MITSUBISHI ELECTRIC

COMPUTER ROOM AIR CONDITIONER
MODEL

s-MEXT-G00 006-044

INTERFACE MANUAL
TRANSLATION OF THE ORIGINAL INSTRUCTIONS

For ME28-relC software versions

EN

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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.

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Description of the symbols

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

ATTENTION
Indicates situations of grave danger which, if ignored, can seriously endanger the health and safety of people.

OBLIGATION
Indicates that it is necessary to act in an appropriate manner in order not to put at risk the health and safety of people and not cause financial damage.

INFORMATION
Indicates technical information of particular importance which should not be neglected.

1 USABILITY

ATTENTION
The EVOLUTION+ controller software is protected by a digital signature.
This means that it can only work on boards supplied by MEHITS and not on boards purchased from other dealers.
Additionally, the plastic elements and screen prints on the installed hardware are exclusive to MEHITS.

This document **only** applies to systems managed by the EVOLUTION+ electronic controller running on **ME28r00-relC** software version or later.
Information on the version of the electronic controller is shown in the **"Unit" menu**. The access procedure is given below.

Press the **[PRG]** key to access the Main menu.

Main Factory Unit Setpoint	Access mask to main menu. Press “Up” or “Down” to scroll and “Enter” to access the selected menu.
↑ Unit ← ↓	Access mask to unit menu. Press "Up" or "Down" to scroll the other masks and "Esc" to return to the submenu.
Evolution+ Cod. ME 28.00 EN 🔓 HW pCO5+M NAND 50MB Flash 2MB + 7MB + 4MB Ram 2048KB Boot 05.01 Bios06.31	Mask showing the installed software version (the example shows version ME28r00).

The electronic controller may only be installed and programmed by adequately trained technical staff.

The images in the various chapters refer to the larger board, but the procedure remains the same for smaller boards.

2 INSTALLING THE SERIAL BOARD

There are various types of communication protocols. A serial board connected to the controller on the unit must be used for each one.

Even if the serial boards 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.

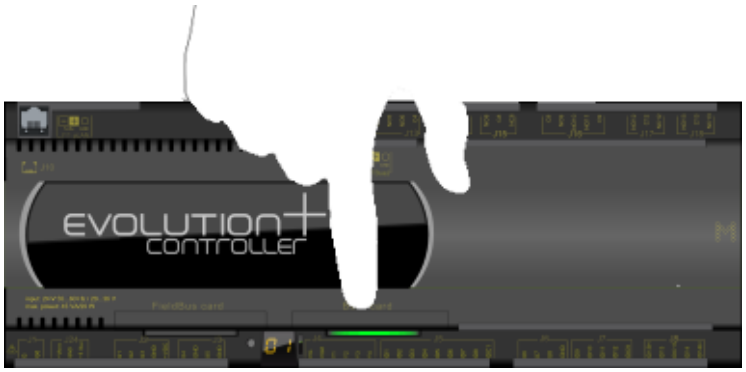
This procedure is not necessary if the serial board is already on board the unit.

ATTENTION
The boards must not be powered during these operations.

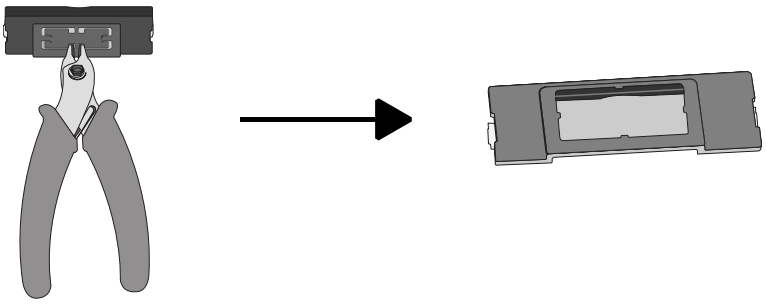
1. Identify the electronic controller on board the unit.

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

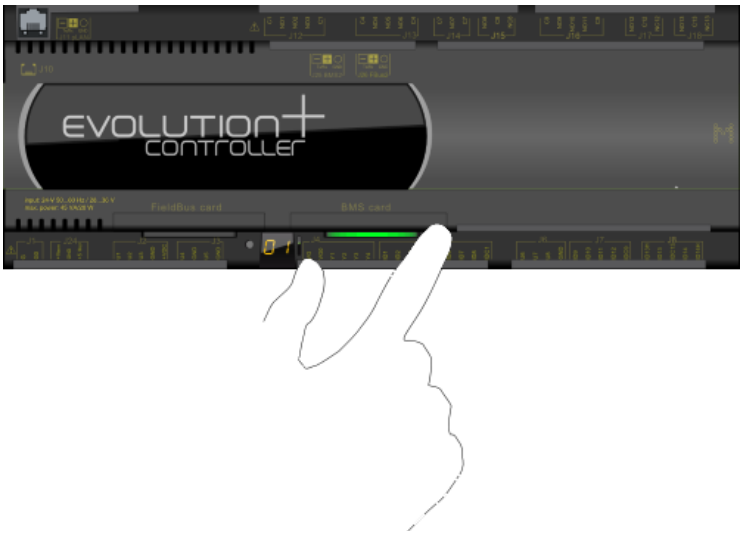
3. Push the interface board into its dedicated slot making sure it correctly engages the dedicated comb connector mounted in the controller.



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



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



3 INTERFACING WITH THE MODBUS SYSTEM

3.1 COMPONENTS REQUIRED

- Modbus serial interface board

- Electronic control board
  (Already installed on the unit)

3.2 INSTALLING THE SERIAL INTERFACE BOARD

Follow the points in the chapter “Installing the serial board” to insert the Modbus serial board into the controller.

3.3 SETTING SUPERVISOR PARAMETERS

The parameters for communication with the BMS must be set as shown below.

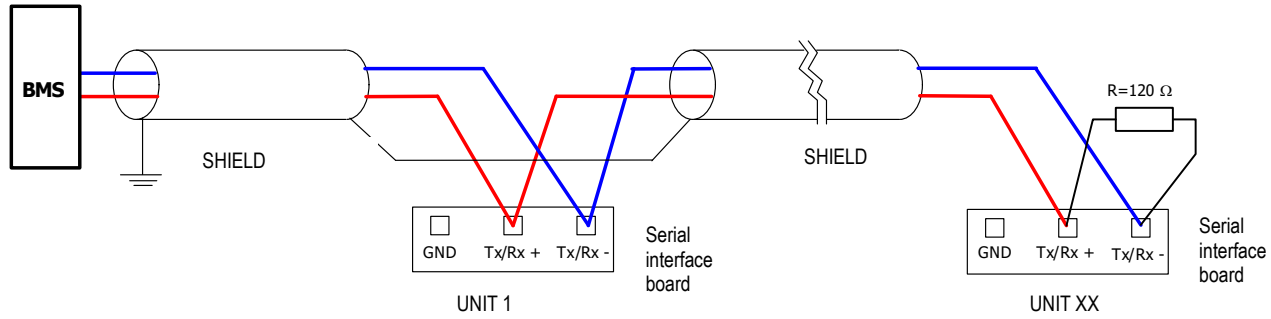
Access the User menu, enter the **“User”** password and scroll to the listed masks.

