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**UF 322 CO & UF 322 RV
UF 322 CO/S & UF 322 RV/S**

**Flowmeters for Open Channels
& Small or large Rivers**

NT 226C GB1 Technical Manual

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Note : *In the interests of continuous improvement of the products, Ultraflux reserves the right to change them without notice. Furthermore, they accept no liability for any error that could be introduced into the documentation in spite of the care taken to write it*

The UF322 Open channel flow meter complies with the requirements in force in the European Economic Community (EEC) and has the CE mark of conformity.

Advice : This device is classed A. So, in a residential district, it may happen some radio interference if not any precautions is taken to prevent this risk. If any claim, please contact Ultraflux or his agent.

GENERAL PRESENTATION

The UF 322-CO (for open channels) and UF 322-RV (for rivers) are ultrasonic flow meters which enable to measure in bi-directional stream and with better than 5 % accuracy most of channel or river flows up to 200 m width by using the method of the difference in transit time of ultrasonic waves.

The stream velocity measure can be achieved by the means of one and up to six chords.

A chord corresponds to the acoustic path between two matched and aligned probes, each probe being alternately emitter and receiver. Using several chords is needed when the channel section has an irregular shape or if flow profile is very changing versus flow conditions or water level.

A complementary but necessary device is the level sensor information.

The UF 322-CO and UF 322-RV* families main difference is the ultrasonic frequency range. An UF 322 CO* works at 0.5 MHz frequency (optionally 1 MHz) and is suitable for small rivers or sewage water channels. UF 322 RV allows lower frequencies, down to 0.2 MHz, and thus accepts more distance between probes.*

Both units have different versions depending on how many chords connections are available:

UF 322-CO/S and UF 322-RV/S have resources of 2 chords.

UF 322-CO and UF 322-RV allow each up to 5 chords.

UF 322-CO4 is a complementary device which is limited to 4 chords.

Important : *If you are unacquainted with the measurement method based on the difference in transit times, we recommend to begin with the reading of our didactic manual "Flow measuring by transit time difference" reference NT 122.*

Chapters 1 gives ultrasonic basis and chapter 2 is oriented to full pipes measurements.

Chapter 3§1 explains the principles of the open flow measurement and chapter 3§2 gives very useful information for a site commissioning.

We have also some nice pictures and application data sheets from typical sites as examples.

Please contact our sales people or our distributors. They will be very happy to keep you informed and meet your expectation.

Reminder : *Ultraflux is also a world-wide well-known manufacturer of full pipe flow meters.*

We offer a large range of fix & dedicated units and also portable units.

CERTIFICATIONS

All Ultraflux equipments are CE certified. This CE mark is for EMC and LVD.

ATEX certification for the relevant probes is possible when this quality is required, accepted and documented. All equipment will be labeled accordingly.

Some probes can be manufactured and certified with an EEx m IIC T6 for zone 1 or 2.

Some other probes can be installed in zone O and can be certified EEx ia IIB T6. This solution is possible only with our barriers "Ultrasafe" between UF_322* and its probes.

Another protection and certification must be taken in account for the level probe.

IP Rated as shown on each item. Some probes can be manufactured as IP 68.

The IP 67 rating of the UF_322-CO or RV enclosure is complied with only if assembly is done according to the manual and installations rules.

APPLICABLE STANDARDS :

Concerning high voltage human safety risks: LVD

Concerning EMC : EN 61000 , EN 55022 et EN 50204

Note : This device is classed A. So, in a residential district it may happen some radio interference if not any precaution is taken to prevent this risk. If any claim, please contact Ultraflux or his agent.

Concerning tightness (IP) : EN 60529

Concerning ATEX : Directive 94 / 4 / CE

- + EN 50014 : General rules
- + EN 50019 : EEx e protection for connections .
- + EN 50028 : EEx m – protection by encapsulation.
- + EN 50020 : EEx i - Intrinsic safety.

CONCERNED UF_322-CO/RV VERSIONS :

This technical manual concerns **all software versions after version 6.**

Most of examples as shown (LCD screens or Software menus) are imported from **version 9.**

Previous versions could have some difference and less setting data.

Further version, from 10, there are three important changes :

- Minimum immersion has to be entered in centimeters, not in millimeters (better for rivers).
- These versions accept the new Emitting / Receiving P.C. Board **ER-3**. This is shown by the Software reference code, which displays for instance **LsCoW 10.03.67 A** (10 = version ; 03 = application) ; **67** = 6 for ER-2 & 7 for ER-3 and A = revision).
- DC input supply is accepted from 10 up to 32 Volts. Higher voltage upon request.

SUMMARY :

1 - Main characteristics of UF_322-CO (S) or RV (S) resources and functions.	Pages 06 to 08
2 – General procedure from site selection up to commissioning.	Pages 09 & 10
3 – Mechanical and Electrical installation.	Pages 11 to 14
4 – Probes and Supports installation.	Page 15
5 – How to use the keypad.	Pages 16 & 17
6 – How to install and use the Ls322_CoW PC software.	Pages 18 to 21
7 – Instrument setting, menu per menu.	Pages 22 to 35
8 – Measurements reading.	Pages 36to 38
9 – Measurements record.	Pages 39 to 44
10- Recommended controls.	Pages 45 to 48
11- Appendix.	Pages 49 to 51

1 - MAIN CHARACTERISTICS OF RESOURCES & FUNCTIONS :

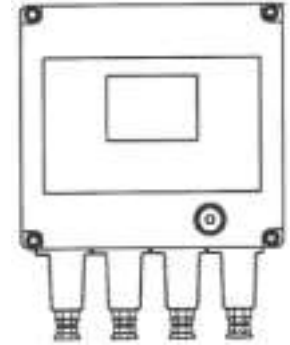
These data are only for information. Contractual characteristics are in sales leaflet with confirmation in attached offer or quotation.

Dimensions and weight of UF 322-CO/S and UF 322-RV/S :

L =239 mm / H =340 mm / D =138 mm (including the wall plate)

Weight = 4.2 kg

Leave a 200 mm free space under the enclosure in order to allow easy wiring and easy removing and fixing the connectors.



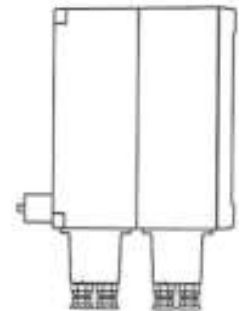
Dimensions and weight of UF 322-CO and UF 322-RV :

Each of these two devices is made up of two attached cases:

- A UF 322-CO/S or RV/S case as above
- A case between wall plate and main case allowing connecting up to three additional chords.

The total depth is 225 mm, including wall plate.

Total weight is around 6 kg.



Tightness:

IP 67 protection, thus a total protection against dust and also against temporary immersion (30 minutes under 1 m of water). Every parts must be screwed correctly and glands passages, closed.

Environmental conditions and ambient temperature :

Case and included electronic P.C. boards accept outdoors conditions with up to 90% humidity and ambient temperature from -25°C up to $+50^{\circ}\text{C}$.

The LCD graphic display accepts more restricted conditions to allow reading. Contrast must be adjusted according these conditions. So, avoid direct sunrays and try to install unit indoors if possible.

In case of outdoor installation, a cover roof or an external enclosure could help to long-term reliability.

Cleaning the UF 322 **::

The cases can be cleaned with water, alcohol or detergent using a sponge or soft cloth. Do not use abrasive objects or solvents.

Power supply :

UF_322 ** accepts, depending on external wiring, to be supplied from the mains or from a DC source. With mains, selection of 230 V AC (standard delivery) or 110 V AC (option) is done internally. With a DC source or a battery, UF_322-** accepts any from 12 to 32 V DC (since version 10). Maximum consumption is 10 Watt. Normal consumption is 5 or 6 watt.

Important:

- 1) Check the device voltage indicated on the manufacturer plate.*
 - 2) The device is designed for an installation with over voltage category II.*
- If site present some higher level over voltage risks, please place a protection module.*
- This is true also for lightning risks.*

Inputs / Outputs :

In addition to probe connections, the UF 322-CO (S) et UF 322-RV(S) offer the following possibilities :

Two 4-20 mA inputs for level measure: input 1 has priority, input 2 being for redundancy and would be used if the input 1 is out from the 3,6 - 22 mA range. If the two inputs are different over a settable threshold, the device will give an alarm.

Three programmable static relays: they can copy global flow direction, stream direction at a chord level, alarm at a threshold on a flow value or a flow velocity value or a level value, volume unit increase (counting pulses), fault status...to be selected in a proposed menu.

One 4-20 mA analog output proportional, according to the selection, to average flow, average flow speed, flow velocity at a chord level, water level... to be selected in the proposed menu.

Serial link :

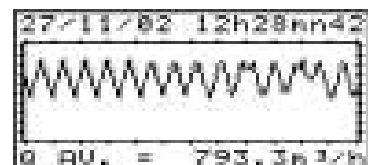
The UF 322-CO (S) and UF 322-RV (S) have a Jbus / Modbus protocol serial link allowing connecting the device to a computer or to a PLC or supervision system.

In addition, a specific software, LS 322-CO_W, running under Windows 98, NT4, 2000 & XP allows to configure the device, to display the different measured values (flow, average flow speed...), and to save the different files for printing or later re-use or export.

*We highly recommend the use of this software though a PC to set an UF_322-** device.*

Possibility of data recording :

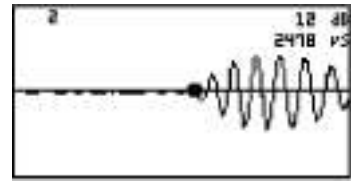
The device allows to record measured data and to display their graphic evolution from a built-in data logger.



You can select 4 or 9 variables (among about fifteen) to be recorded: average flow, minimum flow, maximum flow, water level, amplification gains, stream velocities, sound velocity, ...

Ultrasonic signals visualisation :

The oscilloscope function (Echo view menu) allows to display the ultrasonic signal of each chord, to check the quality of the signal which makes the measure and to directly see if there are possible nuisances (electrical noise, air bubbles...) and check the effect of corrective actions (positioning and alignment of probes, adjustment of amplification gain or threshold on the signal, probe cleaning...)



Other available functions :

Flow volume totalizers : three totalizers are available ; each one allows to count positive or negative flow volumes or total of both. The volume unit or pulse weight can be adjusted from 1 liter to 100,000 x 100 m³.

Measurement filtering with a first order filter allowing smoothing fast and non-significant flow fluctuations.

Measurement adjustable memory to interface momentary echo loss (due, for instance, to a floating object or to air bubbles).

Cut-off function to force flow display to zero if the transit time difference and consequently the flow, is lower than a set value (Delta T eff).

Zero setting adjustment if there is a possibility to stop the flow.

Check, control and re-calibration of the analog output or inputs : a calibrated multimeter and a current source are necessary.

Simulation & Tests Menu: this menu permits the internal simulation of a level value or a flow velocity value or both to permit a flow calculation. This function is useful when the level probe is not operating. It permits also to simulate every output data when flow conditions are not permitting to issue such a test.

2 – GENERAL INSTALLATION PROCEDURE.

This procedure is a guide of step after step milestones that we recommend to respect to guaranty final results. Some actions have a better place at the project beginning and are normally cleared up better before the purchase order.

One of the main advantages of this ultrasonic V x S flow measurement method compared to flumes, weirs, V notches or other invasive systems is that it has no or few dependence from downstream influences nor to the channel / river bed slope. But the probes or sensors to measure the flow stream and the water surface level must be placed at judicious locations to represent correct samples for the flow calculation.

We remind you the reading of our didactic manual !

3.1 – Site selection :

A visit to the site with some pictures is very helpful to start a project. When the site is not already built, an in-depth examination of the project drawings is recommended.

It is also very important to make an enquiry near by site people and ask for extreme possible conditions as floods, overflows, discharges, extra charge to be carried by the flow, aeration... thus different traps that it is better to detect rather than to fall down.

A particular attention must be put to search any upstream water fall or pump that could aerate the water as it is often in a sewage water treatment plant.

3.2 – Ultrasonic Probes selection for velocity measurement:

This is normally our business and responsibility. This choice concerns the frequency (the lower is the frequency, the less ultrasonic is sensitive to water solid particles charge) and the probe dimension to have a more or less accurate beam. Usual frequencies are from the highest to the lowest 1 ; 0,5 and 0,2 MHz with probe active diameter from 20 mm up to 150 mm.

Probe design with its possible support is also important for the installation. We offer plenty of experienced solutions. One of them should be the best for you.

3.3 – Number of chords with their relative positions:

This choice is very dependent from expected accuracy and hydraulic conditions:

- More chords give more information on the flow profile, but it costs more.
- Large water level variations ask for more chords than it is necessary with stable conditions.
- Their elevation from riverbed or channel bottom is 100% dependent from site.
- The lowest chord must be placed above mud, sand or rocks sediments.

In practice, a river is usually controlled by one or two chords with the upper one better placed for flood conditions flow control, and a sewage water channel is usually equipped with three or four chords, the lowest to control dry or night conditions and the upper one placed for flood or rainy conditions.

3.4 – Level sensor(s) :

Any sensor model can be used if it is stable, accurate and able to deliver a proportional to level 4 to 20 mA signal : Piezzo resistive or capacitive, Ultrasonic, Radar, Bubbler...

An ultrasonic sensor must not be exposed to sunny conditions (air temperature gradient).

A piezzo system must have its sensitive face above mud or sand deposit and be protected in a tube.

Intrusive sensors are less exposed to vandalism but more exposed to floating bodies as pieces of wood, plastic bags, threads ...

As UF_322-** has two level entries, thus you can use two complementary techniques.

3.5 – Cables length & installation of the converter by the probes or at distance :

Ultrasonic signals are not very sensitive to cable length. If our recommended twin-ax cable is used, a distance up to 300 m and more (depending on probe frequency) between converter and probes is not a problem and permits to install the converter indoors.

On the other hand, long cable routs are more expensive.

It is same concerning the level sensor that we also recommend to protect against lightnings.

3.6 – Definition of the geometrical data or measurements to be plotted after installation.

As you will see later in this manual, each chord menu must be fulfilled by three data: the chord elevation, the distance face to face between the two probes of a same chord and the projection onto the channel axis. It is very often easier to check up these data at construction or installation step.

Same concerning the channel or river section: note the width versus the level.

Note also at what level from the riverbed or the channel bottom is installed the level sensor.

We will ask for these data before the commissioning.

3.7 – Definition or enquiry about the main parameters to start the setting /commissioning.

As it is for any instrument, all data concerning the instrument setting will be asked for: flow units and flow range, 4-20 mA output range, relays to be used, flow profile information, ...

If some data are known before instrument delivery, this can help us to prepare your instrument in accordance to and thus help for an easier commissioning.

3.8 – Signals analyze.

When everything is installed and the converter setting is done, it is very important, if level and probes immersion permit it, to control the ultrasonic signals level and quality.

Our Echo Display menu is very helpful for this control. Good signals = good reliability.

3.9 – Other setting with calibration & instrument acceptance tests.

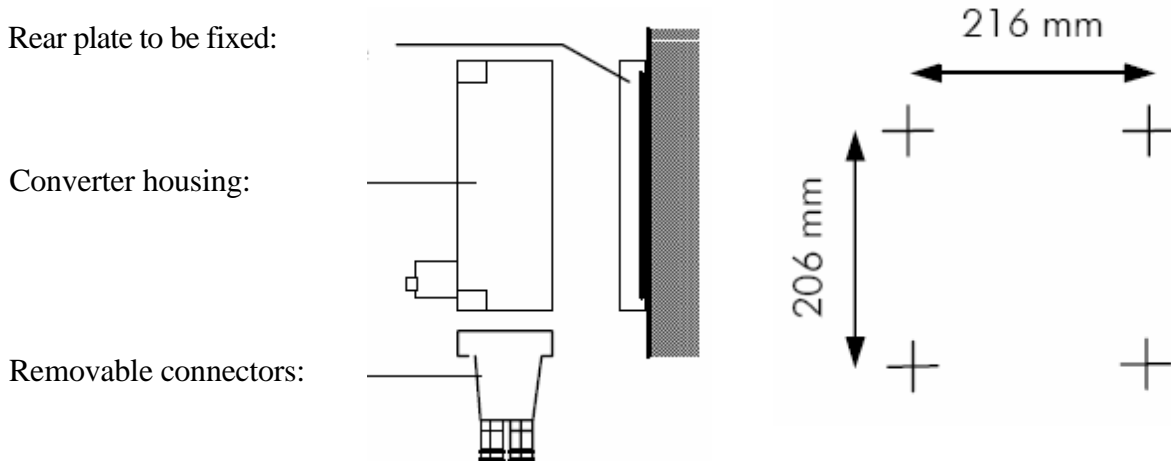
This flow measurement principle doesn't require a flow calibration by comparison with a standard, which don't really exist for large channels. Meanwhile, the flow profile hypothesis can be more or less exact. Thus, any practical information from difference between measured chords or from spot measurements devices as turbine, electromagnetic probe, Pitot tube ... can help to set an adapted hydraulic profile and a better flow accuracy in extreme conditions.

As it is usually very difficult to make the flow conditions (as rain, floods ...) , your help and your experienced informations and your collaboration are very, very important to have as soon as possible the final expected result.

3 – MECHANICAL AND ELECTRICAL INSTALLATION .

3.1 - Installation of the wall mounting plate :

The UF 322-CO (S) or RV (S) are designed to be fixed on a wall or any vertical panel by its rear plate which must be installed according to following dimensions:



To fix this rear plate, separate it from converter main housing by unscrewing at the 4 corners.

Important: keep the converter housing in a safe place, far from water or dust projection risk.

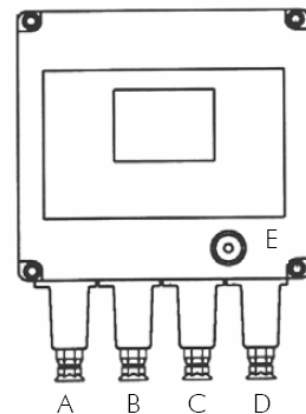
A 200 mm minimum free space under the plate will permit easier conditions for a screwdriver use when you will fix the connectors.

Re-install the converter housing by screwing it onto its wall plate. Apply a sufficient force to guaranty the tightness.

