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**TOSVERT VF-PS1 series**

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**LONWORKS<sup>®</sup> Communication option LIU006Z**

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**Instruction Manual**

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NOTICE



1. Make sure that this instruction manual is delivered to the end user of LONWORKS communication option.
2. Read this manual before installing or operating the LONWORKS communication option. Keep it in a safe place for reference.
3. All information contained in this manual are subject to change without notice.  
Please confirm the latest information on TOSVERT series web site.

## Safety precautions

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

Read the instruction manual attached to the inverter along with this instruction manual to completely understand the safety precautions, the symbols and indications shown below. Please adhere to the contents of these manuals at all times.





### Explanation of markings

Marking	Meaning of marking
 Danger	Indicates that errors in operation may lead to death or serious injury.
 Warning	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. What is dangerous will be described in or near the symbol in either text or picture form.
	Indicates warning. What the warning should be applied to will be described in or near the symbol in either text or picture form.



■ **Limitation of use**

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



■ **Handling in general**

<b>⚠ Danger</b>	
 Never Disassemble	▼ Never disassemble, modify or repair the product. Disassembling the product may cause electric shocks, fire or 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-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.
<b>⚠ Warning</b>	
 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**



<b>⚠ Danger</b>	
 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. ▼ Install this option into VF-PS1 and secure it by tightening the terminal board fixing screws to the specified torque. Otherwise, it may cause the product falling, the damage, or malfunctions. ▼ When installing this option, do not touch its sharp portions such as leads of parts on the board, the corner of board or etc. Doing so may result in injury.

■ **Wiring**



 <b>Warning</b>	
 Mandatory	<ul style="list-style-type: none"> <li>▼ 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.</li> <li>▼ 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.</li> <li>▼ Tighten the screws on the terminal blocks to the specified torque when connecting cables to terminal blocks. Otherwise, it may lead to fire.</li> </ul>

■ **Operations**

 <b>Danger</b>	
 Prohibited	<ul style="list-style-type: none"> <li>▼ Do not pull on the cable and connector. It may cause damage or malfunctions.</li> </ul>
 Mandatory	<ul style="list-style-type: none"> <li>▼ 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.</li> <li>▼ 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.</li> </ul>

 <b>Warning</b>	
 Mandatory	<ul style="list-style-type: none"> <li>▼ 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.                             <ul style="list-style-type: none"> <li>- Receive heart beat timer (See the VF-PS1 LONWORKS Communication Function Manual for details)</li> </ul>                             Deactivated option unit may cause an accident, if the “Communication error trip function” is not properly set up.                         </li> <li>▼ Make sure that the operation signals are STOP before clearing the inverter’s fault. The motor may suddenly start and that may result in injuries.</li> </ul>

■ **Disposal**

 <b>Warning</b>	
 Mandatory	<ul style="list-style-type: none"> <li>▼ 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).</li> </ul>

■ **Notes on operation**

<b>Notes</b>	
	<ul style="list-style-type: none"> <li>▼ Avoid installing in a place where ambient temperature or/and humidity change sharply.</li> <li>▼ Keep the transmission cable separate from the power cable of the inverter to prevent the inverter from malfunctioning due to electromagnetic noise.</li> <li>▼ Ground of SHIELD terminal on this option at the grounding terminal separated from those of inverters and motors. It may cause malfunction due to noise.</li> </ul>

# Preface

Thank you for purchasing the “LONWORKS communication option (LIU006Z)” for TOSVERT VF-PS1 inverter. By Installing this unit into the VF-PS1, data communication can be made with a host computer or other device via LONWORKS network.

