MITSUBISHI ELECTRIC HYDRONICS & IT COOLING SYSTEMS S.p.A.

INTERFACE MANUAL

Translation of the original instructions

MANAGER 3000+

Version 02

EN

Before carrying out any operation on the machine,
you must carefully read this manual
and make sure you understand
all the instructions and information given

Keep this manual in a known and easily
accessible place to refer to as necessary
during the entire life-span of the unit.

Contents

SYMBOLS:

A number of symbols are used to highlight some parts of the text that are of particular importance. These are described below.

CAUTION:
Information on the occurrence of situations/operations which, if ignored or not duly acted upon, could put not only the Unit but also the functions of the Software and the various electronic parts at risk

OBLIGATION:
Indicates the need to take appropriate precautions/perform specific operations to avoid compromising protection of the points of access reserved for authorised operators and/or operators who guarantee the proper operation of the Unit

INFORMATION:
Indicates technical/functional information of particular importance which should not be overlooked

1 INSTALLING THE SERIAL BOARD

There are various types of communication protocols. A serial board connected to the controller on board of the unit must be used for each one of them.
Even if the serial board differ according to the supervisor to connect, the installation procedure on the controller is the same and comprises the following steps to be performed in order.
This procedure is not necessary if the serial board is already on board the unit.

INFORMATION:
The boards must not be powered during these operations

1. Identify the electronic controller on board the unit.
The images refer to the board with the largest number of terminals, but the procedure is the same even for smaller boards

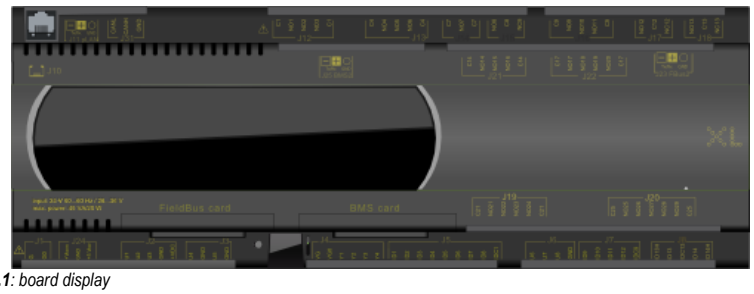


***Figure 1.1**: board display*

2. Remove the “BMS Card” cover from the controller using a screwdriver

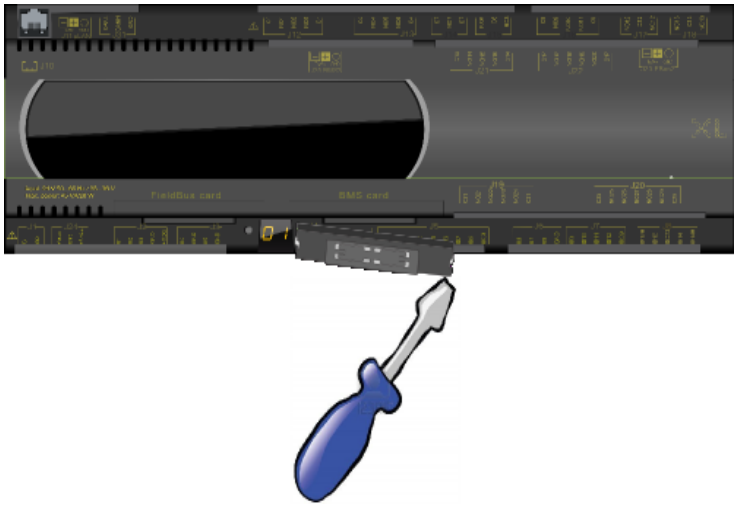


***Figure 1.2**: demonstration for removing the cover*

3. Push the interface board into its dedicated slot making sure it correctly engages the dedicated comb connector mounted in the controller

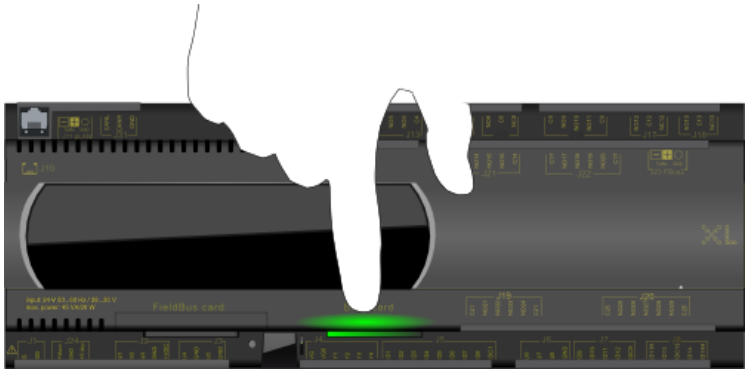


***Figure 1.3**: demonstration for inserting the board*

4. If necessary, remove the perforated plastic element with a pair of nippers to allow the serial board connector to pass through

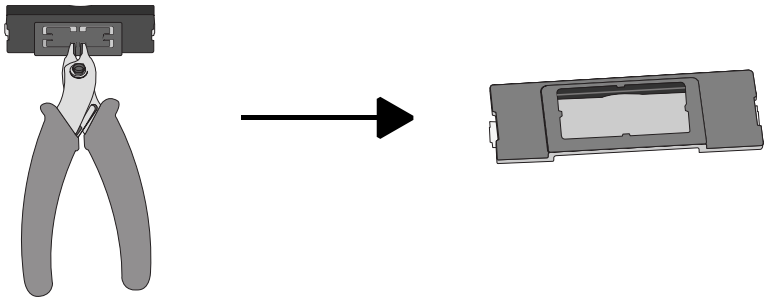


Figure 1.4: *demonstration for removing the perforated plastic*

5. Put back the cover making sure to match the hole in the cover with the engaged serial board connector

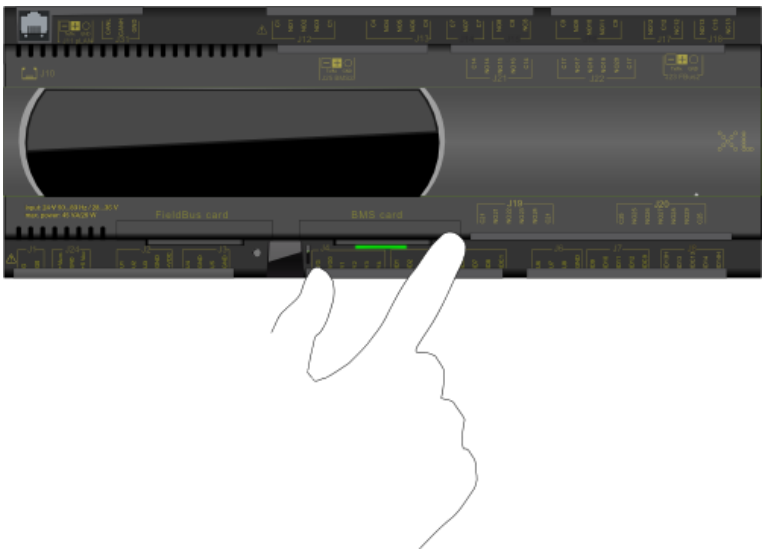


Figure 1.5: *demonstration for inserting the cover*

For units fitted with the +2P module, a dual serial board is required, one for the main control and the other for the remote control of the +2P module.
The interface database is identical for both controls.
Different ID's must be allocated to the two controls in order to prevent conflicts in the BMS network.

INFORMATION:
The connection to the FWS3000, FWS3 and Manager3000 system is unavailable on this type of unit

2 MODBUS INTERFACE

2.1 Components required

Interface board
MODBUS RTU (for RS485 serial line transmission) or MODBUS TCP/IP (for Ethernet cable transmission)

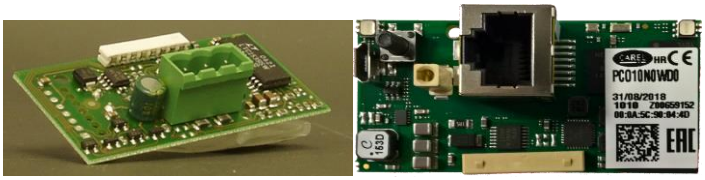


***Figure 2.1**: Interface board*

Gateway inside the Manager3000+ control panel if requested by the customer

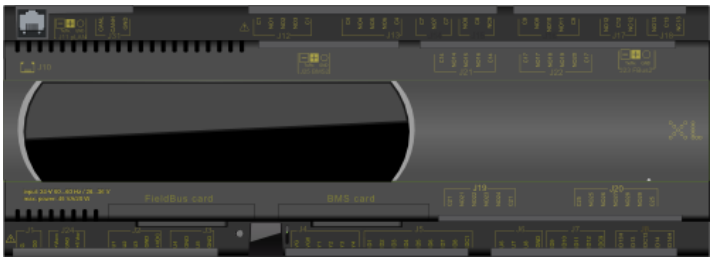


***Figure 2.2:** gateway*

2.2 Installing the serial interface board

Follow the points in paragraph 1 “Installing the serial board” to insert the MODBUS serial board into the controller.

