TOSVERT VF-AS3

Embedded Ethernet Function Manual

TOSHIBA INDUSTRIAL PRODUCTS AND SYSTEMS CORPORATION

NOTICE

1. Read this manual before installing or operating. Keep this manual on hand of the end user, and make use of this manual in maintenance and inspection.
2. All information contained in this manual will be changed without notice. Please contact your Toshiba distributor to confirm the latest information.

Safety precautions

On the inverter and in its instruction manual, important information is contained for preventing injuries to users and damages to assets and for proper use of the device. Read the instruction manual attached to VF-AS3 along with this instruction manual for completely understanding the safety precautions and adhere to the contents of these manuals.

- TOSVERT VF-AS3 Instruction Manual.....E6582062

⚠WARNING	
Prohibited	▼ Do not use application of writing into inverter parameters more than 100,000 times. The Life of EEPROM is approximately 100,000 times. Frequent writing to the EEPROM of inverter will cause a memory corruption.
Mandatory	▼ The following steps must be performed before wiring and installation. Turn off all input power, wait at least 15 minutes, and confirm that the charge lamp of the drive is no longer lit. If steps above are not properly performed, this can result in electric shock. ▼ Use an emergency stop device and an additional safety device in your system to prevent serious accident due to the option malfunctions. Usage without any emergency stop device or any additional safety device can result in accident or injury.

⚠CAUTION	
Prohibited	▼ Do not use application of writing into inverter parameters more than 100,000 times. The Life of EEPROM is approximately 100,000 times. Frequent writing to the EEPROM of inverter will cause a memory corruption. ▼ Do not connect RS485 communication cable into Ethernet port. Erroneous connection will result in failure.
Mandatory	▼ Insert an electromagnetic contactor between the inverter and the power supply so that the machine can be stopped without fail from an external controller in case of an emergency. ▼ About the handling of the inverter, please follow the Inverter's instruction manual. ▼ Set up "Communication error trip function (see below)" to stop the Inverter when the device is deactivated by an unusual event such as tripping, an operating error, power outage, failure, etc. - Network Time-Out, Inverter operation at disconnection, Preset speed operation selection (Refer to "2.4.4 Setting for Communication error detection" for details) Deactivated the device may cause an accident, if the "Communication error trip function" is not properly set up.

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1. Overview

The VF-AS3 embeds an Ethernet dual port adapter that can be used for the following Modbus TCP functions and EtherNet/IP functions. Also VF-AS3 is certified for EtherNet/IP communication with CPU1 version 108 or more.

1.1. **Specification**

Embedded ethernet module specifications

Item	Specification
Ethernet connector	Dual RJ45 shielded connector
Supported topology	Daisy chain topology, Star topology
Supported network	Modbus TCP / EtherNet/IP
Indicator	4 LEDs indicating the communication status and error status.

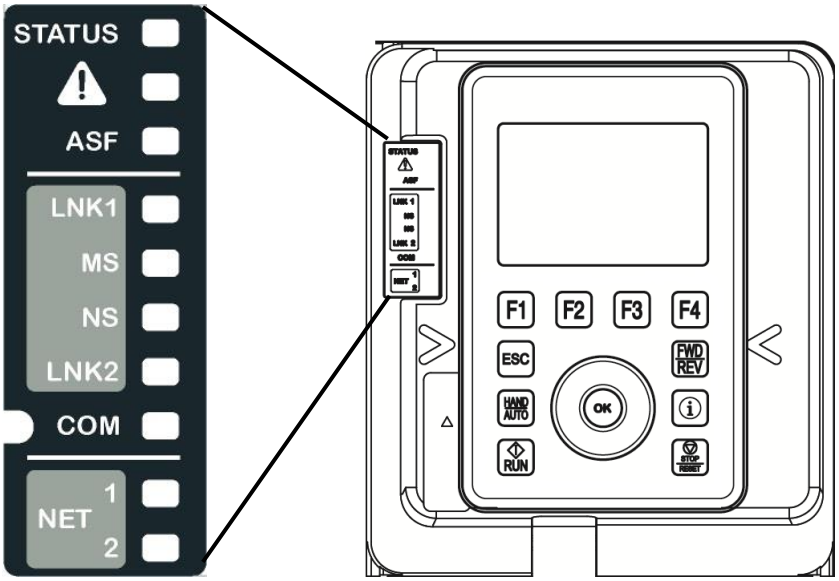
Network specifications

Item		Specification
Modbus TCP	Supported function	Read Holding Registers (0x03)
		Write Single Register (0x06)
		Write Multiple Registers (0x10)
		Read/Write Multiple Registers (0x17) with I/O scanning
		Read Device Identification (0x2B)
	Command reception time	About 5ms *
EtherNet/IP (CPU1 version V108 or more)	Supported Object	Identity Object (0x01)
		Message Router Object (0x02)
		Assembly Object (0x04)
		Connection Manager Object (0x06)
		Motor Data Object (0x28)
		Control Supervisor Object (0x29)
		AC/DC Drive Object (0x2A)
		Parameter access 1 Object (0x64)
		Parameter access 2 Object (0x65)
		Port Object (0xF4)
		TCP/IP Interface Object (0xF5)
		Ethernet Link Object (0xF6)
	I/O assembly instances	20/70, 21/71, 22/72, 23/73 (AC Drive Device profile) 100/150, 101/151, 102/152, 105/155, 107/157 (Vender specification)
	Command reception time	About 5ms *
Ethernet	Baud rate	Auto negotiation (10/100Mbps, Full/Half duplex)
	IP configuration mode	Fixed, BOOTP, DHCP
	Auto MDI-X	Supported
	LLDP	Supported
	Web server	Inverter status monitor, inverter parameter monitor/configuration, network status monitor, password lock, access management
	SNTP	Supported (Setup from Web server interface)

* Command reception time is until the inverter is operated by RUN command from network.

1.2. **LED indicator**

The LED indicator shows the present status of the network and module.



■The behavior of LNK1 LED and LNK2 LED

Link Activity	
Color and behavior	Meaning
OFF	No link
Green blinking	Network activity at 100 Mbit/s
Green ON	Link established at 100 Mbit/s
Yellow blinking	Network activity at 10 Mbit/s
Yellow ON	Link established at 10 Mbit/s

■The behavior of MS LED

Module Status	
Color and behavior	Meaning
OFF	Device does not have IP address or powered off
Flashing Green/Red (250ms cycle)	Power on testing
Green flashing (500ms cycle)	Device has not been configured
Green ON	Device is operating correctly
Red flashing (500ms cycle)	Device has detected a communication error
Red ON	Device has detected a non-recoverable error

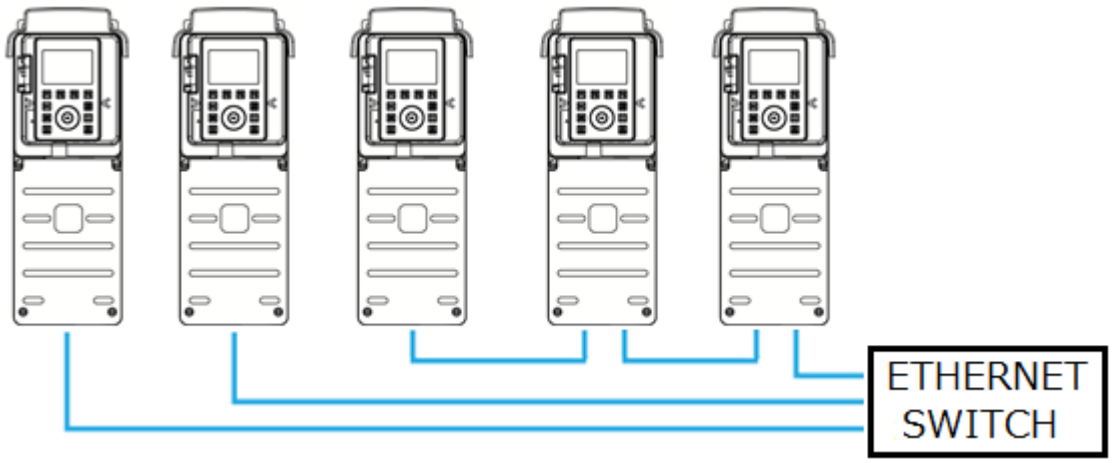
■The behavior of NS LED

Network Status	
Color and behavior	Meaning
OFF	The device does not have IP address or powered off
Flashing Green/Red (250ms cycle)	Power on testing
Green flashing (500ms cycle)	Device has a valid IP, but no command word connection
Green ON	A connection is established to control the command word
Red flashing (500ms cycle)	An established connection to control the command word is closed or timed out
Red ON	Duplicated IP

1.3. Installation Topology

The product support daisy chain and star topology wiring solutions:

Daisy Chain and/or Star topology



Note: Please use the LAN cable comply with ANSI/TIA/EIA-568-B.2 (CAT5E or successor).

1.4. EDS file

As for acquisition of an EDS file for VF-AS3, please contact your Toshiba distributor.

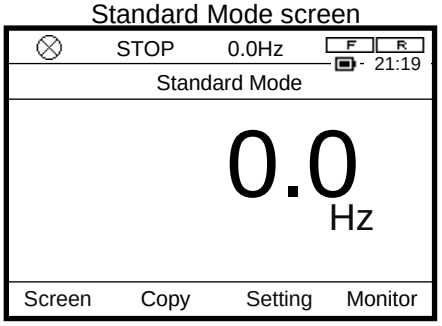
1.5. **Display of Embedded Ethernet setting screen**

Inverter IP address can be set easily by Embedded Ethernet setting screen from guidance function of LCD panel. In addition, current settings can be checked in the monitor display by scrolling the screen.

Access Embedded Ethernet setting screen of the guidance function with the following operation.

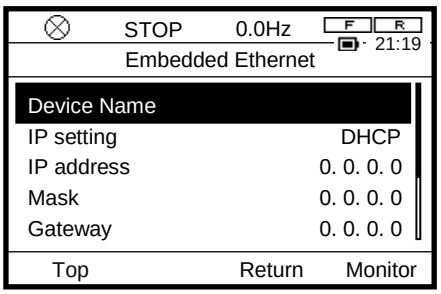
[ESC] key => Select "3. Guidance function"
=> [OK] key => Select "3.1 Embedded Ethernet"
=> [OK] key

Standard Mode screen

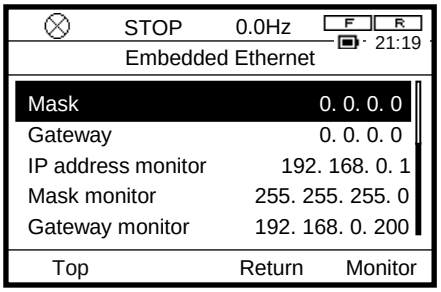


The Embedded Ethernet setting screen allows you to set IP address setting mode, IP address, subnet mask, default gateway and device name.
In addition, you can check the currently settings in the monitor display by scrolling the screen.

Embedded Ethernet setting screen



Here is an example when the IP address 192. 168. 0. 1 is obtained by DHCP server.

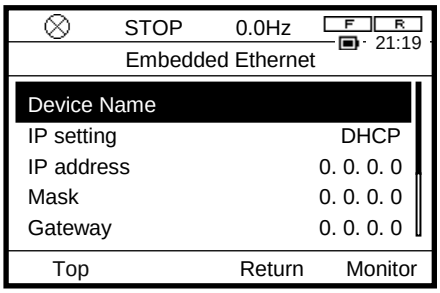


1.6. Setting IP address

This section contains two methods to set the IP address.
One is a method using the DHCP servicer, and the other a method to set manually.
For detail of IP setting parameters, refer to section “0”.

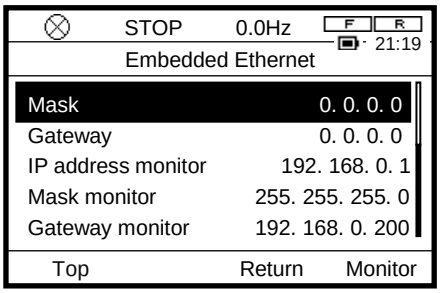
To obtain the IP address by using the DHCP server

(1) Select "IP Setting" on Embedded Ethernet setting screen and set "2: DHCP."



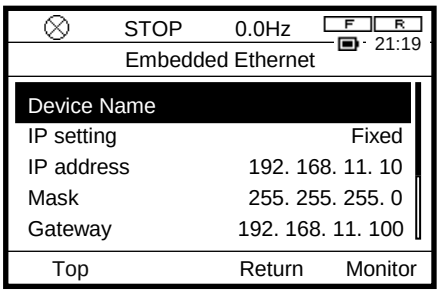
(2) Connect the inverter and the equipment with a DHCP server function, and reset the inverter.

(3) Check that the IP settings have been obtained by the monitor display in Embedded Ethernet setting screen.



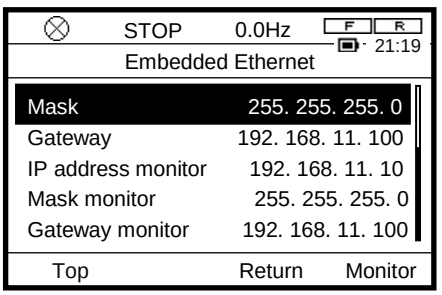
To set the IP address manually

(1) Select "IP Setting" on the Embedded Ethernet setting screen and set "0: Fixed."



(2) Set "IP Address", "Mask", "Gateway" to arbitrary values, and reset the inverter. If you don’t know Gateway address, you may set the value of “0.0.0.0” for “Gateway” setting.

(3) Check that the IP settings have been changed by Embedded Ethernet setting screen.



2. Parameters

2.1. **Common parameters**

The product doesn't operate if these parameters are not correctly set.

Title	Comm. No.	Parameter name	Description	Default setting
CMOd	0003	Command mode selection	0: Terminal 1: Operation panel, Extension panel 2: Embedded Ethernet 3: RS485 communication (connector 1) 4: RS485 communication (connector 2) 5: Communication option	1
FMOd	0004	Frequency setting mode selection 1	0: － 1: Terminal RR 2: Terminal RX 3: Terminal II 4: Terminal AI4 (option) 5: Terminal AI5 (option) 6-9: － 10: Touch wheel 1 (power off or press OK to save) 11: Touch wheel 2 (press OK to save) 12: Sr0 13,14: － 15: Terminal Up/Down frequency 16: Pulse train 17: High resolution pulse train (option) 18,19: － 20: Embedded Ethernet 21: RS485 communication (connector 1) 22: RS485 communication (connector 2) 23: Communication option	1
AUE	0032	Eco-standby power setting	0: - 1: Embedded Ethernet OFF (Unable to communicate with Ethernet)	0
F519	0519	Setting of acceleration / deceleration time unit	0: - 1: 0.01s unit (0 after execution) 2: 0.1s unit (0 after execution)	0 (*1)
F749	0749	Integrating wattmeter display unit selection	0: 1.0=1kWh 1: 1.0=10kWh 2: 1.0=100kWh 3: 1.0=1000kWh 4: 1.0=10000kWh 5: 1.0=100000kWh	(*2)
F830	0830	MODBUS continuous address	0: Disabled 1: Enabled	0
F856	0856	Number of motor pole pair for communication	1: 2 pole 2: 4 pole 3: 6 pole 4: 8 pole 5: 10 pole 6: 12 pole 7: 14 pole 8: 16 pole	2
F897	0897	Parameter Writing	0: Storage to memory device 1: Storage to memory device except by communication	0

Title	Comm. No.	Parameter name	Description	Default setting
F899	0899	Communication function reset	0: - 1: Reset option and inverter (after execution: 0)	-

(*1): 0.1s unit is selected as default setting.

(*2): Default setting values vary depending on the capacity.

2.2. **Communication parameters**

Title	Comm. No.	Parameter name	Description	Default setting
C081 to C096	C081 to C096	Device Name 1-16 (*1)	Max 16 characters Default setting1 function ([tyP] = “3”) does not work for this parameter.	0
C606	C606	Emb Eth. Communication error detection delay	0.0 - 100.0 sec.	0.0
C607	C607	Emb Eth. Communication error operation	0: Turn off bit 10, 14 and 15 of FA36 1: Continue running 2: Deceleration stop 3: Coast stop 4: Network error stop (E-43 trip) 5: Preset speed operation (by C608 setting)	4
C608	C608	Emb Eth. Preset speed at communication error	0: None 1 to 15: Preset speed	0
C609	C609	Emb Eth. Communication error detection	0: Always 1: Communication command (Frequency command and command from Emb Eth.) enabled 2: 1 + during run	1
C610	C610	Emb Eth. IP setting mode (*1)	0: Fixed 1: BOOTP 2: DHCP	2
C611 to C614	C611 to C614	Emb Eth. IP address setting value (*1)	The IP address of the device. These fields are effective settings at [C610] = “0”.	0.0.0.0
C615 to C618	C615 to C618	Emb Eth. Subnet mask setting value (*1)	The subnet mask of the device. These fields are effective settings at [C610] = “0”.	0.0.0.0
C619 to C622	C619 to C622	Emb Eth. Default gateway setting value (*1)	The gateway IP address of the device. These fields are effective settings at [C610] = “0”.	0.0.0.0
C641 to C650	C641 to C650	Emb Eth. Scanner input select 1 to 10	0: No action 1: FA36 (Emb Ethernet command 1) 2: FA38 (Emb Ethernet command 2) 3: FA37 (Emb Ethernet frequency command) 4: FA40 (Emb Ethernet torque command) 5: FA50 (Terminal output data) 6: FA51 (Terminal FM data) 7: FA52 (Terminal AM data) 8: F601 (Stall prevention level 1) 9: F441 (Power running torque limit level 1) 10: F443 (Regenerative torque limit level 1) 11: F460 (Speed control response 1) 12: F461 (Speed control stabilization coefficient 1) 13: ACC (Acceleration time 1) (*2) 14: dEC (Deceleration time 1) (*2) 15: UL (Upper limit frequency) 16: vb (Manual torque boost 1) 17: vLv (Base frequency voltage 1)	C641: 1 C642: 3 C643 to C644: 0

Title	Comm. No.	Parameter name	Description	Default setting
C651 to C660	C651 to C660	Emb Eth. Scanner output select 1 to 10	0: No action 1: FD01 (Inverter status 1) 2: FD00 (Output frequency) 3: FD03 (Output current) 4: FD05 (Output voltage) 5: FC91 (Alarm code) 6: FD22 (PID feedback value) 7: FD06 (Input terminal status) 8: FD07 (Output terminal status) 9: FE35 (Terminal RR input value) 10: FE36 (Terminal RX input value) 11: FE37 (Terminal II input value) 12: FD04 (Input voltage (DC detection)) 13: FD16 (Speed feedback frequency (real time)) 14: FD18 (Torque) 15: FE60 (My function monitor output 1) 16: FE61 (My function monitor output 2) 17: FE62 (My function monitor output 3) 18: FE63 (My function monitor output 4) 19: F880 (Free memorandum) 20: FD29 (Input power) 21: FD30 (Output power) 22: FE14 (Cumulative operation time) 23: FE40 (Terminal FM output value) 24: FE41 (Terminal AM output value) 25: FD20 (Torque current) 26: FD23 (Motor overload factor) 27: FD24 (Inverter overload factor) 28: FD25 (Braking resistor overload factor) 29: FD26 (Motor load factor) 30: FD27 (Inverter load factor) 31: FE56 (Terminal S4/S5 pulse train input value) 32: FE70 (Inverter rated current) 33: FE76 (Input cumulative power) 34: FE77 (Output cumulative power) 35: FD83 (Internal temperature 1)	C651: 1 C652: 2 C653 to C654: 0
C666	C666	Emb Eth. I/O scan timeout detection time	0: Disable 0.1-30.0 s	2.0
C667	C667	Emb Eth. I/O scan setting (*1) (*4)	0: Disable 1: Enable	1
C668	C668	Emb Eth. Web server (*1)	0: Disabled 1: Enabled	1
C669	C669	Emb Eth. Web server reset	0: - 1: Execution (after execution: 0)	0
C670	C670	Emb Eth. Unit ID	0-247 (*3)	0
C671	C671	Emb Eth. Massage timeout detection time (*1) (*4)	0: Disable 0.1-100.0 s	2.0
C680	C680	EmbEth. Inverter to inverter communication select (*1) (*4)	0: Disabled 1: Inverter to inverter communication 2: Pump control	0
C681	C681	EmbEth. Inverter to inverter communication ID (*1) (*4)	0: Leader 1-9: Follower 1-9	0

Title	Comm. No.	Parameter name	Description	Default setting
C682	C682	EmbEth. Inverter to inverter communication (*1) (*4)	0: Follower (0Hz command when Leader fails) 1: Follower (continue running when Leader fails) 2: Follower (emergency off when Leader fails) 3: Leader (transmit frequency command) 4: Leader (transmit output frequency signal) 5: Leader (transmit torque command) 6: Leader (transmit output torque command)	0

(*1): These parameters are affected after reset. Wait 5 second from the setting to reset to ensure that settings are reflected.

