Data logger and analysis tools

General description

This application note explains and shows how to optimally analyse data of an Xtender system by means of the data logging function.

The data logging function is very useful for precise analysis of the functioning of a system. For example, to see the consumption evolution of a system, to perform all sorts of statistics, etc...

Composed of two parts, this process save electrical values of an Xtender system (Voltage and current of the battery, output power, etc...) and then analyze the data graphically with a Microsoft® Office Excel® 07 document or a Matlab® script.

Free download of these analysis tools on our website:
*www.studer-innotec.com/support*

Features

- Daily, weekly, monthly and yearly reports automatically generated.

- Saving of the electrical values such as the consumed and produced energy, the battery current and voltage, the output power, the relay status, etc…

- Measurement resolution : 1 point every minute.

Minimal configuration

- **Range of inverters**
  - **All Xtender Series**

- **Xtender**
  - *Software vers.   : 1.3.28 and higher*

- **RCC02 / 03**
  - *Software vers.   : 1.3.34 and higher*
  - *RCC User level : EXPERT*

Principle of operation
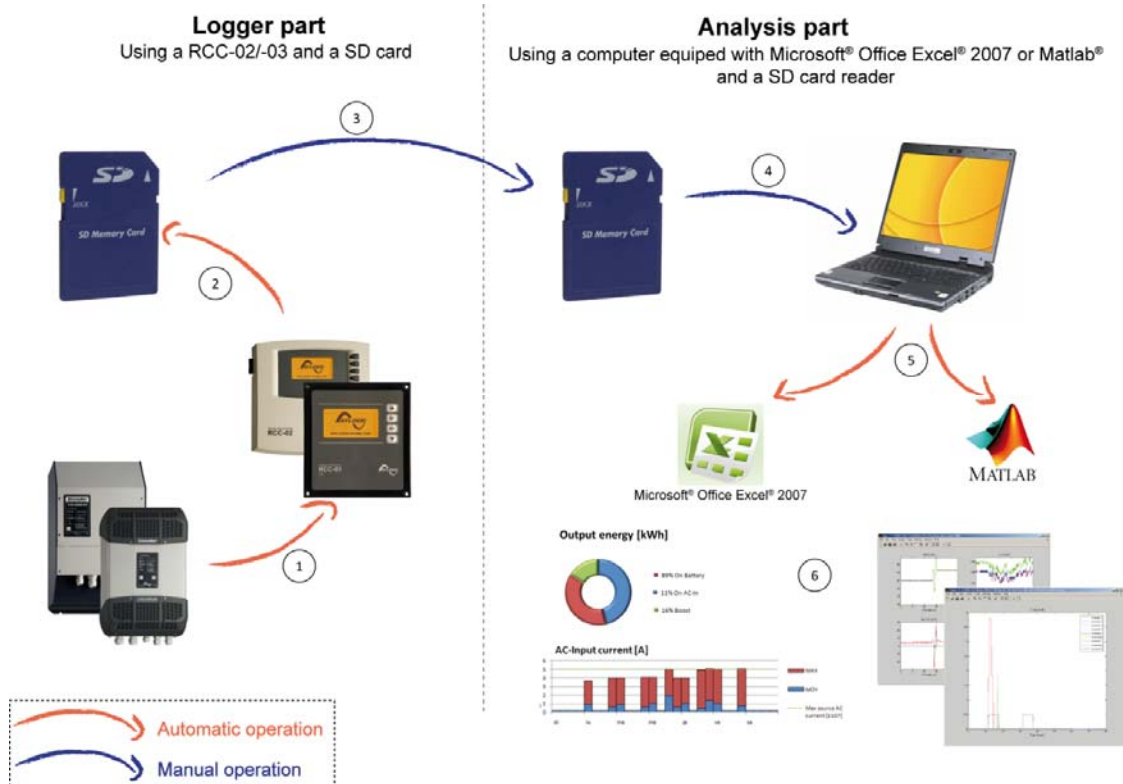
(Figure 1) Data logger and analysis tools for the Xtender series

Detailed description

The RCC-02/-03 includes a recording function of electrical values. These values can be displayed on a computer and analyzed for statistical purposes or to verify the functioning of a system [i].

