz		
	Power consumption	30 VA max.		
	Inrush current	20 A max. (for 100 V AC) 40 A max. (for 240 V AC)		
	Leakage current	0.2 mA max. (for 100 V AC) 0.5 mA max. (for 240 V AC)		
	Insulation resistance	Between the power terminals and the ground terminal 100 MΩ or more (500 V DC)		
CPU		32-bit		
Memory device		256 MB SDRAM, 32 MB Flash ROM, 2 MB SRAM		
RAM, RTC backup		Powered by lithium batteries (not rechargeable)		
Communications	RS-485	Number of channels	2	
		Protocol	BACnet MS/TP, Modbus RTU, Modbus ASCII	
		Communication speed	BACnet MS/TP: 9.6 kbps, 19.2 kbps, 38.4 kbps, 76.8 kbps Modbus RTU, Modbus ASCII: 4.8 kbps, 9.6 kbps, 19.2 kbps, 38.4 kbps, 76.8 kbps	
		Communication distance	1000 m max.	
		Number of connectable devices	BACnet MS/TP: Only the Azbil devices are connected: up to 50 per channel Only the third-party devices are connected: up to 31 per channel Modbus RTU and Modbus ASCII: up to 31 per channel There are restrictions depending on the software.	
	ETHERNET (LAN 0)	Communication type	Autonegotiation, MDI/MDI-X auto recognition	
		Protocol	BACnet/IP (IPv4 or IPv6)	
		Communication speed	1000 Mbps, 100 Mbps	
	ETHERNET (LAN 1, LAN 2)	Number of ports	2	
		Communication type	MDI/MDI-X auto recognition	
		Protocol	Proprietary protocol	
		Communication speed	100 Mbps	
	Major material		Case, cover	Modified PPE resin
			DIN holder	POM resin
Weight		1.10 kg		
Environmental conditions	Rated operating conditions	Ambient temperature	0–50 °C	
		Ambient humidity	10–90 % RH (without condensation)	
		Altitude	2000 m max.	
		Vibration	5.9 m/s ² max., 10–150 Hz	
	Transport/storage conditions	Ambient temperature	-20–60 °C	
		Ambient humidity	5–95 % RH (without condensation)	
		Vibration (storage)	5.9 m/s ² max., 10–150 Hz	
		Vibration (transport)	9.8 m/s ² max., 10–150 Hz	
	Others		<ul style="list-style-type: none"> ● No corrosive gas should be detected. ● The product should not be exposed to direct sunlight. ● Do not let the product get wet. 	
	Installation location		In the control panel	
Mounting		Mounted on a DIN rail or with screws		

CPU: central processing unit
MDI: medium dependent interface
MDI-X: medium dependent interface crossover
PPE: polyphenylene ether
RAM: random-access memory

ROM: read-only memory
RTC: real-time clock
SDRAM: synchronous dynamic random-access memory
SRAM: static random-access memory

● Input/output specifications

Item		Specification	
Digital input	Number of input terminals	4	
	Voltage	24 V DC typ.	
	Current	5 mA DC typ.	
	Connected device output type	Dry contact or open collector	
	Rated dry contact resistance	Allowable ON contact resistance 100 Ω max. Allowable OFF contact resistance 100 kΩ min.	
	Rated open collector voltage/current	Allowable ON residual voltage 2 V max. Allowable OFF leakage current 500 μA max.	
	Pulse integration	10 Hz max. Note: Digital input pulse integration requires a pulse width and a pulse interval that satisfy the conditions shown in the following figure. 	
Universal input	Number of input terminals	8	
	Voltage input	Input range	0–10 V DC, 2–10 V DC, 0–5 V DC, 1–5 V DC
		Input impedance	1 MΩ typ.
	Current input	Input range	4–20 mA
		Input impedance	100 Ω typ.
	Resistance temperature detector input	Connected sensor output type	Pt100, Pt1000
		Pt100 sensor measurement range	0–50 °C, 0–100 °C, 0–200 °C, -20–80 °C, -20–30 °C, -50–100 °C, -100–50 °C
		Pt1000 sensor measurement range	0–50 °C, 0–100 °C, -20–80 °C, -20–30 °C, -50–100 °C
	Digital input	Voltage	5 V DC typ.
		Current	1.5 mA DC typ.
		Connected device output type	Dry contact or open collector
		Rated dry contact resistance	Allowable ON contact resistance 100 Ω max. Allowable OFF contact resistance 100 kΩ min.
Rated open collector voltage/current		Allowable ON residual voltage 2 V max. Allowable OFF leakage current 100 μA max.	
Relay output (normally open contact)		Number of output terminals	6
Digital output	Output type	Relay output, normally open contact	
	Rated contact voltage/current	24 V AC, 0.5 A max. (Max. inductive load: cosφ = 0.4) 24 V DC, 0.5 A max.	
	Min. applicable load	5 V DC, 10 mA	
	Number of output terminals	6	
Analog output	Voltage output	Output range	0–10 V DC, 2–10 V DC, 0–5 V DC, 1–5 V DC
		Load resistance	10 kΩ min.
	Current output	Output range	4–20 mA
		Load resistance	500 Ω max.
Controller alarm output*	Number of output terminals	1	
	Relay output	Output type	Relay (photo MOS relay), normally open contact Normal: ON Abnormal, power off, idling, debugging, initializing: OFF
		Rated contact voltage/current	24 V AC, 100 mA max. 24 V DC, 100 mA max.
	Applicable voltage	24 V AC ±15 %, 24 V DC ±15 %	
	Contact ON resistance	20 Ω max.	

* Overcurrent protection circuit is built-in.

When the overcurrent protection circuit works due to short-circuit, lightning surge, etc., the contact will break (the same state when an alarm occurs).

In order to recover the state to normal, turn off the power supplied to the output circuits and then turn on the power.

