

RTCA Special Committee 209

ATCRBS / Mode S Transponder MOPs Maintenance

Meeting #12

**In Joint Session with EUROCAE WG-49
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**Register 08₁₆ Timeout Issues
and
Test Procedure Changes**

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SUMMARY

Working Paper **SC209-WP11-04** was presented during **SC209/WG49 Meeting #11** and at **ICAO ASP Meeting #9 as WP ASP09-21**. The working paper proposed several changes to RTCA/DO-181D, EUROCAE ED-73C and ICAO Doc. No. 9871 in regards to Register 08₁₆ Timeout Issues. The proposed changes were accepted in each of the two meetings.

This **WP12-05** document is now submitted in response to **Action Item 11-01** and provides appropriate Test Procedure changes that must be made to be consistent with the accepted requirements changes.

Introduction:

SC209-WP11-04 was presented and discussed at length at SC-209 Meeting #11 held at RTCA in Washington, D.C., on September 8 -- 10, 2010.

Likewise, WP ASP09-21 was presented and discussed at length at ICAO ASP Working Group Meeting #9 held at Eurocontrol Headquarters in Brussels, Belgium, on October 4 – 8, 2010.

SC209-WP11-04 discusses at length several differences that have been established in regards to clearing data in Register 20₁₆ and 08₁₆. The Working Paper also proposes changes to RTCA/DO-181D and Eurocae ED-73C in regards to the processing of Register 20₁₆ and 08₁₆. All of the proposed changes were confirmed and agreed during SC209 Meeting #11 and again at ICAO ASP Working Group Meeting #9.

The purpose of this document is to review the changes, then review the existing test procedures, and amend such test procedures to be consistent with the changes that were agreed.

A. In RTCA/DO-181D:

A.1. Changes Made in RTCA/DO-181D

A.1.1 In Appendix B, Table B-2-1 (see SC209-WP11-04, Item A.3., page 4)

The notes provided directly after Appendix B, Table B-2-1 were changed to read as follows:

Note 1: The term “minimum update rate” is used in this document. The minimum update rate is obtained when data is loaded in one Register field once every maximum update interval.

*Note 2: If Extended Squitter is implemented, then Register 08₁₆ is **not** cleared or ZEROed once either Flight Identification or Aircraft Registration data has been loaded into the Register during the current power-on cycle. Register 08₁₆ is **not** cleared since it provides information that is fundamental to track file management in the ADS-B environment. (See RTCA DO-260B, section 2.2.5.1.11.c). Refer to Appendix B, §B.4.3.3 for implementation guidelines regarding register 20₁₆ and 08₁₆.*

A.1.2 In Section 2.2.23.1.4.2 (see SC209-WP11-04, Item A.4., page 5)

Note 2 of Section 2.2.23.1.4.2 was changed to read as follows:

*2. The identification register, 08₁₆, is not cleared since it contains data that rarely changes in flight and is not frequently updated. With Extended Squitter, Register 08₁₆ is **not** cleared or ZEROed once either Flight Identification or Aircraft Registration data has been loaded into the Register during the current power-on cycle. Register 08₁₆ is **not** cleared since it provides information that is fundamental to track file management in the ADS-B environment. (See RTCA DO-260B, section 2.2.5.1.11.c). Refer to Appendix B, §B.4.3.3 for implementation guidelines regarding register 20₁₆ and 08₁₆.*

The event-driven register, 0A₁₆ or equivalent transmit register, does not need to be cleared since its contents are only broadcast once each time that the register is loaded.

