

## Gateway for the integration of XRV Systems in a "BMS" based on LonWorks™ Network: DTLON-IHXR



### Installation & Configuration Manual

- Please keep this specifications Manual properly.
- Read this specifications Manual carefully before using the Unit.

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## PRESENTATION & PRECAUTIONS

### ■ Acknowledgments

Thank you for your confidence in **HOKKAIDO** Gateway LonWorks™ DTLON-IHXR.

### ■ Use of this Specification Manual

This Specification Manual describes the installation and the configuration of Gateway LonWorks™ DTLON-IHXR. For convenience of future reference, please keep this Manual properly after the device's installation and testing.

### ■ Available functions on Gateway LonWorks™ DTLON-IHXR

The function of DTLON-IHXR is to integrate the Control System - based on Personal Computer and on the Control Software BMS-UHXRV installed on PC - of air-conditioning systems **HOKKAIDO** "XRV Systems" inside a Lonworks™ Network for "Building Management System" ("BMS") which already exists.

Therefore, through DTLON-IHXR it is possible the following:

- To read and change the operating parameters of the Indoor Units, by modifying the corresponding Lonworks™ Network Variable Types. The operating parameters which can be modified are the following: operation mode, fan speed, set temperature value, set time for TIMER ON, set time for TIMER OFF, auxiliary and accessory functions.
- To read the operating parameters of the Outdoor Units, by modifying the corresponding Lonworks™ Network Variables ("SNVT: Standard Network Variable Types"). These variables (for the comprehensive list concerning "XRV Systems", see further on) conform to the Standards fixed by *LonMark™ International*, therefore they ensure operation among devices produced by different Producers, but which all use Standard protocol with packages called LonTalk™ (ISO/IEC 14908.1).

### ■ Connection of Gateway LonWorks™ DTLON-IHXR

This Gateway must be connected to a serial port RS-232 of the Personal Computer, through a common serial cable with a female 9 pin-connector at each end.

The (nonpolarized) connection to the Lonworks™ Network is realized by a shielded twisted pair and a 2-contact terminal block ("A" & "B") of screw type.

The device is powered (24V DC) by the current transformer included in the packing box. The supply terminal block (+24V DC & Ground wire) is of screw type.

■ **Appearance and functions** DTLON-IHXR device

- Removal 2-contacts power supply terminal block, of screw type.
- Removal 2-contacts terminal block for the connection to the Lonworks™ Network, of screw type.
- 9-pin male serial connector (RS-232) Input/Output (I/O), for the connection of DTLON-IHXR to the Personal Computer equipped of BMS-UHXR Software.
- Operation LED ("STATUS", Green). It shows the connexion of DTLON-IHXR to Lonworks™ Network.
- Power supply LED ("POWER", Red). It is ON when DTLON-IHXR is powered by the dedicated transformer.
- Service microswitch ("INSTALL"). If you press this microswitch, reachable from outside, allows the database of Lonworks™ Network (so-called "*LNS Network Operating System*") to receive the information about the presence of DTLON-IHXR on Lonworks™ Network. The integration of the device inside Lonworks™ Network occurs afterwards, for example through the tool software "*LonMaker™ Integration Tool*".)
- Removal 11-channel I/O terminal block (2 contacts for each Channel), with screw type contacts.

■ **For further information and/or eventual explanations**

In case of doubt or whatever need referred to the operation of DTLON-IHXR device, it is recommended to contact the Dealer who provided the device and/or the air-conditioning systems.

# 1. INSTALLATION & CONFIGURATION


## ■ Packing box list

Check whether the assemblies are complete:

1. Gateway LonWorks™ DTLON-IHXR.
2. Power supply transformer (Input: 100-240V AC, 50/60Hz. Output: 24V DC, 1.2A) with corresponding wiring.
3. Removal 2-contact power supply terminal block, of screw type.
4. Removal 2-contact terminal block for the connection to Lonworks™ Network, of screw type.
5. Removal 11-Channel I/O terminal block (2 contacts for each Channel), with screw type contacts.
6. This Installation & Configuration Manual.

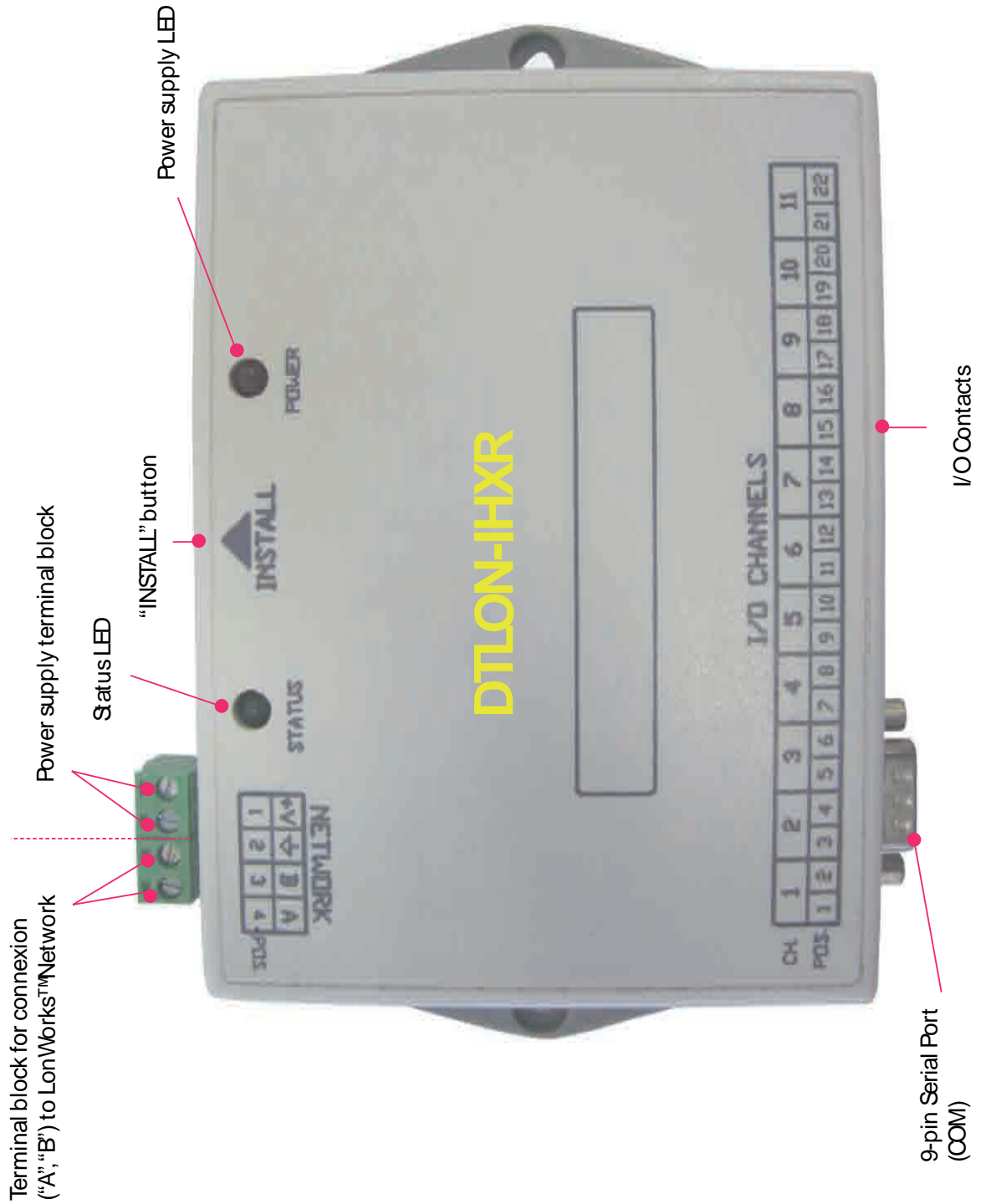
## ■ Hardware & software assemblies, not included in the packaging (to be purchased on site)