■ Specifications for Wiring

Item	Recommended wire	Specification	Max. wiring length	Connection type	Remarks
Power supply	IV, CVV, or equivalent	1.25–2.0 mm ² stranded wire (AWG16–AWG14)	—	Screw terminal block	
Ground	IV, CVV, or equivalent	1.25–2.0 mm ² stranded wire (AWG16–AWG14)	—	Screw terminal block	Ground the product with resistance less than 100 Ω.
ETHERNET (LAN 0)	—	EIA/TIA-568 category 5e or higher	100 m	RJ-45 modular connector	
ETHERNET (LAN 1 / LAN 2)	—	EIA/TIA-568 category 5e or higher	100 m	RJ-45 modular connector	
RS-485	Belden 3106A, 3107A, 9842, or equivalent	0.2–0.3 mm ² shielded twisted-pair cable (AWG24–AWG22)	1200 m	Screw terminal block	Use the cable that satisfies the following specifications: Impedance: 100–130 Ω Capacities between conductors: 100 pF/m max. Capacities between conductor and shield: 200 pF/m max.
Digital input	IV, CVV, or equivalent	0.5–1.25 mm ² stranded wire (AWG20–AWG16)	100 m	Screw terminal block	
Digital output	IV, CVV, or equivalent	0.5–1.25 mm ² stranded wire (AWG20–AWG16)	100 m	Screw terminal block	
Universal input (Voltage/current/digital inputs)	IV, CVV, or equivalent	0.5–1.25 mm ² stranded wire (AWG20–AWG16)	100 m	Screw terminal block	
Universal input (input for RTD Pt100 or Pt1000))	IV, CVV, or equivalent	0.5–1.25 mm ² stranded wire (AWG20–AWG16)	100 m	Screw terminal block	Since the wiring resistance will cause an error, wires with a cross-sectional area of 1.25 mm ² (AWG 16) are recommended.
Analog output (Voltage/current outputs)	IV, CVV, or equivalent	0.5–1.25 mm ² stranded wire (AWG20–AWG16)	100 m	Screw terminal block	
Controller alarm output	IV, CVV, or equivalent	0.5–1.25 mm ² stranded wire (AWG20–AWG16)	30 m	Screw terminal block	

■ Dimensions

140 mm (H) x 190 mm (W) x 80 mm (D)

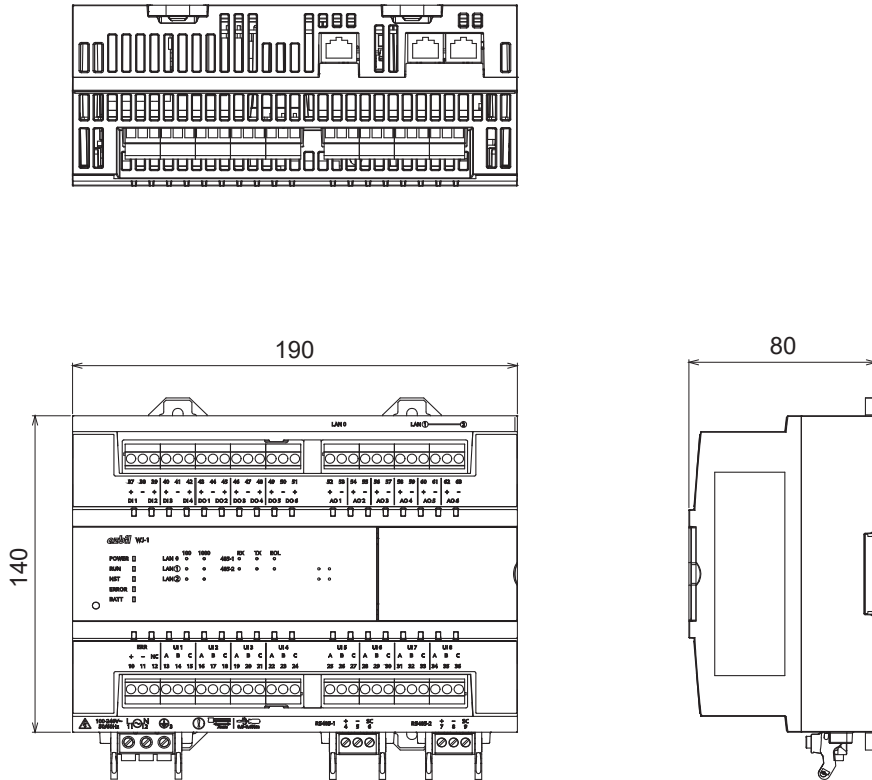


Figure 3. Dimensions (mm)

■ Parts Indication

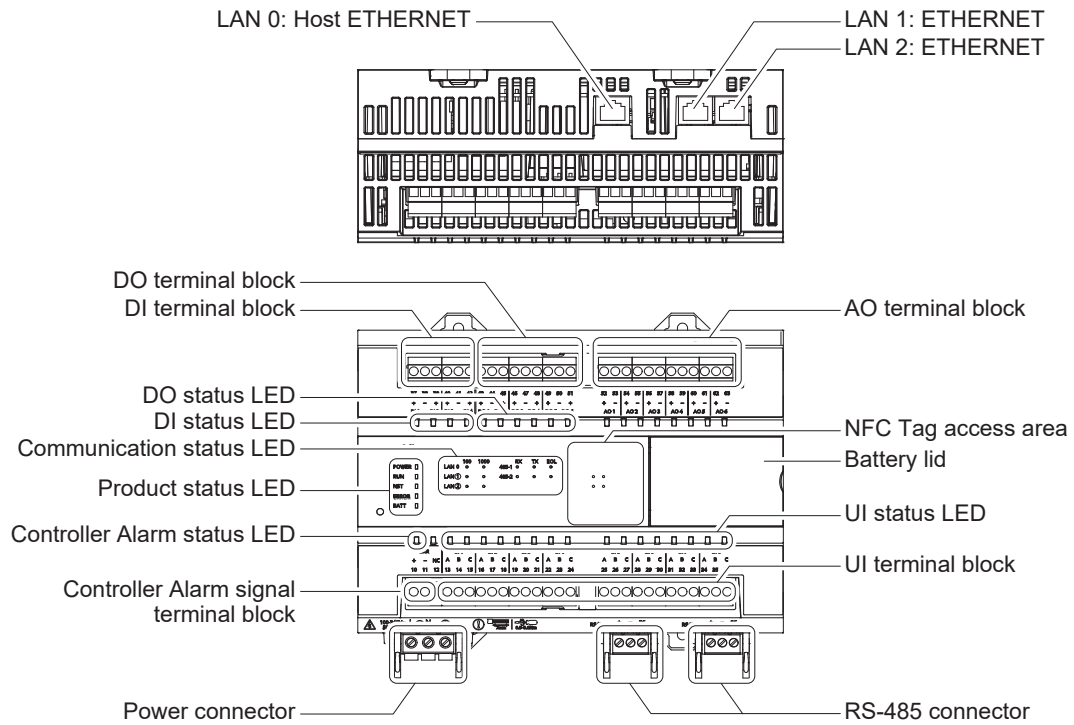


Figure 4.

