TOSVERT VF-AS1/PS1 series

ModbusTCP option unit Instruction Manual

MBE001Z

Safety precautions

On the inverter and in its instruction manual, important information is contained to prevent injuries to users, damages to assets, and for proper use of the device.

Read the instruction manual provided with the inverter along with this instruction manual and thoroughly understand the safety precautions, the symbols, and indications as shown below.

Please adhere to the contents of these manuals at all times.

Explanation of markings

Marking	Meaning of marking
⚠ Warning	Indicates that errors in operation may lead to death or serious injury.
⚠ Caution	Indicates that errors in operation may lead to injury (*1) to people or that these errors may cause damage to physical property. (*2)

(*1) Such things as injury, burns or shock that will not require hospitalization or long periods of outpatient treatment.

(*2) Physical property damage refers to wide-ranging damage to assets and materials.

Meanings of symbols

Marking	Meaning of marking
🚫	Indicates prohibition (Do not do it). What is prohibited will be described in or near the symbol in either text or picture form.
❗	Indicates something mandatory (must be done). What is mandatory will be described in or near the symbol in either text or picture form.
⚠	Indicates danger or warning. What is dangerous, or what the warning should be applied to will be described in or near the symbol in either text or picture form.

■ **Limitation of use**

⚠**Safety precaution**
▼   Never use this unit with any device other than the TOSVERT VF-AS1/PS1 series inverters. Doing so may cause an accident.

■ **Handling in general**

⚠ **Warning**	
🚫 Never Disassemble	▼ Never disassemble, modify or repair the product. Disassembling the product may cause electric shocks, fire, and injuries. For repairs, call your sales/repair agency.
🚫 Prohibited	▼ Do not open the front cover on the inverter while the inverter power is on. It may lead to electric shocks. ▼ Do not remove this option from VF-AS1/PS1 while the power is on. It may lead to electric shocks. ▼ Do not put or insert foreign objects such as waste cable, bars or wires into the product. It may lead to electric shocks or fire. ▼ Do not splash water over the product, and do not wipe the body with a wet cloth. It may lead to electric shocks or fire.
❗ Mandatory	▼ Turn off the power immediately in case of any abnormalities such as smoke, smell or abnormal noise. Neglect of these conditions may lead to fire. For repairs, call your sales/repair agency. ▼ Do not touch the sharp portions (such as leads of parts on the board, the corner of board, or etc.) on this option. It may lead to injuries.

⚠ **Caution**	
❗ Mandatory	▼ This option is an electrostatic discharge sensitive device. Handle it, where the environment is protected against electrostatic electricity. Otherwise, permanent damage to device will result.

■ **Transportation and installation**

⚠ **Warning**	
🚫 Prohibited	▼ Do not apply a dropping shock or other physical shocks. Otherwise, damage or malfunction will result. ▼ Do not install or operate the inverter if it is damaged or any part of it is missing. Operating a defective inverter may lead to electric shocks or fire. For repairs, call your sales/repair agency. ▼ Do not put any flammable material near the product. It may catch fire due to the product sparking in the case of a malfunction.
❗ Mandatory	▼ Use this product under the environmental conditions prescribed in the instruction manual. Usage it under any other conditions may result in malfunction. ▼ An emergency stop device must be installed that fits with system specifications (e.g. shut off input power then engage mechanical brake). Operation cannot be stopped immediately by the inverter or this unit alone, thus risking an accident or injuries.

■**Wiring**

	⚠ **Caution**
![Mandatory] **Mandatory**	▼ Electrical construction work must be done by a qualified expert. Connection of input power by someone who does not have expert knowledge may result in electric shocks or fire. ▼ Turn off input power before wiring. Wait at least 15 minutes and make sure that the charge lamp (on the inverter unit) is no longer lit. Otherwise, it may lead to electric shocks.

■**Operations**

	⚠ **Warning**
Prohibited	▼ Do not pull on the cable and connector. It may cause damage or malfunctions.
Mandatory	▼ Use this option under the environment specified in the instruction manual. Usage under the environment other than them may cause damages or malfunctions or an accident. ▼ Use an additional safety device with your inverter or system to prevent a serious accident due to the unit malfunctions. Usage without an additional safety device may cause an accident.
Mandatory	▼ Use the [IP MASTER] ($F589$-$F592$) parameter to configure a network master device. If a valid IP address for a master device is not specified using this option, other Ethernet clients can saturate the TCP connections or send incorrect commands leading to unintended equipment operation. Failure to follow this instruction can result in death, serious injury, or equipment damage

	⚠ **Caution**
Mandatory	▼ Set up "Communication error trip function (see below)" to stop the inverter when the option unit is deactivated by an unusual event such as an operating error, power outage, failure, etc. - Time Out on Modbus Communication ($F594$) (See the VF-AS1/PS1 ModbusTCP Communication Function Manual for details.) Deactivated option unit may cause an accident, if the "Communication error trip function" is not properly set up. ▼ Make sure that the operation signals are STOP before resetting inverter's fault. The motor may suddenly start and that may result in injuries.