2.3 Setting supervisor parameters

2.3.1 MODBUS RTU

The communication with the BMS requires the setting of dedicated parameters through the Web interface or the touchscreen (access the menu using the ☰ key and select the “Device Configuration” page) as described below:

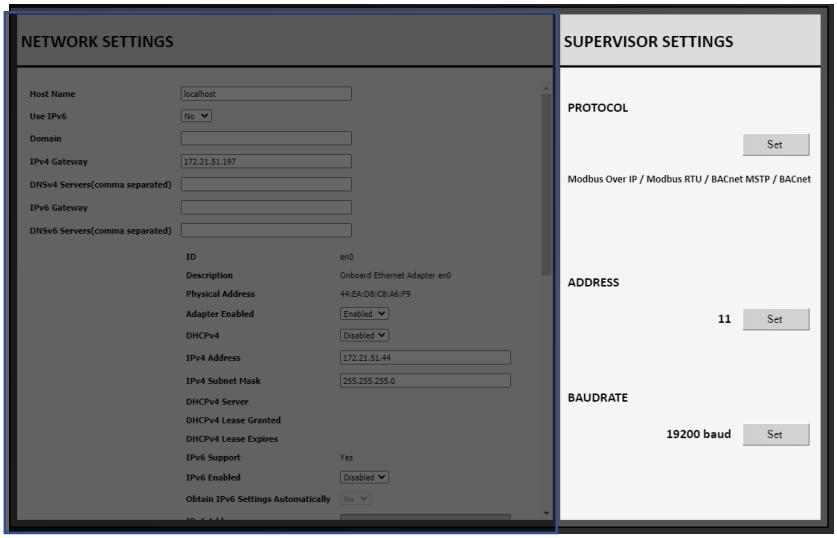


***Figure 2.3:** “Device Settings” screen*

In the SUPERVISOR SETTINGS section set

PROTOCOL	Modbus Over IP/Modbus RTU/ BACnet MSTP/BACnet
ADDRESS	Address to assign to MANAGER3000+ in the modbus network
BAUD RATE	Select the communication protocol speed

Other non-changeable settings for communication with the supervisor:

Protocol	Configuration

Modbus	Data Bit: 8 Parity: none Stop bits: 2 Start Address: 1

2.3.2 MODBUS Over IP

The communication with the BMS requires the setting of dedicated parameters through the Web interface or the touchscreen (access the menu using the ☰ key and select the "Device Configuration" page) as described below:

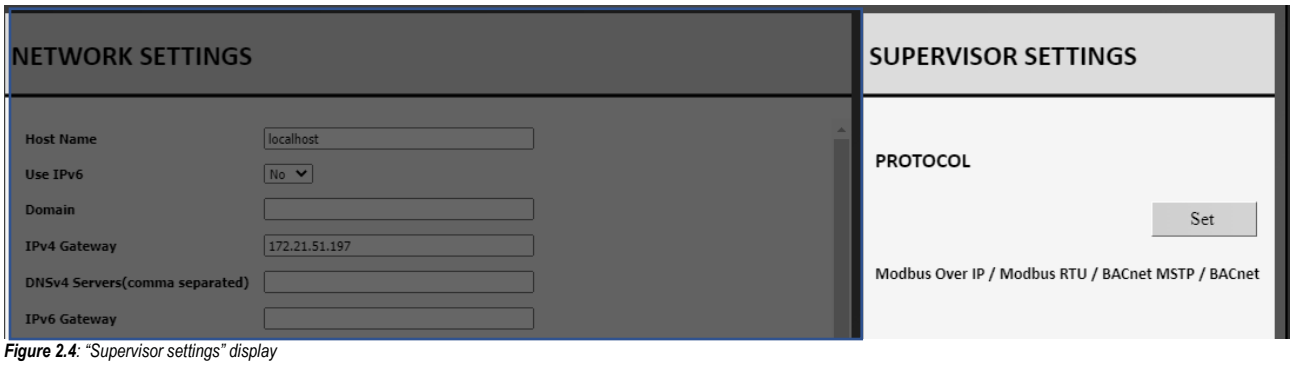


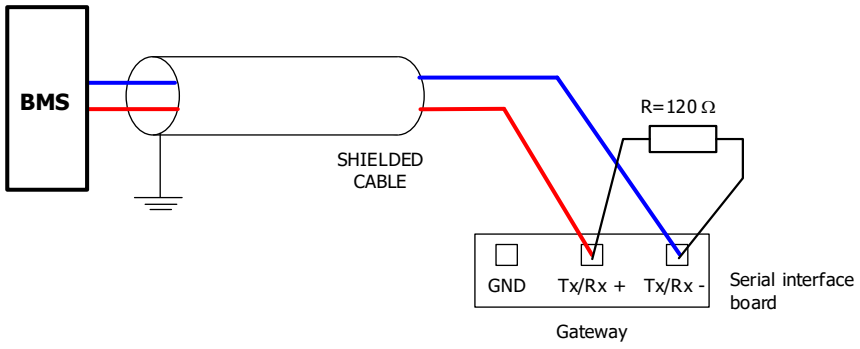
***Figure 2.4**: "Supervisor settings" display*

In the SUPERVISOR SETTINGS section set:

PROTOCOL	Modbus Over IP/ Modbus RTU/ BACnet MSTP/ BACnet

2.4 Setting up the supervisor network

The supervisor network must be set up as shown below:



Summary diagram showing a possible BMS supervision network layout

Special attention must be paid in the realisation of the serial line. This is an RS485 serial line, based on a balanced differential communication line with a characteristic impedance of 120 ohm.

The maximum length of the connection depends on the Baud-rate, background electrical noise, and the type and quality of the cable. Operation is generally guaranteed up to 1000 m.

For the serial line, use a twisted and shielded AWG 20/22 cable.
The serial connection is made with a single cable running from the BMS to the gateway.
The serial cable must be kept separate from the power cables.

Connect the shield of the connecting cable to earth in just one point.

2.5 Interface database

R: register C: coil	Address	Type	Flow	Description
R	001	A	OUT	Unit 1 evaporator inlet temperature
R	002	A	OUT	Unit 2 evaporator inlet temperature
R	003	A	OUT	Unit 3 evaporator inlet temperature
R	004	A	OUT	Unit 4 evaporator inlet temperature
R	005	A	OUT	Unit 5 evaporator inlet temperature
R	006	A	OUT	Unit 6 evaporator inlet temperature
R	007	A	OUT	Unit 7 evaporator inlet temperature
R	008	A	OUT	Unit 8 evaporator inlet temperature
R	017	A	OUT	Unit 1 evaporator outlet temperature
R	018	A	OUT	Unit 2 evaporator outlet temperature
R	019	A	OUT	Unit 3 evaporator outlet temperature
R	020	A	OUT	Unit 4 evaporator outlet temperature
R	021	A	OUT	Unit 5 evaporator outlet temperature
R	022	A	OUT	Unit 6 evaporator outlet temperature
R	023	A	OUT	Unit 7 evaporator outlet temperature
R	024	A	OUT	Unit 8 evaporator outlet temperature
R	033	A	OUT	Unit 1 recovery inlet temperature
R	034	A	OUT	Unit 2 recovery inlet temperature
R	035	A	OUT	Unit 3 recovery inlet temperature
R	036	A	OUT	Unit 4 recovery inlet temperature
R	037	A	OUT	Unit 5 recovery inlet temperature
R	038	A	OUT	Unit 6 recovery inlet temperature
R	039	A	OUT	Unit 7 recovery inlet temperature
R	040	A	OUT	Unit 8 recovery inlet temperature
R	049	A	OUT	Unit 1 recovery outlet temperature
R	050	A	OUT	Unit 2 recovery outlet temperature
R	051	A	OUT	Unit 3 recovery outlet temperature
R	052	A	OUT	Unit 4 recovery outlet temperature
R	053	A	OUT	Unit 5 recovery outlet temperature
R	054	A	OUT	Unit 6 recovery outlet temperature
R	055	A	OUT	Unit 7 recovery outlet temperature
R	056	A	OUT	Unit 8 recovery outlet temperature
R	065	A	OUT	Unit 1 condenser inlet temperature
R	066	A	OUT	Unit 2 condenser inlet temperature
R	067	A	OUT	Unit 3 condenser inlet temperature
R	068	A	OUT	Unit 4 condenser inlet temperature
R	069	A	OUT	Unit 5 condenser inlet temperature
R	070	A	OUT	Unit 6 condenser inlet temperature
R	071	A	OUT	Unit 7 condenser inlet temperature
R	072	A	OUT	Unit 8 condenser inlet temperature
R	090	A	OUT	Cold/hot circuit inlet temperature
R	091	A	OUT	Cold/hot circuit outlet temperature
R	092	A	OUT	Recovery circuit inlet temperature
R	093	A	OUT	Recovery outlet circuit temperature
R	094	A	IN / OUT	Cold temperature setpoint
R	095	A	IN / OUT	Cold temperature adjustment band
R	096	A	IN / OUT	Hot temperature setpoint
R	097	A	IN / OUT	Hot temperature adjustment band
R	098	A	IN / OUT	Recovery temperature setpoint
R	099	A	IN / OUT	Recovery temperature adjustment band
R	100	A	OUT	Cold/hot active temperature setpoint
R	101	A	OUT	Recovery temperature active setpoint
R	102	A	OUT	External air temperature
R	103	A	OUT	Unit 1 condenser outlet temperature
R	104	A	OUT	Unit 2 condenser outlet temperature
R	105	A	OUT	Unit 3 condenser outlet temperature

