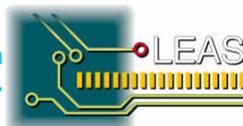


Projet	<i>CityShark II</i>
Sous Ensemble	TECHNICAL NOTICE
Document	NoticeUtilCity2VIGB20080221
Client	IRD
Affaire	PCB CSII 02.511

09	I	25/01/08	Evolution Continuous mode – Update V808	SFB		JS	18/02/08
08	H	17/09/04	English translation	JMN		JFM	
07	G	06/06/04	Modifs suite industrialisation V413	JMN		JFM	
06	F	12/03/03	Modifs suite version soft V311	LD		JMN	
05	E	05/11/02	Modifs suite version soft V245	LD		JMN	
04	D	21/06/02	Description nouvel écran de paramétrage + mesure batterie + modifs divers + Description des gains + résolution	LD		JMN	
03	C	13/05/02	Compatibilité carte Flash + précautions Message pour détection “stack overflow” Utilisation du mode DEBUG analogique	LD		JMN	
02	B	29/04/02	Corrections + modifications	LD		JMN	
01	A	14/03/02	Edition originale	LD		JMN	
Ind	Re v	Date	Modification	Name	Visa	Name	Visa
				Written		Verified	

SUMMARY

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1 - STARTING SEQUENCE

After powering on, the station of acquisition *CityShark II* proceeds to its initialization. During this phase the central processing unit, memory, and the interfaces are initialized and configured, then the software starts an auto test of the functions and of the internal components:

```
LEAS SYSTEM 2008
CITYSHARK II - V 0 2
-----
-SN-1 8 8 0 - 0 8 0 8 - 0 0 0 1 -
```

Screen 1

Note: the bottom line indicates the type, the software version and the model of the material.

The *Screen 1* remains displayed a few seconds, and then the initialization screen is displayed:

```
Software Vers. : 0 8 0
8 CityShark II No : 0
4 5
Max Channel nb : 1 8
```

Screen 2

- ? The first line indicates the current software version of the station.
- ? The second line indicates the serial number of station.
- ? The third line indicates the maximum number of components available with the station. (The broken ADCs or Acquisition boards turn off the following ADC).
- ? The fourth line indicates the status of the station. It indicates if errors were encountered during the self test of the station. "00" indicates a correct status of the station. In other cases, refer to the code list of error.

A second starting screen displayed a few seconds:

```
Dynamic range:      5 v
Continuous mode :
available
```

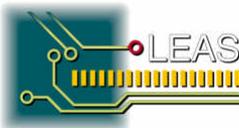
Screen 3

- ? The information « **Dynamic range** » indicates the dynamic range used on the differential analog input (5V in the example). 10 V is also available, contact the manufacturer at js@leas.fr.
- ? "**Continuous mode**" indicates if the option is available or not on the station. (Activated in the example). To activate the continuous mode, it is necessary to get the "user licence", contact the manufacturer at js@leas.fr.

The initialization screen remains displayed a few seconds; if no channel of acquisition is detected (**Input channels: 0 0**) the following screen is displayed:

```
* * * * *
* *
*  SYSTEM ERROR
*
```

Screen 4



This screen remains displayed until station *CityShark II* is turned off. Correct the problem and switch on again. The previous *Screen 3* remains displayed a few seconds. Then, the *CityShark II* seeks the presence of the GPS receiver connected on its serial link:

```
Checking GPS link
>GPS setting done
>Please wait . . . .
```

Screen 5

This *Screen 5* remains displayed during a few seconds, during this moment, the connection between *CityShark II* and the GPS receiver is initialized. The link waits for a valid NMEA 0183 message (max 15 seconds). As soon as the connection is established with the GPS receiver, the following message is displayed:

```
Checking GPS link
>GPS setting done
>Please wait . . . .
>>GPS ready <<
```

Screen 6

If the GPS receiver is unavailable or unconnected, the following message is displayed:

```
Checking GPS link
>GPS setting done
>Please wait . . . .
GPS not found !!
```

Screen 7

In that case, GPS data are unavailable: time, date and hour are then fixed on the internal real time clock (safeguarded by a battery). In the same way the recordings could not be completed with the data of positioning: latitude, longitude, altitude and the number of satellites.

The supply of receiver GPS is automatically powered off (low power mode), and the “GPS Update” and "GPS receiver” are placed to "NO", and cannot be modified.

The following screen is then displayed:

```
*****
*
*   GPS RECEIVER
*
```

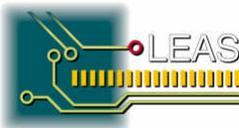
Screen 8

When the *CityShark II* is powered on, and if the GPS connection is correct, the parameter “GPS receiver” is “On”, and the “GPS update” is “Yes” automatically.

Then, if no flash card is installed and detected, the following message is displayed:

```
*****
*
*   WARNING   !!!
*
```

Screen 9



2 - USING THE FLASHCARD

Precautions for use

- ? Only the recommended and validated by LEAS flash cards (mark and model) can be used on the *CityShark II* station. (**See 11. Compatibility of flash cards**)
- ? Don't use the flash card if the battery is discharged or close to the threshold from stop to the station *CityShark II*, to prevent the possible loss of data at the time of the complete stop of the station.
- ? Be careful to never unplug the flash card when red indicator LED is flashing (read/ write access): data can be lost and/or flash card could be destroyed.
- ? Avoid the falls, shocks, pressures and impacts on the flash card.
- ? Don't expose the flash card to excessive moisture, heat, or direct rays of the sun.
- ? Never directly touch the contacts of a compact flash card (with PCMCIA adapter): risk of permanent destruction of contacts, loss of data or complete flash card destruction. (Electrostatic discharges).
- ? Please take all the precautions of use concerning handling of electrostatic electricity sensitive components and devices.