■**Disposal**

	⚠ **Caution**
Mandatory	▼ If you dispose off this unit, have it done by a specialist in industrial waste disposal*. Improper disposal may result in explosion of capacitors or produce noxious gases, resulting in injuries. (*) Persons who specialize in the processing of waste and known as "Industrial Waste Product Collectors and Transporters" or "Industrial Waste Disposal Persons." If the collection, transport and disposal of industrial waste is done by someone who is not licensed for that job, it is a punishable violation of the law (Laws in regard to cleaning and processing of waste materials).

■**Notes on operation**

	Notes
	▼ Avoid installing in a place where ambient temperature or/and humidity change sharply. ▼ Keep the transmission cable separate from the power cable of the inverter to prevent the inverter from malfunction due to electromagnetic noise.

Preface

Thank you for purchasing the "ModbusTCP option (MBE001Z)" for the TOSVERT VF-AS1/PS1 inverter. By Installing this board into the VF-AS1/PS1, data communication can be made with a host computer or other device via ModbusTCP network.
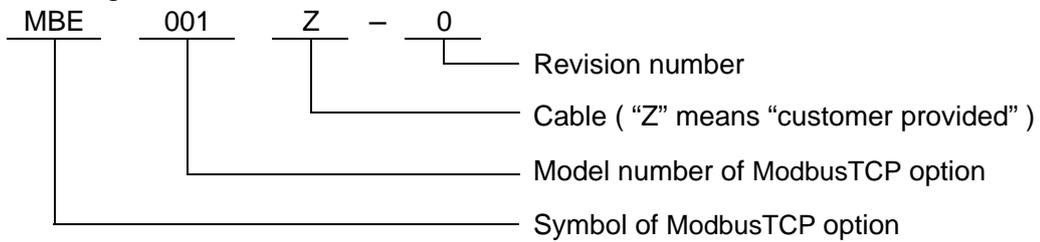
Before using this unit, carefully read and understand the safety precautions, this manual and the inverter instruction manual. This way you can utilize the excellent performance of this unit. Besides this instruction manual, the "ModbusTCP option Function Manual" which includes the contents to install into ModbusTCP network is prepared. If it is required, please contact with our branch offices, sales offices or web site "www.inverter.co.jp".

("ModbusTCP option Function Manual": E6581636)

After reading this instruction manual, please keep it handy for future reference.

*MBE001Z is applicable for VF-AS1(software version V150 or later) and VF-PS1(software version V V650 or later).

- Part numbering

```
MBE     001     Z  –   0
                       └──────── Revision number
                   └──────────── Cable ( "Z" means "customer provided" )
         └────────────────────── Model number of ModbusTCP option
└──────────────────────────────── Symbol of ModbusTCP option
```
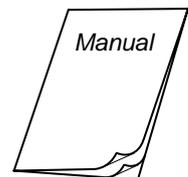
- Accessory check list

ModbusTCP communication option is shipped together with the following accessories. On opening the packing case, check to see if the following accessories are contained or not.

(1) ModbusTCP option (MBE001Z)....... 1 board
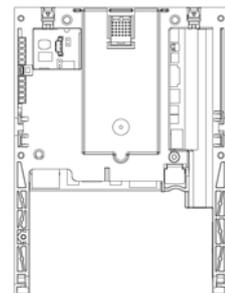
(2) Instruction manual for the VF-AS1/PS1 ModbusTCP option.....1 copy

English: E6581635
             (This manual)
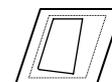
(3) LED name label   1 sheet

Table of Contents

1. Overview

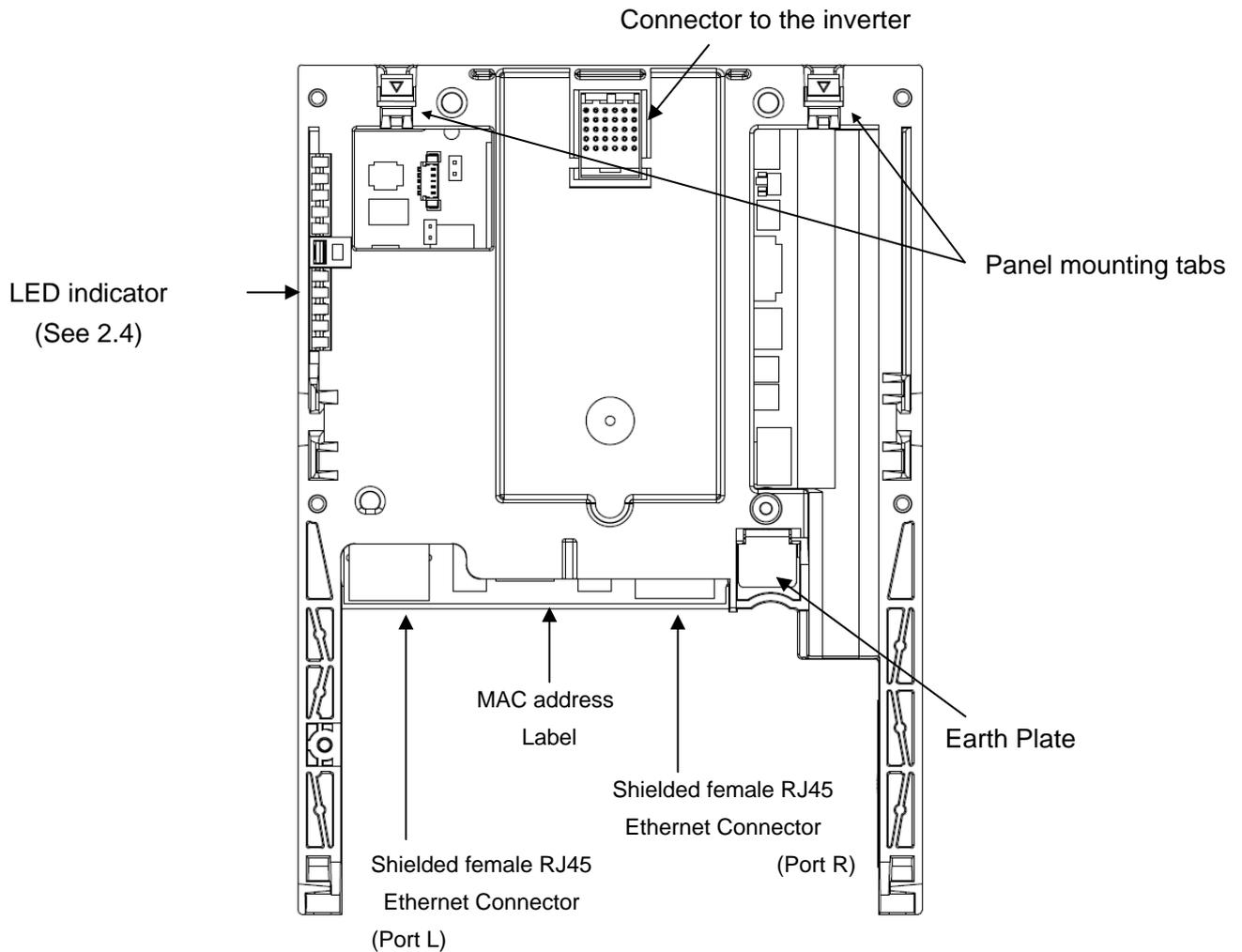The ModbusTCP interface (MBE001Z) allows the VF-AS1/PS1 inverter to be connected into a ModbusTCP network.

2. Names and functions

The drawing below shows names and functions of main parts.

2.1. Outline

Connector to the inverter

Panel mounting tabs

LED indicator
(See 2.4)

MAC address
Label

Earth Plate

Shielded female RJ45
Ethernet Connector
(Port R)

Shielded female RJ45
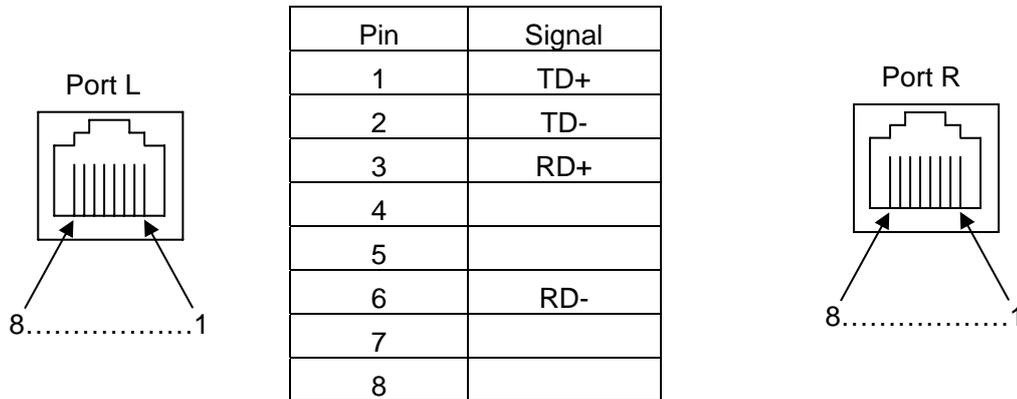Ethernet Connector
(Port L)

2.2. RJ45 connector pinout

The ModbusTCP card is equipped with two shielded RJ45 connectors. The shielding is connected to the drive ground.
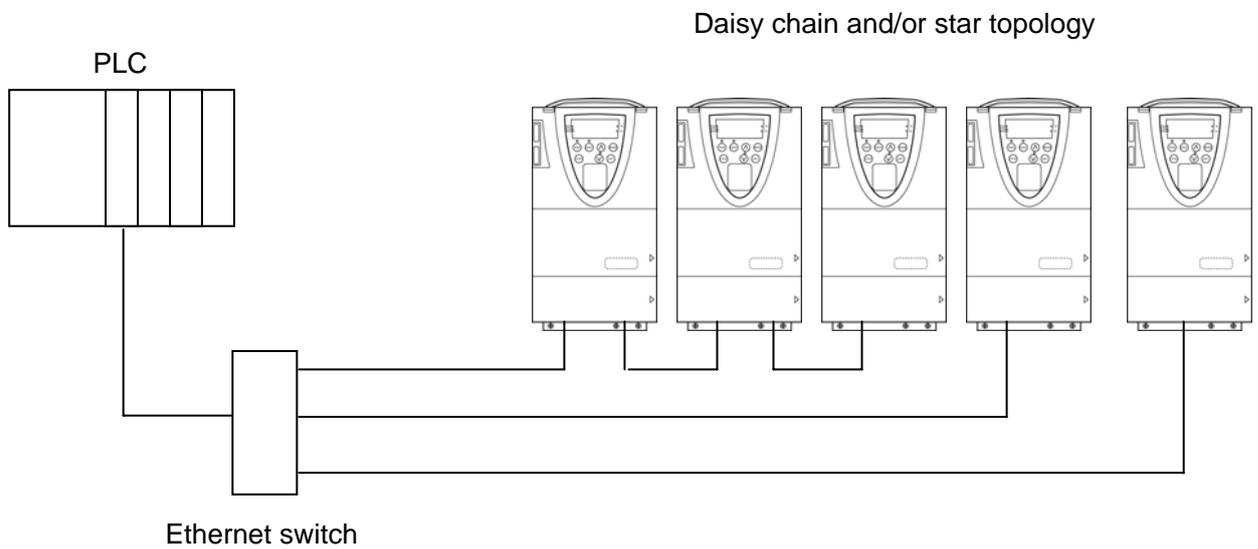
Use a STP (shielded twisted pair) Ethernet cable

The transmission speed is detected automatically by the card (10 Mbps or 100 Mbps).

The card can operate in half duplex or full duplex mode, whether connected to a hub or a switch and regardless of the transmission speed (10 Mbps or 100 Mbps).

Port L

8·················1

Pin	Signal
1	TD+
2	TD-
3	RD+
4	
5	
6	RD-
7	
8	

Port R

8·················1

The card supports the ETHERNET 2 frame format (IEEE 802-3 not supported).

2.3. Example of connection to a ModbusTCP

Daisy chain and/or star topology

PLC

Ethernet switch

Notes	
	▼ Provide strain relief so that the communication connector does not take the weight of the cable. ▼ Please connect this option to only the Modbus TCP communication line. This option does not work when connected to the other communication lines. For example, the RJ45 connector on the front of AS1/PS1 operation panel is for RS485 communication. Do not connect the Modbus TCP communication line to the RJ45 connector