It is therefore important to separate the part of "Data logger" (requiring at least an Xtender, a RCC-02/-03 and a SD card) and the part of "Data analysis" (done with a PC).

For this reason, this application note describes at first the "**Data logger**" and then the "**Data analysis**".

The Data logger

The data logger function is by default disabled, it is necessary to activate the parameter {5058} "Datalogger enabled" to start the recording. (See page 5)

When the data logger is turned on, a file is created on the SD card inserted in the RCC-02/-03 at the end of each day (midnight). This file contains the components data of the Xtender system and the recordings of the electrical values minute after minute.

The file is registered in CSV format on the SD card and can be read by many programs. The filename contains the date of the day in the form :

- **LGyymmdd.csv** *(LG+year+month+day)*

Data are saved at the end of the day. To obtain data from the current day, it is possible to manually create a file during with the data already recorded. (See page 5)
After retrieving data, it is necessary to reinsert the SD card. So, a new file with the complete data will be created at midnight.

Warning

- The update process of the software causes the erasure of the daily data.

- At midnight the daily data are saved on the SD card. If no SD card is present in the RCC-02/-03 the data of the day will be lost.

- The RCC-02/-03 does not support SD XC cards whose memory size exceeds 32 Gb and SD cards in FAT32 formatted.

- A SD card of 2Gb is sufficient to save 1 year of data from a system composed of 9 Xtender interconnected.

- The SD card provided with a RCC-02/-03 is of 2 Gb.

- If a SD card has reached its maximum capacity, all new data will be lost.

- The data logger is not compliant with the RCC-02/-03-32 (Remote control with a RS-232 port).

The Analysis part

To process the data saved on the SD card, Studer Innotec provides two analysis tools.

a. XTENDER Data Analysis Tool (Excel® 07 document)

b. XTENDER Matlab® Data Analysis (Matlab® script)

The **XTENDER Data Analysis Tool** is an analytical tool in the form of a Microsoft Excel® 07 file [ii] which allows you to read the datalogger files and generate reports daily, weekly, monthly and yearly.

The **XTENDER Matlab® Data Analysis** is a Matlab® script [iii] that can display graphics of the data of the Xtender system.

This script plots :

- Battery voltages and currents
- AC-input voltages and currents
- Power profiles

In the workspace, variables are created that contain the data and they can be used for one's own computations or simulations.

Notes

[i]   A system may consist of 1 to 9 Xtender interconnected.

[ii] The use of this file implies the use of Microsoft Excel® version 2007 SP2 or later.

[iii] The use of this script does not require the installation of special Matlab® toolbox.

XTENDER Data Analysis Tool

User guide

*It can happen that the security of Windows®
disables macros. By opening the Excel®
document, it will be necessary to enable them
as follow :*

Options > Activate these contents > OK
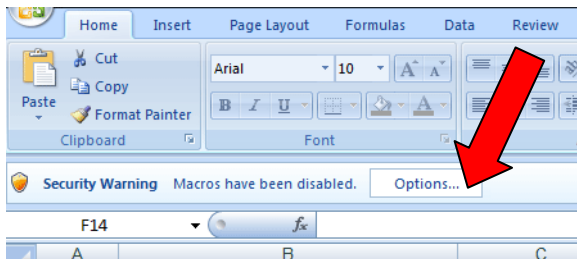
(Figure 2), Options of Security

**(Figure 3), Enable Macros & ActiveX contents**

Step 1

To view a report, it is first necessary to load the
data generated by the system. Use the IMPORT
CSV FILE BUTTON, and locate data files. You
can load a single data file or select multiple files
to import. To select all files in the directory, use
the key combination CTRL+A. In the SD card,
the files are located in the directory CSVFILE in
the subfolder LOG. The import of many data
files (for example 1 year of data) may require
very long treatment along several minutes.
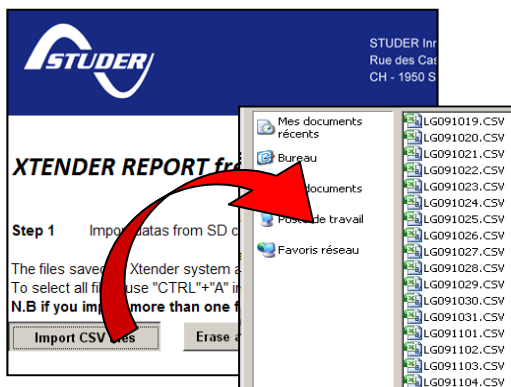
(Figure 4), Import of CSV files
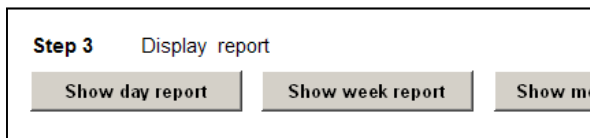
Step 2