■ Instrumentation

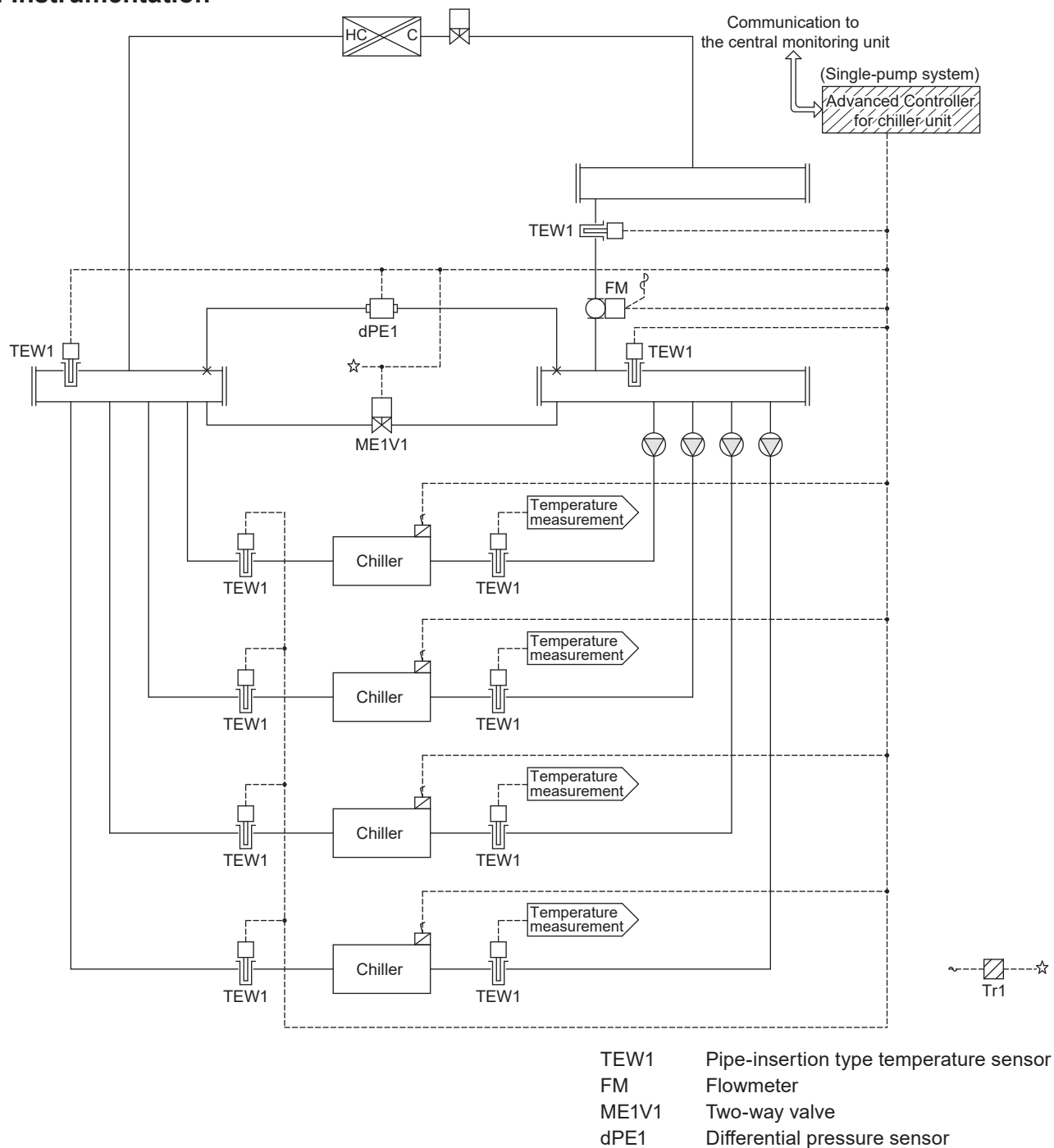
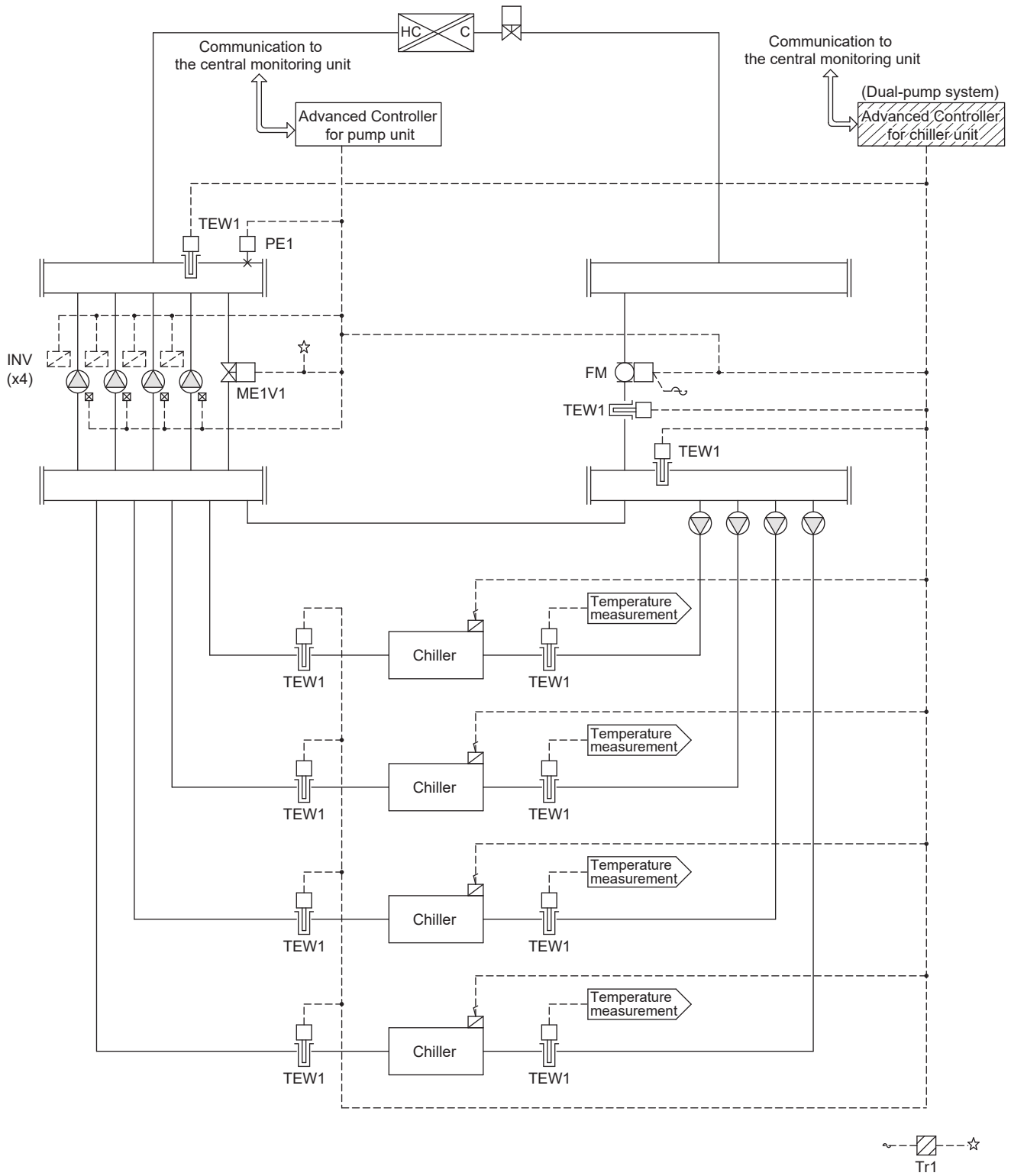


