

TOSVERT VF-PS1 / VF-FS1 series

LONWORKS[®] option unit

Communication Function Manual



NOTICE

1. Read this manual before installing or operating the LONWORKS option unit. Keep it in a safe place for reference.
2. All information contained in this manual are subject to change without notice. Please confirm the latest information on the web site "www.inverter.co.jp".

Introduction




Thank you for purchasing the “LONWORKS option unit” for TOSVERT VF-PS1 / VF-FS1 series inverter.
 Before using LONWORKS option unit, carefully read this function manual in order to completely and correctly utilize its excellent performance.

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






For details of its general handling, see an instruction manual attached with the option unit.

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■ Handling in general

| | |
|---|--|
|  Danger | |
|  Prohibited | ▼ Do not connect or disconnect a network cable while the inverter power is on. It may lead to electric shocks or fire. |
|  Mandatory | ▼ See the instruction manual attached with the option unit for cautions the handling. Otherwise, it may lead to electric shocks, fire, injuries or damage to product. |

■ Network control

| | |
|--|--|
|  Danger | |
|  Prohibited | ▼ Do not send the value out of the valid range to network variables. Otherwise, the motor may suddenly start/stop and that may result in injuries. |
|  Mandatory | ▼ Use an additional safety device with your system to prevent a serious accident due to the network malfunctions. Usage without an additional safety device may cause an accident. |
|  Warning | |
|  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 tripping, an operating error, power outage, failure, etc. - Receive heart beat timer See the “nciRcvHrtBt (Receive Heartbeat Time)” 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 clearing the inverter fault. The motor may suddenly start and that may result in injuries. |

■ Notes on operation

| | |
|--------------|--|
| Notes | |
| | ▼ When the control power is shut off by the instantaneous power failure, communication will be unavailable for a while. ▼ The Life of EEPROM is approximately 10000 times. Avoid writing data more than 10000 times to the same parameter of the inverter and configuration properties on LONWORKS option unit. |

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1. Scope

1.1. 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. it is featured by peer to peer communication between the LONWORKS nodes. This LONWORKS option is equipped with the LONWORKS Smart Transceiver (Neuron Chip) and LonTalk protocol in its firmware.

This network has following features.

1. Features the merit of distributed control. It enables to configure the network without Host computer.
2. The free topology wiring supported by the TP/FT-10 channel type accommodates bus, star, loop, or several combinations of these topologies.
3. Network construction tools are commercially available, and desirable network environment can be designed.
4. Products of the other manufacturer can also be laid out by open and non-exclusive network.

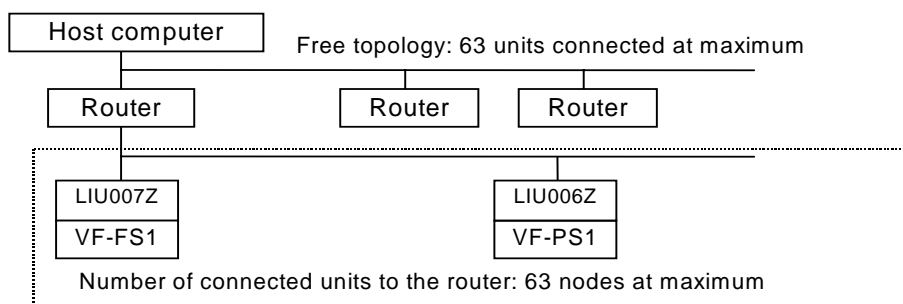
1.2. Applicable model

Applicable models are shown in the table below.

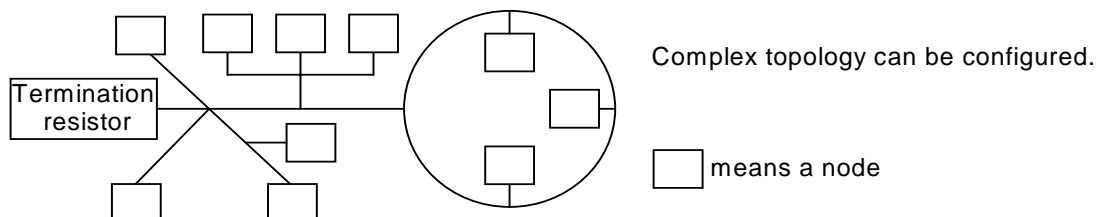
| Part number of LONWORKS option unit | Applicable inverter model |
|-------------------------------------|---------------------------|
| LIU006Z | VF-PS1 series |
| LIU007Z | VF-FS1 series |

1.3. System configuration

- Network configuration example



- The free topology wiring example

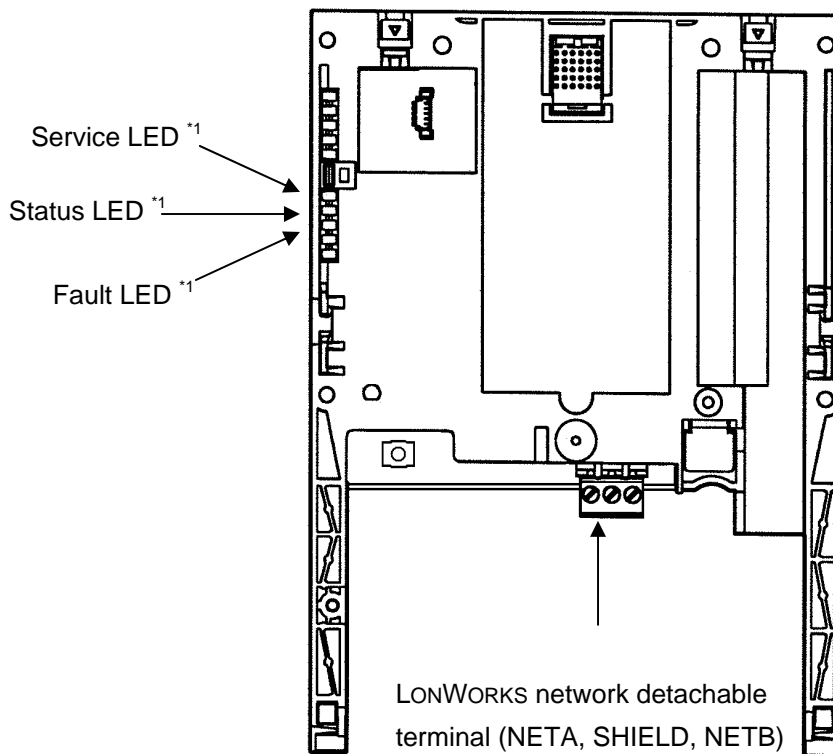


2. Names and functions of main parts

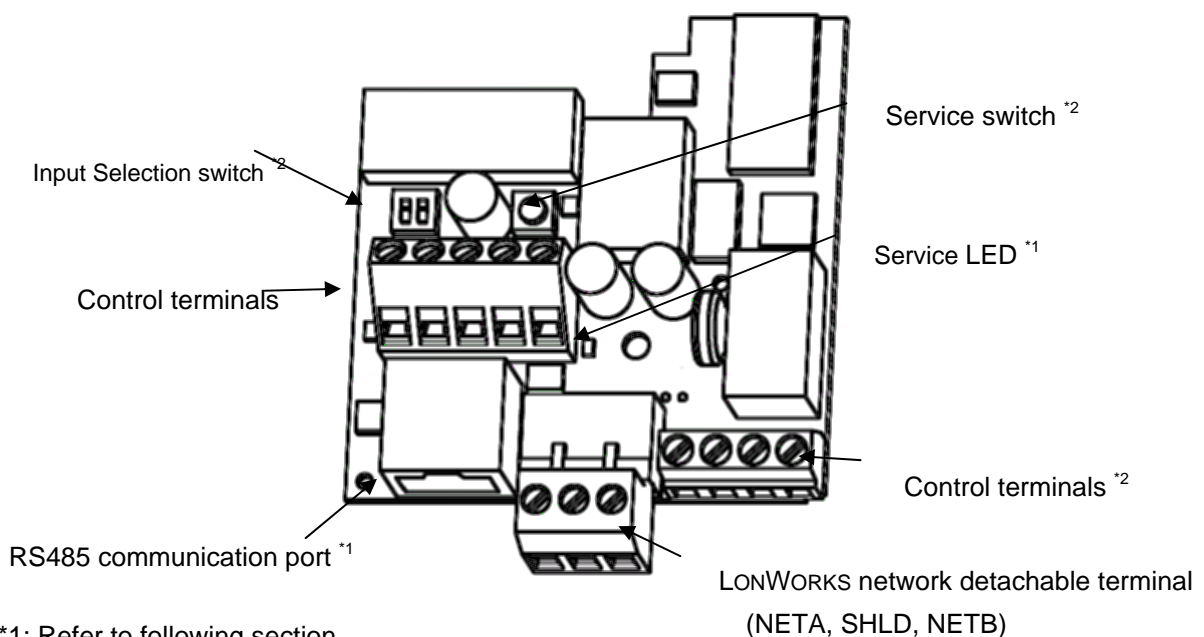
2.1. Outline view

The drawings below show names of main parts. Refer to each instruction manual for installing and wiring.

2.1.1. LIU006Z (for VF-PS1)



2.1.2. LIU007Z (for VF-FS1)



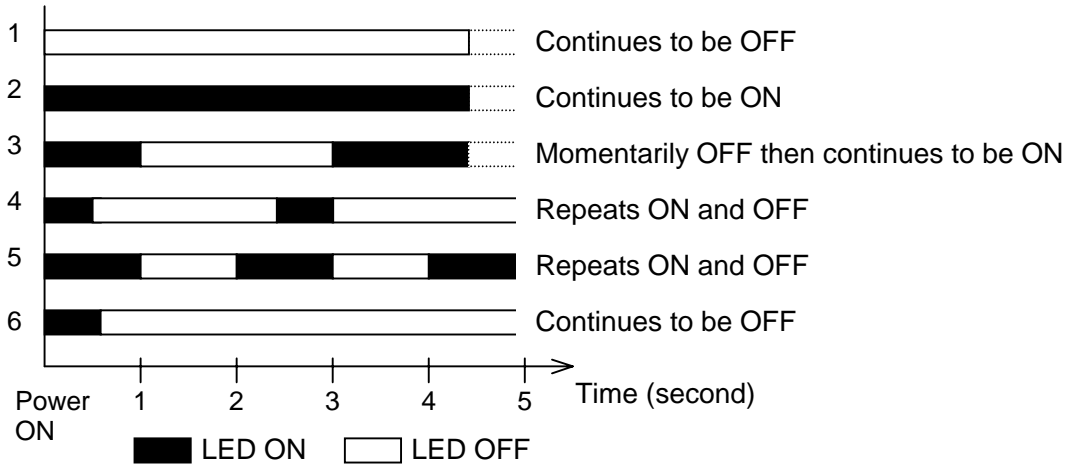
*1: Refer to following section.

*2: Refer to LIU007Z instruction manual (E6581371) for details.

2.2. Diagnostics

2.2.1. Service LED

Service LED indicates the node condition.

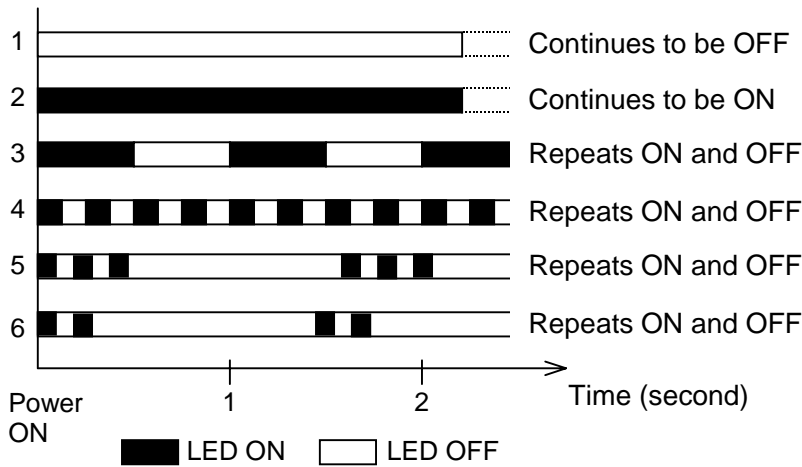


| No | Phenomenon | Problem & Solutions |
|----|---|--|
| 1 | Although the inverter is turned on, LED remains OFF. | Check the connection between the inverter and the LONWORKS option unit. If abnormality is not found after checking, it needs to be repaired. |
| 2 | LED continues to be ON after the inverter 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 program is in the condition of "Configures" 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 holding down service switch. | This is normal action while holding down service switch. |

The phone numbers for a service call are listed on the back cover of the inverter instruction manual or on its catalog.

2.2.2. Status LED

It displays node status with green color. Only LIU006Z has this LED.



| 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. | |

The phone numbers for a service call are listed on the back cover of the inverter instruction manual or on its catalog.

2.2.3. Fault LED

It displays fault with red color. Only LIU006Z has this LED.

| 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. |

2.3. RS485 communication port

RS485 port is useful for RS485 serial communication option (USB001Z) or Remote Keypad (RKP002Z, RKP005Z). Refer to the inverter instruction manual for details.

N.B.: Caution for LIU007Z

When a RS485 port of LIU007Z is used for RS485 serial communication option, the communication option interrupts and disables the communication line between LONWORKS option unit and the inverter. At that time LONWORKS option unit propagates the abnormality as "Communication error (bit6)" in "nvoAlarmWord" and "nvoDrvAlarm" to the network. However, "Fault (bit0)" in "nvoStatusWord" is not set at that time. this is because identify difference between this alarm and Communication error trip (E r r 5). This abnormality will automatically cancel itself if the RS485 serial communication option is disconnected.

3. Configurations

3.1. Neuron ID

LONWORKS device has the individual Neuron ID. The ID is indicated on the option unit as the barcode. Products have 3 sticker labels where the Neuron ID is indicated.

3.2. Service pin

Service pin function causes the node to propagate the service message over the network so that the network controller finds the node. There is Service pin as a mechanical switch on the LONWORKS option unit (refer to an attached instruction manual in detail).

Only LIU006Z 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 message over the network.

3.3. Device interface (XIF) file

Device interface (XIF) files are the files that define the network-visible interface for one or more LONWORKS devices. The device interface is the interface to a device that is exposed over a LONWORKS network. The device interface includes the device's self-documentation information, the number of address table entries, the number of message tags, and the number, types, and directions of network variables.

XIF files are distributed on the web site "www.inverter.co.jp".

3.4. LNS Plug-in

LNS Plug-in provides one or more means to monitor or alter configuration properties or network variables. It may be used for device-specific configuration or monitoring. LIS006Z and LIS007Z are prepared as their device plug-ins for LIU006Z and LIU007Z.

The device plug-ins are also distributed on the web site "www.inverter.co.jp".

3.5. Inverter configurations

Set the inverter parameters according to the instruction manual attached with the product.

However, LONWORKS option unit will edit some of the inverter parameters (*FH, UL, LL, ACC, DEC, LL*) so that they should not be edited.

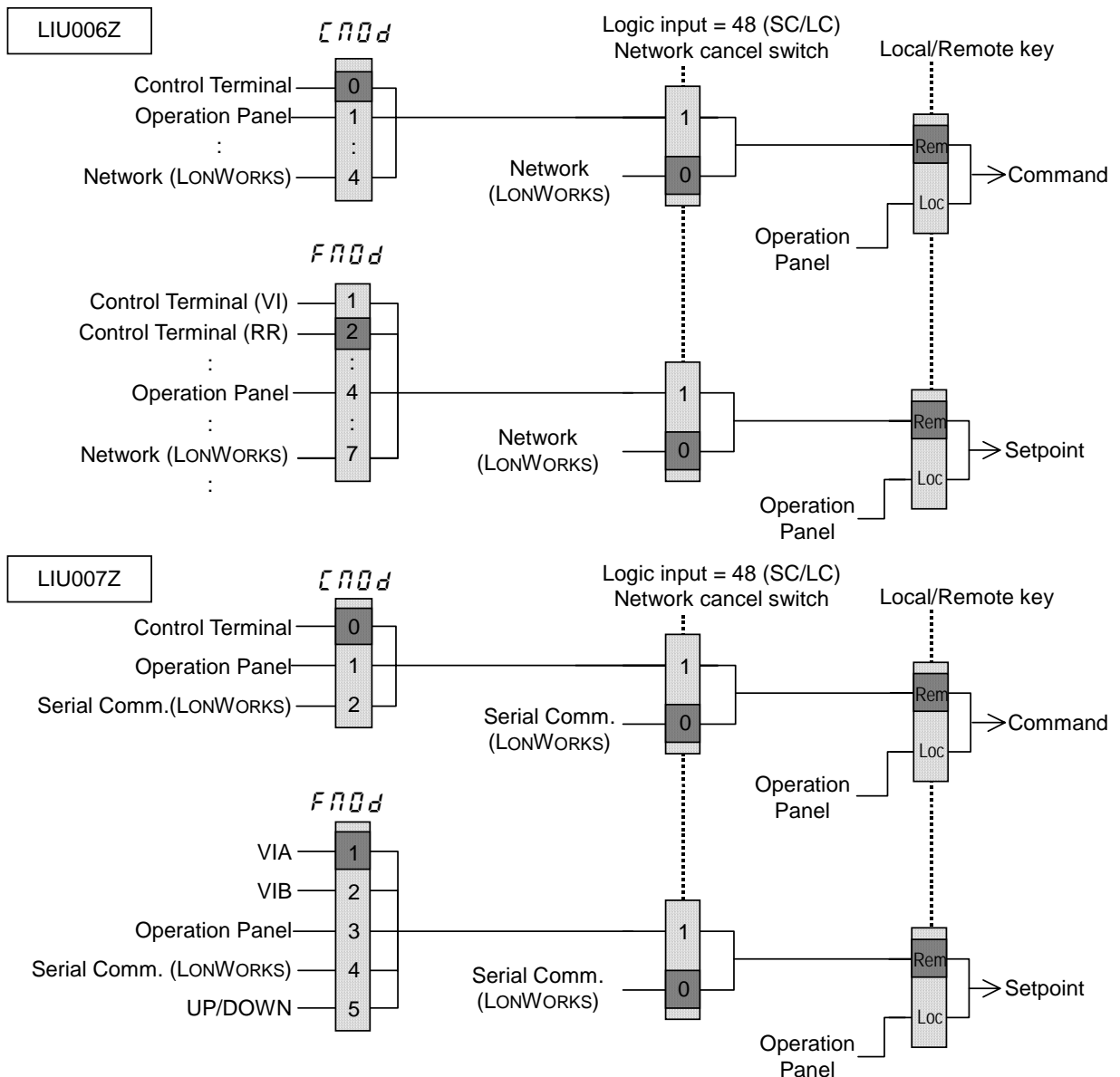
Configuration by PC commissioning software (PCM001Z) is also available by using serial communication option (USB001Z) through RS485 port.

N.B.: Refer to Section 2.3 for RS485 port specification in detail.

