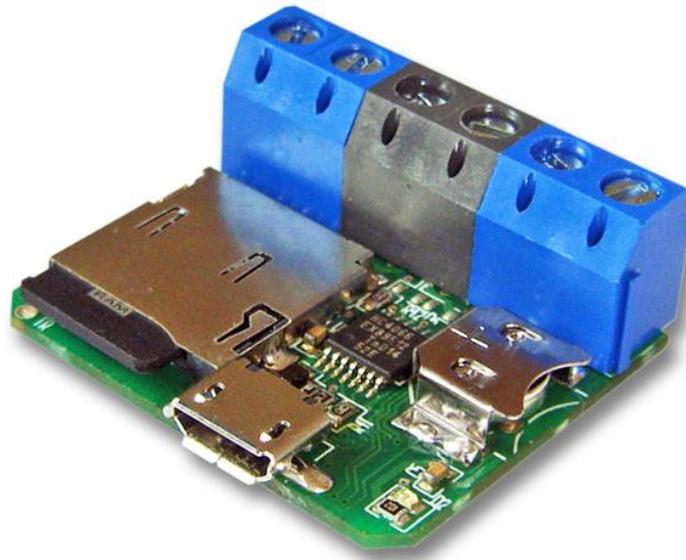


## User's Guide

# **SerialGhost Module SerialGhost Pro Module**



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## Introduction

### *About the product*

The *SerialGhost Module* and *SerialGhost Pro Module* are modular RS-232 and serial bus loggers with high-capacity internal memory, which may be accessed as a USB flash drive or USB Virtual COM port (*SerialGhost Pro Module*). Bidirectional data flowing through the serial bus will be captured and stored on the microSD card in a special file. This data may be retrieved by enabling flash drive mode, or removing the card. The *SerialGhost Module* does not require any dedicated software or drivers.

The *SerialGhost Module* and *SerialGhost Pro Module* have an additional built-in time-stamping module and battery. This enables adding time and date information to the log file. Thanks to the internal battery, the time and date persist even when the device is not powered.

The *SerialGhost Pro Module* is an enhanced version of the *SerialGhost Module* with Virtual COM port connectivity. It may be controlled by commands sent over the serial port, allowing accessing the stored data and configuring the device. A special application named *KL Tools* is delivered free of charge to demonstrate this functionality.

### *Features*

- Logs asynchronous serial transmission (RS-232 compatible)
- Baud rates up to 115200 bps
- Logs 2 streams simultaneously (RX and TX)
- High-capacity internal flash memory, accessible as a USB removable drive
- Powered from a USB port, or external power supply
- No software or drivers required, Windows, Linux, and Mac compatible
- USB flash drive mode
- Time and date stamping
- Built-in battery
- Virtual COM port mode (*SerialGhost Pro Module*)

### *Requirements*

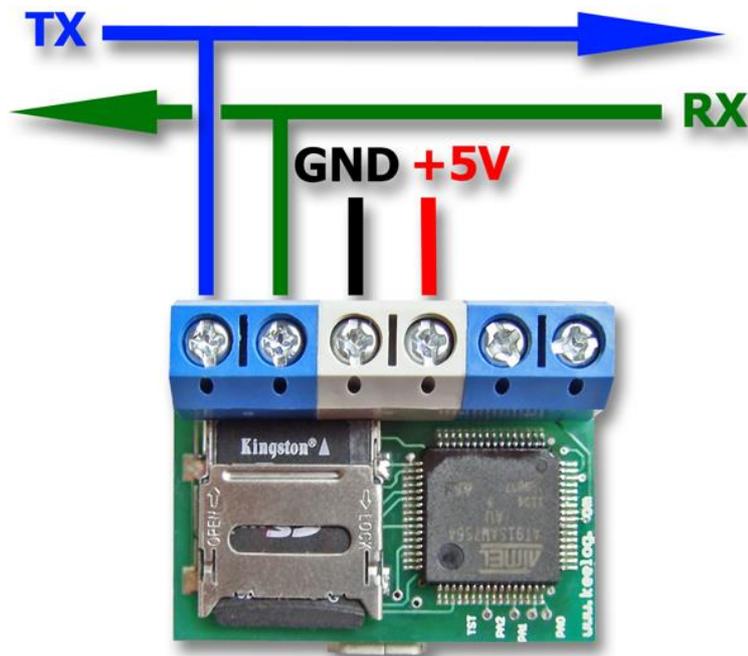
- Asynchronous serial bus with RS-232 logic levels (+/-12V)
- Operating system with USB Mass-Storage device support
- 5V DC power source (external power supply, or USB port)

