TOSVERT VF-S11 built-in board option

LONWORKS® Communication Instruction Manual

LIU005Z

NOTICE

1. Make sure that this instruction manual is delivered to the end user of LONWORKS® Communication built-in option board.
2. Read this manual before installing or operating the LONWORKS® Communication built-in board option. And keep it handy as a reference for maintenance and inspections.

∗ The data given in this manual are subject to change without notice.

Safety precautions

The VF-S11 instruction manual and labels on the inverter provide very important information that you should bear in mind to use the inverter properly and safely, and also to avoid injury to yourself and other people and damage to property.
Read the safety precautions in the VF-S11 instruction manual before reading this manual and strictly follow the instructions given.

■Handling in general

⚠ Danger	
Disassembly Prohibited	▼ Never disassemble, modify or repair. Disassembling the product could cause electric shocks, fire or injuries. For repairs, call your sales agency.
Prohibited	▼ Do not remove this option from VF-S11 when the power is on. It could lead to electric shocks. ▼ Do not put or insert foreign objects such as waste cable, bars, or wires into the product. It could lead to electric shocks or fire. ▼ Do not splash water over the product. It could lead to electric shocks or fire.
Mandatory	▼ Wiring should be conducted after turning VF-S11 power off. Wait at least ten minutes and check to make sure that the charge lamp (on VF-S11 unit) is no longer lit. ▼ Turn off the power immediately in case any abnormalities such as smokes, smells or abnormal noise are found. Neglect of these conditions could lead to fire. For repairs, call your agency.

■Transportation and installation

⚠ Danger	
Prohibited	▼ Do not install or operate the inverter if it is damaged or any component is missing. Operating a defective inverter could lead to electric shocks or fire. For repairs, call your agency. ▼ Do not put any inflammable material near the product. It could catch fire if the product sparks due to a breakdown and the like. ▼ Do not install the product where it could be splashed with water and the like. It could lead to electric shocks or fire.
Mandatory	▼ The product must be used under environmental conditions prescribed in this instruction manual. Use under any other conditions may result breakdown. ▼ Install this option in VF-S11 and tighten the screws to the specified torque. Otherwise it could lead to breakdown.
⚠ Warning	▼ Be careful of the option board when you exchange the terminal boards. Otherwise it can cause injury to people.

■Wiring

Danger	
Mandatory	▼ Turn off input power before wiring. Wait at least ten minutes and make sure that the charge lamp (on VF-S11 unit) is no longer lit. ▼ Tighten the screws on the terminal board to the specified torque. If the screws are not tightened to the specified torque, it could lead to fire. ▼ Electrical construction work must be done by a qualified expert. Connection of input power by someone who does not have that expert knowledge may result in fire or electric shock.

■About operation

Danger	
Prohibited	▼ Do not wipe the body with a wet cloth. Don't touch the body with your wet hand. It could lead to electric shocks. ▼ Do not pull on the cable It could cause damage or error.

■About disposal of the product

Warning	
Mandatory	▼ Dispose of the product as an industrial waste. Unless it is disposed of as an industrial waste, it may result in human injury.

Notes on use

NOTES	
	▼ Avoid installing locations where may be subjected to rapid changes in ambient temperature or/and humidity. ▼ Route the transmission cable separate from the inverter input/output power wiring. When disconnecting connection cable, make sure to hold its connector with care not to give unreasonable stress to the cable and the unit. ▼ Separate the ground of SHLD terminal on the LONWORKS® communication built-in board option from those of the inverter and the motor. It could cause malfunction due to noise. ▼ Install this board inside the VF-S11 and secure it with board fixing screws, otherwise it could fall and cause malfunction or breakdown. ▼ Connect an electromagnetic contactor or the like between the inverter and the power source to secure external control of emergency stop.

Introduction

Thank you for purchasing the “LONWORKS® communication built-in board option (LIU005Z)” for TOSVERT VF-S11 inverter. By Installing this board to the VF-S11, data communication can be made with a host computer or other device via LONWORKS® network.

Please read the entire manual carefully before attempting to control your inverter via LONWORKS® network serial connection. Besides this instruction manual, the “VF-S11 LONWORKS® Communication Function Manual” is required to develop software communicating with VF-S11. In such a case, please contact with our branch offices or sales offices.
(“VF-S11 LONWORKS® Communication (LIU005Z) Function Manual”: E6581250)

This manual is also aimed at the operator using " LONWORKS® Communication built-in board option", so please use it for future maintenance and inspection.