Localisation and function of the different connectors :

The 4+1 connectors of the UF 322-CO/S or RV/S are as follows :

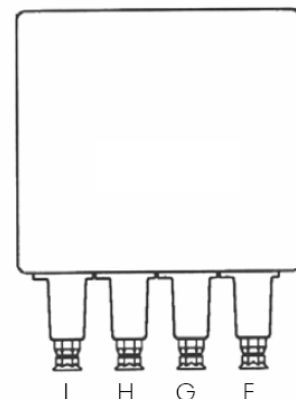
- Connector N° A = power supply (AC or DC + earth)
- Connector N° B = level inputs, 4-20 mA output & relays
- Connector N° C = probes of chord N° 2
- Connector N° D = probes of chord N° 1
- Connector N° E = serial port / link (RS 232 or 485 upon request)



The additional connectors which concern UF 322-CO or RV

permit the wiring of more chords , up to 5 (2+3) :

- Connector N° F = probes of chord N° 3
- Connector N° G = probes of chord N° 4
- Connector N° H = probes of chord N° 5
- Connector N° I = for optional use



3.2 – **Electrical connections:** (See also wiring schematic in appendix 1)

All A, B, C, D, F, G, H, I but E connectors have their terminal 1 towards the front panel.

Power supply -> connector A:

The device is delivered with the power voltage indicated with the order for connection to mains 110 or 230 V AC. Contact Ultraflux if you need to modify this power voltage.

Connection to a DC source is ready to be used within the range 12 to 32 Volts in standard.

Upon request, we can install DC // DC converters with an higher input range.

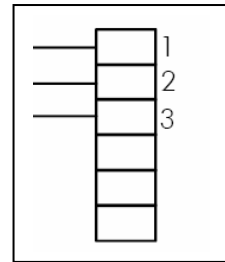
UF_322-* have internal fuses on AC and DC inputs to protect the device against over current.

Connections to the mains :

Use a 3 x 1.5 mm² cable. We recommend it flexible rather than rigid :

Connect phase to terminal 1 and neutral to terminal 3.

Earth must be connected to terminal 2. *Keep in the same terminal 2 the short cable which insure the connector itself to be earthen at screw location.*



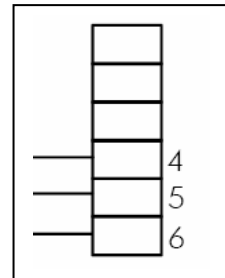
Connections to a DC source :

It is important to respect the + / - polarity: check it before any connection.

Connect + DC to terminal 5 and – DC to terminal 6.

It is recommended to earth the unit for safety and EMC reasons.

So, connect earth to terminal 4. Let the short cable in 2.

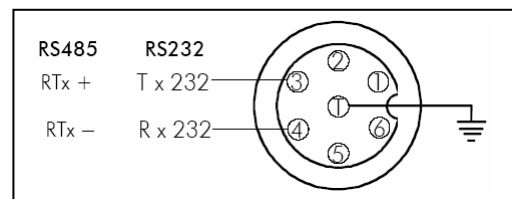


Serial link -> connector E:

This connector is mainly used to receive our cable to PC and use our software for setting and controls. We can also deliver a free connector do a serial link to a PLC or supervision.

The standard delivery is done with a RS 232 driver.

Optionally, we can replace it with a RS 485 driver.



Note : our standard cable to PC has at its other end a DB 9 female connector.

Pin out is standard with Tx 232 to 2, Rx 232 to 3 and common to 5.

If a DB 25 is requested, pin out should be respectively 3, 2, 7.

*We recommend to use this feature (PC + Software + cable) to set and commission our UF_322***

Connection to ultrasonic probes (connectors C, D, F, G, H) :

We recommend the use of our twin-ax cable up to the probes.

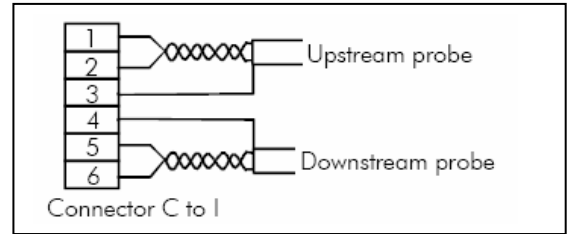
If this cable is delivered with armor, please stop this protection at some distance.

This twin-ax cable has two wires, one with red copper, the other one with tinned copper, both under a common shield.

Do respect following terminals and polarity:

Upstream probe > terminals 1 to 3 with: 1 = tinned wire,
2 = red wire, shield to 4 (internally to the earth)

Downstream probe > terminals 4 to 6 with: shield to 4,
Tinned wire is to 5 and red wire to 6.



Inverting upstream and downstream probes would make a reverse flow velocity display.

It is sometimes necessary to swap terminals on one of the two probes to invert the echo polarity.

Level inputs (4-20 mA):

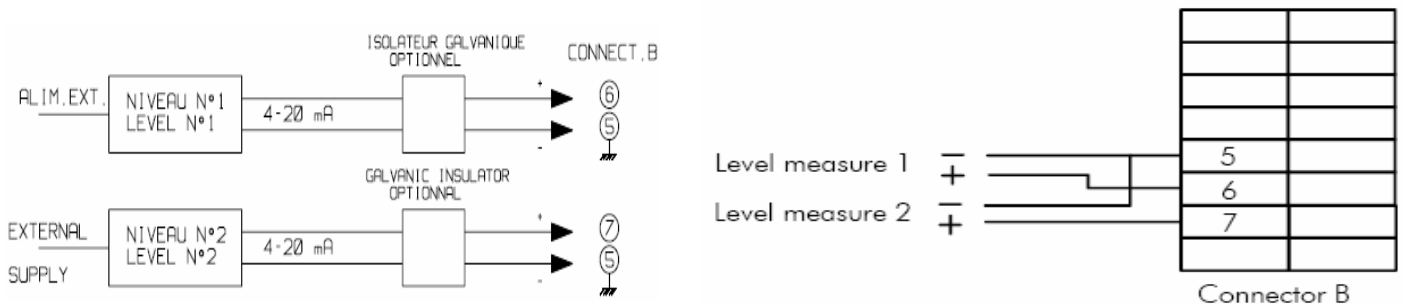
UF_322-CO/RS (S) needs, at least, level information from a 4-20 mA external sensor on input 1.

We remind you that it is possible to simulate a level value in case of information temporary lack.

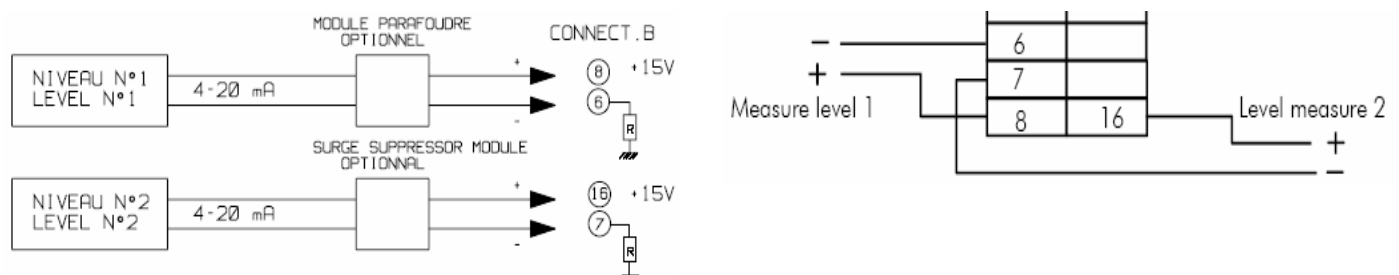
Advise : as inputs and outputs are grouped on the same connector B, it is recommended to do their wiring at the same time.

Important: these two level inputs include some protection against level sensor failure but they are not galvanically insulated. Input resistors are 10 Ohm. Their (-) terminal is referred to internal 0V.

To have a heavy-duty installation with benefit of this insulation and a better protection against lightning, we recommend connections as shown below:



When the site presents no risk, a + 15V DC / 40 mA maxi source is available on terminals 8 & 16 to supply a 2 wires level sensor. Anyway, when used, place a lightning protection module in series on the line. As terminal 5 is also the (-) of the 15V, do following connections:

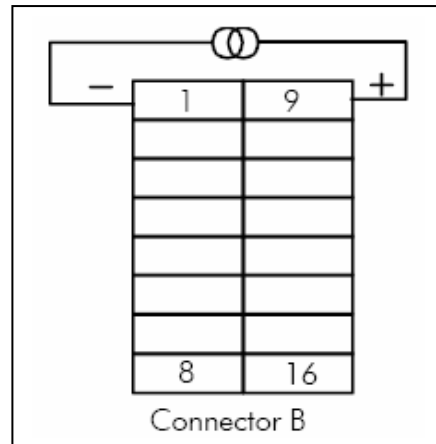


Analog and relays outputs:

The analog output can be set as 0-20 or 4-20mA as well. It is used mainly for the flow result but can copy different other measures from the menu.

- It is galvanically insulated
- It is an active output.
- It can drive a resistive charge up to 1000 Ohm

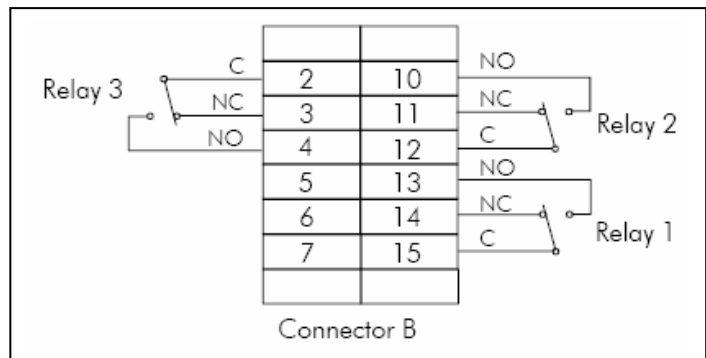
Connections are:



Important: as it is for inputs, if a site presents some lightning risks, we recommend to place a protection module in series with the 4-20 mA output. A good earth connection offers better result guaranty.

Output contacts: UF_322 have 3 static relays.

- Switching power < 100 V / 100 mA
- Relay “On” resistance < 45 Ohm
- Contact can be at rest or active when relay is switched ON (two positions).
- Drawing represents relays at rest position.
- When copying volume pulses, we limit the switching frequency to 30 Hz.



Advise:

After these output connections are finished and then UF_322- is supplied, our test menu offers simulation facilities: you can simulate any current in the 0 to 20 mA range and do a state change on each relay.*

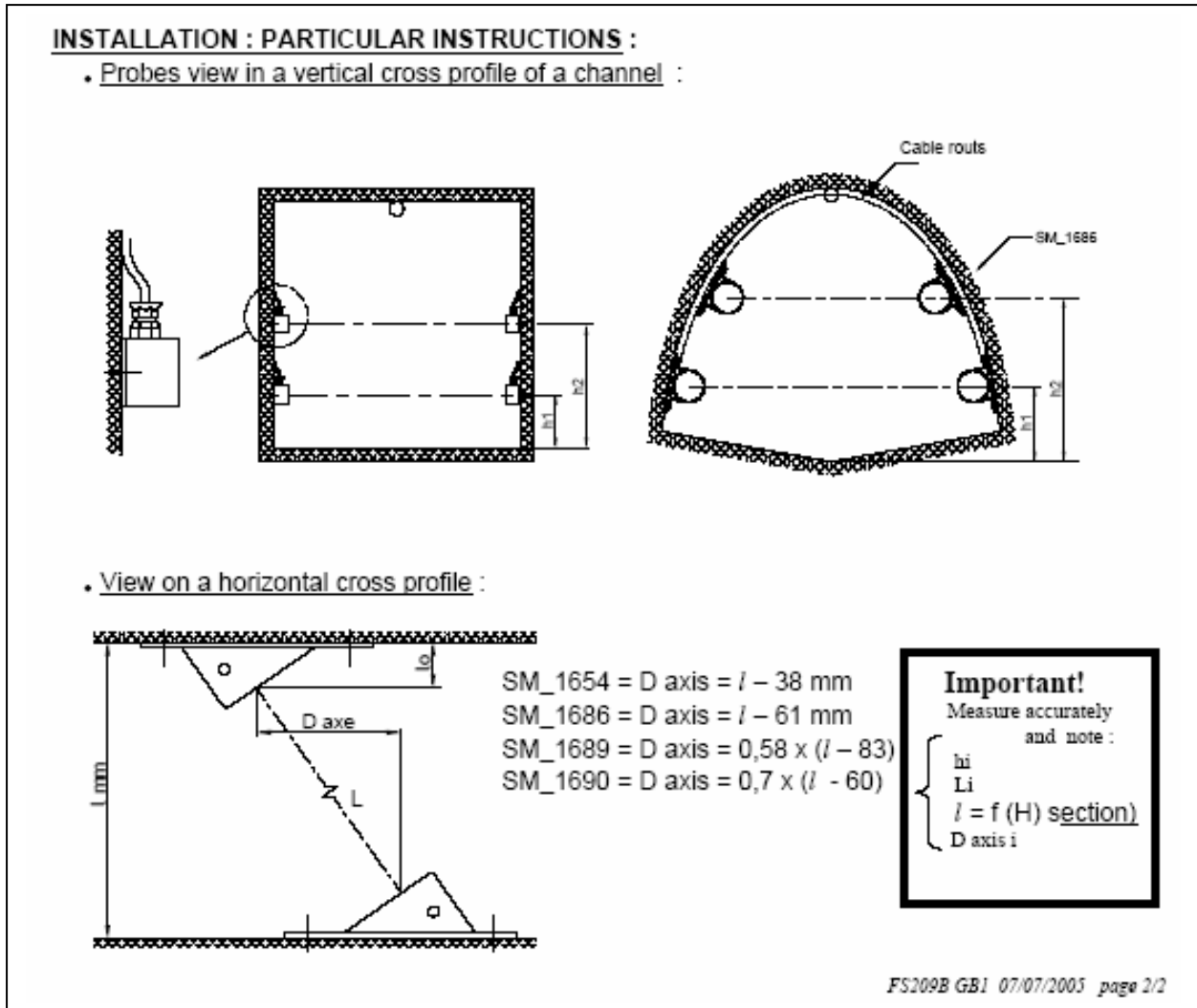
This can help for the electrical works reception.

4 – PROBES & SUPPORT INSTALLATION :

Resources or supports for probe installation are not developed in this manual.

Please refer to the selected probe data sheet or to our probes installation procedure.

Here below is an example:



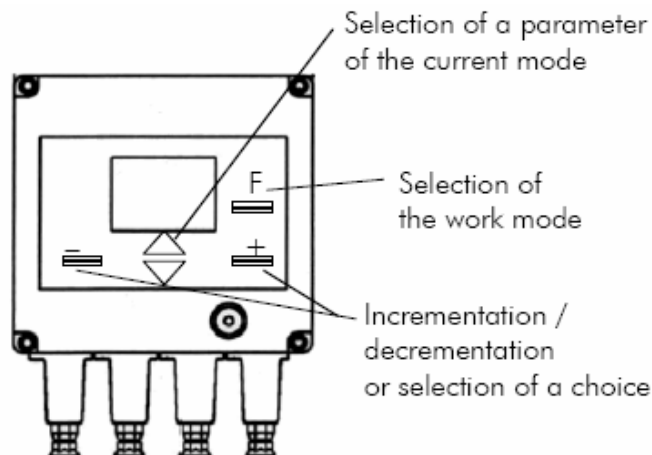
Thus, it is very important to choose the best probe for your application and decide how to install it before to order an instrument. Our sales and project engineers will be very happy to guide you.

Any special or dedicated solution as studied by our people and proposed for your application has priority on our general procedures.

It is very important to perform an as good as possible probes alignment and to plot and note carefully all L , D and H distances.

5 – USE OF UF 322 CO/RV (S) THROUGH KEYPAD AND GRAPHIC DISPLAY.

5.1 : Function of the keys



The LCD graphic display can be used both for measurement reading plus attached information as signal quality..., and also for new setting entry, if you are allowed to do it.

So, to protect a converter from a “wild” change, it is possible to enter an access code, from 1 to 65535. Later, its entry is not requested to read measures or setting data but will be requested to do more.

Pressing **Up** and **Down** arrow does display screen to change, both in measurement mode or calibration / setting menus.

Pressing **F** permits to select a menu. Browser is obtained by pressing F many times or F followed by +, + ...to go up, or - ...to come back.

Entry in a menu or mode is done by **Up** or **Down** arrows.

Modification (when allowed) is done by pressing + or – touch. This permits, depending on the concerned data, else increasing / decreasing of a number, else changing the attached text.

Pressing a long time does the change rate faster.

Pressing **F** touch does the exit from the menu and a comeback to the measurement mode.

5.2 : Listing of the different Mode & Menus by pressing **F** :

- Measurement mode: it has priority Nr 1 after switching On the unit or any return by F :
- Configuration Allowed? : Access code, language selection, storage or recall, firmware version.
- Calibration: setting of units, outputs, display...
- Definition of chords: number, L, D and H,...
- Description of the channel / river section.
- Description of the hydraulic profile.
- Definition of the level information(s) format / range.
- Velocity versus level calculation.
- Linearization.
- Data logger setting and display.
- Echoes display.
- Tests and simulations.

- A confidential code permits to access the Factory Setting menu : in this menu, we place the input and output analog to digital conversion factors. As their calibration requires qualified current source or milliamp meter devices, it is recommended to let them to Ultraflux charge.

This menu permits also some advanced setting on echoes digital treatment (Trt ER = Nr 0, 1 ..).

5-3 : Calibration Allowed Menu and Access code :

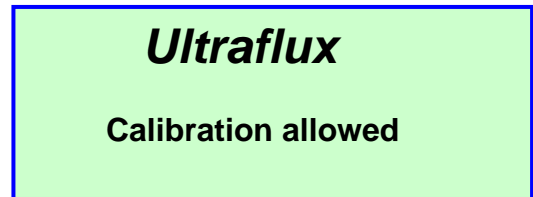
We describe this menu first as it can be a barrier to the user if any access code has been forced.

> Access = press **F** once from the Measurement Display mode :

> If the display is: >

Such a display means that there is no access code.

In fact, code is 0 , which means “no code”.



Thus, it is possible to enter further in the device setting.

From this menu, you can change the LCD display language.

You can also store the active setting menu (config. 0) into config. 1 or recall the already stored config.(1) to take place of the active one.

It is possible to enter a text to give a name to the device.

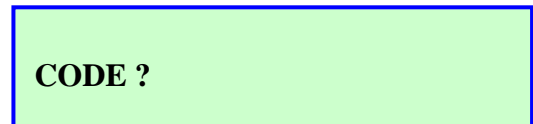
You can also enter an access code, from menu page 2.

