

Installation Instructions

Part Number 40VM900053

For Commercial Use Only

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SAFETY CONSIDERATIONS

Read and follow manufacturer instructions carefully. Follow all local electrical codes during installation. All wiring must conform to local and national electrical codes. Improper wiring or installation may damage thermostat.

Understand the signal words — DANGER, WARNING, and CAUTION. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING signifies hazards that could result in personal injury or death. CAUTION is used to identify unsafe practices, which would result in minor personal injury or product and property damage.

Recognize safety information. This is the safety-alert symbol (⚠). When this symbol is displayed on the unit and in instructions or manuals, be alert to the potential for personal injury. Installing, starting up, and servicing equipment can be hazardous due to system pressure, electrical components, and equipment location.

GENERAL

The VRF (variable refrigerant flow) LonWorks Gateway is a central controller that integrates the central air conditioning system and the LonWorks network system of buildings by converting the Carrier X-NET protocol into the standard LonWorks protocol. The LonWorks Gateway is embedded with a LonWorks functional module and supports the LonWorks protocol. The LonWorks Gateway is available for use with the VRF outdoor units/system listed below in Table 1.

Table 1 —LonWorks Accessory Usage

Unit	Sizes
38VMAR Heat Recovery System	072, 096, 120, 144, 168, 192, 216, 240, 264, 288, 312, 336
38VMAH Heat Pump System	036, 048, 060, 072, 096, 120, 144, 168, 192, 216, 240, 264, 288, 312, 336, 360, 384, 408, 432

Table 2 — Specification

Power Supply (field provided)	24VAC	
Power Consumption	15 W	
Dimensions	H	12-1/2
	W	9-7/8
	D	12-1/2
Net Weight	2.5 lbs	
Number of X-NET Bus Lines / Lon Bus Lines	1/1	
Max. Refrigerant System / IDUS Per Line	8/64	

INSTALLATION CONSIDERATIONS

The LonWorks Gateway should be mounted:

- at a location that allows easy access
- on a section of wall without water or drainage pipes

The LonWorks Gateway should **NOT** be mounted:

- near heat sources such as direct sunlight, heaters, dimmer switches, and other electrical devices.

INSTALLATION

There are three installation methods as shown below. Do not install the unit in any other orientation.

NOTE: Screws are not included. The contractor must purchase screws for installation.

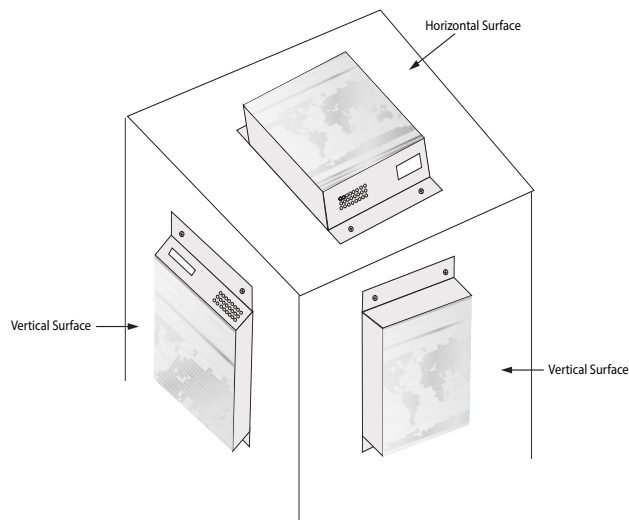
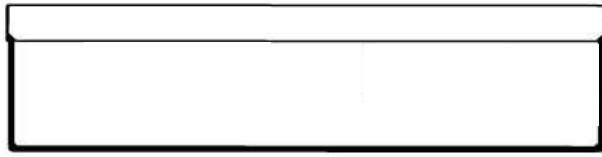


