

SAE J2716 (SENT) Gateway User's Manual for SENT-RS232, SENT-CAN, SENT-USB



CHANGES

DATE	DESCRIPTION	BY
14.5.2024	Clarifications SENT-USB added	MM
20.4.2020	Initial Release	MM
2.2.2020	Draft	JJ, MM

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1 About

This document contains a description of the hardware's properties and general instructions for using the SENT-RS232, SENT-CAN, and SENT-USB with a computer with the SENT Gateway Analyser application, or for connecting the gateway to another system.

2 Introduction

The **SENT-RS232, SENT-CAN, and SENT-USB** gateways offer two bi-directional SAE J2716 (SENT - Single Edge Nibble Transmission) channels. The SENT-RS232 features a RS-232 interface, the SENT-CAN offers a CAN bus interface, whilst the SENT-USB offers a USB VCP.

The SENT-RS232 and SENT-CAN gateways also offer two precise analogue outputs (12-bit, 0 - 4.095 V) that can be mapped onto incoming SENT data. Conversion parameters can be configured. This allows an easy way to convert signal values from SENT directly into an analogue voltage value.

Fast, Short Serial, and Enhanced Serial message formats are supported. The user can configure channel parameters (direction, tick time, nibble count, filtration) and store the configuration into the device's non-volatile memory. Each SENT channel can be configured independently to suit all possible use cases: 2 RX channels / 1 RX and 1 TX channel / 2 TX channels.

An intelligent filtration of incoming SENT frames has been introduced so that RS-232 or CAN communication does not get overloaded. The CAN variant offers configurable CAN Identifiers for both TX and RX which allows multiple devices to be used simultaneously on the same CAN bus. The device's firmware is upgradable from PC.

3 Technical Specification

SENT	
Channels	2x bi-directional SENT channel <i>each channel configurable as RX or TX</i>
Specification	SAE J2716:2016 Pause Pulse Support
Tick Time	0.5 - 90 us (different on request)
Data Nibbles	1 - 6
Message Format	Fast, Short Serial, Enhanced Serial
RX Message Filtration	No filtration, On change, Skip frames
Analogue Outputs (not available on SENT-USB)	
Channels	2x 12-bit DAC
Voltage Range	0 - 4.095 V (internal precise reference)
Mapping	Off, SENT1, SENT2
Configurable Parameters	Start Bit, Bit Length, Multiplier, Offset, Min/Max Voltage
General	
Configuration	Non-volatile memory for storing configuration of SENT channels, communication parameters, and analogue channels

PC application	Free-of-charge PC application (Windows) for device configuration, reception and transmission of SENT Fast/Slow frames
Firmware	Upgradable from PC
Microcontroller	16-bit DSP
Communication Interface	
Protocol	Binary protocol for easy integration
SENT-RS232	RS232: 115200, 8N1
SENT-CAN	CAN bus with configurable parameters: Baud Rate, Sample point, RX/TX CAN Identifiers <i>This allows multiple devices on the same bus</i>
SENT-USB	USB Virtual COM port
Electrical and Mechanical	
Power	SENT-RS232 and SENT-CAN: 9 - 30 V DC (polarity protection) SENT-USB: USB-powered All gateways offer 5 V DC output for sensors (limited to 200 mA)
Consumption	50mA @ 12 V <i>(5V output is not considered)</i>
LEDs	3x Status indicator 1x Power
Button	1x Tactile switch (reset factory defaults)
Connectors	1x Terminal block 8-pin, 3.5 mm pitch SENT-RS232 and SENT-CAN: 1x D-SUB-9 F SENT-USB: microUSB
Dimensions (L x W x H)	108 x 54 x 30 mm
Weight	80 g
Operating Temperature	-20 to 60 °C
Protection	IP40
Placement	Table (adhesive pads included) DIN-rail mount (clip sold separately)

Table 1 Technical Specification

4 Hardware

4.1 Overview

The gateway has two connectors, 4 LEDs, and a reset button.

