1. GENERAL DESCRIPTION.

1.1 ¿How is the net composed?

The purpose of this net is connecting one or several units through the CLIMATIC 10 to a BMS system. For this we use the interface GATEWAY that allows us to use a net of CLIMATIC 10 through MODBUS protocol. We can connect up to 16 units with the CLIMATIC 10 thermostat (we can connect together different sizes) to the same interface, and up to 16 GATEWAYs in the same net.
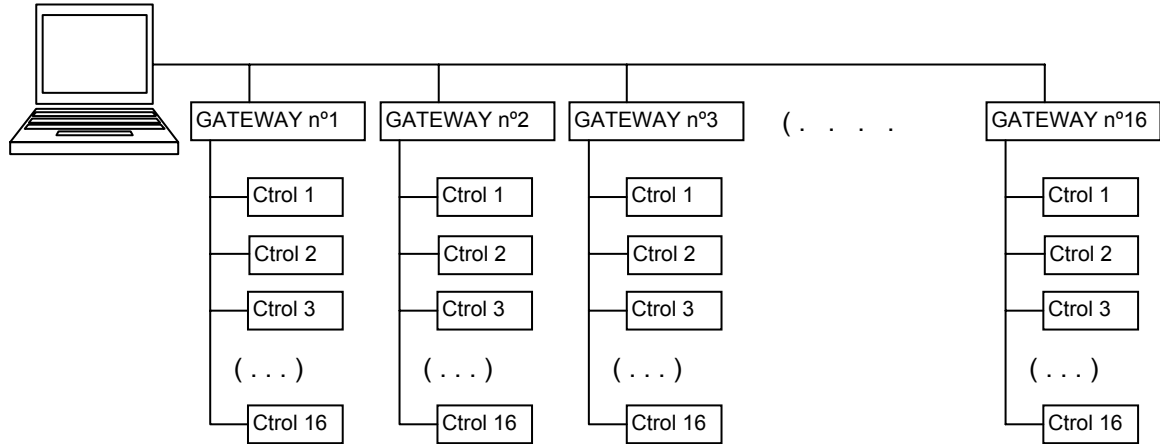
The CLIMATIC 10 must be specific, and substitutes the standard controller of the unit. There is not possibility of programmable option for this thermostat.

In the MODBUS net , it is posible to install different controllers or devices , providing the same configuration of communication is used (protocol RTU , same communication speed , same parity , etc…….) and connection RS485 .

1.2 ¿What can be switched on to this net?

With this system , we can control the following functions of the unit:

- Selection of mode of functioning: OFF/AUTO/FAN/COOL/HEAT and fan mode between FAN ON/AUTO.
- Modify the setpoints : confort, absence and nuit
- Read alarm status and reset alarms
- Read air ambient temperature, condensing temperature (in some programs) and outdoor ambient temperarture (only if the optional freecooling is included)
- Read inlets /outlets status
- Register of hours of functionning (for compressor and fans)
- Keypad blocking /unblocking

- **How to supply.**

In every installation it is necessary to include :

One terminal CLIMATIC 10 with RS485 connection for each of the units connected. This CLIMATIC will be programmed according the type of unit commanded.
One GATEWAY at least for every 16 units.

Connections between the unit and the terminal CLIMATIC 10 must be done according the wiring diagram. GATEWAY is supplied without connecting/wiring and must be installed in an appropriate place , power supplied and communicated through bus connection.