Following the sequence of starting (if the flash card was present before powering on) or after hot insertion of a flash card, the buzzer sounds, indicating the detection of the insertion of a flash card: the system try to reach and identify this one; in the case of an out of service flash card, not fast enough or not recognized flash card, the following message is displayed:

```
FLASH CARD ERROR
!
NOT IDENTIFIED
Please check and
```

Screen 10

The *Screen 10* remains displayed as long as the flash card is removed and then replaced.

If the flash card is valid, the following screen displays the identification of the flash card (example).

```
S a n d i s k  S D C F B - 1 0 2 4
V d e 4 . 4 0
2 8 3 1 7 7 C 1 2 2 4
```

Screen 11

- ? The first two lines (40 characters maximum) are used to indicate mark, model and capacity of the flash card.
- ? The third line displays the version of the flash card.
- ? The fourth line displays the serial number of the flash card.

The identification data remain displayed during a few seconds to a few minutes (according to the capacity of the flash card), during this time, the system seeks pre-formatted files (FICHBASE.DAT and SECTCITY.HEX), installed normally on the flash card. If one of these files is not found, the following message is displayed:

```
FLASH CARD ERROR
!
FILE(S) NOT FOUND
Please check and
```

Screen 12

The *Screen 12* remains displayed as long as the flash card is not removed and replaced.

If the two files are identified and correctly formatted, the identification data remain displayed a few seconds before displaying the main screen, *Screen 15*.

In the event of a heavy problem on the flash card powering system (defect flash card, internal short circuit, damaged connector, defective powering circuit), the error message is displayed:

<p>FLASH CARD ERROR ! POWER OVER CURRENT Please check and</p>	<p><u><i>Screen 13</i></u></p>
---	--------------------------------

This message can be displayed at the time of insertion of the flash card or during normal operation (with flash card present).

The message will remain displayed as long as the flash card is not removed and replaced.

In the event of failure of the FLASH embedded controller (flash card out of service), the following error message is displayed:

<p>FLASH CARD ERROR ! SELFTEST FAILED Please check and</p>	<p><u><i>Screen 14</i></u></p>
--	--------------------------------

The message will remain displayed as long as the flash card is not removed and replaced.

3 - SETTINGS

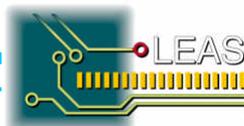
If a flash card is in place and valid (identification and files), the following main screen is displayed:

<p>G a i n = 8 1 9 2 O v f = . 0 0 % N e x t F i l = 0 2 1 4 1 5 2 8 . 0 0 1</p>	<p><u><i>Screen 15</i></u></p>
---	--------------------------------

- ? To enter in setting mode, press the **YELLOW** button then the **BLUE** button by keeping the **YELLOW** button pressed.
- ? To pass from one parameter to the other, press the **YELLOW** button, the cursor flashes on the left of the selected parameter.
- ? To change the value of a parameter, press the **BLUE** button, to change quickly the values, keep the **BLUE** button pressed.
- ? To validate a screen of parameter setting, press the **GREEN** button.

The first parameter setting screen (date and hour system) is displayed:

<p>Clock Setting : Month = 02 Day = 1 4 Hour = 15 Minut = 3</p>	<p><u><i>Screen 16</i></u></p>
---	--------------------------------



- ? The **Month, Day, Hour, Minut** parameters set the date and time of the internal real time clock circuit.
- ? The parameter « **GPS receiver** » switches ON or OFF the GPS receiver. The OFF position reduces the global consumption of the *CityShark II*. GPS data are unavailable in OFF position.

The ON position displays the following screen.

```

Checking GPS link
>GPS setting done
>Please wait . . . .

```

Screen 5

Followed by that screen when GPS receiver is ready.

```

Checking GPS link
>GPS setting done
>Please wait . . . .
>>GPS ready <<

```

Screen 6

Or this one if the receiver is unavailable.

```

Checking GPS link
>GPS setting done
>Please wait . . . .
GPS not found !!

```

Screen 7

Note: if the GPS receiver is not in place or unavailable (See 1 – STARTING SEQUENCE >> GPS not found), the “GPS receiver” parameter is turned OFF. When *CityShark II* is powered on and if the GPS is present, this parameter is turned “On”, and the “GPS Update” is switched to “Yes”.

After the automatic return to Screen 16, press the **GREEN** button to validate the setting. The second screen of setting is displayed.

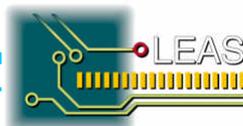
```

GPS update      = Yes
s
Inputs chan(18) = 18
Batt low level  = 11

```

Screen 17

- ? The first line « **GPS update** » allows (Yes) or not (No) the automatic update of the real time clock by the incoming GPS data (date and time). This parameter is locked to No if there is no GPS receiver connected to the station. If this parameter is setting to Yes and if GPS data are valid, the manual modifications of time and date will not be transferred to the real time clock circuit.
- ? The second line « **Inputs chan(18) = 18** » allows the user to change the number of channels available on the *CityShark II* (the maximum channels number is indicated between brackets).
- ? The third line « **Batt low level = 11V** » allows the user to change the battery alarm threshold. If the battery voltage is lower than the threshold, a warning message will be displayed.
- ? The fourth line « **Batt voltage = 12V** » indicates a direct reading of the current value of the battery voltage (read only).



Note – Number of input channels (Inputs chan):

The user can select a number of channels lower than the number of channels available on the station and displayed during the initialisation of *CityShark II*.

This number of channels available is scanned during the acquisition. An invalid channel will disabled all the following channels of *CityShark II*.

Example: if the *CityShark II* is a 18 channels and if the number is limited to 15, that means that the ADC 1 of board 6 (channel 16) is broken down. The ADC 17 and 18 are automatically disabled.

