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NCV7748 LIN Communication Basic Command Protocol Conformance



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The NCV7748 device uses a standard LIN protocol communication link as a slave device in automotive systems.

The NCV7748 conforms to SAE J2602 Protocol and LIN 2.x Physical Layer (PL). This application note addresses some of the detailed aspects of LIN communication to the device for proper operation of the NCV7748.

Figure 1 below highlights the basic communication frame for LIN communication as per LIN specification 2.x. The master sends out commands to slave devices. Each frame consists of five fields. These are the Break Field, Sync Field, Protected Identifier Field (PID), Data Fields, and Checksum.

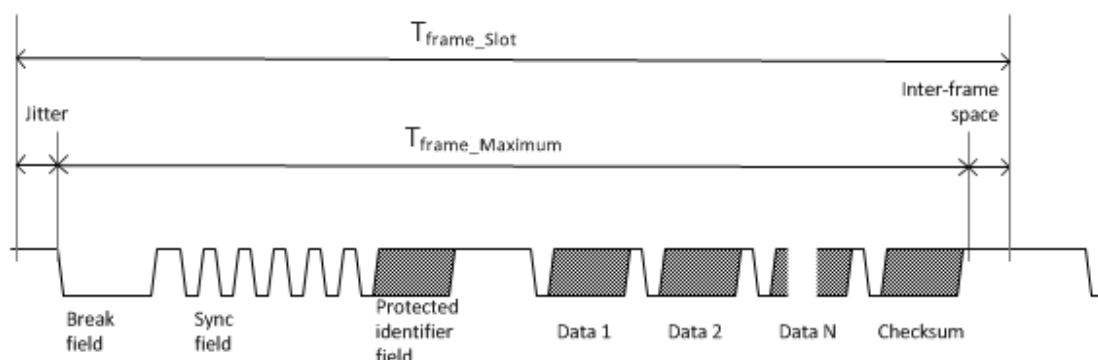


Figure 1. LIN Communication Frame Slot

Break Field

The break field signals the beginning of a new frame.

To ensure Slave tasks can distinguish between a valid Synch Break and the maximum possible allowed sequence of dominant bits within a data frame, the number of bit-time must be ≥ 13 . The standard used in the industry today is 13-bit times. The NCV7748 conforms to this requirement. The NCV7748 can use between 13 and 17 bit times. A corrupt frame sent which is > 17 bits for the break field and the sync field is not \$55 will report a parity error in the NCV7748. The acceptable response per the standard specification is either no error or data error.

The break field (Figure 2) includes a break delimiter at the end of the field signaling the end of the break event.

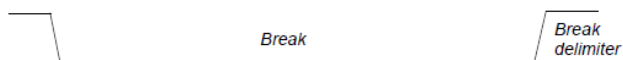


Figure 2. Break Field

ERR2	ERR1	ERR0	Error States	Priority
0	0	0	No Error	0 (lowest)
0	0	1	Reset	1
0	1	0	Reserved	2
0	1	1	Reserved	3
1	0	0	Data Error	4
1	0	1	Data Checksum	5
1	1	0	Byte Field Framing Error	6
1	1	1	ID Parity Error	7 (highest)

Figure 3. Error Fields as Reported with a Get Status or Get Node ID Command

Sync Field

The Sync Field is used by the NCV7748 to synchronize its internal oscillator for proper frequency communication back to the master device from the slave. Communication back to the master is comprised of a signal at the synchronized frequency. Following the Break Field is the Sync field. Succeeding the high from the break delimiter of the Break field is the Start bit of the Sync Field. This sync field consists of the start bit and pulses which contains a signal made up of data value hex 0x55 (0101 0101). The Sync Field ends with a Stop bit.



Figure 4. Sync Field

Protected Identifier & Data

Each LIN command sent to the NCV7748 consists of a PID (protected identifier) and 8 function specific bytes labeled as DATA1–DATA8 in the NCV7748/D datasheet. These two portions are the specifics of what the device is instructed to do. The remaining pieces (break, sync, and checksum) are included only for the purposes of getting the instructions in and out of the IC.


Checksum

Checksums are used to verify data integrity. Two types of checksum are used in the communication with the NCV7748 and they occur after the Data Bytes at the end of the command frame.

1. Classic checksum – Calculation with data bytes (inverted 8 bit sum with carry over all data bytes)
 - Read by Identifier (3C) and response (3D)
 - Broadcast Reset
 - Targeted Reset (3C) and response (3D)
 - Go to sleep
2. Enhanced checksum – Calculation with data bytes and the protected identifier.
 - Output Control
 - Get Status
 - Get Node ID

Table 1. NCV7748 SUPPORT LIN COMMANDS

Output Control	Output driver on/off control.
Get Node ID	Reads identity of prime device.
Get Status	Reads diagnostics of one low-side driver.
Targeted Reset Master Request	Re-initialization of one node.
Targeted Reset Slave Response	Positive response of prime device.
Read by Identifier Master Request	Reads device supplier identity.
Read by identifier Slave Response	Successful processed request.
	Unsuccessful processed request.
Broadcast Reset	Re-initialization of all nodes.
Go to Sleep	Device enters Sleep Mode.

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