



PROGRAMMABLE NUMERIC CONVERTER

**CNL 20
CNL 20 / R
CNL 20 / S
CNL 20 / C**

CONFIGURATION HANDBOOK

LOREME 12, rue des Potiers d'Etain
Actipole BORN Y - B.P. 35014 - 57071 METZ CEDEX 3
Telephone 03.87.76.32.51 - Fax 03.87.76.32.52
Contact: Commercial@Loreme.fr - Technique@Loreme.fr

TABLE OF CONTENTS

DIALOGUE - TERMINAL MODE page 1

 1) PSION serie 2 page 1

 2) PSION Workabout page 1

 3) PC with DOS page 2

 4) PC with WINDOWS 3.11 page 2

 5) PC with WINDOWS 95/98 page 2

 6) Visualization page 3

DEVICE PRESENTATION page 3

CONFIGURATION page 3

 1) Method page 3

 1.1) Menu selection page 3

 1.2) Parameter selection page 3

 1.3) Value acquisition page 3

 2) Input page 4

 3) Analog output page 4

 4) Relay page 4

 5) Special functions page 5

MEASURE MODIFICATION page 5

EMC CONSIDERATION page 6

 1) Introduction page 6

 2) Installation and utilization rules page 6

 2.1) General remarks page 6

 2.2) Power supply page 6

 2.3) Inputs / Outputs page 6

INPUTS - OUTPUTS WIRING page 7

PC TRANSMITTER LINK page 7

DIALOGUE - TERMINAL MODE

Numeric devices can converse with all terminal emulation mode systems. As the dialogue and configuration part are in device's memory, no software or specific interface are necessary for their configuration. Two terminal emulation mode systems are presented: the PSION and the PC. Different procedures are enumerated below.

1) PSION serie 2:

First of all manipulation, plug in "COMMS LINK" on the PSION. To start up the PSION, push on the "ON" key.

The PSION displays this menu:

**RECH SAUV AGENDA
CALC PROG EFFACE**

Push on the "C" key until the menu "COMMS", and validate with "EXE".

The PSION displays this menu:

**TRANSMIT RECEIVE
SETUP TERM AUTO**

Push on the "T" key until the menu "TERM", and validate with "EXE" to obtain a empty screen. The PSION is now in terminal mode and you can link the PSION to the device, by plugging in the RS 232. The measure is displayed, to configurate, push on the "C" key.

2) PSION Workabout:

To start up the PSION push on the "ON" key.

At the presentation, push on the "MENU" key. Select "SYSTEME SCREEN" mode and validate by "ENTER".

Icons display: **DATA CALC SHEET PROGRAM COMMS**

Select icon "COMMS" and validate by "ENTER", on display, a cursor flashing. The PSION is in terminal mode. Plug in "RS232" on PC. The measure is displayed and, to configure, push "C" on keyboard.

To quit terminal mode and switch off PSION, push on "OFF" key. When you re-start the PSION in terminal mode, it start automaticaly and directely in terminal mode without re-start configuration.

3) PC with DOS:

The terminal emulation mode software with DOS "IBM®-PC KERMIT-MS V2.26" is available at simple request. After the PC has booted, type "a: K" then press "ENTER". The PC is in terminal mode and uses COM port 1.

If you want to use the second serial communication port (COM2), type:

- "A:KERMIT" and "ENTER" to launch the program,
- "SET PORT 2" and "ENTER" to select COM2,
- "SET BAUD 9600" and "ENTER" to select speed,
- "CONNECT" and "ENTER", to enter in the terminal mode.

The PC is now emulating a terminal and may be connected to the device by plugging in the RS 232 link cable.

Measure is now displayed and configuration's acces allowed by a press on "C" key.

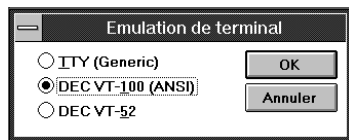
To quit kermit, press "CTRL-\$" then press the key "C". When the message KERMIT-MS appears, type "QUIT" to return to MS-DOS commands.

4) PC with WINDOWS 3.11:

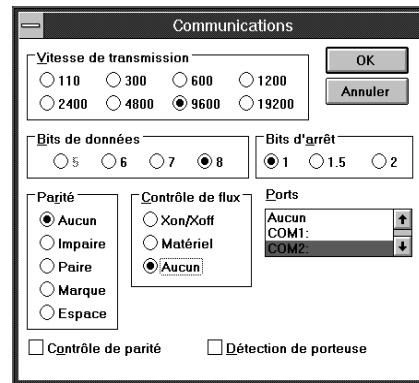
Start **WINDOWS** and in "**ACCESSOIRES**" group, double-click on icon wich get access to terminal mode.

In "**PARAMETRES**" menubar, click on "**COMMUNICATION**" sub-menu. We access to the following windows. Configure communication parameters, 9600 bauds, no parity, 8 data bits, 1 stop bit, no flow control and validate.

Begin terminal emulation by click on "**PARAMETRES**", then on "**EMULATION TERMINAL**". the following board is displayed.



Choose terminal mode **DEC-VT-100(ANSI)** and validate. The PC is in terminal mode, connect it to device by plugging the RS232 link cable. Measure is now displayed and to access at configuration, press on "C" key.



5) PC with WINDOWS 95/98:

To start up terminal program:

- 1 - Cliquez on button "**START**",
- 2 - Tick off "**PROGRAMS**", "**ACCESSOIRES**", and "**HYPER TERMINAL**",
- 3 - Click twice on 

Hypertrm.exe

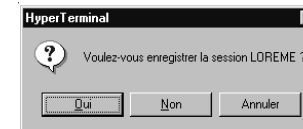
The following window is displayed. Enter a name for a new connection and validate, the hereunder window will appear



Choose a communication port and validate. The belowing window is displayed




Configure communication parameters, 9600 bauds, no parity, 8 data bits, 1 stop bit, no flow control and validate. The PC is in terminal mode, connect to device by plugging in the RS232 link cable. Measure is now displayed and to access at the configuration, press on "C" key .



When quitting HyperTerminal will be displayed the following window. To dialog with all LOREME devices without re-start all the method, click on "OK"

To load LOREME session directly:

- 1 - Click on button "**Start**".
- 2 - Tick off "**Programs**", "**Accessories**", and "**HyperTerminal**".
- 3 - Click twice on the icon 

LOREME.ht

6) Visualization:

When it starts up, the device is in measure mode.

Two datas are send to terminal:

10 mV	Value of the input measure,
11.99 mA	Value of the output result.

To access configuration, type on "**C**" key and follow the configuration procedure.

DEVICE PRESENTATION

The purpose of this handbook is to allow you to become familiar with the different function of the device.

It's necessary to notice the difference between different models:

CNL 20: 1 analog output.