3.6. Command & Setpoint selection (Local/Remote)

Indication to display Local/Remote mode is on the inverter unit (Refer to the inverter instruction manual for details). LONWORKS option command and setpoint are activated on Remote mode^{*1}. LONWORKS option unit propagates the Local / Remote status to the network as the “Command from the network (bit5)” and “Setpoint from the network (bit6)” in “nvoStatusWord” network variable. 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.

*1: Be careful that *CNOd* command and *FNOd* setpoint are activated for a short time just after the inverter power turned on. Set *CNOd* and *FNOd* to “Serial communication” (“network” for LIU006Z) to prevent this problem.



3.7. Reference parameter of the inverter

Reference parameter of the inverter is listed below.

| Title | Name | Description |
|-----------------|------------------------------------|--|
| <i>ACC</i> | Acceleration time | Do not change these parameters, because the LONWORKS option unit using them. |
| <i>DEC</i> | Deceleration time | |
| <i>FH</i> | Maximum frequency | |
| <i>UL</i> | Upper limit frequency | |
| <i>LL</i> | Lower limit frequency | |
| <i>uL</i> | Base frequency 1 | |
| <i>CNOd</i> | Command mode selection | Network command has priority when the inverter is Remote mode. (See previous section) |
| <i>FNOd</i> | Setpoint mode selection | Network setpoint has priority when the inverter is Remote mode. (See previous section) |
| <i>F111 ...</i> | Logic input terminal function | Set proper value if use (See the inverter instruction manual). |
| <i>F603</i> | Emergency stop selection | For "nviEmergOverride" |
| <i>F800</i> | Communication baud rate | Set "1" (default) for LIU007Z |
| <i>F801</i> | Communication parity | Set "1" (default) for LIU007Z |
| <i>F803</i> | Communication error trip time | Set properly value for LIU007Z |
| <i>F829</i> | Communication protocol | Set "1" (MODBUS) for LIU007Z |
| <i>F830</i> | Option parameter 1 | Service pin function for LIU006Z |
| <i>F851</i> | Operation at network disconnection | See section "7.4 Communication health management". |
| <i>F899</i> | Option reset | Option reset function for LIU006Z. Set "1" to activate reset. |

⚠ Warning



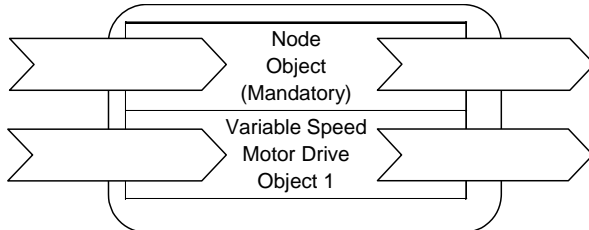
Mandatory

▼ For LIU007Z, set up "Communication error trip function (*F803*, see the inverter instruction manual for details)" to stop the inverter when this option unit is deactivated by an unusual event such as tripping, an operating error, power outage, failure, etc. Deactivated option unit may cause an accident, if the "Communication error trip function" is not properly set up.

4. Functional profile

4.1. Functional profile supported by this option

This LONWORKS option unit supports LONMARK Variable Speed Motor Drive functional profile (SFPTvariableSpeedMotorDrive, 6010_11). It has 2 objects (functional blocks) shown in the figure below.



We implement the manufacturer specific variables into Variable Speed Motor Drive functional block, its external name is "ACMotorDrive". Node Object functional block's external name is "NodeObject".

4.2. Object id

Each object has individual object ID.

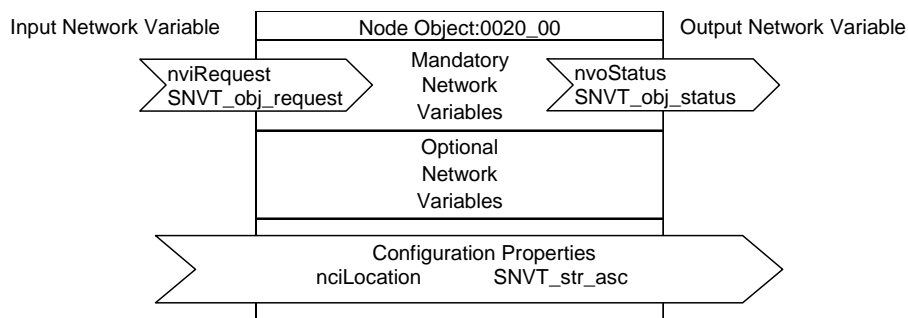
| Object id | Object name | Description |
|-----------|--------------|--|
| 0 | NodeObject | LONMARK functional profile: Node Object |
| 1 | ACMotorDrive | LONMARK functional profile: Variable Speed Motor Drive |

5. Node Object functional block

The Node Object functional block includes 2 mandatory network variables “nviRequest (Object request)” and “nvoStatus (object status)”. Upon receiving an update to the “nviRequest” network variable, the request is processed and the “nvoStatus” network variable is updated with either the results of the request, an in-process indication, or an error indication. The definition of the “nviRequest” network variable includes an object ID field to allow the Node Object to report status and alarm conditions for a device.

5.1. Object map

This figure shows the NodeObject object map.



5.2. Network variables (Node Object)

Network variables included in Node Object functional block are shown in the table below.

| LIU 007Z | LIU 006Z | Name | SNVT type | Function | LONMARK |
|----------|----------|------------------|------------------|--------------------------------|-----------|
| v | v | nviRequest | SNVT_obj_request | Object request | Mandatory |
| v | v | nvoStatus | SNVT_obj_status | Object Status | Mandatory |
| --- | --- | nviTimeSet | SNVT_time_stamp | Time Setting | Optional |
| --- | --- | nviFileReq | SNVT_file_req | File Request | Optional |
| --- | --- | nvoFileStat | SNVT_file_status | File Status | Optional |
| --- | --- | nviFilePos | SNVT_file_pos | File Position | Optional |
| --- | --- | nvoFileDirectory | SNVT_address | File Directory Address | Optional |
| --- | --- | nvoAlarm2 | SNVT_alarm_2 | Alarm output | Optional |
| --- | --- | nviDateEvent | SNVT_date_event | Date Event | Optional |
| --- | --- | nvoDateResync | SNVT_switch | Date Resynchronization Request | Optional |
| --- | --- | nciNetConfig | SNVT_config_src | Network Configuration Source | Optional |
| --- | --- | nciMaxStsSendT | SNVT_elapsed_tm | Maximum Send Time | Optional |
| v | v | nciLocation | SNVT_str_asc | Location label | Optional |
| --- | --- | nciDevMajVer | unsigned short | Device Major Version | Optional |
| --- | --- | nciDevMinVer | unsigned short | Device Minor Version | Optional |

v: Support, ---:Not support.

5.2.1. nciLocation (Location Label)

Configuration property, Node Object 0000_20 (Optional)

SNVT type: SNVT_str_asc (36)

SCPT reference: SCPT_location (17)

It can be used to provide physical location information.

- Valid Range:

Any NULL (“\0”) terminated ASCII string of 31 bytes total length. In fact 30 bytes are available because Null terminator has to be set the last byte.

- Default Value:

The default value is an ASCII string containing all Null (“\0”).

5.2.2. nviRequest (Object Request)

Input network variable, Node Object 0000_20 (Mandatory)

SNVT type: SNVT_obj_request (92)

This is the variable to request the node status response. LONWORKS option unit supports some requests shown in the table below.

| Value | Request | Description |
|-------|------------------|---|
| 0 | RQ_NORMAL | If the device was in the disabled state, this request cancels that state, and returns the functional block to normal operation. |
| 1 | RQ_DISABLED | It requests the specified functional block to change to the disabled state. This request always brings the motor to a controlled stop. |
| 2 | RQ_UPDATE_STATUS | It requests the status of the functional block to be sent to the “nvoStatus” output network variable. The state of the functional block is unchanged. |
| 5 | RQ_REPORT_MASK | It requests a status mask reporting the status bits that are supported by the functional block to be sent to the “nvoStatus” output network variable. A one bit in the status mask means that the device may set the corresponding bit in the object status when the condition defined for that bit occurs. |
| 7 | RQ_ENABLE | This request enables the system, without starting any action in the system (no spinning of motor, etc.) |
| 9 | RQ_CLEAR_STATUS | It requests all status and report bits for the functional block and in the “nvoStatus” output network variable to be cleared. The state of the functional block is unchanged. |
| 10 | RQ_CLEAR_ALARM | It requests the alarm state of the functional block to be cleared. If any alarm conditions are still present for the functional block, the alarms are reported again as they are detected. |

N.B.: In case that receiving the invalid request, optional unit sets “1” to “invalid_request” bit of “nvoStatus” output network variable.

5.2.3. nvoStatus (Object Status)

Output network variable, Node Object 0000_20 (Mandatory)

SNVT type: SNVT_obj_status (93)

This is the variable to inform the object status. LONWORKS option unit supports some status shown in the table below.