※ LONWORKS is the registered trademark of Echelon America.

■ Explanation of model number of LONWORKS® Communication Option board

L I U 0 0 5 Z - 0

- Revision number
- Cable length (Cable length between inverter and Option Unit)
  Z: Without cable
- LONWORKS® Communication Option model number
- Symbol of LONWORKS

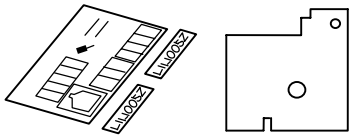
■ Check of accessories

LONWORKS® Communication built-in board option is shipped together with the following items in the package. Contact your sales agency if any of these is missing.

(1) LONWORKS® Communication built-in board option …1 board (LIU005Z)
(Connector terminal : MSTB 2.5/3-ST-5.08 : Phoenix Contact)…1 pcs

(2) Instruction manual of LONWORKS® Communication built-in board option
Japanese(E6581231)…1 copy
English (E6581232)…1 copy (This book)

(4) LONWORKS® Communication built-in board option cabling label 1 pcs.
name plate 2 pcs.
Insulating sheet 1 pcs.



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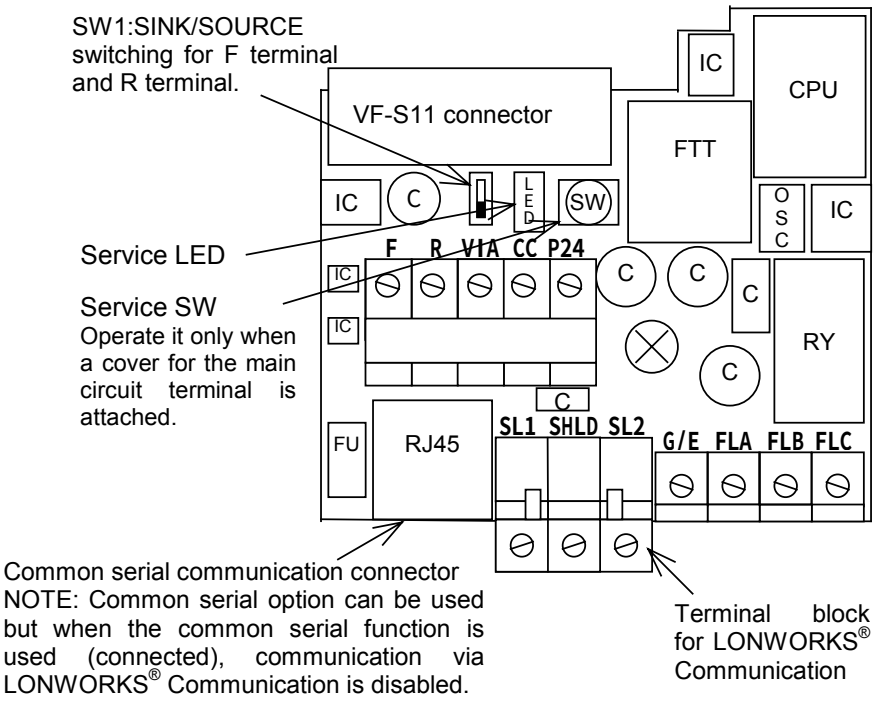
1. Overview

LONWORKS® network was developed by Echelon Corporation, provides local open network which is superior in the distributed control. The LONWORKS® communication board is equipped with the dedicated IC for the communication purpose, and it uses free topology Smart transceiver made by Echelon.

2. Names and functions

The external view of this option and the name of each part are shown below:



M3 screw (tightening torque: 0.5 N·m)
Use a flat blade screwdriver with a 0.6 mm thick and 3.5 mm width blade.

⚠ Danger	
Mandatory	▼ Operate Service SW only when a cover for the main circuit terminal is attached. It could lead to electric shocks. ▼ Operate Service SW using the non-conductive stick. When it is operated with a conductive stick, it could lead to electric shock.

2.1. About use of a common serial option

Common serial option can be used.
(Please use the RS20035-1 as the RS232C communication cable.)
However, when common serial option is used, communication will be forcefully switched to common serial option, thus communication via LONWORKS® is disabled.

