AN1204

Configuration of CANopen devices via LSS

This application note explains the procedure for changing node-ID (address) and bittiming parameters (bit rate) of CANopen devices via LSS (Layer Setting Service).

Contents

1 Introduction

By means of CANopen Layer Setting Services (LSS) the node-ID and bit-timing parameters (bit rate) of a CANopen device can be modified via the CAN-bus /2/. For that purpose, two identifier values are reserved for the LSS service:

- $7E4_h = 2020_d$ - Response from LSS slave (CANopen slave device)
- $7E5_h = 2021_d$ - Request from LSS master (configuration tool)

Both messages are always send with a DLC value of 8.

1.1 Example configuration

The examples in this application note explain the modification of Node-ID and bit rate of a CANopen slave device with the following default values:

- node-ID: $127_d = 7F_h$
- bit rate: 500 kBit/s

These values represent the factory settings for all MicroControl CANopen devices.

The device settings shall be changed to these new values:

- node-ID: $05_d = 05_h$
- bit rate: 125 kBit/s

2   Point-to-point configuration

For a point-to-point configuration (i.e. only a configuration tool and one CANopen slave device connected with each other) it is sufficient to use the „LSS switch mode global" command for selection of the configuration mode.

The „LSS switch mode global" command is used to switch between the LSS states „waiting" and „configuration" /2/. There is no response from the LSS slave device upon this command.

2.1   Configuration of node-ID

The following trace shows the configuration to the required node-ID value of 05_h (line 3 in the trace).

```
No   DIR  ID (hex)  DLC  Data (hex)                  Comment
---  ---  --------  ---  -- -- -- -- -- -- -- --     -----------------------
  1  Tx        000   2   80 7F                       Preop. node-ID 127
  2  Tx        7E5   8   04 01 00 00 00 00 00 00     configuration state
  3  Tx        7E5   8   11 05 00 00 00 00 00 00     set node-ID 5
  4  Rx        7E4   8   11 00 00 00 00 00 00 00     response: OK
  5  Tx        7E5   8   17 00 00 00 00 00 00 00     store configuration
  6  Rx        7E4   8   17 00 00 00 00 00 00 00     response: OK
  7  Tx        7E5   8   04 00 00 00 00 00 00 00     waiting state
  8  Tx        000   2   81 7F                       reset node-ID 127
  9  Rx        705   1   00                          boot-up message
```

Trace 1: node-ID setup

Please note that the new node-ID value is valid after a reset of the device. This can be a NMT reset command (line 8 in the trace) or a power off-on cycle.

2.2   Configuration of bit rate

The following trace shows the configuration to the required bit rate value of 125 kBit/s. Please note that the device already has the node-ID value of 05_h.

```
No   DIR  ID (hex)  DLC  Data (hex)                Comment
---  ---  --------  ---  -- -- -- -- -- -- -- --   ----------------------
  1  Tx        000   2   80 05                     Preop. node-ID 5
  2  Tx        7E5   8   04 01 00 00 00 00 00 00   configuration state
  3  Tx        7E5   8   13 00 04 00 00 00 00 00   set bit rate 125 kBit
  4  Rx        7E4   8   13 00 00 00 00 00 00 00   response: OK
  5  Tx        7E5   8   17 00 00 00 00 00 00 00   store configuration
  6  Rx        7E4   8   17 00 00 00 00 00 00 00   response: OK
  7  Tx        7E5   8   04 00 00 00 00 00 00 00   waiting state
```

Trace 2: bit rate setup

The new bit rate is valid after a reset of the device. It is highly recommended to power off the CANopen slave device first and change the bit rate of the configuration tool to the desired value (125 kBit/s in this example). Performing a NMT reset node command will lead to error frames on the CAN bus, because the configuration tool still has the bit rate of 500 kBit/s.