The installation of DTLON-IHXR requires the presence of the following hardware & software assemblies, operative and having a correct configuration:

| No. | Assembly                            | Equipment specifications  | Recommended Products  | Note   |
|-----|-------------------------------------|---|---|--|
| 1   | PC<br>(Personal Computer)           | CPU: Pentium 4, above 2GHz.<br>Hard disk: not less than 40GB.<br>Internal storage: more than 512MB.<br>Communication terminal: not less than 2 items of RS-232 serial ports and at least 3 USB ports.<br>Operating system: Windows 2000 or Windows XP.<br>Environment: Microsoft SQL Server 2000 Personal Edition.<br>Laser or Inkjet printer, able to print on A4. | DELL, Lenovo Series<br>Personal Computer  | <ul style="list-style-type: none"> <li>• Windows 2000: Updated by SP4.</li> <li>• Windows XP: Updated by SP3.</li> </ul> |
| 2   | UPS<br>(Uninterrupted power supply) | Capacity: 200 ~ 250W/20 min.<br>Voltage: according to power supply voltage.<br>Control signal: Power cut signal.  | APC, SU700 Series   |  |
| 3   | Electric meter<br>(WHM)             | Functions: dynamic variation of WHM address in conformity to RS-485 communication standard, and survey of WHM reading data according to the dynamic address input by PCB of each Unit.  | <br>DTA-IHXR | Complying with Standard DL/T 645 - 1997  |

| No. | Assembly            | Equipment specifications  | Recommended Products | Note  |
|-----|---------------------|---|----------------------|---|
| 4   | BMS-UHXR<br>package | <ul style="list-style-type: none"><li>• In the package there are the following items:<ul style="list-style-type: none"><li>- Installation &amp; Operation Manual.</li><li>- Softlock dog on USB port.</li><li>- CD-ROM for Installation.</li><li>- RS-485 RS-232 Converter.</li></ul></li></ul> |                      | Sold by the Supplier of Installations.                              |
| 5   | Other               | Shielded twisted pair for connexion to the LonWorks™ Network.   |                      | Complying with the installations requirements of Lonworks™ Network. |

■ Detail of DTLON-IHXR assemblies

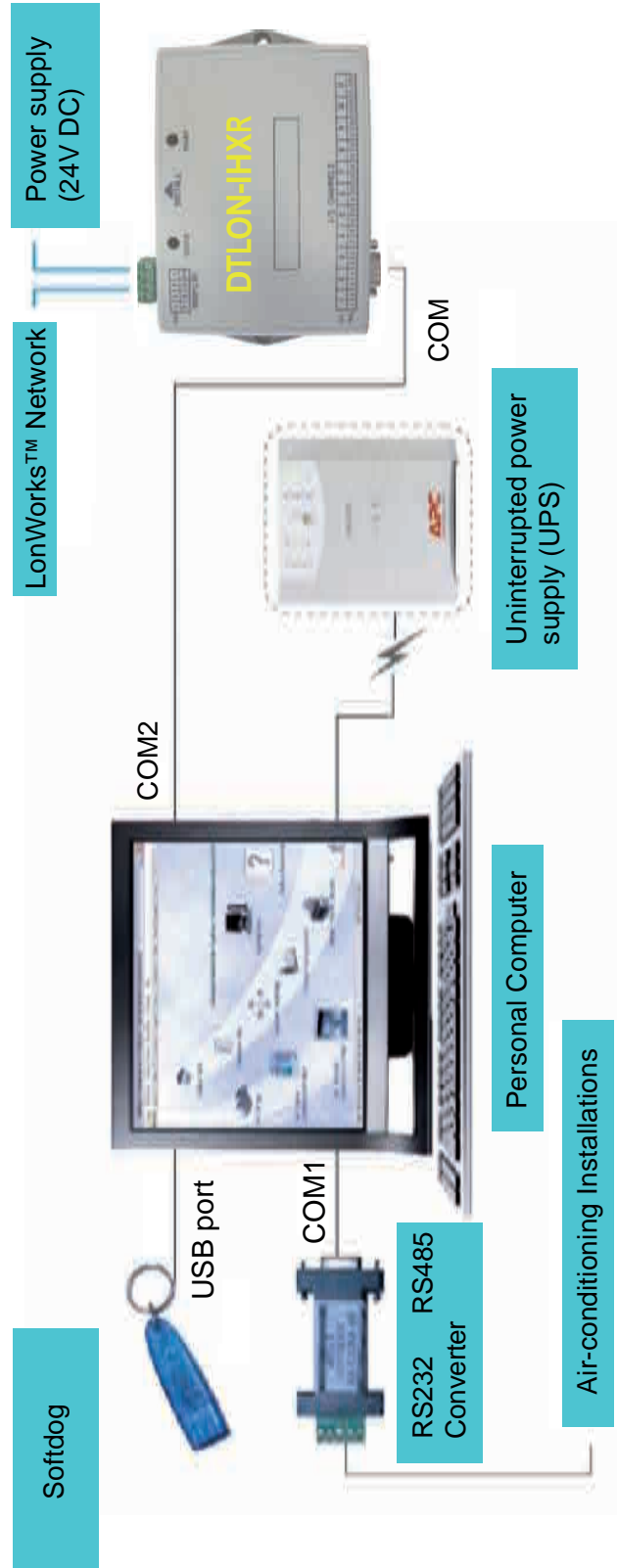


Note.