R: register C: coil	Address	Type	Flow	Description
R	106	A	OUT	Unit 4 condenser outlet temperature
R	107	A	OUT	Unit 5 condenser outlet temperature
R	108	A	OUT	Unit 6 condenser outlet temperature
R	109	A	OUT	Unit 7 condenser outlet temperature
R	110	A	OUT	Unit 8 condenser outlet temperature
C	001	B	OUT	Offline unit 1 (0: unit online – 1: unit offline)
C	002	B	OUT	Offline unit 2 (0: unit online – 1: unit offline)
C	003	B	OUT	Offline unit 3 (0: unit online – 1: unit offline)
C	004	B	OUT	Offline unit 4 (0: unit online – 1: unit offline)
C	005	B	OUT	Offline unit 5 (0: unit online – 1: unit offline)
C	006	B	OUT	Offline unit 6 (0: unit online – 1: unit offline)
C	007	B	OUT	Offline unit 7 (0: unit online – 1: unit offline)
C	008	B	OUT	Offline unit 8 (0: unit online – 1: unit offline)
C	017	B	IN / OUT	Enable unit 1 (0: unit disabled – 1: unit enabled)
C	018	B	IN / OUT	Enable unit 2 (0: unit disabled – 1: unit enabled)
C	019	B	IN / OUT	Enable unit 3 (0: unit disabled – 1: unit enabled)
C	020	B	IN / OUT	Enable unit 4 (0: unit disabled – 1: unit enabled)
C	021	B	IN / OUT	Enable unit 5 (0: unit disabled – 1: unit enabled)
C	022	B	IN / OUT	Enable unit 6 (0: unit disabled – 1: unit enabled)
C	023	B	IN / OUT	Enable unit 7 (0: unit disabled – 1: unit enabled)
C	024	B	IN / OUT	Enable unit 8 (0: unit disabled – 1: unit enabled)
C	033	B	OUT	Cold/hot circuit single pump status (0:Off - 1:On)
C	034	B	OUT	Recovery circuit single pump status (0:Off - 1:On)
C	090	B	IN / OUT	System on/off command (0: system off – 1: system on)
C	091	B	IN / OUT	Demand Limit command from supervision (0: command not active – 1: command active)
C	092	B	IN / OUT	Unit manual rotation command (0: command not active – 1: command active)
R	129	I	OUT	Unit 1 cold/hot demand percentage
R	130	I	OUT	Unit 2 cold/hot demand percentage
R	131	I	OUT	Unit 3 cold/hot demand percentage
R	132	I	OUT	Unit 4 cold/hot demand percentage
R	133	I	OUT	Unit 5 cold/hot demand percentage
R	134	I	OUT	Unit 6 cold/hot demand percentage
R	135	I	OUT	Unit 7 cold/hot demand percentage
R	136	I	OUT	Unit 8 cold/hot demand percentage
R	145	I	OUT	Unit 1 cold/hot active percentage
R	146	I	OUT	Unit 2 cold/hot active percentage
R	147	I	OUT	Unit 3 cold/hot active percentage
R	148	I	OUT	Unit 4 cold/hot active percentage
R	149	I	OUT	Unit 5 cold/hot active percentage
R	150	I	OUT	Unit 6 cold/hot active percentage
R	151	I	OUT	Unit 7 cold/hot active percentage
R	152	I	OUT	Unit 8 cold/hot active percentage
R	161	I	OUT	Unit 1 status (see unit 1 status)
R	162	I	OUT	Unit 2 status (see unit 1 status)
R	163	I	OUT	Unit 3 status (see unit 1 status)
R	164	I	OUT	Unit 4 status (see unit 1 status)
R	165	I	OUT	Unit 5 status (see unit 1 status)
R	166	I	OUT	Unit 6 status (see unit 1 status)
R	167	I	OUT	Unit 7 status (see unit 1 status)
R	168	I	OUT	Unit 8 status (see unit 1 status)
R	169	I	OUT	Unit 1 alarm code active
R	170	I	OUT	Unit 2 alarm code active
R	171	I	OUT	Unit 3 alarm code active
R	172	I	OUT	Unit 4 alarm code active
R	173	I	OUT	Unit 5 alarm code active
R	174	I	OUT	Unit 6 alarm code active
R	175	I	OUT	Unit 7 alarm code active

R: register C: coil	Address	Type	Flow	Description
R	176	I	OUT	Unit 8 alarm code active
R	193	I	OUT	Unit 1 recovery demand percentage
R	194	I	OUT	Unit 2 recovery demand percentage
R	195	I	OUT	Unit 3 recovery demand percentage
R	196	I	OUT	Unit 4 recovery demand percentage
R	197	I	OUT	Unit 5 recovery demand percentage
R	198	I	OUT	Unit 6 recovery demand percentage
R	199	I	OUT	Unit 7 recovery demand percentage
R	200	I	OUT	Unit 8 recovery demand percentage
R	209	I	OUT	Unit 1 recovery active percentage
R	210	I	OUT	Unit 2 recovery active percentage
R	211	I	OUT	Unit 3 recovery active percentage
R	212	I	OUT	Unit 4 recovery active percentage
R	213	I	OUT	Unit 5 recovery active percentage
R	214	I	OUT	Unit 6 recovery active percentage
R	215	I	OUT	Unit 7 recovery active percentage
R	216	I	OUT	Unit 8 recovery active percentage
R	228	I	OUT	System status (0: system ON - 4: system OFF from alarm - 7: system OFF from contact - 8: system OFF
R	229	I	OUT	System alarm code active
R	231	I	OUT	Cold/hot circuit demand percentage
R	232	I	OUT	Cold/hot circuit active percentage
R	233	I	OUT	Recovery circuit demand percentage
R	234	I	OUT	Recovery circuit active percentage
R	235	I	IN / OUT	System operating mode (1: cold only - 2: cold+recovery - 3: recovery only - 4: hot - 5: hot+recovery)
R	236	I	IN / OUT	Cold capacity limit percentage
R	237	I	IN / OUT	Hot capacity limit percentage
R	238	I	IN / OUT	Recovery capacity limit percentage
R	239	I	OUT	Pump speed percentage with unit 1 cold/hot circuit inverter
R	240	I	OUT	Pump speed percentage with unit 2 cold/hot circuit inverter
R	241	I	OUT	Pump speed percentage with unit 3 cold/hot circuit inverter
R	242	I	OUT	Pump speed percentage with unit 4 cold/hot circuit inverter
R	243	I	OUT	Pump speed percentage with unit 5 cold/hot circuit inverter
R	244	I	OUT	Pump speed percentage with unit 6 cold/hot circuit inverter
R	245	I	OUT	Pump speed percentage with unit 7 cold/hot circuit inverter
R	255	I	OUT	Unit 1 cold/hot available percentage
R	256	I	OUT	Unit 2 cold/hot available percentage
R	257	I	OUT	Unit 3 cold/hot available percentage
R	258	I	OUT	Unit 4 cold/hot available percentage
R	259	I	OUT	Unit 5 cold/hot available percentage
R	260	I	OUT	Unit 6 cold/hot available percentage
R	261	I	OUT	Unit 7 cold/hot available percentage
R	271	I	OUT	Unit 1 recovery available percentage
R	272	I	OUT	Unit 2 recovery available percentage
R	273	I	OUT	Unit 3 recovery available percentage
R	274	I	OUT	Unit 4 recovery available percentage
R	275	I	OUT	Unit 5 recovery available percentage
R	276	I	OUT	Unit 6 recovery available percentage
R	277	I	OUT	Unit 7 recovery available percentage
R	278	I	OUT	Unit 8 recovery available percentage
R	287	I	OUT	Pump speed percentage with unit 1 recovery circuit inverter
R	288	I	OUT	Pump speed percentage with unit 2 recovery circuit inverter
R	289	I	OUT	Pump speed percentage with unit 3 recovery circuit inverter
R	290	I	OUT	Pump speed percentage with unit 4 recovery circuit inverter
R	291	I	OUT	Pump speed percentage with unit 5 recovery circuit inverter
R	292	I	OUT	Pump speed percentage with unit 6 recovery circuit inverter
R	293	I	OUT	Pump speed percentage with unit 7 recovery circuit inverter
R	294	I	OUT	Pump speed percentage with unit 8 recovery circuit inverter
R	303	I	OUT	System status (0:system ON - 1:system ON from contact - 20:system OFF from alarm - 27:system OFF from contact - 28:system OFF)