A.1.3 In Appendix B (see SC209-WP11-04, Item A.5., page 5)

The following section B.4.3.3 was added to Appendix B:

B.4.3.3 Register 20₁₆ and 08₁₆ Implementation Considerations

Detailed implementation requirements for Register 20₁₆ are provided in §2.2.24.6. §2.2.23.1.4.2 Note 2 and §B.2.1 Note 2 then provide introduction to Register 08₁₆ implementation. Implementation of Register 08₁₆ should also consider the following:

- a. If valid Flight Identification data is available, then the data **should** be used to populate the character subfields in Register 08₁₆
- b. After using Flight Identification data to populate the character subfields in Register 08₁₆ in a given power-on cycle, if Flight Identification data becomes invalid or not available, then the last known valid Flight Identification data **should** be retained and used to continue population of the character subfields in Register 08₁₆ for the duration of the power-on cycle
- c. If valid Flight Identification data is not available, but valid Aircraft Registration data is available in a given power-on cycle, then the valid Aircraft Registration data **should** be used to populate the character subfields in Register 08₁₆ for the duration of the power-on cycle
- d. If Register 08₁₆ has been populated using Aircraft Registration data in a given power-on cycle, and valid Flight Identification data becomes available, then the Flight Identification data **should** be used to populate the character subfields in Register 08₁₆ for the remainder of the power-on cycle
- e. Once valid Flight Identification data has been used to populate Register 08₁₆ in a given power-on cycle, Aircraft Registration data **should not** be used to populate the character subfields of Register 08₁₆, even if Flight Identification data becomes invalid or not available during the power-on cycle

A.2. Test Procedure Changes Needed in RTCA/DO-181D

Review of the changes made in RTCA/DO-181D and the applicable Test Procedures indicates that as a minimum, the following Test Procedure Changes need to be made:

A.2.1 Section 2.5.4.6.2.2

A.2.1.1 Step 6 Currently Reads as follows:

Step 6 Set the ALT switch to the “on” position and provide altitude code input to the transponder. Provide Extended Squitter updates to the transponder at a ~~rate~~ maximum update interval as specified in Appendix B, Table B-2-1. Include updates to GICB Registers 05₁₆, 06₁₆, 07₁₆, 08₁₆ and 09₁₆. Verify that the ME fields of the airborne position, velocity and aircraft identification squitters match the data input. Stop updates of Extended Squitter data to the transponder for GICB Registers 08₁₆ and 09₁₆ only. After 2.6 seconds, verify that the ~~ME field of the~~ airborne velocity squitter is ~~ZERO no longer transmitted~~. Interrogate with RR=16, DI=7 and RRS=5, 6, 8 and 9 and verify that the MB fields match the ME fields in the corresponding Extended Squitter reply. After 10 seconds, interrogate to extract the data link capability report and verify that SCS is one. After 60 seconds, verify that airborne position and aircraft identification reports squitters are still transmitted ~~and that aircraft identification and airborne velocity squitters are not transmitted~~.

Step 6 needs to be re-written such that Step 6 reads as follows:

Step 6 Set the ALT switch to the “on” position and provide altitude code input to the transponder. Provide Extended Squitter updates to the transponder at a ~~rate~~ maximum update interval as specified in Appendix B, Table B-2-1. Include updates to GICB Registers 05₁₆, 06₁₆, 07₁₆, 08₁₆ and 09₁₆. Verify that the ME fields of the airborne position, velocity and aircraft identification squitters match the data input. Stop updates of Extended Squitter data to the transponder for GICB Registers 08₁₆ and 09₁₆ only. After 2 seconds, verify that the ME field of the aircraft identification squitter continues to match the data input prior to stopping updates to GICB Register 08₁₆. After 2.6 seconds, verify that the ~~ME field of the~~ airborne velocity squitter is ~~ZERO no longer transmitted~~. Interrogate with RR=16, DI=7 and RRS=5, 6, 8 and 9 and verify that the MB fields match the ME fields in the corresponding Extended Squitter reply. Specifically, verify that the MB and ME fields for Register 08₁₆ continue to match the data input prior to stopping the updates to GICB Register 08₁₆. After 10 seconds, interrogate to extract the data link capability report and verify that SCS is one. After 60 seconds, verify that airborne position and aircraft identification squitters are still transmitted ~~and that airborne velocity squitters are not transmitted~~. Specifically, verify that the ME field of the aircraft identification squitter continues to match the data input prior to stopping the updates to GICB Register 08₁₆.