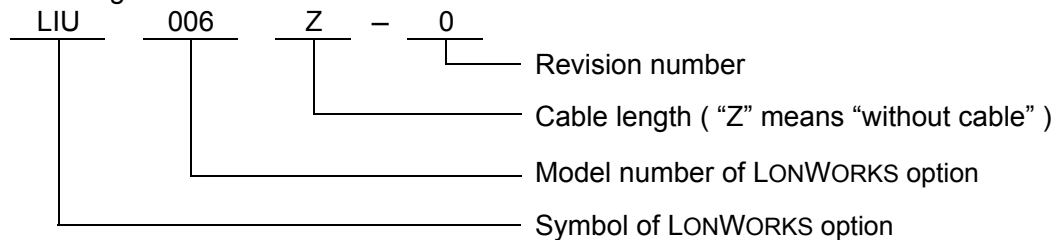
Before using this unit, carefully read this instruction manual in order to completely and correctly utilize excellent performance of this unit. Besides this instruction manual, the “VF-PS1 LONWORKS Communication Function Manual” which includes the contents to install into LONWORKS network is prepared. If it is required, please contact with our branch offices, sales offices or web site “www.inverter.co.jp”.

(“VF-PS1 LONWORKS Communication Function Manual”: E6581373)

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

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- \* LONMARK and LONMARK Logo are managed, granted, and used by LONMARK International under a license granted by Echelon Corporation.

- Part numbering

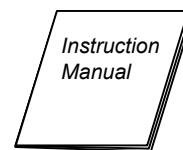


- Accessory check list

LONWORKS 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) Instruction manual

English (E6581369)..... 1 copy (This book)

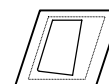


(2) Neuron ID label..... 2 sheets

(Attached on the unit, Barcode type is CODE39)



(3) LED label..... 1 sheet



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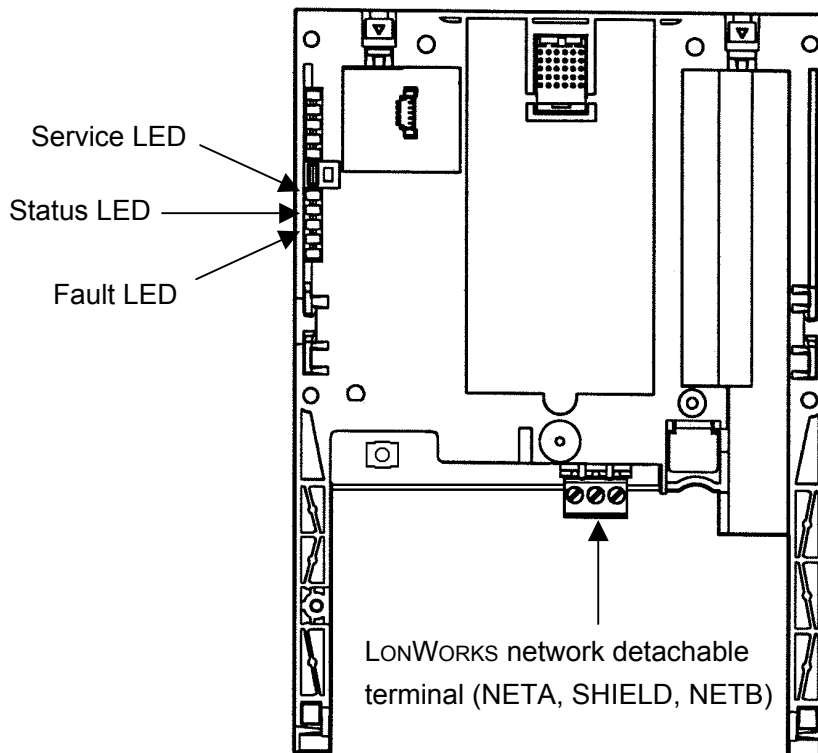
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# 1. Overview

LONWORKS technology is a network control system concept developed by Echelon Corporation, LONWORKS network provides Local Operating Network that is superior in the distributed control. Each device works in a peer-to-peer fashion on LONWORKS network. This LONWORKS option is equipped with the LONWORKS Smart Transceiver (Neuron Chip).

# 2. Names and functions

The drawing below shows names and functions of main parts.



## 2.1. Description of terminals

<Control terminals specification>

Name	Function	Electrical specification	Internal circuits
NETA (A)	LONWORKS transmission data / reception data	No polarity	
NETB (B)			
SHIELD (S)	LONWORKS communication shield terminal.	This terminal is grounded through 10Mohm resistor.	