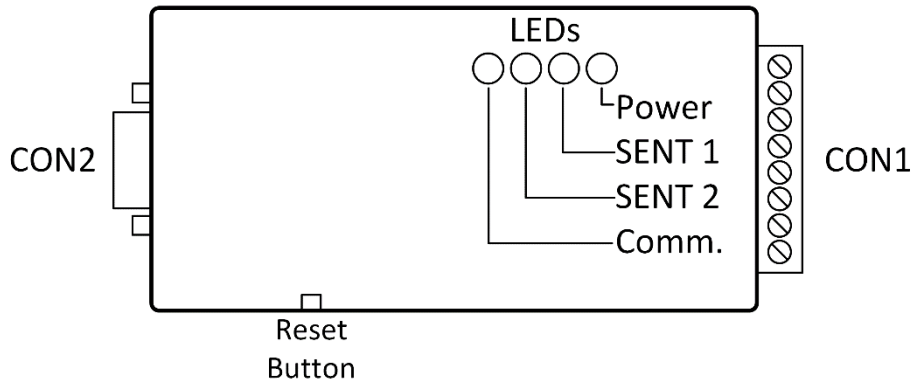


Figure 1 SENT-RS232 and SENT-CAN Top side layout

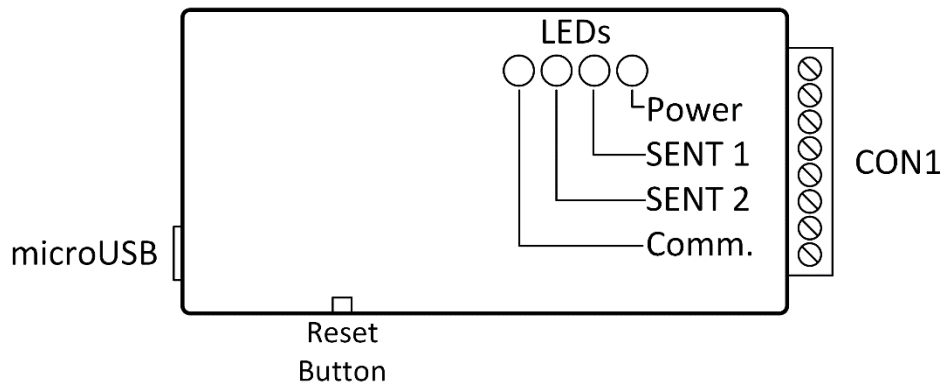


Figure 2 SENT-USB Top side layout



Figure 3 CON 1 - Terminal Connector

4.2 Connectors

4.2.1 CON 1

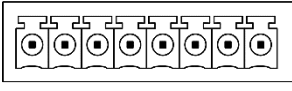
Terminal Block	Pin	Function	Note
 <p>Front view</p>	1	SENT 1 RX	input
	2	SENT 1 TX	output
	3	SENT 2 RX	input
	4	SENT 2 TX	output
	5	GND	internally connected to DSUB9 pin 5
	6	5V output	200 mA protection
	7	GND (Power In-)	connected to pin 5
	8	Vin1 (Power In+)	

Table 2 Connector 1 Pin Assignment

Both SENT-RS232 and SENT-CAN can be powered over CON 1: pins 8 and 9. CAN variant can also be powered via CON 2: pins 9 and 3. All GND pins are connected throughout the device. Hence, there is no galvanic isolation.

4.2.2 CON 2

Applies to SENT-CAN and SENT-RS232.

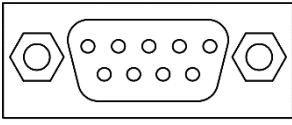
D SUB 9 Female	Pin Number	RS-232 variant	CAN variant
 <p>Front view</p>	1		
	2	TxD (output)	CAN_L
	3	RxD (input)	GND (Power In-)
	4		
	5	GND	GND (internally connected to pin 3)
	6	AO1	AO1
	7		CAN_H
	8	AO2	AO2
	9		Vin2 (Power In+)

Table 3 Connector 2 Pin Assignment

Warning for SENT-RS232: Do not connect the AO1 and AO2 pins directly to an RS-232 port of your system, as the analogue outputs would be damaged.

4.3 LED Status Information

The four LEDs provide the following status information:

LED	Colour	State	Meaning
Power	Green	On	The device is powered
SENT 1	Yellow	Off	Channel is stopped
		Slow blinking	Reception in progress
		Fast blinking	Transmission in progress
SENT 2	Yellow	Off	Channel is stopped
		Slow blinking	Reception in progress
		Fast blinking	Transmission in progress
Communication	Green / Red	Green flash	Communication packet received
		Red flash	Communication packet error

Table 4 LED Function Description

4.4 Power

The device needs an external power supply 9 - 30 V DC.

4.4.1 SENT-RS232

Power is provided over CON 1.

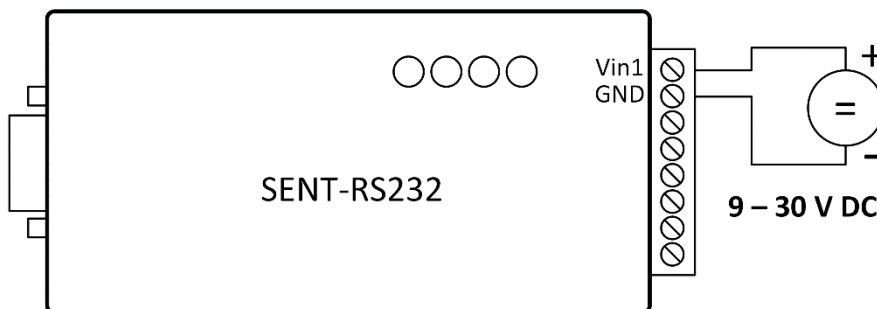


Figure 4 SENT-RS232 Power

4.4.2 SENT-CAN

The SENT-CAN device offers two possibilities to power the device - over CON1 (like SENT-RS232) or over CON2 (DSUB9).

