Serial/CAN-Gateway

SerCAN-ARM7/RMD

User Manual

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User manual SerCAN-ARM7/RMD

Document version: 1.03
Documentation date: May 05th, 2011

This document describes the functionality of the SerCAN-ARM7/RMD hardware with firmware version 2.00. Please contact EMS Dr. Thomas Wünsche, if you have a module with different firmware.

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Content

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1 Overview

1.1 Features

- Connection of a CAN network to a RS232 interface
- Filtering of CAN messages
- CAN bus activity displayed by LED
- Configuration via RS232 connection
- Wiring using a multiway connector
- Available also with low speed CAN transceiver NXP TJA1054

1.2 General description

The Serial/CAN gateway SerCAN-ARM7 connects a CAN network to a RS232 interface. The capability of having different baud rates on the CAN side as well as on the RS232 side marks the devices a versatile tool for a lot of applications. Bandwith differences between CAN and RS232 may be overcome by CAN message filtering.

The device is also available with a low speed physical CAN interface using NXP CAN transceiver TJA1054 (SerCAN-ARM7/RMD/LS).

The device is configured via the RS232 interface. Due to the intuitive structure of the configuration file in ASCII format, programming and administration is easy.

1.3 Ordering information

12-20-202-20	SerCAN-ARM7/RMD
12-20-203-20	SerCAN-ARM7/RMD/LS

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2 Handling

2.1 Connection

SerCAN-ARM7 has a multiway connector for flexible wiring of the CAN interface and the power supply. The RS232 interface has a standard SUB-D-9 male connector and is used for normal operation as well as for the configuration purpose.

The connector assignment of the multiway connector and the RS232 interface is described in chapter "3.1 Pin assignment".

2.2 Operation

To start up the gateway just connect the power supply, the device starts up automatically. As soon as the automatic diagnostic process is successfully completed the green power LED lites up permanently.

Important note: Ex factory the device offers no configuration and must be configured before its first run. Configuration instructions for the gateway are located in chapter "2.3 Configuration".

2.3 Configuration

The gateway configuration process consists of two steps:

- Creating a configuration file
- Loading the configuration into the device

2.3.1 Configuration File

The configuration file is a text file with the extension *.gcf. This file holds all data needed by the gateway for operation. A complete sample configuration is located in chapter "4.1 Configuration File Example".

The values can either be entered in decimal or hexadecimal notation. Using the hexadecimal notation, the character 'x' has to be entered directly before the particular value.

Some parameters are optional. If they are not defined, the gateway uses default settings.

In the following all parameters are listed and described.

#	comment

The configuration file can be provided with comments. Comments are prefaced with the character '#' and they end with the particular line.

Example:

```
# 1st comment
key = value    # 2nd comment
```

version	version

The version number indicates the file format of the configuration file. It must be 1 for the actual version.

Example:

```
version=1
```

configname	name assigned to the configuration

For easier identification of the programmed settings, the configration can be labeled. The configuration name must not have more than 32 characters and must not contain space characters or tabs. If this key is missing, no name will be assigned.

Example:

```
configname=MyOwnConfig
```

canbaudrate	CAN bit timing

The CAN bit timing key indicates the speed of the CAN interface. This key is mandatory and is related directly to the CANBTR0 register of the used controller LPC2119. This allows most flexible customization of the baudrate settings. The basic CAN clock is 48MHz.

Example:

```
# 500 kBaud
canbaudrate = x001c0005
```

serialbaudrate	serial baud rate

The serial baudrate key is optional. If it is not set, the default baudrate of 57600 baud will be used. A particular value is calculated with the following equation:

serialbaudrate = 48000000/(16*BAUDRATE)

The results for some standard values are given below:

```
9600 Baud      : 312
19200 Baud     : 156
38400 Baud     : 78
57600 Baud     : 52
115200 Baud    : 26
```

The line settings for the RS232 interface is always 8 data bits, no parity, 1 stop bit (8N1).

The maximum usable baud rate is limited by the serial transceiver chip to 115200 baud.

Please note, that if a serial baud rate is programmed, which is not supported by the PC used for the configuration process, a reconfiguration may become hard to accomplish.