R: register C: coil	Address	Type	Flow	Description
R	304	I	OUT	Cold/hot circuit single pump % value (value/10)
R	305	I	OUT	Recovery circuit single pump % value (value/10)

Table 2-1: *Interface database*

GATEWAY Address:
This is the ID of Manager3000 within the BMS network. The value can be set from 1 to 200.

Variable address:
This is the supervision variable address in the electronic control unit.

Type:
B: Boolean variable (Coil for the Modbus protocol)
I: Whole variable (Register for the Modbus protocol)
A: Analogue variable (Register for the Modbus protocol)

Flow:
OUT: Read-only variable for the BMS
IN / OUT: Read/write variable for the BMS

Analogue variables are expressed with a decimal number (e.g.: 12.0 bar -> 120; 33.8 °C -> 338).
If a probe is in an alarm condition a value equal to -99.9 is sent.
If a probe or a parameter is not configured a value equal to -88.8 is sent.

Analogue, whole and digital variables with address 0 are considered as incorrect and throw the “ILLEGAL DATA ADDRESS” error code.
All the addresses not indicated in the database must not be used.

3. BACNET INTERFACE

3.1 Components required

The components required to interface the system managed by the Manager30000+ electronic controller to the BACNET system are described below.

BACNET MS/TP board (for the RS485 network) or BACNET/IP board (for the Ethernet network)

***Figure 3.1**: boards display*

Board inside the Manager3000+ control panel if requested by the customer

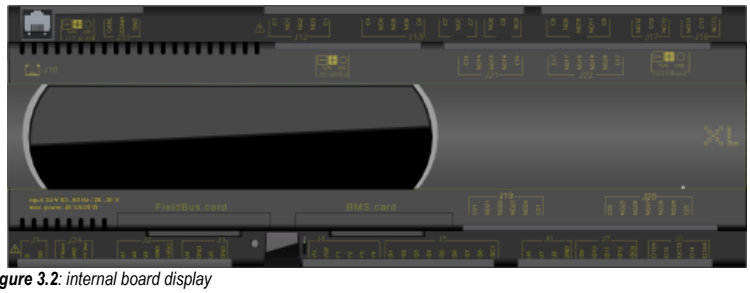


***Figure 3.2**: internal board display*

3.2 Installing the BACNET system serial interface board

Follow the points in paragraph 1 “Installing the serial board” to insert the MODBUS serial board into the controller.

3.3 Setting supervisor parameters

3.3.1 BACNET MS/TP

The communication with the BMS requires the setting of dedicated parameters through the Web interface or the touchscreen (access the menu using the ☰ key and select the “Device Configuration” page) as described below:

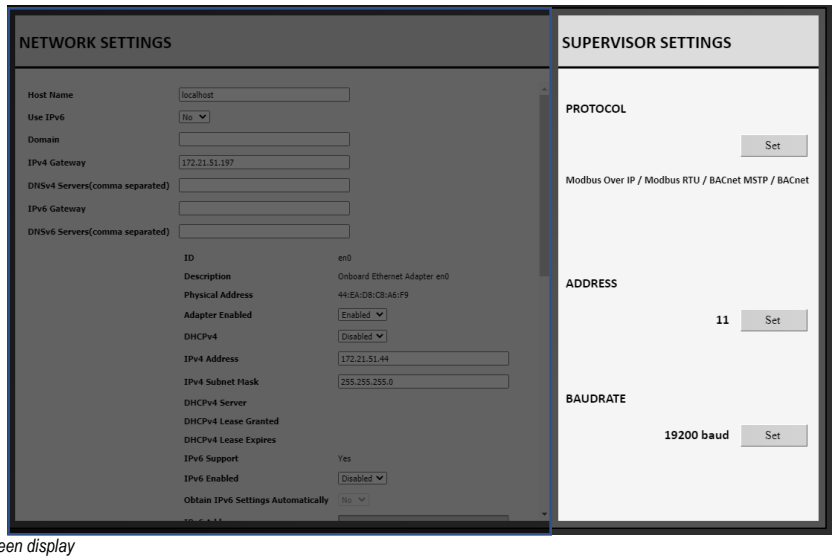


***Figure 3.3:** “Device settings” screen display*

In the SUPERVISOR SETTINGS section set:

PROTOCOL	Modbus Over IP/ Modbus RTU/ BACnet MSTP/ BACnet
ADDRESS	Address to assign to MANAGER3000+ in the bacnet network

3.3.2 BACNET Over IP

The communication with the BMS requires the setting of dedicated parameters through the Web interface or the touchscreen (access the menu using the ☰ key and select the "Device Configuration" page) as described below:

Figure 3.4: *"Supervisor settings" display*

In the SUPERVISOR SETTINGS section set:

PROTOCOL	Modbus Over IP/ Modbus RTU/ BACnet MSTP/BACnet

3.4 Setting up the supervisor network

The PICS (Protocol Implementation Conformance Statement) file for configuring the board must be requested from MEHITS by the technicians setting up the network.
The board is programmed by the technician in charge of the integration.

The supervision network is set up by the technicians developing the BACNET interface. For the connection of the BACNET TCP/IP board to the Ethernet network use a category 5e or better S/FTP type cable.

3.5 Interface database

Address	Type	Flow	Conv. factor	Description
001	A	OUT	valuex1	Unit 1 evaporator inlet temperature
002	A	OUT	valuex1	Unit 2 evaporator inlet temperature
003	A	OUT	valuex1	Unit 3 evaporator inlet temperature
004	A	OUT	valuex1	Unit 4 evaporator inlet temperature
005	A	OUT	valuex1	Unit 5 evaporator inlet temperature
006	A	OUT	valuex1	Unit 6 evaporator inlet temperature
007	A	OUT	valuex1	Unit 7 evaporator inlet temperature
008	A	OUT	valuex1	Unit 8 evaporator inlet temperature
017	A	OUT	valuex1	Unit 1 evaporator outlet temperature
018	A	OUT	valuex1	Unit 2 evaporator outlet temperature
019	A	OUT	valuex1	Unit 3 evaporator outlet temperature
020	A	OUT	valuex1	Unit 4 evaporator outlet temperature
021	A	OUT	valuex1	Unit 5 evaporator outlet temperature
022	A	OUT	valuex1	Unit 6 evaporator outlet temperature
023	A	OUT	valuex1	Unit 7 evaporator outlet temperature
024	A	OUT	valuex1	Unit 8 evaporator outlet temperature
033	A	OUT	valuex1	Unit 1 recovery inlet temperature
034	A	OUT	valuex1	Unit 2 recovery inlet temperature
035	A	OUT	valuex1	Unit 3 recovery inlet temperature
036	A	OUT	valuex1	Unit 4 recovery inlet temperature
037	A	OUT	valuex1	Unit 5 recovery inlet temperature
038	A	OUT	valuex1	Unit 6 recovery inlet temperature
039	A	OUT	valuex1	Unit 7 recovery inlet temperature
040	A	OUT	valuex1	Unit 8 recovery inlet temperature
049	A	OUT	valuex1	Unit 1 recovery outlet temperature
050	A	OUT	valuex1	Unit 2 recovery outlet temperature
051	A	OUT	valuex1	Unit 3 recovery outlet temperature
052	A	OUT	valuex1	Unit 4 recovery outlet temperature
053	A	OUT	valuex1	Unit 5 recovery outlet temperature
054	A	OUT	valuex1	Unit 6 recovery outlet temperature