If you want to change the IP address and the device name, please set the device name first.

(*2): The unit is depended by the [F519] setting.

(*3): In the CPU1 version V104 or earlier of VF-AS3, parameter value 14 is reserved for internal process.

Do not set the <C670> at 14 with V104 or earlier, inverter initialization cannot be completed after reset.

(*4): This parameter is supported in the CPU1 version V114 or rater.

2.3. **Monitor parameters**

The following parameters can be used for network status confirmation of the embedded ethernet.

Title	Comm. No.	Parameter name	Description
C623 to C628	C623 to C628	Emb Eth. MAC address monitor	The MAC address of the device. [C623 – C624 – C625 – C626 – C627 – C628]
C629 to C632	C629 to C632	Emb Eth. IP address monitor	The current IP address of the device.
C633 to C636	C633 to C636	Emb Eth. Subnet mask monitor	The subnet mask actual of the device.
C637 to C640	C637 to C640	Emb Eth. Default gateway monitor	The gateway IP address actual of the device.
C696	C696	Emb Eth. Command monitor	This parameter displays the command from Embedded Ethernet.
C697	C697	Emb Eth. Frequency command monitor	This parameter displays the reference frequency from embedded ethernet.
C698	C698	Emb Eth. Error monitor	Monitor of the Ethernet error. 0: No error 1: Modbus TCP Scanning timeout 3: INV to INV communication timeout 4: EtherNet/IP timeout 5: Modbus Message timeout
C699	C699	Emb Eth. External error monitor	Monitor of the Ethernet error. 0: No error 1: Invalid IP address 2: Duplicate IP address 3: INV to INV communication configuration error

2.4. The details of the parameter setting

2.4.1. [F830: MODBUS continuous address]

VF-AS3 does not have parameters of the communication number “0xXXX**A**” to “0xXXX**F**” and “0xXX**A**X” to “0xXX**F**X”.

When parameters are accessed with the Modbus function command 0x03 and 0x10, it is possible to select these parameters are slipped or not by parameter [F830].

• **[F830] = “0: Disabled” (Default setting)**

Communication number “0xXXX**A**” to “0xXXX**F**” and “0xXX**A**X” to “0xXX**F**X” are skipped.

Example: When 3 word read/write command is executed from communication number “0x0009” ([ACC: Acceleration time 1]), access the communication number in the following order.

Access word	Parameter	Communication No.
1	[ACC: Acceleration time 1]	0x0009
2	[DEC: Deceleration time 1]	0x0010
3	[FH: Maximum frequency]	0x0011

• **[F830] = “1: Enabled”**

Communication number “0xXXX**A**” to “0xXXX**F**” and “0xXX**A**X” to “0xXX**F**X” are not skipped.

Example: When 3 word read/write command is executed from communication number “0x0009” ([ACC: Acceleration time 1]), access the communication number in the following order.

Access word	Parameter	Communication No.
1	[ACC: Acceleration time 1]	0x0009
2	None*	0x000A
3	None*	0x000B

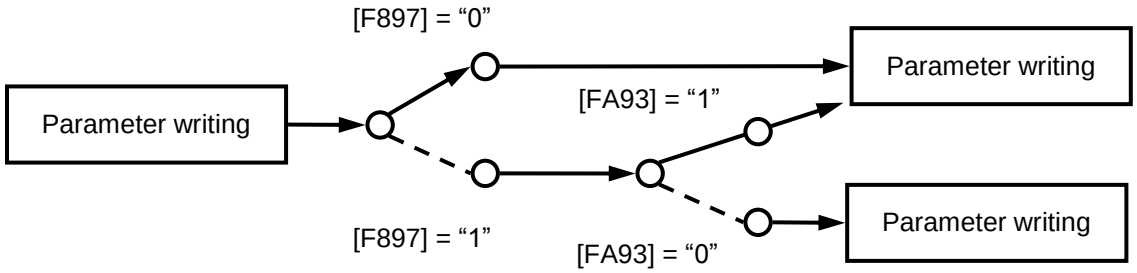
Note) If the parameter not assigned is accessed (read) by communication, inverter returns "0x8000".
If the parameter not assigned is accessed (write) by communication, inverter returns error code “0x02: Illegal Data Address”.

2.4.2. [F897: Parameter writing]

When [F897: Parameter writing] is set to "1", all writing via communication is only done to the RAM. This parameter can be used when frequently writing to EEPROM supported parameters, but the content of the parameters return to the values stored in EEPROM each time the inverter is reset.

If you want to temporarily allow storage to EEPROM when [F897] = "1", you can set [FA93] to "1: Temporarily suppress mode for RAM" to allow writing EEPROM supported parameters.

Important	▼ The [F897] setting is reflected after a reset operation such as power off, so you need power reset after the setting. In addition, note that if [0897] = "0" is set via communication, the [F897] parameter does not return to "0: Storage to memory device". To set to "0", modify the setting from the operation panel.



2.4.3. [C081 to C096: Device name 1 to 16]

This devide can set the "Device name" of 16 characters.

(These 16 characters are stored in the parameter [C081] to [C096].)

Please set the setting of the device name according to the following rules.

1. The parameter is displayed by the hexadecimal number.
2. Each parameter shows an ASCII character on Guidance function and Web server.
3. The relation between the device name and the parameter is as follows.

Example for Device Name =’VFAS3-2007P’

Chars No.	Parameter	Character (Ex.)	ASCII (Ex.)	Set point(Ex.)
1	C081	‘V’	0x56	86
2	C082	‘F’	0x46	70
3	C083	‘A’	0x41	65
4	C084	‘S’	0x53	83
5	C085	‘3’	0x33	51
6	C086	‘-‘	0x2D	45
7	C087	‘2’	0x32	50
8	C088	‘0’	0x30	48
9	C089	‘0’	0x30	48
10	C090	‘7’	0x37	55
11	C091	‘P’	0x50	80
12	C092	-	0x00	0x00
13	C093	-	0x00	0x00
14	C094	-	0x00	0x00
15	C095	-	0x00	0x00
16	C096	-	0x00	0x00

2.4.4. Setting for Communication error detection [C606] to [C609]

[C606: Emb Eth. Communication error detection delay]

Adjustment range: 0.0 - 100.0 sec.

The waiting time of network error detection can be adjusted. If network error was removed during [C606], inverter will continue normal operation.

[C607: Emb Eth. Communication error operation]

Adjustment range:
- 0: Turn off bit 10, 14 and 15 of FA36
- 1: Continue running
- 2: Deceleration stop
- 3: Coast stop
- 4: Network error stop (E-43 trip)
- 5: Preset speed operation (by C608 setting)

When the communication error is detected, inverter will operate in accordance with the setting of [C607].z

[C608: Emb Eth. Preset speed at communication error]

Adjustment range:
- 0: None
- 1 to 15: Preset speed

When the communication error is detected, operation frequency can be selected from preset speed (Only when [C607] is set to 5). When you set “0: None”, inverter will operate in accordance with enabled frequency command.

[C609: Emb Eth. Communication error detection]

Adjustment range:
- 0: Always
- 1: Communication command
- 2: 1 + during run

Condition of communication error detection can be selected by setting of [C609].

When [C609] is set to “1: Communication command”, inverter will enable the communication error detection if frequency command and communication command 1 from Embedded Ethernet are enabled.

When [C609] is set to “2: 1 + during run”, inverter detect the communication error during operation only in the above condition.

2.4.5. [C666: Emb Eth. I/O scan timeout detection time]

Adjustment range:
- 0: Disable
- 0.1-30.0 s

When you use the I/O scanning service of ModbusTCP, inverter will detect the time out error if I/O scanning is not performed between periods of [C666] setting.

When [C666] is set to “0: Disable”, timeout for I/O scanning function does not detected.

2.4.6. [C671: Emb Eth. Massage timeout detection time]

Adjustment range:
0: Disable
0.1-100.0 s

When you use the Massage service of ModbusTCP, inverter will detect the time out error if Massage is not performed between periods of [C671] setting.

When [C671] is set to “0: Disable”, timeout for Massage function does not detected.

Massage time out error is not detected during I/O scanning.

2.4.7. Assigning IP addresses parameters [C610], [C611] to [C622]

The following setting parameters can be accessed from the “Embedded Ethernet setting” on guidance function. For detail of “Embedded Ethernet setting”, refer to section “1.6 Setting IP address”.

The address is assigned according to setting of [C610: Emb Eth. IP setting mode].

C610	Comments
0	The device uses the address defined in [C611] to [C622]
1	The device receives its address from a BOOTP server.
2	The device receives its address from a DHCP server.

When you set up the IP address by manual ([C610] = “0”), bellow parameters setting are needed.

- [C611 to C614: Emb Eth. IP address setting value 1 to 4]
- [C615 to C618: Emb Eth. Subnet mask setting value 1 to 4]
- [C619 to C622: Emb Eth. Default gateway setting value 1 to 4]

These parameters are effective settings at [C610] = “0: Fixed”).

If you set [C610] = “1: BOOTP” or “2: DHCP”, these parameters are invalidity.

After dynamic addressing by BOOTP server or DHCP server, the new address values are displayed in the bellow monitor parameters.

- [C629 to C632: Emb Eth. IP address monitor 1 to 4]
- [C633 to C636: Emb Eth. Subnet mask monitor 1 to 4]
- [C637 to C640: Emb Eth. Default gateway monitor 1 to 4]

2.4.8. Embedded Ethernet Inverter to inverter communication [C680] to [C682]

[C680: EmbEth. Inverter to inverter communication select]

Adjustment range:
0: Disabled
1: Inverter to inverter communication
2: Pump control

[C681: EmbEth. Inverter to inverter communication ID]

Adjustment range:
0: Leader
1 to 9: Follower 1 to 9

[C682: Emb Eth. Inverter to inverter communication]

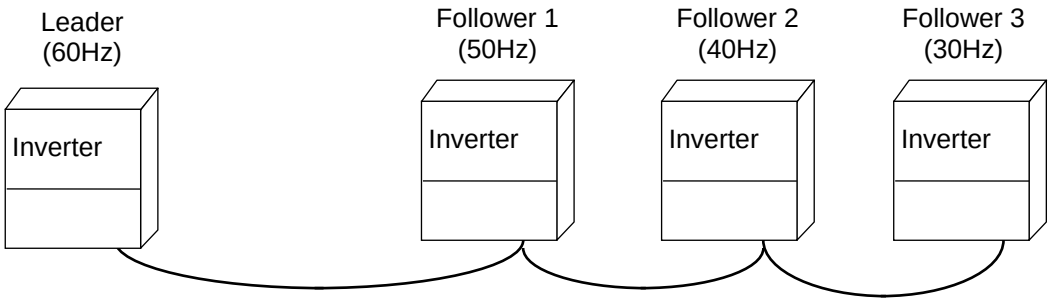
Adjustment range:
0: Follower (0Hz command when Leader fails)
1: Follower (continue running when Leader fails)
2: Follower (emergency off when Leader fails)
3: Leader (transmit frequency command)
4: Leader (transmit output frequency signal)
5: Leader (transmit torque command)
6: Leader (transmit output torque command)

When [C680] is set to “1: Inverter to inverter communication”, you can use inverter to inverter communication. (Please refer to “Pump control function manual” E6582124 for usage of “2: Pump control”) Inverter to inverter communication can be used to implement speed-proportional control between multiple inverters without using a PLC or a computer. Commands are input to the leader inverter via the operation panel or analog signal.

When the inverter-to-inverter communication function is used, the leader inverter keeps sending data selected by parameter [C682] to all follower inverters on the same network. You can configure a network using this function to perform simple synchronized operation or speed proportional operation.

* When the leader trips, all follower inverters operate according to the parameter [C682] of each follower inverter.
* To select how the followers operate when cable is disconnected or the leader is turned off (continue / alarm/trip), use the communication error detection function ([C606] to [C609]).
* Up to 9 followers can be connected by this function.

<Communication connection schematic diagram (example)>



Important	▼ In case of communication cable is disconnected, you can trip a follower inverter by using the communication error detection function ([C606] to [C609]). The leader will not trip even if its cable is disconnected. To trip the leader, install an interlock from the follower side using an FL failure relay signal, etc.

■ Transmission data

The leader side operation command (Run/Stop and Forward/Reverse) and reference value (frequency command, torque command, output frequency or output torque) are transmitted to the follower side.
These data are sent as UDP packets.

When transmitting frequency command or output frequency, data is converted using [FH: Maximum frequency] as below.

- **Details of transmitted data during inverter-to-inverter communication (frequency value)**

$$fc(\%) = \frac{\text{Leader frequency value(Hz)} \times 10000}{\text{Leader maximum frequency(Hz)}} \quad (1=0.01\%)$$

* Calculation results of 1 (0.01%) or less are rounded down. As a result, a maximum error of 0.01% occurs.

- **Conversion details of frequency commands after they are received by followers**

The value after conversion below is written to the RAM as a frequency command value.

$$fc(Hz) = \frac{\text{Reception data}(\%) \times \text{Follower maximum frequency(Hz)}}{10000} \quad (1=0.01\text{Hz})$$

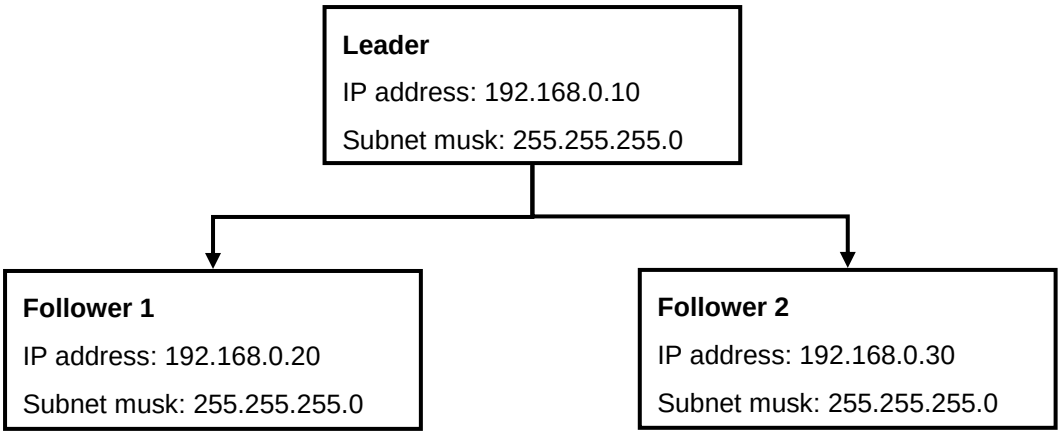
* Calculation results of 1 (0.01 Hz) or less are rounded down. As a result, a maximum error of 0.01 Hz occurs.

■ Parameter setting

- **Network setting**

Please set the parameter [C610] to [C620] so that leader and followers build a single subnetwork.

Example settings



- **Inverter to inverter communication setting**

  Set only one inverter on the network as leader and all others as followers.

  * If multiple leaders are set on the same network, data conflict will occur. Be sure to only set one leader.

  Setting for the leader inverter

  Set the data to be set from the leader to the followers.

  3: Leader (transmit frequency command)

  4: Leader (transmit output frequency signal)

  5: Leader (transmit torque command)

  6: Leader (transmit output torque command)

  Setting for the follower inverters

  Set the operation of the follower side when the leader trips.

  0: Follower (0 Hz command when Leader fails)

  Output frequency is limited by the lower limit frequency.

  1: Follower (continue running when Leader fails)

  When an output frequency is set on the leader, the trip causes the output frequency of the leader to change to 0 Hz. In this case, the frequency command to the followers will be 0 Hz.

  2: Follower (emergency off when Leader fails)

  The stop pattern follows the [F603: Emergency off stop pattern] settings.

* These parameters are reflected after resetting the inverter or turning the inverter power off and then on.

- **Run command select ([CMOD]) and Frequency command select 1 ([FMOd])**

  For [CMOD] and [FMOd], set the input that gives commands to the inverter.

  Setting for the leader inverter

  Set an arbitrary value to receive the command for leader.

  Setting for the follower inverters

  Set a value for Embedded Ethernet ([CMOD] = "2", [FMOd] = "20").

■ Parameter setting example for embedded ethernet

Below setting example, the frequency reference and operation command are input from the panel of the leader, and these are transmitted to the follower by inverter to inverter communication.

Parameters of the leader (examples)

[CMOd] = "1" Example: Operation panel
[FMOd] = "10" Example: Touch wheel 1
[C610] = "0" Fixed
[C611] = "192"
[C612] = "168"
[C613] = "1"
[C614] = "10"
[C611] = "255"
[C612] = "255"
[C613] = "255"
[C614] = "0"
[C680] = "1" Inverter to inverter communication
[C681] = "0" Leader
[C682] = "3" Leader (transmit frequency command)

Parameters of the followers (examples)

[CMOd] = "2" Embedded Ethernet
[FMOd] = "20" Embedded Ethernet
[C610] = "0"
[C611] = "192"
[C612] = "168"
[C613] = "1"
[C614] = "20"
[C611] = "255"
[C612] = "255"
[C613] = "255"
[C614] = "0"
[C680] = "1" Inverter to inverter communication
[C681] = "1" Follower 1
[C682] = "0" Follower (0Hz command when Leader fails)

2.5. The overview of the VF-AS3 command parameters

2.5.1. [FA36: Communication command1 from embedded ethernet]

bit	Function	0	1	Note
0	Preset speed switching 1	0000: Preset speed operation OFF (*1) 0001-1111: Setting of preset speed operation frequencies (1-15)		Preset speed operation is disabled or preset speed operation frequencies (1-15) are set by specifying bits for preset speed operation frequencies 1-4.
1	Preset speed switching 2			
2	Preset speed switching 3			
3	Preset speed switching 4			
4	V/f switching 1 (*2)	V/f 1	V/f 2	V/f 1: Pt = setting value, vL, vLv, vb, tHrA V/f 2: Pt = “0”, F170, F171, F172, F182
5	PID control OFF	PID control permitted	PID control prohibited	-
6	Acc/Dec switching 1 (*3)	AD mode 1	AD mode 2	AD mode 1: ACC, DEC AD mode 2: F500, F501
7	DC braking	OFF	Forced DC braking	-
8	Jog run	OFF	Jog run	-
9	Forward/Reverse	Forward run	Reverse run	-
10	Run/Stop	Stop	Run	-
11	Coast stop (*4)	Standby	Cost stop	-
12	Emergency off	OFF	Emergency off	Always enable, [E] trip
13	Fault reset	OFF	Reset	Trip reset
14	Frequency priority	OFF	Enabled	Enabled regardless of the setting of FMOD
15	Command priority	OFF	Enabled	Enabled regardless of the setting of CMOD

(*1): When set “12 [Sr0]” to FMOd, preset speed operation frequency 0 is selected.
(*2): The V/f switching ORs with Bit 10 of [FA38].
(*3): The Acc/Dec switching ORs with Bit 8 of [FA38]
(*4): When set “2 [Embedded Ethernet]” to CMOd, the Bit 11 (Coast stop) of [FA36] is ON at startup.
If you want to start the operation by [FA36], please turn OFF the Bit 11.

2.5.2. [FA38: Communication command 2 from embedded ethernet]

bit	Function	0	1	Note
0	Control switching	Speed control	Torque control	-
1	Electric power quantity reset	OFF	Reset	Electric power quantity (FE76, FE77) reset
2	(Reserved)	-	-	-
3	Braking request (BC)	Normal	Forcibly braked	-
4	Preliminary excitation	Normal	Enabled	-
5	(Reserved)	-	-	-
6	Braking answer (BA)	Brake applied	Brake released	-
7	Quick deceleration 2	Normal	Enabled	-
8	Acc/dec switching 1 (*1)	00: AD mode 1 01: AD mode 2 10: AD mode 3 11: AD mode 4		Select Acc/Dec mode 1 - 4 by combination of two bits. AD mode 1: ACC, DEC AD mode 2: F500. F501 AD mode 3: F510, F511 AD mode 4: F514, F515
9	Acc/dec switching 2			
10	V/f switching 1 (*2)	00: V/f 1 01: V/f 2 10: V/f 3 11: V/f 4		Select V/f pattern 1 - 4 by combination of two bits V/f 1: Pt = setting value, vL, vLv, vb, tHrA V/f 2: Pt = “0”, F170, F171, F172, F182 V/f 3: Pt = “0”, F174, F175, F176, F183 V/f 4: Pt = “0”, F178, F179, F180, F184
11	V/f switching 2			
12	OC stall level switching and Torque limit switching 1	00: Torque limit 1 / OC stall 1 01: Torque limit 2 / OC stall 2 10: Torque limit 3 / OC stall 1 11: Torque limit 4 / OC stall 2		OC stall 1: F601 OC stall 2: F185 Select torque limit 1 - 4 by combination of two bits Torque limit 1: F441, F443 Torque limit 2: F444, F445 Torque limit 3: F446, F447 Torque limit 4: F448, F449
13	Torque limit switching 2			
14	Speed gain switching	Gain 1	Gain 2	Gain 1: F460, F461, F462 Gain 2: F463, F464, F465
15	(Reserved)	-	-	-

Note: Set 0 to reserved bit.

