Installation Instructions

Procon

BAC-A/50

MITSUBISHI ELECTRIC

1. Product Overview

The Procon BAC-A/50 unit allows a BACnet/IP building management system(BMS) to monitor and control Mitsubishi Mr.SLIM air-conditioning units. Up to 50 units can be handled.
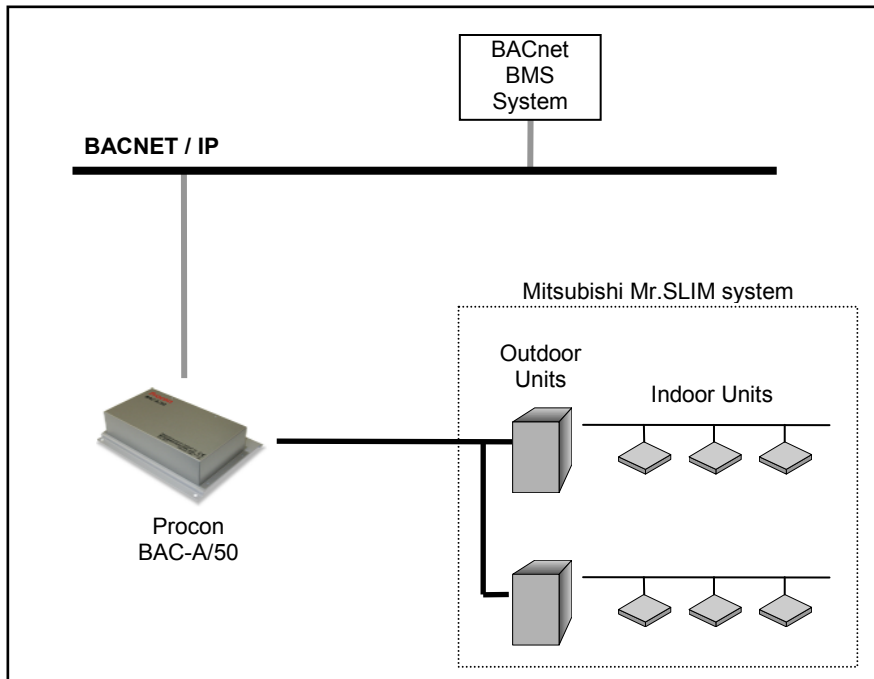

Fig.1 System Configuration Example

1.1 Supplied Parts

No.	Part Name	Quantity
1	Procon BAC-A/50	1
2	Cat-5 'Straight Through' Patch Lead	1
3	Installation Manual	1

2. Connection Details

All electrical work should be carried out by a competent person and wiring must be in accordance with the national electrical installation regulations.
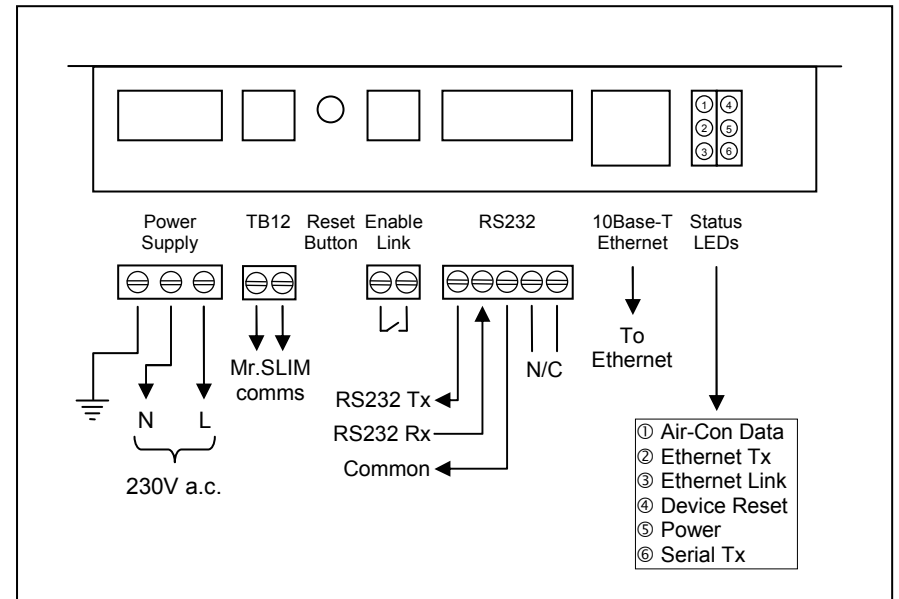

Fig.2 Connection Details

2.1 TB12

The Sub I/F communications link is attached to these terminals.

