Comparison of the Current Drafts of RTCA DO-181D and Eurocae ED-73C "Test Procedures Related to Receiver and Transmitter"

RTCA DO-181D Section	Eurocae ED-73C Section	Section Title	DO-181D Comments	ED-73C Comments
2.4.2.1	5.4.1	Receiver Characteristics	DO-181 includes Mode S low-level reply ratio test	
2.4.2.2	5.4.2	Transmitter Characteristics		ED-73 separates Mode A/C and Mode S continuous reply rate capability tests
2.4.2.3	5.4.3	Reply Pulse Characteristics	Comparable	
2.4.2.4	5.4.4	Side Lobe Suppression	Comparable	
2.4.2.5	5.4.5	Pulse Decoder Characteristics	Comparable	
2.4.2.6	5.4.6	Transponder Desensitization and Recovery	Comparable	
2.4.2.7	5.4.7	Response to Interference		ED-73 includes additional tests for: (1) standard interference pulse positioned at Mode A or Mode C spacing before P1 of Mode S interrogation, and (2) Mode A and Mode C with standard interfering pulse
2.4.2.8	5.4.8	Undesired Replies	Comparable	
2.4.2.9	5.4.9	Self-Test and Monitors	Comparable	
2.4.2.10	5.4.10	Interference Suppression Pulse Response	Comparable	
2.4.2.11	5.4.11	Diversity Operation	Comparable	
2.4.2.12	5.4.12	Data Handling and Interfaces		ED-73 includes additional tests for invalid AA
2.4.2.12.5	5.4.13	Interface Integrity Testing	Comparable	
---	5.4.14	Power Interruption		Tests not in DO-181

Comparison of the Current Drafts of RTCA DO-181D and Eurocae ED-73C "Test Procedures Related to Receiver and Transmitter"

RTCA DO-181D Section	Eurocae ED-73C Section	Section Title	DO-181D Comments	ED-73C Comments
2.5.4.1	5.5.8.1	Error Protection	Comparable	
2.5.4.2	5.5.8.2	Interrogation Acceptance Tests	Comparable	
2.5.4.3	5.5.8.3	CA Verification	Comparable	
2.5.4.4	5.5.8.4	Non-selective Lockout Tests		ED-73 has 3 more patterns in the II/SI discrimination test
2.5.4.5	5.5.8.5	Selective Lockout Tests		ED-73 has more test patterns
2.5.4.6	5.5.8.6	Squitter Verification	DO-181 has additional tests for: (1) Acquisition Squitter, (2) Extended Squitter, (3) Extended Squitter Rate, (4) Extended Squitter Protocol, and (5) Squitter Control	
2.5.4.7	5.5.8.7	FS and VS Protocol	DO-181 includes 64 transactions for "Basic Option" transponder	
2.5.4.8	5.5.8.8	PI Verification	Comparable	
2.5.4.9	5.5.8.9	Address Tests		ED-73 defines test patterns for level 1, level 2, and higher transponders
2.5.4.10	5.5.8.10	Altitude Report Tests	Comparable	
2.5.4.11	5.5.8.11	4096 Code Tests	Comparable	
2.5.4.12	5.5.8.12	RI, Acquisition, and Maximum Airspeed	Comparable	
2.5.4.13	5.5.8.13	PR, Probability of Reply, Stochastic Acquisition	Comparable	
2.5.4.14	5.5.8.14	Not used	Not used	

RTCA DO-181D Section	Eurocae ED-73C Section	Section Title	DO-181D Comments	ED-73C Comments
2.5.4.15	5.5.8.15	Comm-A, Interface and Control	Comparable	
2.5.4.16	5.5.8.16	Broadcast Formats		ED-73 includes a test with UF=11 interrogation
2.5.4.17	5.5.8.17	Downlink Interface. DF=0,16	Comparable	
2.5.4.18	5.5.8.18	Comm-B Protocol	Comparable	
2.5.4.18A	5.5.8.19	Enhanced Comm-B Protocol		DO-181 includes UM field tests
2.5.4.19	5.5.8.20	AIS Flight Identification	Comparable	
2.5.4.20	5.5.8.21	Extended Capability Report	Comparable	
2.5.4.21	5.5.8.22	Directed Comm-B	Comparable	
2.5.4.21A	5.5.8.23	Comm-B Broadcast		ED-73 includes test for transponder-initiated broadcast
2.5.4.22	5.5.8.24	Downlink Interface, Storage Design, Buffer Rate	Comparable	
2.5.4.23	5.5.8.25	Downlink Interface, No Storage Design,	Comparable	
2.5.4.24	5.5.8.26	Comm-C Protocol	Comparable	
2.5.4.24	5.5.8.27	Enhanced Comm-C Protocol	Comparable	
2.5.4.25	5.5.8.28	Uplink Interface, ELM-Comm-C	Comparable	
2.5.4.26	5.5.8.29	Comm-D Protocol	Comparable	
2.5.4.26	5.5.8.30	Enhanced Comm-D Protocol	Comparable (note that DO-181 combines Comm-D and Enhanced Comm-D test sections)	
2.5.4.27	5.5.8.31	Directed Comm-D	Comparable	
2.5.4.28	5.5.8.32	Comm-D Interface, Rate and Content	Comparable	
2.5.4.29	--	Not used	Not used	

RTCA DO-181D Section	Eurocae ED-73C Section	Section Title	DO-181D Comments	ED-73C Comments
--	5.5.8.33	Comm-U Uplink Interface	DO-181 does not include these tests	
2.5.4.30	5.5.8.34	Sensitivity Level Operation	Comparable	
2.5.4.31	5.5.8.35	Transmission of RA Report to Mode S Sensor	Comparable	
2.5.4.32	5.5.8.36	Transmission of TCAS Capability to Mode S Sensor	Comparable	
2.5.4.33	5.5.8.37	TCAS or Transponder/TCAS Interface Failure….	Comparable	
2.5.4.34	5.5.8.38	Coordination	DO-181 has separate tests for TSO-C119A and DO-185A compatible TCAS units	
2.5.4.35	5.5.8.38	MU Messages to TCAS	DO-181 has separate test section, ED-73 tests included in “coordination” section	
???	5.5.8.39	ACAS Broadcast Message		Unclear if the ED-73 tests are included in DO-181
2.5.4.36	5.5.8.40	Transponder Replies to Incoming TCAS RAs	Comparable	
2.5.4.37	5.5.8.41	Transponder/TCAS Throughput	Comparable	
2.5.4.38	5.5.8.42	Transponder Communication Timing	Comparable	
2.5.4.39	5.5.8.43	TCAS Crosslink	Comparable	
--	5.5.8.44	Mode S Transponder Hijack Mode		DO-181 does not contain these tests

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Detailed Differences Table follows on the next page:

TEXT in blue differs from the opposing standard

Highlighted text was highlighted in the draft of DO-181D to note text changed from DO-181C.
Note some highlighted text is blue, indicating differences in the respective document.

Resolutions, Agreements and Action Item notes are highlighted in Turquoise

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2.5.4.4 Procedure #4 Non-Selective Lockout Tests

(§)

Non-selective lockout is initiated on receipt of a correctly addressed interrogation UF=4, 5, 20, 21 containing PC=1 or LOS=1 together with IIS=0. This starts the T_D timer which holds the lockout condition for 18 ±1.0 seconds.

Non-selective Lockout applies to both (8 and 21 microseconds) ATCRBS/Mode S All-Calls and to UF=11 with IC and CL=0.

The lockout state is verified by interrogating with the locked-out All-Call types and by observing that a reply is not generated.

The lockout duration is verified by interrogation with the locked-out All-Call types 100 milliseconds before the earliest permissible timer runout and by observing that a reply is not generated.

The lockout termination is verified by interrogation with the locked-out All-Call types 100 milliseconds after the latest permissible timer runout and by observing that a reply is generated.

The timer restart feature is verified by transmitting a second lockout command while the lockout is still in effect and by observing that lockout termination occurs after the latest permissible timer runout reckoned from the last lockout command.

Negative tests verify that interrogation patterns not specifically designated as lockout commands do not cause a lockout condition in the transponder, and that lockout affects only the specified formats.

2.5.4.4.1 Positive Tests

Interrogate with UF=4, PC=1.

Verify: Lockout state, lockout duration, lockout termination.
Repeat with UF=5, PC=1 for Level 1 transponder.
Repeat with UF=5, UF=20, UF=21 and PC=1 for all other designs.
Repeat, using LOS=1 with IIS=0 as the lockout command.

Recommended Test Sequence:

Item	Time (sec)	Action
A	0	Interrogate with UF=4, PC=1.
B	0.02	Verify lockout with ATCRBS Mode A/Mode S.
C	0.04	Verify lockout with ATCRBS Mode C/Mode S.
D	0.06	Verify lockout with UF=11, PR=0, IC=0, CL=0.
E	16.9	Repeat items B, C, D.
F	19.1	Verify termination with All-Call.
G	19.12	Verify termination with ATCRBS Mode C/Mode S.
H	19.14	Verify termination with UF=11, PR=0, IC=0, CL=0.

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5.5.8.4 PROCEDURE #4 - Non-Selective Lockout Tests (Paragraph)

Non-selective lockout is initiated on receipt of a correctly addressed interrogation UF = 4, 5, 20, 21 containing PC=1 or LOS=1 together with IIS=0. This starts the TD timer which holds the lockout condition for 18 ±1.0 seconds.

Non-selective Lockout applies to both (8 and 21 µs) Mode A/C/Mode S All-Calls and to UF=11 with IC and CL equal to 0.

The lockout state is verified by interrogating with the locked-out All-Call types and by observing that a reply is not generated.

The lockout duration is verified by interrogation with the locked-out All-Call types 100 milliseconds before the earliest permissible timer runout and by observing that a reply is not generated.

The lockout termination is verified by interrogation with the locked-out All-Call types 100 milliseconds after the latest permissible timer runout and by observing that a reply is generated.

The timer restart feature is verified by transmitting a second lockout command while the lockout is still in effect and by observing that lockout termination occurs after the latest permissible timer runout reckoned from the last lockout command.

Negative tests verify that interrogation patterns not specifically designated as lockout commands do not cause a lockout condition in the transponder, and that lockout affects only the specified formats.

a. Positive Tests

Interrogate with UF=4, PC=1.

Verify: Lockout state, lockout duration, lockout termination.
Repeat with UF=5, PC=1 for Level 1 transponder. Repeat with UF=5, UF=20, UF=21 and PC=1 for all other designs.
Repeat, using LOS=1 with IIS=0 as the lockout command.

Recommended Test Sequence:

Item	Time (sec)	Action
a.	0	Interrogate with UF=4, PC=1.
b.	0.02	Verify lockout with Mode A/Mode S All-Call.
c.	0.04	Verify lockout with Mode C/Mode S All-Call.
d.	0.06	Verify lockout with UF=11, IC=0, CL=0, PR=0.
e.	16.9	Repeat items b, c, d.
f.	19.1	Verify termination with All-Call.
g.	19.12	Verify termination with Mode A/C Mode C/Mode S.
h.	19.14	Verify termination with UF=11, IC=0, CL=0, PR=0.

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I	21.0	Interrogate with UF=5, PC=1.
J	21.02	Verify as in items B, C, D.
K	26.0	Interrogate with UF=20, PC=1.
L	26.02	Verify as in items B, C, D.
M	31.0	Interrogate with UF=21, PC=1.
N	31.02	Verify as in items B, C, D.
O	41.9	Verify as in items B, C, D.
P	46.9	Verify as in items B, C, D.
Q	50.1	Verify termination as in items F, G, H.

Note: *This sequence must be modified for Level 1 transponders, because they do not accept long interrogations.*

2.5.4.4.2 Required Negative Tests

a. PC Discrimination

The interrogation patterns are:

UF = 4, 5, 20, 21.
PC = 0 and DI≠3,
PC = 0 and DI=3 and LSS=1 and SIS=0,
PC = 1 and DI=3,
PC = 2, 3, 4, 5, 6. 7.
Total number of patterns = 36.

With the transponder not in non-selective lockout state, interrogate with all of the above patterns consecutively. Verify that, after the sequence, the non-selective lockout state does not exist.

b. Broadcast Discrimination

The interrogation patterns are:

UF = 4, 5, 20, 21.
PC = 0, 1, 2, 3, 4, 5, 6, 7.
IIS = 0
LOS = 1
Address = Broadcast (FF FFFF hex).
Total number of patterns = 32.

With the transponder not in non-selective lockout state, interrogate with all patterns consecutively. Verify that, after the sequence, the non-selective lockout state does not exist.

c. Address Discrimination

The interrogation patterns are:

UF = 4, 5, 20, 21.

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i.	21.0	Interrogate with UF=5, PC=1.
j.	21.02	Verify as in items b, c, d.
k.	26.0	Interrogate with UF=20, PC=1.
l.	26.02	Verify as in items b, c, d.
m.	31.0	Interrogate with UF=2l, PC=1.
n.	31.02	Verify as in items b, c, d.
o.	41.9	Verify as in items b, c, d.
p.	46.9	Verify as in items b, c, d.
q.	50.1	Verify termination as in items f, g, h.

NOTE: *This sequence must be modified for level 1 transponders, because they do not accept long interrogations.*

b. Required Negative Tests

(1) PC Discrimination

The interrogation patterns are:

UF = 4, 5, 20, 21.
PC = 0, 2, 3, 4, 5, 6, 7.
Total number of patterns = 28.

With the transponder not in non-selective lockout state, interrogate with all of the above patterns consecutively. Verify that the non-selective lockout state never exists during this test sequence.

WG-49 will review the above differences and make recommendation

(2) Broadcast Discrimination

The interrogation patterns are:

UF = 4, 5, 20, 21.
PC = 0, 1, 2, 3, 4, 5, 6, 7.
IIS = 0.
LOS = 1.
Address = Broadcast (FF FFFF {HEX}).
Total number of patterns = 32.

With the transponder not in non-selective lockout state, interrogate with all patterns consecutively. Verify that the non-selective lockout state never exists during this test sequence.

(3) Address Discrimination

The interrogation patterns are:

UF = 4, 5, 20, 21.
PC = 1.

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PC = 1. Address: not for this transponder. Total number of patterns = 4. With the transponder not in non-selective lockout state, interrogate with all of the above patterns. Verify that, after the sequence, the non-selective lockout state does not exist.	Address: not for this transponder. Total number of patterns = 4. With the transponder not in non-selective lockout state, interrogate with all of the above patterns. Verify that the non-selective lockout state never exists during this test sequence.
d. II and SI Discrimination The interrogation patterns are: UF = 11. PR = 0. CL = 0 through 4. IC = 1 through 15. DO-181C revised to comply with ED-73C Total number of patterns = 75. With the transponder in non-selective lockout state, interrogate with all of the above patterns and verify that the corresponding II or SI code is not locked out.	(4) II/SI Discrimination The interrogation patterns are: UF = 11. PR = 0. CL = 0 through 1; IC = 1 through 15 CL = 2 through 4; IC = 0 through 15 Total number of patterns = 78. (refer to paragraphs)…. With the transponder in non-selective lockout state, interrogate with all of the above patterns and verify that they are not locked out.
e. All-Call Discrimination This test verifies that the lockout state applies only to All-Call formats and not to ATCRBS or discrete interrogations. The interrogation patterns are: All non-All-Call formats for which the transponder is designed (Procedure #2 – §…). With the transponder in non-selective lockout state, interrogate with all of the above patterns and verify that they are not locked out.	(5) All-Call Discrimination This test verifies that the lockout state applies only to All-Call formats and not to Mode A/C or discrete interrogations. The interrogation patterns are: All non-All-Call formats for which the transponder is designed (Procedure #2). With the transponder in non-selective lockout state, interrogate with all of the above patterns and verify that they are not locked out.