(*1): The Acc/Dec switching ORs with Bit 6 of [FA36]. When changing Acc/Dec in four types, set Bit 6 of [FA36] to “0” and use [FA38].

(*2): The V/f switching ORs with Bit 4 of [FA36]. When changing V/f in four types, set Bit 4 of [FA36] to “0” and use [FA38].

2.5.3. [FA37: Frequency command from embedded ethernet]

Setting range: “0” to [FH: Maximum frequency]

This frequency command value is enabled only when the frequency command via embedded ethernet is enabled. To make frequency commands via embedded ethernet enabled, set [FMOd: Frequency command select 1] to “20”: Embedded Ethernet” or set the “Command priority” option (bit 14 of [FA36]).

Frequency command is set up by 0.01Hz unit and the hexadecimal number.
For example: when "Frequency command" is set up to “80Hz”, since the minimum unit is 0.01Hz,

80Hz=80÷0.01 = 8000 (Dec.) = 0x1F40 (Hex.)

2.5.4. [FA40: Torque command setting from embedded ethernet]

Torque reference is set up by 0.01% unit and the hexadecimal number.
For example: when "torque command" is set up to “50%”, since the minimum unit is 0.01%,

50%=50÷0.01=5000 (Dec.) =0x1388 (Hex.)

2.5.5. [FA50: Terminal output data]

By setting up the data of the bit 0 - 1 of [FA50] from communication, setting data (OFF or ON) can be outputted to the output terminal.
Please select the functional number 92 - 95 as the selection of the output terminal function [F130 to F138] before using it.

bit	Output TB function name	0	1
0	Designated data output 1 (Output terminal No.: 92, 93)	OFF	ON
1	Designated data output 2 (Output terminal No.: 94, 95）	OFF	ON
2-15	(Reserved)	-	-

Note: Set 0 to reserved bit

2.6. The overview of the VF-AS3 monitor parameters

2.6.1. [FD01: Inverter status 1]

bit	Function	0	1	Note
0	Failure FL	No output	Under in progress	-
1	Failure	Not tripped	Tripped	Trip status includes [rtry] and the trip retention status is also regarded as tripped statuses.
2	Alarm	No alarm	Alarm issued	-
3	Under voltage ([MOFF])	Normal	Under voltage	-
4	V/f switching status	V/f 1	V/f 2	V/f 1: Pt = setting value, vL, vLv, vb, tHrA V/f 2: Pt = “0”, F170, F171, F172, F182
5	PID control OFF	PID control permitted	PID control prohibited	-
6	Acc/Dec switching status	AD mode 1	AD mode 2	AD mode 1: ACC, DEC AD mode 2: F500, F501
7	DC braking	OFF	Forced DC braking	-
8	Jog run	OFF	Jog run	-
9	Forward / reverse run	Forward run	Reverse run	-
10	Run/stop	Stop	Run	-
11	Coast stop (ST = OFF)	ST=ON	ST=OFF	-
12	Emergency stop	No emergency stop status	Emergency stop status	-
13	Standby ST=ON	Start-up process	Standby	Standby: Initialization completed, not failure stop status, not alarm stop status ([MOFF], , [COFF], [StOP], [LStP]), ST =ON and RUN=ON
14	Standby	Start-up process	Standby	Standby: Initialization completed, not failure stop status and not alarm stop status ([MOFF], [COFF], [StOP], [LStP])
15	HAND/AUTO (LOC/REM)	AUTO (REM)	HAND (LOC)	Enabled with [F750] = ”2” HAND: Panel operation is enabled AUTO: Operation method selected [CMOd] and [FMOd] are enabled. Enabled with [F732] = ”0” LOC: Panel operation is enabled REM: Operation method selected [CMOd] and [FMOd] are enabled.

2.6.2. [FD00: Output frequency]

The current output frequency is read into 0.01Hz of units and by the hexadecimal number.
For example, when the output frequency is “80Hz”, 0x1F40 (hexadecimal number) are read.

Since the minimum unit is 0.01Hz,
0x1F40 (Hex.) = 8000(Dec.) * 0.01 = 80 (Hz)

Also about the following parameters, these are the same as this.
- [FD16: Speed feedback frequency] ..... Unit: 0.01Hz
- [FD22: PID feedback value] ..... Unit: 0.01Hz
- [FD29: Input power] ..... Unit: 0.01kW
- [FD30: Output power] ..... Unit: 0.01kW

2.6.3. [FD03: Output current]

The output current is read into 0.01% of units and by the hexadecimal number.
For example, when the output current is 2.4A with the rated current 4.8A, 0x1388 (50.00%) is read out.

Since the minimum unit is 0.01%,
0x1388 (Hex.) = 5000 (Dec.) * 0.01 = 50 (%)

Also about the following parameters, these are the same as this.
- [FD04: Input voltage (DC detection)] ..... Unit: 0.01% (V)
- [FD05: Output voltage] ..... Unit: 0.01% (V)
- [FD18: Torque] ..... Unit: 0.01% (Nm)*

* When the motor information are set to the parameter ([F405 to F415]), torque monitor value "100%" is same as the rated torque of a motor in general.

2.6.4. [FE35, FE36, FE37: Monitoring of the analog input RR, RX, II]

[FE35: Terminal RR input value]
[FE36: Terminal RX input value]
[FE37: Terminal II input value]

These monitors can be used as A/D converter.

[FE35] and [FE37] are capable of reading the data from external devices in a range of 0.01 to 100.00% (unsigned data: 0x0000 to 0x2710).

[FE36] is capable of reading the data from external devices in a range of -100.00 to 100.00% (signed data: 0xD8F0 to 0x2710).

If analog input mode is selected with the frequency setting mode selection parameter, however, keep in mind that any data entered via an analog terminal is regarded as a frequency command.

2.6.5. [FE14: Cumulative run time for monitor]

The operated cumulative time is read by the hexadecimal number.
For example, when cumulative operation time is 18 hours, 0x12 (18 hours) is read.
0x12 (Hex.) = 18 (Dec., hour)

2.6.6. [FE40: FM output monitor], [FE41: AM output monitor]

The output value of FM terminal or AM terminal are read.
The value range is set to 0 to 10000 (0x2710).

2.6.7. [FC91: Alarm code]

bit	Function	0	1	Panel display
0	Overcurrent alarm	Normal	Alarming	[C] flicking
1	Inverter over load alarm	Normal	Alarming	[L] flicking
2	Motor over load alarm	Normal	Alarming	[L] flicking
3	Overheat alarm	Normal	Alarming	[H] flicking
4	Overvoltage alarm	Normal	Alarming	[P] flicking
5	(Undefined)	-	-	-
6	Inverter overheat alarm	Normal	Alarming	[L] flicking
7	Undercurrent alarm	Normal	Alarming	-
8	Overtorque alarm	Normal	Alarming	-
9	Braking resistor overload alarm	Normal	Alarming	-
10	Cumulative run time alarm	Normal	Alarming	-
11	Communication option alarm	Normal	Alarming	[t] flicking
12	Serial communication alarm	Normal	Alarming	[t] flicking
13	Power circuit under voltage alarm	Normal	Alarming	[MOFF] flicking
14	Stop after instantaneous power off	-	Dec., Under stop	[StOP] flicking
15	During sleep	-	Dec., Under stop	[LStP] flicking

Note: The bit described "Undefined" is unstable. Do not use the bit for the judgment.

2.6.8. [FD06: Input terminal status]

bit	TB Name	Function (Parameter)	0	1
0	F	[F111: Input terminal function selection 1]	OFF	ON
1	R	[F112: Input terminal function selection 2]		
2	RES	[F113: Input terminal function selection 3]		
3	S1	[F114: Input terminal function selection 4]		
4	S2	[F115: Input terminal function selection 5]		
5	S3	[F116: Input terminal function selection 6]		
6	S4	[F117: Input terminal function selection 7]		
7	S5	[F118: Input terminal function selection 8]		
8	DI11	[F119: Input terminal function selection 9]		
9	DI12	[F120: Input terminal function selection 10]		
10	DI13	[F121: Input terminal function selection 11]		
11	DI14	[F122: Input terminal function selection 12]		
12	DI15	[F123: Input terminal function selection 13]		
13	DI16	[F124: Input terminal function selection 14]		
14 to 15	(Undefined)	-	-	-

Note: The bit described "Undefined" is unstable. Do not use the bit for the judgment.

2.6.9. [FD07: Output terminal status]

bit	TB Name	Function (Parameter)	0	1
0	FP	[F130: Terminal FP function 1]	OFF	ON
1	(Undefined)	-	-	-
2	FL	[F132: Terminal FL function]	OFF	ON
3	R1	[F133: Terminal R1 function 1]	OFF	ON
4	R2	[F134: Terminal R2 function]	OFF	ON
5	DQ11	[F159: Terminal DQ11 function]	OFF	ON
6	DQ12	[F160: Terminal DQ12 function]	OFF	ON
7	R4	[F161: Terminal R4 function]	OFF	ON
8	R5	[F162: Terminal R5 function]	OFF	ON
9	R6	[F163: Terminal R6 function]	OFF	ON
10	R4(B)	[A201: Terminal R4 (B) function]	OFF	ON
11	R5(B)	[A202: Terminal R5 (B) function]	OFF	ON
12	R6(B)	[A203: Terminal R6 (B) function]	OFF	ON
13 to 15	(Undefined)	-	-	-

Note: The bit described "Undefined" is unstable. Do not use the bit for the judgment.

3. Modbus TCP

3.1. **Header format**

Byte	Description		Comments
0	Transaction identifier	high order	Same transaction ID is returned from Modbus TCP server. Fixed at 0 if it is not required.
1		low order	
2	Protocol identifier	high order	This identifier always equals 0.
3		low order	
4	Length of data	high order	Number of bytes after the Unit ID (Byte 6). The value of the high order should be “0”, because the frame length is always less than 256 bytes.
5		low order	
6	Unit ID (Destination identifier)		Chose from Unit ID described in Section 3.2.
7	Modbus request function code		Chose from Function code described in Section 3.3.

3.2. **Setting of Unit ID**

The Unit ID (destination identifier) is used to access inverter Modbus TCP server.

When you use the Unit ID other than 0, please set the Unit ID to parameter [C670].

Unit ID	Modbus TCP server	Accessible data
0 or value of [C670]	Inverter (VF-AS3)	Inverter parameter Device identification of inverter
255	I/O Scanner	Please refer to “3.7.1 Outline of IO scanning service”

Note: Detection of time out error in Modbus TCP is done only when using the I/O scanner service.

3.3. **List of Modbus functions supported**

Function code	Function name	Description	Size of data
03 (0x03)	Read Holding Register	Read N output words	63 words max.
06 (0x06)	Write Single Register	Write one output word	1 word
16 (0x10)	Write Multiple Registers	Write N output words	63 words max.
23 (0x17)	Read/Write Multiple Registers	Read/Write N words (For I/O Scanning)	8 / 8 words max.
43 (0x2B)	Read Device Identification	Identification	-

3.4. "03 (0x03) Read Holding Registers" function

This Modbus request is used to read a value continuously from contiguous inverter parameters.

Request Format:

Byte	Meaning
0	Function Code = 0x03
1	Communication No. of Starting Parameter Hi
2	Communication No. of Starting Parameter Lo
3	Number of Parameters Hi (0)
4	Number of Parameters Lo (1 - 125)

Response format:

Byte	Meaning
0	Function Code = 0x03
1	Byte Count (B = 2 × Number of Points)
2	First Parameter Data Hi
3	First Parameter Data Lo
. . .	. . . . .
B	Last Parameter Data Hi
B+1	Last Parameter Data Lo

Exception response format:

Byte	Meaning
0	Function Code = 0x83
1	Exception Code 1: Illegal Function 2: Illegal Data Address 3: Illegal Data Value

Notes

▼ If the communication number that doesn't exist is read, device returns 0x8000.

3.5. "06 (0x06) Write Single Register" function

This Modbus request is used to write the value to the inverter parameter.

Request format:

Byte	Meaning
0	Function Code = 0x06
1	Communication No. of Parameter Hi
2	Communication No. of Parameter Lo
3	Write Data Hi
4	Write Data Lo

Response format:

Byte	Meaning
0	Function Code = 0x06
1	Communication No. of Parameter Hi
2	Communication No. of Parameter Lo
3	Write Data Hi
4	Write Data Lo

Exception response format:

Byte	Meaning
0	Function Code = 0x86
1	Exception Code 1: Illegal Function 2: Illegal Data Address 3: Illegal Data Value 4: Slave Device Failure

Notes

▼ When you use this Modbus request, the value is written to the EEPROM.

3.6. "16 (0x10) Write Multiple Registers" function

This Modbus request is used to write a value continuously to contiguous inverter parameter.

Request format:

Byte	Meaning
0	Function Code = 0x10
1	Communication No. of Starting Parameter Hi
2	Communication No. of Starting Parameter Lo
3	Number of Parameters Hi (0)
4	Number of Parameters Lo (1 - 123)
5	Byte Count (B = 2 × Number of Registers)
6	First Parameter Data Hi
7	First Parameter Data Lo
. . .	. . . . .
B+4	Last Parameter Data Hi
B+5	Last Parameter Data Lo

Response format:

Byte	Meaning
0	Function Code = 0x10
1	Communication No. of Starting Parameter Hi
2	Communication No. of Starting Parameter Lo
3	Number of Parameters Hi (0)
4	Number of Parameters Lo (1 - 123)

Exception response format:

Byte	Meaning
0	Function Code = 0x90
1	Exception Code 01: Illegal Function 02: Illegal Data Address 03: Illegal Data Value 04: Slave Device Failure

Notes

▼ When you use this Modbus request, the value is written to the EEPROM.

3.7. "23 (0x17) Read/Write Multiple Registers" function

The "Read/Write Multiple Registers" service is used for the IO Scanning service.

Request format:

Byte	Meaning
0	Function Code = 0x17
1	Read Starting Register Hi(0)
2	Read Starting Register Lo(0)
3	Number of Read Registers Hi (0)
4	Number of Read Registers Lo (2 – 9)
5	Write Starting Register Hi (0)
6	Write Starting Register Lo (0)
7	Number of Write Registers Hi (0)
8	Number of Write Registers Lo (2 - 9)
9	Byte Count (B = 2 × Number of Write Registers)
10	First Write Register Data Hi
11	First Write Register Data Lo
. . .	. . . . .
B+8	Last Write Register Data Hi
B+9	Last Write Register Data Lo

Response format:

Byte	Meaning
0	Function Code = 0x17
1	Byte Count (B = 2 × Number of Points)
2	First Read Register Data Hi
3	First Read Register Data Lo
. . .	. . . . .
B	Last Read Register Data Hi
B+1	Last Read Register Data Lo

Exception response format:

Byte	Meaning
0	Function Code = 0x97
1	Exception Code = 01 (Illegal Function) 02 (Illegal Data Address) 03 (Illegal Data Value) 04 (Slave Device Failure)

Notes

▼ If the communication number that doesn't exist is read, device returns 0x8000.

▼ When you use this Modbus request with I/O scanning service, the value is written to RAM.

▼ Please set the “00” for Read Starting Address and Write Starting Address

3.7.1. Outline of IO scanning service

The IO Scanning service is used to exchange I/O data between controller (PLC) and inverter. It is usually performed by implicit services, thus avoiding the need to program the controller (PLC).
The IO Scanning service operates if it has been enabled in the PLC with function code 0x17.

When you use the I/O scanning service, set the “255” (0xFF) to the Unit ID.
Time out detection time of IO scanning service can be changed by parameter [C666: Emb Eth. I/O scan timeout detection time].

3.7.2. Word register setup

Up to eight of the Read/Write register data will be exchanged by the I/O scan services using Modbus function code 0x17. By parameter setting of C641-C648, C651-C658, you can assign command / monitor parameters for each register.
Since the No. 0 of register is in the reservation data, please use the register No. 1 to No. 8.

Register No.	Output variables (written by IO Scanner)	Input variables (read by IO Scanner)
0	Reserved	Reserved
1	Scanner write word 1 (selected by [C641])	Scanner read word 1 (selected by [C651])
2	Scanner write word 2 (selected by [C642])	Scanner read word 2 (selected by [C652])
3	Scanner write word 3 (selected by [C643])	Scanner read word 3 (selected by [C653])
4	Scanner write word 4 (selected by [C644])	Scanner read word 4 (selected by [C654])
5	Scanner write word 5 (selected by [C645])	Scanner read word 5 (selected by [C655])
6	Scanner write word 6 (selected by [C646])	Scanner read word 6 (selected by [C656])
7	Scanner write word 7 (selected by [C647])	Scanner read word 7 (selected by [C657])
8	Scanner write word 8 (selected by [C648])	Scanner read word 8 (selected by [C658])
9-31	Reserved	Reserved

3.8. "43 (0x2B) Read Device identification" function

This Modbus request is used to read the device identification.

Example in VFAS3-2007P with device name “TOSVERT” is shown below.

Device supports Basic Device ID and Regular Device ID.

Request format:

Byte	Meaning	Example value
0	Function Code = 2Bh	0x2B
1	Type of MEI	0x0E
2	Read Device ID code	0x01: Basic (Stream access) 0x02: Regular (Stream access) 0x04: Individual access
3	Object ID	0x00, 0x01, 0x02, 0x04, 0x05, 0x06 (Please set 0x00 for stream access)

Response format: Device ID = 0x01 and 0x02 (Stream access)

Byte	Meaning	Example value	
0	Function Code = 2Bh	0x2B	
1	Type of MEI	0x0E	
2	Read Device ID code	0x01: Basic 0x02: Regular	
3	Conformity Level	0x82 Regular (stream / individual access)	
4	More Follows	0x00: No more Object	
5	Next Object Id	0x00	
6	Number Of Objects	0x03 for Basic 0x06 for Regular	
7	Obj 0 Id → Vendor Name	0	
8	Obj 0 length	7	
9-15	Obj 0 value	“TOSHIBA”	
16	Obj 1 Id → Product Code	1	
17	Obj 1 length	11	
18-28	Obj 1 value	“VFAS3-2007P”	
29	Obj 2 Id → Version	2	
30	Obj 2 length	4	
31-34	Obj 2 value	“V102”	
35	Obj 4 Id → Product Name	4	Only for Regular
36	Obj 4 length	6	
37-42	Obj 4 value	“VF-AS3”	
43	Obj 5 Id → Model Name	5	
44	Obj 5 length	3	
45-47	Obj 5 value	“TSB”	
48	Obj 6 Id → User Application Name	6	
49	Obj 6 length	16 maximum	
50-65	Obj 6 value	“TOSVERT”	

Exception response format:

Byte	Meaning
0	Function Code = 0xAB
1	Exception Code 01: Illegal Function 02: Illegal Data Address 03: Illegal Data Value

3.9. **Error Code**

If the following errors occur, the reply command from the inverter is returned by adding 80H to the command received by the inverter. The error codes are as follows.

Error code	Name	Description
01	Command error	• No command exists. • The MEI type is not 14 (0x0E) with the model information reading by Modbus function code 0x2B.
02	Communication number error	• No communication number exists. • Writing was performed to the exclusive reading parameter. • Illegal Object ID with the model information reading by Modbus function code 0x2B.
03	Data error	• Data range error. • The communication format has an error. • When the reading equipment code is set to 4 or more in model information reading command.
04	Execution impossible	• Writing to parameter that is impossible to be written while running. • Writhing to parameter for which TYP is being executed. • Writing to [F738: Password setting] when [F738] is set.

4. EtherNet/IP

This section contains the object specifications for all EtherNet/IP objects.
EtherNet/IP functions are supported with CPU1 version 108 or more.