Areas of change are in “blue italic” font and highlighted in “yellow”.

A.2.1.2 Step 7, Second Paragraph Currently Reads as follows:

Set the ALT switch to the “off” position and stop update to GICB Registers 05₁₆, 06₁₆, 08₁₆ and 09₁₆. After 2 seconds, verify that the ME fields of the airborne position ~~and airborne velocity~~ squitters are ZERO. After 2.6 seconds, verify that the airborne velocity squitter is no longer transmitted. Interrogate with UF=4, RR=16, DI=7 and RRS=5, 6, 8 and 9, respectively. Verify that the MB fields of the replies match the data of the corresponding Extended Squitter reply. After 60 seconds, verify that Extended Squitter airborne position squitter transmissions stop and the transponder resumes Acquisition squitter broadcast.

The Step 7, Second Paragraph needs to be re-written such that Step 7, Second Paragraph reads as follows:

Set the ALT switch to the “off” position and stop update to GICB Registers 05₁₆, 06₁₆, 08₁₆ and 09₁₆. After 2 seconds, verify that the ME fields of the airborne position ~~and airborne velocity~~ squitters are ZERO. After 2.6 seconds, verify that the airborne velocity squitter is no longer transmitted. Interrogate with UF=4, RR=16, DI=7 and RRS=5, 6, 8 and 9, respectively. Verify that the MB fields of the replies match the data of the corresponding Extended Squitter reply. *Specifically, verify that the MB fields of the replies for Register 08₁₆ continue to match the data that was provided prior to stopping the updates to GICB Register 08₁₆.* After 60 seconds, verify that surface position, airborne position and airborne velocity Extended Squitter transmissions stop. Verify that the aircraft identification extended squitter transmissions are continued and that the contents of the ME field matches the data that was provided prior to stopping the updates to GICB Register 08₁₆. Verify that Acquisition squitter transmissions do NOT resume.

Note: Acquisition squitter transmissions are not resumed since Aircraft Identification extended squitter transmissions are continued.

Areas of change are in “blue italic” font and highlighted in “yellow”.

A.2.1.3 Step 10, sub-paragraph 5 has been modified in the Change 1 document and split into two separate steps and renumbered as follows:

6. Stop update of GICB Registers 05₁₆, 06₁₆, 08₁₆, ~~and~~ 09₁₆ and 65₁₆. After 2 seconds, verify that the surface position squitter ME field is ZERO. Verify that after 2 seconds the Extended Squitter ME fields of the aircraft operational status squitter (GICB Register 65₁₆) are not cleared, as they contain various integrity, mode or status information.
7. After 60 seconds, verify that surface position ~~and aircraft identification~~ squitters stop and Acquisition squitters resume.

The highlighted areas above need to be re-written such that the sub-paragraph 7 reads as follows:

6. Stop update of GICB Registers 05₁₆, 06₁₆, 08₁₆ , ~~and~~ 09₁₆ and 65₁₆. After 2 seconds, verify that the surface position squitter ME field is ZERO. After the same 2 seconds, verify that the ME field of the aircraft identification squitter continues to match the data input prior to stopping updates to GICB Register 08₁₆.
 7. After 60 seconds, verify that surface position ~~and aircraft identificaiton~~ squitters stop. Verify that the aircraft identification extended squitter transmissions are continued and that the contents of the ME field matches the data that was provided prior to stopping the updates to GICB Register 08₁₆. Verify that Acquisition squitter transmissions do NOT resume.
- Note:** Acquisition squitter transmissions are not resumed since Aircraft Identification extended squitter transmissions are continued.

Areas of change are in “blue italic” font and highlighted in “yellow”.

B. In Eurocae ED-73C:

B.1. Test Procedure Changes Needed in Eurocae ED-73C

The test procedure changes made in Section A above for RTCA/DO-181D require the following equivalent changes to be made in Eurocae ED-73C.

