Baby-LIN
Jumbo frames V1.0

1   Introduction

The LIN specification defines a maximum number of 8 data bytes. Certain applications require or benefit from the usage of frames with more data bytes. Therefor all current[*] Baby-LIN products can be enabled to process LIN-Bus frames with more than 8 data bytes. These frames will be referred to as jumbo frames.

> **Advice**
>
> The jumbo frame support needs to be activated with a special voucher code.
>
> Please ask for the optional voucher code "Option-BL-HARP-Jumbo Frames" (Item number: 8000831).

(*)   The following products support jumbo frames: Baby-LIN-II, Baby-LIN-RC-II, Baby-LIN-RM-II, Baby-LIN-MB-II, HARP-4, HARP-5

2   Jumbo frames via inject commands

Jumbo frames are LIN-Bus frames with more than 8 data bytes. The maximum number of data bytes supported by any Baby-LIN product is 1024 Bytes.

Jumbo frames can be sent by any Baby-LIN product as master by using so called inject commands. They allow the user to freely assemble a custom frame and send it on the LIN-Bus. Inject frames can even be sent without being defined in a schedule. The inject frame will be sent at the next possible moment in time, which usually is at the end of the slot time of the current scheduled frame.

> **Attention**
>
> Some LIN-Bus nodes may have problems if a schedule table is interrupted and an inject frame is inserted. All Baby-LIN products have the ability to run a schedule table just once instead of in a loop. Therefor it is possible to finish a schedule table before injecting a frame.

Jumbo frames can be injected in custom applications using the Baby-LIN-Dll. It is also possible to inject jumbo frames using the Simple Menu for testing purposes.

> **Attention**
>
> Right now it is not possible to use jumbo frames in SDFs and therfore they can not be used in stand-alone applications.

Using inject commands custom frames can be assembled. To send a jumbo frame the following informations are required:
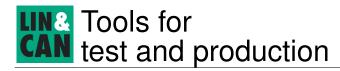
- The checksum type (Classic, extended, undefined)
- The frame ID
- The data bytes itself
- The slot time for the inject frame

To receive a jumbo frame the following informations are required:

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- The frame ID
- The number of the data bytes
- The slot time for the inject frame

Up to 8 inject commands can be issued to be send or received consecutive.

3   Testing jumbo frames using the Simple Menu

The most simple way to test the sending or receiving of a jumbo frame is by using the Simple Menu and the so called monitor mode. The monitor mode lets the Baby-LIN product simulate a master on the LIN-Bus without the need for a SDF. In this mode the schedule table has to be created manually by injecting frames.

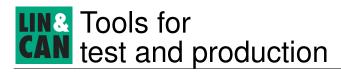Please follow these steps to send or receive a jumbo frame:

- Prepare the device and PC:
  - Connect the Baby-LIN product to a PC.
  - Start the Simple menu and connect to the Baby-LIN product.
- Optional: Activate or check the jumbo frame option:
  - Right click on the Baby-LIN product in the device list.
  - Select "Activation codes".
  - Enter an activation code to enable the jumbo frame support or check that "Jumbo-Frame Support: enabled" is listed.
- Enable the monitor mode as master:
  - Select the LIN channel window/tab.
  - Open the channel shell by choosing "Channelshell ..." from the "Window" menu.
  - Enter `mon_init 20000 1` in the command prompt (20000 is the baud rate and the 1 signals that the Baby-LIN product is the master).
- Open the frame monitor. Here you can see all frames on the LIN-Bus.
  - Open the frame monitor by choosing "Frame monitor..." from the "Window" menu.
- Inject a jumbo frame:
  - Enter `inject 1 0x15 [ 0x0 0x1 0x2 0x3 0x4 0x5 0x6 0x7 0x8 0x9 0xA 0xB 0xC 0xD 0xE 0xF ] 0 0` to inject a jumbo frame with the following properties:
    - Checksum: `1` (Classic checksum)
    - Frame ID: `0x15` (Decimal 21)
    - 16 data bytes: `[ 0x0 0x1 0x2 0x3 0x4 0x5 0x6 0x7 0x8 0x9 0xA 0xB 0xC 0xD 0xE 0xF ]`
    - Slot time in [ms]: `0` (0: Automatic slot time. ≠0: The next frame will start immediately when this time is over.)
    - No more inject frames issued to wait for: `0`
- Inject a jumbo frame request:
  - Enter `inject 4 0x15 16 [ ] 0 0` to inject a jumbo frame request with the following properties:
    - Request a frame from a slave: `4`
    - Frame ID: `0x15` (Decimal 21)
    - Expected data bytes: `16`