Once the data are loaded, choose a date (in the
yellow insert) to generate reports relating
specifically to it (daily, weekly, monthly). To view
a report of another day, week or month, it is
necessary to enter a new date and generate the
report again.
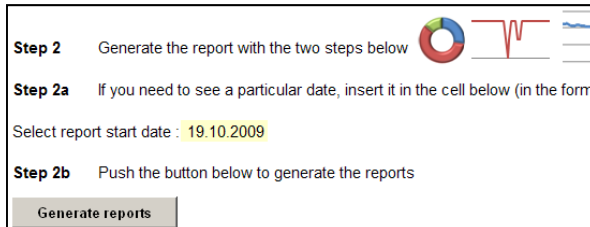
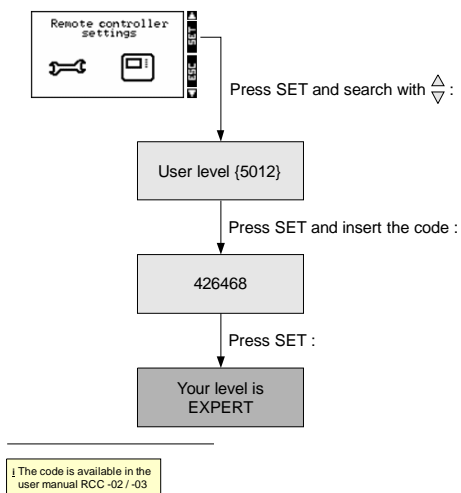**(Figure 5), Report generation**

Step 3

After generating the report, simply select a type
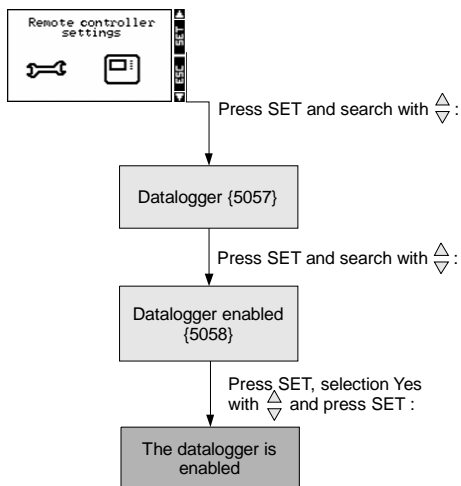of report (daily, weekly, monthly, yearly) to view
graphs of various data recorded.

(Figure 6), Report displaying

RCC -02 / -03 programming guide

1. User level to EXPERT

Remote controller settings

Press SET and search with △▽ :

User level {5012}

Press SET and insert the code :

426468

Press SET :

Your level is EXPERT

ⓘ The code is available in the user manual RCC -02 / -03

2. Datalogger enabled

Remote controller settings

Press SET and search with △▽ :

Datalogger {5057}

Press SET and search with △▽ :

Datalogger enabled {5058}

Press SET, selection Yes with △▽ and press SET :

The datalogger is enabled

3. Save today's datas

Remote controller settings

Press SET and search with △▽ :

Datalogger {5057}

Press SET and search with △▽ :

Save today's datas {5059}

Press SET

The current day data are now saved on the SD card
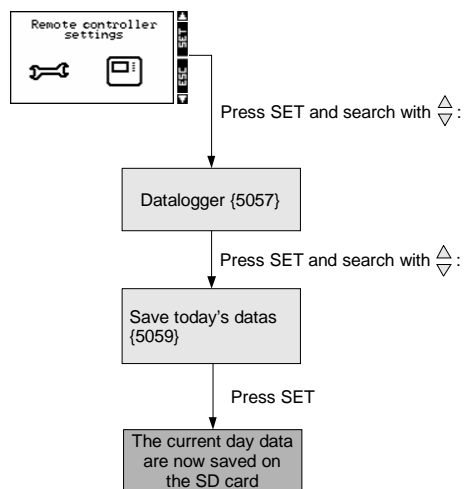
STUDER