## Recording data

Record mode is the default mode of operation for the *SerialGhost Module (SerialGhost Pro Module)* data logger. In record mode, the device will silently monitor the bidirectional data flow on the serial bus and store the captured data on the microSD card in file LOG.TXT.

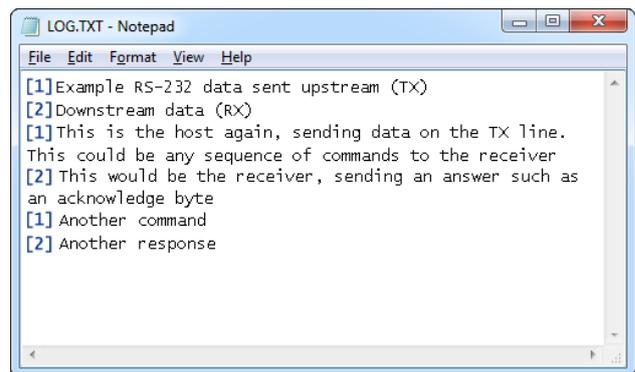
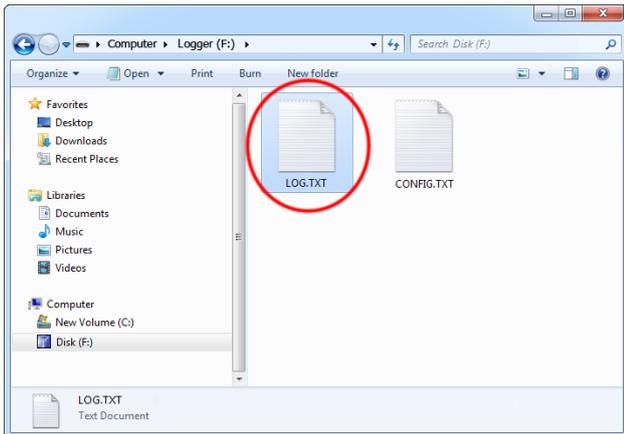
The *SerialGhost* must first be configured to the appropriate serial bus parameters, such as baud rate. Refer to section **Configuration** for detailed instructions.

Installation of the *SerialGhost Module (SerialGhost Pro Module)* in record mode is quick and easy, no software or drivers are required. Simply connect both serial streams to the RX and TX input connectors. Usually this will be the upstream and downstream line of a serial bus. The device must be powered with a **+5V DC** (min. 200 mA) power supply, through the +5V/GND connectors, or using the micro-USB socket.



