Description of STM8 LIN software package (STSW-STM8A-LIN)
release 4.1

Introduction

The STM8 LIN package implements the LIN 2.x (2.1 and 2.0) and LIN 1.3 protocols to drive USART/UART1 (named SCI2) and LINUART/UART2 or UART3 (named SCI1) of STM8A/STM8S microcontrollers.

This release note describes the content of the STM8 LIN software package (STSW-STM8A-LIN) release 4.1, the bugs fixed and the remaining limitations.

The results of the conformance tests with LIN 2.x specifications are also provided. These tests have been performed for the 5 standard baudrates: 20000, 19200, 10417, 9600 and 2400 bps (for further details, see *Section 4: LIN 2.x conformance tests*).

Several bugs have been fixed in STSW-STM8A-LIN release 4.1.

Table 1. Release information

STM8 LIN package	
Release version	4.1
Release date	18/08/2011
Customer support	For all queries, information or support please contact the local FAE or visit http://www.st.com/mcu

Table 2. Reference documents

Document Name	Version
LIN specification package revision 2.0 of LIN consortium	2.0 [18/09/2003]
LIN conformance test specification for the LIN specification package revision 2.0 (in particular LIN OSI Layer 2 – Data Link Layer)	1.0 [01/08/2004]
Technical Note TN0322: Results of the conformance tests performed on the STM8 LIN software package release 4.1	2.0 [08/2011]
LIN specification package revision 2.1 of LIN consortium	2.1 [24/11/2006]
LIN conformance test specification for LIN specification package 2.1	2.1 [10/10/2008]
LIN 2.1 specification erratasheet	1.1 [30/07/2008]

1 Minimum requirements

1.1 Software toolchain

- ST7 Visual Develop version 4.1.5
- CXSTM8 COSMIC C compiler version 4.2.8.

1.2 Hardware

- Host PC running under Windows®
- CANOE.LIN provided by Vector
- ST-LINK or RAISONANCE RLink
- STM8/128-EVAL evaluation board revision B
- CANCaseXL
- Waveform signal generator.

2 Release 4.1 content

2.1 Directory structure

The STM8 LIN package release 4.1 is organized into five main folders:

- **demo**
- **src**
- **Lingen**
- **Make**
- **doc**
- **uninst**

demo folder

The **demo** folder contains two demonstrations (demo) for the STM8 microcontroller, one for the master node and one for slave nodes. They are located under two distinct sub-folders.

The demos have been designed to demonstrate the communications between the master and slave nodes using STM8/128-EVAL boards. To run the demo, the two evaluation boards must be connected to each other through the LIN2 connector.Each demo reads the positions of the DIP switches present on the evaluation board and converts them into LIN frame signals that are then transmitted to the other board. The status of the switches is then displayed on the evaluation board LEDs.

Table 3. Hardware connections between Master and Slave evaluation boards for demo

STM8/128-EVAL REV.B (Master)	STM8/128-EVAL REV.B (Slave)
LINUART/UART2 or UART3 - LIN_SCI1 Interface	
LIN2 (CN14 connector) PIN3 (GND)	LIN2 (CN14 connector) PIN3 (GND)
LIN2 (CN14 connector) PIN7 (LIN)	LIN2 (CN14 connector) PIN7 (LIN)
LIN2 (CN14 connector) PIN9 (VBAT = 12 V)	LIN2 (CN14 connector) PIN9 (VBAT = 12 V)
Master clock source: Crystal 8 MHz	Slave clock source: HSI 8 MHz