Figure 5. Example close-loop single-pump system instrumentation



- TEW1 Pipe-insertion type temperature sensor
- FM Flowmeter
- ME1V1 Two-way valve
- PE1 Pressure sensor
- INV Inverter

Figure 6. Example close-loop dual-pump system instrumentation

■ Control Function

● Operation management

(1) Auto/Manual changeover

Change over between Auto and Manual with the I/O object for auto/manual changeover (BV) or DI input. Manual DI input has the highest priority.

Note: Wait for at least 10 seconds after manual changeover before starting or stopping units after changing over from Auto to Manual.

● Manual

The operating status before changing the mode is maintained. Sequence control is not executed. When Manual is selected, you can start or stop the unit manually.

● Auto

When Group command is ON, sequence control is executed.

(2) Group command

Execute the command operation with the I/O object for group command (BO) or DI input.

Note: When the system is operated with the group command from the central monitoring unit, the group command DI via anti-freeze control can also be used.

● Group command ON

When Auto is selected, sequence control is executed.

● Group command OFF

When Auto is selected, all the units are stopped.

(3) Daytime/nighttime mode changeover

Change over between modes with the I/O object for daytime/nighttime changeover (BV) or DI input.

Note: The operation sequence table, the maximum number of operating units, and the start load are changed over between the daytime mode and the nighttime mode.

(4) Cooling/heating mode changeover

Change over between the modes with the I/O object for cooling/heating changeover (BV) or DI input.

Note: The operation sequence table, the maximum number of operating units, and the start load are changed over between the cooling mode and the heating mode.

● Units control

(1) Sequence control method

There are three methods in accordance with the model (instrumentation type).

● Flow rate method (single-pump system)

Flow rate is used as the load on sequence control and it is compared with the total rated capacity of operating chillers to define the appropriate number of operating chillers. Models that support up to a 4-system flow rate are also available.

● Quantity of heat method (dual-pump system)

Quantity of heat, which is calculated by supply water temperature, return water temperature, and load flow, is used for the load of sequence control and it is compared with the total rated capacity of operating chillers to define the appropriate number of operating chillers. Some models support calorie calculation and up to three systems can be added.

Note: The quantity of heat method can be changed to the flow rate method as necessary.

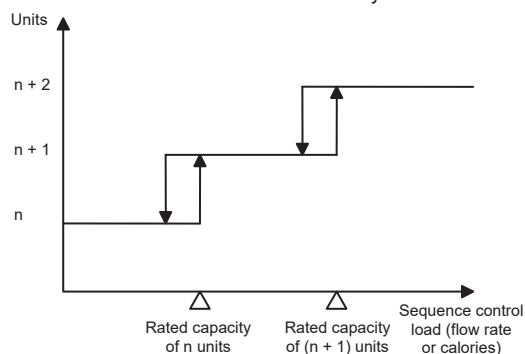


Figure 7.

● Temperature method

Sequential control is done by increasing the capacity monitoring the supply water temperature or by decreasing the capacity monitoring the return water temperature.

Note: This method can be used for thermal source systems that are not equipped with a flow meter.

(2) Operation sequence change method

One of the following operation sequence change methods can be selected.

● Sequential method

The start and stop sequence is fixed.

Units with higher priority start earlier and stop later.

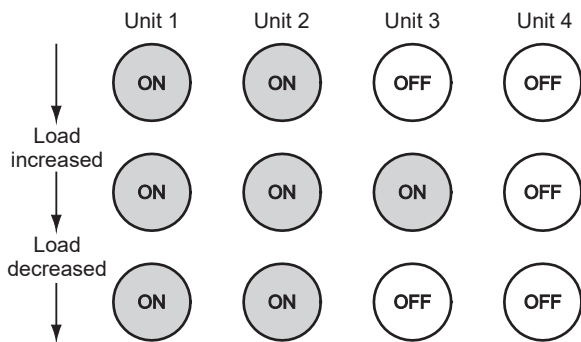


Figure 8.

- Sequential method with base unit changeover
This is one of the sequential methods. When Group command is OFF, the operation sequence is shifted by 1 so that the unit with the highest priority moves to the lowest position.

- Rotation method
This method controls the operating hours of each unit to be leveled.

There are two methods.

