

Title: AS8202NF / C2NF – CRC Calculation

Description

To protect messages in a TTP network from undetected corruption, a redundant data value named CRC (cyclic redundancy check) is appended to the transmitted message. A mismatch of the message's CRC at the receiving end will allow a detection of the error so that corrupted data cannot be used by the TTP protocol or the host application. *Polynomial*, chapter 8.3.1 of the TTP High Level Requirements Document (V1.6.4 and earlier versions), defines that "a CRC code with a Hamming Distance of at least 6 shall be used." Note that the Hamming Distance corresponds to the number of bits in the message, which, when arbitrarily corrupted on the physical media, can lead to an undetected reception error.

The following summarizes the features of the implemented polynomial:

- The polynomial implemented in the AS8202NF device's transmitter and receiver blocks (based on the C2NF chip model) and described in its related documents provides a **Hamming Distance of 6 for messages of up to 177 bit reference data** (201 bit total message length). For some shorter message lengths, the Hamming Distance is greater than 6; refer to the attached document "Analysis of a CRC Polynomial".
- The implemented polynomial protects **messages of a length between 178 bit and 2024 bit reference data** (up to 2048 bit total message length) with a **Hamming Distance of 4**.
- The implemented polynomial protects **messages of any length up to 2024 bit reference data** (up to 2048 bit total message length) from a **single burst error with a length of up to 24 bits**.
- The implemented polynomial protects **messages of any length up to 2024 bit reference data** (up to 2048 bit total message length) from **any odd number of bit errors**.
- The probability to detect any error that is not covered by the conditions listed above is at least $1 - 2^{-24}$, which is more than 99.999994 percent, the fault probability is less than $6 \cdot 10^{-8}$.

Detailed CRC Polynomial Description

Please refer to the attached document "Analysis of a CRC Polynomial".

Considerations for the System Designer

If a Hamming Distance of 6 is required, messages of less than 202 bit total message length shall be used in the TTP network.

If a Hamming Distance of 4 is sufficient, the message length can be chosen arbitrarily.

Summary

The AS8202NF device uses CRC for error detection in the TTP messages. The implemented CRC fulfills the requirement "Hamming distance of 6" for messages of up to 201 bit total message length. Beyond this value, a Hamming distance of 4 is assured by the implementation.