Mask of the terminal	Description	N. Par.
Serial ← ↓	Access mask to BMS management submenu. Press "Up" or "Down" to scroll the other masks and "Esc" to return to the submenu.	
---------- P30.01 Enable supervision: Y	Communication towards the supervisor system **must** be enabled.	30.01
---------- P30.02 BMS Address: 001 ---------- P30.03 BMS protocol config.: Modbus	Parameters for configuring the BMS address and protocol (0:Standard - 1:Modbus - 2:GSM Modem - 3:LON - 4:Bacnet - 5:TCP/IP - 6:WinLoad) The supervisor connection parameters must be set as follows: • Protocol: **Modbus** • Unit ID: from **001 to 200** (default 01, …)	30.02 30.03
---------- P30.04 BMS baud rate config.: 19200	BMS baud rate configuration parameter (0:1200 - 1:2400 - 2:4800 - 3:9600 - 4:19200) The supervisor connection parameters must be set as follows: • Communication speed: **192000 baud**	30.04

Mask of the terminal	Description	N. Par.
---------- P30.05 ON/OFF by BMS status: Y	Parameter for configuring the ON/OFF from the BMS (N:disabled - Y:enabled) The supervisor connection parameters must be set as follows: • Enable on/off: **Yes**	30.05
---------- P30.11 Enable FC STOP by supervisor: N	Enable stopping of Freecooling from BMS *Visible only on unit with Direct Freecooling*	30.11

3.4 SETTING UP THE SUPERVISOR NETWORK

The supervisor network must be set up as shown in the diagram below.



Take great care when connecting the serial line to the units. 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 up to 1000 m is guaranteed as standard. It is recommended to use a shielded and twisted 3 x AWG 22/7 cable for the network.

If the reference signal must be equalised use the third wire.

The serial connection must be made with a single cable running from the BMS to the first unit (the closest), then continuing to connect with the next ones (in order of distance).
The serial cable must be kept separate from the power cables.
The shield of each connection cable must be connected to the shield of the previous derivation. The ground connection must be made in just one point.

A maximum of 200 units can be connected to the network. The polling time of the entire plant is proportional to the number of units supervised by the BMS.

3.5 MODBUS CHARACTERISTICS

Modicon Modbus protocol implemented as described in the following document:

Modicon Modbus protocol reference guide
March 1992, PI Modbus-300 rev D.

As regards serial communication with the Modbus protocol, the characteristics are:

- Speed: May be selected by software (see user menu, usually from 1200 to 19200 baud).
- Data bits: 8 (not modifiable).
- Stop bits: 2 (not modifiable).
- Parity: None (not modifiable)
- Flow Control: Establishes how the PC and the converter interact, no influence on the controller.
- Start address: This is 1 and not 0.

Address

This is the supervision variable address in the electronic control unit.
When using the addresses with the Modbus protocol, add 128 for whole variables.
(For example: Software address 3 → Modbus address 131 [128+3])

Type

- B: Boolean variable (Coil for the Modbus protocol).
- A and I: Whole variable (Register for the Modbus protocol).

Flow

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

Scale factor

As regards the value read (OUT) or written (IN) by the BMS:

- Value x1: The value is the true value, no conversion factor is required.
- Value x10: The value must be multiplied by 10 after being read, or before being written.
- Value x100: The value must be multiplied by 100 after being read, or before being written.
- Value/10: The value must be divided by 10 after being read, or before being written.
- Value/100: The value must be divided by 100 after being read, or before being written.

Example: Writing and reading the chiller temperature setpoint

- Writing:

40002	001	A	IN	Value x10	°C	Cold temperature setpoint

If the "Chiller temperature setpoint" variable must be written (IN) at 21.3 °C
The BMS must multiply the value to send to the controller by 10: 21.3x10 = 213

- Read only:

40002	001	A	OUT	Value/10	°C	Cold temperature setpoint

If the "Cold temperature setpoint" variable must be read (OUT)
The BMS must divide the value received from the controller by 10: 213/10 = 21.3 °C

If a probe is in an alarm condition a value equal to -999 is sent that is -99.9.
If a probe or a parameter is not configured a value equal to -888 is sent that is -88.8.

Unit of Measurement

This is the data unit of measurement after conversion with the scale factor.

Example: Reading a value of 221 from the controller

- Read only:

40013	012	A	OUT	Value/10	bar	High pressure

With the scale factor, the true value is 22.1 which involves reading 22.1 bar in the unit of measurement column.

Function codes

The read and write controls (function codes) for the coils and registers available are shown in the following table.

Type of datum	Type of control	Function Codes
Coils (Boolean)	Read	1
	Write one variable	5
	Write multiple variables	15
Registers (analogue and whole)	Read	4
	Write one variable	6
	Write multiple variables	16

Coil Modbus addresses (Boolean variables):

Register/Coil Modbus protocol	Protocol addresses: Standard | Trend | Bacnet	Type	
Boolean			
001	000	B	**Not managed**
002	001	B	Boolean 001
003	002	B	Boolean 002
004	003	B	Boolean 003
…	…	B	…
182	181	B	Boolean 181
183	182	B	Boolean 182
184	183	B	Boolean 183

Register Modbus addresses (Analogue and Whole variables):

Register/Coil Modbus protocol	Protocol addresses: Standard | Trend | Bacnet	Type	
Analogue			
40001	000	A	**Not managed**
40002	001	A	Analogue 001
40003	002	A	Analogue 002
40004	003	A	Analogue 003
…	…	…	…
40127	126	A	Analogue 126
40128	127	A	Analogue 127
40129	128	A	Analogue 128
Whole			
40129	000	I	**Not managed**
40130	001	I	Whole 001
40131	002	I	Whole 002
40132	003	I	Whole 003
…	…	…	…
40255	126	I	Whole 126
40256	127	I	Whole 127
40257	128	I	Whole 128

3.6 INTERFACE DATABASE

The reference database for systems using the Modbus networks is shown below. The addresses **not** indicated in the database **must not** be used.

Register/Coil Modbus protocol	Protocol addresses: Standard | Trend | Bacnet	Type	Flow	Conversion factor	Unit of measurement	Description
Boolean						
001	000	B				**Not managed**
002	001	B	OUT	-	-	Unit status (0: Off - 1: On)
003	002	B	OUT	-	-	Presence of Alarm (0: Unit OK – 1: Alarm)
009	008	B	IN	-	-	On/Off command by supervisor (0:Off - 1:On)
			OUT	-		
016	015	B	OUT	-	-	Status step 1 heating elements
017	016	B	OUT	-	-	Status step 2 heating elements
038	037	B	IN	-	-	FC stopped by BMS (0: Normal operation of FC; 1: FC disabled)
Analogue						
40001	000	A				**Not managed**
40002	001	A	IN	Value x10	°C	Cold temperature setpoint
			OUT	Value/10		
40003	002	A	IN	Value x10	°C	Hot temperature setpoint
			OUT	Value/10		
40005	004	A	OUT	Value/10	°C	Cold temperature setpoint active
40006	005	A	OUT	Value/10	°C	Hot temperature active set point
40007	006	A	OUT	Value/10	°C	Room temperature
40008	007	A	OUT	Value/10	°C	Delivery temperature
40009	008	A	OUT	Value/10	°C	Temperature used for adjustment
40017	016	A	OUT	Value/10	bar	Low pressure
40018	017	A	OUT	Value/10	bar	Circuit 2 low pressure
40021	020	A	OUT	Value/10	°C	External air temperature
40022	021	A	OUT	Value/10	%	Ambient humidity
40024	023	A	OUT	Value/10	°C	Address 129 auxiliary probe temperature
40025	024	A	OUT	Value/10	%	Address 129 auxiliary probe humidity
40041	040	A	OUT	Value/10	%	Fan speed
40054	053	A	OUT	Value/10	%	Position of Freecooling damper
40055	054	A	OUT	Value/10	%	Humidifier request
Whole						
40129	000	I				**Not managed**
40132	003	I	OUT	Value x1	-	Software version
40133	004	I	OUT	Value x1	-	Software version (revision)
40139	010	I	OUT	Value x1	-	Flow control type (0=Adjustable Head / 1=Constant Flow / 2=Constant Head)
40140	011	I	OUT	Value x1	-	Probe used for adjustment (0= Ambient air probe / 1= Delivery air probe)
40141	012	I	OUT	Value x1	-	Unit status (0: ON from keyboard, 1: ON from a digital input, 2 ON from PLAN, 3: ON from time bands, 4: ON from supervision, 5: OFF from alarm, 6: OFF from supervision, 7: OFF from time bands, 8: OFF from Plan, 9: OFF from digital input 10: OFF from keyboard, 11: OFF from deselected ventilation, 12: Switching off)
40143	014	I	OUT	Value x1	-	Unit operating mode (0: Unit OFF, 1: Ventilation only, 2: Cooling, 3: free cooling, 4: cooling+free cooling, 5: Dehumidification, 6: Dehumidification+Post heating, 7: Humidification, 8: Cooling+Humidification, 9: Heating, 10: Heating+Humidification)
40154	025	I	OUT	Value x1	-	Year
40155	026	I	OUT	Value x1	-	Month
40156	027	I	OUT	Value x1	-	Day
40157	028	I	OUT	Value x1	h	Time