Figure 1. Hardware connections between Master and Slave evaluation boards for demo
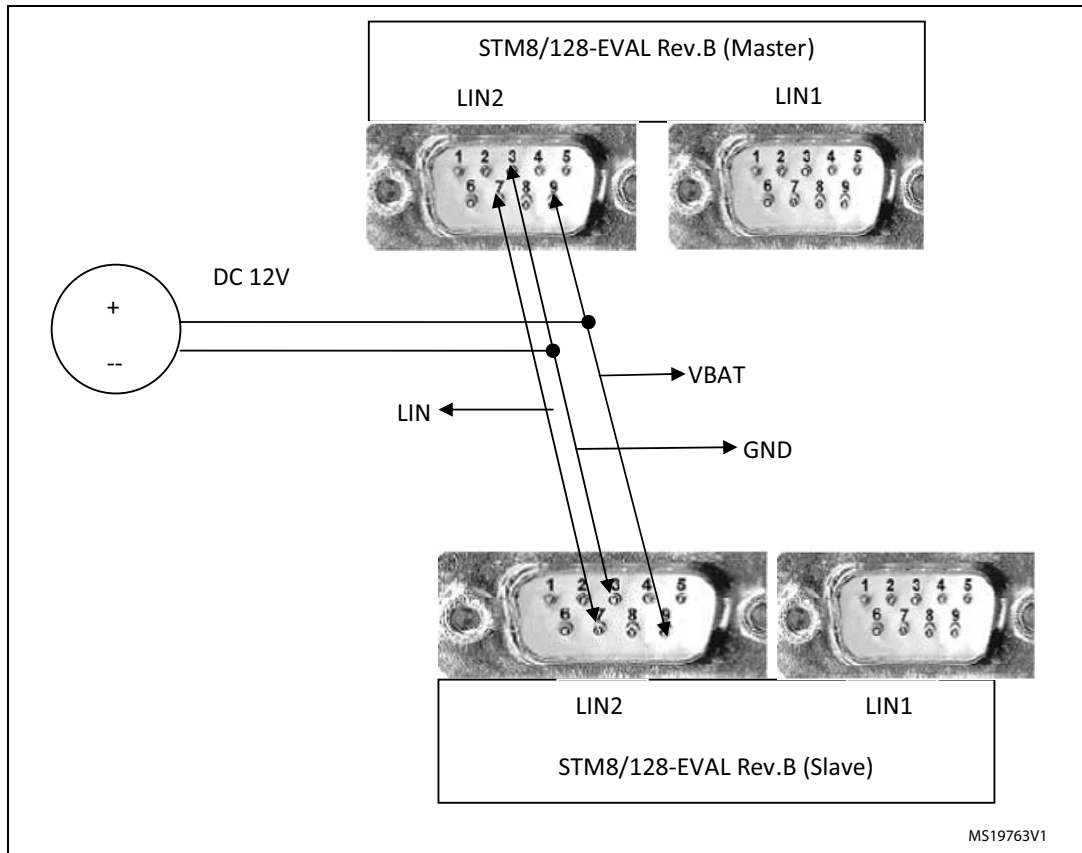
For more information on STM8 microcontrollers, refer to the related documentation (datasheets, reference manuals, application notes, and user manuals) available from http://www.st.com/mcu.

src folder

The **src** folder contains the source code.

Lingen folder

The **Lingen** folder contains the software allowing to generate the network configuration files.

Make

The **make** folder contains the MAKE_LIN file.

doc folder

The **doc** folder contains the package documentation.

uninst

The **uninst** folder contains the setup file.

2.2 Difference between release 4.1 and previous release

The changes in release 4.1 are due to bug fixing, as explained in *Section 3: Description of STM8 LIN fixes*.

3 Description of STM8 LIN fixes

3.1 LIN driver fixes

Following are the bug fixes done in the driver of STM8 LIN Package 4.1.

Table 4. LIN driver bugs

CR. ID	Summary	Description	Release 4.1
BUGZILLA_1142	Read By Id response wrong	*Section 3.1.1*	Fixed
BUGZILLA_1143	The slave node is not able to ignore any interleaved functional addressed transmission from the master node when a Physical RX is ongoing.	*Section 3.1.2*	Fixed
BUGZILLA_1144	The IUT answers to all the Assign Frame ID Range requests with Positive Response.	*Section 3.1.3*	Fixed
BUGZILLA_1164	LIN Conformance Test Case 13.4.2: "Receiving segmented request with functional request between request parts" fails.	*Section 3.1.4*	Fixed
BUGZILLA_1165	LIN conformance Test Case 13.8.2: "Sending segmented response with functional request between response parts" fails.	*Section 3.1.5*	Fixed
BUGZILLA_1166	LBDF flag issue (Master mode)	*Section 3.1.6*	Fixed

3.1.1 BUGZILLA_1142

Description

When the master sends the following request frame:

05 06 B2 20 1E 00 02 00 (read by Id with Identifier = 32),

the slave driver responds with the following frame:

05 05 F2 .. .. (positive response to the Read By Id service).