! This code will become active after de-energizing the device.

Remember to make a note of it. It will be required for any further intervention.

> If the display has in addition this message :

Enter this code.



Otherwise, no possibility to change any data in the instrument.

After having entered the correct code, the second screen of this menu displays it, meaning that you are true (or the winner!).

You are then allowed to reset it to zero or to change it.

> In case of loss of this code, contact Ultraflux by giving the following information:

- The serial number of your UF_322 as it appears at the last line of the screen Nr 4 of this menu.
- The “to day” date (*) as displayed by the instrument in measurement mode (*or later dates).
- Ultraflux will send you back a (or some) “one day available” codes.
- An operation will be requested to force a “joker” code to be calculated and placed instead of hidden real code in UF_322. This code will be placed in Ram memory.
- To force this temporary code for the selected day, switch Off the UF_322. While keeping F touch pressed, switch unit On and, without releasing F, press Up and Down at the same time.
- Red LED shows that the action has been done.
- Don’t switch the unit Off, otherwise you will loose this action results.

Enter the code as given by Ultraflux. It must permit you to take again the hand. Reset it or change it.

6 – USE OF Ls 322 CoW SOFTWARE TO SET OR SUPERVISE AN UF 322-CO/RV(S) :

This software is delivered for free use with all our instruments. You must also have the cable to connect the device to a PC on its RS-232 serial communication port COM.

In case of lack of this “Com. Port” on your PC, use a converter module from USB.

As already explained, software makes easier and more reliable the setting operations. It makes the PC to be a supervisor of the connected UF_322.

Among the large possibilities that it offers, we can mention:

- Following up in real time of measurement mode and its results: flow, stream velocities, water level, sound velocity, ultrasonic signal or amplification gain on each chord...
- Saving measurements or parameter setting data into a file, for later analyze.
- Displaying and saving the data logger in a file with connection to Excel.
- Preparation of new calibration / setting menu(s).
- Downloading to the UF322 a new or modified configuration menu.
- Printing of displayed or saved data.

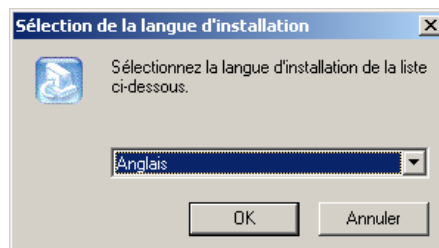
6-1 : Software installation : *This software is included in the delivered CD Rom.*

Check that it is good version as displayed by UF_322 in its configuration menu at line DISP= xx. Here below, we list menus of version 09.

The line DSP has less importance and concerns only the Emitting / Receiving installed PC Board.

This software works on a PC with Windows version 98, NT4, Millenium, XP, 2000 and Excel 97 or later versions.

The installation file comes with a “**Set up.exe**”. A double click on it will display:



After language selection (French or English – but this change can be done later in Config. menu), and a click on OK, the installation procedure will start.

Software proposes to place this file in “C: \ Program Files \ Ultraflux” folder and will create an attached data file. Up to you to guide this installation at another place or folder name with the browser.

If this software already exists on your PC or if it is a new version with same first reference Nr (here 09), the PC will ask if you want to remove the previous version before installing the new one or to repair or modify it. We recommend removing it first and then re-installing the new one.

After a click on “Next”, our installation shield will display “Finished”. Close opened windows.

Installation is finished. Software can now be launched from the corresponding icon on PC Desk.

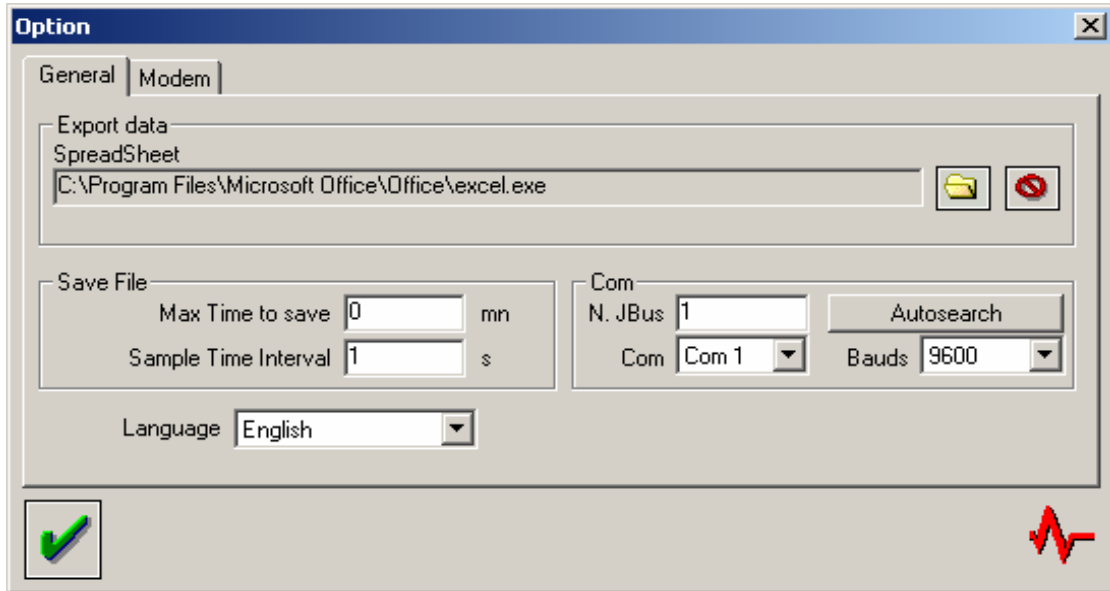
6-2 : Software configuration :

This menu permits to fix the direct communication data with the connected UF 322: Used com. port on the PC/ Baud rate / and UF_322 device slave number.

These two data must be the same than those already entered in this UF_322.

To force these parameters, click on “Autosearch” which will test all possible combinations.

Important! *This dialogue is possible only if the device is in its measurement mode.*

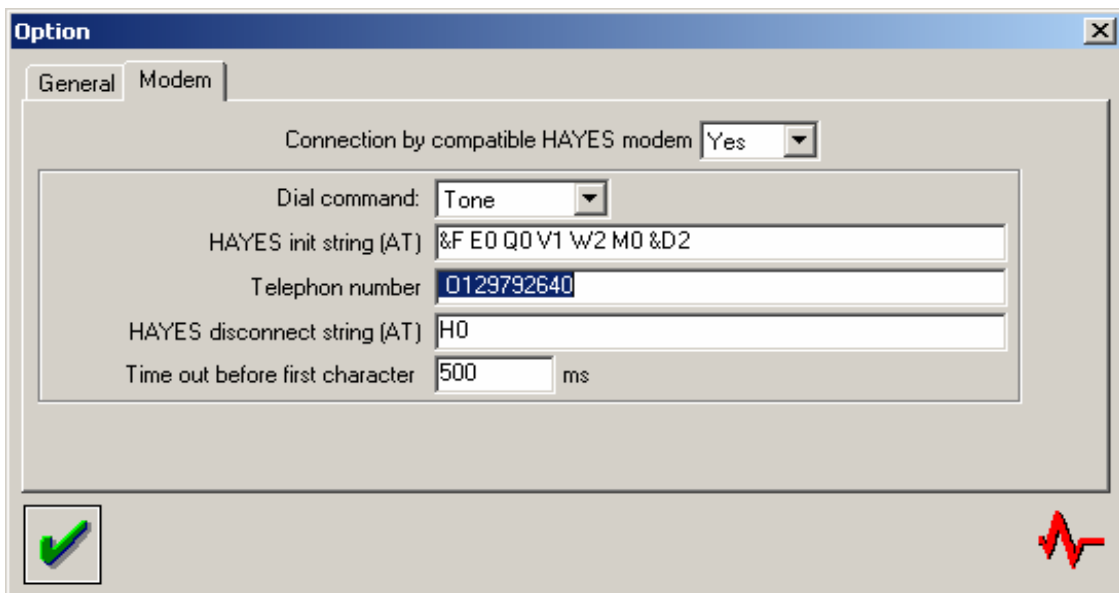


Software detects the path up to Excel. You can also fix in “Save File “ menu a sampling rate and an automatic record time to use PC through software as a data logger.

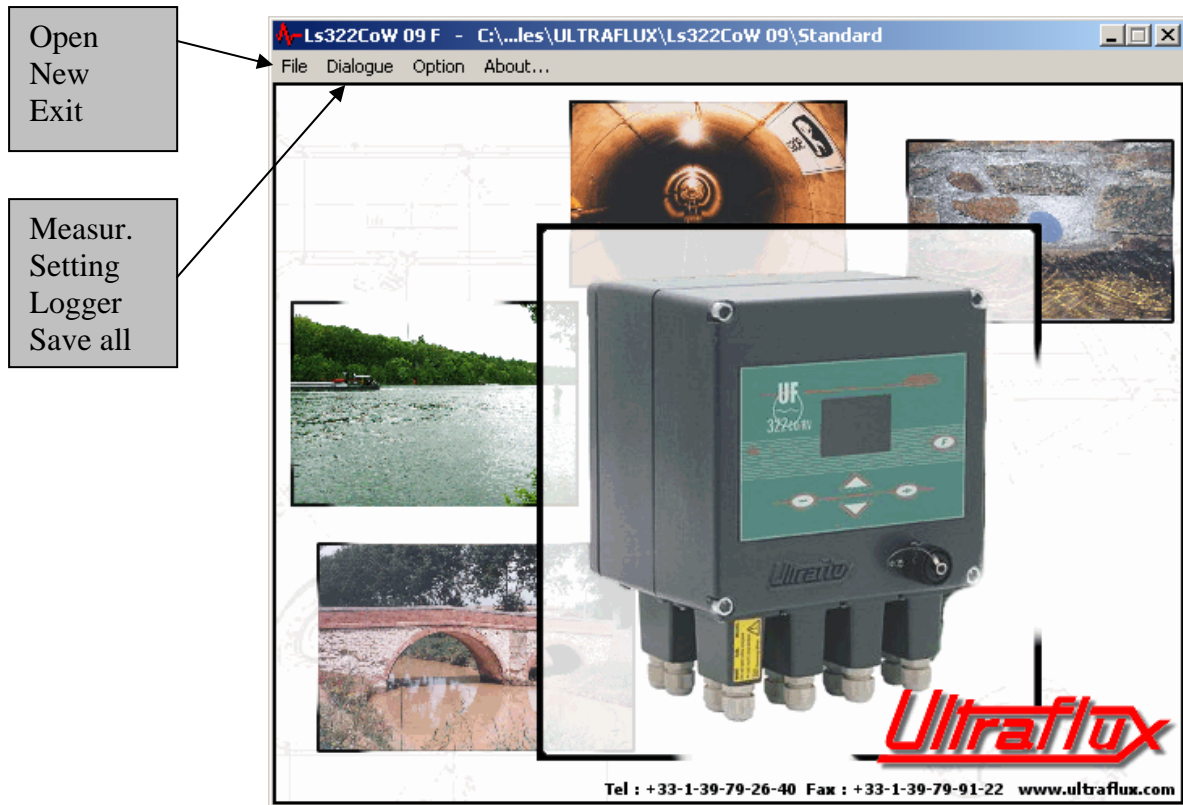
A click on the green button permits to record this configuration and use it another time.

If UF 322 is distant, it is possible to enter in dialog through a compatible Modem .

Here below is a typical configuration menu for such a communication:



6-3 : Software control panel with its control tab :



A click on tab. “Dialogue” asks for the connection with the UF_322 device.

This condition being OK, you can get on your PC screen, after a click on one of the proposed tab.:

- Measurement” menu: the complete display of all calculated results (including raw values and their quality indication). See chapter 8.
- The display of actual “Setting” and the possibility to modify them, download, save (> file) or print.
- The reading of the internal “data-logger” records and saving in a file.
- The tab. “Save all” permits to save the setting menu, but also other menus for which you don’t have the rights: Factory setting & Ultraflux setting.

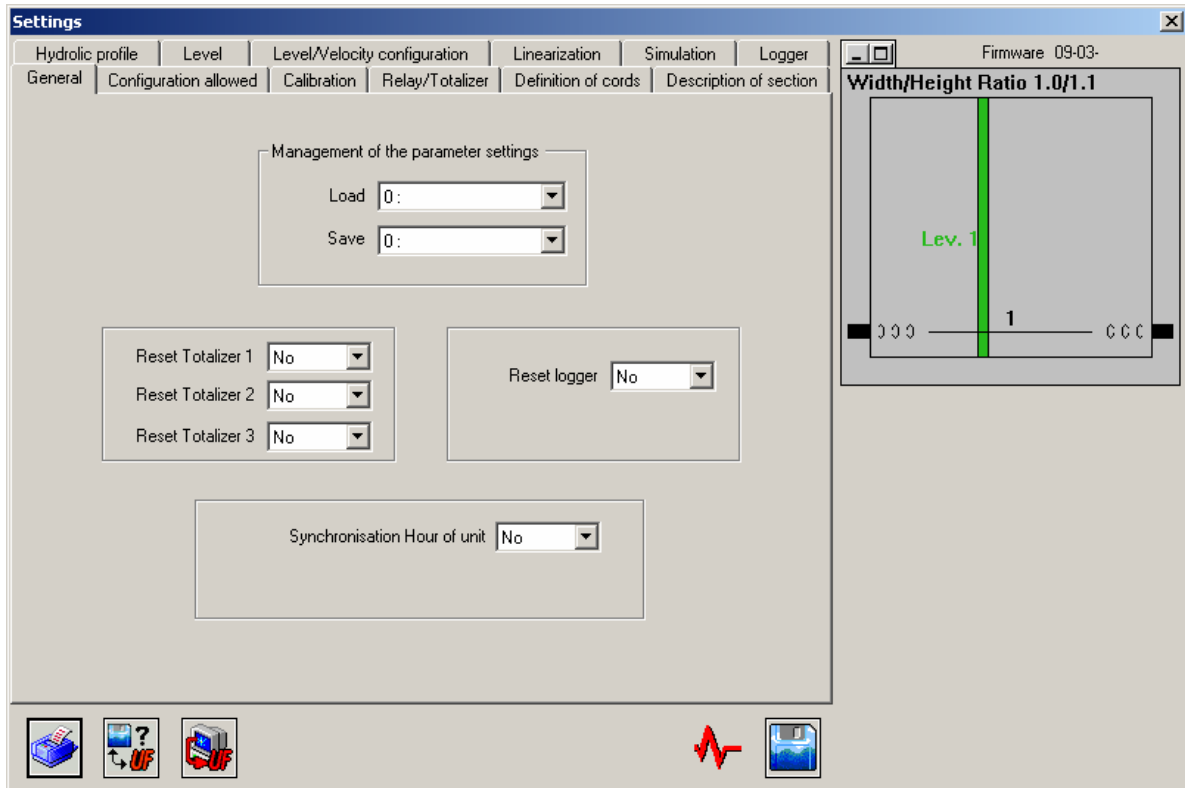
A click on tab. File permits (but Exit, which effect is evident!):

- to read an already saved file with tab. “Open” :measurements (*.mes) , setting (*.eta or **.rus**) or **logger** (.log), for analyze or treatment (> Excel for instance : *.xls).
- to use a setting file, to modify it if necessary, to save it with another name, and to download it to the UF_322.
- to start a new setting menu from a blank sheet by a click on “New”. This new menu can be saved, printed and download to UF_322 device just after or later.

We will use this last menu further to show and comment each chapter of this setting menu.

6-4 : Software in Setting menu :

The arrangement of top control-tab is very similar to the listing of Keypad / Display sub-menus:



The different icons at the bottom need few comments:

- A click on the icon “Printer” opens *Windows* available printers dialog window.
- A click on the icon “Diskette” opens a standard dialog window and asks you for a name before to save a file.
- A click on “PC > UF” permits to download the selected menu to the device.
- A click on “ ? “ will ask for another saved menu, do a comparison and display the difference. This permits to compare actual menu to a reference one.

From this General setting screen, you can also save or load different setting menus with only a number as reference (setting menus management).

Another possibility is to update the time setting of the UF_322 at the PC time & date.

This menu permits also the reset of the totalizers and of the data-logger.

The corresponding action is done after a click on PC > UF icon plus confirmation.

7 – UF 322-CO/RV(S) SETTING TO A TYPICAL APPLICATION :

*To set data in the different sub-menus, we recommend to do it step after step in a logical order. To show these steps with comments, we will copy principally software menu screens. When useful or necessary, we will add corresponding display of the UF_322** menu.*

We recommend the following order to enter the data or required setting:

- Chords and Probe menu: Number of chords, Probe reference (Freq.), “as built” geometry.
- Channel or River section description from (Ho) or bottom.
- Definition of the level(s) information.
- Level > Velocity calculation table (If used and level is lower than lowest chord).
- Hydraulic typical velocity profile.
- Calibration : graphic display / flow units /4-20 mA output / Totalizers / Relays / Com.
- Data logger setting.
- When rights are allowed, Factory setting.
- Optionally (anyway, later and if necessary only), a linearization function.

The test and simulation menu can be used simultaneously to fix a level or a velocity. The measurement mode will show what are the obtained results, step after step.

The echo display menu is helpful as soon probes are connected and their menu set. It helps to check the signals quality, the probes and their alignment.

Probes must be immersed! Do your best to have this situation at commissioning or test time.

*When using the software, every time that you change of sub-menu, the view shown on the upper right side is actualized to **display channel or river section and probes position.***

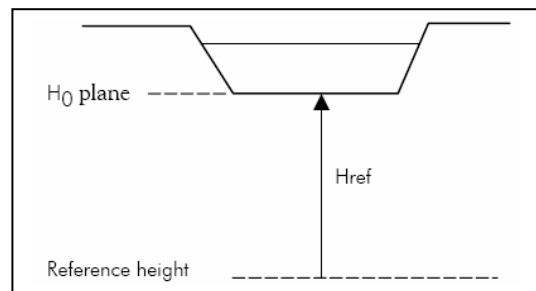
This picture is very interesting to see your setting to advance. Moreover, it permits to detect immediately a wrong entering and thus to correct it as soon as possible.

This picture don't respect the Width / Height dimensions. But it displays the ratio.

Very important: to understand the setting logic, you must fix a reference level Ho.

All geometrical descriptions in elevation as chords position, section description, level input, are plotted and entered from this Ho.

Same, hydraulic profile is described from this Ho.