Register/Coil Modbus protocol	Protocol addresses: Standard | Trend | Bacnet	Type	Flow	Conversion factor	Unit of measurement	Description
40158	029	I	OUT	Value x1	m	Minutes
40161	032	I	OUT	Value x1	-	Active alarm code (with greater priority)
40163	034	I	OUT	Value/10	%	Cold thermoregulator request (%)
40166	037	I	OUT	Value/10	%	Heat request (%)
40169	040	I	OUT	Value/10	%	Post-heating request (%)
40175	046	I	IN	Value x1	%	Dehumidification setpoint (%)
			OUT	Value x1		
40176	047	I	IN	Value x1	%	Humidification setpoint (%)
			OUT	Value x1		
40177	048	I	OUT	Value x1	h	Unit operating hours (Thousands)
40178	049	I	OUT	Value x1	h	Unit operating hours (Units)
40191	062	I	OUT	Value x1	h	Heating element 1 operating hours (Thousands)
40192	063	I	OUT	Value x1	h	Heating element 1 operating hours (Units)
40193	064	I	OUT	Value x1	h	Heating element 2 operating hours (Thousands)
40194	065	I	OUT	Value x1	h	Heating element 2 operating hours (Units)
40195	066	I	OUT	Value x1	h	Humidifier operating hours (Thousands)
40196	067	I	OUT	Value x1	h	Humidifier operating hours (Units)
40197	068	I	IN	Value x1	°C	High ambient temperature set point
			OUT	Value x1		
40198	069	I	IN	Value x1	°C	Low ambient temperature set point
			OUT	Value x1		
40199	070	I	IN	Value x1	%	Ambient humidity high set point
			OUT	Value x1		
40200	071	I	IN	Value x1	%	Low ambient humidity set point
			OUT	Value x1		
40209	080	I	OUT	Value x1	V	Voltage measured between L1 and N
40210	081	I	OUT	Value x1	V	Voltage measured between L2 and N
40211	082	I	OUT	Value x1	V	Voltage measured between L3 and N
40212	083	I	OUT	Value x1	V	Voltage measured between L1 and L2
40213	084	I	OUT	Value x1	V	Voltage measured between L2 and L3
40214	085	I	OUT	Value x1	V	Voltage measured between L3 and L1
40215	086	I	OUT	Value/10	A	Maximum current at L1
40216	087	I	OUT	Value/10	A	Maximum current at L2
40217	088	I	OUT	Value/10	A	Maximum current at L3
40218	089	I	OUT	Value/10	A	Maximum current at N
40219	090	I	OUT	Value/10	kW	L1 power
40220	091	I	OUT	Value/10	kW	L2 power
40221	092	I	OUT	Value/10	kW	L3 power
40222	093	I	OUT	Value/10	kW	Total Power
40223	094	I	OUT	Value x1	kWh	Energy
40232	103	I	OUT	Value x1	Pa	Average differential pressure for DeltaP control with APL
40233	104	I	OUT	Value x1	Pa	Differential pressure for DeltaP control

4 INTERFACING WITH THE LONWORKS SYSTEM

4.1 COMPONENTS REQUIRED

- LonWorks interface board

- Electronic control board
  (Already installed on the unit)

4.2 INSTALLING THE SERIAL INTERFACE BOARD

Follow the points in the chapter “Installing the serial board” to insert the LonWorks serial board into the controller.

4.3 SETTING SUPERVISOR PARAMETERS

To communicate with the LonWorks system, set the parameters as shown below.

Access the User menu, enter the **“User”** password and scroll to the listed masks.

Mask of the terminal	Description	Par.N.
Serial ← ↓	Access mask to BMS management submenu. Press "Up" or "Down" to scroll the other masks and "Esc" to return to the submenu.	
---------- P30.01 Enable supervision: Y	Communication towards the supervisor system **must** be enabled.	30.01
---------- P30.02 BMS Address: 001 ---------- P30.03 BMS protocol config.: LON	Parameters for configuring the BMS address and protocol (0:Standard - 1:Modbus - 2:GSM Modem - 3:LON - 4:Bacnet - 5:TCP/IP - 6:WinLoad) The supervisor connection parameters must be set as follows: • Protocol: **LON** (LonWorks) • Unit ID: from **001 to 200** (default 01, …)	30.02 30.03
---------- P30.04 BMS baud rate config.: 4800	BMS baud rate configuration parameter (0:1200 - 1:2400 - 2:4800 - 3:9600 - 4:19200) The supervisor connection parameters must be set as follows: • Communication speed: **4800 baud*** *Communication speed between pCO and serial interface board.* *The speed of communication between the interface board and the external BMS is always 78 kbps.*	30.04

Mask of the terminal	Description	Par.N.
---------- P30.05 ON/OFF by BMS status: Y	Parameter for configuring the ON/OFF from the BMS (N:disabled - Y:enabled) The supervisor connection parameters must be set as follows: • Enable on/off: **Yes**	30.05
---------- P30.11 Enable FC STOP by supervisor: N	Enable stopping of Freecooling from BMS *Visible only on unit with Direct Freecooling*	30.11

4.4 SETTING UP THE SUPERVISOR NETWORK

The supervisor network is set up by LonWorks staff.
Note: MEHITS will supply the serial files and some files necessary for LonWorks technicians to configure the network.
A .NXE file and a .XIF file will be provided. The board is programmed by the technician in charge of the integration.

4.5 MEANING OF VARIABLES

Analogue (type A) 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 -999 is sent that is -99.9.
If a probe or a parameter is not configured a value equal to -888 is sent that is -88.8.

4.6 INTERFACE DATABASE

The reference database for systems using the LonWorks networks is shown below: The addresses **not** indicated in the database **must not** be used.

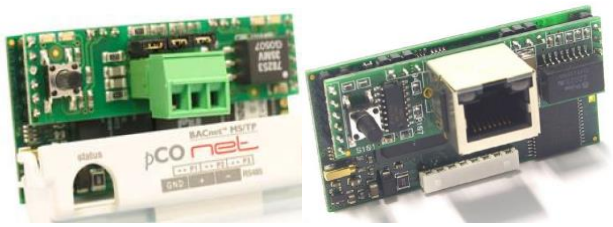
Address	Type	NV type	Flow	Conversion factor	Unit of measurement	Description
Boolean						
0	B					**Not managed**
1	B	95	OUT	-		Unit status (0:Off - 1:On)
2	B	95	OUT	-		Presence of Alarm (0: Unit OK – 1:Alarm)
8	B	95	IN	-		On/Off command by supervisor (0:Off - 1:On)
			OUT	-		
Analogue						
0	A					**Not managed**
1	A	105	IN	Value x10	°C	Cold temperature setpoint
			OUT	Value/10		
2	A	105	IN	Value x10	°C	Hot temperature setpoint
			OUT	Value/10		
6	A	105	OUT	Value/10	°C	Room temperature
7	A	105	OUT	Value/10	°C	Delivery temperature
16	A	30	OUT	Value/10	bar	Low pressure
17	A	30	OUT	Value/10	bar	Circuit 2 low pressure
20	A	105	OUT	Value/10	°C	External air temperature
21	A	81	OUT	Value/10	%	Ambient humidity
40	A	81	OUT	Value/10	%	Fan speed
Whole						
0	I					**Not managed**
12	I	0	OUT	Value x1	-	Unit status (0:ON from keypad, 1:ON from digital input, 2:ON from PLAN, 3: ON from time bands, 4:ON from supervision, 5: OFF from alarm, 6: OFF from supervision, 7:OFF from time bands, 8: OFF from Plan, 9: OFF from digital input 10: OFF from keypad, 11:OFF from deselected ventilation, 12:disconnection)
14	I	0	OUT	Value x1	-	Unit operating mode (0: Unit OFF, 1: Ventilation only, 2: Cooling, 3: free cooling, 4: cooling+free cooling, 5: Dehumidification, 6: Dehumidification+Post heating, 7: Humidification, 8: Cooling+Humidification, 9: Heating, 10: Heating+Humidification)
32	I	0	OUT	Value x1	-	Active alarm code (with greater priority)
34	I	81	OUT	value/10	%	Cold thermoregulator request (%)
37	I	81	OUT	value/10	%	Heat request (%)
46	I	81	IN	Value x1	%	Dehumidification setpoint
			OUT	Value x1		
47	I	81	IN	Value x1	%	Humidification setpoint
			OUT	Value x1		
68	I	105	IN	Value x1	°C	High ambient temperature set point
			OUT	Value x1		
69	I	105	IN	Value x1	°C	Low ambient temperature set point
			OUT	Value x1		
70	I	81	IN	Value x1	%	High ambient humidity set point
			OUT	Value x1		
71	I	81	IN	Value x1	%	Low ambient temperature set point

