

RTCA Special Committee 209

ATCRBS / Mode S Transponder MOPs Maintenance

Meeting #12

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**TCS / RCS Commands
and
Test Procedure Changes
Revision 3**

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SUMMARY

Working Paper **SC209-WP11-12R1** made extensive changes in regards to TCS and RCS commands and which message formats are impacted as well as providing methods to inhibit ATCRBS and All-Call Interrogations.

This **WP12-06** document is now submitted in response to **Action Item 11-02** and provides appropriate Test Procedure changes that must be made to be consistent with the accepted requirements changes made in WP11-12R1.

1. **Introduction:**

Working Paper SC209-WP11-12R1, made extensive changes in RTCA/DO-181D Section 2.2.23.1.7.1 and 2.2.23.1.7.2 in order to have TCS and RCS commands apply to all surface type messages and also to inhibit replies to ATRBS and All-Call interrogations. This document proposes changes to the associated test procedures provided in section 2.5.4.6.3 of RTCA/DO-181D and section 5.5.8.6.3 of EUROCAE ED-73C.

2. **Changes:**

Inspection of RTCA/DO-181D Section 2.5.4.6.3 [5.5.8.6.3 of EUROCAE ED-73C] reveals that most of the test procedure was written with multiple procedures being provided in a single paragraph. To retain the prior approach proved to be untenable considering the number of changes that had to be made. Therefore, the following new procedure breaks down the prior procedure into subparagraphs and then makes the appropriate changes. Actual changes or additions to the fundamental procedure are highlighted in yellow. Upon approval of the procedure, it is recommended that it be ported into DO-181D/ED-73C as written and simply remove the “yellow” highlights.

2.5.4.6.3 **Squitter Control Verification**

Squitter operation is dependent upon control from Extended Squitter ground stations from interrogation content of the SD field. SD data can command the transponder to broadcast surface position squitters and control surface Extended Squitter rate and surface squitter antenna selection.

Step 1 Squitter Type Control

- a. Provide pressure altitude data and Extended Squitter updates to the transponder through the appropriate external interface. Include updates to GICB Registers 05₁₆, 06₁₆, 08₁₆, 09₁₆, 61₁₆ and 65₁₆. Use other than ZERO or all ones for the corresponding GICB registers. Update the registers at a half second rate to prevent time out of these registers. Set TRS to ZERO or ONE and for those transponders that support automatic on-the-ground detection, set the transponder to **airborne** state. Throughout the following entire step 1:
 1. verify that CA remains equal to 5 for transponders that support automatic on-the-ground detection; otherwise verify CA remains equal to 6, and
 2. verify that the transponder continues broadcast of Acquisition squitters throughout the test.
- b. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 1, RCS = 2, SAS = 0.
 1. Verify that the transponder:
 - (a). broadcasts surface position (06₁₆), aircraft identification (08₁₆), **aircraft status (61₁₆) and surface aircraft operational status (65₁₆) squitters** for 15 seconds at the low rate,
 - (b). does not broadcast airborne position (05₁₆) or **airborne velocity (09₁₆)** squitters during the 15 second period, and
 - (c). **inhibits replies to ATRBS, ATRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 15 second period.**
 2. Verify that after the 15 second interval the transponder:
 - (a). reverts to broadcast of the airborne position (05₁₆), **airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters,**
 - (b). resumes broadcast of the aircraft identification (08₁₆) squitter at the high rate, and

- (c). replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations.
3. Repeat using an interrogation as above except set TCS = 2 and verify that:
 - (a). the transponder broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the low rate for 60 seconds
 - (b). does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 60 second period,
 - (c). inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 60 second period, and
 - (d). After the 60 second interval, verify:
 - (1). that the transponder reverts to broadcast of airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters, and
 - (2). resumes broadcast of aircraft identification (08₁₆) squitters at the high rate,
 - (3). replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations.
 - c. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 1, RCS = 2, SAS = 0.
 1. Verify that the transponder:
 - (a). broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters for 15 seconds at the low rate,
 - (b). does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 15 second period, and
 - (c). inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 15 second period.
 2. Prior to the timeout of the 15 second interval, repeat interrogation. Verify that:
 - (a). the transponder continues broadcast of the surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters for another 15 seconds from the second interrogation,
 - (b). does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the additional 15 second period after the second interrogation, and
 - (c). inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the additional 15 second period after the second interrogation.
 3. Repeat using an interrogation as above except set TCS = 2 and verify:
 - (a). the transponder broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the low rate for 60 seconds,

