SI-GATE GMBH

VDL-1000

User's Guide

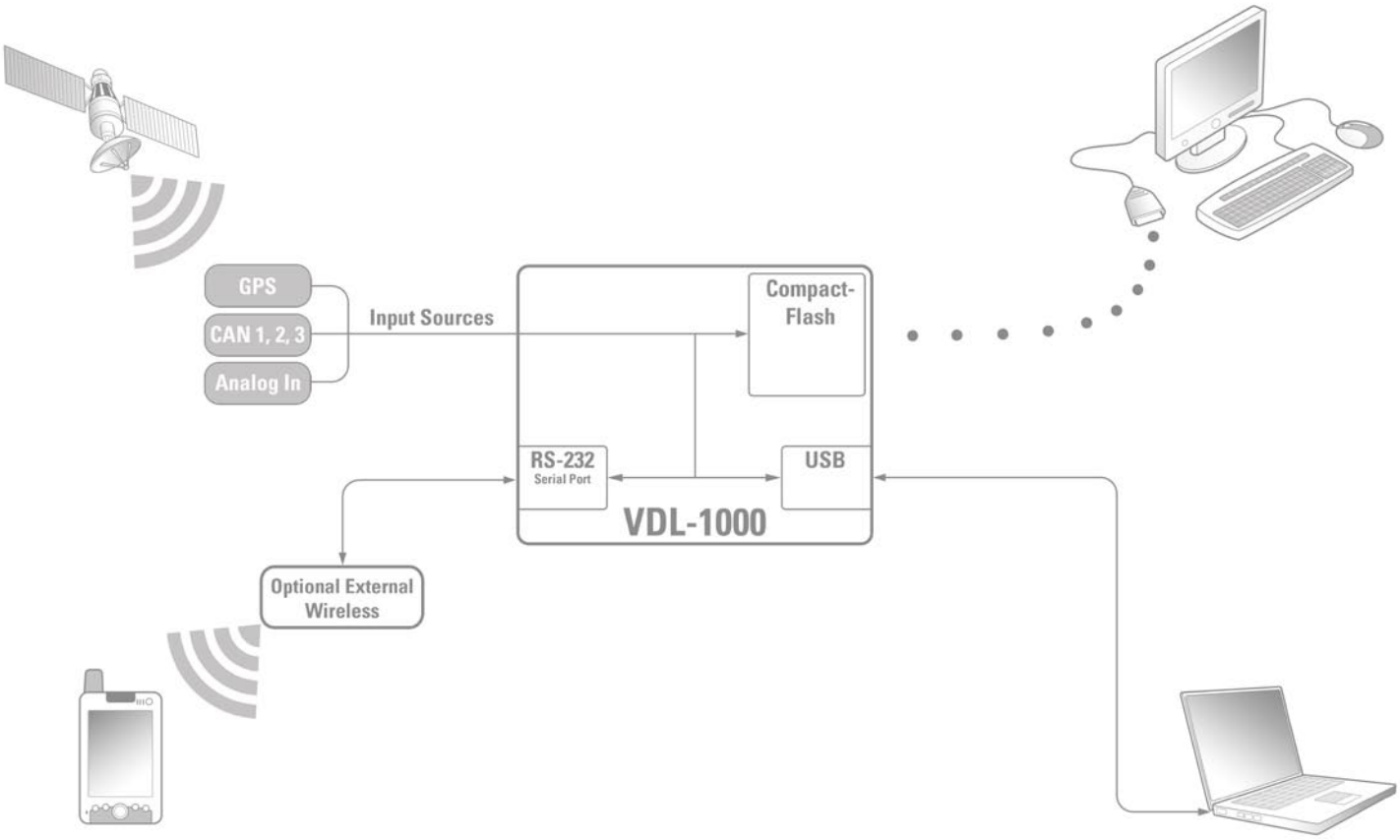
Contents

Introduction

Congratulations on your purchase of the Si-Gate VDL-1000 Automotive DataLogger. The VDL-1000 is todays most flexible and full featured type of its kind. Please read and understand the following manual thoroughly to receive the most of your new purchase.

The VDL-1000 provides a simple way to collect vehicle data and store information on a CompactFlash™ card. The VDL-1000 can be configured for many different application possibilities which require integration of data originating from various analog sensors, Global Positioning System data, accelerometer, and multiple Vehicle buses all at the same time scale. The VDL-1000 has been optimized for automotive data logging requirements and has a versatile yet simple configuration interface. The result is that the user can focus more on analyzing every aspect of the testing route which may be of interest to record information.

Because of the vast range of applications which the VDL-1000 maybe used, this manual attempts to cover some typical examples of use. Not every example is possible to describe in this manual but we hope that the end user will be satisfied with the VDL-1000's versatility and the user is welcome to visit *www.si-gate.com* for additional configuration updates which may not be presented in this manual.