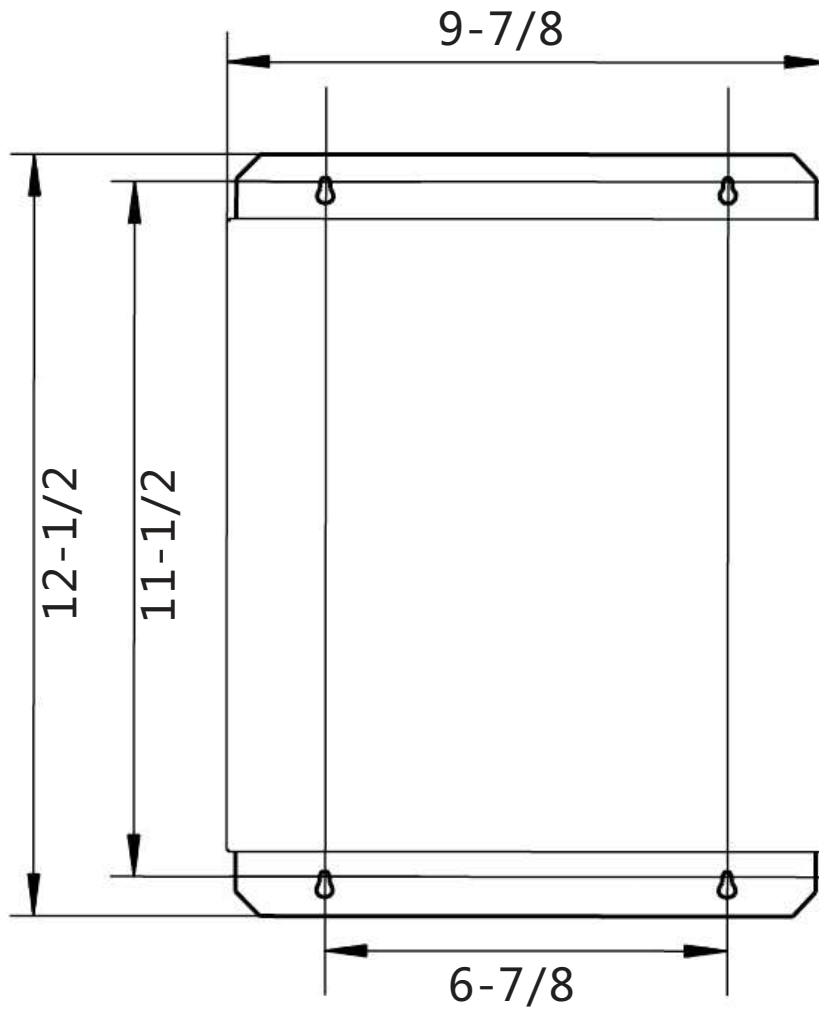
Fig. 1 — Installation Layout

DIMENSIONAL DRAWINGS

Bottom View



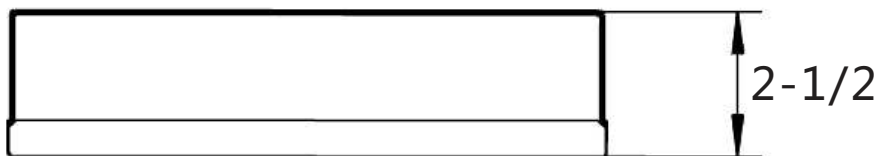
Front View



Side View



Top View



NOTE: All dimensions are shown in inches.