3. Connection to the device

3.1. Installation method

Install the LONWORKS® Communication built-in board option to VF-S11 as follows:

(1) Turn off input power of VF-S11 and wait for at least ten minutes and then check that the CHARGE lamp on VF-S11 is no longer lit.

(2) Open the VF-S11 front cover, remove the board fixing screw and take out the VF-S11 standard terminal block board.
(Be careful not to lose the board fixing screw when removed since it may be used again.)

(3) Please wire an inverter, if an option board is already attached, you may not be able to perform wiring of an inverter depending on the model of inverter, please perform wiring by the side of an inverter beforehand.

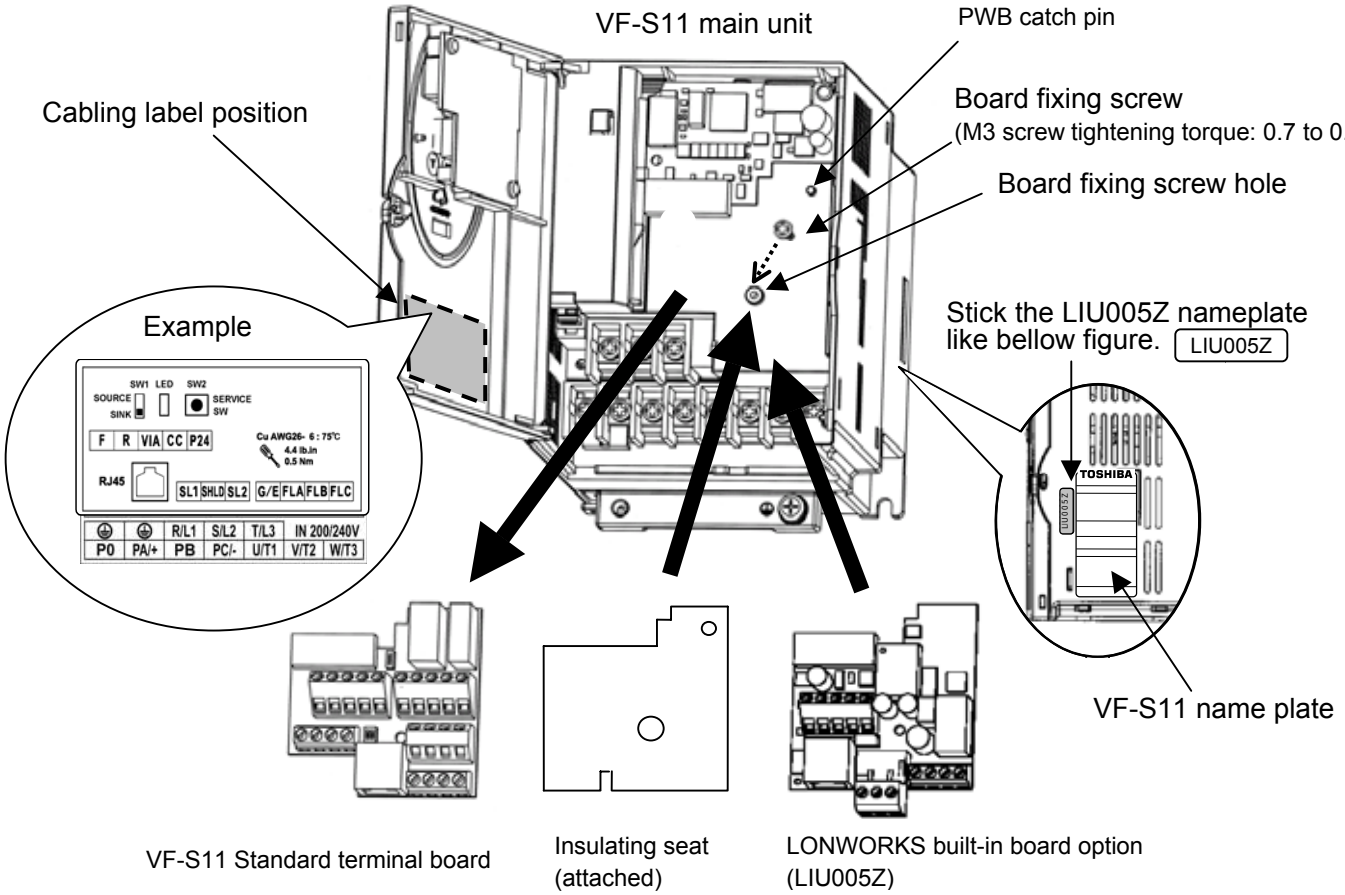
(4) Please attach the insulating seat in VF-S11.
(Set to the Board fixing screw hole and PWB catch pin.)

