Sefram

INSTRUMENTS & SYSTEMES

TWO - CHANNEL RECORDER

8211

USER MANUAL

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M8211001A/01

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1 - PRESENTATION

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1.2.2 Front part

The front part of the recorder includes :

- a paper drive sub-unit . The usable paper width is 250 mm.inches. (9 ¾ inches).
- a mechanical channel writing sub-unit
- a side front panel including a keyboard and a digital display for the programmation of the operating parameters.
- a pen protective cap
- a carrying handle

NB: An optional "Winder/unwinder" unit can be retrofitted into the paper drive sub-unit .

1.3 DISPLAY

```
      INPUT 1
      150.0 V
---------------------
TYPE    :voltage
RANGE   :   100.0 V
CENTER  :   200.0 V
FILTER  :without
AUTO OFFSET:no

From     150.0 V
to       250.0 V
---------------------

 voltage    pt100
  j k t s b e n w5
```

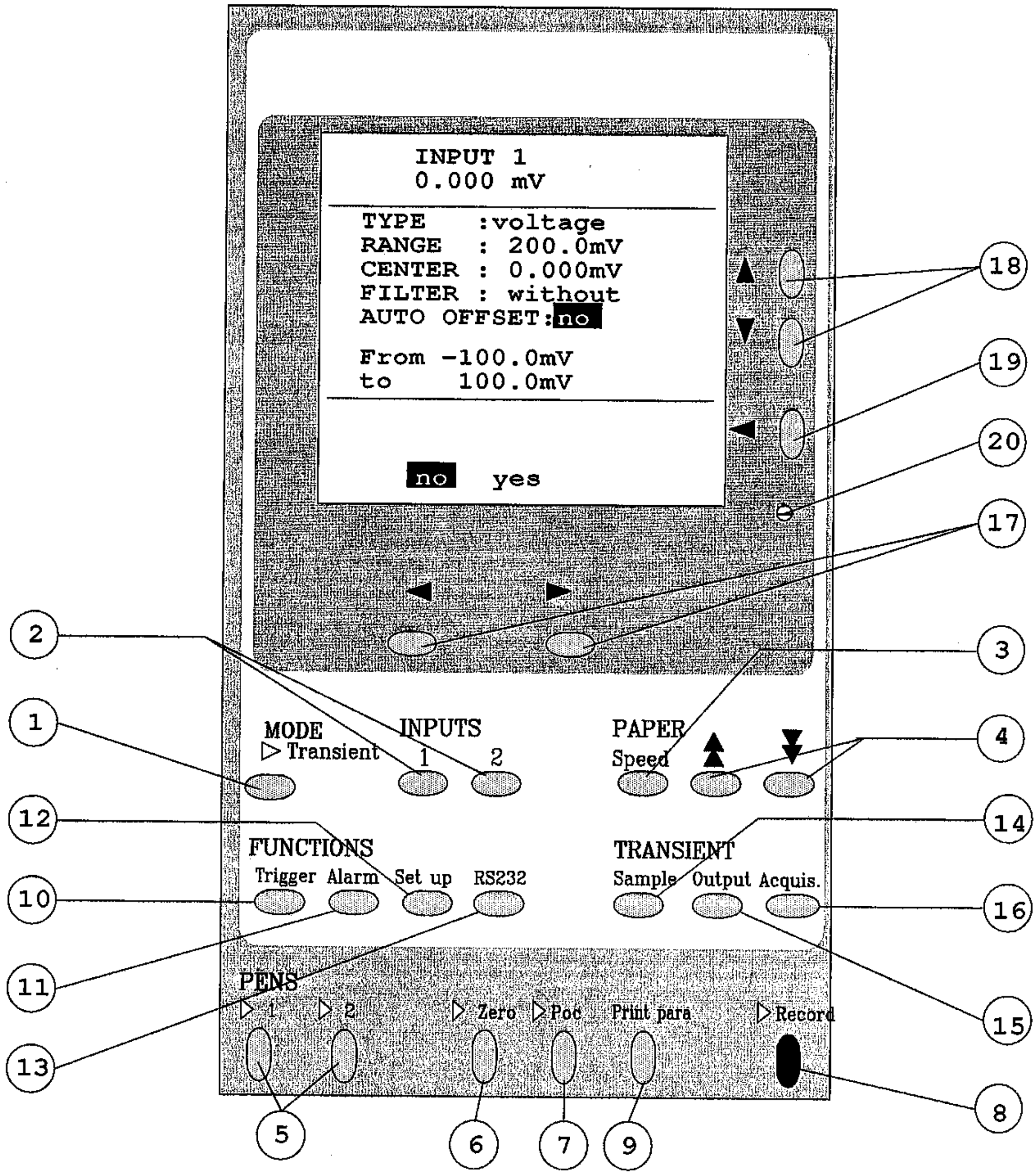
Menu example in relation with the input 1

The display is divided into three areas:

- A header part giving the selected function or input number.
- A center part defining the parameters related with the menu.
- A lower part describing the various options accurately.

NOTA: When the instrument remains unattended for ten minutes, the light of the display goes out and restores once a key is pressed again.

1.4 FRONT PANEL KEYS



1.4.1 Key '1' : mode

Instrument programming mode:
- direct mode or continous mode
- transient mode. In that case the related LED is lit.

1.4.2 Keys '2' : inputs

Selected input programmation: (type, range,center,filter selection and automated offset)
The measurement is displayed on the second line of the display.

```
        INPUT  2
        20.50mV
-------------------------
TYPE    :voltage
RANGE   :   200.0mV
CENTER  :   0.000mV
FILTER  :without
AUTO OFFSET:no

From    -100.0mV
to       100.00mV
-------------------------


        no    yes
```

Menu example related with the input 2

1.4.3 Keys '3' et '4' : paper

Key '3' : speed

- displays the menu related to the selected scrolling mode. (f(t) mode or step mode with the auxiliary control).
- switches to xy mode.
- writes down time, alarms and automatic offset.
- enables the winder if the option is provided.

Keys "4" : Forward and backward paper motion

While maintaining this key down, performs the paper scrolling in both directions (forth and back)..

1.4.4 Keys '5' : pens

Controls the lock-in of the related mechanical channel. Each pen is associated with an input and can be independently stopped. A stopped pen is set in "park" position, and its corresponding motor is released.

1.4.5 Key '6' : zero

Simulates a short-circuit (0Volts or Degree) on both inputs. If the center offset differs from zero it does not mandatorily correspond with the center of the paper.

1.4.6 Key '7' : synchro

Compensates electronically the offset between both pens. The axis time in synchro mode is therefore the same on both channels.

1.4.7 Key '8' : record

In direct mode :

Lowers the selected pens and the paper scrolling.

NOTA: Some working conditions may delay the trace; in that case, the "record" pilot lamp flashes, meaning that the recorder is on stand-by waiting for the trigger condition.

In transient mode :

Writes down on the paper the recorded curve stored in memory.

1.4.8 Key '9' : print parameters

Writes down on the paper the selected parameters and document identification.

1.4.9 Keys '10' , '11' , '12' and '13' : functions

Key
'10' :trigger

Allows the trigger selection of the plot start or stop on any event (manual, date, time, threshold or external).

Key '11' :alarm

In connection with the auxiliary controls connector, it allows the alarm relays to be used on a threshold overrange (2 separate contacts).

Key '12' :Set up

It performs the following parameters programmation:

-Language selection (French or English)

-Set up of the instrument on its initial configuration.

-Back-up and restores any of 10 configurations

-Date programmation

-Time programmation

Key '13' : RS232

RS232 parameters programmation (Transmission speed, start bit , parity, protocol) according to the parameters of the controlling computer

1.4.10 Keys '14' , '15' et '16' : transient

These keys operate in transient mode only.

Key '14' :sample

Acquisition parameters programmation (memory, sampling rate, trigger delay and definition) .

Key '15' :output

Retranscription parameters programming of the record either on paper or display (window, scale).

Key '16' :acquisition

Acquisition start.

1.4.11 Keys '17' : incrementation-decrementation

Modify the parameter pointed by the cursor (displayed in white on black)

1.4.12 Keys '18' et '19' : parameter access

Moves the cursor up and down;

1.4.13 Adjusting potentiometer

Adjusts the display contrast.

SETTING UP

2

2 - SETTING UP

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2 - SETTING UP

2.1 PEN CHOICE AND REMOVAL

Three pen types may be used:

ball-point pen:	red and blue
fibre tip pen:	red and blue
slow recording pen:	(optional)

The plot quality depends on the pen used, it must therefore be adapted to your applica tion.

ADVICES FOR 8211 PENS USE

Ball-point pen ref. SEFRAM 883500051 and 883500052

The tip of the pen is made of a ball. This is a general purpose pen which presents the following characteristics:

-fine writing
-fast and slow writing (> 20mm/h)
-writing length : up to1500 m at 20 cm/s
-good life time: low evaporation since the ink comes out only when the ball is rolling.

Fibre pen: ref. SEFRAM 883500043 and 883500044

- writing slightly thicker than the ball-point pen, ensuring a good contrast.
- slow and fast writing(> 20mm/h)
- writing length : up to 1500 m at 20 cm/s
- recap the pen once used to avoid drying and evaporation.

Slow pen : ref. SEFRAM 8835000500 et 8835000501

- to be recommended for a recording speed lower than 50mm/h
- low ink deposit : plot hardly visible at 50 mm/s.

Remarks :

The very slow pen motions (10 et 20mm/h) apply to the recording of very slow phenomenons. In these cases, filters giving a relatively fine trace must be used, avoiding ink spots that may damage the paper.

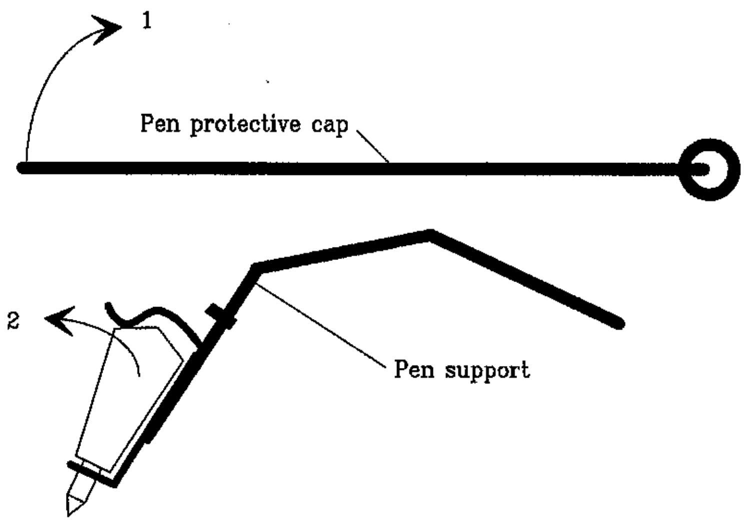
APPLICATION CHART V/S PAPER SCROLLING SPEED

SPEED	10 mm/h	20 mm/h	50 mm/mn	1 mm/mn	2 mm/mn	5 mm/mn	10 à 50 mm/s
Ball-point			X	X	X	X	X
Fibre pen			X	X	X	X	X
Slow point	X	X					
min filtering	0.25 hz	0.5 hz	0.5 hz	1 hz	ind.	ind.	ind.

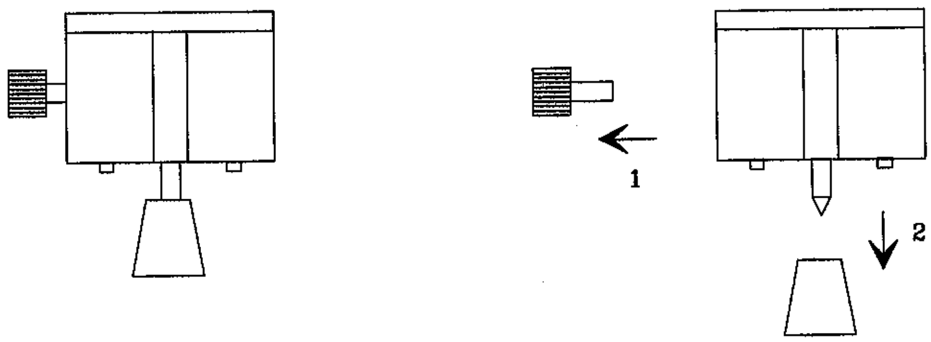
Pen change

To change a pen :

-release the pen to be changed
-bring the corresponding channel manually to the middle of the table
-rock backwards the pen protective cap (see fig. below)
-disengage the pen from its socket in rocking the upper part forward (2)



Setting a pen again into place



-prior using, first remove the cork (1) then the cap (2)

-Set the new pen into place in inserting both lower lugs of the pen into their respective holes.

-Gently push the pen into its seating.

NOTA : Do not forget to recap the pen after use to avoid ink evaporation.

2.2 CHART PAPER LOADING

Should a winder-unwinder be used, further information related to the paper load are given in the chapter 10. This chapter apply to the basic instrument only.
To carry-out this manipulation, the instrument is to be off power so that the paper motor is released.

Operation to perform:

- Raise the table cover

- Introduce the paper axe into the paper roll

- Set this assembly into the housing provided for this purpose.
  For an easy paper manipulation, it is advised to set it into the housing on the handle side.
  The round holes are at the left, the oblong ones at the right.

-Properly engage the paper under the teeth of the sprocket wheel, while making sure the paper is in correct position, and move the paper forward by hand in turning the sprocket wheel.

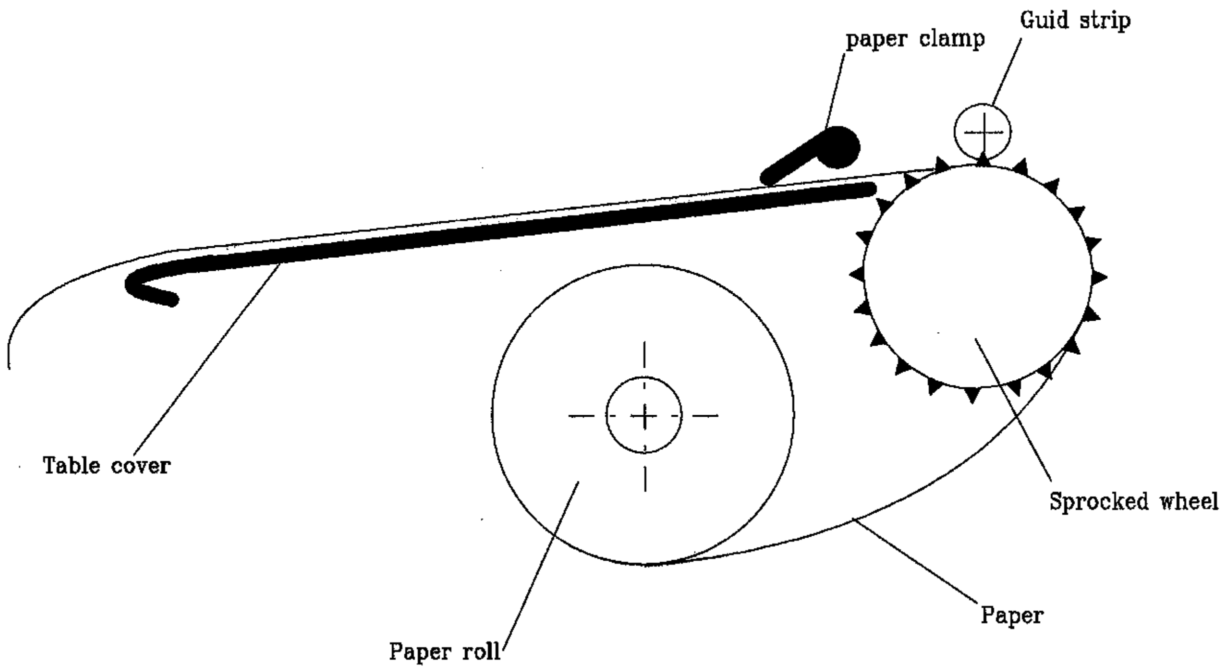
- Make sure the paper is correcly inserted, otherwise do the procedure again..

- Engage the paper under the paper clamp and the guide strip.

- Close the table cover.

> Remark: If the paper roll is used, it is advised to cut it again, so that the first roun hole (at the left of the paper) and the first oblong hole (at the right) are well lined-up.
> The paper will then correctly wrap around the sprocket wheels.

SCHEMATIC VIEW OF THE PAPER WAY



OTHER PAPER LOADING METHOD

Refer to the instructions under the cover of the table.
Since the paper is supplied with the tip pointed, this loading method is more convenient.

-Insert the paper under the sprocket wheel and grasp the tip above the table.
-Drag the paper by the tip in properly lining up the thick lines with the rule marks.

2.3 POWER SUPPLY

The 8211 recorder is mains operated:
- mains voltage : from 85 to 264 Volts AC.
- frequency : from 47 to 440 Hz.

The 8211 can be fed from a sinusoidal static generator 12/220 V. In this opportunity apply to the After Sales Service of SEFRAM INSTRUMENTS ET SYSTEMES.

2.3.1 Switching ON

At the power-up the 8211 displays an information page giving :

- - The instrument type :SEFRAM 8211
- - The software version: Version 1.0

NOTE : At the power-up, the pens move towards the left mechanical stop for seeking their reference. It is essential not to hinder their displacement during that move.

2.3.2 Fuse

The safety fuse is not accessible to the user. In case of trouble, contact the SEFRAM INSTRUMENTS ET SYSTEMES After-Sales dept.

2.4 CONFIGURATION AT THE POWER-UP

At the power up, the instrument keeps the configuration preceding the power outage.

NOTE : If the previous configuration is not restored at the power-up, please contact the SEFRAM INSTRUMENTS ET SYSTEMES After-sales dept..

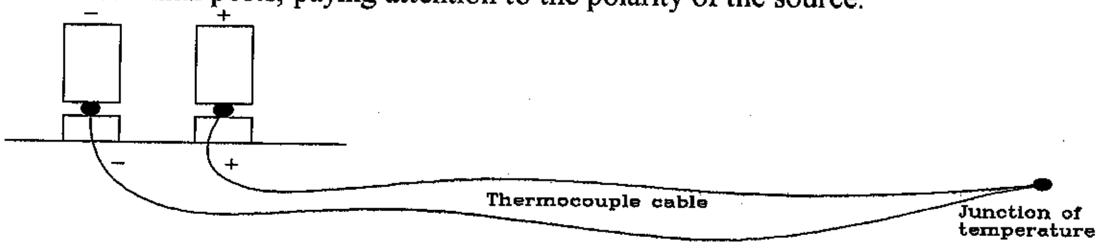
2.5 CONNECTION TO THE CIRCUIT UNDER TEST

2.5.1 Voltage measurements

The voltage measurement is performed between the red and black input terminals. Two connecting possibilities are available:
- Wires fitted with male "Banana" plugs.
- End bared wires. In that case slightly unscrew the posts and insert the bared wires into the transversal holes provided for this purpose.
- Firmly tighten the posts to ensure a good contact.

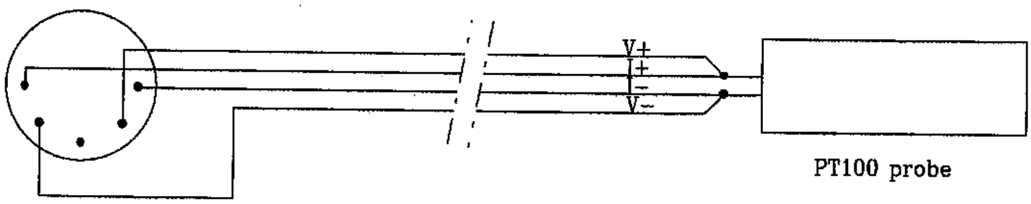
2.5.2 Temperature measurement with thermocouple

The voltage induced by the thermocouple is to be measured between the red and black input terminals. A correct measurement is performed in firmly tightening the bare ends of the wires on the terminal posts, paying attention to the polarity of the source.



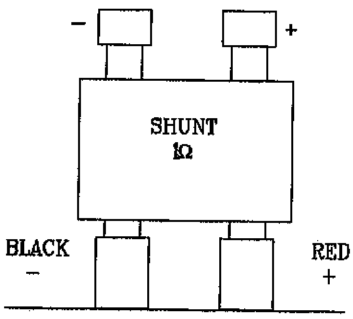
2.5.3 Temperature measurement by PT100 probe

Each input is provided with a DIN socket for the connection to a PT100 probe.
It is to be connected with the instrument by means of a four wires cord. Being fed separately this type of connection makes the measurement independent from the line.



2.5.4 Current measurement

Current measurement can be performed in "Voltage" mode, provided a shunt of 1 OHM is connected across the + and - input terminals.



Shunt ref. SEFRAM: 899620026

Connect the measurement leads across the shunt, the reading in volts corresponds to Amperes and those in mVolts to mAmps.

2.5.5 Grounding connections

For very low voltages measurements, the spurious voltages problems induced by electroma gnetic fields, or common mode voltages, becomes troublesome as much a high sensitivity is selected. The external wiring must therefore be carefully designed according to the rules, generally not easy to define however.

These problems have several origins:

- uncertainty about the exact origin of the perturbing voltage and the impedance under which the are generated
- uncertainty about the stray capacitance of the wiring
- input point of the common mode voltage introduced by the measured network out of access
- instruments not meeting the laid-down current rules
- even sometimes, source impedance of the signals to be recorded unknown.

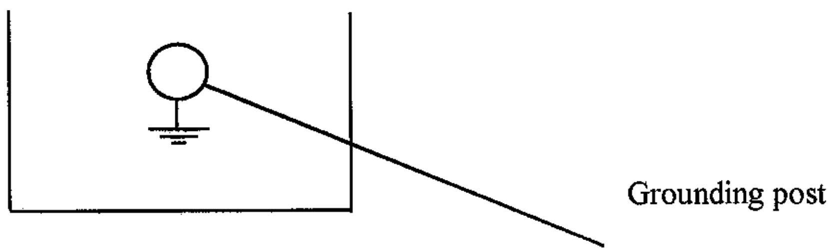
While performing low level measurements, on instruments with floating inputs under high impedances, prior to charge the measuring instrument in case of poor operation, (vibrations, background noise, hum...) a critical evaluation of the external wiring should be performed.

IT IS RECOMMENDED TO MEET THE FOLLOWING PRESCRITIONS

1° - All instruments chassis and frames must be grounded.

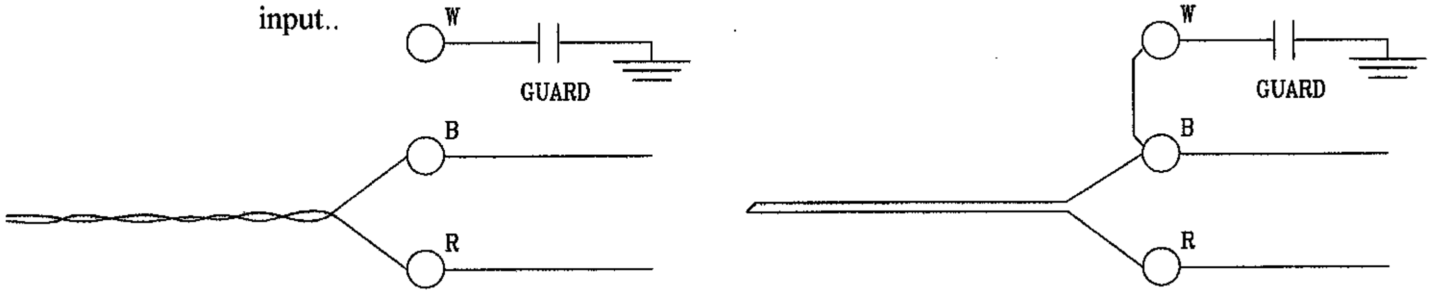
The mechanical frame of the recorder is grounded by the main line cord.(provided the earth is actually connected to the mains wall socket)
However, should all other instruments of the assembly be not such provided, it is advised to gather their mechanical frames to that of the 8211, by means of the socket available at the rear of the recorder.