XTENDER Data Analysis Tool

Example

Fieldtests and pictures by STUDER Innotec (http://www.studer-innotec.com)
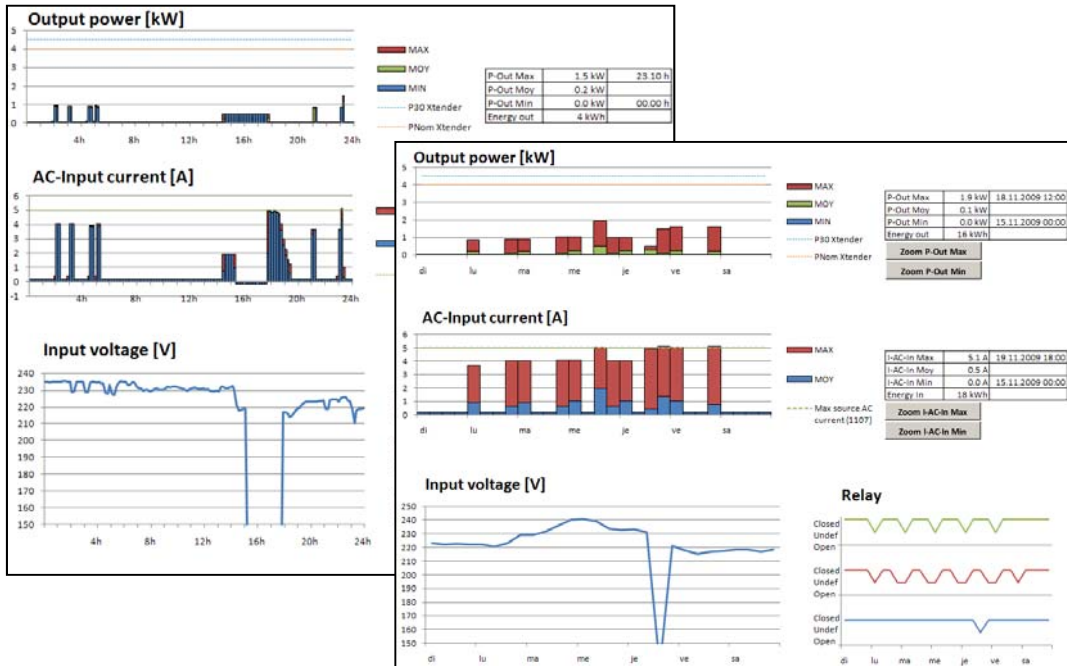
(Figure 10), View of the XTENDER Data Analysis Too
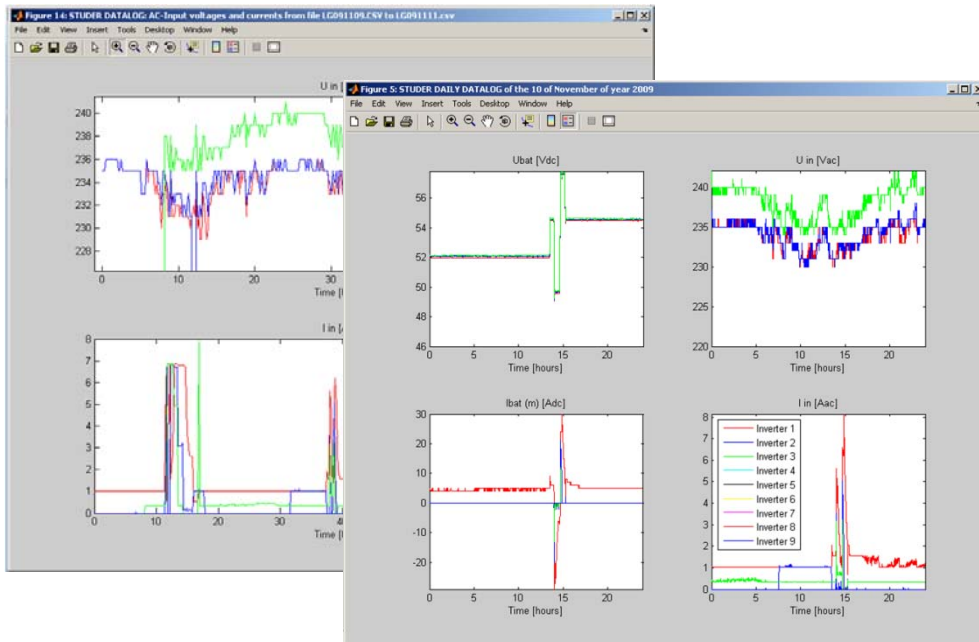
XTENDER Matlab® Data Analysis