- (1) Starts or stops the unit according to its running hours. To increase the supply capacity, it starts the unit that has been stopped for the longest time. To decrease the supply capacity, it stops the unit that has been running for the longest time. The lowest starting order is assigned to the unit that has just started.

Note: This method is not intended to compare the runtime of units and sort the starting order by their runtime.

- (2) Starts or stops the unit according to its total runtime. In order to level the runtime of each unit exactly, it starts the unit whose total runtime is the shortest first, and stops the unit whose total runtime is the longest first.

Note: Since the total runtime is used for deciding which unit should start, if the value of a unit is preset to "0," that unit starts up first. Be aware of this when the total runtime is preset to "0."

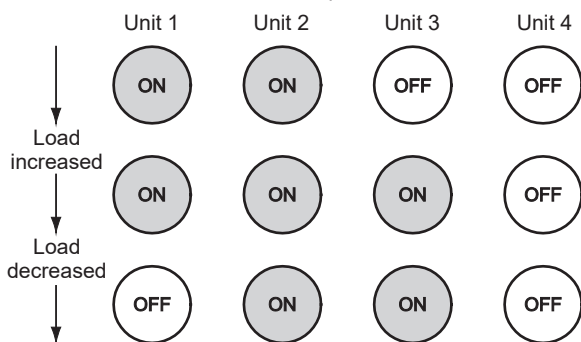


Figure 9.

- Rotation method with forced increase capacity
This is one of the rotation methods. If there is no demand for increasing capacity for a certain period, the capacity is forced to increase to rotate the operating order. There are two methods of initiating the forced rotation by specifying the amount of running hours or time.

- Program method
Use this method to combine the various capacities of units and operate them. This method supports the capacity of eight groups (types). Up to 12 levels can be set as the number of operating units in each group. This method shifts the operation sequence in the same group as is done in the rotation method. Note: (1) or (2) in "Rotation method" can be selected.

Table 1. Group table settings

Group	Member unit No.			
1	1	—	—	—
2	2	3	4	—
3	—	—	—	—
4	—	—	—	—
5	—	—	—	—
6	—	—	—	—
7	—	—	—	—
8	—	—	—	—

Note: In Table 1, "Group table settings," one unit with a small capacity is registered in Group 1 and three units with large capacities are registered in Group 2 as an example.

- If there is no demand for increasing capacity for a certain period, this method is used for switching the operating units in a group that contains rotatable units.

Note: Units are not rotated if a group does not contain rotatable units.

If multiple groups contain rotatable units, the units in one of them are rotated. The priority order among groups is also rotated.

Table 2. Level table settings

Level	Group 1 Number of units	Group 2 Number of units	Group 3 Number of units	Group 4 Number of units	Group 5 Number of units	Group 6 Number of units	Group 7 Number of units	Group 8 Number of units	Load condition of the level
1	1	0	0	0	0	0	0	0	Load \leq Capacity of the units in Group 1
2	0	1	0	0	0	0	0	0	Capacity of the units in Group 1 < Load \leq Capacity of the units in Group 2
3	1	1	0	0	0	0	0	0	Capacity of the units in Group 2 < Load \leq Capacity of the units in Group 1 + Capacity of the units in Group 2
4	0	2	0	0	0	0	0	0	Capacity of the units in Group 1 + Capacity of the units in Group 2 < Load \leq Capacity of the units in Group 2 x 2
5	1	2	0	0	0	0	0	0	Capacity of the units in Group 2 x 2 < Load \leq Capacity of the units in Group 1 + Capacity of the units in Group 2 x 2
6	0	3	0	0	0	0	0	0	Capacity of the units in Group 1 + Capacity of the units in Group 2 x 2 < Load \leq Capacity of the units in Group 2 x 3
7	1	3	0	0	0	0	0	0	Capacity of the units in Group 2 x 3 < Load
8	—	—	—	—	—	—	—	—	—
9	—	—	—	—	—	—	—	—	—
10	—	—	—	—	—	—	—	—	—
11	—	—	—	—	—	—	—	—	—
12	—	—	—	—	—	—	—	—	—

(3) Operation sequence table

The operation sequence can be set for each of the following four types of tables:

- For heating mode and daytime mode
- For heating mode and nighttime mode
- For cooling mode and daytime mode
- For cooling mode and nighttime mode

The same operation sequence change method applies to all tables. When the table is changed over, the sequence control at unit startup described later is executed.

In addition, up to eight preset operation sequence table patterns can be automatically changed by separately associating them with I/O objects (up to eight MVs).

(4) Operating sequence adjustment

When the operation table is switched, the operation mode is switched, a unit is restored from a failure or a forced shutdown, etc., you can select one of the following methods for adjusting the operating sequence (only with the sequential method).

- Operating unit priority method
Gives operation priority to running units (ON state) over stopped units (OFF state). This minimizes the counts of start/stop operation.
 - Sequence setting priority method
Always starts or stops the units according to the operation sequence setting.
- When adjusting the operating sequence, the start operation of some units and stop operation of other units may occur simultaneously. If the start and stop operations are executed simultaneously, abnormal pressure rises or drops in unit capacities due to starting delays of units may occur. To prevent this, simultaneous ON/OFF processing will be conducted. The following two processes are available.

- ON priority process
Sequentially starts the units scheduled to start up first, waits for a while to give the units time to start up, and then sequentially stops the units scheduled to shut down.
- OFF priority process
Sequentially stops the units scheduled to shut down first, waits for a while to give the units time to shut down, and then sequentially starts the units scheduled to start up.