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2.5.4.5 Procedure #5 Selective Lockout Tests (§…) Selective lockout is initiated on receipt of a correctly addressed interrogation UF=4, 5, 20, or 21 containing DI=1, 7; LOS=1 and IIS from 1 to 15, or DI=3, LSS=1 and SIS from 1 to 63. This starts the T_L timer associated with the received II or SI code and holds the lockout condition for 18 ±1.0 seconds. Selective lockout applies only to UF=11 with II or SI corresponding to the running T_L timer. The lockout state, duration, termination and restart are defined and tested as described in §2.5.4.4. Negative tests follow the same procedures and have the same purpose as described in §2.5.4.4. Pattern Definition for Level 1 Transponders Positive Interrogation Patterns Per Timer UF: 2 codes. 2 codes with LOS=1 or 1 code with LSS=1. Total: 4 patterns for II timers, 2 patterns for SI timers starting lockout. Total Interrogation Patterns Per Timer UF: 2 codes. 2 codes with LOS=0,1; 1 code with LSS=0, 1 5 codes with SD field bits 23 & 26 = 1 Total: 20 possible patterns for II timers, 18 possible patterns for SI timers. Positive test patterns: 2 or 4. Negative test patterns: 16. Gary Furr to provide traceability from SC-209 Working Papers where the above changes were suggested and approved Pattern Definition of All Other Transponder Designs Positive Interrogation Patterns Per Timer UF: 4 codes. 2 codes with LOS=1 or 1 code with LSS=1. Total: 8 patterns for II timers, or 4 patterns for SI timers starting lockout. Total Interrogation Patterns Per Timer UF: 4 codes. 2 codes with LOS= 0,1; 1 code with LSS=0,1;	**5.5.8.5 PROCEDURE #5 Selective Lockout Tests (Paragraph …)** Selective lockout is initiated on receipt of a correctly addressed interrogation UF=4, 5, 20, 21 containing DI=1 or 7 (with LOS=1 and IIS from 1 to 15) or DI = 3 (with LSS= 1 and SIS from 1 to 63). This starts the TL timer associated with the received II or SI code and holds the lockout condition for 18 ±1.0 seconds. Selective lockout applies only to UF=11 with a non-zero II or a non-zero SI (indicated by CL and IC fields) corresponding to the running TL timer. The lockout state, duration, termination and restart are defined and tested as described in Procedure #4. Negative tests follow the same procedures and have the same purpose as described in Procedure #4. ***5.5.8.5.1 Pattern Definition*** a. Level 1 Transponders The patterns below are a list of possible patterns that can be used to run the tests in this procedure for Level 1 Transponders. Positive Interrogation Patterns per Timer (II Related) UF: 4, 5 (2 codes). DI: 1,7 (2 codes). LOS: 1 (1 code). Total: 4 patterns starting lockout per timer. Positive Interrogation Patterns per Timer (SI Related) UF: 4, 5 (2 codes). DI: 3 (1 code). LSS: 1 (1 code). Total: 2 patterns starting lockout per timer. Total Interrogation Patterns per Timer UF: 4, 5 (2 codes). DI: 0,1,2,3,4,5,6,7 (8 codes). LOS: 0, 1 (2 codes). LSS: 0, 1 (2 codes). Positive test patterns: 6. Negative test patterns: 58. Total: 64 possible patterns per timer. b. Pattern Definition of All Other Transponder Designs The patterns below are a list of possible patterns that can be used to run the tests in this procedure for Level 2 Transponders and above. Total Interrogation Pattern per Timer (II Related) UF: 4, 5, 20, 21 (4 codes). DI: 1,7 (2 codes). LOS: 1 (1 code). Total: 8 possible patterns per timer. Positive Interrogation Patterns per Timer (SI Related) UF: 4, 5, 20, 21 (4 codes). DI: 3 (1 code). LSS: 1 (1 code).

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5 codes with SD field bits 23 & 26 = 1 Total: 40 possible patterns for II timers, 36 possible patterns for SI timers. Positive test patterns: 4 or 8. Negative test pattern: 32. *The 8 negative test patterns per UF code are as follows: For each value of DI (0 – 7) set the IIS or SIS code correctly. For DI code values where there is no IIS or SIS subfield within the SD field, set the corresponding bits (bits 17-20 for IIS or 17-22 for SIS). If DI=1 or 7, set LOS=0, for all other values of DI, set bit 26=1. If DI=3, set LSS=0, for all other values of DI, set bit 23=1.* Test Sequence Because 78 timers, each running 18 ±1.0 seconds, are involved, a test sequence is shown here that minimizes the time needed, while providing a comprehensive validation of transponder performance. Principle of Test Sequence A lockout timer is started by a surveillance or Comm-A interrogation and with the next interrogation, the lockout state is verified for UF=11 with the corresponding II or SI. Just before the earliest and just after the latest timer runout duration, lockout and non-lockout state is verified. Timer intervals must be interlaced to verify their independence and to save time. The requirement that each timer can be restarted while running must also be verified. Multisite, T_L Timer and Lockout: Timer Duration and Insensitivity to Non-Valid Signals (All Transponders)	Total: 4 patterns starting lockout per timer. Total Interrogation Patterns per Timer UF: 4, 5, 20, 21 (4 codes). DI: 0,1,2,3,4,5,6,7 (8 codes). LSS: 1 (1 code). Positive test patterns: 12. Negative test patterns: 116 Total: 128 patterns. ***5.5.8.5.2 Test Sequence*** Because seventy eight timers, each running 18 ±1.0 seconds, are involved, a test sequence is shown here that minimizes the time needed, while providing a comprehensive validation of transponder performance. ***5.5.8.5.3 Principle of Test Sequence*** A lockout timer is started by a surveillance or Comm-A interrogation and with the next interrogation, the lockout state is verified for UF=11 with the corresponding II or SI (indicated by CL and IC fields). Just before the earliest and just after the latest timer runout duration, lockout and non-lockout state is verified. For tests #2 and #3 timer intervals shall be interlaced to verify their independence and to save time. The requirement that each timer can be restarted while running shall also be verified. a. Test #1 - Multisite, TL Timer and Lockout: Timer Duration and Insensitivity to Non-Valid Signals (All Transponders) (1) run test for each IIS related TL timer

Time (sec)	Action
0.0	Start timer with UF=4.
0.02	Verify lockout to timer's II or SI with UF=11.
0.04 to 1.62	Verify non-lockout to all other non-locked out IIS and SIS (times 0.9 and 1.1 will be used for the last 2 steps of the sequence for timers started previously with interlace, see *note* below).
2.0	Start next timer for interlace.
3.64	Try timer restart with correct IIS or SIS and incorrect DI-LOS and DI-LSS combinations (DI:0 – 7 = 8 combinations) (see *note* above).
16.9	Verify lockout to timer's II or SI with UF=11.
19.1	Verify non-lockout.

Time (sec)	Action
0.00	Start timer with UF=4, DI= 1, LOS = 1
0.02	Verify lockout to timer's II with UF=11.
0.04 to 9.90	Verify non-lockout to all other IIS and SIS.
10.0	Try timer restart with correct IIS and incorrect DI - LOS combinations (DI= 0, 2, 3, 4, 5, 6 and Bit 26 (location of LOS)=0,1; DI = 1, 7 and LOS = 0 (14 combinations))
13.3	Try timer restart with correct IIS and all DI-LSS combinations (DI=0, 1, 2, 3, 4, 5, 6, 7 and Bit 23 (location of LSS)=0,1 (16 combinations)).
16.9	Verify lockout to timer's II with UF=11.
19.1	Verify non-lockout with UF=11.

If the last test fails, the timer either runs too long or has been restarted by a non-valid signal.

If the last test fails, the timer either runs too long or has been restarted by a

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Test #1 provides the basic timing of a test sequence that satisfies the principles of the test procedure while maintaining a maximum of 50 interrogations per second. Because the test sequence calls for interlacing multisite lockout timers (in this case one is started every 2 seconds), the above sequence will need to accommodate the critical timer verifications that occur at 16.9 and 19.1 seconds relative to the start of each timer. When the test sequence reaches 16.9 and 19.1 seconds after the start of each timer it will be 0.9 and 1.1 after the start of a new timer. Priority is given to verify the lockout of the earlier timer at the correct time, while the verification of non-lockout to all other timers is scheduled around these critical measurements.	non-valid signal. (2) run test for each SIS related TL timer
	Time (sec) / Action 0.00 — Start timer with UF=4, DI = 3, LSS =1. 0.02 — Verify lockout to timer's SI with UF=11. 0.04 to 9.90 — Verify non-lockout to all other IIS and SIS. 10.0 — Try timer restart with correct SIS and all DI-LOS combinations (DI=0, 1, 2, 3, 4, 5, 6, 7 and Bit 26 (location of LOS)=0,1 (16 combinations)) 13.3 — Try timer restart with correct SIS and incorrect DI-LSS combinations (DI=0, 1, 2, 4, 5, 6, 7 and LSS=0,1; DI=3 and Bit 23 (location of LSS) = 0 (15 combinations)). 16.9 — Verify lockout to timer's SI with UF=11. 19.1 — Verify non-lockout with UF=11.
	If the last test fails, the timer either runs too long or has been restarted by a non-valid signal. b. Test #2 - Multisite TL Timer and Lockout: Restart Capability and Sensitivity to Valid Formats (All Transponders) (1) run test for each IIS related TL timer, using DI=1
Multisite T_L Timer and Lockout: Restart Capability and Sensitivity to All Valid Formats (All Transponder)	
Time (sec) / **Action** 0.0 — Start timer with UF=4. 0.02 — Verify lockout to timer's II or SI. 4.5 — Restart timer with UF=5. 21.4 — Verify lockout for timer's II or SI. 23.6 — Verify non-lockout for timer's II or SI.	Time (sec) / Action 0.00 — Start timer with UF=4, DI = 1, LOS = 1 0.02 — Verify lockout to timer's II with UF = 11. 4.5 — Restart timer with UF=5, DI = 1, LOS = 1. 21.4 — Verify lockout for timer's II with UF = 11. 23.6 — Verify non-lockout for timer's II with UF = 11.
Interlace all timers in approximately 0.3-second intervals.	Interlace all timers in approximately 0.3 second intervals.
For Level 2 transponders and above, alternate using UF=4 and UF=20 interrogations to start the timers, and alternate using UF=5 and UF=21 interrogations to restart timers.	
If the test at 21.4 seconds fails, the timer has not been restarted.	If the test at 21.4 seconds fails, the timer has not been restarted.
	(2) run test for each IIS related TL timer, using DI=7
	Time (sec) / Action 0.00 — Start timer with UF=5, DI=7, LOS=1. 0.02 — Verify lockout to timer's II with UF =

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	11.
4.5	Restart timer with UF=4, DI=7, LOS=1.
21.4	Verify lockout for timer's II with UF = 11.
23.6	Verify non-lockout for timer's II with UF = 11.

Interlace all timers in approximately 0.3 second intervals.
If the test at 21.4 seconds fails, the timer has not been restarted

(3) run test for each SIS related TL timer, using DI=3

Time (sec)	Action
0.00	Start timer with UF=4, DI=3, LSS=1.
0.02	Verify lockout to timer's SI with UF = 11.
4.5	Restart timer with UF=5, DI=3, LSS=1.
21.4	Verify lockout for timer's SI with UF = 11.
23.6	Verify non-lockout for timer's SI with UF = 11.

Interlace all timers in approximately 0.3 second intervals.
If the test at 21.4 seconds fails, the timer has not been restarted.

c. Test #3 - Multisite TL Timer and Lockout: Restart Capability and Sensitivity to Valid Formats (Level 2 and above transponders)

(1) run test for each IIS related TL timer, using DI=1

Time (sec)	Action
0.00	Start timer with UF=20, DI=1, LOS=1.
0.02	Verify lockout to timer's II with UF = 11.
4.5	Restart timer with UF=21, DI=1, LOS=1.
21.4	Verify lockout for timer's II with UF = 11.
23.6	Verify non-lockout for timer's II with UF = 11.

Interlace all timers in approximately 0.3 second intervals.
If the test at 21.4 seconds fails, the timer has not been restarted.

(2) run test for each IIS related TL timer, using DI=7

Time (sec)	Action
0.00	Start timer with UF=21, DI=7, LOS=1.
0.02	Verify lockout to timer's II with UF = 11.
4.5	Restart timer with UF=20, DI=7, LOS=1.

21.4	Verify lockout for timer's II with UF = 11.
23.6	Verify non-lockout for timer's II with UF = 11.

Interlace all timers in approximately 0.3 second intervals.
If the test at 21.4 seconds fails, the timer has not been restarted.

(3) run test for each SIS related TL timer using DI=3

Time (sec)	Action
0.00	Start timer with UF=20, DI=3, LSS=1.
0.02	Verify lockout to timer's SI with UF = 11.
4.5	Restart timer with UF=21, DI=3, LSS=1.
21.4	Verify lockout for timer's SI with UF = 11.
23.6	Verify non-lockout for timer's SI with UF = 11.

Interlace all timers in approximately 0.3-second intervals.
If the test at 21.4 seconds fails, the timer has not been restarted.

d. Test #4 - Broadcast Discrimination related to IIS

(1) All transponders
run test for each IIS related TL timer, using interrogations with broadcast address FF FF FF {HEX}

Time (sec)	Action
0.00	Start timer with UF=4, DI=1, LOS=1.
0.02	Verify non-lockout to timer's II with UF = 11.
0.04	Start timer with UF=5, DI=1, LOS=1.
0.06	Verify non-lockout to timer's II with UF = 11.

(2) Level 2 and above transponders
run test for each IIS related TL timer, using interrogations with broadcast address FF FF FF {HEX}

Time (sec)	Action
0.00	Start timer with UF=20, DI=1, LOS=1.
0.02	Verify non-lockout to timer's II with UF = 11.
0.04	Start timer with UF=21, DI=1, LOS=1.
0.06	Verify non-lockout to timer's II with UF = 11.

e. Test #5 - Broadcast Discrimination related to SIS

(1) All transponders

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	run test for each SIS related TL timer, using interrogations with broadcast address FF FF FF {HEX} Time (sec) / Action 0.00 — Start timer with UF=4, DI=3, LSS=1. 0.02 — Verify non-lockout to timer's SI with UF = 11. 0.04 — Start timer with UF=5, DI=3, LSS=1. 0.06 — Verify non-lockout to timer's SI with UF = 11. (2) Level 2 and above transponders run test for each SIS related TL timer, using interrogations with broadcast address FF FF FF {HEX} Time (sec) / Action 0.00 — Start timer with UF=20, DI=3, LSS=1. 0.02 — Verify non-lockout to timer's SI with UF = 11. 0.04 — Start timer with UF=21, DI=3, LSS=1. 0.06 — Verify non-lockout to timer's SI with UF = 11. ***NOTE:*** *Any other test-procedure not involving lockout may be run simultaneously with Test #1 as long as the tests do not interfer with each other.* ***NOTE:*** *After Test #1 has been passed, Tests #2, #3, #4 and #5 can be interlaced with the interrogation acceptance test.*

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2.5.4.6 Procedure #6 Squitter Verification (Subparagraph §…) The squitter function of the transponder **shall** be tested to verify that the transponder correctly generates squitters at the proper rate and with the proper content. Squitters will occur randomly throughout operation of all test procedures. Squitters should be noted by the reply receiver and the test controller as unsolicited replies. Provisions should be made in the test setup to detect squitters, both acquisition and Extended Squitters, and verify their content and rate. If a squitter is detected during the operation of any of the test procedures in this document, the procedure should delay the next scheduled interrogation so that it doesn't overlap the squitter and go undetected by the transponder. The following subparagraphs contain test procedures and expected results that vary according to the aircraft installation for which the transponder is designed, those that support automatic detection of on-the-ground status and those that do not. If a transponder design allows either installation type, the test procedure should be conducted with the transponder switched to support automatic on-the-ground detection and repeated with the transponder switched for installation without automatic on-the-ground detection. If the transponder implements a manual switch to the pilots as per §… to disable the transponder from replying to ATCRBS, ATCRBS/Mode S All Call and Mode S-only All Call interrogations, verify for the following tests that this switch has no effect to Acquisition and Extended Squitter transmissions. Verify that the switch has no effect to CA coding and Extended Squitter format selection.	**5.5.8.6 PROCEDURE #6 Squitter Verification (Paragraphs 3.20.2.6 and 3.21.2.6)** The squitter transmissions function of transponders cannot be externally disabled. Squitters will occur randomly at approximately one-second intervals during all test procedures. As a result, squitter transmissions will be noted by the reply receiver and the test controller as unsolicited replies. Software or hardware provisions shall be made in the test setup so that squitter transmissions are recognized as such, and it should be noted that they occur in the specified random manner. The following is recommended: If an unsolicited reply is detected, the processor shall delay the next scheduled interrogation so that it doesn't overlap the squitter transmissions and remain undetected by the transponder. When squitter transmissions are detected, their content shall be verified observing the CA, AA and PI fields of the transmissions. For diversity transponders, it shall be verified that squitters are transmitted alternately from both channels. For tests of the squitter function, refer to paragraph 5.4.11.2
2.5.4.6.1 Acquisition Squitter Verification The following test **shall** verify proper transmission of Acquisition squitters when the transponder is not transmitting Extended Squitters. The following tests **shall** be conducted with no external data input to the Extended Squitter GICB registers. Step 1: Setup the transponder to airborne status. The Acquisition squitter transmission **shall** be verified to be uniformly distributed between 0.8 and 1.2 seconds with a time quantization less than or equal to 15 milliseconds. The test setup will require measuring the time difference between successive Acquisition squitters. The time interval measured between successive Acquisition squitters **shall** be counted in individual 15 millisecond bins between 0.8 and 1.2 seconds. Validation of the proper quantization is achieved upon receipt of at least one Acquisition squitter in each 15 millisecond time bin between 0.8 and 1.2 seconds. Improper times are those occurring outside of the time bins between 0.8 and 1.2 seconds. Verify that the Acquisition squitters are uniformly distributed over the interval between 0.8 and 1.2 seconds. Step 2: Verify the content of the CA, AA and PI fields. For diversity transponders, verify that the squitters occur alternately from both channels. For transponders that are designed for aircraft installations with automatic means	WG-49 to review the text of ED-73C and consider copying text from DO-181D