The connexion to LonWorks™ Network through "A," "B" terminal block is nonpolarized.

### ■ System Connection Illustration of DTLON-IHXR

The Figure below shows the main external assemblies required for the installation of Gateway LonWorks™ **HOKKAIDO** DTLON-IHXR:



## ■ Technical Specifications of **HOKKAIDO** DTLON-IHXR

| No. | Assembly/Parameter          | Description  |
|-----|-----------------------------|--|
| 1   | Processor & Memory          | 10MHz Chip Neuron 3150™. 56KB Flash Memory.  |
| 2   | Functional assemblies       | <ul style="list-style-type: none"> <li>• “INSTALL” microswitch (visible/hidden device).</li> <li>• Operation Green LED (“STATUS”).</li> <li>• Power supply Red LED (“POWER”).</li> </ul>                         |
| 3   | Connection to PC (I/O)      | 9-pin RS-232 Serial Port.  |
| 4   | I/O circuit insulation      | <ul style="list-style-type: none"> <li>• Combined optoelectronic control insulation.</li> <li>• Test voltage for insulation: 2500V RMS.</li> </ul>   |
| 5   | Transmitter                 | <ul style="list-style-type: none"> <li>• FTT-10A (78 Kbps “Free Topology Transceiver”).</li> </ul>   |
| 6   | Connection to LonWorks™     | <ul style="list-style-type: none"> <li>• Green terminal block, with 2 screw type contacts.</li> </ul>  |
| 7   | Power supply specifications | <ul style="list-style-type: none"> <li>• Voltage range: 8V DC ~ 24V DC.</li> <li>• Current range: 30mA ~ 115mA.</li> </ul>   |
| 8   | Power supply connection     | <ul style="list-style-type: none"> <li>• Green terminal block, with 2 screw type contacts.</li> </ul>  |
| 9   | Operation conditions        | <ul style="list-style-type: none"> <li>• Temperature: 0°C ~ 70°C.</li> <li>• Relative humidity: 25% ~ 90%.</li> </ul>  |
| 10  | Available functions         | <ul style="list-style-type: none"> <li>• Reading of operation parameters of Indoor Units.</li> <li>• Setting of Indoor Unit’s operation.</li> <li>• Reading of operation parameters of Outdoor Units.</li> </ul> |
| 11  | Supported Software          | <ul style="list-style-type: none"> <li>• Standard applications package “LonMark™ profiles”.</li> <li>• Support to reading and writing directed from/to memory by “LNS Network Management Tool”.</li> </ul>       |
| 12  | Physical dimensions         | <ul style="list-style-type: none"> <li>• Max.: 17cm (A) x 12.6cm (L) x 3.1cm (P).</li> <li>• Central Module: 16cm (A) x 10.5cm (L) x 3cm (P).</li> </ul>   |

### Notes

- LonWorks™ & Neuron 3150™ are registered trademarks by *Echelon Corporation* in United States and other Countries.
- LonMark™ is a registered trademark by *LonMark International* in United States and other Countries.

## ■ Brief description of LonWorks™ Technology

The abbreviation “LON” (“*Local Operating Network*”) indicates a communication technology in Network, of decentralized type. Each device, called “node”, communicates with the other devices without need of a Central station.

The current condition (Lonworks™ 2.0) of Lonworks™ technological platform, developed by *Echelon™* during the last 20 years, allows the Network connection of min. 2 devices, up to max. 32 000 devices.

Each device is called “node”. A “node” is an intelligent device, which can be connected to other devices in “*wired*” physical mode (by different wiring, called “Channels” or “Segments”: shielded twisted pair; power supply wires with or without voltage; coaxial cables; optical fibre) and/or “*wireless*” (wireless connections: radio frequency, RF; infrared connection, IR). The different kinds of connections can be used in combination each other, by resorting to a “*Router*”.

The devices communicate each other thanks to the special protocol LonTalk™ (formally called ISO/IEC 14908.1), created and licensed by *Echelon™*. It is a matter of transmission protocol by data packages that has been adopted (in January, 2009) as Standard for building automation, and officially certified [ANSI/EIA 709.1 (North America), EN14908.1 (Europe)] by National and International Auditing Corporations.

The adoption of LonTalk™ as a common protocol is the condition to the possibility - for devices produced by different Manufacturers - to dialogue each other. To that end, however, the standardization of protocol is a necessary, but not sufficient condition. In fact, it is also necessary a standardization of software applications (through the so-called “*LonMark profiles*”) and a standardization of the used variables (“*SNVT*”, “*Standard Network Variable Types*”) to describe to LonWorks™ the physical states of the appliances controlled by Network. Whole operation in LonWorks™ world is entrusted to the supervision of *LonMark™ International*, an organization which group the main Producers (more than 700, in February 2009) of devices projected and produced for LonWorks™. Among its main functions, there are the following: to fix the guidelines for operation among different devices; the standardization of software applications; to test and certify the devices which are projected and produced for LonWorks™; the training and the certification of so-called

“*System Integrators*”, that is people who write the necessary applications for integrating the devices inside LonWorks™.

## ■ Structure and features of the assemblies of a LonWorks™ “node”

LonWorks™ Network is of “*Peer-to-peer*” type (“P2P”), that is there is a perfect parity (so there is no hierarchy of Principal/Secondary kind) among the “nodes” (synonymous of “devices”) which belong to it.

During production, a different 48-bit ID is assigned to each “node”. This ID is used as a network address only during the installation and the configuration of the “node”, while it can be read and used by applications as a serial number to identify the device (“node”).

- The core of each “node” is a “Chip Neuron™” (chip created and licensed by *Echelon* but produced, under licence, mainly by Motorola and Toshiba), composed of three 8-bit microprocessors. Two microprocessors are dedicated to the data processing transmitted by LonTalk™ protocol, while the third microprocessor is dedicated to the execution of the applications written for the “node”.

The “nodes” are free to communicate each other - each one directly with all the others - and the eventual malfunction of one of them does not impede the operation of the other “nodes”. Thanks to “P2P” architecture, the “bottlenecks” in the data transmission are reduced, and a blockage of Network due to the malfunction of “Master” (which is not present here), is prevented.

All the “nodes” of a LonWorks™ Network can be seen as objects which reply to different “input” and produce the desired “output”. If an “input” variable (nvi) and an “output” variable (nvo) are defined inside the same “SNVT” Type (Type of Variable of Standard Network) when the “System Integrator” writes the application, these variables can be connected each other on the Network through the so-called “*binding*”; this connection allows the execution of the desired operations (“*tasks*”), through the Network. Even if the function of a single “node” in particular can be very simple, the “*binding*” between the variables “nvi” and “nvo” of the different LonWorks™ “nodes” allows to carry out also very difficult operations, through the Network.

- Another key assembly of the “node” is the “*Transceiver*”. Each transceiver has been conceived for data transmission by LonTalk™ protocol on a special kind of “Channel” or “Segment”.

The adoption of a “*Free Topology Transceiver*” FTT-10A, that has been conceived for transmitting 78 Kbps data on “*Twisted pair*”, like the one in Gateway **HOKKAIDO** DTLON-IHXR, allows the integration of the device in LonWorks™ Network which are structured in a “*Free Topology*”: linear structure,

star-shaped structure, ring-shaped structure, or also mixed structure. The “nodes” which are equipped of this transceiver can communicate up to a distance of 500m with wired-up connexion (up to 2700m in case of linear structure and installation of a terminal at each end) - without a “Repeater” - and up to 1000m if a repeater is installed. The main features of “Free Topology Transceiver” FTT-10A used on DTLON-IHXR, are the low energy consumption in standby and the high insulation voltage between the “node” and the Network.

Therefore, the laying of wiring between the “nodes” which adopt this transceiver results very flexible and so easily adjustable to the Customer’s needs.

#### ■ LonWorks™ Networks & Web Services

As we have already seen, the adoption of LonTalk™ as a common protocol is the basic condition for the possibility of dialogue among devices which have been produced by different Manufacturers.

The further conditions - as the standardization of software applications by the so-called “LonMark profiles” and the standardization of the variables (“SNVT”) used for describing to LonWorks™ the physical states of the appliances which are controlled by the Network - , also pass through the connectivity guaranteed by Web Services (by now an international standard in IT - “Information Technology” - world).

The remote access to LonWorks™ Networks and the control of LonWorks™ Networks through Web Services, permits - for example - to LonWorks™ Networks to get an integral part of software applications developed for Companies, and allows Technical Centres and Service Companies to carry out more and more targeted remote interventions for supporting Customers.

■ Tables of LonWorks™ Network Variables (“SNVT”) for “**HOKKAIDO** XRV Systems”

1. Tables for Operation Data Reading

1.1 Table of Indoor Unit Network Variables “SNVT”

 Caution

The network variables described below allow to read the operating parameters of each Indoor Unit, provided that input variables “nviMainAddr” (Network Address of the Unit) and “nviNetAddr” (Address of the Centralized Controller) are modified so as to correctly identify a given Indoor Unit. The variable which allows the “refresh” (update) of parameters is “nviGetLastValue”.

**Table 1**

| No. | Meaning  | Type           | Name             | Description  |
|-----|--|----------------|------------------|--|
| 1   | Model Information                              | SNVT_count     | nvoDeviceInfo    | See “Annexed Table” to Table 1.  |
| 2   | Operation Mode                                 | SNVT_hvac_mode | nvoWorkMode      | =HVAC_NUL = -1, Mode has not been set.<br>=HVAC_AUTO = 0, Auto mode.<br>=HVAC_COOL = 3, Cooling mode.<br>=HVAC_HEAT = 1, Heating mode.<br>=HVAC_DEHUMID = 14, Dry mode.<br>=HVAC_FAN_ONLY = 9, Fan only mode.<br>=HVAC_OFF = 6, OFF mode.                |
| 3   | Mode Locking State                             | SNVT_hvac_mode | nvoModeLock      | =HVAC_NUL = -1, Mode has not been locked.<br>=HVAC_AUTO = 0, Lock on Auto mode.<br>=HVAC_COOL = 3, Lock on Cooling mode.<br>=HVAC_HEAT = 1, Lock on Heating mode.<br>=HVAC_DEHUMID = 14, Lock on Dry mode.<br>=HVAC_FAN_ONLY = 9, Lock on Fan only mode. |
| 4   | Indoor Fan State                               | SNVT_lev_disc  | nvoFanSpeed      | =ST_LOW = 1, Low speed.<br>=ST_MED = 2, Medium speed.<br>=ST_HIGH = 3, High speed.<br>=ST_ON = 4, Auto speed.  |
| 5   | Setting Temperature (Ts)                       | SNVT_temp_p    | nvoSetTemp       | 16 ~ 32 = 16°C ~ 32°C.   |
| 6   | Indoor Temperature (T1)                        | SNVT_temp_p    | nvoIndoorTemp    | 0 ~ 240 = -20°C ~ 100°C.   |
| 7   | Indoor Unit's Heat Exchanger Temperature (T2A) | SNVT_temp_p    | nvoEvprtrTemp    | 0 ~ 240 = -20°C ~ 100°C.   |
| 8   | Gas side Temperature (T2B)                     | SNVT_temp_p    | nvoEvprtrMidTemp | 0 ~ 240 = -20°C ~ 100°C.   |
| 9   | Outdoor Unit's Heat Exchanger Temperature (T3) | SNVT_temp_p    | nvoCdrTemp       | 0 ~ 240 = -20°C ~ 100°C.   |
| 10  | Compressor Current                             | SNVT_amp_ac    | nvocprCurrent    | 0 ~ 200 = 0A ~ 200A.   |
| 11  | Relative Humidity                              | SNVT_lev_cont  | nvoHumidity      | 0 ~ 100 = 0% ~ 100%.   |

(To be continued)