Address	Type	Flow	Conv. factor	Description
055	A	OUT	valuex1	Unit 7 recovery outlet temperature
056	A	OUT	valuex1	Unit 8 recovery outlet temperature
065	A	OUT	valuex1	Unit 1 condenser inlet temperature
066	A	OUT	valuex1	Unit 2 condenser inlet temperature
067	A	OUT	valuex1	Unit 3 condenser inlet temperature
068	A	OUT	valuex1	Unit 4 condenser inlet temperature
069	A	OUT	valuex1	Unit 5 condenser inlet temperature
070	A	OUT	valuex1	Unit 6 condenser inlet temperature
071	A	OUT	valuex1	Unit 7 condenser inlet temperature
072	A	OUT	valuex1	Unit 8 condenser inlet temperature
090	A	OUT	valuex1	Cold/hot circuit inlet temperature
091	A	OUT	valuex1	Cold/hot circuit outlet temperature
092	A	OUT	valuex1	Recovery circuit inlet temperature
093	A	OUT	valuex1	Recovery outlet circuit temperature
094	A	IN / OUT	valuex1	Cold temperature setpoint
095	A	IN / OUT	valuex1	Cold temperature adjustment band
096	A	IN / OUT	valuex1	Hot temperature setpoint
097	A	IN / OUT	valuex1	Hot temperature adjustment band
098	A	IN / OUT	valuex1	Recovery temperature setpoint
099	A	IN / OUT	valuex1	Recovery temperature adjustment band
100	A	OUT	valuex1	Cold/hot active temperature setpoint
101	A	OUT	valuex1	Recovery temperature active setpoint
102	A	OUT	valuex1	External air temperature
103	A	OUT	valuex1	Unit 1 condenser outlet temperature
104	A	OUT	valuex1	Unit 2 condenser outlet temperature
105	A	OUT	valuex1	Unit 3 condenser outlet temperature
106	A	OUT	valuex1	Unit 4 condenser outlet temperature
107	A	OUT	valuex1	Unit 5 condenser outlet temperature
108	A	OUT	valuex1	Unit 6 condenser outlet temperature
109	A	OUT	valuex1	Unit 7 condenser outlet temperature
110	A	OUT	valuex1	Unit 8 condenser outlet temperature
001	B	OUT	valuex1	Offline unit 1 (0: unit online – 1: unit offline)
002	B	OUT	valuex1	Offline unit 2 (0: unit online – 1: unit offline)
003	B	OUT	valuex1	Offline unit 3 (0: unit online – 1: unit offline)
004	B	OUT	valuex1	Offline unit 4 (0: unit online – 1: unit offline)
005	B	OUT	valuex1	Offline unit 5 (0: unit online – 1: unit offline)
006	B	OUT	valuex1	Offline unit 6 (0: unit online – 1: unit offline)
007	B	OUT	valuex1	Offline unit 7 (0: unit online – 1: unit offline)
008	B	OUT	valuex1	Offline unit 8 (0: unit online – 1: unit offline)
017	B	IN / OUT	valuex1	Enable unit 1 (0: unit disabled – 1: unit enabled)
018	B	IN / OUT	valuex1	Enable unit 2 (0: unit disabled – 1: unit enabled)
019	B	IN / OUT	valuex1	Enable unit 3 (0: unit disabled – 1: unit enabled)
020	B	IN / OUT	valuex1	Enable unit 4 (0: unit disabled – 1: unit enabled)
021	B	IN / OUT	valuex1	Enable unit 5 (0: unit disabled – 1: unit enabled)
022	B	IN / OUT	valuex1	Enable unit 6 (0: unit disabled – 1: unit enabled)
023	B	IN / OUT	valuex1	Enable unit 7 (0: unit disabled – 1: unit enabled)
024	B	IN / OUT	valuex1	Enable unit 8 (0: unit disabled – 1: unit enabled)
033	B	OUT	valuex1	Cold/hot circuit single pump status (0:Off - 1:On)
034	B	OUT	valuex1	Recovery circuit single pump status (0:Off - 1:On)
090	B	IN / OUT	valuex1	System on/off command (0: system off – 1: system on)
091	B	IN / OUT	valuex1	Demand Limit command from supervision (0: command not active – 1: command active)
092	B	IN / OUT	valuex1	Unit manual rotation command (0: command not active – 1: command active)
129	I	OUT	valuex10	Unit 1 cold/hot demand percentage
130	I	OUT	valuex10	Unit 2 cold/hot demand percentage
131	I	OUT	valuex10	Unit 3 cold/hot demand percentage
132	I	OUT	valuex10	Unit 4 cold/hot demand percentage
133	I	OUT	valuex10	Unit 5 cold/hot demand percentage

Address	Type	Flow	Conv. factor	Description
134	I	OUT	valuex10	Unit 6 cold/hot demand percentage
135	I	OUT	valuex10	Unit 7 cold/hot demand percentage
136	I	OUT	valuex10	Unit 8 cold/hot demand percentage
145	I	OUT	valuex10	Unit 1 cold/hot active percentage
146	I	OUT	valuex10	Unit 2 cold/hot active percentage
147	I	OUT	valuex10	Unit 3 cold/hot active percentage
148	I	OUT	valuex10	Unit 4 cold/hot active percentage
149	I	OUT	valuex10	Unit 5 cold/hot active percentage
150	I	OUT	valuex10	Unit 6 cold/hot active percentage
151	I	OUT	valuex10	Unit 7 cold/hot active percentage
152	I	OUT	valuex10	Unit 8 cold/hot active percentage
161	I	OUT	valuex10	Unit 1 status (see unit 1 status)
162	I	OUT	valuex10	Unit 2 status (see unit 1 status)
163	I	OUT	valuex10	Unit 3 status (see unit 1 status)
164	I	OUT	valuex10	Unit 4 status (see unit 1 status)
165	I	OUT	valuex10	Unit 5 status (see unit 1 status)
166	I	OUT	valuex10	Unit 6 status (see unit 1 status)
167	I	OUT	valuex10	Unit 7 status (see unit 1 status)
168	I	OUT	valuex10	Unit 8 status (see unit 1 status)
169	I	OUT	valuex10	Unit 1 alarm code active
170	I	OUT	valuex10	Unit 2 alarm code active
171	I	OUT	valuex10	Unit 3 alarm code active
172	I	OUT	valuex10	Unit 4 alarm code active
173	I	OUT	valuex10	Unit 5 alarm code active
174	I	OUT	valuex10	Unit 6 alarm code active
175	I	OUT	valuex10	Unit 7 alarm code active
176	I	OUT	valuex10	Unit 8 alarm code active
193	I	OUT	valuex10	Unit 1 recovery demand percentage
194	I	OUT	valuex10	Unit 2 recovery demand percentage
195	I	OUT	valuex10	Unit 3 recovery demand percentage
196	I	OUT	valuex10	Unit 4 recovery demand percentage
197	I	OUT	valuex10	Unit 5 recovery demand percentage
198	I	OUT	valuex10	Unit 6 recovery demand percentage
199	I	OUT	valuex10	Unit 7 recovery demand percentage
200	I	OUT	valuex10	Unit 8 recovery demand percentage
209	I	OUT	valuex10	Unit 1 recovery active percentage
210	I	OUT	valuex10	Unit 2 recovery active percentage
211	I	OUT	valuex10	Unit 3 recovery active percentage
212	I	OUT	valuex10	Unit 4 recovery active percentage
213	I	OUT	valuex10	Unit 5 recovery active percentage
214	I	OUT	valuex10	Unit 6 recovery active percentage
215	I	OUT	valuex10	Unit 7 recovery active percentage
216	I	OUT	valuex10	Unit 8 recovery active percentage
228	I	OUT	valuex10	System status (0: system ON - 4: system OFF from alarm - 7: system OFF from contact - 8: system OFF
229	I	OUT	valuex10	System alarm code active
231	I	OUT	valuex10	Cold/hot circuit demand percentage
232	I	OUT	valuex10	Cold/hot circuit active percentage
233	I	OUT	valuex10	Recovery circuit demand percentage
234	I	OUT	valuex10	Recovery circuit active percentage
235	I	IN / OUT	valuex10	System operating mode (1: cold only - 2: cold+recovery - 3: recovery only - 4: hot - 5: hot+recovery)
236	I	IN / OUT	valuex10	Cold capacity limit percentage
237	I	IN / OUT	valuex10	Hot capacity limit percentage
238	I	IN / OUT	valuex10	Recovery capacity limit percentage
239	I	OUT	valuex10	Pump speed percentage with unit 1 cold/hot circuit inverter
240	I	OUT	valuex10	Pump speed percentage with unit 2 cold/hot circuit inverter
241	I	OUT	valuex10	Pump speed percentage with unit 3 cold/hot circuit inverter
242	I	OUT	valuex10	Pump speed percentage with unit 4 cold/hot circuit inverter
243	I	OUT	valuex10	Pump speed percentage with unit 5 cold/hot circuit inverter
244	I	OUT	valuex10	Pump speed percentage with unit 6 cold/hot circuit inverter