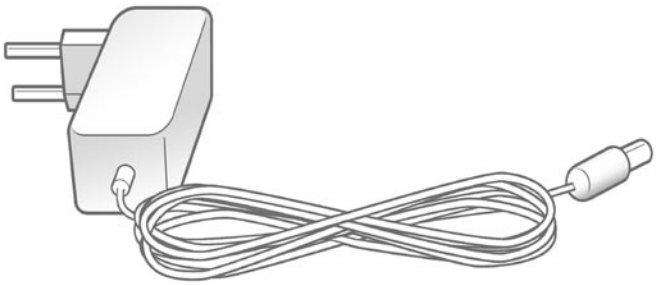
Overview of a typical VDL-1000 data flow

Package Contents

Your VDL-1000 DataLogger car kit includes the following components:

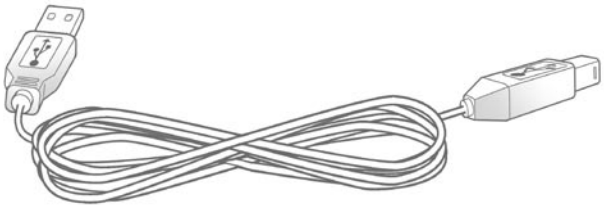
Users Manual

Installation CD

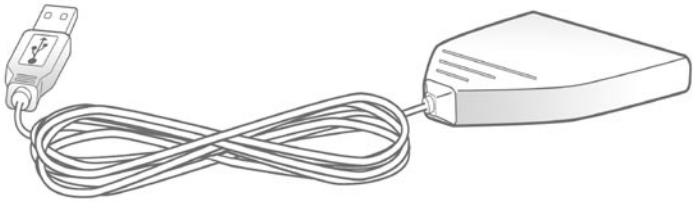


Mains Adapter

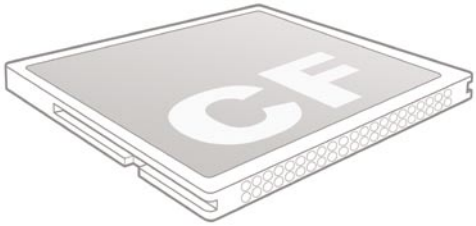
Car Adapter



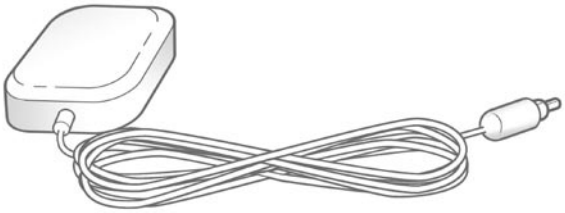
USB A/B Cable



CompactFlash Card Reader



128MB CompactFlash Card



GPS Antenna
(only supplied with optional GPS)

Getting Started

Communicating with the VDL-1000 over USB

In order to communicate with the VDL-1000 via USB, a USB driver must first be installed. There are two drivers found on the installation CD, however, for typical usage and communication with the VDL-1000 the VCP Driver should be installed. The VCP Driver emulates a COM-port on the VDL-1000's USB port. The number of COM-ports is dependent upon which USB port the VDL-1000 is connected to.

The second driver, the D2XX, is for a very specific purpose and is intended for use only with programming applications. The VCP Driver and the D2XX Driver cannot be installed simultaneously.The creator of both of these USB drivers is FTDI Ltd. More information can be found on their web site at *www.ftdichip.com*.

Please see other important information concerning usage of the USB port under the additional comments section of this manual.

GPS Analyzer

Included on the installation CD is a GPS analyzer. This program is beneficial for the NMEA-Datastream of the GPS-Module and can be used to evaluate any recorded position data.

