TOYODENKI

TOYO INTELLIGENT INVERTER
OPTION
JEMA-NET(OPCN-1) Interface Card

OPCN64

INSTRUCTION MANUAL

《INTRODUCTION》

Thank you for your adoption of JEMA Net (OPCN-1) Option OPCN64 for our VF64/ED64sp series Inverter.
This option is communication device meeting the Standard of PLC Field Network 'OPCN-1', which is recommended by The Japan Electrical Manufacturers' Association (JEMA).
Please refer Standard Book issued by JEMA about the detailed standard of OPCN-1.

This Manual shows summary on the setting and specifications (Standard) of Inverter side.
In case of creation of communication program of master station by customer, please refer to 'OPCN64 COMMUNICATION PROTOCOL MANUAL' currently prepared independently.

Explanation of the word currently used with this manual.
*ARC: Acceleration/Deceleration control function. (Auto Ramp-function Controller)
*MRH: The speed acceleration/slowdown function by the Up/Down input.
(Motored RHeostat)

《SAFETY PRECAUTIONS》

Before use of the product, please read ***Safety precautions*** thoroughly.
In this Manual, rank of safety precautions is distinguished to ***Danger*** and ***Caution***.

Misoperation may lead to dangerous situation and could result in death or serious injury.

Misoperation may lead to dangerous situation and could result in injury light or medium degree as well as in damage to physical property only.
However, such misoperation could cause serious result depending on the situation. Since important content is written in the Manual, please obey it surely.

⚠ Caution

- Don't use the products, which are found damaged or deformed at the time of unpacking.
  - They could cause trouble or mal-operation.
- Avoid shock to the product by drop, falling down, etc.
  - They could cause damage of product and trouble.
- Connect communication cable and connector securely and lock them.
  - Imperfect connection could cause trouble and mal-operation.
- Since operation setting from low till high speed can be set to Inverter, operate Inverter confirming permissible range of motor and machine enough.

⚠ Danger

- Carry out fitting, removing, wiring works and maintenance and inspection surely After turning off the power.
  - Such works under supply of power could result in electric shock and fire.
- Turn on the input power surely after fitting of the front cover. Also, don't remove it during power supply.
  - Otherwise, that could result in electric shock.
- Don't touch Inverter terminals during power supply.
  - Otherwise, that could result in electric shock.
- If alarm is set while operation signal (command) is kept inputting, Inverter re-start suddenly. Therefore, set alarm after confirmation of turning off of operation signal (command).
  - Otherwise, that could result in injury.
- Never execute remodeling.

《The notes about the software version by the side of Inverter》

When using the multifunction input/output by terminal block of OPCN64, the software by the side of Inverter needs to be a version corresponding to it.
Please be careful.

Version of the Inverter side software corresponding to multifunction input/output by terminal block of OPCN64:

VF64 series	>VF64-02-A7 or later (however, 03-A1 removes) >VF64-61-**
ED64sp series	>ED64-02-A7 or later (however, 03-A1, 03-A2, 03-A3 and 03-A4 remove)

In addition, even when it is used in the Inverter side software of the version that does not correspond to the multifunction input/output by terminal block of OPCN64, and the combination of OPCN64, the OPCN-1 (JEMA-NET) communication itself can be used satisfactory at all.
The problem is only that multifunction input/output by terminal block do not become effective.

《Contents》

１．SUMMARY OF FUNCTION 4
1-1. OPCN-1 network 4
1-2. Placing of OPCN-1 4
２．Standard Book of JEMA 5
３．Basic Specification 5
４．Explanation of OPCN64 P.C.Board 6
５．Fitting method of OPCN64 7
６．Method of initial setting of Inverter 8
７．Setting station number 10
８．Composition of hardware 11
９．External connection diagram 11
１０．Multifunction input/output by terminal block 12
10-1. Multifunction input by terminal block 12
10-2. Multifunction output by terminal block 13
１１．Troubleshooting 14
11-1. Option error 14
11-2. Communication cannot be executed 15

1. SUMMARY OF FUNCTION

This option card OPCN64 is mounted on the connector of control P.C.Board (VFC64/VFC2001) of VF64/ED64sp Inverter, instead of terminal block P.C.Board (VFC64TB). Function of OPCN64 is to do operation command, speed command, setting of kinds of parameter, monitoring of operation, etc. by upper CPU system, personal computer, PLC, etc. rapidly.

As a network specification, OPCN64 is in conformity to OPCN-1 (Standard of The Japan Electrical Manufacturers' Association) and realized transmission speed of 1Mbps.

Also, communication protocol can establish the network by creation of control program based on master station of OPCN-1.

