

RTCA Special Committee 186, Working Group 3
ADS-B 1090 MOPs, Revision A
Meeting #14

**Review of 4-Pulse
Preamble Detection Testing**

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Summary

Action Item 12-03, assigned to RHS and SR:

Review the four pulse preamble detection tests to assure pulse width and position tolerances are correct and that the test is stated in a way that is independent of sample rate.

Review was completed. Minimum -to- no re-work of test procedure is required, and analysis conclusions provided in the main body of this working paper.

1. Background

Proposed RTCA DO-260A section 2.2.4.3.4.7.2 provides the requirements for Preamble Acceptance.

Proposed RTCA DO-260A section 2.4.4.3.4.7.1, then provides the appropriate test procedures to validate the requirements given in section 2.2.4.3.4.7.2.

2. Review

Review of the test procedures provided in section 2.4.4.3.4.7.1 reveals the following:

- a. Pulse requirements for Input A are provided in Table 2-111 of section 2.4.4.3.4.7.1. This table provides the appropriate 4 preamble pulses having the appropriate rise and fall times specified for the pulses. The table provides that the first and third pulses be at the maximum “Must Accept” pulse width of $0.5 + 0.05$ microseconds. The table provides that the second and fourth pulses be at the minimum “Must Accept” pulse width of $0.5 - 0.05$ microseconds. The table then provides that the second and fourth pulses occur at the minimum allowed spacing deviation for “Must Accept” at -0.125 microseconds. The table provides that the third pulse occurs at the maximum allowed spacing deviation for “Must Accept” at $+0.125$ microseconds.

In short, Table 2-111 provides the baseline “Must Accept” pulse stimulus for the receiver in regards to preamble detection.

Step one of the test procedure then verifies that the receiver properly receives at least 90 percent of the messages sent with the preamble established in accordance with Table 2-111.

- b. Pulse requirements for Input B are provided in Table 2-112 of section 2.4.4.3.4.7.1. This table maintains nominal pulse position spacing of the preamble pulses having nominal rise and fall times. However, this table provides that the preamble pulses all be narrowed by 0.3 microseconds which will result in a “Must Reject” criteria for each of the pulses.

Step 3 of the test procedure then verifies that the receiver accepts no more than 10 percent of the messages sent with the preamble established in accordance with Table 2-112.

- c. Pulse requirements for Input C are provided in Table 2-113 of section 2.4.4.3.4.7.1. This table maintains nominal pulse width, rise time, and fall time, while increasing the pulse position spacing to a “Must Reject” limit of 0.200 microseconds.

Step 5 of the test procedure then verifies that the receiver accepts no more than 10 percent of the messages sent with the preamble established in accordance with Table 2-113.

- d. Pulse requirements for Input D are provided in Table 2-114 of section 2.4.4.3.4.7.1. This table provides a preamble having a single pulse that exceeds a width of 4.5 microseconds.

Step 7 of the test procedures then verifies that the receiver accepts no more than 10 percent of the messages sent with the preamble established in accordance with Table 2-113.

- e. Steps 2, 4, 6, and 8 of the test procedures simply verify that each of the respective preceding test steps are executed at reduced input signal levels of -65 dBm.

3. Conclusion / Summary

Having reviewed the requirements and test procedures discussed above, it is apparent that the test procedures provided in RTCA DO-260A section 2.4.4.3.4.7.1:

- a. Appropriately test and verify the requirements established in RTCA DO-260A section 2.2.4.3.4.7.2,
- b. Appropriately test and verify the pulse width and pulse position tolerances established in RTCA DO-160A section 2.2.4.3.4.7.2,
- c. And provide the appropriate level of requirements (performance) verification in a manner that is independent and mutually exclusive of the receiver sample rate that is ultimately established.