2.2 Ethernet

The Procon BAC-IP/50 is a 10Base-T half duplex device and needs to be connected to the BACnet/IP network.

2.3 RS232

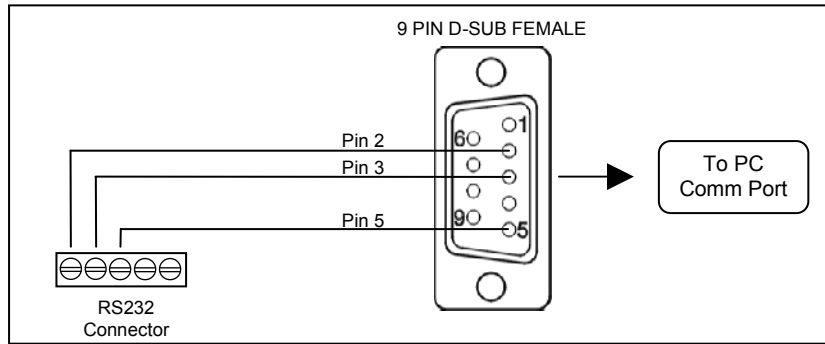Serial communications port currently only used for unit configuration and updating the firmware.

9 PIN D-SUB FEMALE

Pin 2
Pin 3
Pin 5

To PC
Comm Port

RS232
Connector

Fig.3 RS232 Comms Lead Wiring Diagram

2.4 Enable Link

Allows a normally-closed volt-free contact to set or reset the 'Forced-Off' feature. While the 'Forced-Off' feature is enabled, all air-conditioning units are switched off.
Upon detection of the open contact, the Procon unit sends the 'Forced-Off' Set command, and resends at 5 seconds intervals while the contact is open.
As soon as the contact closes, the Procon unit sends the 'Forced-Off' Reset command once only. This ensures that any subsequent 'Forced-Off' commands sent via the BACnet BMS system are not overridden.

Note: The Procon BAC-A/50 comes supplied with a wire link across the Enable Link terminals.

2.5 Power Supply

The Procon BAC-A/50 requires 230V a.c.

THIS EQUIPMENT MUST BE EARTHED

3. Air-Conditioning Configuration

Procon BAC-A/50 — TB12

Outdoor Unit — Sub I/F

Indoor Unit

R/C

Outdoor Unit — Sub I/F

Indoor Unit

Indoor Unit

R/C

To The Next Sub I/F
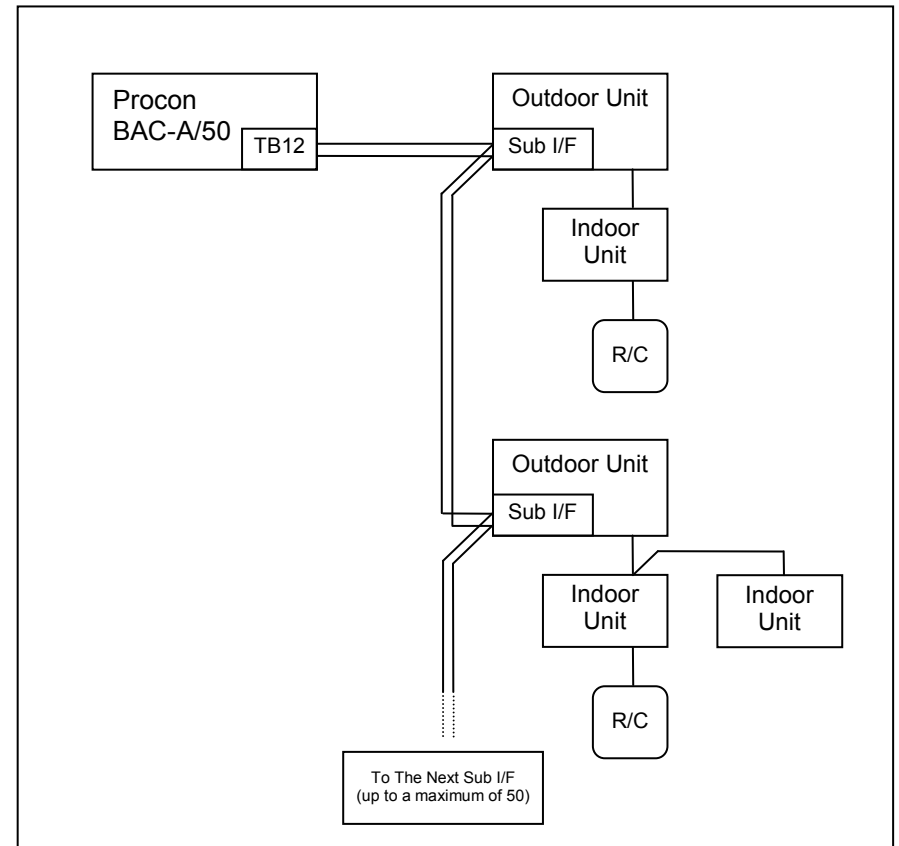(up to a maximum of 50)