Fig. 2 — LonWorks Gateway Dimensions

CONNECTION DESCRIPTIONS

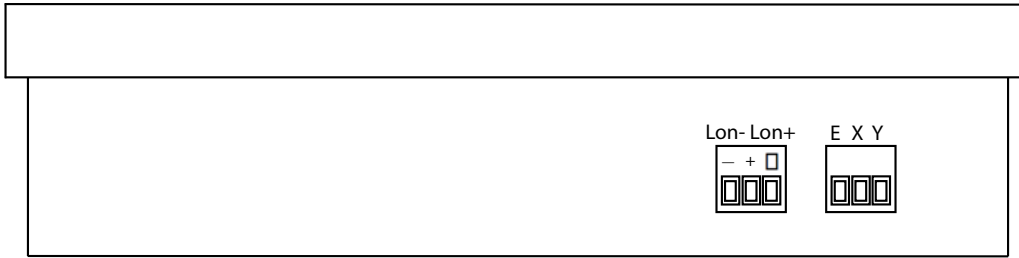


Fig. 3 — LonWorks Gateway Bottom View

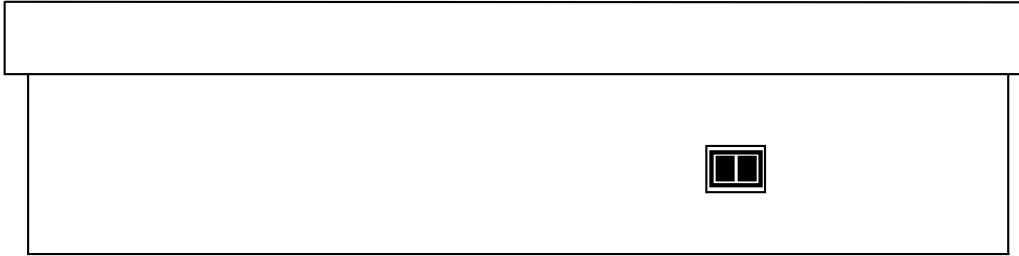


Fig. 4 — LonWorks Gateway Top View

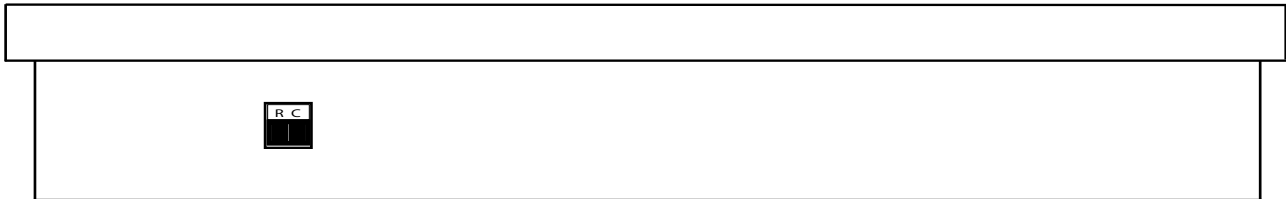


Fig. 5 — LonWorks Gateway Side View

Table 3 —LonWorks Gateway Connectors

Name	Function
R	24VAC power
C	24VAC common
E	Shield conductor, X/Y bus
X	X conductor, X/Y bus
Y	Y conductor, X/Y bus
Lon +	Lon + conductor, Lonworks bus
Lon-	Lon- conductor, Lonworks bus

INSTALLATION OF THE LONWORKS GATEWAY

Perform the following procedure to install LonWorks Gateway:

1. Turn off all power to the outdoor units, indoor units, and MDC.

⚠ WARNING

Electrical shock can cause personal injury and death. Before installing thermostat, shut off all power to this equipment during installation. There may be more than one power disconnect. Tag all disconnect locations to alert others not to restore power until work is completed.

⚠ CAUTION

Failure to follow this caution may result in equipment damage or improper operation.

Improper wiring or installation may damage the thermostat. Check to make sure wiring is correct before proceeding with installation or turning on unit.

2. Mount the Interface to the surface according to allowed orientations shown in Figure 1.

4. Wire LonWorks:

Control Wire: Use 16 to 20 AWG (American Wire Gage), stranded twisted pair shielded 2-core wiring (copper wire). Be sure the distance between the controller and the furthest outdoor units is not more than 3937 ft.

Field-Provided 24VAC Power Wire: Use copper wire rated for at least 1A.

NOTE: Follow all applicable electrical codes.

The controller has 1 central control bus (X/Y) lines. This line can support up to 8 refrigerant systems and 64 indoor units.

1. Using control wire, connect outdoor units' E/X/Y central control bus terminals in a "daisy chain" configuration.
2. Connect terminating end to the Central Controller's designated E/X/Y line. For larger Heat Pump systems with dual or triple modules on a refrigerant system, wire E/X/Y daisy chain only to the Header outdoor unit of each refrigerant system.
3. Connect the customer-provided LonWorks system to the Lon Bus port.

See Figure 5.