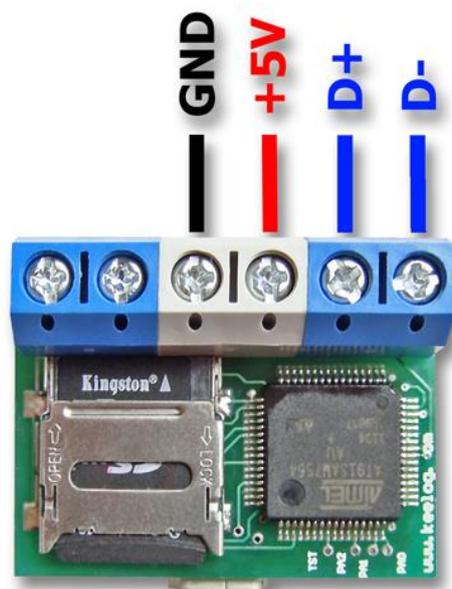
## Viewing recorded data

Once serial data has been recorded, it may be viewed simply by removing the microSD card, and inserting it into card reader. The microSD card is formatted as a FAT16 file-system, and may be accessed as a removable drive. The removable disk will contain the file LOG.TXT with a text log of all captured data. The data is stored in the same format as appearing on the serial bus, without any encoding. The upstream data (TX) and downstream data (RX) will be differentiated by the markers [1] and [2] interleaved in the log file. The file LOG.TXT can be viewed and searched with any text editor, such as *Notepad* or *MS Word*.



Alternatively, a the micro-USB socket may be used to connect the *SerialGhost* logger to a computer. The *SerialGhost* will then enumerate as a Mass-Storage device, and show up as a removable drive. Accessing the log file is identical, as when using a card reader.

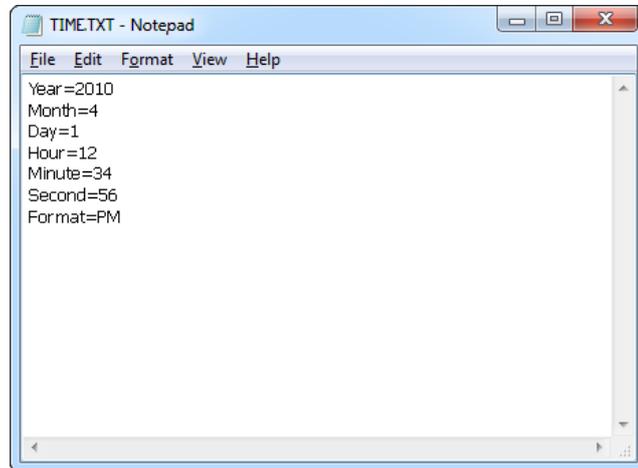
For embedded applications, the USB cable may be replaced with hard-wired connections. Refer to the diagram below for a description of pins.



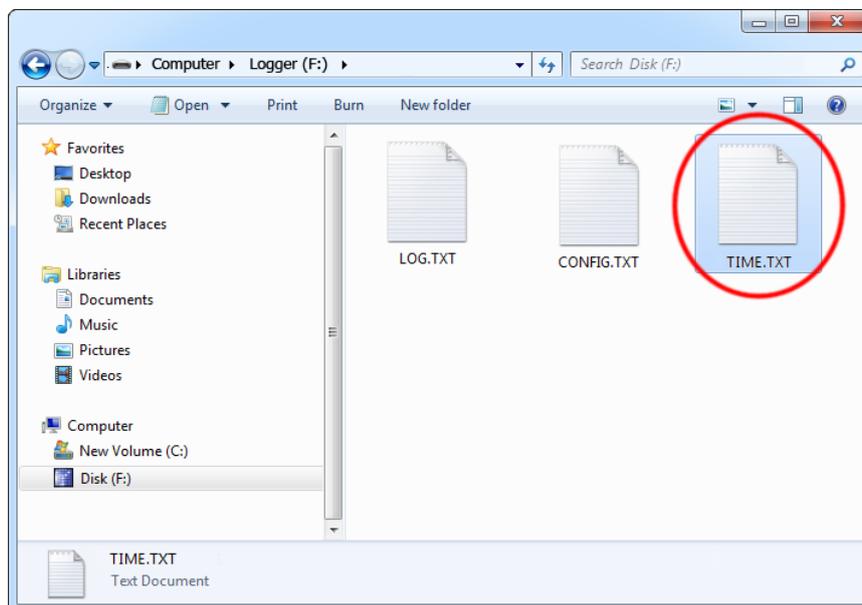
## Clock configuration

It is necessary to configure the built-in clock module for getting correct date and time-stamps. To do this, a text file named TIME.TXT should be prepared with the following format:

```
Year=2019
Month=4
Day=1
Hour=12
Minute=34
Second=56
Format=PM
```



The fields should contain the current time and date. The field *Format* allows distinguishing between A.M., P.M., and 24-hour time (use the value *AM*, *PM*, or *24*). After the file has been prepared, switch to flash drive mode and copy the file TIME.TXT to the root folder of the flash disk.



After copying the file, safely remove the flash drive. The new clock configuration will be loaded during the next power-up.

The clock configuration file must be named TIME.TXT and must be placed in the root folder. Variable and value strings are case insensitive, however they must match the options listed below.

- *Year* sets the clock year value. Valid range is from 2000 to 2099.
- *Month* sets the clock month value. Valid range is from 1 (January) to 12 (December).
- *Day* sets the clock day value. Valid range is from 1 to 31. If the specified day exceeds the maximum number of days in the specified month, the next valid day value will be chosen.
- *Hour* sets the clock hour value. Valid range is from 1 to 12 for 12-hour time (A.M./P.M.), and 0 to 23 for 24-hour time.
- *Minute* sets the clock minute value. Valid range is from 0 to 59.
- *Second* sets the clock second value. Valid range is from 0 to 59.
- *Format* sets the time format. Valid values are *AM*, *PM*, and *24*. If *AM* is chosen, the 12-hour format is selected and the specified hour is treated as before noon. If *PM* is chosen, the 12-hour format is selected and the specified hour is treated as afternoon. If *24* is chosen, the 24-hour format is selected and the specified hour is treated as 24-hour format.

Sample TIME.TXT for 12-hour time:

```
Year=2019
Month=10
Day=25
Hour=5
Minute=51
Second=43
Format=PM
```

Sample TIME.TXT for 24-hour time:

```
Year=2019
Month=10
Day=25
Hour=17
Minute=51
Second=43
Format=24
```

## Configuration

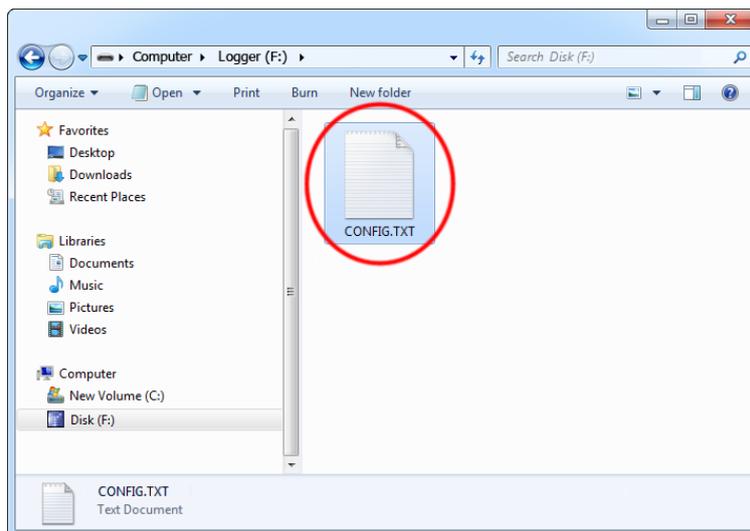
The *SerialGhost Module* (*SerialGhost Pro Module*) may be configured through the file CONFIG.TXT, placed on the microSD card's root folder. Use any text editor to prepare such a configuration file, containing the following text:

```
Baudrate=9600
Bits=8
Parity=No
StopBits=1
```

Copy this file to the root folder of the microSD card. This can be done in 2 different ways:

- Removing the microSD card and using a card reader to access it
- Connecting a computer using the micro-USB connector and USB cable

When the configuration file CONFIG.TXT is copied to the microSD card, the new configuration will be loaded on next power-up.