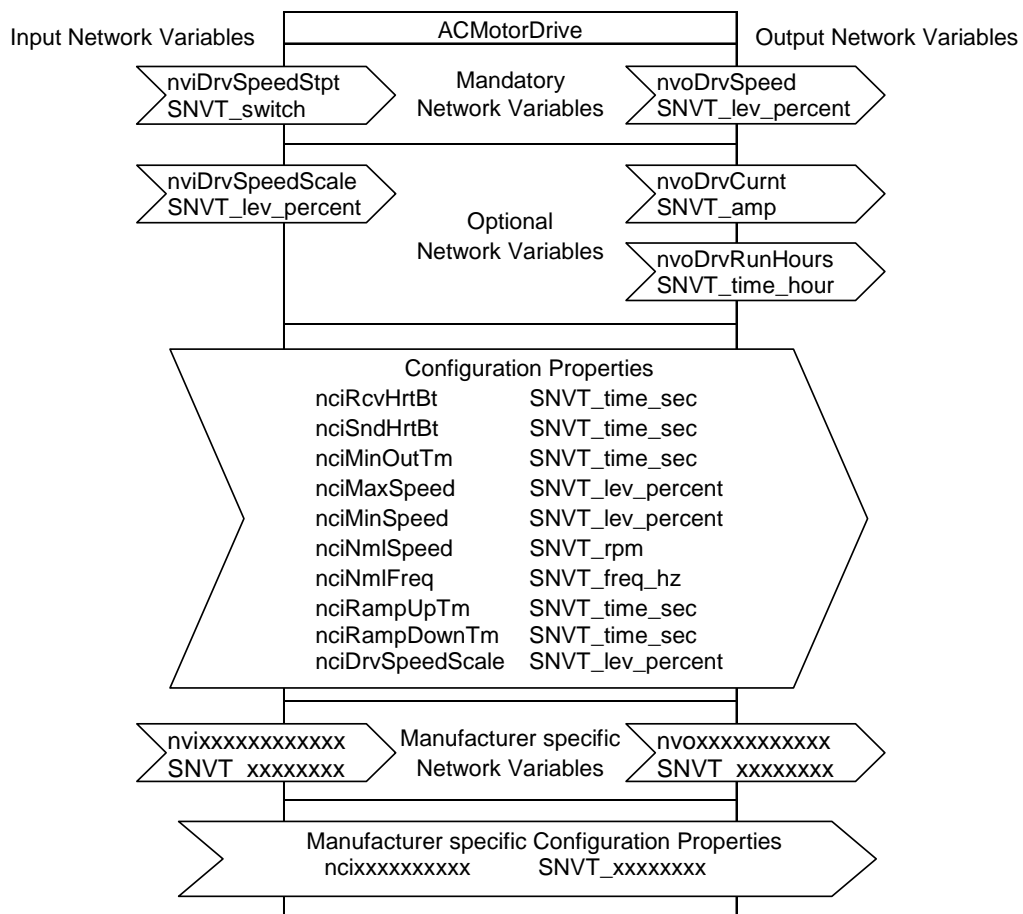
| Bit | Request | Description |
|-----|------------------------------------|--|
| --- | object_id | object_id of requested functional block |
| 0 | invalid_id | Set to "1" if a request is received for a functional block index that is not defined in the device. No further checking of the request code is required when set to one. |
| 1 | invalid_request | Set to "1" if an unsupported request code (RQ_xxx) is received on the "nviRequest" input network variable. |
| 2 | disabled | Under the disabled state, <ul style="list-style-type: none"> - Output network variables belonging to the functional block are not propagated to the network. However, it must be possible to poll the output network variables of a functional block in this state. - The functional block must not respond to any updates received on its input network variables, but it must support reading and writing of any configuration properties belonging to the functional block. - If the functional block was already in the disabled state, a request to disable the functional block is not an error. - If the Node Object functional block is disabled, any other requests for the Node Object functional block are not disabled. - Status and alarm reporting via the "nvoStatus" outputs is not disabled when the Node Object functional block is disabled. |
| 12 | comm_failure (Only for LIU006Z) | Set to "1" when the communication fault between the inverter and the option unit |
| 17 | in_alarm | Set to "1" if the inverter fault occurred or Communication fault between the LONWORKS option unit and the inverter occurred. |
| 19 | report_mask | Set to "1" if an RQ_REPORT_MASK request is received by the "nviRequest" input network variable. |

6. ACMotorDrive functional block

ACMotorDrive functional block includes the “Variable Speed Motor Drive (6010_11)”. It can perform Run/stop control of the inverter, intensive surveillance control of an operation state, monitor the inverter status through network variables.

6.1. Object map

The object map is the following.



6.2. Network variable list (VSD_6010_11)

LONWORKS option unit supports all mandatory network variables included in LONMARK functional profile “Variable Speed Motor Drive”. The network variables are shown in the table below.

“nvi” means an input network variables, “nvo” means an output network variables and “nci” means a network configuration properties.

| LIU 007Z | LIU 006Z | Variables | SNVT_type. | unit | Default value | LONMARK |
|-------------|-------------|------------------|------------------|--------------------|-----------------------|-----------|
| v | v | nviDrvSpeedStpt | SNVT_switch | 0.5%,1 | {0.0%, -1} | Mandatory |
| v | v | nvoDrvSpeed | SNVT_lev_percent | 0.005% | | Mandatory |
| v | v | nviDrvSpeedScale | SNVT_lev_percent | 0.005% | nciDrvSpeedScale | Optional |
| v | v | nvoDrvCurnt | SNVT_amp | 0.1A | | Optional |
| --- | --- | nvoDrvVolt | SNVT_volt | 0.1V | | Optional |
| --- | --- | nvoDrvPwr | SNVT_power_kilo | 0.1kW | | Optional |
| v | v | nvoDrvRunHours | SNVT_time_hour | 1h | | Optional |
| --- | --- | nciLocation | SNVT_str_asc | Ascii | | Optional |
| v | v | nciMaxSpeed | SNVT_lev_percent | 0.005% | 100.000% | Mandatory |
| v | v | nciMinSpeed | SNVT_lev_percent | 0.005% | 0.000% | Mandatory |
| v | v | nciRcvHrtBt | SNVT_time_sec | 0.1s | 0.0s | Optional |
| v | v | nciSndHrtBt | SNVT_time_sec | 0.1s | 0.0s | Mandatory |
| v | v | nciMinOutTm | SNVT_time_sec | 0.1s | 0.5s | Optional |
| v | v | nciNmlSpeed | SNVT_rpm | 1min ⁻¹ | 1800min ⁻¹ | Mandatory |
| v | v | nciNmlFreq | SNVT_freq_hz | 0.1Hz | 60Hz | Mandatory |
| v | v | nciRampUpTm | SNVT_time_sec | 0.1s | 10.0s | Mandatory |
| v | v | nciRampDownTm | SNVT_time_sec | 0.1s | 10.0s | Mandatory |
| v | v | nciDrvSpeedScale | SNVT_lev_percent | 0.005% | 100.000% | Optional |

v: Support, ---: Not support.

6.3. Network variable list (the other)

The other network variables are shown in the table below.

LIU006Z as an upper range, provides additional LONWORKS feature not supported by LIU007Z.

| LIU 007Z | LIU 006Z | Variables | SNVT_type. | unit | Default value |
|----------|----------|------------------|------------------|---------|--------------------|
| v | v | nviResetFault | SNVT_switch | 0.5%,1 | {0.0%, 0} |
| v | v | nviInvSetFreq | SNVT_freq_hz | 0.1Hz | 3276.7Hz = invalid |
| v | v | nvoStatusWord | SNVT_state | boolean | |
| v | v | nvoDrvFeedback | SNVT_switch | 0.5%,1 | |
| v | v | nvoInvOutFreq | SNVT_freq_hz | 0.1Hz | |
| v | v | nvoDrvAlarm | SNVT_switch | 0.5%,1 | |
| v | v | nvoAlarmWord | SNVT_state | boolean | |
| --- | v | nvoDrvThermal | SNVT_lev_percent | 0.005% | |
| --- | v | nvoMotorThermal | SNVT_lev_percent | 0.005% | |
| v | v | nvoTorque | SNVT_lev_percent | 0.005% | |
| v | v | nvoDrvEnergy | SNVT_elec_kwh_l | 0.1kWh | |
| v | v | nvoDigitalIn1 | SNVT_switch | 0.5%,1 | |
| v | v | nvoDigitalIn2 | SNVT_switch | 0.5%,1 | |
| --- | v | nvoDigitalIn3 | SNVT_switch | 0.5%,1 | |
| --- | v | nvoDigitalIn4 | SNVT_switch | 0.5%,1 | |
| --- | v | nvoDigitalIn5 | SNVT_switch | 0.5%,1 | |
| --- | v | nvoDigitalIn6 | SNVT_switch | 0.5%,1 | |
| --- | v | nvoDigitalIn7 | SNVT_switch | 0.5%,1 | |
| --- | v | nvoDigitalIn8 | SNVT_switch | 0.5%,1 | |
| --- | v | nvoDigitalInput | SNVT_state | boolean | |
| --- | v | nvoAnalogIn1 | SNVT_lev_percent | 0.005% | |
| v | v | nvoAnalogIn2 | SNVT_lev_percent | 0.005% | |
| --- | v | nvoAnalogIn3 | SNVT_lev_percent | 0.005% | |
| v | v | nviRelay1 | SNVT_switch | 0.5%,1 | {0.0%, 0} |
| --- | v | nviDigitalOut1 | SNVT_switch | 0.5%,1 | {0.0%, 0} |
| --- | v | nviDigitalOut2 | SNVT_switch | 0.5%,1 | {0.0%, 0} |
| --- | v | nviDigitalOutput | SNVT_state | boolean | {0,0,...,0} |
| --- | v | nviAnalogOut1 | SNVT_lev_percent | 0.005% | 0.000% |
| --- | v | nviAnalogOut2 | SNVT_lev_percent | 0.005% | 0.000% |
| v | v | nviEmergOverride | SNVT_hvac_emerg | binary | |
| v | v | nvoEmergStatus | SNVT_hvac_emerg | binary | |
| v | v | nviParamCmd | SNVT_preset | binary | |
| v | v | nvoParamResp | SNVT_preset | binary | |
| v | v | nvoTypeVer | SNVT_str_asc | Ascii | |
| v | v | nciPwUpOutTm | SNVT_time_sec | 0.1s | 0.0s |

v: Support, ---:Not support,

6.4. Configuration properties

6.4.1. nciMaxSpeed (Maximum Speed)

Configuration property (nc50), Variable Speed Drive 6010_11 (Mandatory)