*It is possible to enter a small section **So below Ho** when this area is very difficult to describe.*

*This Ho can be fixed from an absolute level with **H Ref.** data, which varies country by country. In France, it is the level of a marshland by Marseille harbor (NGF reference level).*

If an H Ref. is entered, it will only shift the level display result.

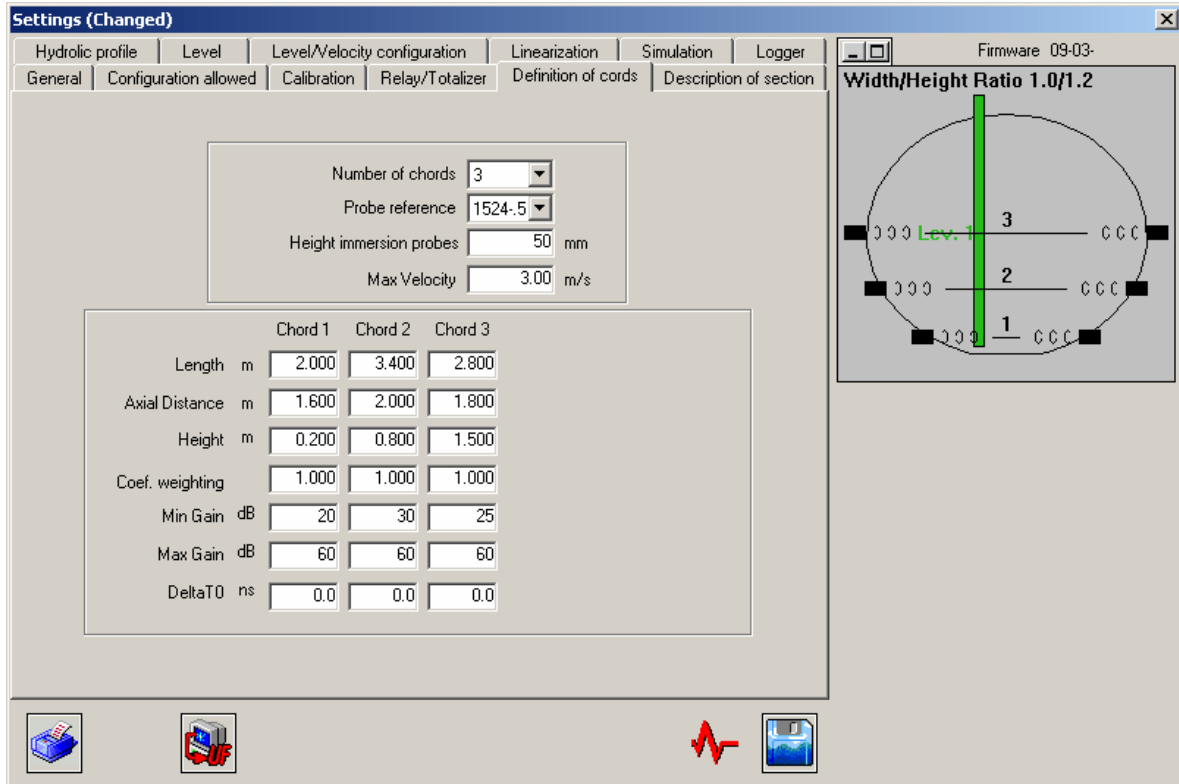
Later on, we will give some counsels more oriented to river applications or other to channel flow measurements. But, your site knowledge or analyze has priority.

7-1: Chords and Probe menu :

Probe reference will give its characteristics to the E/R board and especially the ultrasonic frequency. Please fulfill this request correctly in accordance to installed probes (same ref.).

The number of chords will open the same number of chords menus. If three chords are installed and connected, enter 3. Otherwise, the last chord(s) will be ignored.

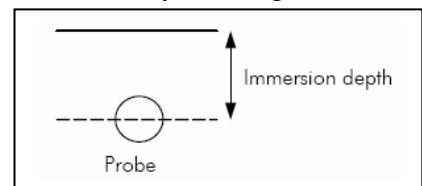
We recommend setting the chord Nr. 1 as the lower, Nr 2 above ..., but it is possible to let the UF_322 decide from the installed elevation entered value.



This is an example of installation of three chords in a sewage water circular channel.

To avoid the risk of wrong information from a chord, which is not sufficiently immersed, we enter a minimum immersion level. Just note that we can use mm or cm.

This entry depends on the chord length and probe frequency. 50 mm (5 cm) is usual with 0.5 MHz probes and L up to 5 meters.



L is the distance probe-to-probe faces, chord per chord.

D is the projection of L on channel or river stream axis.

H is the chord elevation from Ho. The two probes must be installed at the same elevation.

The Max Velocity is to detect over speed, thus impossible, such a measurement to be rejected.

Min / Max amplification range is to limit the automatic gain control when the water quality is very changing. For instance, the chord is rejected when gain reaches max set value.

Delta To is the zero offset compensation. It can be controlled at null flow, when possible (rare!).

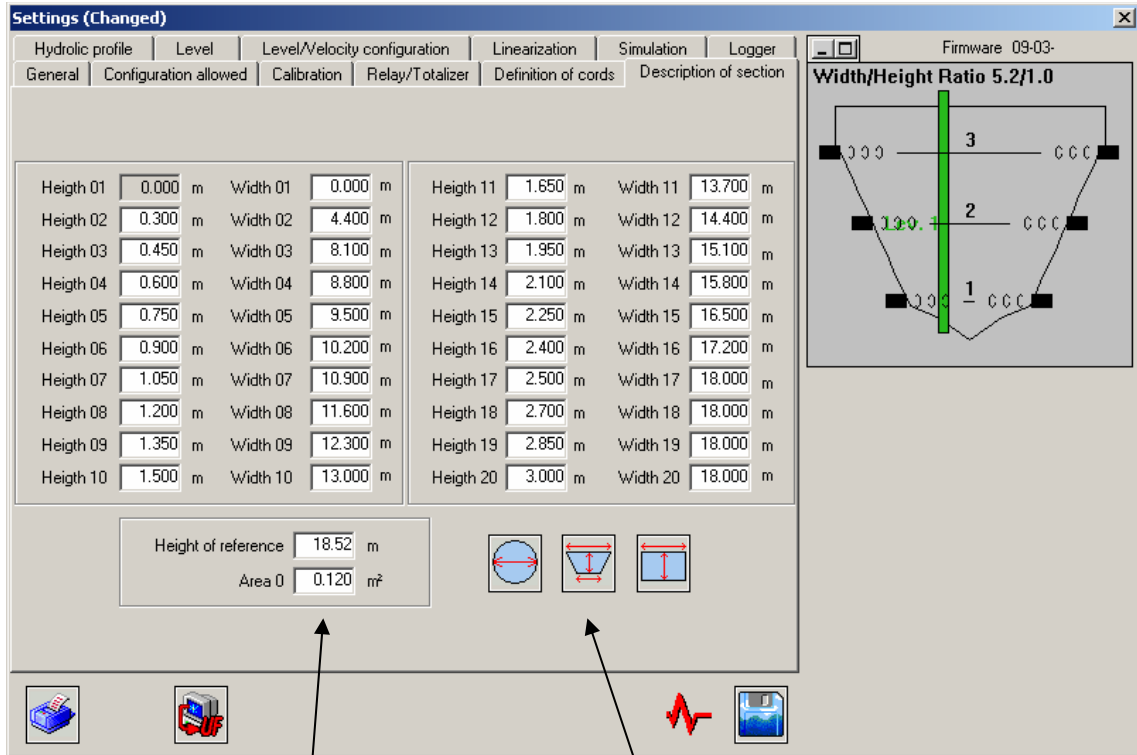
The weighting coefficient is normally 1. It is a multiplying coefficient for each chord.

7-2: Channel or River Section Description :

UF_322-** offers up to 20 couples of data to describe “width versus level”. The elementary section between two successive data (thus 19) is considered as trapezoidal.

The description starts from Ho, normally nearby the channel / river bottom or bed, and with increasing levels. It is not necessary to fulfill the complete table as long the section concerned with the flow is described.

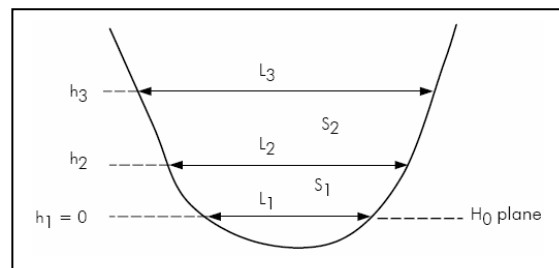
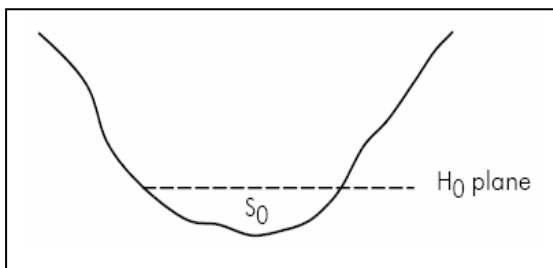
At its upper part, this section can be closed (underground duct) or opened (river, irrigation canal).



The software permits a fast setting on some typical channel shapes: if round, enter the pipe diameter; if trapezoidal, enter lowest and highest width plus height between; if rectangular, enter width and height.

To enter a small **So** section, below **Ho**, use Area 0 data. This data permits an easy compensation of the really wetted section when there are sand or other solid deposits at the bottom and that this level can change. In such condition, Ho would be set a little bit above this bottom. This data is also very useful to describe a river irregular bed (stones...).

Another solution is to enter the first elementary section as null and change H1 to adjust it.



$$S_i = \frac{(L_i + L_{i+1}) \cdot (h_{i+1} - h_i)}{2}$$

7-3: Definition of the Level information :

Although most of UF_322-CO/RV (S) are installed with only one level sensor, it is possible to connect a second one. Level Nr 1 has always priority. If level Nr 2 differs more than entered {Max. difference}, UF_322 gives an alarm. It doesn't switch automatically from 1 to 2.

UF_322 screens are :

Nr of Levels = 1 or 2

Priority = level 1 (always)

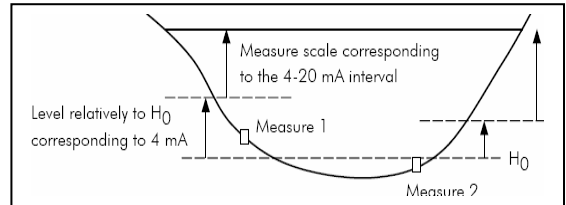
Max. difference = x.xx m

Level / Ho

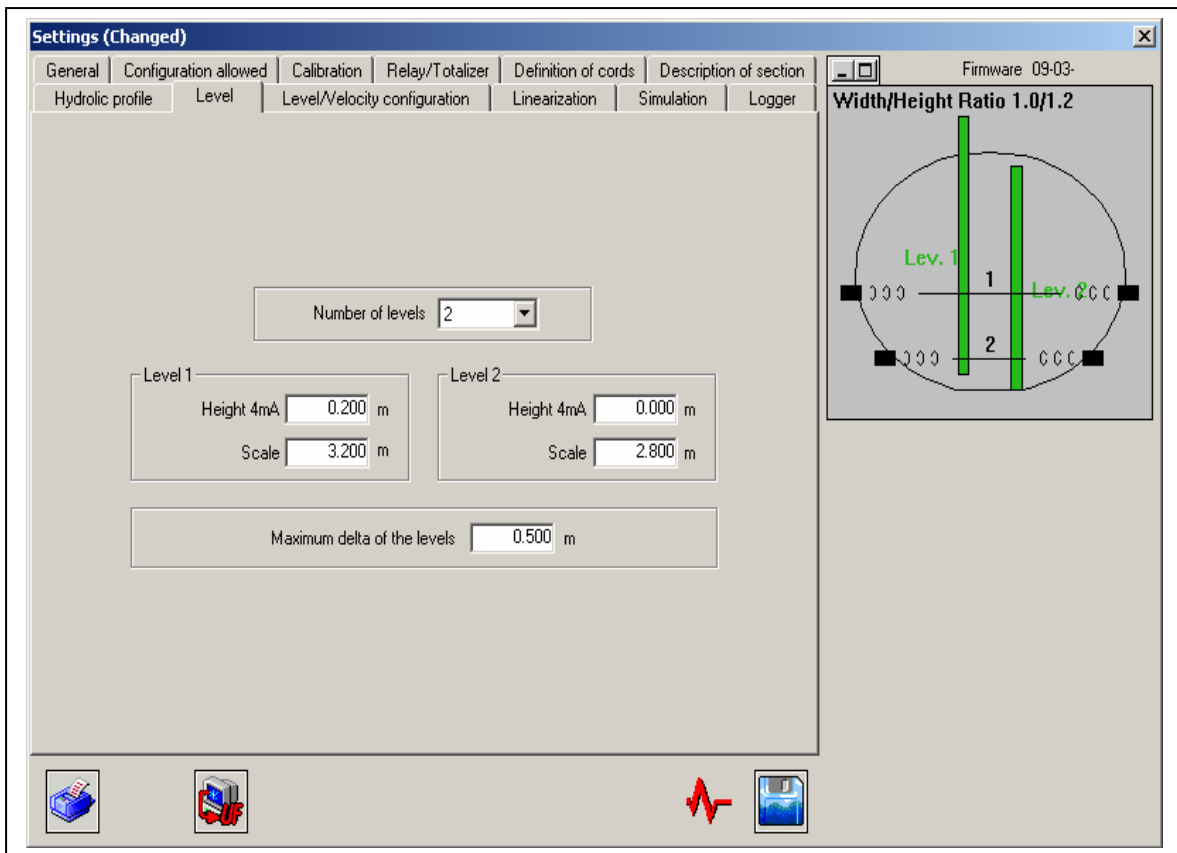
Level 1 : 4 mA = -/+ xx.xxx m
Scale = -/+ xx.xxx m

Level 2 : 4 mA = -/+ xx.xxx m
Scale = -/+ xx.xxx m

Note that we ask to enter the equivalent level from Ho at sensor 4 mA, which can be above (+) or below (-) Ho. Scale is not the level value at 20 mA but the range of the sensor from 4 to 20 mA.



Corresponding screen on PC is :



The graph shows that the two level sensors can have a different calibration.

7-4 : Velocity versus Level calculation table : (Level / Speed configuration)

The use of this menu is optional. If you let all data set to zero, it is inactive.

When water level is lower than the chord 1 (the lowest) plus requested minimum immersion, the chord measurement result will be rejected, even if it is still working. Thus, the UF_322 will display FLOW = 0.00 and message **Low Level**.

To replace the missing flow velocity information, it is sometimes possible to calculate an approximate velocity from the water level. This is usually possible when flow and level are not or not much influenced by downstream conditions.

With a correct filling of this menu, UF_322 would continue to calculate a not too wrong flow. This permits to have continuous informations as long as the channel doesn't dry out, as it can be during dry weather conditions, and to continue to drive a sampler with no interruption.

To calculate what the more reliable data to enter are, there are two methods:

- Either calculate what would be the flow at a certain level by using Manning* or Chezy* formula.
- Or have these data from site experience.

(): Please contact Ultraflux or your specialist in hydraulics for more information.*

In both cases, it is necessary to calculate the flow average velocity from flow divided by wetted section at some correctly spaced levels.

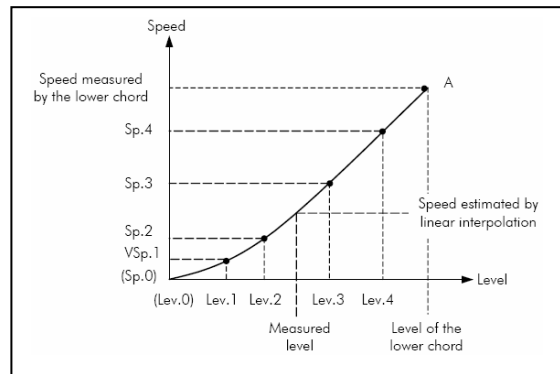
- We consider that a level = 0 (Ho) gives a null flow velocity.
- Above Ho, **we can enter 4 couples of points V = f (H)** which give 4 segments to interpolate progressive results.

- H4 must be a little bit above H[Chord 1 + its Min. Immersion].

Enter these points as follows

We give here below a copy of a typical screen on UF_322 display :

CONFIGURATION LEVEL VELOCITY		
Pt N°	H (m)	V (m/s)
0	0	0
1	0.05	0.12
2	0.20	0.30
3	0.42	0.55
4	0.68	0.88



This example considers lowest chord at 0.60 m and min. immersion = 50 mm.

7-5 : Hydraulic Flow Velocity profile :

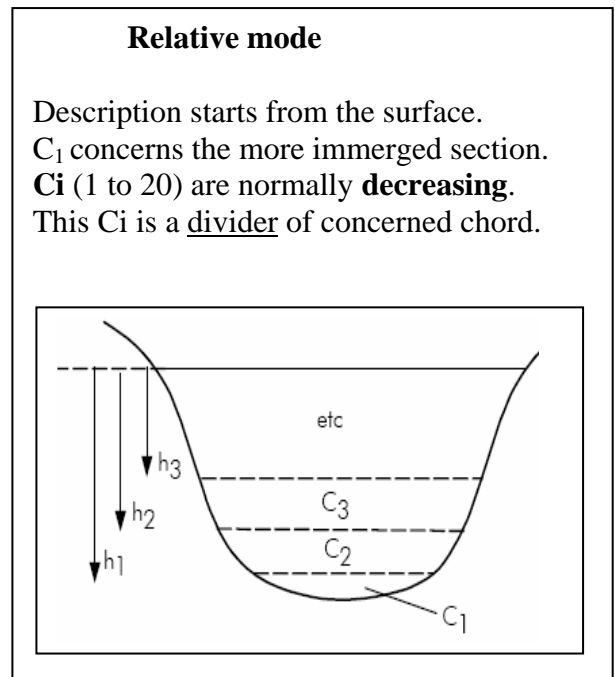
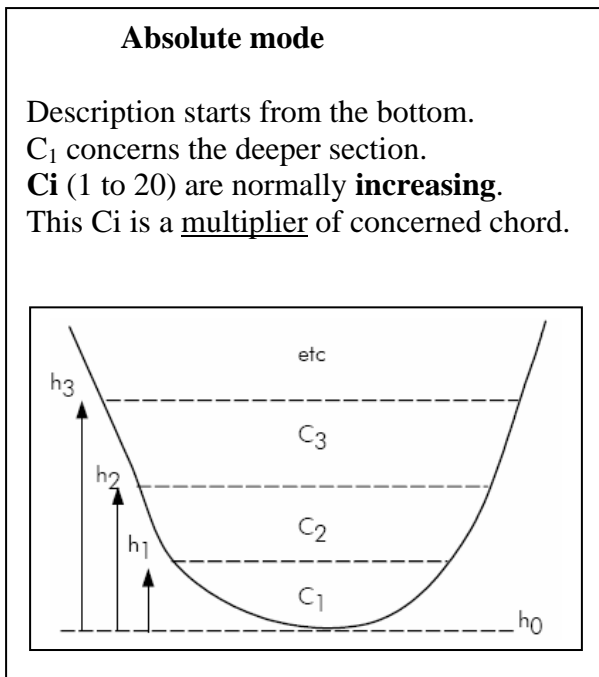
Any channel or river have an equivalent hydraulic radius, due to its particular wall or bed surface roughness and other reasons which make the flow stream not the same at different locations. The best solution would to measure everywhere, but it is not so easy.