8211 rear panel



2° - In case of a low source impedance, twisted wires will be used. In case of a high source impedance, screened wires will be used.

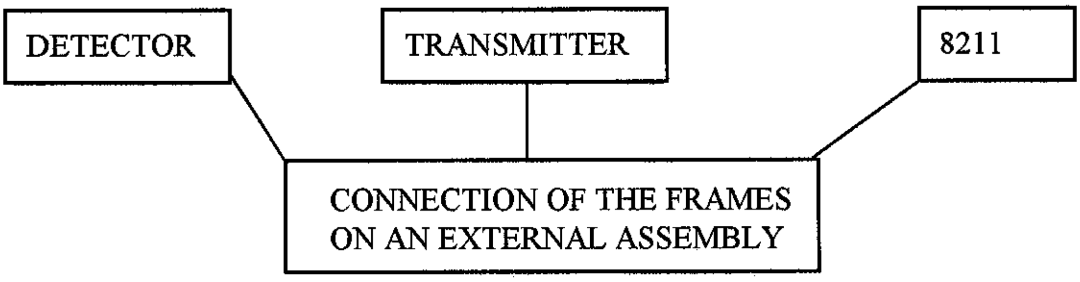
3° - So as to reduce the common mode effect, one of the plugs (black or red) could be connected to the white guard post, loosing however the differential character of the channel input..



FOR LOW IMPEDANCE SOURCES
TWISTED WIRES

FOR HIGH IMPEDANCE SOURCES CONNECT THE BLACK POST TO THE WHITE

4°- When several frames of the assembly under measurement are to be connected together on the posts, it must be ascertained that a low impedance potential difference does no exist between them so as to avoid any short circuit. To achive this a perfect knowledge of the circuit is sufficient. In case of doubt, a measurement should be performed with a voltmeter on a low load (say 1 Kohm) across the posts.



2.6 ROUTINE MAINTENANCE

The maintenance of the instruments merely consists in the external cleaning of the 8211. Any other operation requires a skilled personal.

CAUTION : **Disconnect the instrument prior to any intervention.**

In order to avoid electrical shocks avoid water spilling into the 8211
Periodically clean up the instrument following these instructions:

- Use soapy water for the cleaning of the front and rear plates.
- Prohibit any liquid containing petrol, trichlorethylen, benzin, or alcool that would erase the silkscreened plates.
- Wipe-out with a soft, not shaggy cloth..

MENUS AND THEIR RELATED FRONT PANEL KEYS

3

3 - MENUS RELATED TO THE FRONT PANEL KEYS

SUMMARY **page**

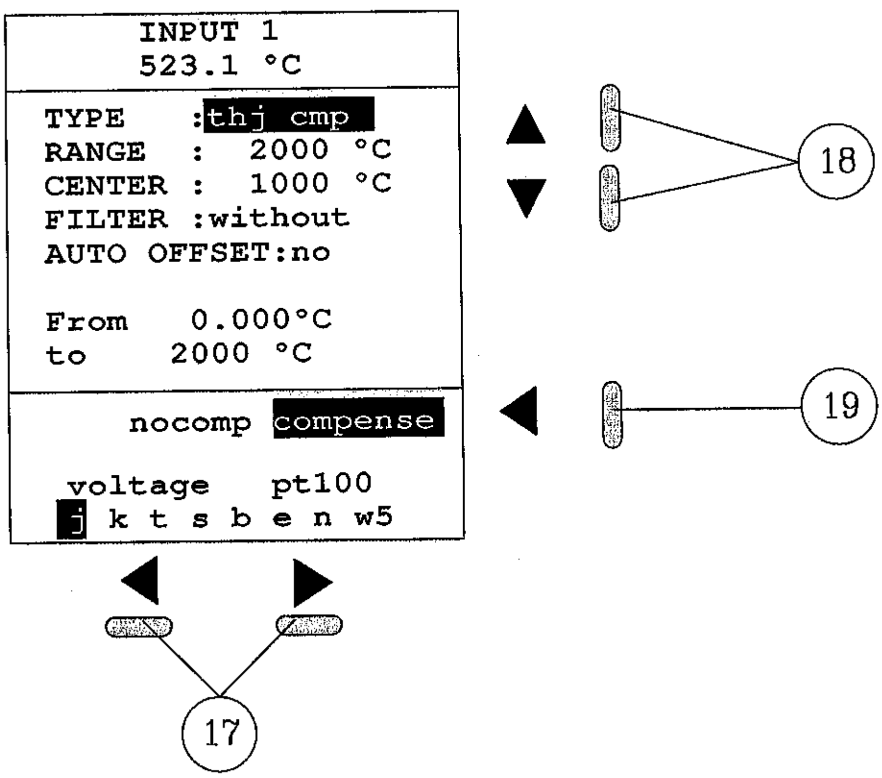
3 - MENUS RELATED TO THE FRONT PANEL KEYS

3.1 ACCESS TO THE PROGRAMMATION PARAMETERS

The 8211 is controlled by menus, keyboard controlled and displayed on a screen.
This chapter describes the various programmation facilities offered, and the menus associated to the control keys..
Both keys (18) at the right of the display allow the line and parameter selection.

The selected parameter is emphasized (display in white on black background)
To each selected parameter corresponds a range of values, displayed on the lower part of the window.

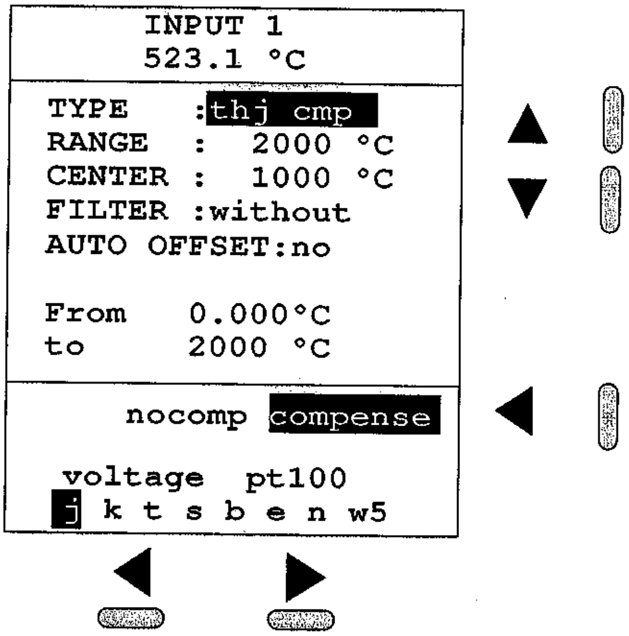
These values can be modified by both keys (17) "Incrementation" and "decrementation", while the key (19) allows in some cases a further selection.



3.2 MENUS AND THEIR RELATED KEYS

3.2.1 "INPUT" keys

Menu example :



<u>TYPE</u> : Proposed selection :
- voltage (Voltage measurement)
- pt100 (temperature measurement by PT 100 probe))
- thermocouples j, k, t, s, b, e, n, w5

A special key allow for each thermocouple a cold junction selection.

<u>RANGE</u> : Range adjust (see chapter 4)
The special key makes possible to select a fine or preset adjustment
In preset adjustment, the range selection take place by 1, 2 or 5 units steps.
In fine adjustment position, the user can at will set a fine range adjustment.

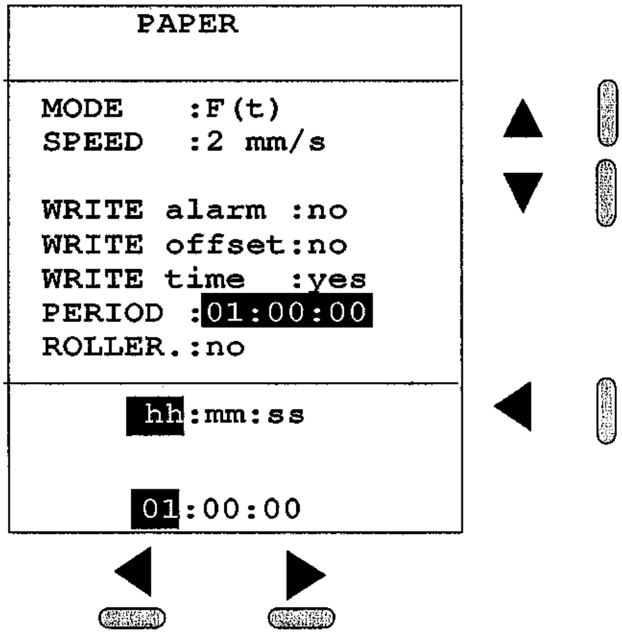
<u>CENTER</u> : Center value adjustment (mid-paper). See chapter 4
The special key makes possible to select a fine or preset adjustment.
In preset adjustment, the range selection take place by 1, 2 or 5 units steps.
In fine adjustment position, the user can at will set a fine center adjustment .

<u>FILTER</u> : Filter selection : "without filter", 1Hz, 0.5Hz, 0.25Hz, 0.07Hz or 0.02Hz.

<u>AUTO OFFSET</u> :Automatic offset Enable/Inhibit (See chapiter 4)

3.2.2 "PAPER Speed" Key

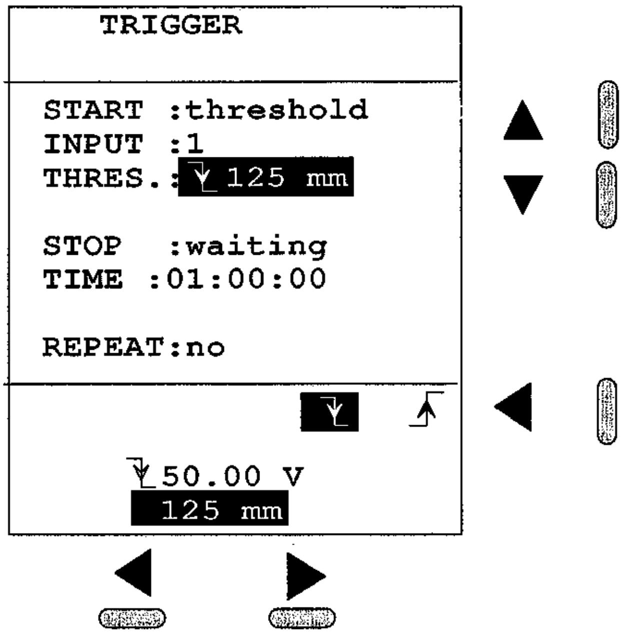
Menu example :



<u>MODE</u>	:	scrolling mode: F(t) or XY In the XY mode , the parameters below are no longer displayed.
<u>SPEED</u>	:	Paper scrolling speed: from 10mm/h to 50 mm/s by 1,2,5 steps
<u>WRITE alarm</u>	:	Alarm writing enable
<u>WRITE Offset</u>	:	Automatic offset writing enable
<u>WRITE time</u>	:	periodic time writing enable The "PERIOD" line is not displayed if the periodical time writing is not enabled.
<u>PERIOD</u>	:	Period time writing: (from 30 sec up to 23H 59min 59sec)
<u>WINDER</u>	:	Paper rewinder enable

3.2.3 "Trigger" Key

Menu example :



<u>START</u> : Start trigger selection

Proposed choice:

- Manual : Trigger at the first keypress on "Record"
- Threshold : Trigger on threshold overshoot on rising or falling front
- Waiting : Trigger on a waiting time
- Date : Trigger at a precise date/time
- External : Trigger on a rising front of the "External input" of the auxiliary connector.

In case of threshold triggering :

<u>INPUT</u> : Selection of the watched input (1 or 2)

<u>THRESHOLD</u> : Trigger threshold adjust (from 0 to 250 mm)
The Special key selects either the rising or falling front.

In case of a waiting time triggering:

<u>DURATION</u> : Waiting time adjust (from 0sec.to 23h59min59sec.)

In case of a date/Time triggering :

<u>DAY</u> : Day of triggering selection

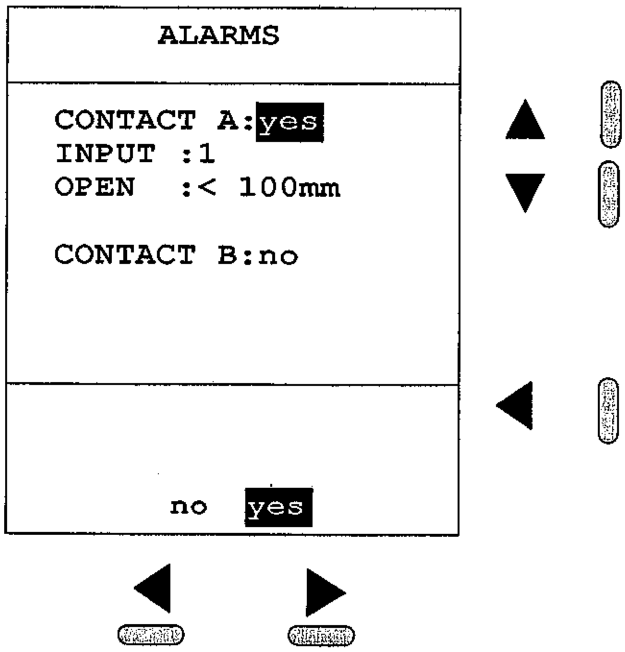
<u>HOUR</u> : Time of triggering selection

If the start and stop of the plot are not set on a manual trigger, the line "REPEAT" is displayed

REPEAT : Automatic reinitialization enable

3.2.4 "Alarm" key

Menu example :



CONTACT A : Contact A enable
If the Contact A is not enabled, the following lines are not displayed:

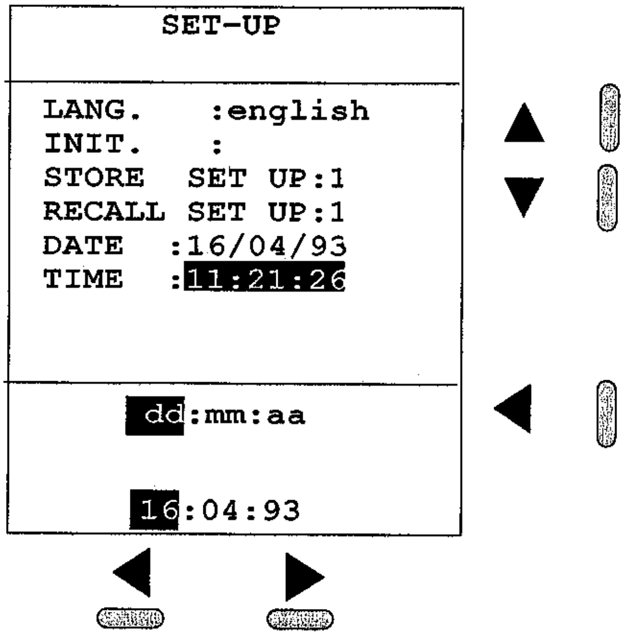
INPUT : Watched Input number(1 ou 2)

OUVERT : Measuring range within which the contact A remains open, (from 0 to 250 mm)
The value in Volts or in Celsius degrees is displayed at the bottom of the screen..

CONTACT B : Same as for contact A

3.2.5 "set up" key

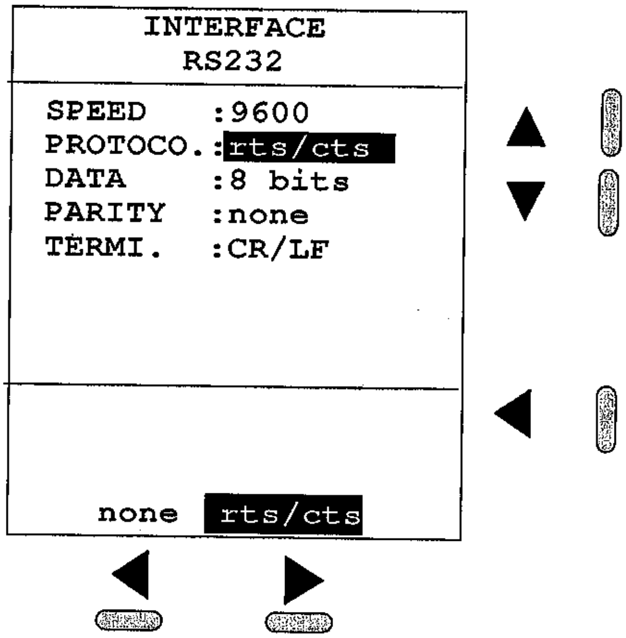
Menu example :



<u>LANG.</u>	: Language selection : French or English
<u>INIT</u>	: Instrument init in a standard configuration. Enabling is confirmed by the special key "VALID"
<u>CONFIG MEM</u>	: Storage of the current configuration : from 1 to 10
<u>CONFIG RECALL</u>	: Restoring a configuration : from 1 to 10
<u>DATE</u>	: Current date adjustment
<u>TIME</u>	: Current time adjustment

3.2.6 Key "RS232"

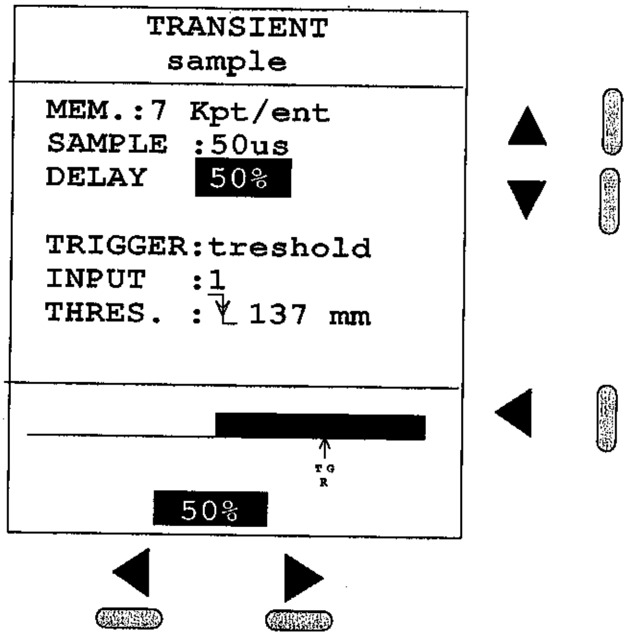
Menu example :



SPEED	: Throughoutput adjustment. Proposed choice : 300, 1200, 2400, 4800 or 9600 bauds
PROTOCO.	: Transmission protocol selection : "without" or "rts/cts"
DATA	: Data bits : 7 or 8
PARITY	: Parity selection : "even " or "without"
TERMI.	: Message terminator selection: "CR", "LF", "CR/LF" or "EOT"

3.2.7 "TRANSIENT sample" Key

Menu example :



<u>MEM.</u> : Memory capacity for the recorded transient event "1Kpt/ent", "2Kpt/ent", "5Kpt/ent" or7Kpt/ent"

<u>SAMPLE</u> : Sampling period adjust : from 50 micro-seconds to 1 second by 1, 2, 5. steps

<u>DELAY</u> : Trigger delay adjust : from -100% to +100%

<u>TRIGGER</u> : Acquisition trigger selection of transient events
Proposed choice :

- manual	: pressing the key "Acquis"
- threshold	: trigger on threshold overshoot, on rising or falling front
- waiting	: Trigger on a waiting time
- external	: Trigger on the rising front of the "External trigger" input of the auxiliary connector.
- auto	: Automatic trigger

In case of a threshold trigger:

<u>INPUT</u> : Selection of the watched input (1 or 2)

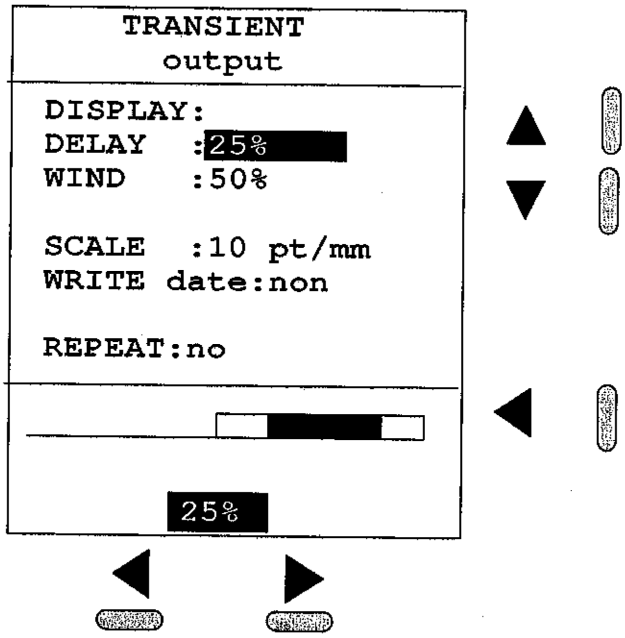
<u>THRESHOLD</u> : Threshold trigger adjust (from 0 to 250 mm)
The special key allows the selection of either rising or falling front

In case of trigger on a waiting time

<u>WAITING</u> : Waiting time adjust (from 2sec. to 23h59min59sec.)

3.2.8 "TRANSIENT output" key

Menu example :



DISPLAY : Reading of the curve displayed
DELAY : Beginning of the window adjust (from 0 to 99%)
WINDOW : Window length adjust (from 1 to 100%)
SCALE : Output scale adjust.Proposed selection :
1, 2, 5, 10, 20 or 50 points/mm
WRITE date : Date and time writing enable, once the transient event is plot
REPEAT : enable the repeat function

INPUTS PROGRAMMING

4

4 - INPUTS PROGRAMMATION

SUMMARY

4 - INPUTS PROGRAMMATION

4.1 PROGRAMMATION

Type programmation

Select the type according to the measurement to be carried - out.
For thermocouple types, the cold junction compensation can be selected or not
For temperature measurements by PT 100 probe, the red and black input terminals must be mandatorily disconnected.

Center and range programmation

The range is the measurement span corresponding to the total width of the paper (250 mm).

The center is the measured value of the paper center (125 mm).
As a general rule , the center value excursion may reach ± twice the range value. For example for a 10 volts range, the center value may extend from -20Vto +20V. For thermocouples, the extreme values are specified in the chapter 10 "appendixe" of this manual

The values related to the paper limits are displayed at the bottom of the screen..
Example:For a range of 5V and an offset of 2,5V,the 8211 will display the following limits:

from 0.000 mV
to 5.000 V

So as to take advantage of the full paper width, or to adapt your application to the available paper scale, a fine adjust of the range and the offset can be achieved.

Filter programmation

Filters may be used to eliminate the background noise. The proposed values are 1Hz, 0.5Hz, 0.25Hz, 0.07Hzand 0.02Hz.