SNVT type: SNVT_lev_percent (81)

SCPT reference: SCPTmaxSetpoint (50)

It is used to define the maximum speed of the inverter output. The value is entered as a percentage of nominal speed. The value of the maximum speed must be validated against the value of the minimum speed as follows:

- Valid range: $0.000\% \leq \text{minimum speed} \leq \text{maximum speed} \leq 163.830\%$
(Limited within the value of the inverter parameter “ $\underline{U}\underline{L}$ ” limitation)
- Unit: 0.005%
- Default Value: 100.000%

N.B.: By editing this variable, this option unit changes the inverter parameter “ $\underline{U}\underline{L}$ ”, automatically.
When setting small value, it may be limited by the lower limit of the inverter parameter “ $\underline{U}\underline{L}$ ”

| | |
|--|---|
|  Danger | |
|  Prohibited | ▼ Do not set the value out of valid range. Setting the value out of valid range may result in injuries by motor running with unexpected speed. |

6.4.2. nciMinSpeed (Minimum Speed)

Configuration property, Variable Speed Drive 6010_11 (Mandatory)



SNVT type: SNVT_lev_percent (81)

SCPT reference: SCPTminSetpoint (53)

It is used to define the minimum speed of the inverter output. The value is entered as a percentage of nominal speed. The value of the minimum speed must be validated against the value of the maximum speed as follows:

- Valid range: $0.000\% \leq \text{minimum speed} \leq \text{maximum speed} \leq 163.830\%$
(Limited within the value of the inverter parameter “ $\underline{L}\underline{L}$ ” limitation)
- Unit: 0.005%
- Default Value: 0.000%

N.B.: By editing this variable, this option unit changes the inverter parameter “ $\underline{L}\underline{L}$ ”, automatically.

| | |
|---|---|
|  Danger | |
|  Prohibited | ▼ Do not set the value out of valid range. Setting the value out of valid range may result in injuries by motor running with unexpected speed. |

6.4.3. nciRcvHrtBt (Receive Heartbeat Time)

Configuration property, Variable Speed Drive 6010_11 (Optional)



SNVT type: SNVT_time_sec (107)

SCPT reference: SCPTmaxRcvTime (48)

It is used to control the maximum period of time that elapses after the last update of the network variables ("nviDrvSpeedStpt", "nviDrvSpeedScale", "nviInvSetFreq") before detecting the network malfunction and initializing the command and setpoint values. Refer to "7.4:Communication health management" for the inverter behavior in that case.

- Valid range: 0.0 to 6553.4 sec
- Unit: 0.1s
- Default value: 0.0s

A value of 0.0 sec disables the Receive Heartbeat mechanism.

| | |
|---|---|
|  Danger | |
|  Mandatory | <p>▼ Set up "nciRcvHrtBt" to stop the inverter when the option unit is disconnected from the network by network abnormality, etc. The option unit disconnected from the network may cause an accident, if the "nciRcvHrtBt" is not properly set up.</p> |

6.4.4. nciSndHrtBt (Send Heartbeat Time)

Configuration property, Variable Speed Drive 6010_11 (Mandatory)

SNVT type: SNVT_time_sec (107)

SCPT reference: SCPTmaxSendTime (49)

It defines the maximum period of time that expires before the network variables specified for heartbeat in some monitor values will automatically be updated. This timer restarts to count just after sending network variables. Refer to "7.4:Communication health management" for details.

- Valid range: 0.0 to 6553.4 sec
- Unit: 0.1s
- Default value: 0.0s

A value of 0.0sec disables the automatic update.

6.4.5. nciMinOutTm (Minimum Send Time)

Configuration property, Variable Speed Drive 6010_11 (Optional)

SNVT type: SNVT_time_sec (107)

SCPT reference: SCPTminSendTime (52)

It defines the minimum period of time between automatic network variable transmissions. This function is prior to "nciSndHrtBt". This timer starts to count just after sending the last variable. Refer to "7.4:Communication health management" for details.

- Valid range: 0.0 to 6553.4 sec
- Unit: 0.1s
- Default value: 0.5s

Setting 0.0sec disables transmission limitation.

6.4.6. nciNmlSpeed (Nominal Motor Speed in min⁻¹)



Configuration property, Variable Speed Drive 6010_11 (Mandatory)

SNVT type: SNVT_rpm (102)

SCPT reference: SCPTnomRPM (158)

It is used to provide the nominal speed of the inverter output in min⁻¹.

- Valid range: 0 to 65534 min⁻¹
- Unit: 1 min⁻¹
- Default value: 1800 min⁻¹

| | |
|---|--|
|  Danger | |
|  Prohibited | <ul style="list-style-type: none"> ▼ Do not change this value while the motor is running. Otherwise, It may result in injuries by motor running with unexpected speed. ▼ Do not set the value out of valid range. Otherwise, It may result in injuries by motor running with unexpected speed. |

6.4.7. nciNmlFreq (Nominal Motor Frequency)

Configuration property, Variable Speed Drive 6010_11 (Mandatory)



SNVT type: SNVT_freq_hz (76)

SCPT reference: SCPTnomFreq (159)

This configuration property is used to provide the nominal speed of the inverter output in Hz. This is used as the base speed on ACMotorDrive functional block. It should be set to Rated Frequency of motor.

- Valid range: 25.0 to 500.0 Hz (for LIU006Z)
25.0 to 200.0 Hz (for LIU007Z)
- Unit: 0.1 Hz
- Default value: 60.0 Hz

N.B.: By editing this variable, this option unit changes the inverter parameter “ ω_L ” automatically.

| | |
|---|--|
|  Danger | |
|  Prohibited | <ul style="list-style-type: none"> ▼ Do not change this value while the motor is running. Otherwise, It may result in injuries by motor running with unexpected speed. ▼ Do not set the value out of valid range. Otherwise, It may result in injuries by motor running with unexpected speed. |

6.4.8. nciRampUpTm (Ramp Up Time)

Configuration property, Variable Speed Drive 6010_11 (Mandatory)

SNVT type: SNVT_time_sec (107)

SCPT reference: SCPTrampUpTm (160)

It determines the ramp up time of the motor.

- Valid range: 0.1 to 6000.0 sec. (LIU006Z)
0.1 to 3200.0 sec. (LIU007Z)
- Unit: 0.1 sec.
- Default value: 10.0 sec.

N.B.: By editing this variable, this option unit changes the inverter parameter “ R_L ” automatically.

6.4.9. nciRampDownTm (Ramp Down Time)

Configuration property, Variable Speed Drive 6010_11 (Mandatory)

SNVT type: SNVT_time_sec (107)

SCPT reference: SCPTrampDownTm (161)

It determines the ramp down time of the motor.

- Valid range: 0.1 to 6000.0 sec. (LIU006Z)
0.1 to 3200.0 sec. (LIU007Z)
- Unit: 0.1 sec.
- Default value: 10.0 sec.

N.B.: By editing this variable, this option unit changes the inverter parameter “ $dE\bar{L}$ ” automatically.

6.4.10. nciDrvSpeedScale (Default value for nviDrvSpeedScale)

Configuration property, Variable Speed Drive 6010_11 (Optional)

SNVT type: SNVT_lev_percent (81)

SCPT reference: SCPTdefScale (162)

It is used as the default value for “nviDrvSpeedScale”. When this option unit is initialized, it will be updated.

- Valid range: -163.840 to 163.830%
- Unit: 0.005%
- Default value: 100.000%

6.4.11. nciPwUpOutTm (Power up delay time).

Configuration property

SNVT type: SNVT_time_sec (107)

SCPT reference: SCPTpwrUpDelay (72)

It defines the time until starting transmission after the device powered up. It is useful to improve network traffic at power-up.

- Valid range: 0.0 to 300.0 sec (If the value exceed 300.0, the value is limited to 300.0 sec)
- Unit: 0.1 sec.
- Default value: 0.0 sec.

6.5. Input network variables

6.5.1. nviDrvSpeedStpt (Drive Speed Setpoint)

Input network variable, Variable Speed Drive 6010_11 (Mandatory)

SNVT type: SNVT_switch (95)

It provides start/stop control and a low resolution speed setpoint as a percentage of nominal speed.

Output frequency = “nciNmIFreq” x “nviDrvSpeedStpt.value” x “nviDrvSpeedScale”

- Valid range

| nviDrvSpeedStpt | | Operation |
|-----------------|-------|--------------------------------------|
| value | state | |
| N/A | 0 | Stop |
| 0.0 to 100.0% | 1 | Drive at the speed from 0.5% to 100% |
| 100.5 to 127.5% | 1 | Drive at 100% speed |
| N/A | -1 | AUTO (Invalid) |

- Unit (nviDrvSpeedStpt.value): 0.5%

- Default value: 0.0% (value), AUTO (state = -1),

Default value will be adopted at power-up and in case of not receiving an update of “nviSpeedStpt”, “nviDrvSpeedScale” or “nviInvSetFreq” within the specified Receive Heartbeat time (nciRcvHrtBt). Speed reference set by “nviInvSetFreq” will override “nviDrvSpeedStpt” (refer to “nviInvSetFreq”).

N.B. The value exceeded to the inverter setpoint resolution will be rounded.

6.5.2. nviDrvSpeedScale (Drive Speed Setpoint Scaling)

Input network variable, Variable Speed Drive 6010_11 (Optional)

SNVT type: SNVT_lev_percent (81)

This input network variable provides scaling for “nviDrvSpeedStpt”. Negative values indicate a motor direction in reverse.

- Valid range: -163.840 to 163.830%

- Unit: 0.005%

- Default value: “nciDrvSpeedScale”

Default value will be adopted at power-up and in case of not receiving an update of “nviSpeedStpt”, “nviDrvSpeedScale” or “nviInvSetFreq” within the specified Receive Heartbeat time (nciRcvHrtBt).