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of determining on-the-ground condition, when the transponder is in on-the-ground status, verify that Acquisition squitters occur on the top antenna only at the prescribed rate. ***2.5.4.6.2 Extended Squitter Verification*** Extended squitters occur randomly at rates determined by internal states of the transponder. Each Extended Squitter type must be separately verified for content, rate and antenna selection which are dependent upon transponder air/ground state and Extended Squitter ground station interrogations. The selection of airborne or surface position formats are dependent upon determination of on-the-ground status and ground station control via interrogation content. The following tests **shall** be performed to verify proper operation of the transponder Extended Squitter functions. The external data sources for Extended Squitter loading **shall** be connected via the appropriate interfaces. **2.5.4.6.2.1 Extended Squitter Rate Verification** Extended squitter transmission rate **shall** be verified to be uniformly distributed as specified for each Extended Squitter type in § . The time quantization for each Extended Squitter type **shall** also be verified to be less than or equal to 15 milliseconds. The test setup will require measuring the time difference between successive Extended Squitters of the same type. The time interval measured between successive Extended Squitters of the same type **shall** be counted in individual 15 millisecond bins between the minimum and maximum interval specified in § . Validation of the proper quantization is achieved upon receipt of at least one Extended Squitter in each 15 millisecond time bin in the time interval specified. Improper times are those occurring outside of the time bins within the specified time interval. Verify that the Extended Squitters are uniformly distributed over the specified time interval. Verify the content of the CA, AA and PI fields. For diversity transponders, setup the transponder to transmit airborne format Extended Squitters. Verify that each Extended Squitter type identified in § occur alternately from both channels. For transponders that are designed for aircraft installations with automatic means of determining on-the-ground condition, set the transponder to on-the-ground status and verify that Extended Squitters occur on the top antenna only at the prescribed rates. **2.5.4.6.2.2 Extended Squitter Protocol Verification** The following test verifies the transponder properly transmits Extended Squitters according to the protocol specified in § . Verify the content of the CA, AA and PI fields of all Extended Squitter replies. For the following test, connect the transponder to the appropriate source that provides altitude code input to the transponder. Also, as required, setup to provide Extended Squitter data to ground initiated Comm-	

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B registers 05 {HEX}, 06{HEX}, 07 {HEX}, 08 {HEX}, 09 {HEX} and 0A {HEX} through an external interface as specified in § . Unless otherwise noted, for the following steps, setup the transponder to not inhibit Acquisition squitters and to report barometric pressure altitude in the airborne position report (subfield ATS equals ZERO). For transponders that support automatic detection of air/ground state, setup the transponder to airborne state.	
Step 1 Disable altitude code and all other Extended Squitter data into the transponder. Set the ALT switch to the "off" position. Upon power-up initialization of the transponder, verify that the transponder broadcasts Acquisition squitters but does not broadcast Extended Squitters. Interrogate the transponder with ground initiated Comm-B requests with RR=16, DI=7 and RRS=5, 6, 7 and 9 respectively. Verify that the MB field of the corresponding replies are ZERO. Set the ALT switch to the "on" position. Verify that the transponder continues to broadcast Acquisition squitters but does not broadcast Extended Squitters.	
Step 2 Set the ALT switch to the "on" position and provide altitude code input to the transponder. After power-up initialization, verify that the transponder does not broadcast Extended Squitters. Interrogate the transponder with ground initiated Comm-B requests with RR=16, DI=7 and RRS=5, 6, 9 and 10 respectively. Verify that the altitude is ZERO in the airborne position report and remaining bits are ZERO. Verify that the MB field of the remaining replies are ZERO. Interrogate the transponder with UF=4, RR=17 and DI≠7 and verify that the SCS subfield of the data link capability report is ZERO. Verify that the transponder broadcasts Acquisition squitters.	
Step 3 Provide Extended Squitter updates to the transponder at a one half second rate. Include updates to GICB registers 5, 6, 7, 8 and 9. Use other than ZERO or all ONEs for the airborne position report, aircraft identification report, and the airborne velocity report. Verify that the transponder broadcasts airborne position squitters, airborne identification squitters and airborne velocity squitters at the proper rate and the ME data content matches the data stored in GICB register 5, 8 and 9, respectively. Verify that the SSS and ACS subfields of the airborne position squitter are correct. Interrogate the transponder with ground initiated Comm-B requests with RR=16, DI=7 and RRS=5, 6, 7, 8 and 9, respectively. Verify that the MB field contains the proper data. Repeat except vary the data content of each GICB and verify the data content of each Extended Squitter subsequent to each register update. Interrogate the transponder with RR=17 and DI≠7 and verify that the SCS subfield of the data link capability report is one.	
Step 4 Setup the transponder as in step 3 with Extended Squitter updates to the transponder at a one half second rate. Place the transponder in the airborne state. Stop updates of all Extended Squitter data, except altitude information, to the transponder for GICB registers 05, 06, 07, 08 and 09. Verify that after 2 seconds, all subsequent Extended Squitter ME fields	

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(GICB registers 07 and 09) are ZERO with the exception of the ACS field in the airborne position squitter (GICB register 05) and the airborne identification squitter (GICB register 08). Place the transponder in the ground state and verify that the surface position Extended Squitter ME field (GICB register 06) is ZERO. Repeat the setup as in step 3 with Extended Squitter updates to the transponder at a one half second rate. Place the transponder in the airborne state. Interrogate the transponder with RR=17 and DI=7 and verify that the SCS subfield of the data link capability report is one. After all updates (except altitude information) have ceased for 10 seconds, interrogate to extract the data link capability report and verify that the SCS subfield is ZERO. Interrogate the transponder with ground initiated Comm-B requests with RR=16, DI=7 and RRS=5, 6, 7, 8 and 9 respectively. Verify that the MB fields are ZERO with the exception of the ACS field in the airborne position squitter (GICB register 05) and the airborne identification squitter (GICB register 08). After all updates (except altitude information) have ceased for 60 seconds, verify that airborne identification and airborne velocity Extended Squitters are no longer transmitted. Place the transponder in the ground state and verify that the surface position Extended Squitter (GICB register 06) is no longer transmitted. Return the transponder to the airborne state. Verify that the acquisition squitter and airborne position squitter are broadcast. Set the ALT switch to the "off" position. Verify that the ME field of the airborne position squitter is ZERO. After 60 seconds, verify that the transponder no longer broadcasts airborne position squitters.	
Step 5 Setup the transponder as in step 3 and provide Extended Squitter updates to the transponder at a one half second rate. Stop update of GICB registers 5 and 6 only. After 2 seconds, verify that the ME field of the airborne position squitter is ZERO with the exception of the ACS subfield. Verify that the transponder broadcasts airborne position, aircraft identification and airborne velocity squitters at the proper rate and the ME data content matches the data stored in GICB registers 5, 8 and 9, respectively. Interrogate with RR=16, DI=7 and RRS=5, 6, 8 and 9 and verify the MB fields matches the ME field in the corresponding Extended Squitter reply. After 10 seconds, interrogate to extract the data link capability report and verify that SCS is ZERO. After 60 seconds, verify that airborne position squitters are still transmitted. Set the ALT switch to the “off” position. Verify that the ME field of the airborne position squitter is ZERO. After 60 seconds, verify that the transponder no longer broadcasts airborne position squitters. Verify that aircraft identification and airborne velocity squitters are transmitted throughout the test at the proper rate and with the correct data content.	
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 one half second rate. Include updates to GICB registers 5, 6, 7, 8 and 9. Verify that the ME fields of the airborne position, velocity and aircraft	

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identification squitters match the data input. Stop updates of Extended Squitter data to the transponder for GICB registers 8 and 9 only. After 2 seconds, verify that the ME field of the airborne velocity squitter is ZERO. 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 reports are still transmitted and that aircraft identification and airborne velocity squitters are not transmitted.	
Step 7 Configure the transponder to inhibit Acquisition squitters when Extended Squitters are broadcast. Prior to providing Extended Squitter updates, verify that Acquisition squitters are broadcast. Provide Extended Squitter updates at a one half second rate to GICB registers 5, 6 and 8 and provide altitude code input to the transponder. Verify that Extended Squitters are broadcast and Acquisition squitters are not broadcast. Verify that airborne position and aircraft identification squitters are broadcast at the proper rate and alternately on the top and bottom antenna ports as specified for airborne state if antenna diversity is supported. Additionally provide updates to GICB register 9. Verify the broadcast of airborne position squitters, aircraft identification squitters and airborne velocity squitters at the proper rate and the ME data content matches the data stored in GICB registers 5, 8 and 9, respectively. Verify that the transponder does not broadcast Acquisition squitters. Set the ALT switch to the “off” position and stop update to GICB registers 5, 6, 8 and 9. After 2 seconds, verify that the ME fields of the airborne position and airborne velocity squitters are ZERO. 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 transmissions stop and the transponder resumes Acquisition squitter broadcast. Repeat above sequence except stop update to GICB registers 5 and 6 only. After 2 seconds, verify that the ME field of the airborne position report is ZERO. After 60 seconds, verify that the transponder no longer broadcasts airborne position squitters and continues to broadcast airborne velocity and aircraft identification squitters. Verify that the transponder continues to inhibit the broadcast of Acquisition squitters. Repeat above except stop update to GICB register 9 only. Again, verify that after 2 seconds the ME field of the airborne velocity squitter is ZERO and after 60 seconds, both airborne velocity and Acquisition squitters are not transmitted.	
Step 8 Input GICB register 0A {HEX} and verify that an event-driven Extended Squitter is generated with the proper data content. Update GICB register 0A{HEX]}at a rate less than twice every second. Verify that an event-driven Extended Squitter is generated subsequent to each update with the proper data content. Vary the data content provided externally to the	

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transponder and verify that the data content subsequent to update of the event-driven report is correct. Increase the update rate to exceed twice per second. Verify that the event-driven squitter rate does not exceed twice per second and that the data content reflects the most recent update contents. For the following steps, for those transponders that support automatic detection of on-the-ground status, change the transponder to on-the-ground status. Configure the transponder to not inhibit Acquisition squitters when Extended Squitters are broadcast. Step 9 Upon power-up initialization of the transponder, verify that the transponder broadcasts Acquisition squitters at the proper rate but does not broadcast Extended Squitters. For transponders that support automatic detection of on-the-ground status and diversity, verify that Acquisition squitters occur on the top antenna port only. Interrogate the transponder with GICB requests with RR=16, DI=7 and RRS=5, 6, 8 and 9 respectively. Verify that the MB field of the corresponding replies are ZERO. Step 10 Provide Extended Squitter updates to the transponder at a half second rate. Include updates to GICB registers 5, 6, 8 and 9. Use other than ZERO or all ONEs for the surface position report and the aircraft identification report. Set TRS to ZERO. For transponders that support automatic on-the-ground detection, perform the following: 1. Verify that the transponder broadcasts surface position squitters at the high rate and the ME data content matches the data stored in GICB register 6. 2. Verify that the transponder broadcasts aircraft identification squitters and occur uniformly over the range of 4.8 to 5.2 seconds as specified in § .d. Verify that the ME data content matches the data stored in GICB register 8. 3. Verify that the transponder does not broadcast the airborne position and the airborne velocity squitter. 4. Verify that the transponder does not broadcast Acquisition squitters. 5. Stop update of GICB registers 5, 6, 8 and 9. After 2 seconds, verify that the surface position squitter ME field is ZERO. After 60 seconds, verify that surface position and aircraft identification squitters stop and Acquisition squitters resume. For transponders that do not support automatic on-the-ground detection, verify that airborne position squitters, airborne velocity squitters and aircraft identification squitters are transmitted at the proper rate and data content. Verify that surface position squitters are not emitted. Verify that the transponder broadcasts Acquisition squitters at the proper rate. Repeat except vary the data content of GICB registers 6 and 8 and verify the data content of each Extended Squitter subsequent to each register update. Step 11 For transponders that support automatic on-the-ground detection and can determine surface squitter rate, repeat step 10 with TRS set to 1 and verify that the surface position and aircraft identification squitters occur at the high rate. Change TRS to 2 and repeat except verify that the surface position squitter switches to the low rate and aircraft identification squitters occur	

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uniformly over the range 9.8 to 10.2 seconds as specified in § .d. In all of the above steps, interrogate the transponder with a ground-initiated Comm-B request containing RR=16, DI=7 and RRS=7 and verify that the TRS and ATS subfields are reported properly. ***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 Provide pressure altitude data and Extended Squitter updates to the transponder through the appropriate external interface. Include updates to GICB registers 5, 6, 8 and 9. 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 and for those transponders that support automatic on-the-ground detection, set the transponder to airborne state. Throughout the following step, verify that CA remains equal to 5 for transponders that support automatic on-the-ground detection; otherwise verify CA remains equal to 6. Verify that the transponder continues broadcast of Acquisition squitters throughout the test. Interrogate the transponder with UF=4, PC and RR=0, DI=2, TCS=1, RCS=2, SAS=0. Verify that the transponder broadcasts surface position and aircraft identification squitters for 15 seconds at the low rate and does not broadcast airborne position squitters. Verify that after the 15 second interval the transponder reverts to broadcast of the airborne position squitter and resumes broadcast of the aircraft identification squitter at the high rate. Repeat using an interrogation as above except set TCS=2 and verify that the transponder broadcasts surface position and aircraft identification squitters at the low rate for 60 seconds. After the 60 second interval, verify that the transponder reverts to broadcast of airborne position squitters and resumes broadcast of aircraft identification squitters at the high rate. Interrogate the transponder with UF=4, PC and RR=0, DI=2, TCS=1, RCS=2, SAS=0. Verify that the transponder broadcasts surface position and aircraft identification squitters for 15 seconds at the low rate and does not broadcast airborne position squitters. Prior to the timeout of the 15 second interval, repeat interrogation. Verify that the transponder continues broadcast of the surface position squitter for another 15 seconds from the second interrogation. Repeat using an interrogation as above except set TCS=2 and verify that the transponder broadcasts surface position squitters at the low rate for 60 seconds and prior to the timeout of the 60 second interval, repeat interrogation. Verify that the surface position squitters continue for another 60 seconds from the second interrogation. Repeat first interrogation and within 1 second interval, interrogate with same	

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interrogation except set TCS=3. Verify that the transponder stops broadcast of the surface position squitter and resumes broadcast of the airborne position squitter. Verify that aircraft identification squitters are broadcast at the high rate. Interrogate the transponder with UF=4, PC and RR=0, DI=2, TCS=0, RCS=0, SAS=0. Verify that the transponder continues to broadcast airborne position squitters at the proper rate. Repeat last interrogation with TCS=3, 4, 5, 6, 7 and verify that the transponder correctly broadcasts airborne Extended Squitters at the proper rate and does not broadcast surface position Extended Squitters. 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 broadcasts surface position and aircraft identification squitters for 15 seconds at the low rate. Verify that the transponder resumes broadcast of the surface position squitter after the 15-second interval. Verify that the surface position and aircraft identification squitters occur at the high rate. Repeat using an interrogation as above and after one second, switch the transponder to airborne state. Verify that the transponder broadcasts surface position squitters at the low rate for the full 15-second interval. After the 15 seconds, verify that the transponder broadcasts airborne position squitters at the proper rate. Step 2 Squitter Rate Control 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 airborne state. Except as otherwise noted, verify that the Acquisition squitter is broadcast throughout the following step at the proper rate. Interrogate the transponder with UF=4, PC and RR=0, DI=2, TCS=2, RCS=1 and SAS=0. Verify that the transponder broadcasts surface position squitters for 60 seconds at the high rate and does not broadcast airborne position squitters. Verify that after the 60-second interval the transponder reverts to broadcast of the airborne position squitter. Repeat above procedure except prior to the 60 second interval, repeat the interrogation with TCS=2 and RCS=1 and verify that the transponder continues to transmit surface position squitters another 60 seconds after which the transponder reverts to airborne position squitter transmission. Interrogate the transponder with UF=4, PC and RR=0, DI=2, TCS=0, RCS=1 and SAS=0. Verify that the transponder continues to broadcast airborne position squitters at the proper rate. Repeat last interrogation with TCS=3-7 and verify that the transponder correctly continues to broadcasts airborne position squitters at the proper rate after each interrogation. Interrogate the transponder with UF=4, PC and RR=0, DI=2, TCS=1, RCS=2, SAS=0. Verify that the transponder broadcasts surface position squitters for 15 seconds at the low rate and does not broadcast airborne	