The following list presents the most common configuration options. All variable and value strings are case insensitive.

**Baudrate** sets the baud rate in bits per second of the monitored serial bus. Range is 300 bps to 115,200 bps. Default value is 9600.

**Bits** sets the number of bits per transfer of the monitored serial bus. Possible values are 5, 6, 7, 8. Default value is 8.

**Parity** sets the parity bit type of the monitored serial bus. Possible values are *No*, *Even*, *Odd*, *Space*, *Mark*. Default value is *No*.

**StopBits** sets the number of stop bits per transfer of the monitored serial bus. Possible values are 1, 1.5, 2. Default is 1.

**DisableLogging** allows to disable logging. Allowed values are *Yes* (logging disabled) and *No* (logging enabled). Default value is *No*.

**LogMode** sets the logging mode. Possible values are *Bin* (data is logged as binary data), *Hex* (data is logged as hexadecimal numbers), *Dec* (data is logged as decimal numbers). Default value is *Bin*.

**Separator** sets the separator character between data values in logging mode *Dec/Hex*. Possible values are *None*, *Space*, *Comma*, *Tab*, *Newline*. Default is *Space*.

**LogStream** configures which serial streams are to be logged. Possible values are *Both* (both RX and TX get logged), *Rx* (only Rx is logged), *Tx* (only Tx is logged). Default is *Both*. If the mode is set to *Both*, the *[1]* and *[2]* markers will be used to differentiate between streams.

**UsbMode** allows to switching between flash drive mode and Virtual COM mode (Pro version only). Allowed values are *Flash* (flash drive mode) and *Com* (Virtual COM mode). Default value is *Flash*.

The following tables present all possible configuration parameters.

## CONFIG.TXT

The file CONFIG.TXT is responsible for configuring serial bus parameters.

Parameter	Values	Example	Description
<b>Baudrate</b>	Baud rate in bps (default 9600)	Baudrate=115200	Serial bus baud rate in bits per second (300...115200).
<b>Bits</b>	5 6 7 8 (default)	Bits=7	Number of bits per transfer on the monitored serial bus.
<b>Parity</b>	No (default) Even Odd Space Mark	Parity=Even	Type of parity bit on the monitored serial bus.
<b>StopBits</b>	1 (default) 1.5 2	Parity=1	Number of stop bits per transfer on the monitored serial bus.
<b>Timestamping</b>	Yes (default) No	Timestamping=Yes	Time-stamping disable flag.
<b>TimestampInterval</b>	Timestamp interval in seconds (default 10)	TimestampInterval=1	Interval of bus inactivity which will result in a time-stamp being added.
<b>DisableLogging</b>	Yes No (default)	DisableLogging=Yes	Data logging disable flag.
<b>Separator</b>	None Space (default) Comma	Separator=Comma	The separator between data values in Dec/Hex modes.

	Tab Newline		
<b>LogMode</b>	Bin (default) Hex Dec	LogMode=Hex	Data format in log file.
<b>LogStream</b>	Both (default) Rx Tx	LogStream=Tx	Selection of serial data streams to be logged.
<b>UsbMode</b>	Flash (default) Com	UsbMode=Com	USB mode configuration setting, allowing switching between flash drive mode and Virtual COM mode. Effective only on device startup.

## TIME.TXT

The file TIME.TXT is responsible for configuring the built-in real-time.

