

Modbus RTU

Fujitsu Air Conditioning

Compatible with Domestic and VRF line air conditioners commercialized by Fujitsu

USER MANUAL

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Important User Information

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Gateway for the integration of a Fujitsu air conditioning unit in ModBus RTU enabled monitoring and control systems.

Compatible with Domestic and VRF line air conditioners commercialized by Fujitsu.

| ORDER CODE | LEGACY ORDER CODE |
|-----------------|-------------------|
| INMBSFGL001I000 | FJ-AC-MBS-1 |

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1 Presentation

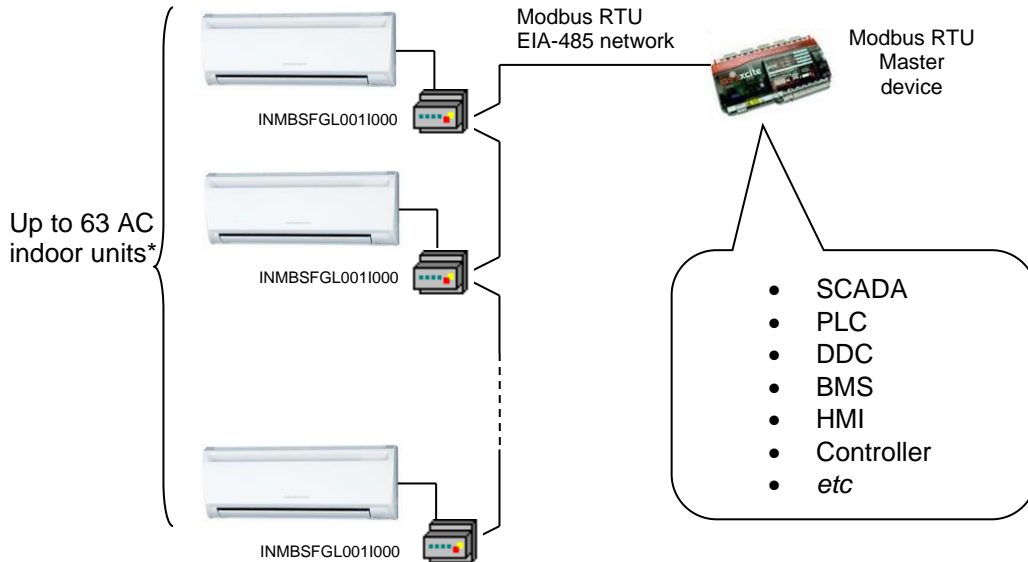


The INMBSFGL001I000 interfaces allow a complete and natural integration of **Fujitsu** air conditioners into Modbus RTU (EIA-485) networks.

Reduced dimensions. 93 x 53 x 58 mm
3.7" x 2.1" x 2.3"

Quick and easy installation.
Mountable on DIN rail, wall, or even inside the indoor unit of AC.

- External power not required.
- Direct connection to Modbus RTU (EIA-485) networks. Up to 63 INMBSFGL001I000 devices can be connected in the same network.
INMBSFGL001I000 is a Modbus slave device.
- Direct connection to the AC indoor unit.
- Configuration from both on-board DIP-switches and Modbus RTU.
- Total Control and Supervision.
- Real states of the AC unit's internal variables.
- Allows simultaneous use of the AC's remote controls and Modbus RTU.



* Up to 63 Intesis devices can be installed in the same Modbus RTU bus. However, depending on the configured speed, the installation of Modbus Repeaters may be required

2 Connection

The interface comes with cable + connectors for direct connection to the AC indoor unit, and with a plug-in terminal block of 3 poles for connection to a Modbus RTU EIA-485 network.

2.1 Connect to the AC indoor unit

The INMBSFGL001I000 connects directly to the indoor unit internal control board. In the control board locate the socket connector marked as **CN65/CN12/CN6**.

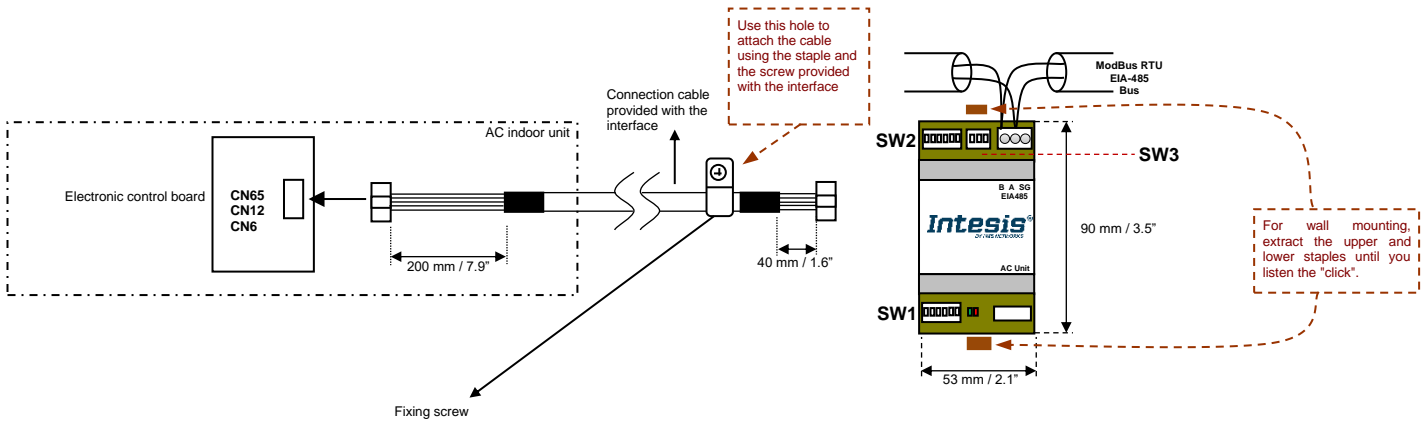


Figure 2.1 INMBSFGL001I000 connection diagram

2.2 Connection to the EIA-485 bus

Connect the EIA-485 bus wires to the plug-in terminal block of INMBSFGL001I000 and keep the polarity on this connection (A+ and B-). Make sure that the maximum distance to the bus is 1,200 meters (3,937 ft). Loop or star typologies are not allowed in the case of the EIA-485 bus. A terminator resistor of 120Ω must be present at each end of the bus to avoid signal reflections. The bus needs a fail-safe biasing mechanism.