1-1. OPCN-1 network

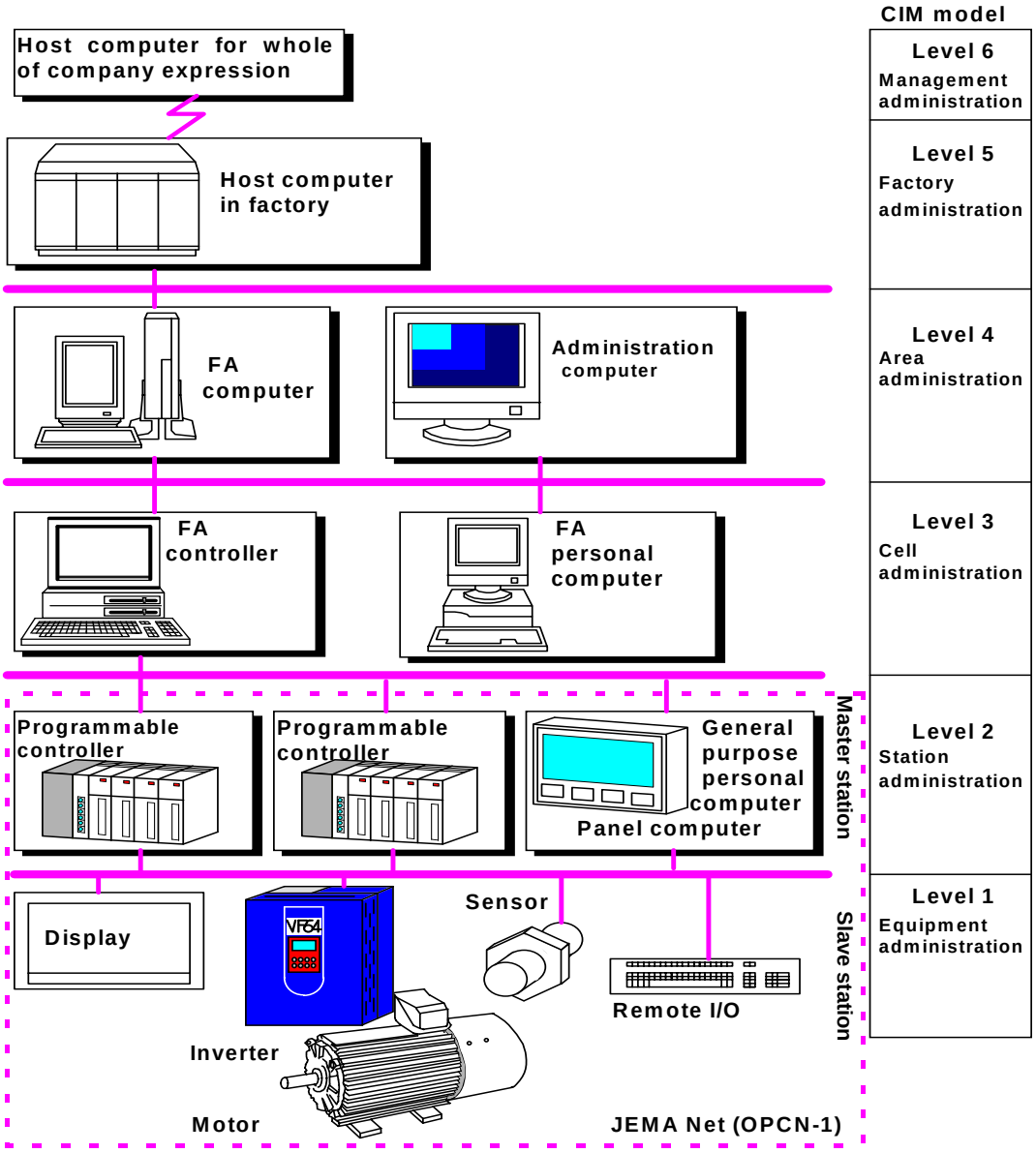
OPCN-1 (Open Programmable Controller Network level-1) is the Standard of network, which aims station administration of FA System making Programmable Controller as its center.

OPCN64 Option has verification of this Standard, which aims control of plural input/output devices by one PLC in PLC lower network rapidly, economically and in small size.

1-2. Placing of OPCN-1

OPCN-1 is multi-vender network to offer mutual connection specification among different makers, different models and placing in OSI (Open System Interconnection/CIM ref. Model is to connect level 1 and level 2. It offers data communication network between devices such as sensor, actuator, Inverter, servomotor, etc. of being so called "field area" and control equipment (PLC, etc.). See figure below.

We developed and started selling of product complying with the demand at an early stage.



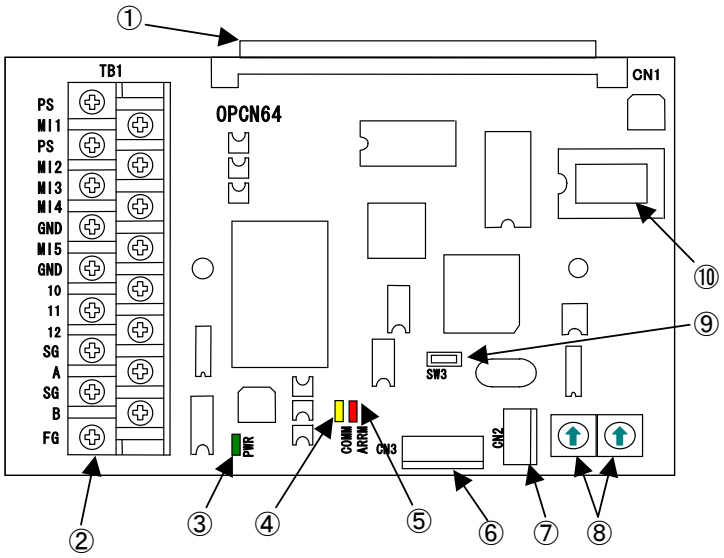
2. Standard Book of JEMA

Code of Standard Book	Name of Standard	Time of enactment
JIS B 3511 (JEM-F 3008)	Field Network Standard for programmable controller (Level 1)	1999.12
JIS B 3512 (JEM-F 3009)	Test and inspection methods of Field Network Standard for programmable controller (Level 1)	1999.12