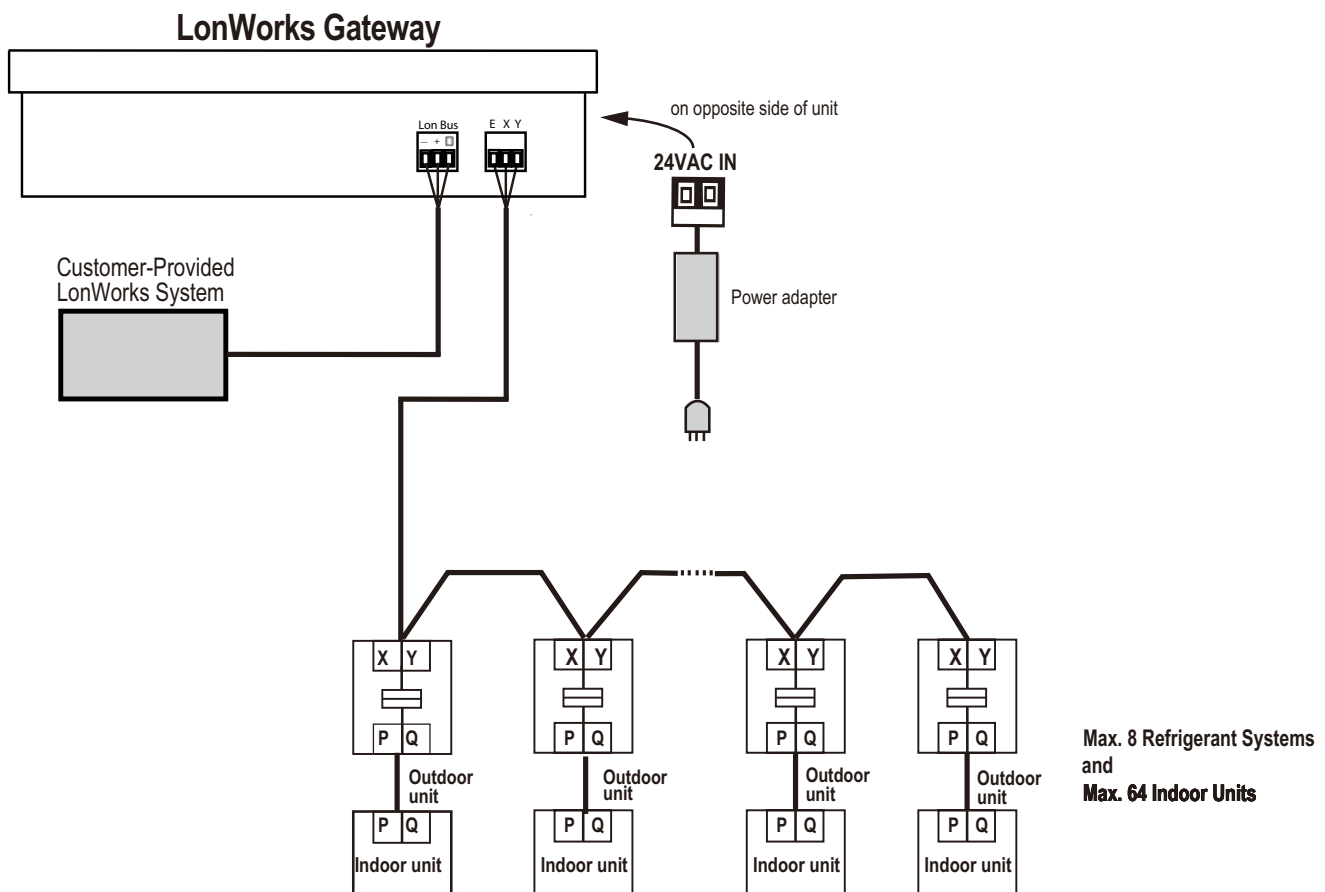


Fig. 6 — System Wiring Diagram

SETTING NETWORK ADDRESS

Make sure each outdoor unit / refrigerant system has its own unique network address: 0-7. Set by turning rotary encoders shown below (ENC4 for 3-Phase Heat Pump and Heat Recovery; ENC2 for single Phase Heat Pump).

For larger Heat Pump systems with dual or triple modules, set all addresses the same for each module within the refrigerant system.

