Horstermeer logger

User Manual

vrije Universiteit amsterdam

Loggersoftware v1.01i, (081110)
Hardware 1.0
Loggerconf v1.0d

Arnoud Denker , July 7, 2010 Elektronica Bèta VU, FEW / FALW *Vrije* Universiteit *Amsterdam*, the Netherlands	**Project ID : 2008-2926-02** Filename : Hortslog.doc Pages : 18 Last save : (August 25, 2011)
Phone : +31-20-5987825 Fax : +31-20-5987899	Email : a.denker@beta.vu.nl Web : http://ele.beta.vu.nl

Warning

This equipment uses voltages which are dangerous to life. It should be serviced only by qualified personnel.

Table of contents

1 Precautions

Safety check has been done following the NEN-EN 50110-1 and NEN 3140

Hazardous voltages exist in this apparatus. Besides the regular safety precautions the following should be observed when working with this unit:

1. When power is required, the unit should be plugged into an outlet with a properly grounded receptacle. The use of two prong plug adapters is not recommended.

2. The use of extension cords may compromise the safety of the operator and is not recommended.

3. Ensure that the fuses installed in the unit are of the correct rating.

4. A damaged power cord or plug may constitute a shock or fire hazard. Do not allow continued operation of the unit until the damaged cord or plug has been replaced.

5. Ensure that none of the ventilation openings in the apparatus are blocked. Excessive heat build up in the unit may cause failures.

6. Do not exceed maximum allowable mains input voltage.

7. The apparatus is designed for horizontal use only.

8. The apparatus should not be opened by the user; in case of a malfunction it should be offered for service by the Electronics group.

2 General Description

The Horstermeer logger is a logger specially build for a site called Horstermeer.
This logger has some special features which makes it different to other loggers.

- On the fly SDcard change. So no need to stop logging while changing of the storage media.
- Does an 'Eddy covariance' over the measured analogue data and sends the result by GSM.
- Captures serial data (from a 23X) and sends the stored serial data by a time interval.
- The logger keeps a report file, with errors and/or other system messages; ands sends a summary by GSM.
- Can be configured by a console, or can be preconfigured by a file stored on the SDcard. The configuration file is generated by a utility (called logger conf).
- The logger has 8 analogue channels (12 bit ± 10vtt), and 1 serial channel. (5 digital channels is hardware ready, but are not enables in the software).

The Horstermeer logger

2.1 Internal setup of the logger

The logger can be dived into different sections.

- Report engine
  Every important action the logger does, a log entry is generated and fed into a report file stored onto the SDcard. Creating of a data file, sample frequency, even errors are logged. A summary of those entries are send by ftp or email. The is written in standard ascii and can be read by an editor to see the behaviour of the Horstlog.

- Logger section
  This section performs the actual (data)logging. It reads data from the hardware and prepares it to store to disk and prepares it for the eddy covariance routine. The collected serial data fed to disk section and to the modem section.

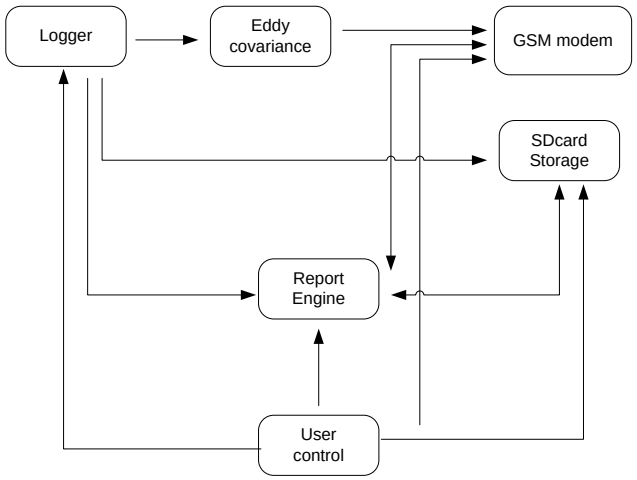
- Eddy covariance section
  The modem is capable to calculate an eddy covariance over the measured data. The result of these calculations are send by a gsm modem to the VU.

- SDcard storage section

This section performs the storage to SDcard. It also monitors the buffer handling and the mount and unmount actions.

- GSM modem section
  This section controls the modem. The data is buffered, and send by modem. When the modem fails, the data is lost. The modem is restarted and ready to try it again with a new dataset. The time to setup a connection is relatively long. That's why data is thrown away instead of to retry to send it again.