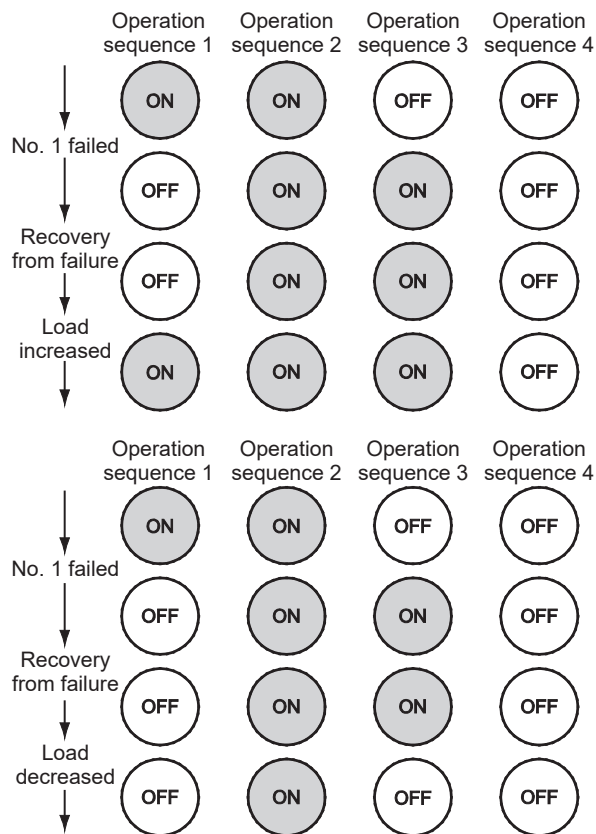


Figure 10. Operating unit precedence method (sequential)

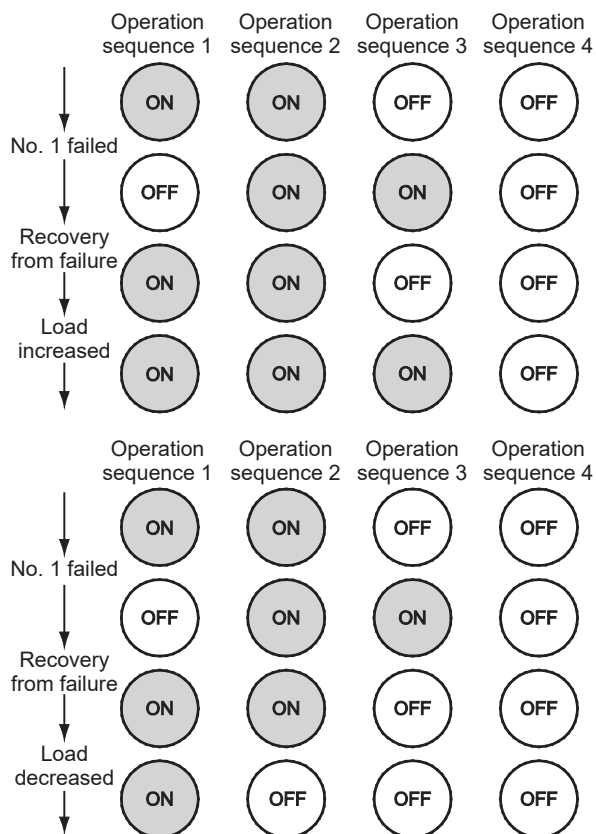


Figure 11. Sequence setting precedence method (sequential)

- (5) **Rated capacity setting**
Define the rated capacity of a unit (flow rate or calorie) from the central monitoring unit.
- (6) **Sequence control at unit startup**
When Group command is ON, to shorten the startup time, sequence control by "Start load" will be executed. Sequence control is forcibly applied when the operation mode is switched from daytime to nighttime so that the units can react to a sudden drop in load during overtime working hours.
When Group command ON is executed or the mode is switched from nighttime to daytime, the actual load will be used if it is greater than the start load. When the mode is switched from daytime to nighttime, actual load will be used if it is smaller than the start load.
The start load can be defined for weekday, multiple special days, daytime mode, and nighttime mode.
Note: When the mode is changed over from daytime to nighttime, the start load (nighttime) or the actual load, whichever is the larger, can be used depending on the setting.
The start load is changed over among weekday and multiple special days using the start load calendar information (MV).
- (7) **Stabilizing control while waiting for effect**
When the number of units is increased or decreased, sequence control is not executed for a certain period of time to wait for the load to stabilize.
- **Waiting for effect at startup**
Waiting for effect at startup is defined as the unit's startup time and the water cycle time.
When the outlet temperature of all chillers reaches the specified value, without waiting for the defined time to elapse, the chillers are regarded as having started.
 - **Waiting for effect at shutdown**
Waiting for effect at shutdown is defined as the remaining operating time of the unit that was stopped, the startup time of the units other than the stopped units, and the water cycle time.
- (8) **Number of units adjustment by temperature**
If the return water temperature on the header side drops below a certain level for a certain period, the number of running units will be decreased. If the supply water temperature exceeds a certain level for a certain period, the number of running units will be increased (cooling mode example).

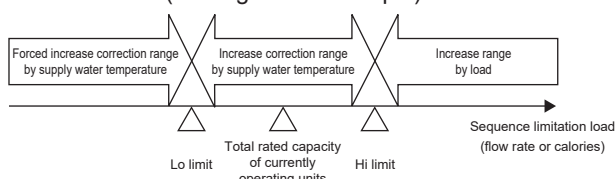


Figure 12.

● Forced stop

Individual units can be shut down (excluded) by inputting the shutdown DI.

Shutdown has priority over all start commands from the controller.

Note: This can be changed to the shutdown operation from the central monitoring unit by changing the point.

● Individual ON/OFF

Individual units can be forced to start or stop from the central monitoring unit.

Individual ON/OFF has priority over all other ON/OFF commands from the Advanced Controller for heat source except for shutdown.

When individual units are forced to start or stop while Auto and Group command are ON, the operation mode is changed to the normal sequence control after the effect wait time, restart prevention time, or minimum stop time elapses.

Note: The individual ON/OFF operation is not available when Auto is selected and Group command is OFF.

● Restart prevention control

To protect the units, they will not be restarted during the restart prevention time (a certain amount of time after startup), or the minimum stop time (a certain amount of time after shutdown).

● Sequential start/stop control

In order to prevent a rush current and water condensation, simultaneous start or stop of multiple units is prohibited.

When multiple units need to be started or stopped, the units will sequentially start up or stop at a constant interval in the registered order, not in the order of the defined operating sequence.

● Power demand control

Individual units are stopped by the power demand control command from the central monitoring unit.

At this time, substitute units are not operated to avoid increasing the power consumption. When the power demand control commands for all the units are cleared, the operation mode returns to the normal sequence control.

● Control at failure

If a unit fails and stops or ON/OFF fails (the output command and the operating status do not match within a certain amount of time after output), that unit is considered to have failed.