- (b). does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 60 second period, and
- (c). inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 60 second period, and
- (d). prior to the timeout of the 60 second interval, repeat interrogation. Verify:
 - (1). that the surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters continue for another 60 seconds from the repeat interrogation,
 - (2). does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 60 second period after the repeat interrogation, and
 - (3). inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 60 second period after the repeat interrogation.
- d. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 1, RCS = 2, SAS = 0. Within a 1 second interval, interrogate with the same interrogation except set TCS = 3. Verify that the transponder:
 - 1. stops broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
 - 2. resumes broadcast of the airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters,
 - 3. resumes broadcast of the aircraft identification (08₁₆) squitter at the high rate, and
 - 4. replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations.
- e. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 0, RCS = 0, SAS = 0. Verify that the transponder:
 - 1. continues to broadcast airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters at the proper rate,
 - 2. continues to broadcast the aircraft identification (08₁₆) squitter at the high rate,
 - 3. continues to reply to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations, and
 - 4. does not broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- f. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 3,4,5,6,7 RCS = 0, SAS = 0 interrogations. For each interrogation, verify that the transponder:
 - 1. broadcasts airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters at the proper rate,
 - 2. broadcasts the aircraft identification (08₁₆) squitter at the high rate,
 - 3. replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations, and

4. does not broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- g. Perform the following for transponders that support automatic on-the-ground detection. Set the transponder to **on-the-ground** status. ~~Set TRS to ZERO.~~ Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 1, RCS = 2, SAS = 0. Verify that the transponder:
1. broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the low rate for 15 seconds,
 2. does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 15 second period,
 3. inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 15 second period, and
 4. After the 15 second interval, verify that the transponder:
 - (a). broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the high rate,
 - (b). does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 15 second period, and
 - (c). continues to inhibit replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations.
- h. Repeat the interrogation used in Step 1.g. After one (1) second, set the transponder to the airborne state. Then verify that the transponder:
1. broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the low rate for the entire 15 second period,
 2. does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 15 second period,
 3. inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 15 second period, and
 4. After the 15 second period, verify that the transponder:
 - (a). broadcasts airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters at the proper rate,
 - (b). broadcasts the aircraft identification (08₁₆) squitter at the high rate,
 - (c). replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations, and
 - (d). does not broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.

Step 2 Squitter Rate Control

With the equipment connected as specified in Step 1, set TRS to ZERO or ONE and for transponders that support automatic on-the-ground detection, set the transponder to **airborne state**. Except as otherwise noted, verify that the Acquisition squitter is broadcast throughout the following step at the proper rate.

- a. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 2, RCS = 1 and SAS = 0. Verify that the transponder:
 1. broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the high rate for 60 seconds,
 2. does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 60 second period,
 3. inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 60 second period, and
 4. After the 60 second period, verify that the transponder:
 - (a). broadcasts airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters at the proper rate,
 - (b). broadcasts the aircraft identification (08₁₆) squitter at the high rate,
 - (c). replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations, and
 - (d). does not broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- b. Repeat the step 2. procedure except prior to the 60 second interval, repeat the interrogation with TCS = 2 and RCS = 1 and verify that the transponder:
 1. continues to broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the high rate for 60 seconds after the repeat interrogation,
 2. does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 60 second period after the repeat interrogation,
 3. inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 60 second period after the repeat interrogation, and
 4. After the 60 second period after the second interrogation, verify that the transponder:
 - (a). broadcasts airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters at the proper rate,
 - (b). broadcasts the aircraft identification (08₁₆) squitter at the high rate,
 - (c). replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations, and
 - (d). does not broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- c. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 0, RCS = 1 and SAS = 0. Verify that the transponder:
 1. continues to broadcast airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters at the proper rate,
 2. continues to broadcast the aircraft identification (08₁₆) squitter at the high rate,