Fig.4 Wiring Example

Every outdoor unit must be fitted with a Sub I/F board and the address set accordingly. The Sub I/F boards are daisy-chained together and connected to the TB12 terminals on the Procon BAC-A/50.

4. Functional Description

When power is applied, the Reset LED will light for 2 seconds. A few seconds later the Procon unit will perform a complete scan of the air-conditioning system to discover which units exist. This scan includes all units up to the number stored in the ACtrl_Units_To_Scan register. During this initial scan no commands will be sent to the air-con units. Depending upon the number of units being scanned this could take anywhere from a few seconds to a few minutes.

Once the initial scan is complete, the Procon unit will continually poll all available units (1 unit every 2 seconds) and occasionally poll unavailable units to see if they become available.

The Air-Con Data LED gives an indication of the communication activity between the Procon unit and the air-con system:

'Double flash' :   a unit was polled and then replied shortly afterwards.

'Single flash' :   a unit was polled but no reply was received.

When an Ethernet cable is attached to the Procon unit the Ethernet Link LED should light to indicate a good connection to the network. The Ethernet Tx LED will light intermittently to show that the Procon unit is transmitting data to the network. This is a good indication that BACnet/IP messages are being correctly received.

5. BACnet Specification

The Procon BAC-A/50 is designed to work with a BACnet/IP network as described in the ANSI/ASHRAE Standard 135-2004.

Property	Setting
Segmentation	Not Supported
Maximum APDU length supported	206 octets
Object List	Supported
Device ID	User settable [1]
Device Name	User settable [1]
Object Names	User settable [1]

Notes: (1)   Only settable via PC configuration program.

5.1 Object Types

Object Type		Supported
Analog Input	0	Yes
Analog Output	1	Yes
Analog Value	2	Yes
Binary Input	3	Yes
Binary Output	4	Yes
Binary Value	5	Yes
Calendar	6	
Command	7	
Device	8	Yes
Event Enrollment	9	
File	10	
Group	11	
Loop	12	
Multi-State Input	13	Yes
Multi-State Output	14	Yes
Notification Class	15	
Program	16	
Schedule	17	
Averaging	18	
Multi-State Value	19	
Trend Log	20	

5.2 Service List

Supported Services	
Read Property	12
Read Property Multiple	14
Write Property	15
Write Property Multiple	16
Who-Has	33
I-Have	27
Who-Is	34
I-Am	36

5.3 Object List

Object	Object Type	Instance No.	'Present Value' Settings	Notes
On/Off (Setup)	Binary Output	1xxx01	Inactive:Off Active:On	
On/Off (State)	Binary Input	1xxx02	Inactive:Off Active:On	
Error Code	Analog Input	1xxx03	4 digit error code where 8000 = 'No Error'	
Operation Mode (Setup)	Multi-State Output	1xxx04	01: Cool 02: Dry 03: Fan 04: Heat 05: Auto 06: Ventilation	
Operation Mode (State)	Multi-State Input	1xxx05	01: Cool 02: Dry 03: Fan 04: Heat 05: Auto 06: Ventilation	
Fan Speed (Setup)	Multi-State Output	1xxx06	01: Low 02: Mid2 03: Mid1 04: High	
Fan Speed (State)	Multi-State Input	1xxx07	01: Low 02: Mid2 03: Mid1 04: High	
Room Temperature	Analog Input	1xxx08	8°C to 39°C	
Setpoint Temperature (Setup)	Analog Output	1xxx09	Cool/Dry : 19°C to 30°C Heat : 17°C to 28°C Auto : 19°C to 28°C Others:Fixed at 25°C	
Setpoint Temperature (State)	Analog Input	1xxx10	Cool/Dry : 19°C to 30°C Heat : 17°C to 28°C Auto : 19°C to 28°C Others:Fixed at 25°C	
Filter Sign (State)	Binary Input	1xxx11	Inactive:Sign Off Active:Sign On	
Filter Sign (Setup)	Binary Output	1xxx12	Inactive:Clear Sign Active:No Action	
Local Inhibit (Setup)	Binary Output	1xxx13	Inactive:Off Active:Inhibit	
Local Inhibit (State)	Binary Input	1xxx14	Inactive:Off Active:Inhibited	
(Unused)		1xxx15		
(Unused)		1xxx16		