Class Code		Object Class	Page
Hex.	Dec.		
0x01	1	Identity Object	35
0x02	2	Message Router Object	37
0x04	4	Assembly Object	38
0x06	6	Connection Manager Object	51
0x28	40	Motor Data Object	52
0x29	41	Control Supervisor Object	53
0x2A	42	AC/DC Drive Object	55
0x64	100	Parameter Access 1 Object	56
0x65	101	Parameter Access 2 Object	57
0xF4	244	Port Object	58
0xF5	245	TCP/IP Interface Object	60
0xF6	246	Ethernet Link Object	62

For definitions of all data types referred to in these object specifications, refer to the ODVA EtherNet/IP™ Specifications.
In general, however, the following are some of the most prevalent types:

BOOL	Boolean	0(False) or 1(TRUE)
SINT	Signed Short Integer	-128 to 127
INT	Integer	-32768 to 32767
DINT	Double Integer	-2^{31} to $2^{31}-1$
USINT	Unsigned Short Integer	0 to 255
UINT	Unsigned Integer	0 to 65535
UDINT	Unsigned Double Integer	0 to $2^{32}-1$
STRING	character string (1 byte per character)	
SHORT_STRING	character string (1 byte per character, 1 byte length indicator)	
BYTE	Bit string - 8-bits	
WORD	Bit string - 16-bits	
DWORD	Bit string - 32-bits	
EPATH	CIP path segments	

4.1. Identity Object (0x01)

This object provides identification of and general information about the device.

Class Attributes

Instance	Attribut ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	1
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	1
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	1
	4	Get	Optional attribute list	STRUCT of	List of optional instance attributes utilized in an object class implementation.	-
			Number of attributes	UNIT	Number of attribute in the optional attribute list.	0
			Optional attributes	ARRAY of UNIT	List of optional attribute numbers.	-
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	7

Class Service

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute

Instance Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
1	1	Get	Vendor ID	UINT	Identification of vendor by number	377
	2	Get	Device type	UINT	AC/DC Drive profile	2
	3	Get	Product code	UINT	Identification No. of a drive	32004
	4	Get	Revision	STRUCT of	Revision of the item the Identity Object represents	
			Major revision	USINT	Major revision	-
			Minor revision	USINT	Minor revision	-
	5	Get	Status	WORD	See “Attribute 5 State Description” on next page	*
	6	Get	Serial number	UDINT	4 last bytes of MAC Address	-
	7	Get	Product name	SHOT_ STRING	Human readable identification	6, VF-AS3

* These values depend on firmware version and revision of Embedded Ethernet card. (FE91)

Instance Services

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x05	Reset	Invokes the Reset for the device
0x0E	Get_Attribute_Single	Read one attribute

Attribute 5 State Descriptions

Adapted from document [CIP] “THE CIP NETWORKS LIBRARY Volume 1”

Bit	Called	Definition	
0	Owned	TRUE indicates the device (or an object within the device) has an owner. Within the Master/Slave paradigm the setting of this bit means that the Predefined Master/Slave Connection Set has been allocated to a master.	
1	-	Reserved	
2	Configured.	TRUE indicates the application of the device has been configured to do something different than the “out–of–box” default. This shall not include configuration of the communications.	
3	-	Reserved	
4-7	Extended Device Status	0000	Self-Testing or unknown
		0001	Firmware update in progress
		0010	At least one faulted I/O connection
		0011	No I/O connections established
		0100	Non-Volatile configuration bad
		0101	Major Fault – either bit 10 or bit 11 is true (1)
		0110	At least one I/O connection in run mode
		0111	At least one I/O connection established, all in idle mode
		1000-1111	Unused
8	Minor Recoverable Fault	TRUE indicates the device detected a problem with itself, which is thought to be recoverable. The problem does not cause the device to go into one of the faulted states.	
9	Minor Unrecoverable Fault.	No minor unrecoverable fault.	
10	Major Recoverable Fault.	TRUE indicates the device detected a problem with itself, which caused the device to go into the “Major Recoverable Fault” state.	
11	Major Unrecoverable Fault	No major unrecoverable fault.	
12-15	-	(System reserved)	

Note: Don’t use the “System reserved” bit and Bit0 for the judgement.

4.2. Message Router Object (0x02)

The Message Router Object provides a messaging connection point through which a Client may address a service to any object class or instance residing in the physical device.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	1
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	1
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	1
	4	Get	Optional attribute list	STRUCT of	List of optional instance attributes utilized in an object class implementation.	-
			Number of attributes	UNIT	Number of attribute in the optional attribute list.	2
			Optional attributes	ARRAY of UNIT	List of optional attribute numbers.	1, 2
	5	Get	Optional service list	STRUCT of	List of optional service utilized in an object class implementation.	-
			Number of services	UNIT	Number of service in the optional service list.	0
			Optional services	ARRAY of UNIT	List of optional service numbers.	-
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	2

Class Service

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute

Instance Attribute

Instance	Attribute ID	Access	Name	Data type	Details	Value
1	1	Get	Number Available	STRUCT of	Maximum number of connections supported	-
			Number	UNIT	Number of supported classes in the classes array	12
			Classes	ARRAY of UINT	List of supported class codes	0x01, 0x02, 0x04, 0x06, 0x28, 0x29, 0x2A, 0x64, 0x65, 0xF4, 0xF5, 0xF6
	2	Get	Number Available	UNIT	Maximum number of connections supported	32

Instance Services

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute

4.3. Assembly Object (0x04)

The Assembly Object binds attributes of multiple objects, which allows data to or from each object to be sent or received over a single connection. Assembly objects can be used to bind input data or output data. The terms ”input” and ”output” are defined from the network’s point of view. An input will produce data on the network and an output will consume data from the network.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	2
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	157
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	18
	4	Get	Optional attribute list	STRUCT of	List of optional instance attributes utilized in an object class implementation.	-
			Number of attributes	UNIT	Number of attribute in the optional attribute list.	1
			Optional attributes	ARRAY of UNIT	List of optional attribute numbers.	4
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	4

Class Service

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute

Instance Attribute

Instance	Attribute ID	Access	Name	Details
See below	3	Get/Set	Data	Settable Only on Output Assembly. **See below**
See below	4	Get	Size	Number of bytes in Attribute 3.

Output Assembly Instance:

Instance name	Number (Hex)	Size
CIP basic speed control output	20 (0x14)	2 words (4 bytes)
CIP extended speed control output	21 (0x15)	2 words (4 bytes)
CIP basic speed and torque control output	22 (0x16)	3 words (6 bytes)
CIP extended speed and torque control output	23 (0x17)	3 words (6 bytes)
Toshiba control output	100 (0x64)	2 words (4 bytes)
CIP extended and parameter change control output	101 (0x65)	4 words (8 bytes)
Native transport control output	102 (0x66)	6 words (12 bytes)
Native transport and parameter change control output	105 (0x69)	9 words (18 bytes)
Large native transport control output	107 (0x6B)	10 words (20 bytes)

Input Assembly Instance:

Instance name	Number (Hex)	Size
CIP basic speed control input	70 (0x46)	2 words (4 bytes)
CIP extended speed control input	71 (0x47)	2 words (4 bytes)
CIP basic speed and torque control input	72 (0x48)	3 words (6 bytes)
CIP extended speed and torque control input	73 (0x49)	3 words (6 bytes)
Toshiba control input	150 (0x96)	2 words (4 bytes)
CIP extended and parameter change control input	151 (0x97)	4 words (8 bytes)
Native transport control input	152 (0x98)	6 words (12 bytes)
Native transport and parameter change control input	155 (0x9B)	9 words (18 bytes)
Large native transport control input	157 (0x9D)	10 words (20 bytes)

Instance Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute
0x10	Set_Attribute_Single	Write one attribute

4.3.1. Instance 20: CIP basic speed control output

Instance 20 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	-	-	-	-	Fault reset	-	Run Fwd
1	-							
2	Drive Speed Reference min^{-1} (Low byte) *							
3	Drive Speed Reference min^{-1} (High byte) *							

4.3.2. Instance 70: CIP basic speed control input

Instance 70 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	-	-	-	-	Running Fwd	-	Faulted
1	-							
2	Drive Actual Speed min^{-1} (Low byte)							
3	Drive Actual Speed min^{-1} (High byte)							

Examples of Instance 20/70

(1) Stop

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 20	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 70	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000

(2) Forward running 1800 min^{-1} **

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 20	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0x0001
	3, 2	0	0	0	0	0	**1**	**1**	**1**	0	0	0	0	**1**	0	0	0	0x0708
Input Instance 70	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0x0004
	3, 2	0	0	0	0	0	**1**	**1**	**1**	0	0	0	0	**1**	0	0	0	0x0708

(3) Fault reset ***

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 20	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0x0004
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

** Drive Speed Reference is set up number of rotations by the hexadecimal number.
For example, when "Frequency reference" is set up to 1800 min^{-1}:
1800 = 0x0708

*** Fault reset works only 1 time when 0 -> 1.

4.3.3. Instance 21: CIP extended speed control output

Instance 21 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	NetRef *	NetCtrl *	-	-	Fault reset	Run Rev	Run Fwd
1	-							
2	Drive Reference Speed min^{-1} (Low byte)							
3	Drive Reference Speed min^{-1} (High byte)							

* Bit 5 and 6 of the instance 21 byte 0 are defined as follows.

Bit 5 (Net Ctrl).....When "1" is set, Run/Stop is according to bits 0 (Run forward) and 1 (Run reverse) of byte 0. When "0" is set, Run/Stop is according to setup of the parameter [CMOd].

Bit 6 (Net Ref).....When "1" is set, Drive Reference Speed is according to bytes 2 and 3. When "0" is set, Drive Reference Speed is according to setup of the parameter [FMOd].

4.3.4. Instance 71: CIP extended speed control input

Instance 71 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At Reference **	Ref From Net **	Ctrl From Net **	Ready	Running Rev	Running Fwd	Warning	Faulted
1	Drive Status ***							
2	Drive Actual Speed min^{-1} (Low byte)							
3	Drive Actual Speed min^{-1} (High byte)							

** Bit 5, 6, and 7 of the instance 71 byte 0 are defined as follows.

Bit 5 (Ctrl from Net).....When RUN/STOP command from EtherNet/IP is enabled, "1" is set.

Bit 6 (Ref from Net).....When Drive Reference Speed from EtherNet/IP is enabled, "1" is set.

Bit 7 (At reference) .....When Drive Actual Speed becomes the same as frequency command, "1" is set.

*** Drive Status is same as the Control Supervisor class State attribute (refer to section 4.6.2).

■Examples of Instance 21/71

(1) Stop

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 21	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 71	1, 0	0	0	0	0	0	0	**1**	**1**	0	0	0	**1**	0	0	0	0	0x0310
	3, 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000

(2) Forward running 1800 [min^{-1}] with network control and network reference

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 21	1, 0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0	**1**	0x0061
	3, 2	0	0	0	0	0	**1**	**1**	**1**	0	0	0	0	**1**	0	0	0	0x0708
Input Instance 71	1, 0	0	0	0	0	0	**1**	0	0	**1**	**1**	**1**	**1**	0	**1**	**0**	0	0x04F4
	3, 2	0	0	0	0	0	**1**	**1**	**1**	0	0	0	0	**1**	0	0	0	0x0708

(3) Fault reset *

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 21	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	0	0x0004
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Fault reset works only 1 time when 0 -> 1.

4.3.5. Instance 22: CIP basic speed and torque control output

Instance 22 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	-	-	-	-	Fault reset	-	Run Fwd
1	-							
2	Drive Speed Reference min^{-1} (Low byte) *							
3	Drive Speed Reference min^{-1} (High byte) *							
4	Drive Reference Torque Nm (Low byte)							
5	Drive Reference Torque Nm (High byte)							

4.3.6. Instance 72: CIP basic speed control input

Instance 72 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	-	-	-	-	Running Fwd	-	Faulted
1	-							
2	Drive Actual Speed min^{-1} (Low byte)							
3	Drive Actual Speed min^{-1} (High byte)							
4	Drive Actual Torque Nm (Low byte)							
5	Drive Actual Torque Nm (High byte)							

4.3.7. Instance 23: CIP extended speed and torque control output

Instance 23 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	Net Ref *	Net Ctrl *	-	-	Fault reset	Run Rev	Run Fwd
1	-							
2	Drive Reference Speed min^{-1} (Low byte)							
3	Drive Reference Speed min^{-1} (High byte)							
4	Drive Reference Torque Nm (Low byte)							
5	Drive Reference Torque Nm (High byte)							

* Bit 5 and 6 of the instance 21 byte 0 are defined as follows.

Bit 5 (Net Ctrl).....When “1” is set, Run/Stop is according to bits 0 (Run forward) and 1 (Run reverse) of byte 0. When “0” is set, Run/Stop is according to setup of the parameter [CMOd].

Bit 6 (Net Ref).....When “1” is set, Drive Reference Speed is according to bytes 2 and 3. When “0” is set, Drive Reference Speed is according to setup of the parameter [FMOd].

4.3.8. Instance 73: CIP extended speed and torque control input

Instance 73 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At Reference **	Ref From Net **	Ctrl From Net **	Ready	Running2 (Rev)	Running1 (Fwd)	Warning	Faulted
1	Drive Status ***							
2	Drive Actual Speed min^{-1} (Low byte)							
3	Drive Actual Speed min^{-1} (High byte)							
4	Drive Actual Torque Nm (Low byte)							
5	Drive Actual Torque Nm (High byte)							

** Bit 5, 6, and 7 of the instance 71 byte 0 are defined as follows.

Bit 5 (Ctrl from Net).....When RUN/STOP command from EtherNet/IP is enabled, “1” is set.

Bit 6 (Ref from Net).....When Drive Reference Speed from EtherNet/IP is enabled, “1” is set.

Bit 7 (At reference) .....When Drive Actual Speed becomes the same as frequency command, “1” is set.

*** Drive Status is same as the Control Supervisor class State attribute (refer to section 4.6.2).

4.3.9. Instance 100: Toshiba control output

Instance 100 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	DC braking	AD mode 1/ AD mode 2	PID off	V/f switching	Preset Speed4	Preset Speed3	Preset Speed2	Preset Speed1
1	Net Ctrl*	Net Ref *	Reset trip	Emergency stop	Free run (ST)	Run/stop	Forward/ Reverse	Jog run
2	Drive Reference Speed Hz (Low byte) **							
3	Drive Reference Speed Hz (High byte) **							

* Bit 6 and 7 of the instance 100 byte 1 are defined as follows.

Bit 7 (Net Ctrl)..... When “1” is set, all commands of byte 0 and 1 are enabled. When “0” is set, commands other than Emergency stop and Reset trip are according to setup of the parameter [CMOd].

Bit 6 (Net Ref)..... When “1” is set, Drive Reference Speed is according to bytes 2 and 3. When “0” is set, Drive Reference Speed is according to setup of the parameter [FMOd].

** Drive Reference Speed is set up by 0.01Hz unit and the hexadecimal number.
For example, when "Frequency reference" is set up to 60Hz, since the minimum unit is 0.01Hz,
60 / 0.01 = 6000 = 0x1770

4.3.10. Instance 150: Toshiba control input

Instance 150 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	DC braking	AD mode	PID	V/f 2	MOFF	ALARM	EMG	FL
1	HAND/AUTO (LOC/REM)	READY without ST/RUN	READY with ST/ RUN	Emergency stopping	Free run (ST)	Run/Stop	Forward / Reverse	Jog running
2	Drive Actual Speed Hz (Low byte)							
3	Drive Actual Speed Hz (High byte)							

■Examples of Instance 100/150

①Stop

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 100	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 150	1, 0	0	**1**	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0x4800
	3, 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000

②Forward running 60Hz

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 100	1, 0	**1**	**1**	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0xC400
	3, 2	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770
Input Instance 150	1, 0	0	**1**	**1**	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0x6400
	3, 2	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770

③Reverse running 60Hz

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 100	1, 0	**1**	**1**	0	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0xC600
	3, 2	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770
Input Instance 150	1, 0	0	**1**	**1**	0	0	**1**	**1**	0	0	0	0	0	0	0	0	0	0x6600
	3, 2	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770

④Preset speed 1 with forward running ([Sr1])

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 100	1, 0	**1**	0	0	0	0	**1**	0	0	0	0	0	0	0	0	0	**1**	0x8401
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 150	1, 0	0	**1**	**1**	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0x6400
([Sr1] is set 5Hz.)	3, 2	0	0	0	0	0	0	0	**1**	**1**	**1**	**1**	**1**	0	**1**	0	0	0x01F4

⑤Fault reset *

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 100	1, 0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0x2000
	3, 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

About the other command, refer to section 2.5.1.

* Fault reset works only 1 time when 0 -> 1.

4.3.11. Instance 101: CIP extended and parameter change control output

Instance 101 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-	Net Ref*	Net Ctrl*	-	-	Fault reset	Run reverse	Run forward
1	-							
2	Drive Reference Speed min^{-1} (Low byte)							
3	Drive Reference Speed min^{-1} (High byte)							
4	Index (Low byte)							
5	Write	Index (High byte)						
6	Data (Low byte)							
7	Data (High byte)							

* Bit 5 and 6 of the instance 21 byte 0 are defined as follows.

Bit 5 (Net Ctrl).....When “1” is set, Run/Stop is according to bits 0 (Run forward) and 1 (Run reverse) of byte 0. When “0” is set, Run/Stop is according to setup of the parameter [CMOd].

Bit 6 (Net Ref).....When “1” is set, Drive Reference Speed is according to bytes 2 and 3. When “0” is set, Drive Reference Speed is according to setup of the parameter [FMOd].

4.3.12. Instance 151: CIP extended and parameter change control input

Instance 151 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	At reference**	Ref from Net**	Ctrl from Net**	Ready	Running Reverse	Running Forward	Warning	Faulted/ tripped
1	Drive Status *							
2	Drive Actual Speed min^{-1} (Low byte)							
3	Drive Actual Speed min^{-1} (High byte)							
4	Index (Low byte)							
5	Write	Error	Index (High byte)					
6	Data (Low byte)							
7	Data (High byte)							

* Drive Status is same as the Control Supervisor class State attribute (refer to 4.6.2).

** Bit 5, 6, and 7 of the instance 71 byte 0 are defined as follows.

Bit 5 (Ctrl from Net).....When RUN/STOP command from EtherNet/IP is enabled, “1” is set.

Bit 6 (Ref from Net).....When Drive Reference Speed from EtherNet/IP is enabled, “1” is set.

Bit 7 (At reference) .....When Drive Actual Speed becomes the same as frequency command, “1” is set.

■Examples of Instance 101/151

Access the inverter parameter is enabled using byte 4 to 6 of this Instance.
Set the communication number of the parameter to byte 4, 5 (Index), and the value to byte 6, 7 (Data).

① Read the parameter [CMOd] (Command mode selection, communication number is 0003).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 101	5, 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0x0003
	7, 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 151 ([CMOd] is 0.)	5, 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0x0003
	7, 6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000

② Read the parameter [F268] (Initial value of UP/DOWN frequency).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 101	5, 4	0	0	0	0	0	0	**1**	0	0	**1**	**1**	0	**1**	0	0	0	0x0268
	7, 6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 151 ([F268] is 60.0Hz.)	5, 4	0	0	0	0	0	0	**1**	0	0	**1**	**1**	0	**1**	0	0	0	0x0268
	7, 6	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770

③ Write “60 (Hz)” to the parameter [Sr1] (Preset speed 1, communication number is 0018).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 101	5, 4	**1**	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0x8018
	7, 6	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770
Input Instance 151 (OK)	5, 4	**1**	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0x8018
	7, 6	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770
Input Instance 151 (NG) (Error code *)	5, 4	**1**	**1**	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0xC018
	7, 6	0	0	0	**1**	0	0	0	**1**	0	0	0	0	0	0	0	0	0x1100

*Data of "Error code"

0x1100: Data out of range

0x1101: Bad address

0x1103: Read only address / Password protection

0x1106: Read only during running

4.3.13. Instance 102: Native transport control output

Instance 102 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	[C641] Command data (Low byte)							
1	[C641] Command data (High byte)							
2	[C642] Command data (Low byte)							
3	[C642] Command data (High byte)							
4	[C643] Command data (Low byte)							
5	[C643] Command data (High byte)							
6	[C644] Command data (Low byte)							
7	[C644] Command data (High byte)							
8	[C645] Command data (Low byte)							
9	[C645] Command data (High byte)							
10	[C646] Command data (Low byte)							
11	[C646] Command data (High byte)							

Refer to "Emb Eth. Scanner input select ([C641] – [C650])" for detail of Command data.

4.3.14. Instance 152: Native transport control input

Instance 152 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	[C651] Monitor data (Low byte)							
1	[C651] Monitor data (High byte)							
2	[C652] Monitor data (Low byte)							
3	[C652] Monitor data (High byte)							
4	[C653] Monitor data (Low byte)							
5	[C653] Monitor data (High byte)							
6	[C654] Monitor data (Low byte)							
7	[C654] Monitor data (High byte)							
8	[C655] Monitor data (Low byte)							
9	[C655] Monitor data (High byte)							
10	[C656] Monitor data (Low byte)							
11	[C656] Monitor data (High byte)							

Refer to "Emb Eth. Scanner output select ([C651] – [C660])" for detail of Monitor data.

