Procon
A1M

FOR INSTALLERS

INSTALLATION MANUAL
Version 1.1.1

For safe and correct use, please read this installation manual thoroughly before installing the PROCON A1M.

MITSUBISHI ELECTRIC

Preface

Safety warnings

⚠ **Caution:**

Do not expose to rain or moisture.

⚠ **Shielded Signal Cables:**

Use only shielded cables for connecting peripherals to any Procon A1M device to reduce the possibility of interference with radio communications services. Using shielded cables ensures that you maintain the appropriate EMC classification for the intended environment.

⚠ **CE Notice:**

This product has been determined to be in compliance with 2004/108/EC (EMC Directive) and amendments of the European Union.

⚠ **European Union, Class A:**

Class A products are intended for use in non-residential/non-domestic environments. Class A products may also be utilized in residential/domestic environments but may cause interference and require the user to take adequate corrective measures.

This is a Class A product. In a domestic environment this product may cause radio frequency interference in which case the user may be required to take adequate measures.

A "Declaration of Conformity" in accordance with the preceding directives and standards has been made and is available on request.

If this equipment does cause interference with radio communications services, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

Reorient the receiving antenna.
Relocate the Procon A1M with respect to the receiver.
Move the Procon A1M away from the receiver.

If necessary, consult a Procon A1M technical support representative or an experienced radio/television or EMC technician for additional suggestions.
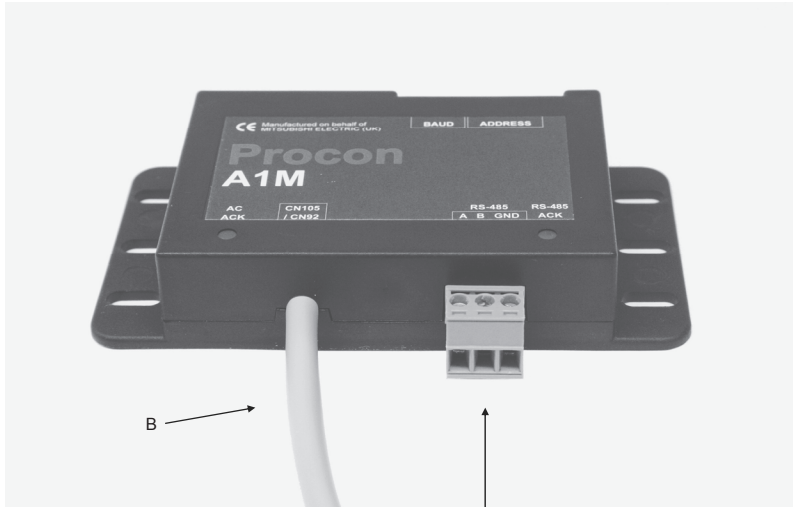
Disclaimer

⚠ **Warranty:**

All products manufactured on behalf of Mitsubishi Electric UK are warranted against defective materials for a period of three years from the date of delivery to the original purchaser.

⚠ **Warning:**

Mitsubishi Electric UK assumes no liability for damages consequent to the user of this product. We reserve the right to change this manual at any time without notice. The information furnished by us is believed to be accurate and reliable. However, no responsibility is assumed by us for its use, nor for any infringements of patents or other rights of third parties resulting from its use.

1

[Fig. 1]

A	RS-485 connector
B	CN105/CN92 connection lead

2

[Fig. 2]

Contents

1. Safety precautions

> ➤ **Before installing the unit, make sure you read all the "Safety precautions"**
>
> ➤ **The "Safety precautions" provide very important points regarding safety. Make sure you follow them**

Symbols used in the text

⚠ **Warning:**

Describes precautions that should be observed to prevent danger of injury or death to the user.

⚠ **Caution:**

Describes precautions that should be observed to prevent damage to the unit.

⚠ **Warning:**

- **Ask the dealer or an authorised technician to install the unit**
  - Improper installation by the user may result in electric shock, or fire
- **Use the specified cables for wiring. Make the connections securely so that any outside forces acting on the cables are not applied to the terminals**
  - Inadequate connection and fastening may generate heat and cause a fire
- **Never repair the unit. If the controller must be repaired, consult the dealer**
  - If the unit is repaired improperly, electric shock, or fire may result
- **Have all electric work done by a licensed electrician according to "Electric Facility Engineering Standard", "Interior Wire Regulations" and the instructions given in this manual and always use a special circuit**
  - If the power source capacity is inadequate or electric work is performed improperly, electric shock and fire may result
- **Keep the electric parts away from any water - washing water etc…**
  - Contact may result in electric shock, fire or smoke
- **To dispose of this product, consult your dealer**

⚠ **Caution:**

- **Safely dispose of the packing materials**
  - Packing materials, such as nails and other metal or wooden parts, may cause stabs or other injuries
  - Tear apart and throw away plastic packaging bags so that children will not play with them - If children play with a plastic bag which has not been torn apart, they face the risk of suffocation

2. Overview

The Procon A1M Protocol Converter is used for remote monitoring and control of M-, S- and P-series split air conditioning systems. It acts as a gateway between the split system and external third party equipment.