5 INTERFACING WITH THE BACNET SYSTEM

5.1 COMPONENTS REQUIRED

- BACnet serial interface board

As well as the BACnet MS/TP board (for RS485 network) the BACnet TCP/IP serial board is also available



- Electronic control board
  (Already installed on the unit)

5.2 INSTALLING THE SERIAL INTERFACE BOARD

Follow the points in the chapter “Installing the serial board” to insert the BACnet serial board into the controller.

5.3 SETTING SUPERVISOR PARAMETERS

To communicate with the BACnet system, set the parameters as shown below.

Access the User menu, enter the **“User”** password and scroll to the listed masks.

Mask of the terminal	Description	Par.N.
Serial ← ↓	Access mask to BMS management submenu. Press "Up" or "Down" to scroll the other masks and "Esc" to return to the submenu.	
---------- P30.01 Enable supervision: Y	Communication towards the supervisor system **must** be enabled.	30.01
---------- P30.02 BMS Address: 001 ---------- P30.03 BMS protocol config.: Standard	Parameters for configuring the BMS address and protocol (0:Standard - 1:Modbus - 2:GSM Modem - 3:LON - 4:Bacnet - 5:TCP/IP - 6:WinLoad) The supervisor connection parameters must be set as follows: • Protocol: **Bacnet** • Unit ID: from **001 to 200** (default 01, …)	30.02 30.03
---------- P30.04 BMS baud rate config.: 19200	BMS baud rate configuration parameter (0:1200 - 1:2400 - 2:4800 - 3:9600 - 4:19200) The supervisor connection parameters must be set as follows: • Communication speed: **19200 baud*** *Communication speed between pCO and serial interface board.* *The speed of communication between the interface board and the external BMS may be 9600-19200-36400-76800.*	30.04

Mask of the terminal	Description	Par.N.
---------- P30.05 ON/OFF by BMS status: Y	Parameter for configuring the ON/OFF from the BMS (N:disabled - Y:enabled) The supervisor connection parameters must be set as follows: • Enable on/off: Yes	30.05
---------- P30.11 Enable FC STOP by supervisor: N	Enable stopping of Freecooling from BMS Visible only on unit with Direct Freecooling	30.11

5.4 SETTING UP THE SUPERVISOR NETWORK

The supervision network is set up by the technicians developing the BACnet interface.
The Modbus protocol database is used for interfacing.

5.5 MEANING OF VARIABLES

Analogue (type A) variables are expressed with a decimal number (e.g. 12,0 bar → 120; 33.8°C → 338).
The scale factor of the analogue variables must be multiplied by 10 before being applied to the read or written variable value.
If a probe is in an alarm condition a value equal to -999 is sent that is -99.9.
If a probe or a parameter is not configured a value equal to -888 is sent that is -88.8.

6 INTERFACING WITH THE SNMP SYSTEM

6.1 COMPONENTS REQUIRED

- BACnet TCP/IP serial interface board

This Ethernet board is used for connection to the SNMP v1, v2c, v3 networks

- Electronic control board
  (Already installed on the unit)

6.2 INSTALLING THE SERIAL INTERFACE BOARD

Follow the points in the chapter “Installing the serial board” to insert the BACnet TCP/IP serial board into the controller.

6.3 SETTING SUPERVISOR PARAMETERS

To communicate with the SNMP system, set the parameters as shown below.

Access the User menu, enter the **“User”** password and scroll to the listed masks.

Mask of the terminal	Description	Par.N.
Serial ← ↓	Access mask to BMS management submenu. Press "Up" or "Down" to scroll the other masks and "Esc" to return to the submenu.	
---------- P30.01 Enable supervision: Y	Communication towards the supervisor system **must** be enabled.	30.01
---------- P30.02 BMS Address: 001 ---------- P30.03 BMS protocol config.: Standard	Parameters for configuring the BMS address and protocol (0:Standard - 1:Modbus - 2:GSM Modem - 3:LON - 4:Bacnet - 5:TCP/IP - 6:WinLoad) The supervisor connection parameters must be set as follows: • Protocol: **Standard** • Unit ID: from **001 to 200** (default 01, …)	30.02 30.03
---------- P30.04 BMS baud rate config.: 19200	BMS baud rate configuration parameter (0:1200 - 1:2400 - 2:4800 - 3:9600 - 4:19200) The supervisor connection parameters must be set as follows: • Communication speed: **19200 baud*** *Communication speed between pCO and serial interface board.* *The speed of communication between the interface board and the external BMS may be 9600-19200-36400-76800.*	30.04

Mask of the terminal	Description	Par.N.
---------- P30.05 ON/OFF by BMS status: Y	Parameter for configuring the ON/OFF from the BMS (N:disabled - Y:enabled) The supervisor connection parameters must be set as follows: • Enable on/off: Yes	30.05
---------- P30.11 Enable FC STOP by supervisor: N	Enable stopping of Freecooling from BMS Visible only on unit with Direct Freecooling	30.11

6.4 SETTING UP THE SUPERVISOR NETWORK

The supervisor network is set up by the technicians developing the SNMP interface.
The Modbus protocol database is used for interfacing.
Note: MEHITS will provide the boards and some files required by the SNMP engineers to configure the network.
A file in .MIB format will be supplied. The board is programmed by the technician in charge of the integration.

6.5 MEANING OF VARIABLES

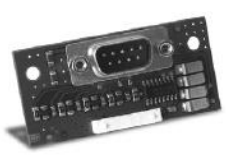
Analogue (type A) variables are expressed with a decimal number (e.g. 12,0 bar → 120; 33.8°C → 338)
If a probe is in an alarm condition a value equal to -99.9 is sent.
If a probe or a parameter is not configured a value equal to -88.8 is sent.

7 RS232 – GSM MODEM SERIAL INTERFACE

The optional RS232-Modem serial board directly interfaces the unit with a GSM system.
The GSM modem is used to send an SMS on the GSM phone in the event of and alarm.

7.1 COMPONENTS REQUIRED

- RS232 serial interface board
- External GSM modem



- Electronic control board
  (Already installed on the unit)

7.2 INSTALLING THE SERIAL INTERFACE BOARD

Follow the points in the chapter “Installing the serial board” to insert the RS232 serial board into the controller.

7.3 SETTING SUPERVISOR PARAMETERS

To communicate with the SNMP system, set the parameters as shown below.

Access the User menu, enter the **“User”** password and scroll to the listed masks.

Mask of the terminal	Description	Par.N.
 Serial ← ↓	Access mask to BMS management submenu. Press "Up" or "Down" to scroll the other masks and "Esc" to return to the submenu.	
---------- P30.01 Enable supervision: Y	Communication towards the supervisor system **must** be enabled.	30.01
---------- P30.02 BMS Address: 001 ---------- P30.03 BMS protocol config.: GSM Modem	Parameters for configuring the BMS address and protocol (0:Standard - 1:Modbus - 2:GSM Modem - 3:LON - 4:Bacnet - 5:TCP/IP - 6:WinLoad) The supervisor connection parameters must be set as follows: • Protocol: **GSM Modem** • Unit ID: from **001 to 200** (default 01, …)	30.02 30.03
---------- P30.04 BMS baud rate config.: 9600	BMS baud rate configuration parameter (0:1200 - 1:2400 - 2:4800 - 3:9600 - 4:19200) The supervisor connection parameters must be set as follows: • Communication speed: **9600 baud*** *Communication speed between pCO and serial interface board.* *The speed of communication between the interface board and the external BMS may be 9600-19200-36400-76800.*	30.04

8 INTERFACING WITH THE KONNEX SYSTEM

8.1 KONNEX COMMUNICATION

The EVOLUTION+ controller is compatible with program ETS3 or ETS4.

INFORMATION
*The controller is currently **not** compatible with program ETS5.*

The mode supported by the EVOLUTION+ controller for the Konnex network is TP1 9.6 kbits/s System mode, with cyclical transmission at fixed intervals (2 sec).
Transmission is carried out the moment that variation in the value is detected, or cyclically every 2 sec.
Complete retransmission of all the variables takes about N+2 sec, where N indicates the number of output variables.

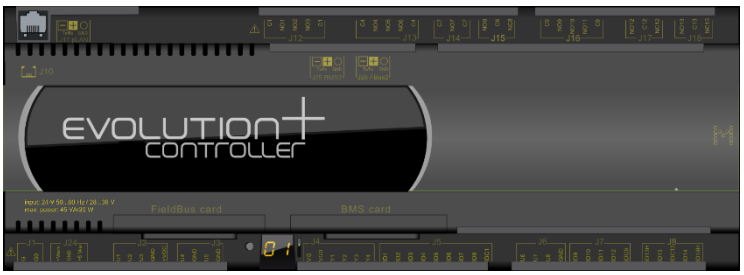
ATTENTION
The operation of a Konnex network requires a specific bus power supply that supplies the bus 29 volts DC (not provided by MEHITS).

The network is configured using a personal computer installed with the ETS3 or ETS4 program and a connection device between the USB port and the Konnex bus (**not** provided by MEHITS).

8.2 COMPONENTS REQUIRED

- Konnex interface card

- Electronic control board
  (Already installed on the unit)



8.3 INSTALLING THE SERIAL INTERFACE BOARD

Follow the points in the chapter “Installing the serial board” to insert the Konnex serial board into the controller.

8.4 SETTING SUPERVISOR PARAMETERS

To communicate with the Konnex system, set the parameters as shown below.

Access the User menu, enter the **"User"** password and scroll to the listed masks.

Mask of the terminal	Description	Par.N.
Serial ← ↓	Access mask to BMS management submenu. Press "Up" or "Down" to scroll the other masks and "Esc" to return to the submenu.	
---------- P30.01 Enable supervision: Y	Communication towards the supervisor system **must** be enabled.	30.01
---------- P30.02 BMS Address: 001 ---------- P30.03 BMS protocol config.: LON	Parameters for configuring the BMS address and protocol (0:Standard - 1:Modbus - 2:GSM Modem - 3:LON - 4:Bacnet - 5:TCP/IP - 6:WinLoad) The supervisor connection parameters must be set as follows: • Protocol: **LON** (LonWorks) • Unit ID: from **001 to 200** (default 01, …)	30.02 30.03
---------- P30.04 BMS baud rate config.: 4800	BMS baud rate configuration parameter (0:1200 - 1:2400 - 2:4800 - 3:9600 - 4:19200) The supervisor connection parameters must be set as follows: • Communication speed: **4800 baud*** *Communication speed between pCO and serial interface board.* *The speed of communication between the interface board and the external BMS is always 78 kbps.*	30.04
---------- P30.05 ON/OFF by BMS status: Y	Parameter for configuring the ON/OFF from the BMS (N:disabled - Y:enabled) The supervisor connection parameters must be set as follows: • Enable on/off: Yes	30.05
---------- P30.11 Enable FC STOP by supervisor: N	Enable stopping of Freecooling from BMS Visible only on unit with Direct Freecooling	30.11

8.5 SETTING UP THE SUPERVISOR NETWORK

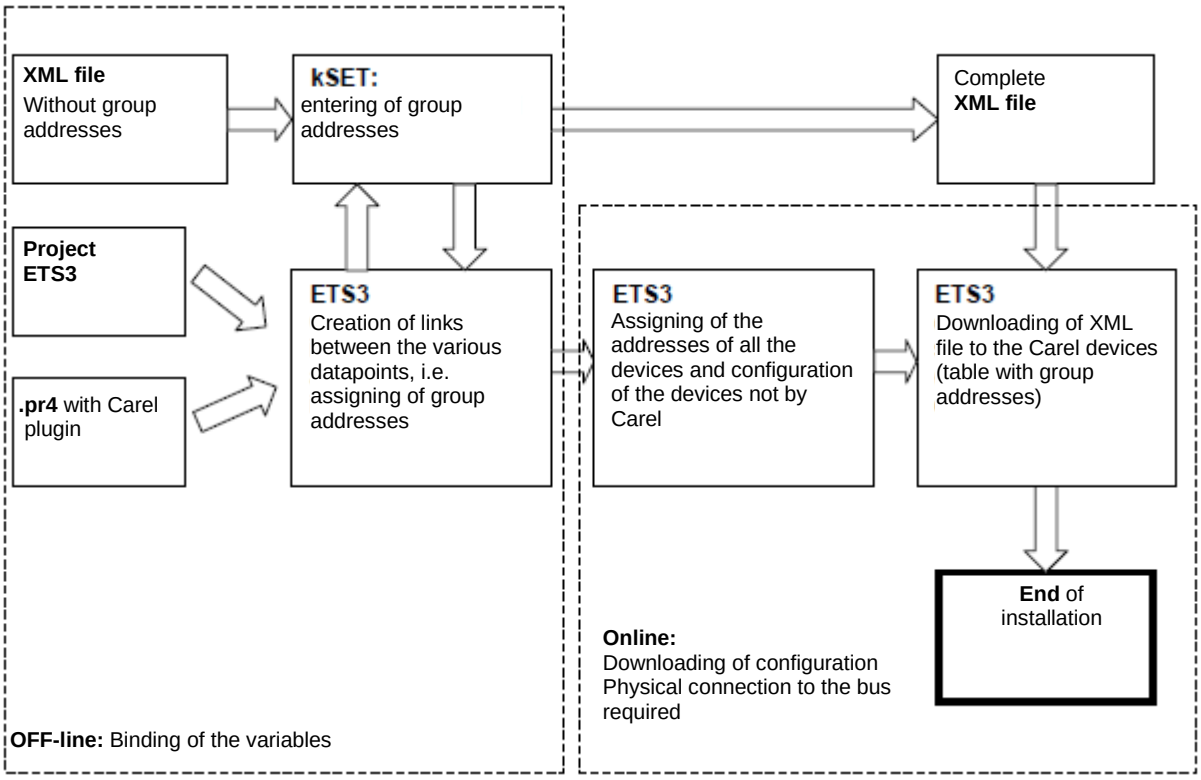
The supervisor network is set up by Konnex staff.
Note: MEHITS will supply the serial files and some files necessary for Konnex technicians to configure the network.
The following is provided:

- XML file containing the variables database.
- Controller plug-in for ETS3 program.
- Controller plug-in for ETS4 program.
- K-Set program for configuration of the variables database in relation to the BMS.
- Konnex card manual.

Programming of the board and adapting of the variables database to the BMS system in use is to be carried out by the technician responsible for integration.

ATTENTION
The groups assigned to each Konnex datapoint of the XML file are purely indicative and must be adapted to the supervision system in use. The groups are adapted by the technician responsible for integration.

The diagram below shows the phases of the configuration process carried out by the technician responsible for integration.



In order to assign the address to the board and download the XML file created with the K-Set program, the ETS3 or ETS4 data archive must be loaded with a specific description of the EVOLUTION+ controller. A plugin is distributed in the form of a "project database".
The manual of the Konnex card explains how to import the database in the program and how to use the K-Set program.

Both the K-Set program provided by MEHITS and the ETS3 or ETS4 are required to assign the group addresses to the EVOLUTION+ controller. The K-Set is used to configure the Konnex card while the ETS3 or ETS4 is for assigning the physical address of the card and downloading the configuration table.

8.6 MEANING OF VARIABLES

Analogue (type A) 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 -999 is sent that is -99.9
If a probe or a parameter is not configured a value equal to -888 is sent that is -88.8.

8.7 INTERFACE DATABASE

The reference database for systems using the Konnex networks is shown below. The addresses **not** indicated in the database **must not** be used.

Address	Type	NV type	Flow	Conversion factor	Unit of measurement	Description
Boolean						
0	B					**Not managed**
1	B	95	OUT	-	-	Unit status (0:Off - 1:On)
8	B	95	IN	-	-	On/Off command by supervisor (0:Off - 1:On)
Analogue						
0	A					**Not managed**
1	A	105	IN	Value x10	°C	Cold temperature setpoint
			OUT	Value/10		
2	A	105	IN	Value x10	°C	Hot temperature setpoint
			OUT	Value/10		
6	A	105	OUT	Value/10	°C	Room temperature
7	A	105	OUT	Value/10	°C	Delivery temperature
16	A	30	OUT	Value/10	bar	Low pressure
17	A	30	OUT	Value/10	bar	Circuit 2 low pressure
20	A	105	OUT	Value/10	°C	External air temperature
21	A	81	OUT	Value/10	%	Ambient humidity
40	A	81	OUT	Value/10	%	Fan speed

Address	Type	NV type	Flow	Conversion factor	Unit of measurement	Description
Whole						
0	I					**Not managed**
12	I	0	OUT	Value x1	-	Unit status (0:ON from keypad, 1:ON from digital input, 2:ON from PLAN, 3: ON from time bands, 4:ON from supervision, 5: OFF from alarm, 6: OFF from supervision, 7:OFF from time bands, 8: OFF from Plan, 9: OFF from digital input 10: OFF from keypad, 11:OFF from deselected ventilation, 12:disconnection)
14	I	0	OUT	Value x1	-	Unit operating mode (0: Unit OFF, 1: Ventilation only, 2: Cooling, 3: free cooling, 4: cooling+free cooling, 5: Dehumidification, 6: Dehumidification+Post heating, 7: Humidification, 8: Cooling+Humidification, 9: Heating, 10: Heating+Humidification)
32	I	0	OUT	Value x1	-	Active alarm code (with greater priority)
34	I	81	OUT	Value/10	%	Cold thermoregulator request (%)
37	I	81	OUT	Value/10	%	Heat request (%)
46	I	81	IN	Value x1	%	Dehumidification setpoint
			OUT	Value x1		
47	I	81	IN	Value x1	%	Humidification setpoint
			OUT	Value x1		
68	I	105	IN	Value x1	°C	High ambient temperature set point
			OUT	Value x1		
69	I	105	IN	Value x1	°C	Low ambient temperature set point
			OUT	Value x1		
70	I	81	IN	Value x1	%	High ambient humidity set point
			OUT	Value x1		
71	I	81	IN	Value x1	%	Low ambient temperature set point
			OUT	Value x1		

8.8 LIMITATIONS

Each line can reach 1,000 m, including all the branches. Multiple lines can be connected together using a “Line coupler”.
Two EVOLUTION+ controllers can be installed a maximum distance of 700 m apart, while each device must not be more than 350 m from the line power supply.

A maximum of 64 devices can be connected to each segment in the line. Multiple segments can be connected together using the couplers to reach the maximum of 255 devices in each line. Each line can have a maximum of 3 couplers.

Use the YCYM 1x2x0.8 cable in accordance with the EIB specifications.

9 ANNEXES

9.1 AWG (AMERICAN WIRE GAUGE) CONVERSION TABLE

Conversion : AWG number – Diameter in mm – Area in mm²

AWG no.	Diameter mm	Area mm²
1	7.350	42.400
2	6.540	33.600
3	5.830	26.700
4	5.190	21.200
5	4.620	16.800
6	4.110	13.300
7	3.670	10.600
8	3.260	8.350
9	2.910	6.620
10	2.590	5.270
11	2.300	4.150
12	2.050	3.310
13	1.830	2.630
14	1.630	2.080
15	1.450	1.650
16	1.290	1.310
17	1.150	1.040
18	1.024	0.823
19	0.912	0.653
20	0.812	0.519
21	0.723	0.412
22	0.644	0.325
23	0.573	0.259
24	0.511	0.205
25	0.455	0.163
26	0.405	0.128
27	0.361	0.102
28	0.321	0.080
29	0.286	0.065
30	0.255	0.050

9.2 ETHERNET SERIAL INTERFACE: INTERFACING WITH THE BACNET OR SNMP SYSTEM

9.2.1 Use

The ETHERNET board acts as a “gateway”, in other words, a translator between the proprietary protocol and the BACnet and SNMP protocols. These are the emerging protocols in the world of HVAC and based on the Ethernet standard. The board has an extensive memory (8MB flash, 4MB of which available to the user) and calculation capacity (ARM7 74MHz processor with Linux operating system).

The Ethernet board is used to connect to the following networks:

- LAN or the Internet:
  Thanks to its web-server capability, users can download, via FTP, the HTML pages relative to their application and then use a browser such as Internet Explorer to view/edit the variables sent to the supervisor.
- SNMP v1, v2c, v3 networks;
- BACnet Ethernet ISO8802-2 over 8802-3 networks;
- BACnet/IP networks.

The network parameters can also be configured automatically if a DHCP server is present.

By connecting the Ethernet board to an Ethernet network, the following functions can be used:

- WEB Server:
  Allows the user to check or change the operating status of the EVOLUTION+ controller using a remote computer with, for example, Internet Explorer™ or Mozilla Firefox. It is possible to insert dynamic web pages built by the user; it supports CGI technology; it supports web page access protection.
- Logger:
  The Ethernet board can save the values of some EVOLUTION+ controller variables to a non-volatile memory file. This file can be downloaded to a PC via Internet Explorer™.
- Charts:
  The trends of the data recorded using the Logger function can be consulted in chart form.
- E-mails:
  The Ethernet board can send e-mails if events that can be programmed by the EVOLUTION+ controller occur (tripped alarms, exceeded thresholds), or at preset time intervals. An XML file containing the values of variables can be attached.
- FTP Push:
  The Ethernet board can send a XML file containing values of variables to a suitably configured computer. Transmission can be programmed in the same way as for sending e-mails (events or time intervals). The file is sent using the FTP protocol;
- SNMP v1 & v2:
  To access the Ethernet board from a computer using supervision software based on the SNMP protocol. The Ethernet board can send programmable “enterprise” type Trap or Inform to notify alarms.
- BACnet Ethernet ISO8802-2 over 8802-3:
  To access the Ethernet board of the EVOLUTION+ controller using supervision software based on the BACnet Ethernet protocol.
- BACnet/IP (Addenda A/Annex J):
  For access using supervision software based on the BACnet/IP protocol.
- FTP Server:
  To easily copy data files or web pages from/to the Ethernet board, using programs where icons are simply dragged from one window to another.
- DHCP:
  To connect the Ethernet board to a local network that automatically assigns addresses from the central server, rather than static addresses set in the individual devices.
- Plugin:
  To insert additional applications realised by the user in script or compiled format.
- Firmware update:
  The Ethernet board firmware can be updated via computer.

Before a PC can communicate with the Ethernet board, the settings of both devices must be correctly aligned.
As the factory settings of the Ethernet 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 Ethernet board.

The configuration procedures are described in the following sections.

9.2.2 PC settings

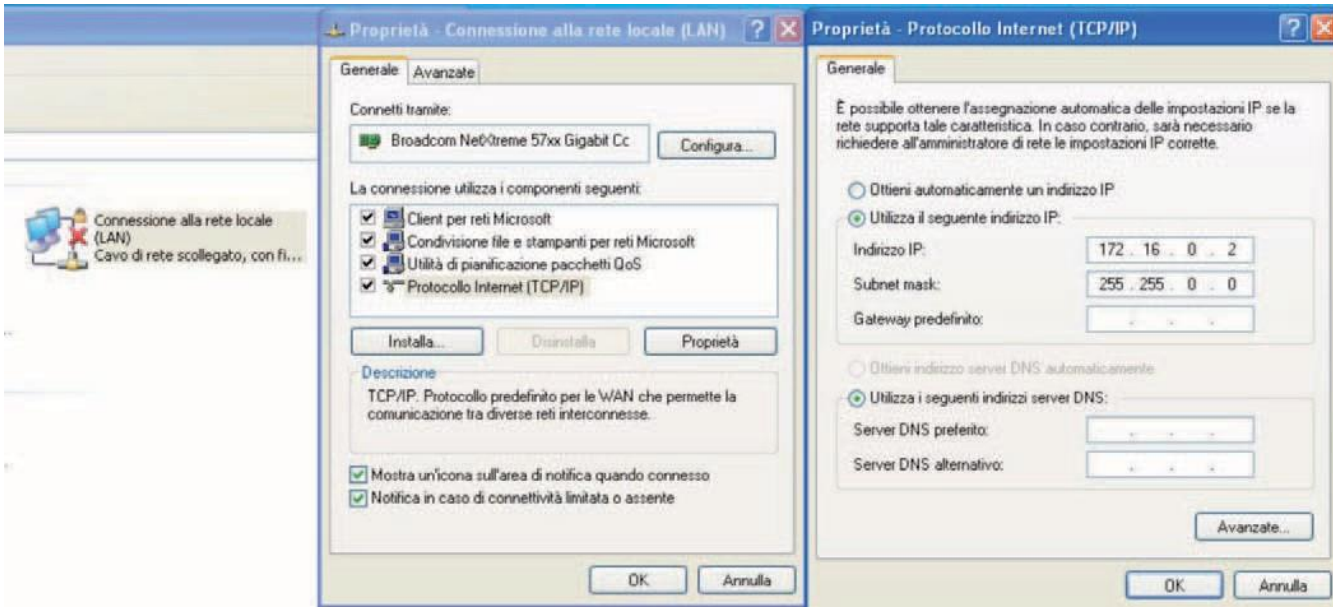
Disconnect the Personal Computer from any networks and connect it directly to the Ethernet board using the cable (crossed).

Follow these steps to set the Personal Computer to use the IP address 172.16.0.2 instead of the DHCP.
The Subnet mask field also needs to be specified. The Gateway does not need to be specified.

1. Access the “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)”.

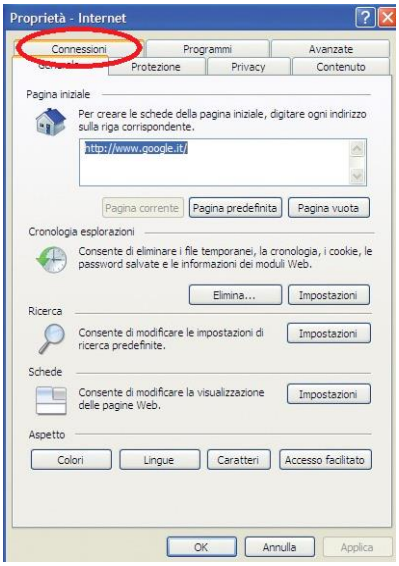
Before changing the settings, take note of all existing settings. They will be needed to reset them after work so that the PC is once again able to communicate with the data network it was previously connected.

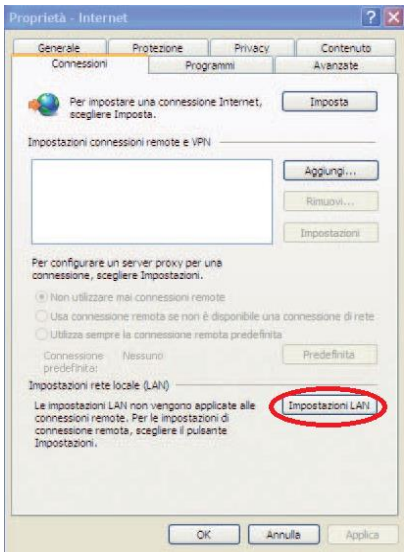
6. Click “Use the following IP address”.
7. Set the following parameters:
   - IP address = 172.16.0.2
   - Subnet mask = 255.255.0.0
8. Press OK to close the windows.

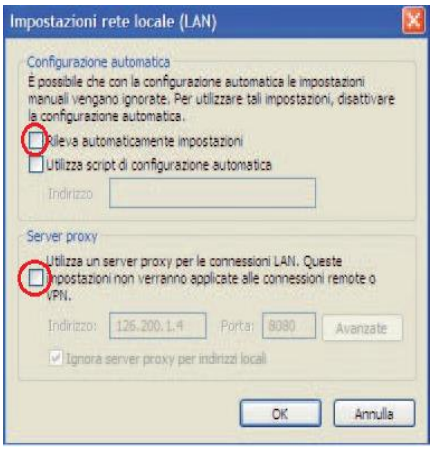


The Personal Computer is set so that it does not use the “proxy” network device as a communication channel.
In fact, the PC is not networked and if the use of “proxy” were not disabled, communication would become impossible.

1. Access the “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.







9.2.3 Starting the Ethernet board with factory settings

1. Switch on the EVOLUTION+ controller.
2. Make sure that both LEDs of the Ethernet board connector light up within a few seconds.

ATTENTION
The choice as to whether to activate factory settings or user settings can only be made when starting the Ethernet board. The Ethernet board restarts whenever it is turned on.

3. As soon as it restarts and the Status LED turns a steady **green**, press and hold the button to activate the factory settings.
4. Keeping the button held down, after about 20 seconds the Status LED slowly flashes **red** 3 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 confirms the button has been pressed and released by rapidly flashing **red** 3 times and then shining **green** for about 1 minute (completion of the start phase).
6. The Status LED starts flashing when the Ethernet board is effectively running.

In this way, the Ethernet board does 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

Note: These values remain **active until the Ethernet board is restarted**.
After restart, the Ethernet board will return to the “User” configuration values.

It is recommended that the network communication parameters are configured immediately.

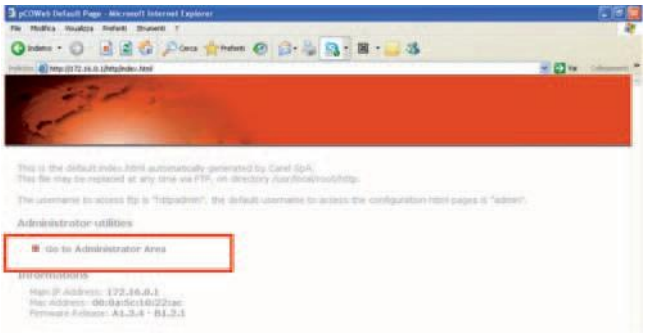
9.2.4 Access the Ethernet board via the PC

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

ATTENTION
The network administrator must establish whether the Ethernet board can be connected and must communicate essential system data.

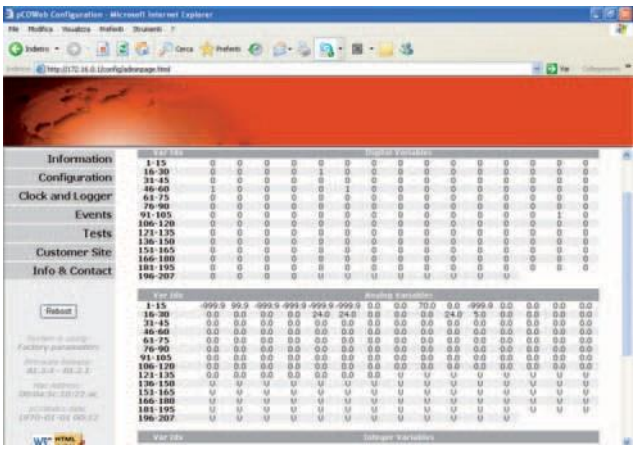
1. Open a web browser on the PC. Enter 172.16.0.1 in the address bar and press Send.

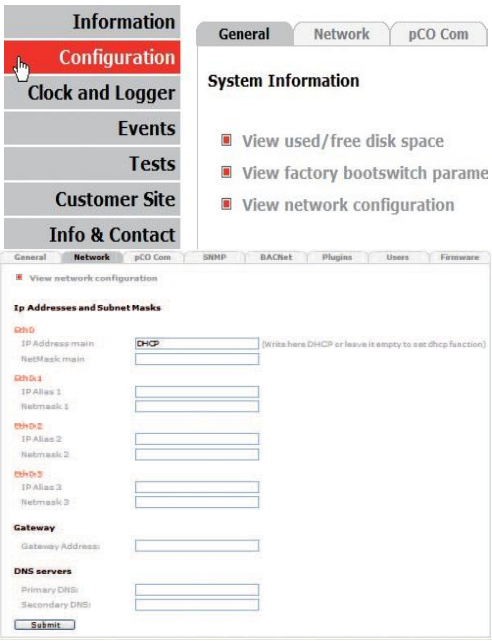
2. The main page of the Ethernet board appears ("index.html"). Click on "Go to Administrator Area".



3. At the login request enter the factory values:
   - Username: **admin**
   - Password: **fadmin**

4. If the details entered during the previous access stage are correct, the page shown in the figure appears.
   Update the data of the variables by clicking the Information button.





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

5. To set the user network parameters, click on "Configuration", then on the "Network" board and set the following basic network parameters:
   - IP address
   - NetMask

The set values will only be used from the next time the Ethernet board is restarted.

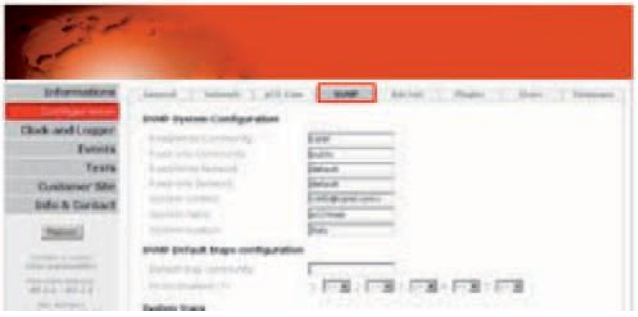
9.2.5 Configuring the board for the BACnet or SNMP protocol

The Ethernet 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.

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



The set values will only be used from the next time the Ethernet board is restarted.

ATTENTION
The professional system integrator who sets the various parameters, checks the network communication, and starts the supervision system, must be familiar with SNMP or BACNET.

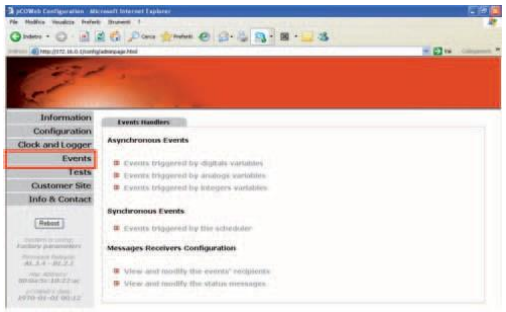
9.2.6 Notification events

The transmission of notification messages when events occur can be programmed. The following message notification types are available:

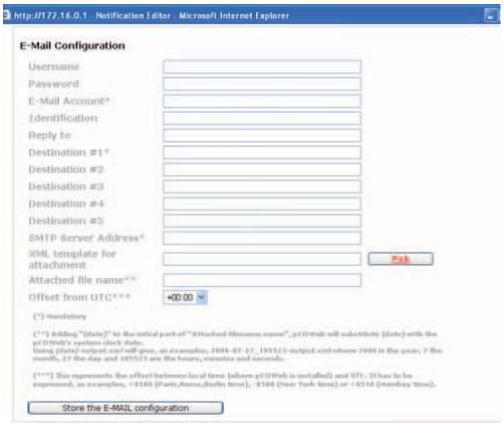
- E-mail, the body of which can contain a custom text or a web page with the EVOLUTION+ controller variable values read at the moment of transmission; a custom XML file containing the variable values can also be attached.
- XML file, identical to the one that can be forwarded by e-mail, but sent through the FTP protocol (FTP Push function).
- Trap or Inform SNMP, to which a selection of up to 5 variable values can be attached.

Setting of recipients

1. On the main page of the Ethernet board, open the “Events” page.



2. Open the recipient settings window and the attachable “View and modify the events recipients” files for e-mail configuration (these must be supplied by the system administrator).

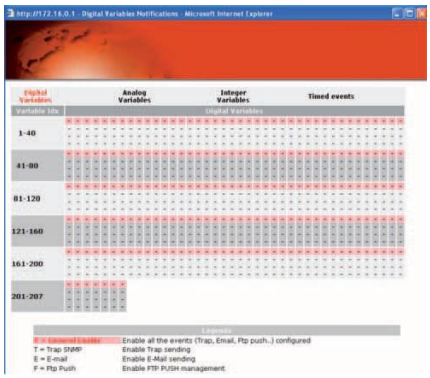


The settings of this window are common to all generated events.

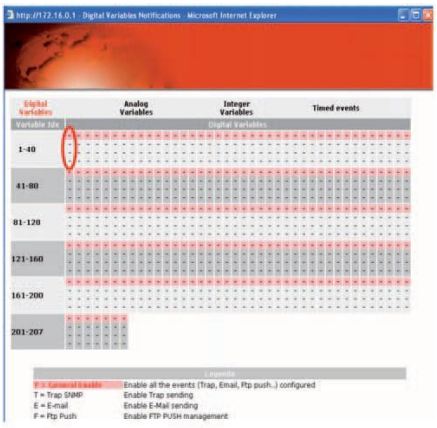
Transmission of notifications regarding variable variations

1. Click one of the following:
   - "Events triggered by digital variables"
   - "Events triggered by analogue variables"
   - "Events triggered by integer variables"

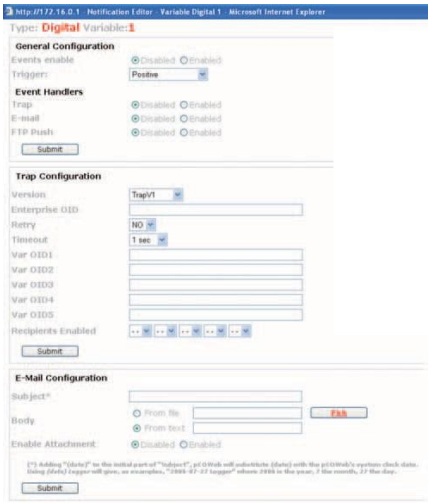
An example of setting a digital variable is shown in the figure.



2. Click the check box of the variable.
   (Digital variable 1 in the example)



3. Customise the parameters.



For all the functions and details of the individual menus, see the full Ethernet board manual.

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