The number of operating units is determined again excluding that unit from the sequence control. If the substitution operation is necessary, substitute units are operated even during the effect wait time.

The stop command is not output for the failed unit.

The following two failure reset methods are available.

- Manual reset

Remove the cause of failure of the relevant unit and stop it from the central monitoring unit.

This matches the status to the command and the normal operation is restored.

- Auto reset

If the failure auto reset time is set in advance, when the specified time elapses, the Advanced Controller for heat source automatically stops the unit.

This matches the status to the command and normal operation is restored if the failure DI input has been cleared.

● **Pressure control
(only for bypass valve control and single-pump system)**

The bypass valve is controlled by the PID control every 0.5 seconds so that the differential pressure between headers is constant.

Before executing Group command ON or increasing the number of running units, the bypass valve is forced to open to a certain position to prevent a sudden pressure rise.

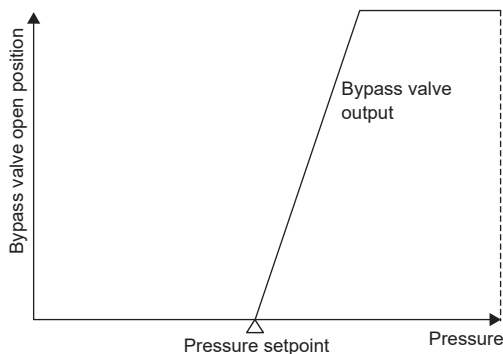


Figure 13.

● **Primary pump variable flow control**

- Single-pump system

In order to make differential pressure of the bypass valve constant, the bypass valve and the inverter of primary pump are PID-controlled at 0.5 sec intervals.

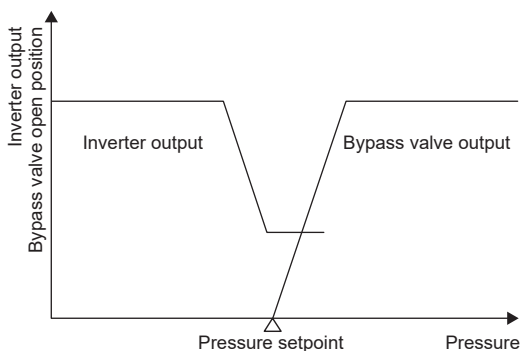


Figure 14.

- Dual-pump system

Output value of the primary pump inverter is calculated so that the secondary load flow rate and the primary flow rate are equal.

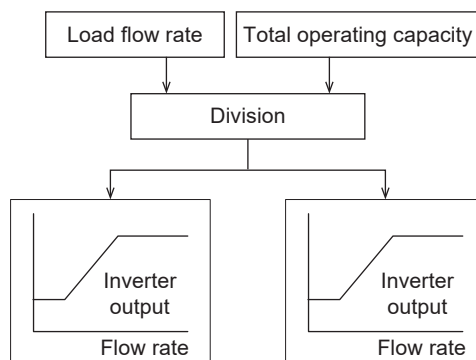


Figure 15.

● **Power failure recovery control**

(1) Detection of the power supply status

A power failure is detected based on the power supply status sent from the central monitoring unit or the power status of the target unit DI (OFF = Power supplied, ON = Power failed).

(2) Operation at power recovery

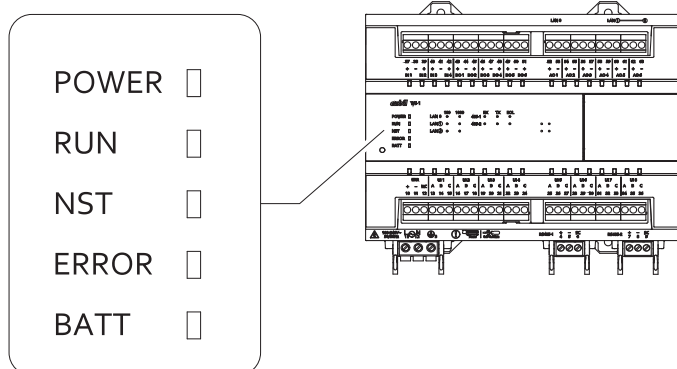
Auto/Manual changeover	Power to the Advanced Controller for heat source failed	Power to the units failed	Power failure time	Operation
Auto	Yes	Yes	Within a certain amount of time	Sequence control using the actual load before power failure or the start load, whichever is larger. (The units stopped due to the power failure are not restarted.)
			More than a certain amount of time	Sequence control using the actual load after power recovery or the start load, whichever is larger.
		No	Within a certain amount of time	Sequence control using the actual load before power failure or the start load, whichever is larger.
			More than a certain amount of time	Sequence control using the actual load after power recovery or the start load, whichever is larger.
	No	Yes	—	Sequence control using the larger one of the actual load or start load. (The units stopped due to the power failure are not restarted.)
	Manual	Yes	Yes	—
No			—	The same status as before power failure
No		Yes	—	Stops all units.

Notes:

1. It is assumed that the units use commercial power or a combination of commercial power and generators. Under normal circumstances, it is not possible for only the power to Advanced Controller for Chiller Units to fail. The above description assumes the case where the control panel is turned off for maintenance or other purposes.
2. "Power to the units failed" means that the power to all the units have failed. For the operation when units are turned off without setting Manual for maintenance or other purposes, see the above description about control at failure.
3. Stop of units due to power failure is different from stop by sequence control. Stabilizing control while waiting for effect is not executed after a stop due to power failure.
4. The case where the mode is changed over between Auto and Manual before and after power failure is not described here.
5. The amount of time is defined using the parameter (Default: 120 seconds).