The great advantage of an ultrasonic chord is that it integrates the flow velocity all along its path, this been repeated in the different installed planes. If 3 chords are installed and immerged, UF_322 knows three very rich informations.

How works our hydraulic profile calculation ? For a better understanding, please read our didactic manual NT 122. Here below is only a summary.

- We offer the possibility to describe this flow profile by 20 elementary vertical sections, each one being a trapezoidal section and each section receiving a coefficient **C_i** in reference to the average flow velocity, which coefficient should be C=1.00.
- The width of each section is the channel width at the level, and the height of each section is a percentage of the whole height. Basically, we propose to set this percentage 5% per 5%.
- There are two means to consider this whole channel height : or the whole channel section or only the actual wetted part.

The first method is named **Absolute mode** and the second one is named **Relative mode**.



As the chord number is limited and thus all these C_i are not really measured, our firmware looks for the nearest available chord which result is **V_{NAC}** (it can be V₁, V₂,... V_N).

Absolute mode gives **V_i = V_{NAC} * C_i / C_{NAC}** ; Relative mode gives **V_i = V_{NAC} * C_{NAC} / C_i**

Then, actual flow is calculated as an integral : **Q = Σ_(1 to 20) S_i * V_i**

What is the best mode to select and what are the coefficients?

Relative mode is the easiest to set if you want a ready to use solution. We deliver our instruments with this mode and we attached table already filled with coefficients as recommended by **ISO 6416**.

With this mode, the level can vary in a wide range and the device will continue to adapt these coefficients to take in account that the flow velocity is reduced near the channel bottom.

Absolute mode permits easier entering of coefficients adapted to a site. We usually start with coefficients forced to [1.000]. Then, we look to what would happen at certain levels (channel width changes from a narrow section to a wider for instance), which will do the flow speed decrease nearby. Another method is to have already done a flow profile by plotting. Then, you have to fill our table with the corresponding relative coefficients, some being obtained by extrapolation.

We recommend absolute mode for rivers where water level is quite stable.

For both modes, the more there are chords, the less any hypothesis has weight on the flow result. Each chord Velocity results can be plotted on the theoretical flow profile curve. This practical point must be on (or closed to) this curve, otherwise something goes wrong and asks you to change the hydraulic profile coefficients to adapt them to your site.

We highly recommend using the software to fill the hydraulic profile.

Immersion	Level (%)	Coefficient
Immersion 01	95	1.600
Immersion 02	90	1.417
Immersion 03	85	1.261
Immersion 04	80	1.154
Immersion 05	75	1.084
Immersion 06	70	1.039
Immersion 07	65	1.005
Immersion 08	60	0.978
Immersion 09	55	0.955
Immersion 10	50	0.936
Immersion 11	45	0.921
Immersion 12	40	0.908
Immersion 13	35	0.895
Immersion 14	30	0.883
Immersion 15	25	0.871
Immersion 16	20	0.863
Immersion 17	15	0.858
Immersion 18	10	0.845
Immersion 19	5	0.837
Immersion 20	0	0.829

Mode selection and automatic table filling.

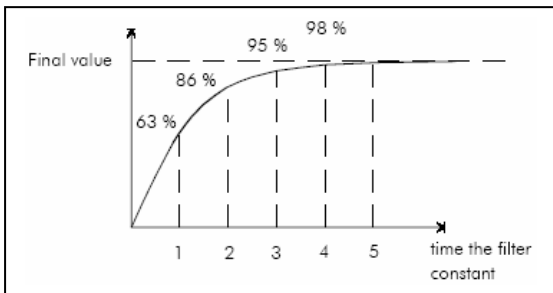
7-6 : Calibration menu : Display / 4-20 mA / Totalizers & Relays / Communication

If you use the UF_322 keypad / display resource, these setting are in Calibration menu, which menu includes also the settings concerning totalizers & relays and those concerning communication with PC.

If you prefer to use the software, we propose separated control tab. for [Display + 4-20 mA] and [Totalizers + Relays] setting, communication between UF_322 and PC being already done.

We copy and comment here below the UF_322-** keypad menu. There are 6 screens :

First screen : flow unit, filter, graph

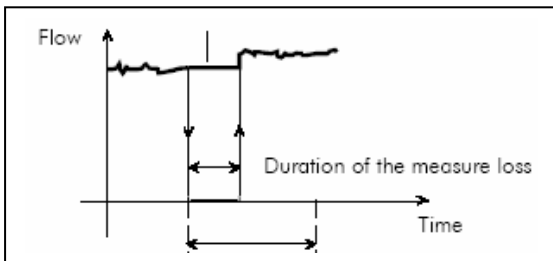


Unit Q = l/h, l/mn, l/s, m³/d, m³/h, m³/s
 Filter = 0 up to 240 s. per steps of 5 s
 Memory = 0 up to 3600 s

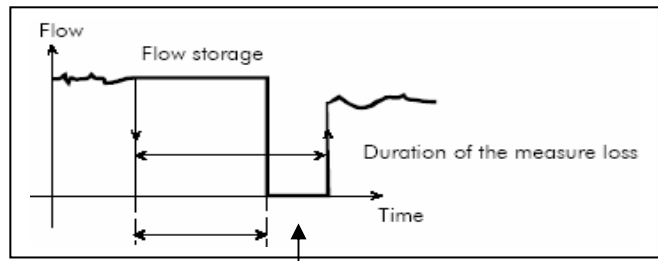
Graph. = Q moy (average), Vi, Level...
 min. =
 max =
 Graph step = 0, 5, 10, 30 second
 Or 1, 2, 5 mn > 24 hours

Thus, filter rate is a compromise: enough but not too high, stable reading but not too in late reading: 10 to 30 seconds are usual values.

Memory keeps the display on and also 4-20 mA & totalizers, in case of temporary lack of measurement data. Thus, as it is with filter, set it enough but not too high : 30 to 120 seconds are usual values.



Memory



Display and 4-20 mA forced to Zero

Second screen : 4 – 20 mA scale.

The 4-20 mA output can be set Off, copy a 4-20 mA format but also a 0-20 mA and a 0 + 4-20 mA, which means that output will be zero if measurement is not possible.

mA = 4/20, 0/20, 4+0/20, [4/20], ...
 O.C. = Q moy, V, Vi, Level 1 or 2, ΔL
 Min. =
 Max. =

This current can be drives from the absolute result (within vertical bars) which means that the data sign is ignored, or from the signed value.

Select the chosen data to drive the 4 – 20 mA output and give your min. /max. scale values.

Third screen : **Totalizers.**

There are three, named 1 to 3 :
(+) does totalizing up if flow is positive.
(-) does totalizing up if flow is negative
+/- does counting up without taking care of sign.

As soon a totalizer is declared active (not Off), display proposes to set the unit for volume counting and the weight for each totalizer (one can count 10 units per 10 units, another one have any number , 56, to drive proportionally a sampler).

All these totalizers can be separately reset to zero (Yes / No).

There is a fourth volume totalizer that you can read and use in measurement mode. It is only in liter, can be stored in our data-logger, can be activated, stopped or reset to zero from the menu.

Fourth screen : **Relays**

There are three : named 1 to 3
They can copy any listed information.
Some selections ask for another information.
If a relay copy a totalizer increasing, pulse width permits setting the relay closed state.

Totalizer 1 = OFF, +, -, +/-
Reset ? : Yes/No **Pulse weight** = 10
Totalizer 2 = OFF, +, -, +/-
Totalizer 3 = OFF, +, -, +/-
Unit Volume = 1 liter to 100 m³

Relay 1 = Open, Closed, **Tot.1** to 3, Fault, Flow Direction (+/-), Alarm
Relay 2 = **Fault**, +/-, ...as above
Q moy., V, Vi, Level
Relay 3 = **Alarm**, ...as above
Threshold value =
Pulse Width = from 17 to 200 ms

A too long pulse width limits the maximum relay frequency. So, the pulse weight has to be set also to prevent from an over speed...and an instrument unable to copy the information in real time (UF_322 does its LED lighted in such conditions, meaning a fault report).

Maximum frequency is 30 Hz (17 ms). 50 ms gives 10 Hz max., 100 ms gives 5 Hz ...if we consider a rest time equal to the pulse width.

Fifth screen : **Display setting**

Resume to measurement set a timer that does an automatic return to measurement mode if any touch is pressed.
Contrast setting depends on ambient temperature. Cold conditions could ask for 100%, but display screen could become black in summer. So, set a compromise or change it with seasons.

Back Light
ON / OFF / TIMED 1 to 5 mn
Resume to measurement
0 (=Off) or 1 to 30 mn (=On)
Video Display
Normal / Reverse
Contrast = 0 to 100 % (~65)

Sixth screen : **Communication with Software** (+time setting)

Select with V and set with + and -
Wrong setting or format does no communication or no record in the data logger.

Slave Nr (Serial Output) = 1 (up to 255)
Baud Rate = 9600 (300 to 9600)
Date = 17 / 10 / 05 (Day / Month / Year)
Time = 18 h 18 mn 54 s

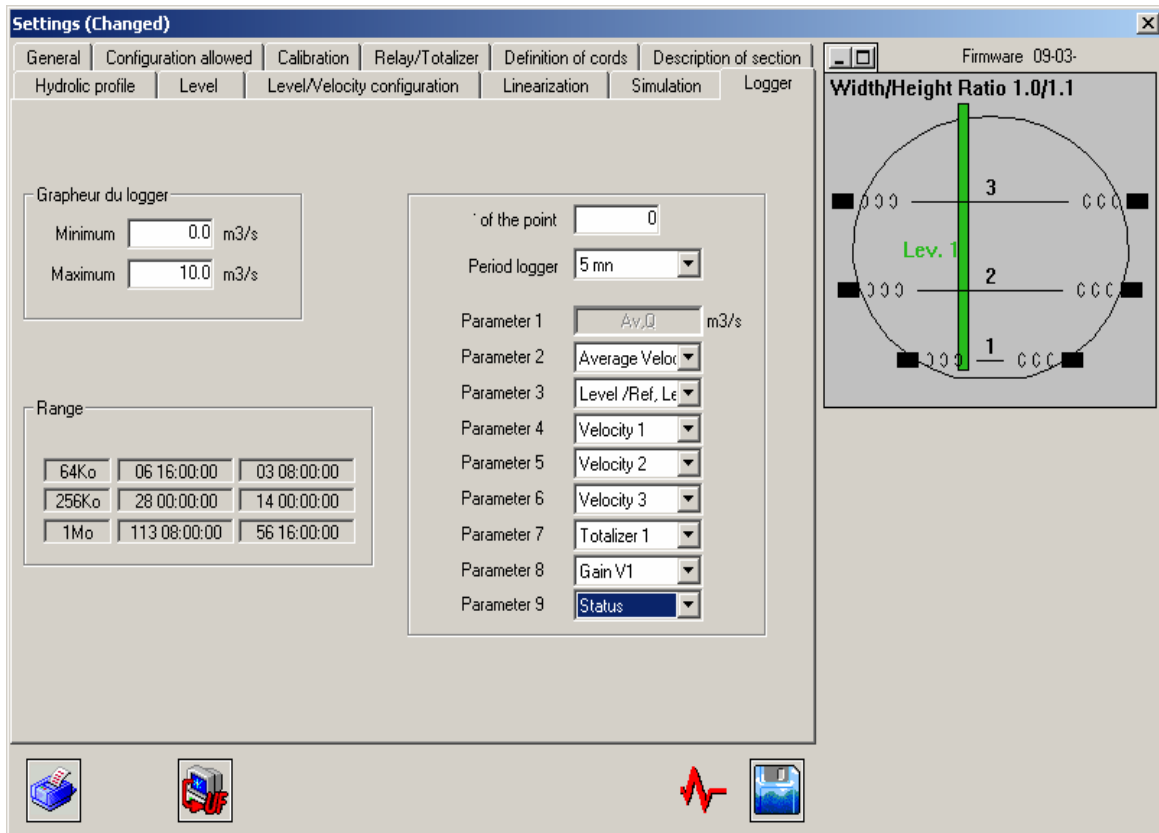
7-7 : Data Logger Setting menu :

The UF_322-** has a built-in data logger for its measurement results and control data records. We explain later in chapter 8 how to use this data-logger by using keypad + graphic display or, better, PC + software to Excel.

Before, it is necessary to set this data logger with your own selections.

As it is with other menus, this setting can be done on the device or through PC + software. Note just that instrument menu includes both setting and reading menus. Software proposes two separated Control tab., one in setting menu, another one for reading and saving (Dialog. Logger).

Here is the copy of the logger setting software menu :



- This data-logger records date & time , plus 4 or 9 selectable data.
- To change from 4 to 9 or conversely, it is necessary to reset it first to zero from keypad of from general setting menu.
- You can fix a logging period of 1, 5, 10, 30 seconds, 1, 2, 5, 10, 15, 30 mn, 1, 2, 6, 12 or 24 h.
- Depending on installed PCMCIA memory card, the autonomy is displayed in time range.
- The data to be recorded are selectable in a list except parameter 1 which is always the average flow. Open this list by a click on **V** and do your selection of parameters 2 to 9.

Except Q_{min} and Q_{max} which are the peak min / max obtained flow values during the set period, all the other results are averaged during all the period. This is very important for the accuracy of these results if we compare them to records done by sampling.

We recommend recording the “Status” word. It is a coded word that our software translates.

7-8 : Factory Setting menu :

As you may understand, this menu includes some confidential or, at least, important information or settings that only an Ultraflux qualified technician has ability to modify.

Thus, this menu is protected with a code from keypad and software as well. In case of need, we could give you the rights on keypad. After this code is entered, this Factory setting menu comes after the test & simulation menu. It permits to open successively 6 different screens.

First screen concerns the current output.

Its calibration is done through two numbers, that fixes the digital to analog conversion factors :

4 mA = xxxxx Pts is set to adjust exactly 4 mA

20 mA = xxxxx Pts is set to have exactly 20 mA

Current = x.xx mA does a current simulation for a test.

**OUTPUT CURRENT
ADJUSTMENTS**

4 mA = 10835 Pts
20 mA = 54255 Pts

Current = 12.5 mA

Second screen displays Level input(s) conversion .

The input current is converted in a number.

This conversion is linear, thus a Nr = xx.x mA

If you measure this input current, UF_322 displays the Nr and the current that it understands.

If the two currents are not equal, note the two Nr at 4 mA and 20 mA for each input and go to the next screen to enter the new 4 & 20 mA Nr (Pts).

DISPLAY INPUT CURRENT

1 : 24285 Pts
I = 8.87 mA

2 : 53697 Pts
I = 19.89 mA

Third screen displays these calibration Nr (Pts) :

If you are 100 % sure of your controls and your Milliamp instrument, you could change these calibration reference numbers if they are too wrong.

We do this calibration & control in our factory test procedure. We can also do it on site.

**INPUT CURRENT
ADJUSTMENTS**

1 : 4.00 mA = 10986 Pts
20.00 mA = 54562 Pts

2 : 4.00 mA = 11025 Pts
20.00 mA = 55106 Pts

Fourth screen concerns precisely the ultrasonic signals.

The possible adjustments will come after an “in depth” analyze of signals as displayed in our echo display menu.

Polarity adjustment helps to present the more reliable signal alternation to time measurement threshold.

A swap on a probe cable wiring does the same.

POLARITY Echo 1 = NORMAL
POLARITY Echo 2 = REVERSE

Trt ER-2 = 0 or 1, or Other.
Δ T Eff. = xx.x ns

Treatment E/R-2 does a change in “dsp” signal treatment. Standard delivery is with a code = 0.

A code = 1 forces the threshold at a lower level to have a more reliable triggering on amplitude changing signals. To know more about the other codes, please contact Ultraflux.

Δ T Eff = xx.x nano-second does a cut-off at very low flow velocity conditions.

Fifth screen shows some other factory codes.

Please, just note that code **Menu DEV** is no more used since version 6, the automatic reset of ER-2 after a long period without results (no water...) being activated by default.

Never modify any ER2 / ER3 SP menus if there are.

Reverse Display must be set on YES.
Otherwise, display turns 180° !

RAZ Q day = Yes permits to calculate a daily average flow that can be recorded in the data-logger.

Menu DEV = 0
ER2 SP1 : 32
ER2 SP2 : 32
ER2.....

REVERSE DISPLAY : YES
RAZ Q Day = NO

Sixth screen permits to set a special probe.(SP N°1)

We use this menu especially for large rivers.
Indeed, these applications ask often for special probes.
This menu permits to set their frequency, angle and
and dead time, but this entry is tight to the firmware
version.

Thus, don't touch !

The last parameter (Margin G max) concerns advanced possibilities, which touch measurement acceptance criteria when the amplification gain is too high.

Ref. : SP N° 1

To = x.x μ s
Angle = 0.00
Freq. = 200 kHz

Margin G max. = 5 dB

We don't comment here how to use it.

7.9- Test and simulation menu:

The maintenance or troubleshooting purpose of this menu is explained in 10.5

Here below, we explain how this menu and its facilities can be used during the commissioning.
We recommend using it from keypad, because the proposed functions are more complete.

The simulation menu is normally set with **Function = Measure**.

With a set message **Function = Simulation**, menu proposes Simulation **S** (Speed or flow Velocity), Simulation **L** (Level) or Simulation **T** (Total or both).

Supposing that you choose Simulation T, LCD will display such a screen:

V sim is the V value simulated on each chord.
Jitter is a variable ratio.

L sim is the level sensor simulated value.
Jitter is its variable ratio

UF_322* calculates from these values the T and Delta T, chord per chord, with C=1472 m/s , the wetted surface and the flow results. Outputs are active as they must be in measure function.