Select a number of channels higher than the maximum channels available on the station is unauthorised.

Low battery detection:

During operation (except in acquisition mode), if the battery level is too low (lower to the threshold), the following message is displayed.

```
G a i n = 8 1 9 2   O v f = 0 0
%
N e x t F i l = 0 3 1 4 1 5 2 8 . 0 0
1
```

Screen 18

The last line flashes (alternatively bargraph/message « **Low batt: 11 volts** »), it indicates that the battery is discharged, the *CityShark II* has to be switched Off and the battery **must be charged**.

Press on the **GREEN** button, the third screen of parameter setting (Recording parameters) is displayed.

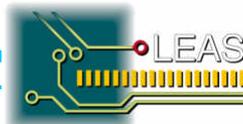
```
G a i n = 8 1 9 2   O v m x = 0 5
%
L g t h = 1 5 m n   R e p = 0 h
S a m p l e R a t e =   2 0 0 H
```

Screen 19

```
G a i n = 8 1 9 2   O v m x = 0 5
%
L g t h = 1 5 m n
C o n t i n u o u s
```

Screen 19 - bis

- ? Available “**Gain**”: 1, 2, 4, 8, 16, 32, 64, 128, 256, 512, 1024, 2048, 4096, 8192.
- ? The “**Ovmx**” consists in a maximum rate of saturated samples in % recorded in the file. Over this threshold, the buzzer is activated. No action on the buzzer in repeat mode and continuous mode.
- ? The file duration “**Lgth**” from 1 to 60 minutes. In repeat mode, the file duration cannot be select to 60 minutes if the repeat parameter is set to 1 hour.
- ? The repeat mode “**Rep**” from 1 to 12 hours. If 0, no repeat mode, if “continuous”, the continuous mode is activated (only if you get the licence).
- ? The “**Sample Rate**” can be select in the following table: 10, 20, 25, 40, 50, 60, 75, 80, 100, 125, 150, 200, 250, 300, 400, 600, 750, 1000 Hz.



? The "File Index" of the next record can be selected from 1 to 999.

Continuous mode specification:

Data are recorded in files; the file duration is selected with "Lgth". At the beginning of each new file recorded, the header data are calculated and saved. There is no lost data between the end of a file and the beginning of the next one and the sample rate is saved.

Press on the **GREEN** button to validate the parameters setting; *CityShark II* takes a moment to save them. The next screen is displayed during this time.

P L E A S E W A I T	<u>Screen 20</u>
UPDATING PARAMETERS	

Before returning to main *Screen 15*.

G a i n = 0 0 0 4 O v f = 0 5	<u>Screen 15</u>
%	
N e x t F i l = 0 2 1 4 1 5 2 8 . 0 0	
1	

Notes :

? Only the Gain can be changed using the **YELLOW** and **BLUE** buttons when the main *Screen 15* is displayed. It is not necessary to return in setting mode.

4 - SHOWING GPS DATA

From the main *Screen 15* and if a flash card is present and valid, press the **YELLOW** button during 3 second to display GPS data collected during 10 seconds. CAUTION!! During this moment, data are not refreshed.

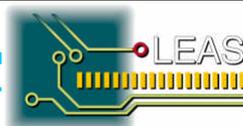
If GPS receiver is powered on and if GPS data are valid, the following screen is displayed (example given below):

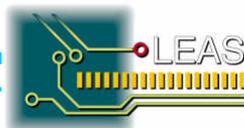
A = 0 0 3 2 8 m S a t . = 0	<u>Screen 21</u>
7	
0 8 : 0 7 : 1 0 0 2 / 1 5 / 0	
8	

- ? On line 1, "A" indicates the Altitude in meters, "Sat", the number of satellites viewed by the receiver.
- ? On line 2, UTC time followed by the date (MM / DD / YY).
- ? On line 3, the latitude of the point, **XX°XX'XXX** with North (**N**) or South (**S**) precision.
- ? On line 4, the longitude of the point, **YYY°YY'YYY** with East (**E**) or West (**W**) precision.

In the GPS receiver is off or if data are unavailable, the following screen is displayed.

* * * * * * * GPS NOT READY ! * *	<u>Screen 22</u>
---	------------------





5 - GENERAL USE

If a valid Flash card is detected, the main *Screen 15* is displayed.

```
G a i n = 0 0 0 4   O v f = 0 5
%
N e x t F i l = 0 2 1 4 1 5 2 8 . 0 0
1
```

Screen 15

- ? Line 1 indicates the gain and the Oversampling threshold level. The gain can be modified using the **YELLOW** and **BLUE** buttons.
- ? Line 2 indicates the file name followed by the index number in the format **MMDDHHNN.XXX**. **MM** for month, **DD** for day, **HH** for hour, **NN** for minutes and **XXX** for index. The file name changes automatically with the time data collected in the *CityShark II* clock circuit. The file index is automatically incremented at each new file recorded.
- ? The flash */= on line 2 indicates a high accuracy of GPS data and a correct synchronisation between GPS time and *CityShark II* clock circuit.
- ? Line 3 indicates :
 - The file duration of recording "**Lgth**".
 - The automatic repetition period of the recording "**Rep**" or the activation of the continuous mode.
 - The flash of "**Rep = xH**" indicates that the repeat mode has been launched by the mean of the **GREEN** button or by the use of the remote control

All of these parameters have been specified during the setting of *CityShark II*.

- ? The bargraph in line 4 indicates in real time the instantaneous maximum amplitude "**Amp**" for the whole of the detected and valid channels. The number "**nn**" indicates the channels number allowed for the record.