- User control
  This section handles all the commands given by the user. It also controls the LEDS and the switches



Internal setup of the logger

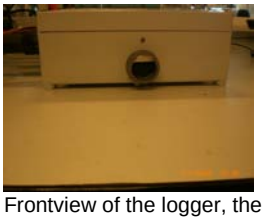
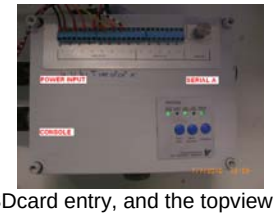
In the picture 'internal setup of the logger' you can see the dataflow between the sections. The data path flows from the logger section to the SDcard or from the logger section through the Eddy covariance and then to the GSM modem.
The control path is from the user control section to the logger, modem and sdcard storage.
The rest is the report data, to inform the user.

3 Description of Controls

Controlling the basis functions is quite simple (by buttons). Controlling the advances functions can be done by a console, or by a pre configured configuration file.

3.1 Setting up the logger

Setting up the logger is quite simple. Just insert a preconfigured SDcard into the SDcard entry. Connect the 23X to the SERIAL A port. Connect the power supply at the supply connector. Plug in the power supply into a wall-outlet.
At first the Power Status Led is off. The Horstlog will now start to boot.

Frontview of the logger, the SDcard entry, and the topview of the logger, the key controls

If the user wants some information (on what the logger does in this post-idle phase), a console can be connected to the Horstlog (115200 baud, none)

First the logger tries to mount the SDcard. When the logger isn't capable to do so, a beep will be sound, and the logger stops. When a valid SDcard is found, the logger tries to read its configuration (conf.sy). When this configuration file is not present, it will be using a default configuration. After some hardware initialisation, the logger looks if the GSM modem is present. When the GSM modem isn't found, the logger goes into IDLE mode, ready to start logging. The logger is full functional but not capable of sending data to a server.

When the modem is found, the logger tries to initialize GSM modem. This will take a while (A couple of minutes). When all goes OK, the logger gives a beep, and goes into IDLE mode, Ready to start logging.

The logger can be controlled in 2 ways. The first way of controlling the logger is by a console connected at the console port. The second way is by pressing the control keys at the top of the logger. Note that the keys are deliberate not sensitive. The Start/Stop and the Mount/Unmount keys have to be hold for about 10 seconds to function. The Shutdown key has to be hold for about 20 seconds.


The LEDs and the key controls, and a dump of the console, while the logger runs through is initial start-up sequence

3.1.1 Modes

The logger has 3 modes.

- Idle mode. In this mode, the logger is waiting for the commands. Either given by a set of buttons, or by the console. In this time and date can be set. See “console commands”. In this mode the Power Status Led blinks
- Logger mode. In this mode, the logger rejects almost all console commands. This is done to guarantee to be logging in the given log frequency
- Admin mode. In this mode all (console) commands are accepted, but the logger doesn’t guaranteed to be logging in the given log frequency (it could skip some measurements). This mode is for debugging purpose only.

What does the logger do when its logging

The logger stores the data which is measured on SDcard (in the directory data). Besides storing the measure data, a eddy covariance is made of this data. The calculated data is send to a server. (See for the server setting configuration).

3.1.2 Start the logger

Be sure before starting the logger, the logger is in the IDLE mode. The logger can be started in 2 ways. The first way is by pressing the Start/Stop key. Hold it for a while. The second way of starting the logger is by issuing the command “start” in the console.

When the logger starts to log, a sound can be heard, and the “System status” led starts to flash. This flash frequency is derived from the log frequency (but much lower to make the led visible).

3.1.3 Stopping the logger

Stopping the logger is just a easy to start it. Just press the button “Start/Stop” and hold it for a while). Or issue the command stop in the console. A beep sound can be heard and the “System status led” stops with flashing.

3.1.4 Replacing the SDcard

Before removing the SDcard press the “Mount/Unmount” button (and hold it for 10 secs). This tells the logger to flush all its data in memory to the SDcard. The logger will sound a beep, and the Disk status led will go off. It now possible to remove the card.

Just insert a new preconfigured SDcard. Press the “Mount/Unmount” button. The logger will sound a beep, and the Disk status led will go on. The SDcard is now complete.

The replacing of the SDcard can be done while the logger is logging. The time to change the cards is about 5 minutes (depending on the log frequency).