2. WIRING.
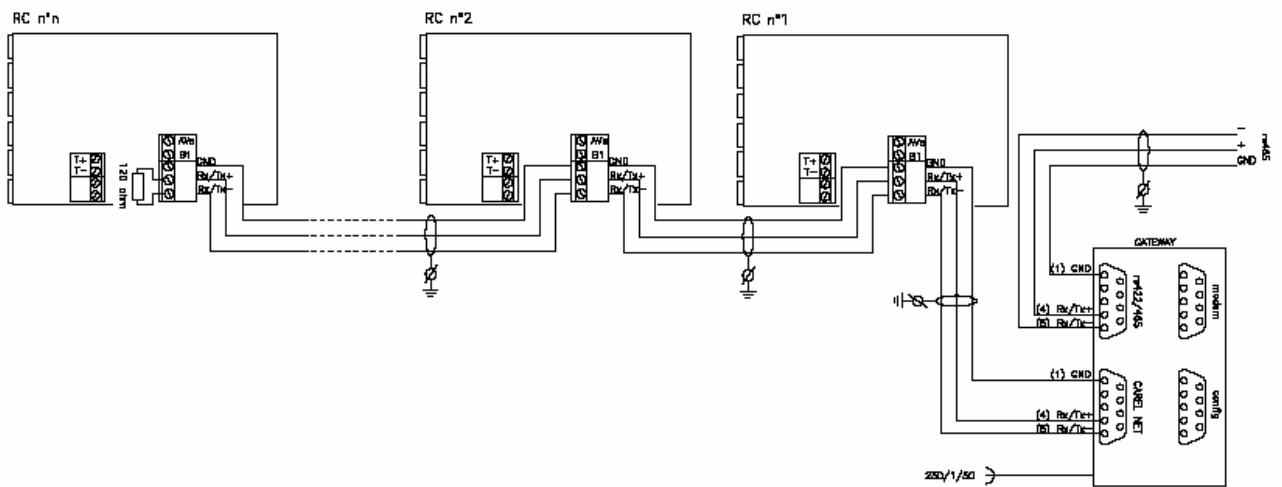
The connections between terminals CLIMATIC 10 must be done with screened cable section AWG 20 (0,5mm^2) o AWG 22(0.32 ÷ 0.38 mm^2) with a capacity between wires less than 100 pF/m. The screen shall be preferable of made continous wiring (Models Belden 8761 y 8762 fulfill this requirements) .

In the last terminal CLIMATIC 10 a 120 Ohm resistance shall be installed.

Power supply of GATEWAY is 230V , and it has to fulfill all the requirements related to electricity norm requirements.

In the wiring diagram above , the connection to a net RS 485 is represented.

If we want to connect only one GATEWAY directly to a computer , we can use through the MODEM connection a RS 232 wiring according the following equivalence table.

It has to be taken into account that in the configuration , it has to be defined the type of connection (RS 232 or RS 485) to the GATEWAY .

3. CONFIGURATION

3.1 CLIMATIC 10 – GATEWAY.

There is some parameters in CLIMATIC 10 that control the communication

L1: Adress 1..16. Every CLIMATIC 10 connected to a GATEWAY must have an address between 1 and 16 .

L6: Protocol mode. Communication protocol with the net. Its value must be **L6=1** for connecting with the GATEWAY.

L7: Speed. Communicating speed between GATEWAY and CLIMATIC 10 controls. Set up at **L7=3** (9600 bauds). This parameter must not be misunderstood with the communication speed between the system and the GATEWAY.

3.2 GATEWAY – BMS.

The configuration of the GATEWAY allow reading and writing the following parameters, which are necessary to get settled for a correct operation of the device. The configuration is done through a software supplied together with the GATEWAY.

- Adress of the GATEWAY in the MODBUS net
- Number of terminals in the CLIMATIC 10 net.
- Communication speed between the GATEWAY and the CLIMATIC 10
- Communication parameters between the GATEWAY and the supervisión net (speed, word lenght, stopping bits , parity)

To use this configuration software it is necessary to wire a cable from the "config" connection of the GATEWAY to the computer RS232 port, like the one shown in the following diagram. Once made the configuration , this connection must be removed.
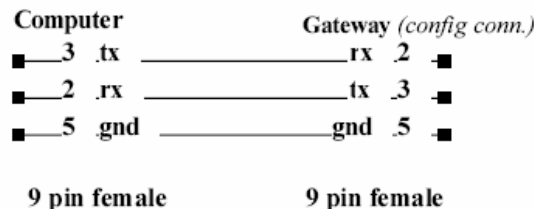
To read the configuration of the GATEWAY , the following program has to be executed

A:>readmb0 /Com

/Com = /COM1,/COM2, is the port in which the GATEWAY is connected.

Following data will appear in the display:

RDMOD32 Version 2.0 - 2002 Carel Software VERSION : MB0 3.1 14/07/04	Software Version
ADDRESS : 01	Adress MODBUS of GATEWAY
SLAVES : 01	Number of CLIMATIC 10 connected
MODBUS PORT PARAMETER bauds : 9600 bits : 8 stop : 1 parity : NONE	Communication MODBUS configuration
CAREL PORT BAUD RATE : 9600 Mode: Rs485	Communication CLIMATIC 10 configuration net

To change this configuration we use:

A:>writemb0 /Com Modbus_address num_of_slave Carel_baud Modbus_baud stop_bit parity