FUNCTIONS

From this main *Screen 15*, 3 functions are reachable:

- ? Access to the *CityShark II* settings by pressing the **YELLOW** button then the **BLUE** button, with keeping the **YELLOW** button pressed (see § 3 - SETTINGS).
- ? Access to the GPS data viewing by pressing the **YELLOW** button during 3 seconds (see § 4 - SHOWING GPS DATA).
- ? Launch a RECORDING by pressing the **GREEN** button (see § 6 -RECORDING).

6 - RECORDING

6.1 Local Start Recording.

From the *Screen 15*, launch the record by pressing the **GREEN** button.
The following screen is displayed:

NOW RECORDING 18 CHANNELS AT 200 Hz	<u>Screen 23</u>
--	------------------

This screen allows to check the number of effective channels selected and the sample rate of acquisition. The recording Screen is then displayed.

Normal or Repeat mode Screen

Gain = 8192 Ovf = 10 % File = 02141528.001 Remaining Time = 9	<u>Screen 24</u>
--	------------------

Continuous mode Screen

Gain = 8192 Ovf = 10 % File = 02141528.001 Continuous (Rt: 59	<u>Screen 24 Bis</u>
--	----------------------

- ? Line 1, the "**Gain**" followed with the oversampling threshold "**Ovf**".
- ? Line 2, file name with index.
- ? Line 3, the file remaining time. "**Remaining Time =**" or "**Rt**", in minutes then in secondes.
- ? The bargraph in line 4 indicates in real time the instantaneous maximum amplitude "**Amp**" for the whole of the detected and valid channels. The number "**nn**" indicates the channels number allowed for the record.

During recording, time remaining is decremented and the recording LED flashes at the rate of the access to the flash card.

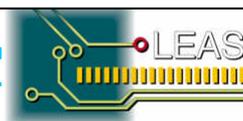
Except in Repeat mode and Continuous mode, the end of the recording is indicated by a serie of three beeps. At the end of the recording, the following Screen is displayed.

END OF ACQUISITION ----- Data save on file :	<u>Screen 25</u>
--	------------------

Then, the main *Screen 15* is displayed and the file index is incremented. The next file will start manually by pressing the **GREEN** button or automatically in Repeat or Continuous mode.

When the user starts the recording by pressing on the **GREEN** button, it is possible that the system displays the following message.

Gain = 8192 Ovf = 05 % NextFil = 02141543.00 2	<u>Screen 26</u>
---	------------------



The line 4 of *Screen 26* flashes (white line/message "FLASH CARD FULL"), it indicates that there is not enough place available on the flash card to contain the next file. The buzzer rings 5 beeps periodically indicating the impossibility to launch a recording.

The message remains displayed and the buzzer continues to ring during a few seconds, then the main *Screen 15* is displayed. The user must replace the flash card with an empty one or change the setting and program a smaller duration file.

The *Screen 26* is displayed also in Repeat and Continuous mode but with no action on the buzzer.

STOP during RECORDING.

At any time, it is possible to stop the file recording by pressing the **GREEN** button during 5 seconds. The following *Screen* is then displayed.

<p>S T O P Acq. SAVE FILE? Elapsed time: 9:47 File duration = 9mn SAVE DON'T SAV</p>	<p><u><i>Screen 27</i></u></p>
--	--------------------------------

2 options are available:

- Pressing the **BLUE** button "**SAVE**" will stop the file recording and will save the file in progress cut at the last round minute (File Duration).
- Pressing the **YELLOW** button "**DON'T SAVE**" will stop the file recording and will not save the file in progress.

Note: If the '**Elapsed time**' is lower than one minute, only the '**STOP**' option become available by pressing the **YELLOW** button.

'**Elapsed time**' in minutes and secondes.

'**File duration**' in minutes indicates the file duration if the **BLUE** button is pressed.

Pressing the **GREEN** button returns to the recording.

In Repeat mode or Continuous mode, the actions will be the same as the normal mode.

6.2 Remote Start Recording.

The Start Recording can be launched by the mean of the RCS (Remote Control System).

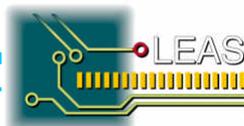
Switch on the *CityShark II* "Remote Control", the red Led lights on.

The following *Screen* is displayed.

<p>S Y N C H R O N O U S M O D E ----- H F receiver powered</p>	<p><u><i>Screen 28</i></u></p>
--	--------------------------------

Then, the process returns to the *Screen 23*.

In remote mode, the red Led "start acknowledge" indicates the HF reception. It is normal to get an irregular flash of this led during the waiting period of the remote order.



After the reception of a Remote Start Recording action, the receiver remains blind during 2 minutes.

The Remote Start Recording action can be used in Normal, Repeat or Continuous mode. Stopping a recording is also possible by pressing the **GREEN** button during 5 seconds. Follow the screen indication.

It is possible to start a new recording only in Normal mode. In Repeat mode, the user must rearm the Remote Control Switch (Off then On) to authorize a new remote start recording.

7 - MALFUNCTIONS DURING OPERATION

Central processing unit error:



Screen 29

- ? This screen indicates an error of the central processing unit (fatal error), The *CityShark II* cannot continue to work properly.
- ? **XXX** can take a value between 1 and 127.

Program error:



Screen 30

- ? This screen indicates an error of execution and/or a malfunction of the main program (fatal error), The *CityShark II* cannot continue to work properly.

In the event of errors of the **central processing unit** type or **program error** *CityShark II* station is **reinitialized automatically after a few seconds**. If the error persists:

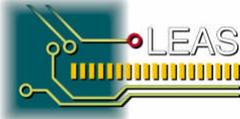
1. Power off the station.
2. Remove the flash card if this one is present.
3. Disconnect all the sensors connected to *CityShark II*.
4. Wait a few minutes.
5. Power on the station.