Automatic offset programmation

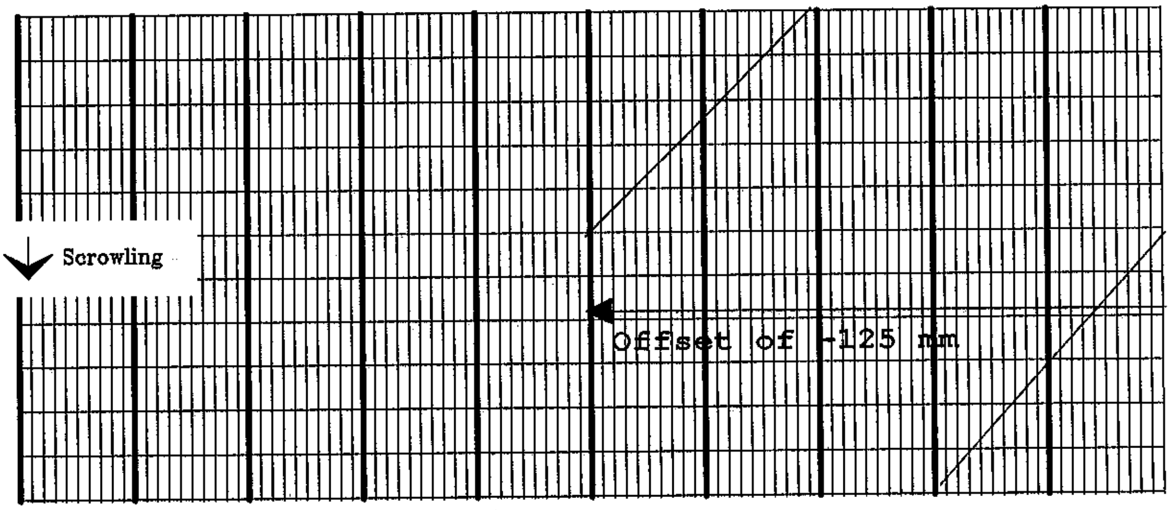
It is advised to use the automatic offset function if the variations of the recorded signals are expected to extend beyond the measurement range. It consists in the automatic research of the most convenient measuring range, so as to fit whithin the paper limits. It entails the automatic adjustment of the center input value.

NOTE:

The automatic offset only apply for the plotting of low frequency signals. It determines preset offset values of +125 mm. when the signal is at the left stop, or - 125 mm at the right stop.

The automatic offset make the alarm or trigger threshold change automaticly; this for no modification of the voltage or the temperature threshold first programmed. After consecutive automatic offsets, the value of the threshold can be set between -1000 and +1000mm.

The user can request the values corresponding to the limits of the paper to be written down for each offset.

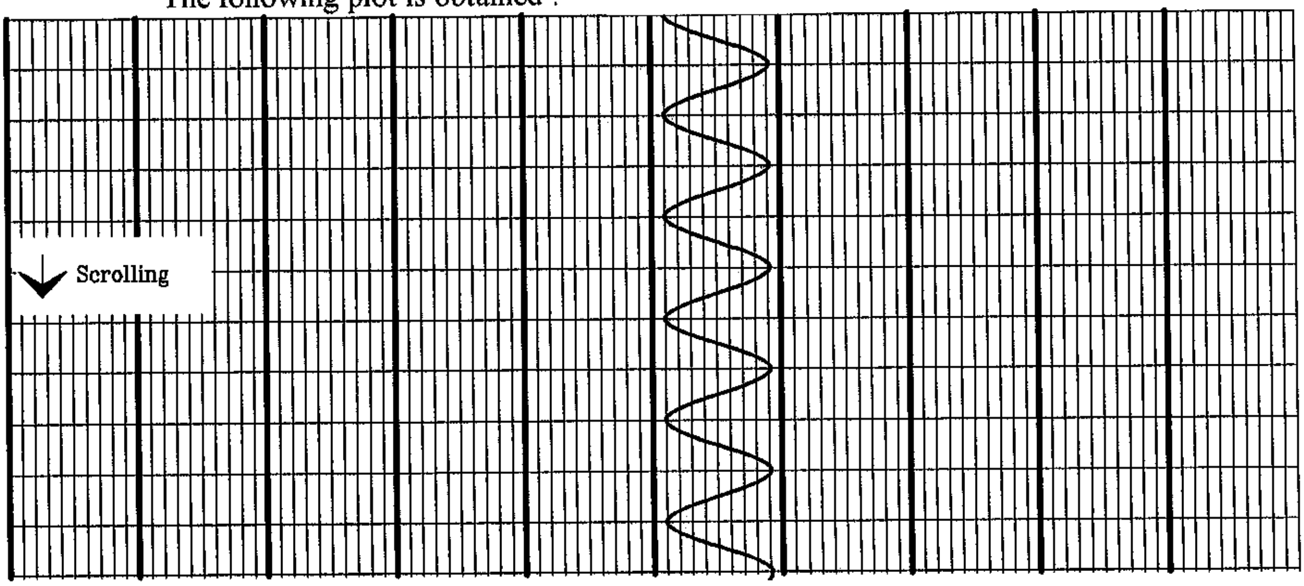


4.2 PROGRAMMING EXAMPLE

Plotting of a sinusoidal signal the peak values of which are unknown.
Input to be programmed in the following configuration:

- type : voltage
- range : 100 V
- center : 0 V
- filter : without
- auto. offset : no

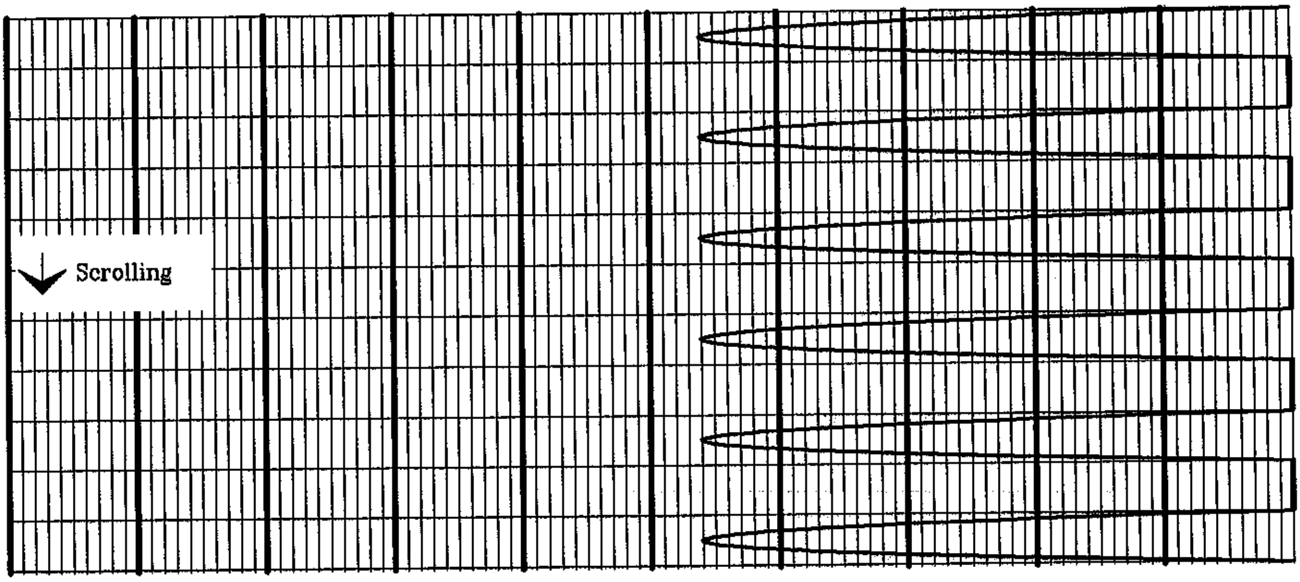
The following plot is obtained :



The paper width is 100 divisions, the sensitivity measurement for a range of 100 V is 1V/ division. Since the measured signal covers 8 divisions , the signal amplitude is 8 volts.

Select the 10 volts range

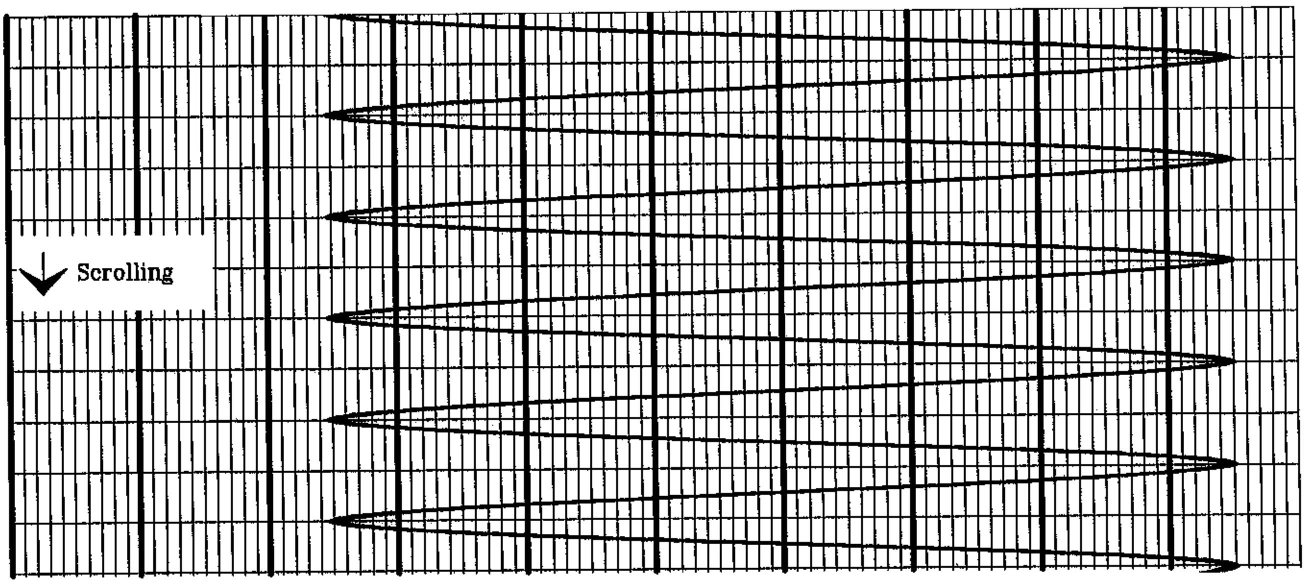
Here is the corresponding plot



The signal is truncated at its maximum (right stop) This plot is poorly situated with respect to the paper center .

Adjust the center value at 10V

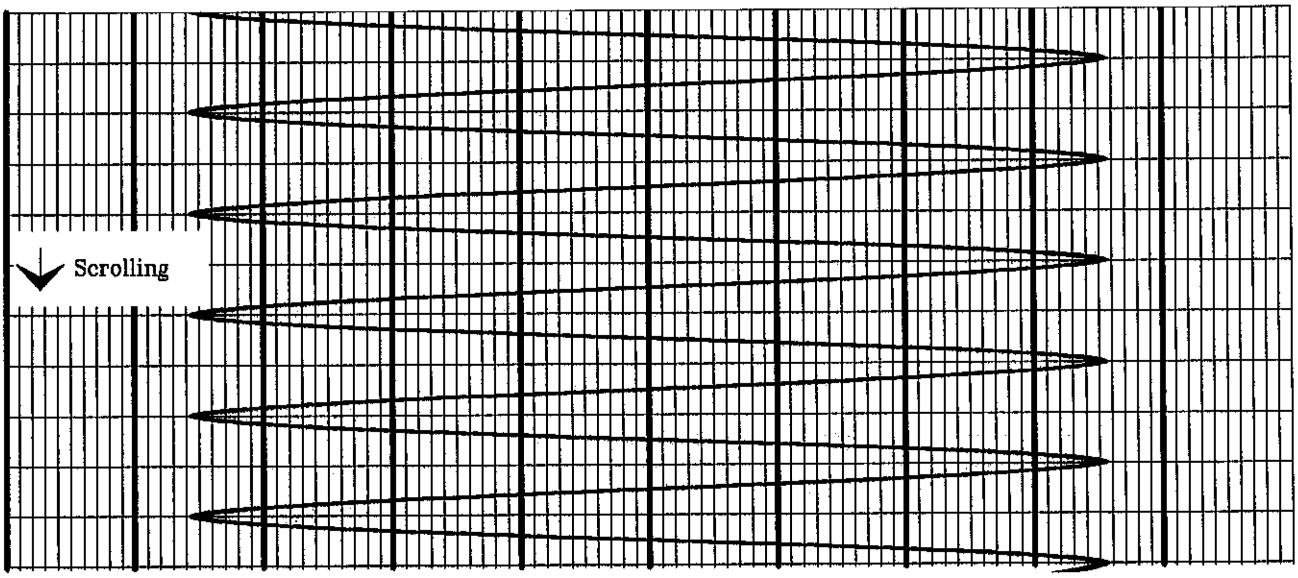
The following plot is then obtained :



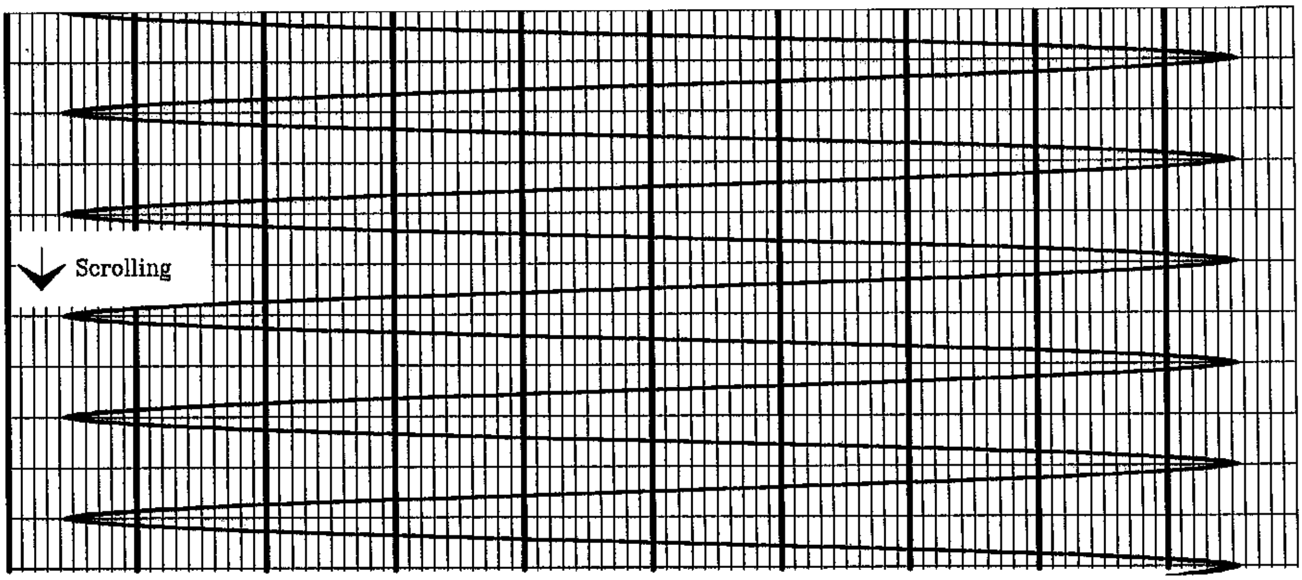
The plot is now within the paper scale but the centering can be improved.

Readjust more accurately the center value

The plot then becomes: :



With a fine adjustment of the range value, the operator can improve the plotting so that it's entirely expand within the paper scale.



PLOT PROGRAMMING

5

5 -PLOT PROGRAMMING

SOMMAIRE **page**

5 -PLOT PROGRAMMING

5.1 PAPER SCROLLING SPEED

The paper scrolling speed must meet the needs of the measurement to implement.
Extended facilities are provided in the 8211 for the scrolling speed adjustment of the paper.

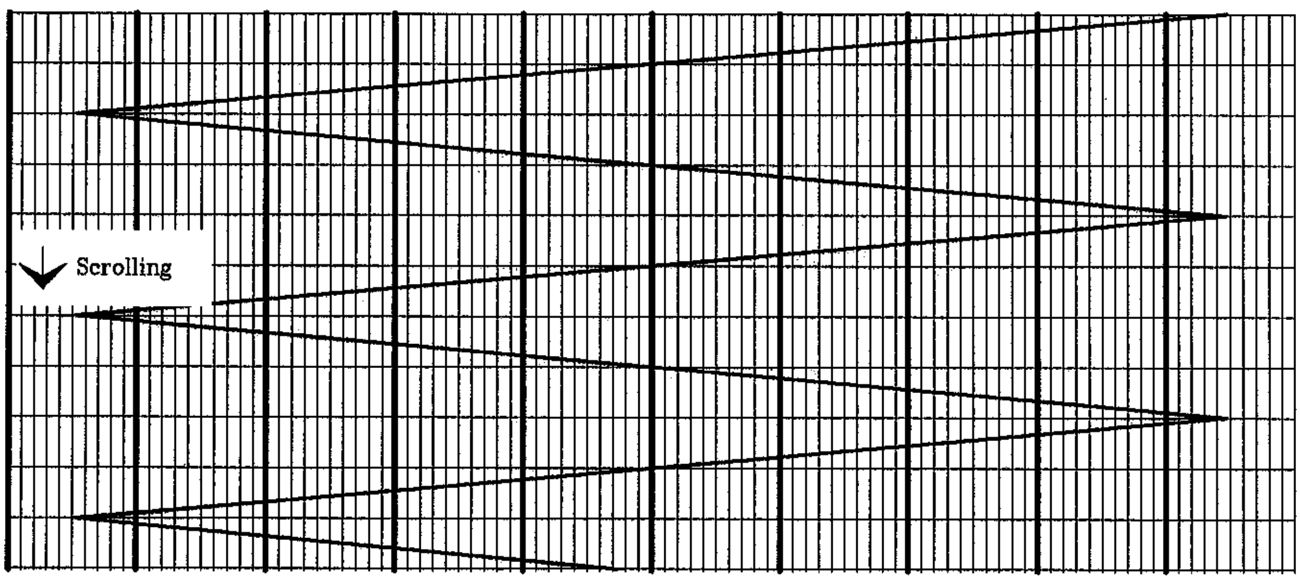
- Internal : In f(t) mode : the scrolling speed is programmed and vary from 10 mm/h to 50 mm/sec.

- External : Step mode: the scrolling is defined by the number of pulses received by the recorder through the auxiliary controls connector and the step resolution (in mm by step).
- In XY mode : The paper scrolls according to the value fed on the input 1.All parameters fed to this input are affected to the paper motor.

As for a pen, the paper therefore moves freely over a 250 mm amplitude.

5.1.1 Speed programmation

Make sure the auxiliary connector, is not connected, and select the F(t) mode
Select the paper speed convenient to your application.



5.1.2 XY programmation

Switching to XY mode can be performed only once the plot is stopped.
The input 1 is related to the paper move, the input 2, to the channel 2 move.
Therefore, the pen 1 is always in "park "position.

The displacement amplitude of the paper is now 250 mm, which corresponds to the paper width. If the channel 1 is not selected, the paper position corresponds to the "0mm"setting.

Without winder/unwinder option:

It is advised to place the paper roll into the housing on the handle side in order to avoid paper jamming for the latter can move backwards by 250 mm..

Capability limits of the mode XY

In XYmode,the paper feed is limited at 50 mm/s, therefore the maximal slope of the input is limited with respect to that speed.
The signal slope is given by the following formula :

$$\text{Slope} = \frac{\text{Range}}{250\ \text{mm}} * 50\ \text{mm/s} = 1/5\ \text{Range /s}$$

Example : On the 10 V. range,the maximal input slope is 2V /s
In case of overshoot, the plot on the paper is distorted.

"Lissajou" plot are undeformed for frequency < 0.1 Hz

5.1.2 Step programmation

See chapter 6 "auxiliary controls"

5.2 PLOTS SYNCHRONISATION

5.2.1 Plot without channel synchronization

A real time plotting is performed on the width of the paper. The pens move simultaneously on parallel lines about 3 mm apart. The plots therefore show an offset by about 3 mm with respect to the paper scrolling axis (time axis).

5.2.2 Plot with channel synchronization

This function give an immediately usable plot, each channel having the same time origin.The principle consists in a memory storage of the pen 1 position at a given time and in sending that position with a delay (in relation with the scrolling speed) that allow to compensate for the mechanical spacing between the channels.

5.2.3 Implementation of the channel synchronization.

The "Synchro."key determines the synchro validation. The associated Led informs about its state.

The synchronization is effective only if the plot is being performed.

NOTE: At the plot beginning, the pens will lower. The pen n°1 will synchronize with the n°2 when the paper has advanced by 3mm. (For example after 18mn. for a 10mm/h speed).

Synchronization capability limits

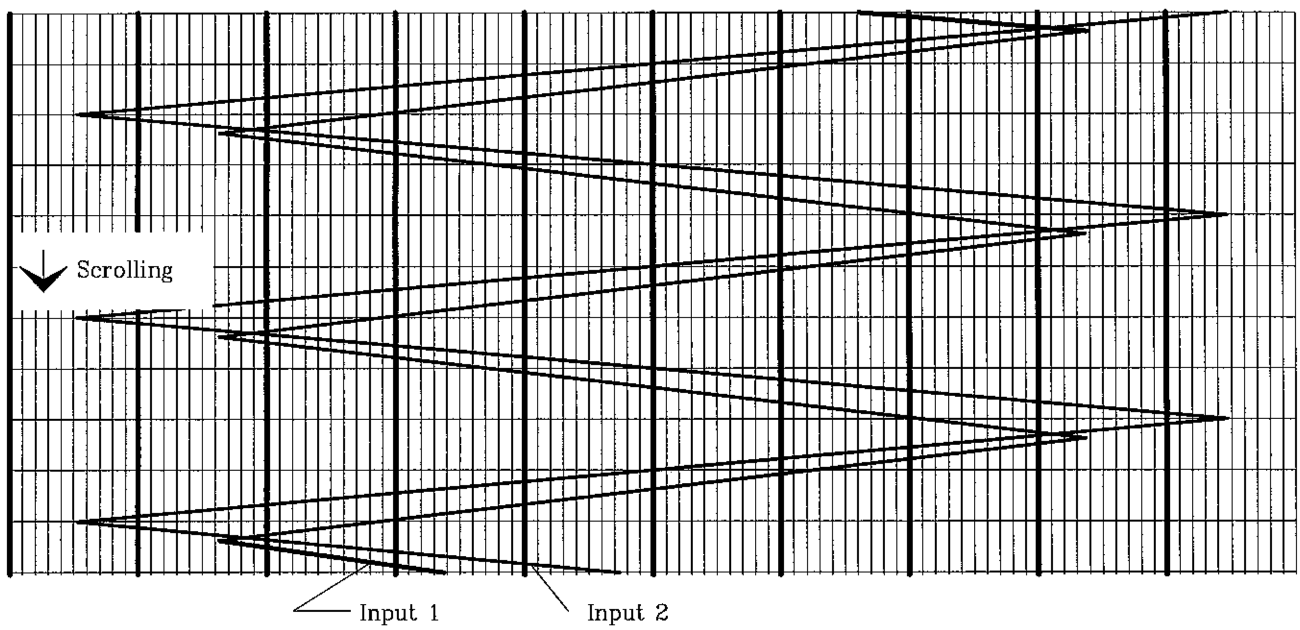
The synchronization has been designed to make possible any phenomenon transcription, with the exception of the following extreme cases:

The processing resolution of the synchro is limited to a sampling frequency of 16ms and 10 points stored for a 1 mm paper advance:

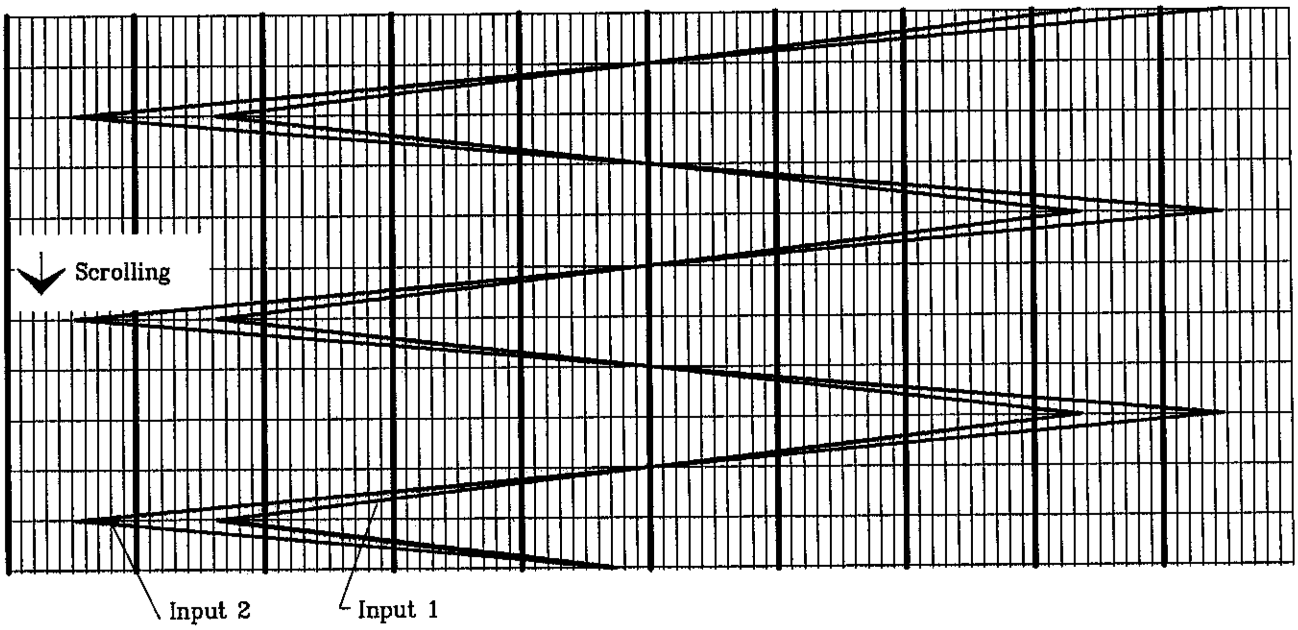
- At 50 mm/s the compensation will establish at $\pm$0,4 mm and will be accordingly lower for low speeds.

