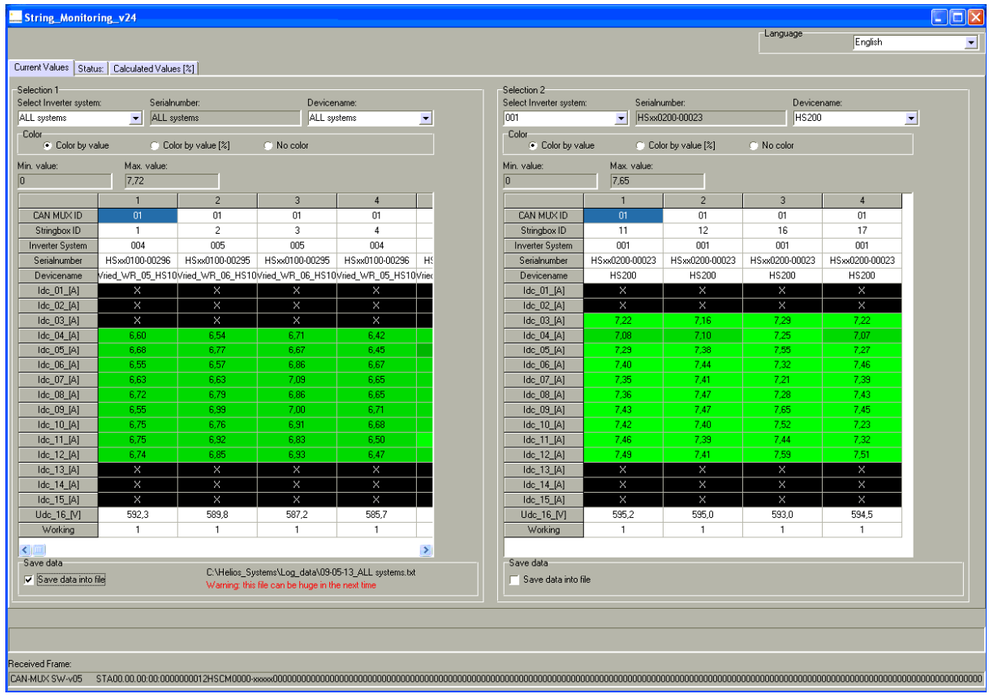
ANALYSIS SOFTWARE

The program “String Monitoring“ offers a tabular view of string currents and voltages. The string currents are gathered through current transducers in the string boxes and sent via Ethernet or CAN-bus (CAN-MUX option required) to the PC, where the program “String Monitoring” displays the measured values.

The string current values can also be highlighted in different colours—positive values in green and negative values (in case of malfunction) in red. Hence a comparison of string current values against each other is eased significantly.

In drop-down menus, it can be chosen, which String Boxes of an inverter are to be displayed. Moreover it is possible to record the displayed values.