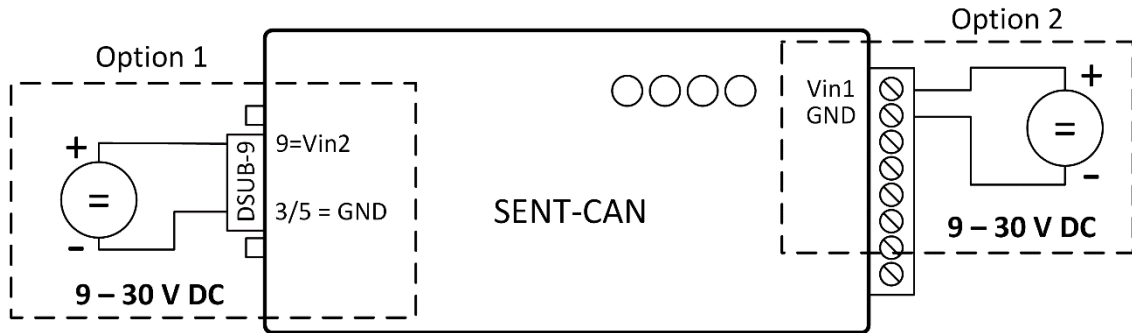


Figure 5 SENT-CAN Power

4.4.3 SENT-USB

The SENT-USB can be powered from USB. If the user wants to lower the USB consumption, he can still power the device over the terminal block.

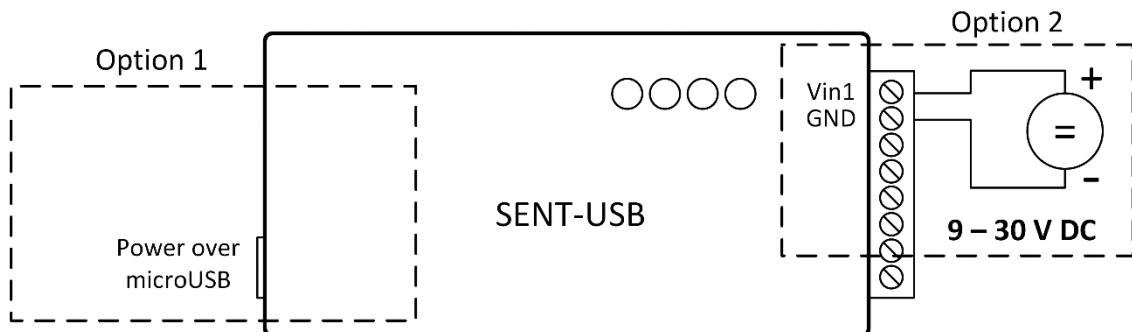


Figure 6 SENT-USB Power

4.5 CAN Bus Termination

The SENT-CAN does not have an internal termination resistor on the CAN bus. Therefore, a proper termination of the CAN bus is needed. The user needs to make sure the CAN bus is properly terminated at both ends.

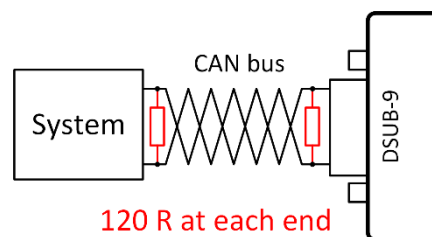


Figure 7 SENT-CAN Bus Termination

4.6 Factory Reset

The reset button is located on the side of the device. For resetting to factory defaults, power the device, wait a few seconds and then press and hold the button for 10 seconds. The button can be pressed by tweezers or a pen.



Figure 8 Reset Switch

4.7 Firmware Update

The device's firmware can be updated over its interface, depending on the device variant. Please see www.machsystems.cz/en/support for more details.