3 Quick Start Guide

1. Disconnect the air conditioning from Mains Power.
2. Attach the interface next to the AC indoor unit (wall mounting) following the instructions of the diagram below or install it inside the AC indoor unit (respect the safety instructions given).
3. Connect to **CN65/CN12/CN6** between the interface and the AC indoor unit following the instructions of the diagram.
4. Connect the EIA-485 bus to the connector *EIA485* of the interface.
5. Close the AC indoor unit.
6. Check the DIP-Switch configuration of the Intesis interface and make sure it matches the current installation's parameters:

By default, the interface is set to:

- Modbus Slave Address → 1
- Modbus baud rate → 9600 bps

These parameters can be modified from DIP-Switches (see for further information).

NOTE: All changes on the DIP-Switch configuration require a system power cycle to be applied.

7. Connect the AC system to Mains Power.

IMPORTANT: The Intesis interface requires to be connected to the AC unit (powered) to start communicating.

4 Modbus Interface Specification

4.1 Modbus physical layer

INMBSFGL001I000 implements a Modbus RTU (Slave) interface, to be connected to an EIA-485 line. It performs 8N2 communication (8 data bits, no parity and 2 stop bit) with several available baud rates (2400 bps, 4800 bps, 9600 bps -default-, 19200 bps, 38400 bps, 57600 bps, 76800 bps and 115200 bps). It also supports 8N1 communication (8 data bits, no parity and 1 stop bit).

4.2 Modbus Registers

All registers are type “16-bit unsigned Holding Register” and they use the *Modbus big endian* notation.

4.2.1 Control and status registers

| Register Address (protocol address) | Register Address (PLC address) | R/W | Description |
|-------------------------------------|--------------------------------|-----|---|
| 0 | 1 | R/W | AC unit On/Off <ul style="list-style-type: none"> ▪ 0: Off ▪ 1: On |
| 1 | 2 | R/W | AC unit Mode ¹ <ul style="list-style-type: none"> ▪ 0: Auto ▪ 1: Heat ▪ 2: Dry ▪ 3: Fan ▪ 4: Cool |
| 2 | 3 | R/W | AC unit Fan Speed ^{1, 2} <ul style="list-style-type: none"> ▪ 0: Auto ▪ 1: Quiet ▪ 2: Low ▪ 3: Med ▪ 4: High |
| 3 | 4 | R/W | AC unit Vane Position ¹ <ul style="list-style-type: none"> ▪ 1: Position-1 (Horizontal) ▪ 2: Position-2 (Horizontal) ▪ 3: Position-3 (Medium) ▪ 4: Position-4 (Vertical) ▪ 10: Swing |
| 4 | 5 | R/W | AC unit Temperature Setpoint ^{1,3,4,5} <ul style="list-style-type: none"> ▪ -32768 (Initialization value) ▪ 16..30 (°C) (0 = undetermined) ▪ 61..86 (°F) (0 = undetermined) |
| 5 | 6 | R | AC unit Temperature reference ^{1,3,4,4} <ul style="list-style-type: none"> ▪ 18..30 (°C) (0 = undetermined) ▪ 64,4..86 (°F) (0 = undetermined) ▪ 0x8000 There is no temperature sent from the Remote controller |
| 6 | 7 | R/W | Window Contact <ul style="list-style-type: none"> ▪ 0: Closed (Default) ▪ 1: Open |
| 7 | 8 | R/W | INMBSFGL001I000 Disablement ⁶ <ul style="list-style-type: none"> ▪ 0: INMBSFGL001I000 enabled (Default value) ▪ 1: INMBSFGL001I000 disabled |
| 8 | 9 | R/W | AC Remote Control Disablement ⁵ <ul style="list-style-type: none"> ▪ 0: Remote Control enabled (Default value) ▪ 1: Remote Control disabled |

¹ Available values will depend on the AC unit mode. Check the AC unit model functions in its user manual to know the possible values for this register.

² Number of FanSpeeds configurable via DIP-Switches.

³ Magnitude for this register can be adjusted to Celsius x 1°C, Celsius x 10°C (default) or Fahrenheit.

⁴ It is not possible to turn to x10 the value shown in Fahrenheit.

⁵ See section 4.2.3 CONSIDERATIONS ON TEMPERATURE REGISTERS for more information

⁶ This value is stored in non-volatile memory

| Register Address (protocol address) | Register Address (PLC address) | R/W | Description |
|-------------------------------------|--------------------------------|-----|---|
| 9 | 10 | R/W | AC unit Operation Time <ul style="list-style-type: none"> 0..65535 (hours). Counts the time the AC unit is in "On" state. |
| 10 | 11 | R | AC unit Alarm Status <ul style="list-style-type: none"> 0: No alarm condition 1: Alarm condition |
| 11 | 12 | R | Error Code ⁷ <ul style="list-style-type: none"> 0: No error present 65535(-1 if it is read as signed value): Error in the communication of INMBSFGL0011000 or Remote Controller with the AC unit. Any other value, see the table at the end of this document. |
| 21 | 22 | R | Number of FanSpeeds <ul style="list-style-type: none"> 3..6 FanSpeeds |
| 22 | 23 | R/W | Indoor unit's ambient temperature from external sensor (at Modbus side) ^{1,3,4,4} <ul style="list-style-type: none"> -32768: (Initialization value). No temperature is being provided from an external sensor. Any other: (°C/x10°C/°F) |
| 23 | 24 | R | AC Real temperature setpoint ^{1,3,4,4} <ul style="list-style-type: none"> When no external temperature is provided, this read-only register will have the same value as register 5 (PLC addressing). In all cases, it will show the current setpoint in the indoor unit. 16..31°C (°C/x10°C) 60..92°F |
| 24 | 25 | R | Current AC max setpoint ^{1,3,4} <ul style="list-style-type: none"> -32768 (Initialization value) Ranges are specific from Manufacturer |
| 25 | 26 | R | Current AC min setpoint ^{1,3,4} <ul style="list-style-type: none"> -32768 (Initialization value) Ranges are specific from Manufacturer |
| 26 | 27 | R/W | AC unit Horizontal Vane Position ¹ <ul style="list-style-type: none"> 0: Auto (Default) 1: Position 1 ... 5: Position 5 10: Swing |
| 31 | 32 | R | Window status (feedback) <ul style="list-style-type: none"> 0: Not active (Default value) 1: Active (Window is open) |
| 36 | 37 | R/W | External On/Off disablement: <ul style="list-style-type: none"> 0: Not active (Default value) 1: Active |
| 40 | 41 | R | Window contact ON/OFF disablement: <ul style="list-style-type: none"> 0: Window contact is disabled (not working) 1: Window contact is enabled (in use) |
| 43 | 44 | W | Filter reset: <ul style="list-style-type: none"> 1: Reset |
| 44 | 45 | R | Filter status <ul style="list-style-type: none"> 0: Off 1: Lit |
| 56 | 57 | R/W | Antifreeze operation <ul style="list-style-type: none"> 0: Disabled 1: Enabled |
| 64 | 65 | R/W | Economy <ul style="list-style-type: none"> 0: Disabled |