However, the correct response should be:

05 06 F2 .. .. (positive response to the Read By Id service).

The bug is in the PCI of the response that must not be fixed to 0x05, but in the range [0x02..0x06], as specified in LIN 2.1 errata sheet (LIN_2.1_specification_errata_sheet_rev1.1.pdf), Section 2, page 5.

Modified file and function

File lin_diag_slave.c

Function ld_readById()

3.1.2 BUGZILLA_1143

Description

The slave node does not answer to the slave when a functional request is transmitted by the master in between a master request (0x3C) and the slave response header (0x3D). This happens due to the fact that the new master request resets the previous pending response flag.

The slave IUT should answer to a slave response header (0x3D) and in fact the slave IUT should ignore the functional request but not discard the pending response.

Modified file and function

File lin_diag_slave.c

Function ld_requestReceived()

3.1.3 BUGZILLA_1144

Description

The slave node should not answer with a Positive Response to the master request frame carrying the Assign frame Id range command when the frame Index is not supported or when the assignment is not successful. But the slave node does answer with Positive Response to all sent Assign Frame Id range commands.

Modified file and function

File lin_slave.c

Function l_changePIDs()

3.1.4 BUGZILLA_1164

Description

LIN conformance Test Case 13.4.2: "Receiving segmented request with functional request between request parts" fails. The purpose of this test is to check whether a master request is completely received or not (segmented request) and to verify that, when a functional request is received in between, it is ignored by the slave. But the slave node stops responding to the master request after receiving the functional request.

Modified file and function

File lin_diag.c

Function ld_diag3CookedRxHandler()

3.1.5 BUGZILLA_1165

Description

LIN conformance Test Case 13.8.2: "Sending segmented response with functional request between response parts" fails. The purpose of this test is to verify if slave response is pending (segmented response) and a functional request is received in between from the master side, it should be ignored by the slave node. But the slave node stops responding to the master request after receiving the functional request.

Modified file and function

File lin_diag.c

Function ld_diag3CookedRxHandler()

3.1.6 BUGZILLA_1166

Description

When the LIN bus is shorted to ground, LIN communication failure happens and mcu resets continuously. The cause of the problem is as follows:

When the LIN bus is shorted to ground when it is idle, a LIN_RX interrupt is generated on a received character event (0x00 character with a framing error). At this step, no particular action is done in the software. Then, when the software has to start a header transmission, the l_sendBreak function clears CR2_RIEN and sets CR4_LBDIEN in order to be able to receive back the transmitted break and delimiter. Then, the l_sendBreak function triggers the break transmission. At this step, if the LIN bus is still shorted to ground, the LBDF flag event does not occur because it is waiting for the break delimiter. As soon as the short to ground disappears (the LIN bus is released to idle), the LBDF flag is set and an interrupt is generated.

The issue starts then: in such a case, the FE flag is not set (because it has already been set and reset in previous interrupt routine and then no other character has been received), and thus the code clearing the flag is not executed. This leads to entering continuously in interrupt routine and the LIN communication never restarts.

Modified file and function

File lin_stm8.c

Function l_ifc_rx_SCI1

4   LIN 2.x conformance tests

Conformance tests were performed on the STM8A microcontroller using the STM8/128-EVAL evaluation board revision B. Two sets of tests were executed:

- LIN 2.1 slave and master conformance tests

    The objective of these tests is to check that the new release of the package is compliant with *LIN specification package revision 2.1 of LIN consortium*. The tests were done both on master and slave nodes.

    The LIN 2.1 slave conformance tests are based on *LIN conformance test specification for LIN specification package revision 2.1*, while the LIN 2.1 master conformance tests are based on *LIN conformance test specification for LIN specification package revision 2.0*. All the tests were performed using CANOE software suite v7.2.

    They have been performed using the CANOE software v7.2.

- LIN 2.0 master and slave conformance tests

    The objective of these tests is to check that the new release of the package is compliant with LIN specification package revision 2.0 of LIN consortium. The tests were done both on master and slave nodes.

    The LIN 2.0 slave conformance tests are based on *LIN conformance test specification for the LIN specification package revision 2.0*. They were performed using CANOE software suite v6.0.63 (SP3).