**FUNCTION
SIMULATION (Measure)**

V sim = + 1.923 m/s
Jitter = 5 %
L sim = + 2.127 m
Jitter = 8 %

Don't forget to set this menu function back to measure mode after having used it!

This menu permits also to make a test on the relays.

State of the three relays is changed by pressing + / -

RELAY 1 = OPEN / CLOSED
RELAY 2 = OPEN / CLOSED
RELAY 3 = OPEN / CLOSED

This menu permits to simulate the 4-20 mA output :

Change the simulated value with + / -

OUTPUT CURRENT TEST

CURRENT = 12 mA

The last function of this menu is to know the conversion factor on the level current inputs.

If you simulated 4 mA and then 20 mA on an input, you do have the two numbers to set this current input in its Factory setting menu.

Here we test the hardware conversion coefficients.

INPUT CURRENT DISPLAY

1 : 32540 Points
I₁ = 13.98 mA

2 : 29680 Points
I₂ = 12.74 mA

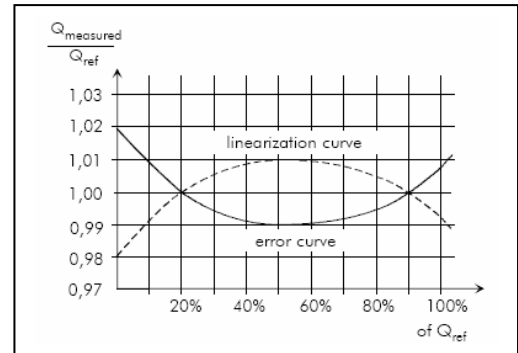
7-10 : Linearization function menu :

The use of this menu is very rare with open channel or river applications.

It is necessary first to know the error curve at many points of the flow range.

Supposing that you have these practical results or that you have a reliable standard, it is easy to correct our flow display by entering the invert of the error curve.

- Supposing that you have $E = + 3.4 \%$ as a relative error at 30 % of the flow range, you would enter in the linearization table : $30 \% = 0.966 \dots$ and so-on.
- The reference range for % is chosen with Q Ref. + Unit.
- We recommend the use of the software to set and enter a linearization curve.
- In standard, all the coefficients are (must be) set at 1.00. It is very easy to by a click on [= 1].



With $Q_{Ref} = 0$, this correction curve will be not active, even if there are wrong values in the table.

8 – MEASUREMENT READING :

This chapter explains both dialogs in real time with UF_322-CO/RV(S) in measurement mode plus records reading saving from internal data logger.

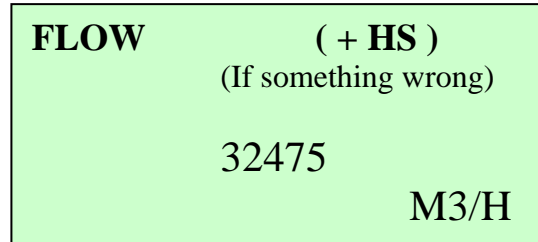
The measurement mode permits to know the actual flow results as measured by the device and their attached control data as well. As explained before, the software presents many advantages.

Meanwhile, the **display plus keypad use permits a quick access** to the knowledge of actual conditions, which are presented on 9 different LCD screens (or more if the UF_322* has more than 2 chords). We present here below some useful screen samples:

1 – Main Flow screen :

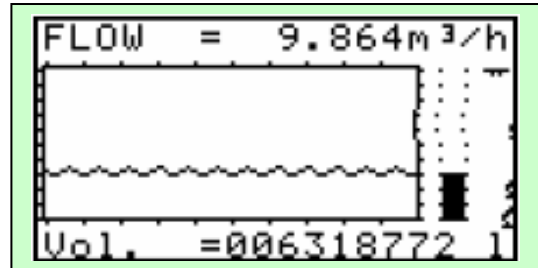
If any HS advise is displayed, please consult the screen [+9] or [-1] to know what should be the reason.

When water level is too low (below the lowest chord), unit displays here a “ Too low level “ message.



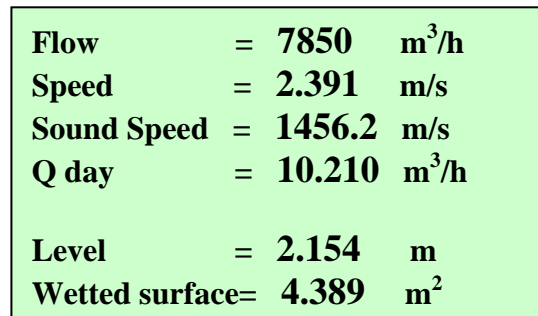
2 – Secondary flow screen with flow chart :

The chart display in relation with the graph period and range is very useful to compare actual flow to the time just before.



3 – Main values display :

On this screen, we have grouped: flow result, flow average velocity (Speed), average sound speed, last period (day...) average flow, actual water level and the corresponding wetted surface.

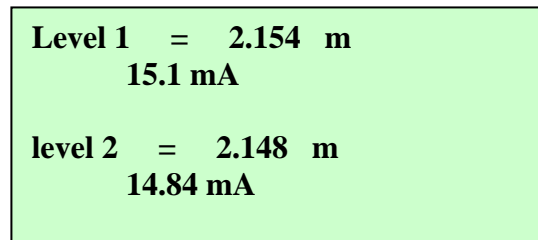


4 – Level versus level input current :

Level value as displayed comes through an acquisition of a (or two) current signal from a level sensor.

Everything should be OK if inputs/ outputs are well calibrated.

Here, the level display is given with its current image That you can compare to the sensor current.



5 – Raw measurements screen:

This screen displays transit time and its difference for each chord, plus flow velocity at chord level and sound velocity as measured by this chord.

All these results are very important as the final flow result is depending from.

Sound velocity can be used to check the L(path length) setting if you know the water temperature ($C = f(T^{\circ}C)$), or to know the water temperature along a deep chord, L being known in that case (river application).

Time Chord 1	= xxxx.x	Micro sec.
Delta T 1	= xxxx.x	Nano sec.
C 1	= xxxx.x	m/s
V 1	= xx.xxx	m/s
Time Chord 2	= xxxx.x	Micro sec.
Delta T 2	= xxxx.x	Nano sec.
C 2	= xxxx.x	m/s
V 2	= xx.xxx	m/s

6 – Next screen permits to read the volume totalizers.

The lowest one is usable as a partial totalizer. A press on [+] stops its counting up, the next press on [+] reset it to zero and starts a new counting up.

7 - Next screen displays the actual date and time plus when was the last Mains break down and power up of the device.

8 – Next screen gives a status on the running data logger : memory size, completed and free memory and last averaged flow record.

9 – Last screen before a complete lap shows the amplification gain value plus the possible reason(s) of a HS faulty message.

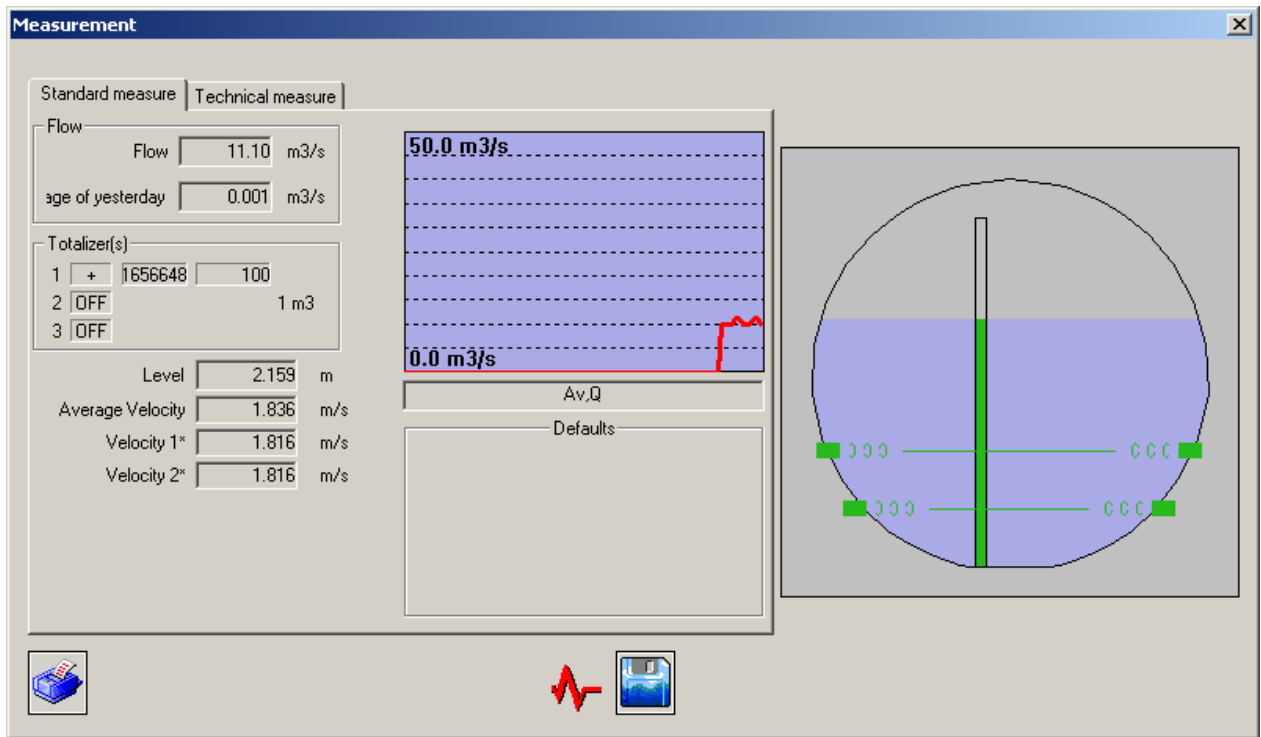
It is very important to note the usual amplification range. If later, a probes becomes too dirty or out from condition, or if any weeds or branches are laying in front a probe or along the ultrasonic path, the amplification gain will change and try to compensate the signal attenuation... up to a certain limit which could make the HS advise displayed.

Typical faulty conditions are when the amplification gain varies continuously from Min gain up to the maximum allowed value Max gain.

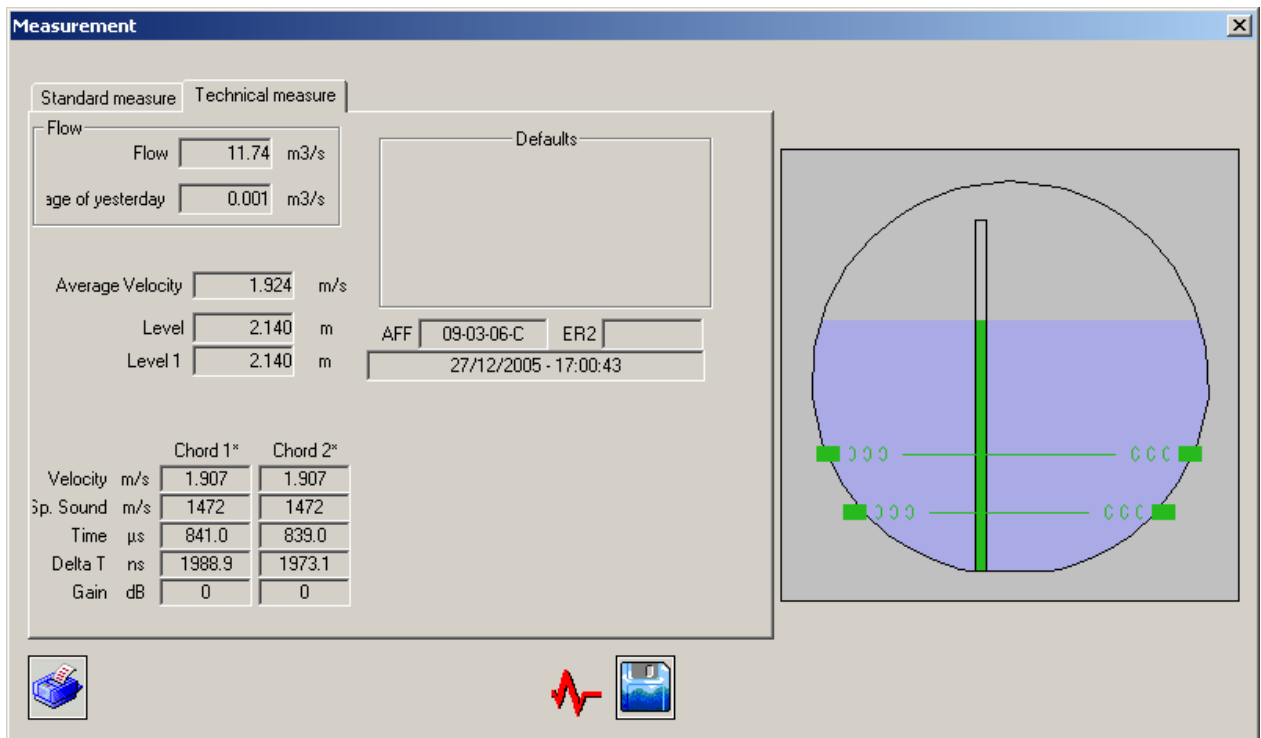
If there is not any level information, a message Fault L1 or L2 is displayed.

With our Ls322Co software, all these results and control data are presented in two menus:

The first one is called “standard”. It is oriented to measurement results.



The second one is called “Technical”. It includes more technical data, as PC boards& firmware versions (AFF ; ER).



9 – MEASUREMENT RECORDS :

There are two ways to make and then read the records:

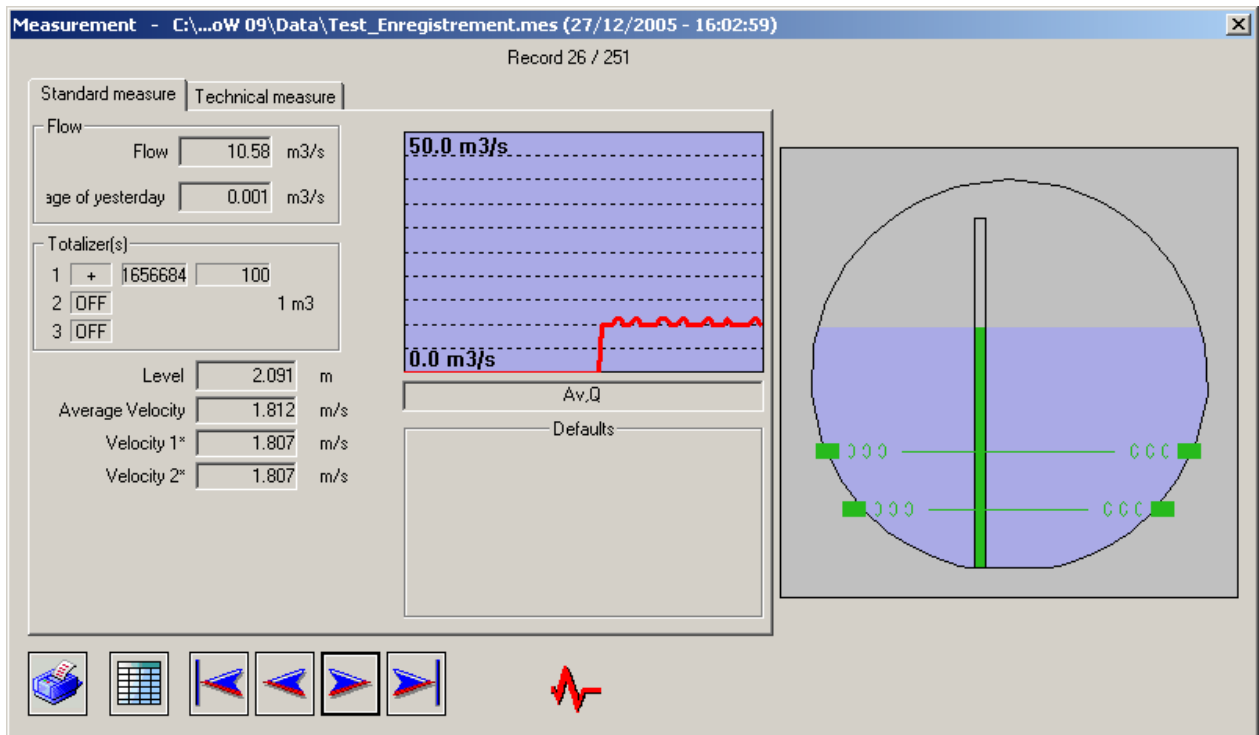
- Directly on the PC connected to the device, PC being recorder and reader.
- By using the data-logger (to be first configured- see 7.7) as recorder / reader, plus PC as reader.

9.1- Records by using only PC and our software:

It is recommended to fit first the record sampling rate and duration from the software configuration menu (see 6-2) by fixing the averaging period and the record duration (0 mn means that you will manually control this time).

Coming back to previous page, do a click on the diskette control tab. Software window asks for a file name. Give a name and confirm by a click on “save”. Records start immediately, at period rate and until the set time is finished (or if you click on “Stop”).

You can then read your records from the menu “File \ Open \ file name”, a click on and open. The display is very similar to the two screens copy on previous page.