⁷ See section 7 ERROR CODES for possible error codes and their explanation

| Register Address (protocol address) | Register Address (PLC address) | R/W | Description |
|-------------------------------------|--------------------------------|-----|---|
| | | | <ul style="list-style-type: none"> 1: Enabled |
| 65 | 66 | R | Input reference temperature ^{1,3,4} <ul style="list-style-type: none"> 0x8000: No temperature's value is being provided from an external sensor. No virtual temperature is being applied. Any other: (°C/x10°C/°F) |
| 66 | 67 | R | Return path temperature ^{1,3,4} <ul style="list-style-type: none"> -32768 (Initialization value) Ranges are specific from Manufacturer |
| 97 | 98 | R/W | Block Periodic Sendings ^{5,8} <ul style="list-style-type: none"> 0: Non-blocked (Default value) 1: Blocked |
| 98 | 99 | R | Master/Slave (gateway's role) <ul style="list-style-type: none"> 0: Slave 1: Master |

4.2.2 Configuration Registers

| Register Address (protocol address) | Register Address (PLC address) | R/W | Description |
|-------------------------------------|--------------------------------|-----|---|
| 13 | 14 | R/W | "Open Window" switch-off timeout ⁹ <ul style="list-style-type: none"> 0..30 (minutes) Factory setting: 30 (minutes) |
| 14 | 15 | R | Modbus RTU baud-rate <ul style="list-style-type: none"> 2400bps 4800bps 9600bps (Default) 19200bps 38400bps 57600bps 76800bps 115200bps |
| 15 | 16 | R | Modbus Slave Address <ul style="list-style-type: none"> 1..63 |
| 49 | 50 | R | Device ID: 0x0D00 |
| 50 | 51 | R | Software version |
| 99 | 100 | W | Reset <ul style="list-style-type: none"> 1: Reset |

4.2.3 Considerations on Temperature Registers

- AC unit Temperature Setpoint (R/W)** (register 5 – in PLC addressing): This is the adjustable temperature setpoint meant to be required by the user. This register can be read (Modbus function 3 or 4) or written (modbus functions 5 or 16). A remote controller connected to the 3-wire bus of the Fujitsu indoor unit will report the same temperature setpoint value as this register.
- AC unit external reference temperature (R/W)** (register 23 – in PLC addressing): This register allows providing an external temperature reference from Modbus side. If an external temperature is provided through this register, indoor unit will use it as reference for its temperature control loop.
 - This register will have no effect in those Fujitsu RAC / domestic line splits Air-Conditioning units – this is, those models requiring an additional communication accessory enabling communication with INMBSFGL0011000.
 - For this temperature to take effect it is required that the Fujitsu AC indoor unit is configured in such a way that it uses the "thermostat sensor in the remote controller" (this is, INMBSFGL0011000 will act as thermostat sensor providing a temperature sensor reading).

⁸ If the register is configured as "0:Non-blocked", all commands received from Modbus will be sent to the AC system. If "1: Blocked", commands from Modbus will only be sent to the AC system if they differ from the previous value.

⁹ Once window contact is open, a count-down to switch off the AC Unit will start from this configured value.

- This configuration is done via a Fujitsu remote controller connected to the indoor unit (Function number “42” – setting value “1” / operation of Thermosensor button) and must be done by Fujitsu authorized installers at the time of the installation of the AC.
- Register value after INMBSFGL001I000 startup is -32768, which means that no temperature reference is provided to the AC indoor unit. In that case, AC indoor unit will use its own return path temperature sensor as reference for its control loop.
- Virtual temperature mechanism will be activated once the first temperature value is received on register 23 – in PLC addressing:

$$S_{AC} = S_u - (T_u - S_u)$$

Where:

S_{AC} - setpoint value currently applied to the indoor unit

S_u - setpoint value

T_u - external temperature reference written at BACnet side

When INMBSFGL001I000 detects a change in any of the values of $\{S_u, T_u\}$, it will send the new setpoint (S_{AC}) to the indoor unit.

Moreover, notice that temperature's values of all these four registers are expressed according to the temperature's format configured through its onboard DIP-Switches (See sectin 4.3 for details). These following formats are possible:

- **Celsius value:** Value in Modbus register is the temperature value in Celsius (i.e. a value “22” in the Modbus register must be interpreted as 22°C).
- **Tenths of value:** Value in Modbus register is the temperature value in decicelsius (i.e. a value “220” in the Modbus register must be interpreted as 22.0°C).
- **Fahrenheit value:** Value in Modbus register is the temperature value in Fahrenheit (i.e. a value “72” in the Modbus register must be interpreted as 72°F (~22°C)).