2.4. LED indicator

The LED shows the present status of the network and error.
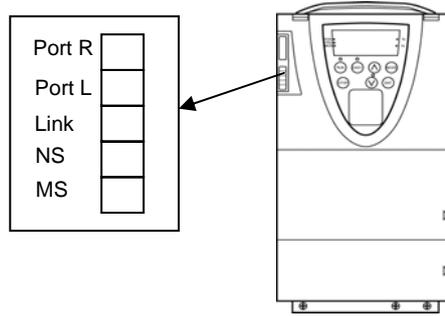
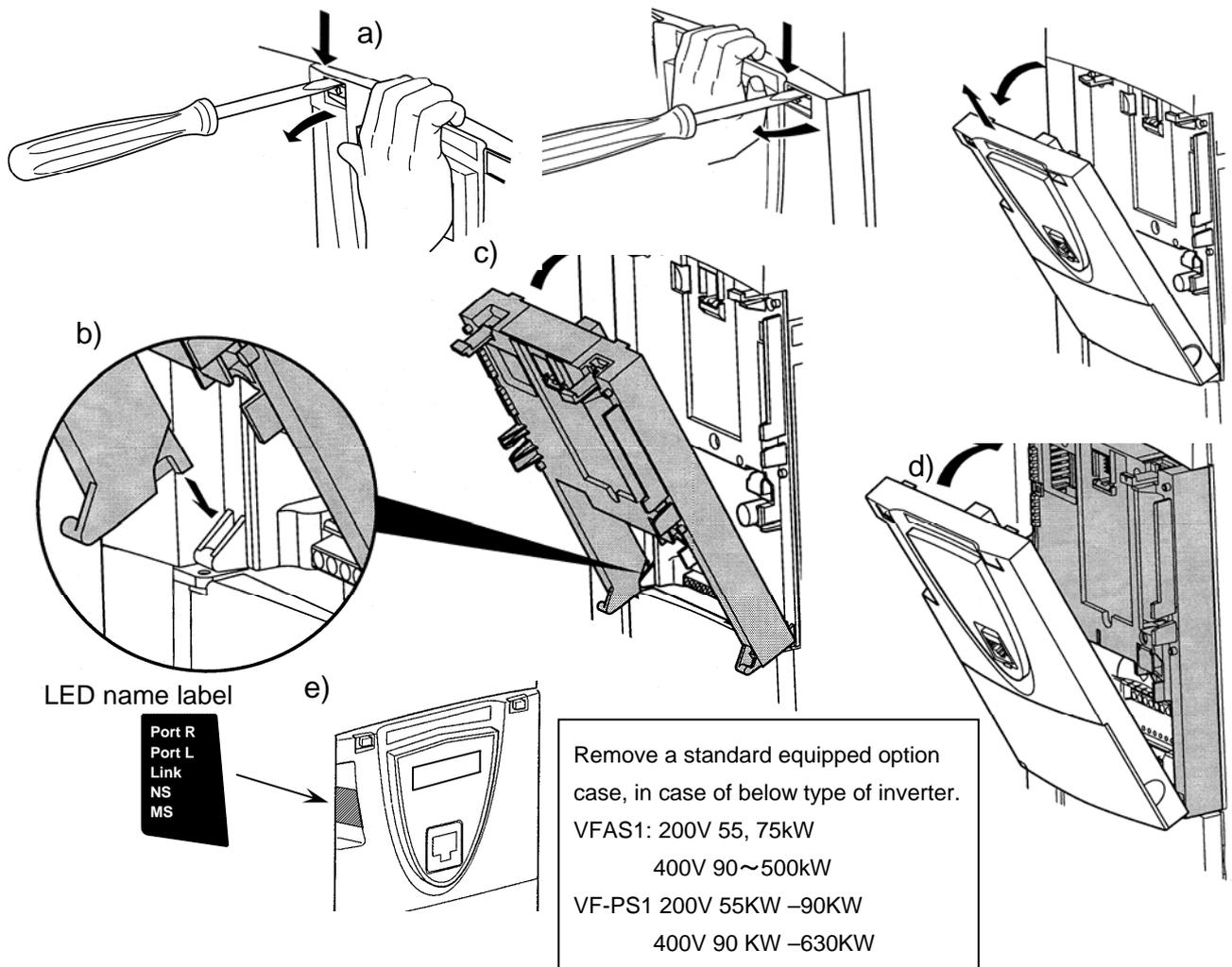| LED	Color/ state	Description
2.1 "Port R"	Off	No Link
	Flashing Green/Yellow	Power Up testing
	Green ON	Link at 100 Mbps
	Yellow ON	Link at 10 Mbps
	Green BLINK	Activity at 100 Mbps
	Yellow BLINK	Activity at 10 Mbps
2.2 "Port L"	Off	No Link
	Flashing Green/Yellow	Power Up testing
	Green ON	Link at 100 Mbps
	Yellow ON	Link at 10 Mbps
	Green BLINK	Activity at 100 Mbps
	Yellow BLINK	Activity at 10 Mbps
2.3 "Link"	Off	Physical connections unplugged - No IP address obtained
	Flashing Green/Red	Power Up testing
	Green ON	At least one port is connected and an IP address has been obtained
	Green flashing 3 times	All ports are unplugged, but the card has an IP address.
	Green flashing 4 times	Error: Duplicated IP address (1)
	Green flashing 5 times	The card is performing a BOOTP or DHCP sequence
2.4 "NS"	Off	The device does not have an IP address or powered off.
	Flashing Green/Red	Power up testing.
	Green ON	The device has at least one established connection (even to the Message Router.)
	Green flashing	The device has not established connections, but has obtained an IP address.
	Red flashing	One or more of the connections in which this device is the target has timed out. This shall be left only if all time out connections are reestablished or if the device is reset.
	Red ON	The device has detected that its IP address is already in use (1).
2.5 "MS"	Off	No power is supplied to the device.
	Flashing Green/Red	Power Up testing.
	Green ON	The device is operating correctly.
	Green flashing	The device has not been configured.
	Red flashing	The device has detected a recoverable minor fault.
	Red ON	The device has detected a non-recoverable major fault (1).

(1) In case of duplicate IP Address, the LED 2.3.is green flashing 4times, LED 2.4 and 2.5 are solid red.

3. Installing the MBE001Z

Install the ModbusTCP option to VF-AS1/PS1 as follows.