Address	Type	Flow	Conv. factor	Description
245	I	OUT	valuex10	Pump speed percentage with unit 7 cold/hot circuit inverter
255	I	OUT	valuex10	Unit 1 cold/hot available percentage
256	I	OUT	valuex10	Unit 2 cold/hot available percentage
257	I	OUT	valuex10	Unit 3 cold/hot available percentage
258	I	OUT	valuex10	Unit 4 cold/hot available percentage
259	I	OUT	valuex10	Unit 5 cold/hot available percentage
260	I	OUT	valuex10	Unit 6 cold/hot available percentage
261	I	OUT	valuex10	Unit 7 cold/hot available percentage
271	I	OUT	valuex10	Unit 1 recovery available percentage
272	I	OUT	valuex10	Unit 2 recovery available percentage
273	I	OUT	valuex10	Unit 3 recovery available percentage
274	I	OUT	valuex10	Unit 4 recovery available percentage
275	I	OUT	valuex10	Unit 5 recovery available percentage
276	I	OUT	valuex10	Unit 6 recovery available percentage
277	I	OUT	valuex10	Unit 7 recovery available percentage
278	I	OUT	valuex10	Unit 8 recovery available percentage
287	I	OUT	valuex10	Pump speed percentage with unit 1 recovery circuit inverter
288	I	OUT	valuex10	Pump speed percentage with unit 2 recovery circuit inverter
289	I	OUT	valuex10	Pump speed percentage with unit 3 recovery circuit inverter
290	I	OUT	valuex10	Pump speed percentage with unit 4 recovery circuit inverter
291	I	OUT	valuex10	Pump speed percentage with unit 5 recovery circuit inverter
292	I	OUT	valuex10	Pump speed percentage with unit 6 recovery circuit inverter
293	I	OUT	valuex10	Pump speed percentage with unit 7 recovery circuit inverter
294	I	OUT	valuex10	Pump speed percentage with unit 8 recovery circuit inverter
303	I	OUT	valuex10	System status (0:system ON - 1:system ON from contact - 20:system OFF from alarm - 27:system OFF from contact - 28:system OFF)
304	I	OUT	valuex10	Cold/hot circuit single pump % value
305	I	OUT	valuex1	Recovery circuit single pump % value

Table 3-1: *Interface database*

Type:
B: Boolean variable
I: Whole variable
A: Analogue variable

Flow:
OUT: Read-only variable for the BMS
IN / OUT: Read/write variable for the BMS

All the addresses not indicated in the database must not be used.

3.6 Meaning of variables

Analogue variables are expressed with a decimal number (e.g.: 12.0bar -> 120; 33.8°C -> 338)
If a probe is in an alarm condition a value equal to -99.9 is sent.
If a probe or a parameter is not configured a value equal to -88.8 is sent.

3.7 Instructions on configuration of the BACNET TCP/IP board on the PC

Before a PC can communicate with the BACNET TCP/IP board, the settings of both devices must be correctly aligned.
As the factory settings of the BACNET TCP/IP board can only be changed after establishing the connection with the PC, when making access for the first time, the Personal Computer will have to be adapted to the factory settings of the BACNET TCP/IP board.

3.7.1 PC settings

Disconnect the Personal Computer from any networks and connect it directly to the BACNET TCP/IP board using the cable (crossed).

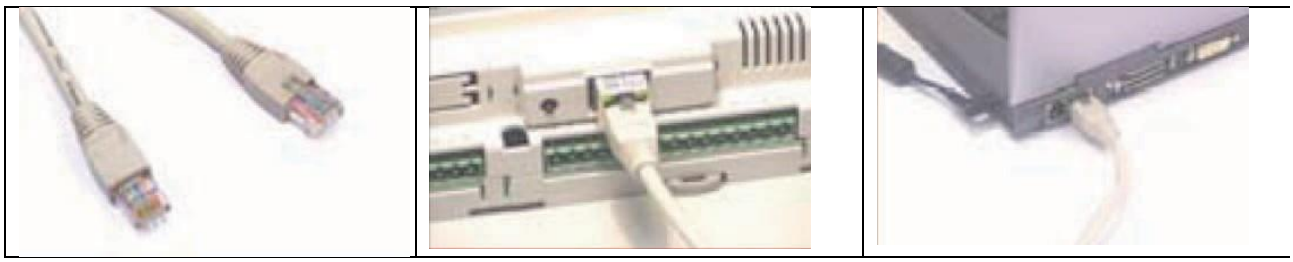


Figure 3.5: *demonstration of cable connection to BACNET TCP/IP board*

Set the Personal Computer so that it does not use DHCP, but rather the IP address: 172.16.0.2.
Also specify the Subnet mask field; it is not necessary to specify the Gateway.

1. From “Control Panel”
2. Double click “Network Connections”
3. Double click on “Local Area Connection (LAN)”
4. Click “Properties”
5. Double click “Internet Protocol (TCP/IP)

INFORMATION:
Before changing the settings, take note of all the existing settings as these will be have to be restored afterwards in order to allow the PC to communicate with the data network it was previously connected to

6. Click “Use the following IP address” and set the following parameters:
   - IP address: 172.16.0.2
   - Subnet mask: 255.255.0.0
7. Click on “OK” to close all the windows

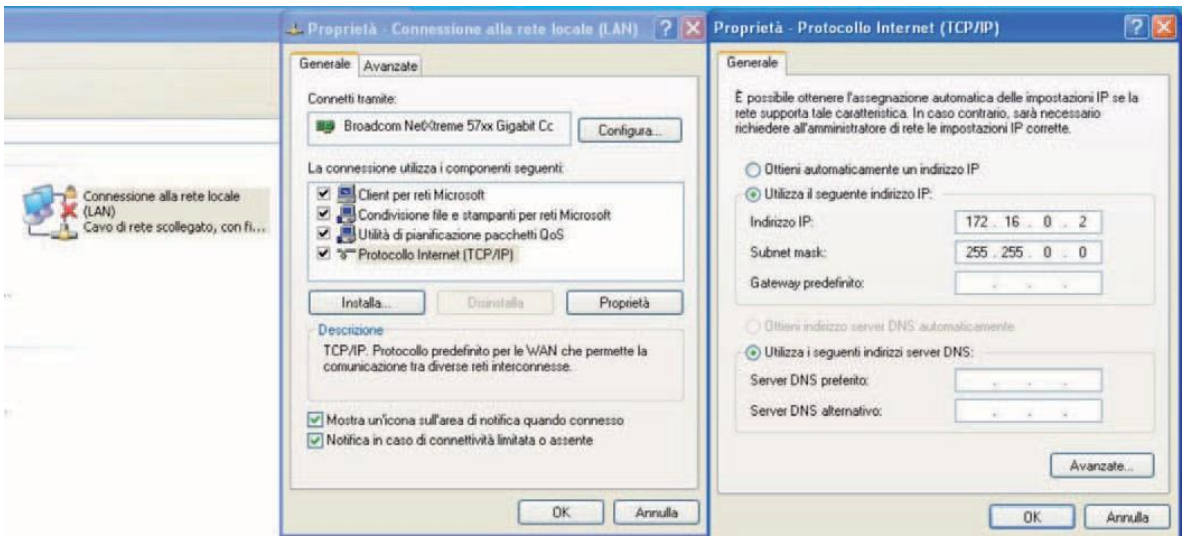


Figure 3.6: *demonstration of connection mode*

The Personal Computer is set so that it does not use the “proxy” network device as a communication channel. In fact, the PC is not networked and if the use of “proxy” were not disabled, communication would become impossible.