## 2.2. Service pin

Service pin function causes the node to propagate the service message over the network so that the network controller finds the node.

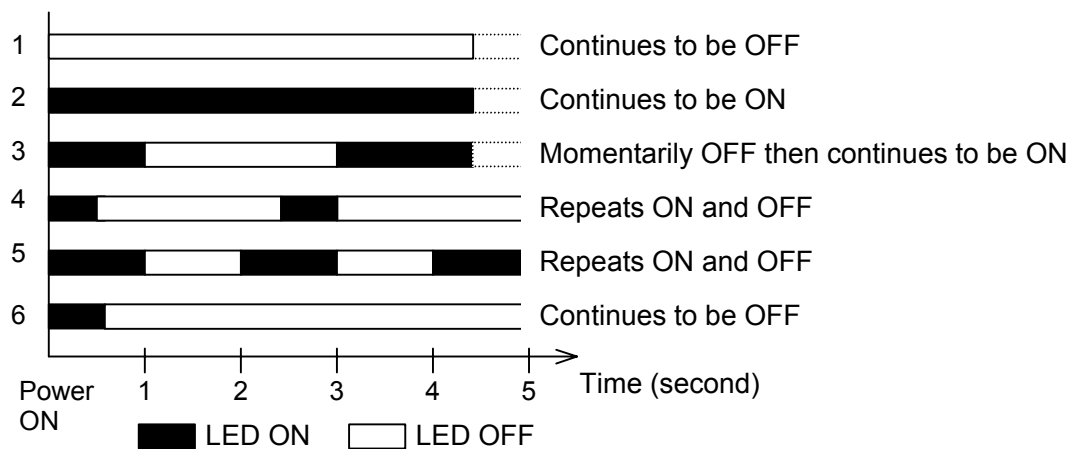
This option unit has the software service pin function that operates the procedure shown in below.

1. Set the inverter parameter *F830* to 1.
2. Set the inverter parameter *F830* to 0.

Just after the parameter is set to "0", LONWORKS option unit propagates the service message over the network.

## 2.3. Service LED

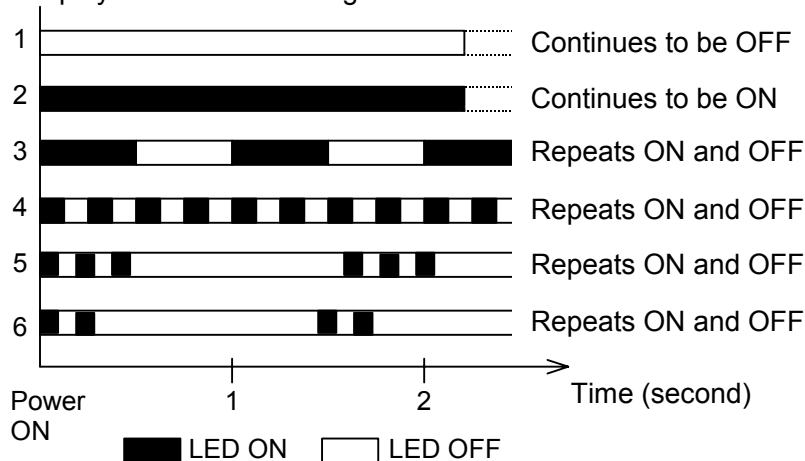
Service LED indicates the node condition.



No	Phenomenon	Problem & Solutions
1	Although the inverter is turned on, LED remains OFF.	Check the connection between the inverter and the LONWORKS option unit. If abnormality is not found after checking, it needs to be repaired.
2	LED continues to be ON after the inverter is turned on.	
3	LED is ON then OFF when the inverter is turned on, and it continues to be ON.	Internal application program is abnormal. If the same indication appears after resetting the power, it needs to be repaired.
4	LED flashes every 0.5 second.	
5	LED flashes every 1 second.	This is a normal action of the "Unconfigured" device. If the device is not "Unconfigured", Internal application program is broken. It needs to be repaired.
6	LED momentarily turns ON then continues to be OFF.	When the node is in "Configured" status, LED momentarily turns ON when the inverter is turned on. Then the LED continues to be OFF for some seconds. The node indicates "Configured" status that means the normal condition.
-	Flicker of LED (Approximately 10Hz to 30Hz)	CPU is abnormal. It needs to be repaired.
-	LED turns ON while activating service pin.	This is normal action while activating service pin.