⚠ Mandatory	Turn off the input power of VF-AS1/PS1 and wait for at least 15 minutes and then check that the CHARGE lamp on VF-AS1/PS1 is no longer lit.

(1) Turn off input power of VF-AS1/PS1 and wait for at least 15 minutes and then check that the CHARGE lamp on VF-AS1/PS1 is no longer lit.

(2) Securing the option to the inverter

   a) Insert a flat-blade screwdriver in each of the two holes at the upper part of the front panel, release the panel mounting tab by pushing the screwdriver down and remove the front panel cover.

   b) Install the option in the inverter by fitting the tabs on the lower side the option into the slots at the lower part of the inverter front panel.

   c) Make sure the option is securely attached to the inverter. Then check whether the plastic bosses on the inverter case have fitted in the holes at the upper and lower parts of the option.

   d) Insert the tabs at the lower part of the front cover into the slots at the lower part of the inverter to attach the front cover to the inverter.

   e) Stick the enclosed "LED name label" to the option LED display part of the front cover.

LED name label

Port R
Port L
Link
NS
MS

Remove a standard equipped option case, in case of below type of inverter.
VFAS1: 200V 55, 75kW
     400V 90～500kW
VF-PS1 200V 55KW −90KW
     400V 90 KW −630KW

Case of installing two options

Please install this option (MBE001Z) on the top of options when you install two options. Do not install under the another option.

4. Parameters

4.1. Communication parameters

Set up the inverter parameters as follows. These parameters do not take effect until the inverter is reset. If these parameters are not set to correct value, this unit can not work normally.

Title	Communication No.	Function	Description	Factory setting
F821	0821	Rate Setting (*1)	This field is used to set the transmission speed and the transmission mode of the card. 0:Autodetect(default) 1:10Mbps Full 2:10Mbps Half 3:100Mbps Full 4:100Mbps Half	0
F822	0822	Actual Rate (Port L)	This field displays the baud rate and the transmission mode currently used by the communication card. **(Display only)** 0:Autodetect	0
F823	0823	Actual Rate (Port R)	1:10Mbps Full 2:10Mbps Half 3:100Mbps Full 4:100Mbps Half	
F792 - F799	0792- 0799	DEVICE NAME (*1)	16 characters by a hex digit 0h to FFFFh for each of fields. (There are 2 characters per one parameter.) The device name is required if the card uses DHCP to obtain its IP Address.	0,0,0,0 0,0,0,0 (HEX) (*2)
F576	0576	IP mode (*1)	Use this parameter to select the IP address assignment method. 0:Manual 1:BOOTP 2:DHCP	0
F577 - F580	0577- 0580	IP address (*1)	IP address of the card 0 to 255 for each of fields. These fields are editable when IP mode = 0.	0,0,0,0
F581 - F584	0581- 0584	IP Mask (*1)	Subnet mask of the card 0 to 255 for each of fields. These fields are editable when IP mode = 0.	0,0,0,0
F585 - F588	0585- 0588	IP Gate (*1)	Gateway IP address of the card 0 to 255 for each of fields. These fields are editable when IP mode = 0.	0,0,0,0
If the address has been given by a BOOTP or a DHCP server, these fields ("IP address", "IP Mask", "IP Gate") are read only. •If you enter a value other than [0.0.0.0] (0) (0) (0) (0), dynamic addressing by a BOOTP or DHCP server is disabled. •After dynamic addressing by a BOOTP or DHCP server, the new address value is displayed.				
F589 - F592	0589- 0592	IP Master	0 to 255 for each of fields. • If the value is [0.0.0.0] then accepted by the Ethernet card regardless of which device has sent it. •If the value is other than [0.0.0.0] then only the device which has the IP address [IP Master] is authorized to write. .	0,0,0,0
F784 - F789	0784- 0789	MAC address	MAC address display 0 to 255 for each of fields.	----
F594	0594	Time Out on Modbus Communication	0: No Time-Out (unit:1=0.1s) 1 to 600 (0.1s to 60.0s)	0