1. Open the Windows “Control Panel”
2. Double click “Internet Options”

3. Click “Connections”. Another window appears
4. Click “LAN settings”
5. Disable the proxy server
6. Press Ok to close the windows

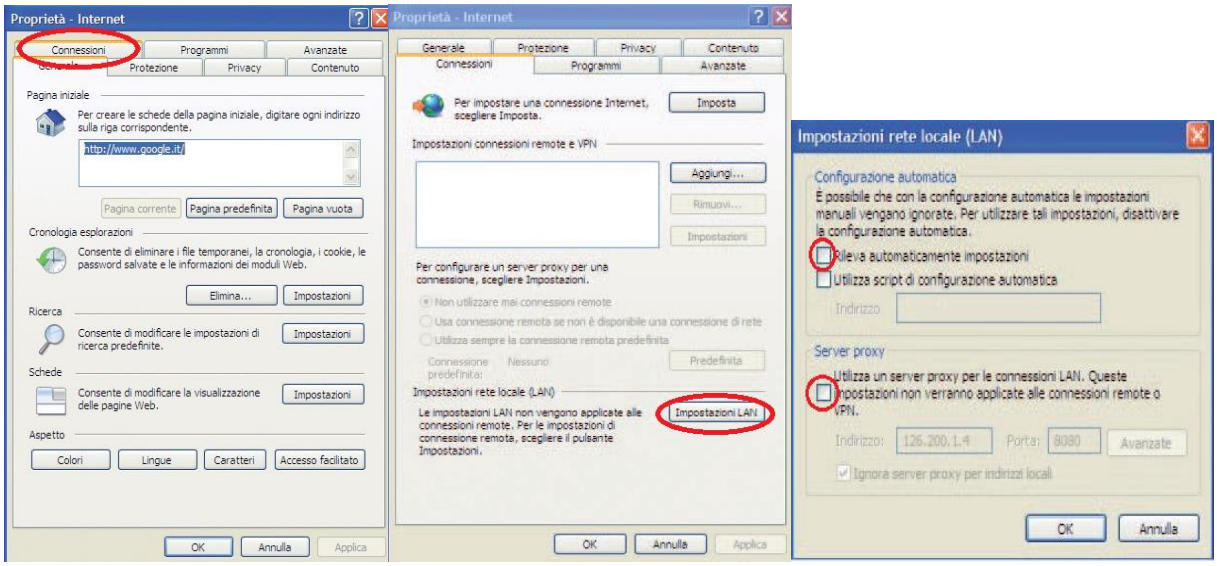


Figure 3.7: *demonstration of elimination of “proxy” network device*

3.7.2 Starting the BACNET TCP/IP board with the factory settings

1. Switch on the W3000 + controller
2. Make sure that both the LEDs of the BACNET TCP/IP board connector light up within a few seconds

Figure 3.8: *display of leds presents on the connector*

INFORMATION:
The choice as to whether to activate factory settings or user settings can only be made when starting the BACNET TCP/IP board. The BACNET TCP/IP board restarts whenever it is turned on

3. As soon as the Status LED turns on GREEN immediately after restart, hold down the button to activate the factory settings
4. If the button is held down, after about 20 seconds the Status LED will turn RED, flashing slowly three times. Release the button during these 3 flashes
5. After the 3 red flashes, the Status LED turns GREEN and, if the procedure has been performed correctly, the Status LED will confirm the button has been pressed and released by rapidly flashing RED 3 times and will then turn steady GREEN for about 1 minute (completion of the start phase). Once the start phase is complete, the Status LED will start flashing: the BACNET TCP/IP board will be effectively running

In this way, the BACNET TCP/IP board will not use the “User” set communication configuration parameter values, but rather the following factory values:

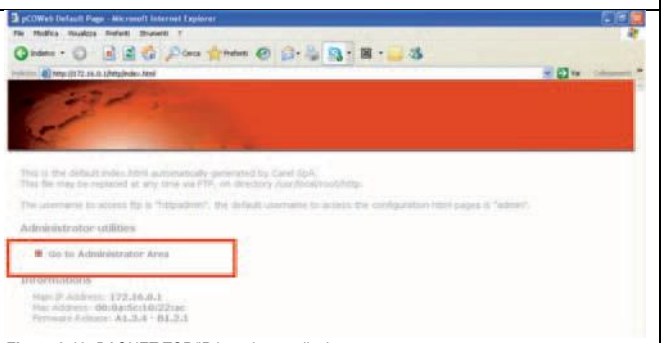
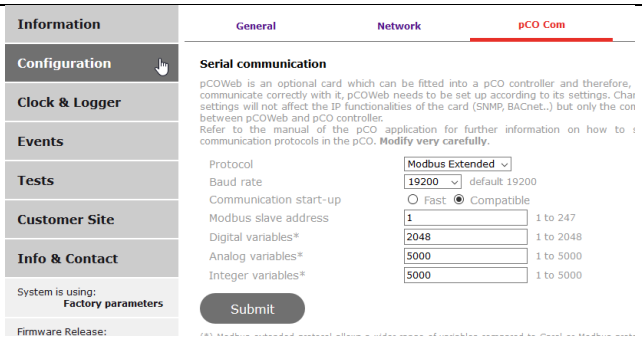
- IP address: 172.16.0.1
- Subnet mask: 255.255.0.0

INFORMATION:
These values will remain active until the BACNET TCP/IP BOARD IS RESTARTED.
After restart, the BACNET TCP/IP board will return to the “User” configuration values.
It is recommended that the network communication parameters are configured immediately

3.7.3 Access the BACNET TCP/IP board via the PC

To allow the board to communicate with the data network it will be installed to, certain network communication parameters must be set.

INFORMATION:
The network administrator must establish whether the BACNET TCP/IP board can be connected and must communicate essential system data

Start the Internet Explorer application on the PC. Write the following number including dots in the address field: 172.16.0.1 and press ENTER	 ***Figure 3.9:*** *entering the IP address*
The main page of the BACNET TCP/IP board "index.html" appears. Click "Go to Administrator Area"	 ***Figure 3.10:*** *BACNET TCP/IP board page display*
At the login and password request enter the factory values: • Username: **admin** • Password: **fadmin**	 ***Figure 3.11:*** *Details entry screen*
At the login and password request enter the factory values: • Username: **admin** • Password: **fadmin** **The BACNET TCP/IP board is set at the factory with Carel protocol.** **Switch the protocol to Modbus Extended** All the settings will be enabled the next time the BACNET TCP/IP board is started	 ***Figure 3.12:*** *Login display page*

The BACNET TCP/IP board is set at the factory for the reading of maximum 207 digital, analogue and whole variables.
In the BACnet menu change the values in the pCO Mapping Parameters fields from 207 to 2048

All the settings will be enabled the next time the BACNET TCP/IP board is started

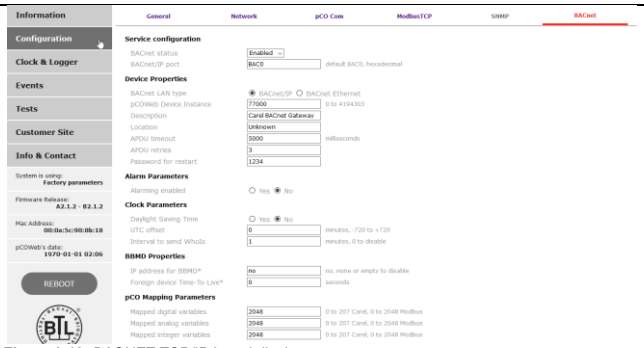


Figure 3.12: *BACNET TCP/IP board display*

If the details entered during the previous access stage are correct, the following page appears:

Update the variable data by clicking the “Information” button

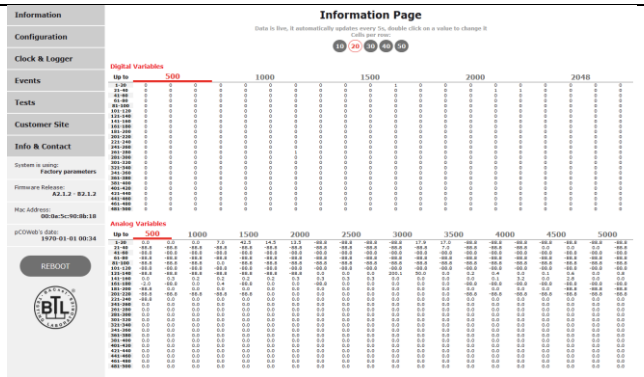


Figure 3.13: *information page*

As the BACNET TCP/IP board in its factory configuration is set with DHCP addressing (automatic addressing), it will already be operational and no further action will be required.

To set the user network parameters, click on “Configuration”, then on the “Network” board and set the following basic network parameters:

- IP address
- NetMask

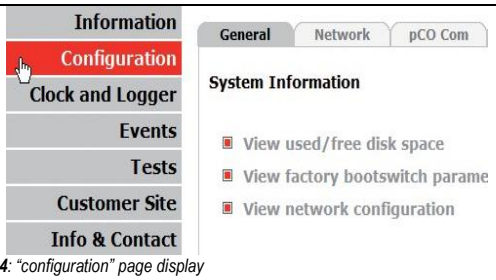


Figure 3.14*: “configuration” page display*

The set values will only be used from the next time the BACNET TCP/IP board is restarted

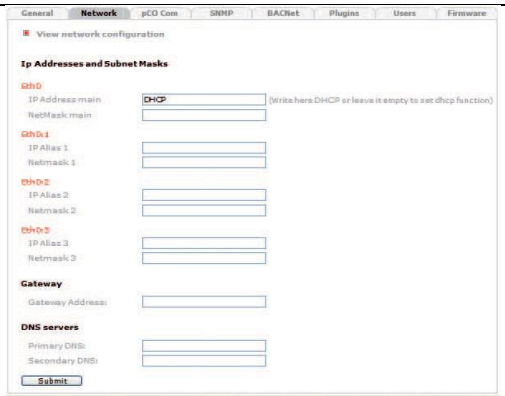


Figure 3.15*: “configuration” page values display*

3.7.4 Configuring the board for the BACNET protocol

The BACNET TCP/IP board can recognise queries sent by a supervisor using either of the following two versions of the BACnet (Building Automation Control Networks) protocol:
• BACnet/IP (Addenda A/Annex J)
• BACnet Ethernet ISO8802-2 over 8802-3

The configuration of the parameters for the BACnet protocol is available on the corresponding page of the "Configuration" menu.