Notes

▼ Command/Monitor targets are determined by scanner address setting value at startup of Class 1 connection.

4.3.15. Instance 105: Native transport and parameter change control output

Instance 105 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-							
1	Function code (Read / Write) Read: 0x00, Write: 0x80							
2	Index (Low byte)							
3	Index (High byte)							
4	Data (Low byte)							
5	Data (High byte)							
6	[C641] Command data (Low byte)							
7	[C641] Command data (High byte)							
8	[C642] Command data (Low byte)							
9	[C642] Command data (High byte)							
10	[C643] Command data (Low byte)							
11	[C643] Command data (High byte)							
12	[C644] Command data (Low byte)							
13	[C644] Command data (High byte)							
14	[C645] Command data (Low byte)							
15	[C645] Command data (High byte)							
16	[C646] Command data (Low byte)							
17	[C646] Command data (High byte)							

Refer to "Emb Eth. Scanner input select ([C641] – [C650])" for detail of Command data.

4.3.16. Instance 155: Native transport and parameter change control input

Instance 105 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	-							
1	Function code (Read / Write) results Read: 0x00, Write: 0x80 Read error: 0x40, Write error: 0xC0							
2	Index (Low byte)							
3	Index (High byte)							
4	Data (Low byte)							
5	Data (High byte)							
6	[C651] Monitor data (Low byte)							
7	[C651] Monitor data (High byte)							
8	[C652] Monitor data (Low byte)							
9	[C652] Monitor data (High byte)							
10	[C653] Monitor data (Low byte)							
11	[C653] Monitor data (High byte)							
12	[C654] Monitor data (Low byte)							
13	[C654] Monitor data (High byte)							
14	[C655] Monitor data (Low byte)							
15	[C655] Monitor data (High byte)							
16	[C656] Monitor data (Low byte)							
17	[C656] Monitor data (High byte)							

Refer to "Emb Eth. Scanner output select ([C651] – [C660])" for detail of Monitor data.

Notes

▼ Command/Monitor targets are determined by scanner address setting value at startup of Class 1 connection.

■Examples of Instance 105/155

Access the inverter parameter is enabled using byte 1 to 5 of this Instance.
Set the communication number of the parameter to byte 2, 3 (Index), and the value to byte 4, 5 (Data).

① Read the parameter [CMOd] (Command mode selection, communication number is 0003).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 105	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0x0003
	5, 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 155 ([CMOd] is 0.)	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0x0003
	5, 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000

② Read the parameter [F268] (Initial value of UP/DOWN frequency).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 105	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	0	0	0	0	0	0	**1**	0	0	**1**	**1**	0	**1**	0	0	0	0x0268
	5, 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Input Instance 155 ([F268] is 60.0Hz.)	1, 0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x0000
	3, 2	0	0	0	0	0	0	**1**	0	0	**1**	**1**	0	**1**	0	0	0	0x0268
	5, 4	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770

③ Write "60 (Hz)" to the parameter [Sr1] (Preset speed 1, communication number is 0018).

Instance	Byte	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	Hex.
Output Instance 105	1, 0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x8000
	3, 2	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0x0018
	5, 4	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770
Input Instance 155 (OK)	1, 0	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0x8000
	3, 2	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0x0018
	5, 4	0	0	0	**1**	0	**1**	**1**	**1**	0	**1**	**1**	**1**	0	0	0	0	0x1770
Input Instance 155 (NG) (Error code *)	1, 0	**1**	**1**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0xC000
	3, 2	0	0	0	0	0	0	0	0	0	0	0	**1**	**1**	0	0	0	0x0018
	5, 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0x1100

*Data of "Error code"

0x1100: Data out of range

0x1101: Bad address

0x1103: Read only address / Password protection

0x1106: Read only during running

4.3.17. Instance 107: Large native transport control output

Instance 107 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	[C641] Command data (Low byte)							
1	[C641] Command data (High byte)							
2	[C642] Command data (Low byte)							
3	[C642] Command data (High byte)							
4	[C643] Command data (Low byte)							
5	[C643] Command data (High byte)							
6	[C644] Command data (Low byte)							
7	[C644] Command data (High byte)							
8	[C645] Command data (Low byte)							
9	[C645] Command data (High byte)							
10	[C646] Command data (Low byte)							
11	[C646] Command data (High byte)							
12	[C647] Command data (Low byte)							
13	[C647] Command data (High byte)							
14	[C648] Command data (Low byte)							
15	[C648] Command data (High byte)							
16	[C649] Command data (Low byte)							
17	[C649] Command data (High byte)							
18	[C650] Command data (Low byte)							
19	[C650] Command data (High byte)							

Refer to "Emb Eth. Scanner input select ([C641] – [C650])" for detail of Command data.

4.3.18. Instance 157: Large native transport control input

Instance 157 mapping

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	[C651] Monitor data (Low byte)							
1	[C651] Monitor data (High byte)							
2	[C652] Monitor data (Low byte)							
3	[C652] Monitor data (High byte)							
4	[C653] Monitor data (Low byte)							
5	[C653] Monitor data (High byte)							
6	[C654] Monitor data (Low byte)							
7	[C654] Monitor data (High byte)							
8	[C655] Monitor data (Low byte)							
9	[C655] Monitor data (High byte)							
10	[C656] Monitor data (Low byte)							
11	[C656] Monitor data (High byte)							
12	[C657] Monitor data (Low byte)							
13	[C657] Monitor data (High byte)							
14	[C658] Monitor data (Low byte)							
15	[C658] Monitor data (High byte)							
16	[C659] Monitor data (Low byte)							
17	[C659] Monitor data (High byte)							
18	[C660] Monitor data (Low byte)							
19	[C660] Monitor data (High byte)							

Refer to "Emb Eth. Scanner output select ([C651] – [C660])" for detail of Monitor data.

Notes

▼ Command/Monitor targets are determined by scanner address setting value at startup of Class 1 connection.

4.4. Connection Manager Object (0x06)

Use this object for connection and connectionless communications, including establishing connections across multiple subnets.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	1
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	1
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	1
	4	Get	Optional attribute list	STRUCT of	List of optional instance attributes utilized in an object class implementation.	-
			Number of attributes	UNIT	Number of attribute in the optional attribute list.	8
			Optional attributes	ARRAY of UNIT	List of optional attribute numbers.	1, 2, 3, 4, 5, 6, 7, 8
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	8

Class Services

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute

Instance 1 Attribute

Instance	Attribute ID	Access	Name	Data type	Details
1	1	Get	Open Requests	UINT	Number of Forward Open service requests received.
	2	Get	Open Format Rejects	UINT	Number of Forward Open service requests which were rejected due to bad format.
	3	Get	Open Resources Rejects	UINT	Number of Forward Open service requests which were rejected due to lack of resources.
	4	Get	Open Other Rejects	UINT	Number of Forward Open service requests which were rejected for reasons other than bad format or lack of resources.
	5	Get	Close Requests	UINT	Number of Forward Close service requests received.
	6	Get	Close Format Requests	UINT	Number of Forward Close service requests which were rejected due to bad format.
	7	Get	Close Other Requests	UINT	Number of Forward Close service requests which were rejected for reasons other than bad format.
	8	Get	Connection Timeouts	UINT	Total number of connection timeouts that have occurred in connections controlled by this Connection Manager

Instance Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute
0x10	Set_Attribute_Single	Write one attribute
0x4E	Forward_Close	Closes a connection
0x54	Forward_Open	Opens a connection, maximum data size is 511 bytes
0x5B	Large_Forward_Open	Opens a connection, maximum data size is 65535 bytes

4.5. Motor Data Object (0x28)

This object serves as a database for motor parameters.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	1
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	1
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	1
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	15

Class Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute

Instance 1 Attribute

Instance	Attribute ID	Access	Name	Data type	Details	Unit
1	1	Get	Attribute Number	USINT	Number of attributes supported	-
	2	Get	Attribute List	ARRAY of USINT	List of attributes supported	-
	3	Get	Motor Type	USINT	3: PM Synchronous Motor 7: Squirrel Cage Induction Motor	-
	6	Get/Set	Rated Current	UINT	Motor Rated Current ([F415])	100mA
	7	Get/Set	Rated Voltage	UINT	Motor Rated Volt ([vLv])	V
	8	Get/Set	Rated Power	UDINT	Motor rated Power ([F405])	W
	9	Get/Set	Rated Frequency	UINT	Motor Base Frequency ([vL])	Hz
	12	Get/Set	Pole Count	UINT	Motor pole number ([F856] (number of motor pole pair) × 2)	-
	15	Get/Set	Base Speed	UINT	Motor Base Speed ([F417])	min^{-1}

Instance Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute
0x10	Set_Attribute_Single	Write one attribute

4.6. Control Supervisor Object (0x29)

This object models all the management functions for devices within the “Hierarchy of Motor Control Devices”. The behavior of motor control devices is described by the State Transition Diagram.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	1
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	1
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	1
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	15

Class Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute

Instance 1 Attribute

Instance	Attribute ID	Access	Name	Data type	Details
1	1	Get	Number of attributes	UINT	Number of attributes supported
	2	Get	AttrList	LIST of USINT	List of attributes supported
	3	Get/Set	Run Forward	BOOL	Refer to "4.6.1 Run/Stop Event Matrix." 0 = Stop 1 = Forward Run (On edge)
	4	Get/Set	Run Reveres	BOOL	Refer to "4.6.1 Run/Stop Event Matrix." 0 = Stop 1 = Reveres Run (On edge)
	5	Get/Set	Net Ctrl	BOOL	Request Run/Stop control to be local or from network. 0 = Local Control(default) 1 = Network Control
	6	Get	State	USINT	Refer to "4.6.2 State of the drive."
	7	Get	Running Forward	BOOL	1 = (Enabled and Forward Run) or (Stopping and Forward Running) or (Fault Stop and Forward Running) 0 = Other state
	8	Get	Running Reveres	BOOL	1 = (Enabled and Reveres Run) or (Stopping and Reveres Running) or (Fault Stop and Reveres Running) 0 = Other state
	9	Get	Ready	BOOL	1 = Ready or Enabled or Stopping 0 = Other state
	10	Get	Faulted	BOOL	1 = Fault Occurred 0 = No Faults present
	11	Get	Warning	BOOL	1 = Warning 0 = No Warnings present
	12	Get/Set	Fault Reset	BOOL	0->1 = Fault Reset 0 = No action
	15	Get	CtrlFromNet	BOOL	Status of Run/Stop control source. 0 = Control is local 1 = Control is from network

Instance Services

Service Code	Service Name	Description of Service
0x05	Reset	Resets the drive to the start-up state.
0x0E	Get_Attribute_Single	Read one attribute
0x10	Set_Attribute_Single	Write one attribute

4.6.1. Run/Stop Event Matrix

Run1	Run2	Trigger Event	Run Type
0	0	Stop	No Action
0 -> 1	0	Run	Run1
0	0 -> 1	Run	Run2
0 -> 1	0 -> 1	No Action	No Action
1	1	No Action	No Action
1 -> 0	1	Run	Run2
1	1 -> 0	Run	Run1

4.6.2. State of the drive

The Control Supervisor class State attribute (Att. ID= 6) shows state of the drive.

1 (=BN: 00000001): Startup

2 (=BN: 00000010): Not ready

3 (=BN: 00000011): Ready

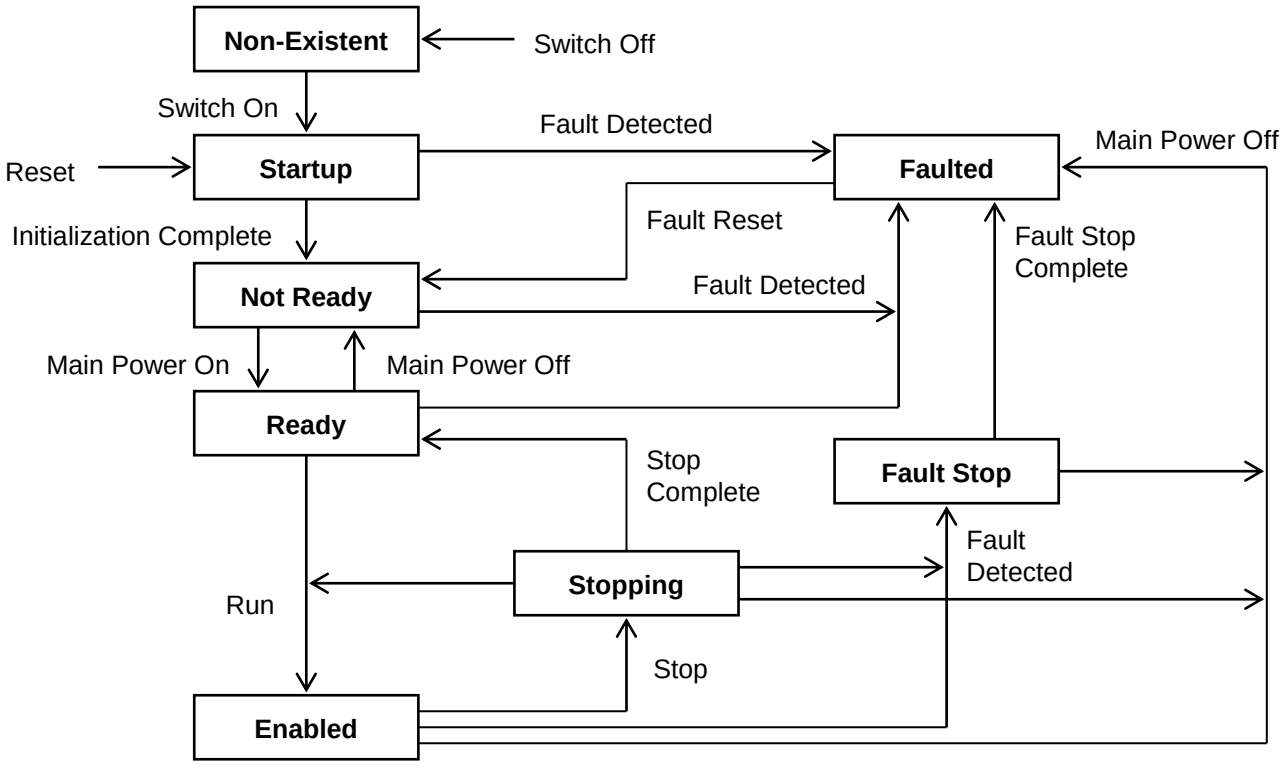
4 (=BN: 00000100): Enabled

5 (=BN: 00000101): Stopping

6 (=BN: 00000110): Fault Stop

7 (=BN: 00000111): Faulted

4.6.3. Control Supervisor State Transition Diagram



4.7. AC/DC Drive Object (0x2A)

This object models the functions specific to an AC or DC Drive. e.g. speed ramp, torque control etc.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	1
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	1
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	1
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	46

Class Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute

Instance 1 Attribute

Instance	Attribute ID	Access	Name	Data type	Details	Unit
1	1	Get	NumAttr	USINT	Number of Attributes supported	-
	2	Get	Attrbutes	ARRAY of USINT	List of Attributes supported	-
	3	Get	At Reference	BOOL	1 = Drive actual at reference	-
	4	Get/Set	NetRef	BOOL	Requests torque and speed reference to be local or from the network. 0 = Set Reference not DN Control 1 = Set Reference at DN Control	-
	6	Get	Drive mode	USINT	Drive Mode	-
	7	Get	Speed Actual	INT	Actual Speed	min^{-1}
	8	Get/Set	Speed Ref *	INT	Reference Speed	min^{-1}
	9	Get	Current Actual	INT	Drive Current	100 mA
	10	Get/Set	Current Limit	INT	Drive Current Limit	100mA
	11	Get	Torque Actual	INT	Drive Actual Torque	Nm
	15	Get	Power Actual **	INT	Drive Power	W
	18	Get/Set	Acc Time ***	UINT	Drive Acceleration	ms
	19	Get/Set	Dec Time ***	UINT	Drive Deceleration	ms
	20	Get/Set	Low Speed Limit	UINT	Drive minimum speed	min^{-1}
	21	Get/Set	High Speed Limit	UINT	Drive maximum speed	min^{-1}
	24	Get/Set	Torque scaling	SINT	Torque scaling factor	-
	26	Get/Set	Power scaling	SINT	Power scaling factor	-
	28	Get/Set	Time scaling	UINT	Time scaling factor	-
	29	Get	Ref From Net	BOOL	Status of speed reference 0=Local speed reference 1=Network speed reference	-
	46	Get	Hours On	DINT	Number of hours	h

* The output frequency of the drive follows [FH] though the frequency of [FH] or more can be written.
** This information can be used in a range of 0.0kW-32.76kW.
*** This information can be used in a range of 0.0s-65.5s.

Instance Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute
0x10	Set_Attribute_Single	Write one attribute

4.8. Parameter access 1 Objects (0x64)

This object provides access to the Inverter parameters following range.

Input Instance	Inverter parameter communication No.
0x4000-0x4999	0x0000-0x0999
0x7A00-0x7E99	0xFA00-0xFE99

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	1
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	0x7FFF
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	0x2FFE
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	3

Class Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute

Instance Attribute

Instance	Attribute ID	Access	Name	Data type	Details
0x4000 – 0x4999, 0x7A00 – 0x7E99	3	Get/Set	parameter	UINT	Parameter corresponding to the Instance address

Instance Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute
0x10	Set_Attribute_Single	Write one attribute

Attribute ID for all parameter access is 3. Moreover, about the instance ID of each parameter, can be calculated as "parameter communication number + 0x4000”.

If the parameter communication number begins with "F", it can be calculated as
"parameter communication number - 0x8000”.
About the detail contents of a parameter, please refer to a VF-AS3 instructions manual.

Example 1:
In case of Basic parameter “[CMOd] - Command mode selection”,
Communication No: **0**003 -> Instance ID: **4**003

Example 2:
In case of Monitor parameter “[FE03] - Output current”,
Communication No: **F**E03 -> Instance ID: **7**E03
* Monitor parameter can access "Get" only.

Notes

▼ When you use this object, the value is written to the EEPROM.

4.9. **Parameter access 2 Objects (0x65)**

This object provides access to the Inverter parameters following range.

Input Instance	Inverter parameter communication No.
0x0001-0xFE99	0x0001-0xFE99

* If you want to access to drive parameter [AU1], you can access the communication number 0x0000 (communication number of [AU1]) by using the instance 0x1000.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	2
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	0xFFFF
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	0xFFFF
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	3

Class Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute

Instance 1 Attribute

Instance	Attribute ID	Access	Name	Data type	Details
0x0000 – 0xFE99	3	Get/Set	parameter	UINT	Parameter corresponding to the Instance address

Instance Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute
0x10	Set_Attribute_Single	Write one attribute

Attribute ID for all parameter access is 3. Moreover, about the instance ID of each parameter, it becomes "parameter communication number".
About the details of the contents of a parameter please refer to VF-AS3 instruction manual.

Example 1:
When "ACC. time" is set to 5 s, since the minimum unit is 0.1s,
5 / 0.1 = 50 = 0x0032
Since the communication umber of "Acc. time" is "0009", it writes "0x0032" is instance ID "0009."

Notes

▼ When you use this object, the value is written to the EEPROM.

4.10. **Port Object (0xF4)**

The Port Object enumerates the CIP ports present on the device.