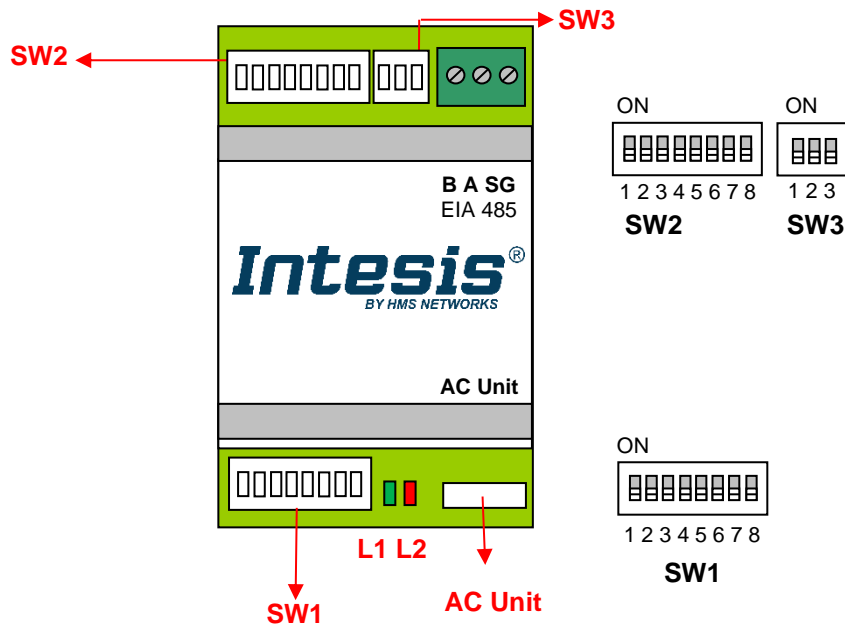
NOTE

- Fujitsu General cannot guarantee the Room Temperature object value is consistently equal to the current actual room temperature.
- The Room Temperature is only allowed for displaying, it cannot be used for controlling other equipment.

4.3 DIP-switch Configuration Interface

All the configuration values on INMBSFGL001I000 can be written and read from Modbus interface. Otherwise, some of them can also be setup from its on-board DIP-switch interface.

The device has DIP-switches SW1, SW2 and SW3 on the following locations:



The following tables apply to the interface’s configuration through DIP-switches:

SW1 – AC configuration + Modbus baud rate

| SW1 | | | | | | | | Description |
|-----|---|---|---|---|---|---|---|-----------------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| ↓ | ↓ | x | x | x | x | x | x | 3 FanSpeeds |
| ↓ | ↑ | x | x | x | x | x | x | 4 FanSpeeds (Default value) |
| ↑ | ↓ | x | x | x | x | x | x | 5 FanSpeeds |
| ↑ | ↑ | x | x | x | x | x | x | 6 FanSpeeds |
| x | x | ↓ | x | x | x | x | x | Not used (Default value) |
| x | x | ↑ | x | x | x | x | x | Not used |
| x | x | x | ↓ | x | x | x | x | Not used (Default value) |
| x | x | x | ↑ | x | x | x | x | Not used |
| x | x | x | x | ↓ | x | x | x | Not used (Default value) |
| x | x | x | x | ↑ | x | x | x | Not used |
| x | x | x | x | x | ↓ | ↓ | ↓ | 2400 bps |
| x | x | x | x | x | ↑ | ↓ | ↓ | 4800 bps |
| x | x | x | x | x | ↓ | ↑ | ↓ | 9600 bps (default value) |
| x | x | x | x | x | ↑ | ↑ | ↓ | 19200 bps |
| x | x | x | x | x | ↓ | ↓ | ↑ | 38400 bps |
| x | x | x | x | x | ↑ | ↓ | ↑ | 57600 bps |
| x | x | x | x | x | ↓ | ↑ | ↑ | 76800 bps |
| x | x | x | x | x | ↑ | ↑ | ↑ | 115200 bps |

Table 4.1 SW1: AC Configuration + Modbus baud rate

SW2 – Modbus Slave address + Degrees/tenths of degrees (x10) + Temp. magnitude (°C/°F)

| SW2 | | | | | | | | MBS slave Address |
|-----|---|---|---|---|---|---|---|-------------------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| ↓ | ↓ | ↓ | ↓ | ↓ | ↓ | x | x | 0 |
| ↑ | ↓ | ↓ | ↓ | ↓ | ↓ | x | x | 1 (Default value) |
| ↓ | ↑ | ↓ | ↓ | ↓ | ↓ | x | x | 2 |
| ↑ | ↑ | ↓ | ↓ | ↓ | ↓ | x | x | 3 |
| ↓ | ↓ | ↑ | ↓ | ↓ | ↓ | x | x | 4 |
| ↑ | ↓ | ↑ | ↓ | ↓ | ↓ | x | x | 5 |
| ↓ | ↑ | ↑ | ↓ | ↓ | ↓ | x | x | 6 |
| ↑ | ↑ | ↑ | ↓ | ↓ | ↓ | x | x | 7 |
| ↓ | ↓ | ↓ | ↑ | ↓ | ↓ | x | x | 8 |
| ↑ | ↓ | ↓ | ↑ | ↓ | ↓ | x | x | 9 |
| ↓ | ↑ | ↓ | ↑ | ↓ | ↓ | x | x | 10 |
| ↑ | ↑ | ↓ | ↑ | ↓ | ↓ | x | x | 11 |
| ↓ | ↓ | ↑ | ↑ | ↓ | ↓ | x | x | 12 |
| ↑ | ↓ | ↑ | ↑ | ↓ | ↓ | x | x | 13 |
| ↓ | ↑ | ↑ | ↑ | ↓ | ↓ | x | x | 14 |
| ↑ | ↑ | ↑ | ↑ | ↓ | ↓ | x | x | 15 |
| ↓ | ↓ | ↓ | ↓ | ↑ | ↓ | x | x | 16 |
| ↑ | ↓ | ↓ | ↓ | ↑ | ↓ | x | x | 17 |
| ↓ | ↑ | ↓ | ↓ | ↑ | ↓ | x | x | 18 |
| ↑ | ↑ | ↓ | ↓ | ↑ | ↓ | x | x | 19 |
| ↓ | ↓ | ↑ | ↓ | ↑ | ↓ | x | x | 20 |
| ↑ | ↓ | ↑ | ↓ | ↑ | ↓ | x | x | 21 |
| ↓ | ↑ | ↑ | ↓ | ↑ | ↓ | x | x | 22 |
| ↑ | ↑ | ↑ | ↓ | ↑ | ↓ | x | x | 23 |
| ↓ | ↓ | ↓ | ↑ | ↑ | ↓ | x | x | 24 |
| ↑ | ↓ | ↓ | ↑ | ↑ | ↓ | x | x | 25 |
| ↓ | ↑ | ↓ | ↑ | ↑ | ↓ | x | x | 26 |
| ↑ | ↑ | ↓ | ↑ | ↑ | ↓ | x | x | 27 |
| ↓ | ↓ | ↑ | ↑ | ↑ | ↓ | x | x | 28 |
| ↑ | ↓ | ↑ | ↑ | ↑ | ↓ | x | x | 29 |
| ↓ | ↑ | ↑ | ↑ | ↑ | ↓ | x | x | 30 |
| ↑ | ↑ | ↑ | ↑ | ↑ | ↓ | x | x | 31 |