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position squitters. Verify that aircraft identification squitters occur at the low rate. Verify that after the 15-second interval the transponder reverts to broadcast of the airborne position squitter at the high rate and aircraft identification squitters occur uniformly over the range 4.8 to 5.2 seconds as specified in § .d. Repeat using an interrogation as above except set TCS=2. Verify that the transponder broadcasts surface position squitters at the low rate for 60 seconds and reverts to airborne position squitters after the 60-second interval. Also, verify that aircraft identification squitters occur uniformly over the range 9.8 to 10.2 seconds for the 60-second interval and resumes broadcast at the high rate after the 60-second interval. 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 stops broadcast of surface squitters (surface position and aircraft identification squitters) and after 15 seconds resumes broadcast of the airborne position squitter. Repeat the first interrogation and this time follow within 1 second with TCS=0 and RCS=4. Verify that the transponder again stops broadcast of surface squitters and after 15 seconds resumes broadcast of the airborne position squitter. 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 continues the broadcast of the airborne position and aircraft identification squitters at the proper rates. Repeat above except set RCS=2, 3, 4, 5, 6 and 7, respectively and verify that the transponder continues broadcast of the airborne position and aircraft identification squitters at the proper rates following each interrogation. 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 broadcasts surface squitters at the proper rates. Repeat the interrogation except set TCS=0 and RCS=5, 6 and 7, respectively and verify that the transponder continues broadcast of surface position squitters at the proper rate following each interrogation. 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 stops broadcast of surface squitters. Prior to 60 seconds from the first interrogation, repeat the first interrogation except set RCS=0. Verify that the transponder resumes broadcast of the surface position squitter after 60 seconds from the second interrogation. 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	

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interrogation except set TCS=0 and RCS=4. Verify that the transponder stops broadcast of surface squitters. Repeat the first interrogation with RCS=0 within 60 seconds of the first interrogation to prevent timeout of the surface position squitter format and repeat 60 seconds later. After 120 seconds from the second interrogation, verify that the transponder resumes broadcast of the surface position squitter. 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 stops broadcast of surface squitters. Prior to 60 seconds from the first interrogation, repeat the first interrogation. Verify that the transponder immediately resumes broadcast of the surface position squitter at the high rate for 60 seconds. 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. Interrogate the transponder with UF=4, PC and RR=0, DI=2, TCS=0, RCS=3 and SAS=0. Verify that the transponder stops broadcast of surface squitters for 60 seconds and Acquisition squitters are broadcast. After 60 seconds, verify that the transponder resumes broadcast of surface squitters at the high rate and stops transmission of Acquisition squitters. Repeat interrogation except set RCS=4. Verify that the transponder stops broadcast of surface squitters and broadcasts Acquisition squitters for 120 seconds. After 120 seconds, verify that Acquisition squitters are no longer broadcast and the transponder resumes broadcast of surface squitters at the high rate. Repeat interrogation as above except set RCS=0, 5, 6 and 7 delaying 120 seconds between interrogations. Verify that the transponder correctly continues broadcasting surface position squitters at the high rate. 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. 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 broadcasts surface Extended Squitters on the top antenna only and. Verify that the transponder does not broadcast Acquisition squitters. 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 the following interrogations have no impact to Extended Squitter and Acquisition squitter transmissions. Otherwise,	

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verify that the transponder broadcasts extended and Acquisition squitters on the top antenna only. Repeat interrogation except set SAS=1. Verify that each Extended Squitter type and Acquisition squitters occur alternately on the top and bottom antennas. After 120 seconds, verify that the transponder broadcasts extended and Acquisition squitters from the top antenna only. Repeat interrogation except set SAS=2. Verify that the transponder broadcasts extended and Acquisition squitters for 120 seconds from the bottom antenna only. After the 120-second interval, verify that the transponder resumes broadcasting extended and Acquisition squitters from the top antenna only. Repeat interrogation except with SAS=1 followed by an interrogation 10 seconds later with SAS=3. After the second interrogation, verify that the transponder resumes broadcasting extended and Acquisition squitters from the top antenna only. 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. 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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2.5.4.7 Procedure #7 FS and VS Protocol/Code Tests The following procedure verifies the FS, VS and SSS protocol and verifies proper coding. The FS and SSS codes are dependent upon Alert conditions input to the transponder. The FS, VS and also the CA codes are dependent upon the automatically determined on-the-ground condition input to the transponder for installations so equipped. If a manual switch is provided to the pilots as per §… to disable the transponder from replying to ATCRBS, ATCRBS/Mode S All Call, and Mode S-only All Call interrogations, verify that this switch has no effect to the on-the-ground status determination of the aircraft for the following tests. (§…– FS code). (§…– VS code). (§…– SSS code). (§…, §… – protocol). (§…– interface). (Figure 2-13 – Flowchart). This procedure verifies the proper operation of the FS and VS protocols and codes. Transponder States A = Alert Register set. B = T_C timer runs = 16 states, independent. C = T_L timer runs. D = Ground Register set. Interrogation Patterns for the Level 1 Transponder UF=4, 5 with RR=0 = 3 patterns. UF=0. Interrogation Patterns for All Other Transponders UF=4, 5, 20, 21 with RR=0 and 16 through 31. UF=0, 16 = 70 patterns. Transaction Summary 48 transactions. Basic Option Transponder: 64 transactions. ← ACTION ON VAN DONGEN 1120 transactions. Required Code Verification Test Observe that the FS code follows the transponder states as specified in § and verify that VS=1, if and only if the "on-the-ground" input is active. ***Note:*** *The Alert Register is set when the manual or interface input to the ID function is 7500, 7600, 7700.* *The T_C timer is started when the input to the ID function is changed.* *The T_I timer is started when manual or interface input exists for SPI momentarily.* *The Ground Register is set when input to the "on-the-ground" interface indicates that condition.*	**5.5.8.7 PROCEDURE #7 FS and VS Protocol/Code Tests** (Paragraph …- FS code). (Paragraph … - VS code). (Paragraph … - protocol). (Paragraph 3.20.2.11 - interface). (Figure 3-12 - Flowchart). This procedure verifies the proper operation of the FS and VS protocols and codes. ***5.5.8.7.1 Conditions*** Transponder States A = Alert Register set. B = TC timer runs. C = TI timer runs. D = Ground Register set. Total number of independent states = 16. Interrogation Patterns for Level 1 Transponders UF=4, 5, with RR=0 (2 patterns). UF=0, (1 pattern). Interrogation Patterns for All Other Transponders UF=4, 5, 20, 21 with RR=0 and l6 through 31 (68 patterns). UF=0, 16 (2 patterns). Transaction Summary Level 1 Transponder: 48 transactions. All Other Transponders: 1120 transactions. Declared to be functionally equal. Deleted reference to “Basic Option” ***5.5.8.7.2 Required Code Verification Test*** Observe that the FS code follows the transponder states as specified in paragraph xxx and verify that VS=1, if and only if the "on-the-ground" input is active. In particular, the following shall be verified : a. when the input of the ID function is changed to 7500, 7600, 7700 verify that: (1) the alert register is permanently set, (2) the FS field value is 2, 3, or 4, (3) TC is not started (4) verify that the FS field value changes to a value not equal to 2, 3, or 4 only

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	when a new input of the ID function other than 7500, 7600, 7700 is made. b. when the input of the ID function is changed to other values than 7500, 7600, 7700 verify that: (1) the alert register is set, (2) the FS field value is 2, 3, or 4, (3) TC is started, (3) following TC expiry, verify that the FS field value is not 2, 3, nor 4. c. when manual or interface input exists for SPI, verify that : (1) TI timer is started, (2) the FS field value is 4 or 5, (3) following TI expiry, verify that the FS field value is neither 4 nor 5. d. when the "on-the-ground" input is active, verify that : (1) the ground register is set, (2) the FS field value is 1, 3, 4, or 5. e. when the "on-the-ground" input is not active, verify that : (1) the ground register is not set, (2) the FS field value is 0, 2, 4, or 5. The transactions required for this test can be interlaced during the procedures required for interface verification or during any other convenient interval. This can be arranged so that no time is lost in waiting for the timers to run out.
Both are functionally equal, but Roland will take an action to double check	
The transactions required for this test can be interlaced during the procedures required for interface verification or during any other convenient interval. This can be arranged so that no time is lost in waiting for the timers to run out.	
Required Timer Duration Test Duration of each timer run (T_C and T_I) must be verified to be 18 ±1.0 seconds by observation of FS code change.	***5.5.8.7.3 Required Timer Duration Test*** Duration of each timer run (TC and T_I) shall be verified to be 18 ±1.0 seconds by observation of FS code change.
On-the-Ground Validation Test For transponders that support automatic on-the-ground condition input and either implement Extended Squitter formatting or support the on-the-ground validation requirements of § .c, the following test **shall** be performed. The on-the-ground input is used in determining the codes for FS, VS and CA fields. The requirements of Section § .c utilize radio altitude, ground speed and airspeed inputs to validate the on-the-ground status when indicated by the input to the transponder. If the conditions for overriding the on-the-ground status indicated by the input to the transponder, the airborne status **shall** be utilized to select FS, VS and CA field coding. Also, for extender squitter format selection, airborne formats **shall** be transmitted unless overridden by ground station interrogation commands. CA field validation for Acquisition squitters and Extended Squitters is verified as part of Procedure #6 in §2.5.4.6, so the following test can be incorporated as part of that testing. Setup the transponder to indicate on-the-ground status by input to the transponder. With no input of radio altitude, airspeed and ground speed to the transponder, verify that the FS codes are determined by the transponder states above with the Ground Register set to on-the-ground and VS is set to 1. Input radio altitude,	Action on both SC-209 and WG-49 to check the changes in MASPS, MOPS and SARPS documents related to Air/Ground Determination and Verification of On-Ground Status

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airspeed and ground speed to the transponder. Since not all aircraft installations may have access to all three inputs, testing is required for all combinations of inputs being provided to the transponder so that each input is tested individually and collectively. This is to insure that any one input reporting a value that sets airborne status as specified in § .c, properly outputs FS values according to Figure 2-13 with the Ground Register reset to NOT indicate on-the-ground condition and VS is ZERO. If all inputs are supported by the transponder, a total of 27 combinations are required. This represents 9 cases with radio altitude not input, 9 cases with a value above 50 feet and 9 cases with a value below or equal to 50 feet. The same variation for airspeed and ground speed is required except the values selected would be above 100 knots to satisfy the requirement to reset the Ground Register to NOT indicate on-the-ground condition and a value at 100 knots or below to not modify the on-the-ground status. SSS Code Validation Test The SSS subfield is contained in the ME field of airborne Extended Squitters. Setup the transponder to transmit airborne Extended Squitters at the nominal rates. Verify the following: 1) SSS=0 when no alert (the Alert Register is clear and T_C timer is not running) and no SPI condition is active. 2) SSS=1 when Alert Register is set and no SPI Condition is active. 3) SSS=2 when the T_C timer is running and returns to ZERO after the temporary alert has cleared after 18 ±1 seconds. 4) SSS=3 when the T_I timer is set indicating a SPI Condition is active and returns to ZERO after the T_I timer expires. 5) SSS=1 when Alert Register is set and SPI Condition is active. Clear the alert Register during the T_I timer running and verify that SSS=3 until the T_I timer expires. 6) SSS=2 when the T_C timer is running and the T_I timer is running. Start the T_C timer followed by the T_I timer. Verify that SSS equals 3 upon expiration of the T_C timer and returns to ZERO upon T_I timer expiration. 7) SSS=3 when the T_I timer is started. Prior to expiration of the T_I timer, start the T_C timer and verify that SSS equals 2. Upon expiration of the T_C timer, verify that SSS returns to ZERO. 8) SSS=3 when the T_I timer is started. Set the Alert Register while the T_I timer is running and verify that SSS equals 1.	

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2.5.4.8 Procedure #9 Address Tests (§ – addressing discrimination) (§ .a (1) – protection of Mode S address bits) (§ .a (2) – address reporting) (§ .a (3) and § .c – address encoding) (§ – address interface) This test procedure verifies that the address set into the address interface of the transponder is only accepted during power-up or unit reset, that the accepted address set is actually the address to which the transponder responds, and that the accepted address is the only address which the transponder reports in DF=11. It is also verified that this accepted address pattern is used in generating the AP field of replies and that the transponder does reply only to this address.	**5.5.8.8 PROCEDURE #9 Address Tests** (Paragraph - address discrimination) (Paragraph - address reporting) (Paragraphs and c address encoding) (Paragraph 3.20.2.11 - address interface) This test procedure verifies that the address set into the address interface of the transponder is actually the address to which the transponder responds, and the address which the transponder reports in DF=11. It is also verified that this address pattern is used in generating the AP field of replies and that the transponder does reply only to this address.
WG-49 will take an action to understand why the text was written in the manner that it is written.	***5.5.8.9.1 Pattern Selection*** Because more than 16 million addresses are possible, exhaustive testing is not practical. Address test patterns must be chosen so that the most likely failure modes (incorrect wiring of the interface connector, register malfunction, etc.) can be found. As a minimum the 276 address patterns consisting of two ONEs and 22 ZEROs (Pattern group A) and the 276 patterns having two ZEROs and 22 ONEs (Pattern group B) shall be used for verification.
XXXXX Joint Session Ended Review of this Working Paper here XXXXX	***5.5.8.9.2 Transponder Designs***
	Design / No. of UFs / Number of Tests Level 1 / 3 / 1656 Level 2 / 6 / 3312 All Others / 7 / 3864
Test Sequence: 1. Remove power from the transponder under test. 2. Set the transponder address selector device to any valid Mode S address (not all 0's or all 1's), referred to as "address #1." 3. Apply power to the transponder under test and wait a minimum of 2 seconds. 4. Interrogate the transponder with address #1 and observe: Acceptance for all formats. Correct reporting of address # 1 in AA field of DF=11. Correct encoding of address # 1 in AP field of replies. 5. Interrogate the transponder with any Mode S address other than address #1 and observe: Non-acceptance of all formats. 6. Set the transponder address selector device to a different valid Mode S address, referred to as "address #2." 7. Verify correct reporting of address # 1 in AA field of DF=11.	***5.5.8.9.3 Test Sequence*** Set transponder address selector device to each address in pattern group A in turns. Interrogate with the selected address from pattern group A and observe: a. Acceptance for all formats. b. Correct report in AA field of DF=11. c. Correct encoding of AP in replies.

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8. If the transponder is designed to monitor the Mode S address, then: 9. Verify that the transponder generates an appropriate diagnostic error message to indicate that the transponder address has changed. 10. Interrogate the transponder with address #2 and observe: Non-acceptance of all formats. 11. Interrogate the transponder with address #1 and observe: Acceptance of all formats. Correct reporting of address # 1 in AA field of DF=11. Correct encoding of address # 1 in AP field of replies.	**ITEMS IN RED BELOW IN PARA 2.4.4.8 looks like a typo** Interrogate with each address in pattern group B and observe: - Non-acceptance of all formats. Set transponder address selector device to each address in pattern group B in turns. Interrogate with the selected address from pattern group B and observe: (1) Acceptance for all formats. (2) Correct report in AA field of DF=11. (3) Correct encoding of AP in replies.