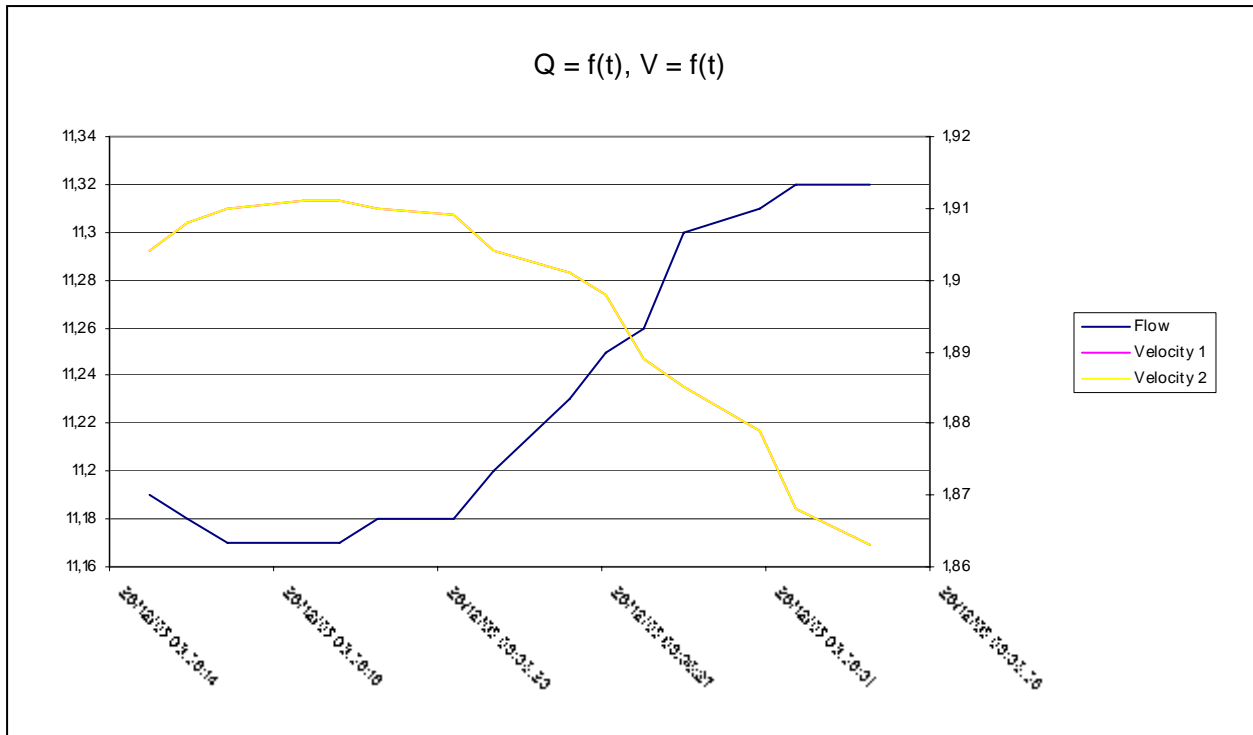
As you can see, there are some control tabs at the page bottom.

- The four blue arrows are used to run the recorded pages
- The fifth one permits a link to Excel and will launch a macro “Mesure 322Co_Vx.xls” to edit these recorded data on an Excel file.

Coming back to the configuration menu (6.2), our software installation shield should have detected Excel path and should show it. You can also force it with the browser.

Excel must be set to accept the macro (Excel tools). This macro permits an automatic edition of the flow / velocity curves.

Do a click on this fifth control tab: a first window asks you first if you accept or not to launch the macro to be applied to the selected. A confirmation message will be displayed. Confirm with “Activate”. A similar result must appear after few seconds:



N°	Date	Time	Date/Time	Flow	Flow Unit	Level	Velocity 1	Velocity 2
1	28/12/2005	09:38:15	28/12/05 09:38:15	11,19	m3/s	2,097	1,904	1,904
2	28/12/2005	09:38:16	28/12/05 09:38:16	11,18	m3/s	2,091	1,908	1,908
3	28/12/2005	09:38:17	28/12/05 09:38:17	11,17	m3/s	2,088	1,91	1,91
4	28/12/2005	09:38:19	28/12/05 09:38:19	11,17	m3/s	2,088	1,911	1,911
5	28/12/2005	09:38:20	28/12/05 09:38:20	11,17	m3/s	2,088	1,911	1,911
6	28/12/2005	09:38:21	28/12/05 09:38:21	11,18	m3/s	2,09	1,91	1,91
7	28/12/2005	09:38:23	28/12/05 09:38:23	11,18	m3/s	2,092	1,909	1,909
8	28/12/2005	09:38:24	28/12/05 09:38:24	11,2	m3/s	2,1	1,904	1,904
9	28/12/2005	09:38:26	28/12/05 09:38:26	11,23	m3/s	2,104	1,901	1,901
10	28/12/2005	09:38:27	28/12/05 09:38:27	11,25	m3/s	2,11	1,898	1,898
11	28/12/2005	09:38:28	28/12/05 09:38:28	11,26	m3/s	2,121	1,889	1,889
12	28/12/2005	09:38:29	28/12/05 09:38:29	11,3	m3/s	2,127	1,885	1,885
13	28/12/2005	09:38:31	28/12/05 09:38:31	11,31	m3/s	2,134	1,879	1,879
14	28/12/2005	09:38:32	28/12/05 09:38:32	11,32	m3/s	2,146	1,868	1,868
15	28/12/2005	09:38:34	28/12/05 09:38:34	11,32	m3/s	2,151	1,863	1,863

We recommend using these records on PC instead of records on data logger when you do a focused operation as commissioning, expertise and maintenance control...

The other advantage of this method is that you obtain files (*.xls) that Excel can open later. These files are “by default” stored in our Ls322Co \ data folder.

Our software can only open the first raw file with (*.mes) extension.

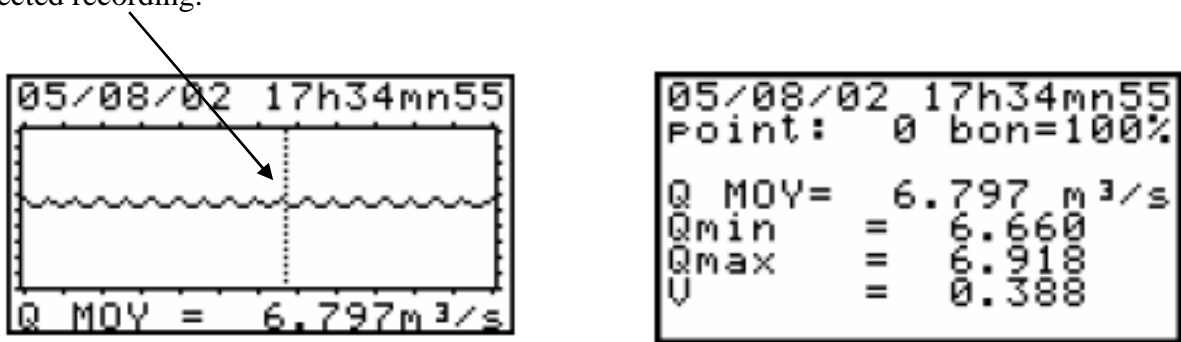
9.2- Records by using built-in data logger.

The data logger is considered as already set for records. Otherwise, set it according to 7.7

Also, if you want to reset the data logger before making new recordings or after download, please refer to the settings menu, 6.4.

There are two ways to see the records: directly on the LCD display by using the keypad or on PC by using our software. But, only PC + software allows to save the recordings. This second method will be preferred to the first one.

Anyway, the LCD display is very useful to know if everything is running correctly. Press **F** many times until reach the data logger menu and enter with **V**. The UF_322 displays the last periods flow curve (range can be set) and attached numeric values (V). By using < > touches, you can see what were these records previously, until the older one. A vertical discontinuous line permits to point a selected recording.



When you are reading manually like that the logger, the UF_322 is not measuring.*

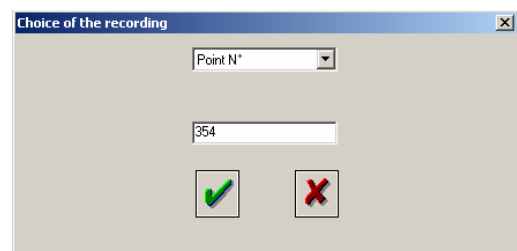
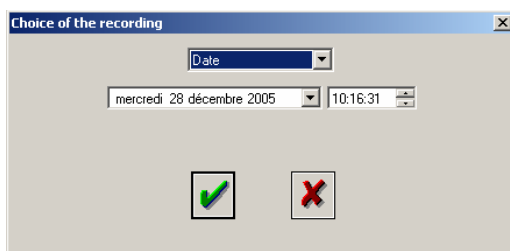
Using the software is much more powerful.

Select the menu "Dialog \ Logger. It does an automatic import of the oldest page of data logger and place it in the PC screen memory.

By using the different blue arrows, you do a slight shift in the records, a page shift or jump to the end or come back to the beginning:



By using the finger control tab, you can set the first record that you want to import by choosing its date and time or its number.



Here is an example of data logger importation:

N°	Date	Time	Flow Unit	Parameter 1	Value	I.Q.	Parameter 2	Value	I.Q.	Parameter 3	Value	I.Q.
6	28/12/2005	10:30:00	m3/s	Av.Q	17.801	100	Max Q	19.367	100	Min Q	16.890	
7	28/12/2005	10:31:00	m3/s	Av.Q	17.961	100	Max Q	19.373	100	Min Q	16.152	
8	28/12/2005	10:32:00	m3/s	Av.Q	17.560	100	Max Q	18.454	100	Min Q	16.873	
9	28/12/2005	10:33:00	m3/s	Av.Q	18.058	100	Max Q	19.373	100	Min Q	16.152	
10	28/12/2005	10:34:02	m3/s	Av.Q	17.555	100	Max Q	18.894	100	Min Q	13.110	
11	28/12/2005	10:35:00	m3/s	Av.Q	9.421	100	Max Q	10.046	100	Min Q	9.028	
12	28/12/2005	10:36:00	m3/s	Av.Q	9.806	100	Max Q	10.769	100	Min Q	8.861	
13	28/12/2005	10:37:00	m3/s	Av.Q	9.819	100	Max Q	10.400	100	Min Q	9.064	
14	28/12/2005	10:38:00	m3/s	Av.Q	9.674	100	Max Q	10.765	100	Min Q	8.864	
15	28/12/2005	10:39:00	m3/s	Av.Q	9.921	100	Max Q	10.391	100	Min Q	9.383	
16	28/12/2005	10:40:00	m3/s	Av.Q	9.667	100	Max Q	10.765	100	Min Q	8.864	
17	28/12/2005	10:41:00	m3/s	Av.Q	9.843	100	Max Q	10.391	100	Min Q	9.012	
18	28/12/2005	10:42:00	m3/s	Av.Q	9.799	100	Max Q	10.765	100	Min Q	8.997	
19	28/12/2005	10:43:00	m3/s	Av.Q	9.674	100	Max Q	10.391	100	Min Q	8.864	
20	28/12/2005	10:44:00	m3/s	Av.Q	9.905	100	Max Q	10.765	100	Min Q	8.997	
21	28/12/2005	10:45:00	m3/s	Av.Q	9.615	100	Max Q	10.391	100	Min Q	8.864	
22	28/12/2005	10:46:00	m3/s	Av.Q	9.838	100	Max Q	10.765	100	Min Q	8.997	
23	28/12/2005	10:47:14	m3/s	Av.Q	9.752	100	Max Q	10.655	100	Min Q	8.864	
24	28/12/2005	10:48:00	m3/s	Av.Q	9.752	100	Max Q	10.778	100	Min Q	8.899	
25	28/12/2005	10:49:00	m3/s	Av.Q	9.778	100	Max Q	10.333	100	Min Q	8.964	
26	28/12/2005	10:50:00	m3/s	Av.Q	9.698	100	Max Q	10.778	100	Min Q	8.899	
27	28/12/2005	10:51:00	m3/s	Av.Q	9.914	100	Max Q	10.333	100	Min Q	9.392	
28	28/12/2005	10:52:00	m3/s	Av.Q	9.654	100	Max Q	10.778	100	Min Q	8.899	
29	28/12/2005	10:53:00	m3/s	Av.Q	9.871	100	Max Q	10.333	100	Min Q	9.138	
30	28/12/2005	10:54:00	m3/s	Av.Q	9.766	100	Max Q	10.778	100	Min Q	8.954	
31	28/12/2005	10:55:00	m3/s	Av.Q	9.702	100	Max Q	10.333	100	Min Q	8.899	
32	28/12/2005	10:56:00	m3/s	Av.Q	9.893	100	Max Q	10.778	100	Min Q	8.954	
33	28/12/2005	10:57:00	m3/s	Av.Q	9.605	100	Max Q	10.333	100	Min Q	8.899	
34	28/12/2005	10:58:00	m3/s	Av.Q	9.865	100	Max Q	10.778	100	Min Q	8.954	
35	28/12/2005	10:59:00	m3/s	Av.Q	9.697	100	Max Q	10.571	100	Min Q	8.899	

Except Min / Max Q that are the lowest and highest flow values during the recorded period, all other recordings are averaged values by the recording period. Each value has its quality indicator (I.Q.), which is normally 100 %. It considers the % of accepted / rejected values. A temporary display of a lower % is not important but just inform you that something has happened. A too low % is a sign of weak conditions.

Contrary to manual reading method, the UF_322* continues to measure during the software data logger menu connection.

You can print the selected page.
It is also possible to adjust the column width.

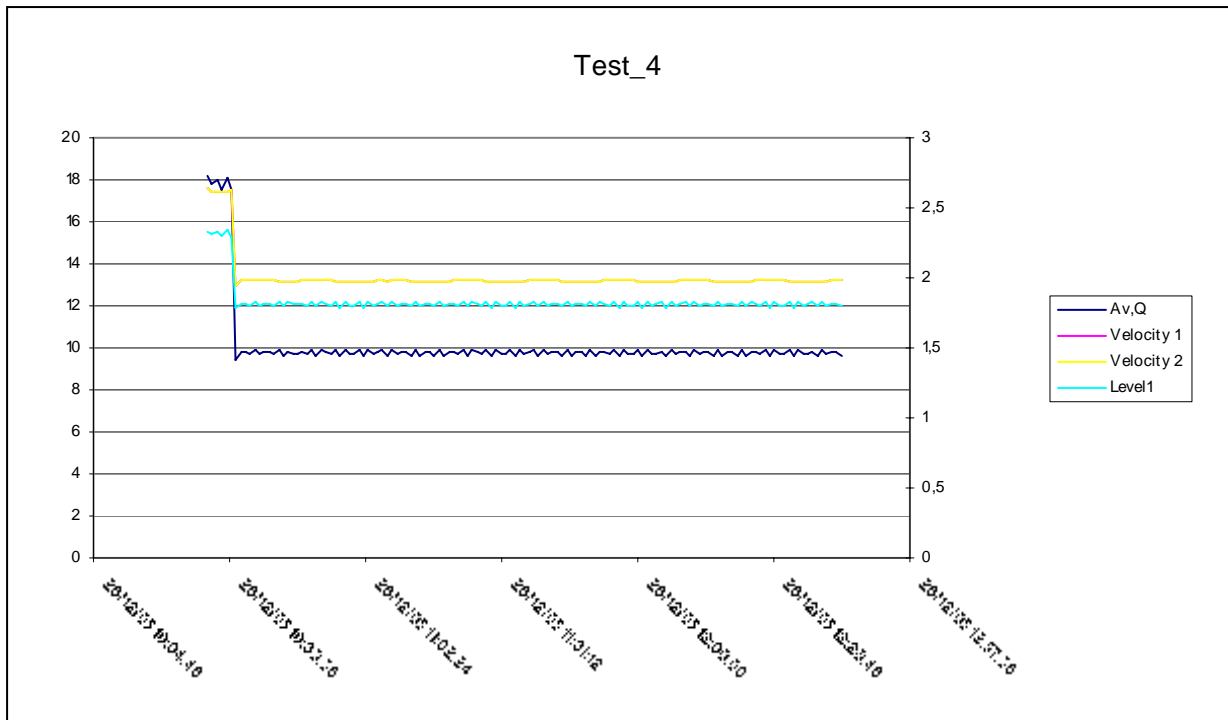
If the Status word has been set, the recorded letters permit to know more about “what could have happened”.

To edit this list on you PC screen, just do a click on [?]. →

This status word records also when a chord becomes immersed or is considered as invalid.

Status
A = Power OFF
B = Velocity fault
C = Level fault
D = RAMCARD Battery fault
E = Overflow relay
F = Setting access
G = Low level
H = Delta Level fault
I = Input Level1 fault
J = Input Level2 fault
K = V1 fault
L = V2 fault
M = V3 fault
N = V4 fault
O = V5 fault
P = V6 fault
Q = Flow fault
R = Frequency probes does not exist
U = Echo Loss V1
V = Echo Loss V2
W = Echo Loss V3
X = Echo Loss V4
Y = Echo Loss V5
Z = Echo Loss V6
0 = Wet chord 1
1 = Wet chord 2
2 = Wet chord 3
3 = Wet chord 4
4 = Wet chord 5
5 = Wet chord 6

The attached graph shows automatically the flow scale on the left and level and flow velocities on the right. You can also edit your own graphs by using Excel tools.



It is obvious that it should be better to spread the Excel spreadsheet in many parts to edit readable graphs when the recorded period is very long.

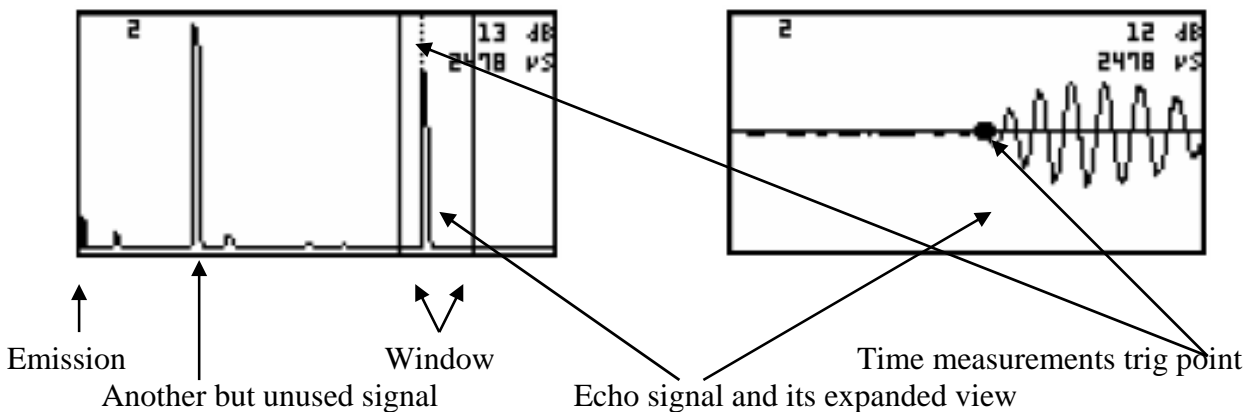
10 – RECOMMENDED CONTROLS & TROUBLESHOOTING:

10.1- Control of Ultrasonic signals (Echoes) level and quality.

As explained previously in the measurement menu, the amplification gains are important data. The lower they are, the stronger the signals are. But it is not all: selection window must be set according to the signal delay time and the receiver must trig the delay time measurement attached to a reliable point of these signals. Even if experience will later guide you, we give you here below some typical counsels.

There are two means to know more about these signals. The fastest and easiest is to use the “Echo display menu”. Press **F** up to this menu and enter in with **V**. It permits to display successively the time graph of the signals chord per chord and an expanded view of the used echo, on which the receiver must trig its delay time measurement.