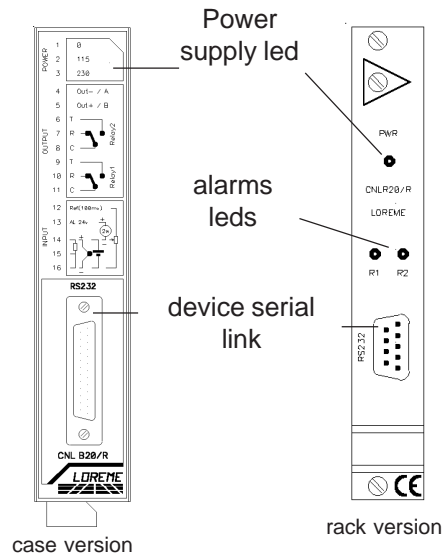
CNL 20 /S2: 2 analog outputs identical and insulated between themselves.

CNL 20 /S3: 3 analog outputs identical and insulated between themselves.

CNL 20 /R: 2 relays, 1 analog output.

CNL 20 /C: 1 analog output, 1 RS 485 link.

/R and **/C** options can not be taken with the **/S** option.



CONFIGURATION

This manual recapitulates a detailed account of several configuration possibilities: Input, analog output, special functions, relay.

To access configuration mode, type on "**C**" key.

1) Method:

At configuration, several question types are asked. For each of them, several answers are possibles. Description of each of them:

1.1) Menu selection:

Example: INPUT
Y - N

The choice is done by typing on "**Y**" or "**N**" keys.

This choice allows access to different configuration menus.

1.2) Parameter selection:

Example: VOLTAGE or VOLTAGE
(Y-N) YES (Y-N) NO

Previous choice = YES: - push on "**Y**" => Validation of choice = YES,
- push on "**←**" => Validation of choice = YES,
- push on "**N**" => Change of choice = NO.

Previous choice = NO: - push on "**N**" => Validation of choice = NO,
- push on "**←**" => Validation of choice = NO,
- push on "**Y**" => Change of choice = YES.

Choices are made pushing on "**Y**" or "**N**" keys, and validation by pushing on "**←**" (PC) / "**EXE**" (PSION) when the answer "**Y**" or "**N**" is displayed. Pushing on the key "**←**" / "**EXE**" without modification allows validate previous answer.

1.3) Value acquisition:

Example: LOW SCALE
4 mA

Two possibilities:

- The validation without modification by pushing on "**←**" / "**EXE**",
- The keyboard value modification (simultaneous display), then the validation by "**←**" / "**EXE**".

Note concerning the value acquisition:

- It is possible, when a mistake is made during a value acquisition, before validating it, to go back pressing "**DEL**" key (only on PSION), which re-displays the message without taking notice of the wrong value.
- In configuration mode, if there is no action, the device goes back in operating mode after a two minutes delay without taking notice of the modifications made before.
- In configuration mode, if you want to shift to measure mode without taking notice of the modifications made before, you just have to press "**ESC**" (PC) or "**SHIFT + DEL**" (PSION) key.

2) Input:

The input possibilities are:

- Voltage (mV, V),
- Current (mA),
- Resistance (Ω),
- Pt 100 ($^{\circ}\text{C}$),
- Thermocouple ($^{\circ}\text{C}$),

for each type of input, you can choose:

- the low scale,
- the high scale.

Particularity:

- Thermocouple:

Choice of thermocouple type (B, E, J, K, R, S, T),

Choice of compensation type (internal or external).

Choose the **internal compensation** when the thermocouple is connected on device with a compensation cable.

Choose the **external compensation** when a compensation box where the temperature will be known and fixed is used.

Enter this temperature as the external compensation value.

- Potentiometer:

Configure voltage input (mV):

- start of scale: 0 mV,
- end of scale: 100 mV.

Move the potentiometer at the start and at the end of the range and measure the values.

Change the voltage input (mV):

- start of scale: Start range value,
- end of scale: End range value.

View wiring diagram for potentiometer cabling.

- Sensor power supply:

To supply a converter in 2 wires technical and measure the current in the loop, it's necessary to configure the device in 4-20 mA current input and select "SENSOR POWER".

View wiring diagram for sensor power supply and current input cabling.

3) Analog output(s) (2 outputs CNL35/S2):

3.1) CNL 20 / R, CNL 20 / C versions:

Analog outputs configuration is presented through 2 rubrics:

- Output type:

- current output (mA),
- voltage output (V).

with for each output type, the choice of:

- low scale,
- high scale.

- Output parameters:

- security value,
- limitation,
- response time.

The security value allows to set the output on a known state when there is a sensor breaking or a measure range overflow.
The acquisition value is sent to the output.

The limitation allows, for all input signal values, to peak clip the output signal swing at scale configuration.
Only security value goes beyond this function.

The response time is adjustable from 200 ms to 60 s.

3.2) CNL 20 / S versions:

All analog outputs are identical.

Analog outputs configuration is presented through 2 rubrics:

- Output type:

- current output (mA),
- voltage output (V).

with for each output type, the choice of:

- low scale,
- high scale.

- Output parameters:

- security value,
- limitation,
- response time.

4) Relay (CNL20/R):

The 2 relays configuration is presented through 2 rubrics:

- Detection type:

- watch dog detection,
- breaking detection,
- threshold detection.

The watchdog detection activates the alarm when the device is outside the working temperature range specified on the technical card or in configuration mode

The breaking detection activates the alarm on sensor breaking or on measure range overflow.

The threshold detection activates the alarm on threshold overstepping. It is necessary to choose the threshold type (high or low), threshold and hysteresis values.

The two detections types can be chosen simultaneous.

The **threshold detection** works in this way:

- high threshold detection:

- .the alarm is activated when the measure goes above the threshold,
- . the alarm is removed when the measure goes below the threshold less the hysteresis.

- low threshold detection:

- .the alarm is activated when the measure goes below the threshold,
- . the alarm is removed when the measure goes above the threshold more the hysteresis.

- Relay parameter:

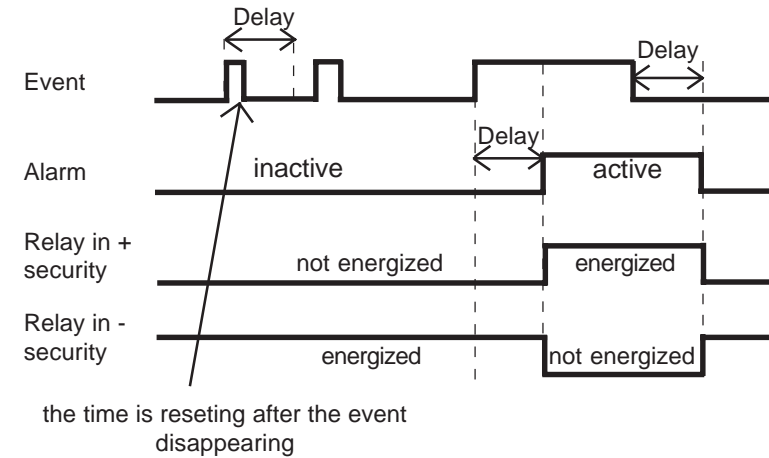
- security,
- delay.

The security works in this way:

- in positive security, the relay is energized when the alarm is active,
- in negative security, the relay is energized when the alarm is inactive.

The delay value (in seconds), determines the time above which the alarm changes his statement after detection of the event. The delay is active at the appearance and disappearance of the event.

The special delay value (in seconds), determines the time above which the alarm can be take into consideration after and only after a turn of "threshold breaking".



5) Special functions:

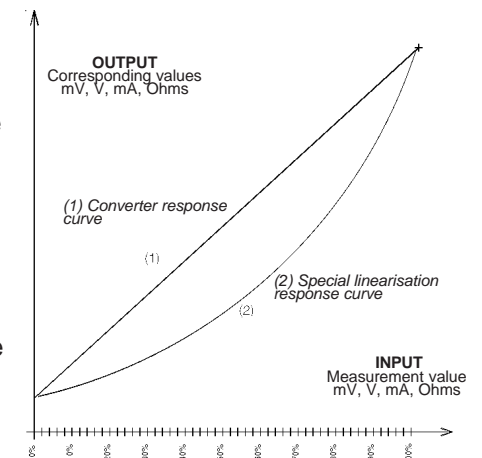
This functions are not available for Pt100 or TC inputs:

Square root: this function executes a square root on the measure percentage of the input range and is reported on analog output.

Special linearization: when this function is chosen, it is directly validated, but the linearization configuration isn't modified. To modify the special linearization, it is necessary to validate by YES the configuration suggest.

When the special linearization is enabled, the converter will use the curve that you program (2).

To have a special linearization curve (2), it's necessary to put for each curve point the physical input value and the corresponding physical output value (max.: 52 signed points including 0 % and 100 % of the input). So, for each measure in the input range (**device can't use the linearization function out of range**), the device will make the corresponding of linearized output value.



6) Communication (CNL 20/C):

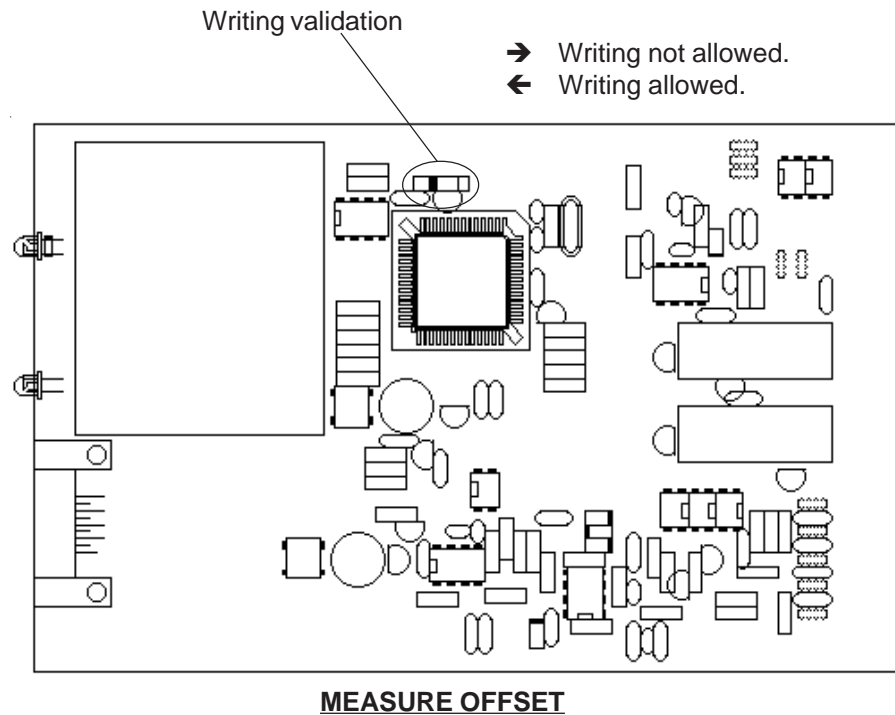
The numerical output RS 485 configuration is presented through 3 rubrics:

- device address in the communication network (1 to 255),
- speed in bauds (600, 1200, 2400, 4800, 9600),
- data format (floating, integer 16 bits, 12 bits, 8 bits).

Datas accessible by the communication are:

- measure result (reading),
- measure control (reading),
- alarm threshold (reading and writing).

To bolt the alarm thresholds writing, move the switch on the board.



Sometimes, it may be interesting to modify measure by a keyboard intervention. It can be used in many situations as a sensor's degradation or to calibrate the input with magnifying effect to obtain a better accuracy in the measure window.

To shift the measure, it is necessary:

- to be in measure mode,
- type on "+" or "-" to access at the function,

- the display on terminal is:

105.2 DC measure value with offset taken in consideration,
OFFSET 10 offset function, offset value.

- use keys "+" and "-" to regulate the offset, the measure is directly modify.
- type on "ENTER" to save the offset.

When the device is not supplied or in configuration, the offset is active. To reset the offset, it is necessary to start the "OFFSET" function, to put this value to zero by keys "+" and "-", then validate by "ENTER". In offset control mode when there is no action on keys "+", "-" or "ENTER" during 15 s, the device exits of this mode without to take of the executed control into consideration.

SENSOR BREAKING DETECTION SPEED

Sometimes, it's interesting to modify the sensor breaking detection speed. Device is delivered with an acceleration nul.

To modify the sensor breaking detection speed, it's necessary:

- to be in measure mode,
- type "RPTR" (after each typed code, wait for a "BEEP"), the message "ACCELERATOR" is sent on the RS 232.
- type the new value of sensor breaking detection speed (included between 0 and 255),
- type on "ENTER" to memorize the sensor breaking detection speed.

CONFIGURATION ACCESS BOLTING

The access at the configuration can be restricted. When device comes out of factory, the configuration access is total.

To bolt the configuration access, it's necessary:

- to be in measure mode,
- type "PRO1" (after each typed code, wait for a "BEEP"), the message "THRESHOLD ACCESS" is sent on the RS 232. The configuration will only accessible for alarm thresholds.

To unbolt the configuration access, it's necessary:

- to be in measure mode,
- type "PRO0" (after each typed code, wait for a "BEEP"), the message "CONFIGURATION ACCESS" is sent on the RS 232.

The configuration access will total.

EMC CONSIDERATION

1) Introduction

In order to insure its policy concerning EMC, based on the European directive 89/336/CE, LOREME takes into account all the standards relative to this directive as soon as the design of each device starts.