| Title	Communication No.	Function	Description	Factory setting
F851	0851	Operation at communication error by disconnection	0: Inverter stop, communication command, frequency mode open (by *CMOd*, *FMOd*) 1: None (continued operation) 2: Deceleration stop 3: Coast stop 4: Network error (*Err8* trip) 5: Preset speed operation (by *F852* setting)	0
F852	0852	Preset speed operation selection	0:None 1~15:Preset speed operation (by parameter setting)	0
F593	0593	Enable IO Scanner	0: IO Scanner disabled 1: IO Scanner Enabled	0
F831-F838	0831-0838	IO Scanner Command data	0: No action 1: FA06 (Communication option command 1) 2: FA23 (Communication option command 2) 3: FA07 (Communication option frequency command, 0.01Hz) 4: FA33 (Torque command, 0.01%) 5: FA50 (Terminal output) 6: FA51 (Analog output (FM) data from comm.) 7: FA52 (Analog output (AM) data from comm.) 8: F601 (Stall prevention level, %) 9: F441 (Power running torque limit 1 level, 0.01%) 10: F443 (Regenerative braking torque limit 1 level, 0.01%) 11: F460 (Speed loop proportional gain) 12: F461 (Speed loop stabilization coefficient)	0
F841-F848	0841-0848	IO Scanner Monitor data	0: No action 1: FD01 (Inverter status 1) 2: FD00 (Output frequency, 0.01Hz) 3: FD03 (Output current, 0.01%) 4: FD05 (Output voltage, 0.01%) 5: FC91 (Inverter alarm) 6: FD22 (PID feedback value, 0.01Hz) 7: FD06 (Input terminal status) 8: FD07 (Output terminal status) 9: FE36 (VI/II input) 10: FE35 (RR/S4 input) 11: FE37 (RX input) 12: FD04 (Input voltage (DC detection), 0.01%) 13: FD16 (Speed feedback (real-time value) 14: FD18 (Torque, 0.01%) 15: FE60 (My monitor) 16: FE61 (My monitor) 17: FE62 (My monitor) 18: FE63 (My monitor) 19: F880 (Free notes) 20: FD29 (Input power, 0.01kW) 21: FD30 (Output power, 0.01kW) 22: FE14 (Cumulative operation time, 0.01=1 hour) 23: FE40 (FM terminal output monitor) 24: FE41 (AM terminal output monitor)	0
F899	0899	Network option reset setting	0:None 1:Reset option circuit board and inverter	0
—	FE66	Add-on option 1 CPU version (Under side option)	High byte is version. Low byte is revision. For example, When version number 1, and revision number 2 is, panel indication becomes with 1.02. The version of the option with it has equipped can be checked by using the function of *F710* to *F718* (standard monitor display selection). *For details, refer to the inverter instruction manual.	—
—	FE67	Add-on option 2 CPU version (Panel side)		—

(*1): This parameter is effective by reset. Please reset (power supply reset or *F899=1*) after changing a set point.

(*2): The Factory default setting parameter (*tYP*) does not work for this parameter.

5. Command & Setpoint selection (Local/Remote)

Indication to display Local/Remote mode is on the inverter unit (Refer to the inverter instruction manual for details). ModbusTCP option command and setpoint are activated on Remote mode.

Inverters have some switches to select the command and setpoint location. Following figure shows the diagram. Refer to the inverter instruction manual for the parameter in detail.
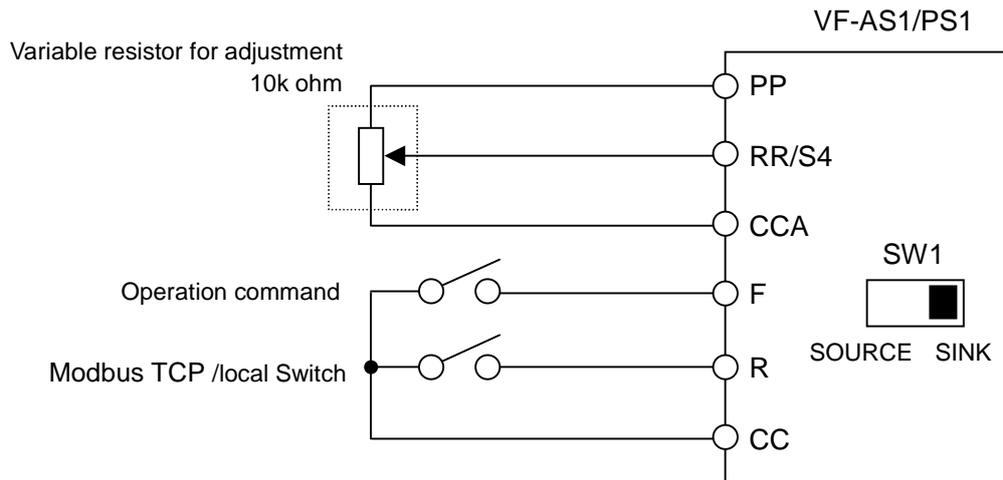
<Example>
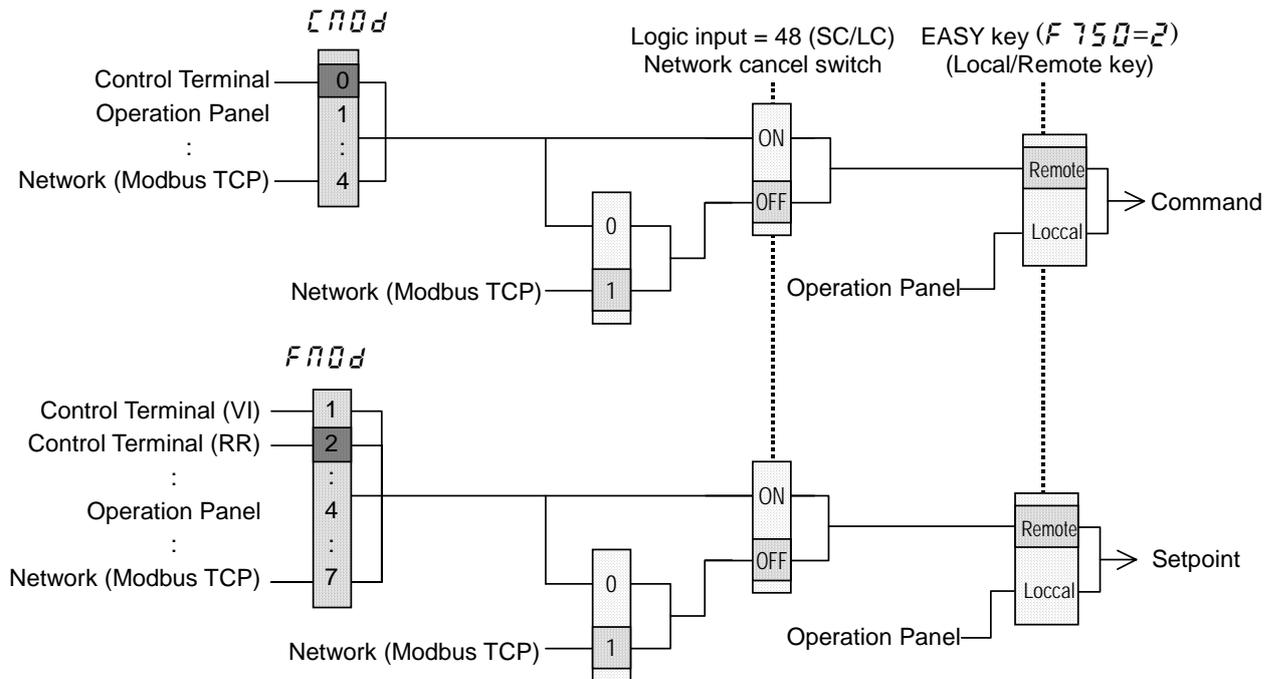
The example below shows how to configure the VF-AS1/PS1 for local/remote operation.