Values for possible bit rates are listed in /2/:

Value	Bitrate
0	1 MBit/s
1	800 kBit/s
2	500 kBit/s
3	250 kBit/s
4	125 kBit/s
5	reserved
6	50 kBit/s
7	20 kBit/s
8	10 kBit/s
9	Automatic bit rate detection

3 Network configuration

For a network configuration (i.e. a configuration tool and more than one CANopen slave device connected with each other) it is required to use the „LSS switch mode selective" command for selection of the configuration mode.

The „LSS switch mode selective" command is used to switch only one of the CANopen devices from the LSS state „waiting" into the LSS state „configuration" /2/. There is a response from the LSS slave device upon this command. The „LSS switch mode selective" command requires the LSS address of the device, i.e. the values of the identity object (1018_h).

In this example the device has the following LSS address:

- Vendor-ID (1018_h, sub-index 1): 0000 000E$_h$
- Product code (1018_h, sub-index 2): 0014 4B51$_h$
- Software version (1018_h, sub-index 3): 0302 0200$_h$
- Serial number (1018_h, sub-index 4): 0102 0304$_h$

```
No   DIR  ID (hex)  DLC  Data (hex)                 Comment
---  ---  --------  ---  -- -- -- -- -- -- -- --     ----------------------
  1  Tx        000   2   80 7F                       Preop. node-ID 127
  2  Tx        7E5   8   40 0E 00 00 00 00 00 00     vendor ID
  3  Tx        7E5   8   41 51 4B 14 00 00 00 00     product code
  4  Tx        7E5   8   42 00 02 02 03 00 00 00     software version
  5  Tx        7E5   8   43 04 03 02 01 00 00 00     serial number
  6  Rx        7E4   8   44 00 00 00 00 00 00 00     response: OK
```

Trace 3: Using the „LSS switch mode selective"

3.1 Configuration of node-ID

The following trace shows the configuration to the required node-ID value of 05_h after the device has been set into configuration state (trace 3).

```
No   DIR  ID (hex)  DLC  Data (hex)                 Comment
---  ---  --------  ---  -- -- -- -- -- -- -- --     ----------------------
  1  Tx        7E5   8   11 05 00 00 00 00 00 00     set node-ID 5
  2  Rx        7E4   8   11 00 00 00 00 00 00 00     response: OK
  3  Tx        7E5   8   17 00 00 00 00 00 00 00     store configuration
  4  Rx        7E4   8   17 00 00 00 00 00 00 00     response: OK
  5  Tx        7E5   8   04 00 00 00 00 00 00 00     waiting state
  6  Tx        000   2   81 7F                       reset node-ID 127
  7  Rx        705   1   00                          boot-up message
```

Trace 4: node-ID setup

Please note that the new node-ID value is valid after a reset of the device. This can be a NMT reset command (line 6 in the trace) or a power off-on cycle.

3.2   Configuration of bit rate

The following trace shows the configuration to the required bit rate value of 125 kBit/s after the device has been set into configuration state (trace 3).

```
No    DIR  ID (hex)  DLC  Data (hex)               Comment
---   ---  --------  ---  -- -- -- -- -- -- -- --  ----------------------
  1   Tx        7E5   8   13 00 04 00 00 00 00 00  set bit rate 125 kBit
  2   Rx        7E4   8   13 00 00 00 00 00 00 00  response: OK
  3   Tx        7E5   8   17 00 00 00 00 00 00 00  store configuration
  4   Rx        7E4   8   17 00 00 00 00 00 00 00  response: OK
  5   Tx        7E5   8   04 00 00 00 00 00 00 00  waiting state
```

Trace 5: bit rate setup

The new bit rate is valid after a reset of the device.

It is highly recommended to check proper configuration of all CANopen devices in a network to the same bit rate. Unequal bit rate settings will cause error frames and bring devices into bus off state.

4 References

/1/ CiA 301, CANopen Application Layer and Communication Profile, Version 4.2, CAN in Automation (CiA) e.V.,
http://www.can-cia.org

/2/ CiA 305, CANopen Layer setting services and protocols, Version 2.2, CAN in Automation (CiA) e.V.,
http://www.can-cia.org

5 Revision history

Revision	Date	Description
01	12.05.2009	Initial version

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