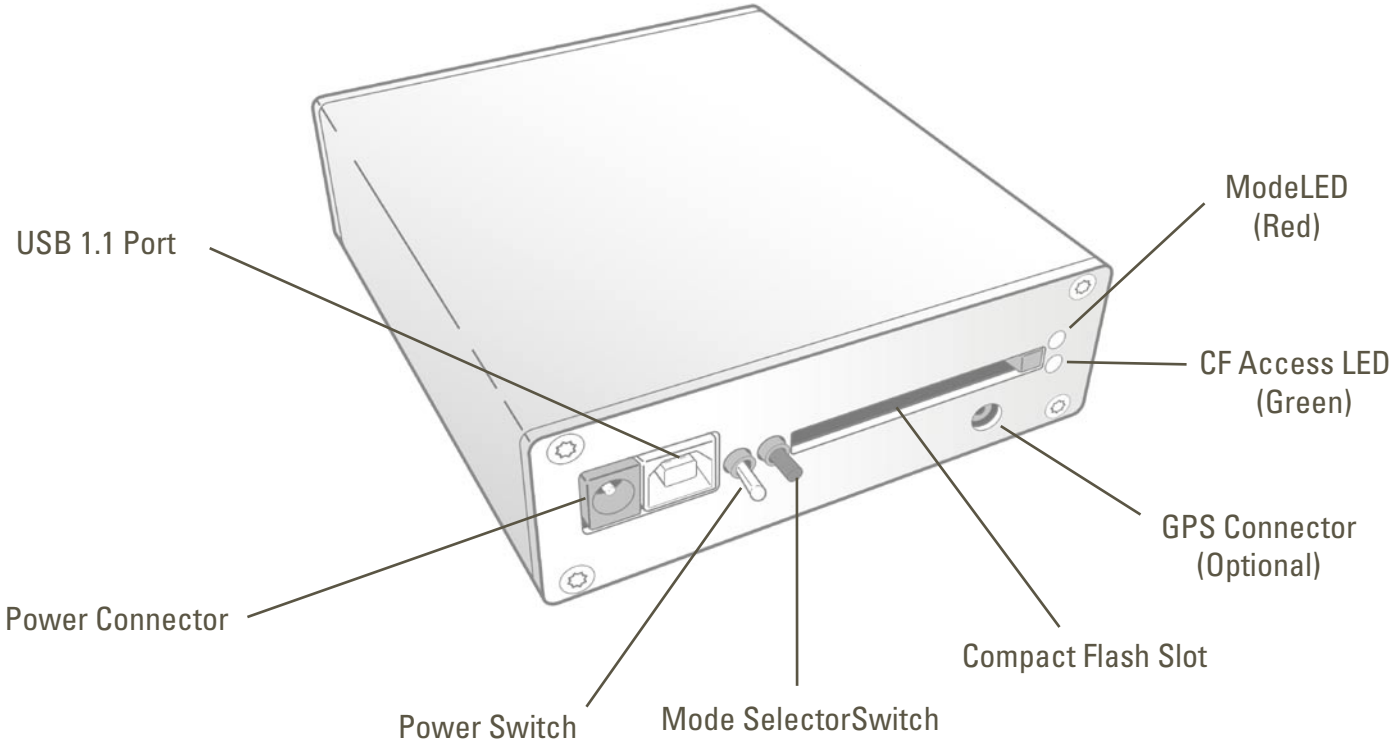
VDL-1000 Configuration data and CompactFlash Card

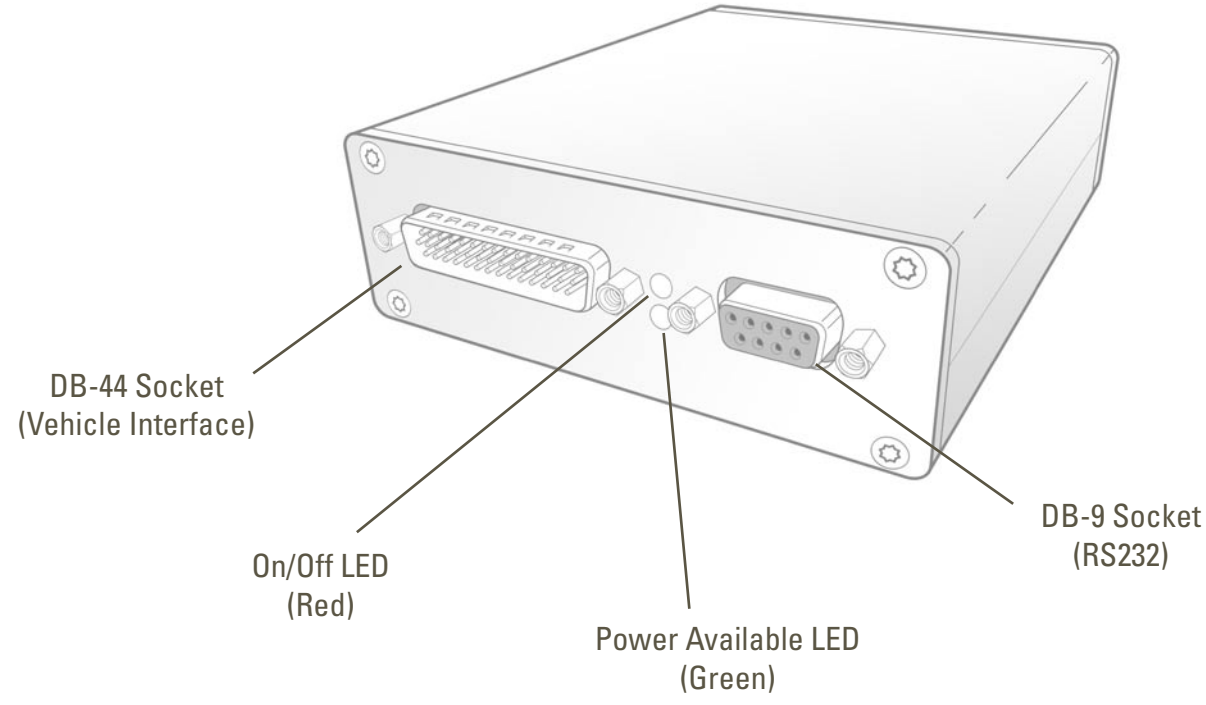
The CompactFlash must be formatted in a FAT32 data format. A default configuration file is loaded onto the CompactFlash when it leaves the factory. A back-up of this file can also be found on the installation CD which, if necessary can be re-written onto the CompactFlash.