All the tests made on our devices, designed to work in industrial plants, have been made regarding the EN 50081-2 and EN 50082-2 standards in order to edit a conformity certificate.

It is difficult to guarantee all the results concerning EMC because tests are made in a standard and typical configuration. Results may vary when a change of configuration occurs.

In order to be sure to use all the capabilities of the device, it will be necessary to respect a few rules concerning its installation.

2) Installation and utilization rules

2.1) General remarks

- Installation should be made with respect to the informations given in technical documents (installation, spacing between each device ...).

- Utilization conditions should be in accordance with specifications of the transmitter (temperature range, protection level) specified in technical datasheet.

Dust, excessive humidity, corrosives atmospheres or important heat sources should be prohibited in order to insure an optimum utilization.

- Noisy environment or elements creating perturbations should be avoided.

If it is possible, it will be better to install instrumentation devices separately from hi-power or commutation devices.

Do not install measurement devices close to hi-power relays, thyristor groups, contactors or all electromagnetic noise generators.

Do not use a portable transmitter (walkie-talkie) at less than 50 cm of the device. A 5 W transmitter may generate a field which intensity may be more than 10 V/m at a distance near of 50 cm.

2.2) Power supply

- At first, it's important to install the equipment with respect to the technical specifications given in the device's datasheet (supply voltage, frequency, tolerance of values, stability, variations ...).

- The power supply of the device should be issued from a supply system using section switches and fuses made for instrumentation devices, and the supply line should be as direct as possible from section switch.

Don't use this power supply for relays, contactors or valves command.

- An isolating transformer, with its screen shorted to ground may be necessary if the supply circuit is made noisy with commutation of thyristors, relays, motors, speed variators ...

- It's important that the installation has to be connected to ground.

The voltage between neutral and earth must be less than 1 V and the resistance must be less than 6 Ohms.

- If the equipment has been installed near hi-frequency generators or arc welding installations, it may be useful to install adequate filters on the mains supply.

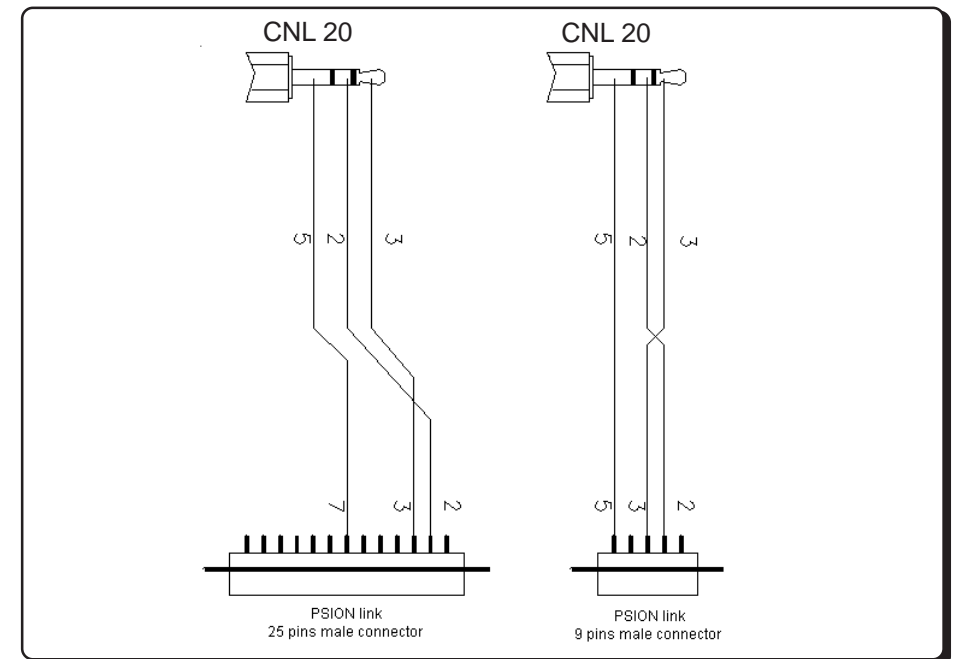
2.3) Inputs / Outputs

- In a noisy environment, it will be better to use shielded and twisted wires. The ground connection will be made at a single end of the wire.

- I/O lines should be well separated from supply wires in order to avoid coupling between these wires.

- Data wires length should be as short as possible.

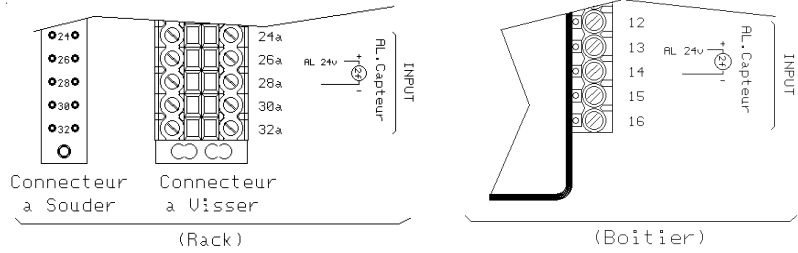
PC - TRANSMITTER LINK



WIRING DIAGRAMS

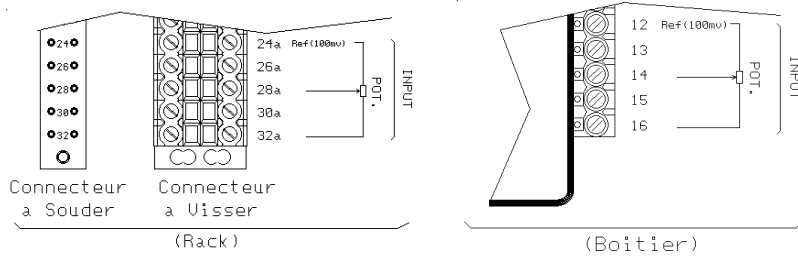
CNL 20, CNL 20/R, CNL 20/C, CNL 20/S INPUT WIRING

SENSOR POWER SUPPLY INPUT



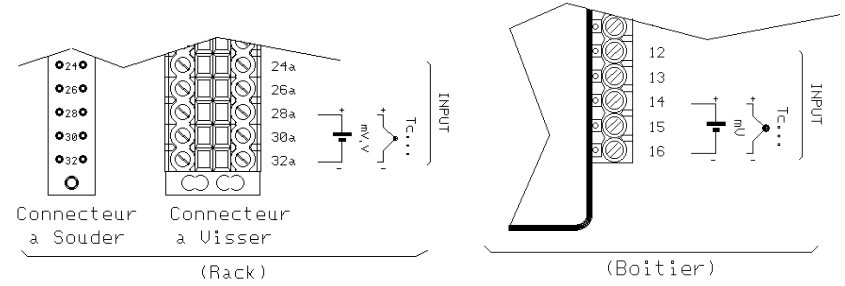
Shunt of 5 ohms to lay on the input (14-16 or 28a-32a) for CNL 20/S only.