5 SENT Gateway Analyser

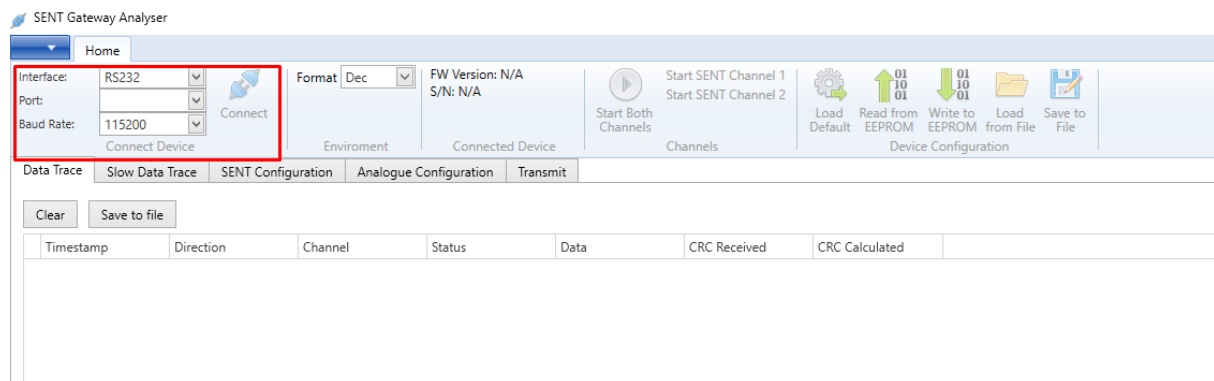
The SENT Gateway Analyser is a Windows application that provides the user an easy way to use the gateway. The application is provided free-of-charge and allows to configure SENT channels and analogue output channels, save and load the runtime and non-volatile configuration, and receive and transmit Fast and Slow SENT messages.

5.1 Connection

5.1.1 SENT-RS232 and SENT-USB

SENT-RS232: Make sure your computer has an on-board COM port or a USB-COM adapter.

SENT-USB: Will also be visible as an RS-232 COM port.



Default Communication Parameters:

Parameter	Value	Note
Baud Rate	115200 Baud	
Data bits	8	<i>not configurable</i>
Parity	None	<i>not configurable</i>
Stop bit	1 bit	<i>not configurable</i>

Table 5 SENT-RS232 and SENT-USB Default Communication Parameters

5.1.2 SENT-CAN

The SENT Gateway application works with CAN interfaces by Kvaser (www.kvaser.com). Therefore, a Kvaser interface is needed in order to use the application.

Make sure that Kvaser driver is installed on your computer.

Select CAN channel, baud rate and CAN ID for both directions.

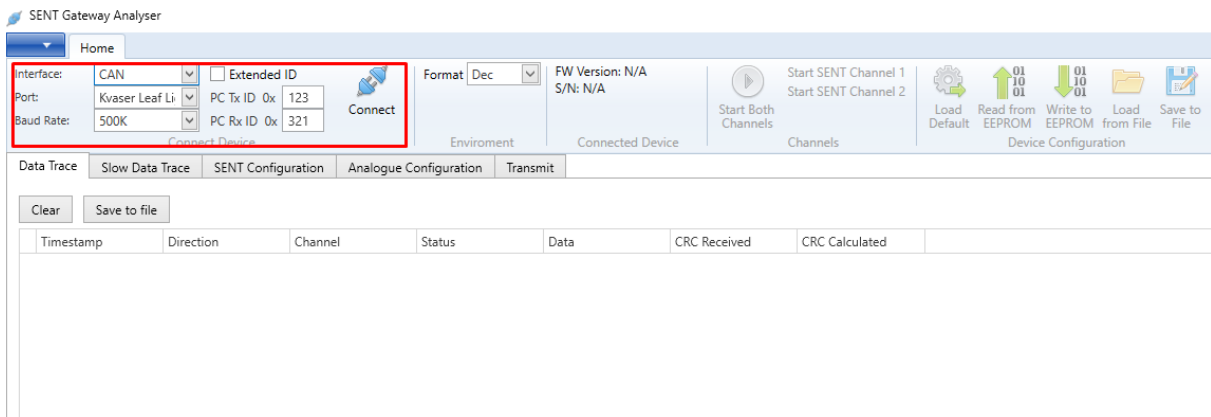
Default Communication Parameters:

Parameter	Value
Baud Rate	500 KBaud
PC TX CAN Id	0x123 (Standard)
PC TX CAN Id	0x321 (Standard)

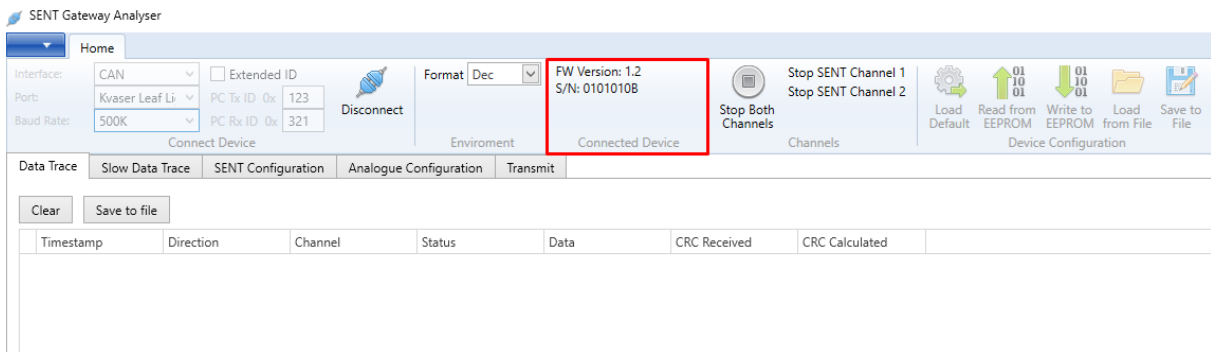
Table 6 SENT-CAN Default Communication Parameters