One instance exists for each CIP port.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	2
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	2
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	2
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	9
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	10
	8	Get	Entry Port	UINT	Returns the instance of the Port Object that describes the port through which this request entered the device.	2
	9	Get	All Ports	STRUCT of Port Type Port Number	Array of structures containing instance attributes 1 and 2 from each instance.	0, 0 1, 2

Class Services

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute

Instance 1 Attribute

Instance	Attribute ID	Access	Name	Data type	Details	Value
1	1	Get	Port Type	UINT	Enumerate the type of port.	0
	2	Get	Port Number	UINT	CIP port associated with this port (identify each communication port). Value ‘1’ is reserved.	1
	3	Get	Link Object	STRUCT of UINT Padded EPATH	Identify Object attached to this port. For EtherNet/IP, this path corresponds to TCP/IP Interface object.	0x02 0x00 0x20 0x64 0x24 0x01
	4	Get	Port Name	SHORT_ STRING	String which names the port.	9, "Backplane"
	7	Get	Node address	Padded EPATH	Node number of this device on port. The range within this data type is restricted to a Port Segment.	0x01
	10	Get	Port Routing Capabilities	DWORD	Bit string that defines the routing capabilities of this port	0x00 0x00 0x00 0x00

Instance Services

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute

Instance 2 Attribute

Instance	Attribute ID	Access	Name	Data type	Details	Value
2	1	Get	Port Type	UINT	Enumerate the type of port.	0
	2	Get	Port Number	UINT	CIP port associated with this port (identify each communication port). Value '1' is reserved.	2
	3	Get	Link Object	STRUCT of UINT Padded EPATH	Identify Object attached to this port. For EtherNet/IP, this path corresponds to TCP/IP Interface object.	0x02 0x00 0x20 0xF5 0x24 0x01
	4	Get	Port Name	SHORT_ STRING	String which names the port.	16, "EtherNet/IP Port"
	7	Get	Node address	Padded EPATH	Node number of this device on port. The range within this data type is restricted to a Port Segment.	0x12 0x00
	10	Get	Port Routing Capabilities	DWORD	Bit string that defines the routing capabilities of this port	0x00 0x00 0x00 0x00

Instance Services

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute

4.11. **TCP/IP interface Object (0xF5)**

The TCP/IP Interface Object provides the mechanism to configure a device's TCP/IP network interface.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	4
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	1
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	1
	4	Get	Optional attribute list	STRUCT of	List of optional instance attributes utilized in an object class implementation.	-
			Number of attributes	UNIT	Number of attribute in the optional attribute list.	0
			Optional attributes	ARRAY of UINT	List of optional attribute numbers.	-
	5	Get	Optional service list	STRUCT of	List of optional services utilized in an object class implementation.	-
			number services	UINT	Number of services in the optional service list.	0
			optional services	ARRAY of UINT	List of optional service codes.	-
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	13

Class Services

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute

Instance 1 Attribute

Instance	Attribute ID	Access	Name	Data type	Details
1	1	Get	Status	DWORD	Bits 0 -3: Interface configuration 000: The Interface Configuration attribute has not been configured. 001: The Interface Configuration attribute contains valid configuration. Bit 5: Interface Configuration Pending Bit 6: ACD Status
	2	Get	Configuration capability	DWORD	Bit 0 = 1 (TRUE) shall indicate the device is capable of obtaining its network configuration via BOOTP. Bit 1 = 1 (TRUE) shall indicate the device is capable of resolving host names by querying a DNS server. Bit 2 = 1 (TRUE) shall indicate the device is capable of obtaining its network configuration via DHCP. Bit 3 = 1 (TRUE) shall indicate the device is capable of sending its host name in the DHCP request. Bit 4 = 1 (TRUE) shall indicate the Interface Configuration attribute is settable.
	3	Get/Set	Configuration control	DWORD	Bits 0-3: Start-up configuration 000: The device shall use the interface configuration values previously stored. 001: The device shall obtain its interface configuration values via BOOTP. 010: The device shall obtain its interface configuration values via DHCP upon start-up. Bit 4 = 1 (TRUE), the device shall resolve host names by querying a DNS server.
	4	Get	Physical Link Object	STRUCT of UINT EPATH	Path Size Path: Logical segments identifying the physical link object Example [20][F6][24][01] : [20] = 8 bit class segment type; [F6] = Ethernet Link Object class; [24] = 8 bit instance segment type; [01] = instance 1.
	5	Get/Set	Interface Configuration	STRUCT of	TCP/IP network interface configuration *
			IP Address	UDINT	IP address (0 : no address configured)
			Network Mask	UDINT	Network Mask (0 : no Network mask configured)
			Gateway Address	UDINT	Gateway IP address (0 : no address configured)
			Name Server	UDINT	Name server address (0 : no address configured)
			Name Server 2	UDINT	Name server address 2 (0 : no address configured)
			Domain Name	STRING	Domain Name
	6	Get/Set	Host Name	STRING	Device Name**
	13	Get/Set	Encapsulation Inactivity Timeout	UINT	Number of seconds of inactivity before TCP connection is closed. 0 = Disable 1-3600 = timeout in seconds Default = 120

* The processing time of this Set service is about 5 seconds.
Please do not turn off the power supply, and do not use the other services without response from this Set service.
** Only 16 characters in 64 characters can be set in the Inverter.
Note: Don't use the "System reserved" bit and Bit0 for the judgement.

Instance Services

Service Code	Service Name	Description of Service
0x0E	Get_Attribute_Single	Read one attribute
0x10	Set_Attribute_Single	Write one attribute

4.12. **Ethernet link object (0xF6)**

The Ethernet Link Object maintains link-specific counters and status information for IEEE 802.3 communications interface.

Class Attributes

Instance	Attribute ID	Access	Name	Data type	Details	Value
0	1	Get	Revision	UINT	Revision of this object	4
	2	Get	Max Instances	UINT	Maximum instance number of an object currently created in this class level of the device.	2
	3	Get	Number of Instances	UINT	Number of object instances currently created at this class level of the device.	2
	4	Get	Optional attribute list	STRUCT of	List of optional instance attributes utilized in an object class implementation.	-
			Number of attributes	UNIT	Number of attribute in the optional attribute list.	2
			Optional attributes	ARRAY of UINT	List of optional attribute numbers.	7, 8
	6	Get	Max ID of class attributes	UINT	The attribute ID number of the last class attribute of the class definition implemented in the device.	7
	7	Get	Max ID of instance attribute	UINT	The attribute ID number of the last instance attribute of the class definition implemented in the device.	11

Class Services

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute

Instance Attribute

Instance	Attribute ID	Access	Name	Data type	Details
1 or 2	1	Get	Interface Speed	UDINT	Interface speed currently in use 0: indeterminate (Auto baudrate) 10: 10Mbps 100: 100Mbps
	2	Get	Interface Flags	DWORD	Bit 0: Link Status Indicates 0: Inactive link 1: Active link. Bit 1: Half/Full Duplex 0: Half duplex 1: Full duplex. Bit 2-4: Negotiation Status 000: Auto-negotiation in progress. 001: Auto-negotiation and speed detection failed. 010: Auto negotiation failed but detected speed. Duplex was defaulted. 011: Successfully negotiated speed and duplex. 100: Auto-negotiation not attempted. Forced speed and duplex. 101-111: Unused Bit 5: Manual Setting Requires Reset. Bit 6: Local Hardware Fault.
	3	Get	Physical Address	ARRAY of 6 USINTs	MAC layer address
	4	Get	Interface Counters	STRUCT of	
			In Octets	UDINT	Octets received on the interface
			In Ucast Packets	UDINT	Unicast packets received on the interface
			In NUcast Packets	UDINT	Non-unicast packets received
			In Discards	UDINT	Inbound packets received on the interface but discarded
			In Errors	UDINT	Inbound packets that contain errors (does not include In Discards)
			In Unknown Protos	UDINT	Inbound packets with unknown protocol
			Out Octets	UDINT	Octets sent on the interface
			Out Ucast Packets	UDINT	Unicast packets sent on the interface
			Out NUcast Packets	UDINT	Non-unicast packets sent on the interface
			Out Discards	UDINT	Outbound packets discarded
			Out Errors	UDINT	Outbound packets that contain errors

Note: Don’t use the “System reserved” bit and Bit0 for the judgement.

Instance	Attribute ID	Access	Name	Data type	Details
1 or 2	5	Get	Media Counters	STRUCT of	Media-specific counters
			Alignment Errors	UDINT	Frames received that are not an integral number of octets in length
			FCS Errors	UDINT	Frames received that do not pass the FCS check
			Single Collisions	UDINT	Successfully transmitted frames which experienced exactly one collision
			Multiple Collisions	UDINT	Successfully transmitted frames which experienced more than one collision
			SQE Test Errors	UDINT	Number of times SQE test error message is generated
			Deferred Transmissions	UDINT	Frames for which first transmission attempt is delayed because the medium is busy
			Late Collisions	UDINT	Number of times a collision is detected later than 512 bit times into the transmission of a packet
			Excessive Collisions	UDINT	Frames for which transmission fails due to excessive collisions
			MAC Transmit Errors	UDINT	Frames for which transmission fails due to an internal MAC sublayer transmit error
			Carrier Sense Errors	UDINT	Times that the carrier sense condition was lost or never asserted when attempting to transmit a frame
			Frame Too Long	UDINT	Frames received that exceed the maximum permitted frame size
			MAC Receive Errors	UDINT	Frames for which reception on an interface fails due to an internal MAC sublayer receive error
	7	Get	Interface Type	USINT	Type of interface 2: twisted pair
	10	Get	Interface Label	SHORT_ STRING	Human readable identification Instance 1: 9, “Left port” Instance 2: 10, “Right port”
	11	Get	Interface Capability	STRUCT of	Indication of capabilities of the interface.
			Capability Bits	DWORD	Interface capabilities, other than speed/duplex.
			Speed/Duplex Options	STRUCT of	Indicates speed/duplex pairs supported in the Interface Control attribute.
			Speed/Duplex Array Count	USINT	Number of elements.
			Speed/Duplex Array	Array of Struct of	
			Interface Speed	UINT	Speed in Mbps
			Interface Duplex Mode	USINT	0=Half duplex 1=Full duplex

Note: Don’t use the “System reserved” bit and Bit0 for the judgement.

Instance Services

Service Code	Service Name	Description of Service
0x01	Get_Attribute_All	Read all attributes
0x0E	Get_Attribute_Single	Read one attribute
0x10	Set_Attribute_Single	Write one attribute
0x4C	Get_and_Clear	Gets then clears the specified attribute (Interface Counters or Media Counters).

5. Web server

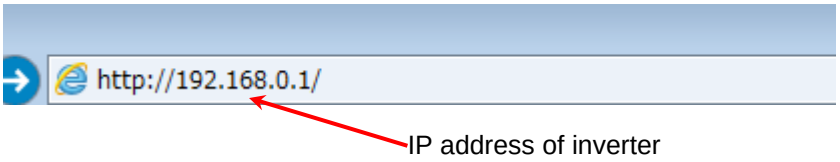
The embedded ethernet module provides an embedded Web server which allows several functions.

- Inverter monitor
- Inverter parameters read/write
- Network parameter setting
- Administration function
- TCP/IP statistics monitor

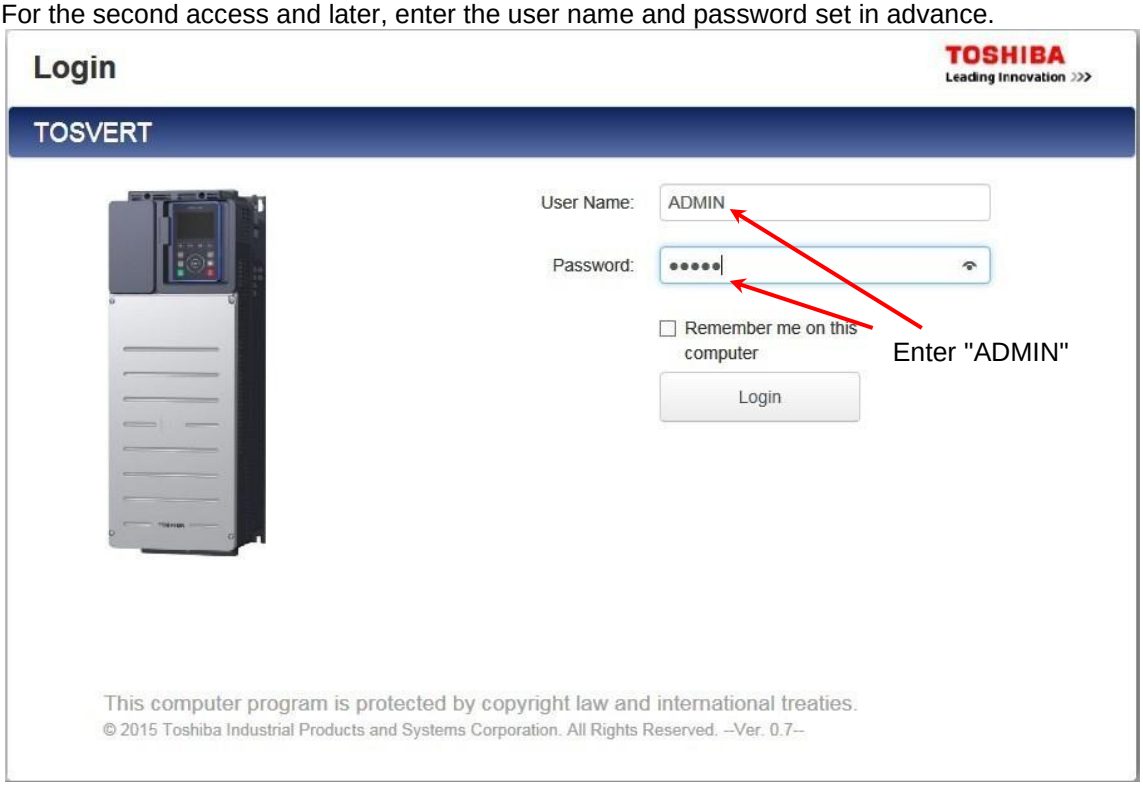
5.1. Accessing webserver of VF-AS3

The webserver can be accessed by standard browsers like Internet Explorer, chrome, safari and Firefox (Firefox is supported with inverter CPU1 version 116 or later).
Operation on the all of environment and the software version of browsers are not guaranteed.

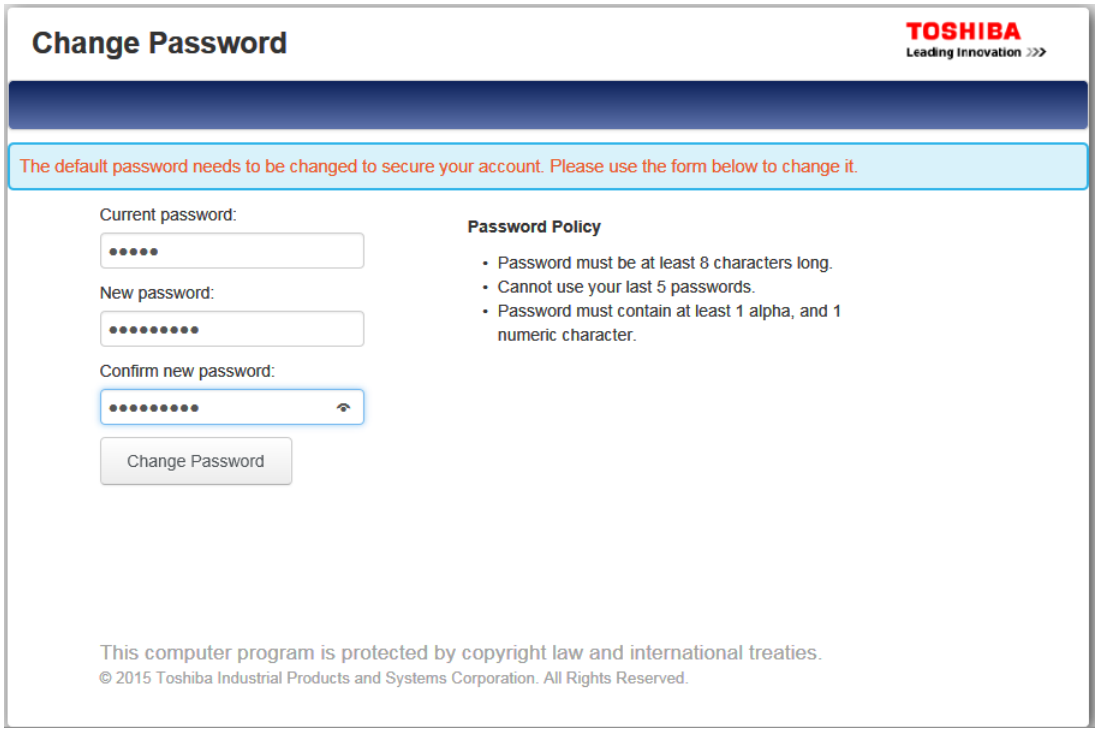
In the following example, the Inverter has received the IP address 192.168.0.1:
Enter the IP address of inverter after "http://" in the URL entry field of the browser to connect.



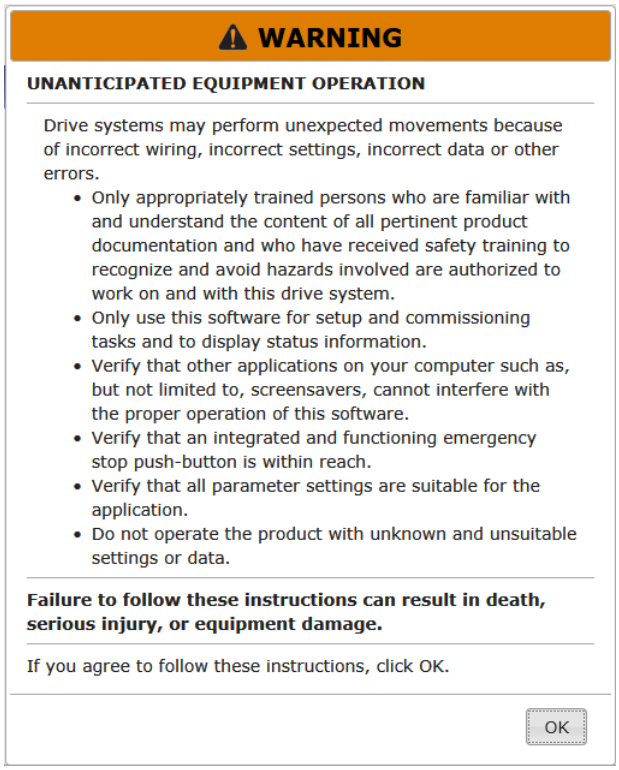
For the first access, enter "ADMIN" for the user name and the password and click the Login button.
For the second access and later, enter the user name and password set in advance.



At the time of first access, change the password to a new one.
(The password can be initialized by setting [C669] = "1", however, all the settings of the web server are also initialized then. It can be also initialized by the [tyP] function.)



Instructions for use are displayed. Click the [OK] button after accepting the contents.



5.2. **Page structure of web server**

The page structure of web server is as follows.

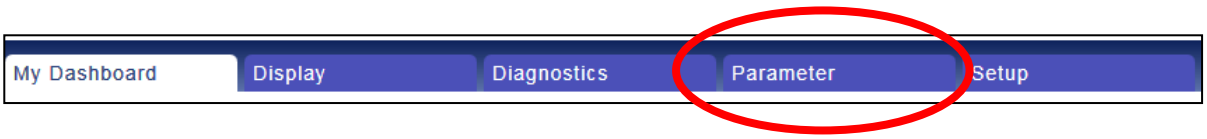
<table>
<tr><th>Page</th><th colspan="2">Side menu</th><th>Overview</th></tr>
<tr><td>My Dashboard</td><td colspan="2">Customizable Home Page</td><td>Allows you to add, delete, and reposition a widget you like.</td></tr>
<tr><td rowspan="5">Display</td><td rowspan="4">Monitor Viewer</td><td>IO Status</td><td rowspan="4">Allows you to monitor the IO status and some monitor parameters in a preset monitor table.
Allows you to create a new monitor table by selecting arbitrary monitor parameters.</td></tr>
<tr><td>Analog Input / Output</td></tr>
<tr><td>Inverter & Motor</td></tr>
<tr><td>+ Create New Table</td></tr>
<tr><td rowspan="3">Chart Viewer</td><td>Drive Monitor</td><td rowspan="3">Allows you to check the inverter status in a preset chart.
Allows you to create a new chart by selecting arbitrary monitor parameters.</td></tr>
<tr><td>Torque Monitor</td></tr>
<tr><td>+ Create New Chart</td></tr>
<tr><td rowspan="3">Diagnostics</td><td rowspan="2">Inverter</td><td>Inverter identification</td><td rowspan="3">Allows you to check inverter information, trip history, and status of ethernet.</td></tr>
<tr><td>Trip History</td></tr>
<tr><td>Network</td><td>Ethernet</td></tr>
<tr><td rowspan="3">Parameter</td><td rowspan="3">Inverter Parameter</td><td>Simply Start</td><td rowspan="3">Allows you to read and write some parameter settings in a preset parameter table.
Allows you to create a new parameter table by selecting arbitrary parameters.</td></tr>
<tr><td>Ethernet Error Setup</td></tr>
<tr><td>+ Create New Table</td></tr>
<tr><td rowspan="4">Setup</td><td>Network</td><td>TCP/IP</td><td rowspan="4">Allows you to set TCP/IP, theme, and password level.
You can also manage the account.</td></tr>
<tr><td rowspan="3">My Preferences</td><td>User Access</td></tr>
<tr><td>Themes</td></tr>
<tr><td>Access Management</td></tr>
</table>

5.3. Description for each page

5.3.1. How to move to each page

Each page has tabs displayed to move to another page.

For example, when you want to move the Parameter page, you can move there by clicking the "Parameter" tab.