(5) Install the LIU005Z built-in board option and secure it with the board fixing screw.
(M3 tapping screw tightening torque: 0.7 to 0.8N・m)

(6) Please set it as SW1 by which an input terminal shall be used between a sink or sauce.

(7) Stick the LIU005Z cabling label on the standard cabling label stuck on the back of the VF-S11 cover. And stick the LIU005Z nameplate near the standard nameplate. (Be careful not to cover slits on the VF-S11 main board.

* To install or remove the terminal block board, make it slide in or out in parallel with board.



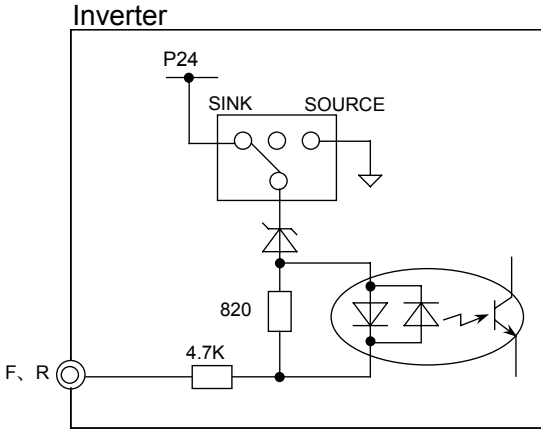
3.2. Description of terminals

<Control circuit terminals specification>

Terminal symbol	I/O type	Function	Electrical specifications
F	Input	Multifunctional programmable contact input. Shorting across F-CC causes forward rotation; opening causes slowdown and stop. (When SINK logic is selected and ST is always ON.)	No voltage contact input 24 V_{DC}, 5mA or less * SINK/SOURCE can be selected with SW1.
R		Multifunctional programmable contact input. Shorting across R-CC causes reverse rotation; opening causes slowdown and stop. (When SINK logic is selected and ST is always ON.)	
VIA	Input	Multifunction programmable analog input. Factory default setting: 0～60Hz frequency setting with 0～10 V_{DC} input. In addition, this terminal can be used as a multifunctional contact input using the parameters (F 109 and F 118).	10V_{DC} Internal impedance: 30kΩ
CC	Common to Input/Output	Control circuit's equipotential terminal	
P24	Output	24 V_{DC} power supply output	24V_{DC}-100mA
FLA FLB FLC	Output	Multifunctional programmable relay contact outputs The standard factory setting is set to detect the activation of the inverter protection function. Contact across FLA-FLC is closed and FLB-FLC is opened during protection function operation.	250V_{AC}-1A (cosφ=1) 30V_{DC}-0.5A 250V_{AC}-0.5A (cosφ=0.4A)
G/E	---	Grounding terminal	
SL1	LON WORKS	transmission data / reception data (There is no polarity.)	
SL2			
SHLD		LONWORKS® communication shield terminal. This terminal is not connected to other circuits in this board. Ground this terminal in a location separated from the ground of power line.	

[The internal circuit figure of the F and R terminal.]

* Except F and R terminal, refer to the instruction manual of VF-S11 for the internal circuit of the input and output terminal.