| SW2 | | | | | | | | MBS slave Address |
|-----|---|---|---|---|---|---|---|-------------------|
| 1 | 2 | ↓ | 4 | 5 | 6 | 7 | 8 | |
| ↓ | ↓ | ↓ | ↓ | ↓ | ↑ | x | x | 32 |
| ↑ | ↓ | ↓ | ↓ | ↓ | ↑ | x | x | 33 |
| ↓ | ↑ | ↓ | ↓ | ↓ | ↑ | x | x | 34 |
| ↑ | ↑ | ↓ | ↓ | ↓ | ↑ | x | x | 35 |
| ↓ | ↓ | ↑ | ↓ | ↓ | ↑ | x | x | 36 |
| ↑ | ↓ | ↑ | ↓ | ↓ | ↑ | x | x | 37 |
| ↓ | ↑ | ↑ | ↓ | ↓ | ↑ | x | x | 38 |
| ↑ | ↑ | ↑ | ↓ | ↓ | ↑ | x | x | 39 |
| ↓ | ↓ | ↓ | ↑ | ↓ | ↑ | x | x | 40 |
| ↑ | ↓ | ↓ | ↑ | ↓ | ↑ | x | x | 41 |
| ↓ | ↑ | ↓ | ↑ | ↓ | ↑ | x | x | 42 |
| ↑ | ↑ | ↓ | ↑ | ↓ | ↑ | x | x | 43 |
| ↓ | ↓ | ↑ | ↑ | ↓ | ↑ | x | x | 44 |
| ↑ | ↓ | ↑ | ↑ | ↓ | ↑ | x | x | 45 |
| ↓ | ↑ | ↑ | ↑ | ↓ | ↑ | x | x | 46 |
| ↑ | ↑ | ↑ | ↑ | ↓ | ↑ | x | x | 47 |
| ↓ | ↓ | ↓ | ↓ | ↑ | ↑ | x | x | 48 |
| ↑ | ↓ | ↓ | ↓ | ↑ | ↑ | x | x | 49 |
| ↓ | ↑ | ↓ | ↓ | ↑ | ↑ | x | x | 50 |
| ↑ | ↑ | ↓ | ↓ | ↑ | ↑ | x | x | 51 |
| ↓ | ↓ | ↑ | ↓ | ↑ | ↑ | x | x | 52 |
| ↑ | ↓ | ↑ | ↓ | ↑ | ↑ | x | x | 53 |
| ↓ | ↑ | ↑ | ↓ | ↑ | ↑ | x | x | 54 |
| ↑ | ↑ | ↑ | ↓ | ↑ | ↑ | x | x | 55 |
| ↓ | ↓ | ↓ | ↑ | ↑ | ↑ | x | x | 56 |
| ↑ | ↓ | ↓ | ↑ | ↑ | ↑ | x | x | 57 |
| ↓ | ↑ | ↓ | ↑ | ↑ | ↑ | x | x | 58 |
| ↑ | ↑ | ↓ | ↑ | ↑ | ↑ | x | x | 59 |
| ↓ | ↓ | ↑ | ↑ | ↑ | ↑ | x | x | 60 |
| ↑ | ↓ | ↑ | ↑ | ↑ | ↑ | x | x | 61 |
| ↓ | ↑ | ↑ | ↑ | ↑ | ↑ | x | x | 62 |
| ↑ | ↑ | ↑ | ↑ | ↑ | ↑ | x | x | 63 |

Table 4.2 SW2: Modbus slave address

| SW2 | | | | | | | | Description |
|-----|---|---|---|---|---|---|---|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
| x | x | x | x | x | x | ↓ | x | Temperature values in ModBus register are represented in degrees (x1) (default value) |
| x | x | x | x | x | x | ↑ | x | Temperature values in ModBus register are represented in tenths of degrees (x10) |
| x | x | x | x | x | x | x | ↓ | Temperature values in ModBus register are represented in Celsius degrees (default value) |
| x | x | x | x | x | x | x | ↑ | Temperature values in ModBus register are represented in Fahrenheit degrees |

Table 4.3 SW2: Degrees / tenths of degrees (x10) + Temperature magnitude (°C/°F)

SW3 – Termination resistor + BUS polarization configuration

| SW3 | | | Description |
|-----|---|---|--|
| 1 | 2 | 3 | |
| ↓ | x | x | EIA-485/RS-485 bus without termination resistor (Default value). |
| ↑ | x | x | Internal termination resistor of 120Ω connected to EIA-485/RS-485 bus. |
| x | ↓ | ↓ | No BUS polarization (Default value). |
| x | ↑ | ↑ | BUS polarization active. |

Table 4.4 SW3: Temperature and termination resistor configuration**4.4 Implemented Functions**

INMBSPAN001R000 implements the following standard Modbus functions:

- 3: Read Holding Registers
- 4: Read Input Registers
- 6: Write Single Register
- 16: Write Multiple Registers (Despite this function is allowed, the interface does not allow to write operations on more than 1 register with the same request, this means that length field should be always be 1 when this function is being used in case of writing)

4.5 Device LED indicator

The device includes two LED indicators to show all the possible operational states. In the following table there are written the indicators which can be performed and their meaning.