Here below are typical pictures. *UF_322* will not measure during these controls.*

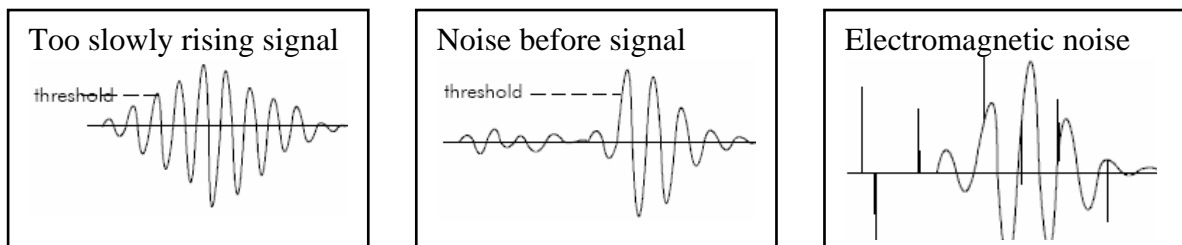


It is very important to see the discontinuous vertical line attached to the echo beginning on the first picture. Otherwise, the lack of it would mean that some interference hinder the digital treatment process.

Likewise, on the second picture, the horizontal plain line shows the noise level and, just above, a discontinuous line shows the trigger threshold level. The lower both level are, better it is. A trig on the signal beginning is more reliable than a trig on a second or third signal period.

Note that the exact time measurements are done at the signal zero crossing point.

Here are not good condition signals:



When there is no noise, it is possible to force the trigger threshold at a lower value by changing a code (ER2 / 0 to ER2 / 1 for instance) in “Factory setting”. Ask for the code to Ultraflux.

The other mean to see these echoes is by using our software, but this resource must be validated with a special code to be entered on your PC. As we need to control these rights, it is necessary to contact Ultraflux who will decide.

When the rights are allowed, another dialog menu “*Echo Display*” is available. Same than above, the software advise you that the **UF_322** will stop its measurements during the echo display.**

The main advantage of the software connection is that you can save these echo pictures and send them to Ultraflux for comments or analyse. Saving operation starts after a click on the floppy disk icon and a given name to file. Select successively the different chords with global (P_1, P_2, \dots) plus zoom (Z_1, Z_2, \dots) views, to store them in the same file. This file has an *.ultraflux format that we can convert to a *.bmp format if we need to include these pictures in a technical report.

Thus, it is possible to record a signal before and during perturbations...Beware to don't record a too long time, because the recorded file could become too heavy for an E-mail transmission.

A similar service can be obtained by using a digital camera in front UF_322 display.

When the UF_322 device is connected to a Modem, Ultraflux (or you) can observe these signals at distance with this software extension.*

How to improve these signals ?

The echoes display is very useful to perform or control the probes alignment. It is better to use the probe support resources to make this alignment. An optical method is sufficient when applicable. Otherwise, you can change the probes direction to obtain the stronger signal.

The signals typical level depends on the selected probes, their installation, including ultrasonic path length, and the application. With sewage water, usual gains are 10 to 30 dB; with irrigation water & channels, typical gains are 0 to 20 dB; same with rivers. Amplification gain 30 to 40 dB is a sign of difficult conditions. Over 50 dB, there is a large risk of troubles (interferences...).

If the echo signal is out from the selection window, it is evident that some L data has not been entered correctly. Please check and revise it.

If the echo signal is unstable, may be some branches, weeds, or other solid bodies have been caught by probe support or are staying along the ultrasonic path. Please improve.

If there are electrical or electromagnetic interferences, please check that cable shields are connected and that the earth connection is done.

Sometimes, it is possible to add a frequency band pass filter (coil, transformer...) to probes.

When water is flowing air bubbles, the solution is more difficult. Signal level can become too low or worst can disappear, making the time and delta time measurements impossible. We can only filter and reject these periods (Max gain) if they are temporary and focus the measurement display on periods when signals are OK. Memory time will interface these periods.

As noted above, some special setting is included in our Factory setting menu or Ultraflux menu, to apply a better adapted signal treatment, or to force a lower threshold when your conditions are requesting it. Please contact Ultraflux who will advise.

Next page is explained a possibility to do some of these changes by e-mail exchanges.

10.2 : How to check or change some factory setting ?

As explained above, Ultraflux keeps the control on this menu. We do enter typical setting for your application before delivery and thus there is normally no need to change anything.

To check the menu contents and, if decided, change some setting, please do following operations:

- With PC and software in dialog with the device, do a “Save all”. Software will save both Setting menu (*.eta) and Factory setting menu (*.rus). Do also a copy of Dialog \ Measurement menu (*.mes). *The (*.rus) file will appear in Program files\Ultraflux\Ls322Cox\data folder by using Explorer. In our software “File\Open” menu, it is necessary to ask for all files with (*.*) as you don’t have rights.*

- Send these three saved files to Ultraflux who will check.
If Ultraflux propose to do some change in this Factory setting menu, we will return a modified file that you will copy in data folder.

- Then, with Ls322Co software, you will ask for all files with (*.*), and select this new (*.rus) file. Software will not edit it but it will ask you if you want to transmit it to the concerned device.
Before to transmit it and thus activate the new setting, software check if we do the connection to the same unit from which you imported the original (.rus) file. This means that you cannot use this file to another instrument.*

- If everything is OK, your unit would work better with new factory setting data. If not, you can return to the previous situation by sending back the original (*.rus) file to your device.

10.3- Geometrical checking:

It is very important that probes installation has been rigorously done and that all dimensions, surface description, distance between probes face, axial distance, elevation, level transmitter range...have been measured first and noticed in your installation report.

From our ultrasonic waves transit time measurement, we do have a relevant evidence that the L distance is correctly set. For that, we use a reliable relation between water temperature and sound velocity.

Supposing a L distance already entered (within a range that permits the selection window to be centered on the echo) and the water temperature known, you can compare expected sound velocity (C_{Ref}) and value (C_M) that UF_322* returns. If the difference is more than 0.5%, we recommend to correct L to $L' = L * (C_{Ref} / C_M)$.

Here is this relation $C_{Ref} = f(t^{\circ}C)$

Approached value $C_{m/s} = 1557 - 0.0254 * (74 - t)^2$

t (°C)	C (m/s)	t (°C)	C (m/s)
0	1 403.0	30	1 506.4
5	1 426.5	35	1 520.1
10	1 447.6	40	1 529.2
15	1 466.3	45	1 536.7
20	1 482.7	50	1 542.9
25	1 497.0		

10.4- Other controls.

Supply and fuses checking :

If there is no display, no communication, no output signal, check that your device is correctly connected and supplied. If everything seems OK, there are internal fuses, both on connection to mains and connection to a DC source. There is no reason to have them blown out. To check them, it is necessary to separate UF_322* from its wall mounting plate.

Do this operation with unit disconnected from its power source.

Alarm messages :

Most of alarm messages are not meaning that the device has a problem. The usual meaning is that something goes wrong or a setting is not adapted to your application. Please do a setting parameters review.

There are some fatal error message as “Fault dsp», which could mean that something goes wrong in the signal digital treatment processing.

Do a switching Off / On and check if this fault has disappeared. If it not the case or if this fault comes again too often, the device must be sent to Ultraflux for fixing (P.C. board exchange...).

Problems at the level input.

If you meet any problem with the level signal transmission (UF_322* don't read the correct value though correctly set, or if any failure happens in this connection (due to lightning's...), we recommend to separate the two devices, each one having its own supply, and a galvanic separator doing the transmission.

Accuracy controls.

If every setting has been entered correctly, please trust your UF_322*.

When there is a relevant evidence of the error, the usual reason comes from the geometrical description. Are you 100% sure of them?

Another but less important reason could come from an inexact flow profile description. The by default profiles are supposing that hydraulic conditions are stabilized. If you put means to know your application flow profile, our unit is ready to accept your data.

Problems with ultrasonic signal transmission.

Usual problems come from too aerated water. Avoid these conditions by placing the probes as far as possible from the fall or other cause. Lower frequency probes are less sensitive but cannot solve completely the problem. We can only mask the troubles if they are not permanent.

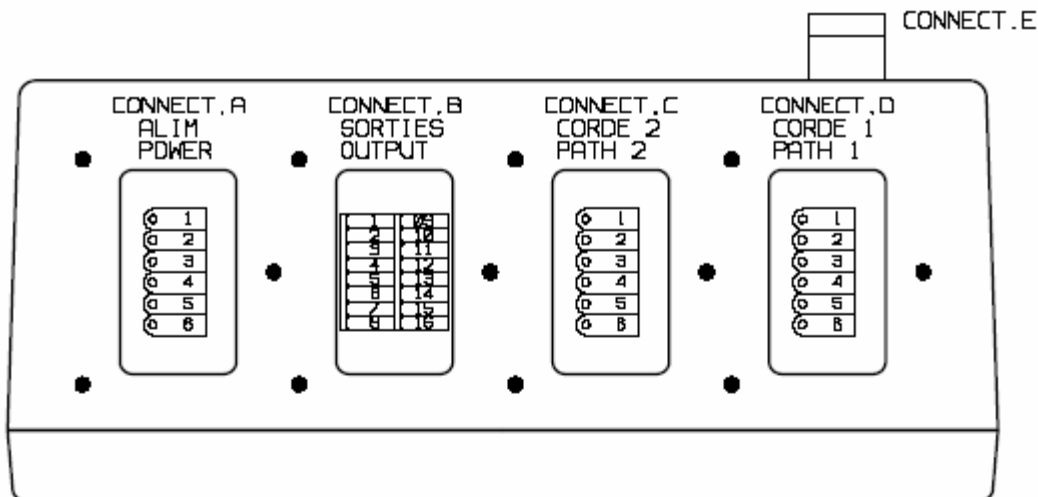
10.5- Test & Simulation menu:

This complementary menu, which is included in our setting menu and available on keypad and software as well and which is normally set in measure mode, permits to simulate a flow velocity (simulation S and then V sim.=xxx m/s), a water level (simulation L and then L sim.=xx.xx m) or both (simulation T and then V and L =). V and L values can be made varying with the Jitter (% of entered value at a period of one second) to have these data alive.

Then, all T, Delta T, sound velocities, wetted surface, flow results are calculated and outputs are active. This menu is very useful to test outputs or communication. It permits to temporary replace a missing level sensor (set resume to measurement time to zero).

After have used these facilities, don't forget to set this menu in Measure mode.

Appendix N° 1 : Wiring overview / drawing



CONNECT . A ALIM /POWER

- | | | |
|--------------------|---|--|
| 1: PHASE /LINE | } | 110 V OU/OR 220 V 16VA
SELON CABLAGE INTERNE
SELECTED BY INTERNAL
STRAP |
| 2: TERRE /GROUND | | |
| 3: NEUTRE /NEUTRAL | | |
| 4: TERRE /GROUND | | |
| 5: +BAT /+BAT | } | 12V 12VA |
| 6: -BAT /-BAT | | |

CONNECT . C CORDE 2 /PATH 2

- | |
|-----------------------------------|
| 1: SOND E AMONT /UPSTREAM PROBE |
| 2: SOND E AMONT /UPSTREAM PROBE |
| 3: TRESSE/TERRE /GROUND |
| 4: TRESSE/TERRE /GROUND |
| 5: SOND E AVA L /DOWNSTREAM PROBE |
| 6: SOND E AVA L /DOWNSTREAM PROBE |

CONNECT . D CORDE 1 /PATH 1

- | |
|-----------------------------------|
| 1: SOND E AMONT /UPSTREAM PROBE |
| 2: SOND E AMONT /UPSTREAM PROBE |
| 3: TRESSE/TERRE /GROUND |
| 4: TRESSE/TERRE /GROUND |
| 5: SOND E AVA L /DOWNSTREAM PROBE |
| 6: SOND E AVA L /DOWNSTREAM PROBE |

CONNECT . B SORTIES /OUTPUT

- | |
|--|
| 1: SORTIE ANALOGIQUE- /ANALOGIQUE OUTPUT- |
| 2: RELAIS 3 COMMUN /COMMON |
| 3: RELAIS 3 REPOS /NC |
| 4: RELAIS 3 TRAVAIL /NO |
| 5: COMMUN-I _e -MASSE /COMMON-I _e -GROUND |
| 6: ENTREE-I _e 1 /INPUT-I _e 1 |
| 7: ENTREE-I _e 2 /INPUT-I _e 2 |
| 8: 15 Volt /15 Volt |
| 9: SORTIE ANALOGIQUE+ /ANALOGIQUE OUTPUT+ |
| 10: RELAIS 2 TRAVAIL /NO |
| 11: RELAIS 2 REPOS /NC |
| 12: RELAIS 2 COMMUN /COMMON |
| 13: RELAIS 1 TRAVAIL /NO |
| 14: RELAIS 1 REPOS /NC |
| 15: RELAIS 1 COMMUN /COMMON |
| 16: 15 Volt /15 Volt |



CONNECT . E

LIAISON SERIE (FACE AVANT)
SERIAL CONNECTION (FRONT PANNEL)

- | |
|------------------------------|
| 1: 5V IMPRIMANTE /5V PRINTER |
| 2: NC /NC |
| 3: TX /TX |
| 4: RX /RX |
| 5: NC /NC |
| 6: IMP /PRINTER TEST |
| 7: 0V/TERRE /GROUND |

CONNECTEUR INTERNE TRANSFORMATEUR INSIDE TRANSFORMING CONNECTION

- | | | | |
|-------------------------------|-------|-----------------------------------|-------|
| 1 2 3 ● 5 6 | 220 V | 1 2 3 4 5 6 | 110 V |
| 1: NDIR /BLACK | | 1: NOIR ROUGE /BLACK RED | |
| 2: MARRON ROUGE /CHESTNUT RED | | 2: NC /NC | |
| 3: ORANGE /ORANGE | | 3: MARRON ORANGE /CHESTNUT ORANGE | |
| 4: NC /NC | | 4: NC /NC | |
| 5: JAUNE /YELLOW | | 5: JAUNE /YELLOW | |
| 6: VIOLET /PURPLE | | 6: VIOLET /PURPLE | |

Appendix N°2 : Complementary documents.

If you ask for a data transmission through a Modem and that you want to use our software for this dialog, the connection is only possible if you enter the data specific to your country in our configuration menu and also that our unit can meet your requirements.

Please contact our technical department before to decide such a configuration.

If the data / measurements transmission is done to a PLC through our RS-232 port (or optionally RS-485), you must respect our transmission format and table.

We use a Jbus / Modbus protocol.. The control code is a CRC 16. The data format is conformed to the IEEE norm.

Here below, we give elementary basis of this protocol.

Complementary and contractual up to date document is as per our NT_210A. Ask for this document to Ultraflux (the French version is included in our CD Rom) if you need to perform such a connection.

Appendix 4 : UF 322 co / UF322-rv UF322 serial link protocol

Used protocol : JBUS. Baud rate : from 300 to 9 600 bauds.	Number of bytes : 8 Parity : None Number of stop bits : 1
---	---

N word reading (function code 3) $1 \leq N \leq 125$

Request :

Slave number	Function code (3)	Address of the 1st word	Number of words (N)	CRC16 check ⁽¹⁾
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response :

Slave Number	Function code (3)	Number of read bytes	First word value		Last word value	CRC16 check ⁽¹⁾
1 byte	1 byte	1 byte	2 bytes		2 bytes	2 bytes

Reading of N logger records (function code 4)
 $1 \leq N \leq 8$ if the logger records 4 variables ; $1 \leq N \leq 4$ if the logger records 9 variables (see p. 3-51)

Request :

Slave number	Function code (4)	Address of the 1st record.	Number of records (N)	CRC16 check ⁽¹⁾
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response :

Slave number	Function code (4)	Number of read bytes	Value of the 1st record.		Value of the last record	CRC16 check ⁽¹⁾
1 byte	1 byte	1 byte	31 or 62 bytes ⁽²⁾		31 or 62 bytes ⁽²⁾	2 bytes

⁽¹⁾ See page A-35

⁽²⁾ 31 bytes if the logger records 4 variables, 62 bytes if it records 8 variables.

N word writing (function code 16)

$1 \leq N \leq 123$

Important Writing exclusively allowed at specific addresses (from

Request :

Slave number	Function code (16)	Address of the 1st word to be forced	Number of words to be forced (N)	Number of bytes (2N)
1 byte	1 byte	2 bytes	2 bytes	1 byte

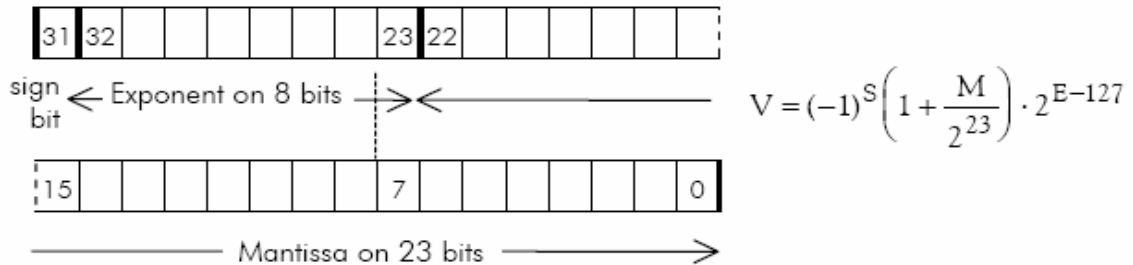
First word value	Last word value	CRC16 check ⁽¹⁾
2 bytes	2 bytes	2 bytes

Response :

Slave number	Function code (16)	Add. of the 1st forced word	Number of forced words	CRC16 check ⁽¹⁾
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Data format used in transmission tables

FLOAT : Number in floating point coded on 4 bytes according IEEE standard



Example : Given the value 40.21.80.40H



S = 0
 E = 128
 M = 218040H
 = 2195520

$$V = (-1)^0 \left(1 + \frac{2195520}{2^{23}} \right) \cdot 2^{128-127} = 2,523452759$$

ULONG (Unsigned Long) : Unsigned number coded on 4 bytes

ULONG3 : Unsigned number coded on 3 bytes

LONG3 : Signed number coded on 3 bytes

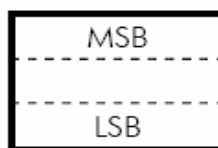
UINT (Unsigned Integer) : Unsigned integer coded on 2 bytes

CHAR : Character coded on 1 byte

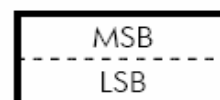
Important : Data are put in the table beginning with Most Significant Bits (MSB).



Coding on 4 bytes



Coding on 3 bytes



Coding on 2 bytes