The A1M continuously reads data from the indoor unit and changes configuration when necessary. Because the reading is continuous the A1M always stores up-to-date data. This data is then available to external devices through the RS-485 port using the Modbus RTU software protocol. Values can be read and changed via this connection. Please refer to the Modbus section for further information.

The A1M is powered from the indoor unit when connected via the CN105/CN92 connector, hence no external power supply is needed.

⚠ **Caution:**

MAC-397IF and MAC-399IF units cannot be connected when the Procon A1M is connected, as the same CN105/CN92 connector is used.

Figure 1 shows the A1M converter.

Figure 2 shows the CN105/CN92 connector on the indoor unit PCB that the A1M connects to.

3. Settings

There is a bank of 8 DIP switches on the Procon A1M PCB labelled as 'CONFIGURATION'. These switches are used to configure the Modbus Slave ID and the RS-485 baud rate.

3.1. Modbus Slave ID

Any Modbus Slave ID in the range 1 – 31 can be chosen using switches 1 – 5. The address is set in binary, where the switch positions have the following values:

Switch number	Value when switch is set to ON
1	1
2	2
3	4
4	8
5	16

To get the Slave ID, add together the value for each switch set to ON. For example, to set address 13, set switches 1, 3 and 4 ON (1 + 4 + 8 = slave ID 13).

Please note: Each Procon A1M connected to the same RS-485 network must be set to a unique address.

3.2. Baud rate

The baud rate can be set to values from 1200 up to 115200 baud using DIP switches 6 – 8 as follows:

Baud rate	Switch 6	Switch 7	Switch 8
1200	OFF	OFF	OFF
2400	ON	OFF	OFF
4800	OFF	ON	OFF
9600	ON	ON	OFF
19200	OFF	OFF	ON
38400	ON	OFF	ON
57600	OFF	ON	ON
115200	ON	ON	ON

3.3. Other communication settings

All other communication settings are fixed:
- 8 Data Bits
- No Parity
- 1 Stop Bit

3.4. RS-485 termination

RS-485 termination resistors can also be enabled on the A1M PCB using a single jumper. These settings are summarised below:

Jumper Setting	Description
Not connected	No termination or pull-up resistors enabled
LK1	Pull-up resistor A enabled
LK2	RS-485 termination resistor enabled
LK3	Pull-down resistor B enabled

4. Installation

4.1. Physical connection between the Procon A1M and M-, S-, and P-Series indoor units

The Procon A1M has a 1 metre flying lead to connect directly into the CN105/CN92 connector on the indoor unit controller PCB. As an example, Figure 2 shows this connection on a Mr Slim indoor unit.

4.2. Power supply

The Procon A1M is powered from the CN105/CN92 connector and hence does not require an external power supply.

4.3. Modbus connections

The Procon A1M has a 3-way screw terminal to provide Modbus RTU communication via RS-485. Figure 1 shows the RS-485 connections. The Modbus section contains further detail of the Modbus communications.

5. Status LEDs

There are 2 status LEDs on the Procon A1M. The LED indications are as follows:

LED Name	Colour	Functionality
LED1	Green	Lit when A1M is powered, flashing indicates valid communication with the indoor unit.
LED2	Green	Lit when A1M is powered, flashing indicates valid Modbus communication.

Please note: if one or both of the LEDs are permanently on, this indicates that the Procon A1M is powered successfully, but no communication traffic is present. In this case please check the Slave ID settings, and ensure the CN105/CN92 connector is seated correctly.

6. Modbus connection

6.1. Modbus background

Modbus is a master-slave protocol, which means there are two types of Modbus device, Modbus *Masters* and Modbus *Slaves*.

Slave devices simply wait until they receive a command from a Master, act upon that command and send a reply to the Master. Slaves do not have the ability to send commands to other devices on the bus. Master devices are responsible for sending commands to slave devices and receiving data. Modbus only permits there to be one Master device on the bus at any one time, but up to 247 slaves can be connected at a time.

Modbus is most commonly used over RS-485, which is a hardware standard allowing multiple devices to be connected on the same bus.

Each Slave device must have a unique ID on the bus, which is referred to as a *Slave ID*. Each Modbus command the Master sends will contain this Slave ID and only the Slave with that Slave ID will reply.

6.2. Modbus connections

For communication over RS-485 all 3 connections are needed. These are labelled A, B and GND. Please refer to the connection diagrams below.