Upon starting the VDL-1000, it will read the configuration data from the CompactFlash and configure itself accordingly. If a CompactFlash configuration file is not present, it will revert to the default configuration file which is also stored internally. It is possible with simple commands to arrange a specific configuration file to fit different needs. This includes definition of wake up signal, sleep time, CAN filters, active ports, etc. The custom configuration file can then be used by simply writing it onto the CompactFlash. More is explained about this in the next chapter of this manual.

Short Overview

The following section will inform you on the basic operation of the VDL-1000.





VDL-1000 User Interface	
Power Connector	Connect here either one of the supplied power adapters: the 12V DC car adapter or the mains adapter If the unit is being powered thru the DB-44 Socket then no connection here is required
Power Switch	When switched upwards the unit is off When switched downwards the unit is switched on
Data Log Start/Stop Switch	By pressing this button for approximately one second it will switch the VDL-1000 into one of three modes; sleep, configuration, or logging. This will be confirmed by both an audible beep form the unit as well as the mode LED. **The transition of the modes can only be:** From configuration mode to log mode → From log mode to sleep mode → From sleep mode to log mode → From log mode to configuration mode →
Mode LED (Red)	**This LED shows 3 different conditions:** 1. LED off - The unit is either in off or in sleep mode 2. LED steady - The unit is in configuration mode 3. LED blinking - Indicates unit is actively logging data
CF Access LED (Green)	When flashing, this LED indicates that there is activity (reading/writing) to the CompactFlash card
USB 1.1 Port	Used to communicate to and from a PC (or similar device) to the VDL-1000
CompactFlash Slot	Allows you to use the industry standard CompactFlash memory medium to easily log data to or to read the stored configuration file
GPS Antenna Connector (Optional)	Use this connector to connect the GPS antenna to the VDL-1000
On/Off LED (Red)	This is LED is steadily lit when the VDL-1000 is switched on
Power Available (Green)	This LED is steadily lit when there is power connected to the VDL-1000
DB-9 Socket (RS232)	This connector is a serial port based on RS232 It can be used for communication to and from the VDL-1000 from a PC or similar device
DB-44 Socket (Vehicle Interface)	**This port includes the following interfaces:** Two high speed CAN buses One low speed CAN bus 12 Analog inputs (up to 16 when optional pressure sensor, temperature sensor, and accelerometer is not present) Additional 12V DC power input

Configuration Commands

Operation Elements and Operation of the VDL-1000

The VDL-1000 may either operated by Automatic Configuration mode by reading out Configuration File(SGLOGGER.CNV) present on root directory of Compact Flash(CF) device inserted into the CF slot. Or alternatively the VDL-1000 may be configured on-line while connected via a USB cable to a USB 1.1 compatible port located on a PC or the RS232 interface.

The following chapters define the global known commands to control the VDL-1000. The commands can be used in the configuration file on the CompactFlash card, from the serial interface and from the USB interface.
Every command must end with a colon followed by a value, except the commands for start and stop logging. Every command needs a complete line. Thus the input of a parameter must end with a return and a linefeed ('\r\n').
All commands except the stop log command can only be used, when the datalogger is in configuration mode.

Default Configuration File

The following is the default configuration file that is written on the CompactFlash card upon leaving the factory and which is also stored internally on the VDL-1000 if no CF card is present.

```
stop log
set system timebase:1000
set sleep time:0
set logfile:
set log format:ascii
set log time:0
set log size:
set can1 sjw:3
set can1 brp:3
set can1 tseg1:4
set can1 tseg2:3
set can1 listen only:0
set can1 wake up:no
set can1 mask value:0xFFFFFFFF
set can1 acc value:0x00000000
set can2 sjw:3
set can2 brp:3
set can2 tseg1:4
set can2 tseg2:3
set can2 listen only:0
set can2 wake up:no
set can2 mask value:0xFFFFFFFF
set can2 acc value:0x00000000
set can3 sjw:3
set can3 brp:24
set can3 tseg1:4
set can3 tseg2:3
set can3 listen only:0
set can3 wake up:no
set can3 mask value:0xFFFFFFFF
set can3 acc value:0x00000000
set atd period:500000
set gps nmea:$PFST,RESTORE
set gps nmea:$PFST,STOP
use can1:no
use can2:no
use can3:no
use atd:no
use gps:no
sci report:off
usb report:off
cf report:off
EOF
```

The following pages explain in order each configuration command.