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- Slot time in [ms]: `0` (0: Automatic slot time. ≠0: The next frame will start immediately when this time is over.)
- No more inject frames issued to wait for: `0`

- Check the frame monitor for the jumbo frames on the LIN-Bus:

Timestamp	FrameId	FrameData	Checksum	State
+377364	0x05 [0x85]	0x00 0x01 0x02 0x03 0x04 0x05 0x06 0x07 0x08 0x09 0x0a 0x0b 0x0c 0x0d 0x0e 0x0f	0x87	Other (injected)

4   Custom application using the Baby-LIN-Dll

A custom application is the best way to use jumbo frames since you are able to programmatically load and process the high amount of data. The communication between the Baby-LIN product and the custom application is handled by the Baby-LIN-Dll.

Advice

The Baby-LIN-Dll can be used from custom applications written in C/C++. Wrapper for the .NET framework as well as LabView are available.

There are two possible modes that can be used to inject frames:

Mode	Description
SDF based mode	In this mode a SDF is loaded. The SDF contains the information from the LDF including the schedule tables. Schedules can be executed once or in a loop. The jumbo frames can be injected while a schedule is running.
Monitor mode as master	In this mode no SDF is required. The schedule has to be created manually by injecting frames.

In both cases the following table lists the functions a customer application would usually start with:

Baby-LIN-Dll function	Description
`BLC_getVersionString()`	This function returns the version of the Baby-LIN-DLL. The version should always be mentioned when asking for support.
`BLC_getBabyLinPorts()`	This function returns information about the Baby-LIN products connected to the PC.
`BLC_open()`	This function starts the connection with the Baby-LIN product.

`BLC_getChannelCount()`
`BLC_getChannelHandle()`
`BLC_getChannelInfo()`
	These function give you information about the channels that are usable from your Baby-LIN product.

`BLC_registerJumbo FrameCallback()`	This function registers a callback to receive jumbo frames.

If you want to use a SDF the following functions need to be called:

Baby-LIN-Dll function	Description
`BLC_loadSDF()`	This function loads a SDF into the DLL and down to the Baby-LIN product.

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Baby-LIN-DII function	Description
`BLC_sendCommand( "disframe 0xC0000000 1;")`	This command subscribes to frame reports for certain frame IDs (`0xC0000000` for all IDs).
`BLC_sendCommand( "start;")`	This command starts the LIN-Bus and the first schedule.

If you do not want to use a SDF but the monitor mode the following functions need to be called:

Baby-LIN-DII function	Description
`BLC_sendCommand( "mon_init 20000 1;")`	This function starts the monitor mode as master.
`BLC_sendCommand( "mon_on 0xC0000000 1;")`	This command subscribes to frame reports for certain frame IDs (`0xC0000000` for all IDs).

Now you can inject jumbo frames or jumbo frame requests:

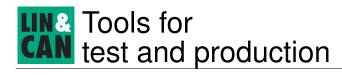| Baby-LIN-DII function	Description

`BLC_sendCommand( "inject 1 0x15 [ 0x0 0x1 0x2 0x3 0x4 0x5 0x6 0x7 0x8 0x9 0xA 0xB 0xC 0xD 0xE 0xF ] 0 0;")`	This command injects a jumbo frame with the following properties:
	• Classic checksum: `1`
	• Frame ID: `0x15` (21)
	• 16 data bytes:
	`[ 0x0 0x1 0x2 0x3 0x4 0x5 0x6 0x7`
	`0x8 0x9 0xA 0xB 0xC 0xD 0xE 0xF ]`
	• Slot time in [ms]: `0` (0: Automatic slot time. ≠0: The next frame will start immediately when this time is over.)
	• No more inject frames issued to wait for: `0`

`BLC_sendCommand( "inject 4 0x15 16 [ ] 0 0;");`	This command injects a jumbo frame request with the following properties: • Request a frame from a slave: `4` • Frame ID: `0x15` (21) • Expected data bytes: `16` • Slot time in [ms]: `0` (0: Automatic slot time. ≠0: The next frame will start immediately when this time is over.) • No more inject frames issued to wait for: `0`

5 Support information

In case of any questions you can get technical support by email or phone. We can use TeamViewer to give you direct support and help on your own PC. This way we are able to sort out problems fast and direct. We have sample code and application notes available, which will help you making your job.

Lipowsky Industrie-Elektronik GmbH realized many successful LIN and CAN related projects and therefor we can draw upon many years of experience in these fields. We also provide turn key solutions for specific applications like EOL (End of Line) testers or programming stations.

Lipowsky Industrie-Elektronik GmbH designs, produces and applies the Baby-LIN products, so you can always expect qualified and fast support.

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