POTENTIOMETER INPUT

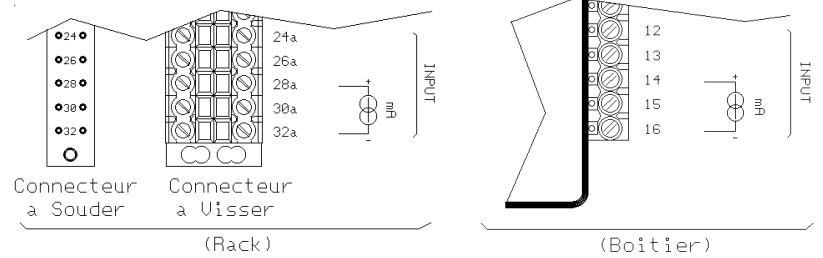


CNL 20, CNL 20/R, CNL 20/C, CNL 20/S INPUT WIRING.

VOLTAGE AND THERMOCOUPLE INPUT

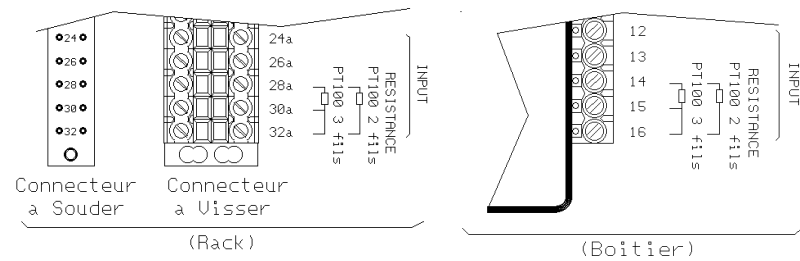


CURRENT INPUT



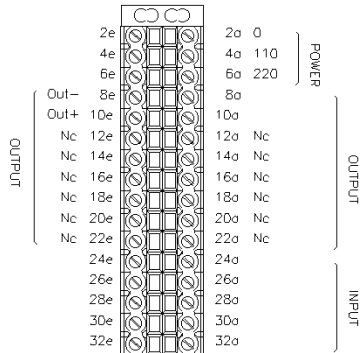
Shunt of 5 ohms to lay on the input (14-16 or 28a-32a) for CNL 20/S only.

OHMS AND 2 or 3 wires PT 100 INPUT



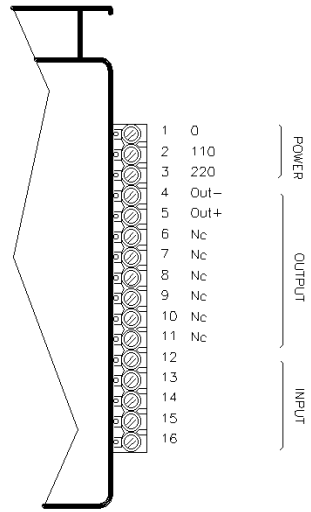
POWER SUPPLY / OUTPUT WIRING

CNL 20



Connecteur
à Visser

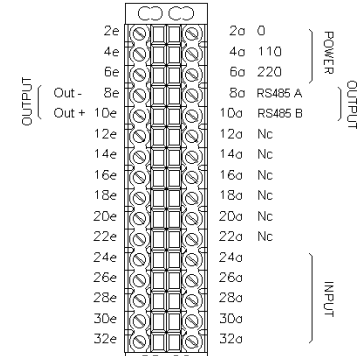
CNLR20 (Rack)



CNLB20 (Boitier)

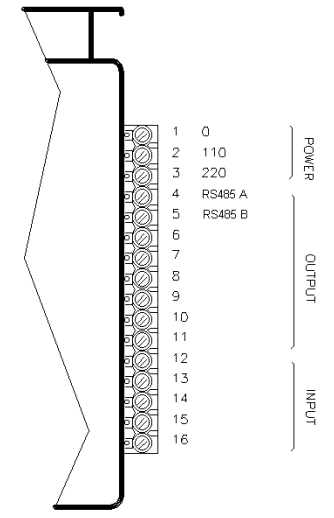
POWER SUPPLY / OUTPUT WIRING

CNL 20 / C



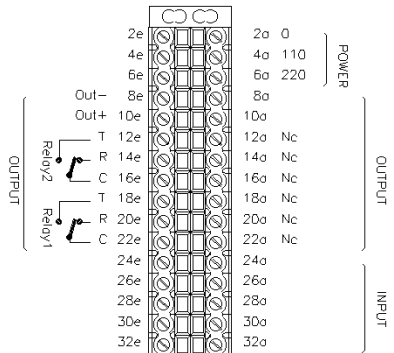
Connecteur
à Visser

CNLR20/S (Rack)



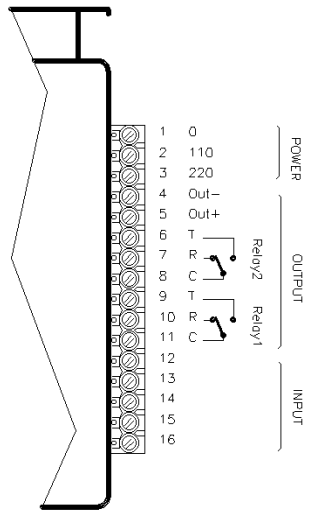
CNLB20/S (Boitier)

CNL 20 / R



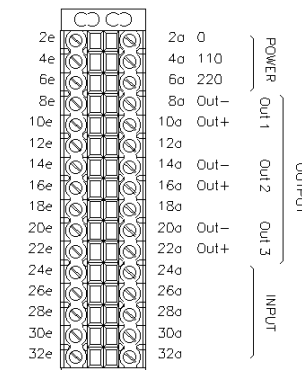
Connecteur
à Visser

CNLR20/R (Rack)



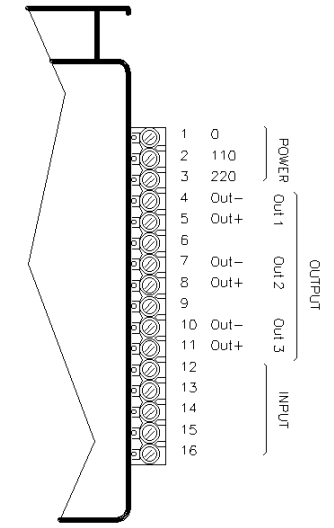
CNLB20/R (Boitier)

CNL 20 / S



Connecteur
à Visser

CNLR20/S (Rack)



CNLB20/S (Boitier)