N.B. The value exceeded to the inverter setpoint resolution will be rounded.

6.5.3. nviResetFault (Fault Reset Command)

Input network variable

SNVT type: SNVT_switch (95)

This command clears the inverter fault when the inverter is under a fault that can be cleared.

- Valid range

| nviResetFault | | Command |
|----------------|-------|---------------------------------------|
| value | state | |
| N/A | 0, -1 | Invalid |
| 0.0% | 1 | |
| 0.5% to 127.5% | 1 | Clear a fault and reset the inverter. |

6.5.4. nviInvSetFreq (Frequency Setpoint)

Input network variable

SNVT type: SNVT_freq_hz (76)

It provides speed setpoint in Hz. The rotation direction is provided by “nviDrvSpeedScale” (Negative value means in reverse).

- Valid range: 0.0 Hz to the maximum vale in the inverter.

(Refer to the inverter instruction manual for details.)

| nviInvSetFreq | nviDrvSpeedStpt | | Operation |
|------------------|-----------------|-------|--|
| | value | state | |
| N/A | N/A | 0 | Stop |
| 3276.7 Hz | value | 1 | Drive at the speed provided by “nviDrvSpeedStpt” |
| 0.0 to 3276.6 Hz | N/A | 1 | Drive at the speed provided by “nviInvSetFreq” |

Setpoint by “nviInvSetFreq” is limited by value of “nciMaxSpeed” and “nciMinSpeed”.

- Unit: 0.1Hz
- Default value: 3276.7Hz (In this case, nviDrvSpeedStpt enables to provide the setpoint)

Default value will be adopted at power-up and in case of not receiving an update of “nviSpeedStpt”, “nviDrvSpeedScale” or “nviInvSetFreq” within the specified Receive Heartbeat time (nciRcvHrtBt).

6.5.5. nviRelay1 /nviDigitalOut1,2 (Control of Digital Output)

Input network variable

SNVT type: SNVT_switch (95)

They enable a command of the Relays and Logic outputs on the inverter if they are assigned.

- Valid range

| nviRelay1, nviDigitalOut1,2 | | Command |
|-----------------------------|-------|------------|
| value | state | |
| N/A | 0 | Output OFF |
| 0.0% | 1 | |
| 0.5 to 127.5% | 1 | Output ON |
| N/A | -1 | Invalid |

- Assignment

If these variables are used, the inverter parameters must be set as follows.

| Variables | LIU007Z | | LIU006Z | |
|----------------|----------|-----------|----------|-----------|
| | Terminal | Parameter | Terminal | Parameter |
| nviDigitalOut1 | --- | --- | OUT1 | F130 = 92 |
| nviDigitalOut2 | --- | --- | OUT2 | F131 = 94 |
| nviRelay1 | FL | F132 = 38 | FL | F132 = 96 |

If multiple digital output control signals are used at the same time, the output value is the OR of all digital output controls.

6.5.6. nviDigitalOutput (Control of All Digital Outputs)

Input network variable (Only for LIU006Z)

SNVT type: SNVT_state (83)

This variable enables the command of all the Relays and Logic outputs of the inverter if they are assigned.

- Valid range

| Bit | LIU007Z | | LIU006Z | |
|------|----------|-----------|--------------------|------------|
| | Terminal | Parameter | Terminal | Parameter |
| 0 | --- | --- | OUT1 | F130 = 92 |
| 1 | --- | --- | OUT2 | F131 = 94 |
| 2 | --- | --- | FL | F132 = 96 |
| 3 | --- | --- | OUT3 ^{*1} | F133 = 98 |
| | | | OUT5 ^{*1} | F136 = 98 |
| 4 | --- | --- | OUT4 ^{*1} | F134 = 100 |
| | | | OUT6 ^{*1} | F137 = 100 |
| 5 | --- | --- | R1 ^{*1} | F131 = 102 |
| | | | R2 ^{*1} | F138 = 102 |
| 6-15 | --- | --- | --- | (reserved) |

If multiple digital output control signals are used at the same time, the output value is the OR of all digital output controls.

*1: OUT3, OUT4, OUT5, OUT6, R1 and R2 are on the Expansion I/O card option (ETB003Z, ETB004Z).

6.5.7. nviAnalogOut1,2 (Control of Analog output)

Input network variable (Only for LIU006Z)

SNVT type: SNVT_lev_percent (81)

They enable the analog output control.

- Valid range: 0.000 to 100.000%

(Output value is not adjusted by the inverter parameter "F \bar{n} ", "R \bar{n} ")

- Unit: 0.005% (The resolution depends on the inverter specification)

When the variables will be used, the inverter parameters must be assigned.

| Name | LIU007Z | | LIU006Z | |
|---------------|----------|-----------|----------|-----------|
| | Terminal | Parameter | Terminal | Parameter |
| nviAnalogOut1 | --- | --- | FM | FMSL = 31 |
| nviAnalogOut2 | --- | --- | AM | AMSL = 31 |

6.5.8. nviEmergOverride (Emergency stop)

Input network variable

SNVT type: SNVT_have_emerg (103)

It provides an emergency stop of the motor. Emergency stop can be configured by Emergency stop selection (F503) to coast stop, slow down stop or emergency DC braking (refer to the inverter instruction manual for details).

- Valid range

| Value | Command | Description |
|----------|------------------|--|
| 0 | Remove emergency | EMERG_NORMAL (No Emergency mode) |
| 1 | Emergency stop | EMERG_PRESSURIZE (Emergency pressurize mode) |
| 2 | | EMERG_DEPRESSURIZE (Emergency depressurize mode) |
| 3 | | EMERG_PURGE (Emergency purge mode) |
| 4 | | EMERG_SHUTDOWN (Emergency shutdown mode) |
| 5 | | EMERG_FIRE (Emergency fire mode) |
| 6 to 255 | | --- |

N.B.: "Remove emergency" command clears a fault and resets the inverter.

6.5.9. nviParamCmd (Parameter access)

Input network variable

SNVT type: SNVT_preset (94)

It is used to access the inverter parameters. Refer to section 7.5 "Parameter access method" for the example usage.

- Valid range: All accessible parameters in the inverter (except for E000 to E499)

- Format:

| field | Length | Description |
|-------------|---------|--|
| learn | 1 byte | Command |
| | | 0 (LN_RECALL) : Not support |
| | | 1 (LN_LEARN_CURRENT) : Not support |
| | | 2 (LN_LEARN_VALUE) : Write |
| | | 3 (LN_REPORT_VALUE) : Read |
| selector | 2 bytes | Parameter address (unsigned value) ^{*1} |
| value[0] | 1 byte | 0 |
| value[1] | 1 byte | 0 |
| value[2] | 1 byte | The most significant 2 hex bytes of data |
| value[3] | 1 byte | The least significant 2 hex bytes of data |
| day | 2 bytes | Invalid ^{*2} |
| hour | 1 byte | Invalid ^{*2} |
| minute | 1 byte | Invalid ^{*2} |
| second | 1 byte | Invalid ^{*2} |
| millisecond | 2 bytes | Invalid ^{*2} |

*1: This value is Hexadecimal value, but it may be displayed with decimal value on network tool.

*2: The time fields (day, hour, minute, second and millisecond) are not supported by this option unit. Any values in the time fields of the Parameter access command will be ignored.

6.6. Output network variables

6.6.1. Output network variable update

Normally, output network variables are updated when the inverter status was changed. Automatic transmission function is also prepared by “nciSndHrtBt (Send Heartbeat Time)”, “nciMinOutTm (Minimum Send Time)” configuration properties.

See section 7.4 “Communication health management” for detail.

6.6.2. nvoDrvCurnt (Drive Output Current)

Output network variable, Variable Speed Drive 6010_11 (Optional)

SNVT type: SNVT_amp (1)

It provides the inverter output current in amperes.

- Valid range: 0.0 to 3276.6 A It is overwritten 0.0A when the inverter faulted.)
- Unit: 0.1 A

6.6.3. nvoDrvSpeed (Drive Speed Feedback)

Output network variable, Variable Speed Drive 6010_11 (Mandatory)

SNVT type: SNVT_lev_percent (81)

It provides the motor speed as a percentage of the nominal speed. Negative value means a speed in reverse.

- Valid range: -163.840 to 163.830%
- Unit: 0.005% (The resolution depends on the inverter specification)

N.B.: It indicates the rotating direction at the time of a stop, only when at the time of the operation starts after changing rotating direction. However, the rotating direction of the inverter performs correctly.

6.6.4. nvoDrvRunHours (Drive Total Running Hours)

Output network variable, Variable Speed Drive 6010_11 (Optional)

SNVT_type: SNVT_time_hour (124)

This output network variable provides the total operation time for the motor in running hours.

- Valid range: 0 to 65534 h (The overflow caused the value to return 0.)
- Unit: 1 h

6.6.5. nvoInvOutFreq (Frequency Feedback)

Output network variable

SNVT type: SNVT_freq_hz (76)

It provides the inverter output frequency.

- Valid range: 0.0Hz to 3276.6Hz
- Unit: 0.1Hz

6.6.6. nvoDrvFeedback (Velocity Feedback)

Output network variable

SNVT type: SNVT_switch (95)

It provides stopped / running status and low resolution output speed of the motor.

- Specification

| nvoDrvFeedback | | Operation |
|----------------|-------|---|
| value | state | |
| N/A | 0 | Stop |
| 0.0 to 127.5% | 1 | Drive at 0.0 to 127.5% speed. value = (Drive frequency) / nciNmIFreq / nviDrvSpeedScale |

N.B.: When the speed exceeds the 127.5%, "value" is limited to 127.5%

If "nviDrvSpeedScale" was set to 0, nvoDrvFeedback.value shows 0.0%.