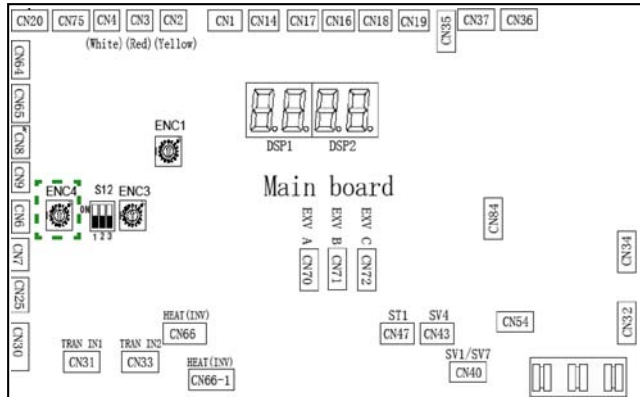


Fig. 7 — Heat Pump ENC4

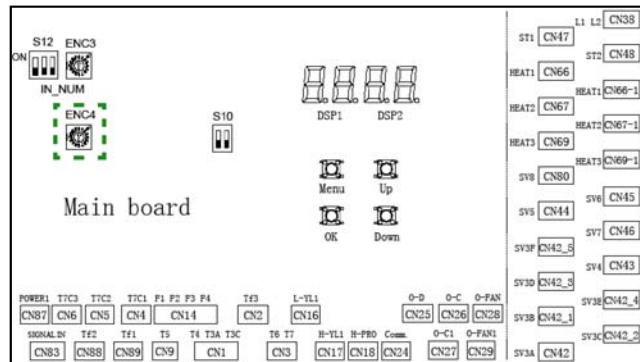


Fig. 8 — Heat Recovery ENC4

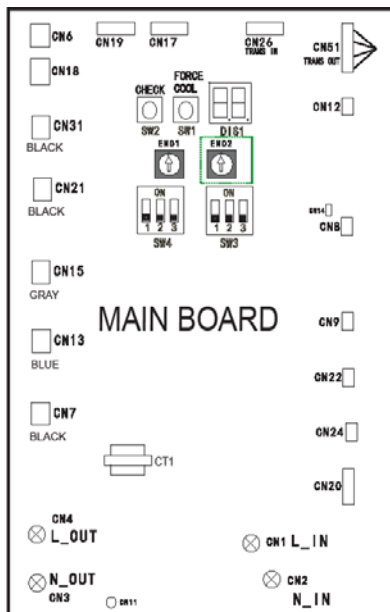


Fig. 9 — Single Phase Heat Pump ENC2

WIRING INSTRUCTIONS FOR LONWORKS



The LonWorks Gateway has one group of X-NET communication ports that can connect to one X-NET bus. Through this X-NET bus, LonWorks Gateway can connect to up to 64 indoor units (addresses ranging from 0 to 63) and 24 outdoor units (eight refrigerant systems, with addresses ranging from 96 to 127).

LonWorks Gateway provides one Lon bus port, with the channel type TP/FT-10. The Lon bus port connects to the LonWorks system of buildings through a twisted pair with free topology.

Both the theoretical communication distances of the Lon bus and X-NET bus are 1,000 m, but the actual communication distances are subject to the installation environment.

One LonWorks Gateway supports air conditioning systems with one temperature unit only: either Celsius or Fahrenheit.

LonWorks Gateway can determine whether the indoor unit is an outside air unit or a non-outside air unit.

In the following cases, the LonWorks Gateway must be restarted:

1. The temperature unit of the air conditioner connected to the gateway switches to another <<Another what?>>.
2. The indoor unit type at the same network address changes.

DESCRIPTION OF LONWORKS GATEWAY

Communication Object Description —

LonWorks Gateway has two main boards. Each board can connect to up to 32 indoor units and 12 outdoor units. The addresses of the indoor units connected to the main board range from 0 to 31, and the addresses of the outdoor units range from 96 to 111. The addresses of the indoor units connected to the sub main board range from 32 to 63, and the addresses of the outdoor units range from 112 to 127.

LonWorks Gateway description of the indoor unit — An indoor unit has 10 LonWorks objects to be used by the main unit of the LonWorks system in a building.

Input-type variables — Readable and writable input type variables are sent by LonWorks to indoor units.

SETTING MODE — Variable name: nviSetMode_M

Table 4 —Setting Mode - Parameter Definition

Status	Value-LonMaker	Value-NLutil
Heating	1	1
Cooling	3	3
Power-off	6	6
Air supply	9	9
Dehumidifying	14	E

NOTES:

1. M indicates the indoor unit address
2. nviSetMode_1 indicates No.0 indoor unit mode
3. nviSetMode_1 to nviSetMode_32 of the main board indicate modes of No.0 to No.31 indoor units
4. nviSetMode_1 to nviSetMode_32 of the sub main board indicate modes of No.32 to No.63 indoor units

By default, when this variable is specified, the indoor unit is powered on and the mode is set. If the upper computer sends a value outside the definition, the indoor unit powers off by default.

Each indoor unit type of Carrier supports the following modes:

Table 5 —Modes Supported by Carrier

Outside air unit	Cooling, heating, air supply, power-off
ERV	Cooling/heating/air supply/dehumidifying (When the variable specifies cooling/heating/air supply/dehumidifying mode, the indoor unit is powered on), power-off
Other indoor units	Cooling, heating, air supply, dehumidifying, power-off

SETTING FAN SPEED — Variable name: nviSetWind_M

Table 6 —Setting Fan Speed - Parameter Definition

Status	Value-LonMaker	Value-NLutil
Weak	1.01	02 01
Moderate	3.01	06 01
Strong	5.01	0A 01
Auto	7.01	0E 01

NOTES:

1. M indicates the indoor unit address
2. nviSetWind_1 indicates the fan speed of No.0 indoor unit
3. nviSetWind_1 to nviSetWind_32 of the main board indicate fan speeds of No.0 to No.31 indoor units
4. nviSetWind_1 to nviSetWind_32 of the sub main board indicate fan speeds of No.32 to No.63 indoor units

If the upper computer sends a value outside the definition, the fan speed is regarded as weak by default.