3.1.5 Shutting down the logger

It is important to shutdown the logger properly (not just by removing the power). Otherwise the GSM modem has some problems to start the next time the logger is turned on. When the modem doesn't start, just use the shutdown procedure to get the GSM modem in the normal shutdown status.
To shutdown the logger, just press shutdown and hold it for about 20 seconds. The 'shutdown' command can also be issued in ADMIN mode on the console. The logger will beep, and after a while all status LEDs will go off. When all LEDs are off, the logger is truly off, so the power can be removed.
When the power is removed while the shutdown sequence is running, no prediction can be done in which status the modem will be, while turning the logger on again.

3.1.6 Additional console commands

So as written earlier, the logger can be controlled by a console. The console is default an RS232 port, at 115200 baud, no parity, no handshaking.

As read before, the logger has three status levels, IDLE, LOGGING and ADMIN.

In the ADMIN mode the logger accepts all commands. But this mode **doesn't guarantee that the logger keeps its log frequency**. It's even possible to create strange behaviour by issuing some commands.

> *While logging, you can change the time. If the time set is earlier than the time before, the new log data would be from an earlier date, so new log data is faulty.*
> *On other example is turning the modem off, while a send transfer is in progress. It's all up to the user to keep that in mind.*

The ADMIN mode is intended for debugging purposes, and not for normal use.

When the logger is first booted, the logger comes in the status IDLE. In this mode, some parameters can be changed needed for the logging process, such as time, or the sample frequency.

When the logger is logging, the status becomes LOGGING. In this mode, most commands can't be executed, to prevent errors in the logging process.

In every status the command help can be issued, so see which commands are possible in the current status.

The logger has some commands which makes installation in the field a much easier.

To reach some of those commands, you have to be in admin mode. Just give the command 'admin' with password 'admin'

> By using the command '**samples on'** the logger dumps the analogue and digital data in an interval of 1 second to the console.
>
> If you use the command '**sercon on'** the logger will direct all serial input directly to the console. Note that this command is overridden while logging.

The command “**modem ftptest filename data**” setsup a ftpconnection.

The command “**modem emailtest email@vu.nl subject data**” tries to send an email.

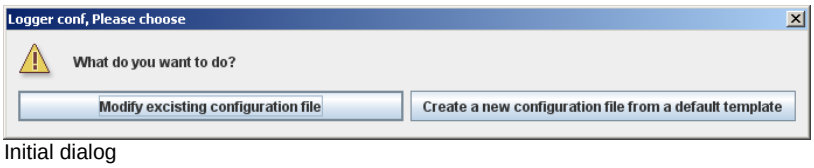
See for a complete command set appendix commands

4 Configuration

When the loggers boots, its reads a configuration file stored on the SDcard. In this configuration file (conf.sys) all user configurable settings are stored. If the logger can't find the configuration file, a default configuration is used. All setting can be altered in admin mode. But 1 wrong typo and the logger could fail.
Because some of those settings are a little cryptically, a utility (Logger conf) is written, to make life easier. Just start Logger conf.

4.1 Initial dialog Logger conf

When starting Logger conf a requester will popup. Here you have to choose what you want.



Initial dialog

After the selection a new dialog appears. On the top of the window, different tabs can be chosen. By pressing a tab (main / modem / serial / eccalc / eccalcheader) other setting can be filled in.

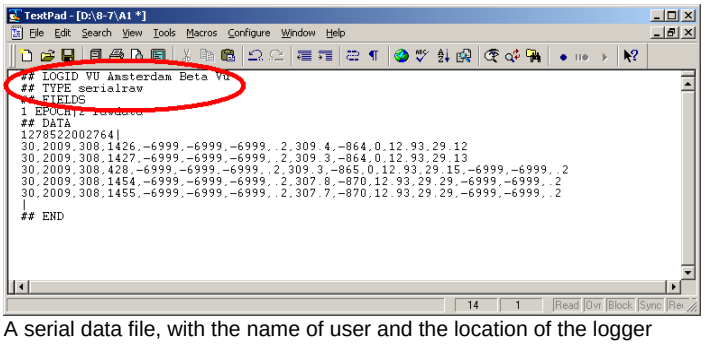
4.2 Main settings

Main settings tab

This is the Main section of the window.

Here we can enter some global settings.

The first is the name of the user. The second is the location of the site. In the files send to the server these settings are include. So is the user capable to see from which site and which logger the data is send.



A serial data file, with the name of user and the location of the logger

Note that the following commands can be used in the console to override the settings set in this dialog section.

set location [location]
set user [user]
set samplerate [rate]

4.3 Modem settings

Modem settings tab

This section is the modem section. In the first scrolldown menu, you can select which protocol it has to use to send, or to disable to send sequence. (ftp, email or none).