If all seems to function correctly, then reconnect the sensors and re-insert the flash card. Then, check the operation of the unit. If the error is always present, contact your *CityShark II* manufacturer 'LEAS'.

8 - FILES FORMAT

A compatible PCMCIA flash card (or Compact Flash with adapter) is used as mass storage unit. Before using, the flash card must pre-formatted to be compatible with *CityShark II*, and moreover be compatible with FAT16 format under MS-DOS/ WINDOWS operating systems.

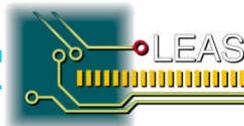
Preparation of the Flash card:



1. Formatting of unit **n** : **C: \> FORMAT n: /U**

2. Preparation of files SECTCITY.HEX and FICHBASE.DAT by using the **Initialize** command of *ReadCity* Software.

Note: The **sectcity.hex** file takes only one allocation unit; all the remainder of the available space is used by the **fichbase.dat** file. It is this part which supports the data.



9 - SECTCITY.HEX FILE FORMAT

SECTCITY.HEX

This is a small size file (one allocation unit). It allows the access of data recorded on the FICHBASE.DAT file.

SECTCITY.HEX		
Offset	Value	Description
0	String >>	Status indicator of the flash card: Value = CARTE FLASH NEUVE or CARTE FLASH CITY
24	xxxx...xxx	Available place on the flash card, hexadecimal ASCII encoded on maximum 8 characters. The place is expressed in bytes.
32	XXXX	Number of the current sector : binary encoded 32 bits
36	XX	Number of the recording index : binary encoded 16 bits
38	XX	Recording pointer: binary encoded 16 bits

Example of file sized for a 20 Mo flash card, just formatted.

SECTCITY.HEX	
Offset	Value
0	« CARTE FLASH NEUVE » (ASCII chain)
24	« 0 1 3 E 8 F F 5 » (hexadecimal ASCII encoded number)
32	0000 (binary)
36	00 (binary)
38	00 (binary)

Available place on the flash card:

The file preparation program take care of the recording marker "CITYSHARK" placed at the beginning of file FICHBASE.DAT:

Size of the file FICHBASE.DAT = 20.877.311 - 10 = 20.877.301 of available bytes.

After conversion

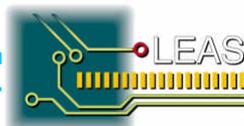
« 0 1 3 E 8 F F 5 » <=> 20.877.301 bytes.

10 - FICHBASE.DAT FILE FORMAT

FICHBASE.DAT

This file uses all the remaining space in the flash card (file SECTCITY.HEX in less); it contains data recorded by *CityShark II*. Each recording consists in :

FICHBASE.DAT		
Offset	Value	Description
0	CITYSHARK or CITY.xxxx	When the flash card has just been formatted When the first recording was written; . xxxx is the version of the embedded software (example: 0808) coded on 4 digits preceded by a point.
9	« DEB2 »	Marker of beginning of recording; DEB2 means a <i>CityShark II</i> recording.
18	NN , YYY	NN = valid channels number for the recording (decimal ASCII encoded - from 00 to 18) , = separator (comma) YYY = <i>CityShark II</i> serial number (decimal ASCII encoded – 001 to 254)
27	« FILE »	File marker
36	MMDDHHNN	Name of the file made at starting, built with the date and hour of the station



		(decimal ASCII encoded) in the form: MM = month; DD = day; HH = hours; NN = minutes
45	SSMMM	SS = seconds et MMM = milli seconds (decimal ASCII encoded)
54	NNN	File Index (decimal ASCII encoded – 1 to 999)
63	« PARAM »	This Marker indicates the beginning of the recording parameters
72	FFFF,TT	FFFF = sampling rate in Hz (decimal ASCII encoded - 10 to1000) , = separating (comma) TT = acquisition duration in minutes (decimal ASCII encoded - 1 to 60)
81	XXXXXX	Gain
90	XX ou X.XX	oversampling rate expressed as a percentage
99	XXXXXX	Absolute maximum value of the data according to the frequency of acquisition
108	XXXXXX	Maximum absolute value obtained
117	XXN,YYE	XX = degrees of latitude, N = N or S indication North/South , = separating (comma) YYY = degrees of longitude, E = W or E western indication West/East
126	XX.XXXX	XX.XXXX minutes and seconds of Latitude
135	XX.XXXX	XX.XXXX minutes and seconds of Longitude
144	XX,XXXXX	XX=Number of satellites, XXXXX = altitude in meters
153	XXXXXXXX	Duration of the file in milliseconds
162	X,	X: accuracy of the time stored in the file. 0: Bad (from local circuit 50 ppm) 1: Correct (from GPS accuracy +/-2.5ppm) 2: High accuracy from UTC GPS time
171	« DATA »	Marker indicating the beginning of the data (samples)
180	ZZZ NNN EEE	Data sensor 1 components Z, N, E coded on 24 bits (3 bytes)
189	ZZZ NNN EEE	Data sensor 2 components Z, N, E coded on 24 bits (3 bytes)
198
XXXXX	« FIN »	End of recording marker

The 144 parameter "number" of satellites is the number of satellites viewed at the end of the file acquisition. The position information got from the GPS receiver are stored in the file when these information are present and delivered from the GPS receiver.

The 153 parameter is the length of the file in milliseconds. This value can be calculated from the internal timer if there is no GPS data (theoretic value got from a 1,5 ppm Chrystal), it is a real value calculated from GPS data if these GPS data are valid.

The position information (117-126-135-144 parameters) got from GPS are filled with spaces (ASCII 0x20) if GPS data are unavailable.

The best choice to get a high time accuracy with *CityShark II* consists to work with GPS receiver On.

