

RTCA Special Committee 209 and EUROCAE WG-49

ATCRBS / Mode S Transponder MOPS Maintenance

Meeting #13

In Joint Teleconference and WebEx Session

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**Receiver Dynamic Range Errors in both RTCA/DO-181D and
EUROCAE ED-73C**

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SUMMARY

This Working Paper brings to light separate errors in both documents with respect to the requirement and test procedures for receiver dynamic range.

Receiver Dynamic Range Errors in both RTCA/DO-181D and EUROCAE ED-73C:

Upon review of the respective requirements and test procedure sections on both RTCA/DO-181D and EUROCAE ED-73C, there were found to be separate errors in both documents.

1. In DO-181D, there is a missing requirement in §2.2.2.4.f for “MTL [+3 dB](#),” but the test procedure in §2.4.2.1 Step 3 correctly specifies the test.
2. In ED-73C, the requirement for MTL +3 dB is correctly specified in §3.2.4.f, but the test procedure in §5.4.1.2.c Step 3 needs to address the “MTL [+3 dB](#).”

RTCA/DO-181D, section §2.2.2.4.a and f provide:

2.2.2.4 Sensitivity and Dynamic Range

- a. The MTL for ATCRBS and ATCRBS/Mode S All-Call interrogations **shall** be -73 dBm ±4 dB.

→ *This is a Sensitivity requirement as it establishes the Minimum Trigger Level (MTL)*

- f. The reply ratio **shall** be at least 90 percent for ATCRBS and ATCRBS/Mode S All-Call interrogations between MTL [+3 dB](#) and -21 dBm.

→ *This is a Dynamic Range requirement as Sensitivity was established in subparagraph “a”.*

→ *As such, subparagraph “f” is in error and should specify “MTL + 3 dB” as indicated by the change.*

RTCA/DO-181D, section §2.3.2.1. provides:

Step 3 ATCRBS and ATCRBS/Mode S All-Call Dynamic Range (§Error! Reference source not found..f)

Interrogate the transponder with a standard Mode A interrogation at RF levels from MTL +3 dB to -21 dBm in approximately 5 equal steps. Determine reply ratio. Repeat for a standard Mode C ATCRBS/Mode S All-Call.

→ *This is a Dynamic Range test provided in the Environmental Test Section and is CORRECT, provided that the suggested change is made to §2.2.2.4.f as detailed above.*

RTCA/DO-181D, section §2.4.2.1 provides:

Step 2 Sensitivity (§Error! Reference source not found. a and e)

Connect the equipment as shown in Figure 2-34. Interrogate the transponder with a standard Mode A interrogation. Determine the minimum RF signal level required to produce 90 percent transponder reply efficiency. Repeat the procedure using a standard Mode A ATCRBS/Mode S All-Call interrogation and a standard Mode C ATCRBS/Mode S All-Call interrogation. Determine MTL for all cases. This is the ATCRBS MTL.

Step 3 ATCRBS and ATCRBS/Mode S All-Call Dynamic Range (§Error! Reference source not found..f)

Repeat Step 2 for RF levels in 5 dB intervals between MTL +3 dB and -21 dBm. Determine reply ratio.

- *This is a Dynamic Range test provided in the Ambient Test Section and is CORRECT, provided that the suggested change is made to §2.2.2.4.f as detailed above.*

EUROCAE ED-73C section §3.2.4.f provides:

f. The reply ratio shall be at least 90% for Mode A/C and Mode A/C/S All-Call interrogations between MTL + 3 dB and -21 dBm.

- *This is a Dynamic Range requirement and is CORRECT. It will be consistent with RTCA/DO-181D section §2.2.2.4.f, provided that the suggested change is made to §2.2.2.4.f as detailed above.*

EUROCAE ED-73C section §5.4.1.2 provides:

b. STEP 2 - Sensitivity (Paragraph 3.2.4 a and e)

Interrogate the transponder with a Mode A interrogation.

Record the minimum RF signal level required to produce 90% transponder reply efficiency.

Repeat the procedure using :

- a Mode C interrogation,
- a Mode A/Mode S All-Call interrogation and
- a Mode C/Mode S All-Call interrogation.

This determines the MTL for these interrogations.

[Under environment conditions, it is sufficient to perform this test using only a Mode C/Mode S All-Call interrogation.]

c. STEP 3 - Mode A/C and Mode A/C/S All-Call Dynamic Range (Paragraph 3.2.4f)

Interrogate the transponder with a Mode A interrogation.

Vary the RF level in 5 approximately equal steps between MTL + 3 dB and -21 dBm.

Record the reply ratio at each step.

Repeat the procedure using :

- a Mode A/Mode S All-Call interrogation and
- a Mode C/Mode S All-Call interrogation.

[Under environmental conditions, it is sufficient to perform the above test using approximately 5 equal steps between MTL + 3 dB and -21 dBm with Mode A interrogations and Mode C/Mode S All-Call interrogations.]

- *This is a Dynamic Range test and is in error as it should specify “MTL + 3 dB” as indicated by the change detailed above.*

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