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- 2.2.24.1 **Ground Initiated Comm.-B**

Commentary: *The Ground Initiated Comm.-B requirements provided in this section are included to provide continuity to understanding the implementation of Elementary and Enhanced surveillance. As such, it provides the baseline for all Comm.-B Data Selector (BDS) register extraction by an interrogator.*

The Mode-S Transponders **shall** support extraction of BDS Registers **1,0 / 1,7 / 1,8** - through- **1,C / 2,0 / 2,1 (Optional) / 4,0 / 5,0 / 5,F (Optional)** and **6,0** using the Ground Initiated Comm.-B Protocols in accordance RTCA Document No. DO-181C section **2.2.19.1.12.3.**

2.2.24.2 Surveillance Identifier (“SI”) Code Requirements

2.2.24.2.1 MOPS / ICAO Requirements Relevant to “SI”

Mode-S Transponders support the requirements of the Surveillance Identifier (“SI”) codes in accordance with the following sections of this document.

- a. Section 2.2.14.11., “DI” Designator, Identification Field
- b. Section 2.2.14.17., “II” Interrogator Identification Field
- c. Section 2.2.14.4.29., “PI” Parity / Interrogator Identity
- d. Section 2.2.14.4.35., “SD” Special Designator and “IIS”, Subfield in “SD”
- e. Section 2.2.14.4.9., “CL” Code Label
- f. Section 2.2.14.4.15., “IC” Interrogator Code
- g. Section 2.2.14.4.36., “SI” Surveillance Identifier
- h. Section 2.2.18.2.1., Basic Mode-S Error Protection
- i. Section 2.2.18.2.5., “Multisite Lockout Protocol”
- j. Section 2.2.18.2.6., “Acquisition Squitter”
- k. Section 2.2.23.1.1., “Extended Squitter Format (DF=17)”
- l. Section 2.2.18.2.9., “All-Call Reply Protocol”

2.2.24.2.2 Declaration of Capability in BDS 1,0

See subparagraph 2.2.25.1.1.c.(4) of this appendix.

2.2.24.3 Flight Identification and Aircraft Registration Requirements

2.2.24.3.1 Flight Identification GICB Extraction Protocol

2.2.24.3.1.1 Flight Identification (Aircraft Registration) Reporting

The Mode-S Transponder *shall* support Flight Identification and Aircraft Registration reporting in accordance with section 2.2.19.1.13 of this document.

2.2.24.3.2 Flight Identification Change Annunciation

If the aircraft identification reported in the “AIS” subfield is changed in flight (i.e., during a power-on cycle) then the transponder *shall* report the new aircraft identification to the ground in accordance with section 2.2.19.1.13.e by use of the Comm.-B Broadcast Message protocol (see section 2.2.19.1.12.4.1).

2.2.24.3.3 BDS 2,0 __ Aircraft Identification and Data Sources

2.2.24.3.3.1 Purpose and Definition of Aircraft Identification

Appendix B, Table **B-3-32** provides full definition of BDS 2,0.

The Mode-S transponder *shall* comply with all constraints and requirements for servicing BDS Register **2,0** that are expressed in Appendix B, Table **B-3-32**.

2.2.24.3.3.2 Definition of Aircraft Registry Data

Appendix B, Table **B-3-33** provides full definition of BDS Register **2,1**.

The Mode-S transponder *shall* comply with all constraints and requirements for servicing BDS Register **2,1** that are expressed in Appendix B, Table **B-3-33** for BDS Register **2,1**.

2.2.24.3.4 Flight Identification and / or Aircraft Registration Data Usage

2.2.24.3.4.1 ICAO Guidelines (i.e., Requirements)

Use of Flight Identification or Aircraft Registration Data in BDS **2,0** *shall* comply with the following guidelines:

Note: *Aircraft Registration Data may also be used in BDS Register 0,8 when Extended Squitter is implemented. As such, the requirements inferred below will also apply to BDS Register 0,8 when Extended Squitter is implemented.*

- a. In accordance with the intent of ICAO Annex 10, Volume IV, Section **3.1.2.9**, if Flight Identification data is available at anytime during unit operation, then flight identification data *shall* be inserted into the character subfields of BDS Register **2,0** HEX.

Note: *Flight Identification data is normally provided via ARINC Labels 233 through 237 or by Label 360 for block transfer data. Available data means that the status of the data is not set to No Computed Data (NCD).*

- b. If Flight Identification data is **NOT** available then Aircraft Registration *shall* be inserted into the character subfields of BDS Registers **2,0** HEX.
- c. If Flight Identification data has been entered into BDS register **2,0** HEX and then becomes NOT available, then the character subfields of the registers *shall* be set to all **ZERO**'s.
- d. In all of the above cases, encoding of the character subfields in BDS Register **2,0** HEX *shall* conform to ICAO Annex 10, Volume IV, section **3.1.2.9**, where:
 - (1). All characters will be left justified prior to encoding the Character fields.
 - (2). Characters will be coded consecutively without intervening SPACE codes.
 - (3). Any unused character spaces at the end of the subfield should contain a SPACE character code.
 - (4). Any extra characters shall be truncated.

2.2.24.3.4.2 Aircraft Registration __ (Optional)

Note: *Elementary Surveillance does not require that BDS Register 2,1 is used. However, if it is implemented, the following subparagraphs need to be complied with.*

- a. If valid Aircraft Registration data is available, then the data *shall* be used to fill the Characters in BDS **2,1**, "Aircraft and Airline Registration Markings" as shown in **Appendix B, Table B-3-33**:

Note: Aircraft Registration data is normally provided via ARINC Labels 301 through 303 or by Label 360 for block transfer data. Available data means that the status of the data is not set to No Computed Data (NCD).

- b. There is currently no method to provide the transponder with ICAO Airline Registration marking. Therefore, bits **44** -through- **56** of BDS **2,1** *shall* be set to **zero**.
- c. When BDS Register **2,1** is being serviced with Aircraft Registration data, then BDS Register **2,1** register *shall* be available for GICB Extraction as per section 2.2.24.1.

2.2.24.3.4.2.1 BDS 2,1 __ Update Rates

- a. The minimum update rate at which BDS Register **2,1** *shall* be reloaded with valid data is **15.0** seconds.

(Effectively, BDS Register **2,1** must be updated every **15.0** seconds or sooner).
- b. If BDS Register **2,1** cannot be updated within a **30.0** second timeframe (e.g., twice the specified minimum update rate of **15.0** seconds), then the contents of BDS Register **2,1** *shall* be set to **ZERO** and:
 - (1). Bit **24** of BDS Register **1,8** *shall* not change state if BDS Register **2,1** has been properly serviced during the power-on cycle. If BDS Register **2,1** has not been properly serviced during the power on cycle, then bit 24 of BDS Register **1,8** must be verified as being set to **ZERO**. (see section 2.2.24.3 of this appendix)
- c. The time between availability of data that causes a change in BDS Register **2,1** and the time that the change is made to BDS Register **2,1** *shall* be less than the minimum update rate specified as **15.0** seconds.

Note: The time between establishing availability of data and the time of updating BDS Register **2,1** should be minimized (e.g., data latency should be minimized).

2.2.24.3.5 Flight Identification or Aircraft Registration Declaration of Capability

2.2.24.3.5.1 In BDS Register 1,0 __ Data Link Capability Report

Refer to Appendix B, Table **B-3-16** for full definition of BDS Register **1,0**.

Servicing of BDS Register **2,0** requires the updating of BDS Register **1,0** as follows:

- a. BDS Register **1,0** (Data Link Capability Report) bit **33** *shall* be set to **"1"** if the transponder is receiving any data from the Aircraft installation with which to service BDS Register **2,0** with Flight Identification or Aircraft Registration data as provided in the respective sections for each BDS register in the subsequent sections of this document.

Note: This requirement is not established by the transponder LRU own capability to service BDS Register **2,0**. Rather, it is established by the

Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 2,0.

- b. BDS Register 1,0 (Data Link Capability Report) bit 33 *shall* be set to "0" if the transponder is receiving no data from the Aircraft installation that could be used to properly service BDS Register 2,0.

2.2.24.3.5.2 In BDS 1,7 __ Common Usage GICB Capability Report

Refer to Appendix B, Table B-3-23 for full definition of BDS Register 1,7.

The Mode-S transponder *shall* comply with all constraints and notes provided in Appendix B, Table B-3-23 for BDS Register 1,7.

2.2.24.3.5.2.1 Flight Identification Servicing

- a. BDS Register 1,7 bit 7 *shall* be set to "1" if the transponder is receiving either Aircraft Identification (also referred to as Flight Identification as specified in the Flight Plan) or Aircraft Registration (which should be assigned based on the Mode-S 24-bit Address) data in the Aircraft installation.

***Note:** This requirement is not established by the transponder LRU own capability to service BDS Register 2,0. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 2,0.*

- b. BDS Register 1,7 bit 7 *shall* be set to "0" if the transponder is receiving no data from the Aircraft installation that could be used to properly service BDS Register 2,0.

2.2.24.3.5.2.2 Aircraft Registration Servicing (Optional)

***Note:** Enhanced Surveillance does not require that BDS Register 2,1 is used. However, if it is implemented, the following subparagraphs need to be complied with.*

- a. BDS Register 1,7 bit 8 *shall* be set to "1" if the transponder is receiving Aircraft Registration (which should be assigned based on the Mode-S 24-bit Address) data in the Aircraft installation.

***Note:** This requirement is not established by the transponder LRU own capability to service BDS Register 2,1. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 2,1.*

- b. BDS Register 1,7 bit 8 *shall* be set to "0" if the transponder is receiving no data from the Aircraft installation that could be used to properly service BDS Register 2,1.

2.2.24.3.5.3 In BDS 1,8 -through- 1,C __ Mode-S Specific Services Capability Report

Refer to Appendix B, Table B-3-24 -through- B-3-28 for full definition of BDS Registers 1,8 -through- 1,C respectively.

The Mode-S transponder *shall* comply with all constraints and notes provided in Appendix B, Table **B-3-24** –through- **B-3-28** for BDS Registers **1,8** -through- **1,C** respectively.

Note: *BDS Registers 1,8 –through- 1,C are used to indicate which Registers are being serviced by the installation for Mode-S Specific Services.*

2.2.24.3.5.3.1 Flight Identification Servicing

- a. BDS Register **1,8** bit **25** *shall* be set to "1" if the transponder has received either Aircraft Identification (also referred to as Flight Identification as specified in the Flight Plan) or Aircraft Registration (which should be assigned based on the Mode-S 24-bit Address) data in the Aircraft Installation during the power on cycle.

Note: *This requirement is not established by the Transponder LRU own capability to service BDS Register 2,0. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 2,0.*

Once BDS Register **1,8** bit **25** has been set to "1" during a particular power on cycle, then it *shall* remain set to "1" for the duration of the power on cycle.

- b. BDS Register **1,8** bit **25** *shall* be set to "0" if the transponder receives no data from the Aircraft installation that could be used to properly service BDS Register **2,0** during the power on cycle.

2.2.24.3.5.3.2 Aircraft Registration Servicing

- a. BDS Register **1,8** bit **24** *shall* be set to "1" if the transponder has received Aircraft Registration (which should be assigned based on the Mode-S 24-bit Address) data in the Aircraft Installation during the power on cycle.

Note: *This requirement is not established by the Transponder LRU own capability to service BDS Register 2,1. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 2,1.*

Once BDS Register **1,8** bit **24** has been set to "1" during a particular power on cycle, then it *shall* remain set to "1" for the duration of the power on cycle.

- b. BDS Register **1,8** bit **24** *shall* be set to "0" if the transponder receives no data from the Aircraft installation that could be used to properly service BDS Register **2,1** during the power on cycle.

2.2.24.3.6 BDS 2,0__Flight Identification Update Rates

- a. The minimum update rate at which BDS **2,0** *shall* be reloaded with valid data is **5.0** seconds.

(Effectively, BDS **2,0** must be updated every **5.0** seconds or sooner).

- b. If BDS **2,0** cannot be updated within a **10.0** second timeframe (e.g., twice the specified minimum update rate of **5.0** seconds), then the contents of BDS **2,0** *shall* be set to ZERO and:

- (1). Bit 7 of BDS 1,7 shall be set to **ZERO**.
 - (2). Bit 25 of BDS 1,8 shall not change state if BDS 2,0 has been properly serviced during the power-on cycle. If BDS 2,0 has not been properly serviced during the power on cycle, then bit 25 of BDS 1,8 must be verified as being set to **ZERO**. (see section 2.2.24.5.3.1 of this appendix)
- c. The time between availability of data that causes a change in BDS 2,0 and the time that the change is made to BDS 2,0 shall be less than the minimum update rate specified as 5.0 seconds.

Note: *The time between establishing availability of data and the time of updating BDS Register 2,0 should be minimized (e.g., data latency should be minimized).*

2.2.25 Enhanced Surveillance (EHS) Compliant Transponder

2.2.25.1 Declaration of Capability in BDS 1,0

2.2.25.1.1 Declaration of BDS 1,0 / 2,0 / 2,1 / 1,7 / 1,8 – 1,C / 4,0 / 5,0 / 5,F / or 6,0 Capability

- a. BDS Register 1,0 (Data Link Capability Report) bit 25 shall be set to "1" if the transponder is receiving any data from the Aircraft installation with which to service BDS Register 1,0 / 2,0 / 2,1 (Optional) / 1,7 / 1,8 - 1,C / 4,0 / 5,0 / 5,F (Optional) or 6,0 (or other BDS registers) as provided in the respective sections for each BDS register in this document. **Update for Dataflash in BDS 1,D to 1,F implementation. Even if you are not servicing, reply with zeros.**

Note: *This requirement is not established by the transponder LRU own capability to service BDS Register 1,0 / 2,0 / 2,1 / 1,7 / 1,8 - 1,C / 4,0 / 5,0 / 5,F or 6,0 (or other BDS registers). Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 1,0 / 2,0 / 2,1 / 1,7 / 1,8 - 1,C / 4,0 / 5,0 / 5,F or 6,0 (or other BDS registers).*

- b. BDS Register 1,0 (Data Link Capability Report) bit 25 shall be set to "0" if the transponder is receiving no data from the Aircraft installation that could be used to properly service either BDS Register 1,0 / 2,0 / 2,1 (Optional) / 1,7 / 1,8 - 1,C / 4,0 / 5,0 / 5,F (Optional) or 6,0.
- c. When bit 25 is set to 1, it shall indicate that at least one Mode S Specific Service is supported.

Effectively, the transponder must update the following BDS Register 1,0 bits where applicable:

- (1). Bit 25 as provided in subparagraphs "a" and "b" above.
- (2). Bit 33 as provided in section §2.2.24.5.1
- (3). Bit 36 as provided in section §2.2.25.1.2.
- (4). Bit 35 when capable of servicing Surveillance Identifier (SI) capability.
Bit 35: = 0 if no surveillance identifier code capability is available

= 1 if capable of surveillance identifier code

2.2.25.1.2 Declaration of BDS 1,7 Capability

- a. BDS Register 1,0 (Data Link Capability Report) bit 36 *shall* be toggled (i.e., changed from "0" to "1", or from "1" to "0") each time that the Common Usage GICB Capability Report (BDS Register Code 1,7) is changed.
- b. To avoid the generation of too many broadcast capability report changes, BDS Register Code 1,7 *shall* be sampled at approximately one minute intervals to check for changes that may require the toggling of bit 36 as discussed in subparagraph a.

2.2.25.1.3 Datalink Capability Report (BDS 1,0) Full Definition

Refer to Appendix B, Table B-3-16 for full definition of BDS Register 1,0.

2.2.25.1.4 Minimum Update Rate of BDS Register 1,0

- a. The minimum update rate at which BDS Register 1,0 *shall* be reloaded with valid data is ≤ 4.0 seconds.

(Effectively, BDS Register 1,0 must be updated every 4.0 seconds or sooner).
- b. BDS Register 1,0 *shall* be updated within one second of the data changing and at least every four seconds thereafter.
- c. If a particular data field in BDS Register 1,0 cannot be updated within 8.0 seconds (e.g., twice the specified minimum update rate of ≤ 4.0 seconds, then the status bit (if specified for that field) *shall* indicate that the data in that field is invalid and the data field *shall* be ZEROED.

2.2.25.2 BDS Register 1,7__Common Usage GICB Capability Report

2.2.25.2.1 BDS Register 1,7__Purpose and Definition

Refer to Appendix B, Table B-3-23 for full definition of BDS Register 1,7.

The Mode-S Transponder *shall* comply with all constraints and notes provided in Appendix B, Table B-3-23 for BDS Register 1,7.

2.2.25.2.2 Enhanced Surveillance Servicing Requirements

2.2.25.2.2.1 Required Servicing of BDS Register 1,7 Associated with BDS Register 2,0

Refer to §2.2.24.3.5.2.1, where requirements have previously been provided.

2.2.25.2.2.2 Required Servicing of BDS Register 1,7 Associated with BDS Register 2,1

Refer to §2.2.24.3.5.2.2, where requirements have previously been provided.

2.2.25.2.2.3 Required Servicing of BDS Register 1,7 Associated with BDS Register 4,0

- a. BDS Register 1,7 bit 9 *shall* be set to "1" if the transponder is receiving either Selected Altitude, FMS Selected Altitude, or Barometric Pressure Setting data in

the Aircraft installation. (Refer to Appendix B, Table **B-3-64** for full definition of BDS 4,0) **Update for Mode Bits (48 – 56)**

Note: *This requirement is not established by the transponder LRU own capability to service BDS Register 4,0. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 4,0.*

- b. BDS Register 1,7 bit 9 **shall** be set to "0" if the transponder is receiving no data from the Aircraft installation that could be used to properly service BDS 4,0.