(Continued Table 1)

| No.  | Meaning  | Type                    | Name             | Description   |   |
|------|--|-------------------------|------------------|---|---|
| 12   | Set ON TIME                                    | SNVT_time_min           | nvoSetOnTime     | 0 ~ 96<br>0, stands for no set time for ON TIME.<br>96, stands for 24 hours' time interval for setting ON TIME.   |   |
| 13   | Set OFF TIME                                   | SNVT_time_min           | NvoSetOffTime    | 0 ~ 96<br>0, stands for no set time for OFF TIME.<br>96, stands for 24 hours' time interval for setting OFF TIME. |   |
| 14   | Outdoor Unit's devices state                   | SNVT_state (bit0-bit15) | nvo0drDevStats   | Bit6 ~ Bit15  | Reserved range (Set 0)  |
|      |  |                         |                  | Bit5  | Oil return<br>1, On; 0, Off.  |
|      |  |                         |                  | Bit4  | Crankcase<br>1, On; 0, Off.   |
|      |  |                         |                  | Bit3  | 4-way valve<br>1, On; 0, Off.   |
|      |  |                         |                  | Bit2  | Outside fan at "Low" speed<br>1, On; 0, Off.  |
|      |  |                         |                  | Bit1  | Outside fan at "High" speed<br>1, On; 0, Off.   |
|      |  |                         |                  | Bit0  | Compressor<br>1, On; 0, Off.  |
| 15   | Auxiliary functions state                      | SNVT_state (bit0-bit15) | nvoAsstFuntStats | Bit15   | Remote Controller Locked<br>1, On; 0, Off.  |
|      |  |                         |                  | Bit14   | Centralized Controller Locked<br>1, On; 0, Off.   |
|      |  |                         |                  | Bit13   | 00, Forced stop or unlocking.<br>01, Lock-on Cooling.<br>10, Lock-on Heating.<br>11, Lock-on Fan only mode. |
|      |  |                         |                  | Bit12   |   |
|      |  |                         |                  | Bit11   |   |
|      |  |                         |                  | Bit10   | Water drainage pump<br>1, On; 0, Off.   |
|      |  |                         |                  | Bit9  | Water added<br>1, On; 0, Off.   |
|      |  |                         |                  | Bit8  | Humidifying device<br>1, On; 0, Off.  |
|      |  |                         |                  | Bit7  | Vertical louvers swinging<br>1, On; 0, Off.   |
|      |  |                         |                  | Bit6  | Drying function<br>1, On; 0, Off.   |
|      |  |                         |                  | Bit5  | Oxygen added<br>1, On; 0, Off.  |
|      |  |                         |                  | Bit4  | Air renewal<br>1, On; 0, Off.   |
|      |  |                         |                  | Bit3  | Ventilation<br>1, On; 0, Off.   |
| Bit2 | Horizontal flaps swinging<br>1, On; 0, Off.    |                         |                  |   |   |
| Bit1 | Auxiliary electrical heating<br>1, On; 0, Off. |                         |                  |   |   |
| Bit0 | Economic operation<br>1, On; 0, Off.           |                         |                  |   |   |

(To be continued)

(Continued Table 1)

| No.  | Meaning   | Type                       | Name             | Description |  |
|------|---|----------------------------|------------------|-------------|--|
| 16   | Alarm states  | SNVT_state<br>(bit0-bit15) | nvoACAAlarmStats | Bit15       | Other malfunctions (Set 1).  |
|      |   |                            |                  | Bit14       | Water level detection malfunction.   |
|      |   |                            |                  | Bit13       | Outdoor malfunction protection.  |
|      |   |                            |                  | Bit12       | Refresh malfunction.   |
|      |   |                            |                  | Bit11       | Inverter module protection.  |
|      |   |                            |                  | Bit10       | Compressor overcurrent (4 times).  |
|      |   |                            |                  | Bit9        | Communication malfunction between main PCB PCB Display.                          |
|      |   |                            |                  | Bit8        | Indoor Unit's fan speed out of control.  |
|      |   |                            |                  | Bit7        | EEPROM error.  |
|      |   |                            |                  | Bit6        | Communication error (in the transmission of data packagings).                    |
|      |   |                            |                  | Bit5        | Malfunction of a temperature sensor: compressor discharge; T3 sensor; T4 sensor. |
|      |   |                            |                  | Bit4        | T2B sensor malfunction.  |
|      |   |                            |                  | Bit3        | T2A sensor malfunction.  |
|      |   |                            |                  | Bit2        | T1 sensor malfunction.   |
| Bit1 | Communication malfunction.  |                            |                  |             |  |
| Bit0 | Phases' sequence error or default.  |                            |                  |             |  |
| 17   | Protection functions  | SNVT_state<br>(bit0-bit15) | nvoACProtStats   | Bit15       | Other protection functions.  |
|      |   |                            |                  | Bit14       | Unused.  |
|      |   |                            |                  | Bit13       | Unused.  |
|      |   |                            |                  | Bit12       | Unused.  |
|      |   |                            |                  | Bit11       | Unused.  |
|      |   |                            |                  | Bit10       | Unused.  |
|      |   |                            |                  | Bit9        | Unused.  |
|      |   |                            |                  | Bit8        | Compressor overcurrent.  |
|      |   |                            |                  | Bit7        | Power supply over-under voltage protection.                                      |
|      |   |                            |                  | Bit6        | Air exhaust pipe low pressure protection (compressor).                           |
|      |   |                            |                  | Bit5        | Air exhaust pipe high pressure protection (compressor).                          |
|      |   |                            |                  | Bit4        | Air exhaust pipe overtemperature protection (compressor).                        |
|      |   |                            |                  | Bit3        | Compressor overtemperature.  |
|      |   |                            |                  | Bit2        | Overtemperature on Outdoor Unit's heat exchanger (in Cooling mode).              |
| Bit1 | Anti-cool air (I.U.) or automatic defrost protection (O.U) in Heating mode. |                            |                  |             |  |
| Bit0 | Overtemperature on Indoor Unit's heat exchanger (in Cooling mode).          |                            |                  |             |  |

(To be continued)