Object	Object Type	Instance No.	'Present Value' Settings	Notes
(Unused)		1xxx17		
(Unused)		1xxx18		
(Unused)		1xxx19		
(Unused)		1xxx20		
(Unused)		1xxx21		
(Unused)		1xxx22		
ACtrl Units To Scan	Analog Value	100023	1 to 50	See Appendix C
System Forced Off	Binary Value	100024	Inactive:Off Active:On	See Appendix C
Enable Link State	Binary Input	100025	Inactive:Off Active:On	See Appendix C
New_Setting_Compare	Binary Value	100026	Inactive:Off Active: On	See Appendix C
Device	Device	zzz		zzz = 1 to 4194302

where   xxx represents unit address 001 to 050

5.4 Object Names

	Object	Object Name	Notes
1	On/Off (Setup)	nnn_ON_w	
2	On/Off (State)	nnn_ON_r	
3	Error Code	nnn_ECode	
4	Operation Mode (Setup)	nnn_MD_w	
5	Operation Mode (State)	nnn_MD_r	
6	Fan Speed (Setup)	nnn_FS_w	
7	Fan Speed (State)	nnn_FS_r	
8	Room Temperature	nnn_RA	
9	Setpoint Temperature (Setup)	nnn_SP_w	
10	Setpoint Temperature (State)	nnn_SP_r	
11	Filter Sign (State)	nnn_FL_r	
12	Filter Sign (Setup)	nnn_FL_w	
13	Local Inhibit (Setup)	nnn_LI_w	
14	Local Inhibit (State)	nnn_LI_r	
15	(Unused)		
16	(Unused)		
17	(Unused)		
18	(Unused)		
19	(Unused)		
20	(Unused)		
21	(Unused)		
22	(Unused)		
23	ACtrl Units To Scan	Sys_Units_To_Scan	
24	System Forced Off	Sys_Forced_Off_Ctrl	
25	Enable Link State	Sys_Enable_Link_State	
26	New_Setting_Compare	Sys_New_Setting_Compare	

where 'nnn' is the unit name entered via the configuration program.
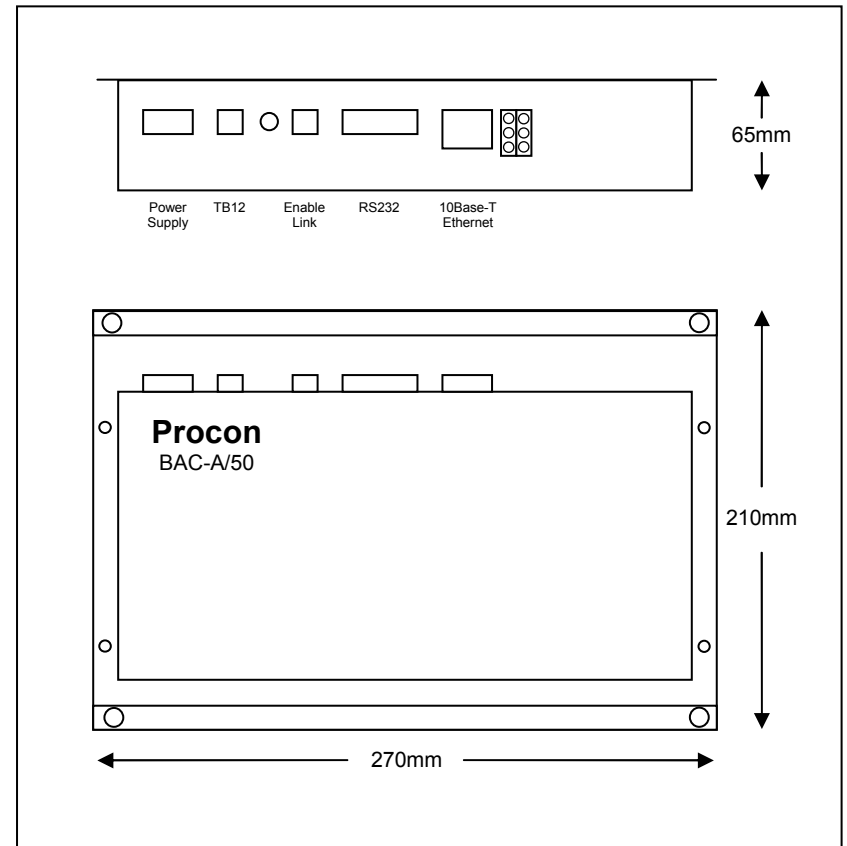
Appendix A : Physical Dimensions