3. Basic Specification

Item	Specification
Power source	Control side +5V ... to be supplied from control P.C.Board (VFC64/VFC2001) of Inverter main unit
	Communication side +5V ... to be supplied isolatedly from built-in DC/DC converter
Communication protocol	In conformity to JIS B 3511 (JEM-F3008) (OPCN-1)
Applicable class of OPCN-1	TYPE-S521
Electrical charac-teristics of physical layer	In conformity to RS-485
Objective devices of communication	Devices having specification of master station of OPCN-1 in addition to our uGPCsx, uGPCH
Type of connection	Bus type (Multi-drop system)
Transmission speed and transmission distance	To be set by built-in console of Inverter main unit 125kpbs - 1000m or less 250kpbs - 800m or less 500kpbs - 480m or less 1Mbps - 240m or less
Transmission procedure	Half duplex transmission
Synchronization system	Frame synchronization
Modulation system	Base band system
Encoding system	NRZI
Connection, wiring system Connection cable	Terminal block (5 poles), 2 wires or 3 wires type Twisted pair cable with shield (CO-SPEV-SB(A)2Px0.5 is recommendable)
Number of connection station	1～31 stations as slave station against master station of 1 unit
Setting of station number	to be set by built-in rotary switch of OPCN64 main unit
Communication control system	Polling/selecting system
Error check system	FCS (Frame check sequence)
Data type	Binary or bit data
Network service	Initial setting, Input/output, Data readout, Data writing, Reset, Simultaneous communication all together