**2.4. Status LED**

It displays node status with green color.



No	LED state	Description
1	Although the inverter is turned on, LED remains OFF.	No power
2	LED continues to be ON after the inverter is turned on.	The LONWORKS option unit is running in normal mode.
3	LED flashes every 1 second.	There is no connection to the LONWORKS network.
4	LED flashes every 0.25 second.	The LONWORKS option unit has received a Wink command. It continues for 30 second.
5	Repeats 3 flashing and OFF for 1 second.	These phenomenon occurs when the fault LED turning ON. CPU or Internal application program is abnormal. If the same indication appears after resetting the power, it needs to be repaired.
6	Repeats 2 flashing and OFF for 1 second.	

**2.5. Fault LED**

It displays fault with red color.

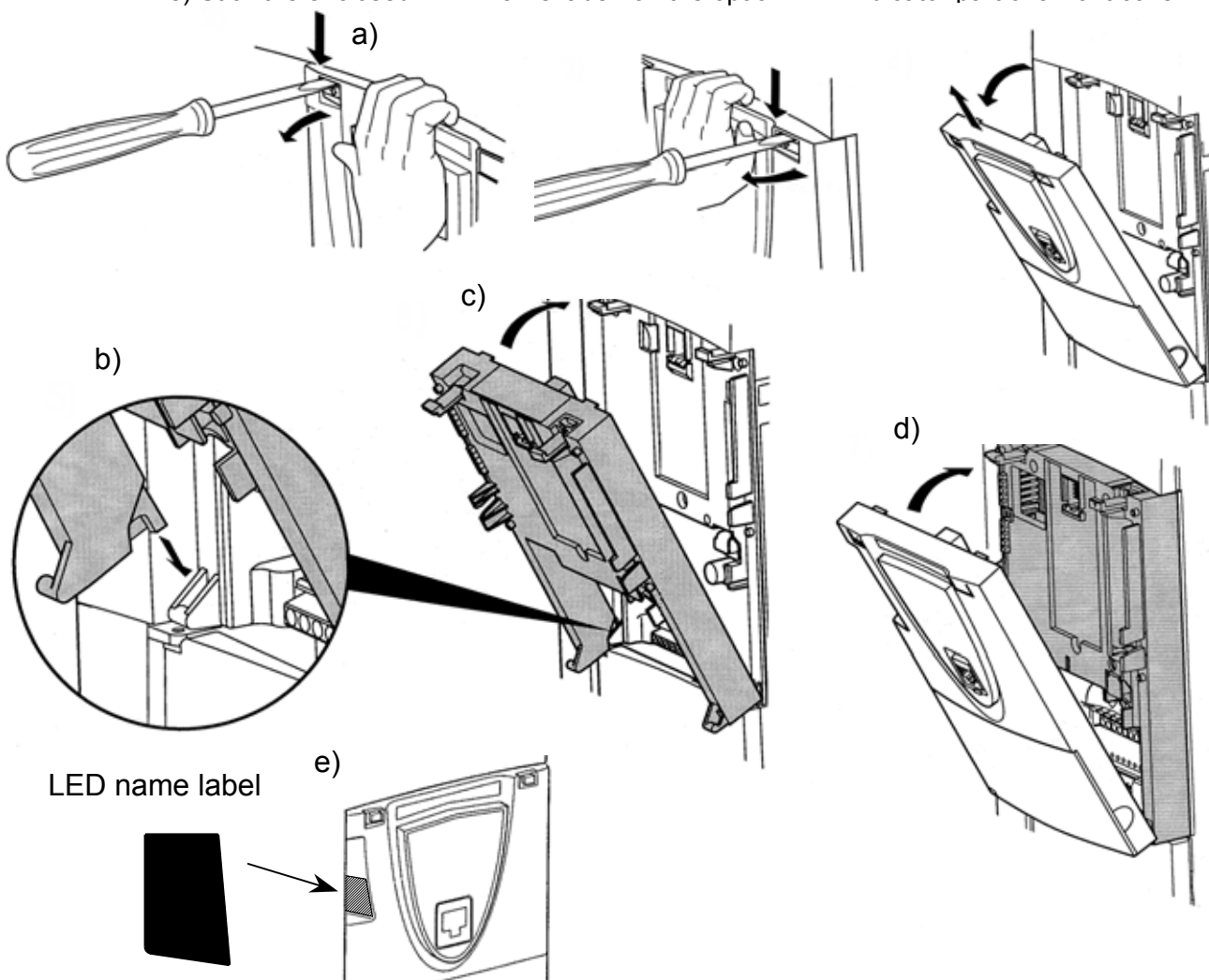
LED state	Description
OFF	LONWORKS option unit has no fault.
ON	Hardware or software fault of the LONWORKS option unit
Flashing	The LONWORKS option unit does not communicate with the inverter. "E - 23" or "E - 24" error occurs. If the same indication appears after resetting the power, it needs to be repaired.