Stop log

This command causes the VDL-1000 to stop logging data. It is recommended, that this command is the first command in a configuration file to ensure a proper boot-up of the VDL-1000.

Command Line:

"*stop log*"

Start log

This command puts the Datalogger in log mode. If this command is in the configuration file, then it should be the last command.

Command Line:

"*start log*"

System time

The VDL-1000 provides logged data with a time stamp. The resolution of this time stamp is specified by the command "set system timebase". The datalogger increments the system time for these stamps after one time tick. One time tick equals:

$$t_{tick} = timebase 10^{-6} sec$$

So a timebase of 1000 for example means that one time tick equals 10 millisecond. To ensure a proper operation, the time base should not be less than 500.

Command Line:

"*set system timebase:v*" where v is a integer value between 100 and 2^{16} - 1.

Sleep mode time

The datalogger enters the sleep mode, after a defined time has passed without any action on the CAN-interfaces happened. This time is defined by the command "set sleep time". This command needs an integer value, which specifies the time after which the datalogger should go to sleep mode, if no event has occurred on the CAN-nodes, the serial interface or the USB interface. This integer number is considered as time value in time ticks. If the value is zero, the sleep mode is disabled.

Command line:

"*set sleep time:v*" where v is a integer value between 0 and 2^{16} - 1.

The sleep mode is quit, when an event on the serial interface or the USB is recognized or if the start/stop button is pressed. In addition, the sleep mode is also left, when a message on a CAN node is detected, which has permission to wake up the datalogger. The CAN message that woke up the datalogger will be lost.

Logfile name

This command defines the name and the path of the logfile for the next log. The nomenclature for the names and the paths is a standard 8 to 3 naming. Every other naming will cause in an error.
If no name for the logfile is specified, the datalogger will not write logged data to the CF-card, weather the flag for file-logging is set or not.
Command Line:

"*set logfile:p\n.e*"

where p is the path, n is the file name and e is the file extension
Multiple paths are allowed.

Log format

The datalogger knows two formats for the logged data. The first format is a readable ASCII-format. Every data is presented in an legible font. The second format is a binary format. The logged data is displayed as it is logged.
The corresponding command and values are:
"*set log format:ascii*" for ASCII output
"*set log format:binary*" for binary output

Attention: The ASCII format requires more calculation power from the internal Microprocessor. Therefore the maximum allowed sample rates on all ports (ATD, CAN, …) will drop by 80%. (ca. 50ms minimum sample time per input source compared to 10ms in binary mode)

Log time

The VDL-1000 provides a command for time limited logging. The command "set log time" limits the time where the datalogger is in log mode to a user defined time in system-ticks. If the value for log time is zero, time unlimited logging is enabled.
Command Line:

"*set log time:v*", where v is a integer value between 0 and 2^{32} -1.

Log size

If cf-report is enabled, it is necessary to specify a maximum size of the log file. The size must be indicated in bytes. Thus a maximum file size of 1MB must be posted as the integer number 1048576.
Command Line:

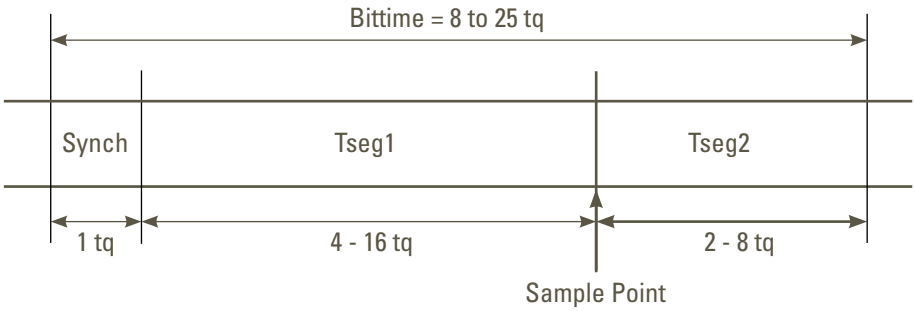
"*set log size:v*", where v is the maximum file size in bytes.

CAN timing

The VDL-1000 provides three CAN interfaces. The timing of every interface can be controlled by several commands. These commands control:

1. the internal baud rate prescaler (brp)
2. the synchronization jump width (sjw)
3. and the first and the second CAN time segments (tseg1 and tseg2)

The baud rate prescaler generates the time quanta clock (tq) from the system clock, which is running at 16MHz.