4. Explanation of OPCN64 P.C.Board



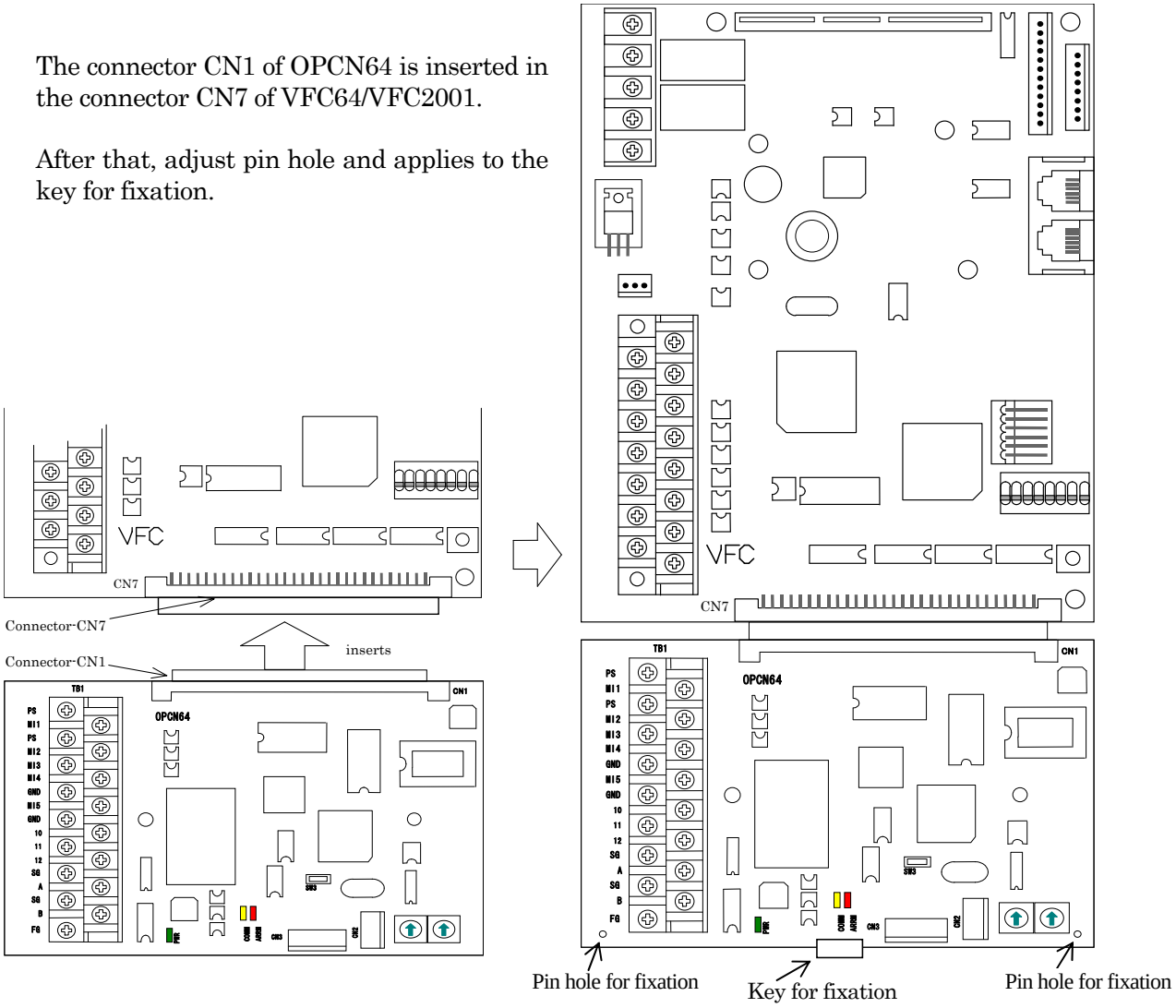
Outside appearance of OPCN64 P.C.Board

No.	Name	Explanation
①	Connector (CN1)	For connection with Inverter control P.C.Board (VFC64/VFC2001)
②	Terminal block (TB1)	1-9 :For multifunction iput 13-17 : For connection with master station, and OPCN64
③	Power source lamp (green)	Shows supply of power for communication (Lamp goes on when power is supplied)
④	Communication Lamp (yellow)	goes on at the time of transmission data carrying out and detection of receive data.
⑤	Alarm lamp (red)	goes on at the time of communication error (CRC error, occurrence of over-run) or time out. blinks when incorrect station number is set (80H-FFH)
⑥	Connector (CN3)	For multifunction output.
⑦	Coonector (CN2)	For our adjustment
⑧	Rotary switch	For setting of station number (Recognition of station number is at the time of turning on the power only) Please turn off the power of Inverter when changing this switch.
⑨	Switch (SW3)	Change of communication mode. Usually, it is not necessary to change this switch. Please refer to 'OPCN64 COMMUNICATION PROTOCOL MANUAL' about the details of communication mode
⑩	ROM label	shows software version

5. Fitting method of OPCN64

The connector CN1 of OPCN64 is inserted in the connector CN7 of VFC64/VFC2001.

After that, adjust pin hole and applies to the key for fixation.



Fitting method of OPCN64 Option P.C.Board

As to removing

Surely turn off the power in case of fitting and removing of option P.C.Board.
At this time, start the work after confirmation of going off of [CHG lamp] (red) in the Inverter unit.
If option P.C.Board is mounted/demounted during power supply, there may be a case of becoming abnormal of control circuit P.C.Board.

6. Method of initial setting of Inverter

In case of control of Inverter by OPCN-1 communication function, it is necessary to set and input the built-in console (SET64 or SET64OP) of Inverter main unit and contact of terminal block on the Inverter control P.C.Board.
In accordance with the purpose of use, set the items of explained below.

(1) Setting of Digital option use selection

FUNC		
Setting No.	Setting item	Content of setting
J-00	Digital option use selection	Off On

When using OPCN64 Option, please be sure to set this item to 'On'.

(2) Setting OPCN-1 baud rate

FUNC		
Setting No.	Setting item	Content of setting
J-02	Setting OPCN-1 baud rate	0: 125kbps 1: 250kbps 2: 500kbps 3: 1Mbps

* When setting J-02 is changed, once you turn off the power supply of Inverter, please turn on the power supply again.

(3) Setting of number of input frame (OPCN64 → Master station)

FUNC		
Setting No.	Setting item	Content of setting
J-04	Setting of number of OPCN-1 input frame	3 - 19

Setting is input of WORD unit. (14 Words at the time of delivery from factory)

* When setting J-04 is changed, once you turn off the power supply of Inverter, please turn on the power supply again.

(4) Setting of number of output frame (Master station → OPCN64)

FUNC		
Setting No.	Setting item	Content of setting
J-05	Setting of number of OPCN-1 output frame	2 - 12

Setting is input of WORD unit. (6 Words at the time of delivery from factory)

* When setting J-05 is changed, once you turn off the power supply of Inverter, please turn on the power supply again.

(5) Selection of command setting position

FUNC		
Setting No.	Setting item	Content of setting
b-15	Selection of setting position at interlocking	0: Terminal block 1: Console 2: D.G. Option
b-16	Selection of speed command setting position	0: Interlocking 1: Terminal block 2: Console 3: D.G. Option 4: Isolated analog input option
b-17	Selection of operation command setting position	0: Interlocking 1: Terminal block 2: Console 3: D.G. Option
b-18	Selection of jog (inching) command setting position	
b-19	Selection of torque command setting position	0: Interlocking 1: Terminal block 2: D.G. Option

(6) Selection of multifunction input position

FUNC		
Setting No.	Setting item	Content of setting
c-00	Selection of multifunction input position	0 (Terminal) 1 (DG. Option)

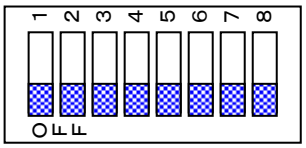
When using the multifunction input by terminal block, please set to '0'.
When using the multifunction input by OPCN-1 communication, please set to '1'.