Fig.5 Dimensions

Appendix B : Reset Button

The Reset button has 2 functions :

1) To restore various internal settings to their factory defaults,

2) To force the unit into 'bootloader' mode ready for a firmware update.

<u>Function 1 – Restore Factory Defaults</u>

There are 2 levels to this function.

Level 1 : With the unit already ON, press and hold in the reset button. After approximately 5 seconds the 'Device Reset' light will start to flash slowly. Releasing the reset button while the light is flashing slowly will activate Level 1, and then reset the unit.

Settings Restored: None

Level 2 : With the unit already ON, press and hold in the reset button. After approximately 5 seconds the 'Device Reset' light will start to flash slowly. Continue to hold in the reset button until the light starts to flash rapidly. Releasing the reset button while the light is flashing rapidly will activate Level 2, and then reset the unit.

Settings Restored:

IP Address	192.168.1.14
Gateway Address	192.168.1.14
Subnet Mask	255.255.255.0
BACnet Device ID	14
BACnet Device Name	Procon BAC-A/50
ACtrl Units to Scan	50

<u>Function 2 – Enable 'Bootloader' Mode</u>

Bootloader mode allows the firmware to be updated from a PC.

Press and hold in the reset button while powering up the unit. Continue to hold in the reset button for approx. 5 seconds, until the 'Device Reset' light begins to flash (Long ON, Short OFF). The unit is now in bootloader mode.

<u>Note</u>: Enabling the bootloader in this way is only necessary if the firmware update software fails to automatically put the unit into bootloader mode.

Appendix C : System Objects

There are 4 'System' objects contained within the Procon BAC-A/50. A description of each is detailed below.

System Object	Description
ACtrl_Units_To_Scan	Used to limit the number of fan coils being scanned. Any value between 1 and 50 is allowed. Note: Any change to this setting will only take effect when the unit is restarted.
System Forced Off	Writeable object to enable and disable the 'Forced Off' command.
Enable Link State	Provides an indication of whether the 'Enable Link' is present or not. Inactive : No Link Present Active : Link Present
New_Setting_Compare	Selects the way in which the Procon BAC-A/50 handles new command settings. Inactive : New command values are written regardless of the current setting. Active : New command values are only written if the new setting is different to the current setting. (Useful for systems which continuously write to the command parameters).

Appendix D : PICS

BACnet Protocol Implementation Conformance Statement (page 1)

Date: 06th November 2007
Vendor Name: Microtrol Limited
Product Name: Procon BAC-A/50
Product Model Number: RM2428
Product Version: 1.05
BACnet Protocol Version: 1
BACnet Protocol Revision: 4

Product Description:

The BAC-A/50 provides a gateway between a Mitsubishi Mr.SLIM air-conditioning system and a BACnet IP network. It allows for the direct control and monitoring of up to 50 air conditioners. The BAC-A/50 may be set to update the air conditioner parameters either on demand or only on change of setting value. The unit also incorporates a global On/Off command.