The prescaler controls the bittime together with the two time segments tseg1 and tseg2. The frequency of the time quanta and of the bitrate are calculated as:

$$f_{tq} = \frac{16MHz}{brp - 1}$$

$$Bitrate = \frac{f_{tq}}{1 + tseg1 + tseg2}$$

The synchronization jump width defines the maximum number of time quanta clock cycles a bit can be shortened or lengthened to achieve resynchronization to data transitions on the bus. The jump width is calculated as:

$$jump\_width = (sjw - 1) \bullet tq$$

The commands for controlling these parameters are:

"*set canx sjw:v*"
"*set canx brp:v*"
"*set canx tseg1:v*"
"*set canx tseg2:v*"

Here the character "x" is a number of the can node. It can be "1", "2" or "3". The value "v" is an integer value.

For example the command “set can2 brp:6” sets the baud rate prescaler of the second can node to six, so tq will be 0.3125 microseconds.

For more information about the CAN bus please refer to the BOSCH CAN 2.0 A/B Specification dated September 1991.

CAN Listen only mode

The CAN nodes can be programmed to a listen only mode. In this mode the nodes do not respond to a received message. They do not send an acknowledge nor error frames. So the nodes act as pure bus monitors. The commands for enabling or disabling the listen only mode are:

“*set canx listen only:v*”

Here “x” is the number of the CAN node. “v” can be either “0” for disabling the listen only mode or “1” for enabling this mode.

CAN wake up

The CAN nodes can wake up the datalogger from sleep mode. To give a CAN node permission for waking up the VDL-1000 the following commands are used:

“*set canx wake up:v*”

“x” denotes the number of the CAN node. “v” can be either “yes” or “no” for enabling or disabling the wake up function from the corresponding CAN node.

CAN Message filtering

The datalogger provides one message filter for each CAN node. The filter consists of two parameters. The acceptance message ID (acc) and the ID mask (mask).
The acceptance message ID is a base ID for allowed messages. The bits of this message ID are stored with the ID mask.
So if the acc message ID is “0x0000FEA5” and the mask is “0x00000100” the messages with the ID’s “0x0000FEA5” and “0x0000FFA5” will be logged. If the mask is set to “0xFFFFFFFF” all messages on the CAN bus will be logged.

The acc ID and the mask are controlled by two commands:

“*set canx mask value:v*”
“*set canx acc value:v*”

"x" denotes the CAN node for which the settings should be provided. The value "v" must be present and has a string representing a hexadecimal ID value with a leading "0x".

Example:
The command "set can3 acc value:0x0000FEA5" sets the acceptance message ID of CAN node three to "0x0000FEA5".

Analog to digital converter timing

The sample rate of analog interfaces is controlled by the following command:

"*set atd period:v*" with v= sample time in 10^{-6} seconds

So the command "set atd period:100000" will set the sample time for the analog channels to:

$$t_{atd} = atd\_ticks \bullet 10^{-6}\,sec = 100000 \bullet 10^{-6}\,sec = 1\,sec$$

The smallest allowed sample time for all analog channels is 3 milliseconds in binary mode and 15 milliseconds in ASCII mode.

GPS - NMEA commands

In some expansion stages the VDL-1000 has an internal GPS receiver for position logging. This GPS module is controlled by commands in the NMEA 0183 format. To send a NMEA sentence to the GPS module, the following VDL-1000
command is used:

"*set gps nmea:v*" In this case "v" is the NMEA sentence.

For example, the command: "set gps nmea:$PFST,FIXRATE,10" sets the sample time of the GPS module to 10 seconds.
Since the VDL-1000 controls the GPS module, no report of the NMEA sentence will be provided to the interface, which has sent the NMEA command. CRC calculations and handshaking are done by the internal microcontroller.

Enabling and disabling interfaces

The VDL-1000 provides five sources for data. Each one of these sources can be enabled or disabled by a command.
The according commands are:

"*use can1:v*"
"*use can2:v*"
"*use can3:v*"
"*use atd:v*"
"*use gps:v*"

Here "v" can be either "yes" or "no". The value "yes" enables the corresponding source, while "no" disables it. It is recommended, that unused data sources are disabled, to free unused calculation power on the internal microcontroller.

Reports

The VDL-1000 supports three interfaces for displaying logged data. These interfaces are the CompactFlash card, the USB interface and the serial interface. Controlling these three interfaces is done by three commands for enabling or disabling output of logged data on the corresponding interface.These commands are:

"*sci report:v*"
"*usb report:v*"
"*cf report:v*"

In these cases "v" can have the value "on" or "off". The value "on" enables data output on the corresponding interface, while the value "off" disables output.

End of Configuration File

This section describes commands that can be only used in the configuration file on the CompactFlash card. Usage of these commands on the USB or serial port will cause in an error.