⚠ **Caution:**

The RS-485 cable must be a shielded data cable. Mains flex or other unshielded cable should not be used. The cable shield should be connected to GND at one end only.

⚠ **Caution:**

RS-485 has polarised data connections. It is crucial that all 'A's are connected together, all 'B's are connected together and all 'GND's are connected together.

⚠ **Caution:**

The RS-485 cable must be daisy-chained in a bus network. T-junctions (e.g. star network wiring) are not permitted.

⚠ **Caution:**

RS-485 biasing jumpers must be fitted on the M2M. Please refer to the diagram below.
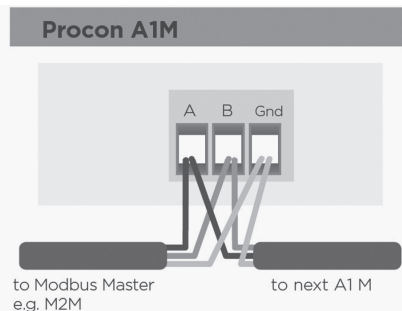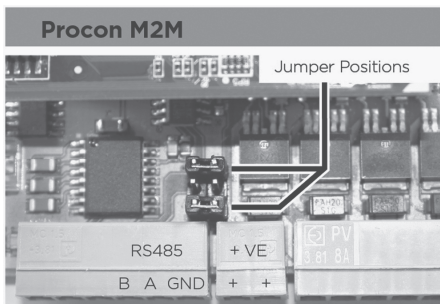
7. Modbus tables

7.1. Modbus registers

Modbus Slave devices store data in registers. There are four register types and each type has its own register bank. The register types are summarised below:

Register Name	Register Type	Description
Discrete Input	Digital Input	Read only register used for holding status information which holds a value of 0 or 1.
Coil	Digital Output	Read and write accessible register which holds a value of 0 or 1.
Input Register	Analogue Input	Read only register used for status information which holds a 16-bit value (0-65535)
Holding Register	Analogue Output	Read and write accessible register used for status information which holds a 16-bit value (0-65535)

7.2. Discrete Inputs

This device has no Discrete Inputs.

7.3. Coils

Coils are read using function code 01 and written to using either function code 05 or 15. Function code 05 is used when writing to a single coil register, function code 15 is used for writing to multiple coil registers in the same command.

Coils (Digital Outputs)			
Register Name	Location (decimal)	Length	Details
Drive On/Off	0	1	0x00 = Drive off 0x01 = Drive on

7.4. Input registers

Input Registers are read using function code 04.

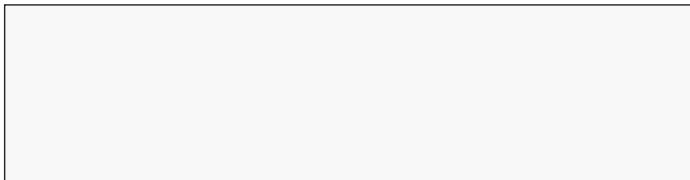| Input Registers (Analogue Inputs)			
Register Name	Location (decimal)	Length	Details
Room Temperature in °C	0	1	Holds a temperature value in °C multiplied by 10. E.g. a value of 200 = 20°C
Fault Code	1	1	0x8000 = No error 0x6999 = Bad communication with indoor unit

7.5. Holding registers

Holding Registers are read using function code 03 and written to using either function code 06 or 16. Function code 06 is used when writing to a single holding register, function code 16 is used for writing to multiple holding registers in the same command.

Holding Registers (Analogue Outputs)			
Register Name	Location (decimal)	Length	Details
Drive Mode	0	1	0x01 = Heating 0x02 = Humidity reduction 0x03 = Cooling 0x07 = Ventilation, clean air operation 0x08 = Auto Operation 0x09 = i-see heating operation* 0x0A = i-see humidity reduction* 0x0B = i-see cooling * * indicates a read only value, writing this value will have no effect
Temperature Setpoint in °C	1	1	Holds a temperature value in °C multiplied by 10. E.g. a value of 200 = 20°C
Fan Speed	2	1	0x00 = Auto 0x02 = Quiet 0x03 = Weak 0x05 = Strong 0x06 = Very strong (SH i)
Air Direction	3	1	0x00 = Auto 0x01 = Position 1 0x02 = Position 2 0x03 = Position 3 0x04 = Position 4 0x05 = Position 5 0x07 = Swing

Please be sure to put the contact address/telephone number on
this manual before handing it to the customer.

MITSUBISHI ELECTRIC UK

MITSUBISHI ELECTRIC UK, TRAVELLERS LANE, HATFIELD, HERTFORDSHIRE, AL10 8XB