## 3. Installation and Setup

### 3.1. Installation method

Install the LONWORKS communication option to VF-PS1 as follows.

- (1) Turn off input power of VF-PS1 and wait for at least 15 minutes and then check that the CHARGE lamp on VF-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) Fix the option into the inverter by fixing the tabs on the lower side of the option into the slots at the lower part of the inverter front panel.
  - \* ~~Install this option into the front panel side when it is used together with the IO card option.~~
  - c) Make sure the option is securely attached to the inverter. Then, check whether the plastic bosses on the inverter case have fixed 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" on the option LED indicator part of a front cover.



### 3.2. VF-PS1 communication parameters

VF-PS1 parameters referring to below table are available.

Title	Function	Description
<i>CNOd</i>	Command mode selection	While LONWORKS communication option is installed into VF-PS1 and configured to network, the network command and setpoint are prior to <i>CNOd/FNOd</i> . VF-PS1 LOCAL mode is prior to it.
<i>FNOd</i>	Setpoint mode selection	
<i>FB30</i>	Option parameter	Service pin function (see section 2.2).
<i>FB51</i>	Operation at network error	Set the behavior when "Receive heart beat timer" overflow occurred (see function manual).
<i>FB99</i>	Option reset	Set 1 when resetting the option unit.

### 3.3. Network cable connection

Connect the LONWORKS network cable to LONWORKS communication option as follows.

(1) Cable selection (a twisted pair cable with shield)

Use Level 4/22 AWG cable for the network cable.

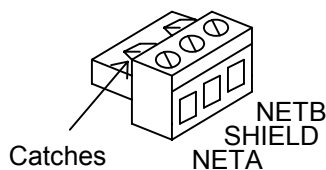
- Recommended cable

Manufacturer: SWCC SHOWA CABLE SYSTEMS CO.,LTD.

Model name: LW221S, 22AWG, 1P, With shield, Standard 300m/reel

Use 0.75mm<sup>2</sup> wire for grounding to the earth terminal (G/E) of the board.

(2) Terminal blocks



Manufacturer: PHOENIX CONTACT

Model name: MSTB 2,5/3-ST-5.08

- Communication terminal "NETA (A)", "NETB (B)"

Connect LONWORKS transmission/reception data cable.

Polarity of the communication terminals NETA and NETB does not have to be considered.

- Shield terminal "SHIELD (S)"

Connect the shield of network cable. Refer to next section for grounding.

(3) Connection

Cable sheath should be peeled off by about 7mm.

For wiring work, use a flat blade screwdriver with a 0.6mm thick and 3.5mm width blade.