(7) Shortcircuit of forward run contact

In case of making run/stop of Inverter by communication, ***it is necessary to shortcircuit the forward run operation (ST-F) contact of terminal block on VFC64/VFC2001 P.C.Board***. (If this contact is in status of open, control of Inverter by communication cannot be executed.) By opening when error occurred in external device such as master station, this contact can keep the safety of system. Also, in case that sequence function of Inverter is effective and forward run command position is changed, add the sequence to turn ***forward run(ST-F) command to ON when input signal to terminal block*** in ladder drawing is inputted.

8) Make rewriting of setting data by communication effective

In case of changing of setting data of Inverter by communication from master station, turn No.1 of SW1 on control P.C.Board of Inverter main unit to OFF side.



DIP switch (SW1)

(9) Super-block (HC function) use selection

FUNC		
Setting No.	**Setting item**	**Content of setting**
b-00	**Super-block (HC function) use selection**	**Off** **On**

When using the Super-block function (HC function) in Inverter, please set b-00 to 'ON'.
In not using the Super-block function (HC function), please do not set to 'ON' by any means.

(10) Sequence function (PLC function) use selection

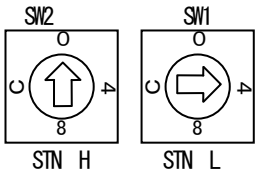
FUNC		
Setting No.	**Setting item**	**Content of setting**
b-14	**Sequence function (PLC function) use selection**	**Off** **On**

When using the Sequence function (PLC function) in Inverter, please set b-14 to 'ON'.
In not using the Sequence function (PLC function), please do not set to 'ON' by any means.

7. Setting station number

Set station number of slave station (Inverter unit) in communication of OPCN-1 by rotary switches [SW1] and [SW2] on OPCN64 P.C.Board. As OPCN64 is slave station, set the number by hexadecimal of 01H - 7FH. Since 00H is station number of master station, setting will be ineffective, even setting is done. Therefore, don't use it for setting.
(If station number is set to 00H, Inverter becomes Option-error)
Moreover, if station number is set more than 80H, red LED on OPCN64 P.C.Board blinks.

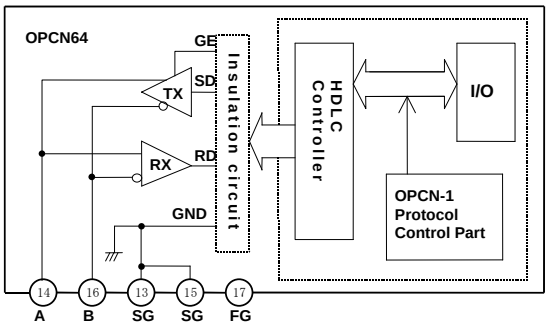
(Example) For setting of station number at 04H, set SW1 at 0 and SW2 at 4 as shown in following figure.



Rotary switch

[Caution]: When changing the rotary switch, please be sure to turn off the power supply of Inverter.

8. Composition of hardware



Conceptual drawing of control circuit

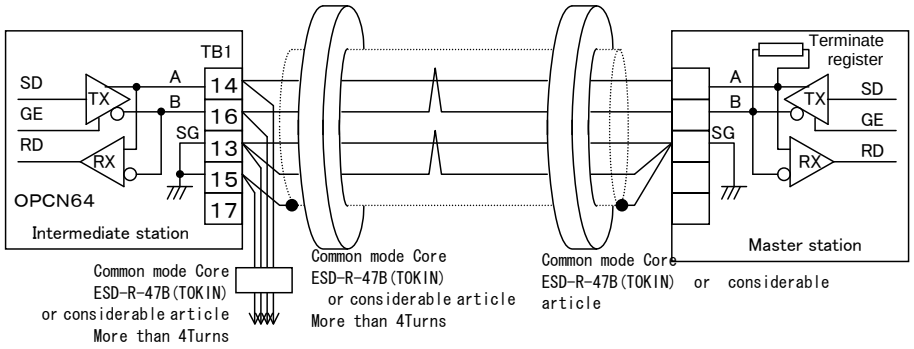
- **RD** : Received data .....Data signal transmitted from master station
- **SD** : Transmission data ..... Data signal to be transmitted to master station
- **GE** : Permission of transmission..... Signal to be set at the time of transmission
- **A/B**: RS485 signal polarity ..... Signal level of RS485
- **SG** : Signal ground
- **FG** : Earthing for safety (FG) ..... Use when earthing wire is connected to all over stations

9. External connection diagram

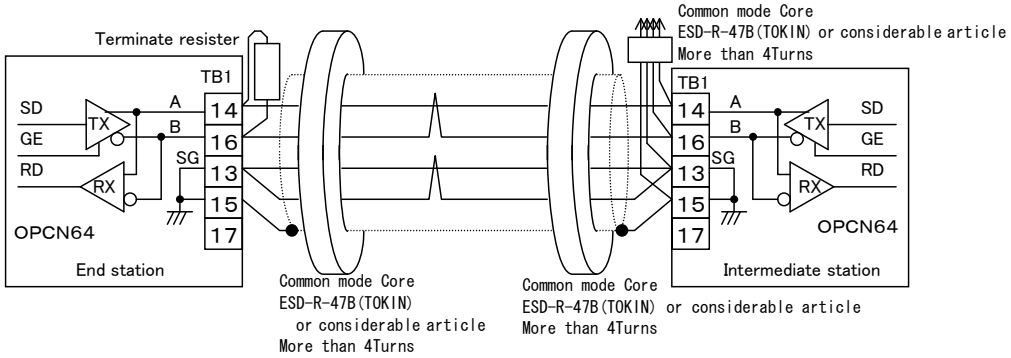
Connection of each station is wired by transmission cable via terminal block. Connect terminal resistor to end station. In case that terminal resistor is not connected to master station, connect terminal resistor like end station.