- For very low speeds, if the signal is subject to many variations, all the points will not be stored (10 pts/mm). The curve excursion displayed on the paper is reduced with respect to the real amplitude of the electric signal fed to the corresponding input. (Input 1 only).

<u>EXAMPLE: Plot in unsynchronized mode</u>



EXAMPLE: Plot in synchronized mode

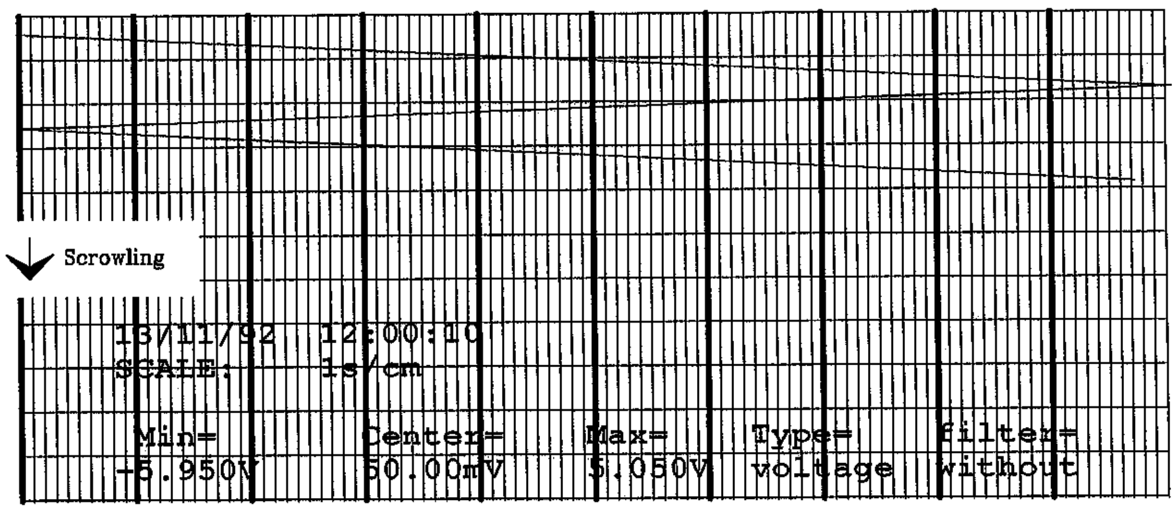


5.3 INFORMATION WRITING ON THE PAPER

5.3.1 Caption

The caption printing is independent of the signal recording. This action is implemented in pressing the "print. param." key. The printed information only apply to the selected channels.

Printing example



5.3.2 Offset

When the automatic offset function is enabled on a given input,(cf § 4.3), the operator may request the printing of the measurement range (min and max) for each offset, not including the XY mode.

Programmation :

Point onto the "WRITE offset" of the key menu"paper speed", and enable the writing.

NOTE:

Writing only takes place when the 8211 is in plot mode (waiting for a trigger or currently plotting)
The writing is performed in a few seconds and offsets the paper by 5 mm per line: the time axis of the full record is no longer linear.
If, due to a wrong handling an input constantly changes its offset, the 8211 will be permanently writing.

5.3.3 Alarms

When the alarms are used (cf § 6.6), the operator may require an alarm log-on every time the contact(s) switch(es) from a closed to an open state (XY mode excepted).

The message signals the involved contact A or B, the date and time of the state change.

Programmation :

Point onto the "WRITE alarm" line of the key menu paper speed, and enable the writing.

NOTE:

Writing only takes place when the 8211 is in plot mode (waiting for a trigger or currently plotting)
The writing is performed in a few seconds and offsets the paper by 5 mm by line: the time axis of the full record is no longer linear.
If, due to a wrong handling an alarm contact constantly changes its state, the 8211 will be permanently writing.

5.3.4 Date and time writing

During the current plot, the operator may request the date and time log-on at regular intervals (XY mode excepted)

The written message gives the current date and time.

Programmation :

Point onto the line "WRITE time" in the key menu "paper speed" and validate the writing. Then, adjust the writing period between 30 s and 23h 59m 59s).

NOTE:

Writing only takes place when the 8211 is in plot mode (waiting for a trigger or currently plotting)
The writing is performed in a few seconds and offsets the paper by 5 mm by line: the time axis of the full record is no longer linear.

5.4 PLOT TRIGGERING MODE

In direct mode,the start or stop of the plot is triggered by the "Record" key.

The plot start takes place only when the starting conditions are met. As well the plot stop becomes effective only when the stop conditions are realized only.

The Led associated to the "Record" key flashes if the 8211 is in a triggering wait state.It remains steady when the plot is running.

NOTE:

The operator may at any time force the triggering in depressing the key "Record".If the 8211 is waiting for a plot trigger (Led "record" flashing) the 8211 starts plotting. If the plot is already running , it is immediately stopped.

If a power outage occurs during the plot, once the mains is restored the 8211 writes the current date and time and starts the plot again.

Manuel triggering

At the start, the plot becomes effective at the first keypress on "record". there is no trigger wait state.
For stopping the plot, it stops once the key "record" is depressed.

Threshold trigger

The triggering is performed as soon as the threshold is exceeded on a rising or falling front.

The following points are to be programmed:

- The input to watch

- The input threshold (from 0 to 250 mm), the correspondence in V ou in °C is displayed at the bottom of the screen.

  N.B: If you use the automatic offset function, the displayed value of the threshold can be set between -1000mm and +1000mm. (See the chapter "Automatic offset programmation" page 4.1). If you modify the threshold, the last one will be set between -1000 and +1000mm.

- The trigger front (rising or falling)

Triggering on a wait state

Once the plot is triggered (keypress on "record") the waiting temporization is set. As soon as the programmed time has elapsed the plot is triggered.
The temporization duration must be programmed, from 2s to 23h 59m 59s).

Triggering on a date

The triggering takes place automatically at the programmed date and time.

Triggering on an external input

See chapter 6 "Auxiliary controls"
The triggering is performed on the rising edge ot the "External triggering" input of the auxiliary connector.

5.5 PLOT REINITIALIZATION

In automatic reinitialization mode, the plot start again automatically when the stop conditions of the plot are met. Therefore the 8211 switches from itself in waiting trigger condition for a new plot.

To stop the cycle, simply stop the plot in depressing the "record" key during the current plot.

In manual start or stop plotting, the automatic reinitialization is not available.

6

AUXILIARY CONTROLS

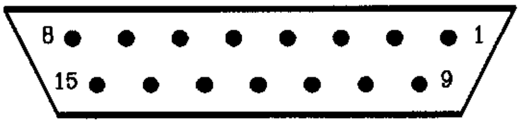
6 -AUXILIARY CONTROLS

SUMMARY **page**

6 - <u>AUXILIARY CONTROLS</u>

6 -AUXILIARY CONTROLS

6.1 AUXILIARY CONTROLS CONNECTOR



Back view

PINS	SIGNAL NAMES
1	Cabinet ground (earth)
2	Step pulses input
3	Channel 1 marker
4	Channel 2 marker
5	External triggering
6	Paper control
7	Step motion enable
8	Ground
9	Alarm A1
10	Alarm A2
11	Alarm B1
12	Alarm B2
13 to 15	unused

6.2 PAPER SCROLLING IN STEP MODE

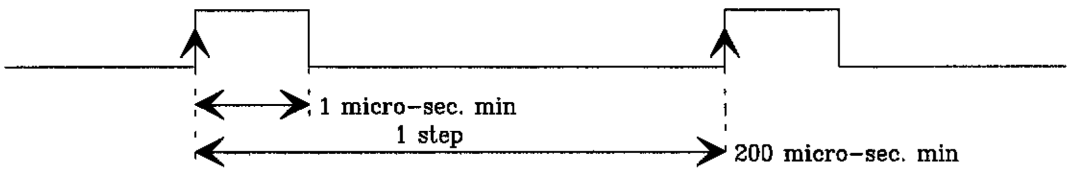
<u>Auxiliary control connector wiring</u>

The pins 2-7- 8 of this connector are devoted to the step operation.

-Strap on pins 7 - 8: step mode operation

-Feed the control pulses on the pin 2 (ground on 8)

<u>Control signal characteristics</u>



The recorder takes the control pulses of the step mode into account in detecting the ascending fronts. To be actually detected, that front must be kept at 1 for at least 1 µs.The maximal frequency of the control signal depends on the selected scale, taking into account the maximum speed of the paper scrolling which is limited at 50 mm/s.
Example 5 KHz for a scale of 0.01 mm/step.

STEP MODE PROGRAMMATION

If the input "Step enable" (pin) goes down, the 8211 automatically switches onto "Step mode". In that case the menu of the "Paper" key is modified.
The menu of the "Paper" key allows the programmation of the paper scrolling resolution. This speed resolution may vary from 0.01 mm/step to1 mm/ step.

The paper scale corresponds to the paper advance for a pulse fed at the step pulse input of the auxiliary connector.

6.3 PAPER CONTROL

A low level applied at the input lowers the pens and starts the paper scrolling at the speed programmed on the front panel of the instrument.

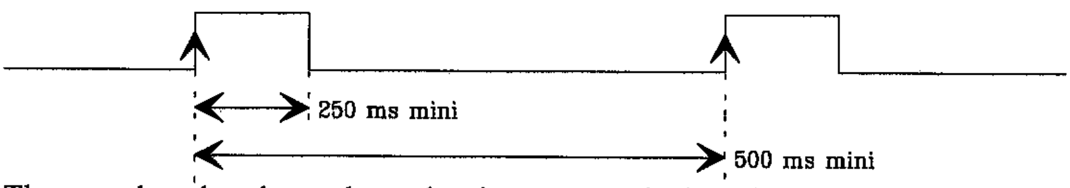
6.4 USING THE MARKER FUNCTION

This function causes a line of about 6 to 10 mm to be drawn.
The plotting of these marks is triggered by an external signal.
To each mechanical channel, a marker input of the auxiliary controls connector is assigned.

Auxiliary control connector wiring

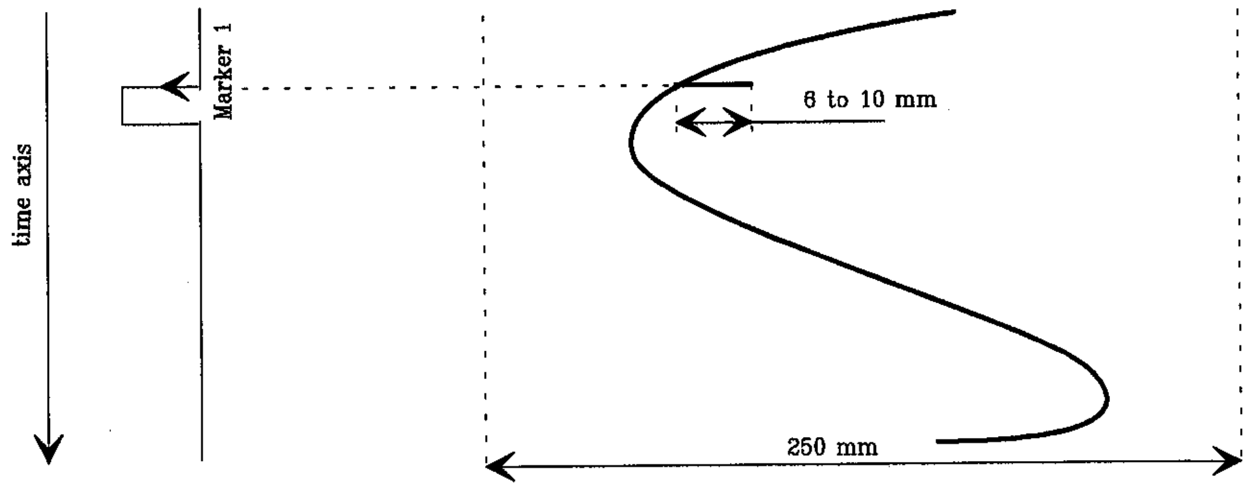
The pins 3 and 4 are respectively associated to the markers 1 and 2 inputs.

Control signal characteristics



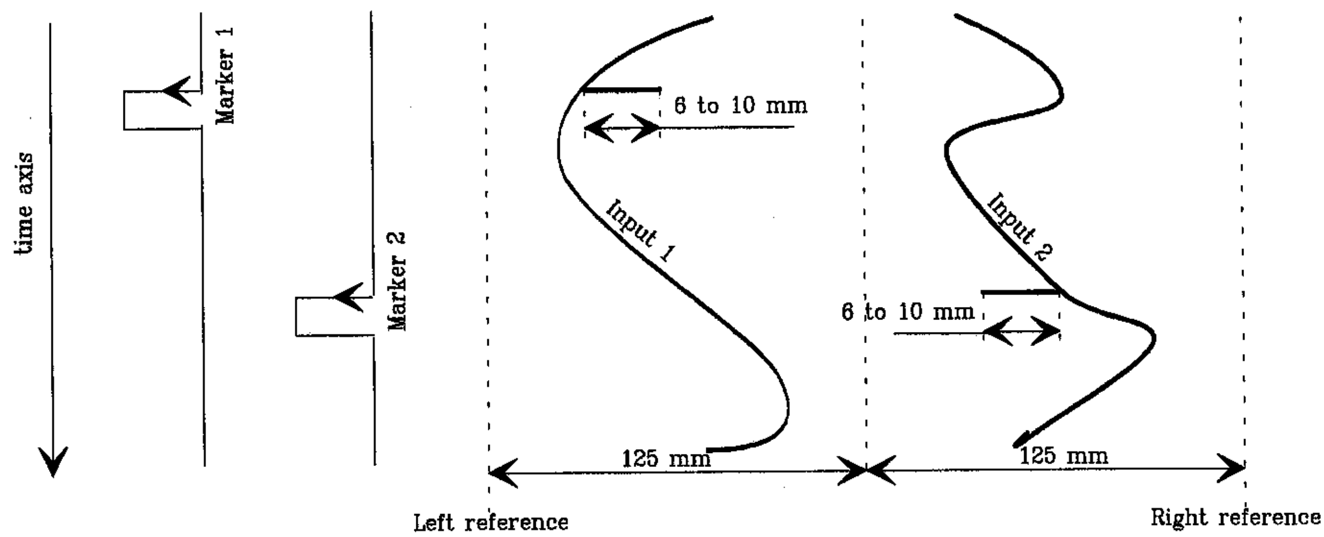
The recorder takes the marker pulses into account in detecting the ascending fronts on the marker inputs at the marker inputs of the connector.

Marking example



- Signal recording : input 1
- Marking signal : marker 1 (pin 3)

General case of signals close to the mini or maxi stops..

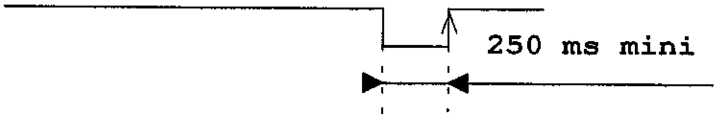


- Signals recording: Input 1 and 2
- Marking signals : marker 1 (pin 3), marker 2 (pin 4).

6.5 TRIGGERING ON AN EXTERNAL SIGNAL

The triggering on an external signal makes possible to start or stop the plot by a signal fed on the pin "External triggering" of the "auxiliary controls" connector.

<u>Characteristics of the control signal</u> (pin 5 of the connector "Auxiliary controls")



The 8211 takes into account the ascending front of the trigger pulses.

<u>Programmation</u>

To start or stop the plot, select the "external" trigger mode ("trigger menu")

6.6 ALARMS PROGRAMMATION

```
ALARMS

CONTACT A:oui
INPUT     :1
OPEN      :< 100mm

CONTACT B:non



no  yes
```

Two contacts A and B are available on the rear plug: pins 9 and 10 for A, pins 11 and 12 for B. They can be assigned to both channels . The state of these contacts is depending on the menu "ALARMS" programmation.

NOTE: These contacts are free from any voltage (24V/100mA) (open contacts: instrument not powered).

<u>Programmation</u>

Select the desired contact:

- the input to be watched
- the threshold input
- the choice of the contact closing , either by a value below or above the threshold.

TRANSIENT MODE

7

7 - TRANSIENT MODE

SUMMARY **page**

7 - TRANSIENT MODE

7.1 GENERAL

If the input signals frequency is too high to allow a continuous mode record, the signals must be first stored in memory so that they can be further called-back at a slower rate: This is the transient mode.

The signals are memorized according to the current configuration during the recording time. These parameters must therefore be properly programmed in order to avoid any incorrect memorization (cf.§4).

The "MODE" key switches on the direct or transient mode selection.

Differences between the direct and transient mode

Transient mode :

- Filter, automatic offset, inputs zero reset and alarms are always disabled
- The input plotting is always synchronized.
- Out of the plot, the pens are in "Park" position, the "Measure" function is disabled.
- The printing of the drawing parameters includes with further information such as trigger date and time, memory size, sampling period, trigger delay and paper scale.

7.2 ACQUISITION

7.2.1 Size of the acquisition memory

The memory size may extend from 1Kpt/input to 7 Kpt/input
The record duration is displayed at the bottom of the window.

```
     TRANSIENT
       sample
MEM. :1Kpt/inp
SAMPLE :50 µs
DELAY  :0%

TRIGGER: manual


       50.00ms
     1 Kpt/ent
```

7.2.2 Sampling period

Reminder:

The sampling consists in picking-up the instantaneous value of a signal at regular intervals.

Programmation

Select the sampling period in pointing onto the "SAMPLE" line of the menu.

The sampling period may range from 50 µs to 1 s.

The record duration is displayed at the bottom of the window..

Usable frequency

So as to obtain a correct periodic signal plot, a sampling period consequent with the frequency of the signals fed at the 8211 input terminals must be selected. A resolution of 20 points by period is a minimal value to obtain a satisfactory plotting.

Example :

Sampling at 50 ms for 1000 Hz
Sampling at 500 ms for 100 Hz

7.2.3 Triggering delay

Principle :

Given a memory capacity of n samples. When the memory is full, the sample (n+1) is memorized in place of the sample 1, the sample (n+2) in place of the 2...so that the memory recording is permanent and the stored data permanently updated by new acquisitions. This memory always retain the last n samples.

Trigger delay definition :

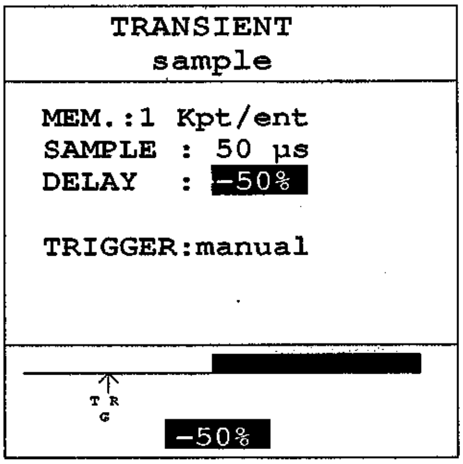
The operator may choose the time when the samples presently in memory will be set; to achieve this he defines a delay separating the trigger time from the beginning of the actual memory storage since that delay may be either positive or negative,the memorized samples can be therefore situated either before or after, or even besides the trigger instant.

Programmation

Select the trigger delay in pointing onto the "DELAY" line of the "sample" menu

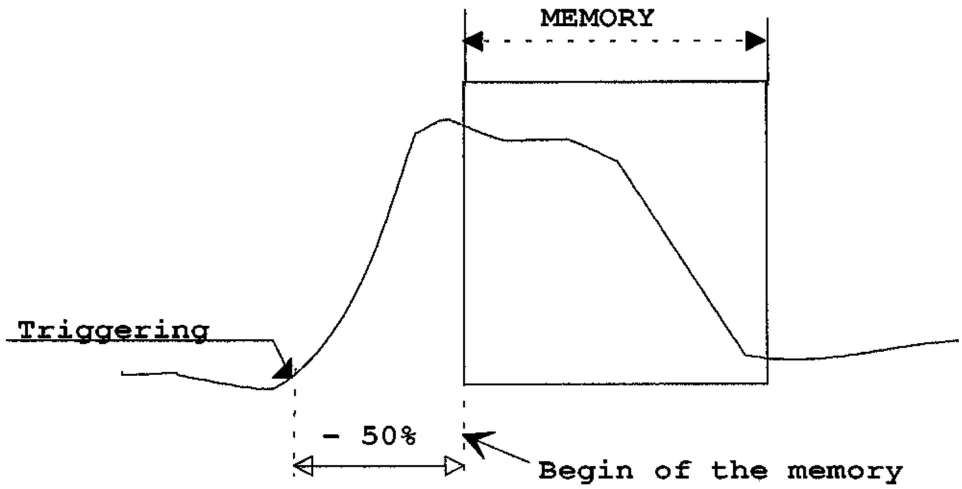
The trigger delay may range from -100% to +100%.

The black rectangle at the bottom of the display gives an image of the 8211 memory, and the arrow with the TRG sign indicates the position of the trigger point.