The second section of this dialog are the provider settings. Without these settings, the modem can't establish a GSM connection. Refer to the gsm provider for the correct settings. Mostly the DNS server has to be blank.

On the third section are the settings of the ftp server. Refer to your administrator for the correct values. Be sure that the FTP server can be reached from outside of the domain, where its hosted. When you want to use a other port then the default 21 port, you can use a ':' to specify a other port. These settings should be correct and not blank when FTP is used.

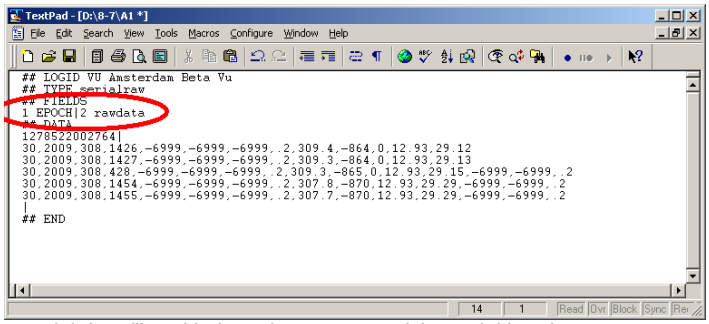
The fourth section is the mail (SMTP) settings section. Use here the settings of the GSM provider, or use a server which is accessible from the outside.

The last entry is a SMS phone number. When the logger fails, but has still modem reception, it will send a SMS to inform the user that the logger has a critical error. There will be only 1 SMS send per day.

4.4 Serial settings

On this tab the serial settings can be configured (at this moment only 9600 baud is supported).

On the 'Serial A' header fields, the column names can be given. These are the columns which are send to the server.

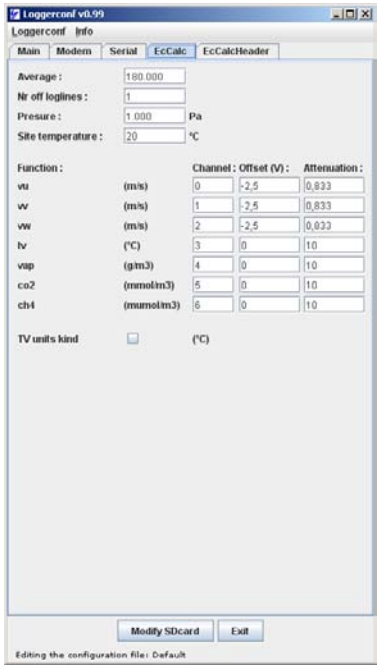


A serial data file, with the colums names of the serial header

The last entry is the serial send time interval. This time interval is in mS. (So 180000 mSec is an half hour). When no data is available, no data is send to the server.

Serial settings tab

4.5 EcCalc settings



In this section the EcCalc settings can be altered.

The first field is the averaging of the samples. Note that this has a relationship with the sample frequency.
When logger has a sample frequency of 10Hz, its sample interval is 100mS. When taking an average of 180000 points, an average of an half hour is made.
The section field is the nr of loglines. Aka, the nr of averages made. (so 1 is an half hour, 2 is send the data in an hour).

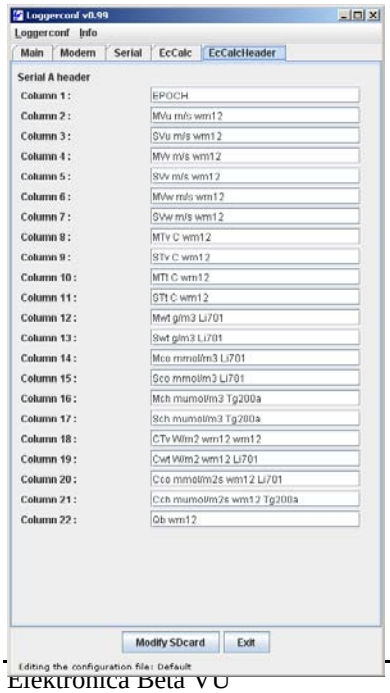
The other field is the pressure on site and the mean temperature of the site.

The next entries is to make a relation betweens the measured data, and how this data is fed to the eccalc routine. In the first row you can set the hardware channel, regarding the measured unit. So in this example 'vu' is expexted at hardware channel 0. Necos the windmasterpro is single ended, and the routine is calculated in real values we have to subtract 2,5V. To get the singnal at the right level, we have to multiply the signal with 0,833. (The multiplication is done after the substraction!).