(Continued Table 1)

| No.  | Meaning              | Type                    | Name           | Description  |
|--|----------------------|-------------------------|----------------|--|
| 18   | Network device alarm | SNVT_state (bit0-bit15) | nvoNetDevAlarm | Bit15 ~ Bit8 Reserved range (Set 0)  |
|  |                      |                         |                | Bit7 Error command (Set 1).  |
|  |                      |                         |                | Bit6 Target address ineffective.   |
|  |                      |                         |                | Bit5 Not performed (expired timeout).  |
|  |                      |                         |                | Bit4 Command limits performance.   |
|  |                      |                         |                | Bit3 Communication malfunction between the Centralized Controller and PC (Gateway).                  |
|  |                      |                         |                | Bit2 Communication malfunction between the Centralized Controller and the Function Module.           |
|  |                      |                         |                | Bit1 Communication malfunction between the Centralized Controller and the Network Interface ("NIM"). |
| Bit0 Communication malfunction between the Network Interface ("NIM") and main PCB. |                      |                         |                |  |
| 19   | Electric Power       | SNVT_power              | nvoElecPower   | Unit 0.1 W. "0Ffh" stands for no effective data.   |

**Annexed Table to Table 1: Information on Indoor Unit's Models and corresponding functions**

These information are composed of 2 bytes. The 1<sup>st</sup> byte is referred to the Unit's Model/Type; the 2<sup>nd</sup> byte is referred to the different functions of Unit. This is shown on the Table below.

|                      |      |                                      |   |   |
|----------------------|------|--------------------------------------|---|---|
| 1 <sup>st</sup> byte | Bit7 | Main Model (Commercial Type)         | 0001, Wall Mounted type. 0010, Floor type. 0011, Embedded type. 0100, Duct type. 0101, Floor & Ceiling type. 0110: Cassette type. 1001, Auxiliary machine for Indoor Unit. 1010, Digital multi-connection. 1100, Inverter Unit. 1110, Digital Control Unit. |   |
|                      | Bit6 |                                      |   |   |
|                      | Bit5 |                                      |   |   |
|                      | Bit4 |                                      |   |   |
|                      | Bit3 | Auxiliary Model (Residential Type)   |   | 4 types: 00 ~ 11.                                   |
|                      | Bit2 | Alternative versions                 |   | 00, Original version. 01 ~ 11, Alternative version. |
|                      | Bit1 |                                      |   |   |
|                      | Bit0 |                                      |   |   |
| 2 <sup>nd</sup> byte | Bit7 | Extended temperature range           | 1, Yes (16°C ~ 32°C); 0: No (17°C ~ 32°C).  |   |
|                      | Bit6 | Oxygen added function                | 1, Yes; 0: No.  |   |
|                      | Bit5 | Refresh function                     | 1, Yes; 0: No.  |   |
|                      | Bit4 | Air outlet flaps swinging            | 1, Yes; 0: No.  |   |
|                      | Bit3 | Air exchange function                | 1, Yes; 0: No.  |   |
|                      | Bit2 | Auxiliary electric heating           | 1, Yes; 0: No.  |   |
|                      | Bit1 | Reserved function                    | Set 0.  |   |
|                      | Bit0 | Cooling only/ Both Cooling & Heating | 1, Cooling only; 0: Both Cooling & Heating.   |   |

**Example. Reading operation data from Indoor Unit.**

If in "BMS" System you want to read the data of the Indoor Unit having Network Address = 6, Centralized Controller Address = 1, please proceed in the following way:

- 1) Modify the input variable nviMainAddr = 6.
- 2) Modify the input variable nviNetAddr = 1.
- 3) Modify the input variable nviGetLastValue = 100.0 1. In this way, the information referred to the operation of the selected Indoor Unit are sent to the Lonworks™ Network.

 Caution

The variable “nviGetLastValue” allows the simultaneous “refresh” (update) of all operating parameters of a given Indoor Unit. Therefore, it is not needed to repeat “refresh” procedure for each parameter.

1.2 Table of Outdoor Unit Network Variables “SNVT”

 Caution

The network variables listed below allow to read the operating parameters of each Outdoor Unit, provide that the input variables “nviMainAddr” (Network Address of the Unit) and “nviNetAddr” (Centralized Controller’s Address) are modified so as to correctly identify a given Outdoor Unit. The variable which allows the “refresh” (update) of parameters is “nviGetLastValue”.

**Table 2**

| No. | Meaning   | Type           | Name           | Description  |
|-----|---|----------------|----------------|--|
| 1   | Model Information                                       | SNVT_count     | nvoDeviceInfo  | See “Annexed Table” to Table 2.  |
| 2   | Operation Mode  | SNVT_hvac_mode | nvoWorkMode    | =HVAC_NUL = -1, Mode has not been set.<br>=HVAC_COOL = 3, Cooling mode.<br>=HVAC_HEAT = 1, Heating mode.<br>=HVAC_OFF = 6, OFF mode. |
| 3   | Mode Locked State                                       | SNVT_hvac_mode | nvoModeLock    | =HVAC_NUL = -1, Mode has not been locked.<br>=HVAC_COOL = 3, Lock on Cooling mode.<br>=HVAC_HEAT = 1, Lock on Heating mode.          |
| 4   | Outdoor Fan State                                       | SNVT_lev_disc  | nvoFanSpeed    | =ST_LOW = 1, Low speed.<br>=ST_MED = 2, Medium speed.<br>=ST_HIGH = 3, High speed.   |
| 5   | Outdoor Temperature (T4)                                | SNVT_temp_p    | nvoOutdoorTemp | 0 ~ 240 = -20°C ~ 100°C.   |
| 6   | Outdoor Unit’s Heat Exchanger Temperature (T3)          | SNVT_temp_p    | nvoCdsOutTemp  | 0 ~ 240 = -20°C ~ 100°C.   |
| 7   | Temperature at the inlet of outdoor heat exchanger (T6) | SNVT_temp_p    | nvoCdsInTemp   | 0 ~ 240 = -20°C ~ 100°C.   |
| 8   | Compressor 1 ventilated temperature                     | SNVT_temp_p    | nvoCpr1Temp    | 0 ~ 20 = -20°C ~ 180°C.  |
| 9   | Compressor 2 ventilated temperature                     | SNVT_temp_p    | nvoCpr2Temp    | 0 ~ 20 = -20°C ~ 180°C.  |
| 10  | Compressor 3 ventilated temperature                     | SNVT_temp_p    | nvoCpr3Temp    | 0 ~ 20 = -20°C ~ 180°C.  |
| 11  | Indoor Unit quantity                                    | SNVT_count     | nvoInDevCt     | 0 ~ 250 = 0 ~ 250 Units.   |