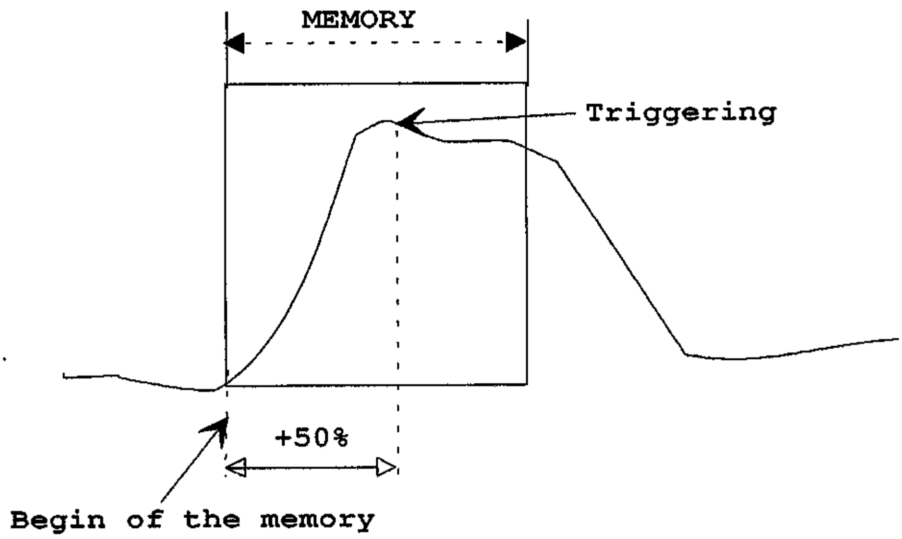
Example:

memory storage with a delay of -50% with respect to the beginning of the storage.



Example

Memory storage with a delay of 50% with respect to the memory beginning.



7.2.4 Triggering conditions

The triggering may be manual, on a threshold, on a wait state, external or automatic..

Manual triggering

The triggering condition is achieved by the "acquisition" keypress.

Triggering on threshold

The triggering takes place when a programmed threshold is exceeded.

Triggering on a wait state

The temporization is set once the acquisition is launched. The triggering takes place at the end of this time.This temporization may range from 0 Sec. to 23h-59min-59sec.

External triggering

The triggering takes place on the rising front of the external input of the auxiliary connector. (pin 5)

Automatic triggering

The triggering is automatically performed. A positive trigger delay (0 à 100%) has no effect.

NOTE:

Whatever the selected triggering is, this latter can always be overriden in depressing the "Acquis" key. Of course, the 8211 must be in triggering waiting state.

7.2.5 Acquisition start

The acquisition start takes place by a keypress on "acquis". Once the recording is confirmed, the following screen is displayed.

```
        acquisition
         in process
----------------------------
BEFORE  TRIGGER    :
WAIT    TRIGGER    :<-
AFTER   TRIGGER    :
----------------------------
                STOP ACQUI
      Hit ACQUIS for
        triggering
```

Acquisition stop

During the acquisition, the various phases of the storing operation shows up on the display. The arrow point onto the current operation.

- before triggering
- waiting for triggering
- after triggering

7.2.6 Acquisition stop

The operator may stop a recording in depressing the special key "STOP ACQUI" during all the process (see above sketch).
In that case the recording may be not completed or inexistent.

7.2.7 Acquisition processing

Once the acquisition is achieved, the acquisition processing automatically starts.
This processing consists in computing the motor position relevant to the recorded point and this for all recorded points.
The processing duration is about 30 seconds while the 8211 prohibits any parameter modification on the inputs.
The message "Modification impossible during the acquisition processing" will be then displayed.

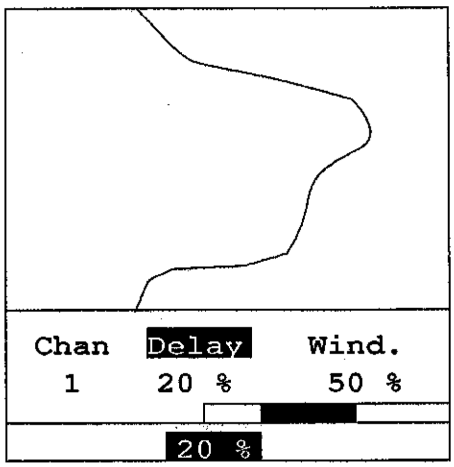
7.3 CURVE VISUALIZATION ON THE DISPLAY UNIT

The plot can be observed, in part or as a whole on the display. The delay and the window are common for both the visualization and the plotting, thus permitting the visualized plot to be directly transcripted on the paper.

The display though not offering an accurate figure of the end result, gives a good approximation. This function therefore allows to check of the signal before being plotted and eventually to modify the window position if necessary.

Point onto the line "DISPLAY" of the "output" menu and depress the special "VALID" key.

Recording example :



Either the vizualized channel or the window to vizualize can be selected.
The delay paramater represents the window beginning, and the window parameter the length of that window (displayed at the bottom of the window)

7.4 PLOTTING THE RECORDED CURVE

<u>Paper scale programmation</u>

Point onto the "SCALE" line of the "output" menu ,then select the scale.
It may range from 1 pt/mm to 50 pt/mm. The relation time/length is displayed.

Plotting start or stop

The plot is started or stopped by a by a keypress on the "plot" key. According to the wanted channel, the selection is performed by a keypress on "pen 1" or "pen 2".

NOTE: The date can be written down once the plotting is finished by enabling "ECR date" ("TRANSIENT output"menu key).

```
       TRANSIENT
         output
DISPLAY:
DELAY   : 10%
WIND.   : 50%

SCALE   : 1 pt/mm
WRITE date: no

REPEAT.: no

       500 us/cm
        1 pt/mm
```

7.5 REPEAT FUNCTION

The repeat function allows an automatic chaining of the plotting when the acquisition is finished, then the acquisition again when the plotting is achieved.

To stop the cycle, simply stop the acquisition or the plotting.

Programming

Point onto the "REPEAT" of the menu key "TRANSIENT output", then enable or not the repeat function.

RS 232 INTERFACE

8

8 - INTERFACE RS232

8 - RS 232 INTERFACE

8 - INTERFACE RS232

8.1 GENERAL

<u>Electrical norms</u>

BINARY STATE	1	0
VOLTAGE RANGE	+3V to + 25V	- 3V to - 25V
LEVEL NAME	SPACE	MARK
LINE STATE	high	low
FUNCTION	ON	OFF

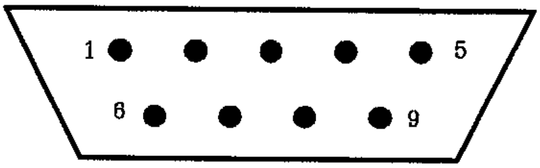
The line is maintained "low" (0) when no data are present.

<u>Link type</u>

The link is a "FULL DUPLEX" (simultaneous bi-directional)

<u>Mechanical norms</u>

Sub - D 9 pins connector . Le 8210 is delivered in DCE mode.



Back view

8.2 ASYNCHRONOUS TRANSMISSION

The bits corresponding to the character (ASCII code) are serially transmitted, character by character.
Character transmission: start bit, byte to be sent, parity bit, stop bit.

The RS 232 norm specify some characteristics of the data line, such as used voltage level, rts cts protocol, but allow some freedom on the following characteristics:

- <u>Throughput (transmission speed)</u> :
  It is expressed in bauds ; it specify the number of bits transmitted per second and therefore, by extension the number of characters transmitted per second. The proposed values are 300, 600, 1200, 2400, 4800 and 9600 bauds.

- <u>Character length</u> :
  7 or 8 bits

Parity : Even, odd or whithout.
The 8211 proposes either 8 data bits without parity, or 7 data bits with even parity.

connection lines

DCE

1 DCD	→
2 TXD	→
3 RXD	←
4 DTR	←
5 GROUND	
6 DSR	→
7 RTS	←
8 CTS	→
9 RI	unused

RS 232 signals definition

TxD (transmitted data) : Data sent by the terminal to be transmitted by the transmission modem.

RxD (received data) : Incoming data from the modem in response to signals transmitted by the transmission modem.

RTS (request to send) : Inform the transmitting modem that the terminal is ready for the data transmission.

CTS (clear to send) : Inform the terminal that its modem is ready for data transmission.

DSR (data set ready) :Inform the terminal that its modem is not in test mode and its power is ON.

DCD (data carrier detect) : Inform the terminal that its modem receives a signal from the transmitting modem.

DTR (data terminal ready) : Inform the modem that its terminal is ready for receiving the data.

8.3 CHARACTERISTICS OF THE 8211 INTERFACE

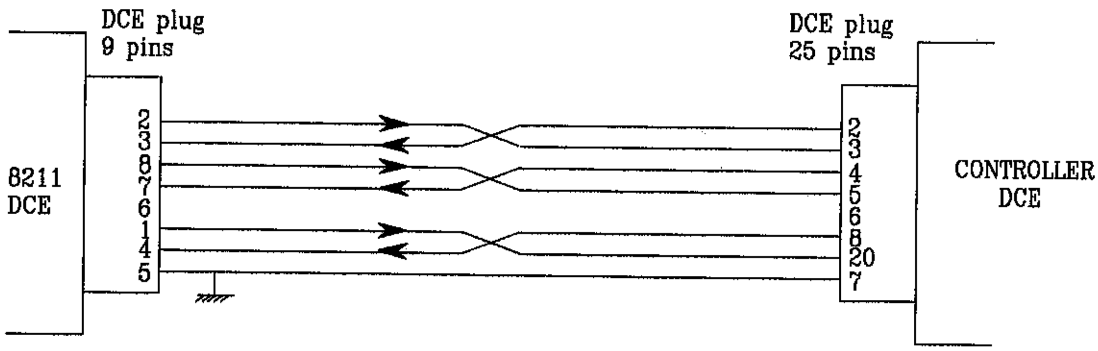
- Transmission mode : asynchronous
- Link : full duplex type
- Output : DCE
- Transmitting throughput in bauds : menu selected
- Character composition :
  . 1 stop bit
  . 8 data bits without parity or
  7 data bits with even parity
  . 1 stop bit

8.4 OPERATING PRINCIPLE

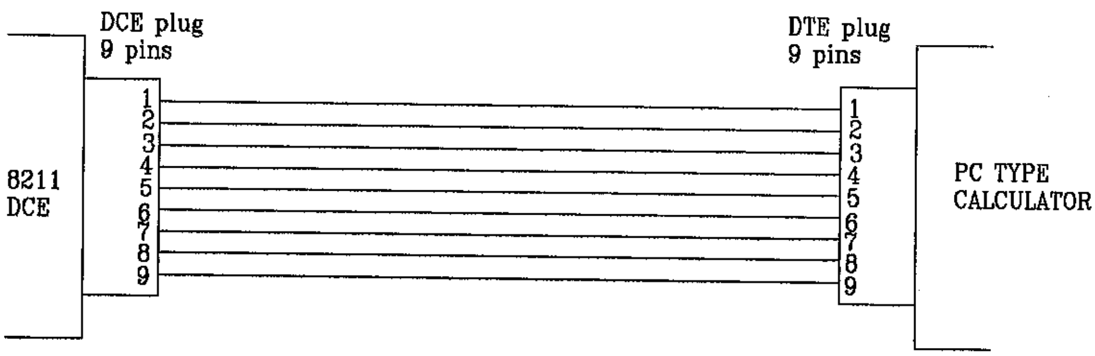
At the power-up, the 8211 sets the lines RTS, DTR et DCD high (> 3V) indicating that it is ready for data transmission on TxD.

NOTE: With a universal controller in DCE, a cross-wired cord must mandatorily be used.

Cross cord connecting the 8211 to a 25 pins DCE plug.



Connecting cord between a 8211 and a PC computer.

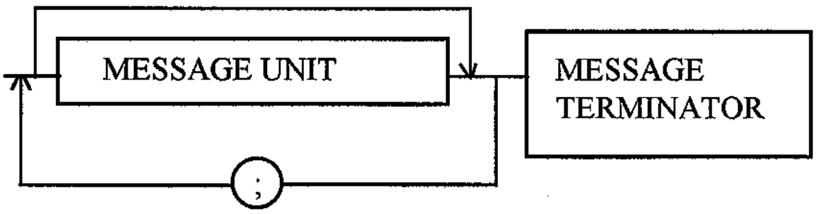


8.5 PROGRAMMING LANGUAGE

8.5.1 Reception messages format

NB: In all the following examples the space mark is represented with a white space.

The exchanges between a controller and the 8211 are performed with messages made of ASCII characters (and possibly binary bytes) ended with a message terminator
This is the syntax of a reception message:



Message unit: If the message is made of several messages units, these are separated by a semicolon «; » and eventually preceded and/or followed by one or several « filling » characters in ASCII code (0 to 9 and 11 to 32, decimal value).

The mesage terminator is one of any following terminators:

CR	:	Carriage Return (ASCII code : 13 décimal)
LF	:	Line Feed (ASCII : 10 décimal)

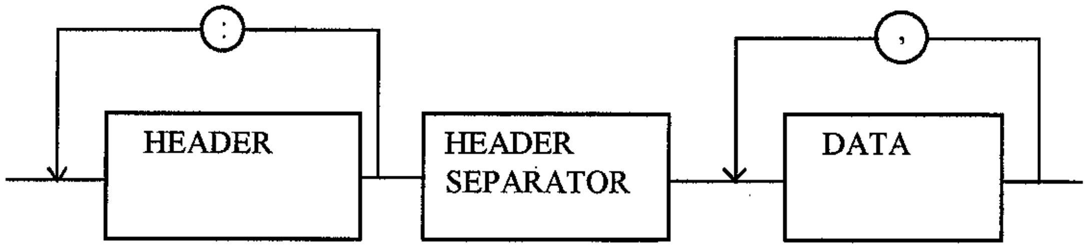
The terminator message may be eventually preceded and/or followed by one or several «filling» characters in ASCII code (0 to 9 and 11 to 32, decimal value)

Example of messages made of 3 message units

MESSAGE 1; MESSAGE 2 ; MESSAGE 3 'CR'

CHANNEL 1; :ZERO WITH 'LF'

Message units syntax:



A message unit (for example : PAP:SPEED 1, MM_S) is made of several fields:

Header: For the control messages (for example: PAP: SPEED 1, MM_S) or for the polling messages (for example :PAP:SPEED ?).

A string is made of 1 to12 alpha-numeric characters or the character '_' (decimal ASCII code 95).
Recommended string length : 4 characters.

A header string mandatorily begins with an alphabetical character. It may eventually be preceded by a colon: (composite header) or end with a question mark '?' (polling message)

CAUTION : A POLLING MESSAGE MUST ALWAYS BE FOLLOWED BY A TERMINATOR.

In a composite header, the character strings are separated by a colon ':'
(for example :PAP:SPEED).

Header separator:
One or several ASCII characters (0 to 9 and 11 to 32, decimal values).

One or several data :
For example : PAP:SPEED 1,MM_S, alphanumeric, numeric, or made of any character or binary bytes.

Data separator :
A comma «,» eventually followed and/or preceded by one or several «filling» characters in ASCII code (0 to 9 and 11to 32, decimal values)

Data

There are several types of data:

-Alphanumeric data :

Word of 1 to 12 either alphabetic (upper or lower case), numeric or the character '-' (95d) ASCII coded.
The word must begin with an alphabetic character.
For example ,for a non numerical parameter: Voltage

-Numeric decimal data :

Made of a mantissa, and possibly an exponent represented by a group of ASCII coded characters beginning with a numeral or a (+ or -) sign. It is of NR1 (integer) sign, NR2 (décimal) or NR3 (with exponent) or any combination of these three types.
The mantissa is made of 255 characters maximum and the exponent has a value comprised between -128 and + 127. If the received value is more than expected, it may be rounded off before use. A decimal numeric value may possibly be added to a unit.

-Text:

String of any ASCII coded characters framed by quotation marks:
For example : "8211 Recorder"

8.5.2 Transmission messages format

The exchanges between a controller and the 8211 are performed by messages made of ASCII characters (and possibly binary bytes) ended with a message terminator.
Both messages format, transmission and reception are identical. However the transmission format structure is more rigid. There is the syntax of a transmission message:

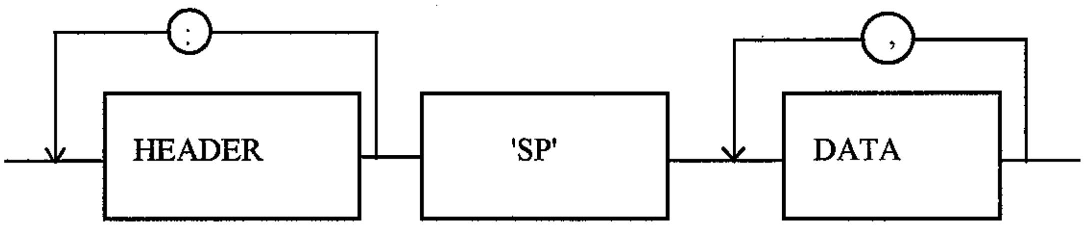
→ MESSAGE UNIT → TERMINATOR →

Message unit : If the message includes several message units, they are separated by a semicolon ';'.

Message terminator : It is always CR, LF, CR/LF,EOT . It is selected from the front panel

CHANNEL 2 'CR'/'LF'

Messages unit



A message unit (for example : PAP:SPE 1,MM_S) is made of several fields

- A header:

(for example :PAS:SPE) made of only one (simple header) or several (composite header) strings of 1 to 12 alphabetic characters Upper case only or numerical, or the ASCII coded character '_' (95 decimal). A header string begins with an alphabetical character.

- A header separator:

«space»character only (32d) uniquement.

- One ore several data:

(for example : 1,MM_S) alphanumeric, numeric or made of any character or binary bytes.

- A data separator :

A comma ','.

Data

There are several data types :

-Alphanumeric data:

A word of 1 to 12 characters, either alphabetic (upper case only), numeric or the character '_' (95d) ASCII coded (example "VOLTAGE").

-Decimal numeric data:

Made of a group of ASCII coded characters beginning with a numeral or a (+ or -) sign. It is of NR1 (integer) sign, NR2 (décimal) or NR3 (with exponent).

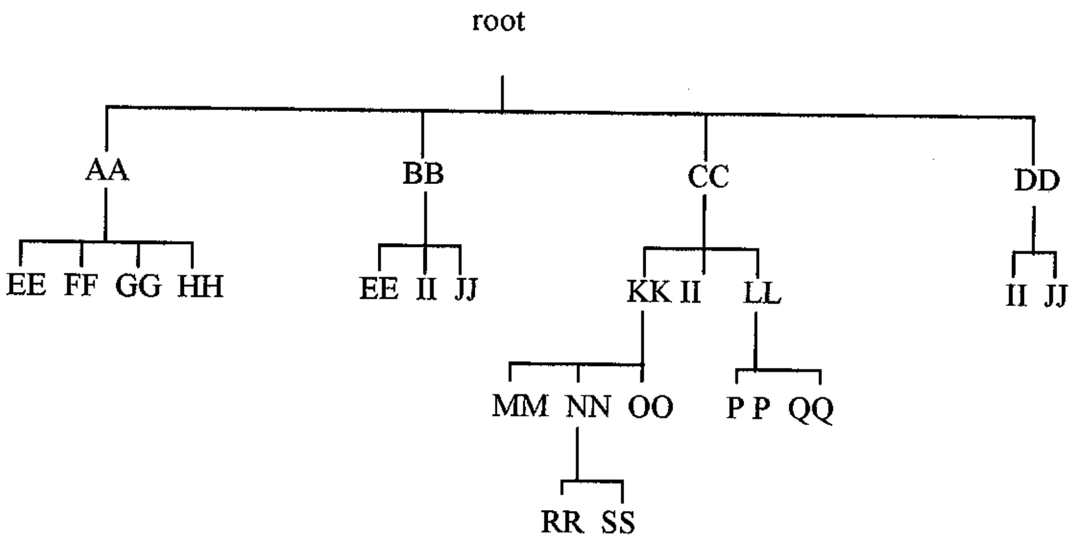
For example, for a numeric character: 25.02

- String of any ASCII character,

Ends with a message terminator.

8.5.3 Message units tree

The message units 8211 have a «tree» structure, and their progression through the tree follow specific rules.



REMARKS :

- The unit AA / EE FF GG HH makes a tree
- The unit "EE FF GG HH"is a sub-tree of "AA"
- "AA" is a node
- "EE" "FF" "GG" "HH" are sub-nodes.

The following examples give various applications of the messages writing rules.

1 AA:EE 5;:BB:EE 7 'CR'

The character ':' at the beginning of the second message unit send back to the root of the tree.
8211 *application*: MOD:CONT;:PAPER :MOD FT; SPEED 10,MM_S 'CR'

2 AA:EE 5 'CR' BB:EE 7 'CR'

The terminator of the first message unit sends back to the root of the tree.The character ':' before BB:EE 7 is therefore not required to inform of the return to the root of the tree.

8211*application* : PAPER :MOD FT 'CR' PAPER:SPEED 10,MM.S 'CR'

Error examples

1 AA:EE 7 ; BB:EE 7 'CR'

The node “BB” is not a sub-node of “AA”. The correct message is: :
AA:EE 7;:BB:EE 7 'CR'

2 CC:KK:MM 3; LL:PP 7 ' CR'

The node“LL”is not a sub-node of “KK”. The correct message is :
CC:KK:MM 3;:CC:LL:PP 7 'CR'

8.5.4 STATUS REGISTER

The status register is related to a 16 bits register checking the instrument status.

NOTE: Bits 12 to 16 are unused

	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
bits	11	10	9	8	7	6	5	4	3	2	1	0

The unused bits are set to 0.
<u>Reading of these data structure status.</u>

Reading of the structure status is performed with the command :STATUS?
Reading a register clears its content.

bit 0 : Plotting start
This bit indicates the beginning of the actual plotting.

bit 1 : End of plot
This bit indicates the end of plotting.

bit 2 : End of scrolling
This bit signals the end of the paper motion, triggered by a PAP:MOV P1 ou PAP:POS REC command.

bit 3 : End of writing
This bit signals the end of writing

bit 4 :Active alarm A

bit 5 :Active alarm B

bit 6 : Motor failure
This bit signals a functioning problem on the8211

bit 7 : Motor overheat
This bit signal a functioning or operating problem of the 8211.

bit 8 : This bit defines the acquisition in transient mode.

bit 9 : Acquisition error in transient mode

bit 10 : Plotting start in transient mode

bit 11 : Plotting end in transient mode

8.5.5 Instructions

All these instructions begin with an asterisk '*'.

*IDN? Identification polling of an instrument
Instrument response: : SEFRAM 8211 (Instument type) - V1.0 (Software edition)

*RST Instrument reset
Action: setting-up of the instrument in a fixed configuration .
1 and 2 TYPE : VOLTAGE mode
RANGE 100 V
WITHOUT OFFSET
AUTOMATIC OFFSET :no
WITHOUT FILTER
PENS 1 and 2 ON LINE

*REM Switching on RS 232 programmation

*LOC Local mode return.

When the 8211 is in «programmation» the LCD screen displays

- REMOTE MODE-

After a return in local mode, the screen display:

-LOCAL MODE -

8.6 PROGRAMMING DICTIONNARY

8.6.1 Channel programmation parameters

Reminder : Lower case characters in headers or parameters are optional

HEADER	PARAMETERS	EXAMPLES
CHAnnel P1 CHAnnel ?	Define the input about to be modified by means of the following commands P1 = Input selection(1 ou 2) returns the selected input number and its value	CHAN 2
PARCHannel PARCHannel ?	P1,P2,P3,P4,P5 modify all input parameters defined by the command "CHANNEL". P1= Input type P2= Range value P3= Offset value P4= Filter value P5= Automatic offset Returns all parameters of the selected input	PARCH TEN,0.01, 0.02,FIL05 ,WOUT TYPE voltage RANGE 10 mV OFFSET 20mV FILTER 0.5Hz Without auto offset
TYPe P1 TYPe ?	Modify the input type defined by the command "CHANNEL" P1= input type VOLtage, PT100, TJN, TKN,TTN, TSN,TBN,THEN, TNN, TW5N, TJCmp, TKCmp, TTCmp, TSCmp, TBCmp, TECmp, TNCmp, TW5Cmp. Returns the input type.	TYPE TENS Sets the type of selected input at voltage.