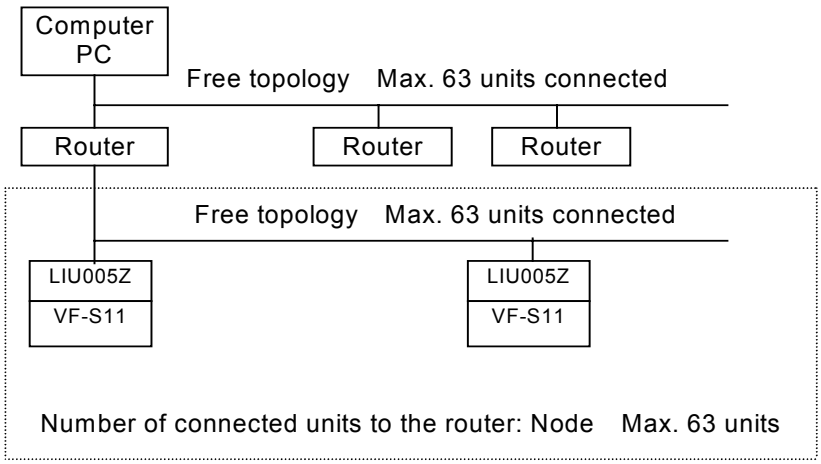


⚠ Danger	
Prohibited	▼ Do not change switch settings while power is on. It can damage the product and also lead to electric shocks, damage, and breakdown.
Mandatory	▼ When setting the VIA function, set the parameter after confirming removed motor cables. The motor may suddenly start and that could result in injury.

3.3. Network wiring

Network configuration is expanded as follows. Refer to the subsequent descriptions about the wiring between the communication board and the networks.
Use 0.75mm^2 wire for grounding to the earth terminal of the board.

Example of network configuration



Strictly observe the following cautions for the network wiring.

- Use Level 4/22 AWG cable for the communication cable.
  Recommended cable - Manufacturer :Showa Electric Wire & Cable Co., Ltd.
  - Model name : LW221S, 22AWG, 1P, With shield, Standard 300m/reel
- Cable sheath should be peeled off by about 10mm.
- For wiring work, Use a flat blade screwdriver with a 0.6 mm thick and 3.5 mm width blade.
- Tightening torque for the terminal block is 0.5 to 0.6 N・m.
- Never bundle the communication line and the power circuit line together.
  Separate the transmission cable 20 cm or more from the main circuit wiring.

3.4. Network cable connection

This communication board is provided with the free topology transceiver made by Echelon America, which enables the optimum wiring connection regardless of the types of network configuration such as bus-type, star-type or loop type arrangement.

◎ Communication terminal SL1, SL2

Structure the communication path by using a twisted pair cable with shield as shown in the figure below.

Polarity of the communication terminals SL1 and SL2 does not have to be considered.

◎ Communication shield terminal SHLD

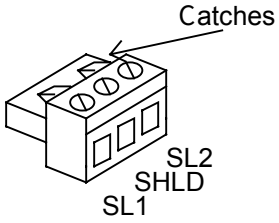
Please connect the shield line of a network cable. This terminal is not connected to other circuits in this board. Please ground through metal film resistor of 470k ohm, 1/4W, and 10% or less of error accuracy so that static electricity does not increase.

◎ Terminal resistor (Please refer to "3.5.Terminal resistor")

Only one terminal resistor is necessary for the segment of the free topology, and it can be placed in anywhere in the free topology segments.

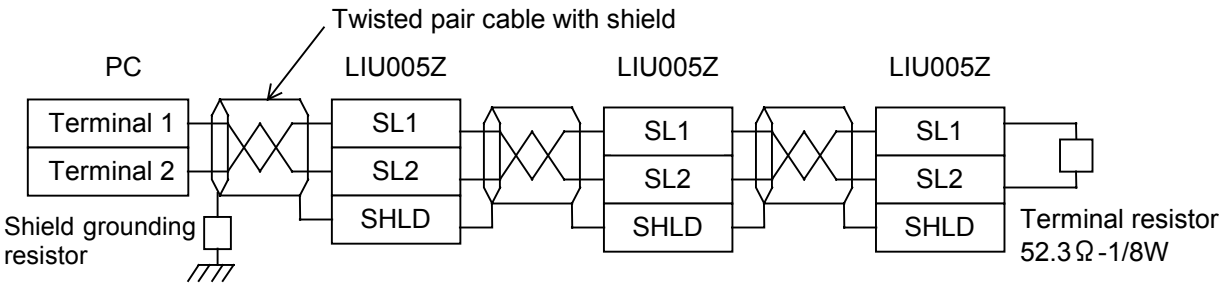
Terminal resistor: 52. 3Ω±1%, 1/8W

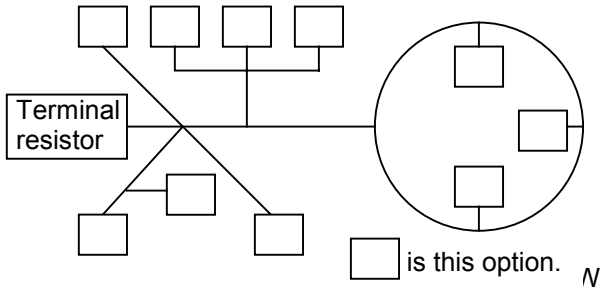
Relevant removable terminal block



For the connection of cable to the terminal block, refer to the aforementioned explanation.