(To be continued)

(Continued Table 2)

| No.   | Meaning                                       | Type                    | Name             | Description  |                                     |
|-------|---|-------------------------|------------------|--|-------------------------------------|
| 12    | Compressor 1 current                          | SNVT_amp                | nvoCpr1Current   | 0 ~ 200 = 0A ~ 200A.   |                                     |
| 13    | Compressor 2 current                          | SNVT_amp                | nvoCpr2Current   | 0 ~ 200 = 0A ~ 200A.   |                                     |
| 14    | Compressor 3 current                          | SNVT_amp                | nvoCpr3Current   | 0 ~ 200 = 0A ~ 200A.   |                                     |
| 15    | Converter compressor frequency                | SNVT_freq_hz            | nvoCprHz         | 0 ~ 250 = 0Hz ~ 250Hz.   |                                     |
| 16    | Electric expanding valve (EXV1) opening angle | SNVT_lev_cont           | nvoValve1        | 00h ~ 07Dh = Total closing ~ 1000 impulses. (Increases of 8 impulses' steps). Valve OFF = No data. |                                     |
| 17    | Electric expanding valve (EXV2) opening angle | SNVT_lev_cont           | nvoValve2        | 00h ~ 07Dh = Total closing ~ 1000 impulses. (Increases of 8 impulses' steps). Valve OFF = No data. |                                     |
| 18    | States of Outdoor Unit Solenoid Valve         | SNVT_state (bit0-bit15) | nvoodrDevStats   | Bit 15 ~ Bit 8   | Reserved range (Set 0)              |
|       |   |                         |                  | Bit 7  | Solenoid valve SV8. 1, On; 0, Off.  |
|       |   |                         |                  | Bit 6  | Solenoid valve SV7. 1, On; 0, Off.  |
|       |   |                         |                  | Bit 5  | Solenoid valve SV6. 1, On; 0, Off.  |
|       |   |                         |                  | Bit 4  | Solienoid valve SV5. 1, On; 0, Off. |
|       |   |                         |                  | Bit 3  | Solenoid valve SV4. 1, On; 0, Off.  |
|       |   |                         |                  | Bit 2  | Solenoid valve SV3. 1, On; 0, Off.  |
|       |   |                         |                  | Bit 1  | 4-way valve ST2. 1, On; 0, Off.     |
| 19    | States of Compressor & Auxiliary Functions    | SNVT_state (bit0-bit15) | nvoAsstFuntStats | Bit 15 ~ Bit 8   | Reserved range (Set 0)              |
|       |   |                         |                  | Bit 7  | Reserved range (Set 0)              |
|       |   |                         |                  | Bit 6  | Reserved range (Set 0)              |
|       |   |                         |                  | Bit 5  | Reserved range (Set 0)              |
|       |   |                         |                  | Bit 4  | Reserved range (Set 0)              |
|       |   |                         |                  | Bit 3  | Reserved range (Set 0)              |
|       |   |                         |                  | Bit 2  | Compressor 1. 1, On; 0, Off.        |
|       |   |                         |                  | Bit 1  | Compressor 2. 1, On; 0, Off.        |
| Bit 0 | Compressor 3. 1, On; 0, Off.                  |                         |                  |  |                                     |

(To be continued)

(Continued Table 2)

| No.  | Meaning   | Type                       | Name            | Description                                      |   |
|------|---|----------------------------|-----------------|--|---|
| 20   | Alarm states  | SNVT_state<br>(bit0-bit15) | nvoACAlarmStats | Bit15  | Other malfunctions (Set 1).   |
|      |   |                            |                 | Bit14  | Reserved (Set 0).   |
|      |   |                            |                 | Bit13  | Anomalous increase in number of Outdoor Units (effect on main O.U.)                     |
|      |   |                            |                 | Bit12  | Anomalous decrease in number of Outdoor Units (effect on main O.U.)                     |
|      |   |                            |                 | Bit11  | Network communication malfunction.  |
|      |   |                            |                 | Bit10  | DSP communication malfunction.  |
|      |   |                            |                 | Bit9   | Voltage malfunction.  |
|      |   |                            |                 | Bit8   | Reserved (Set 0).   |
|      |   |                            |                 | Bit7   | Reserved (Set 0).   |
|      |   |                            |                 | Bit6   | T6 sensor malfunction.  |
|      |   |                            |                 | Bit5   | Reserved (Set 0).   |
|      |   |                            |                 | Bit4   | Reserved (Set 0).   |
|      |   |                            |                 | Bit3   | Malfunction of a temperature sensor: air discharge of compressor; T3 sensor; T4 sensor. |
|      |   |                            |                 | Bit2   | Communication malfunction (O.U. I.U.).  |
| Bit1 | Phases' sequence error or default.                      |                            |                 |  |   |
| 21   | Protection Functions                                    | SNVT_state<br>(bit0-bit15) | nvoACProtStats  | Bit0   | Outdoor Unit communication malfunction.   |
|      |   |                            |                 | Bit15  | Other malfunctions (Set 1).   |
|      |   |                            |                 | Bit14  | Oil average.  |
|      |   |                            |                 | Bit13  | Oil return.   |
|      |   |                            |                 | Bit12  | Reserved (Set 0).   |
|      |   |                            |                 | Bit11  | Reserved (Set 0).   |
|      |   |                            |                 | Bit10  | Defrost protection.   |
|      |   |                            |                 | Bit9   | Power supply over-under voltage protection.   |
|      |   |                            |                 | Bit8   | Overcurrent to compressor 3.  |
|      |   |                            |                 | Bit7   | Overcurrent to compressor 2.  |
|      |   |                            |                 | Bit6   | Protection on Inverter Module.  |
|      |   |                            |                 | Bit5   | Overtemperature on Outdoor Unit's heat exchanger (in Cooling mode).                     |
|      |   |                            |                 | Bit4   | Overtemperature on air exhaust pipe (compressor).                                       |
|      |   |                            |                 | Bit3   | Overcurrent to Compressor 1.  |
| Bit2 | Low pressure air exhaust pipe protection (compressor).  |                            |                 |  |   |
| Bit1 | High pressure air exhaust pipe protection (compressor). |                            |                 |  |   |
| Bit0 | Overtemperature of compressor.                          |                            |                 |  |   |
| 22   | Electric Power  | SNVT_power                 | nvoElecPower    | Unit 0.1 W. "0Ffh" stands for no effective data. |   |