The value exceeded to the resolution will be rounded.

6.6.7. nvoStatusWord (Inverter Status)

Output network variable

SNVT type: SNVT_state (83)

It provides the inverter status.

- Format:

| Bit | Description | 0 | 1 |
|------|---------------------------|----------------------|------------------|
| 0 | Fault | No fault | Fault |
| 1 | Warning | No warning | Warning |
| 2 | Running | Stopped | Running |
| 3 | Rotation | Forward | Reverse |
| 4 | Ready | Disable | Enable |
| 5 | Command from the network | Not from the network | From the network |
| 6 | Setpoint from the network | Not from the network | From the network |
| 7 | At setpoint | Setpoint not reached | Setpoint reached |
| 8-15 | (reserved) | ----- | ----- |

N.B.: On LIU007Z, "At setpoint" bit could work under the condition that VF-FS1 software version was V106 or successor,

6.6.8. nvoDrvAlarm (Alarm)

Output network variable

SNVT type: SNVT_switch (95)

It provides the inverter fault.

- Status

| nvoDrvAlarm | | Status |
|-------------|-------|----------|
| value | state | |
| 0% | 0 | No fault |
| 100% | 1 | Fault |

*Refer to "nvoAlarmWord" for detail fault information.

6.6.9. nvoAlarmWord (Alarm Status)

Output network variable

SNVT type: SNVT_state (83)

It provides the inverter fault status. If the inverter faulted, "Fault" bit and the contents bit are set to ON.

| Bit | Description |
|------|--|
| 0 | Fault |
| 1 | Supply fault |
| 2 | Inverter fault |
| 3 | Motor fault (overvoltage, phase loss, overheating ...) |
| 4 | Process fault |
| 5 | External fault (including I/O fault) |
| 6 | Communication fault |
| 7-15 | (reserved) |

6.6.10. nvoDrvThermal (Drive Thermal State)

Output network variable (Only for LIU006Z)

SNVT type: SNVT_lev_percent (81)

It provides the inverter thermal level in percentage. 100% means Over Heat fault.

- Valid range: 0.000% to 163.830%
- Unit: 0.005% (The resolution depends on the inverter specification)

6.6.11. nvoMotorThermal (Motor Thermal State)

Output network variable (Only for LIU006Z)

SNVT type: SNVT_lev_percent (81)

It provides motor thermal level in percentage. This value is shown in percentage based on motor thermal fault level.

- Valid range: 0.000% to 163.830%
- Unit: 0.005% (The resolution depends on the inverter specification)

6.6.12. nvoTorque (Motor Torque Monitor)

Output network variable,

SNVT type: SNVT_lev_percent (81)

It provides the motor torque in percentage of nominal motor torque calculated by the inverter.

- Valid range: -163.840% to 163.830% (LIU006Z)
0.000% to 163.830% (LIU007Z)
(If an overflow occurred, the value is limited to maximum value.)
- Unit: 0.005% (The resolution depends on the inverter specification)

N.B.: It is overwritten 0.000% when the inverter faulted.

6.6.13. nvoDrvEnergy (Cumulative Input Energy)

Output network variable,

SNVT type: SNVT_elec_kwh_I (146)

It provides the cumulative input energy calculated by the inverter.

- Valid range: 0.0kWh to 42949672.9kWh (If an overflow occurred, the value returns to 0.)
- Unit: 0.1kWh

*How to clear the value

This cumulative data value is cleared if the inverter power source is cycled with setting the parameter *F748* to 0. When clearing it without cycling the power source, use inverter parameter *F820*. Refer to section 7.5 "Parameter access method" for detail.

6.6.14. nvoDigitalInput (All Digital Inputs Monitor)

Output network variable (Only for LIU006Z)

SNVT_type: SNVT_state (83)

It provides all states of the inverter logic input terminals. Each bit is set to "1" when the terminal is activated.

Bit field is arranged as the table shown in below.

| Bit | LIU007Z | LIU006Z |
|-----|---------|----------------|
| 0 | ----- | F terminal |
| 1 | ----- | R terminal |
| 2 | ----- | (reserved) |
| 3 | ----- | RES terminal |
| 4 | ----- | S1 terminal |
| 5 | ----- | S2 terminal |
| 6 | ----- | S3 terminal |
| 7 | ----- | RR/S4 terminal |
| 8 | ----- | LI1 terminal* |
| 9 | ----- | LI2 terminal* |
| 10 | ----- | LI3 terminal* |
| 11 | ----- | LI4 terminal* |
| 12 | ----- | LI5 terminal* |
| 13 | ----- | LI6 terminal* |
| 14 | ----- | LI7 terminal* |
| 15 | ----- | LI8 terminal* |

*Terminals LI1 to LI8 are placed on the expansion terminal option cards (ETB003Z, ETB004Z)

6.6.15. nvoDigitalIn1 to 8 (Digital Input Monitor)

Output network variable

SNVT type: SNVT_switch (95)

They provide the inverter logic input terminal state.

- Status

| nvoDigitalIn1 to 8 | | Status |
|--------------------|-------|-----------|
| value | state | |
| 0% | 0 | Input OFF |
| 100% | 1 | Input ON |

The relationship between the network variables and input terminals is shown in below.

| Variables | LIU007Z | LIU006Z |
|---------------|------------|----------------|
| nvoDigitalIn1 | F terminal | F terminal |
| nvoDigitalIn2 | R terminal | R terminal |
| nvoDigitalIn3 | ----- | (reserved) |
| nvoDigitalIn4 | ----- | RES terminal |
| nvoDigitalIn5 | ----- | S1 terminal |
| nvoDigitalIn6 | ----- | S2 terminal |
| nvoDigitalIn7 | ----- | S3 terminal |
| nvoDigitalIn8 | ----- | RR/S4 terminal |

6.6.16. nvoAnalogIn1 to 3 (Analog Input Monitor)

Output network variable

SNVT type: SNVT_lev_percent (81)

They provide the inverter analog input terminal state in percentage.

- Valid range: 0.000 to 100.000%

(At only RX terminal, -100.000 to 100.000%)

- Unit: 0.005% (The resolution depends on the inverter specification)

The adjustment of analog input value is possible to set the inverter parameter (*F470* to *F475*)

(Refer to the inverter instruction manual for details).

The relationship between the network variable and the terminal is shown in the table below.

| Name | LIU007Z | LIU006Z |
|--------------|--------------|----------------|
| nvoAnalogIn1 | ---- | RR/S4 terminal |
| nvoAnalogIn2 | VIB terminal | VI/II terminal |
| nvoAnalogIn3 | ---- | RX terminal |

When RR/S4 terminal has Logic input terminal function, “nvoAnalogIn1” always shows 0.000%.

6.6.17. nvoEmergStatus (Emergency Status)

Output network variable

SNVT type: SNVT_have_emerg (103)

It provides the response against an emergency stop of the inverter (nviEmergOverride). When the node received “nviEmergOverride” network variable, it propagates the information to the network.

- Valid range

| Value | Status | Description |
|----------|----------------|--|
| 0 | Trip release | EMERG_NORMAL (No Emergency mode) |
| 1 | Emergency stop | EMERG_PRESSURIZE (Emergency pressurize mode) |
| 2 | | EMERG_DEPRESSURIZE (Emergency depressurize mode) |
| 3 | | EMERG_PURGE (Emergency purge mode) |
| 4 | | EMERG_SHUTDOWN (Emergency shutdown mode) |
| 5 | | EMERG_FIRE (Emergency fire mode) |
| 6 to 255 | | --- |

6.6.18. nvoParamResp (Parameter Access Response)

Output network variable

SNVT type: SNVT_preset (94)

It provides to the response of the inverter parameters accessing (nviParamCmd). Refer to “7.5 Parameter access method” for the example usage.

- Format

| field | Length | Description |
|-------------|---------|--|
| learn | 1 byte | Command 2 (LN_LEARN_VALUE) : Write 3 (LN_REPORT_VALUE) : Read the other : Not support |
| selector | 2 bytes | Parameter address (unsigned value) ^{*1} |
| value[0] | 1 byte | 0 at successful, FFh at occurred error ^{*2} |
| value[1] | 1 byte | 0 |
| value[2] | 1 byte | The most significant 2 hex bytes of data |
| value[3] | 1 byte | The least significant 2 hex bytes of data |
| day | 2 bytes | 0 |
| hour | 1 byte | 0 |
| minute | 1 byte | 0 |
| second | 1 byte | 0 |
| millisecond | 2 bytes | 0 |

*1: This value may be displayed with decimal value on network tool.

*2: When access error occurred, “value[0]” field shows FFh and the error code is shown in “value[3]” field.

01h: Illegal function for the addressed node

02h: Illegal parameter address

03h: Illegal data value

04h: Illegal access (cf. prohibit writing)

6.6.19. nvoTypeVer (Identification)

Output network variable

SNVT type: SNVT_str_asc (36) polled

It provides the inverter identification data (Brand, Commercial Reference, Version) by Ascii code. The string is ended by Null terminator (“\0”). This variable can be read only with polling.

- Structure

| Data | Length | Description | ASCII |
|----------------|--------|-----------------------------------|-------|
| Vendor name | 7 | “TOSHIBA” | ----- |
| space | 1 | Character “space” | 0x20 |
| Product code | free | “VFPS1-xxxx...”, “VF-FS1-xxxx...” | ----- |
| space | 1 | Character “space” | 0x20 |
| V | 1 | Character “V” | 0x56 |
| major revision | 1 | Software version (major) | ----- |
| . | 1 | Character “.” | 0x2E |
| minor revision | 2 | Software version (minor) | ----- |

Ex. “TOSHIBA VFFS1-2022PM V1.06”

7. Example usage

7.1. Procedure

Lower example shows the procedure to send the 100% speed drive command to the inverter.