HEADER	PARAMETERS	EXAMPLES
CALdec CALdec ?	P1, P2 Modify the range and the center of the input defined by the CHANNEL command P1 = Range ISO unit (V ou °C) P2 = Center ISO unit (V ou °C) Returns the range and the center of the selected input	CALDEC 0.001,0 RANGE 1mV CENTER 0mV
FILter FILter ?	P1 Modify the filter of the input defined by the "CHANNEL" command. P1 : Input filter WOUT, FIL1, FIL05, FIL025, FIL007 FIL002.(WOUT=without) returns the filter of the selected input	FIL FIL05 FILTer of the selected input:0.5 HZ
DECauto DECauto ?	P1 modify the automatic offset of the selected input P1= WOUT ou WITH returns the command status	DEC WOUT sets the selected input without automatic offset
WDECauto WDECauto ?	P1 Writes every offset in automatic mode P1= NOor YES returns the command status	WDEC YES Writing enable

NB:In transient mode , the offset and filter information are not used

8.6.2 Scrolling parameters programmation

HEADER	PARAMETERS	EXAMPLES
PAPer:MODe PAPer : MODE ?	P1 Selects the paper scrolling mode P1 = Scrolling type FT XY DIGital (the paper is then set by the command PAPER:MOVE) Returns the scrolling type.	PAP:MOD FT The 8211 is in FT mode FT
PAPer:SPEed PAPer:SPEed ?	P1,P2 Selects the paper speed in F(t) mode (without auxiliary command) P1 = Speed value 1,2,5,10,20,50 P2 = units MM_S (mm/second) MM_M (mm/minute) MM_H (mm/hour) Returns the paper scrolling speed.	PAP:SPE 20,MM_S Scrolling speed 20 mm/s
PAPer:STEp PAPer:STEp ?	P1 Gives the choice of the paper scale in step mode when the auxiliary command is used P1 = step number/mm 1,2,5,10,20,50,100 Returns the scrolling scale in auxiliary command	PAP:STE 10 Scale 10 steps/ mm

HEADER	PARAMETERS	EXAMPLES
PAPer:POSition P1	Stores a paper position in memory and allow to come back to that position P1 = MEM memorization RECall return	PAP:POS REC Return to the memorized position
PAPer:MOVe P1	Moves the paper independently of the used mode. P1 = displacement in 1/10 mm -300 000 à + 300 000	PAP:MOV - 1450 move back paper of 145mm
PAPer:ROLler P1	Enables or not the winder P1=ON ou OFF	PAP:ROL ON

8.6.3 General parameters

HEADERS	PARAMETERS	EXAMPLES
MODe MODe ?	P1 Defines the utilization mode of the 8211. P1 = Operating mode : CONTi : The channels follow the inputs DIGital : The channels follow the positions given by the calculator TRANs Transient mode NB.The digital mode can be requested by a computer only, in local mode the continuous mode is restored Returns the command status.	MODE CONT continuous recording mode.
STATUS ?	Reads the status register bits	Response: STATUS 1 End of the plot

HEADER	PARAMETERS	EXAMPLE
ZERo	P1 Resets all inputs to zero P1 = Zero reset WOUT, WITH	ZER WITH The ZERO function is enabled
ZERo ?	Returns the command status.	
SYNchro	P1 Selects the channels synchro P1 = Plot synchronization WOUT, WITH	SYN WITH Plot synchronization.
SYNchro ?	Returns the synchro status	
PEN	P1 , P2 Pens enable or not P1 = Pen number P2 = Pen status ON or OFF	PEN 1, ON Pen 1 enable
PEN ?	Return the status of all pens.	

8.6.4 Triggering conditions

HEADER	PARAMETERS	EXAMPLES
MEAsure	P1 Plotting start or stop P1 = ON ou OFF	MEA ON Plotting started (idem "plot" key)
MEAsure ?	Returns the plotting status.	
REarm	P1 Initialization of the trigger cycle P1= MONO no reinit CYCL automatic initialization	REA MONO
REArm ?	returns the command status	

HEADER	PARAMETERS	EXAMPLES
DEFTrigger DEFTrigger ?	P1 Define the triggering parameter about to be programmed by the following commands P1= START STOP Returns the command status	DEFT START The start will be defined
TRIgger:MODE TRIgger:MODE ?	P1 define the start or stop of the measurement trigger P1= MANual : manual trigger. THReshold : threshold trigger. WAIT : wait state trigger DATE : date trigger EXTernal : external trigger returns the selected trigger mode	DEFT START; :TRI:MODE DATE Trigger on date
TRIgger:THReshold TRIgger:THR ?	P1,P2,P3 Trigger threshold definition P1= Channel number (1 or 2) P2= by value above or under ABOve,UNDer P3=threshold in millimeters 0 à 250 mm returns the command status	DEFT STOP; :TRI:THR 2,ABO,50

HEADER	PARAMETERS	EXAMPLES
TRIgger:WAIT	P1,P2,P3 Waiting time definition P1= waiting hours (fm 0 to 23) P2= waiting minutes (fm 0 to 59) P3= seconds waiting(fm 0 to 59)	DEFT START; :TRI:WAIT 2,30,30 start in 2 h 30mn 30 s after plotting start
TRIgger:WAIT ?	returns the command status	
TRIgger:DATe 10,3,90,15,30	P1,P2,P3,P4,P5,P6 Trigger date definition . P1=day (from 1 to 31) P2= month (from 1 to 12) P3= year (from 0 to 99) P4= hour(from 0 to 23) P5= minute (from 0 to 59) P6= second (from 0 to 59)	DEFT STA; TRI:DATE start on 10/03/90 at 15 h 30 mn
TRIgger:DATe ?	returns the command status	

8.6.5 Alarms

HEADER	PARAMETERS	EXAMPLES
DEFAlarme DEFAlarme ?	P1 define the Alarm contact P1= ALA A alarm P1= ALB B alarm returns the command status	DEFA ALA Alarm A is selected
ALArm ALArm ?	P1,P2,P3,P4 Define the alarm P1=Alarm enable YES or NO P2= Channel number (1 or 2) P3= open if above or below ABOve or UNDer P4= threshold: 0 to 250 mm returns the commmand status	DEFA ALB; ALA YES,2,UNDer,5 Alarm on channel 2 less than 5 mm
WALArm WALArm ?	P1 Allow to write an alarm information every time a contact opens. P= YES or NO returns the command status	WALA YES writing enable in case of an alarme

In transient mode the alarms are not used.

8.6.7 Measured values read in direct mode

HEADER	PARAMETERS	EXAMPLES
RECord:UNIt	P1 Measurement unit selection of the sendings required by RECord: MEA P1= measurement unit ISO unit of each channel MM Unit in tens of mm	REC:UNI ISO Sending in volt or degree according to the type
RECord:UNIt ?	Returns the selected unit	
RECord:CHAnnel	P1,P2 Define the channels about to be sent by the command "REC:MEA ?" P1 = Channel 1 selection ON,OFF P2 = idem for the channel 2	REC:CHA ON,OFF sending the channel 1 values
RECord:CHAnnel ?	Returns the command status	
RECord:MEAsure ?	sending of the input values previously selected ; the unit being that selected by the "REC:UNIT"command	

NB: The inputs can also be read by the command "CHAnnel ?" and the pens position by the command "POSition ?" (The relation with the inputs can be obtained only in continuous mode, if the channels are enabled).

These commands are unused in the transient mode

8.6.8 Reading/command pen position.

HEADER	PARAMETERS	EXAMPLES
POSition	P1,P2 Place the pens at a given position when the instrument is set in digital mode P1 = pen 1 position in tenths of a mm (0 à 2500) P2 = pen 2 position	POS 0,0 Position of the 2 left channels
POSition ?	Gives the channels position 0 à 2500 tenths of millimeters, the pens synchronization is not taken into account Usable independently of the selected mode.	

8.6.9 Hour and date parameters

HEADER	PARAMETERS	EXAMPLES
DATe	P1,P2,P3 modify the current date P1 = day (from 1to 31) P2 = month (from 1 to 12) P3 = year (from 0 to 99)	DAT 12,11,90 December 11th. 90
DATe ?	returns the present date	
HOUrs	P1,P2,P3 modify the current time P1 = hour (from 1 to 23) P2 = minute (from 0 to 59) P3 = second (from 0 to 59)	HOU 10,06,06 10 h 6 mn 6 s
HOUrs ?	returns the present time	

8.6.10 Caption writing

HEADER	PARAMETERS	EXAMPLES
CAPtion	caption writing	
WRIte	P1,P2 particular message to be written between quotation marks or apostrophes P1= pen number (1 or 2) P2= message	WRI,1"8211"

8.6.11 Transient parameters analysis

HEADER	PARAMETERS	EXAMPLES
TRANSient:SIZE TRANSient:SIZE ?	P1 selects the acquisition size P1= size value in kilopoints by input: 1,2,5,7 returns the acquisition size	TRANS:SIZE 2 memory size 2Kpt/input
TRANSient:SAMPling TRANS:SAMP ?	P1,P2 selects the sampling speed P1= sampling value P2= unit P1=1,2,5,10,20,50,100,200,500 P2=MICRO sec ,MILLIsec or SECond the variable ranges from 50 µs to 1s returns the sampling period	TRANS:SAMP 50, MICRO Sampling at 50 µs

HEADER	PARAMETERS	EXAMPLES
TRANSient:TRGDelay P1	Selects the tiggering position within the acquisition P1 vary from -100 to +100	TRANS:TRGD -50 trigger delay at 50%
TRANS:TRGD ?	returns the triggering position	

CAUTION: The values returned in this 8.6.11. chapter are values for the next acquisition, and not the variables used for the memorized acquisition.

8.6.12 Transient mode triggering

HEADER	PARAMETERS	EXAMPLES
TRANSient:TRIgger: DEFT	P1 defines the triggering mode P1= MANual: manual triggering EXTernal:external triggering WAIT: waiting THReshold: threshold triggering AUTO: automatic triggering	TRANS:TRI:DEFT: MAN the triggering is manual
TRANSient:TRIgger: DEFT ?	returns the triggering type	
TRANSient:TRIgger: WAIT	P1,P2,P3 defines the trigger waiting time P1= hours (from 0 to 23) P2= minutes (from 0 to 59) P3= seconds (from 0 to 59)	TRANS:TRI:WAIT: 2,30,10 triggering in 2 h 30 mn 10 s
TRANSient:TRIgger: WAIT ?	returns the waiting time	

EN-TETE	PARAMETRES	EXEMPLES
TRANSient:TRIgger: THReshold	P1,P2,P3 Defines the trigering threshold P1= 1or 2 :channel number P2= by a value above or below :ABOve orUNDer P3= threshold from 0 to 250 mm	TRANS:TRI:THR: 2,ABOve,50 triggering if the channel 2 is above 50 mm
TRANSient:TRIgger: THReshold?	returns the threshold definition	
TRANSient :REPeat	P1 triggering cycle reinitialization P1= WOUT no reinitialization = WITH with reinitialization	TRANS:REP WITH
TRANSient :REPeat ?	returns the command	

8.6.13 Transient mode measurement

HEADER	PARAMETERS	EXAMPLES
TRANSient:MEAsure	Starts the acquisition	TRANS:MEA

NOTE: During the acquisition the RS 232 dialog does no longer operate. Nevertheless in the RTS/CTS protocol, the RTS wire is active, which inhibits the transmission of the controller linked with the 8211. The STATUS ? command permits to check whether the acquisition is completed .

8.6.14 Transient mode plotting

HEADER	PARAMETERS	EXAMPLES
TRANSient:WRDate	P1 determines whether the date of acquisition should be written P1= WITH ou WOUT	TRANS:WRD WITH the date is written after every acquisition
TRANSient:WRDate ?	returns the command value	
TRANSient:WINdow	P1,P2 defines the beginning of the plot within the acquisition as well as its duration P1= vary from 0 to 99 (%) P2= vary from 1 to 100 (%)	TRANS:WIN 50,10 10% of the acquisition is plotted from the center
TRANSient:WINdow ?	returns the values	
TRANSient:SCAle	P1 defines the output scale P1=1,2,5,10,20,50 (points/mm)	TRANS:SCA 10 the output scale is 10 pt/mm
TRANSient:SCAle ?	returns the output scale	
TRANSient:PLOT	P1 Start or stop of the plotting in transient mode P1= ON or OFF ON : start OFF : stop	TRANS:PLOT ON plotting start
TRANSient PLOT ?	Returns the status of the curve plotting	

8.6.15 Transient mode data reading

EN-TETE	PARAMETRES	EXEMPLES
TRANSient:READ	P1,P2,P3,P4 reads the stored data P1= channel to be read P2= masurement beginning. Vary from 0 to the number of points of the record P3=number of points read, from 1to 7000 P4= measurement unit ISO unit of each channel MM unit of points read	TRANS:READ 1,0,10 ISO reading of the 10 first data of the channel 1
TRANSient:READ ?	returns the data formatted according to the :TRANSient:READ command	

COMPLEMENTARY FUNCTION RELATED WITH THE RS232 INTERFACE PROGRAMMATION

When RS 232 programmed, the 8211 provides a few supplementary functions:

Digital mode

In this mode, the controller drives the pens displacement, allowing for example the plotting of a curve computed by the controller.

<u>Programmation</u>

- Digital mode selection by the message:
  MODe DIGital (cf § 6.6.3)
- Pen position command by the message:
  POSition P1,P2 (cf §6.6.7)

The pens reach the Pi positions (expressed in tenths of a mm) and stay there until a POS command or a mode change is sent.

Reading the pens positions

Each time the interface send a poll message POSition ? (cf §6.6.7) the 8211 returns the pen position in tenths of a mm. This makes possible the storage and/or to follow the signal reproduced by the pens. It is also possible to read the measured values of one or several inputs.

Memory storage of a paper position and return to that position

-Memorization of the paper position in sending the command message:
PAPer:POSition MEM (cf § 6.6.2)
(for example, before sending a plotting command).

- Return to the memorized position by :
  PAPer:POSition RECall (cf § 6.6.2)
  (for example return at the beginning of the plot)

Paper scrolling in digital mode

In this mode, the controller drives the paper motion. (the F(t) mode is inhibited).

<u>Programmation</u>

- Selection of the digital paper scrolling mode with the command message:

- Paper moving control by:
  PAPer:MOVe P1 (cf § 6.6.2)

  The paper moves from the point P1 (expressed in tenths of a mm, $\pm$30 m maximum).
  It stay on this position until a new command PAPer : MOVe. The paper move can therefore be computer controlled.

NOTE: The command PAPer:MOVe can also be used in the F(t) scrolling modes

Writing a message on the paper

Pen and text selection to be written by the command:
WRIte P1,P2 (cf §6.6.6)
The P1 pen writes down the message M1 on the paper

Status request of the 8211

The user can be informed about specific events in reading the status register.
refer to § 6.5.4 et §6.6.3

8.7 PROGRAMMING EXAMPLE

The following programs describe a few possibilities of remote controlling a 8211 with a PC compatible micro-computer through the RS 232 serial interface. (cf links 6.4).
Thes examples are written in GW BASIC and are Q Basic compatible.

EXAMPLE 1: Inputs measurements reading.
PAPer:MODe DIGital (cf § 6.6.2)

Action :
- 8211 configuration,
- plotting start,
- display every two seconds of both inputs on the screen,
- stop by action on the PC keyboard.

RS 232 configuration of the 8211 :
- THROUGHPUT : 9600 bauds,
- DATA- PARITY : 8 bits -without,
- TERMINATOR: CR,
- PROTOCOL : rts/cts.

Program:

```
10 OPEN "COM1: 9600,N,8,1" FOR RANDOM AS #1
20 " COM1 port opening and configuration

30 PRINT #1, "*REM;*RST"
40 " Programmation of the 8211 in remote mode and complete  initialization

50 " Programmation loop of the range  1V, center 0V and start of both pens on boths inputs
60 FOR N.INPUT = 1 TO 2
70  N.INPUT$ = STR$(N.INPUT)
80  PRINT #1, "CHAN " + N.INPUT$ + ";CAL 1,0;PEN " + N.INPUT$ + ",ON"
90 NEXT N.INPUT

100 PRINT #1, "PAP:MOD FT;:PAP:SPE 1,MM_S;:MEA ON"
110 " Programmation of the paper scrolling in F(t) mode , of the speed at
120 " 1mm/S and plotting start
130 " do not omit the «:» character in front of  PAP:SPE and MEA ON to send back to top of the
140 " arborescence (cf 7.1.3)
150 " The command message can be sent under another forms:
160 "  "PAP:MOD FT;SPE 1,MM_S;:MEA ON"
170 "  (the SPE node being a sub-node of PAP, it is useless to remind
180 "  the header PAP; )
190 "  "PAPER:MODE FT;:PAPER:SPEED 1,MM_S;:MEASURE ON"
200 "  (complete writing for a better readability of the  program)
210 PRINT #1, "REC:CHA ON,ON;UNIT ISO"
220 " Selection of both inputs so as to read the measures in ISO units
230 CLS    " screen clear
240 STOP = 0
250 PRINT "8211 MEASUREMENTS :"

260 " Branch to the sub-program reading of the 8211 measurements reading every second
270 ON TIMER(1) GOSUB 1000
280 TIMER ON
290 IF STOP <> 1 THEN GOTO 290

300 PRINT #1, "MEA OFF;*LOC"  " Plotting stop command and return in local mode
310 END


1000 " 8211 measurements reading sub-program
1010 PRINT #1, "REC:MEA ?"  " Measurements reading request
1020 LINE INPUT #1, MEASUREMENT$ " measurements reading
1030 LOCATE 3, 12, 0  " Cursor setting on the screen
1040 PRINT "INPUT "; MID$(MEASUREMENT$, 17, 11)  " Display of the measurement input1
1050 LOCATE 3, 36, 0: PRINT "INPUT "; MID$(MEASUREMENT$, 29, 11)  " Display of the
measurement  on the input 2
1060 IF INKEY$ <> "" THEN TIMER OFF: STOP = 1  " Stop if keypress
1070 RETURN
```

EXAMPLE 2 : Using the status word of the 8211

CAUTION : This example apply to a 8211 provided with a winder option.

Action :
- 8211 configuration,
- Plotting for 50 seconds,
- Rewinding of the paper at the plot beginning.

RS232 configuration of the 8211:
- THROUGHPUT : 9600 bauds,
- DATA - PARITY : 7 bits - even,
- TERMINATOR : CR,
- PROTOCOL : rts/cts.

Program:

```
10  OPEN "COM1: 9600,E,7,1" FOR RANDOM AS #1
20  " COM1 port opening and configuration

30  PRINT #1, "*REM;*RST"
40  " 8211 in remote mode and complete initialization (cf 2.4)

50  " Programmation loop 1V, center 0V and start of both pens on both inputs
60  FOR N.INPUT = 1 TO 2
70    N.INPUT$ = STR$(N.INPUT)
80    PRINT #1, "CHAN " + N.INPUT$ + ";CAL 1,0;PEN " + N.INPUT$ + ",ON"
90  NEXT N.INPUT

100  PRINT #1, "PAP:MOD FT;:PAP:SPE 20,MM_S"
110  " Programmation of the paper scrolling in F(t) mode, of the speed at 10mm/S

130 CLS  " screen clear
140 PRINT "8211 STATUS :"
150 GOSUB 2000: STATUS = 0 " Reading of the 8211 status register for reinitialization
160 ON TIMER(50) GOSUB 1000  " Branch to the sub-program stop plotting after 50 S
170 PRINT #1, "PAP:POS MEM;:MEA ON": TIMER ON
180 " Paper position memorization command  and plot beginning; timer interrupt enable
190 LOCATE 3, 18, 0: PRINT "PLOTTING IN PROCESS"

200 " Waiting loop of the plotting end
210 WHILE (STATUS AND 2) <> 2
220   GOSUB 2000    " Reading of the 8211 status
230 WEND

240 PRINT #1, "PAP:POS REC"
250 " Paper rewinding command up to the memorized position (beginning of the plot)

260 LOCATE 3, 18, 0: PRINT "RE-WINDING IN PROCESS"
2040 RETURN
```

```
270 " Waiting loop of the rewinding end
280 WHILE (STATUS AND 4) <> 4
290   GOSUB 2000   " Reading of the 211 status
300 WEND

310 LOCATE 3, 18, 0: PRINT "OPERATIONS TERMINATED"
320 PRINT #1, "*LOC"  " Return to local mode command
330 END


1000 " Sub-program of the 8211 plotting stop command
1010 TIMER OFF
1020 PRINT #1, "MEA OFF"  " Plotting stop command
1030 RETURN


2000 " Sub-program reading of the 8211 status register in STATUSdans ETAT
2010 PRINT #1, "STATUS  ?"
2020 LINE INPUT #1, STATUS$
2030 ETAT = VAL(MID$(STATUS$, 9, 5))
2040 RETURN
```

ADJUSTMENTS TROUBLE SHOOTING

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9 -ADJUSTMENTS
TROUBLE - SHOOTING

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9 -ADJUSTMENTS TROUBLE - SHOOTING

9.1 ORIGIN AND ELONGATION ADJUSTMENTS

These adjustments have been performed in works. Nevertheless it may happen, after a new paper installation that the paper pattern slightly offsets with respect to the pen displacement.

The following procedure allow to readjust the concerned channel(s)

CAUTION : These adjusments must be performed in the order origin then extension .
1° Simultaneously depress the keys "INPUT 1" and "INPUT 2".
The following message appears on the display:

```
MECHANICAL

CHANNEL  :1
ORIGIN   :10
MAX.     :19

SAVE     :

1
```

2° - Select the channel to be adjusted (1 or 2)

3° - Set the cursor onto the "ORIGIN" line
Both pens automatically move onto the leftmost line of the paper.

4° - Make the pen tip lining-up on the leftmost line of the paper in adjusting the origin control.

5° - Set the cursor onto the "MAX" line.
Both pens automatically move to the rightmost line of the paper.
Make the pen tips lining-up on the rightmost line of the paper in adjusting the elongation control.

6° - Repeat the procedure for the second channel.

7° -Store the adjusting coefficients in setting the cursor on the "SAVE" line and in depressing the "VALID" key.

9.2 AUTOTEST

The autotest performs a rapid test of the instrument.

9.2.1 Autotest start

1° - Disconnect the inputs
2° - Switch OFF the instrument
3° - Depress the key "18" (Cursor up) and switch the instrument ON again while keeping the key pressed.
- Release that key once the message **-AUTOTEST IN PROGRESS** - is displayed on the screen.

9.2.2 Autotest result

- The message: **OK** ou **Err n** is displayed on the following line of the LCD screen.

OK	The 8211 is correct
ERR1	The lithium dry cell is worn out
ERR 2	The EEPROM is faulty
ERR 3	EEPROM defective
ERR 4	Input 1 defective
ERR 5	Input 1 not calibrated
ERR 6	Input 2 defective
ERR 7	Input 2 not calibrated

Should an error message be displayed, please contact the After Sales Dept. of SEFRAM INSTRUMENT ET SYSTEMES.

NB. :After an autotest the instrument configuration is modified.