11 - FLASHCARDS COMPATIBILITY

Only the flash cards (mark and model) which are recommended and selected by LEAS can be used on the station *CityShark II*. The flash cards are recommended according to 4 criteria:

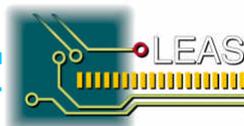
- Reduced consumption and power 3,3V or Bi-tension (5V or 3,3 V).
- Read and Write access time.
- Reliability in industrial or severe environment.
- Respect of standards PCMCIA, ATA and Compact Flash.

Flash card recommended and selected by LEAS:

- **SANDISK** (www.sandisk.COM), Compact Flash cards with standard PCMCIA II adapter.
- **LEXARMEDIA** (www.lexarmedia.COM), Compact Flash cards with standard PCMCIA II adapter.

NB: the flash card must be specified for the range of temperature for which they are intended to be used.

The read and write operations are not guaranteed in the event of using flash card of a type and a mark different from those which are specified.



Using general purpose Flash Cards is not advised, because that can cause various problems:

- ? Not detection of the Flash card (invalid card).
- ? Misreading and/or miswriting.
- ? Loss of data.
- ? Destruction of the Flash card.
- ? Destruction of the internal interface.

Following the insertion of a Flash card, if the media is not fast enough or if it is not recognized, the following message is displayed:

<p>FLASH CARD ERROR ! NOT IDENTIFIED Please check and</p>	<u>Screen 31</u>
---	------------------

The message will remain displayed as long as the flash card is not removed and replaced.

12 -A/N CONVERTERS TEST MODE

Reserved for the development and maintenance, the *CityShark II* has a mode of visualization of all the registers of the A/D converters, on a standard ASCII terminal; for that it is necessary to have:

- A connecting cable RS232 (contact js@leas.fr)
- An ASCII terminal (PC Windows under Hyperterminal for example).

Configuration of the serial link:

- Connection RS232-V24 standard.
- Speed: 19200 bauds.
- Format: 8 bits, no parity, one stop bit
- No control of hardware or software flow.

Configuration of the terminal:

- Terminal in standard ASCII mode.
- Port series: COM1 or COM2, 19200, N, 8, 1.
- Standard ANSI keyboard.

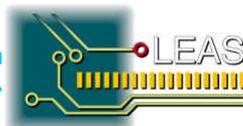
Connection:

- ? Make Off the PC and *CityShark II* and connect the cable.
- ? Power On the PC and *CityShark II*.
- ? Configure a session under HYPERTERMINAL.
- ? Enter in DEBUG mode ('D').

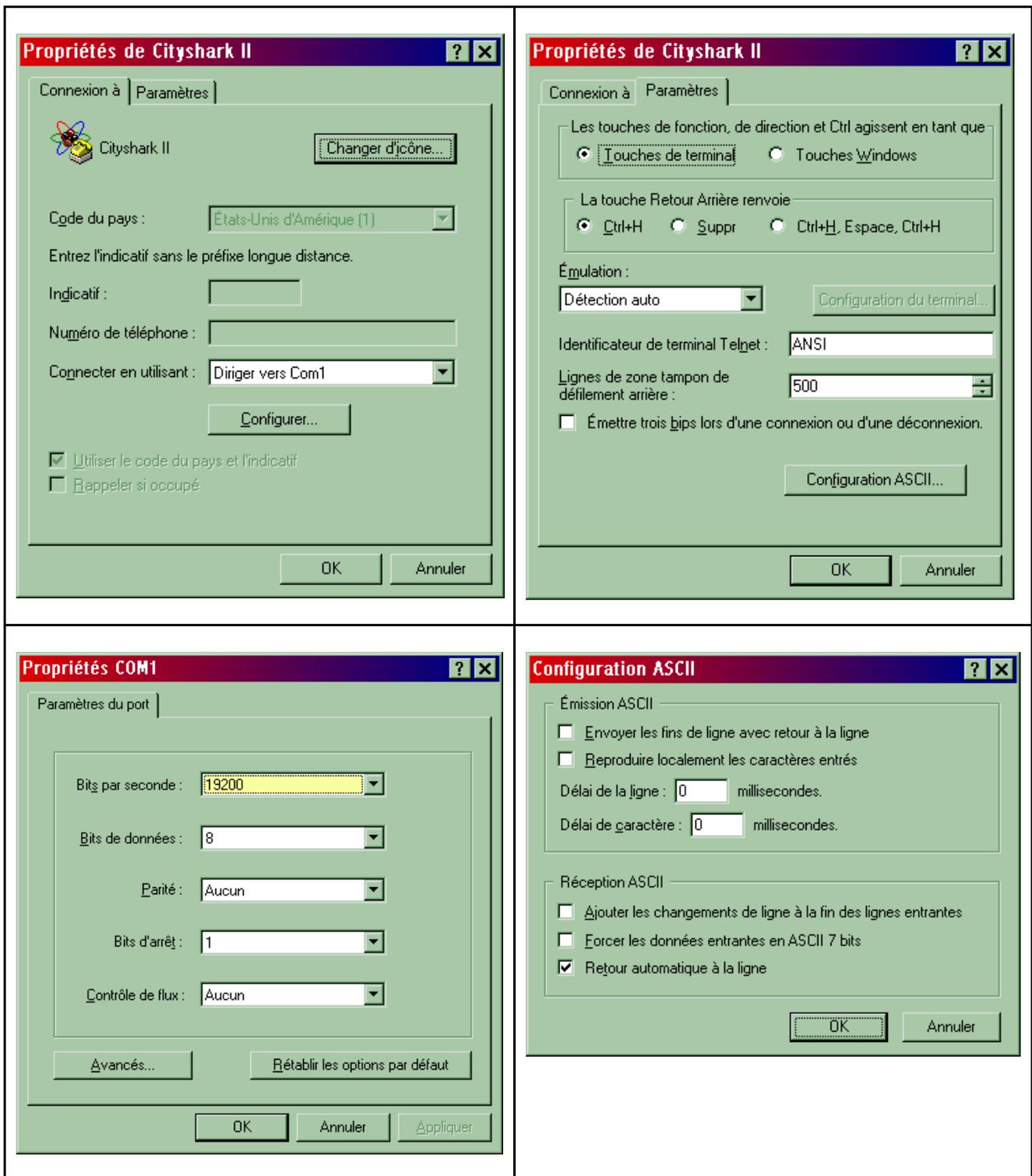
WARNING !!