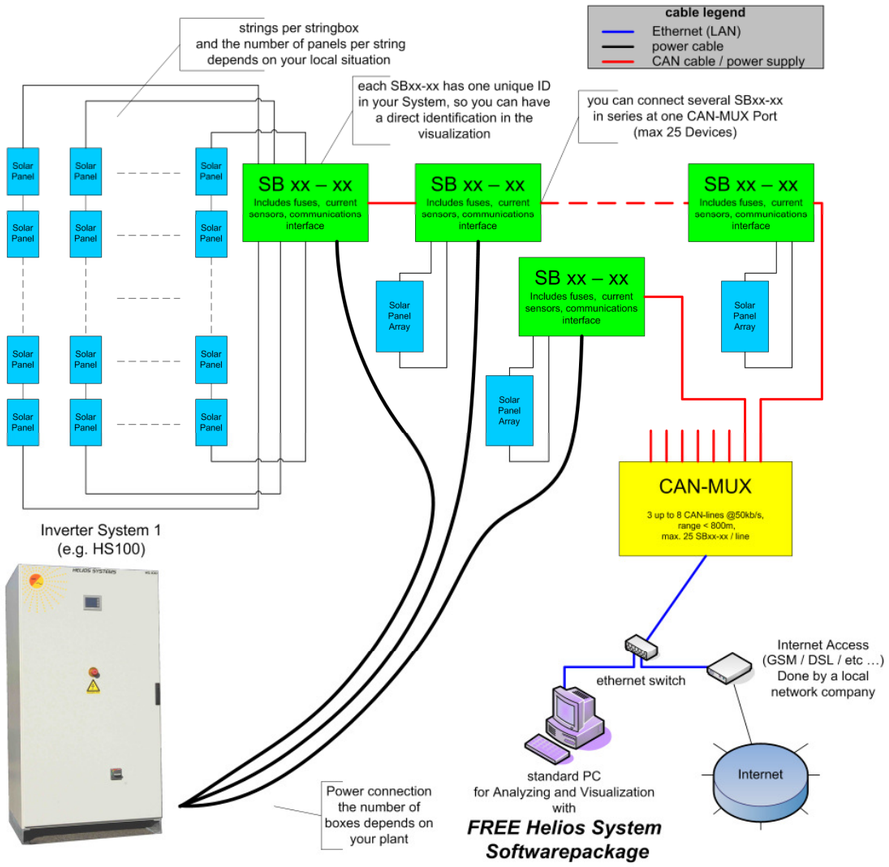
Surface of the program “String Monitoring”

STRING BOX MONITORING SYSTEM

SUPERVISION AND VISUALISATION OF THE OPERATIONAL BEHAVIOUR OF A PHOTOVOLTAIC ARRAY

The system consists of three main components: String Box, CAN-MUX and PC with free of charge HELIOS SYSTEMS analysis software „String Monitoring”. It fulfils basically the following functions:

- Tabular and graphical visualisation of string currents
- Allocation of the strings to inverter systems
- Individual definition of the connected power of each string
- Support of all HELIOS SYSTEMS string boxes
- Evaluation of strings regarding output deficit as percentage of average output power



HELIOS SYSTEMS – A Wind & Sun Technologies Company
www.helios-systems.net
Tel.: 0034 93 633 44-16 · Fax: 0034 93 633 44-19 · E-Mail: jh.decalf@helios-systems.net

COMPONENTS OF THE STRING BOX MONITORING SYSTEMS

String Box

The functions of the String Box are shortly described in the following. For further information regarding the HELIOS SYSTEMS String Boxes please refer to the datasheet *SB 15-15 / SB 15-08*.

Logging and processing of measuring data

The String Box measures every single string current as well as the common DC voltage V_{dc}. These values are sampled continuously and filtered digitally. The latest measuring values can be downloaded via CAN-bus or Ethernet interface respectively.

Paralleling of strings

The strings are grouped locally by paralleling so that the number of cables to the inverter and therefore the effort of cabling are remarkably reduced. Due to the shortness of these connections, conductors of small cross-section can be implemented. Then the cross-section of the cable to the inverter can be chosen with respect to the distance and the acceptable voltage drop. The String Boxes allow the connection of copper as well as aluminium wires up to a cross-section of 240 mm^2.

CAN-MUX

The CAN-MUX is the star-point of communication. It automatically detects and reads out all String Boxes connected to the CAN-bus. The cumulated data are sent cycle-by-cycle as an UDP-stream to a predefined server. The CAN-MUX detects an inaccurate configuration of the CAN-bus network autonomously and signals this state via LED blink-code. The CAN-MUX is an option that is only necessary, if the CAN-bus-version of the String Box is employed.

PC system with analysis software “String Monitoring”

The analysis software serves as a tool to evaluate and visualise the current and voltage curves measured by the String Boxes. For parameterising the Monitoring System, only the following details have to be entered:

- Input current range of a string
- Connected power of a string
- Allocation of every string to a particular inverter
- Permissible difference between normalised string currents

After the evaluation of all parameters the application software generates status messages, which can, if required, be forwarded to a service technician via e-mail. Furthermore, a fault protocol in form of a text file is stored every month. A recording of every single string current is inverter-wise possible. In the log file, the measured values are written in distances of about five seconds.