Folowing figure show method of connection with external. Figures show the examples of use of twisted pair shield transmission wire of 2P or 3P.

(The transmission wire recommends CO-SPEV-SB(A)2Px0.5 of Hitachi Cable)



Connection with master station



Connection with end station

* When OPCN64 becomes the end station, please connect 100 ohms (more than 1W) terminate resister between A(No. 14)-B (No. 16) of the terminal block.
Please cover the lead of terminate resister by the clothing tube, and the end of a lead should attach a sticking-by-pressure terminal.
(Please solder a sticking-by-pressure terminal and a lead for disconnection prevention)
Please connect a shield line to 0V (SG) terminal of the signal line of the master station.

10. Multifunction input/output by terminal block

Cautions: When using the multifunction input/output by terminal block of OPCN64, the software by the side of Inverter needs to correspond to it.
Please check with reference to 3 pages of this manual.

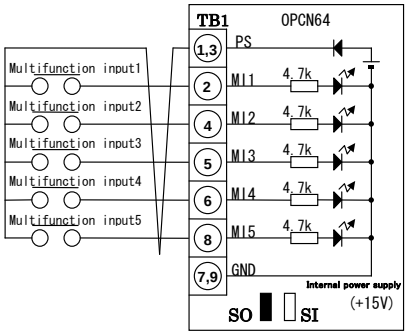
The terminal block for multifunction input/output is prepared on OPCN64.
It is possible to operate multifunction input/output from the terminal block without using communication.

When using multifunction input, whether communication is used or the terminal block is used choose by the setting item [c-00] of Inverter.
Multifunction output can use both communication and the terminal block.

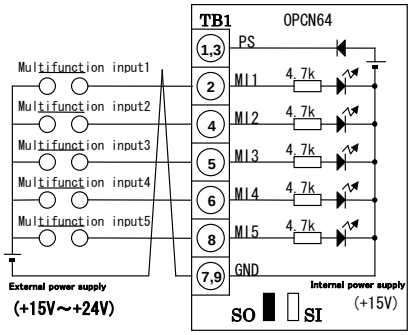
The setting method of the multifunction input/output from the terminal block is the same as the setting method of the multifunction input/output by the standard terminal block board (VFC64TB) which does not use a communication option. However, there is the multifunction input only to input 5.
The function of terminal block multifunction input/output is assigned using [c-01] - [c-17] of the setting item of Inverter. Please refer to the INSTRUCTION MANUAL of Inverter for details.

10-1. Multifunction input by terminal block

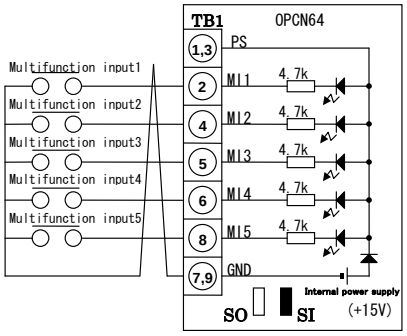
TB1 on OPCN64 is used



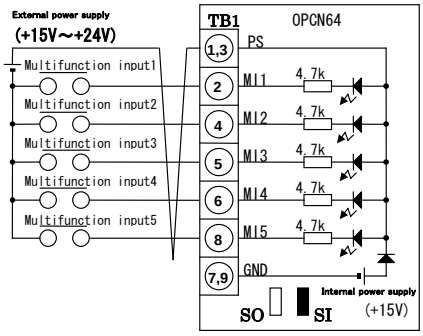
1. Source mode (Using internal power supply)



2. Source mode (Using external power supply)



3. Sink mode (Using internal power supply)



4. Sink mode (Using external power supply)

The above figure shows the typical connection system of multifunction input signal.

The multifunction input signal can choose the source mode (set at the time of Inverter shipment), or the sink mode, and can choose use of the inside power supply of Inverter, or use of an external power supply, respectively.

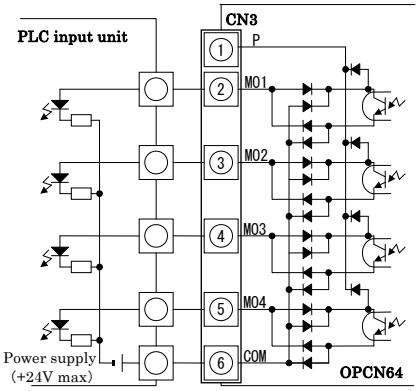
Change in the source mode and the sink mode is possible at substitution of the jumper connector in VFC64/VFC2001 control board.(SO: source mode selection jumper connector, SI: sink mode selection jumper connector)
(However, a change of SI and SO is common use of Inverter operation signal inputs ST-F, ST-R, JOG-F, JOG-R, EMG and RESET.)