L1 (green LED)

| Device status | LED indication | ON / OFF Period | Description |
|-----------------------------|----------------|-----------------------|--|
| During not normal operation | LED blinking | 500ms ON / 500ms OFF | Communication error |
| During normal operation | LED flashing | 100ms ON / 1900ms OFF | Normal operation (configured and working properly) |

L2 (red LED)

| Device status | LED indication | ON / OFF Period | Description |
|-----------------------------|----------------|-------------------|---------------|
| During not normal operation | LED Pulse | 3sec ON / --- OFF | Under voltage |

L1 (green LED) & L2 (red LED)

| Device status | LED indication | ON / OFF Period | Description |
|-----------------------------|----------------------------|----------------------|-----------------|
| During normal operation | LED Pulse | 5sec ON / --- OFF | Device Start-up |
| During not normal operation | LED alternatively blinking | 500ms ON / 500ms OFF | EEPROM failure |

4.6 EIA-485 bus. Termination resistors and Fail-Safe Biasing mechanism

EIA-485 bus requires a 120Ω terminator resistor at each end of the bus to avoid signal reflections.

To prevent fail status detected by the receivers, which are “listening” the bus, when all the transmitters’ outputs are in three-state (high impedance), it is also required a fail-safe biasing mechanism. This mechanism provides a safe

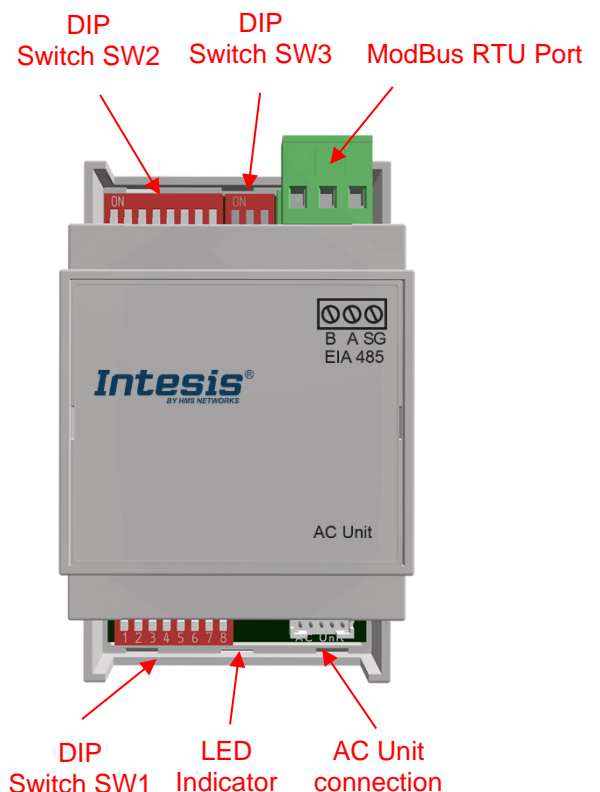
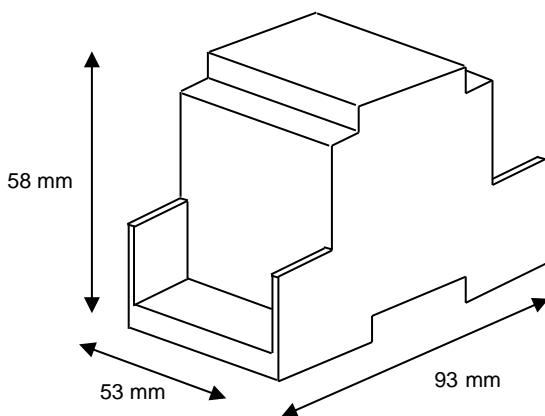
status (a correct voltage level) in the bus when all the transmitters' outputs are in three-state. This mechanism must be supplied by the Modbus Master.

The INMBSFGL001I000 device includes an on-board terminator resistor of 120Ω that can be connected to the EIA-485 bus by using DIP-switch SW4.

Some Modbus RTU EIA-485 Master devices can provide also internal 120Ω terminator resistor and/or fail-safe biasing mechanism (Check the technical documentation of the Master device connected to the EIA-485 network in each case).

5 Mechanical & electrical characteristics

| | | | |
|---|--|-----------------------|--------------------------------------|
| Enclosure | Plastic, type PC (UL 94 V-0) Net dimensions (dxwxh): 93 x 53 x 58 mm / 3.7" x 2.1" x 2.3" Color: Light Grey. RAL 7035 | Operation Temperature | 0°C to +70°C |
| Weight | 85 g. | Stock Temperature | -20°C to +85°C |
| Mounting | Wall DIN rail EN60715 TH35. | Operational Humidity | <95% RH, non-condensing |
| Terminal Wiring (for low-voltage signals) | For terminal: solid wires or stranded wires (twisted or with ferrule) 1 core: 0.5mm ² ... 2.5mm ² 2 cores: 0.5mm ² ... 1.5mm ² 3 cores: not permitted | Stock Humidity | <95% RH, non-condensing |
| ModBus RTU port | 1 x EIA485 Plug-in screw terminal block (2 poles + GND) with 120 Ω resistor termination and polatization selectable by switch. | Isolation voltage | 1500 VDC |
| AC unit port | 1 x Specific connector Specific cable included | Isolation resistance | 1000 MΩ |
| Switch 1 (SW1) | 1 x DIP-Switch for Air Conditioner Unit + ModBus baud rate | Protection | IP20 |
| Switch 3 (SW3) | 1 x DIP-Switch for ModBus RTU slave address + temperature magnitude (°C/°F) and scale (x1/x10). | LED indicators | 2 x Onboard LED - Operational status |



6 AC Unit Types compatibility

Please, check compatibility list at to know which Fujitsu units are compatible with our gateway.

https://www.intesis.com/docs/compatibilities/inxxfgl001i000_compatibility

7 Error codes

7.1 Intesis Codes

| Error Code Modbus | Error in Remote Controller | Error Description |
|-------------------|----------------------------|---|
| 0 | N/A | No active error |
| 65535 (-1) | N/A | Error in the communication of INMBSFGL001I000 or Remote Controller with the AC unit |