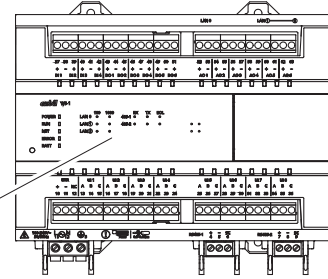
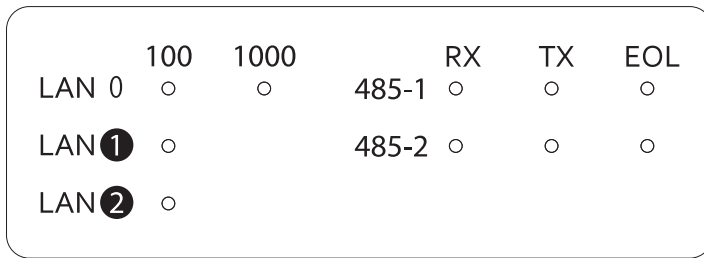
■ Indicators

● Product status LEDs



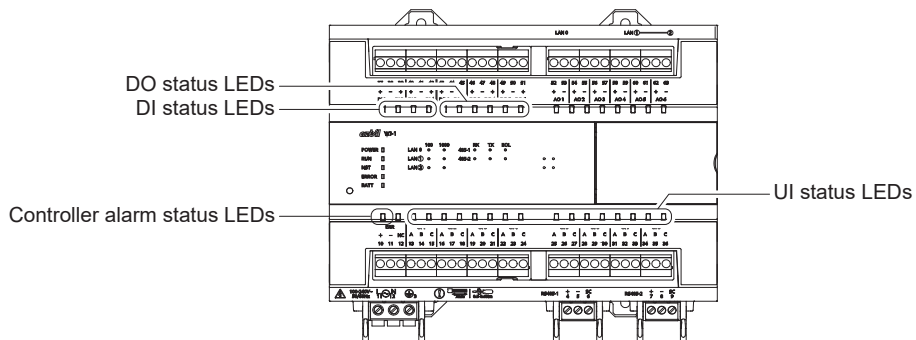
Item	LED name	Color	State	Description
Power supply status	POWER	Green	Lit	Power ON
			Not lit	Power OFF
Operation mode	RUN	Green	Lit	Operating in RUN mode
			High speed blinking (0.2 sec cycle)	ETHERNET congestion detected
			Low speed blinking (1.4 sec cycle)	Operating in DEBUG mode
			Not lit	Operating in IDLE mode
Network status	NST	Orange	Lit	Non-ring is set for communication with the local I/O network.
			High speed blinking (0.2 sec cycle)	If Ring is set, the ring for communication with the local I/O network is disconnected at some node.
			Low speed blinking (1.4 sec cycle)	If Ring is set, the ring for communication with the local I/O network is disconnected between adjacent nodes.
			Not lit	If Ring is set, the ring for communication with the local I/O network is connected normally.
Abnormal status	ERROR	Red	Lit	Major failure
			Flashing	Minor failure
			Not lit	Normal
Battery status	BATT	Red	Lit	Battery voltage low
			Not lit	Normal battery voltage

● Communication status LEDs



Item	LED name	Color	State	Description	
Communication status	LAN0 100	Green	Lit	A link is established at 100 Mbps.	
			Flashing	Data is being transmitted and received at 100 Mbps.	
			Not lit	A link is not established at 100 Mbps.	
	LAN0 1000	Green	Lit	A link is established at 1 Gbps.	
			Flashing	Data is being transmitted and received at 1 Gbps.	
			Not lit	A link is not established at 1 Gbps.	
Communication status	LAN1	Green	Lit	A link is established.	
			Flashing	Data is being transmitted and received.	
			Not lit	A link is not established.	
	LAN2	Green	Lit	A link is established.	
			Flashing	Data is being transmitted and received.	
			Not lit	A link is not established.	
RS-485 CH1 Communication status	485-1	RX	Green	Flashing	Data is being received.
			Green	Not lit	Data is not being received.
		TX	Green	Flashing	Data is being transmitted.
			Green	Not lit	Data is not being transmitted.
		EOL	Green	Lit	RS-485 built-in terminating resistor ON
			Green	Not lit	RS-485 built-in terminating resistor OFF
RS-485 CH2 Communication status	485-2	RX	Green	Flashing	Data is being received.
			Green	Not lit	Data is not being received.
		TX	Green	Flashing	Data is being transmitted.
			Green	Not lit	Data is not being transmitted.
		EOL	Green	Lit	RS-485 built-in terminating resistor ON
			Green	Not lit	RS-485 built-in terminating resistor OFF

● IO status LEDs



Item	LED name	Color	State	Description
DI status	DI1–DI4	Green	Lit	DI ON
			Not lit	DI OFF
DO status	DO1–DO6	Green	Lit	DO ON
			Not lit	DO OFF
UI status	UI1–UI8	Green	Lit	DI is ON when DI is set.
			Not lit	DI is OFF when DI is set.

● Controller alarm status LED

Item	LED name	Color	State	Description
Controller alarm status	ERR	Green	Lit	Normal
			Not lit	Abnormal, power off, initializing (uncontrolled state)

■ For CE-Marked Products

Install this product in a panel cabinet. Additionally, always keep the panel cabinet accessible only to people with sufficient knowledge concerning electrical equipment.

This product complies with the following harmonised standards of the Radio Equipment Directive (RED), the Electromagnetic Compatibility Directive (EMCD) and the Low Voltage Directive (LVD).

RED: EN 300 330

EMCD: EN 61326-1 Class A, Table 2 (for use in an industrial electromagnetic environment)

EN 301 489-1 / EN 301 489-3

LVD: EN 61010-1 Overvoltage category II

Pollution degree 2

■ For UL-Marked Products

Install this product in a panel cabinet.

•PAZX ENERGY MANAGEMENT EQUIPMENT

•E492866

•UL 60730-1

•Pollution degree 2

•Overvoltage category II

•Rated impulse voltage 4000V

•IP20

•TYPE 1 ACTION



The model numbers of the UL-certified product are WJ-1102Q_____ -U and WJ-1102W0000-U.
WJ-1102Q_____ -U is listed by UL as WJ-1102W0000-U.

■ For BTL-Listed Products



BACnet is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or guarantee compliance with BTL's products. Compliance of listed products to the requirements of ASHRAE Standard 113 is the responsibility of BTL (see BTL website), BTL is a registered trademark of BTL.

Firmware version 1.3.22 and later of this product comply with BTL certification requirements.

ACTIVAL is a trademark of Azbil Corporation.

BACnet is a registered trademark of ASHRAE.

Modbus is a trademark and the property of Schneider Electric SE, its subsidiaries and affiliated companies.

Azbil Corporation
Building Systems Company

azbil

<https://www.azbil.com/>

Specifications are subject to change without notice.

AS-1001E
Rev. 6.0 Oct. 2022
(J: AS-1001 Rev.6.0)