Table 5 shows the configurations for which LIN2.0 conformance tests have been done for the master node:

Table 5. Configurations for master node conformance tests

Master node					
Test No	Clock frequency	Clock source	LINUART/UART2 or UART1, USART/UART1	SCIx	Baud rate
1	8 MHz and 16 MHz	External clock (quartz)	LINUART/UART2 or UART3	SCI1	2400
2	"	"	"	"	9600
3	"	"	"	"	10417
4	"	"	"	"	19200
5	"	"	"	"	20000
6	"	"	USART/UART1	SCI2	2400
7	"	"	"	"	9600
8	"	"	"	"	10417
9	"	"	"	"	19200
10	"	"	"	"	20000

Table 6 shows the configurations for which LIN2.0 and LIN 2.1 conformance tests have been done for the slave node.

Table 6. Configurations for slave node conformance test

			Slave node		
Test No	Clock frequency	Clock source	LINUART/UART2 or UART3	SCIx	Baud rate
1	16 MHz	Internal RC oscillator	LINUART/UART2 or UART3 (with Autosync enabled)	SCI1	2400
2	"	"	"	"	9600
3	"	"	"	"	10417
4	"	"	"	"	19200
5	"	"	"	"	20000

For additional information on the test results, refer to Technical Note TN0322 *Results of the conformance tests performed on the STM8 LIN software package release 4.1*.

5 Known limitations

The STM8 LIN package release 4.1 has one known limitation:

- Master and slave node transmission handler not completely tested.

  The two state machines described in sections 5.4.4 and 5.5 of LIN specification package revision 2.1 of LIN consortium were implemented but not tested. These state machines are used since a node can receive or transmit both normal or diagnostic frames, and it must know at any time if, how, and to which requests it must respond, and which requests/data has to be sent. A new API (l_ifcStatusTPWord()) has been introduced to manage these state machines.

6 Deliverables

Table 7 shows the files that are installed by running the setup. The version corresponds to the revision number of the file stored under the configuration management system.

The items in dark grey have been updated in release 4.1, and their revision number changed, while those in white were not.

Table 7. Deliverables

Family	File Name	Version
Documents	ReadMe.txt	4.1
Source	\demo\generic\lin_basic_demo\slave\src\lin_basic_demo_slave.c	4.1
Source	\demo\generic\lin_basic_demo\slave\src\lin_basic_demo_slave.h	1.0
Source	\demo\generic\lin_basic_demo\master\src\lin_basic_demo_master.c	4.0
Source	\demo\generic\lin_basic_demo\master\src\lin_basic_demo_master.h	1.0
Prompt Dos	'demo/stm8/lin_basic_demo/master/Command Prompt.lnk'	4.1
Make file	'demo/stm8/lin_basic_demo/master/make.exe'	1.0
Make file	'demo/stm8/lin_basic_demo/master/makefile'	4.1
Batch file	'demo/stm8/lin_basic_demo/master/rm.bat'	1.0
Locator file	'demo/stm8/lin_basic_demo/master/cfg/lin_master_app.lkf'	2.0
Source	'demo/stm8/lin_basic_demo/master/lin_config/ lin_basic_demo.ldf'	2.0
Source	'demo/stm8/lin_basic_demo/master/lin_config/lin_basic_demo.lgn'	1.0
Source	'demo/stm8/lin_basic_demo/master/lin_config/lin_def.c'	2.0
Source	'demo/stm8/lin_basic_demo/master/lin_config/lin_def.h'	4.0
Source	'demo/stm8/lin_basic_demo/master/lin_config/lin_def_stm8.h'	2.0
CXSTM8 Library	'demo/stm8/lin_basic_demo/master/obj/crtsi.sm8'	2.0
CXSTM8 Library	'demo/stm8/lin_basic_demo/master/obj/libisl.sm8'	2.0
CXSTM8 Library	'demo/stm8/lin_basic_demo/master/obj/libm.sm8'	2.0
Source	'demo/stm8/lin_basic_demo/master/src/interrupt_vector.c'	2.0
Source	'demo/stm8/lin_basic_demo/master/src/lin_master_app.c'	3.0
Source	'demo/stm8/lin_basic_demo/master/src/lin_test_hardware.h'	4.0
Prompt Dos	'demo/stm8/lin_basic_demo/slave/Command Prompt.lnk'	4.1
Make file	'demo/stm8/lin_basic_demo/slave/make.exe'	1.0
Make file	'demo/stm8/lin_basic_demo/slave/makefile'	4.1
Batch file	'demo/stm8/lin_basic_demo/slave/rm.bat'	1.0
Locator file	'demo/stm8/lin_basic_demo/slave/cfg/lin_slave_app.lkf'	2.0
Source	'demo/stm8/lin_basic_demo/slave/lin_config/lin_basic_demo.ldf'	2.0