7.2 RAC and VRF J-II / V-II / VR-II series

| Error Code Modbus | Error in Remote Controller | System | Error Description |
|-------------------|----------------------------|-------------------------------------|--|
| 0 | 00 | RAC Inverter and Non Inverter | Wired remote controller error |
| 1 | 01 | | Indoor signal error |
| 2 | 02 | | Indoor room temperature sensor error |
| 3 | 03 | | Indoor room temperature sensor error |
| 4 | 04 | | Indoor heat exchanger temperature sensor (middle) error |
| 5 | 05 | | Indoor heat exchanger temperature sensor (middle) error |
| 6 | 06 | | Outdoor heat exchanger temperature sensor (outlet) error |
| 7 | 07 | | Outdoor heat exchanger temperature sensor (outlet) error |
| 8 | 08 | | Power voltage error |
| 9 | 09 | | Float switch operated |
| 10 | 0A | | Outdoor temperature sensor error |
| 11 | 0b | | Outdoor temperature sensor error |
| 12 | 0C | | Outdoor discharge pipe temperature sensor error |
| 13 | 0d | | Outdoor discharge pipe temperature sensor error |
| 14 | 0E | | Heat sink thermistor (Inverter) error |
| 15 | 0F | | Discharge temperature error |
| 17 | 11 | | Indoor unit EEPROM error |
| 18 | 12 | | Indoor fan error |
| 19 | 13 | | Indoor signal error |
| 20 | 14 | | Outdoor EEPROM error |
| 21 | 15 | | Compressor temperature sensor error |
| 22 | 16 | | Pressure switch abnormal, Pressure sensor error |
| 23 | 17 | | IPM protection |
| 24 | 18 | | CT error |
| 25 | 19 | | Active filter error |
| 26 | 1A | | INV voltage protection |
| 27 | 1b | | Compressor location error |
| 28 | 1C | | Outdoor fan error |
| 29 | 1d | | Outdoor unit computer communication error |
| 30 | 1E | | 2-way valve temperature sensor error |
| 31 | 1F | | 3-way valve temperature sensor error |
| 32 | 20 | | Connected indoor unit error |
| 33 | 21 | | Indoor MANUAL AUTO switch error |
| 34 | 22 | | reverse VDD permanent stop protection |
| 36 | 24 | | VDD permanent stop protection |
| 37 | 25 | | Excessive high pressure protection on cooling |
| 38 | 26 | | P.F.C. circuit error |
| 39 | 27 | | Indoor signal error |
| 40 | 28 | | Indoor signal error |
| 41 | 29 | | Indoor heat exchanger temperature sensor (inlet) error |
| 42 | 2A | | Outdoor heat exchanger temperature sensor (middle) error |
| 43 | 2b | | Power supply frequency detection error |
| 44 | 2C | | Compressor temperature error |
| | | | 4-way valve error |

| Error Code Modbus | Error in Remote Controller | System | Error Description |
|-------------------|----------------------------|---|---|
| 45 | 2d | RAC Inverter and Non Inverter | Heat sink thermistor P.F.C. error |
| 46 | 2E | | Indoor unit damper error |
| 47 | 2F | | Inverter error |
| 48 | 30 | | Low pressure error |
| 49 | 31 | | Refrigerant circuit address set-up error |
| 50 | 32 | | Master unit, Slave unit set-up error |
| 51 | 33 | | Connected the indoor number set-up error |
| 52 | 34 | | P.F.C. printed circuit board error |
| 53 | 35 | | Indoor fan 2 error |
| 54 | 36 | | Control box thermistor error |
| 55 | 37 | | Indoor unit CT error |
| 56 | 38 | Indoor fan motor 1 driving circuit error | |
| | | | Indoor fan motor 2 driving circuit error |
| 117 | 11 | RAC Inverter Models G series VRF J-II/V-II/VR-II Series | Serial communication error between indoor/outdoor units |
| 118 | 12 | | Remote controller communication error |
| 119 | 13 | | Communication error between outdoor units |
| 120 | 14 | | Network communication error |
| 121 | 15 | | Scan error |
| 122 | 16 | | Peripheral unit communication error |
| 123 | 17 | | Electricity charge apportionment error |
| 133 | 21 | | Indoor unit initial setting error |
| 134 | 22 | | Indoor unit capacity abnormal |
| 135 | 23 | | Incompatible series connection error |
| 136 | 24 | | Connection unit number error |
| 137 | 25 | | Connection pipe length error |
| 138 | 26 | | Indoor unit address setting error |
| 139 | 27 | | Master/slave unit setting error |
| 140 | 28 | | Other setting error |
| 141 | 29 | | Connection unit number error in wired remote controller system |
| 149 | 31 | | Indoor unit power supply abnormal |
| 150 | 32 | | Indoor unit main PCB error |
| 151 | 33 | | Indoor unit display PCB error |
| 152 | 34 | | Power relay error |
| 153 | 35 | | Indoor unit manual auto switch error |
| 154 | 36 | | Heater relay error |
| 155 | 37 | | Indoor unit transmission PCB error |
| 156 | 38 | | Network convertor PCB error |
| 157 | 39 | | Indoor unit power supply circuit error |
| 158 | 3A | | Indoor unit communication circuit (wired remote controller) error |
| 165 | 41 | | Indoor unit room temp. thermistor error |
| 166 | 42 | | Indoor unit heat ex. temp. thermistor error |
| 167 | 43 | | Humidity sensor error |
| 168 | 44 | | Light sensor error |
| 169 | 45 | | Gas sensor error |
| 170 | 46 | | Float sensor error |
| 171 | 47 | | Water temperature sensor error |
| 172 | 48 | | Warm water flow rate sensor error |
| 173 | 49 | | Heater sensor error |
| 181 | 51 | | Indoor unit fan motor 1 error |
| 182 | 52 | | Indoor unit coil (expansion valve) error |
| 183 | 53 | | Indoor unit water drain abnormal |
| 184 | 54 | | Air cleaning function error |
| 185 | 55 | Filter cleaning function error | |
| 186 | 56 | Water circulation pump error | |
| 187 | 57 | Indoor unit damper error | |
| 188 | 58 | Indoor unit intake grille position error | |
| 189 | 59 | Indoor unit fan motor 2 error | |