Example

Fieldtests and pictures by STUDER Innotec (http://www.studer-innotec.com)

(Figure 11), View of the XTENDER Matlab® Data Analysis

XTENDER Matlab® Data Analysis

User guide

A Matlab® script is available to import and plot automatically all the data in Matlab®.

In this script, variables contain all recorded data and allow all sorts of processing and analysis.

To import in Matlab® the CSV FILES from the SD card, just run the script "**datalog_import.m**". The program will ask you the file to import. Note that import of many data files may require very long treatment along several tens of minutes.

Warning

The two other files "**plot_day_log.m**" and "**studer_datalog_day_converter.m**" must remain in the same folder because they contain functions used by the script "**datalog_import.m**".

At the beginning of the script there are configurable basic options :

used_csv_separator=','	For english Excel display (parameter choosen in the RCC).
used_csv_separator=';'	For french Excel display (parameter choosen in the RCC).
I_want_daily_display=1	The detailed plots of every minute data of every day will be displayed.
I_want_daily_display=0	No daily plot.
I_want_multi_day_import=1	Convert all files after the selected one, all the days after the selected files will be imported.
I_want_multi_day_import=0	Convert just the selected file.

(Figure 7) Configurable functions

To modify these options, simply open the script "datalog_import.m" with the Matlab® editor.

Doing one's own calculations and simulations

After running the script, the variable "**day_datalog**" is available. This variable is a structure containing all the data points. With this one, it is possible to perform all kinds of simulations with the information of the 14 channels logged.

For more information on this variable and the 14 logged channels enter in Matlab the command :

"**help datalog_import.m**".

day_datalog =

channels_label	{1x14 cell}	Name of the 14 channels logged
day	1 value	Day of the month
month	1 value	Month of the year
year	1 value	Year
time_minutes_of_ the_day	[1x1440 double]	Time in minutes of the logged day
datalog_value	[14x1440x9 double]	12 channels of the 9 inverters

(Figure 8) day_datalog structure

If many days were registered, "**day_datalog**" is an array with each row containing a different day. For example to access to the 2nd day, use "**day_datalog(2)**"

day_datalog =
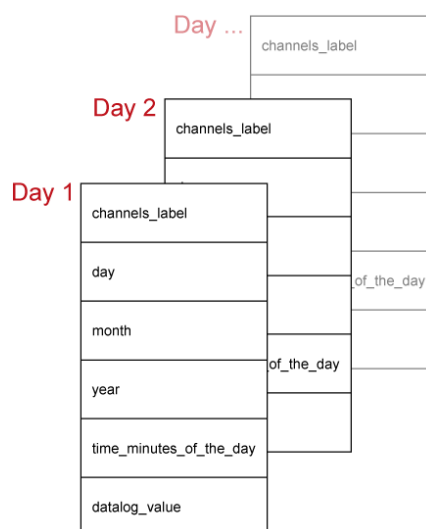
(Figure 9) day_datalog structure with many days

Notes

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Worldwide sales and service

Switzerland

Studer Innotec SA
Rue des Casernes 57
1950 SION / Switzerland
Tel :027 205 60 80 / Fax : 027 205 60 88
Email : info@studer-innotec.com
Web : http://www.studer-innotec.com

Limitation of responsibility

The use of STUDER INNOTEC SA devices is the responsibility of the customer in all cases. STUDER INNOTEC SA reserves the right to make any modifications to the product without prior notification.