Parameter	Values	Example	Description
<b>Year</b>	Year value (range 2000...2099, default 2010)	Year=2019	Year setting (range 2000 to 2099).
<b>Month</b>	Month value (range 1...12, default 1)	Month=10	Month setting (1 is January, 12 is December).
<b>Day</b>	Day value (range 1...31, default 1)	Day=15	Day setting (range 1 to 31).
<b>Hour</b>	Hour value (range 1...12 or 0...23, default 1)	Hour=6	Hour setting (range 1 to 12 for A.M./P.M. format and 0 to 23 for 24-hour time).
<b>Minute</b>	Minute value (range 0...59, default 0)	Minute=37	Minute setting (range 0 to 59).
<b>Second</b>	Second value (range 0...59, default 0)	Second=49	Second setting (range 0 to 59).
<b>Format</b>	AM PM (default) 24	Format=24	Time format setting. If AM is chosen, the 12-hour format is selected and the specified hour is treated as before noon. If PM is chosen, the 12-hour format is selected and the specified hour is treated as afternoon. If 24 is chosen, the 24-hour format is selected and the specified hour is treated as 24-hour format.

## Virtual COM mode (SerialGhost Pro Module only)

Virtual COM mode is a special mode available in the *SerialGhost Pro Module* in which the device connects as a serial COM port. The CDC (Communications Device Class) driver class will be used, which is built-in most operating systems. To enable Virtual COM mode, the following entry needs to be present in CONFIG.TXT (refer to the **Configuration** section for details):

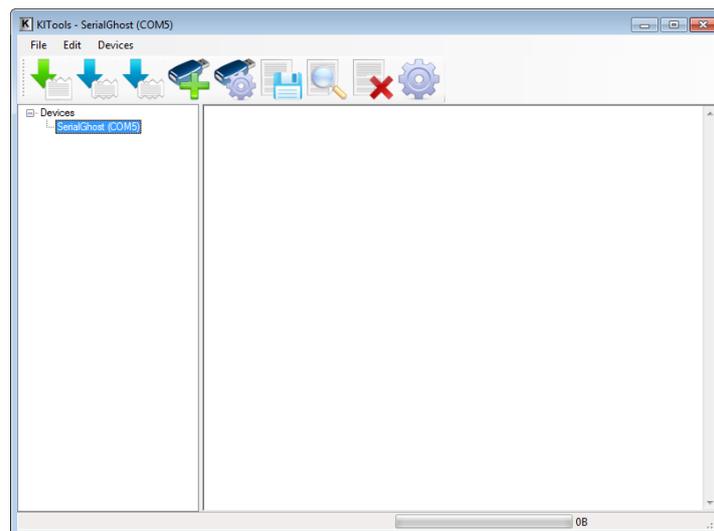
```
usbMode=Com
```

Make sure the CONFIG.TXT file is properly saved in the flash drive root folder. Upon next power-up, the device will connect as a Virtual COM port.

The simplest way of accessing the device in Virtual COM mode is using the application *KL Tools* (refer to the **Using KL Tools** section for details). Upon start-up select the proper device:



Then, use the wizard to access the device using Virtual COM mode. Finally a window will appear, allowing full control of any devices connected in Virtual COM mode. Adding a device will scan all available serial ports, searching for compatible devices.



*KL Tools* will guide through all features of the device with its intuitive user interface.

Switching the device back to flash drive mode can be achieved by changing the following entry in CONFIG.TXT to:

```
usbMode=Flash
```

## Specifications

<b>Power supply</b>	4.5 V – 5.5 V DC
<b>Max. power consumption</b>	65 mA (0.33 W)
<b>Maximum continuous log speed (approx.)</b>	100 kB/s (both streams)
<b>Data retention</b>	100 years
<b>Device support</b>	Asynchronous serial devices operating at RS-232 logic levels (+/-12V)
<b>Maximum log read speed</b>	1 MB/s
<b>Dimensions including connectors (L x W x H)</b>	25 mm x 31 mm x 14 mm (1.0" x 1.2" x 0.6")

## **Legal disclaimer**

No responsibility is taken for any damage, harm or legal actions caused by misuse of this product. The user should follow the guidelines contained in this document, otherwise no liability will be assumed. It is the user's responsibility to obey all effective laws in his/her country, which may prohibit usage of this product.

**For more information, visit the following websites:**

**<http://www.keelog.com/>**

**<http://www.airdrivewifi.com/>**