F terminal.....................Operating command

R terminal ....ModbusTCP local/remote (Terminal in this example) switching

RR/S4 terminal..........Operation frequency command

<Wiring>

VF-AS1/PS1

<Parameter setting>

$C \Pi D d$ (Command mode selection) = 0 (Terminal board)

$F \Pi D d$ (Frequency setting mode selection 1) = 2 (RR/S4)

$F \mid \mid 2$ (Input terminal selection 2 (R)) = 48 (Remote/Local control)

<Operation>

R-CC terminal open: VF-AS1/PS1 is controlled as a slave device of The ModbusTCP.

R-CC terminal closed:

F-CC terminal short to RUN

F-CC terminal open to STOP

Output frequency is set up by the RR/S4 signal input.

(Note)

When the local(HAND) / remote key ($F \ 1 5 D = 2$) is chosen as EASY key selection and the EASY key lamp of an inverter front panel is on, priority is most given to operation by a panel. (Refer to the inverter instruction manual for details).

Note that the HAND mode of the panel has priority over FLN local control.

6. Specifications

Item	Specification
Model number	MBE001Z
Ethernet	Baud-rate: Auto negotiation or manual selection of data rate and duplex can be selected. 10Mbps Full/10Mbps Half/100Mbps Full/100Mbps Half
Service environment	Conforms to VF-AS1/PS1
Ambient temperature	Conforms to VF-AS1/PS1
Storage temperature	Conforms to VF-AS1/PS1
Relative humidity	Conforms to VF-AS1/PS1
Vibration	Conforms to VF-AS1/PS1
Power supply	24VDC supplied from the inverter

7. Warranty

Any part ModbusTCP communication option that is proved to be defective will be repaired free of charge under the following conditions:

1. This product will be repaired free of charge, if problem/fault occurs under normal handling within one year of delivery and is caused obviously by a design or manufacturing defect.
2. The warranty applies only to the delivered product.
3. For the following kinds of failure or damage, the repair cost shall be borne by the customer even within the warranty period.
    i)   Failure or damage caused by improper or incorrect use or handling, or unauthorized repair or modification of the inverter.
    ii) Failure or damage caused by the unit falling or an accident during transportation after the purchase.
    iii) Failure or damage caused by fire, salty water or wind, corrosive gas, earthquake, storm or flood, lightning, abnormal voltage supply, or other natural disasters.
    iv) Damage due to the use of ModbusTCP communication option for non-intended purposes.
4. If an additional warranty is provided then those conditions will also apply.