Tightening torque for the terminal block is 0.5Nm.

**3.4. Network configuration**

Make up the network as follows.

- Transmission/reception signals (NETA, NETB)

Make up the communication path by connecting all transmission/reception data cables (No polarity).

- Grounding the shield of cable (SHIELD)

Connect the all shield lines of network cable. Ground through as a total resistance of network cable shield is about 470k ohm, so that static electricity does not increase (at the point where it separated from the power ground of inverters or motors).

- Termination resistor (Please refer to “3.5. Termination resistor”)

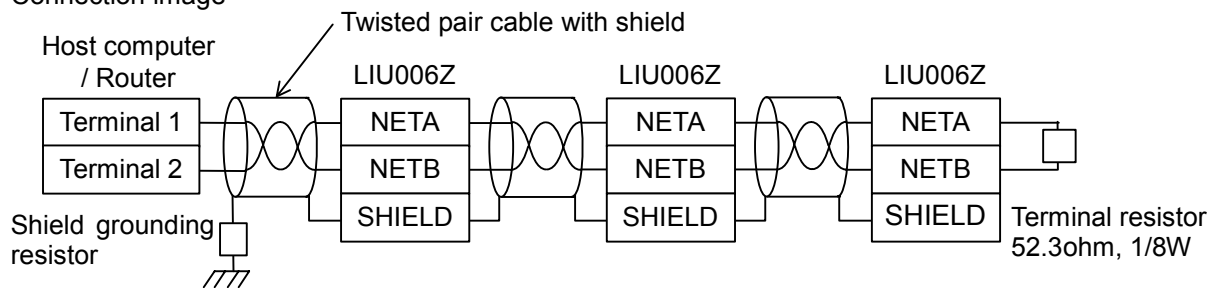
Only one terminal resistor is needed for the segment of the free topology. It can also be placed wherever it is on the free topology segments. (2 termination resistors in case of Bus topology)

- Network cable length (for recommended cable usage)

Free-Topology: device-to-device distance is 400m or less, total wire length is 500m or less

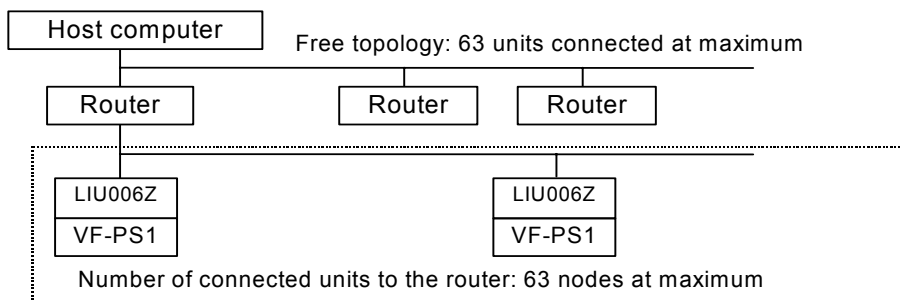
Bus-Topology: total wire length is 1400m or less, stub length is 3m or less.

- Connection image

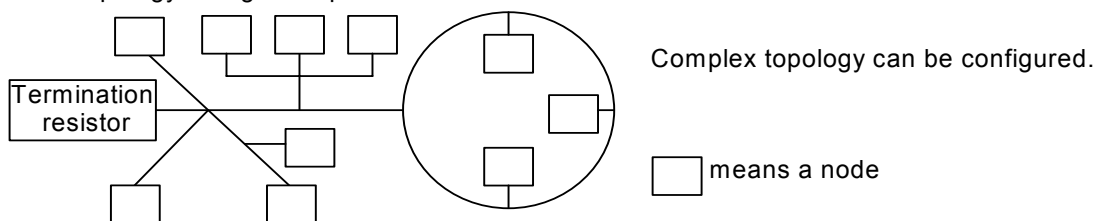


Network configuration is shown in the figures below. This LONWORKS communication option has TP/FT-10 channel type transceiver. The free topology wiring supported by the TP/FT-10 channel type accommodates bus, star, loop, or several combinations of these topologies shown in below.