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2.5.4.16Procedure #16 Broadcast Formats (§…) The broadcast function is verified as part of Procedure #15. A negative test must be conducted to verify that the broadcast function does not occur when short formats are used. Patterns and Sequence: Interrogate with UF=0, 4, 5 and a broadcast address. Verify that no information transfer occurs at uplink interfaces as a result of these interrogations.	**5.5.8.16 PROCEDURE #16 Broadcast All-Call Formats** (Paragraph - Broadcast) The broadcast function is verified as part of Procedure #15. A negative test must be conducted to verify that no data is transfered across the interface when short formats are used. Patterns and Sequence Interrogate with UF=0, 4, 5 and a broadcast address. Verify that no information transfer occurs at uplink interfaces as a result of these interrogations. Interrogate with UF=11. Verify that no information transfer occurs at uplink interfaces as a result of this interrogation.
2.5.4.18A Procedure #18A Enhanced Comm-B Protocol If the transponder adheres to the enhanced air-initiated Comm-B protocol as described in §…, the following test procedures **shall** verify that the enhanced protocol is carried out correctly by the transponder. The following tests verify that: The transponder will properly carry out the Comm-B protocol and will operate with non-selective interrogators, interrogators in multisite configuration and interrogators that will take advantage of the enhanced protocol and extract B messages without making Comm-B reservations. The modified Comm-B protocol test will verify that the transponder can properly carry out the enhanced Comm-B protocol, handling 16 independent B timers, one for each II and up to 16 concurrent Comm-B messages waiting indications to ground interrogators. Procedure: The transponder **shall** be tested according to the guidelines stipulated in procedure 18 with the following additions and/or modifications: Transponder conditions E and F are defined for non-selective and IIS values 1 - 15. The transponder condition G is defined for IIS values 1 - 15. Condition H is no longer a necessary condition since the transponder can have 15 concurrent reservations. Procedure 18 is expanded to include additional combinations of conditions E, F and G. For current transponder state 1, produce 15 additional states with a Comm-B message not waiting for II=1 - 15. As the II varies, vary the number of other Comm-B messages waiting for the remaining II values from 0 - 15. States 2 and 3 must be similarly expanded except these states stipulate a Comm-B message waiting as II varies from 0 - 15. The number of Comm-B messages waiting concurrently with the Comm-B message for the II under test is to vary from 0 - 15. It should be noted that state changes from interrogations will be more extensive with the enhanced protocol and that proper setup is required to produce the required transponder	**5.5.8.19 PROCEDURE #18A - Enhanced Comm-B Protocol** If the transponder adheres to the enhanced air-initiated Comm-B protocol as described in subparagraph 3.21.5.1, the following test procedures shall verify that the enhanced protocol is carried out correctly by the transponder. The following tests verify that: a. The transponder will properly carry out the Comm-B protocol and will operate with non multisite interrogators, interrogators in multisite configuration and interrogators that will take advantage of the enhanced protocol and extract B messages without making Comm-B reservations. b. The modified Comm-B protocol test will verify that the transponder can properly carry out the enhanced Comm-B protocol, handling 16 independent B timers, one for each II and up to 16 concurrent Comm-B messages waiting indications to ground interrogators. ***5.5.8.19.1 Basic Procedures:*** The transponder shall be tested according to the guidelines stipulated in procedure 18 with the following additions and/or modifications: a. Transponder conditions E and F are defined for non multisite and IIS values 1 - 15. The transponder condition G is defined for IIS values 1 - 15. Condition H is no longer a necessary condition since the transponder can have 15 concurrent reservations. b. Procedure 18 is expanded to include additional combinations of conditions E, F and G. For current transponder state 1, produce 15 additional states with a Comm-B message not waiting for II = 1 - 15. As the II varies, vary the number of other Comm-B messages waiting for the remaining II values from 0 - 15. States 2 and 3 must be similarly expanded except these states stipulate a Comm-B message waiting as II varies from 0 - 15. The number of Comm-B messages waiting concurrently with the Comm-B message for the II under test is to vary from 0 - 15. It should be noted that state changes from interrogations will be more extensive with the enhanced protocol and that proper setup is required to produce the required transponder states. It is necessary to produce a Comm- B

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states. It is necessary to produce a Comm- B message waiting for the proper IIS by input of directed Comm-Bs to the transponder or a Comm-B message for II of 0 followed by the extraction by the necessary IIS. Verification of proper transponder state requires multiple interrogations to extract the transponder state for each IIS. An air initiated Comm-B message which is extracted by a non zero IIS potentially changes all 16 Comm-B message states. Those interrogation patterns used to close out a Comm-B message for a given IIS must insure that the proper message for the given IIS is closed out. The reply data for Comm-B messages **shall** be verified. Each of the interrogation patterns 1 through 24 inclusive are now IIS sensitive and must be run for each IIS value. Additionally, verify for each IIS that upon B timer expiration, the message for that IIS is indicated as available to all other available II codes. Repeat the procedures defined above for 2, 3 and 4 segment Comm-Bs and insure that the proper data is indicated in the replies. <u>UM Field Verification</u> In all cases, verify that the transponder reports the proper state in the UM field and the report is for the IIS contained in the interrogation pattern.	message waiting for the proper IIS by input of directed Comm-Bs to the transponder or a Comm-B message for II of 0 followed by the extraction by the necessary IIS. Verification of proper transponder state requires multiple interrogations to extract the transponder state for each IIS. An air initiated Comm-B message which is extracted by a non zero IIS potentially changes all 16 Comm-B message states. Those interrogation patterns used to close out a Comm-B message for a given IIS must insure that the proper message for the given IIS is closed out. The reply data for Comm-B messages shall be verified. Each of the interrogation patterns 1 through 24 inclusive are now IIS sensitive and must be run for each IIS value. c. Additionally, verify for each IIS that upon B timer expiration, the message for that IIS is indicated as available to all other available II codes. Repeat the procedures defined above for 2, 3 and 4 segment Comm-Bs and insure that the proper data is indicated in the replies. UM Field Verification In all cases, verify that the transponder reports the proper state in the UM field and the report is for the IIS contained in the interrogation pattern. ***5.5.8.19.2 Additional Tests*** The Transponder can be in one of the following II sensitive states: a. Test 1: correct handling of multisite message vs. multisite directed message Input a multisite directed message for IIS = 15. Input a multisite message. *Verify that transponder state is #6 for all IIS.* Send interrogation pattern #12 for IIS = 15. Verify that transponder state is #4 for IIS = 15 and unchanged for other IIS.

#	E	F	G	I	STATE
1	0	0	0	0	NULL
2	1	1	0	0	Msg being extracted, not multisite, ready to closeout
3	1	1	0	1	Msg being extracted, not multisite, ready to closeout and process next message
4	1	1	1	0	Msg being extracted, ready to closeout
5	1	1	1	1	Msg being extracted, ready to closeout and process next message
6	1	0	0	0	Msg waiting for an IIS
7	1	0	0	1	2 or more msg waiting for an IIS
8	0	0	1	0	Broadcast msg waiting

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	Send interrogation pattern #12 for IIS = 1.Verify that transponder state is #4 for IIS = 1 and 15 and #1 for other IIS. Send interrogation pattern #12 for IIS = 2. Verify that transponder state remain unchanged for all IIS. Send interrogation pattern #7 for IIS = 15. Verify that transponder state is #1 for IIS = 15 and unchanged for other IIS. Send interrogation pattern #7 for IIS = 1. Verify that transponder state is #1 for IIS = 1, #6 for other IIS (including 15). b. Test 2: parallel delivery of 15 multisite directed messages and correct process when a next message is waiting for a particular IIS. Input a multisite directed message for all IIS. V*erify that transponder state is #6 for all IIS.* Send interrogation pattern #12 for IIS = 1. Verify that transponder state is #4 for IIS = 1 and unchanged for other IIS and that the correct message is included in the reply. Send interrogation pattern #12 for IIS = 2. Verify that transponder state is #4 for IIS = 2 and unchanged for other IIS and that the correct message is included in the reply. Repeat the above for IIS = 3 to 15 (state should then be #4 for all IIS). Input the next multisite directed message for IIS = 1. V*erify that transponder state is #5 for IIS = 1 and unchanged for other IIS.* Send interrogation pattern #24 for IIS = 1. Verify that transponder state is #4 for IIS = 1 and unchanged for other IIS and that the correct message (the second one) is included in the reply. Send interrogation pattern #7 for IIS = 1 to 15. Verify that the transponder state is #1 for IIS = 2 to 15. c. Test 3: 2 multisite directed messages waiting for a same IIS (test of state #7) Input 2 multisite directed message for IIS = 1. Input a multisite message. Verify that transponder state is #7 for IIS = 1, #6 for other IIS. Send interrogation pattern #12 for IIS = 1. Verify that transponder state is #5 for IIS = 1 and unchanged for other IIS and that the correct message is included in the reply. Send interrogation pattern #24 for IIS = 1. Verify that transponder state is #4 and unchanged for other IIS and that the correct message is included in the reply. Send interrogation pattern #7 for IIS = 1. Verify that transponder state is #6 for all IIS (including IIS = 1). All these tests should be run with all combination of IIS values.

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2.5.4.21A Procedure #21A Comm-B Broadcast (§ protocol) Test Procedure: ***Notes:*** *1. The command to the transponder that a Comm-B broadcast message **shall** be sent originates in a peripheral device or in the device that holds the extended capability report.* *2. The Comm-B broadcast does not affect the existing Comm-B protocol, air or ground initiated. The existing test procedures remain unchanged.* *3. Verification of interface patterns is already part of the Comm-B test procedures and need not be repeated for the Comm-B Broadcast.* This test procedure verifies that the Comm-B broadcast protocol is carried out correctly. During the B-protocol test procedure (Procedure #18) insert the appropriate DR code command and text of the Comm-B broadcast into the transponder. Verify that: 1. The transponder does show the DR codes 4, 5, 6, or 7 only when no air-initiated Comm-B transaction is in progress. 2. The Comm-B broadcast message can be extracted by the interrogator for 18 ±1 seconds. 3. The Comm-B broadcast annunciation (DR=4, 5, 6, or 7) and the Comm-B broadcast text are interrupted by an air-initiated Comm-B initiation and reappear when that transaction is concluded. For transponders implementing the enhanced air initiated Comm-B protocol, the transponder will be independently interrupted by up to 16 Comm-B messages that are assigned to each II code. After the Comm-B is concluded for each II, the Comm-B broadcast is again available to that interrogator. Verify that the next waiting broadcast message is not announced to any interrogators until the current broadcast message has timed out for all interrogators. 4. After interruption another 18 ±1 seconds of broadcast time is available to the interrogator. For transponders implementing the enhanced air-initiated Comm-B protocol, the transponder will be independently interrupted by up to 16 Comm-B messages that are assigned to each II code. After interruption, another 18 ±1 seconds of broadcast time is available for each II. 5. A subsequent and different Comm-B broadcast message is announced with the alternate DR code and that this DR code also follows verifications 1 through 4 above. For transponders implementing the enhanced air-initiated Comm-B protocol, the transponder will be independently interrupted by up to 16 Comm-B messages that are assigned to each II code. The subsequent Comm-B broadcast is announced	**5.5.8.23 PROCEDURE #21A Comm-B Broadcast** (Paragraph c protocol) ***5.5.8.23.1 Test Procedure*** ***NOTE 1:*** *The command to the transponder that a Comm-B broadcast message shall be sent originates in a peripheral device or in the device that holds the extended capability report.* ***NOTE 2:*** *The Comm-B broadcast does not affect the existing Comm-B protocol, air or ground initiated. The existing test procedures remain unchanged.* ***NOTE 3:*** *Verification of interface patterns is already part of the Comm-B test procedures and need not be repeated for the Comm-B Broadcast.* This test procedure verifies that the DR code command and the MB field of the Comm-B broadcast protocol is carried out correctly. a. STEP 1 - General Broadcast Protocol Test During the Comm-B protocol test procedure (Procedure #18) insert the appropriate DR Code command and the MB field of the Comm-B broadcast into the transponder. Verify that: (1) The transponder can correctly show the DR codes 4, 5, 6, 7 when NO air initiated Comm B is in progress and that it cannot show DR codes 4, 5, 6, 7 when an air initiated Comm B is in progress. (2) The Comm-B broadcast message can be extracted by the interrogator for 18 ±1 seconds. (3) The Comm-B broadcast annunciation (DR=4, 5, 6, or 7) and the Comm-B broadcast MB field are interrupted by an air-initiated Comm-B and reappear when that transaction is concluded. For transponders implementing the enhanced air initiated Comm-B protocol, the transponder will be independently interrupted by up to 16 Comm-B messages that are assigned to each II code. After the Comm-B is concluded for each II, the Comm-B broadcast is again available to that interrogator. Verify that the next waiting broadcast message is not announced to any interrogators until the current broadcast message has timed out. (4) After interruption another 18 ±1 seconds of broadcast time is available to the interrogator. For transponders implementing the enhanced air-initiated Comm-B protocol, the transponder will be independently interrupted by up to 16 Comm-B messages that are assigned to each II code. After interruption, another 18 ± 1 seconds of broadcast time is available for each II. (5) A subsequent and different Comm-B broadcast message is announced with the alternate DR code and that this DR code also follows the verifications above. For transponders implementing the enhanced air-initiated Comm-B protocol, the transponder will be independently interrupted by up to 16 Comm-B messages that are assigned to each II code. The subsequent

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	Comm-B broadcast is announced only after each Comm-B is broadcast timer has expired for all II codes. b. STEP 2 - Transponder Initiated Broadcast (1) enter an AIS Flight Identification into the transponder. Verify that a broadcast is automatically initiated by the transponder. Extract the broadcast and verify the correct flight ID. Wait 20 seconds to allow the broadcast timer to time out and enter the same AIS value again. Verify that no new broadcast is initiated by the transponder. Repeat the test with a different AIS flight identification. (2) enter a datalink capability report into the transponder. Verify that a broadcast is automatically initiated by the transponder. Extract the broadcast and verify the correct datalink capability report Wait 20 seconds to allow the broadcast timer to time out and enter the same datalink capability report again. Verify that no new broadcast is initiated by the transponder. Repeat the test with a different datalink capability report.

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2.5.4.26 Procedure #26 Comm-D Protocol (§ – SD codes) (§ – UM codes) (§ and § – multisite) (§ through § – multisite) (§ through § – ELM-D) (Figure 2-22 and Figure 2-23 – Flowchart)	**5.5.8.30 PROCEDURE #26A Enhanced Comm-D Protocol (Paragraph 3.21.5.3)** Flowchart: Figures 3-21A and 3-22A
This test procedure verifies that the Comm-D protocol is carried out correctly. The test procedure follows the notation of transponder states and interrogation patterns as shown in the flowcharts. Transponder States	If the transponder adheres to the enhanced multisite downlink ELM protocol as described in subparagraph 3.21.5.3, the following test procedures shall verify that the enhanced protocol is carried out correctly by the transponder. The transponder shall be tested according to the guidelines stipulated in procedure #26 with the following additions and/or modifications: Transponder condition E is defined for non multisite and IIS values 1 - 15. The transponder condition F is no longer meaningful. The test will be expanded to include the additional combinations of condition E since the condition exists for each II. The resulting transponder states consist of all combinations of conditions for each of the 16 II codes. UM Verification In all cases verify that the transponder reports the proper state in the UM field and the report is for the IIS contained in the interrogation pattern. DR Verification Verify the DR code as described with the addition of DR code extraction for all IIS codes under the conditions of concurrent B messages, B broadcast messages and downlink ELMs.

#	E	F	
1	0	0	Not multisite, will accept cancellation or reservation.
2	0	1	Not multisite, will accept cancellation or reservation.
3	1	0	Multisite, will not accept closeout, cancellation, reservation.
4	1	1	Multisite, will accept closeout, cancellation, reservation.

E = T_{RD} timer running.
F = IIS = stored value.
States 3 and 4 are IIS-sensitive and must be used 16 times.
There are 35 transponder states to be used.
Transponder Design
The maximum number of segments that transponders are able to transmit in one burst varies from 4 to 16; the number of tests to be made varies with the burst capability.
Interrogation Patterns

#	H	G	A	B	C	D	I	
1	0	1	0	0	0	0	0	Ordinary interrogation.
2	0	1	0	0	0	1	0	Invalid closeout, DI wrong.
3	0	1	0	0	1	0	0	Invalid reservation, DI wrong.
4	0	1	0	1	0	0	0	Multisite, not for Comm-D.

5	0	1	0	1	0	1	0	Closeout.
6	0	1	0	1	1	0	0	Reservation.
7	0	1	1	0	0	0	0	Cancellation, not multisite.
8	0	1	1	0	0	1	0	Cancellation, not multisite.
9	0	1	1	0	1	0	0	Cancellation, not multisite.
10	0	1	1	1	0	0	0	Cancellation, multisite not for Comm-D.
11	0	1	1	1	0	1	0	Cancellation and possible closeout, multisite.
12	0	1	1	1	1	0	0	Cancellation, not multisite and reservation.
13	1	0	0	0	0	0	0	UF=24, not for Comm-D.
14	1	0	0	0	0	0	1	UF=24, command to transmit segments per SRS.

A = PC=6 cancel D.
B = DI=1 multisite.
C = MES=3, 6 reservation.
D = MES=4, 5, 7 closeout.
G = UF=4, 5, 20, 21.
H = UF=24.
I = RC=3.

Patterns 5, 6, 11, 12, must be used at least 16 times to provide for all II codes.
Pattern 14 must be used as often as necessary to exhaust the SRS and DR codes according to the capability of the transponder.
Verify that cancellation does not occur when the D-register of Figure 2-22 and Figure 2-23 is not set, i.e., when no request for transmission has been complied with yet.
Test Sequence
The number of combinations of transponder states and interrogation patterns is design dependent. All combinations must be exercised.
DR Verification
At the Comm-B downlink interface, apply a request for air-initiated Comm-B (DR=1), and at the Comm-D interface apply a request to send a Comm-D ELM (DR larger than 15).