3. continues to reply to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations, and
 4. does not broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- d. Repeat the interrogation used in Step 2.c except use TCS = 3 –through- 7. For each TCS used, verify that the transponder continues to respond as in Step 2.c.
- e. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 1, RCS = 2, SAS = 0. Verify that the transponder:
1. broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the low rate for 15 seconds after the interrogation,
 2. does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 15 second period after the interrogation,
 3. inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 15 second period after the interrogation, and
 4. After the 15 second period, verify that the transponder:
 - (a). broadcasts airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters at the proper rate,
 - (b). broadcasts the aircraft identification (08₁₆) squitter at the high rate,
 - (c). replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations, and
 - (d). does not broadcast surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- f. Repeat the interrogation used in Step 2.e except use TCS = 2. Verify that the transponder:
1. broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the low rate for 60 seconds,
 2. does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 60 second period,
 3. inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 60 second period and
 4. After the 60 second period, verify that the transponder:
 - (a). broadcasts airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters at the proper rate,
 - (b). broadcasts the aircraft identification (08₁₆) squitter at the high rate,
 - (c). replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations, and
 - (d). does not broadcast surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.

- g. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 1, RCS = 1, SAS = 0. Follow this interrogation within 1 second with the same interrogation except set TCS = 0 and RCS = 3. Verify that the transponder:
1. stops broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
 2. resumes broadcast of the airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters,
 3. resumes broadcast of the aircraft identification (08₁₆) squitter at the high rate, and
 4. replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations.
- h. Repeat the first interrogation used in Step 2.g. Follow this interrogation within 1 second with the same interrogation except set TCS = 0 and RCS = 4. Verify that the transponder responds as required in Step 2.g.
- i. The following verifies that the RCS subfield has no effect when the transponder is not transmitting surface position squitters. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 0, RCS = 1, SAS = 0. Verify that the transponder:
1. continues to broadcast airborne position (05₁₆), airborne velocity (09₁₆), aircraft status (61₁₆) and airborne aircraft operational status (65₁₆) squitters at the proper rate,
 2. continues to broadcast the aircraft identification (08₁₆) squitter at the high rate,
 3. continues to reply to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations, and
 4. does not broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- j. Repeat Step 2.i except set RCS = 2,3,4,5, 6 and 7. For each setting used for RCS, verify that the transponder responds as required in Step 2.i.
- k. The following verifies that unassigned RCS codes have no effect when the transponder is transmitting surface position squitters. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 2, RCS = 0, SAS = 0. Verify that the transponder:
1. broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the required rate.
 2. does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 60 second period following the interrogation,
 3. inhibits replies to ATCRBS, ATCRBS/Mode S All-Call and Mode S-Only All-Call interrogations during the 60 second period following the interrogation.
- l. Repeat the interrogation used in Step 2.k, except set TCS = 0 and RCS = 5, 6 and 7 respectively. For each setting used, verify that the transponder:
1. broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the required rate.
 2. does not broadcast airborne position (05₁₆) or airborne velocity (09₁₆) squitters during the 60 second period following the interrogation,

- m. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 2, RCS = 1, SAS = 0. Follow this interrogation within 1 second with the same interrogation except set TCS = 0 and RCS = 3. Verify that the transponder:
 - 1. stops broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- n. Prior to 60 seconds from the first interrogation used in Step 2.m, repeat the interrogation used in Step 2.m except set RCS = 0. Sixty (60) seconds after the repeat interrogation, verify that the transponder:
 - 1. resumes broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters.
- o. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 2, RCS = 1, SAS = 0 to again set the transponder to transmit surface position squitters. Follow this interrogation after 30 seconds with the same interrogation except set TCS = 0 and RCS = 4. Verify that the transponder:
 - 1. stops broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- p. Prior to 60 seconds from the first interrogation used in Step 2.o, repeat the interrogation used in Step 2.o except set RCS = 0. After 120 seconds from the repeat interrogation, verify that the transponder:
 - 1. resumes broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters.
- q. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 2, RCS = 1, SAS = 0. Follow this interrogation within 1 second with the same interrogation except set TCS = 0 and RCS = 3. Verify that the transponder:
 - 1. stops broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters.
- r. Prior to 60 seconds from the first interrogation used in Step 2.q, repeat the interrogation used in Step 2.q and verify that the transponder:
 - 1. immediately resumes broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the high rate for a period of 60 seconds..
- s. Perform the following for transponders that support automatic on-the-ground detection. Set ~~TRS to ZERO and set~~ the transponder to **on-the-ground** status. Verify that Acquisition squitters are not broadcast.
- t. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 0, RCS = 3 and SAS = 0.
 - 1. Verify that the transponder:
 - (a). stops broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters for 60 seconds, and
 - (b). Transmits Acquisition squitters.
 - 2. After 60 seconds, verify that the transponder:
 - (a). resumes broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the high rate, and