| Error Code Modbus | Error in Remote Controller | System | Error Description |
|-------------------|----------------------------|--|--|
| 195 | 5U | RAC Inverter Models G series | Indoor unit miscellaneous error |
| 197 | 61 | | Outdoor unit power supply abnormal |
| 198 | 62 | | Outdoor unit main PCB error |
| 199 | 63 | | Outdoor unit inverter PCB error |
| 200 | 64 | | Outdoor unit active filter/PFC circuit error |
| 201 | 65 | | Outdoor unit IPM error |
| 202 | 66 | | Convertor distinction error |
| 203 | 67 | | Outdoor unit power short interruption error (protective operation) |
| 204 | 68 | | Outdoor unit magnetic relay error |
| 205 | 69 | | Outdoor unit transmission PCB error |
| 206 | 6A | | Outdoor unit display PCB error |
| 213 | 71 | | Outdoor unit discharge temp. thermistor error |
| 214 | 72 | | Outdoor unit compressor temp. thermistor error |
| 215 | 73 | | Outdoor unit heat ex. temp. thermistor error |
| 216 | 74 | | Outside air temp. thermistor error |
| 217 | 75 | | Outdoor unit suction gas temp. thermistor error |
| 218 | 76 | | Outdoor unit operating valve thermistor error |
| 219 | 77 | | Outdoor unit heat sink temp. thermistor error |
| 220 | 78 | | Expansion valve temperature sensor error |
| 229 | 81 | | Receiver liquid level detection sensor error |
| 230 | 82 | | Outdoor unit sub-cool heat ex. gas temp. thermistor error |
| 231 | 83 | | Outdoor unit liquid pipe temp. thermistor error |
| 232 | 84 | | Outdoor unit current sensor error |
| 233 | 85 | | Fan motor current sensor error |
| 234 | 86 | | Outdoor unit pressure sensor error |
| 235 | 87 | | Oil sensor error |
| 245 | 91 | | Outdoor unit compressor 1 error |
| 246 | 92 | | Outdoor unit compressor 2 error |
| 247 | 93 | | Outdoor unit compressor start up error |
| 248 | 94 | | Outdoor unit trip detection |
| 249 | 95 | | Outdoor unit compressor motor control error |
| 250 | 96 | | Open loop error (Field-weakening relevant) |
| 251 | 97 | | Outdoor unit fan motor 1 error |
| 252 | 98 | | Outdoor unit fan motor 2 error |
| 253 | 99 | | Outdoor unit 4-way valve error |
| 254 | 9A | | Outdoor unit coil (expansion valve) error |
| 259 | 9U | | Outdoor unit miscellaneous error |
| 261 | A1 | | Outdoor unit discharge temperature 1 error |
| 262 | A2 | | Outdoor unit discharge temperature 2 error |
| 263 | A3 | | Outdoor unit compressor temperature error |
| 264 | A4 | | Outdoor unit pressure error 1 |
| 265 | A5 | | Outdoor unit pressure error 2 |
| 266 | A6 | | Outdoor unit heat exchanger temperature error |
| 267 | A7 | Suction temperature abnormal | |
| 268 | A8 | Poor refrigerant circulation | |
| 269 | A9 | Current overload error | |
| 270 | AA | Outdoor unit special operation error | |
| 271 | AC | Ambient temperature error | |
| 272 | AF | Out of the possible operation range | |
| 273 | AJ | Freeze protection operated | |
| 277 | C1 | Peripheral unit main PCB error | |
| 278 | C2 | Peripheral unit transmission PCB error | |
| 279 | C3 | Peripheral unit PCB 1 error | |
| 280 | C4 | PCB 2 error | |
| 281 | C5 | PCB 3 error | |
| 282 | C6 | PCB 4 error | |
| 283 | C7 | PCB 5 error | |

| Error Code Modbus | Error in Remote Controller | System | Error Description | |
|-------------------|----------------------------|---------------------------------------|---|---|
| 284 | C8 | RAC Inverter Models G series | Peripheral unit input device error | |
| 285 | C9 | | Display device error | |
| 286 | CA | | EEPROM error | |
| 287 | CC | | Peripheral unit sensor error | |
| 288 | CF | | Peripheral unit external connector error (USB memory) | |
| 289 | CJ | | Other parts error | |
| 293 | F1 | | System tool software error | |
| 294 | F2 | | System tool adaptor error | |
| 295 | F3 | | System tool interface error | |
| 296 | F4 | | System tool environment error | |
| 309 | J1 | | VRF J-II/V-II/VR-II Series | RB unit error |
| 310 | J2 | | | Branch boxes error |
| 311 | J3 | | | Total heat exchanging, ventilation unit error |
| 312 | J4 | Domestic hot water unit error | | |
| 313 | J5 | Zone control interface error | | |

7.3 VRF V / S / J Series

| Error Code Modbus | Error in Remote Controller | System | Error Description |
|-------------------|----------------------------|----------------------------|---|
| 0 | 00 | VRF V / S / J Series | No Error |
| 2 | 02 | | Model information Error |
| 4 | 04 | | Power frequency Error |
| 6 | 06 | | EEPROM access Error |
| 7 | 07 | | EEPROM deletion Error |
| 9 | 09 | | Room sensor Error |
| 10 | 0A | | Heat Ex. Middle Sensor Error |
| 11 | 0b | | Heat Ex. Inlet sensor Error |
| 12 | 0C | | Heat Ex. Outlet sensor Error |
| 13 | 0d | | Blower temperature thermistor Error |
| 17 | 11 | | Drain Error |
| 18 | 12 | | Room temperature Error |
| 19 | 13 | | Indoor fan motor Error |
| 20 | 18 | | Standard wired remote Error |
| 31 | 1F | | Standard wired token Error |
| 32 | 20 | | Network communication Error |
| 33 | 21 | | Node setting error |
| 34 | 32 | | Communication Error between Main PCB & Transmission PCB |
| | | | Outdoor unit Error |

In case you detect an error code not listed, contact your nearest Fujitsu technical support service for more information on the error meaning.