All the settings will be enabled the next time the BACNET TCP/IP board is started

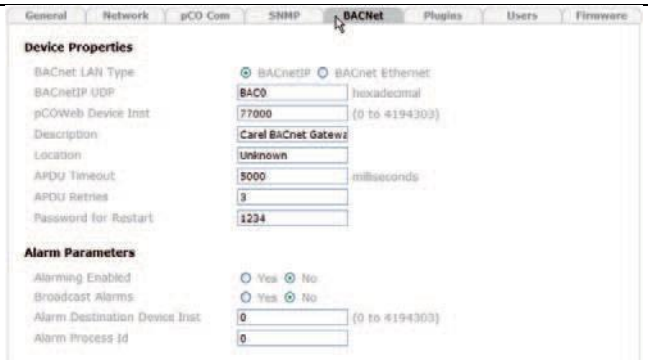


Figure 3.16: *BACnet protocol parameters configuration display*

INFORMATION:
The professional system integrator who sets the various parameters, checks the network communication, and starts the supervision system, must be familiar with BACNET

4. MITSUBISHI ELECTRIC SYSTEM INTERFACE

Below is the table showing the compatibility of the Mitsubishi Electric system remote controllers with MANAGER3000+:

MITSUBISHI ELECTRIC SYSTEMS R/C	AE-200E (Ver.7.68 or later)	
	AE-50E (Ver.7.68 or later) *AE-200E is required on same system	
	EW-50E (Ver.7.68 or later) *AE-200E is required on same system	
MEHITS	2-pipe systems consisting of chiller unit and heat pump	MANAGER3000+ (HG06 versions or later)
	ADAPTER MEHITS (version 1.00)	

INFORMATION:
1) This supervising system cannot be used for 4-pipe systems with energy raisers
2) The temperature values that can be set have the restriction that they must only be values greater than or equal to zero

4.1 Components required

MEHITS Adapter

INFORMATION:
The use of the ADAPTER requires a central controller

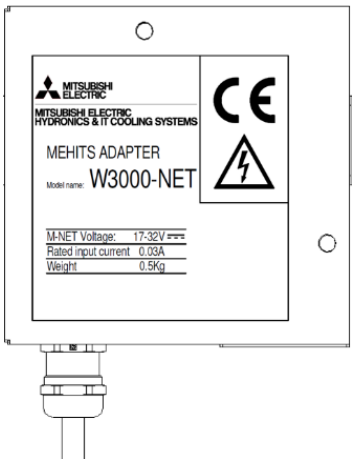


***Figure 4.1**: Mehits adapter display*

Serial interface board

***Figure 4.2:** serial interface board*

Board inside the Manager3000+ panel

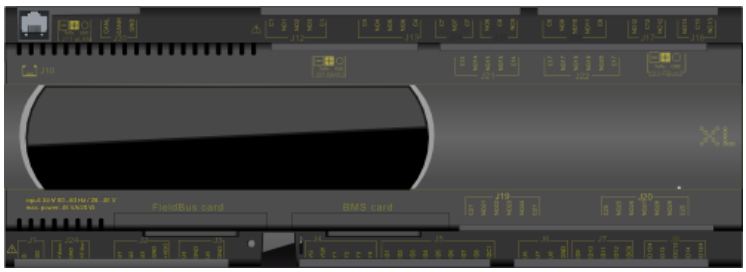


***Figure 4.3:** internal board*

4.2 Installing the serial board

Follow the points in paragraph 1 “Installing the serial board” to insert the MODBUS serial board into the controller.

4.3 Manager3000+ - setting the serial line parameters

The communication with the BMS requires the setting of dedicated parameters through the Web interface or the touchscreen (access the menu using the ☰ key and select the “Device Configuration” page) as described below:

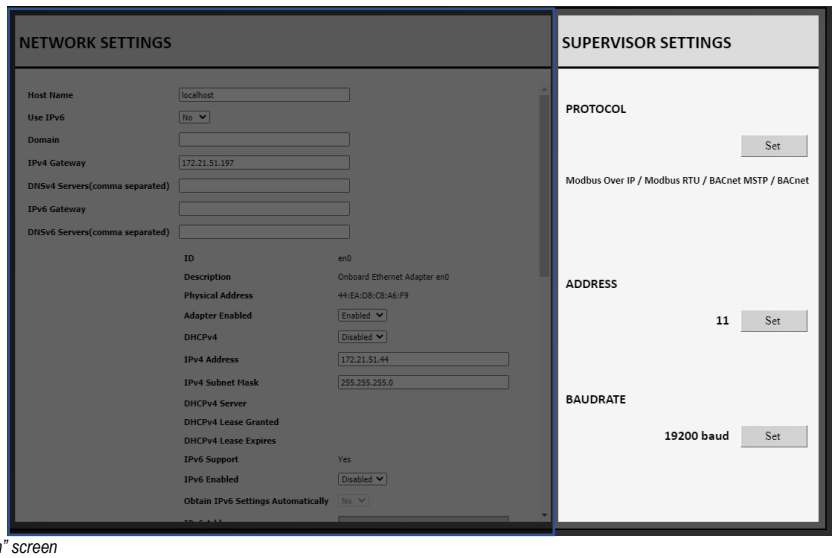


Figure 4.4: *“Device configuration” screen*

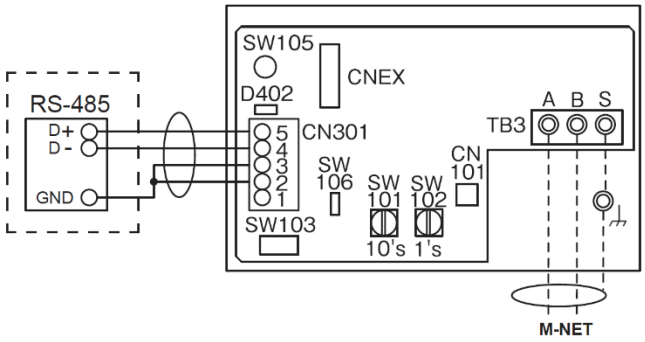
In the SUPERVISOR SETTINGS section set:

PROTOCOL	Modbus Over IP/ Modbus RTU/ BACnet MSTP/BACnet

4.4 Setting up the supervisor network

M-NET Transmission Cable and Modbus cable wiring*

W3000-NET



ITEM	CONTENTS
TB3	M-NET LINE TERMINAL BLOCK
CN301	RS-485 CONNECTOR
CNEX	SOFTWARE UPDATE CONNECTOR
CN101	POWER SUPPLY FOR SW UPDATE
D402	LED(POWER/ERROR)
SW101	M-NET ADDRESS (10th DIGIT)
SW102	M-NET ADDRESS (1st DIGIT)
SW103	SWITCH(FOR FUNCTION SETTINGS)
SW105	SWITCH(RESET)
SW106	SWITCH(TERMINAL RESISTOR RS-485)

Serial Interface board Included

INFORMATION:

*** Refer to MEHITS Adapter manual for details about connection.**
The serial cable must be kept separate from the power cables.
The shield of the connection cable must be earthed in just one point

5. Annexes

5.1 AWG (American Wire Gauge) conversion table

Conversion: AWG number – diameter in mm – area in mm²

AWG n°	Diam. mm	Area mm²		AWG n°	Diam. mm	Area mm²
1	7,350	42,400		16	1,290	1,310
2	6,540	33,600		17	1,150	1,040
3	5,830	26,700		18	1,024	0,823
4	5,190	21,200		19	0,912	0,653
5	4,620	16,800		20	0,812	0,519
6	4,110	13,300		21	0,723	0,412
7	3,670	10,600		22	0,644	0,325
8	3,260	8,350		23	0,573	0,259
9	2,910	6,620		24	0,511	0,205
10	2,590	5,270		25	0,455	0,163
11	2,300	4,150		26	0,405	0,128
12	2,050	3,310		27	0,361	0,102
13	1,830	2,630		28	0,321	0,080
14	1,630	2,080		29	0,286	0,065
15	1,450	1,650		30	0,255	0,050

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