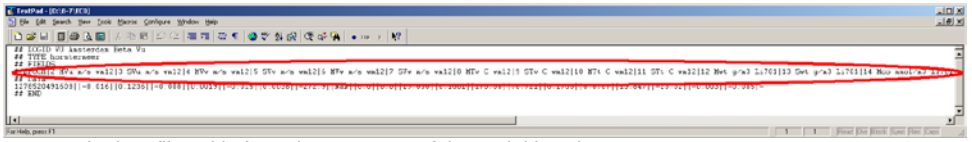
EcCalc settings tab

The 'tv' value can be delivered in two flavours. One in degrees and the other in m/s. The eccalc routine expects degrees. If the checkbox is set, a pre calculation is done to convert the m/s to degrees.

4.6 EcCalc header settings



By pressing the last tab on de window, the eccalc header settings can be altered. You can here fill in how the eccalc send data header looks like.



An EcCalc data file, with the colums names of the serial header

EcCalc header settings tab

4.7 Saving the configuration

At the bottom of the window you can choose modify SDcard. When this button is pressed, the configuration is saved.

By pressing exit, the window gets closed, and no data is altered.

5 Specifications

- Power consumption is 3 watt when GSM modem is idle. When the GSM modem is sending an additional 4W of bursts can be added. The additional 4W is not continuous.
- Max log frequency 20Hz. The logger should go faster, but this is not tested in combination with the Gsm modem, and calculation of the eddy Covariance.
- 8 analogue channels (12 bit ± 10vtt).
- 5 digital channels 5V TTL.
- 1Serial channel, 115200 Baud max.
- GSM modem class 12
- SDcard in FAT32, 2GB max

6 Service

When the logger has problems, just bring it back to Electronica Beta VU. There is one 1 fuse which can be replaced.

7 Appendix, command set

command	idle	logging	admin	function
start	*		*	starts logging
stop		*	*	stops the logger if logging
shutdown	*	*	*	shuts doen the logger
help				gives a list of all availble commands
cls	*		*	clears console screen
dir	*		*	displays directory of SDcard
mount	*	*	*	mounts SDcard
unmount	*	*	*	unmounts SDcard
report	*		*	display current report
admin	*	*		get logger in admin mode
exit			*	logs of from admin mode
get time	*		*	displays the time
get date	*		*	displays the date
get info	*		*	displays some logger info
get preferences	*		*	displays the current configuration
get debugmode	*		*	displays if debugmode is on or off
get location	*		*	displays the location
get user	*		*	displays the user
get version	*		*	displays logger version
get status	*		*	displays current status
get disk status	*		*	displays if disk is mounted
set time [hh:mm:ss]	*		*	sets time of logger
set date [dd-mm-yyyy]	*		*	sets date of logger
set serialnr [serialnr]			*	set serial nr of logger
set debugmode [on / off]			*	set logger in debug mode. All debug data is written to console
set location [location]	*		*	sets location of logger
set user [user]	*		*	sets user of logger
set samplerate [rate]	*		*	sets sample rate (in hz)
load preferences	*		*	reloads configuration
save preferences	*		*	saves current configuration to the SDcard
get printsample	*		*	prints a sample of all analog en digital inputs
samples [on / off]	*		*	if on prints continues samples of all analog en digital inputs and stops when off
eddydebug [on / off]	*		*	dumps debug messages of the eccalc routine to the console
sercon [on / off]	*		*	if on, the serials data is directed to the console
serial A [data]	*		*	pushes data to serial A
serial B [data]	*		*	pushes data to serial B

serouttest [on/off]	*	*	dumps random data out of serial A and seral B. This to test the serial port
spi		*	toggles all chipselects of the spi bus
modem status	*	*	gives current modm status
modem sms [phonenr text]		*	sends sms
modem getpin		*	gives current pincode of modem
modem setpin		*	set pincode of modem
modem ftptest [filename data]		*	command to test a ftp connection
modem emailtest [to subject data]		*	command to send an email for test purposes
modem sics		*	gives coinnection status with provider
modem sigquality		*	gives signal quality. Higher = beter, but 99 is connection fail
modem [on / off / reboot]		*	turns modem on or off, or reboots modem
modemdebug [on / off]	*	*	dumps debug messages from the modem to the console
@	*	*	direct console direct to modem. @ ATZ resets modem