5.1.3 Connect the Device

- 1) Click on *Connect* button

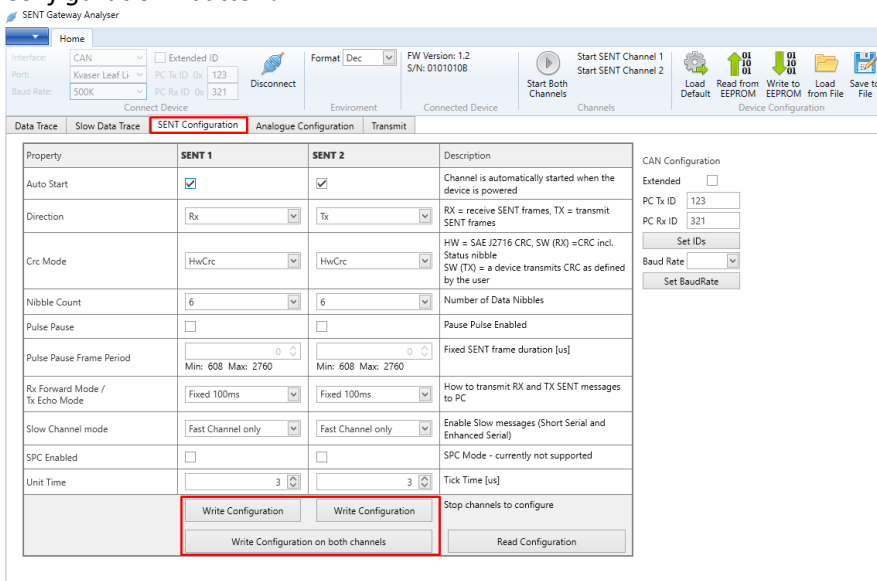


- 2) If the gateway is correctly powered and connected to the computer, its serial number and firmware version, and the current configuration will be loaded:

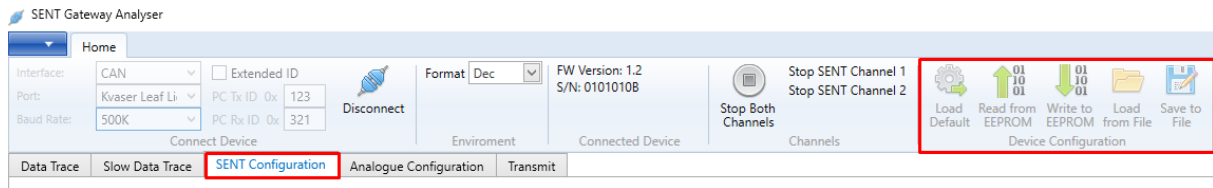


5.2 Channel Configuration

The gateway has two independent SENT channels that can be configured in “*SENT Configuration*” tab. After modifying the configuration, don’t forget to write it into the gateway by clicking to “*Write Configuration*” button!

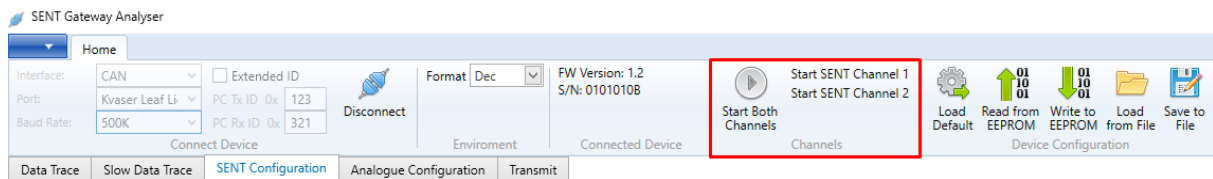


You can also save the SENT and analogue channels configuration into gateway's EEPROM, which makes the gateway to load this configuration on power-up.