Moreover, the input terminal specification of multifunction input and the voltage specifications of an external power supply are the same as that of Inverter operation signal input (VFC64/VFC2001-TB2).

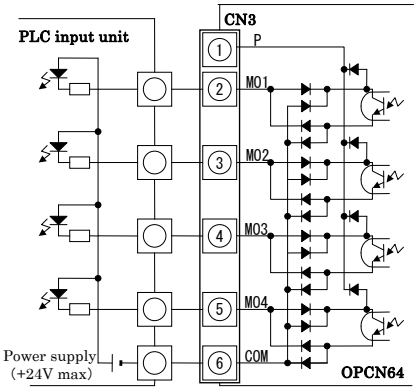
The multifunction input signal of OPCN64 option can be used also as an input signal in the sequence function of Inverter. About sequence function, please refer to the INSTRUCTION MANUAL of Inverter and sequence function.

10-2. Multifunction output by terminal block

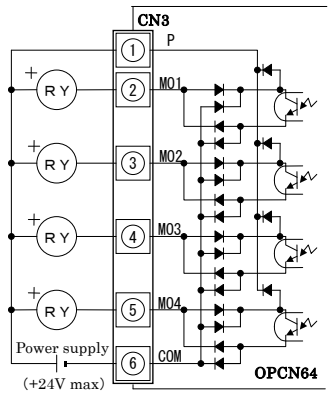
CN3 on OPCN64 is used. (Conformity socket : molex 5051－06)



1. Connection of PLC (source mode)



2. Connection of PLC (sink mode)



3. Connection of relay

The above figure shows the typical connection system of a multifunction output signal.

A multifunction output is an open collector output of a transistor, and needs a DC power supply for the exterior in case of use.
The maximum permission voltage is 24V and the maximum permission current per one terminal is 20mA.

When connecting the input unit of PLC outside, connection in sink and source both the modes is possible for OPCN64.
It recommends that the wiring between PLC - OPCN64 options uses a twist line.

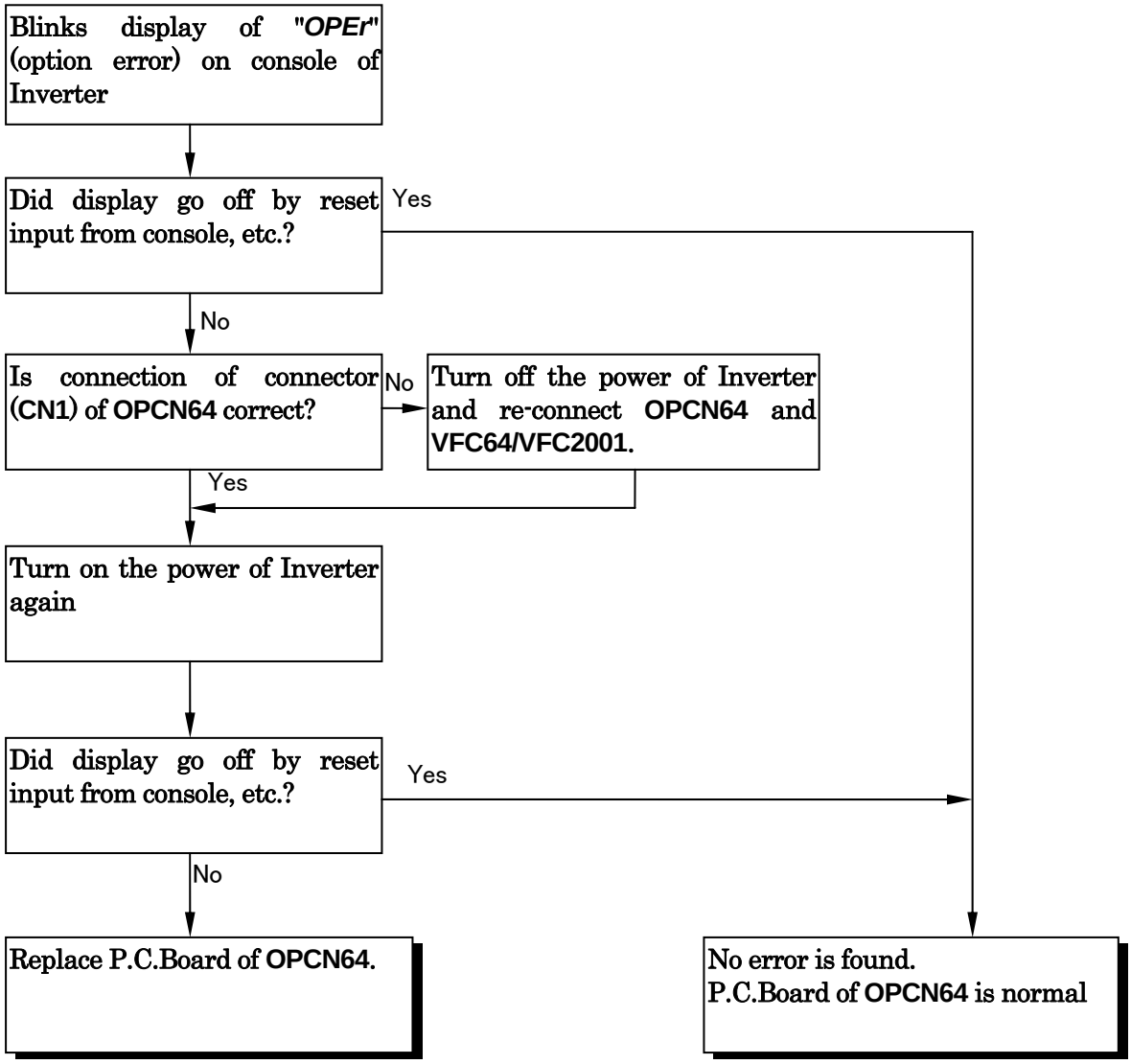
When you connect a relay outside, a coil should use the thing of DC operation.
Moreover, since the flowing-back diode for serge voltage control is built in OPCN64, please be sure to connect + side output of an external power supply to P terminal.