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





Complex topology can be configured.

Connection of communication cable

Signal name	Name
SL1	Transmission and receiving data
SL2	Transmission and receiving data
SHLD	Shield

When recommended cable is used (in one segment)
Maximum distance between nodes: 400m
Maximum total wire length: 500m

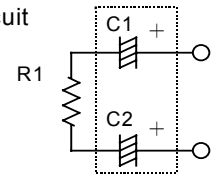
* Do not connect the ground wire of the shield to the power earth of the inverter or other unit.
* Separate the control/communication cables and the main circuit wiring of 20 cm or more without bundling.

3.5. Terminal resistor

Please set up the impedance of all the terminals of a cable to be set to about 52.3 ohms. In a doubly terminated bus topology, two terminations are required and may be placed anywhere on the free topology segment. 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 = 52.3Ω±1%,1/8W
2. Doubly Terminated Bus Topology Segment
   Two terminations and one at each end of the bus.
   RC network(Following figure), with R1 = 105Ω±1%,1/8W

Terminal circuit



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

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

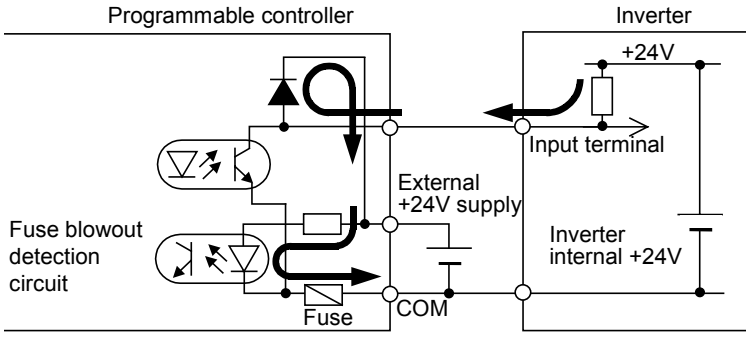
3.6. Wiring of a control terminal

Observe the following when wiring.

- Separate the control/communication cables and the main circuit wiring of 20 cm or more without bundling. Wiring them close the one to each other may lead to malfunction due to noise.
- Use 0.3 to 1.5 mm^2 solid/stranded wire (AWG 22 to 16) for control cables.

  * Interface between programmable controller and inverter

  When the operation is controlled by using a programmable controller which is the open collector output type, if the programmable controller is turned off with the inverter is on, the difference between each control power potential will cause wrong signals to the inverter as shown in below figure. Be sure to provide an interlock so that the programmable controller cannot be turned off when the inverter is on.



- Remove the sheath of wire about 6 mm (7mm for FLA, FLB and FLC) from the end of wire.
- Use a flat-headed screwdriver with its blade 0.6 mm in thickness and 3.5 mm in width.
- Screw tightening torque for the terminal block screws should be 0.5 N·m.

3.7. VF-S11 communication parameters

A communicative response can be improved by setting a transmission speed setup of an inverter to 19.2kbps. In addition, reset power supply after a parameter setup.

Function	Parameter	Description
Communication speed	F800	By setting a transmission speed setup to 19.2kbps(setting value 4), a response becomes good. It can be used also with a standard value (9.6kbps).

4. Specifications

＜Environmental specification＞

Item	Specification
Use environment	Indoor, Altitude 1000m or lower, Avoid direct sunlight, corrosive or explosive gas, steam, powdered particles, dust, grinding fluid and cutting oil.
Operation temperature	Conforms to VF-S11
Storage temperature	-25 to +65℃
Relative humidity	20 to 90% (No dew condensation)
Vibration	5.9m/s^2 (0.6G) or less (10 to 55 Hz) (To be complied with JIS C0040.)