Table 7. Deliverables (continued)

Family	File Name	Version
Source	'demo/stm8/lin_basic_demo/slave/lin_config/lin_basic_demo.lgn'	1.0
Source	'demo/stm8/lin_basic_demo/slave/lin_config/lin_def.c'	2.0
Source	'demo/stm8/lin_basic_demo/slave/lin_config/lin_def.h'	4.0
Source	'demo /stm8/lin_basic_demo/slave/lin_config/lin_def_stm8.h'	2.0
CXSTM8 Library	'demo/stm8/lin_basic_demo/slave/obj/crtsi.sm8'	2.0
CXSTM8 Library	'demo/stm8/lin_basic_demo/slave/obj/libisl.sm8'	2.0
CXSTM8 Library	'demo/stm8/lin_basic_demo/slave/obj/libm.sm8'	2.0
Source	'demo/stm8/lin_basic_demo/slave/src/interrupt_vector.c'	2.0
Source	'demo/stm8/lin_basic_demo/slave/src/lin_slave_app.c'	3.0
Source	'demo/stm8/lin_basic_demo/slave/src/lin_test_hardware.h'	3.0
Documents	\doc\reports\Software Release Note for STM8 LIN Package.pdf	2.0
Documents	\doc\reports\Software Test Report for STM8 LIN Package.pdf	2.0
Documents	\doc\user guide\LIN 2.1 - Master user guide.pdf	2.0
Documents	\doc\user guide\LIN 2.1 - Slave user guide.pdf	2.0
Executable	\lingen\BIN\win\lingen.exe	3.5.0
Make file	'make/stm8/Make_LIN'	3.0
Make file	\make\MAKE_LIN_DEPENDENCIES	2.0
Source	\src\lin.h	3.0
Source	\src\lin_version_control.h	4.1
Source	\src\arch\lin_arch_include.h	2.0
Source	\src\arch\lin_def_arch_include.h	2.0
Source	'src\arch\stm8\lin_def_stm8_gen.h'	2.0
Source	'src\arch\stm8\lin_stm8.c'	2.0
Source	'src\arch\stm8\lin_stm8.h'	2.0
Source	\src\config\lin_def_stm8.h	2.0
Source	\src\config\lin_def.h	4.0
Source	\src\config\lin_def.c	3.0
Source	\src\diag\lin_diag.c	4.0
Source	\src\diag\lin_diag.h	3.0
Source	\src\diag\lin_diag_api.h	2.0
Source	\src\diag\lin_diag_master.c	3.0
Source	\src\diag\lin_diag_master.h	1.0
Source	\src\diag\lin_diag_slave.c	4.1

Table 7. Deliverables (continued)

Family	File Name	Version
Source	\src\diag\lin_diag_slave.h	2.0
Source	\src\general\lin_def_gen.h	2.0
Source	\src\general\lin_general.c	3.0
Source	\src\general\lin_general.h	3.0
Source	\src\general\lin_types.h	2.0
Source	\src\master\lin_master.c	2.0
Source	\src\master\lin_master.h	1.0
Source	\src\slave\lin_slave.c	4.0
Source	\src\slave\lin_slave.h	1.0
Source	\src\timer\lin_timer.c	2.0
Source	\src\timer\lin_timer.h	2.0
Source	\src\arch\stm8\lin_stm8.c	3.0

7 Revision history

Table 8. Document revision history

Date	Revision	Changes
16-June-2010	1	Initial release.
16-Aug-2011	2	Updated document with release 4.1 data.
27-May-2014	3	Added STSW-STM8A-LIN.

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