- (b). Does not transmit Acquisition squitters.
- 3. Repeat the interrogation except set RCS = 4. Verify that the transponder:
 - (a). stops broadcast of surface position (06₁₆) and surface aircraft operational status (65₁₆) squitters for 120 seconds, and
 - (b). Transmits Acquisition squitters.
- 4. After 120 seconds, verify that the transponder:
 - (a). resumes broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the high rate, and
 - (b). Does not transmit Acquisition squitters.
- 5. Repeat the interrogation except set RCS = 0, 5, 6 and 7 and delaying 120 seconds between each interrogation. Verify that the transponder:
 - (a). continues to broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters at the high rate, and
 - (b). Does not transmit Acquisition squitters.

Step 3 Squitter Antenna Control

The following procedure verifies that the transponder correctly broadcasts surface Extended Squitters and Acquisition squitters on the proper antenna ports as commanded by the SAS subfield. For transponders that do not support antenna diversity, verify that the SAS commands have no impact on Acquisition or Extended Squitter transmissions.

- a. With the equipment connected as specified in Step 1, ~~set TRS to ZERO and~~ for transponders that support automatic on-the-ground detection, set the transponder to **on-the-ground** status. For transponders that support automatic detection of on-the-ground condition, verify that the transponder:
 - 1. broadcasts surface position (06₁₆), aircraft identification (08₁₆), aircraft status (61₁₆), and surface aircraft operational status (65₁₆) squitters on the top antenna only, and
 - 2. Does not broadcast Acquisition squitters.
- b. Interrogate the transponder with UF = 4, PC and RR = 0, DI = 2, TCS = 0, RCS = 0, SAS = 0. For transponders that do not support automatic detection of on-the-ground status, verify that:
 - 1. the following interrogations have no impact to Extended Squitter and Acquisition squitter transmissions.

Otherwise, verify that the transponder:

 - 2. broadcasts Extended and Acquisition squitters on the top antenna only.
- c. Repeat the interrogation used in Step 3.b except set SAS = 1. Verify that:
 - 1. each Extended Squitter type and Acquisition squitters occur alternately on the top and bottom antennas.
 - 2. After 120 seconds, verify that the transponder broadcasts extended and Acquisition squitters from the top antenna only.
- d. Repeat the interrogation used in Step 3.b except set SAS = 2. Verify that:

1. Verify that the transponder broadcasts extended and Acquisition squitters for 120 seconds from the bottom antenna only.
 2. After the 120-second interval, verify that the transponder resumes broadcasting extended and Acquisition squitters from the top antenna only.
- e. Repeat the interrogation used in Step 3.b except set SAS = 1 followed by an interrogation 10 seconds later with SAS = 3. After the second interrogation, verify that the transponder:
1. resumes broadcasting extended and Acquisition squitters from the top antenna only.
- f. Repeat above procedure for transponders that support automatic on-the-ground detection except set the transponder to airborne state and verify that the SAS commands have no effect on Acquisition and Extended Squitter transmissions and squitters are broadcast alternately on top and bottom antenna ports.
- g. Repeat above procedure except command the transponder to report surface Extended Squitters via UF = 4, PC and RR = 0, DI = 2, TCS = 2, RCS = 0 interrogations every 60 seconds to maintain surface squitter transmissions. Setup transponders that support automatic on-the-ground detection to airborne state. Verify that the SAS command properly controls antenna port selection for each Extended Squitter types as specified for each SAS value and that the SAS commands have no effect on Acquisition squitter transmissions.

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