B.1.1 Section 5.5.8.6.2.2

B.1.1.1 Sub-paragraph f, Step 6: Change to read as follows:

- f. Step 6 - Set the ALT switch to the “on” position and provide altitude code input to the transponder. Provide Extended Squitter updates to the transponder at a ~~rate~~ **maximum update interval** as specified in Appendix B, Table B-2-1. Include updates to GICB Registers 05₁₆, 06₁₆, 07₁₆, 08₁₆ and 09₁₆. Verify that the ME fields of the airborne position, velocity and aircraft identification squitters match the data input. Stop updates of Extended Squitter data to the transponder for GICB Registers 08₁₆ and 09₁₆ only.

After 2 seconds, verify that the ME field of the aircraft identification squitter continues to match the data input prior to stopping updates to GICB Register 08₁₆. After 2.6 seconds, verify that the ~~ME field of the~~ airborne velocity squitter is ~~ZERO~~ no longer transmitted. Interrogate with RR=16, DI=7 and RRS=5, 6, 8 and 9 and verify that the MB fields match the ME fields in the corresponding Extended Squitter reply. Specifically, verify that the MB and ME fields for Register 08₁₆ continue to match the data input prior to stopping the updates to GICB Register 08₁₆.

After 10 seconds, interrogate to extract the data link capability report and verify that SCS is one. After 60 seconds, verify that airborne position and aircraft identification squitters are still transmitted and that ~~airborne velocity squitters are not transmitted~~. Specifically, verify that the ME field of the aircraft identification squitter continues to match the data input prior to stopping the updates to GICB Register 08₁₆.

Areas of change are in “blue italic” font and highlighted in “yellow”.

B.1.1.2 Sub-paragraph g, Step 7, Second Paragraph: Change to read as follows: Currently

Set the ALT switch to the “off” position and stop update to GICB Registers 05₁₆, 06₁₆, 08₁₆ and 09₁₆. After 2 seconds, verify that the ME fields of the airborne position ~~and~~ ~~airborne velocity~~ squitters are ZERO. After 2.6 seconds, verify that the airborne velocity squitter is no longer transmitted. Interrogate with UF=4, RR=16, DI=7 and RRS=5, 6, 8 and 9, respectively. Verify that the MB fields of the replies match the data of the corresponding Extended Squitter reply. Specifically, verify that the MB fields of the replies for register 0816 continue to match the data that was provided prior to stopping the updates to GICB Register 08₁₆. After 60 seconds, verify that surface position, airborne position and airborne velocity Extended Squitter transmissions stop. Verify that the aircraft identification extended squitter transmissions are continued and that the contents of the ME field matches the data that was provided prior to stopping the updates to GICB Register 08₁₆. Verify that Acquisition squitter transmissions do NOT resume.

Note: Acquisition squitter transmissions are not resumed since Aircraft Identification extended squitter transmissions are continued.

Areas of change are in “blue italic” font and highlighted in “yellow”.

B.1.1.3 Sub-paragraph j, Step 10, sub-paragraph 5: Change to read as follows:

6. Stop update of GICB Registers 05₁₆, 06₁₆, 08₁₆ , ~~and 09₁₆~~ ~~and 65₁₆~~. After 2 seconds, verify that the surface position squitter ME field is ZERO. *After the same 2 seconds, verify that the ME field of the aircraft identification squitter continues to match the data input prior to stopping updates to GICB Register 08₁₆.*

7. After 60 seconds, verify that surface position ~~and aircraft identificaiton squitters stop~~. *Verify that the aircraft identification extended squitter transmissions are continued and that the contents of the ME field matches the data that was provided prior to stopping the updates to GICB Register 08₁₆. Verify that Acquisition squitter transmissions do NOT resume.*

Note: *Acquisition squitter transmissions are not resumed since Aircraft Identification extended squitter transmissions are continued.*

Areas of change are in “blue italic” font and highlighted in “yellow”.

END OF DOCUMENT: