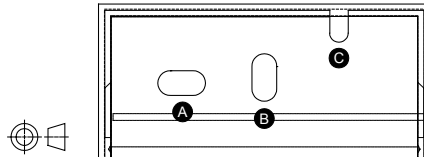
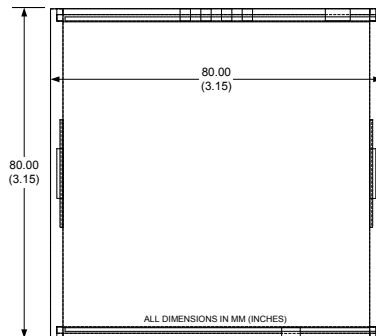
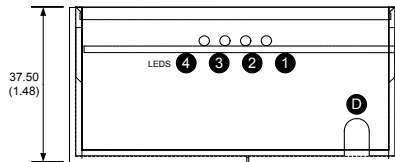
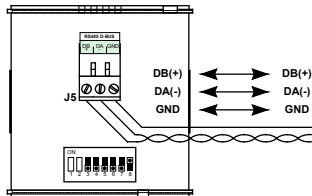
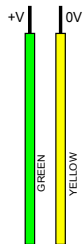
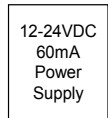
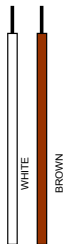
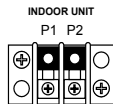
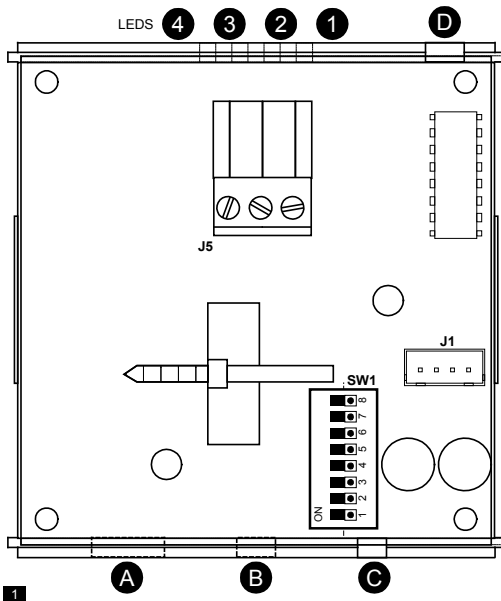


# RTD-LCINC

## Installation Instructions

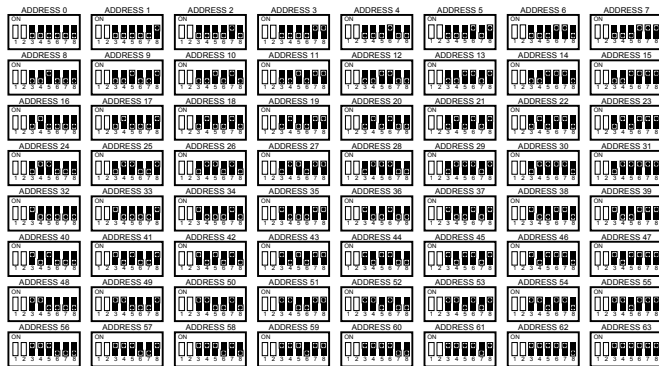
English Installation Instructions





ADDRESS 1

3



4



## Warnings and Cautions

All cable connections to the device must be adequately secured by suitable strain relief fasteners. Cables supplied with strain relief bands must be fitted in the corresponding cable guide slot with the strain relief band inside of the enclosure.

Do not install the RTD inside the air-conditioning unit. Ensure that all external wiring and electrically attached devices is suitably insulated to prevent access by non-qualified persons.

RS485 Cables must use stranded 24AWG shielded or unshielded twisted pair to Cat3, Cat4 or Cat5 specification. Use a twisted pair for connections DB,DA and an extra core for connection GND. Install RS485 cable to J5 terminals as shown in Figure 3.

### FCC/CFR 47 Part 15B:2012

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

Reorient or relocate the receiving antenna. Increase the separation between the equipment and receiver. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. Consult the dealer or an experienced radio/TV technician for help

## Specifications

### Electrical

**Supply** 12-24V DC, 60mA  
Regulated

**Power** <1.0VA

**Connectors** Rising clamp to 0.75mm<sup>2</sup>  
(18-20AWG) cable

### Network

**RS485** <500m (1640ft)

### Environmental

#### Temperature

-10°C to 50°C  
(14°F to 122°F)

#### Storage

0°C to 50°C  
(32°F to 122°F)

#### Operation

#### Humidity

0-90% RH  
non-condensing



Your product is marked with the symbol shown to the left. This symbol on the product indicates that this product must not be disposed of with your other household waste. Inappropriate disposal may be harmful. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. Units must be treated at a specialized treatment facility for re-use, recycling and recovery. By ensuring this product is disposed of correctly, you will help to prevent potential negative consequences for the environment and human health. Please contact the installer or local authority for more information.



Observe precautions for handling Electrostatic Sensitive Devices

## RTD-LCINC Installation Instructions

The RTD-LCINC is a Modbus control interface for Daikin VRV and Skyair ranges of air-conditioners. The interface is compatible with all units that have a P1,P2 remote controller network connection and allows control of a single indoor unit on the P1,P2 network. The RTD-LCINC supports a maximum of 1 indoor units connected to the P1P2 network.

### MOUNTING

The RTD-LCINC is supplied with an adhesive pad fixed to the rear of the enclosure. The RTD-LCINC can be mounted in any orientation to a suitable flat surface by removing the protective wax paper on the adhesive pad. Ensure that the mounting surface is smooth, dry and free from contamination.

### INDOOR UNIT CONNECTION (Figure 2a)

The RTD-LCINC is supplied with a pre-fitted lead for communication with the indoor unit. The lead allows a maximum distance of 1250mm (4.1ft) from the RTD-LCINC to the connection point in the indoor unit. The lead should be fitted and secured through suitable access points in the indoor unit. The pre-stripped P1,P2 connection wires should be fitted to the the P1,P2 screw terminals. The lead can be extended to a maximum distance of 10m (32.8 ft) from indoor unit, a minimum conductor cross sectional area of 0.5mm<sup>2</sup> (20AWG) should be used in this case.

The indoor unit lead enters the RTD-LCINC through Port D on the enclosure as shown in Figure 1, the lead is supplied pre-fitted to J1 on the RTD-LCINC PCB. The fitted strain relief band on the cable must be located on the inside of the enclosure.

### POWER CONNECTION (Figure 2b)

The pre-stripped power connections should be fitted to a suitable 12-24VDC, 60mA power supply. In case of installation to INNCOM equipment the supply should be connected to the 12VDC power bus. The power connection should be wired with YELLOW to 0V of the power supply and GREEN to the +V of the supply. If the power connection polarity is reversed the device will not operate and all LEDs will be off. The lead can be extended to a maximum distance of 10m (32.8 ft) from power supply, a minimum conductor cross sectional area of 0.5mm<sup>2</sup> (20AWG) should be used in this case.

### RS485 NETWORK INSTALLATION (Figure 3)

The RS485 D-Bus network requires a twisted pair cable connecting terminals DB(+) and DA(-) on RTD-LCINC. Terminal DB must be connected to the other DB terminal. Terminal DA must be connected to the other DA terminal. In addition the common terminal GND on the devices must be connected together. If a shielded cable is used then the shield can be used for this purpose. It is recommended that the GND connection is connected to local Earth at one point only.




The RS485 Network lead should be connected to terminals J5 on the RTD-LCINC PCB and should be fitted through Port B on the enclosure as shown in Figure 1. The PCB mounted strain-relief must be used to secure the network cable. Cables should have a maximum outside diameter of 5mm (0.2 inch).

## LED FUNCTIONALITY (Figures 5 to 7)

Led behaviour is shown in the following figures

Power-Up sequence: Factory Configuration	Figure 5a
Power-Up sequence: Custom Configuration	Figure 5b
P1,P2 Search. After power-up and during unit configuration	Figure 5c
No Fault State	Figure 6a
Unit Fault	Figure 6b
Device configuration error	Figure 7a
Indoor Unit Missing (U5 Fault)	Figure 7b
RS485 Communications timeout	Figure 7c

LED Key:

 OFF	 ON	 Flashing
---	--	--

## UNIT SEARCH

When the RTD-LCINC is powered up, or if it loses communication with the indoor unit the RTD-LCINC enters P1,P2 search mode. If P1,P2 communications are not re-established after 1 minute the RTD-LCINC will raise an alarm which will be indicated by LED sequence 5c.

## REMOTE CONTROLLER

The RTD-LCINC will control the indoor unit in MAIN mode without a remote controller fitted. If a remote controller is fitted it must be configured for SUB mode for correct operation of the RTD-LCINC.

## Modbus Protocol

### MODBUS CONFIGURATION

<b>Network</b>	3 wire RS485
<b>Mode</b>	Modbus RTU Slave
<b>Baud</b>	9600*
<b>Parity</b>	None*
<b>Stop bits</b>	1
<b>Register Base</b>	0

\*RTD interfaces can be configured with different baud rate and parity settings if required

Modbus address range 0 to 63 set using SW1 (Figure 4). The address should be set to 0 in case of installation to INNCOM equipment.

Details of the Modbus Protocol can be found in the **Modicon Modbus Protocol Reference Guide** available on the internet.

### MODBUS REGISTERS

The RTD-LCINC supports two types of register, analogue *Holding Registers* and analogue *Input Registers*. Register Addresses are '0' based in the range 0..65535.

Register Type	Access	Function
Holding Register	Read/Write	Control and Command Registers
Input Register	Read Only	Readback and Monitoring Registers

All analogue and digital values are accessed through these registers. All register values are 2 byte (16 bit) values.

Different data types are returned using specific conventions

Data Type	Range	Convention
Digital	0..1	0=FALSE, 1=TRUE
Integer	0..65535	No scaling required
Temperature	0..65535	<p>Temperatures values are generally returned <i>multiplied</i> by 100 to allow greater precision. To allow for negative temperature the value is returned as a <i>signed integer</i>, this means that any value greater than 32767 must be converted into a negative value by subtracting 65536.</p> <p>Examples:</p> <p>A readback value of 2150 is a positive temperature so:  <math>2150 / 100 = 21.50^{\circ}\text{C}</math> (<math>70.7^{\circ}\text{F}</math>)</p> <p>A readback value of 65036 is a negative temperature so:  <math>65036 - 65536 = -500</math>  <math>-500 / 100 = -5.00^{\circ}\text{C}</math> (<math>23.0^{\circ}\text{F}</math>)</p>

Registers are accessed using standard Modbus functions. The following four functions are supported by the RTD interface.

Function Code (hex code)	Function Name	Number of Registers in Message
03 (03h)	Read Holding Registers	1..10
04 (04h)	Read Input Registers	1..10
06 (06h)	Preset Single Holding Register	1
16 (10h)	Preset Multiple Holding Register	1..10

In this document, Holding registers are written as **H0010** where 'H' indicates *Holding* register and '0010' indicates the register address 0010. Similarly Input registers are referred to as **I0010** where 'I' indicates an *Input* register

## MAIN MODE FIELD SETTINGS

With RTD operating as MAIN controller, at start-up the following field settings to the indoor unit are automatically written

Mode n°	Switch n°	Position n°	Setting
20(10)	2	03	Control from Remote Controller Sensor
20(10)	5	02	Indoor unit sends Remote Controller Sensor temperature to ITouch Controller/ Manager
22(12)	2	02	Thermostat Differential Changeover = 0.5°C
22(12)	3	03	SW1.1 = OFF Fan in Heating at Thermo-Off = OFF
		02	SW1.1 = ON Fan in Heating at Thermo-Off = ON
22(12)	6	03	SW1.2 = OFF Fan in Cooling at Thermo-Off = OFF
		02	SW1.2 = ON Fan in Cooling at Thermo-Off = ON

Operation of Fan in Heating or Cooling with Thermo-Off condition is selected using DIP SW1.1 and SW1.2 as shown in the above table. DIP Switch settings must be set before device is powered. Any changes to DIP switches require that device is re-powered.

## Control Functions

### UNIT CONTROL

The RTD-LCINC can be used to control all of the operating functions of

the indoor unit that are available from a standard remote controller. All control registers are analogue Holding Registers.

Holding Register	Name	Range
#0006	Setpoint	1600..3200 (°C x 100)
#0002	Fanspeed	1..3 (1:Low, 2:Medium*, 3: High*)
#0003	Mode	0..4 (0:Auto, 1:Heat, 2:Fan, 3:Cool, 4:Dry)
#0004	Louvre	1..6 (1:Swing, 2: 0 Degrees, 3: 20 Degrees, 4:45 Degrees, 5:70 Degrees, 6:90 Degrees )
#0005	OnOff	0..1 (0:Off, 1:On)

*\*In case of two speed fan indoor unit, both Medium and High speeds select High.*

The Setpoint Holding Register is the setpoint in °C multiplied by 100. E.g. a setpoint of 21.5°C is written as 2150. The value transmitted to the indoor unit is rounded to the nearest 0.1°C, with a value of >=0.05°C being rounded up to 0.1°C, and a value <0.05°C being rounded down to 0.0°C.

## UNIT OPERATION

Holding Register	Name	Range
#0035	Filter Command	0..1 (Write value of 1 to clear filter alarm)
#0037	Force Thermo Off	0..1 (Write value of 1 to prohibit unit Thermo On Operation)
#0050	Simulated Remote Controller Temperature	0..9900 (°C x 100), 0 = Disabled

The Simulated Remote Controller Temperature value is active if the value is >0, the RTD is in MAIN mode and the field setting 20(10)-2-03 is set in the indoor unit. In this case the indoor unit will control to the value transmitted by the RTD-LCINC. If the value is 0 then the indoor

unit will control from its own Return Air Sensor.

## CONTROL UPDATE MODE

Each control field has a corresponding Update Register which determines how the control commands update the unit and if the corresponding remote controller button(s) are locked or unlocked. Four update modes are available:

Update Mode	Keypad Button(s)	Functionality
0:LastTouch	Unlocked	Unit setting is updated when a holding register WRITE occurs even if the value is unchanged.
1:Central	Locked	The corresponding keypad buttons are locked. The value in the holding register is repeatedly written to the unit.
2:Local	Unlocked	Updates to holding registers are not sent to the unit.
3:OnChange	Unlocked	Unit setting is updated when a holding register WRITE occurs only if the value CHANGES.

The *LastTouch* update mode allows updates from the Modbus registers. If the Modbus master repeatedly writes the value then this will overwrite the user setting. The *OnChange* update mode can be used if repeated writes occur, in which case updates are only sent to the indoor unit if the written value changes.

The *Global Update* register #0010 can be used to set all update registers with one command, or the individual registers can be written to.

Holding Register	Name	Lock Mode*
#0010	Global Update	<u>0:LastTouch</u> , 1:Central,2:Local,3:OnChange
#0011	Setpoint Update	<u>0:LastTouch</u> , 1:Central,2:Local,3:OnChange
#0012	Fanspeed Update	<u>0:LastTouch</u> , 1:Central,2:Local,3:OnChange
#0013	Mode Update	<u>0:LastTouch</u> , 1:Central,2:Local,3:OnChange
#0014	Louvre Update	<u>0:LastTouch</u> , 1:Central,2:Local,3:OnChange
#0015	OnOff Update	<u>0:LastTouch</u> , 1:Central,2:Local,3:OnChange

The default settings on power up are all fields in LastTouch mode.

For control functions where only the RTD-LCINC is sending control commands, Update Mode can be left at default of 0:LastTouch. If other control signals can be sent to the indoor unit (e.g. from a Central Controller or Remote Controller), then Update Mode of 1:Central will reject other control commands and ensure the unit operates only to RTD-LCINC commands.

## Readback Data

All readback data is available in analogue Input Registers.

## UNIT READBACK

Unit readback registers provide a summary of the data from the active indoor unit on the network.

Input Register	Name	Range	Notes
10021	Is Fault	0..1	0:No Fault, 1: Unit in fault
10022	Fault Code	0..65535	255: No Fault, else fault code from unit

10023	Return Air Temperature	Degrees °C x 100	Unit return air temperature
10024	Filter Alarm	0..1	0: No Alarm, 1: Unit with filter alarm
10030	Thermo On	0..2	Unit Thermo operation 0:Idle/Fan, 1:Heating, 2:Cooling,
10031	Coil In Temperature	Degrees °C x 100	Coil Inlet Temperature
10032	Coil Out Temperature	Degrees °C x 100	Coil Outlet Temperature
10035	Defrost	0..1	0: No defrost, 1: Unit in defrost Indicates unit in Pressure Equalisation, Hot Start/Pre-heat or outdoor unit Defrost condition

## FAULT CODES

Fault codes are encoded using a standard table to allow standard Daikin fault codes to be generated from the readback value. The **no fault** value is 255.

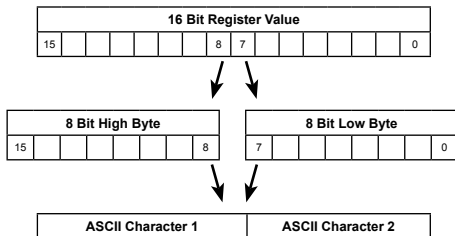
Special fault codes generated by the RTD are as follows

Code Value	Meaning
0	Waiting for data
255	No Fault
14384	(80) Group Fault, timeout on no units found
14388	(84) Unit Missing, reported if unit data previously observed

All other codes are Daikin fault codes.

Fault codes returned from a Modbus Input register are 16 bit values. The fault code is encoded in the 16 bit value by encoding the two 8 bit fault characters in the high and low byte parts of the 16 bit value. Each

of the 8 bit values represents an ASCII text character.



Example:

A fault code value of 16697 is returned.

HighByte(16697) = 65 = ASCII Character 'A'

LowByte(16697) = 57 = ASCII Character '9'

Fault Code: 'A9'