The configuration file "SGLOGGER.CNV" contains settings for the datalogger. The configuration area in the configuration file begins at the file start and ends with the end of config file command. After this command, the configuration file can contain other data like comments on the configuration and the date when the file was made.
The command for the end of the configuration area in the file is:

"*EOF\n\r*"

All necessary settings must be made above this command. A configuration file must at least contain "EOF".
This command can only be used in the configuration file.

USB and Serial Commands

Special USB and serial commands

This section describes commands for the USB interface and the serial interface. The commands can not be used on the CompactFlash card. The datalogger will only react on these commands, when it is in configuration mode. In sleep mode the datalogger will wake up, but not respond on these commands.

Real Time Clock

Since the VDL-1000 is equipped with a real time clock (rtc), the VDL-1000 must provide a command for setting this rtc.
The command to do so is:

"*set rtc:v*"

"v" must be presented in the following format:
"day day . month month . year year : hour hour . minute minute . second second", where the hours are in a 24h format. So the command "set rtc:19.02.05:16.15.30" sets the rtc to the 19th of February in 2005 4pm 15 minutes and 30 seconds.

The real time clock can be read with the following command:

"*read rtc*"

This command returns the current date and time, which is contained in the datalogger.

Logfile transfer

The VDL-1000 can transfer logged data from a logfile on the CompactFlash card to the USB port or to the serial port. The command to do so is:

"*transfer file*"

After this command has been accepted, a filename and path must be provided. If the file is found on the CompactFlash card, it is delivered to the port which has requested the file.

Delete File

To free more space on the CompactFlash card, the datalogger can delete a file from the card. The command

"*del file*"

expects a valid file name. If the file exists, it will be deleted.

Additional Comments

This section describes several limitations of the VDL-1000 concerning the CF card, the sample rates of the analog channels, the CAN bus load and the USB Interface.

CompactFlash card

The CompactFlash interface of the VDL-1000 only supports Type1 cards with a 5V tolerant power supply and a sector size of 512 byte. The only supported file system on the card is FAT32. The partition size of the card should not exceed more than 2GByte, since bigger partitions are not supported on CF cards by FAT32. The partitions on the card must be formatted in FAT32. Every other system will lead to an error message and the card will not be accepted.

Attention: The VDL-1000 must not be turned off or removed from power when logging to the CompactFlash card. This will destroy the file system, and all information on the card will be lost. The card must then be reformatted with FAT32. Removing the card during logging will also cause these problems and data loss. The card should only be removed in configuration mode.

Analog Channels

The highest allowed sample rate for the analog inputs is 20 sps (sample time = 50 milliseconds) in binary mode and 40 sps (sample time = 25 milliseconds) in ASCII mode. Higher sample rates are possible but might cause data loss on either the analog channels or the CAN nodes.

CAN nodes

The CAN nodes one and two support high speed CAN C with up to 1Mbps. CAN node three supports CAN B with up to data rates of 500kbps. All CAN nodes need a two wire differential CAN line as inputs.

The VDL-1000 needs 10 milliseconds to handle an incoming message on a CAN bus in binary log mode. In ASCII mode this time increases to 50 milliseconds. Messages that are received before this time has run out are stored in the internal buffer. If the bus load is so high that the buffer overflows, messages will be lost. The user must take care about the bus load on the CAN bus. A bus load which is too high on one of the CAN nodes can cause data loss on every other input interface and on the related interface.

USB Interface

Upon ending the USB connection, always first quit the Terminal-Program, then disconnect the USB cable, then it is possible to turn off the VDL-1000. If the USB cable is unplugged, or if the VDL-1000 is switched off while the Terminal-Program is still running, it will bring the PC to a freeze. This is due to a limitation in the USB driver.

Appendix

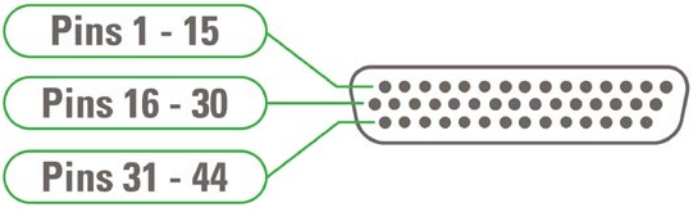
Technical Data

Weight:	~500 grams
Dimensions (LxWxD):	120 mm x 105 mm x 35 mm without mounting flange 120 mm x 130 mm x 35 mm with mounting flange
Current consumption:	Approx. 200 mA at 12 V during normal operation Approx. 130 mA at 12V in sleep mode without any internal sensors
Memory:	Software file system on VDL-1000 supports up to 2 Gigabyte partition size on Compact Flash Card Internal 256 Bytes for buffers
Maximum power supply:	16V DC

Interfaces

- Two high speed CAN bus interfaces
- One low speed CAN bus interface
- 8 Analog inputs (0 – 10V, 10 bit resolution)
- 8 Analog inputs (0 – 5V, 10 bit resolution)
- RS232 interface @ 19.2 kbaud
- USB 1.1 interface
- CompactFlash Type 1 Interface