Example:

```
# serial baud rate set to 57600
serialbaudrate=52
```

bus off	bus off behavior

This key specifies the period of time in milliseconds, which will pass by until the gateway gets bus on again after a bus off condition has occured. If this value is not defined, the device remains in bus off state. If a bus off time of 0 milliseconds is set, the gateway tries immediately to get bus on again.

Example:

```
busoff=100
```

sfilter, xfilter	filter key

This key defines which received CAN messages will be filtered out or not. Either a particular identifier or a range of identifiers can be specified. A message which should pass to the RS232 interface must have a filter rule set. The "sfilter" key relates to 11bit identifier messages, whereas "xfilter" relates to 29bit identifier.

Example:

```
# A range of 11bit messages starting with id 0 and
# ending with id 100h will pass the filter.
sfilter=x0-x100

# A range of 29bit messages starting with id 100h and
# ending with id 1000h will pass the filter.
xfilter=x0-x10
```

2.3.2 Programming the Device

SerCAN-ARM7 is programmed by means of the configuration software. It offers the possibility to configure the gateway via the RS232 interface. A "nullmodem" cable has to be used to connect to the host PC.

The "Program Settings" have to be set to:

- SerCAN-ARM7/RMD
- Program configuration
- a configuration file

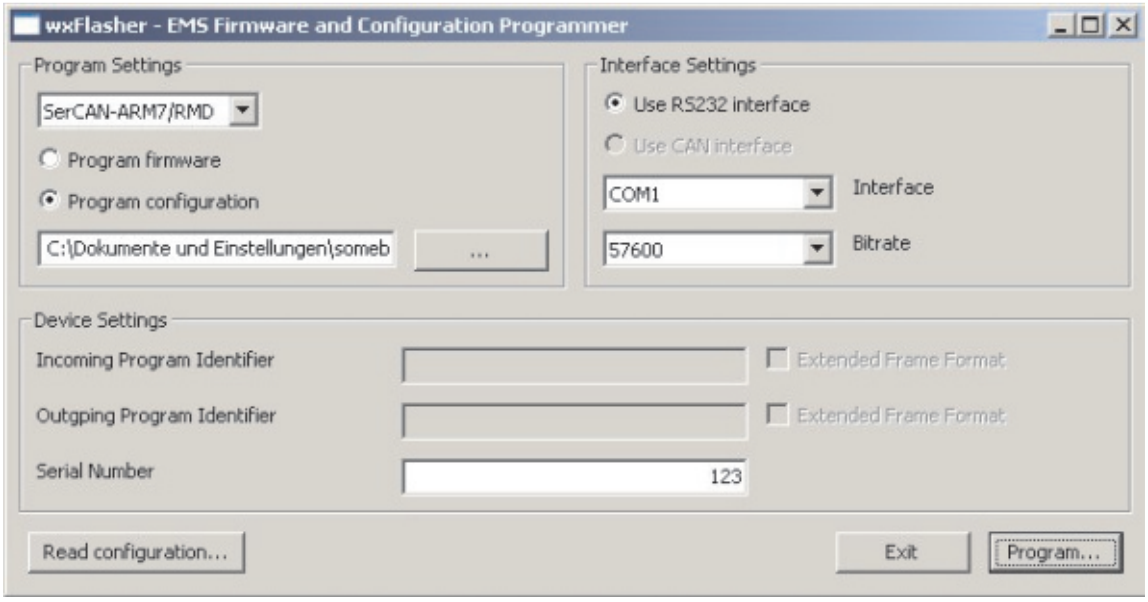
The "Interface Settings" have to be set to:

- Use RS232 interface
- the used PC serial interface port
- the serial baudrate used by the SerCAN-ARM7 device

Within the "Device Settings" the serial number of the SerCAN-ARM7 has to be set. The serial number can be found on a label on the rear side of the device.

After all settings are made a click on the "Process" button starts the download. Do not remove power from the device until the process has finished.

Screenshot of the download tool:



2.4 LED

The device status is displayed by three LEDs.