- Network configuration example



- The free topology wiring example



N.B.: Do not connect the SHIELD terminal to the power ground of inverters or other units.

Keep the network cables 20cm or more separate from the power cables to prevent from malfunctioning due to electromagnetic noise.

**3.5. Termination resistor**

Terminate the network bus with about 52.3ohm impedance to minimize the reflections. There are two choices for the termination.

1. Free Topology Network Segment

Only one termination and may be placed anywhere on the free topology segment.

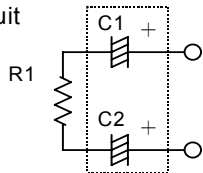
RC network (Following figure), with  $R1 = 52.3ohm \pm 1\%$ , 1/8W

2. Doubly Terminated Bus Topology Segment

It is necessary to terminate at both ends of a twisted pair bus.

RC network (Following figure), with  $R1 = 105ohm \pm 1\%$ , 1/8W

Terminal circuit



C1 and C2 are required for connection to link power network.

C1, C2: Aluminum-electrolytic type  
100uF, 50V min

## 4. Before making a service call

If a problem arises, please see the following trouble-shooting table. If the problem can not be solved, please contact your Toshiba distributor.

Phenomenon	Problem and Solutions
Illegal LED indication	Refer to "Service LED", "Status LED" and "Fault LED" written in section 2.3 to 2.5.
No replying from LONWORKS communication option	Check proper termination resistor is installed on the network. (See section 3.5.) Checking the LED indicator status.
Communication error in network variable	Check the connection between the option and the inverter.

## 5. Specifications

< Environmental specification >

Item	Specification
Service environment	Conforms to VF-PS1
Operation temperature	Conforms to VF-PS1
Storage temperature	-25 to +65°C
Relative humidity	20 to 93% (free from condensation and vapor)
Vibration	5.9m/s <sup>2</sup> (0.6G) or less (10 to 55 Hz) (To be complied with JIS C0040.)

< LONWORKS node specification >

Item	Specification	Notes
Applicable model	VF-PS1 series	
Control supply	24V <sub>DC</sub>	Supplied from VF-PS1
Transceiver Channel type	TP/FT-10 type (Free Topology Transceiver)	78kbps ANSI/EIA/CEA 709.3
Communication signal	2 wires and shield	NETA, SHIELD, NETB
Transmission distance (Free topology)	Between devices: 400m at maximum Total cable length: 500m at maximum	When recommended cable is used: Level 4/22AWG
Transmission distance (Bus topology)	Total cable length: 1400m at maximum Stub length: 3m at maximum	When recommended cable is used: Level 4/22AWG
Number of connected nodes	64 nodes at maximum in a segment	Because a host and routers are counted as one node, the option can be connected up to 63 nodes.
Protocol	LonTalk	ANSI/EIA 709.1
Address and related items	Number of domains: 2 Number of address entries: 53 Number of alias tables: 8	
Network variables	Number of transmission data: 28 Number of receiving data: 13 Number of configuration property: 12	LONMARK Variable Speed Motor Drive (6010_11) functional profile.
Service pin	VF-PS1 parameter <i>F B 3 0</i>	Used for notification of Neuron ID to the host.
Terminal block	Detachable terminal block 3-pole	Applicable terminal block Manufacturer: PHOENIX CONTACT Type-Form : MSTB 2,5/3-ST-5.08

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## **6. Warranty**

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Any part of LONWORKS communication option that proves defective will be repaired free of charge under the following conditions:

1. This warranty applies only to the LONWORKS communication option unit.
2. Any part of the unit which fails or is damaged under normal use within 12 months from the date of delivery shall be repaired free of charge.
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 unit.
  - 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) Failure or damage due to the use of LONWORKS communication option for non-intended purposes.
4. All expenses incurred by Toshiba for on-site services shall be charged to the customer, unless a service contract is signed beforehand between the customer and Toshiba, in which case the service contract has priority over this.