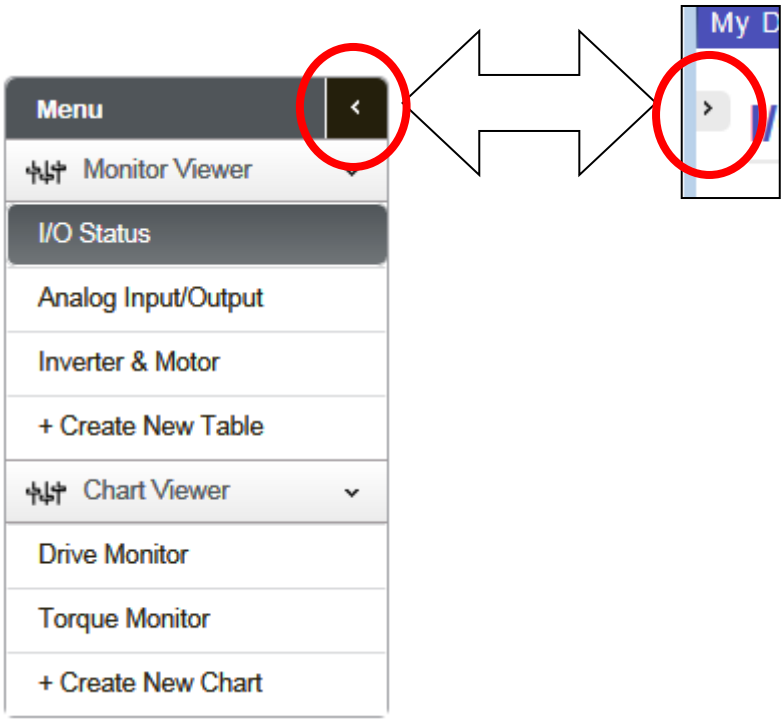
5.3.2. Side menu of each page

Each page except for My Dashboard has a side menu.

When you click each menu item, the corresponding page is displayed.

When you click the upper right of the side menu, it is minimized.

The side menu that has been minimized is displayed again, when you click the minimized icon.



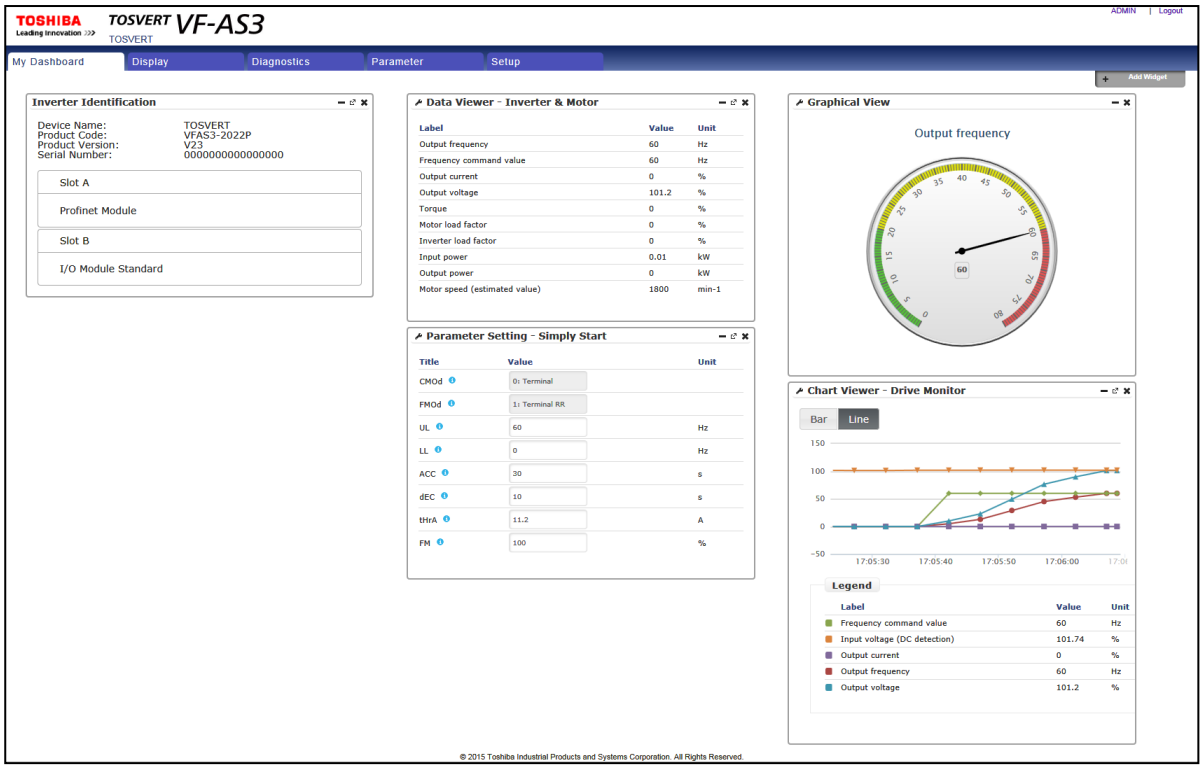
5.3.3. My Dashboard page

The My Dashboard page is the first page displayed when you log in to the web server.
You can add, delete, and move all the widgets, so you can display only information necessary for you and the setting window.

To add a widget, click the "Add Widget" tab at the upper right of the screen to display the widget menu. Select a widget to be added, drag and drop it.
You can edit a widget from buttons displayed on the title bar.

The Ethernet communication may stop when editing My Dashboard. Therefore, do not edit the My Dashboard when inverter is running.

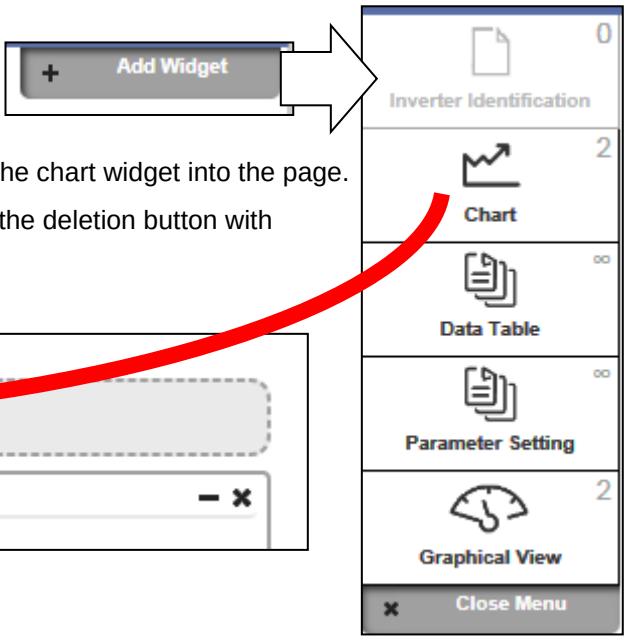
If widget can't be added to My Dashboard, reduce the number of widgets.



⚠ CAUTION	
Prohibited	▼ Do not edit the My Dashboard when inverter is running. If you change My Dashboard, this will stop the Ethernet communication and cause the unexpected movement.

Adding, deleting, and moving widget

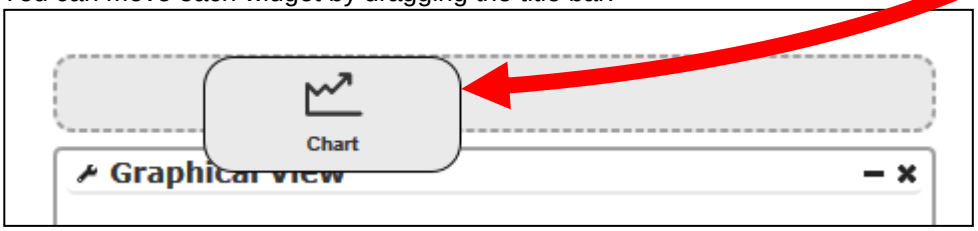
When you click the "Add Widget" tab at the upper right of the screen, the widget menu is expanded.



To add a chart, drag and drop the "Chart" icon and add the chart widget into the page.

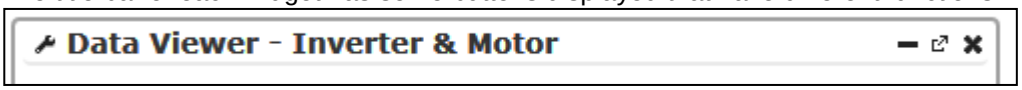
You can delete a widget that has been once added with the deletion button with X mark at the upper right of the widget.

You can move each widget by dragging the title bar.



Editing widget

The title bar of each widget has some buttons displayed that have different functions.

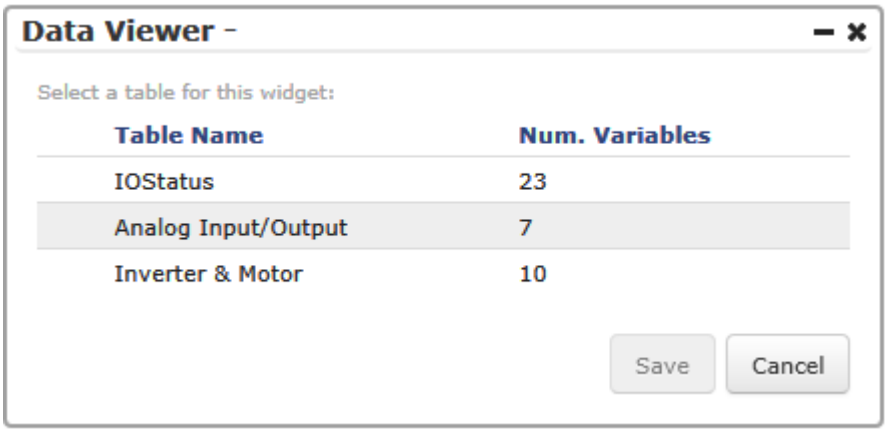


 : Tool button

This button allows you to change the setting of the widget.

With the Data Viewer widget, you can select a monitor table to be displayed as shown in the figure below.

Since tables of each widget are interlocked with tables and charts of each table described later, you can display tables and charts created by yourself as widgets.



 : Minimization button

This button allows you to display the widget in the minimum size.

A widget displayed in the minimum size is expanded again when you press the + button.

 : Jump button

This button allows you to move to the page corresponding to the table displayed in the widget.

For example, you can move from the IO Status widget of Data Viewer to IO Status of the Display page.

 : Deletion button

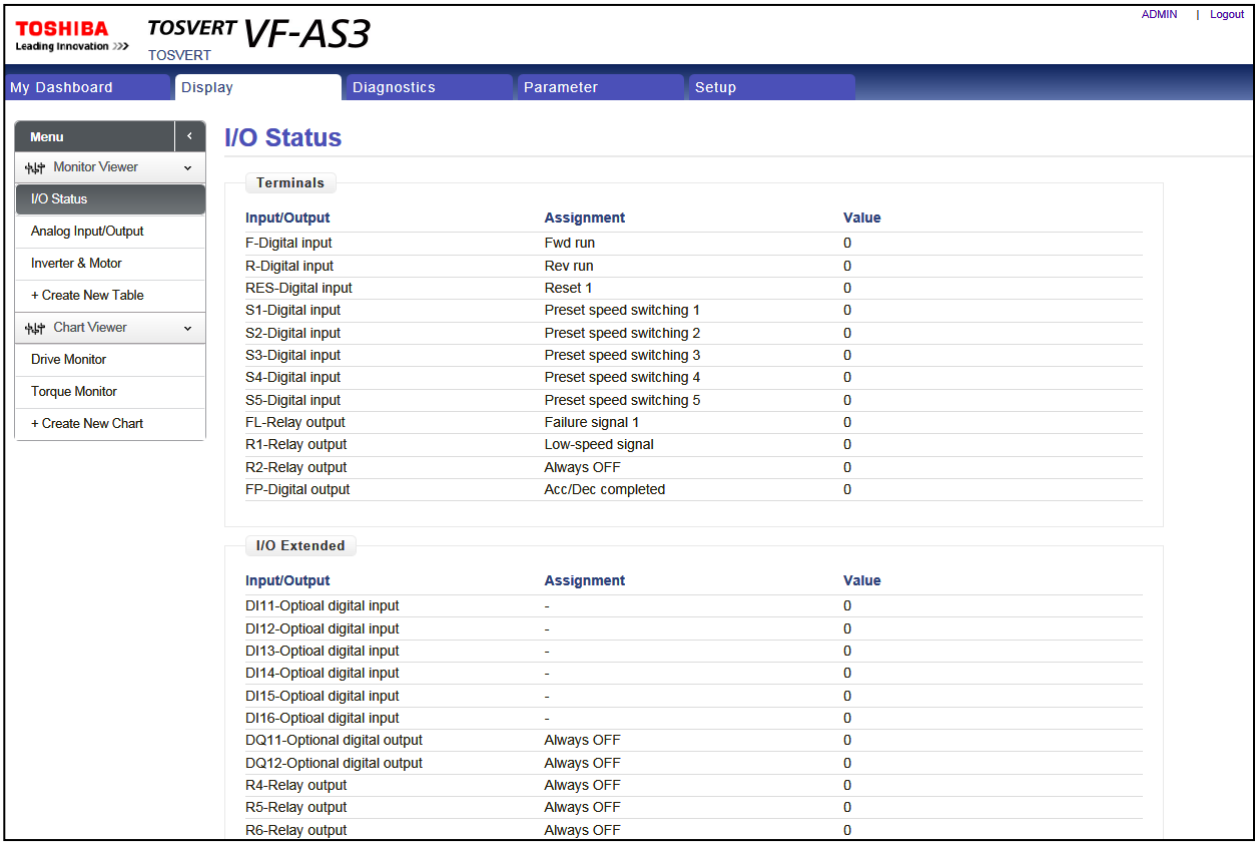
This button allows you to delete the relevant widget.

You can add the deleted widget again from the widget menu.

5.3.4. Display page

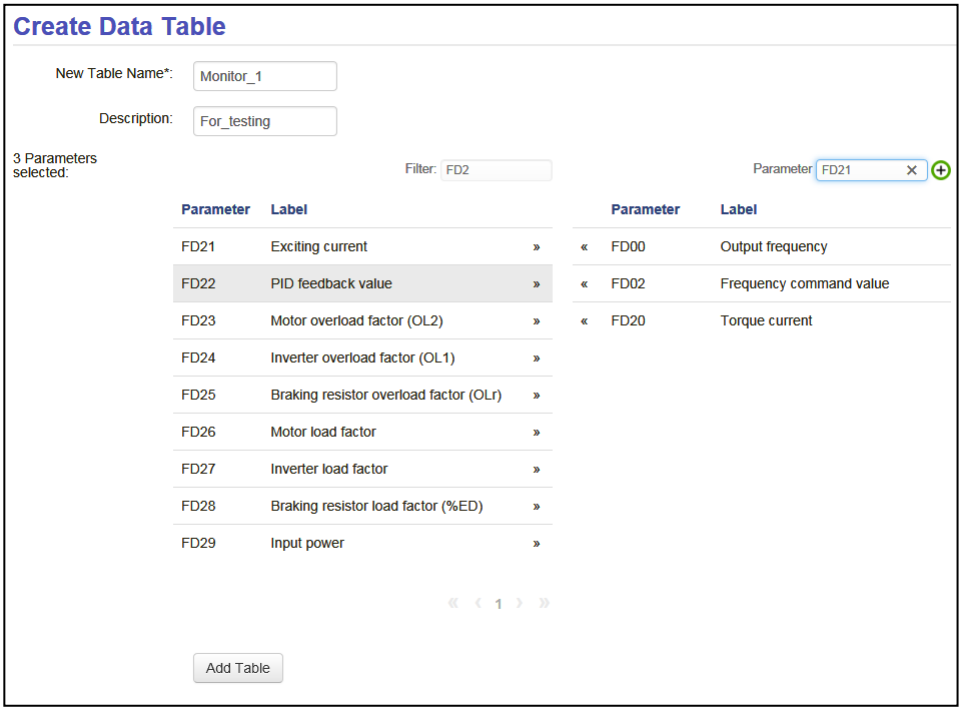
The Display page can display terminal information and preset monitor parameter tables and charts.

In addition to the preset tables and charts, you can select monitor parameters by yourself to create a monitor as you like.

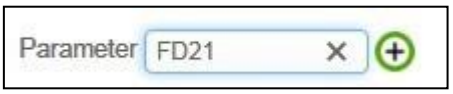


Creating new monitor table/chart

When you click "+ Create New Table" of the side menu, you can move to the table creation screen. Here, you can select up to ten parameters to be displayed on the monitor to create a new table.

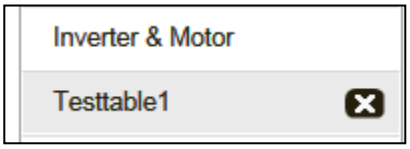


You can filter parameters with the character string entered in the Filter entry field when you select parameters. If you already know the title of the parameter you want to add, you can add it directly to the table by entering the title in the Parameter entry field and clicking the green + mark.



When you click "+ Create New Chart" of the side menu, you can create a new chart in the similar way. When creating a chart, you can separately select the update cycle (s), number of plots, and whether auto scale should be applied or not.

An X button is displayed on the right of the table/chart newly created.
You can delete tables except for the preset one by clicking this X button.



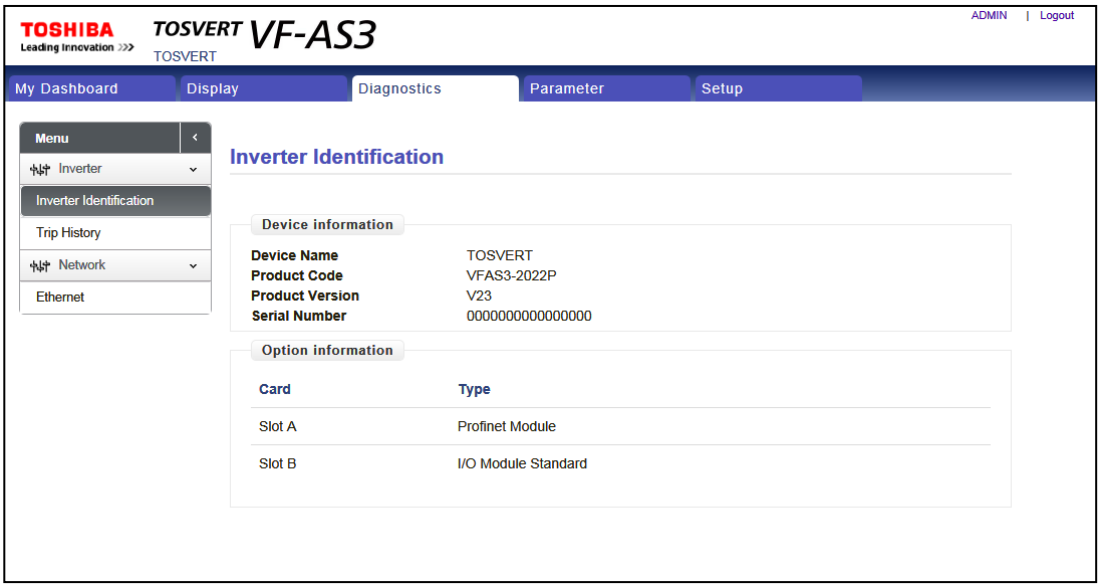
5.3.5. Diagnostics page

The Diagnostics page displays inverter information, trip history, and ethernet status.

You can check display by selecting each item from the side menu.