Power

On	The device is CAN bus on and in normal operation mode
Off	The device is CAN bus off
Blinking	The device is in programming mode

CAN Active

On	There is CAN bus activity
Off	There is no CAN bus activity

3 Technical Data

3.1 Pin Assignment

Pin Assignment multiway connector SerCAN-ARM7/RMD

Pin	Signal	Description
1	+24V	+24 Volt power supply
2	GND	Ground*
3	GND	Ground*
4	CAN_H	CAN high bus line
5	CAN_L	CAN low bus line
6	GND	Ground*
7	GND	Bootloader (connect to Vcc to enter bootloader mode)
8	GND	Bootloader (connect to GND to enter bootloader mode)

Pin Assignment multiway connector SerCAN-ARM7/RMD/LS

Pin	Signal	Description
1	+24V	+24 Volt power supply
2	GND	Ground*
3	GND	Ground*
4	CAN_H	CAN high bus line
5	CAN_L	CAN low bus line
6	GND	Ground*
7	RTH	Connected with Pin 4 by a 5k6 resistor and RTH pin of TJA1054 CAN transceiver
8	RTL	Connected with Pin 5 by a 5k6 resistor and RTL pin of TJA1054 CAN transceiver

*internal connected

Pin assignment RS232

Pin	Signal	Description
1		not connected
2	RxD	Receive signal
3	TxD	Transmit signal
4		not connected
5	GND	Ground
6		not connected
7	RTS	not used
8	CTS	not used
9		not connected

3.2 Limiting Values

Parameter	Min.	Max.	Unit
Storage temperature	-20	80	°C
Operating temperature	0	60	°C
Supply voltage	-100	30	V

3.3 Nominal Values

Parameter	Min.	Max.	Unit
Supply voltage	10	30	V
CAN Baudrates	10	1000	kBit/s

4 Appendix

4.1 Configuration File Example

```
# Serial/CAN Gateway SerCAN-ARM7 configuration file

# Version number of configuration file
version=1

# CAN baud rate set to 500kBaud
canbaudrate=x001C0005

# RS232 baud rate set to 57.6 kBaud
serialbaudrate=52

# set CAN bus off recovery time to 500ms
busoff=500

# filter settings
# all 11bit CAN identifier are routed
sfilter=x0-x7FF

# all 29bit CAN identifiers are routed
xfilter=x0-x1FFFFFFF
```

4.2 Standard CAN Baud Rates

baud rate	**canbaudrate value**
1000 kBaud	0x00140005
800 kBaud	0x00160005
500 kBaud	0x001C0005
250 kBaud	0x001C000B
125 kBaud	0x001C0017
100 kBaud	0x001C001D
50 kBaud	0x001C003B
20kBaud	0x001C0095
10 kBaud	0x001C012B

4.3 Serial Protocol Specification

A block oriented protocol is used for message exchange between RS232 and CAN.

Format of a data block:

Start	Type	Length	Data	Checksum	End
1 byte	1 byte	1 byte	'length' - 4 bytes	2 bytes	1 byte

The 'length' byte counts the number of bytes in the fields 'type', 'length', 'data' and 'checksum'. The two checksum bytes contain the byte by byte summarization of the fields 'type', 'length' and 'data'.

A number of special characters are used. Reserved characters have values less or equal 7.

The following three special characters are used:

Special character	Value	Description
BEGINOFDATA	0x00	Marks the start of a block
ENDOFDATA	0x01	Marks the end of a block
ESCAPE	0x02	The following character is no special character. This allows the transmission of special characters in the fields 'type', 'length', 'data' and 'checksum'.

In case that a special character has to be transmitted within the data field, it must be preceeded by an ESCAPE character and the most significant bit of the character has to be set.

Example: Transmission of 0x01

```
Transmitted is 0x02 (ESCAPE) followed by 0x81 (0x01|0x80).
```

The meaning of the bytes in the 'data' field is indicated by the 'type' field.

Type	Value	Description
CAN	0x08	Denotes a CAN message with 11bit identifier
XCAN	0x09	Denotes a CAN message with 29bit identifier

A message block of type 'CAN' has the following structure:

ID	RTR	Length	Data
2 bytes low byte first	1 byte 0xFF: RTR frame 0x7F: data frame	1 byte	data frame: Number of data bytes corresponding to 'Length' RTR frame: 0 bytes

A message block of type 'XCAN' has the following structure:

ID	RTR	Length	Data
4 bytes low byte first	1 byte 0xFF: RTR frame 0x7F: data frame	1 byte	data frame: Number of data bytes corresponding to 'Length' RTR frame: 0 bytes

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