2.2.25.2.2.4 Required Servicing of BDS Register 1,7 Associated with BDS Register 5,0

- a. BDS Register 1,7 bit 16 **shall** be set to "1" if the transponder is receiving either Roll Angle, True Track Angle, Ground Speed, Track Angle Rate, or True Airspeed data in the Aircraft installation. (Refer to Appendix B, Table **B-3-80** for full definition of BDS 5,0)

Note: *This requirement is not established by the transponder LRU own capability to service BDS Register 5,0. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 5,0.*

- b. BDS Register 1,7 bit 16 **shall** be set to "0" if the transponder is receiving no data from the Aircraft installation that could be used to properly service BDS Register 5,0.

2.2.25.2.2.5 Required Servicing of BDS Register 1,7 Associated with BDS Register 5,F

- a. BDS Register 1,7 bit 23 **shall** be set to "1" if the transponder is receiving Selected Altitude necessary to update BDS Register 4,0 (see §2.2.25.4) which then requires that BDS Register 5,F be updated in accordance with §2.2.25.6.

Note: *This requirement is not established by the transponder LRU own capability to service BDS Register 5,F. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 5,F.*

- b. BDS Register 1,7 bit 23 **shall** be set to "0" if the transponder is receiving no data from the Aircraft installation that could be used to properly service BDS Register 5,F.

2.2.25.2.2.6 Required Servicing of BDS Register 1,7 Associated with BDS Register 6,0

- a. BDS Register 1,7 bit 24 **shall** be set to "1" if the transponder is receiving either Magnetic Heading, Indicated Airspeed, Mach, Barometric Altitude Rate, or Inertial Vertical Velocity data in the Aircraft installation. (Refer to Appendix B, Table **B-3-96** for full definition of BDS 6,0)

Note: *This requirement is not established by the transponder LRU own capability to service BDS Register 6,0. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 6,0.*

- b. BDS Register 1,7 bit 24 *shall* be set to "0" if the transponder is receiving no data from the Aircraft installation that could be used to properly service BDS Register 6,0.

2.2.25.2.3 Minimum Update Rate of BDS Register 1,7

- a. The minimum update rate at which BDS Register 1,7 *shall* be reloaded with valid data is 5.0 seconds.

That is, that BDS Register 1,7 shall be updated at least once every 5.0 seconds.

- b. The time between availability of data that causes a change in BDS Register 1,7 and the time that the change is made to BDS Register 1,7 *shall* be less than the minimum update rate specified as 5.0 seconds.
- c. If a particular data field in BDS Register 1,7 cannot be updated within 10.0 seconds (e.g., twice the specified minimum update rate of 5.0 seconds, then the status bit (if specified for that field) *shall* indicate that the data in that field is invalid and the data field *shall* be ZEROED.

2.2.25.3 BDS Register 1,8 –to- 1,C Mode-S Specific Services GICB Capability

Update for 1,D to 1,F

2.2.25.3.1 Purpose and Definition

Refer to Appendix B, Table B-3-24 –through- B-3-28 for full definition of BDS Register 1,8 –through- 1,C respectively.

The Mode-S transponder *shall* comply with all constraints and notes provided in Appendix B, Table B-3-24 –through- B-3-28 for BDS Register 1,8 -through- 1,C respectively.

2.2.25.3.2 Enhanced Surveillance BDS Register Servicing Requirements

2.2.25.3.2.1 Required Servicing of BDS Register 1,8 Associated with BDS Register 1,7

- a. BDS Register 1,8 bit 34 *shall* be set to "1" if the transponder is required to service any part of BDS Register 1,7 as provided in §2.2.25.2.

Note: *This requirement is not established by the Transponder LRU own capability to service BDS Register 1,7. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data of which processing would result in the need to update BDS Register 1,7.*

- b. Once BDS Register 1,8 bit 34 has been set to "1" during a particular power on cycle, then it shall remain set to "1" for the duration of the power on cycle.
- c. BDS Register 1,8 bit 34 *shall* be set to "0" if the transponder receives no data from the Aircraft installation that could result in the need to service BDS Register 1,7 as provided in §2.2.25.2.

2.2.25.3.2.2 Required Servicing of BDS Register 1,8 Associated with BDS Register 1,8

- a. BDS Register 1,8 bit 33 *shall* be set to "1" if the transponder is required to service any part of BDS Register 1,8 as provided in §2.2.25.3.

Note: *This requirement is not established by the Transponder LRU own capability to service BDS Register 1,8. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data of which processing would result in the need to update BDS Register 1,8.*

- b. Once BDS Register 1,8 bit 33 has been set to "1" during a particular power on cycle, then it *shall* remain set to "1" for the duration of the power on cycle.
- c. BDS Register 1,8 bit 33 *shall* be set to "0" if the transponder receives no data from the Aircraft installation that could result in the need to service BDS Register 1,8 as provided in §2.2.24.3.

2.2.25.3.2.3 Required Servicing of BDS Register 1,8 Associated with BDS Register 1,9

- a. BDS Register 1,8 bit 32 *shall* be set to "1" if the transponder is required to service any part of BDS Register 1,9 as provided in §2.2.25.3.2.6 –through- §2.2.25.3.2.9.

Note: *This requirement is not established by the Transponder LRU own capability to service BDS Register 1,9. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data of which processing would result in the need to update BDS Register 1,9.*

- b. Once BDS Register 1,8 bit 32 has been set to "1" during a particular power on cycle, then it shall remain set to "1" for the duration of the power on cycle.
- c. BDS Register 1,8 bit 32 *shall* be set to "0" if the transponder receives no data from the Aircraft installation that could result in the need to service BDS Register 1,9 as provided in §2.2.25.3.2.6 –through- §2.2.25.3.2.9.

2.2.25.3.2.4 Required Servicing of BDS Register 1,8 Associated with BDS Register 2,0

Refer to §2.2.24.5.3.1.

2.2.25.3.2.5 Required Servicing of BDS Register 1,8 Associated with BDS Register 2,1

Refer to §2.2.24.5.3.2.

2.2.25.3.2.6 Required Servicing of BDS Register 1,9 Associated with BDS Register 4,0

- a. BDS Register 1,9 bit 49 *shall* be set to "1" if the transponder has received either Selected Altitude, FMS Selected Altitude, or Barometric Corrected Altitude data in the Aircraft Installation during the power on cycle. (Refer to Appendix B, Table B-3-64 for full definition of BDS Register 4,0).

Note: *This requirement is not established by the Transponder LRU own capability to service BDS Register 4,0. Rather, it is established by the*

Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 4,0.

- b. Once BDS Register 1,9 bit 49 has been set to "1" during a particular power on cycle, then it shall remain set to "1" for the duration of the power on cycle.
- c. BDS Register 1,9 bit 49 *shall* be set to "0" if the transponder receives no data from the Aircraft installation that could be used to properly service BDS Register 4,0 during the power on cycle.

2.2.25.3.2.7 Required Servicing of BDS Register 1,9 Associated with BDS 5,0

- a. BDS Register 1,9 bit 33 *shall* be set to "1" if the transponder has received either Roll Angle, True Track Angle, Ground Speed, Track Angle Rate, or True Airspeed data in the Aircraft installation during the power on cycle. (Refer to Appendix B, Table B-3-80 for full definition of BDS Register 5,0)

Note: *This requirement is not established by the Transponder LRU own capability to service BDS Register 5,0. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 5,0.*

- b. Once BDS Register 1,9 bit 33 has been set to "1" during a particular power on cycle, then it *shall* remain set to "1" for the duration of the power on cycle.
- c. BDS Register 1,9 bit 33 *shall* be set to "0" if the transponder receives no data from the Aircraft installation that could be used to properly service BDS Register 5,0 during the power on cycle.

2.2.25.3.2.8 Required Servicing of BDS Register 1,9 Associated with BDS Register 5,F

- a. BDS Register 1,9 bit 18 *shall* be set to "1" if the transponder is required to service any part of BDS Register 5,F as provided in §2.2.25.6.

Note: *This requirement is not established by the Transponder LRU own capability to service BDS Register 5,F. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data of which processing would result in the need to update BDS Register 5,F.*

- b. Once BDS Register 1,9 bit 18 has been set to "1" during a particular power on cycle, then it *shall* remain set to "1" for the duration of the power on cycle.
- c. BDS Register 1,9 bit 18 *shall* be set to "0" if the transponder receives no data from the Aircraft installation that could result in the need to service BDS Register 5,F as provided in §2.2.25.6 of this appendix.

2.2.25.3.2.9 Required Servicing of BDS Register 1,9 Associated with BDS Register 6,0

- a. BDS Register 1,9 bit 17 *shall* be set to "1" if the transponder has received either Magnetic Heading, Indicated Airspeed, Mach, Barometric Altitude Rate, or Inertial Vertical Velocity data in the Aircraft installation during the power on cycle. (Refer to Appendix B, Table B-3-96 for full definition of BDS Register 6,0)

Note: *This requirement is not established by the Transponder LRU own capability to service BDS Register 6,0. Rather, it is established by the Aircraft installation capability to provide the transponder with the appropriate data with which to then service BDS Register 6,0.*

- b. Once BDS Register 1,9 bit 17 has been set to "1" during a particular power on cycle, then it *shall* remain set to "1" for the duration of the power on cycle.
- c. BDS Register 1,9 bit 17 *shall* be set to "0" if the transponder receives no data from the Aircraft installation that could be used to properly service BDS Register 6,0 during the power on cycle.

2.2.25.3.3 Minimum Update Rate of BDS Register 1,8 –to- 1,C

- a. The minimum update rate at which BDS 1,8 and/or 1,9 *shall* be reloaded with valid data is 5.0 seconds. **Update for 1,D to 1,F**

That is, that BDS Register 1,8 and/or 1,9 shall be updated at least once every 5.0 seconds.

- b. The time between availability of data that causes a change in BDS Register 1,8 and/or BDS Register 1,9 and the time that the change is made to BDS Register 1,8 and/or BDS Register 1,9 *shall* be less than the minimum update rate specified as 5.0 seconds.
- c. If a particular data field in BDS Register 1,9 cannot be updated within 10.0 seconds (e.g., twice the specified minimum update rate of 5.0 seconds, then the status bit (if specified for that field) *shall* indicate that the data in that field is invalid and the data field *shall* be ZEROED.

2.2.25.4 BDS Register 4,0__Aircraft Intention

2.2.25.4.1 Purpose and Definition

Appendix B, Table B-3-64 provides full definition of BDS Register 4,0.

The transponder *shall* comply will all constraints and requirements for servicing BDS Register 4,0 that are expressed in Appendix B, Table B-3-64.

2.2.25.4.2 BDS Register 4,0__Data Requirements

2.2.25.4.2.1 Selected Altitude from Altitude Control Panel

- a. The transponder *shall* process Selected Altitude From Altitude Control Panel (Mode Control Panel/Flight Control Unit or equivalent equipment) data from on-board aircraft data sources as provided in Appendix B, Table B-3-64 of the BDS Register 4,0 definition table and format the data into bits 2 -through- 13 of the BDS Register 4,0 "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- 1/2 LSB.
- c. Status Bit 1 *shall* be set to "1" whenever valid data is available in bits 2 -through- 13.

- d. Status Bit **1** *shall* be set to "0" whenever there is no valid data with which to fill bits **2** -through- **13**.
- e. Bits **2** -through- **13** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.4.2.2 FMS Selected Altitude

- a. The transponder *shall* process FMS Selected Altitude data from on-board aircraft data sources as provided in Appendix B, Table **B-3-64** of the BDS Register **4,0** definition table and format the data into bits **15** -through- **26** of the BDS Register **4,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- 1/2 LSB.
- c. Status Bit **14** *shall* be set to "1" whenever valid FMS Selected Altitude data is available in bits **15** -through- **26**.
- d. If FMS Selected Altitude data is not available for insertion into bits **15** -through- **26**, Status Bit **14** *shall* be set to "0".
- e. If FMS Selected Altitude data is not available for insertion into bits **15** -through- **26**, bits **15** -through- **26** *shall* be set to "0".

2.2.25.4.2.3 Barometric Pressure Setting

- a. The transponder *shall* process Barometric Pressure Setting data from on-board aircraft data sources as provided in Appendix B, Table **B-3-64** of the BDS Register **4,0** definition table. Further processing of the input Barometric Pressure Setting data is needed as follows:
 - (1). Note that the Barometric Pressure Setting data received may be in **BCD** format and must be converted to **Binary** format prior to encoding data into BDS Register **4,0**. Tentative information regarding BCD to Binary Conversion and final mapping of the data into BDS Register **4,0** is provided in the following Note:

Note: Barometric Pressure Setting BCD -to- BINARY Conversion Method Consider an input of 1085.9 millibars in BCD data.

Multiply by 10 to give the BCD count of 0.1 increments needed to represent the input data.

Yields: 10859

$$\begin{array}{rcl}
 10859/2 & = & 5429 \quad - \quad 1 \\
 5429/2 & = & 2714 \quad - \quad 1 \\
 2714/2 & = & 1357 \quad - \quad 0 \\
 1357/2 & = & 678 \quad - \quad 1 \\
 678/2 & = & 339 \quad - \quad 0 \\
 339/2 & = & 169 \quad - \quad 1 \\
 169/2 & = & 84 \quad - \quad 1 \\
 84/2 & = & 42 \quad - \quad 0 \\
 42/2 & = & 21 \quad - \quad 0
 \end{array}$$

$21/2 = 10 - 1$
 $10/2 = 5 - 0$
 $5/2 = 2 - 1$
 $2/2 = 1 - 0$
 $1/2 = 0 - 1 == 0010\ 1010\ 0110\ 1011\ \text{HEX} == 2A6B\ \text{HEX} == 10859\ \text{Decimal}$

<u>Start:</u>	0001	0000	1000	0101	1001		10859	BCD
Rotate R:	0000	1000	0100	0010	1100	1		
Add	<u>0000</u>	<u>1101</u>	<u>0000</u>	<u>0000</u>	<u>1101</u>			Add "0D" Hex to each nibble that has the
	0000	0101	0100	0010	1001		05429	MSB of the nibble set to "1". Disregard the Carry
Rotate R:	0000	0010	1010	0001	0100	1		
Add	<u>0000</u>	<u>0000</u>	<u>1101</u>	<u>0000</u>	<u>0000</u>			
	0000	0010	0111	00001	0100		02714	
Rotate R:	0000	0001	0011	1000	1010	0		
Add	<u>0000</u>	<u>0000</u>	<u>0000</u>	<u>1101</u>	<u>1101</u>			
	0000	0001	0011	0101	0111		01357	
Rotate R:	0000	0000	1001	1010	1011	1		
Add	<u>0000</u>	<u>0000</u>	<u>1101</u>	<u>1101</u>	<u>1101</u>			
	0000	0000	0110	0111	1000		00678	
Rotate R:	0000	0000	0011	0011	1100	0		
Add	<u>0000</u>	<u>0000</u>	<u>0000</u>	<u>0000</u>	<u>1101</u>			
	0000	0000	0011	0011	1001		00339	
Rotate R:	0000	0000	0001	1001	1100	1		
Add	<u>0000</u>	<u>0000</u>	<u>0000</u>	<u>1101</u>	<u>1101</u>			
	0000	0000	0001	0110	1001		00169	
Rotate R:	0000	0000	0000	1011	0100	1		
Add	<u>0000</u>	<u>0000</u>	<u>0000</u>	<u>1101</u>	<u>0000</u>			
	0000	0000	0000	1000	0100		00084	
Rotate R:	0000	0000	0000	0100	0010	0	00042	
Rotate R:	0000	0000	0000	0010	0001	0	00021	
Rotate R:	0000	0000	0000	0001	0000	1	00010	
Rotate R:	0000	0000	0000	0000	1000			
Add	<u>0000</u>	<u>0000</u>	<u>0000</u>	<u>0000</u>	<u>1101</u>			
	0000	0000	0000	0000	0101		00005	
Rotate R:	0000	0000	0000	0000	0010	1	00002	
Rotate R:	0000	0000	0000	0000	00001	0	00001	
Rotate R:	0000	0000	0000	0000	0000	1	00000	

Binary Equivalent == 0010 1010 0110 1011 = 2A6B Hex = 10859 Decimal

Next:

Establish Equivalent of 800.0 millibars having 0.1 resolution

Effectively, establish a count of 8000 millibars in binary: The value is 1F40 Hex

Establish 2's Complement of 1F40 Hex as E0C0 Hex.

Now, effectively subtract 8000 from the Binary Equivalent above as follows:

Binary Equivalent = 0010 1010 0110 101 = 2A6B Hex = 10859 Decimal

Add Neg. 800.0 mb = 1110 0000 1100 0000 = E0C0 Hex = -8000 millibars

Resultant Sum: = 0000 1011 0010 1011 = 0B2B Hex = 2859 Decimal

Map the Resultant Data into Bits 28 -through- 39 of BDS Register 4,0 as follows:

	M										L											
	S										S											
	B										B											
Bit:	2	2	3	3	3	3	3	3	3	3	8	9	0	1	2	3	4	5	6	7	8	9
Data:	1	0	1	1	0	0	1	0	1	0	1	0	1	1								

- (2). Note that the encoding that is provided in Appendix B, Table **B-3-64** BDS Register 4,0 for Barometric Pressure Setting represents the input Barometric Pressure Setting data **MINUS** 800 millibars (mb). See Appendix B, Table **B-3-64**, BDS Register 4,0 definition. Also, note that this 800 millibar correction has been taken into account in the BCD -to- BINARY conversion performed in the Note given in §2.2.25.4.2.3.a.(1).
- b. The data loaded into the "MB" field *shall* be the Barometric Pressure Setting **MINUS** 800 millibars (mb) that has been converted to BINARY data in a manner that is consistent and equivalent with the BCD -to- BINARY conversion performed in the Note given in §2.2.25.4.2.3.a.(1).
- c. Status Bit **27** *shall* be set to "1" whenever valid data is available in bits **28** -through- **39**, and the conditions given in §2.2.25.4.2.3.d are not applicable.
- d. Status Bit **27** *shall* be set to "0" whenever:
- (1). There is no valid data with which to fill bits 28 -through- 39.
 - (2). The input Barometric Pressure Setting data is less than 800 millibars (mb).