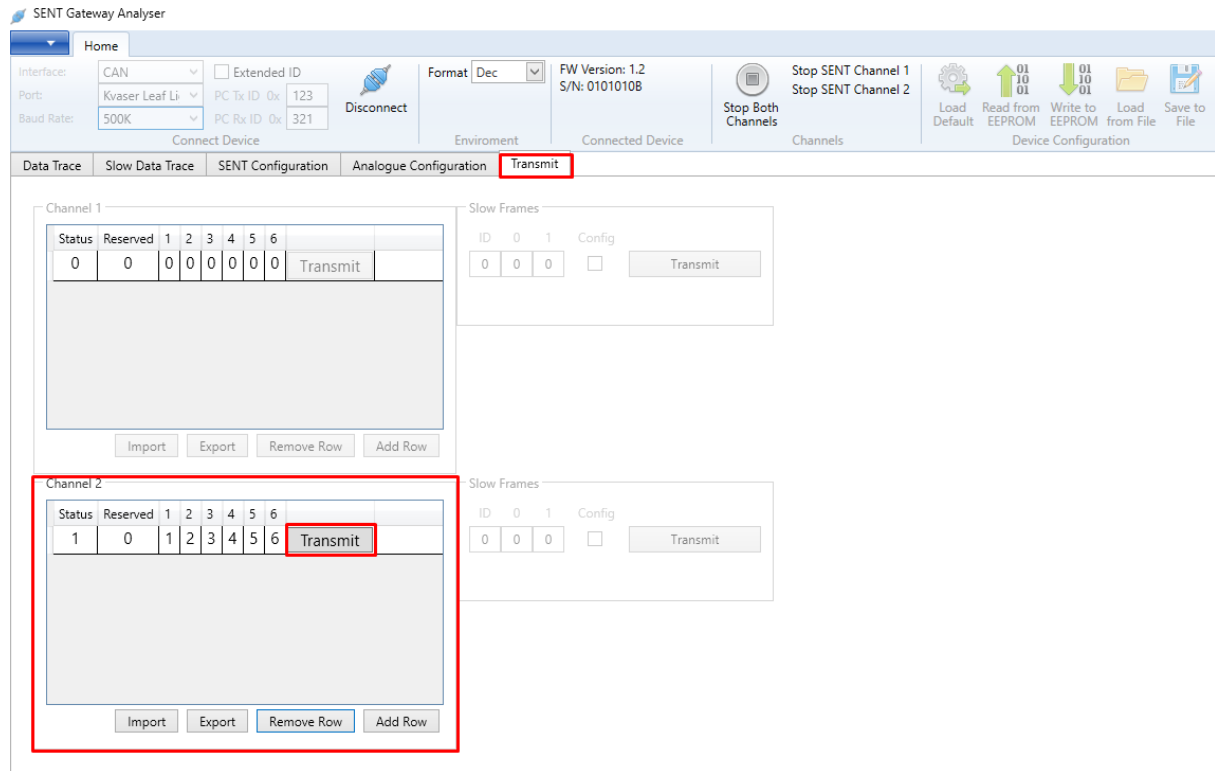
5.3 Start Channel

After a configuration is written into the device, one or both channels can be started.

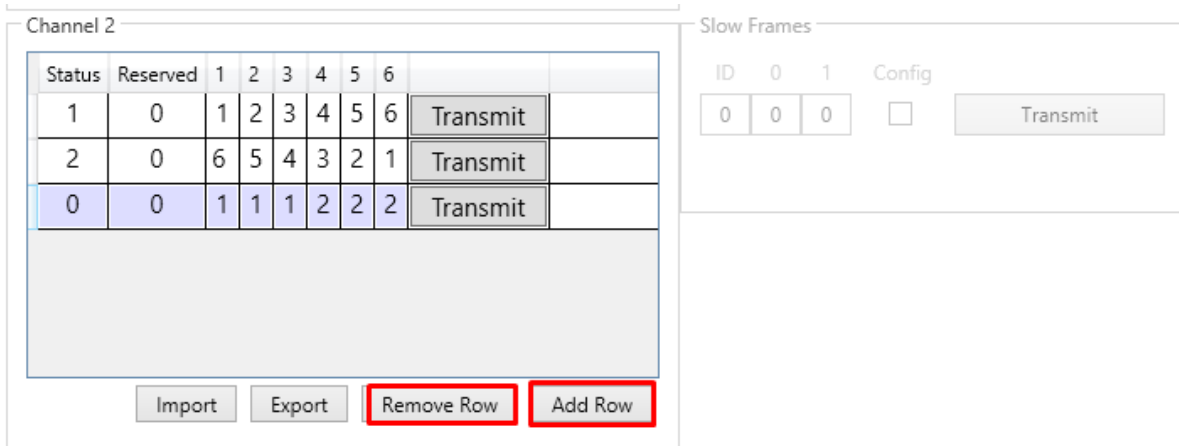


5.4 Transmit Message

If your configuration contains at least one Tx channel, you can fill data to send in *Transmit* tab. Fill your data and click to *Transmit* button.