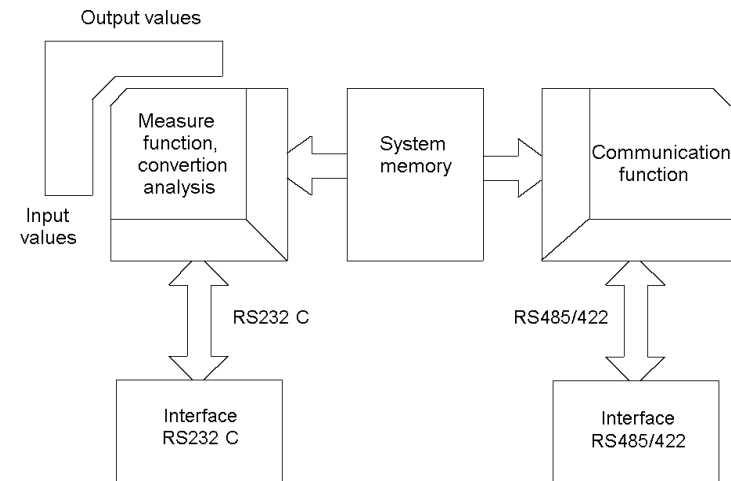
RS 485 COMMUNICATION MODBUS

1) Internal structure	Page 10
1.1) Presentation	Page 10
1.2) Measure function	Page 10
1.3) Communication function	Page 10
1.4) System memory	Page 10
2) Communication	Page 11
3) Implementation	Page 11
3.1) Parametrizing	Page 11
3.2) Interconnection	Page 11
4) Communication time	Page 12
4.1) Procedure	Page 12
4.2) Measure and control reading	Page 12
4.3) Alarm threshold reading	Page 12
4.4) Alarm thresholds writing	Page 12
5) Structure of the frames	Page 13
5.1) Reading of words	Page 13
5.2) Writing of a word	Page 13
5.3) Exception frame	Page 13
6) Data of communication	Page 14
6.1) Reading	Page 14
6.2) Writing	Page 14
6.3) Data format	Page 14
7) Table of datas	Page 14

1) Internal structure:

1.1) Presentation:

The device is divided in two cells. Each cell has a specific function while keeping a continuous exchange of pieces of information with the second cell. The first cell is in charge of the measure, analysis and conversion function. The second cell is in charge of the communication function. The information exchange is continuous and automatic.



1.2) Measure function:

The measure cell runs the acquisition of the different signals and calculates all the values with regards to the configuration of the device. It also runs all the output functions (analogical, alarm, meter, RS 232). All measured or calculated parameters are stored in the system memory and are constantly refreshed.

1.3) Communication function:

The communication cell runs the RS485 communication interface in the MODBUS/JBUS protocol. It analyzes the requests of the main station and answers if the device is addressed. It draws all these data from the system memory that can be continuously accessed.

1.4) System memory:

Each cell can continuously access the system memory. The latter has a dual access, which allows a reading/writing of the data without any possible internal conflicts.

2) Communication:

The type of protocol used is: MODBUS/JBUS in RTU mode. The communication has neither header nor delimitator of frame. The detection of the start of frame is made by a silence whose time is at least equal to the transmission of 3.5 bytes. It implies that a frame received can be processed only after a time equal to the silence given before. The time of this silence is directly linked to the speed of transmission of the system:

Ex: Speed 9600 bauds - no parity (10 bits/byte)
 Silence = $(3.5 \times 10) / 9600 = 3.64 \text{ ms}$

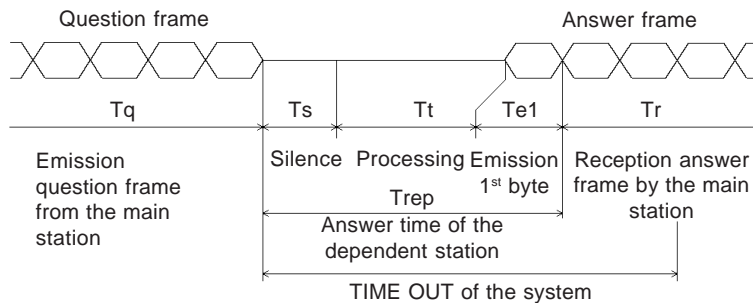
The device starts to process the frame 3.64 ms after receiving the last byte.

The time separating two bytes from a same frame must be inferior to a silence. If the user does not comply with this condition, the second byte will be considered as the first one of a new frame.

The interval of time separating the end of reception of the last byte of the question frame and the end of emission of the first byte of the answer frame (detection of frame of the main station) constitutes the answer time of the device.

This answer time T_{rep} includes:

- the silence (time of 3.5 bytes) T_s ,
- the processing of the frame T_t ,
- the emission of the first byte T_{e1} .



The time beyond which the device does not answer is called "TIME OUT". It depends on the transmission parameters (speed, format) and the type of the function asked (reading, writing). This time must be defined by the user and must be superior to the answer time of the device.

A complete cycle of communication includes:

- the transmission of the question frame T_q ,
- the answer time of the device T_{rep} .

Three reasons might cause a TIME OUT:

- wrong transmission data at the time of the question frame,
- wrong configuration of the TIME OUT on the main station,
- dependent station out-of-order.

3) Implementation:

3.1) Parametrizing:

Before starting up the RS 485 MODBUS/JBUS communication, make sure that:

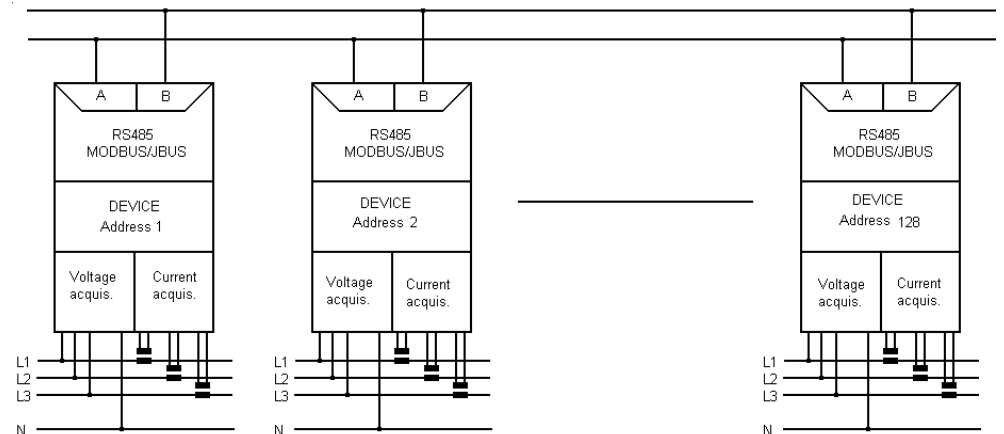
- the speed of transmission is identical between the dependent stations (LOREME devices) and the main station.
- the parity is identical between the dependent stations (LOREME devices) and the main station.
- the addresses are correctly distributed among the dependent stations (LOREME devices), no identical addresses for two dependent stations.
- the TIME OUT is correctly adjusted on the main station.

