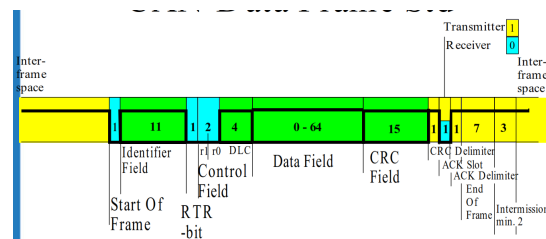


1 CAN questions

1. Describe a CAN message

A CAN message has several fields. First a 11 or 29 bit *identifier field*. Arbitration and prioritization is done here. Then comes the *Control Field*, containing the *Data Length Code*. This determines how long the message is going to be, 0-8. The *Data Field* comes after that, followed by the *CRC* field containing a checksum for the message. Lastly, the *Acknowledgement Field* is set to 1 by the transmitter and is set to 0 by any receiver.



2. What is NRZ? How does it work?

Non Return to Zero means that the signal does not return to a zero between every bit. This means less switching than for example Manchester coding but it is not self clocking.

3. What is bit stuffing? Worst case?

To make sure the signal is synchronized with the clock, after five consecutive bits in a signal, a bit of opposite polarity is sent. This carries no information and is "destuffed" at the receiver. In the worst case scenario, there are five of the same bits sent followed by alternating between four of every bit after that. Bit stuffing then forces all bit clusters to be five of length. This would cause a 29 bit message to be 36 bits long, giving NRZ with bit stuffing a maximum overhead of 24%.

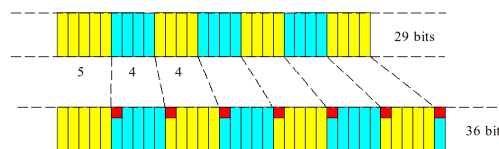


Figure 1: Maximum overhead in bit stuffing

4. How does bit timing work?

Each bit is divided into four parts. These are *Sync*, *Propagation*, *Phase 1* and *Phase 2*. Each part is then built up by time quantas, for a total of 4-25 time quanta per bit. At the sync segment, an edge is expected and the nodes on the bus are then synced after this. During the propagation phase, the physical signal is allowed to settle. The signal is sampled after phase 1. Phase 2 is used to resynchronize the signal if a synchronization error is detected during the sync segment.

5. **What is CRC? What is a parity bit?**

CRC, or *Cyclic Redundancy Checksum*, it checks so that the message received was not corrupted. The parity bit is an error check that counts the number of 1 bits, and returns a 1 or 0 if the number is odd or even.

6. **Why do we need termination resistors? How does cable length affect the maximum bus speed?**

Termination resistors are used in part to prevent high frequency signal reflection but also to connect to *Can₊* rail to the *CAN₋* rail.

7. **If two messages are being sent on the same time on the bus, for example 0101010101 and id 1010101010, which one is received and why?**

The first is received because of 0 being the dominant bit.

8. **Describe the different Frames**

There are four types of frames in CAN. The *Data Frame* is a frame that contains data. On the other hand, there is also the *Remote Frame* that requests data from a specific identity. There are also the *Error Frame* and the *Overload Frame*