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Verify that Comm-B has priority by observing that the B-protocol must be closed out before the DR code of the Comm-D transaction appears in replies. Verify that the DR field in DF=4, 5, 20, 21 correctly states the number of segments waiting at the interface to be transmitted. UM Verification If a multisite reservation is made during the test sequence (patterns 6, 12), the following reply will contain IIS and IDS in the UM field according to § . Verify that the UM content is correct. SRS Verification Consider the SRS bit pattern as a code of length corresponding to the maximum burst capability of the transponder. Use all combinations containing two ONEs and all combinations containing two ZEROs for this word length as the test pattern for the following verifications. Verify that the transponder correctly transmits the number and identity of segments requested in the SRS subfield of UF=24 with RC=3. The identity of segments is indicated in the ND field of each segment and must be inserted at the ELM downlink interface. Verify that if SRS requests a segment identity which is not available in this transaction, the transponder will send ND according to the request but will leave the MD field of that reply all ZEROs. Required Negative Tests If PC is not required to be 6, use all other codes. If DI is not required to be 1, use all other codes. If MES is not required to be 3, 4, 5, 6, 7 use all other codes. Insert interrogation formats other than UF=4, 5, 20, 21, 24 one percent of the time to verify that they have no effect on the protocol. Timer Duration and Automatic Closeout Test Arrange the sequence so that the timer runs out occasionally and verify timer duration and closeout. Simultaneous Tests While the transponder is undergoing the verification of the D-Protocol, the number of interrogations can be used to make tests for interface action and message content. These tests are described in Procedures #27 and #28. Enhanced Downlink ELM Protocol If the transponder adheres to the enhanced multisite downlink ELM protocol as described in § , the following test procedures **shall** verify that the enhanced protocol is carried out correctly by the transponder. The transponder **shall** be tested according to the guidelines stipulated above with the following additions and/or modifications: Transponder condition E is defined for non-selective and IIS values 1 - 15. The transponder condition F is no longer meaningful.	

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The test will be expanded to include the additional combinations of condition E since the condition exists for each II. The resulting transponder states consist of all combinations of conditions for each of the 16 II codes. UM Verification In all cases, verify that the transponder reports the proper state in the UM field and the report is for the IIS contained in the interrogation pattern. DR Verification Verify the DR code as described with the addition of DR code extraction for all IIS codes and under the conditions of concurrent B messages, B broadcast messages and downlink ELMs.	
Not in DO-181	**5.5.8.33 PROCEDURE #29 Comm-U Uplink Interface** (Paragraph - uplink interface) (Paragraph - protocol) (Paragraph - MU message, Comm-U used by ACAS) This test procedure verifies that the Comm-U interface serving UF=0, 16 replicates the uplink content as received. ***5.5.8.33.1 Transponder Design*** This uplink interface is a real-time interface that carries the content of both short and long uplink formats UF=0, 16. The design is otherwise not specified and is likely to be tailored to a specific ACAS installation. ***5.5.8.33.2 Interrogation Patterns*** For UF=0, use a total of 702 different patterns for bits 6 through 32 of the interrogation format. There are 351 patterns containing two ONEs and 351 containing two ZEROs. For UF=16, use 6806 "two ONEs-two ZEROs" patterns for bits 6 through 88 of the interrogation. ***5.5.8.33.3 Test Sequence*** Use all required patterns and verify that they appear correctly at the interface and arrive there before the corresponding transmitted reply. **NOTE:** An ACAS installation may be designed so that this interface is not electrically accessible. If such a condition exists, the test procedures for ACAS must be used to verify Comm-U/V performance.

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2.5.4.34 Procedure #34 Coordination (§ and §) This test verifies that the transponder (1) accepts incoming UF=16 interrogations containing a TCAS Resolution Message and passes all necessary information to the TCAS unit, and (2) receives coordination information from the TCAS unit and correctly reports this information in outgoing DF=16 replies. This test requires that the transponder demonstrate proper operation with both FAA TSO-C119A and RTCA/DO-185A compatible transponder/TCAS interfaces.	**5.5.8.38 Procedure #34 Coordination** (Paragraphs and) This test verifies that the transponder (1) accepts incoming UF=16 interrogations containing an ACAS Resolution Message and passes all necessary information to the ACAS unit, and (2) receives coordination information from the ACAS unit and correctly reports this information in outgoing DF=16 replies.
2.5.4.34.1 Procedure #34 Coordination (§ and §) for a Transponder Operating with an FAA TSO-C119A Compatible TCAS	
a. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=2, CHC=0, HRC=0, VSB=7 when no resolution advisory information has been received from the TCAS unit. Show that the transponder sends a DF=16 reply with VDS=48, ARA=0, and RAC=0. Show that the coordination information in the MU field is correctly output on the transponder/TCAS interface.	a. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=2, CHC=0, HRC=0, VSB=7 when no resolution advisory information has been received via the transponder/ACAS interface. Show that the transponder sends a DF=16 reply with VDS=48, ARA=0, and RAC=0. Show that the coordination information in the MU field is correctly output on the transponder/ACAS interface.
b. Send ARA=0 and RAC='0100' to the transponder from the TCAS unit. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=2, CHC=0, HRC=0, VSB=7. Show that the transponder sends a DF=16 reply with VDS=48. Show that the coordination information in the MU field is correctly output on the transponder/TCAS interface.	b. Send ARA=0 and RAC='0100' to the transponder via the transponder/ACAS interface. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=2, CHC=0, HRC=0, VSB=7. Show that the transponder sends a DF=16 reply with VDS=48, ARA=0, and RAC='0100' {Binary}. Show that the coordination information in the MU field is correctly output on the transponder/ACAS interface.
c. Send ARA='00000100000000' and RAC='0100' to the transponder from the TCAS unit. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=2, VRC=0, CHC=0, HRC=0, VSB=13. Show that the transponder sends a DF=16 reply with VDS=48, ARA='00000100000000', and RAC='0100'. Show that the coordination information in the MU field is correctly output on the transponder/TCAS interface.	c. Send ARA='00 0001 0000 0000' {Binary} and RAC='0100' {Binary} to the transponder via the transponder/ACAS interface. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=2, VRC=0, CHC=0, HRC=0, VSB=13. Show that the transponder sends a DF=16 reply with VDS=48, ARA='00 0001 0000 0000' {Binary}, and RAC='0100' {Binary}. Show that the coordination information in the MU field is correctly output on the transponder/ACAS interface.
d. Send ARA='00000100000000' and RAC=0 to the transponder from the TCAS unit. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=2, VRC=0, CHC=0, HRC=0, VSB=13. Show that the transponder sends a DF=16 reply with	d. Send ARA='00 0001 0000 0000' {Binary} and RAC=0 to the transponder via the transponder/ACAS interface. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=2, VRC=0, CHC=0, HRC=0, VSB=13. Show that the transponder sends a DF=16 reply with VDS=48, ARA='00

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VDS=48. Show that the coordination information in the MU field is correctly output on the transponder/TCAS interface. e. Send ARA=0 and RAC=0 to the transponder from the TCAS unit. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=1, CHC=0, HRC=0, VSB=14. Show that the transponder sends a DF=16 reply with VDS=48, ARA=0, and RAC=0. Show that the coordination information in the MU field is correctly output on the transponder/TCAS interface.	0001 0000 0000' {Binary}, and RAC=0. e. Send ARA=0 and RAC=0 to the transponder via the transponder/ACAS interface. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=1, CHC=0, HRC=0, VSB=14. Show that the transponder sends a DF=16 reply with VDS=48, ARA=0, and RAC=0. **NOTE:** When the resolution advisory is ended, the ARA and RAC fields reflect this change immediately in the DF=16 reply but not until 18 seconds has elapsed for the DF=20, 21 Resolution Advisories Report.
2.5.4.34.2 Procedure #34 Coordination (§ and §) for a Transponder Operating with an RTCA/DO-185A Compatible TCAS a. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=2, CHC=0, HRC=0, VSB=7 when no resolution advisory information has been received from the TCAS unit. Show that the transponder sends a DF=16 reply with VDS=48, ARA=0, RAC=0, RAT=0, and MTE=0. Show that the coordination information in the MU field is correctly output on the transponder/TCAS interface. b. Send ARA=0, RAC='0100', RAI=1, and MTE=0 to the transponder from the TCAS unit. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=2, CHC=0, HRC=0, VSB=7. Show that the transponder sends a DF=16 reply with VDS=48. Show that the coordination information in the MU field is correctly output on the transponder/TCAS interface. c. Send ARA='11100000000000', RAC='0100', RAI=0, and MTE=0 to the transponder from the TCAS unit. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=2, VRC=0, CHC=0, HRC=0, VSB=13. Show that the transponder sends a DF=16 reply with VDS=48, ARA='11100000000000', RAC='0100', RAT=0, and MTE=0. Show that the coordination information in the MU field is correctly output on the transponder/TCAS interface. d. Send ARA='11100000000000', RAC=0, RAI=0, and MTE=1 to the transponder from the TCAS unit. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=2, VRC=0, CHC=0, HRC=0, VSB=13. Show that the transponder sends a DF=16 reply with VDS=48, ARA='11100000000000', RAC=0, RAT=0, and MTE=1. Show that the coordination information in the MU field is correctly output on the	

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transponder/TCAS interface. e. Send ARA=0, RAC=0, RAI=1, MTE=0 to the transponder from the TCAS unit. This RAI=1 is intended to represent the transition from RAI=0 to RAI=1 indicating the end of ARA='11100000000000' in d, above. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=1, CHC=0, HRC=0, VSB=14. Show that the transponder sends a DF=16 reply with VDS=48. Show that the coordination information in the MU field is correctly output on the transponder/TCAS interface.	

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5.5.8.39 Procedure #35 MU Messages To TCAS (§…) This test verifies that the transponder correctly: 1) accepts UF=16 interrogations with MU data containing a TCAS Resolution Message (UDS=48) and passes all necessary information to the TCAS unit; 2) accepts UF=16 broadcast interrogations with MU data containing a TCAS Broadcast Message (UDS=50) and passes all necessary information to the TCAS unit; 3) does not transfer the MU data of UF=16 discrete interrogations with UDS≠48 and broadcast interrogations with UDS≠50 to the TCAS unit. a. Interrogate the transponder with a valid UF=16 TCAS Coordination Message (UDS1=3, UDS2=0). Verify that the transponder replies with a valid DF=16 Coordination Reply Message and the data content of the MU field is correctly output on the transponder/TCAS interface. b. In one second, interrogate the transponder with ten UF=16 interrogations, each containing a TCAS Broadcast Message (UDS1=3, UDS2=2, and interrogation address all ONEs), each containing a unique "own" Mode S address (i.e., ten different Mode S addresses). Verify that the MU data for each interrogation is correctly output on the transponder/TCAS interface. c. Interrogate the transponder at the rate of 10 per second or less with 255 UF=16 interrogations addressed to the transponder with UDS values from 0 to 255 except for UDS=48. Verify that the transponder does not output the messages over the transponder/TCAS interface. d. Interrogate the transponder at the rate of 10 per second or less with 255 UF=16 broadcast interrogations with UDS values from 0 to 255 except for UDS=50. Verify that the transponder does not output the messages over the transponder/TCAS interface.	**5.5.8.38 Procedure #34 Coordination** (Paragraphs and) This test verifies that the transponder (1) accepts incoming UF=16 interrogations containing an ACAS Resolution Message and passes all necessary information to the ACAS unit, and (2) receives coordination information from the ACAS unit and correctly reports this information in outgoing DF=16 replies. a. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=2, CHC=0, HRC=0, VSB=7 when no resolution advisory information has been received via the transponder/ACAS interface. Show that the transponder sends a DF=16 reply with VDS=48, ARA=0, and RAC=0. Show that the coordination information in the MU field is correctly output on the transponder/ACAS interface. b. Send ARA=0 and RAC='0100' to the transponder via the transponder/ACAS interface. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=2, CHC=0, HRC=0, VSB=7. Show that the transponder sends a DF=16 reply with VDS=48, ARA=0, and RAC='0100' {Binary}. Show that the coordination information in the MU field is correctly output on the transponder/ACAS interface. c. Send ARA='00 0001 0000 0000' {Binary} and RAC='0100' {Binary} to the transponder via the transponder/ACAS interface. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=2, VRC=0, CHC=0, HRC=0, VSB=13. Show that the transponder sends a DF=16 reply with VDS=48, ARA='00 0001 0000 0000' {Binary}, and RAC='0100' {Binary}. Show that the coordination information in the MU field is correctly output on the transponder/ACAS interface. d. Send ARA='00 0001 0000 0000' {Binary} and RAC=0 to the transponder via the transponder/ACAS interface. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=2, VRC=0, CHC=0, HRC=0, VSB=13. Show that the transponder sends a DF=16 reply with VDS=48, ARA='00 0001 0000 0000' {Binary}, and RAC=0. e. Send ARA=0 and RAC=0 to the transponder via the transponder/ACAS interface. Interrogate the transponder with a UF=16 interrogation with UDS=48, MTB=0, CVC=0, VRC=1, CHC=0, HRC=0, VSB=14.

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	Show that the transponder sends a DF=16 reply with VDS=48, ARA=0, and RAC=0. **NOTE:** When the resolution advisory is ended, the ARA and RAC fields reflect this change immediately in the DF=16 reply but not until 18 seconds has elapsed for the DF=20, 21 Resolution Advisories Report.
No DO-181 ref	**5.5.8.39 PROCEDURE #35 ACAS Broadcast Message** (Paragraph) This test verifies that the transponder accepts incoming UF=16 interrogations containing an ACAS Broadcast Message and passes all necessary information to the ACAS unit. In one second, interrogate the transponder with ten UF=16 interrogations, each containing an ACAS Broadcast Message (UDS1=3, UDS2=2, and interrogation address=all 1's), each containing a unique "own" Mode S address (i.e., ten different Mode S addresses). Show that incoming information is correctly output on the transponder/ACAS interface.
No DO-181 ref	**1.1.1.1 5.5.8.44 Procedure #40 - Mode S Transponder Hijack Mode (2.7)** This procedure is only applicable to transponders that support the Hijack Mode. Part 1 of this procedure verifies that the transponder intended for a Dual Antenna System and Dual Diversity Transponder Configuration properly executes all the Hijack Mode Entry requirements specified in 2.7 for the Mode S Transponder Hijack Mode. Part 2 of this procedure verifies that the transponder intended for a Single Antenna System and Dual Diversity Transponder Configuration properly executes all the Hijack Mode Entry requirements specified in 2.7 for the Mode S Transponder Hijack Mode. Parts 3 and 4 of this procedure tests the functions of the Hijack Modes and contains the actual tests which are common to both types of installation configuration. These tests are called out specifically in Parts 1 and 2 as needed. Part 5 of this procedure tests the power interrupt operations of the Hijack Modes. ***NOTE:*** *This entire procedure assumes that the transponder is configured such that the Air/Ground discrete inputs are being used to inhibit replies in accordance with 2.5 d.* ***5.5.8.44.1 Part 1 - Dual Antenna System and Dual Diversity Transponder Configuration*** ***NOTE:*** *This procedure applies* to the transponder in a Dual Antenna Systems and Dual Diversity Transponder *configuration.* a. Initial State = Active On With the transponder being in the Active On and Airborne states and **NOT** in the Hijack Mode: (1). Normal Non-Hijack Operation (initial test state) Provide the transponder with a 4096 Identity Code of “7777” and a Sensitivity Level Control (SLC) of “0” decimal, and **NO** SPI. Provide the

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	transponder with an altitude input of 8,000 feet. Ensure that the altitude reporting function of the transponder is **NOT** inhibited. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Replies to all Mode-A interrogations with the 4096 Identity Code of "7777" and **NO** SPI Pulse. (b). Replies to all Mode-C interrogations with an encoded altitude of 8,000 feet. (c). Replies to all Mode S All-Call and Mode S-only All-Call interrogations with an appropriate DF=11 Mode S reply. (d). Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 8,000 feet. (e). Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7777". (f). Properly provides the on-board TCAS (if TCAS equipped) with an SLC = 0 decimal via the Transponder/TCAS interface (g). Properly provides the on-board TCAS (if TCAS equipped) with a 4096 Identity Code set to "7777". (h). Is **NOT** indicating the Hijack mode. (2). Standard "7500" Code Entry (2.7.2, 2.7.2.1.1 b) With the transponder in the Active On and Airborne states, provide the transponder with a 4096 Identity Code of "7500" and a Sensitivity Level Control (SLC) of "0" decimal, and **NO** SPI. Provide the transponder with an altitude input of 8,000 feet. (a). Approximately 10 seconds after providing the 4096 Identity Code of "7500", verify the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing all the Airborne tests as called out in Part 3 a. (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 3 of these test procedures and exit the Hijack Mode as called out in Part 3 b. (5). (c). Provide the transponder with a 4096 Identity Code of "7500". Approximately 10 seconds after providing the 4096 Identity Code of "7500", verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing all the On-Ground tests as called out in Part 3.b. (3). "7500" Code Entry with SPI (2.7.2.2, 2.7.2.2.1.a) With the transponder in the Active On and Airborne states, provide the transponder with a 4096 Identity Code of "7500" and a Sensitivity Level Control (SLC) of "0" decimal. Provide the transponder with an altitude input of 8,000 feet. As soon as possible, thereafter, initiate the SPI (Ident)