Mode DEBUG, when activated, slows down the system because of the reading of all the internal registers of all the converters, after each acquisition; it is necessary to use mode DEBUG with a sampling rate lower than 200Hz.

HyperTerminal configuration under Windows :



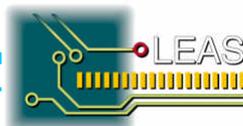
- ? Reach Hyperterminal and create a new (name : *CityShark II* for example)
- ? In the Properties, set up the parameters as showed below



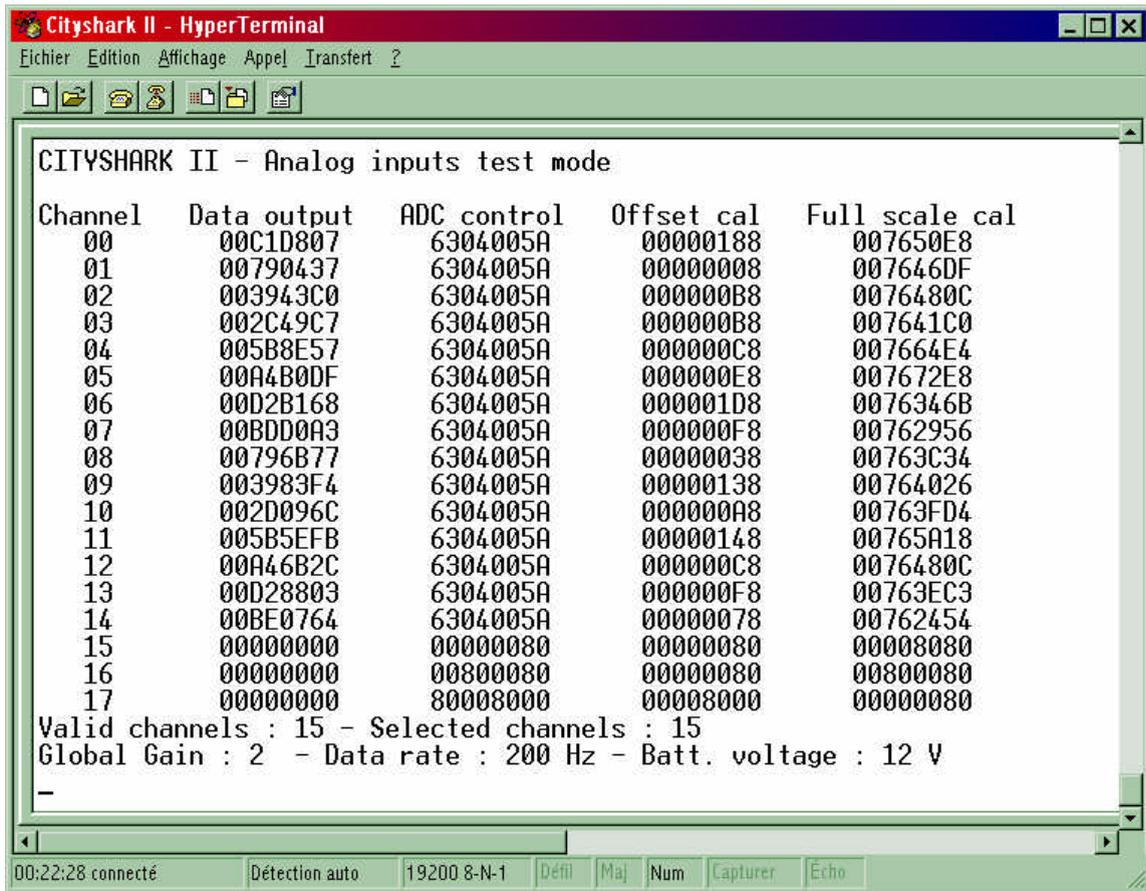
Using the Test mode :

Hyperterminal session being opened (connected):

- ? Pressing the « **d** » key to enter the DEBUG mode.
- ? Pressing the « **e** » key to quit the DEBUG mode.



- ? Pressing the « **ENTER** » key will display the following screen, only if the DEBUG mode was entered before



Note: A new screen is displayed each time the "ENTER" key is pressed.

- ? Channel: number of the input channel or number of the converter.
- ? Data output: rough result of conversion to 24 bits, coded on 32 bits.
- ? ADC control: command register on 32 bits (CMR).
- ? Offset cal: register of zero offset calibration (OCR) on 24 bits, coded 32 bits.
- ? Full scale cal: register of full scale calibration (FCR) on 24 bits, coded 32 bits.
- ? Valid channels: a number of channels available indeed.
- ? Selected channels: a number of channels validated by the user (< = Valid channels)
- ? Total Gain: total gain set by the user.
- ? Dated rate: frequency of acquisition set by the user
- ? Batt. Voltage: direct reading of the battery voltage.

13 - GAIN DESCRIPTION - RANGE OF MEASUREMENTS

The following table gives the correspondence between the gain set by the user, the dynamic range on the sensor input. The ADC value is given for information.