Pin Allocations



DB-44 Socket

Pin No.	Assignment	Description	Input Voltage Range
1	AN0	Available	0-10V
2	AN1	Available	
3	AN2	Available	
4	AN3	Available	
5	AN4	Available	
6	AN5	Available	
7	AN6	Available	
8	AN7	Available	
9	AN8	Available	0-5V
10	AN9	Available	
11	AN10	Available	
12	AN11	Available	
13	AN12	Optional Pressure Sensor	
14	AN13	Optional Temperature Sensor	
15	AN14	Optional Accelerometer X – AXIS	
16	AN15	Optional Accelerometer Y – AXIS	
17-30	GNDA	Analog Ground	
31			
32			
33	VCCIO	Switched +5V Supply Output	
34	VIGN	Power Control Input	
35	GND	Power GND	
36	+12V	+12V Supply In	
37			
38	GND	Communication Ground	
39	CAN1 High	High Speed (ISO 11898), CAN 2.0B	
40	CAN1 Low		
41	CAN2 High	High Speed (ISO 11898), CAN 2.0B	
42	CAN2 Low		
43	CANB High	Low Speed CAN (ISO 11519)	
44	CANB Low		

Typical Log Output files

Here are examples of some typical log output files.

ASCII Log File

```
log begin:
date: 14.10.04
time: 17.01.34
testing devices...
selftest can node 1...passed
tests finished

0000006256 atd : 00441 00437 00445 00437 00436 00470 00470 00453 00000 00000 00000 00000 00000 00000 00000 00000
0000000111 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000006281 atd : 00441 00437 00445 00436 00436 00470 00470 00453 00000 00000 00000 00000 00000 00000 00000 00000
0000000136 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
.
.
.
0000006456 atd : 00442 00437 00446 00437 00437 00470 00470 00454 00000 00000 00000 00000 00000 00000 00000 00000
0000007419 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000006481 atd : 00442 00437 00446 00437 00437 00470 00470 00454 00000 00000 00000 00000 00000 00000 00000 00000
0000007420 can1: id: 0x1E570200 data: 0xF0 0xE1 0xD2 0xC3 0xB4 0xA5 0x96 0x87


logging stopped
time duration: 0000007597 ticks
collected data in log file: 0000032880 bytes
```

CAN1, GPS, and Analog File

```
===== Display starts at offset 441163 within file of length 572235. ====
===== Use File->Reload (Cmd-R) to display more. ====
E570100 data: 0x01 0x02 0x03 0x04
0000212950 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000212998 can1: id: 0x00C0FFEE data: 0xAA 0x55
0000212998 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000212999 can1: id: 0x1E570200 data: 0xF0 0xE1 0xD2 0xC3 0xB4 0xA5 0x96 0x87
0000213046 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000213090 atd : 00002 00002 00002 00002 00002 00002 00002 00002 00006 00001 00001 00001 00001 00001 00494 00504
0000213094 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000213142 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000213190 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000213239 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000213287 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000213335 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000213340 atd :
.

.

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00002 00002 00002 00002 00002 00002 00002 00002 00006 00001 00001 00001 00001 00001 00494 00504
0000281306 can1: id: 0x1E570200 data: 0xF0 0xE1 0xD2 0xC3 0xB4 0xA5 0x96 0x87
0000281353 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000281401 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000281449 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000281497 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000281546 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
0000281699 atd : 00002 00002 00002 00002 00002 00002 00002 00002 00006 00001 00001 00001 00001 00001 00494 00504
0000281594 can1: id: 0x1E570100 data: 0x01 0x02 0x03 0x04
```

Further Information

Technical Support

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Warranty

Si-Gate GmbH warrants the equipment it manufactures to be free from defects in material and workmanship.

If equipment fails because of such defects and Si-Gate GmbH is notified within one (1) year from the date of shipment, Si-Gate GmbH will, at its option, repair or replace the equipment, provided that the equipment has not been subjected to mechanical, electrical or other abuse or modifications.

Equipment that fails under conditions other than those covered will be repaired at the current price of parts and labor in effect at the time of repair. Such repairs are warranted for ninety (90) days from the day of shipment to the Buyer.

This warranty is in lieu of all other warranties expressed or implied, including without limitation, any implied warranty or merchantability or fitness for any particular purpose, all of which are expressly disclaimed.

The information in this manual has been carefully checked and is believed to be accurate. However, Si-Gate GmbH assumes no responsibility for any inaccuracies that my be contained in this manual. In no event will Si-Gate GmbH, be liable for direct, indirect, special, incidental, or consequential damages resulting from any defect or omission in this manual, even if advised of the possibility of such damages. The technical information contained herein regarding the VDL-1000 features and specifications is subject to change without notice.

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