All the parameters of speed, parity and address must be configured on the devices with the RS 232 link.

- address: from 1 to 255,
- speed 600, 1200, 2400, 4800, 9600, 19200, 38400 bauds,
- parity: even, odd, without.

3.2) Interconnection:

The RS 485 interface used allows to connect 128 dependent stations on the same network. For better operating conditions (noise immunity), the network will have to be made up of a twisted pair.



4) Communication time:

4.1) Procedure:

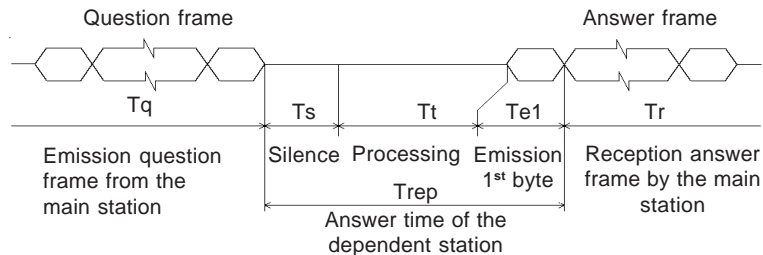
Analysis of the times of communication for parameters of data transmission and for particular cases.

- measure and control reading,
- alarm thresholds 1 and 2 reading,
- alarm thresholds 1 and 2 writing,
- speed 9600 bauds, without parity.

4.2) Measure and control reading:

Reading of 3 words (6 bytes) of the address \$3000 to \$3002:

- measure control (2 bytes),
- measure value (4 bytes).



- Question frame 8 bytes $Tq = (8 \times 10) / 9600 = 8.33 \text{ ms}$
- Silence $Ts = (3.5 \times 10) / 9600 = 3.64 \text{ ms}$
- Processing $Tt = 60 \text{ ms}$
- 1st byte emission $Te1 = (1 \times 10) / 9600 = 1.04 \text{ ms}$
- Answer time $Trep = Ts + Tt + Te1 = 44.68 \text{ ms}$
- Answer frame 11 bytes $Tr = [(11 - 1) \times 10] / 9600 = 10.41 \text{ ms}$
- Complete cycle $Tcyc = Tq + Trep + Tr = 83.42 \text{ ms}$

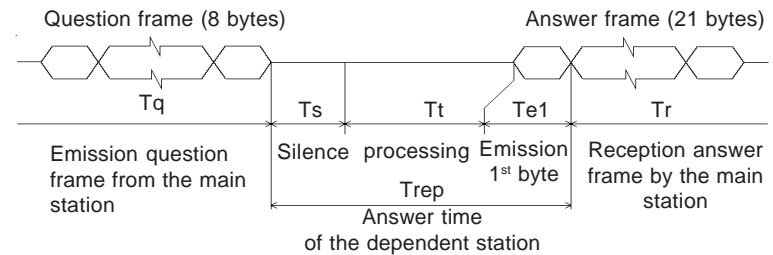
Notes:

The processing time Tt is fixed. It depends neither on the speed nor on the format of transmission. Consequently, for new parameters of transmission, all the times are going to change but for Tt .

To set the TIME OUT of the system, you just have to calculate the answer time $Trep$ of the dependent station according to the parameters of communication. For reading the three voltages, the time of cycle of the system is about 85 ms.

4.3) Alarm threshold reading:

Reading of 4 words (8 bytes) of the address \$3003 to \$3006.



- Question frame 8 bytes $Tq = (8 \times 10) / 9600 = 8.33 \text{ ms}$
- Silence $Ts = (3.5 \times 10) / 9600 = 3.64 \text{ ms}$
- Processing $Tt = 60 \text{ ms}$
- 1st byte emission $Te1 = (1 \times 10) / 9600 = 1.04 \text{ ms}$
- Answer time $Trep = Ts + Tt + Te1 = 64.68 \text{ ms}$
- Answer frame 13 bytes $Tr = [(13 - 1) \times 10] / 9600 = 10.41 \text{ ms}$
- Complete cycle $Tcyc = Tq + Trep + Tr = 83.42 \text{ ms}$

Notes:

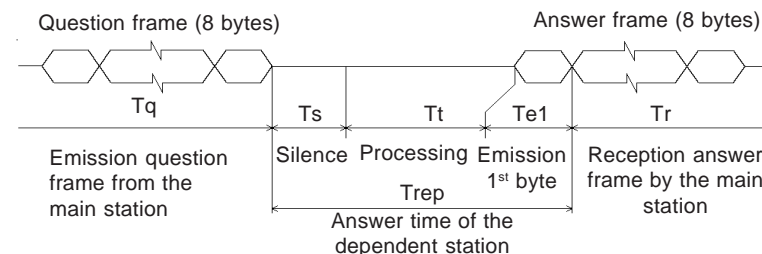
The processing time Tt is fixed. It depends neither on the speed nor on the format of transmission. Consequently, for new parameters of transmission, all the times are going to change but for Tt .

To set the TIME OUT of the system, you just have to calculate the answer time $Trep$ of the dependent station according to the parameters of communication. For reading the energies of the network, the time of cycle of the system is about 85 ms.

4.4) Alarm thresholds writing:

Writing of 4 words (8 bytes)

- address \$3003 to \$3004: threshold 1 (2 bytes),
- address \$3005 to \$3006: threshold 1 (2 bytes),



- Question frame 17 bytes
 - Silence
 - Processing
 - 1st byte emission
 - Answer time
 - Answer frame 13 bytes
 - Complete cycle
- $T_q = (17 \times 10) / 9600 = 17.71 \text{ ms}$
 $T_s = (3.5 \times 10) / 9600 = 3.64 \text{ ms}$
 $T_t = 60 \text{ ms}$
 $T_{e1} = (1 \times 10) / 9600 = 1.04 \text{ ms}$
 $T_{rep} = T_s + T_t + T_{e1} = 64.68 \text{ ms}$
 $T_r = [(13 - 1) \times 10] / 9600 = 7.29 \text{ ms}$
 $T_{cyc} = T_q + T_{rep} + T_r = 89.97 \text{ ms}$

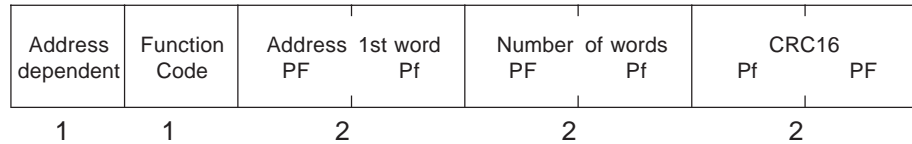
Notes:
 The processing time T_t is fixed. It depends neither on the speed nor on the format of transmission. Consequently, for new parameters of transmission, all the times are going to change but for T_t .
 To set the TIME OUT of the system, you just have to calculate the answer time T_{rep} of the dependent station according to the parameters of communication.
 For reading the energies of the network, the time of cycle of the system is about 90 ms.