9.3 TROUBLES ENTAILING AN ERROR MESSAGE DISPLAY

Displayed messages	Error/warning
MOTOR TROUBLE	make sure the pens are freely moving Switch the instrument off/on. make sure the pens set on their left reference. If the problem persist contact the after sales service.
MOTOR OVERHEAT	The signal at the input is too fast. Lower its frequency The signal is too noisy, select a filter. If the problem persist, contact the after sales service.

9.4 INCIDENTS IN RS232 REMOTE CONTROL MODE

If the 8211 receives a wrong message,(sent by a controller), an error message is displayed on the screen:

REMOTE MODE
ERR : n

n =

1	UNKNOWN COMMAND
2	WAITING FOR A SEPARATOR
3	WAITING FOR THE END OF MESSAGE TERMINATOR
4	NUMBER FORMAT ERROR
5	OUT OF RANGE NUMBER
6	WAITING FOR A COMMA
7	KEYWORD ERROR

9.5 OPERATING TROUBLES

Operating troubles	Error/warning
The pen do not follow the signals and remain steady	Make sure the key "ZERO" has not been activated (corresponding Led lit)
The pen 2 follow the input signal but the pen 1 remain steady	The 8211 synchronisation is active (Led lit) and the pen is waiting for a synchro signal (cf§ 5.2.3)
The 8211 configuration is lost after every power outage	Lithium cell worn out
The input measurement is wrong	Make sure the recommendations about the grounding connections described §2.5 are met Make sure the input is not configurated with a too great filter with respect to the measured signal Perform a 8211 autotest
Noise or incorrect measurement in PT100	Make sure the red and black (+ et -) input posts are disconnected.
No display on the LCD screen	Try to adjust the display contrast . If the problem persist the 8211 is out of service .
No operation	Major defect...

In case of a permanent problem please contact the after sales service of
SEFRAM INSTRUMENTS ET SYSTEMES (tel. 77 59 01 01) Fax (77 57-23-23).

WINDER
UNWINDER
OPTION

10 -WINDER UNWINDER OPTION

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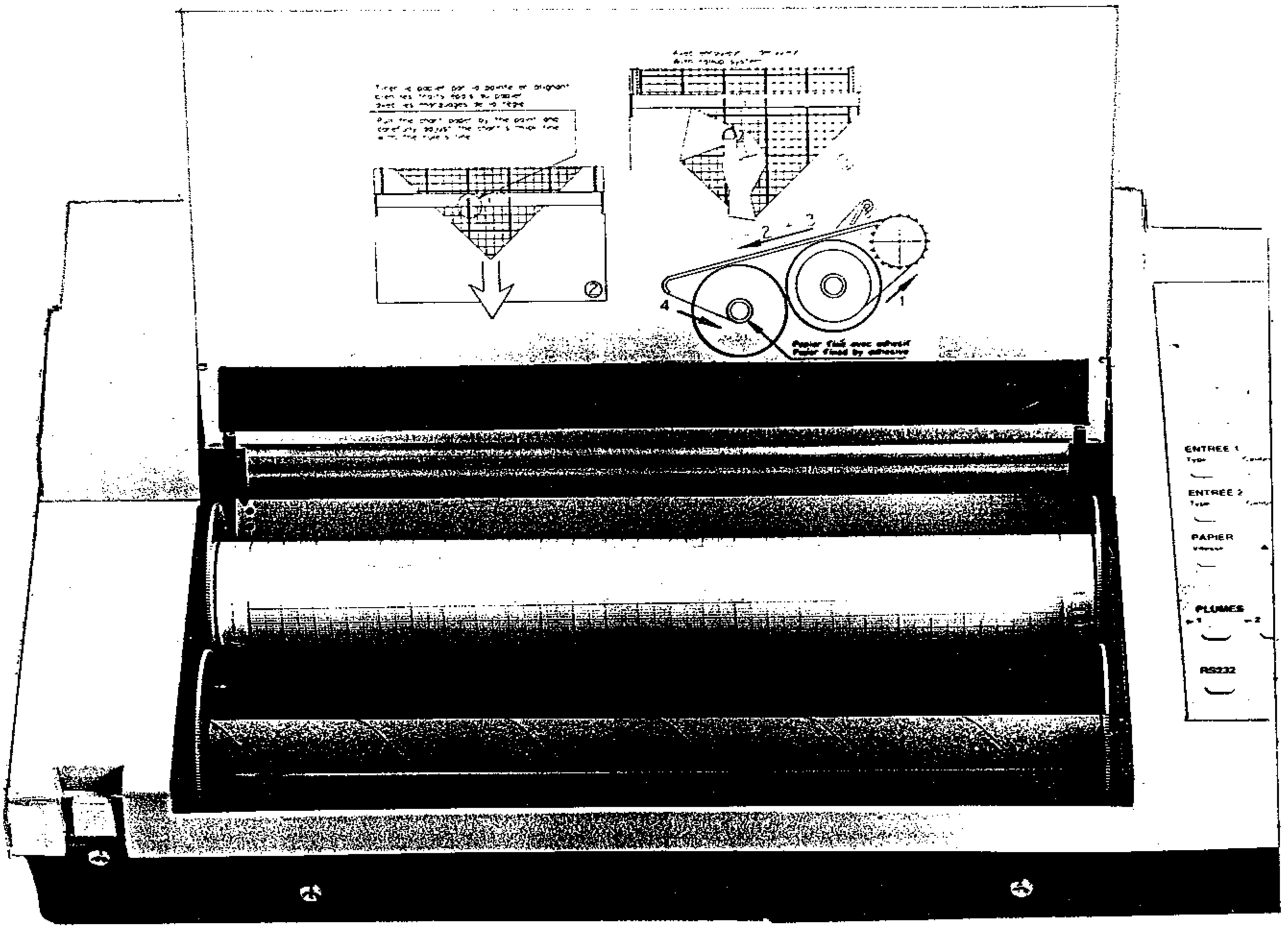
10 -WINDER UNWINDER OPTION



10 -WINDER UNWINDER OPTION

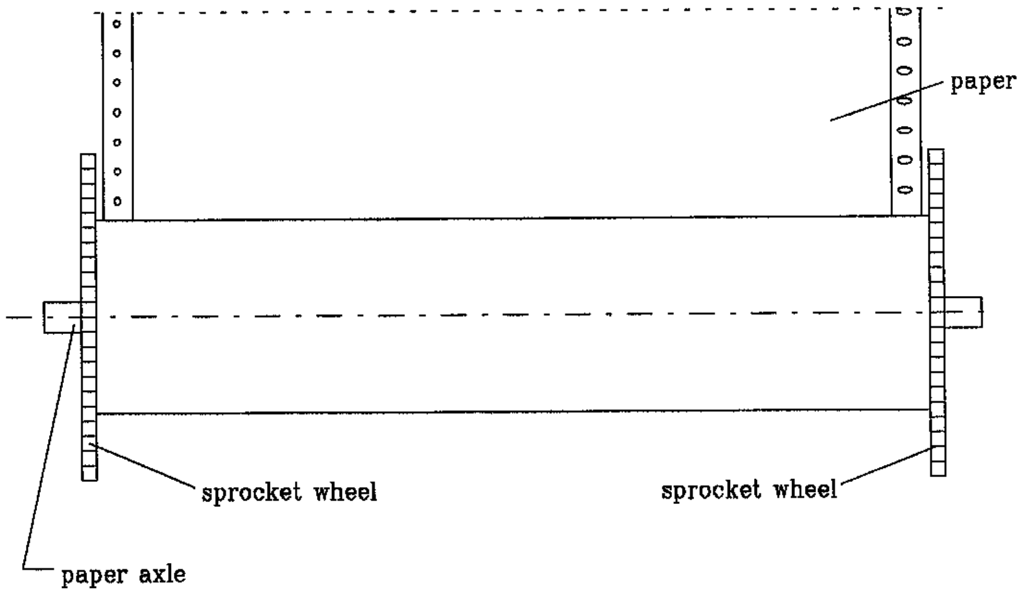
The 8211 may be delivered with the winder-unwinder option. This latter can be further retrofitted, however the instrument is to be sent back to the works for this purpose .

10.1 PAPER SETTING

- Switch off the instrument

- Lift the table cover

- Set the paper roll (oblong holes on the right side) between both sprocket wheels
- Insert the paper axis (refer to figure below)



- Set this assembly into the lower housing of the table (handle side) so as to facilitate the paper handling.

- properly introduce the paper under the lugs besides the sprocket wheel

- Move the paper forward in turning manually the sprocket wheel by hand while making sure it is correctly positioned.

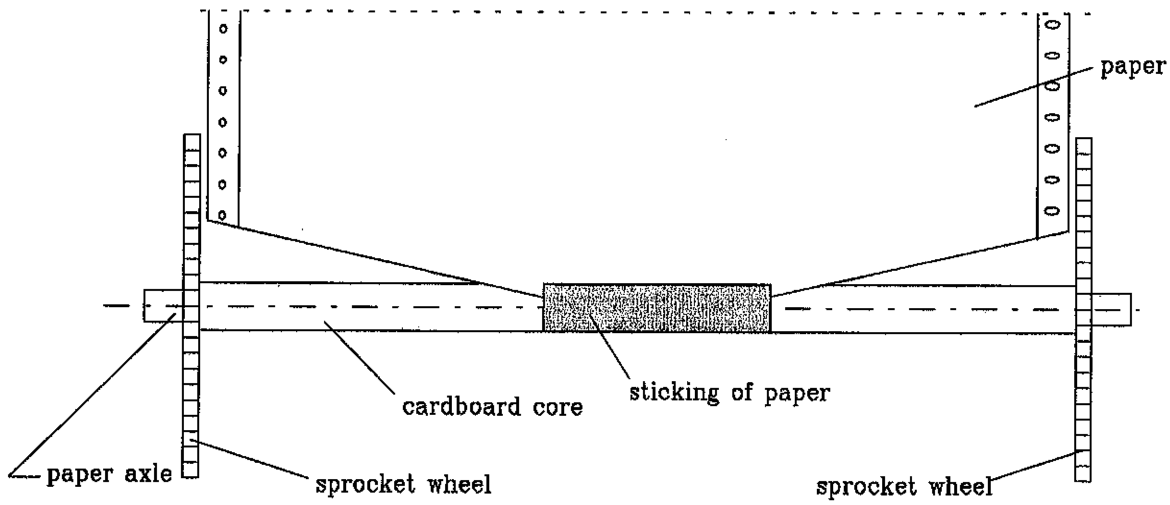
- Introduce the paper under the paper clamp and under the guide strip.

- Reintroduce the assembly (paper roll, sprocket wheels and axis into the upper housing (roll side)

- Put the cardboard paper core between both other sprocket wheels.

- Introduce the axis

10 -WINDER UNWINDER OPTION

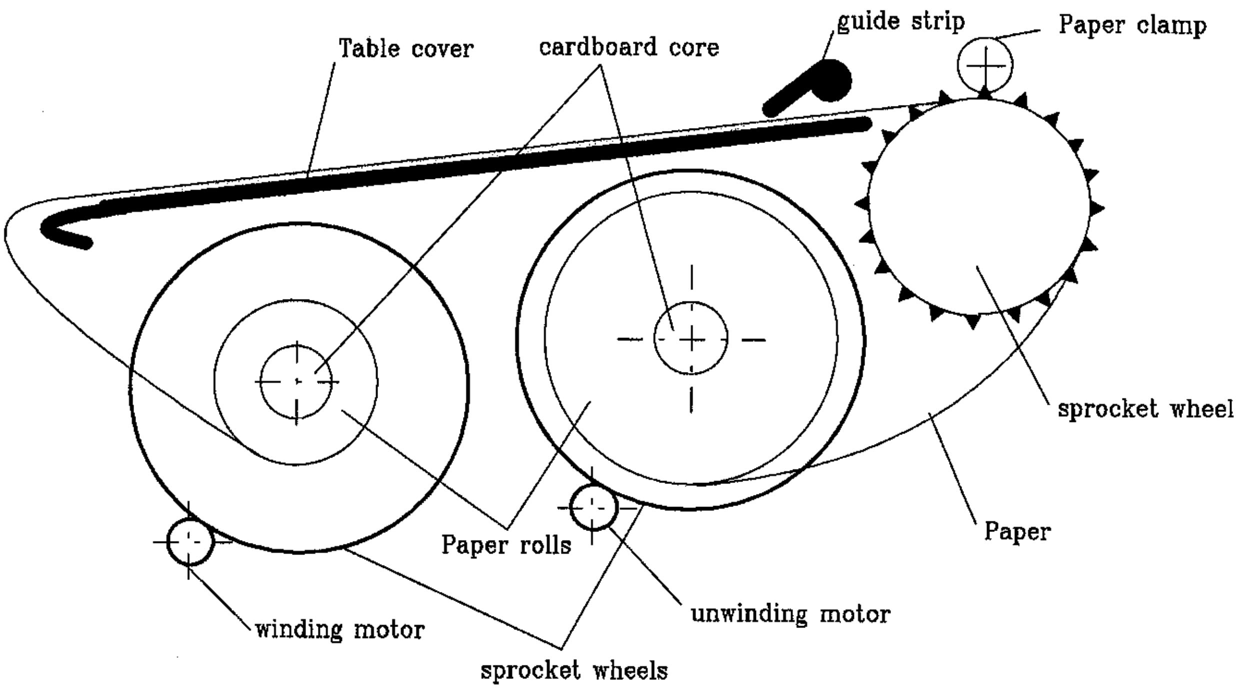


- Put this assembly into the free housing (handle side)

- Let the paper go under the table cover and fix it onto the cardboard core with a scotch tape (in centering the paper as much as possible).

-Wind-up the paper by the hand .

-Close the table cover.



Remark : If the paper roll is not a new one, preferably recut it so that both the round hole (at the left side of the paper) and the oblong hole (at the right side of the paper) are correctly lined up, thus making easier the paper introduction around the sprockets.

<u>OTHER PAPER LOADING METHOD</u>

Refer to the information given under the cover of the table.

This method is more adapted since the paper is delivered with the tip pointed.

- Insert the paper under the sprocket wheel and grasp the tip above the table.

- Drag the paper by the tip in lining up the thick lines of the paper with the rule marks.

10.2 OPERATION

- Enable the winder ("WINDER" line of the menu key "PAPER" speed)

- In that case, the paper will automatically wind-up around the cardboad paper core once the plot begins.

TECHNICAL SPECIFICATION

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11 - TECHNICAL SPECIFICATION

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11 - TECHNICAL SPECIFICATION

11.1 RECORDING CAPABILITIES

11.1.1 Voltage record

Maximum range : 100V.

Minimum range : 1mV (0,5 mV with fine adjust)

Progression: by 1-2-5 steps, a fine adjust offers intermediate values

Offset: Fine center adjust and by 1/2 range steps.

Note: +/- 4 offsets can be performed on all ranges.
One offset = 1/2 paper width (125 mm)
= 1/2 range (250 mm)

11.1.2 Temperature record

SENSORS	DOMAINE OF APPLICATION	RANGES
PT100 probe	-200°C/+ 850° C	20 to 1000°C
Couple J	-210°C/+ 1200°C	20 to 2000°C
Couple K	-250°C/+ 1370°C	20 to 2000°C
Couple T	-200°C/+ 400°C	20 to 500°C
Couple S	-50°C/+1760°C	50 to 2000°C
Couple B	+200°C/+1820°C	200 to 2000°C
Couple E	-250°C/+1000°C	20 to 1000°C
Couple N	-250°C/+1300°C	20 to 1000°C
Couple W5	0°C/+2320°C	50 to 2000°C

Range : in progression 1-2-5, a fine adjust gives intermediate values.
Sensor selection by keyboard
Origins are possible whithin +/- 4 offsets or whithin the use domain of the sensor (one offset = 1/2 a paper width).

11.2 INTERFACE

An interface is provided into the 8211: the RS232C interface

11.2.1 Interface capabilities

- Operating parameters programmation.
- Operating parameters reading.
- Plotting of the values sent by the computer.
- Forward, backward paper motion, return to a memorized position.

11.2.2 RS 232C Interface DCE mode

- Word	: 8 bits without parity or 7 bits with 1 even parity bit
- Speed	: 300 to 9600 bauds.
- Selection	: 1STOP bit
- Terminator	: CR - LF - CR/LF - EOT
- Protocol	: without protocol or RTS/CTS.

11.3 AUXILIARY FUNCTIONS

11.3.1 Auxiliary functions

- TTL level, protected up to ± 24 V
- Remotly controllable functions
  . 2 events markers, 1 per channel.
  . Step scrolling enable.
  . Pulse input for step operation.
  . setting in "plot" mode.
  . Active external triggering on ascending front.

11.3.2 Alarms contacts

Two relays free from any potential (24V/100 mA)
Open circuits when the instrument is not "ON"

11.4 METROLOGICAL CHARACTERISTICS

All these characteristics are valid for the reference conditions (nominal temperature : 20°C to 25 °C)

11.4.1 Voltage recording

-Measurement resolution: 12 bits. Accuracy +/- 10 µV, +/- 0.25 % of the maximum measurable value, taking into account the cumulated scale offsets for the used range, these values being read on the paper

Temperature OFFSET drift: 100 ppm/°C ± 1µV/°C

11.4.2 Temperature recording

Pt100 and Thermocouple Accuracy :

The measurement accuracies are given in appendix (chapter 12)

Cold junction compensation

Couple J, K, T, S, N, E, W5 : ± 1.0°C

11.4.3 Transient recording

In transient mode, a noise characteristic measured on the paper must be added, i.e 40 µv + 0,3% of the full scale.

Bandwith at -3 db:

Range	1mV	: > 250 Hz
	2 mV	: > 500 Hz
	5 mV	: > 900 Hz
	10 mV	: > 1.7 KHz
	20 mV	: > 2.5 KHz
	50 mV	: > 2.5 KHz
	100 mV	: > 2.5 KHz
	200 mV	: > 2.5 KHz
	500 mV	: > 2.5 KHz
	1 V	: > 2.5 KHz
	2 V	: > 2.5 KHz
	5 V	: > 2.5 KHz
	10 V	: > 2.5 KHz
	20 V	: > 2.5 KHz
	50 V	: > 2.5 KHz
	100 V	: > 2.5 KHz

11.5 MECHANICAL CHARACTERISTICS

The characteristics are valid for a specified sector.

11.5.1 Insensitivity range (dead zone)

It is less than 0.3 mm i.e 0.12 % of the full scale
Overshoot : < 1mm.

11.5.2 Pens response

Maximum speed : Approximately 1.5 m/s.
Maximum acceleration : Approximately 6 g.
Response time : 10 % to 90 % of the full scale, approximately 150ms.

11.5.3 Frequency response

AMPLITUDE CC	-10 % (min)	-3 dB (min)	-3dB (typical)
16.6 cm 10cm 2.5 cm	2.8 Hz 2.8 Hz 3 Hz	4 Hz 5 Hz 5 Hz	4.5 Hz 6 Hz 6 Hz

NOTA :
When the motor of a channel is too much pulled, the 8211automatically switches a filter on the corresponding inputs in order to prevent any mechanical damage. This action may occur from a few seconds up to several minutes. It depends upon the frequency of the signal, its amplitude and the mechanical characteristics of the channel.

11.5.4 Paper motion

Dynamic characteristics, forward move :
- Minimal speed : 10 mm/h
- Maximal speed : 50 mm/s
- Fast forth and back motion : 100mm/s

Accuracy of the scrolling speed : 0.01%

11.5.5 External clock control

- Minimal pulse width : 1µs.
- Active front : rising
- Step resolution : from 0.01mm/step to 1 mm/step
- Maximum frequency : 1 KHz and whithin the maximal paper speed motion.

11.5.6 XY analogic mode

- Overshoot : - Without winder-unwinder = 1,5 mm
  - With winder-unwinder = 0,5 mm
- Maximum speed = 50 mm/s
- Frequency response of the channel "X" (Channel 1 in XY mode)

Peak to peak signal amplitude	Band at -3dB
16,6 cm 2,5 cm	0,21 Hz 1,4 Hz

The given passband is typical. The maximum value very sligthly differs from the typical value as the step motor displacement of the X channel is imposed by the software.

11.5.7 Mechanical strength (transport conditions)

Tests on every axis :
- Shocks : 15 g ; 11 ms ; 6 chocs par axe.
- Shakes : 15 g ; 6 ms ; 1000 per axis, rate : one per second.
- Sinusoidal vibrations :
  . from 5 to 9 Hz : 3 mm peak to peak,
  . from 9 to 200 Hz : 1 g max
  . Logarithmic sweep: 1 octave / mn, 6 logarithmic cycles per axis.

11.5.8 Weight and size

- Length = 150 mm Width = 450 mm Deep = 220 mm
- Mass : 5 kgs

11.6 ANALOG INPUT STAGES

11.6.1 Impedance

- range < or equal to 2 V : input impedance > 25 MΩ
- range > 2 V : input impedance = 2 MΩ ± 10 %

11.6.2 Maximum admissible voltage

- Between one measurement channel and the mechanical ground : ± 500 V.
- Between two measurement channels : 500 V
- Between the + and - inputs :± 250 V

11.6.3 Insulation

- Between mechanical mass and measurement channel : 1000 MΩ under 500 V DC.

11.6.4 Stray signals

Tests according to the CEI 484 norm

- Serial mode :
  Rejection on all ranges at 50 HZ: >50 db

- Common mode :
  . DC voltages
  Ra = 0Ω and Rb = Rmax or Ra = Rmax and Rb = 0Ω.
  Common mode rejection > 140 dB for all ranges.

  . AC voltages 50 Hz

In direct mode

RA	RB	RANGE < or equal to 2V	RANGE > 2V
0	10	90 dB	70 dB
10	0	90 dB	70 dB
0	Rmax	90 dB	70 dB
Rmax	0	90 dB	70 dB

In transient mode

		Range			
Ra	Rb	1mV to 200mV	500mV to 2V	5V to 20V	50V to 100V
0	10Ω	> 100 dB	> 90 dB	> 80 dB	> 60 dB
10Ω	0	> 100 dB	> 90 dB	> 80 dB	> 60 dB
0	Rmax	> 60 dB	> 60 dB	> 60 dB	> 55 dB
Rmax	0	> 90 dB	> 90 dB	> 80 dB	> 60 dB

Ra and Rb expressed in Ω

Maximal resistance of the measuring circuit:

R max = 1000 Ω

11.7 ENVIRONMENTAL CONDITIONS

11.7.1 Climatic conditions

- Operating temperature : from 0°C to 40 °C.
- Relative humidity : from 30% to 80 %
- Strorage temperature : from -20 °C to 70°C.

Remark: Do not use the protecting cover option in operation in a very dry and hot atmosphere.