You can prepare more messages by adding more rows. You can also remove them with *Remove Row* button.



The table above do not behave as a scheduler. Only one row will be periodically transmitted onto the SENT bus.

The slow messages are modulated over Fast messages. To transmit Slow message, a transmission of Fast message needs to be started as well.

Further, please note the transmission of Slow messages is not echoed back. Hence, Slow messages will not be seen in the data grid.

5.5 Data Analysis

In *Data Trace* tab you can see received and transmitted SENT messages.

SENT Gateway Analyser

Home

Interface: CAN Extended ID Format: Dec FW Version: 1.2 S/N: 0101010B

Port: Kvaser Leaf Li PC Tx ID: 0x123

Baud Rate: 500K PC Rx ID: 0x321

Stop SENT Channel 1 Stop SENT Channel 2

Stop Both Channels

Load Default Read from EEPROM Write to EEPROM Load from File Save to File

Connect Device Environment Connected Device Channels Device Configuration

Data Trace Slow Data Trace SENT Configuration Analogue Configuration Transmit

Clear Save to file

Timestamp	Direction	Channel	Status	Data	CRC Received	CRC Calculated
03:22:45.200	Rx		1 0	111222	10	10
03:39:25.300	Rx		1 0	111222	10	10
03:39:27.000	Tx		2 0	111222	10	10
03:56:06.200	Tx		2 0	111222	10	10
03:56:08.800	Rx		1 0	111222	10	10
04:12:48.000	Rx		1 0	111222	10	10
04:12:50.600	Tx		2 0	111222	10	10
04:29:29.900	Rx		1 0	111222	10	10
04:29:31.600	Tx		2 0	111222	10	10
04:46:11.700	Rx		1 0	111222	10	10
04:46:13.400	Tx		2 0	111222	10	10
05:02:53.500	Rx		1 0	111222	10	10
05:02:55.200	Tx		2 0	111222	10	10
05:19:34.400	Rx		1 0	111222	10	10
05:19:37.000	Tx		2 0	111222	10	10
05:36:16.300	Rx		1 0	111222	10	10
05:36:18.000	Tx		2 0	111222	10	10
05:52:58.100	Rx		1 0	111222	10	10
05:52:59.800	Tx		2 0	111222	10	10
06:09:39.900	Rx		1 0	111222	10	10
06:09:41.600	Tx		2 0	111222	10	10
06:26:20.800	Rx		1 0	111222	10	10
06:26:23.400	Tx		2 0	111222	10	10
06:43:02.700	Rx		1 0	111222	10	10
06:43:04.400	Tx		2 0	111222	10	10
06:59:44.500	Rx		1 0	111222	10	10
06:59:46.200	Tx		2 0	111222	10	10
07:16:26.300	Tx		2 0	111222	10	10
07:33:07.200	Tx		2 0	111222	10	10
07:33:09.800	Rx		1 0	111222	10	10

14:15:26.1784258 Channel 1 started.
 14:15:26.1804217 Channel 2 started.
 14:28:48.4599641 Channel 1 stopped.
 14:28:48.4619594 Channel 2 stopped.
 14:28:54.1557319 Channel 1 started.
 14:28:54.1587241 Channel 2 started.

Fast Messages: 13484 Slow Messages: 0

6 Legal Information

6.1 Usage Warning

WARNING FOR ALL USERS

WARNING! - YOUR USE OF THIS DEVICE MUST BE DONE WITH CAUTION AND A FULL UNDERSTANDING OF THE RISKS!

THIS WARNING IS PRESENTED TO INFORM YOU THAT THE OPERATION OF THIS DEVICE MAY BE DANGEROUS. YOUR ACTIONS CAN INFLUENCE THE BEHAVIOR OF A DISTRIBUTED EMBEDDED SYSTEM, AND DEPENDING ON THE APPLICATION, THE CONSEQUENCES OF YOUR IMPROPER ACTIONS COULD CAUSE SERIOUS OPERATIONAL MALFUNCTION, LOSS OF INFORMATION, DAMAGE TO EQUIPMENT, AND PHYSICAL INJURY TO YOURSELF AND OTHERS. A POTENTIALLY HAZARDOUS OPERATING CONDITION IS PRESENT WHEN THE FOLLOWING TWO CONDITIONS ARE CONCURRENTLY TRUE: THE PRODUCT IS PHYSICALLY INTERCONNECTED TO A REAL DISTRIBUTED EMBEDDED SYSTEM; AND THE FUNCTIONS AND OPERATIONS OF THE REAL DISTRIBUTED EMBEDDED SYSTEM ARE CONTROLLABLE OR INFLUENCED BY THE USE OF THE CAN NETWORK. A POTENTIALLY HAZARDOUS OPERATING CONDITION MAY RESULT FROM THE ACTIVITY OR NON-ACTIVITY OF SOME DISTRIBUTED EMBEDDED SYSTEM FUNCTIONS AND OPERATIONS, WHICH MAY RESULT IN SERIOUS PHYSICAL HARM OR DEATH OR CAUSE DAMAGE TO EQUIPMENT, DEVICES, OR THE SURROUNDING ENVIRONMENT.