Note: This would result in a negative Barometric Pressure Setting after subtracting 800 millibars (mb) and doing the BCD -to- BINARY conversion.
 - (3). The input Barometric Pressure Setting data is greater than 1209.5 millibars (mb).
- e. Bits **28** -through- **39** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.4.2.4 Status of Altitude Control Panel Mode Bits

Need full update for Bit 48 through 51.

Appropriate sources and/or labels for providing Altitude Control Panel (MCP / FCU) Mode status have not been agreed to universally in the industry: **Therefore:**

Until further definition, Bit 48 of BDS Register 4,0 "MB" field *shall* be set to "0".

2.2.25.4.2.5 Vertical Navigation Mode

Appropriate sources and/or labels for providing Vertical Navigation (VNAV) Mode Status have not been agreed to universally in the industry: Therefore:

Until further definition, Bit 49 of BDS Register 4,0 "MB" field shall be set to "0".

2.2.25.4.2.6 Altitude Hold Bit

Appropriate sources and/or labels for providing Altitude Hold status have not been agreed to universally in the industry: **Therefore:**

Until further definition, Bit 50 of BDS Register 4,0 "MB" field *shall* be set to "0".

2.2.25.4.2.7 Approach Mode Bit

Appropriate sources and/or labels for providing Approach Mode status have not been agreed to universally in the industry: **Therefore:**

Until further definition, Bit 51 of BDS Register 4,0 "MB" field *shall* be set to "0".

2.2.25.4.2.8 Reserved Bits

Bits 52 and 53 of BDS Register 4,0 "MB" field *shall* be set to "0".

2.2.25.4.2.9 Status of Target Altitude Status Bit

Update bits 54, 55 & 56 for dynamic data capability.

Appropriate sources and/or labels for providing Target Altitude status or source have not been agreed to universally in the industry: **Therefore:**

Until further definition, Bit 54 of BDS Register 4,0 "MB" field *shall* be set to "0".

Note: *In order to set bits 54, 55 and 56 appropriately, the transponder must receive information from the Auto Pilot, Vertical Navigation Control, or Flight Management System in order to establish which system has control of the aircraft vertical profile. Until such data is defined and provided, the transponder must set these bits to ZERO.*

2.2.25.4.2.10 Target Altitude Source Bits

Appropriate sources and/or labels for providing Target Altitude status or source have not been agreed to universally in the industry: **Therefore:**

Until further definition, bit 55 and 56 of BDS Register 4,0 "MB" field *shall* be set to "0".

Note: *In order to set bits 54, 55 and 56 appropriately, the transponder must receive information from the Auto Pilot, Vertical Navigation Control, or Flight Management System in order to establish which system has control of the aircraft vertical profile. Until such data is defined and provided, the transponder must set these bits to **ZERO**.*

2.2.25.4.3 Minimum Update Rate of BDS Register 4,0

- a. The minimum update rate at which BDS Register **4,0** *shall* be reloaded with valid data is **1.0** second. **Update to add FMS bit 48 through 51.**

That is, that BDS Register 4,0 shall be updated at least once every 1.0 second.

- b. The time between availability of data that causes a change in BDS Register **4,0** and the time that the change is made to BDS Register **4,0** *shall* be less than the minimum update rate specified as **1.0** seconds.
- c. If Altitude Control Panel (MCP /FCU) Selected Altitude in BDS Register **4,0** "MB" field bits **2** -through- **13** cannot be updated with valid data within **2.0** seconds (e.g., twice the specified minimum update rate of **1.0** seconds) then Status Bit **1** *shall* be set to "0" and bits **2** –through- **13** shall be set to "0".
- d. If FMS Selected Altitude in BDS Register **4,0** "MB" field bits **15** -through- **26** cannot be updated with valid data within **2.0** seconds (e.g., twice the specified minimum update rate of **1.0** seconds) then Status Bit **14** *shall* be set to "0" and bits **15** –through- **26** shall be set to "0".
- e. If Barometric Corrected Altitude in BDS Register **4,0** "MB" field bits **28** -through- **39** cannot be updated with valid data within **2.0** seconds (e.g., twice the specified minimum update rate of **1.0** seconds) then Status Bit **27** *shall* be set to "0" and bits **28** –through- **39** shall be set to "0".

2.2.25.5 BDS Register 5,0__Track and Turn Report

2.2.25.5.1 Purpose and Definition

Appendix B, Table **B-3-80** provides full definition of BDS Register **5,0**.

The Mode-S transponder *shall* comply with all constraints and requirements for servicing BDS Register **5,0** that are expressed in Appendix B, Table **B-3-80**.

2.2.25.5.2 BDS Register 5,0__Data Requirements

2.2.25.5.2.1 Roll Angle

- a. The transponder *shall* process Roll Angle data from on-board aircraft data sources as provided in Appendix B, Table **B-3-80** of the BDS Register **5,0** definition table and format the data into bits **2** -through- **11** of the BDS Register **5,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- **1/2** LSB.
- c. Status Bit **1** *shall* be set to "1" whenever valid data is available in bits **2** -through- **11**.

- d. Status Bit **1** *shall* be set to "0" whenever there is no valid data with which to fill bits **2** -through- **11**.
- e. Bits **2** -through- **11** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.5.2.2 True Track Angle

- a. The transponder *shall* process True Track Angle data from on-board aircraft data sources as provided in Appendix B, Table **B-3-80** of the BDS Register **5,0** definition table and format the data into bits **13** -through- **23** of the BDS Register **5,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- $1/2$ LSB.
- c. Status Bit **12** *shall* be set to "1" whenever valid data is available in bits **13** -through- **23**.
- d. Status Bit **12** *shall* be set to "0" whenever there is no valid data with which to fill bits **13** -through- **23**.
- e. Bits **13** -through- **23** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.5.2.3 Ground Speed

- a. The transponder *shall* process Ground Speed data from on-board aircraft data sources as provided in Appendix B, Table **B-3-80** of the BDS Register **5,0** definition table and format the data into bits **25** -through- **34** of the BDS Register **5,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- $1/2$ LSB.
- c. Status Bit **24** *shall* be set to "1" whenever valid data is available in bits **25** -through- **34**.
- d. Status Bit **24** *shall* be set to "0" whenever there is no valid data with which to fill bits **25** -through- **34**.
- e. Bits **25** -through- **34** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.5.2.4 Track Angle Rate

- a. The transponder *shall* process Track Angle Rate data from on-board aircraft data sources as provided in Appendix B, Table **B-3-80** of the BDS Register **5,0** definition table and format the data into bits **36** -through- **45** of the BDS Register **5,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- $1/2$ LSB.

- c. Status Bit **35** *shall* be set to "1" whenever valid data is available in bits **36** -through- **45**.
- d. Status Bit **35** *shall* be set to "0" whenever there is no valid data with which to fill bits **36** -through- **45**.
- e. Bits **36** -through- **45** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.5.2.5 True Airspeed (TAS)

- a. The transponder *shall* process True Airspeed (TAS) data from on-board aircraft data sources as provided in Appendix B, Table **B-3-80** of the BDS Register **5,0** definition table and format the data into bits **47** -through- **56** of the BDS Register **5,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- 1/2 LSB.
- c. Status Bit **46** *shall* be set to "1" whenever valid data is available in bits **47** -through- **56**.
- d. Status Bit **46** *shall* be set to "0" whenever there is no valid data with which to fill bits **47** -through- **56**.
- e. Bits **47** -through- **56** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.5.3 Minimum Update Rate of BDS Register 5,0

- a. The minimum update rate at which BDS Register **5,0** *shall* be reloaded with valid data is **1.0 second**.

That is, that BDS Register 5,0 shall be updated at least once every 1.0 second.

- b. The time between availability of data that causes a change in BDS Register **5,0** and the time that the change is made to BDS Register **5,0** *shall* be less than the minimum update rate specified as **1.0 seconds**.
- c. If Roll Angle data in BDS Register **5,0** "MB" field bits **2** -through- **11** cannot be updated with valid data within **2.0 seconds** (e.g., twice the specified minimum update rate of **1.0 seconds**) then Status Bit **1** *shall* be set to "0" and bits **2** –through- **11** shall be set to "0".
- d. If True Track Angle data in BDS Register **5,0** "MB" field bits **13** -through- **23** cannot be updated with valid data within **2.0 seconds** (e.g., twice the specified minimum update rate of **1.0 seconds**) then Status Bit **12** *shall* be set to "0" and bits **13** –through- **23** shall be set to "0".
- e. If Ground Speed data in BDS Register **5,0** "MB" field bits **25** -through- **34** cannot be updated with valid data within **2.0 seconds** (e.g., twice the specified minimum update rate of **1.0 seconds**) then Status Bit **24** *shall* be set to "0" and bits **25** –through- **34** shall be set to "0".

- f. If Track Angle Rate data in BDS Register 5,0 "MB" field bits 36 -through- 45 cannot be updated with valid data within 2.0 seconds (e.g., twice the specified minimum update rate of 1.0 seconds) then Status Bit 35 *shall* be set to "0" and bits 36 –through- 45 shall be set to "0".
- g. If True Airspeed (TAS) data in BDS Register 5,0 "MB" field bits 47 -through- 56 cannot be updated with valid data within 2.0 seconds (e.g., twice the specified minimum update rate of 1.0 seconds) then Status Bit 46 *shall* be set to "0" and bits 47 –through- 56 shall be set to "0".

2.2.25.6 BDS Register 5,F__Quasi-Static Parameter Monitoring

2.2.25.6.1 Purpose and Definition

Appendix B, Table B-3-95 provides full definition of BDS Register 5,F.

The transponder shall comply with all constraints and requirements for servicing BDS Register 5,F that are expressed in Appendix B, Table B-3-95.

2.2.25.6.2 Enhanced Surveillance Servicing Requirements

2.2.25.6.2.1 Required Servicing Associated with BDS Register 5,F

- a. BDS Register 5,F bits 1,2 *shall* be set to "00" whenever MCP / FCU Selected Altitude data is not available to set bits 1 -through-13 of BDS Register 4,0.
- b. Whenever a change is detected in the MCP / FCU Selected Altitude data used to set bits 1 -through- 13 of BDS Register 4,0, the BDS Register 5,F bits 1,2 *shall* be incremented by one.

Effectively, the decimal count is as follows: 1, 2, 3, -- 1, 2, 3, etc.
The binary equivalent setting bits 1,2 is as follows: 01, 10, 11, -- 01, 10, 11, etc.

- c. BDS Register 5,F bits 23,24 *shall* be set to "00" whenever FMS Selected Altitude data (Target Altitude) is not available to set bits 14 -through- 26 of BDS Register 4,0.
- d. Whenever a change is detected in the FMS Selected Altitude data (Target Altitude) used to set bits 14 -through- 26 of BDS Register 4,0, the BDS Register 5,F bits 23,24 *shall* be incremented by one.

Effectively, the decimal count is as follows: 1, 2, 3, -- 1, 2, 3, etc.
The binary equivalent setting bits 23,24 is as follows: 01, 10, 11, -- 01, 10, 11, etc.

- e. BDS Register 5,F bits 25,26 *shall* be set to "00" whenever Barometric Pressure Setting data is not available to set bits 27 -through- 39 of BDS Register 4,0.
- f. Whenever a change is detected in the Barometric Pressure Setting data used to set bits 27 -through- 39 of BDS Register 4,0, the BDS Register 5,F bits 25,26 *shall* be incremented by one.

Effectively, the decimal count is as follows: **1, 2, 3, -- 1, 2, 3, etc.**
The binary equivalent setting bits **25,26** is as follows: **01, 10, 11, -- 01, 10, 11, etc.**

- g. BDS Register **5,F** bits **3** -through- **22** and **27** -through- **56** *shall* be set to "0" until such time that the respective parameters identified in Appendix B, Table **B-3-95** are being monitored.

2.2.25.6.3 **Minimum Update Rate of BDS Register 5,F**

- a. The minimum update rate at which BDS Register **5,F** *shall* be reloaded with valid data is **0.5** seconds.

That is, that BDS Register 5,F shall be updated at least once every 0.5 seconds.

- b. The time between availability of data that causes a change in BDS Register **5,F** and the time that the change is made to BDS Register **5,F** *shall* be less than the minimum update rate specified as **0.5** seconds.
- c. If a particular data field in BDS Register **5,F** cannot be updated within **1.0** seconds (e.g., twice the specified minimum update rate of **0.5** seconds, then the status bit (if specified for that field) *shall* indicate that the data in that field is invalid and the data field *shall* be ZEROED.

2.2.25.7 **BDS Register 6,0__Heading and Speed Report**

2.2.25.7.1 **Purpose and Definition**

Appendix B, Table **B-3-96** provides full definition of BDS Register **6,0**.

The transponder *shall* comply with all constraints and requirements for servicing BDS Register **6,0** that are expressed in Appendix B, Table **B-3-96**.

2.2.25.7.2 **BDS Register 6,0__Data Requirements**

2.2.25.7.2.1 **Magnetic Heading**

- a. The transponder *shall* process Magnetic Heading data from on-board aircraft data sources as provided in Appendix B, Table **B-3-96** of the BDS **6,0** definition table and format the data into bits **2** -through- **12** of the BDS **6,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- 1/2 LSB.
- c. Status Bit **1** *shall* be set to "1" whenever valid data is available in bits **2** -through- **12**.
- d. Status Bit **1** *shall* be set to "0" whenever there is no valid data with which to fill bits **2** -through- **12**.
- e. Bits **2** -through- **12** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.7.2.2 Indicated Airspeed

- a. The transponder *shall* process Indicated Airspeed data from on-board aircraft data sources as provided in Appendix B, Table **B-3-96** of the BDS **6,0** definition table and format the data into bits **14** -through- **23** of the BDS **6,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- 1/2 LSB.
- c. Status Bit **13** *shall* be set to "1" whenever valid data is available in bits **14** -through- **23**.
- d. Status Bit **13** *shall* be set to "0" whenever there is no valid data with which to fill bits **14** -through- **23**.
- e. Bits **14** -through- **23** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.7.2.3 Mach

- a. The transponder *shall* process Mach data from on-board aircraft data sources as provided in Appendix B, Table **B-3-96** of the BDS **6,0** definitin table andformat the data into bits **25** -through- **34** of the BDS **6,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- 1/2 LSB.
- c. Status Bit **24** *shall* be set to "1" whenever valid data is available in bits **25** -through- **34**.
- d. Status Bit **24** *shall* be set to "0" whenever there is no valid data with which to fill bits **25** -through- **34**.
- e. Bits **25** -through- **34** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.7.2.4 Barometric Altitude Rate

- a. The transponder *shall* process Barometric Altitude Rate data from on-board aircraft data sources as provided in Appendix B, Table **B-3-96** of the BDS **6,0** definition table and format the data into bits **36** -through- **45** of the BDS **6,0** "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- 1/2 LSB.
- c. Status Bit **35** *shall* be set to "1" whenever valid data is available in bits **36** -through- **45**.
- d. Status Bit **35** *shall* be set to "0" whenever there is no valid data with which to fill bits **36** -through- **45**.

- e. Bits **36** -through- **45** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.7.2.5 Inertial Vertical Rate

- a. The transponder *shall* process Inertial Vertical Rate data from on-board aircraft data sources as provided in Appendix B, Table **B-3-96** of the BDS **6,0** definition table and format the data into bits **47** -through- **56** of the BDS 6,0 "MB" field as shown in that table.
- b. The data loaded into the "MB" field *shall* be rounded so as to preserve accuracy of the source data within +/- 1/2 LSB.
- c. Status Bit **46** *shall* be set to "1" whenever valid data is available in bits **47** -through- **56**.
- d. Status Bit **46** *shall* be set to "0" whenever there is no valid data with which to fill bits **47** -through- **56**.
- e. Bits **47** -through- **56** *shall* be set to "0" whenever there is no valid data with which to fill the bits.

2.2.25.7.3 Minimum Update Rate of BDS Register 6,0

- a. The minimum update rate at which BDS **6,0** *shall* be reloaded with valid data is **1.0** second.
That is, that BDS 6,0 shall be updated at least once every 1.0 second.
- b. The time between availability of data that causes a change in BDS **6,0** and the time that the change is made to BDS **6,0** *shall* be less than the minimum update rate specified as **1.0** seconds.
- c. If Magnetic Heading data in BDS **6,0** "MB" field bits **2** -through- **12** cannot be updated with valid data within **2.0** seconds (e.g., twice the specified minimum update rate of **1.0** seconds) then Status Bit **1** *shall* be set to "0" and bits **2** –through- **12** shall be set to "0".
- d. If Indicated Airspeed data in BDS **6,0** "MB" field bits **14** -through- **23** cannot be updated with valid data within **2.0** seconds (e.g., twice the specified minimum update rate of **1.0** seconds) then Status Bit **13** *shall* be set to "0" and bits **14** –through- **23** shall be set to "0".
- e. If Mach data in BDS **6,0** "MB" field bits **25** -through- **34** cannot be updated with valid data within **2.0** seconds (e.g., twice the specified minimum update rate of **1.0** seconds) then Status Bit **24** *shall* be set to "0" and bits **25** –through- **34** shall be set to "0".
- f. If Barometric Altitude Rate data in BDS 6,0 "MB" field bits **36** -through- **45** cannot be updated with valid data within **2.0** seconds (e.g., twice the specified minimum update rate of **1.0** seconds) then Status Bit **35** *shall* be set to "0" and bits **36** –through- **45** shall be set to "0".

- g. If Inertial Vertical Rate data in BDS 6,0 "MB" field bits 47 -through- 56 cannot be updated with valid data within 2.0 seconds (e.g., twice the specified minimum update rate of 1.0 seconds) then Status Bit 46 *shall* be set to "0" and bits 47 – through- 56 shall be set to "0".

2.3 Equipment Performance – Environmental Conditions

2.4 Equipment Test Procedures

2.5 Test Procedures for the Surveillance and Communications Protocols

2.6 Test Procedures for Elementary Surveillance (ELS) Compliant Transponder (§2.2.24)

Not test procedure required.

2.6.1 Ground Initiated Comm.-B (§2.2.24.1)

No test procedure required as multiple GICB extractions of the applicable BDS registers are performed in subsequent tests.

2.6.2 Surveillance Identifier ("SI") Code Requirements (§2.2.24.2 and 2.2.24.2.1)

- a. Perform Procedure #4_Non-Selective Lockout Tests for all "II" and "SI" codes as required by §2.5.4.4. (§2.2.18.2.4)
- b. Perform Procedure #5_Selective Lockout Tests for all "II" and "SI" codes as required by §2.5.4.5. (§2.2.18.2.5)

2.6.2.1 MOPS / ICAO Requirements Relevant to "SI" (§2.2.24.2.1)

Appropriate test requirements to validate "SI" functions were previously provided in §2.6.2.

2.6.2.2 Declaration of Capability in BDS 1,0 (§2.2.24.2.2)

No test procedure required.

2.6.2.3 Flight Identification and Aircraft Registration Requirements (§2.2.24.3)

Perform a modified Procedure #19__AIS Flight Identification, Protocol and Interface as provided in the following subsections.

(§2.5.4.19– Test Procedure #19)

(§2.2.14.4.20–BDS)

(§2.2.14.4.34–RR)

(§2.2.19.1.12.7–Coding of DLC Report)

(§2.2.19.1.13–AIS Field)

(§2.2.19.1.17_Interface)

Introduction:

The intent of this procedure is to validate all aspects of Flight Identification and Aircraft Registration reporting as required in §2.2.24.3 through §2.2.24.3.6.

Note: *The following procedures define parameter input via ARINC-429 Data buses as such buses and data parameters are defined in the industry. If other data sources are used, then it is up to the Test Personnel to ensure that the proper data is being provided to the Unit Under Test.*

Test Procedure:

PART 1: Capability Verification

Ensure that **NO** Flight Identification or Aircraft Registration data is being provided to the transponder.

Ensure that the TCAS / Transponder interface is **NOT ACTIVE**. If the interface is active, TCAS will provide data to set the Data Link Capability and thereby compromise the results of the following tests. Likewise, TCAS could attempt to set the Resolution Advisory Report and thereby compromise the results of the following tests.

Ensure that no other data is being provided to the transponder that could result in the loading of BDS registers internal to the transponder.

Disable the Extended Squitter and Mode-S Specific Services (“MSSS”) functions prior to starting the following procedures in order to keep from setting various BDS registers during the following tests.

a. **Data Link Capability Report, BDS 1,0:** (§2.2.24.3.5.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,0 Data Link Capability Report.

BDS 1,0 (Data Link Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DP”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = **20** reply with:

- (1). Bit **65** [“AIS” subfield (bit **33** of the “MB” field)] set to “**0**” to indicate **NO** Flight Identification capability,
- (2). Bit **57** [Mode S Specific Services Capability (bit **25** of the “MB” field)] set to “**1**” to indicate Mode S Specific Services Capability (i.e., servicing of BDS **1,0** and **1,8**).
- (3). Bit **67** [Surveillance Identifier (SI) (bit **35** of the “MB” field)] set to “**1**” to indicate that the transponder **DOES** Have “**SI**” Capability,
- (4). Bit **68** [Common Usage GICB Capability Report (bit **36** of the “MB” field)] set to “**0**” to indicate that there has been no change in the Common Usage GICB Capability Report, BDS **1,7**.

b. **Common Usage GICB Capability Report, BDS 1,7:** (§2.24.3.5.2.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,7 Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	7

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bits 33 -through- 60 (bits 1 -through- 28 of the “MB” field) set to “0” to indicate **NO** Capability or capability changes in the Common Usage GICB Capability Report, BDS 1,7.
- (2). Bits 61 -through- 88 (bits 29 -through- 56 of the “MB” field) set to “0” since these bits are Reserved or “Don’t Care”.

c. **Mode S Specific Services GICB Capability, BDS 1,8:**

(§2.24.3.5.3.1 and 2.2.14.3.5.2)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,8 Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	8

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bits 33 –through- 64 (bits 1 –through- 32 of the “MB” Field), Bits 66 –through- 72 (bits 34 –through- 40 of the “MB” Field), and Bits 74 –through- 88 (bits 42 –through- 56 of the “MB” Field) set to “0” to indicate **NO** Capability has been established to service the BDS Registers designated in BDS 1,8.
- (2). Bit 65 (bit 33 of the “MB” Field) set to “1” to indicate in BDS 1,8 that BDS 1,8 is being serviced.
- (3). Bit 73 (bit 41 of the “MB” Field) set to “1” to indicate in BDS 1,8 that the Data Link Capability Report (BDS 1,0) is being serviced.

d. **Mode S Specific Services GICB Capability, BDS 1,9:** (§2.2.24.3.5.3)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,9 Mode S Specific Services GICB Capability:

BDS 1,9 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	9

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bits 33 -through- 88 (bits 1 -through- 56 of the “MB” field) set to “0” to indicate NO Capability has been established to service the BDS Registers designated in BDS 1,9.

e. **Mode S Specific Services GICB Capability, BDS 1,A:** (§2.2.24.3.5.3)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,A Mode S Specific Services GICB Capability:

BDS 1,A (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	A

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bits 33 -through- 88 (bits 1 -through- 56 of the “MB” field) set to “0” to indicate NO Capability has been established to service the BDS Registers designated in BDS 1,A.

f. **Mode S Specific Services GICB Capability, BDS 1,B:** (§2.2.24.5.3)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,B Mode S Specific Services GICB Capability:

BDS 1,B (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	B

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bits 33 -through- 88 (bits 1 -through- 56 of the “MB” field) set to “0” to indicate NO Capability has been established to service the BDS Registers designated in BDS 1,B.

PART 2: Flight Identification and Aircraft Registration Startup

Note: Review all subparagraphs of Part 2 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Data Initialization:** (§2.2.24.3.3.1, §2.2.24.3.3.2 and §2.2.24.3.4.1)

Provide the transponder with the following **ARINC-429** data words at a minimum rate of once per second for each data word in order to provide Flight Identification *AND* Aircraft Registration Data:

Respecify the data input in a table by specific character number alpha numeric and exact encoding, LSB to MSB.

Label 233, Flight Identification Character 1 & 2								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 1	PAD	Char. 2	PAD	SSM	Parity
Data:	1001 1011 (233)	XX	1010101	0	0101001	0000	00	ODD
Character:			“U”		“J”			
<i>Note:</i> “XX” denotes “Don’t Care”.								
Label 234, Flight Identification Character 3 & 4								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 3	PAD	Char. 4	PAD	SSM	Parity
Data:	1001 1100 (234)	XX	1010101	0	0101001	0000	01	ODD
Character:			“U”		“J”			
<i>Note:</i> “XX” denotes “Don’t Care”.								

Label 235, Flight Identification Character 5 & 6								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 5	PAD	Char. 6	PAD	SSM	Parity
Data:	1001 1101 (235)	XX	1010101	0	0101001	0000	11	ODD
Character:			“U”		“J”			
<i>Note:</i> “XX” denotes “Don’t Care”.								

Label 236, Flight Identification Character 7 & 8								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 7	PAD	Char. 8	PAD	SSM	Parity
Data:	1001 1110 (236)	XX	1010101	0	0101001	0000	00	ODD
Character:			“U”		“J”			
<i>Note:</i> “XX” denotes “Don’t Care”.								

Label 237, Flight Identification Character 9 & 10								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 9	PAD	Char. 10	PAD	SSM	Parity
Data:	1001 1100 (234)	XX	0001101	0	1001101	0000	01	ODD
Character:			“X”		“Y”			
<i>Note:</i> “XX” denotes “Don’t Care”.								

Label 301, Aircraft Registration Characters 1, 2, & 3						
Bits:	1 ----- 8	9 -- 10	11 --- 17	18 --- 24	25 --- 31	32
Field:	Label	SDI	Char. 1	Char. 2	Char. 3	Parity
Data:	1100 0001 (301)	XX	0101001	1010101	0101001	ODD
Character:			“J”	“U”	“J”	
Note: “XX” Denotes “Don’t Care”.						

Label 302, Aircraft Registration Characters 4, 5, & 6						
Bits:	1 ----- 8	9 -- 10	11 --- 17	18 --- 24	25 --- 31	32
Field:	Label	SDI	Char. 4	Char. 5	Char. 6	Parity
Data:	1100 0010 (302)	XX	1010101	0101001	1010101	ODD
Character:			“U”	“J”	“U”	
Note: “XX” Denotes “Don’t Care”.						

Label 303, Aircraft Registration Characters 7, 8, & 9						
Bits:	1 ----- 8	9 -- 10	11 --- 17	18 --- 24	25 --- 31	32
Field:	Label	SDI	Char. 7	Char. 8	Char. 9	Parity
Data:	1100 0011 (303)	XX	0101001	1010101	0101001	ODD
Character:			“J”	“U”	“J”	
Note: “XX” Denotes “Don’t Care”.						

b. **Air Initiated Comm.-B Broadcast and Flight Identification Verification:**

(§2.2.24.3.1.1, 2.2.24.3.2 and 2.2.24.3.4.1)

For up to **10.0** seconds after completing Part 2, Step a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 2,0_Aircraft Identification.

Start a test timer at the time of interrogation in order to monitor the “B” Timer.

BDS 2,0 AIRCRAFT IDENTIFICATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	0

Note: The interrogation should initiate the “B” timer for 18 +/- 1.0 seconds since a Comm.-B Broadcast is initiated when Flight Identification Data is changed.

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). “DR” = 4 or 5 if TCAS IS NOT interfaced to the transponder
= 6 or 7 if TCAS IS interfaced to the transponder and is functional.
- (2). And the “MB” field of the reply provides Flight Identification Data as follows:

Part 2. b.(2). DF = 20, BDS 2,0_Flight Identification "MB" Field									
Reply Bits:	33 --- 40	41 -- 46	47 -- 52	53 -- 58	59 -- 64	65 -- 70	71 --76	77 -- 82	83 -- 88
"MB" Bits:	1 --- 8	9 --- 14	15 -- 20	21 -- 26	27 -- 32	33 -- 38	39 -- 44	45 -- 50	51 -- 56
Field:	BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8
Data:	0010 0000	010101	001010	010101	001010	010101	001010	010101	001010
Character:		"U"	"J"	"U"	"J"	"U"	"J"	"U"	"J"

c. **Comm.-B Broadcast Extraction:**

(§2.2.24.3.1.1, §2.2.24.3.2, §2.2.24.3.3 and §2.2.24.3.4.1)

Interrogate the transponder with the following Comm-B Extraction interrogation in order to extract the Comm.-B broadcast message which should be the Data Link Capability Report contained in BDS 1,0.

COMM.-B BROADCAST EXTRACTION INTERROGATION SETUP								
"UF"	"PC"	"RR"	"DI"	"IIS"	"MBS"	"MES"	"LOS"	"RSS"
=	=	=	=	=	=	=	=	=
4	0	16	7	0	0	0	0	0

Verify that the transponder replies with a "DF" = 20 reply with:

- (1). "DR" = 4 or 5 if TCAS IS NOT interfaced to the transponder
= 6 or 7 if TCAS IS interfaced to the transponder and is functional.
- (2). Bit 65 ["AIS" subfield (bit 33 of the "MB" field)] set to "1" to indicate Flight Identification capability,

d. **Air Initiated Comm.-B Broadcast and Aircraft Registration Verification:**

(§2.2.24.3.1.1, 2.2.24.3.2, 2.2.24.3.3, 2.2.24.3.3.1, 2.2.24.3.3.2 and 2.2.24.3.4.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 2,1_Aircraft Registration.

BDS 2,1 AIRCRAFT REGISTRATION EXTRACTION INTERROGATION SETUP								
"UF"	"PC"	"RR"	"DI"	"IIS"	"MBS"	"MES"	"LOS"	"RSS"
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	1

Verify that the transponder replies with a "DF" = 20 reply with:

- (1). "DR" = 4 or 5 if TCAS IS NOT interfaced to the transponder
= 6 or 7 if TCAS IS interfaced to the transponder and is functional.
- (2). And the "MB" field of the reply provides Aircraft Registration Data as follows:

Part 2. c.(2). DF = 20, BDS 2,1 Aircraft Registration "MB" Field											
Reply Bits:	33	34 -- 39	40 -- 45	46 -- 51	52 -- 57	58 -- 63	64 -- 69	70 --75	76	77 -- 82	83 -- 88
"MB" Bits:	1	2 -- 7	8 -- 13	14 -- 19	20 -- 25	26 -- 31	32 -- 37	38 -- 43	44	45 -- 50	51 -- 56
Field:	Status	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Status	Char. 1	Char. 2
Data:	1	001010	010101	001010	010101	001010	010101	001010	0	000000	000000
Character:		"J"	"U"	"J"	"U"	"J"	"U"	"J"			

e. **Data Link Capability Report, BDS 1,0:** (§2.2.24.3.5.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,0 Data Link Capability Report.

BDS 1,0 (Data Link Capability) GICB EXTRACTION INTERROGATION SETUP								
"UF"	"PC"	"RR"	"DI"	"IIS"	"MBS"	"MES"	"LOS"	"RSS"
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	0

Verify that the transponder replies with a "DF" = 20 reply with:

- (1). Bit 65 ["AIS" subfield (bit 33 of the "MB" field)] set to "1" to indicate Flight Identification capability,
- (2). Bit 57 [Mode S Specific Services Capability (bit 25 of the "MB" field)] set to "1" to indicate Mode S Specific Services Capability,
- (3). Bit 67 [Surveillance Identifier (SI) (bit 35 of the "MB" field)] set to "1" to indicate that the transponder DOES Have "SI" Capability,
- (4). Bit 68 [Common Usage GICB Capability Report (bit 36 of the "MB" field)] set to "1" to indicate that there has been a change in the Common Usage GICB Capability Report, BDS 1,7.

f. **Common Usage GICB Capability Report, BDS 1,7:** (§2.2.24.3.5.2.1 and §2.2.24.5.2.2)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,7 Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
"UF"	"PC"	"RR"	"DI"	"IIS"	"MBS"	"MES"	"LOS"	"RSS"
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	7

Verify that the transponder replies with a "DF" = 20 reply with:

- (1). Bit 39 (7 of the "MB" field) set to "1" to indicate that Flight Identification Capability is established.
- (2). Bit 40 (8 of the "MB" field) set to "1" to indicate that Aircraft Registration Capability is established.

g. **Mode S Specific Services GICB Capability, BDS 1,8:**

(§2.2.24.3.5.3.1 and §2.2.24.5.3.2)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,8 Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	8

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 57 (25 of the “MB” field) set to “1” to indicate that Flight Identification Capability is established.
- (2). Bit 56 (24 of the “MB” field) set to “1” to indicate that Aircraft Registration Capability is established.
- (3). Bit 66 (34 of the “MB” field) set to “1” to indicate that BDS 1,7 Servicing Capability is established.
- (4). Bit 65 (33 of the “MB” field) set to “1” to indicate that BDS 1,8 Servicing Capability is established.

h. **Air Initiated Comm.-B Broadcast and Flight Identification Continuation:**

(§2.2.24.3.1.1, §2.2.14.3.2, §2.2.24.3.3 and §2.2.24.3.4.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 2,0_Aircraft Identification.

BDS 2,0 AIRCRAFT IDENTIFICATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). “DR” = 4 or 5 if TCAS IS NOT interfaced to the transponder
= 6 or 7 if TCAS IS interfaced to the transponder and is functional.

Continue to interrogate the transponder with the interrogation given in this step until the “DR” field in the DF = 20 IS NOT EQUAL to 4, 5, 6, or 7. This indicates that the “B” Timer started in Part 2.a. and b. has expired.

- (2). Verify that the time that has elapsed since executing Part 2.b. is within 18 +/- 1.0 seconds.

PART 3: Flight Identification Data Termination

Note: Review all subparagraphs of Part 3 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Flight Identification Data Termination:** (§2.2.24.3.3.1)

Discontinue the provision of Flight Identification data to the transponder. Continue to provide Aircraft Registration data as required in Part 2.a.

b. **Air Initiated Comm.-B Broadcast and Flight Identification Verification:**

(§2.2.24.3.1.1, §2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3, §2.2.24.3.4.1, and §2.2.24.3.6)

For up to **10.0** seconds after completing Part 3.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 2,0_Aircraft Identification.

BDS 2,0 AIRCRAFT IDENTIFICATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	0

Note: The interrogation should initiate the “B” timer for **18 +/- 1.0** seconds since a Comm.-B Broadcast is initiated when Flight Identification Data is changed.

Within **10.0** seconds of completing Part 3.a, verify that the transponder replies with a “DF” = **20** reply with:

- (1). “DR” = 4 or 5 if TCAS **IS NOT** interfaced to the transponder
= 6 or 7 if TCAS **IS** interfaced to the transponder and is functional.
- (2). And the “MB” field of the reply provides Flight Identification Data as follows:

Part 3. b.(2). DF = 20, BDS 2,0 Flight Identification ”MB” Field									
Reply Bits:	33 --- 40	41 -- 46	47 -- 52	53 -- 58	59 -- 64	65 -- 70	71 --76	77 -- 82	83 -- 88
“MB” Bits:	1 --- 8	9 --- 14	15 -- 20	21 -- 26	27 -- 32	33 -- 38	39 -- 44	45 -- 50	51 -- 56
Field:	BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8
Data:	0010 0000	000000	000000	000000	000000	000000	000000	000000	000000
Character:		“NUL”							

c. **Comm.-B Broadcast Extraction:**

(§2.2.24.3.1.1, §2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3 and §2.2.24.3.4.1)

Interrogate the transponder with the following Comm-B Extraction interrogation in order to extract the Comm.-B broadcast message which should be the Data Link Capability Report contained in BDS 1,0.

COMM.-B BROADCAST EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	16	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = **20** reply with:

- (1). **“DR”** = 4 or 5 if TCAS **IS NOT** interfaced to the transponder
= 6 or 7 if TCAS **IS** interfaced to the transponder and is functional.
- (2). Bit **65** [“AIS” subfield (bit **33** of the **“MB”** field)] set to **“0”** to indicate loss of Flight Identification capability.

d. **Common Usage GICB Capability Report, BDS 1,7:**

(§2.2.24.3.5.2.1 and §2.2.24.3.5.2.2)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,7 Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	7

Verify that the transponder replies with a **“DF” = 20** reply with:

- (1). Bit **39** (7 of the **“MB”** field) set to **“0”** to indicate that Flight Identification Capability has changed.
- (2). Bit **40** (8 of the **“MB”** field) set to **“1”** to indicate that Aircraft Registration Capability is established.

e. **Mode S Specific Services GICB Capability, BDS 1,8:**

(§2.2.24.3.5.3 and §2.2.24.3.3.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,8 Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	8

Verify that the transponder replies with a **“DF” = 20** reply with:

- (1). Bit **57** (25 of the **“MB”** field) set to **“1”** to indicate that Flight Identification Capability has been established during the power on cycle.
- (2). Bit **56** (24 of the **“MB”** field) set to **“1”** to indicate that Aircraft Registration Capability is established.
- (3). Bit **66** (34 of the **“MB”** field) set to **“1”** to indicate that BDS 1,7 Servicing Capability is established.
- (4). Bit **65** (33 of the **“MB”** field) set to **“1”** to indicate that BDS 1,8 Servicing Capability is established.

PART 4: Power-On Restart (NO Flight Ident.)

Note: Review all subparagraphs of Part 4 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Power-On Restart:**

(§2.2.24.3.4.1 and §2.2.24.3.1.1)

Remove power from the transponder for approximately 10 seconds.

Continue application of Aircraft Registration data to the transponder as defined in Part 2.a. Do not re-apply Flight Identification data to the transponder at this time.

Re-apply power to the transponder.

b. **Air Initiated Comm.-B Broadcast and Flight Identification Verification:**

(§2.2.24.3.1.1, §2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3, §2.2.24.3.4.1 and §2.2.24.3.6)

For up to **10.0** seconds after completing Part 4.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 2,0_Aircraft Identification (now Aircraft Registration) data.

BDS 2,0 AIRCRAFT IDENTIFICATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). “DR” = 4 or 5 if TCAS **IS NOT** interfaced to the transponder
= 6 or 7 if TCAS **IS** interfaced to the transponder and is functional.
- (2). And the “MB” field of the reply provides Flight Identification (now Aircraft Registration) Data as follows:

Part 4. b.(2). DF = 20, BDS 2,0 Flight Identification (now Aircraft Registration) “MB” Field									
Reply Bits:	33 --- 40	41 -- 46	47 -- 52	53 -- 58	59 -- 64	65 -- 70	71 --76	77 -- 82	83 -- 88
“MB” Bits:	1 --- 8	9 --- 14	15 -- 20	21 -- 26	27 -- 32	33 -- 38	39 -- 44	45 -- 50	51 -- 56
Field:	BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8
Data:	0010 0000	001010	010101	001010	010101	001010	010101	001010	010101
Character:		“J”	“U”	“J”	“U”	“J”	“U”	“J”	“U”

c. **Comm.-B Broadcast Extraction:**

(§2.2.24.3.1.1, §2.2.24.3.3.2, §2.2.24.3.2.1, §2.2.24.3.3 and §2.2.24.3.4.1)

Interrogate the transponder with the following Comm-B Extraction interrogation in order to extract the Comm.-B broadcast message which should be the Data Link Capability Report contained in BDS 1,0.

COMM.-B BROADCAST EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 16	“DI” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = 0

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). “DR” = 4 or 5 if TCAS IS NOT interfaced to the transponder
= 6 or 7 if TCAS IS interfaced to the transponder and is functional.
- (2). Bit 65 [“AIS” subfield (bit 33 of the “MB” field)] set to “1” to indicate Flight Identification capability,

d. **Common Usage GICB Capability Report, BDS 1,7:**

(§2.2.24.3.5.2.1, §2.2.24.3.5.2.2 and §2.2.24.3.2.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,7 Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 17	“DI” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = 7

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 39 (7 of the “MB” field) set to “1” to indicate that Flight Identification Capability has changed.
- (2). Bit 40 (8 of the “MB” field) set to “1” to indicate that Aircraft Registration Capability is established.

e. **Mode S Specific Services GICB Capability, BDS 1,8:**

(§2.2.24.3.5.3 and §2.2.24.3.3.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,8 Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 17	“DI” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = 8

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 57 (25 of the “MB” field) set to “1” to indicate that Flight Identification Capability has been established during the power on cycle.

- (2). Bit **56** (**24** of the “**MB**” field) set to “**1**” to indicate that Aircraft Registration Capability is established.
- (3). Bit **66** (**34** of the “**MB**” field) set to “**1**” to indicate that BDS 1,7 Servicing Capability is established.
- (4). Bit **65** (**33** of the “**MB**” field) set to “**1**” to indicate that BDS 1,8 Servicing Capability is established.

PART 5: Re-Apply Flight Identification

Note: Review all subparagraphs of Part 5 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Power-On Restart:**

(§2.2.24.3.4.1 and §2.2.24.3.1.1)

Continue application of Aircraft Registration data to the transponder as defined in Part 2.a. Re-apply Flight Identification data to the transponder as defined in Part 2.a.

b. **Air Initiated Comm.-B Broadcast and Flight Identification Verification:**

(§2.2.24.3.1.1, §2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3, §2.2.24.3.4.1 and §2.2.24.3.6)

For up to **10.0** seconds after completing Part 5.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS **2,0** Aircraft Identification data.

BDS 2,0 AIRCRAFT IDENTIFICATION EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 18	“DF” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = 0

Verify that the transponder replies with a “**DF**” = **20** reply with:

- (1). “**DR**” = 4 or 5 if TCAS **IS NOT** interfaced to the transponder
= 6 or 7 if TCAS **IS** interfaced to the transponder and is functional.
- (2). And the “**MB**” field of the reply provides Flight Identification Data as follows:

Part 5. b.(2). DF = 20, BDS 2,0 Flight Identification “MB” Field									
Reply Bits:	33 --- 40	41 -- 46	47 -- 52	53 -- 58	59 -- 64	65 -- 70	71 --76	77 -- 82	83 -- 88
“MB” Bits:	1 --- 8	9 --- 14	15 -- 20	21 -- 26	27 -- 32	33 -- 38	39 -- 44	45 -- 50	51 -- 56
Field:	BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8
Data:	0010 0000	010101	001010	010101	001010	010101	001010	010101	001010
Character:		“ U ”	“ J ”						

c. **Comm.-B Broadcast Extraction:**

(§2.2.24.3.1.1, §2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3, and §2.2.24.3.4.1)

Interrogate the transponder with the following Comm-B Extraction interrogation in order to extract the Comm.-B broadcast message which should be the Flight Identification contained in BDS 2,0.

COMM.-B BROADCAST EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DF”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	16	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). “DR” = 4 or 5 if TCAS **IS NOT** interfaced to the transponder
= 6 or 7 if TCAS **IS** interfaced to the transponder and is functional.
- (2). And the “MB” field of the reply provides Flight Identification data as follows:

Part 5. c.(2). DF = 20, BDS 2,0_Flight Identification_”MB” Field									
Reply Bits:	33 -- 40	41 -- 46	47 -- 52	53 -- 58	59 -- 64	65 -- 70	71 -- 76	77 -- 82	83 -- 88
“MB” Bits:	1 -- 8	9 -- 14	15 -- 20	21 -- 26	27 -- 32	33 -- 38	39 -- 44	45 -- 50	51 -- 56
Field:	BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8
Data:	0010 0000	010101	001010	010101	001010	010101	001010	010101	001010
Character:		“U”	“J”	“U”	“J”	“U”	“J”	“U”	“J”

d. **Common Usage GICB Capability Report, BDS 1,7:**

(§2.2.24.3.5.2.1, §2.2.24.3.5.2.2 and §2.2.24.3.2.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,7 Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DF”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	7

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 39 (7 of the “MB” field) set to “1” to indicate that Flight Identification Capability has changed.
- (2). Bit 40 (8 of the “MB” field) set to “1” to indicate that Aircraft Registration Capability is established.

e. **Mode S Specific Services GICB Capability, BDS 1,8:**

(§2.2.24.3.5.3 and §2.2.24.3.3.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,8 Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 17	“DF” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = 8

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 57 (25 of the “MB” field) set to “1” to indicate that Flight Identification Capability has been established during the power on cycle.
- (2). Bit 56 (24 of the “MB” field) set to “1” to indicate that Aircraft Registration Capability is established.
- (3). Bit 66 (34 of the “MB” field) set to “1” to indicate that BDS 1,7 Servicing Capability is established.
- (4). Bit 65 (33 of the “MB” field) set to “1” to indicate that BDS 1,8 Servicing Capability is established.

PART 6: Data Mix #1

Note: Review all subparagraphs of Part 6 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Data Mix #1 Initialization:** (§2.2.24.3.3.1)

Provide the transponder with the following **ARINC-429** data words at a minimum rate of once per second for each data word in order to provide Flight Identification AND Aircraft Registration Data:

Label 233, Flight Identification Character 1 & 2								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 1	PAD	Char. 2	PAD	SSM	Parity
Data:	1001 1011 (233)	XX	0110110	0	0000010	0000	00	ODD
Character:			“6”		“SP”			
Note: “XX” denotes “Don’t Care”.								

Label 234, Flight Identification Character 3 & 4								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 3	PAD	Char. 4	PAD	SSM	Parity
Data:	1001 1100 (234)	XX	1001110	0	0000010	0000	01	ODD
Character:			“9”		“SP”			
Note: “XX” denotes “Don’t Care”.								

Label 235, Flight Identification Character 5 & 6								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 5	PAD	Char. 6	PAD	SSM	Parity
Data:	1001 1101 (235)	XX	0110110	0	0000010	0000	11	ODD
Character:			“6”		“SP”			
<i>Note: “XX” denotes “Don’t Care”.</i>								

Label 236, Flight Identification Character 7 & 8								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 7	PAD	Char. 8	PAD	SSM	Parity
Data:	1001 1110 (236)	XX	1001110	0	0000010	0000	00	ODD
Character:			“9”		“SP”			
<i>Note: “XX” denotes “Don’t Care”.</i>								

Label 237, Flight Identification Character 9 & 10								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30-31	32
Field:	Label	SDI	Char. 9	PAD	Char. 10	PAD	SSM	Parity
Data:	1001 1100 (234)	XX	0001101	0	1001101	0000	01	ODD
Character:			“X”		“Y”			
<i>Note: “XX” denotes “Don’t Care”.</i>								

Label 301, Aircraft Registration Characters 1, 2, & 3						
Bits:	1 ----- 8	9 -- 10	11 --- 17	18 --- 24	25 --- 31	32
Field:	Label	SDI	Char. 1	Char. 2	Char. 3	Parity
Data:	1100 0001 (301)	XX	1110101	0001101	0000010	ODD
Character:			“W”	“X”	“SP”	
<i>Note: “XX” Denotes “Don’t Care”.</i>						

Label 302, Aircraft Registration Characters 4, 5, & 6						
Bits:	1 ----- 8	9 -- 10	11 --- 17	18 --- 24	25 --- 31	32
Field:	Label	SDI	Char. 4	Char. 5	Char. 6	Parity
Data:	1100 0010 (302)	XX	1001101	0101101	0000010	ODD
Character:			“Y”	“Z”	“SP”	
<i>Note: “XX” Denotes “Don’t Care”.</i>						

Label 303, Aircraft Registration Characters 7, 8, & 9						
Bits:	1 ----- 8	9 -- 10	11 --- 17	18 --- 24	25 --- 31	32
Field:	Label	SDI	Char. 7	Char. 8	Char. 9	Parity
Data:	1100 0011 (303)	XX	0010110	0100110	0000010	ODD
Character:			“4”	“2”	“SP”	
<i>Note: “XX” Denotes “Don’t Care”.</i>						

- b. **Flight Identification Verification:**

(§2.2.24.3.1.1, §2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3, §2.2.24.3.4.1 and §2.2.24.3.6)

For up to **10.0** seconds after completing Part 6.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS **2,0**_Aircraft Identification data.

BDS 2,0 AIRCRAFT IDENTIFICATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = **20** reply and that the “MB” field of the reply provides Flight Identification Data as follows:

Part 6. b. DF = 20, BDS 2,0_Flight Identification ”MB” Field									
Reply Bits:	33 --- 40	41 -- 46	47 -- 52	53 -- 58	59 -- 64	65 -- 70	71 --76	77 -- 82	83 -- 88
“MB” Bits:	1 --- 8	9 --- 14	15 -- 20	21 -- 26	27 -- 32	33 -- 38	39 -- 44	45 -- 50	51 -- 56
Field:	BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8
Data:	0010 0000	110110	111001	110110	111001	011000	011001	100000	100000
Character:		“6”	“9”	“6”	“9”	“X”	“Y”	“SP”	“SP”

c. **Aircraft Registration Verification:**

(§2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.2.2, §2.2.24.3.4.2 and §2.2.24.3.4.2.1)

Within **30.0** seconds of completing Part 6.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS **2,1**_Aircraft Registration.

BDS 2,1 AIRCRAFT REGISTRATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	1

Verify that the transponder replies with a “DF” = **20** reply and that the “MB” field of the reply provides Aircraft Registration Data as follows:

Part 6. c. DF = 20, BDS 2,1_Aircraft Registration ”MB” Field											
Reply Bits:	33	34 -- 39	40 -- 45	46 -- 51	52 -- 57	58 -- 63	64 -- 69	70 --75	76	77 -- 82	83 -- 88
“MB” Bits:	1	2 -- 7	8 -- 13	14 -- 19	20 -- 25	26 -- 31	32 -- 37	38 -- 43	44	45 -- 50	51 -- 56
Field:	Status	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Status	Char. 1	Char. 2
Data:	1	010111	011000	011001	011010	110100	110010	100000	0	000000	000000
Character:		“W”	“X”	“Y”	“Z”	“4”	“2”	“SP”			

PART 7: Data Mix #2

Note: Review all subparagraphs of Part 7 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Data Mix #2 Initialization:**

(§2.2.24.3.3.1)

Provide the transponder with the following **ARINC-429** data words at a minimum rate of once per second for each data word in order to provide Flight Identification *AND* Aircraft Registration Data:

Label 233, Flight Identification Character 1 & 2								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32
Field:	Label	SDI	Char. 1	PAD	Char. 2	PAD	SSM	Parity
Data:	1001 1011 (233)	XX	0000010	0	0000010	0000	00	ODD
Character:			“SP”		“SP”			
<i>Note: “XX” denotes “Don’t Care”.</i>								

Label 234, Flight Identification Character 3 & 4								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32
Field:	Label	SDI	Char. 3	PAD	Char. 4	PAD	SSM	Parity
Data:	1001 1100 (234)	XX	0000010	0	0000010	0000	01	ODD
Character:			“SP”		“SP”			
<i>Note: “XX” denotes “Don’t Care”.</i>								

Label 235, Flight Identification Character 5 & 6								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32
Field:	Label	SDI	Char. 5	PAD	Char. 6	PAD	SSM	Parity
Data:	1001 1101 (235)	XX	0010001	0	0011001	0000	11	ODD
Character:			“D”		“L”			
<i>Note: “XX” denotes “Don’t Care”.</i>								

Label 236, Flight Identification Character 7 & 8								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32
Field:	Label	SDI	Char. 7	PAD	Char. 8	PAD	SSM	Parity
Data:	1001 1110 (236)	XX	0000010	0	0010110	0000	00	ODD
Character:			“SP”		“4”			
<i>Note: “XX” denotes “Don’t Care”.</i>								

Label 237, Flight Identification Character 9 & 10								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32
Field:	Label	SDI	Char. 9	PAD	Char. 10	PAD	SSM	Parity
Data:	1001 1100 (234)	XX	0000010	0	1010110	0000	01	ODD
Character:			“SP”		“5”			
<i>Note: “XX” denotes “Don’t Care”.</i>								

Label 301, Aircraft Registration Characters 1, 2, & 3						
Bits:	1 ----- 8	9 -- 10	11 --- 17	18 --- 24	25 --- 31	32
Field:	Label	SDI	Char. 1	Char. 2	Char. 3	Parity
Data:	1100 0001 (301)	XX	0000010	0000010	0000010	ODD
Character:			“SP”	“SP”	“SP”	
<i>Note: “XX” Denotes “Don’t Care”.</i>						

Label 302, Aircraft Registration Characters 4, 5, & 6						
Bits:	1 ----- 8	9 -- 10	11 --- 17	18 --- 24	25 --- 31	32
Field:	Label	SDI	Char. 4	Char. 5	Char. 6	Parity
Data:	1100 0010 (302)	XX	0010001	0011001	0000010	ODD
Character:			“D”	“L”	“SP”	
<i>Note: “XX” Denotes “Don’t Care”.</i>						

Label 303, Aircraft Registration Characters 7, 8, & 9						
Bits:	1 ----- 8	9 -- 10	11 --- 17	18 --- 24	25 --- 31	32
Field:	Label	SDI	Char. 7	Char. 8	Char. 9	Parity
Data:	1100 0011 (303)	XX	0010110	0010110	0000010	ODD
Character:			“4”	“4”	“SP”	
<i>Note: “XX” Denotes “Don’t Care”.</i>						

b. **Flight Identification Verification:**

(§2.2.24.3.1.1, §2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3, §2.2.24.3.4.1 and §2.2.24.3.6)

Within **10.0** seconds of completing Part 7.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 2,0_Aircraft Identification data.

BDS 2,0 AIRCRAFT IDENTIFICATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = 20 reply and that the “MB” field of the reply provides Flight Identification Data as follows:

Part 7. b. DF = 20, BDS 2,0_Flight Identification ”MB” Field									
Reply Bits:	33 --- 40	41 -- 46	47 -- 52	53 -- 58	59 -- 64	65 -- 70	71 -- 76	77 -- 82	83 -- 88
“MB” Bits:	1 --- 8	9 --- 14	15 -- 20	21 -- 26	27 -- 32	33 -- 38	39 -- 44	45 -- 50	51 -- 56
Field:	BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8
Data:	0010 0000	000100	001100	110100	110101	100000	100000	100000	100000
Character:		“D”	“L”	“4”	“5”	“SP”	“SP”	“SP”	“SP”

c. **Aircraft Registration Verification:**

(§2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3.2, §2.2.24.3.4.2 and §2.2.24.3.4.2.1)

Within **30.0** seconds of completing Part 7.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 2,1_Aircraft Registration.

BDS 2,1 AIRCRAFT REGISTRATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	1

Verify that the transponder replies with a “DF” = 20 reply and that the “MB” field of the reply provides Aircraft Registration Data as follows:

Part 7. c. DF = 20, BDS 2,1_Aircraft Registration ”MB” Field											
Reply Bits:	33	34 -- 39	40 -- 45	46 -- 51	52 -- 57	58 -- 63	64 -- 69	70 --75	76	77 -- 82	83 -- 88
“MB” Bits:	1	2 -- 7	8 -- 13	14 -- 19	20 -- 25	26 -- 31	32 -- 37	38 -- 43	44	45 -- 50	51 -- 56
Field:	Status	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Status	Char. 1	Char. 2
Data:	1	000100	001100	110100	110100	100000	100000	100000	0	000000	000000
Character:		“D”	“L”	“4”	“4”	“SP”	“SP”	“SP”			

PART 8: Data Mix 4 NCD Data

Note: Review all subparagraphs of Part 8 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Data Mix #4 Initialization:** (§2.2.24.3.3.1)

Disable the capability to provide Aircraft Registration Data to the transponder.

Provide the transponder with the following **ARINC-429** data words at a minimum rate of once per second for each data word in order to provide Flight Identification Data:

Use only 8-character input

Label 233, Flight Identification Character 1 & 2									
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32	
Field:	Label	SDI	Char. 1	PAD	Char. 2	PAD	SSM	Parity	
Data:	1001 1011 (233)	XX	0000010	0	0000010	0000	10	ODD	
Character:			“SP”		“SP”				
Note: “XX” denotes “Don’t Care”.									

Label 234, Flight Identification Character 3 & 4									
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32	
Field:	Label	SDI	Char. 3	PAD	Char. 4	PAD	SSM	Parity	
Data:	1001 1100 (234)	XX	0000010	0	0000010	0000	10	ODD	
Character:			“SP”		“SP”				
Note: “XX” denotes “Don’t Care”.									

Label 235, Flight Identification Character 5 & 6								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32
Field:	Label	SDI	Char. 5	PAD	Char. 6	PAD	SSM	Parity
Data:	1001 1101 (235)	XX	0010001	0	0011001	0000	10	ODD
Character:			“D”		“L”			

Note: “XX” denotes “Don’t Care”.

Label 236, Flight Identification Character 7 & 8								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32
Field:	Label	SDI	Char. 7	PAD	Char. 8	PAD	SSM	Parity
Data:	1001 1110 (236)	XX	0000010	0	0010110	0000	10	ODD
Character:			“SP”		“4”			

Note: “XX” denotes “Don’t Care”.

Label 237, Flight Identification Character 9 & 10								
Bits:	1 ----- 8	9 -- 10	11 --- 17	18	19 --- 25	26-- 29	30--31	32
Field:	Label	SDI	Char. 9	PAD	Char. 10	PAD	SSM	Parity
Data:	1001 1100 (234)	XX	0000010	0	1010110	0000	10	ODD
Character:			“SP”		“5”			

Note: “XX” denotes “Don’t Care”.

b. **Flight Identification Verification:**

(§2.2.24.3.1.1, §2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3, §2.2.24.3.4.1 and §2.2.24.3.6)

Within **10.0** seconds of completing Part 8.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 2,0_Aircraft Identification data.

BDS 2,0 AIRCRAFT IDENTIFICATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DF”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = 20 reply and that the “MB” field of the reply provides Flight Identification Data as follows:

Part 8. b. DF = 20, BDS 2,0_Flight Identification ”MB” Field									
Reply Bits:	33 --- 40	41 -- 46	47 -- 52	53 -- 58	59 -- 64	65 -- 70	71 --76	77 -- 82	83 -- 88
“MB” Bits:	1 --- 8	9 --- 14	15 -- 20	21 -- 26	27 -- 32	33 -- 38	39 -- 44	45 -- 50	51 -- 56
Field:	BDS	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Char. 8
Data:	0010 0000	000000	000000	000000	000000	000000	000000	000000	000000
Character:		“NUL”							

c. **Aircraft Registration Verification:**

(§2.2.24.3.2, §2.2.24.3.2.1, §2.2.24.3.3.2, §2.2.24.3.4.2 and §2.2.24.3.4.2.1)

Within **30.0** seconds of completing Part 7.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS **2,1** Aircraft Registration.

BDS 2,1 AIRCRAFT REGISTRATION EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DF”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	18	7	0	0	0	0	1

Verify that the transponder replies with a **“DF” = 20** reply and that the **“MB”** field of the reply provides Aircraft Registration Data as follows:

Part 8. c. DF = 20, BDS 2,1 Aircraft Registration ”MB” Field											
Reply Bits:	33	34 -- 39	40 -- 45	46 -- 51	52 -- 57	58 -- 63	64 -- 69	70 --75	76	77 -- 82	83 -- 88
“MB” Bits:	1	2 -- 7	8 -- 13	14 -- 19	20 -- 25	26 -- 31	32 -- 37	38 -- 43	44	45 -- 50	51 -- 56
Field:	Status	Char. 1	Char. 2	Char. 3	Char. 4	Char. 5	Char. 6	Char. 7	Status	Char. 1	Char. 2
Data:	1	000000	000000	000000	000000	000000	000000	000000	0	000000	000000
Character:		“NUL”									

2.7 Test Procedures for Enhanced Surveillance (EHS) Compliant Transponder

Not test procedure required.

2.7.1 BDS-4,0 ENHANCED SURVEILLANCE__PROTOCOL AND INTERFACE

Introduction:

The intent of this procedure is to validate all aspects of Enhanced Surveillance (Servicing of BDS 4,0) as required in §2.2.25.1 -through §2.2.25.4.3.

Note: *The following procedures define parameter input via ARINC-429 Data buses as such buses and data parameters are defined in the industry. If other data sources are used, then it is up to the Test Personnel to ensure that the proper data is being provided to the Unit Under Test.*

TEST PROCEDURE:

PART 1: Capability Verification

Note: *The primary intent of Part 1 is to validate appropriate capability declaration of No Capability prior to providing data to BDS 4,0, and that the Selected Altitude Count in BDS 5,F is set to “00”.*

Ensure that **NO** Flight Identification or Aircraft Registration data is being provided to the transponder.

Ensure that the TCAS / Transponder interface is **NOT ACTIVE**. If the interface is active, TCAS will provide data to set the Data Link Capability and thereby compromise the results of the following tests. Likewise, TCAS could attempt to set the Resolution Advisory Report and thereby compromise the results of the following tests.

Ensure that no other data is being provided to the transponder that could result in the loading of BDS registers internal to the transponder.

Disable the Extended Squitter and Mode-S Specific Services (“MSSS”) functions prior to starting the following procedures in order to keep from setting various BDS registers during the following tests.

a. **Data Link Capability Report, BDS 1,0:** (§2.2.25.1)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,0 Data Link Capability Report.

BDS 1,0 (Data Link Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 65 [“AIS” subfield (bit 33 of the “MB” field)] set to “0” to indicate **NO** Flight Identification capability,

- (2). Bit **57** [Mode S Specific Services Capability (bit **25** of the “**MB**” field)] set to “**1**” to indicate Mode S Specific Services Capability (This is because BDS **1,0** and **1,8** are being serviced).
- (3). Bit **67** [Surveillance Identifier (“**SI**”) (bit **35** of the “**MB**” field)] set to “**1**” to indicate that the transponder **DOES** Have “**SI**” Capability,
- (4). Bit **68** [Common Usage GICB Capability Report (bit **36** of the “**MB**” field)] set to “**0**” to indicate that there has been no change in the Common Usage GICB Capability Report, BDS **1,7**.

b. **Common Usage GICB Capability Report, BDS 1,7:**

(§2.2.25.1.2, §2.2.25.2.1 and §2.2.25.2.2.3)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS **1,7** Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	7

Verify that the transponder replies with a “**DF**” = **20** reply with:

- (1). Bits **33** -through- **60** (bits **1** -through- **28** of the “**MB**” field) set to “**0**” to indicate **NO** Capability or capability changes in the Common Usage GICB Capability Report, BDS **1,7**.
- (2). Bits **61** -through- **88** (bits **29** -through- **56** of the “**MB**” field) set to “**0**” since these bits are Reserved or “**Don’t Care**”.

c. **Mode S Specific Services GICB Capability, BDS 1,8:** (§2.2.25.3)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS **1,8** Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	8

Verify that the transponder replies with a “**DF**” = **20** reply with:

- (1). Bits **33** –through- **64** (bits **1** –through- **32** of the “**MB**” Field), Bits **66** –through- **72** (bits **34** –through- **40** of the “**MB**” Field), and Bits **74** –through- **88** (bits **42** –through- **56** of the “**MB**” Field) set to “**0**” to indicate **NO** Capability has been established to service the BDS Registers designated in BDS **1,8**.
- (2). Bit **65** (bit **33** of the “**MB**” Field) set to “**1**” to indicate in BDS **1,8** that BDS **1,8** is being serviced.

- (3). Bit 73 (bit 41 of the “MB” Field) set to “1” to indicate in BDS 1,8 that the Data Link Capability Report (BDS 1,0) is being serviced.

d. **Mode S Specific Services GICB Capability, BDS 1,9:** (§2.2.25.3)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,9 Mode S Specific Services GICB Capability:

BDS 1,9 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	9

Verify that the transponder replies with a “DF” = 20 reply with:

Bits 33 -through- 88 (bits 1 -through- 56 of the “MB” field) set to “0” to indicate NO Capability has been established to service the BDS Registers designated in BDS 1,9.

e. **Mode S Specific Services GICB Capability, BDS 1,A:** (§2.2.25.3)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,A Mode S Specific Services GICB Capability:

BDS 1,A (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	A

Verify that the transponder replies with a “DF” = 20 reply with:

Bits 33 -through- 88 (bits 1 -through- 56 of the “MB” field) set to “0” to indicate NO Capability has been established to service the BDS Registers designated in BDS 1,A.

f. **Mode S Specific Services GICB Capability, BDS 1,B:** (§2.2.25.3)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,B Mode S Specific Services GICB Capability:

BDS 1,B (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	B

Verify that the transponder replies with a “DF” = 20 reply with:

Bits 33 -through- 88 (bits 1 -through- 56 of the “MB” field) set to “0” to indicate NO Capability has been established to service the BDS Registers designated in BDS 1,B.

g. **Quasi-Static Parameter Monitoring , BDS 5,F:** (§2.2.25.6)

Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 5,F Quasi-Static Parameter Monitoring Capability:

BDS 5,F (Quasi-Static Parameter Monitoring Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	21 (15 hex)	7	0	0	0	0	F

Verify that the transponder replies with a “DF” = 20 reply with:

Bits 33 -through- 88 (bits 1 -through- 56 of the “MB” field) set to “0” to indicate NO Capability has been established to service the parameters designated in BDS 5,F.

PART 2: BDS 4,0 _Aircraft Intention Validation

Note 1: The primary intent of Part 2 beyond data validation in BDS 4,0 is to validate capability declaration, initiation of the Comm. B Broadcast due to initial BDS 4,0 servicing, and that the Selected Altitude Count in BDS 5,F goes to “01”.

Note 2: Review all subparagraphs of Part 2 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Data Input Initialization:** (§2.2.25.4.1 and §2.2.25.4.2)

Note: The following procedures define parameter input via ARINC-429 Data buses as such buses and data parameters are defined in the industry. If other data sources are used, then it is up to the Test Personnel to ensure that the proper data is being provided to the Unit Under Test.

(1). **Mode Control Panel Selected Altitude:**

Via the appropriate Mode Control Panel (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate Mode Control Panel Selected Altitude data.

Label 102, Selected Altitude (feet) _ Mode Control Panel Input								
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity
Data:	0100 0010	10	0	0	1011 1100 1111 0001	0	11	ODD
Reversed data (bit 29, 28 – 13)					0_ 1000 1111 0011 1101			
Data Value(feet):					+ 36,669 [8F3D Hex]			
Rounded Input Data :					0_ 1000 1111 0100			
Rounded Input Data Value (feet) :					+ 36,672			
Note: “SDI” shall be equivalent to the UUT “SDI” strapping. In this case, Side #1.								

(2). Flight Management System (FMS) Selected Altitude:

Via the appropriate FMS (or other) interface, provide the transponder with the following **ARINC-429** data word at a minimum rate of 5 per second in order to provide appropriate FMS Selected Altitude data.

Label 102, Selected Altitude (feet) FMS Input									
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32	
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity	
Data:	0100 0010	10	0	0	0101 1111 1011 1110	0	11	ODD	
Reversed data (bit 29, 28 – 13)					0_0111 1101 1111 0101				
Data Value(feet):					+ 32,250 [7DFA Hex]				
Rounded Input Data :					0_0111 1110 0000				
Rounded Input Data Value (feet) :					+ 32,256				
<i>Note: "SDI" shall be equivalent to the UUT "SDI" strapping. In this case, Side #1.</i>									

(3). Air Data System (ADS) input of Barometric Correction:

Via the appropriate ADS (or other) interface, provide the transponder with the following **ARINC-429** data word at a minimum rate of 5 per second in order to provide appropriate Barometric Correction data.

Label 234, Barometric Correction (millibars) Air Data System Input									
Bits:	1 ----- 8	9 - 10	11 -- 14	15 -- 18	19 -- 22	23 – 26	27 -- 29	30-31	32
Field:	Label (234)	SDI	BCD X 0.1	BCD X 1.0	BCD X 10.0	BCD X 100	BCD X 1000	SSM	Parity
Data:	1001 1100	10	1010	1001	0000	0100	100	00	ODD
Reversed data (binary):			0101	1001	0000	0010	001		
Decimal Data Equivalent:			5	9	0	2	1		
Data Equivalent			1,209.5 millibars						

Barometric Correction Encoding Derivation									
12095/2 = 6047	_ 1	94/2 = 47	_ 0	0010 1111 0011 1111	Hex == 2F3F	Hex ==	12095	Decimal	
6047/2 = 3023	_ 1	47/2 = 23	_ 1	1110.0000 1100.0000	Hex == E0C0	Hex ==	-8000	millibars	
3023/2 = 1511	_ 1	23/2 = 11	_ 1	0000 1111 1111 1111	Hex == 0FFF	Hex ==	4095	Decimal	
1511/2 = 755	_ 1	11/2 = 5	_ 1	Map Bits 28 -through- 40 of BDS 4,0 as: 1111 1111 1111					
755/2 = 377	_ 1	5/2 = 2	_ 1						
377/2 = 188	_ 1	2/2 = 1	_ 0						
188/2 = 94	_ 0	1/2 = 0	_ 1						

b. BDS 4,0 Capability Verification: (§2.2.25.1.2 and §2.2.25.4)

Within **one second** of providing the transponder with data as detailed in Part 2.a., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0_ Aircraft Intent data.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

Note 1: The interrogation should **initiate** the “B” timer for 18 +/- 1.0 seconds since a Comm.-B Broadcast is initiated.

Note 2: In this case, the Comm.-B Broadcast is caused by the contents of BDS 4,0 changing. This change causes a change to BDS 1,7, which then forces a change to BDS 1,0, which then results in the initiation of the Comm.-B Broadcast.

- (1). Verify that the transponder replies with a “DF” = 20 reply.
- (2). During replies to this interrogation sequence and subsequent interrogations during this test procedure, monitor the “DR” field. If the “DR” field changes to 4, 5, 6, or 7, then the transponder has initiated a Comm.-B Broadcast.

When the “DR” field changes, start a Test Timer to monitor that the “B”-Timer runs for 18 +/- 1.0 seconds.

“DR” = 4 or 5 if TCAS IS NOT interfaced to the transponder
 = 6 or 7 if TCAS IS interfaced to the transponder and is functional.

- (3). Verify that the “DF”=20 reply “MB” field provides Aircraft Intent Data as follows:

Add data input and MB verification of bits 48 – 51.

Part 2.b.(3) DF = 20, Aircraft Intent “MB” Field

Reply Bits:	33	34 ----- 45	46	47 ----- 58	59	60 ----- 71	72 --- 79	80	81	82	83	84- 85	86	87 -- 88
“MB” Bits:	1	2 ----- 13	14	15 ----- 26	27	28 ----- 39	40 --- 47	48	49	50	51	52 - 53	54	55 -- 56
Field:	Selected Altitude		FMS Selected Altitude		Baro. Pressure Setting		RSVD	MCP	VNAV	A-HLD	APP	RSVD	Target	Target
	Status	Data	Status	Data	Status	Data		Mode	Mode	Mode	Mode		Status	SRC
Data:	1	1000 1111 0100	1	0111 1110 0000	1	1111 1111 1111	00000000	0	0	0	0	00	0	00

- c. **Quasi-Static Parameter Monitoring , BDS 5,F:** (§2.2.25.1.1. and 2.2.25.6.)

Within 0.5 seconds of completing the reply acceptance in Part 2.b., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 5,F Quasi-Static Parameter Monitoring Capability.

BDS 5,F (Quasi-Static Parameter Monitoring Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DF”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	21 (15 hex)	7	0	0	0	0	F

Verify that the transponder replies with a “DF” = 20 reply with:

Bits 33 and 34 (bits 1 and 2 of the “MB” field) are set to “01” respectively to indicate that the Selected Altitude parameter in BDS 4,0 has changed.

Need to establish equivalent count for FMS Selected Altitude, Baro pressure and bits 48 – 51.

d. **Common Usage GICB Capability Report, BDS 1,7:** (§2.2.25.2.)

Within 4.0 +/- 0.5 seconds of the interrogation/reply sequence in Part 2.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,7 Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	7

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 41 (bit 9 of the “MB” field) set to “1” to indicate that BDS 4,0 servicing capability has been established and that data is valid.
- (2). Bit 55 (bit 23 of the “MB” field) set to “1” to indicate that BDS 5,F servicing capability has been established and that data is valid.

e. **Mode S Specific Services GICB Capability, BDS 1,9:** (§2.2.25.3)

Within 4.0 +/- 0.5 seconds of the interrogation/reply sequence in Part 2.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,9 Mode S Specific Services GICB Capability:

BDS 1,9 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	9

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 80 (bit 49 of the “MB” field) set to “1” to indicate that BDS 4,0 servicing capability has been established.
- (2). Bit 50 (bit 18 of the “MB” field) set to “1” to indicate that BDS 5,F servicing capability has been established.

f. **Mode S Specific Services GICB Capability, BDS 1,8:** (§2.2.25.3)

Within 4.0 +/- 0.5 seconds of the interrogation/reply sequence in Part 2.c., Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,8 Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	8

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit **64** (bit **32** of the “**MB**” field) set to “**1**” to indicate that BDS **1,9** servicing capability has been established.
- (2). Bit **65** (bit **33** of the “**MB**” field) set to “**1**” to indicate that BDS **1,8** servicing capability has been established.
- (3). Bit **66** (bit **34** of the “**MB**” field) set to “**1**” to indicate that BDS **1,7** servicing capability has been established.

g. **Comm.-B Broadcast Validation:** (§2.2.25.1.2)

Continue to interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS **4,0** Aircraft Intent data monitor the “**DR**” field in the reply.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 20	“DI” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = 0

Within **1** minute of the interrogation/reply sequence in Part 2.c.:

Cannot use 1 minute for the time here

Verify that the “**DR**” field in **DF=20** replies is set to “**DR**” = **4, 5, 6, or 7** to indicate that a Comm.-B Broadcast is active.

h. **Comm.-B Broadcast Extraction:** (SRS: section §3.2.5.1.12.4.1)

After determining that the “**DR**” field has been set to “**DR**”= **4, 5, 6, or 7** in Part 2.g., interrogate the transponder with the following Comm-B Extraction interrogation in order to extract the Comm.-B broadcast message which should be the Data Link Capability Report contained in BDS **1,0**.

COMM.-B BROADCAST EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 16	“DI” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = 0

Verify that the transponder replies with a “**DF**” = **20** reply having:

- (1). “**DR**” = **4 or 5** if TCAS **IS NOT** interfaced to the transponder
 = **6 or 7** if TCAS **IS** interfaced to the transponder and is functional.
- (2). Bit **57** [Mode-S Specific Services Capability Bit (**bit 25 of the “MB” field**)] set to “**1**” to indicate that Mode-S Specific Services Capability has been established.
- (3). Bit **68** [Common Usage GICB Capability Report Bit (bit **36** of the “**MB**” field)] toggled to “**1**” (from “**0**”) to indicate that BDS **1,7** has changed.

i. Comm.-B Broadcast Termination: (SRS: section 3.2.5.1.12.4.1)

Continue to interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0_ Aircraft Intent data monitor the “DR” field in the reply.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

Verify that the “DR” field in DF=20 replies is set to “DR” = 4, 5, 6, or 7 for 18 +/- 1.0 seconds and then reverts to “DR” other than “DR” = 4, 5, 6, or 7 to indicate that the “B”-Timer has expired.

PART 3: BDS 4,0 Aircraft Intention Data Change Validation Set 2

Note 1: The primary intent of Part 3 beyond data validation in BDS 4,0 is to validate that the Selected Altitude Count in BDS 5,F goes to “10”.

Note 2: Review all subparagraphs of Part 3 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. Selected Altitude and Barometric Pressure Change:

(§2.2.25.4.1 and 2.2.25.4.2)

(1). Mode Control Panel Selected Altitude:

Via the appropriate Mode Control Panel (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate Mode Control Panel Selected Altitude data.

Label 102, Selected Altitude (feet) _ Mode Control Panel Input								
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity
Data:	0100 0010	10	0	0	0011 1101 0111 1010	0	11	ODD
Reversed data (bit 29, 28 – 13)					0_ 0101 1110 1011 1100			
Data Value(feet):					+ 24,252 [5EBC Hex]			
Rounded Input Data :					0_ 0101 1110 1100			
Rounded Input Data Value (feet) :					+ 24,256			
Note: “SDI” shall be equivalent to the UUT “SDI” strapping. In this case, Side #1.								

(2). Flight Management System (FMS) Selected Altitude:

Via the appropriate FMS (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate FMS Selected Altitude data.

Label 102, Selected Altitude (feet) FMS Input								
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity
Data:	0100 0010	10	0	0	0011 1101 0111 1010	0	11	ODD
Reversed data (bit 29, 28 – 13)					0_0101 1110 1011 1100			
Data Value(feet):					+ 24,252 [5EBC Hex]			
Rounded Input Data :					0_0101 1110 1100			
Rounded Input Data Value (feet) :					+ 24,256			
Note: "SDI" shall be equivalent to the UUT "SDI" strapping. In this case, Side #1.								

(3). Air Data System (ADS) input of Barometric Correction:

Via the appropriate ADS (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate Barometric Correction data.

Label 234, Barometric Correction (millibars) Air Data System Input										
Bits:	1 ----- 8	9 - 10	11 -- 14	15 -- 18	19 -- 22	23 -- 26	27 -- 29	30-31	32	
Field:	Label (234)	SDI	BCD X 0.1	BCD X 1.0	BCD X 10.0	BCD X 100	BCD X 1000	SSM	Parity	
Data:	1001 1100	10	1010	1001	1001	1110	000	00	ODD	
Reversed data (binary):			0101	1001	1001	0111	000			
Decimal Data Equivalent:			5	9	9	7	0			
Data Equivalent			799.5 millibars							

Barometric Correction Encoding Derivation									
7995/2 = 3997	- 1	62/2 = 31	- 0	0001 1111 0011 1011	Hex == 1F3B Hex	== 7995	Decimal		
3997/2 = 1998	- 1	31/2 = 15	- 1	1110 0000 1100 0000	Hex == E0C0 Hex	== -8000	millibars		
1998/2 = 999	- 0	15/2 = 7	- 1	1111 1111 1111 1011	Hex == FFFB Hex	== - 5	Decimal		
999/2 = 499	- 1	7/2 = 3	- 1	0000 0000 0000 0100					
499/2 = 249	- 1	3/2 = 1	- 1	0000 0000 0000 0001					
249/2 = 124	- 1	1/2 = 0	- 1	0000 0000 0000 0101					
124/2 = 62	- 0	Result is Negative: therefore, the input data is invalid.							
Map Bits 28 -through- 40 of BDS 4,0 as: 0000.0000.0000									

b. BDS 4,0 Validation: (§2.2.25.1.2 and §2.2.25.4)

Within **one second** of changing the Selected Altitude data source in Part 3.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0 Aircraft Intent Data:

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
"UF"	"PC"	"RR"	"DI"	"IIS"	"MBS"	"MES"	"LOS"	"RSS"
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

Verify that the DF=20 reply "MB" field provides Aircraft Intent Data as follows:

Part 3.b.(1) DF = 20, Aircraft Intent "MB" Field														
Reply Bits:	33	34 ----- 45	46	47 ----- 58	59	60 ----- 71	72 ---- 79	80	81	82	83	84- 85	86	87 -- 88
"MB" Bits:	1	2 ----- 13	14	15 ----- 26	27	28 ----- 39	40 --- 47	48	49	50	51	52 - 53	54	55 -- 56
Field:	Selected Altitude		FMS Selected Altitude		Baro. Pressure Setting		RSVD	MCP	VNAV	A-HLD	APP	RSVD	Target	Target
	Status	Data	Status	Data	Status	Data		Mode	Mode	Mode	Mode		Status	SRC
Data:	1	0101 1110 1100	1	0101 1110 1100	0	0000 0000 0000	00000000	0	0	0	0	00	0	00

c. **Quasi-Static Parameter Monitoring , BDS 5,F:** (§2.2.25.1.1. and 2.2.25.6.)

Within **0.5** seconds of completing the reply acceptance in Part 3.b., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 5,F Quasi-Static Parameter Monitoring Capability:

BDS 5,F (Quasi-Static Parameter Monitoring Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 21 (15 hex)	“DI” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = F

Verify that the transponder replies with a “DF” = 20 reply with:

Bits 33 and 34 (bits 1 and 2 of the “MB” field) are set to “10” respectively to indicate that the Selected Altitude parameter in BDS 4,0 has changed again.

d. **Common Usage GICB Capability Report, BDS 1,7:** (§2.2.25.2.)

Within **4.0 +/- 0.5** seconds of the interrogation/reply sequence in Part 3.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,7 Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 17	“DI” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = 7

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 41 (bit 9 of the “MB” field) set to “1” to indicate that BDS 4,0 servicing capability has been established and that data is valid.
- (2). Bit 55 (bit 23 of the “MB” field) set to “1” to indicate that BDS 5,F servicing capability has been established and that data is valid.

e. **Mode S Specific Services GICB Capability, BDS 1,9:** (§2.2.25.3)

Within **4.0 +/- 0.5** seconds of the interrogation/reply sequence in Part 3.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,9 Mode S Specific Services GICB Capability:

BDS 1,9 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF” = 4	“PC” = 0	“RR” = 17	“DI” = 7	“IIS” = 0	“MBS” = 0	“MES” = 0	“LOS” = 0	“RSS” = 9

Verify that the transponder replies with a “DF” = 20 reply having:

- (1). Bit 80 (bit 49 of the “MB” field) set to “1” to indicate that BDS 4,0 servicing capability has been established.

- (2). Bit **50** (bit **18** of the “**MB**” field) set to “**1**” to indicate that BDS **5,F** servicing capability has been established.

f. **Mode S Specific Services GICB Capability, BDS 1,8:** (§2.2.25.3)

Within **4.0 +/- 0.5** seconds of the interrogation/reply sequence in Part 2.c., Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS **1,8** Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	8

Verify that the transponder replies with a “**DF**” = **20** reply having:

- (1). Bit **64** (bit **32** of the “**MB**” field) set to “**1**” to indicate that BDS **1,9** servicing capability has been established.
- (2). Bit **65** (bit **33** of the “**MB**” field) set to “**1**” to indicate that BDS **1,8** servicing capability has been established.
- (3). Bit **66** (bit **34** of the “**MB**” field) set to “**1**” to indicate that BDS **1,7** servicing capability has been established.

PART 4: BDS 4,0_Aircraft Intention_Data Change Validation_Set 3

Add single parameter start-up of BDS 4,0 servicing

Note 1: *The primary intent of Part 4 beyond data validation in BDS **4,0** is to validate that the Selected Altitude Count in BDS **5,F** goes to “**11**”.*

Note 2: *Review all subparagraphs of Part 4 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.*

a. **Selected Altitude and Barometric Pressure Change:**

(§2.2.25.4.1 and 2.2.25.4.2)

(1). **Mode Control Panel Selected Altitude:**

Via the appropriate Mode Control Panel (or other) interface, provide the transponder with the following **ARINC-429** data word at a minimum rate of 5 per second in order to provide appropriate Mode Control Panel Selected Altitude data.

Label 102, Selected Altitude (feet) Mode Control Panel Input								
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity
Data:	0100 0010	10	0	0	1010 1111 1011 1110	0	11	ODD
Reversed data (bit 29, 28 – 13)					0_0110 1111 1111 1010			
Data Value(feet):					+ 28,666 [6FFA Hex]			
Rounded Input Data :					0_0111 0000 0000			
Rounded Input Data Value (feet) :					+ 28,672			
<i>Note: "SDI" shall be equivalent to the UUT "SDI" strapping. In this case, Side #1.</i>								

(2). Flight Management System (FMS) Selected Altitude:

Via the appropriate FMS (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate FMS Selected Altitude data.

Label 102, Selected Altitude (feet) FMS Input								
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity
Data:	0100 0010	10	0	0	1010 1111 1011 1110	0	11	ODD
Reversed data (bit 29, 28 – 13)					0_0110 1111 1111 1010			
Data Value(feet):					+ 28,666 [6FFA Hex]			
Rounded Input Data :					0_0111 0000 0000			
Rounded Input Data Value (feet) :					+ 28,672			
<i>Note: "SDI" shall be equivalent to the UUT "SDI" strapping. In this case, Side #1.</i>								

(3). ADS input of Barometric Correction:

Via the selected ARINC-429 Air Data input, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second.

Label 234, Barometric Correction (millibars) Air Data System Input										
Bits:	1 ----- 8	9 - 10	11 -- 14	15 -- 18	19 -- 22	23 -- 26	27 -- 29	30-31	32	
Field:	Label (234)	SDI	BCD X 0.1	BCD X 1.0	BCD X 10.0	BCD X 100	BCD X 1000	SSM	Parity	
Data:	1001 1100	10	1110	0101	0010	1001	000	00	ODD	
Reversed data (binary):			0111	0010	0100	1001	000			
Decimal Data Equivalent:			7	2	4	9	0			
Data Equivalent			942.7 millibars							

Barometric Correction Encoding Derivation									
9427/2 = 4713	_ 1	73/2= 36	_ 1	0010 0100 1101 0011	Hex == 24D3	Hex ==	9427	Decimal	
4713/2 = 2356	_ 1	36/2= 18	_ 0	1110 0000 1100 0000	Hex == E0C0	Hex ==	-8000	millibars	
2356/2 = 1178	_ 0	18/2= 9	_ 0	0000 0101 1001 0011	Hex == 0593	Hex ==	1427	Decimal	
1178/2 = 589	_ 0	9/2 = 4	_ 1						
589/2 = 294	_ 1	4/2 = 2	_ 0						
294/2 = 147	_ 0	2/2 = 1	_ 0						
147/2 = 73	_ 1	1/2 = 0	_ 1						
Map Bits 28 -through- 40 of BDS 4,0 as: 0101 1001 0011									

b. BDS 4,0 Validation:

(§2.2.25.1.2 and 2.2.25.4)

Within **one second** of changing the Selected Altitude data source in Part 4.a, interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0 Aircraft Intent Data:

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

- (1). Verify that the **DF=20** reply “**MB**” field provides Aircraft Intent Data as follows:

Part 4.b.(1) DF = 20, Aircraft Intent “MB” Field														
Reply Bits:	33	34 ----- 45	46	47 ----- 58	59	60 ----- 71	72 --- 79	80	81	82	83	84- 85	86	87 -- 88
“MB” Bits:	1	2 ----- 13	14	15 ----- 26	27	28 ----- 39	40 --- 47	48	49	50	51	52 - 53	54	55 -- 56
Field:	Selected Altitude		Target Altitude		Baro. Pressure Setting		RSVD	MCP	VNAV	A-HLD	APP	RSVD	Target	Target
	Status	Data	Status	Data	Status	Data		Mode	Mode	Mode	Mode		Status	SRC
Data:	1	0111 0000 0000	1	0111 0000 0000	1	0101 1001 0011	00000000	0	0	0	0	00	0	00

- c. **Quasi-Static Parameter Monitoring , BDS 5,F:** (§2.2.25.1.1. and 2.2.25.6.)