Gain	Dynamic range @ Dyn 5 V (input)		Gain	Dynamic range @ Dyn 10 V (input)	ADC Value (for info)
1	+/- 2,5 V		1	+/- 5 V	+/- 2,5 V
2	+/- 1.25 V		2	+/- 2,5 V	+/- 1,25 V
4	+/- 0,625 V		4	+/- 1.25 V	+/- 0,625 V
8	+/- 0,3125 V		8	+/- 0,625 V	+/- 0,3125 V
16	+/- 0,1562 V		16	+/- 0,3125 V	+/- 2,5 V
32	+/- 0,0781 V		32	+/- 0,1562 V	+/- 1,25 V
64	+/- 0,0390 V		64	+/- 0,0781 V	+/- 2,5 V
128	+/- 0,0195 V		128	+/- 0,0390 V	+/- 1,25 V
256	+/- 0,0097 V		256	+/- 0,0195 V	+/- 0,625 V
512	+/- 0,0048 V		512	+/- 0,0097 V	+/- 0,3125 V
1024	+/- 0,0024 V		1024	+/- 0,0048 V	+/- 2,5 V
2048	+/- 0,0012 V		2048	+/- 0,0024 V	+/- 1,25 V
4096	+/- 0,0006 V		4096	+/- 0,0012 V	+/- 0,625 V
8192	+/- 0,0003 V		8192	+/- 0,0006 V	+/- 0,3125 V

The “**Conversion Factor**” used by ReadCity allows the user to get the voltage value read by CityShark II on the sensor input.

The “**Conversion Factor**” is equal to:

$$CF = \frac{2^{(\text{maximum absolute dynamic})}}{\text{Dynamic Range Input}} = \frac{2^{(\text{Range of measure} + 1)}}{\text{Dynamic Range Input}}$$

- The maximum absolute dynamic = Range of measure + 1 (see table §14 below)
- For ex, @ 100 Hz: 132 072 = 131071+1
- The Dynamic Range Input is the extension of voltage on the sensor input at gain One. This value is given peak to peak, see *Screen 3* it can take 5 or 10 Volts in option. Contact js@leas.fr.
- @ 100 Hz, CF = $(2^{131072}/5)$, soit 52428,8.

To get the value of the voltage on the sensor input.

$$Vin = \frac{\text{Data}}{CF * G}$$

- For exemple: if data is equal to -116997, the Gain = 16 and CF = 52428,8
- So Vin = $-116997/(52428,8*16) = -139,471\text{mv}$

14 - EFFECTIVE RESOLUTION DESCRIPTION

The following table makes the correspondence between the sampling rate set by the user, and the number of useful bits for the range of measurement.

Frequency in Hz	Number of useful bits	Range of measurement
10	20	+/- 524.287
20	20	+/- 524.287
25	20	+/- 524.287
40	20	+/- 524.287
50	20	+/- 524.287
60	19	+/- 262.143
75	18	+/- 131.071
80	18	+/- 131.071
100	18	+/- 131.071
125	17	+/- 65535
150	17	+/- 65535
200	16	+/- 32767
250	15	+/- 16383
300	14	+/- 8191
400	13	+/- 4095
600	12	+/- 2047
750	11	+/- 1023
1000	10	+/- 511

Notes: the number of useful bits (effective resolution – RMS bits) results from the specification of the ADC manufacturer.

15 - CONSUMPTION AND AUTONOMY

Maximum consumption evaluation:

Statement of consumption (configuration without GPS (deactivated)):

- ? 6 activ sensors LENNARTZ LE 3D/5S (10 mA per sensor).
- ? Receiving GPS: OFF.
- ? Flash card 64 Mo.

Maximum consumption measured (recording mode): **196 mA under 13 V.**

Statement of consumption (configuration with activated GPS):

- ? 6 active sensors LENNARTZ the 3D/5S (10 mA per sensor).
- ? Receiving GPS: ON + external GPS Antenna active.
- ? Flash card 64 Mo.

Maximum consumption obtained when recording: **243 mA under 13 V.**

Estimate of autonomy (with GPS):

Values determined compared to the manufacturer curves of battery discharge:
YUASA Battery (U.K.) Ltd, NP valve regulated lead acid battery manual.

Parameters:

- ? Standard battery NP 12 V 7Ah - Rated capacity (CA) = 7 Ah.
- ? Battery completely charged, starting nominal voltage between 13 V and 12,7 V.
- ? Ambient temperature of 25 °C.
- ? Maximum current consumption estimation: 250 mA
- ? Index on the discharge curve: 0,035 X CA
- ? Nominal voltage at the end of the autonomy: 11 V to 10,5 V

Estimated theoretical autonomy: 20 to 24 hours minimum.

Practical autonomy (20 % of margin): 16 to 20 hours minimum.

Charge of the battery (12 V/ 7 Ah) (ref NP12/7):

According to the configuration and the use of the station, it acts of a cyclic load: the refill of the battery is an operation made by the user, with its request (contrary to a continued load made by an automatic charger). Battery are never covered by the manufacturer warranty. The user will process to the charge of the battery regularly by the mean of the charger delivered with the instrument.

Technical data for a cyclic load:

(YUASA Battery (U.K.) Ltd, NP valve regulated lead acid battery manual)

Charging voltage: 2,35 V to 2,50 V/cell

Charging current: 25 % of the rated capacity, ie 1,75 Amp.

Maximum tension of load (battery 12 V): 15 V

Ideal current: 0,1 X C are 0,1 X 7 = 700 mA

The ideal charger must have the following characteristics:

- ? **Automatic Stop at the end of the load.**
- ? **Current of nominal load: 700 mA.**
- ? **Nominal charging voltage: 14 V.**

Your manufacturer realised this documentation with all the attention necessary.
However, some error could exist, please contact us for any further question about this instrument.
Contact us at the following mail address, js@leas.fr.