If nviSetMode_M specifies power-off or dehumidifying mode, the value of nviSetWind_M is invalid.

If nviSetMode_M specifies heating mode, the indoor unit may not respond to nviSetWind_M that specifies moderate or strong wind.

The fan speed of each Carrier's indoor unit type when nviSetMode_M is set:

Table 7 —Fan Speed when nviSetMode_M is Set

nviSetMode_M	ERV	Other indoor units
Weak	Weak	Weak
Moderate	Weak	Moderate
nviSetMode_M	ERV	Other indoor units
Strong	Strong	Strong
Auto	Strong	Auto

When the outside air unit sends a command to specify auto wind, the indoor unit automatically converts the command into the one for specifying weak wind.

SETTING TEMPERATURE —
 Variable name: nviSetTemp_M

**Table 8 —Setting Temperature - Parameter Definition
 (Celsius)**

Temperature	Value-LonMaker	Value-NLutil
10	10.00	03 E8
11	11.00	04 4C
12	12.00	04 B0
13	13.00	05 14
14	14.00	05 78
15	15.00	05 DC
16	16.00	06 40
17	17.00	06 A4
18	18.00	07 08
19	19.00	07 6C
20	20.00	07 D0
21	21.00	08 34
22	22.00	08 98
23	23.00	08 FC
24	24.00	09 60
25	25.00	09 C4
26	26.00	0A 28
27	27.00	0A 8C
28	28.00	0A F0
28	29.00	0B 54
30	30.00	0B B8

**Table 9 —Setting Temperature - Parameter Definition
 (Fahrenheit)**

Temperature	Value-LonMaker	Value-NLutil
50	50.00	13 88
51	51.00	13 EC
52	52.00	14 50
53	53.00	14 B4
54	54.00	15 18
55	55.00	15 7C
56	56.00	15 E0
57	57.00	16 44
58	58.00	16 A8
59	59.00	17 0C
60	60.00	17 70
61	61.00	17 D4
62	62.00	18 38
63	63.00	18 9C
64	64.00	19 00
65	65.00	19 64
66	66.00	19 C8
67	67.00	1A 2C
68	68.00	1A 90
69	69.00	1A F4
70	70.00	1B 58
71	71.00	1B BC
72	72.00	1C 20
73	73.00	1C 84
74	74.00	1C E8
75	75.00	1D 4C
76	76.00	1D B0
77	77.00	1E 14
78	78.00	1E 78
79	79.00	1E DC
80	80.00	1F 40
81	81.00	1F A4
82	82.00	20 08
83	83.00	20 C6
84	84.00	20 D0
85	85.00	21 34
86	86.00	21 98

NOTES:

1. M indicates the indoor unit address
2. nviSetTemp_1 indicates the temperature of No.0 indoor unit
3. nviSetTemp_1 to nviSetTemp_32 of the main board indicates the temperature of No.0 to No.31 indoor units
4. nviSetTemp_1 to nviSetTemp_32 of the sub main board indicates the temperature of No.32 to No.63 indoor units

The LonWorks can determine whether the indoor unit is an outside air unit or a non-outside air unit.

Table 10 —Determine if IDU or ODU

	Outside Air Unit	Non-Outside Air Unit
Cooling	Celsius: 10 to 30; Fahrenheit: 50 to 86	Celsius: 17 to 30; Fahrenheit: 62 to 86
Heating	Celsius: 12 to 30; Fahrenheit: 54 to 86	
Dehumidifying	Not supported	Celsius: 17 to 30; Fahrenheit: 62 to 86

- If the upper computer sends a value lower than the lowest defined temperature value, the indoor unit is treated as being at the lowest temperature.
- If the value is higher than the highest temperature value, the indoor unit is treated as being at the highest temperature.
- If the upper computer sends a decimal value, only the integer value is sent. For example, if the upper computer sends 67.68 as temperature value, only 67 is sent.
- If nviSetMode_M specifies power-off or air supply mode, the value of nviSetTemp_M is invalid.
- ERV does not support nviSetTemp_M.

Output type variables — Output type variables are read by the LonWorks from indoor units, which are read-only.