5) Structure of the frames:

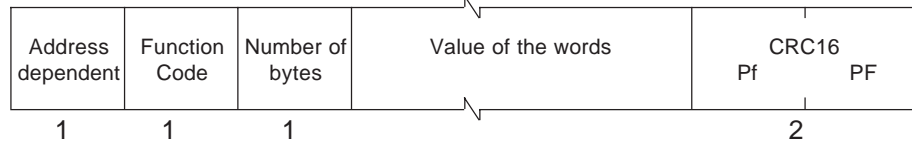
5.1) Reading of words:

Function code used: \$03 or \$04
 Table reading: address \$A000 to \$A05B

Question: length of frame 8 bytes.



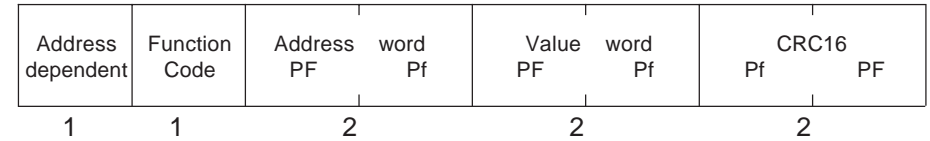
Answer: length of frame 5 bytes+ number of read bytes.



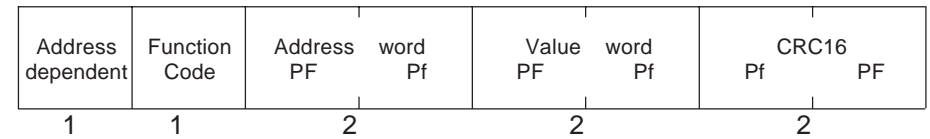
5.2) Writing of a word:

Function code used: \$10.
 Alarm thresholds writing: address \$3003 \$3006

Question: length of frame 8 bytes



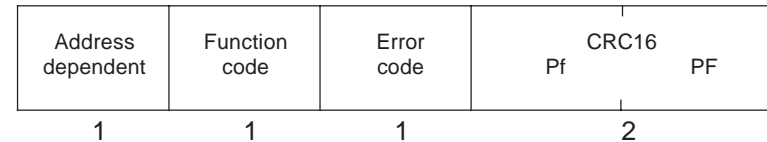
Answer: length of frame 8 bytes



5.3) Exception frame:

When a physical error of transmission of a question frame occurs (CRC16 or parity), the dependent station does not answer.
 If an error of frame (data address, function, value) occurs, an answer of exception will be emitted by the dependent station.

Length of frame: 5 bytes.



Features of the exception frame:

- Function code:
 The function code of the exception frame is identical to the one of the question frame, but its bit of strong load is set to 1 (logical or with \$80).

- Error code:
 The error code establishes the reason of a sending of an exception frame.

Error frame	Meaning
\$01	Function code not used. Only the functions reading of words (\$03 or \$04) and writing of words (\$06 et \$10) are allowed.
\$02	Non-valid data address. Memory access not allowed.
\$03	Non-valid value. Value of word not allowed.

6) Data of communication:

6.1) Reading:

All the measures are accessible in reading mode: control, measure, alarm threshold 1 and alarm threshold 2.

Data are available in different formats:

- on 1 word (2 bytes) at the 16 bits integer format, for the control
- on 2 words (4 bytes) at the 32 bits float format for the measure, the threshold alarm 1 and the threshold alarm 2 when the float format is selected,
- on 1 word (2 bytes) at the 16, 12, 8 bits integer format, for the measure, the threshold alarm 1 and the threshold alarm 2 when the integer format is selected.

Consult the enclosed tables for the detail of the measures.

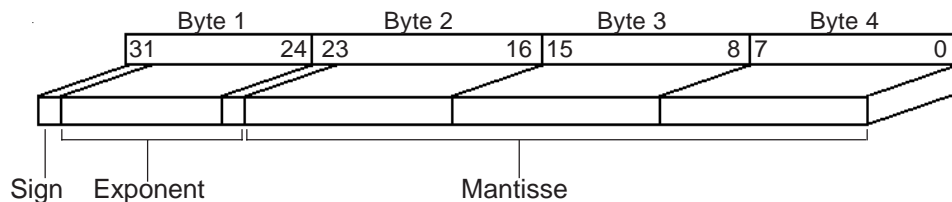
The data format (measures and alarms threshold) is selected during the slave configuration by the RS 232 link.

6.2) Writing:

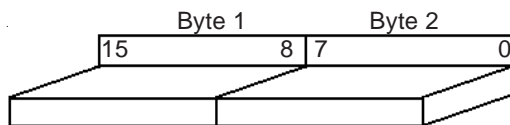
The modification function of alarms thresholds is available in writing. The writing can be carried out independently of the threshold 1, the threshold 2 or two in same time. Confirm before all writing the format used and the switch position on the board authorizing the writing.

6.3) Data format:

- Data at the float 32 bits format.
Data transmission most significant bit first, composed of 4 bytes, i.e. 2 words.



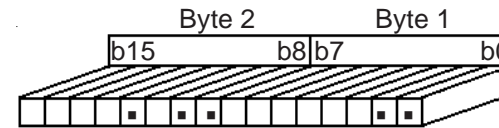
- Data at the integer 16, 12, 8 bits format.
Data transmission most significant bit first, composed of 2 bytes, i.e. 1 word. The second word is used in float format. It is forced to zero.



For the 12 bits format, the least significant half byte is forced to zero.
For the 8 bits format, the least significant byte is forced to zero.
The value is coding on one and half byte for the 12 bits format and on a byte for the 8 bits format.

Values are limited at the define format.
When a sensor breaking occurs, values are to \$FFFF.

- Control word:



- bit 0: Alarm 1,
- bit 1: Alarm 2,
- bit 8: Overflow low scale,
- bit 9: Overflow high scale,,
- bit 11: Sensor breaking.

When the bit is to 1, the function dependant is activate.

7) Table of datas:

Word address	Total								Word	Byte
	B7	B6	B5	B4	B3	B2	B1	B0		
\$3000	Control				Byte 1		Word 1		1	1
					Byte 2					2
\$3001	Measure				Byte 1		Word 1		2	3
					Byte 2					4
\$3002					Byte 3		Word 2		3	5
					Byte 4					6
\$3003	Threshold 1				Byte 1		Word 1		4	7
					Byte 2					8
\$3004					Byte 3		Word 2		5	9
					Byte 4					10
\$3005	Threshold 2				Byte 1		Word 1		6	11
					Byte 2					12
\$3006					Byte 3		Word 2		7	13
					Byte 4					14