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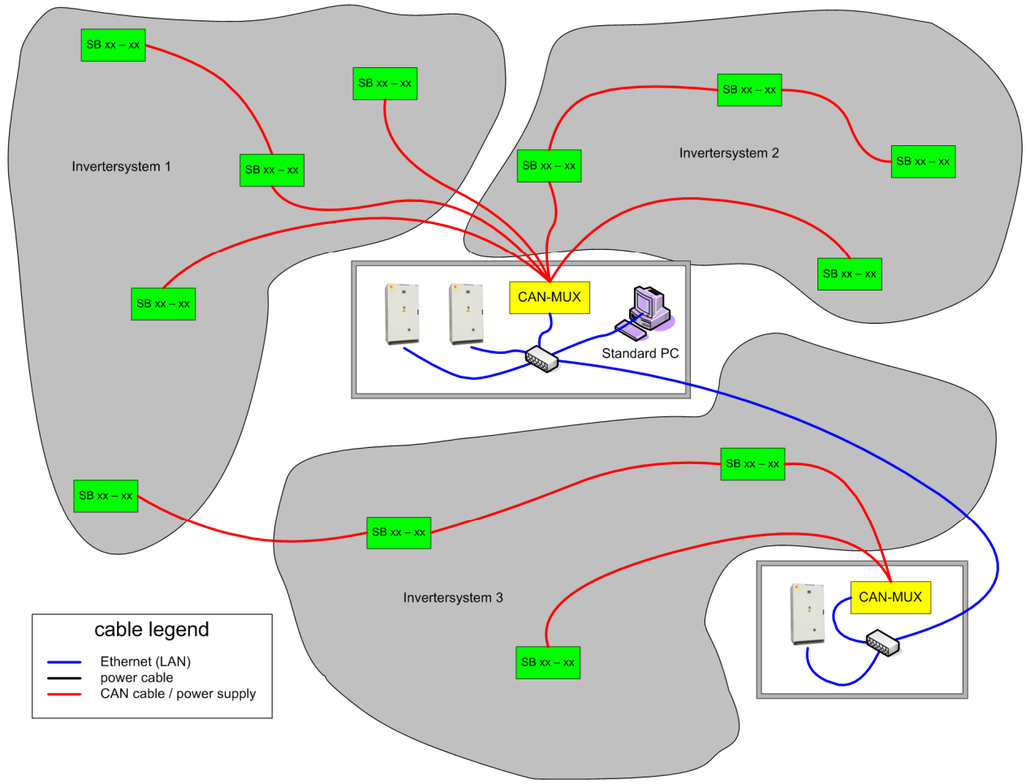
Datasheet rev. 1.1

INSTALLATION DES STRING BOX MONITORING SYSTEMS

The expansion of a String Box Monitoring System is only limited by the maximum permissible length of the CAN-bus and Ethernet cables respectively. A combination of both systems is possible. The maximum circumference of a Monitoring System amounts to 800 m per line for CAN-bus communication with up to eight lines. For Ethernet communication with copper cables, the dimension is limited to 100 m per segment. If the Ethernet connection is realised with fibre optic cables, depending on the systems, a maximum of 2 km or 20 km per segment can be reached.

Hence coverage of two square kilometers per CAN-MUX is reached. For expansion also multiple CAN-MUX can be used in one network. Up to 25 String Boxes can be connected to each port of every CAN-MUX. This results in a maximum number of 200 String Boxes per CAN-MUX.

Also String Boxes of different inverters can be managed by one CAN-MUX. Moreover, if the circumference of the strings got so large, that the connection to one CAN-MUX is impossible, it is feasible to connect String Boxes of one inverter to two or more CAN-MUXs. The allocation of the Boxes to the inverter system is made in the configuration files.



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