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	function. (a). Immediately after providing the SPI function, verify the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the Airborne General Requirements tests as called out in Part 3.a.(1). (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 3 of these test procedures and exit the Hijack Mode as called out in Part 3.b.(5). (c). Provide the transponder with a 4096 Identity Code of "7500". As soon as possible, thereafter, initiate the SPI (Ident) function. Immediately after providing the SPI function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the On-Ground General Requirements tests as called out in Part 3.b.(1). (d). Exit the Hijack Mode as called out in Part 3.b.(5). of these test procedures. (4). Hijack Mode Discrete Initialization (2.7.2.3, 2.7.2.3.1.a) With the transponder in the Active On and Airborne states, provide the transponder with a 4096 Identity Code of "7777" and a Sensitivity Level Control (SLC) of "0" decimal. Provide the transponder with an altitude input of 8,000 feet. Activate the Hijack Mode Discrete function for approximately one second, then deactivate the Hijack Mode Discrete function. (a). Immediately after activating the Hijack Mode Discrete function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the Airborne General Requirements tests as called out in Part 3.a.(1). (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 3 of these test procedures and exit the Hijack Mode as called out in Part 3.b.(5). (c). Activate the Hijack Mode Discrete function for approximately one second, then deactivate the Hijack Mode Discrete function. Immediately after activating the Hijack Mode Discrete function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the On-Ground General Requirements tests as called out in Part 3.b.(1). (d). Exit the Hijack Mode as called out in Part 3.b.(5). of these test procedures. b. Initial State = Standby With the transponder being in the Standby and Airborne states and **NOT** in the Hijack Mode: (1). Normal Non-Hijack Operation (initial test state) Provide the transponder with a 4096 Identity Code of "7777" and a Sensitivity Level Control (SLC) of "1" decimal, and **NO** SPI. Provide the

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	transponder with an altitude input of 8,000 feet. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Does **NOT** reply to any of the interrogations. (b). Does **NOT** emit squitter transmissions. (c). Does **NOT** indicate that it **IS** in the Standby Hijack Mode. (2). Standard "7500" Code Entry (2.7.2.1, 2.7.2.1.1.b) With the transponder in the Standby and Airborne states, provide the transponder with a 4096 Identity Code of "7500" and a Sensitivity Level Control (SLC) of "1" decimal, and **NO** SPI. Provide the transponder with an altitude input of 8,000 feet. (a). Approximately 10 seconds after providing the 4096 Identity Code of "7500", verify that the transponder has entered the Standby Hijack mode by proceeding to Part 4 of these test procedures and performing all the Airborne tests as called out in Part 4.a. (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 4 of these test procedures and exit the Hijack Mode as called out in Part 4.b.(4). (c). Provide the transponder with a 4096 Identity Code of "7500". Approximately 10 seconds after providing the 4096 Identity Code of "7500", verify that the transponder has entered the Standby Hijack mode by proceeding to Part 4 of these test procedures and performing all the On-Ground tests as called out in Part 4.b. (3). "7500" Code Entry with SPI (2.7.2.2, 2.7.2.2.1.b) With the transponder in the Standby and Airborne states, provide the transponder with a 4096 Identity Code of "7500" and a Sensitivity Level Control (SLC) of "1" decimal. Provide the transponder with an altitude input of 8,000 feet. As soon as possible, thereafter, initiate the SPI (Ident) function. (a). Immediately after providing the SPI function, verify that the transponder has entered the Standby Hijack mode by proceeding to Part 4 of these test procedures and performing the Airborne General Requirements tests as called out in Part 4.a.(1). (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 4 of these test procedures and exit the Hijack Mode as called out in Part 4.b.(4). (c). Provide the transponder with a 4096 Identity Code of "7500". As soon as possible, thereafter, initiate the SPI (Ident) function. Immediately after providing the SPI function, verify that the transponder has entered the Standby Hijack mode by proceeding to Part 4 of these test

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	procedures and performing the On-Ground General Requirements tests as called out in Part 4.b.(1). (d). Exit the Hijack Mode as called out in Part 4.b.(4). of these test procedures. (4). Hijack Mode Discrete Initialization (2.7.2.3, 2.7.2.3.1.b) With the transponder in the Standby and Airborne states, provide the transponder with a 4096 Identity Code of "7777" and a Sensitivity Level Control (SLC) of "1" decimal. Provide the transponder with an altitude input of 8,000 feet. Activate the Hijack Mode Discrete function for approximately one second, then deactivate the Hijack Mode Discrete function. (a). Immediately after activating the Hijack Mode Discrete function, verify that the transponder has entered the Standby Hijack mode by proceeding to Part 4 of these test procedures and performing the Airborne General Requirements tests as called out in Part 4.a.(1). (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 4 of these test procedures and exit the Hijack Mode as called out in Part 4.b.(4). (c). Activate the Hijack Mode Discrete function for approximately one second, then deactivate the Hijack Mode Discrete function. Immediately after activating the Hijack Mode Discrete function, verify that the transponder has entered the Standby Hijack mode by proceeding to Part 4 of these test procedures and performing the On-Ground General Requirements tests as called out in Part 4.b.(1). (d). Exit the Hijack Mode as called out in Part 4.b.(4). of these test procedures. ***5.5.8.44.2 Part 2 - Single Antenna System and Dual Diversity Transponder Configuration*** ***NOTE:*** *This procedure applies to the transponder in a Single Antenna System and Dual Diversity Transponder configuration.* a. Initial State = Active On With the transponder being in the Active On and Airborne states and **NOT** in the Hijack Mode: (1). Normal Non-Hijack Operation (initial test state) Provide the transponder with a 4096 Identity Code of "7777" and a Sensitivity Level Control (SLC) of "0" decimal, and **NO** SPI. Provide the transponder with an altitude input of 8,000 feet. Ensure that the altitude reporting function of the transponder is **NOT** inhibited. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Replies to all Mode-A interrogations with the 4096 Identity Code of "7777" and **NO** SPI Pulse.

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	(b). Replies to all Mode-C interrogations with an encoded altitude of 8,000 feet. (c). Replies to all Mode S All-Call and Mode S-only All-Call interrogations with an appropriate DF=11 Mode S reply. (d). Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 8,000 feet. (e). Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7777". (f). Properly provides the on-board TCAS (if TCAS equipped) with an SLC = 0 decimal via the Transponder/TCAS interface (g). Properly provides the on-board TCAS (if TCAS equipped) with a 4096 Identity Code set to "7777". (h). Is **NOT** indicating the Hijack mode. (2). Standard "7500" Code Entry (2.7.2.1, 2.7.2.1.2.a) With the transponder in the Active On and Airborne states, provide the transponder with a 4096 Identity Code of "7500" and a Sensitivity Level Control (SLC) of "0" decimal, and **NO** SPI. Provide the transponder with an altitude input of 8,000 feet. (a). Approximately 10 seconds after providing the 4096 Identity Code of "7500", verify the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing all the Airborne tests as called out in Part 3.a. (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 3 of these test procedures and exit the Hijack Mode as called out in Part 3.b.(5). (c). Provide the transponder with a 4096 Identity Code of "7500". Approximately 10 seconds after providing the 4096 Identity Code of "7500", verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing all the On-Ground tests as called out in Part 3.b. (3). "7500" Code Entry with SPI (2.7.2.2, 2.7.2.2.2.a) With the transponder in the Active On and Airborne states, provide the transponder with a 4096 Identity Code of "7500" and a Sensitivity Level Control (SLC) of "0" decimal. Provide the transponder with an altitude input of 8,000 feet. As soon as possible, thereafter, initiate the SPI (Ident) function. (a). Immediately after providing the SPI function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the Airborne General Requirements tests as called out in Part 3.a.(1). (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 3 of these test procedures and exit the Hijack Mode as

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	called out in Part 3.b.(5). (c). Provide the transponder with a 4096 Identity Code of "7500". As soon as possible, thereafter, initiate the SPI (Ident) function. Immediately after providing the SPI function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the On-Ground General Requirements tests as called out in Part 3.b.(1). (d). Exit the Hijack Mode as called out in Part 3.b.(5). of these test procedures. (4). Hijack Mode Discrete Initialization (2.7.2.3, 2.7.2.3.2.a) With the transponder in the Active On and Airborne states, provide the transponder with a 4096 Identity Code of "7777" and a Sensitivity Level Control (SLC) of "0" decimal. Provide the transponder with an altitude input of 8,000 feet. Activate the Hijack Mode Discrete function for approximately one second, then deactivate the Hijack Mode Discrete function. (a). Immediately after activating the Hijack Mode Discrete function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the Airborne General Requirements tests as called out in Part 3.a.(1). (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 3 of these test procedures and exit the Hijack Mode as called out in Part 3.b.(5). (c). Activate the Hijack Mode Discrete function for approximately one second, then deactivate the Hijack Mode Discrete function. Immediately after activating the Hijack Mode Discrete function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the On-Ground General Requirements tests as called out in Part 3.b.(1). (d). Exit the Hijack Mode as called out in Part 3.b.(5). of these test procedures. b. Initial State = Standby With the transponder being in the Standby and Airborne states and **NOT** in the Hijack Mode: (1). Normal Non-Hijack Operation (initial test state) Provide the transponder with a 4096 Identity Code of "7777" and a Sensitivity Level Control (SLC) of "0" decimal, and **NO** SPI. Provide the transponder with an altitude input of 8,000 feet. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Does **NOT** reply to any of the interrogations.

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	(b). Does **NOT** emit squitter transmissions. (c). Does **NOT** indicate that it **IS** in the Active Hijack Mode. (2). Standard "7500" Code Entry (2.7.2.1, 2.7.2.1.2.b) With the transponder in the Standby and Airborne states, provide the transponder with a 4096 Identity Code of "7500" and a Sensitivity Level Control (SLC) of "0" decimal, and **NO** SPI. Provide the transponder with an altitude input of 8,000 feet. (a). Approximately 10 seconds after providing the 4096 Identity Code of "7500", verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing all the Airborne tests as called out in Part 3.a. (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 3 of these test procedures and exit the Hijack Mode as called out in Part 3.b.(5). (c). Set the transponder to the Standby state and provide the transponder with a 4096 Identity Code of "7500". Approximately 10 seconds after providing the 4096 Identity Code of "7500", verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing all the On-Ground tests as called out in Part 3.b. (3). "7500" Code Entry with SPI (2.7.2.2, 2.7.2.2.2.b) With the transponder in the Standby and Airborne states, provide the transponder with a 4096 Identity Code of "7500" and a Sensitivity Level Control (SLC) of "0" decimal. Provide the transponder with an altitude input of 8,000 feet. As soon as possible, thereafter, initiate the SPI (Ident) function. (a). Immediately after providing the SPI function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the Airborne General Requirements tests as called out in Part 3.a.(1). (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 3 of these test procedures and exit the Hijack Mode as called out in Part 3.b.(5). (c). Set the transponder to the Standby state and provide the transponder with a 4096 Identity Code of "7500". As soon as possible, thereafter, initiate the SPI (Ident) function. Immediately after providing the SPI function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the On-Ground General Requirements tests as called out in Part 3.b.(1). (d). Exit the Hijack Mode as called out in Part 3.b.(5). of these test procedures.

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	(4). Hijack Mode Discrete Initialization (2.7.2.3, 2.7.2.3.2.b) With the transponder in the Standby and Airborne states, provide the transponder with a 4096 Identity Code of "7777" and a Sensitivity Level Control (SLC) of "0" decimal. Provide the transponder with an altitude input of 8,000 feet. Activate the Hijack Mode Discrete function for approximately one second, then deactivate the Hijack Mode Discrete function. (a). Immediately after activating the Hijack Mode Discrete function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the Airborne General Requirements tests as called out in Part 3.a.(1). (b). Provide the transponder with an altitude input of 500 feet and set the transponder to the On-Ground state. Proceed to Part 3 of these test procedures and exit the Hijack Mode as called out in Part 3.b.(5). (c). Set the transponder to the Standby state. Activate the Hijack Mode Discrete function for approximately one second, then deactivate the Hijack Mode Discrete function. Immediately after activating the Hijack Mode Discrete function, verify that the transponder has entered the Active Hijack mode by proceeding to Part 3 of these test procedures and performing the On-Ground General Requirements tests as called out in Part 3.b.(1). (d). Exit the Hijack Mode as called out in Part 3.b.(5). of these test procedures. ***5.5.8.44.3 Part 3 - Active Hijack Mode Operation (2.7.3)*** ***NOTE:*** *This procedure applies to the **Active On** transponder in a Dual Antenna Systems and Dual Diversity Transponder configuration and to both transponders in a Single Antenna System and Dual Diversity Transponder configuration.* a. Airborne Testing With the transponder being in the Active Hijack mode and the Airborne state, provide the transponder with a Sensitivity Level Control (SLC) of "0" decimal and an altitude input of 8,000 feet. (1). General Requirements Tests (2.7.3.1.a, b, 2.7.5.a) Immediately after the transponder enters Active Hijack mode, interrogate the transponder with Mode-A, Mode S All-Call, Mode S-only All-Call, Mode S UF = 5, and UF = 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Replies to all Mode-A interrogations with the 4096 Identity Code of "7500". (b). Replies to all Mode-A interrogations with the SPI Pulse set for a period of 18 +/- 1 seconds. (c). Replies to all Mode S All-Call and Mode S-only All-Call interrogations

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	with an appropriate DF=11 Mode S reply. (d). Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of “7500”. (e). Continues to emit squitter transmissions. (f). Properly indicates that it IS in the Active Hijack Mode. (g). Properly indicates the Alert Status in the "FS" field in accordance with sections 3.18.4.12 and 3.20.2.7. (2). Altitude Reporting Requirements Tests (2.7.3.1.1) (a). Interrogate the transponder with Mode-C, Mode S UF = 4 and UF = 20 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-C interrogations with an encoded altitude of 8,000 feet. [2]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 8,000 feet. (b). Attempt to inhibit the Altitude Reporting function of the transponder. Interrogate the transponder with Mode-C, Mode S UF = 4 and UF = 20 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-C interrogations with an encoded altitude of 8,000 feet. [2]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 8,000 feet. (c). Provide the transponder with an INVALID altitude input of 10,000 feet. Interrogate the transponder with Mode-C, Mode S UF = 4 and UF = 20 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-C interrogations with framing pulses only. [2]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an Altitude Field (AC) of all ZERO’s. (d). Restore the Valid altitude input of 8,000 feet. (3). TCAS Communication Requirements Tests (2.7.3.1.2) (a). Provide the transponder with a Sensitivity Level Control (SLC) of “1” decimal. Verify that the transponder (if TCAS equipped): [1]. Properly provides the on-board TCAS with an SLC = 1 decimal via the Transponder/TCAS interface [2]. Properly provides the on-board TCAS with a 4096 Identity Code set to “7500”. (b). Provide the transponder with a Sensitivity Level Control (SLC) of “2” decimal. Verify that the transponder (if TCAS equipped) properly provides the on-board TCAS with an SLC = 2 decimal via the Transponder/TCAS interface.

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	(c). Provide the transponder with a Sensitivity Level Control (SLC) of "0" decimal. Verify that the transponder (if TCAS equipped) properly provides the on-board TCAS with an SLC = 2 decimal via the Transponder/TCAS interface (4). Loss of Control and Attempted Control Changes Tests (2.7.3.1.c, and 2.7.3.3) (a). Disable the capability to provide the transponder with a 4096 Identity Code of "7500", a Sensitivity Level Control (SLC) and other control functions. Ensure that the altitude reporting function of the transponder **IS** inhibited. (Note that if the Altitude Reporting function is selected via the control function, it should be inhibited automatically by removal of the control function capability). Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all Mode-C interrogations with an encoded altitude of 8,000 feet. [3]. Replies to all Mode S All-Call and Mode S-only All-Call interrogations with an appropriate DF=11 Mode S reply. [4]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 8,000 feet.. [5]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [6]. Continues to emit squitter transmissions. [7]. Does **NOT** provide TCAS with SLC, 4096 Identity Code or any other Control information since the Control Function has been lost. ***NOTE:*** *The loss of control information to the TCAS Computer may result in a TCAS System fail if the test configuration is integrated with TCAS.* [8]. Properly indicates that it **IS** in the Active Hijack Mode. (b). Restore the control function capability to the transponder and set the control function to a setting that attempts to place the transponder into the Standby state. Interrogate the transponder with Mode-A, Mode S UF = 5 and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [3]. Properly indicates that it **IS** in the Active Hijack Mode. (c). Provide the transponder with a 4096 Identity Code of "1200".

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	Interrogate the transponder with Mode-A, Mode S UF = 5 and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [3]. Properly indicates that it **IS** in the Active Hijack Mode. (d). Provide the transponder with a valid altitude of 10,000 feet on the Alternate Air Data Source. Command the transponder to use the Alternate Air Data Source. Interrogate the transponder with Mode-C, Mode S UF = 4 and 20 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-C interrogations with an encoded altitude of 8,000 feet. [2]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 8,000 feet.. [3]. Properly indicates that it IS in the Active Hijack Mode. (e). Command the transponder to Functional Test mode. Interrogate the transponder with Mode-A, Mode S UF = 5 and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [3]. Properly indicates that it IS in the Active Hijack Mode. (f). Activate the SPI command to the transponder. Interrogate the transponder with Mode-A, Mode S UF =4, 5, 20 and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [3]. Indicates that the SPI is **NOT** active in the FS field of DF=4, 5, 20 and 21 replies. [4]. Properly indicates that it **IS** in the Active Hijack Mode. (5). Attempted Hijack Mode Exit Verification (2.7.6.1) Activate the means to exit the Hijack Mode. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds.