/Com = /COM1,/COM2	Port connection for GATEWAY
Modbus_address = 1..16	GATEWAY address in the MODBUS net
num_of_slave = 1..16	Number of thermostats to connect
Carel_baud = 300, 600, 1200, 2400, 4800, 9600, 19200	Communication speed between GATEWAY and CLIMATIC 10(it has to be the same value than the parameter L7 of CLIMATIC 10 and it is set up with the value **9600)**
Modbus_baud = 600, 1200, 2400, 4800, 9600 stop_bit = 1, 2 parity = ODD, EVEN, MARK, SPACE, NONE	Configuration of the net MODBUS connection

For example , to configurate through port com1, the GATEWAY with adress 1, which is connected at the same time to 4 CLIMATIC 10 with a speed of 9600 bauds, and to the MODBUS net through 9600 bauds, 1 bit stop and NONE parity , it has to be written:

Writemb0 /com1 1 4 9600 9600 1 NONE

The CLIMATIC mode of communications has to be configurated through jumpers , as shown in the following chart:

<table>
<tr><td rowspan="4"></td><td>A: GATEWAY communication
(1-2) RS 232
(2-3) RS 422-RS 485</td></tr>
<tr><td>B: GATEWAY communication
(1-2) RS 485
(2-3) RS 422 (Not used)</td></tr>
<tr><td>C: Communication with CLIMATIC 10
(1-2) RS 485 (necessary selection)
(2-3) RS 422 (Not used in CLIMATIC 10)</td></tr>
<tr><td>D: Relay signal (not used)
(1-2) Normally open
(2-3) Normally closed</td></tr>
</table>

4. ADRESS MAP.

There are two kind of addresses:

Digital addresses : they have to be read with MODBUS functions 01 or 02 and written with functions 05 or 15.

Analogic adresses :that have to be read with the MODBUS functions 03 or 04 , and written with functions 06 or 16.

Adresses shown with "R" digit are readable , those shown with "W" are writable and those shown as "R/W" are both readable and writable.

For CLIMATIC 10 adressed with "n" (from 1 to 16) inside the GATEWAY , adresses are the following :

DIGITALS			
1+200*(n-1)	ID1 value (if it is available)	R	0: open 1: closed
2+200*(n-1)	ID2 value (if it is available)	R	0: open 1: closed
3+200*(n-1)	ID3 value (if it is available)	R	0: open 1: closed
4+200*(n-1)	Alarm reset	W	1: Reset
9+200*(n-1)	ON/OFF	R/W	0: OFF 1: ON
16+200*(n-1)	Alarm	R	0=no 1=yes
ANALOGICAS			
1+256*(n-1)	Temperature value B1	R	Value multiplied by 10
2+256*(n-1)	Temperature value B2	R	Value multiplied by 10
3+256*(n-1)	Temperature value B3	R	Value multiplied by 10
4+256*(n-1)	Actual Setpoint	R/W	Value multiplied by 10
5+256*(n-1)	Absence Setpoint	R/W	Value multiplied by 10
6+256*(n-1)	Confort Setpoint	R/W	Value multiplied by 10
7+256*(n-1)	Night setpoint	R/W	Value multiplied by 10
8+256*(n-1)	Differential	R/W	Value multiplied by 10
33+256*(n-1)	Hours counter compressor 1	R	Value in K hours multiplied by 10
34+256*(n-1)	Hours counter compressor 2	R	Value in K hours multiplied by 10
37+256*(n-1)	Hours counter fan	R	Value in K hours multiplied by 10
129+256*(n-1)	Outlet status (relays)	R	Bit 0: Relay 7 Bit 1: Relay 6 Bit 2: Relay 5 Bit 3: Relay 4 Bit 4: Relay 3 Bit 5: Relay 2 Bit 6: Relay 1
135+256*(n-1)	Unit functionning mode	R/W	0: AUTO 1: COOL 2: HEAT 3: FAN
136+256*(n-1)	Fan functionning mode	R/W	0: OFF 1: AUTO 2: SPEED1 3: SPEED2 4: SPEED3

137+256*(n-1)	Alarm 1	R	Bit 0: HR 1 Bit 1: HR 2 Bit 2: HR F Bit 3: HI T Bit 4: LO T Bit 5: E ID Bit 6: REM Bit 7: E DF Bit 8: EE Bit 9: EE Bit 10: n/u Bit 11: E SR Bit 12: E TR Bit 13: E1 Bit 14: E2 Bit 15: E3
138+256*(n-1)	Alarm 2	R	Bit 0: P AL Bit 1: Th F Bit 2: n/u Bit 3: n/u Bit 4: HI T Bit 5: LO H Bit 6: LO P
142+256*(n-1)	Setpoint category	R/W	0: ABSENCE 1: CONFORT 2: NIGHT 3: STAND-BY
143+256*(n-1)	Automatic mode of functioning	R	0: AUTO 1: COOL 2: HEAT 3: FAN ONLY
186+256*(n-1)	Keypad blocking	R/W	0:Not blocked 1:Blocked

5. COMMANDS DESCRIPTION.

The actions done from the MODBUS commands MODBUS , they are reflected automatically in the CLIMATIC 10 and viceversa.