BACnet Standardized Device Profile (Annex L):

☐   BACnet Operator Workstation (B-OWS)
☐   BACnet Building Controller (B-BC)
☐   BACnet Advanced Application Controller (B-AAC)
☑   BACnet Application Specific Controller (B-ASC)
☐   BACnet Smart Sensor (B-SS)
☐   BACnet Smart Actuator (B-SA)

BACnet Interoperability Building Block Supported:

☐   Data Sharing-ReadProperty-A (DS-RP-A)
☑   Data Sharing-ReadProperty-B (DS-RP-B)
☐   Data Sharing-ReadPropertyMultiple-A (DS-RPM-A)
☑   Data Sharing-ReadPropertyMultiple-B (DS-RPM-B)
☐   Data Sharing-ReadPropertyConditional-A (DS-RPC-A)
☐   Data Sharing-ReadPropertyConditional-B (DS-RPC-B)
☐   Data Sharing-WriteProperty-A (DS-WP-A)
☑   Data Sharing-WriteProperty-B (DS-WP-B)
☐   Data Sharing-WritePropertyMultiple-A (DS-WPM-A)
☑   Data Sharing-WritePropertyMultiple-B (DS-WPM-B)
☐   Data Sharing-COV-A (DS-COV-A)
☐   Data Sharing-COV-B (DS-COV-B)
☐   Data Sharing-COVP-A (DS-COVP-A)
☐   Data Sharing-COVP-B (DS-COVP-B)
☐   Data Sharing-COV-Unsolicited-A (DS-COVU-A)
☐   Data Sharing-COV-Unsolicited-B (DS-COVU-B)

Segmentation Capability: None

BACnet Protocol Implementation Conformance Statement (page 2)

BACnet Standard Object Types Supported:
None of the objects are dynamically creatable or deletable

Object Type	Properties Supported	Writeable Properties
Analogue Input	object-identifier object-name object-type present-value status-flags event-state out-of-service units	None
Analogue Output	object-identifier object-name object-type present-value status-flags event-state out-of-service units priority-array relinquish-default	present-value
Analogue Value	object-identifier object-name object-type present-value status-flags event-state out-of-service	present-value
Binary Input	object-identifier object-name object-type present-value status-flags event-state out-of-service polarity	None
Binary Output	object-identifier object-name object-type present-value status-flags event-state out-of-service priority-array relinquish-default	present-value

BACnet Protocol Implementation Conformance Statement (page 3)

Object Type	Properties Supported	Writeable Properties
Binary Value	object-identifier object-name object-type present-value status-flags event-state out-of -service	present-value
Device	object-identifier object-name object-type system-status vendor-name vendor-identifier model-name firmware-revision application-software-version protocol-version protocol-services-supported protocol-object-types-supported object-list max-APDU-length-supported segmentation-supported apdu-timeout number-of APDU-retries device-address-binding database-revision	None
Multi-State Input	object-identifier object-name object-type present-value status-flags event-state out-of -service number-of-states state-text	None
Multi-State Output	object-identifier object-name object-type present-value status-flags event-state out-of -service number-of-states state-text priority-array relinquish-default	present-value

BACnet Protocol Implementation Conformance Statement (page 4)

Data Link Layer Options:

☑ BACnet IP, (Annex J)
☑ BACnet IP, (Annex J), Foreign Device
☐ ISO 8802-3, Ethernet (Clause 7) (10Base2, 10Base5, 10 BaseT, Fiber)
☐ ANSI/ATA 878.1, 2.5 Mb. ARCNET (Clause 8)
☐ ANSI/ATA 878.1, RS-485 ARCNET (Clause 8),baud rate(s)
☐ MS/TP master (Clause 9), baud rate(s):
☐ MS/TP slave (Clause 9), baud rate(s):
☐ Point-To-Point, EIA 232 (Clause 10), baud rate(s)
☐ Point-To-Point, modem (Clause 10), baud rate(s)
☐ LON Talk (Clause 11), medium:
☐ Other:

Device Address Binding:

☐ Support for Static Address Binding

Network Options:

☐ Router
☐ Annex H, BACnet Tunnelling
☐ BACnet/IP Broadcast Management Device (BBMD)
☐ BBMD support of registrations by foreign devices

Character Sets Supported:

☑ ANSI X3.4

non-BACnet Equipment Supported by this Unit:

The unit connects to a Mitsubishi Mr.SLIM air-conditioning system.

Revision 1.0

Document Revision History

Date	Document Ver	Firmware Ver	By	Comments
07/11/2007	v1.00	v1.05	mcb	First complete version.