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	Verify that the transponder: (a). Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. (b). Replies to all Mode-C interrogations with an encoded altitude of 8,000 feet. (c). Replies to all Mode S All-Call and Mode S-only All-Call interrogations with an appropriate DF=11 Mode S reply. (d). Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 8,000 feet. (e). Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". (f). Continues to emit squitter transmissions. (g). Properly provides the on-board TCAS (if TCAS equipped) with an SLC = 2 decimal via the Transponder/TCAS interface. (h). Properly provides the on-board TCAS (if TCAS equipped) with a 4096 Identity Code set to "7500". (i). Properly indicates that it IS in the Active Hijack Mode. b. On-Ground Testing With the transponder being in the Active Hijack mode and the On-Ground state, provide the transponder with a Sensitivity Level Control (SLC) of "0" decimal and an altitude input of 500 feet. (1). General Requirements Tests (2.7.3.1.a,b, 2.7.3.2) Immediately after the transponder enters Active Hijack mode, interrogate the transponder with Mode-A, Mode S All-Call, Mode S-only All-Call, Mode S UF = 5 and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. (b). Replies to all Mode S All-Call and Mode S-only All-Call interrogations with an appropriate DF=11 Mode S reply. (c). Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". (d). Continues to emit squitter transmissions. (e). Properly indicates that it **IS** in the Active Hijack Mode. (f). Properly indicates the Alert Status in the "FS" field in accordance with sections 3.18.4.12 and 3.20.2.7. (2). Altitude Reporting Requirements Tests (2.7.3.1.1) (a). Interrogate the transponder with Mode-C, Mode S UF = 4 and 20 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-C interrogations with an encoded altitude of 500 feet. [2]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of

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	500 feet. (b). Attempt to inhibit the Altitude Reporting function of the transponder. Interrogate the transponder with Mode-C, Mode S UF = 4 and 20 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-C interrogations with an encoded altitude of 500 feet. [2]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 500 feet. (c). Provide the transponder with an INVALID altitude input of 1,000 feet. Interrogate the transponder with Mode-C, Mode S UF = 4 and 20 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-C interrogations framing pulses only. [2]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an Altitude Field (AC) set to all ZERO's. (d). Restore the Valid altitude input of 500 feet. (3). TCAS Communication Requirements Tests (2.7.3.1.2) (a). Provide the transponder with a Sensitivity Level Control (SLC) of "1" decimal. Verify that the transponder (if TCAS equipped): [1]. Properly provides the on-board TCAS with an SLC = 1 decimal via the Transponder/TCAS interface [2]. Properly provides the on-board TCAS with a 4096 Identity Code set to "7500". (b). Provide the transponder with a Sensitivity Level Control (SLC) of "2" decimal. Verify that the transponder (if TCAS equipped) properly provides the on-board TCAS with an SLC = 2 decimal via the Transponder/TCAS interface. (c). Provide the transponder with a Sensitivity Level Control (SLC) of "0" decimal. Verify that the transponder (if TCAS equipped) properly provides the on-board TCAS with an SLC = 2 decimal via the Transponder/TCAS interface (4). Loss of Control and Attempted Control Changes Tests (2.7.3.1.c, and 2.7.3.3) (a). Disable the capability to provide the transponder with a 4096 Identity Code of "7500", a Sensitivity Level Control (SLC) and other control functions. Ensure that the altitude reporting function of the transponder IS inhibited. (Note that if the Altitude Reporting function is selected via the control function, it should be inhibited automatically by removal of the control function capability). Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call,

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	Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all Mode-C interrogations with an encoded altitude of 500 feet. [3]. Replies to all Mode S All-Call and Mode S-only All-Call interrogations with an appropriate DF=11 Mode S reply. [4]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 500 feet. [5]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [6]. Continues to emit squitter transmissions. [7]. Does **NOT** provide TCAS with SLC, 4096 Identity Code or any other Control information since the Control Function has been lost. ***NOTE:*** *The loss of control information to the TCAS Computer may result in a TCAS System fail if the test configuration is integrated with TCAS.* [8]. Properly indicates that it **IS** in the Active Hijack Mode. (b). Restore the control function capability to the transponder and set the control function to a setting that attempts to place the transponder into the Standby state. Interrogate the transponder with Mode-A, Mode S UF = 5 and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [3]. Properly indicates that it IS in the Active Hijack Mode. (c). Provide the transponder with a 4096 Identity Code of "1200". Interrogate the transponder with Mode-A, Mode S UF = 5 and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [3]. Properly indicates that it **IS** in the Active Hijack Mode. (d). Provide the transponder with a valid altitude of 1,000 feet on the Alternate Air Data Source. Command the transponder to use the Alternate Air Data Source. Interrogate the transponder with Mode-C, Mode S UF = 4 and 20 interrogations for a minimum period of 20 seconds. Verify that the transponder:

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	[1]. Replies to all Mode-C interrogations with an encoded altitude of 500 feet. [2]. Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 500 feet.. [3]. Properly indicates that it **IS** in the Active Hijack Mode. (e). Command the transponder to Functional Test mode. Interrogate the transponder with Mode-A, Mode S UF = 5 and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [3]. Properly indicates that it **IS** in the Active Hijack Mode. (f). Activate the SPI command to the transponder. Interrogate the transponder with Mode-A, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Replies to all Mode-A interrogations with the 4096 Identity Code of "7500" and **NO** SPI pulse. [2]. Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". [3]. Indicates that the SPI is **NOT** active in the FS field of DF=4, 5, 20 and 21 replies. [4]. Properly indicates that it **IS** in the Active Hijack Mode. (5). Hijack Mode Exit Verification (2.7.6.2) Provide the transponder with a 4096 Identity Code of "7777". Set the control function to an Active On setting. Activate the means to exit the Hijack Mode. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Does **NOT** reply to Mode-A, Mode-C, Mode S All-Call, or Mode S-only All-Call interrogations. (b). Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7777". (c). Indicates that the Hijack Mode Exit has been accomplished successfully. (d). Properly indicates that it **IS NOT** in the Active Hijack Mode. ***5.5.8.44.4 Part 4 - Standby Hijack Mode Operation (2.7.4)*** ***NOTE:*** *This procedure applies to the **Standby** transponder in a Dual Antenna Systems and Dual Diversity Transponder configuration.* a. Airborne Testing With the transponder being in the Standby Hijack mode and Airborne

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	states, provide the transponder with a Sensitivity Level Control (SLC) of "1" decimal, and an altitude input of 8,000 feet. (1). General Requirements Tests (2.7.4.1.b, c, d, 2.7.5.b) Immediately after the transponder enters Standby Hijack mode, interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Does **NOT** reply to any of the interrogations. (b). Does **NOT** emit squitter transmissions. (c). Properly indicates that it **IS** in the Standby Hijack Mode. (2). TCAS Communication Requirements Tests (2.7.4.2) (a). Provide the transponder with a Sensitivity Level Control (SLC) of "1" decimal. Verify that the transponder (if TCAS equipped): [1]. Properly provides the on-board TCAS with an SLC =1 decimal via the Transponder/TCAS interface [2]. Properly provides the on-board TCAS with a 4096 Identity Code set to "7500". (b). Provide the transponder with a Sensitivity Level Control (SLC) of "2" decimal. Verify that the transponder (if TCAS equipped) properly provides the on-board TCAS with an SLC = 2 decimal via the Transponder/TCAS interface (c). Provide the transponder with a Sensitivity Level Control (SLC) of "0" decimal. Verify that the transponder (if TCAS equipped) properly provides the on-board TCAS with an SLC = 2 decimal via the Transponder/TCAS interface (3). Loss of Control and Attempted Control Changes Tests (2.7.4.1.a, and 2.7.4.3) (a). Disable the capability to provide the transponder with a 4096 Identity Code of "7500", a Sensitivity Level Control (SLC) and other control functions. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Does **NOT** reply to any of the interrogations. [2]. Does **NOT** emit squitter transmissions. [3]. Does **NOT** provide TCAS with SLC, 4096 Identity Code or any other Control information since the Control Function has been lost. ***NOTE:*** *The loss of control information to the TCAS Computer may result in a TCAS System fail if the test configuration is integrated with TCAS.* [4]. Properly indicates that it **IS** in the Standby Hijack Mode.

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	(b). Restore the control function capability to the transponder and set the control function to a setting that attempts to place the transponder into the Active On state. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Does **NOT** reply to any of the interrogations. [2]. Does **NOT** emit squitter transmissions. [3]. Properly indicates that it **IS** in the Standby Hijack Mode. (c). Command the transponder to Functional Test mode. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Does **NOT** reply to any of the interrogations. [2]. Does **NOT** emit squitter transmissions. [3]. Properly indicates that it **IS** in the Standby Hijack Mode. (4). Attempted Hijack Mode Exit Verification (2.7.6.1) Activate the means to exit the Standby Hijack Mode. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Does **NOT** reply to any of the interrogations. (b). Does **NOT** emit squitter transmissions. (c). Properly provides the on-board TCAS (if TCAS equipped) with an SLC = 2 decimal via the Transponder/TCAS interface. (d). Properly provides the on-board TCAS (if TCAS equipped) with a 4096 Identity Code set to “7500”. (e). Properly indicates that it **IS** in the Standby Hijack Mode. b. On-Ground Testing With the transponder being in the Standby Hijack mode and the On-Ground state, provide the transponder with a Sensitivity Level Control (SLC) of “1” decimal and an altitude input of 500 feet. (1). General Requirements Tests (2.7.4.1.b, c, d, 2.7.5.b) Immediately after the transponder enters Standby Hijack mode, interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: (a). Does **NOT** reply to any of the interrogations. (b). Does **NOT** emit squitter transmissions. (c). Properly indicates that it **IS** in the Standby Hijack Mode. (2). TCAS Communication Requirements Tests (2.7.4.2)

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	(a). Provide the transponder with a Sensitivity Level Control (SLC) of "1" decimal. Verify that the transponder (if TCAS equipped): [1]. Properly provides the on-board TCAS with an SLC = 1 decimal via the Transponder/TCAS interface [2]. Properly provides the on-board TCAS with a 4096 Identity Code set to "7500". (b) Provide the transponder with a Sensitivity Level Control (SLC) of "2" decimal. Verify that the transponder (if TCAS equipped) properly provides the on-board TCAS with an SLC = 2 decimal via the Transponder/TCAS interface (c) Provide the transponder with a Sensitivity Level Control (SLC) of "0" decimal. Verify that the transponder (if TCAS equipped) properly provides the on-board TCAS with an SLC = 2 decimal via the Transponder/TCAS interface (3). Loss of Control and Attempted Control Changes Tests (2.7.4.1.a, and 2.7.4.3) (a). Disable the capability to provide the transponder with a 4096 Identity Code of "7500", a Sensitivity Level Control (SLC) and other control functions. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Does **NOT** reply to any of the interrogations. [2]. Does **NOT** emit squitter transmissions. [3]. Does **NOT** provide TCAS with SLC, 4096 Identity Code or any other Control information since the Control Function has been lost. ***NOTE:*** *The loss of control information to the TCAS Computer may result in a TCAS System fail if the test configuration is integrated with TCAS.* [4]. Properly indicates that it **IS** in the Standby Hijack Mode. (b). Restore the control function capability to the transponder and set the control function to a setting that attempts to place the transponder into the Active On state. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder: [1]. Does **NOT** reply to any of the interrogations. [2]. Does **NOT** emit squitter transmissions. [3]. Properly indicates that it **IS** in the Standby Hijack Mode. (c). Command the transponder to Functional Test mode. Interrogate the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum

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	period of 20 seconds. Verify that the transponder: [1]. Does **NOT** reply to any of the interrogations. [2]. Does **NOT** emit squitter transmissions. [3]. Properly indicates that it **IS** in the Standby Hijack Mode. (4). Hijack Mode Exit Verification (2.7.6.2) Provide the transponder with a 4096 Identity Code of "7777". Activate the means to exit the Hijack Mode. Verify that the transponder: (a). Indicates that the Hijack Mode Exit has been accomplished successfully. (b). Properly indicates that it **IS NOT** in the Standby Hijack Mode. ***5.5.8.44.5 Part 5 - Power Interrupt Operations*** a. Normal Non-Hijack Operation (2.7.5.c,d) (1). Active On Mode Set the transponder to the Active On state and **NOT** in the Hijack Mode. Interrupt the power to the transponder for a period of approximately 1-2 seconds. Verify that the transponder: (a). Does **NOT** give a false indication that the Active Hijack mode is active. (b). Does **NOT** give a false indication that the Standby Hijack mode is active (for transponders intended for installation in a Dual Antenna Systems and Dual Diversity Transponder configuration). (2). Standby Mode Set the transponder to the Standby state and **NOT** in the Hijack Mode. Interrupt the power to the transponder for a period of approximately 1-2 seconds. Verify that the transponder: (a). Does **NOT** give a false indication that the Active Hijack mode is active. (b). Does **NOT** give a false indication that the Standby Hijack mode is active (for transponders intended for installation in a Dual Antenna Systems and Dual Diversity Transponder configuration). b. Active Hijack Mode (2.7.7) ***NOTE:*** *This procedure applies to the **Active On** transponder in a Dual Antenna Systems and Dual Diversity Transponder configuration and to both transponders in a Single Antenna Systems and Dual Diversity Transponder configuration.* (1). Hijack Mode Initialization With the transponder being in the Active On and Airborne states and **NOT** in the Hijack Mode, provide the transponder with a valid altitude input of 8,000 feet and a Sensitivity Level Control (SLC) of "0" decimal. Ensure that the altitude reporting function of the transponder IS inhibited. Then, initiate the Activate Hijack mode via either of the methods identified in Part 1 or Part 2 of these test procedures. After the transponder has entered the Active Hijack mode, interrogate

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	the transponder with Mode-A, Mode-C, Mode S All-Call, Mode S-only All-Call, Mode S UF = 4, 5, 20, and 21 interrogations for a minimum period of 20 seconds. Verify that the transponder properly annunciates that it **IS** in the Hijack Mode. (2). Power Interruption: Interrupt the power to transponder for a period of approximately 10 seconds. Retain the conditions applied to the transponder in Part 5.b.(1), except set the 4096 Identity Code to "7777". Then, restore power to the transponder. Verify that the transponder: (a). Replies to all Mode-A interrogations with the 4096 Identity Code of "7500". (b). Replies to all Mode-A interrogations with the SPI Pulse set for a period of 18 +/- 1 seconds after restoration of power. (c). Replies to all Mode-C interrogations with an encoded altitude of 8,000 feet. (d). Replies to all Mode S All-Call and Mode S-only All-Call interrogations with an appropriate DF=11 Mode S reply. (e). Replies to all UF = 4, UF = 20 Mode-S interrogations with an altitude of 8,000 feet. (f). Replies to all UF = 5, UF = 21 Mode-S interrogations with an ID field of "7500". (g). Properly provides the on-board TCAS (if TCAS equipped) with an SLC = 2 decimal via the Transponder/TCAS interface. (h). Properly provides the on-board TCAS (if TCAS equipped) with a 4096 Identity Code set to "7500". (i). Properly annunciates that it **IS** in the Hijack Mode. (3). On-Ground Hijack Mode Exit Set the transponder to the On-Ground state and activate the means to exit the Hijack Mode. Verify that the transponder: (a). Indicates that the Hijack Mode Exit has been accomplished successfully. (b). Properly annunciates that it **IS NOT** in the Active Hijack Mode. c. Standby Hijack Mode (2.7.7) ***NOTE:*** *This procedure applies to the **Standby** transponder in a Dual Antenna Systems and Dual Diversity Transponders configuration.* (1). Standby Hijack Mode Initialization With the transponder being in the Standby and Airborne states and **NOT** in the "Standby Hijack" mode, initiate the Standby Hijack mode via either of the methods identified in Part 1 of these test procedures. At least 10 seconds after initiating the Hijack Mode, verify that the transponder properly indicates that it **IS** in the Standby Hijack Mode. (2). Power Interruption:

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	Interrupt the power to transponder for a period of approximately 10 seconds. Retain the conditions applied to the transponder in Part 5.c.(1), except set the 4096 Identity Code to "7777". Then, restore power to the transponder. Verify that the transponder: (a). Properly annunciates that it **IS** in the Standby Hijack Mode. (3). On-Ground Hijack Mode Exit Set the transponder to the On-Ground state and activate the means to exit the Hijack Mode. Verify that the transponder: (a). Indicates that the Hijack Mode Exit has been accomplished successfully. (b). Properly annunciates that it **IS NOT** in the Standby Hijack Mode.