The handling through the Terminal is operative unless the keypad is blocked.

5.1 FUNCTIONNING

With digital adress 9+200*(n-1) we start and stop the unit. This is a readable/writable parameter. With 1 value we start the unit and with 0 value we stop the unit.

With analogic adress 135+256*(n-1) we can see /select the mode of functionning . The way of selecting the different modes of functioning is writing the values : 0 Auto, 1 : Cool , 2: Heat and 3 : Fan.

In the analogic adress 143+256*(n-1) we can see the real mode of functionning if we have previously selected automatic. This address will show 1 if the unit works in cooling mode, 2 if the unit works in heating mode and 3 if the unit works in fan mode.

With digital adress 136+256*(n-1) we can change fan status between 1: Auto and 2 :Continuous

5.2 SETPOINTS

With the analogic adress 142+256*(n-1) we can select or see the actual setpoint . The way of selecting the different setpoints is introducing the following values : 0; Absence, 1; Confort ; 2 Night and 3 Stand-by

Set points can be modified in the following addresses: .

4+256*(n-1)	Actual Setpoint	R/W	Value multiplied by 10
5+256*(n-1)	Absence Setpoint	R/W	Value multiplied by 10
6+256*(n-1)	Confort Setpoint	R/W	Value multiplied by 10
7+256*(n-1)	Nigth Setpoint	R/W	Value multiplied by 10
8+256*(n-1)	Differential	R/W	Value multiplied by 10

5.3 ALARMS.

Digital adress 16+200*(n-1) will have value when there is an alarm. This adress is readable only.

This alarm can be reset by writing 1 in the digital adress 4+200*(n-1) . This address is only writable. Reset will be made if the default reason has been solve. The value will reset to 0 after alarm reset.

In the analogic adresses 137+256*(n-1) and 138+256*(n-1) we can get the alarms detailed in binary code . The meaning of each bit is shown in the following table. This parameters are only readable.

137+256*(n-1)	Alarm 1	R	Bit 0: HR 1 Bit 1: HR 2 Bit 2: HR F Bit 3: HI T Bit 4: LO T Bit 5: E ID Bit 6: REM Bit 7: E DF Bit 8: EE Bit 9: EE Bit 10: n/u Bit 11: E SR Bit 12: E TR Bit 13: E1 Bit 14: E2 Bit 15: E3
138+256*(n-1)	Alarm 2	R	Bit 0: P AL Bit 1: Th F Bit 2: n/u Bit 3: n/u Bit 4: HI T Bit 5: LO H Bit 6: LO P

5.4 HOURS COUNTER

In the analogic adresses we can see the hours of functioning of each compressor and fan.

33+256*(n-1)	Hours counter compressor 1
34+256*(n-1)	Hours counter compressor 2
37+256*(n-1)	Hour counter fan

These adresses can only be readable , and show the hours of functioning in Khours x 10. So if one of the adresses show 12 , that means 1200 hours.

5.5 KEYPAD BLOCKING

Analogic adress "186+256*(n-1)" allow the blocking of the keypad CLIMATIC 10.
With value 1 , the keypad gets blocked and with value 0 the keypad comes again operative.

5.6 INLETS/OUTLETS

Digital inlets can be displayed in the following adresses :

1+200*(n-1)	ID1 value (if it is available)	R	0: open 1: closed
2+200*(n-1)	ID2 value (if it is available)	R	0: open 1: closed
3+200*(n-1)	ID3 value (if it is available)	R	0: open 1: closed

Inlet sensors values can be displayed in the following analogical adresses:

1+256*(n-1)	Temperature value B1	R	Value multiplied by 10
2+256*(n-1)	Temperature value B2	R	Value multiplied by 10
3+256*(n-1)	Temperature value B3	R	Value multiplied by 10

The relays outlet status can be displayed in the following analogic adress , according the following meanings:

129+256*(n-1)	Outlet status (relays)	R	Bit 0: Relay 7 Bit 1: Relay 6 Bit 2: Relay 5 Bit 3: Relay 4 Bit 4: Relay 3 Bit 5: Relay 2 Bit 6: Relay 1