Refer to the INSTRUCTION MANUAL of Inverter for the function of terminal each of a multifunction output.

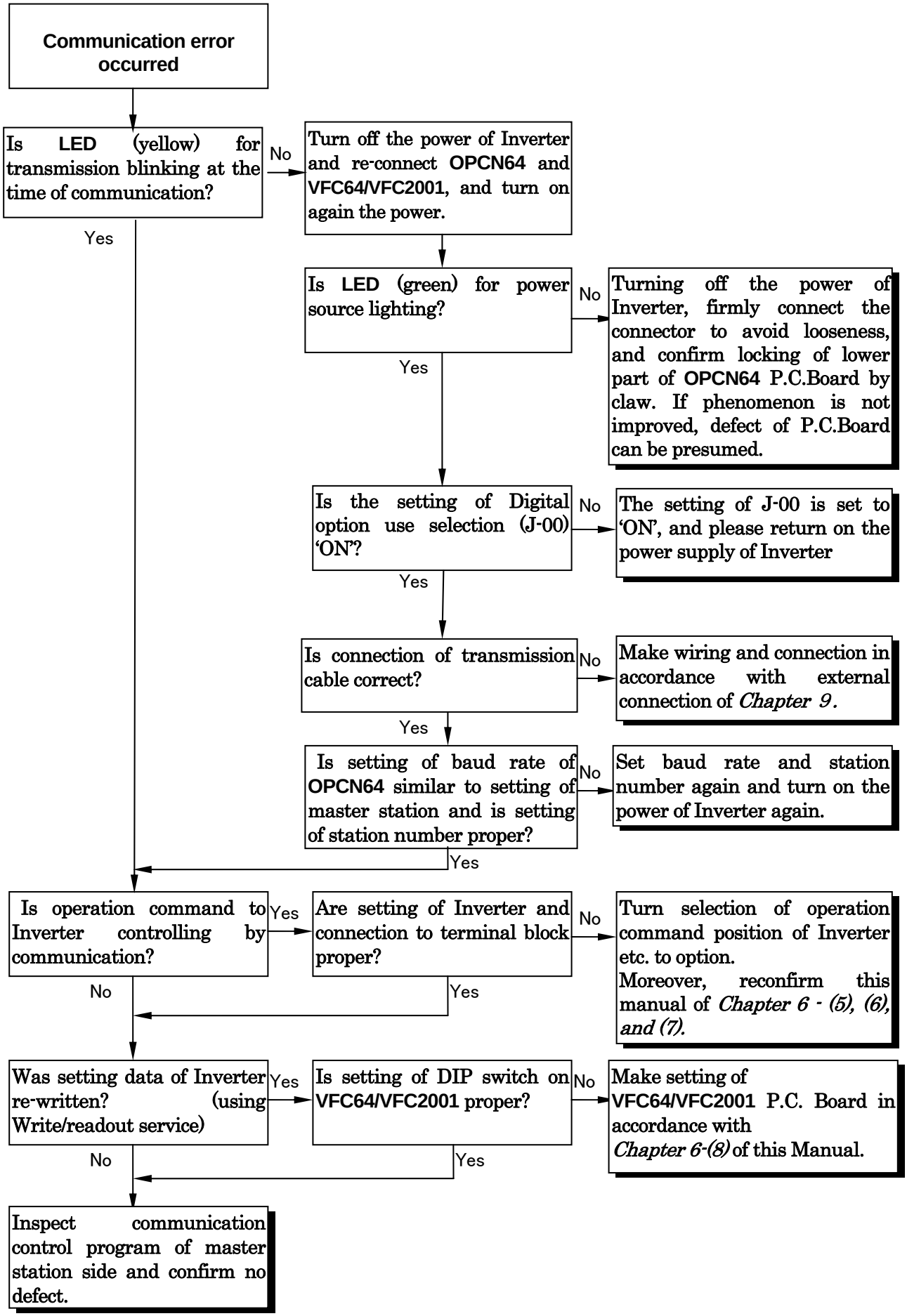
In addition, a multifunction output terminal can be used as a sequence output signal terminal at the time of sequence functional use.
Please refer to the INSTRUCTION MANUAL of a sequence function for details.

11. Troubleshooting

11-1. Option error



11-2. Communication cannot be executed



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