SETTING MODE AND FAN SPEED —

Variable name: nvoModeWind_M

Parameter definition: Variable format: Mode 0000 Fan speed 0

Table 11 —Output Variable Type - Parameter Definition

Mode	HVAC_HEAT	Heating
	HVAC_COOL	Cooling
	HVAC_FAN ONLY	Air Supply
	HVAC_DEHUMID	Dehumidifying
	HVAC_OFF	Power-off
Fan Speed	1.24 or 39	Strong
	1.23 or 31	Moderate
	1.22 or 23	Weak
	2.52 or 1.67	Auto Strong Wind
	2.51 or 1.59	Auto Moderate Wind
	2.5 or 1.51	Auto Weak Wind
	0 or 07 or 1.2 or 1.28 or 1.35 or 2.48	Turn Off the Fan

NOTES:

1. M indicates the indoor unit address
2. nvoModeWind_1 indicates the mode and fan speed of No.0 indoor unit
3. nvoModeWind_1 to nvoModeWind_32 of the main board indicate modes and fan speeds of No.0 to No.31 indoor units
4. nvoModeWind_1 to nvoModeWind_32 of the sub main board indicate modes and fan speeds of No.32 to No.63 indoor units

In variable format, except for mode and fan speed, other values are constantly 0.

When an indoor unit is offline, the variable value is HVAC_OFF 000000.

Setting Temperature —

Variable name: nvoSetTemp_M

Parameter definition: 10.00 to 30.00 indicates 10°C to 30°C, while 50.00 to 86.00 indicates 50°F to 86°F.

NOTES:

1. M indicates the indoor unit address
2. nvoSetTemp_1 indicates the temperature of No.0 indoor unit
3. nvoSetTemp_1 to nvoSetTemp_32 of the main board indicates the temperature of No.0 to No.31 indoor units
4. nvoSetTemp_1 to nvoSetTemp_32 of the sub main board indicates the temperature of No.32 to No.63 indoor units

If nvoModeWind_M specifies auto wind, nvoSetTemp_M indicates the cooling temperature in auto mode.

When an indoor unit is offline, the variable value is 0.

Indoor Temperature —

Variable name: nvoIDUTemp_M

Parameter definition: displays the actual temperature measured in °C or °F.

NOTES:

1. M indicates the indoor unit address
2. nvoIDUTemp_1 indicates the indoor temperature of No.0 indoor unit
3. nvoIDUTemp_1 to nvoIDUTemp_32 of the main board indicates the indoor temperature of No.0 to No.31 indoor units
4. nvoIDUTemp_1 to nvoIDUTemp_32 of the sub main board indicate the indoor temperature of No.32 to No.63 indoor units

When an indoor unit is offline, the variable value is 0.

Indoor unit error code —

Variable name: nvoIDUErrCode_M

Parameter definition:

Table 12 —Indoor Unit Error Code - Parameter Definition

1	2	3	4	5	6	7	8	9	10
dd	E1	E2	E3	E4	E5	E6	E7	E8	E9
11	12	13	14	15	16	17	18	19	20
EA	EB	EC	ED	EE	EF	EH	EL	EP	EU
21	22	23	24	25	26	27	28	29	30
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9
31	32	33	34	35	36	37	38	39	40
CA	CB	CC	CD	CE	CF	CH	CL	CP	CU
41	42	42	44	45	46	47	48	49	50
F0	F1	F2	F3	F4	F5	F6	F7	F8	F9
51	52	53	54	55	56	57	58	59	60
FA	FB	FC	FD	FE	FF	FH	FL	FP	FU
61	62	63	64	65	66	67	68	69	70
H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
71	72	73	74	75	76	77	78	79	80
HA	HB	HC	HD	HE	HF	HH	HL	HP	HU
81	82	83	84	85	86	87	88	89	90
P0	P1	P2	P3	P4	P5	P6	P7	P8	P9
91	92	93	94	95	96	97	98	99	100
PA	PB	PC	PD	PE	PF	PH	PL	PP	PU
101	102	103	104	105	106	107	108	109	110
L0	L1	L2	L3	L4	L5	L6	L7	L8	L9
111	112	113	114	115	116	117	118	119	120
LA	LB	LC	LD	LE	LF	LH	LL	LP	LU
121	122	123	124	125	126	127	128	129	130
U0	U1	U2	U3	U4	U5	U6	U7	U8	U9
131	132	133	134	135	136	137	138	139	140
UA	UB	UC	UD	UE	UF	UH	UL	UP	UU

- Error codes 121 to 140 are used for commissioning only
- Error codes 141 to 240 are reserved error codes
- Error codes 241 to 255 are reserved bytes
- See the service manual for the meanings of the error codes
- Error codes for some models may not be consistent with the faults of the unit. In this case, the actual faults of the unit must be addressed.