1. Commission

Make a network tool to identify this option by using service pin function (refer to network tool manual in detail).

2. Binding

Refer to next section.

3. Configurations

Set correct value into the configuration properties.

4. Local/Remote

Confirm that the inverter is in Remote control mode. Otherwise set Remote control mode.

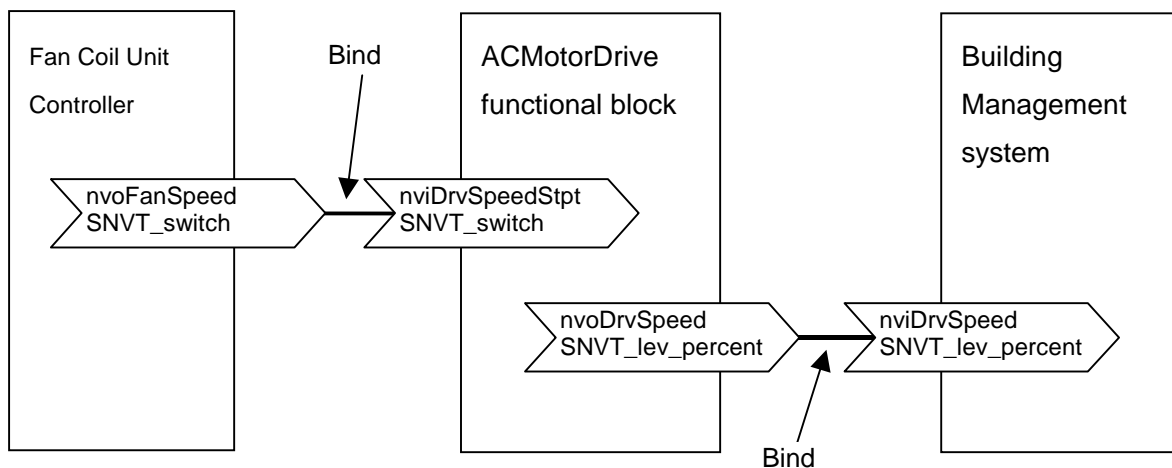
5. Drive command and setpoint

Set the {200, 1} (100% speed drive) into the nviDrvSpeedStpt and propagate it.

7.2. Binding

Network variable bound to the other network variable can transmit/receive the data. "Binding" can be made by network tool. Network variable has a direction (Input/Output) and individual type (SNVT_type). Binding to the same direction variable or the different type is prohibited.

■ Example connection



7.3. Option unit reset method

One method to reset the option unit is cycling the inverter power source.

For VF-FS1, the other is using reset command by network tool.

VF-PS1 has option reset command by the parameter *F899*. (Refer to VF-PS1 instruction manual)

7.4. Communication health management

This option unit has communication health management function.

1. Communication time out function (nciRcvHrtBt)

This value manages the communication time out function. This option unit would initialize the drive command/setpoint variables and try to stop the motor in case of not receiving an update of the following variables within the specified Receive Heartbeat time (nciRcvHrtBt).

- nviDrvSpeedStpt
- nviDrvSpeedScale
- nviInvOutFreq

In this case, the inverter output behavior can be determined by the parameter *F851*. However, next selections are invalid.

- None (continued operation)
- Preset speed operation (only for VF-PS1)

2. Node health transmission function (nciSndHrtBt, nciMinOutTm)

This option unit informs the network manager to its own health. Network variables controlled by this function are shown in the table below.

| Variables | LIU007Z | | LIU006Z | |
|-----------------|-------------|-------------|-------------|-------------|
| | nciSndHrtBt | nciMinOutTm | nciSndHrtBt | nciMinOutTm |
| nvoDrvSpeed | v | v | v | v |
| nvoDrvCurnt | v | v | v | v |
| nvoDrvVolt | v | v | v | v |
| nvoDrvPwr | v | v | v | v |
| nvoDrvRunHours | v | v | v | v |
| nvoStatusWord | v | v | v | v |
| nvoDrvFeedback | v | v | v | v |
| nvoInvOutFreq | v | v | v | v |
| nvoDrvAlarm | v | v | v | v |
| nvoAlarmWord | v | v | v | v |
| nvoDrvThermal | / | / | v | v |
| nvoMotorThermal | / | / | v | v |
| nvoTorque | v | v | v | v |
| nvoDrvEnergy | v | v | v | v |
| nvoDigitalIn1 | v | v | v | v |
| nvoDigitalIn2 | v | v | v | v |
| nvoDigitalIn3 | / | / | v | v |
| nvoDigitalIn4 | / | / | v | v |
| nvoDigitalIn5 | / | / | v | v |
| nvoDigitalIn6 | / | / | v | v |
| nvoDigitalIn7 | / | / | v | v |
| nvoDigitalIn8 | / | / | v | v |
| nvoDigitalInput | / | / | v | v |
| nvoAnalogIn1 | / | / | v | v |
| nvoAnalogIn2 | v | v | v | v |
| nvoAnalogIn3 | / | / | v | v |
| nvoEmergStatus | --- | --- | --- | --- |
| nvoParamResp | --- | --- | --- | --- |
| nvoTypeVer | --- | --- | --- | --- |

v: controlled by nciSndHrtBt and nciMinOutTm

7.5. Parameter access method

Parameter access is allowed by using nviParamCmd and nvoParamResp network variables. The structure format is shown in below table.

| Field | Length | Description |
|---|------------------|---|
| learn | 1 byte | Command 2 (LN_LEARN_VALUE) : Write 3 (LN_REPORT_VALUE) : Read |
| selector | 2 bytes | Parameter address (unsigned value) |
| value[0] | 1 byte | 0 at successful 0xFF at occurred error |
| value[1] | 1 byte | 0 |
| value[2] | 1 byte | The most significant 2 hex bytes of data |
| value[3] | 1 byte | The least significant 2 hex bytes of data |
| day ,hour, minute, second, millisecond | Total 7 bytes | N/A |

- Example 1: Read access

A controller node reads the value of Trip code (address FC90). Now, **OL** trip (trip code is 13 decimal) occurs. The value is 000D hex. The controller node sends/receives the following data.

| Field | Send (nviParamCmd) | Receive (nviParamResp) |
|---|--------------------|------------------------|
| learn | LN_REPORT_VALUE | LN_REPORT_VALUE |
| selector | FC90 hex | FC90 hex |
| value[0] | N/A | 0 |
| value[1] | N/A | 0 |
| value[2] | N/A | 00 hex |
| value[3] | N/A | 0D hex |
| day ,hour, minute, second, millisecond | N/A | 0 |

- Example 2: Write access

The controller node writes cumulative energy clear command (address FA20). The data value is 0002 hex. The controller node sends/receives the following data.

| Field | Send (nviParamCmd) | Receive (nviParamResp) |
|---|--------------------|------------------------|
| learn | LN_LEARN_VALUE | LN_LEARN_VALUE |
| selector | FA20 hex | FA20 hex |
| value[0] | 00 hex | 00 hex |
| value[1] | 00 hex | 00 hex |
| value[2] | 00 hex | 00 hex |
| value[3] | 02 hex | 02 hex |
| day ,hour, minute, second, millisecond | N/A | 0 |

N.B.: After sending cumulative energy clear command, 0000 hex should be re-written into FA20.

- Example 3: Illegal access

Illegal data is written to the inverter parameter $F171$, (Base frequency voltage, address 0171). The upper limit value is 330.0V (200V class). In case of writing 360.0V, the unit of this parameter is 0.1V and the data value is converted to hexadecimal, so the value is 0E10 hex. The controller node sends/receives the following data (out of range error).

| Field | Send (nviParamCmd) | Receive (nviParamResp) |
|---|--------------------|------------------------|
| learn | LN_LEARN_VALUE | LN_LEARN_VALUE |
| selector | 0171 hex | 0171 hex |
| value[0] | 00 hex | FF hex |
| value[1] | 00 hex | 00 hex |
| value[2] | 0E hex | 00 hex |
| value[3] | 10 hex | 03 hex |
| day ,hour, minute, second, millisecond | N/A | 0 |

8. Specifications

| Item | Specification | Notes |
|-----------------------------|---|--|
| Number of domains | 2 | |
| Number of address entries | LIU006Z: 53 LIU007Z: 37 | |
| Number of alias tables | 8 | |
| Communication transceiver | Free topology transceiver TP/FT-10 channel type. | ANSI/EIA/CEA 709.3 |
| Baudrate | 78kbps | |
| Protocol | LonTalk | ANSI/EIA 709.1 |
| Communication signal | 2 wires plus shield | NETA, Sheild, NETB |
| Transmission distance | Free topology: Between devices: 400m or less Total cable length: 500m or less Bus topology (both terminated): Total cable length: 1400m or less Stub length: 3m or less | When recommended cable is used: Level 4/22AWG |
| Functional block | Node Object (0) Variable Speed Motor Drive (1) | LONMARK functional profile Variable Speed Motor Drive (6010_11) |
| Number of Network variables | LIU006Z Input network variables: 13 Output network variables: 28 Configuration properties: 12 LIU007Z Input network variables: 8 Output network variables: 17 Configuration properties: 12 | The LIU006Z, as an upper range, provides additional features not supported by LIU007Z. |
| Number of connected nodes | 64 nodes at maximum | However, a host and routers are counted as one node. |
| Service pin function | LIU006Z Provided by setting the inverter parameter. LIU007Z Mechanical switch (SW2) | 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 |