WITH THIS DEVICE, YOU MAY POTENTIALLY:

- CAUSE A CHANGE IN THE OPERATION OF THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT.
- TURN ON OR ACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- TURN OFF OR DEACTIVATE A MODULE, DEVICE, CIRCUIT, OUTPUT, OR FUNCTION.
- INHIBIT, TURN OFF, OR DEACTIVATE NORMAL OPERATION.
- MODIFY THE BEHAVIOR OF A DISTRIBUTED PRODUCT.
- ACTIVATE AN UNINTENDED OPERATION.
- PLACE THE SYSTEM, MODULE, DEVICE, CIRCUIT, OR OUTPUT INTO AN UNINTENDED MODE.

ONLY THOSE PERSONS WHO:

(A) ARE PROPERLY TRAINED AND QUALIFIED WITH RESPECT TO THE USE OF THE DEVICE,

(B) UNDERSTAND THE WARNINGS ABOVE, AND

(C) UNDERSTAND HOW THIS DEVICE INTERACTS WITH AND IMPACTS THE FUNCTION

AND SAFETY OF OTHER PRODUCTS IN A DISTRIBUTED SYSTEM AND THE APPLICATION FOR WHICH THIS DEVICE WILL BE APPLIED, MAY USE THE DEVICE.


PLEASE NOTE THAT YOU CAN INTEGRATE THIS PRODUCT AS A SUBSYSTEM INTO HIGHER-LEVEL SYSTEMS. IN CASE YOU DO SO, MACH SYSTEMS s.r.o. HEREBY DECLARES THAT MACH SYSTEMS s.r.o.'s WARRANTY SHALL BE LIMITED TO THE CORRECTION OF DEFECTS, AND MACH SYSTEMS s.r.o. HEREBY EXPRESSLY DISCLAIMS ANY LIABILITY OVER AND ABOVE THE REFUNDING OF THE PRICE PAID FOR THIS DEVICE, SINCE MACH SYSTEMS s.r.o. DOES NOT HAVE ANY INFLUENCE ON THE IMPLEMENTATIONS OF THE HIGHER-LEVEL SYSTEM, WHICH MAY BE DEFECTIVE.

6.2 Disposal and Recycling Information



When this product reaches its end of life, please dispose of it according to your local environmental laws and guidelines.

6.3 Declaration of Conformity


MACH SYSTEMS

EU Declaration of Conformity (DoC)

We

Company Name	MACH SYSTEMS s.r.o.	City	Prague
Postal Address	Pocernicka 272/96	Country	Czech Republic
Postcode	108 00		

declare that the DoC is issued under our sole responsibility and belongs to the following product:

SAE J2716 Gateway

Objects of the declaration:

Product	Product Number
SAE J2716 - RS232 Gateway	SENT-RS232
SAE J2716 - CAN Gateway	SENT-CAN
SAE J2716 – USB Interface	SENT-USB

The objects of the declaration described above is in conformity with the relevant Union harmonisation legislation:

2014/30/EU - EMC Directive
2011/65/EU - RoHS (recast)


The following harmonised standards and technical specifications have been applied:

EN 55032:2015	EN 61000-6-3:2007+A1:2011
EN 55035:2017	EN 50581:2012

Signed for and on behalf of: MACH SYSTEMS s.r.o.

Place of issue: Prague, Czech Republic

Date of issue: April 20th 2020

Signature: 

Name, function: Miroslav Machacek, Managing Director

MACH SYSTEMS s.r.o.
www.machsystems.cz

6.4 Patents, Copyrights and Trademarks

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Adobe, the Adobe logo, and Reader are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States and/or other countries.

Kvaser is a registered trademark of Kvaser AB in Sweden and other countries.

7 Ordering Information

Product Number	Description
SENT-RS232	SAE J2716 to RS-232
SENT-CAN	SAE J2716 to CAN bus
SENT-USB	SAE J2716 to USB
DIN-CLIP-1	Clip for mounting on a DIN rail
SENT-NET-SDK	.NET driver for easy integration of SENT-RS232, SENT-CAN, SENT-USB into a .NET application. One-time purchase. Perpetual license valid for one company location.

Table 7 Ordering Codes for SAE J2716 Gateways

8 Contact

MACH SYSTEMS s.r.o.

www.machsystems.cz

info@machsystems.cz

Czech Republic

Company registration: 29413893

EU VAT number: CZ29413893