(To be continued)

• **Annexed Table to Table 2: Information on Outdoor Unit's Models and corresponding functions.**

1) These information are composed of 2 bytes. The 1<sup>st</sup> byte is referred to the Outdoor Unit's Model/Type; the 2<sup>nd</sup> byte is referred to the different functions of Unit. This is shown on the Table below.

|                      |      |                               |  |
|----------------------|------|-------------------------------|--|
| 1 <sup>st</sup> byte | Bit7 | Configuration of Outdoor Unit | 1111B.   |
|                      | Bit6 |                               |  |
|                      | Bit5 |                               |  |
|                      | Bit4 |                               |  |
|                      | Bit3 | 3-Phase option                | 1, 3-Phase; 0, 1-Phase.  |
|                      | Bit2 | Main Model (Commercial Type)  | 000, On/Off type.<br>010, Digital Control Unit.<br>011, Water Unit.<br>0100 ~ 1111, Inverter type. |
|                      | Bit1 |                               |  |
| Bit0                 |      |                               |  |
| 2 <sup>nd</sup> byte |      | HP of Outdoor Unit            | 11 ~ 250 = 1 ~ 250HP   |

2) "00H" indicates an unknown Model.

• **Example. Reading operation data from Outdoor Unit.**

If on "BMS" System you want to read the data of the Indoor Unit having the Network Address = 9, Centralized Controller's Address = 16, please proceed in the following way:

- 1) Modify the input variable nviMainAddr = 9.
- 2) Modify the input variable nviNetAddr = 16.
- 3) Modify the input variable nviGetLastValue = 100.0 1. In this way, the information referred to the operation of the selected Indoor Unit are sent to Lonworks™ Network.

 Caution

The variable "nviGetLastValue" allows the simultaneous "refresh" (update) of all the operating parameters of a given Outdoor Unit. Therefore, it is not needed to repeat "refresh" procedure for each parameter.

2. Tables for setting the operation options of Indoor Units

| No. | Meaning   | Type                    | Name           | Description   |
|-----|---|-------------------------|----------------|---|
| 1   | Selecting the Network Address of Unit           | SNVT_count              | nviMainAddr    | Addresses of Indoor Units: 0 ~ 63.<br>Addresses of Outdoor Units: 0 ~ 31.   |
| 2   | Selecting the address of Centralized Controller | SNVT_count              | nviNetAddr     | Addresses of Centralized Controllers for I.U: 0 ~ 15.<br>Addresses of Centralized Controllers for O.U: 16 ~ 31.   |
| 3   | Selecting the Operation Mode                    | SNVT_hvac_mode          | nviSetWorkMode | =HVAC_NUL = -1, Mode has not been set.<br>=HVAC_AUTO = 0, Auto mode.<br>=HVAC_COOL = 3, Cooling mode.<br>=HVAC_HEAT = 1, Heating mode.<br>=HVAC_DEHUMID = 14, Dry mode.<br>=HVAC_FAN_ONLY = 9, Fan only mode.<br>=HVAC_OFF = 6, OFF mode. |
| 4   | Fan speed of Indoor Unit                        | SNVT_lev_disc           | nviSetFanSpeed | =ST_LOW = 1, Low speed.<br>=ST_MED = 2, Medium speed.<br>=ST_HIGH = 3, High speed.<br>=ST_ON = 4, Auto mode.  |
| 5   | Setting temperature (Ts)                        | SNVT_temp_p             | nviSetTemp     | 16 ~ 32 = 16°C ~ 32°C.<br>The other values do not modify the setting.   |
| 6   | Setting TIMER ON                                | SNVT_time_hour          | nviSetOnTime   | 0 ~ 96<br>0, TIMER ON has not been set.<br>96, 24 hour-interval for TIMER ON.   |
| 7   | Setting TIMER OFF                               | SNVT_time_hour          | nviSetOffTime  | 0 ~ 96<br>0, TIMER OFF has not been set.<br>96, 24-hour interval for TIMER OFF.   |
| 8   | Setting the auxiliary functions                 | SNVT_state (bit0-bit15) | nviSetAsstFunt | Bit15 ~ Bit4   Reserved range (Set 0)   |
|     |   |                         |                | Bit3   Ventilation 1, On; 0, Off.   |
|     |   |                         |                | Bit2   Horizontal flaps swinging 1, On; 0, Off.   |
|     |   |                         |                | Bit1   Auxiliary electrical heating 1, On; 0, Off.  |
|     |   |                         |                | Bit0   Economic operation 1, On; 0, Off.  |

• **Example. Setting operation options for Indoor Unit.**

If on “BMS” System you want to modify the operation options of the Indoor Unit having Network Address = 8, Centralized Controller’s = 2, please proceed in the following way:

- 1) Modify the input variable nviMainAddr = 8.
- 2) Modify the input variable nviNetAddr = 2.
- 3) Modify the input variable nviSetWorkMode = HVAC\_COOL. In this way, the operation options for the selected Indoor Unit are sent through Lonworks™ Network.

 Caution

The operation settings which can be selected and modified are indicated by Numbers from “3” to “8” in the Table above. In case of modification of several settings, they will be sent one at a time through Lonworks™ Network. In Lonworks™ Network, if an input variable (example: “nviSetWorkMode”) is modified, this does not immediately affect the corresponding output variable (“nvoWorkMode”), unless it is required a new reading of the output variable from “BMS” System.

**CE** DECLARATION OF CONFORMITY

We **Termai** Srl - 14, Via della Salute - 40132 Bologna - Italy

DECLARE UNDER OUR SOLE RESPONSIBILITY

that **HOKKAIDO** Product "Gateway LonWorks® DTLON-IHXR"

conforms to the following Directives:

- Electromagnetic Compatibility Directive EMC 2004/108/EC.

- Low Voltage Directive LVD 2006/95/EC.

- Harmonized Rules: EN55014-1:2000+A1:2001+A2:2002

EN61000-3-2:2000, EN61000-3-3:1995+A1:2001

EN55014-2:1997+A1:2001 (Category II)

EN60335-2-40:2003+A11:2004

EN50336:2003.

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Due to on-going technological development of Products by the Manufacturer, we reserve the right to vary the technical specifications at any time and without notice.