Inverter Identification menu

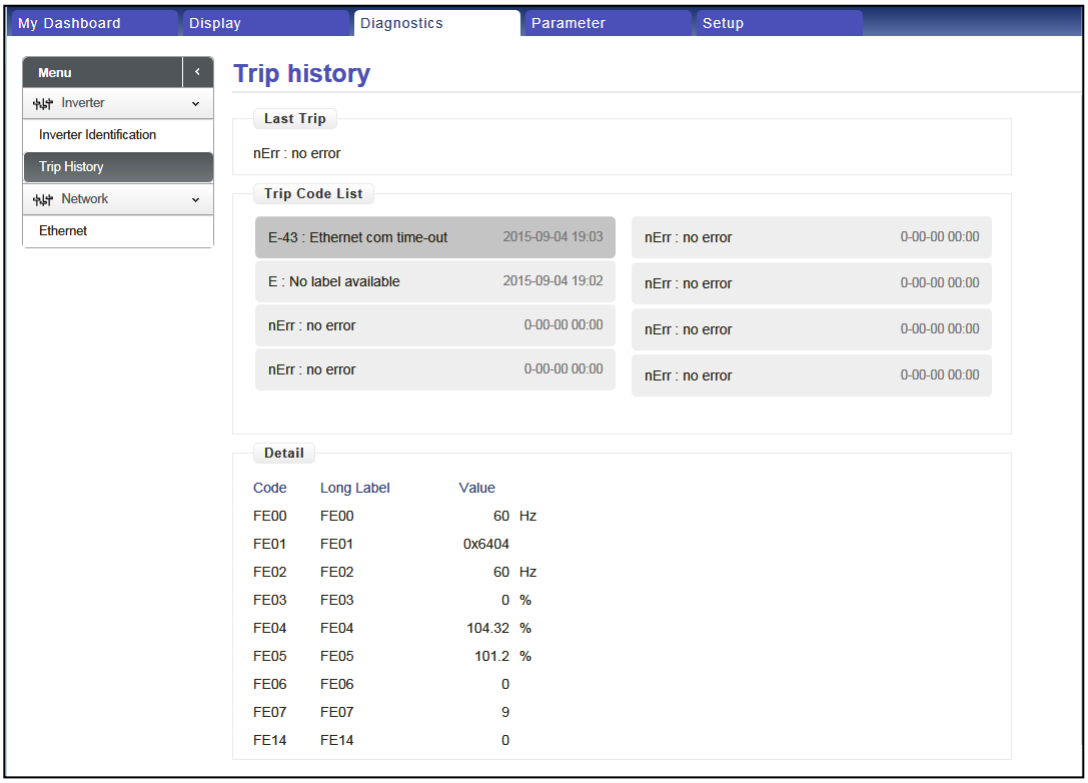
You can check the basic information of the inverter and the type of the option module installed in each option slot.



Trip History menu

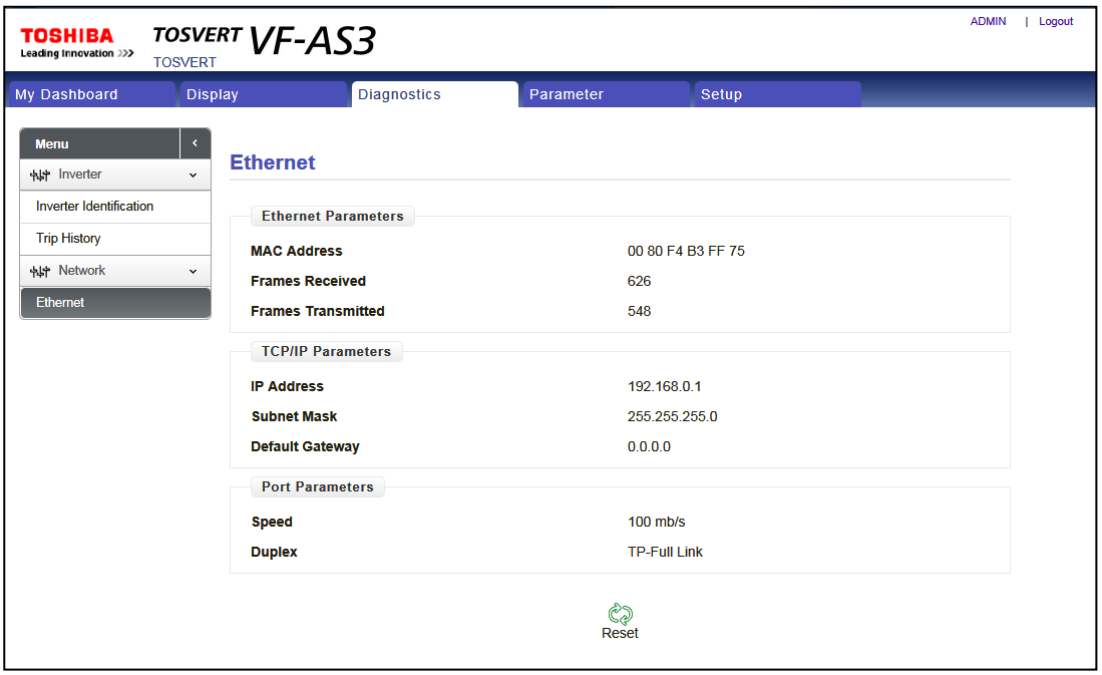
You can check the trip history of the inverter.

When you click each trip, monitor information at the time of trip is displayed in the Detail column.



Ethernet menu

You can check the ethernet status.

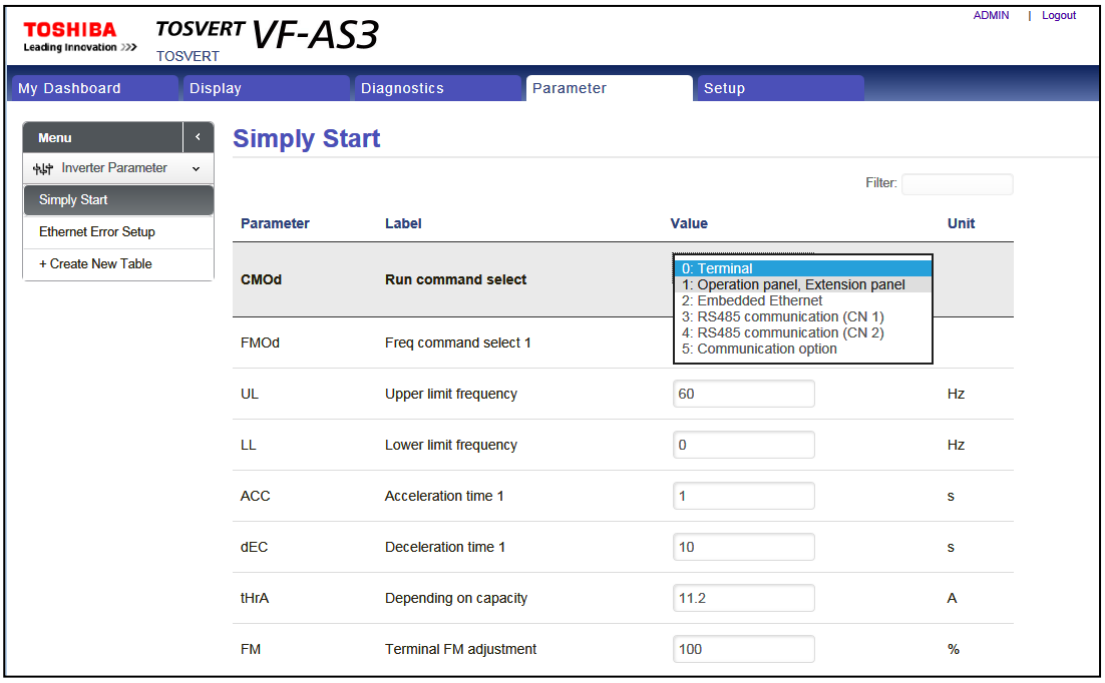


The sending / receiving frame count can be initialized by click the button.

5.3.6. Parameter page

In the Parameter page, you can read and write some parameter settings in the preset parameter table.

You can also create a new parameter table by selecting arbitrary parameters from "+ Create New Table."



Creating new parameter table

When you click "+ Create New Table" of the side menu, you can move to the table creation screen.

Here, you can create a new table in the same manner as "+ Create New Table" in the Display page.

For details, refer to "5.3.4 Display page".

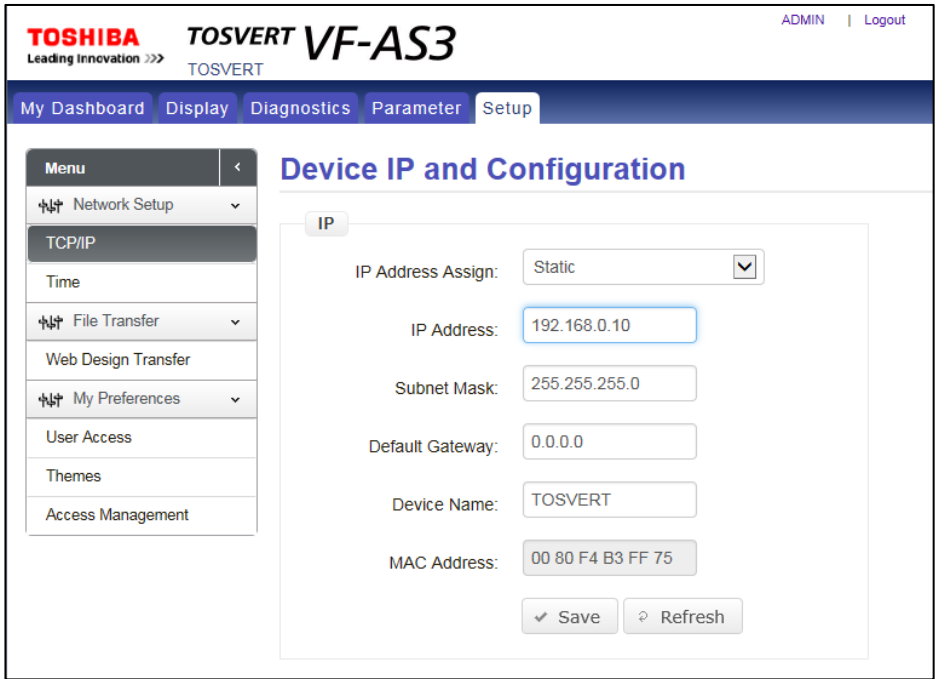
5.3.7. Setup page

In the Setup page, you can change the TCP/IP settings, theme, and password and manage the account.

TCP/IP menu

You can set the IP settings and the device name and check the MAC address.

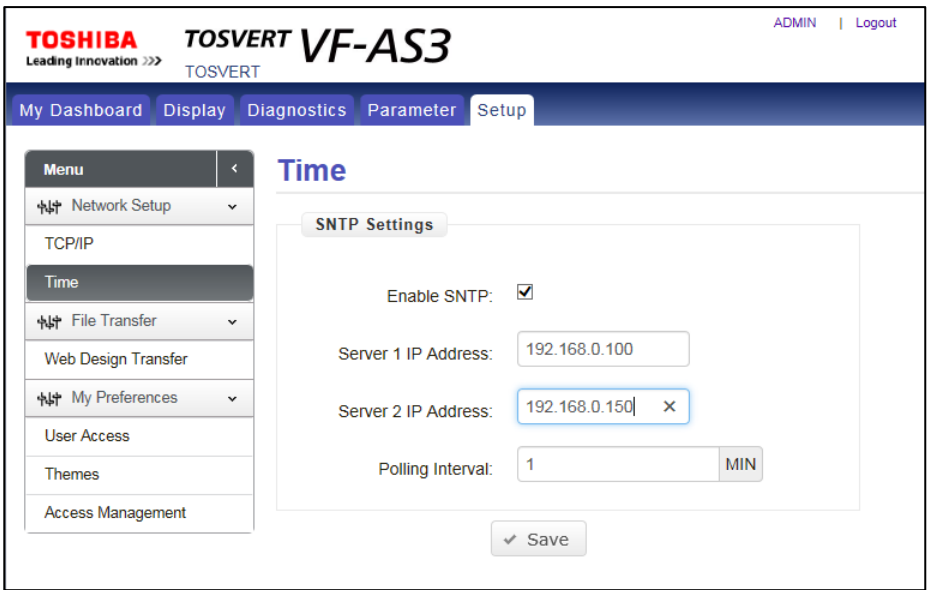
Change of the device name is reflected immediately, but the IP settings are enabled after reset.



Time menu

You can set the SNTP settings.

SNTP is disabled by default.



Note: When the operation panel is not mounted on the inverter, SNTP function does not work.

Web Design Transfer menu

You can Copy the web page design.

My dashboard of the logged in account, monitor viewer table, chart viewer and inverter parameter table will be copied.

When you click the “Copy from Device to PC”, Web server design data will be downloaded to PC with the file name “WebDesign.dat”.

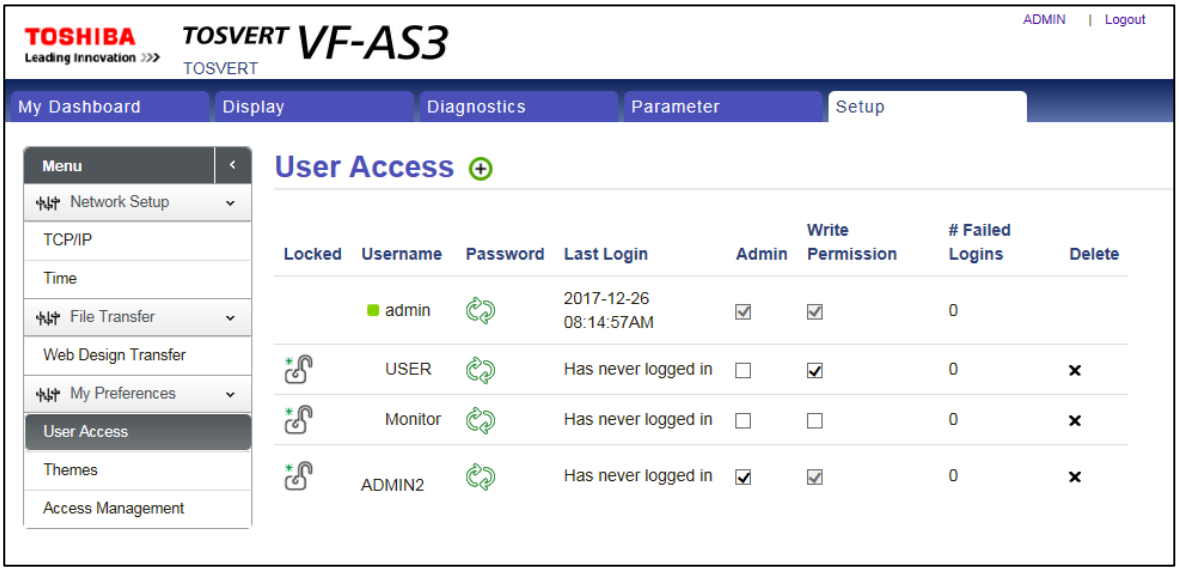
After logging in to the account of the device you want to copy the My dashboard, click "Copy from PC to Device" and upload "WebDesign.dat" to the device, the Web server design data will be reflected on the device.

Note) Please refresh the page after copying to correctly reflect changes.

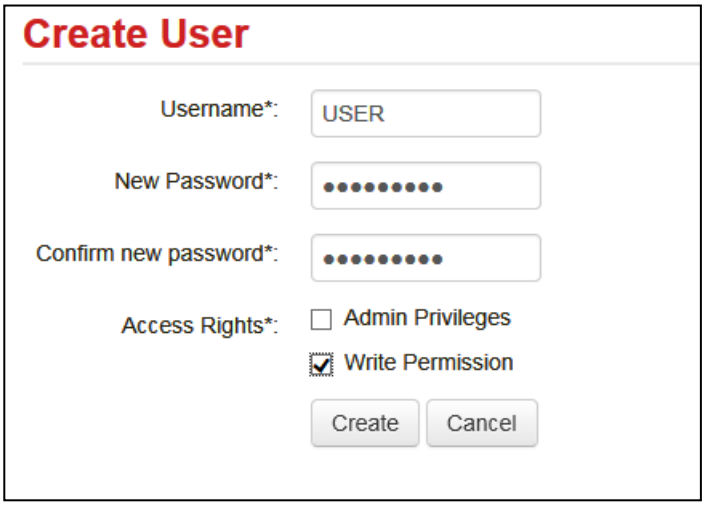
User Access menu

You can manage the account.

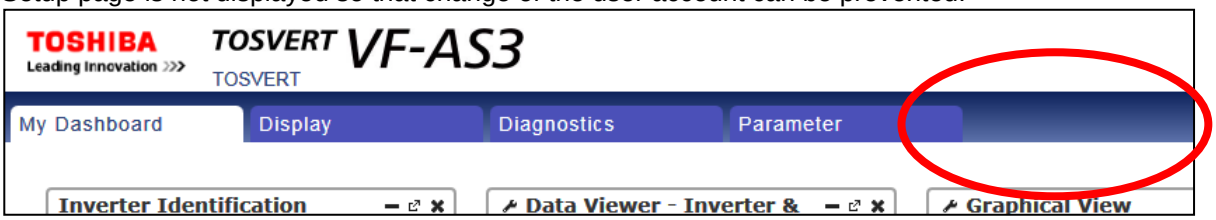
You can create account for up to 10 by selecting whether the administrator privileges and the write permission are given. You can create the account according to the applications. For example, account for monitoring, account for make adjustment, etc.



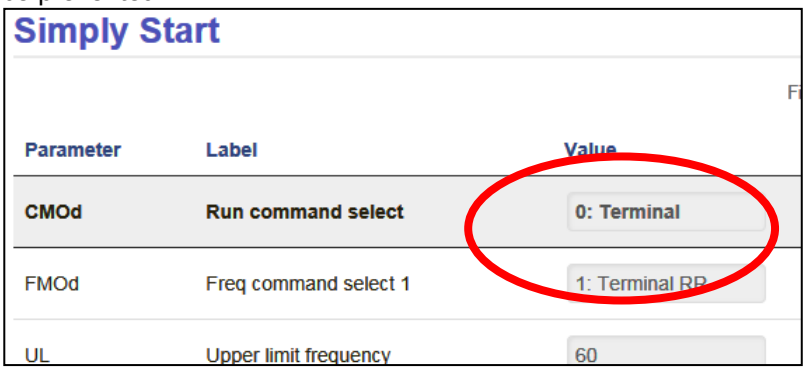
When you click the button on the top of the screen, you can move to the account creation screen. When you enter the user name, password, and privileges and permission to be given and click the "Create" button, a new account is created.



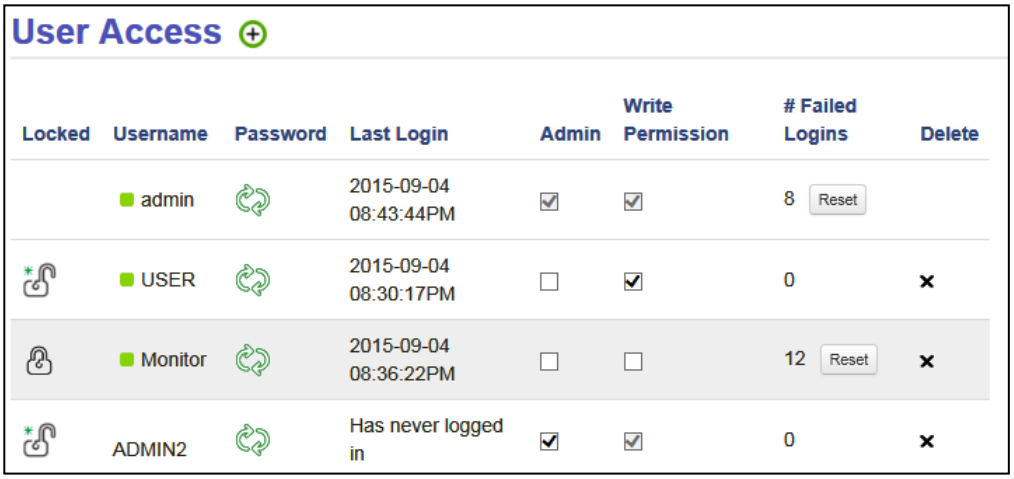
When a user logs in with an account that does not have the administrator privileges, the tab to access the Setup page is not displayed so that change of the user account can be prevented.



When the user tries to change a parameter with account that does not have the write permission, the frame is displayed in gray and becomes unchangeable so that writing from an account for monitoring can be prevented.



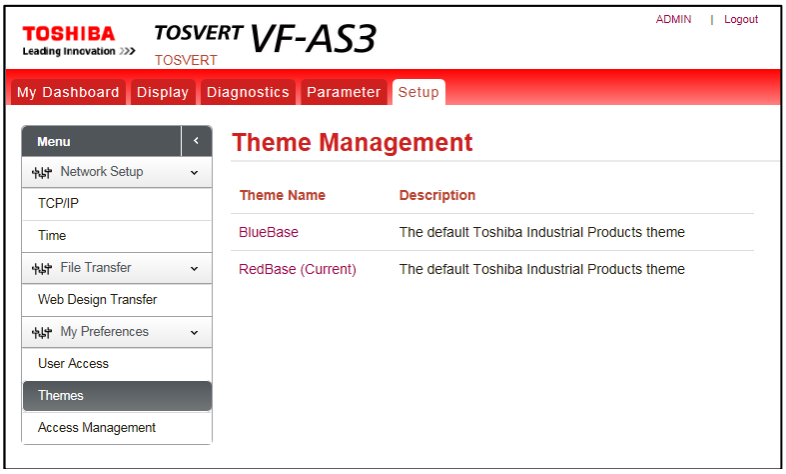
From an account that has the administrator privileges, the user can block an account by clicking the  button and can change the password forcibly by clicking the  button.



Themes menu

You can select the base color of the page between blue and red.

When you click the name of the theme, the base color is changed.



Access Management menu

You can change whether access restriction with password is applied or not and the password policy.