11.7.2 Mains line

- 85 V to 264 V without switching
- 47 to 440 Hz
- Power drain : 75 W
- Internal fuse 2A

11.7.3 Insulation classe (according to CEI 348)

Class 1 equipment.
Security: meets the CEI348 and 1010-1 specifications

11.7.4 Electromagnetic compatibility

Interferences electromagnetic noise immunity	meet or better than CEI 801 norm :	- Electrostatic discharge CEI 801-2 level 3 (NFC 46-021) - Sensitivity to electric fields CEI 801-3 level 2 (NFC 46-022) - Sensitivity to conducted interferences, rapid transients CEI 801-4 level 2 (NFC 46-023)
Perturbations induced by the instrument	Meet or better than EN 55022 and VDE 871 B norms	-Conducted or radiated perturbations

11.8 ACCESSORIES DELIVERED WITH THE INSTRUMENT

1 Instruction manual : ref.:M821100UF
1 red fibre pen : ref.: 883500043
1 blue fibre pen : ref.: 883500044
1 red ball point :ref.: 883500051
1 blue ball point : ref.: 883500052
1 paper roll 30 m, millimetric réf. : 837500021
or normalized paper roll 30m réf. : 837500016
2 DIN male plugs : ref. : 214426056
1 Mains cord : ref. : 241510301
1 SUB-D mâle 15 pins : réf : 214200150
1 Cover connector : réf : 214299013

11.9 OPTIONAL ACCESSORIES

Green fibre pen	réf. : 883500045
Black fibre pen	réf. : 883500046
Magenta fibre pen	réf. : 883500047
Brown fibre pen	réf. : 883500048
Cyan fibre pen	réf. : 883500049
Orange fibre pen	
Green ball point	réf. : 883500053
Black ball point	réf. : 883500054
Purple ball point	réf. : 883500055
Braun ball point	réf. : 883500056
Cyan ball point	réf. : 883500057
Orange ball point	réf. : 883500058
Slow red point	réf. : 883500500
Slow blue point	réf. : 883500501

30 m normalized paper roll	réf. : 837500016
30m millimetric paper roll	réf. : 837500021
Plug-in shunt 1 OHM 0.1 %	réf. : 899620026
RS232 cord PC sub D 9 and 15 pins	ref.: 982101000

<u>OPTIONS</u> :

Winder-unwinder	réf. : 782110010
Protecting cover	réf. : 782110040
Rack mounts	réf. : 782110030

APPENDIX

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12.1 INPUT RANGE INFORMATION

12.1.1 Voltage type input

RANGE	SENSIBILITY	MINI measure	MAX measure
1 mV	40 µV/cm	-2.5 mV	+ 2.5 mV
2 mV	80 µV/cm	-5 mV	+5 mV
5 mV	200 µV/cm	-12.5 mV	+12.5 mV
10 mV	400 µV/cm	-25 mV	+25 mV
20 mV	800 µV/cm	-50 mV	+50 mV
50 mV	2 mV/cm	-125 mV	+125 mV
100 mV	4 mV/cm	-250 mV	+250 mV
200 mV	8 mV/cm	-500 mV	+500 mV
500 mV	20 mV/cm	-1.25 V	+1.25 V
1 V	40 mV/cm	-2.5 V	+2.5 V
2 V	80 mV/cm	-5 V	+5 V
5 V	200 mV/cm	-12.5 V	+12.5 V
10 V	400 mV/cm	-25 V	+25 V
20 V	800 mV/cm	-50 V	+50 V
50 V	2 V/cm	-125 V	+125 V
100 V	4 V/cm	-250 V	+250 V

12.1.2 PT100 type input

RANGE	SENSIBILITY	MINI measure	MAX measure
20 °C	0.8 °C/cm	-50 °C	+50 °C
50 °C	2 °C/cm	-125 °C	+125 °C
100 °C	4 °C/cm	-200 °C	+250 °C
200 °C	8 °C/cm	-200 °C	+500 °C
500 °C	20 °C/cm	-200 °C	+850 °C
1000 °C	40 °C/cm	-200 °C	+850 °C

12.1.3 J type thermocouple input

CALIBRE	SENSIBILITE	MINI mesurable	MAX mesurable
20 °C	0.8 °C/cm	-50 °C	+50 °C
50 °C	2 °C/cm	-125 °C	+125 °C
100 °C	4 °C/cm	-210 °C	+250 °C
200 °C	8 °C/cm	-210 °C	+500 °C
500 °C	20 °C/cm	-210 °C	+1200 °C
1000 °C	40 °C/cm	-210° C	+1200 °C
2000 °C	80 °C/cm	-210 °C	+1200 °C

12.1.4 K type thermocouple input

RANGE	SENSIBILITY	MINI measure	MAX measure
20 °C	0.8 °C/cm	-50 °C	+50 °C
50 °C	2 °C/cm	-125 °C	+125 °C
100 °C	4 °C/cm	-250°C	+250 °C
200 °C	8 °C/cm	-250°C	+500 °C
500 °C	20 °C/cm	-250°C	+1250 °C
1000 °C	40 °C/cm	-250°C	+1370 °C
2000 °C	80 °C/cm	-250°C	+1370 °C

12.1.5 T type thermocouple input

RANGE	SENSIBILITY	MINI measure	MAX measure
20 °C	0.8 °C/cm	-50 °C	+50 °C
50 °C	2 °C/cm	-125 °C	+125 °C
100 °C	4 °C/cm	-200 °C	+250 °C
200 °C	8 °C/cm	-200 °C	+400 °C
500 °C	20 °C/cm	-200 °C	+400 °C

12.1.6 S type thermocouple input

RANGE	SENSIBILITY	MINI measure	MAX measure
50 °C	2 °C/cm	-50 °C	+125 °C
100 °C	4 °C/cm	-50 °C	+250 °C
200 °C	8 °C/cm	-50 °C	+500 °C
500 °C	20 °C/cm	-50 °C	+1250 °C
1000 °C	40 °C/cm	-50 °C	+1760 °C
2000 °C	80 °C/cm	-50 °C	+1760 °C

12.1.7 B type thermocouple input

RANGE	SENSIBILITY	MINI measure	MAX maesure
200 °C	8 °C/cm	+200 °C	+500 °C
500 °C	20 °C/cm	+200 °C	+1250 °C
1000 °C	40 °C/cm	+200 °C	+1820 °C
2000 °C	80 °C/cm	+200 °C	+1820 °C

12.1.8 E type thermocouple input

RANGE	SENSIBILITY	MINI measure	MAX measure
20 °C	0.8 °C/cm	-50 °C	+50 °C
50 °C	2 °C/cm	-125 °C	+125 °C
100 °C	4 °C/cm	-250 °C	+250 °C
200 °C	8 °C/cm	-250 °C	+500 °C
500 °C	20 °C/cm	-250 °C	+1000 °C
1000 °C	40 °C/cm	-250 °C	+1000 °C

12.1.9 N type thermocouple input

RANGE	SENSIBILITY	MINI measure	MAX measure
20 °C	0.8 °C/cm	-50 °C	+50 °C
50 °C	2 °C/cm	-125 °C	+125 °C
100 °C	4 °C/cm	-250 °C	+250 °C
200 °C	8 °C/cm	-250 °C	+500 °C
500 °C	20 °C/cm	-250 °C	+1250 °C
1000 °C	40 °C/cm	-250 °C	+1300 °C

12.1.10 W5 type thermocouple input

RANGE	SENSIBILITY	MINI measure	MAX measure
50 °C	2 °C/cm	0 °C	+125 °C
100 °C	4 °C/cm	0 °C	+250 °C
200 °C	8 °C/cm	0 °C	+500 °C
500 °C	20 °C/cm	0 °C	+1250 °C
1000 °C	40 °C/cm	0 °C	+2320 °C

12.2 MEASUREMENT ACCURACY WITH THERMOCOUPLE

Note : Measurement inaccuracies given below are the maximum values. Typical values are 2 to 3 times lower.

The measurement accuracy in temperature is the addition of several possible inaccuracy sources :

Pl : linearization accuracy
Ps : cold junction accuracy
Pm : equivalent voltage measurement accuracy
Pd : offset measurement accuracy

Therefore the total accuracy Pt is : Pt = Pl + Ps + Pm + Pd
for the 8211 :

Pl = $\pm$ 0.25 °C for all the thermocouples
Ps = $\pm$ 1 °C for all the thermocouples
Pd = $\pm$ 0.25% of the offset
Pm = explained below

Measurement accuracy : Pm

The measurement accuracy Pm depends on the voltage range used by the instrument. The measurement error in degrees will be the voltage error divided by the slope in Volt/°C of the thermocouple. For each thermocouple an indicative value of the slope at a given temperature is given. This slope is significant of the thermocouple and permits to deduce the error in temperature. If someone want to refine further he must read the slope in the thermocouples tables (due to the fact that they are fonction of the temperature).

For all the voltage ranges the accuracy is $\pm$ 0.25% $\pm$ 10µV.

12.2.1 J Thermocouple

Slope at 0°C = 50µV/°C

Temperature Range	Voltage Range (mV)	Max Error in Voltage(µV)	Max Error in °C
20	2	15	0.3
50	5	22.5	0.45
100	10	35	0.7
200	20	60	1.2
500	50	135	2.7
1000	100	260	5.2
2000	100	260	5.2

12.2.2 K Thermocouple

Slope at 0°C = 40µV/°C

Temperature Range	Voltage Range (mV)	Max Error in Voltage(µV)	Max Error in °C
20	2	15	0.37
50	5	22.5	0.56
100	10	35	0.88
200	10	35	0.88
500	50	135	3.4
1000	50	135	3.4
2000	100	260	6.5

12.2.3 T Thermocouple

Slope at 0°C = 40µV/°C

Temperature Range	Voltage Range (mV)	Max Error in Voltage(µV)	Max Error in °C
20	2	15	0.37
50	5	22.5	0.56
100	10	35	0.88
200	20	60	1.5
500	50	135	3.4

12.2.4 S Thermocouple

Slope at 500°C = 10µV/°C

Temperature Range	Voltage Range (mV)	Max Error in Voltage(µV)	Max Error in °C
50	1	12.5	1.25
100	2	15	1.5
200	5	22.5	2.25
500	10	35	3.5
1000	20	60	6
2000	20	60	6

12.2.5 B Thermocouple

Slope at 1000°C = 9µV/°C

Temperature Range	Voltage Range (mV)	Max Error in Voltage(µV)	Max Error in °C
200	5	22.5	2.5
500	10	35	3.9
1000	20	60	6.7
2000	20	60	6.7

12.2.6 E Thermocouple

Slope at 0°C = 60µV/°C

Temperature Range	Voltage Range (mV)	Max Error in Voltage(µV)	Max Error in °C
20	5	22.5	0.38
50	5	22.5	0.38
100	10	35	0.58
200	20	60	1
500	50	135	2.3
1000	100	260	4.3
2000	100	260	4.3

12.2.7 N Thermocouple

Slope at 0°C = 26µV/°C

Temperature Range	Voltage Range (mV)	Max Error in Voltage(µV)	Max Error in °C
20	1	12.5	0.48
50	2	15	0.58
100	5	22.5	0.87
200	10	35	1.4
500	20	60	2.3
1000	50	135	5.2
2000	100	260	10

12.2.8 W5 Thermocouple

Slope at 1000°C = 18µV/°C

Temperature Range	Voltage Range (mV)	Max Error Voltage(µV)	Max Error in °C
50	1	12.5	0.7
100	2	15	0.83
200	5	22.5	1.25
500	10	35	2
1000	20	60	3.3
2000	50	135	7.5

12.3 MEASUREMENT ACCURACY WITH Pt 100

Note : Measurement inaccuracies given below are the maximum values. Typical values are 2 to 3 times lower.

The measurement accuracy in Pt 100 is the addition of several possible inaccuracy sources :

Pl : linearization accuracy
Pz : zero accuracy
Pm : equivalent voltage measurement accuracy
Pd : offset measurement accuracy

Therefore the total accuracy Pt is : Pt = Pl + Pz + Pm + Pd

for the 8211 :

Pl = ± 0.25 °C
Pz = ± 0.25 °C
Pd = ± 0.25% of the offset
Pm = explained below

Measurement accuracy : Pm

The measurement accuracy Pm depends on the voltage range used by the instrument. The measurement error in degrees will be the voltage error divided by the slope in Volt/°C of the thermocouple.
For all the voltage ranges the accuracy is ± 0.25% ± 10µV.

Slope versus temperature :
Slope is dependant of option presence.

Temperature (°C)	-200	-100	0	200	400	600	800
Slope standard (μV/°C)	402	371	352	323	295	269	245
Slope and option (μV/°C)	397	372	359	337	316	295	273

Measurement accuracy at 0°C :

Temperature Range	Voltage Range (mV)	Max Error in Voltage(μV)	Max Error in °C standard	Max Error in °C and option
20	10	35	0.099	0.097
50	20	60	0.17	0.17
100	50	135	0.38	0.38
200	100	260	0.74	0.72
500	200	510	1.4	1.4
1000	500	1260	3.6	3.5

12.4 EXAMPLE OF ACCURACY CALCULATION

12.4.1 Thermocouple

Measurement performed on 50°C range and 25°C centre with a J thermocouple, without cold junction compensation.

Pt = Pl + Ps + Pm + Pd

Pl = $\pm$ 0.25 °C (linearization accuracy)
Ps = $\pm$ 0°C (no cold junction compensation)
Pd = $\pm$ 0.06°C ($\pm$ 0.25% of the middle range temperature)
Pm= $\pm$ 0.45°C (read in the table, for a 50°C range)
Therefore the maximum total accuracy is :

Pt = 0.25 + 0.06 + 0.45 = $\pm$ 0.76°C

12.4.2 Pt 100

240°C measurement performed on 500°C range and 0°C centre with Pt 100 without PT100 long distance measurement.

Pt = Pl + Pz + Pm + Pd

Pl = $\pm$ 0.25 °C (linearization accuracy)
Pz = $\pm$ 0.25°C (zero accuracy)
Slope at 240°C ≈ 323 + (295 - 323) x 40 / 200 ≈ 317 µV/°C
Pm = 510 / 317 ≈ $\pm$ 1.6°C
Pd = 0°C (no offset)

Therefore the maximum total accuracy is :

Pt = 0.25 + 0.25 + 1.6 ≈ $\pm$ 2.1°C

GLOSSARY

13

13 - GLOSSARY

ACCURACY CLASS - CLASS INDEX

This is one of the essential C.E.I concepts ; it aims to relieve the enumeration of specifications. For this purpose, it introduces the notion of ACCURACY CLASS this latter being determined by the C CLASS INDEX. The standard values of the Class index are: C = 0,1 ; 0,25 ; 0,5 et 1.

According to the C.E.I., the adherence of an instrument to an accuracy class implies the following specifications:

- The intrinsic error (within the reference conditions) does not exceed ± C % (The manufacturer can also specify that limit of intrinsic error in absolute value (i.e. ± 5 microvolts) for the first sub-ranges).

- The variations (of the measured values), when an influencing matter vary within the nominal use domain by not more than: C %, for the position, for the magnetic induction of external origin and for the spurious voltages.

. 0,5 C% for the power source
. de 0,3 C%according to the class index for the ambiant temperature (0,15 % for the class 0.25).

- Besides this, the insensitivity range must not be in excess of:

. C% within the reference conditions

. 1,5C% for the maximum resistance of the external measuring circuit.

. 2C% for the spurious voltages.

- Finally the overrange must not exceed 2C% (4C% for the limits of the power supply source).

It therefore appears that, in giving its accuracy class, a great part of the recorder specifications can be summarized.

RANGE

Value corresponding to 250 mm of paper.
In the 8211 the range corresponds to the difference between the maximum value (right limit of the paper) and the mimum measurable value (left limit of the paper)

13 - GLOSSARY

MEASUREMENT DOMAIN

Space included between the edges of the paper.

OVERSHOOT

With measured values suddenly varying of about 2/3 of the measurement interval, it is the difference between the extreme measured value, and the final value measured once the writer is stabilized.

It must not exceed twice the class index (four times for the limits of the power supply voltage within the utilization domain).
(Example : for an instrument of class 0,25 %,and an interval measurement of 25 cm, the maximum overshoot is 1,25mm).

INFLUENCE VALUES

This corresponds to the measurment environnement notion. They are values, other than the values to be measured ,the variation(s) of which are capable to modify the value given by the instrument to be measured, for the same real value of the phenomenon to be measured. The influence values taken in consideration are generally:

- the ambiant temperature
- the instrument position (lying flat, inclined, vertical...)
- external magnetic induction (dc induction, ac induction....)
- the spurious voltages (dc, ac, serial or common mode...)
- the power source of the instrument (voltage, frequency)
- the resistance of the external measuring circuit

SERIAL MODE INTERFERENCES

The specifications must mention the influence factor of the serial mode (or the rejection rate: CMRR) for the mains frequency (50 Hz) and for twice that frequency.

Several values may be given if the recorder is provided with one or several switchable filters.

COMMON MODE INTERFERENCES

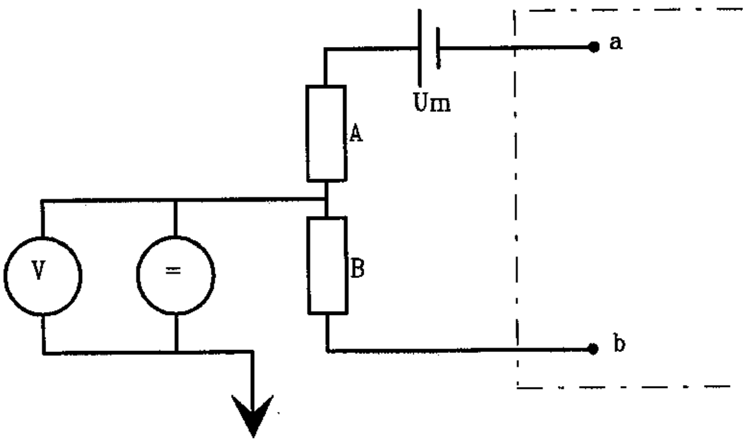
The measurement assembly is such as described in the following figure. To simplify, the Um measured voltage can be zero.

The values of the influence factors are noted for four combinations of the A and B resistors.

	1st. test	2nd. test	3rd. test	4th test
A :	10 ohms	0	Ra	0
B :	0	10 ohms	0	Rb

Ra and Rb are equal, one to the maximum value, given by the manufacturer, of the maximum value of the input circuit resistance, the other to any value given by the manufacturer.
The manufacturer must specify the lowest value of the inluence factor, respectively obtained in the two first and two last tests.

As many series of values can be given as there are switchable filter positions available in the recorder.
Finally, the values are specified in accordance with the interfering voltage,dc or ac at the main frequencies.
For all these tests the actual increase of the insensitivity range must not exceed twice the index class.
Many manuals give a CMRR rejection rate for:
Ra = 1000 ohms (3rd. test) and sometimes for Rb = 1000 ohms
(4th. test).



V = Interference voltage between measurement circuit and ground

Um = Measured voltage.

INSENSITIVITY RANGE (or Dead zone)

Range within which the measured value is varied without entailing a displacement of the writing device .
Akin with the "bracket" or "resolution" notion.
It is measured by the difference between the final positions of the plot, according as the measured value comes very slowly or very quickly, in progressing or decreasing to the same final value.

FREQUENCY RESPONSE

Let's apply a sinusoidal voltage to the recorder, provided by an AF generator at a frequency close to 0,1 Hz and let's adjust range and voltage so as to obtain an initial Ao amplitude plot of 16,6 cm peak to peak.
Progressively apply the F frequency, the amplitude A of the plot practically first equals to Ao, then more and more decreases.

The attenuation expressed in % is:

100 (A0-A)/Ao. It is more often expressed in decibels:
- 20 x log A/Ao.

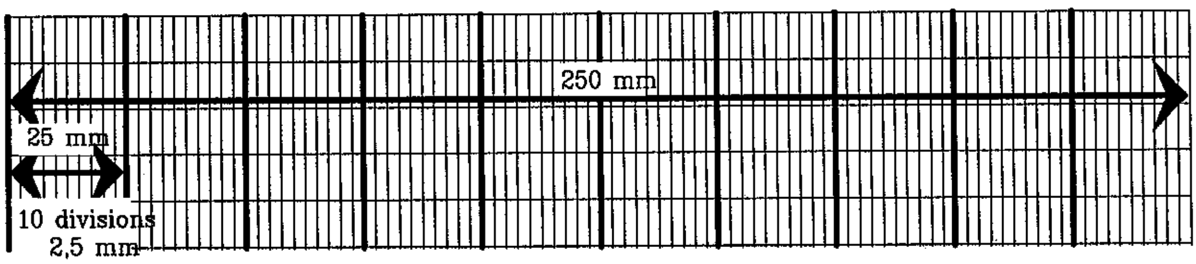
The frequency interval included between 0Hz and the frequency Fm is named "Bandwidth" if whithin this interval the attenuation does not exceed a specified value.
If this test is performed again with an initial Ao amplitude of 2,5cm peak to peak, a new bandwith value is obtained. Therefore one may deduct that any passband given is significant only when are precisely given:

- the inital plot amplitude

- the maximum attenuation admitted whithin the band

SENSITIVITY

Example : Measurement value by cm of paper.



for 1 cm sensitivity = $\frac{\text{range x 4}}{100}$ = measurement unit/cm

For 2,5 mm = $\frac{\text{range}}{100}$

DIGITAL MODE

The mechanical channels are no longer controlled by the input signals but by commands directly sent by the computer.

DIRECT MODE (CONTINUOUS MODE)

In continuous mode, the 8211 records in real time analogic low frequency signals, temperatures and returns them back to mechanical channels (paper).

The transcription is performed by a writing device fastened on a carriage.

The displacement of this carriage is limited to a few hertz (5Hz). If the signal to be recorded entails a too fast displacement, the mechanical device cannot follow. The transient mode must then be used.

TRANSIENT MODE

This mode consists in recording fast analogic signals (> 5hz).

The recording takes place in two times:
- sampling and memory storage of the signal
- restitution and retranscription on the paper at a lower rate.

The amount of information that may be recorded is determined by the available memory.

MARKER

Capability of writing down remarks onto the paper during the plot.

CE

DECLARATION OF CONFORMITY
DECLARATION DE CONFORMITE
ELECTRO-MAGNETIC COMPATIBILITY and SAFETY
COMPATIBILITE ELECTRO-MAGNETIQUE ET SECURITE

N° 96 5202

According to testing performed by : SEFRAM INSTRUMENTS & SYSTEMES
Suite aux essais réalisés par 32, rue E. MARTEL - BP 55
42009 ST ETIENNE CEDEX 2

We declare, under own responsability, that the below mentionned product is in compliance with :
Nous déclarons, sous notre seule responsabilité, que le produit défini ci-dessous est conforme à

the EUROPEAN DIRECTIVE CEM 89/336/CEE
Emission Standard EN 50081-1
Immunity standard EN 50082-1
la DIRECTIVE EUROPEENNE CEM 89/336/CEE
en Emission selon EN 50081-1
en Immunité selon EN 50082-1

&

the EUROPEAN Low Voltage DIRECTIVE 73/23/EEC
Safety requirements for electrical equipement for measurement, control and laboratory use
NF EN 61010-1
la DIRECTIVE EUROPEENNE Basse Tension CEE 73-23
Règles de sécurité pour appareils électriques de mesurage, de régulation et de laboratoire
NF EN 61010-1

PRODUCT NAME : Two channel recorder
DESIGNATION Enregistreur 2 voies

MODEL NUMBER : 8211
NUMERO DE SERIE

Sécurité :

Isolation : Classe 1	Insulation : Class 1
Degré de pollution :2	Degree of pollution : 2
Catégorie d'install. de l'alimen. CAT II (264Vmax)	Power supply CAT II (264V max)

ST ETIENNE LE :24 Dec 1996

Name / Position : T. TAGLIARINO Quality Manager
Nom Fonction / Responsable Qualité

Tagliarino

This declaration has been established in conformity with the article 10 of the 89/336/EEC european directive dated May 3, 1989 and in application of the EN 45014 european standard dated 1989.
Cette declaration est établie conformément à l'article 10 de la directive européenne 89/336/CEE du 3 Mai 1989 et en application de la norme européenne EN 45014 de 1989.