NOTES:

1. M indicates the indoor unit address
2. nvoIDUErrCode_1 indicates the error code for No.0 indoor unit
3. nvoIDUErrCode_1 to nvoIDUErrCode_32 of the main board indicates error codes for No.0 to No.31 indoor units
4. nvoIDUErrCode_1 to nvoIDUErrCode_32 of the sub main board indicate error codes for No.32 to No.63 indoor units

When an indoor unit is offline, the variable value is 0.

Input type variable for the indoor unit group —

SETTING POWER-OFF IN GROUP CONTROL —

Variable name: nviSysForcedOff

Table 13 —Setting power-off in group control - Parameter Definition

Status	Value
Power-off	6

If the upper computer sends other values, LonWorks will ignore them.

If the upper computer sends a variable from the main board, the power-off in group control command will only be sent to the indoor unit connected to the main board.

If the upper computer sends a variable from the sub main board, the power-off in group control command will only be sent to an indoor unit connected to the sub main board.

Output type variable for the indoor unit group

ONLINE STATUS

Variable name: nvoOnState

Parameter definition:

- Each bit indicates an indoor unit
- When the value is 0, it indicates that the indoor unit is offline
- When the value is 1, it indicates that the indoor unit is Online

Power-on status

Variable name: nvoRunState

Parameter definition:

- Each bit indicates an indoor unit
- When the value is 0, it indicates that the indoor unit is powered off
- When the value is 1, it indicates that the indoor unit is powered on

LonWorks object description of the outdoor unit

An outdoor unit has 1 LonWorks object to be used by the main unit of the LonWorks system in a building.

Error codes for outdoor units

Variable name: nvoODUErrCode_M

Parameter definition:

1	2	3	4	5	6	7	8	9	10
E0	E1	E2	E3	E4	E5	E6	E7	E8	E9
11	12	13	14	15	16	17	118	19	20
EA	EB	EC	ED	EE	EF	EH	EL	EP	EU
21	22	23	24	25	26	27	28	29	30
C0	C1	C2	C3	C4	C5	C6	C7	C8	C9
31	32	33	34	35	36	37	38	39	40
CA	CB	CC	CD	CE	CF	CH	CL	CP	CU
41	42	43	44	45	46	47	48	49	50
F0	F1	F2	F3	F4	F5	F6	F7	F8	F9
51	52	53	54	55	56	57	58	59	60
FA	FB	FC	FD	FE	FF	FH	FL	FP	FU
61	62	63	64	65	66	67	68	69	70
H0	H1	H2	H3	H4	H5	H6	H7	H8	H9
71	72	73	74	75	76	77	78	79	80
HA	HB	HC	HD	HE	HF	HH	HL	HP	HU
81	82	83	84	85	86	87	88	89	90
P0	P1	P2	P3	P4	P5	P6	P7	P8	P9
91	92	93	94	95	96	97	98	99	100
PA	PB	PC	PD	PE	PF	PH	PL	PP	PU
101	102	103	104	105	106	107	108	109	110
L0	L1	L2	L3	L4	L5	L6	L7	L8	L9
111	112	113	114	115	116	117	118	119	120
LA	LB	LC	LD	LE	LF	LH	LL	LP	LU
121	122	123	124	125	126	127	128	129	130
U0	U1	U2	U3	U4	U5	U6	U7	U8	U9
131	132	133	134	135	136	137	138	139	140
UA	UB	UC	UD	UE	UF	UH	UL	UP	UU

Error codes 121 to 140 are used for commissioning only.

Error codes 141 to 240 are reserved error codes.

Error codes 241 to 255 are reserved bytes.

For the meanings of the error codes, see the service manual.

Error codes for some models may not be consistent with the faults of the unit. In this case, the actual faults of the unit must be responded to.

Remarks: M indicates the outdoor unit address, while nvoODUErrCode_1 indicates error code of No.96 outdoor unit. Herein, nvoODUErrCode_1 to nvoODUErrCode_32 of the main board indicate error codes for No.96 to No.111 outdoor units, while nvoODUErrCode_1 to nvoODUErrCode_32 of the sub main board indicate error codes for No.112 to No.127 outdoor units.

When an outdoor unit is offline, the variable value is 0.

TECHNICAL INDICATORS AND REQUIREMENTS

1. Input voltage range of the power adapter: 24 VAC
Operating ambient temperature of the module: 32°F (0°C) to 122°F (50°C)
Operating ambient humidity of the module: RH25% to RH90%
2. EMC and EMI comply with UL certification requirements.
3. Electrical appliance complies with the requirements of GB4706.32-1996 and GB/T7725-1996.