＜LONWORKS® communication built-in board option (LIU005Z) side＞

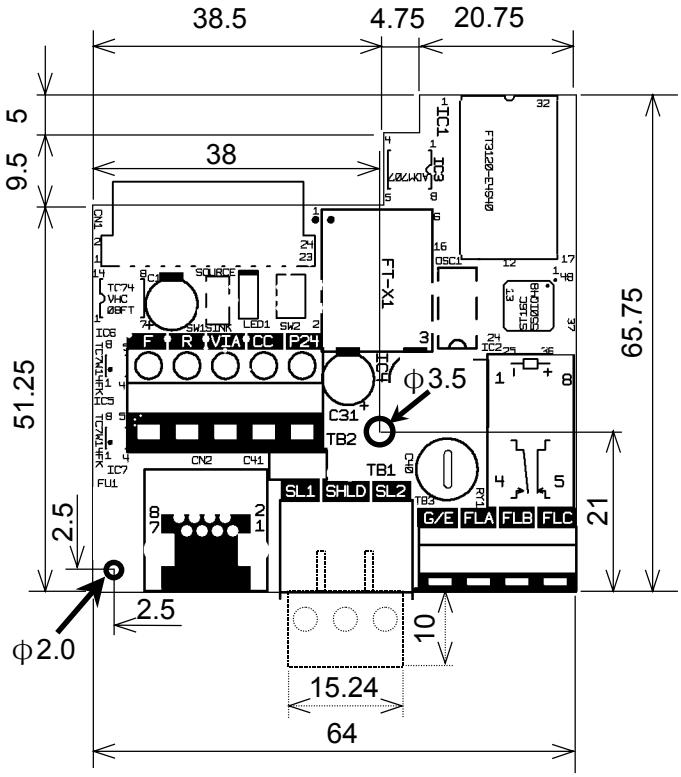
Item		Specification	Note
Communication between inverter	Inverter model, Number of connected INVs	VF-S11, Max. 1 board	
	Communication method	Binary type	
	Baud rate	1200、2400、4800、9600、19200bps	Automatic detection *It is power supply reset necessity at the time of inverter side change.
	Parity	odd number, even number or nothing	
Power supply		5 VDC	Supplied from inverter
Logic input terminals		2 terminals (F,R) With a slide switch, you can easily switch between sink logic and source logic configrations. *An analog input (VIA) is possible to be use as a contact input by parameter setup.	Un-insulating
Logic output terminals		Nothing	
Relay contact output terminals		1 circuit (FL)	insulating
Analog input terminals		1 circuit (VIA)	Un-insulating
Analog output terminals		Nothing	
Power supply		($24V_{DC}$-100mA)	

＜Network side＞

Item	Specification	Notes
Address and related items	Number of domains: 2 Number of address entries: 31	
Network variables	Number of transmission data: 11+1 Number of receiving data: 6+1 Number of configuration property : 12	Standard object variables (nviRequest, nvoStatus) are included.
Communication transceiver	Smart Transceiver made by Echelon is used.	78kbps
Communication signal	2 wires plus shield	
Transmission distance	Between nodes: Max. 400m Total cable length: Max. 500m	When recommended cable is used: Level 4/22AWG
Number of connected board s	Free topology Max. 63 boards	Because a host and router are counted as one board, the option can be connected up to 63 boards.
Service SW	Provided	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

5. Dimensions

The following figure is an outside figure seen from the surface of an option board.



Board thickness:1.6mm

6. Warranty

Any part of LONWORKS® Communication built-in board option that happens to be defective will be repaired free of charge under the following conditions:

1. If and when a trouble occurs on the option board properly installed and handled within one year of delivery, and if the trouble is clearly attributable to defects inherent in our design and manufacturing, the product will be repaired free of charge.
2. The warranty covers only the delivered option board.
3. Even in the term of the warranty, repair service will be charged for the following cases.
   1) Fault or damage resulting from misuse, unauthorized modification or repair.
   2) Fault or damage resulting from falling down of the product or traffic accident during transportation.
   3) Fault or damage originating from fire, salt water/salty breezes, some kind of gas, earthquake, storm or flood, lightning, abnormal supply voltage, or other natural disasters.
   4) Fault or damage caused by improper use of this option board as it is used for a purpose out of its original function.
4. If another special warranty is contracted for this option board, the special warranty has priority over this warranty.