Within **0.5** seconds of completing the reply acceptance in Part 4.b., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 5,F Quasi-Static Parameter Monitoring Capability:

BDS 5,F (Quasi-Static Parameter Monitoring Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	21 (15 hex)	7	0	0	0	0	F

Verify that the transponder replies with a “**DF**” = **20** reply with:

Bits **33** and **34** (bits **1** and **2** of the “**MB**” field) are set to “**11**” respectively to indicate that the Selected Altitude parameter in BDS **4,0** has changed again.

- d. **Common Usage GICB Capability Report, BDS 1,7:** (§2.2.25.2.)

Within **4.0 +/- 0.5** seconds of the interrogation/reply sequence in Part 4.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS **1,7** Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	7

Verify that the transponder replies with a “**DF**” = **20** reply with:

- (1). Bit **41** (bit **9** of the “**MB**” field) set to “**1**” to indicate that BDS **4,0** servicing capability has been established and that data is valid.

- (2). Bit 55 (bit 23 of the “MB” field) set to “1” to indicate that BDS 5,F servicing capability has been established and that data is valid.

e. **Mode S Specific Services GICB Capability, BDS 1,9:** (§2.2.25.3)

Within 4.0 +/- 0.5 seconds of the interrogation/reply sequence in Part 4.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,9 Mode S Specific Services GICB Capability:

BDS 1,9 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	9

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 80 (bit 49 of the “MB” field) set to “1” to indicate that BDS 4,0 servicing capability has been established.
- (2). Bit 50 (bit 18 of the “MB” field) set to “1” to indicate that BDS 5,F servicing capability has been established.

f. **Mode S Specific Services GICB Capability, BDS 1,8:** (§2.2.25.3)

Within 4.0 +/- 0.5 seconds of the interrogation/reply sequence in Part 4.c., Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,8 Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	8

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 64 (bit 32 of the “MB” field) set to “1” to indicate that BDS 1,9 servicing capability has been established.
- (2). Bit 65 (bit 33 of the “MB” field) set to “1” to indicate that BDS 1,8 servicing capability has been established.
- (3). Bit 66 (bit 34 of the “MB” field) set to “1” to indicate that BDS 1,7 servicing capability has been established.

PART 5: BDS 4,0_Aircraft Intention_Data Change Validation_Set 4

Note 1: The primary intent of Part 5 beyond data validation in BDS 4,0 is to validate that the Selected Altitude Count in BDS 5,F goes to “01” as opposed to “00”..

Note 2: Review all subparagraphs of Part 5 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Data Input Initialization:** (§2.2.25.4.1 and §2.2.25.4.2)

(1). Mode Control Panel Selected Altitude:

Via the appropriate Mode Control Panel (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate Mode Control Panel Selected Altitude data.

Label 102, Selected Altitude (feet) Mode Control Panel Input								
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity
Data:	0100 0010	10	0	0	0101 1111 1011 1110	0	11	ODD
Reversed data (bit 29, 28 – 13)					0_0111 1101 1111 0101			
Data Value(feet):					+ 32,250 [7DFA Hex]			
Rounded Input Data :					0_0111 1110 0000			
Rounded Input Data Value (feet) :					+ 32,256			
<i>Note: "SDI" shall be equivalent to the UUT "SDI" strapping. In this case, Side #1..</i>								

(2). Flight Management System (FMS) Selected Altitude:

Via the appropriate FMS (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate FMS Selected Altitude data.

Label 102, Selected Altitude (feet) FMS Input								
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity
Data:	0100 0010	10	0	0	1011 1100 1111 0001	0	11	ODD
Reversed data (bit 29, 28 – 13)					0_1000 1111 0011 1101			
Data Value(feet):					+ 36,669 [8F3D Hex]			
Rounded Input Data :					0_1000 1111 0100			
Rounded Input Data Value (feet) :					+ 36,672			
<i>Note: "SDI" shall be equivalent to the UUT "SDI" strapping. In this case, Side #1..</i>								

(3). Air Data System (ADS) input of Barometric Correction:

Via the appropriate ADS (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate Barometric Correction data.

Label 234, Barometric Correction (millibars) Air Data System Input										
Bits:	1 ----- 8	9 - 10	11 -- 14	15 -- 18	19 -- 22	23 -- 26	27 -- 29	30-31	32	
Field:	Label (234)	SDI	BCD X 0.1	BCD X 1.0	BCD X 10.0	BCD X 100	BCD X 1000	SSM	Parity	
Data:	1001 1100	10	1010	1001	0000	0100	100	00	ODD	
Reversed data (binary):			0101	1001	0000	0010	001			
Decimal Data Equivalent:			5	9	0	2	1			
Data Equivalent			1,209.5 millibars							

Barometric Correction Encoding Derivation									
12095/2 = 6047	_ 1	94/2 = 47	_ 0	0010 1111 0011 1111	Hex == 2F3F	Hex ==	12095	Decimal	
6047/2 = 3023	_ 1	47/2 = 23	_ 1	1110 0000 1100 0000	Hex == E0C0	Hex ==	-8000	millibars	
3023/2 = 1511	_ 1	23/2 = 11	_ 1	0000 1111 1111 1111	Hex == 0FFF	Hex ==	4095	Decimal	
1511/2 = 755	_ 1	11/2 = 5	_ 1	Map Bits 28 -through- 40 of BDS 4,0 as: 1111 1111 1111					
755/2 = 377	_ 1	5/2 = 2	_ 1						
377/2 = 188	_ 1	2/2 = 1	_ 0						

188/2 = 94 = 0	1/2 = 0 = 1
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b. **BDS 4,0 Capability Verification:** (§2.2.25.1.2 and 2.2.25.4)

Within **one second** of providing the transponder with data as detailed in Part 5.a., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0 Aircraft Intent data.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

Verify that the DF=20 reply “MB” field provides Aircraft Intent Data as follows:

Part 5.b.(1) DF = 20, Aircraft Intent_ ”MB” Field														
Reply Bits:	33	34 ----- 45	46	47 ----- 58	59	60 ----- 71	72 --- 79	80	81	82	83	84- 85	86	87 -- 88
”MB” Bits:	1	2 ----- 13	14	15 ----- 26	27	28 ----- 39	40 --- 47	48	49	50	51	52 - 53	54	55 -- 56
Field:	Selected Altitude		Target Altitude		Baro. Pressure Setting		RSVD	MCP	VNAV	A-HLD	APP	RSVD	Target	Target
	Status	Data	Status	Data	Status	Data		Mode	Mode	Mode	Mode		Status	SRC
Data:	1	0111 1110 0000	1	1000 1111 0100	1	1111 1111 1111	00000000	0	0	0	0	00	0	00

c. **Quasi-Static Parameter Monitoring , BDS 5,F:** (§2.2.25.1.1. and 2.2.25.6.)

Within **0.5** seconds of completing the reply acceptance in Part 5.b., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 5,F Quasi-Static Parameter Monitoring Capability:

BDS 5,F (Quasi-Static Parameter Monitoring Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	21 (15 hex)	7	0	0	0	0	F

Verify that the transponder replies with a “DF” = 20 reply with:

Bits 33 and 34 (bits 1 and 2 of the “MB” field) are set to “01” respectively to indicate that the Selected Altitude parameter in BDS 4,0 has changed again.

d. **Common Usage GICB Capability Report, BDS 1,7:** (§2.2.25.2.)

Within **4.0 +/- 0.5** seconds of the interrogation/reply sequence in Part 5.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,7 Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	7

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 41 (bit 9 of the “MB” field) set to “1” to indicate that BDS 4,0 servicing capability has been established and that data is valid.
- (2). Bit 55 (bit 23 of the “MB” field) set to “1” to indicate that BDS 5,F servicing capability has been established and that data is valid.

e. **Mode S Specific Services GICB Capability, BDS 1,9:** (§2.2.25.3)

Within 4.0 +/- 0.5 seconds of the interrogation/reply sequence in Part 5.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,9 Mode S Specific Services GICB Capability:

BDS 1,9 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	9

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 80 (bit 49 of the “MB” field) set to “1” to indicate that BDS 4,0 servicing capability has been established.
- (2). Bit 50 (bit 18 of the “MB” field) set to “1” to indicate that BDS 5,F servicing capability has been established.

f. **Mode S Specific Services GICB Capability, BDS 1,8:** (§2.2.25.3)

Within 4.0 +/- 0.5 seconds of the interrogation/reply sequence in Part 5.c., Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,8 Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	8

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 64 (bit 32 of the “MB” field) set to “1” to indicate that BDS 1,9 servicing capability has been established.
- (2). Bit 65 (bit 33 of the “MB” field) set to “1” to indicate that BDS 1,8 servicing capability has been established.
- (3). Bit 66 (bit 34 of the “MB” field) set to “1” to indicate that BDS 1,7 servicing capability has been established.

PART 6: BDS 4,0_Aircraft Intention_Data Change Validation_Set 5

Note 1: The primary intent of Part 6 beyond data validation in BDS 4,0 is to validate that the Selected Altitude Count in BDS 5,F goes to “00” as since the Selected Altitude input is set to No Computed Data (NCD)..

Note 2: Review all subparagraphs of Part 6 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Data Input Initialization:** (§2.2.25.4.1 and 2.2.25.4.2)

(1). **Mode Control Panel Selected Altitude:**

Via the appropriate Mode Control Panel (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate Mode Control Panel Selected Altitude data.

Label 102, Selected Altitude (feet) _ Mode Control Panel Input								
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity
Data:	0100 0010	10	0	0	0101 1111 1011 1110	0	10	ODD
Reversed data (bit 29, 28 – 13)					0_0111 1101 1111 0101			
Data Value(feet):					+ 32,250 [7DFA Hex]			
Rounded Input Data :					0_0111 1110 0000			
Rounded Input Data Value (feet) :					+ 32,256			
Note: "SDI" shall be equivalent to the UUT "SDI" strapping. In this case, Side #1..								

Note: "SSM" field is set to "No Computed Data" ("NCD").

(2). **Flight Management System (FMS) Selected Altitude:**

Retain the FMS Selected Altitude previously provided in Part 5.a.(2).

(3). **Air Data System (ADS) input of Barometric Correction:**

Retain the ADS Barometric Correction previously provided in Part 5.a.(3).

b. **BDS 4,0 Capability Verification:** (§2.2.25.1.2 and 2.2.25.4)

Within **one second** of providing the transponder with data as detailed in Part 5.a., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0_ Aircraft Intent data.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
"UF"	"PC"	"RR"	"DI"	"IIS"	"MBS"	"MES"	"LOS"	"RSS"
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

Verify that the **DF=20** reply "**MB**" field provides Aircraft Intent Data as follows:

Part 6.b. DF = 20, Aircraft Intent _ "MB" Field														
Reply Bits:	33	34 ----- 45	46	47 ----- 58	59	60 ----- 71	72 ---- 79	80	81	82	83	84- 85	86	87 -- 88
"MB" Bits:	1	2 ----- 13	14	15 ----- 26	27	28 ----- 39	40 --- 47	48	49	50	51	52 - 53	54	55 -- 56
Field:	Selected Altitude		Target Altitude		Baro. Pressure Setting		RSVD	MCP	VNAV	A-HLD	APP	RSVD	Target	Target
	Status	Data	Status	Data	Status	Data		Mode	Mode	Mode	Mode		Status	SRC
Data:	0	0000 0000 0000	1	1000 1111 0100	1	1111 1111 1111	00000000	0	0	0	0	00	0	00

c. **Quasi-Static Parameter Monitoring , BDS 5,F:** (§2.2.25.1.1. and 2.2.25.6.)

Within **0.5** seconds of completing the reply acceptance in Part 6.b., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 5,F Quasi-Static Parameter Monitoring Capability:

BDS 5,F (Quasi-Static Parameter Monitoring Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	21 (15 hex)	7	0	0	0	0	F

Verify that the transponder replies with a “DF” = **20** reply with:

Bits **33** and **34** (bits **1** and **2** of the “MB” field) are set to “**00**” respectively to indicate that the Selected Altitude parameter in BDS **4,0** has changed again.

PART 7: BDS 4,0 Aircraft Intention Data Change Validation Set 6

Note 1: *The primary intent of Part 7 beyond data validation in BDS 4,0 is to validate that the Selected Altitude Count in BDS 5,F goes to “01” as the count should restart after having had NCD data..*

Note 2: *Review all subparagraphs of Part 7 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.*

a. **Data Input Initialization:** (§2.2.25.4.1 and 2.2.25.4.2)

(1). Mode Control Panel Selected Altitude:

Via the appropriate Mode Control Panel (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate Mode Control Panel Selected Altitude data.

Label 102, Selected Altitude (feet)								
Bits:	1 ----- 8	9 - 10	11	12	13 --- 28	29	30-31	32
Field:	Label (102)	SDI	Knob in Motion	PAD	Selected Altitude	Sign	SSM	Parity
Data:	0100 0010	10	0	0	1010 1010 1010 1010	0	11	ODD
Reversed data (bit 29, 28 – 13)					0 0101 0101 0101 0101			
Data Value(feet):					+ 21,845 [5555 Hex]			
Rounded Input Data :					0 0101 0101 0101			
Rounded Input Data Value (feet) :					+ 21,840			
Note: “SDI” shall be equivalent to the UUT “SDI” strapping. In this case, Side #1..								

(2). Flight Management System (FMS) Selected Altitude:

Retain the FMS Selected Altitude previously provided in Part 6.a.(2).

(3). Air Data System (ADS) input of Barometric Correction:

Via the appropriate ADS (or other) interface, provide the transponder with the following ARINC-429 data word at a minimum rate of 5 per second in order to provide appropriate Barometric Correction data.

Label 234, Barometric Correction (millibars)										
Bits:	1 ----- 8	9 - 10	11 -- 14	15 -- 18	19 -- 22	23 - 26	27 -- 29	30-31	32	
Field:	Label (234)	SDI	BCD X 0.1	BCD X 1.0	BCD X 10.0	BCD X 100	BCD X 1000	SSM	Parity	
Data:	1001 1100	10	1010	1001	1001	1110	100	00	ODD	
Reversed data (binary):			0101	1001	1001	0111	000			
Decimal Data Equivalent:			7	2	4	9	0			
Data Equivalent			942.7 millibars							

Barometric Correction Encoding Derivation									
9427/2 = 4713	- 1	73/2 = 36	- 1	0012 0100 1101 0011	Hex == 24D3	Hex ==	9427	Decimal	
4713/2 = 2356	- 1	36/2 = 18	- 0	1110 0000 1100 0000	Hex == E0C0	Hex ==	-8000	millibars	
2356/2 = 1178	- 0	18/2 = 9	- 0	0000 0101 1001 0011	Hex == 0593	Hex ==	1427	Decimal	
1178/2 = 589	- 0	9/2 = 4	- 1	Map Bits 28 -through- 40 of BDS 4,0 as: 0101 1001 0011					
589/2 = 294	- 1	4/2 = 2	- 0						
294/2 = 147	- 0	2/2 = 1	- 0						
147/2 = 73	- 1	1/2 = 0	- 1						

b. **BDS 4,0 Capability Verification:** (§2.2.25.1.2 and 2.2.25.4)

Within **one second** of providing the transponder with data as detailed in Part 5.a., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0_Aircraft Intent data.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

Verify that the **DF=20** reply “MB” field provides Aircraft Intent Data as follows:

Part 7.b. DF = 20, Aircraft Intent “MB” Field														
Reply Bits:	33	34 ----- 45	46	47 ----- 58	59	60 ----- 71	72 ---- 79	80	81	82	83	84- 85	86	87 -- 88
“MB” Bits:	1	2 ----- 13	14	15 ----- 26	27	28 ----- 39	40 --- 47	48	49	50	51	52 - 53	54	55 -- 56
Field:	Selected Altitude		Target Altitude		Baro. Pressure Setting		RSVD	MCP	VNAV	A-HLD	APP	RSVD	Target	Target
	Status	Data	Status	Data	Status	Data		Mode	Mode	Mode	Mode		Status	SRC
Data:	1	0101 0101 0101	1	1000 1111 0100	1	0101 1001 0011	00000000	0	0	0	0	00	1	11

c. **Quasi-Static Parameter Monitoring , BDS 5,F:** (§2.2.25.1.1. and 2.2.25.6.)

Within **0.5** seconds of completing the reply acceptance in Part 7.b., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 5,F Quasi-Static Parameter Monitoring Capability:

BDS 5,F (Quasi-Static Parameter Monitoring Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	21 (15 hex)	7	0	0	0	0	F

Verify that the transponder replies with a “DF” = 20 reply with:

Bits 33 and 34 (bits 1 and 2 of the “MB” field) are set to “01” respectively to indicate that the Selected Altitude parameter in BDS 4,0 has changed again.

PART 8: BDS 4,0 Aircraft Intention Data Change Validation Set 7

Note 1: The primary intent of Part 8 beyond data validation in BDS 4,0 is to validate that the Selected Altitude Count in BDS 5,F goes to “01” as the count should restart after having had NCD data...

Note 2: Review all subparagraphs of Part 8 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. **Data Input Initialization:** (§2.2.25.4.1 and 2.2.25.4.2)

(1). Mode Control Panel Selected Altitude:

Discontinue the provision of Selected Altitude information from the Mode Control Panel.

(2). Flight Management System (FMS) Selected Altitude:

Discontinue the provision of Selected Altitude information from the FMS.

(3). Air Data System (ADS) input of Barometric Correction:

Discontinue the provision of Barometric Correction information from the ADS.

b. **BDS 4,0 Capability Verification:** (§2.2.25.1.2 and 2.2.25.4)

Within **two seconds** of providing the transponder with data as detailed in Part 8.a., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0 Aircraft Intent data.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

Note: The interrogation should initiate the “B” timer for 18 +/- 1.0 seconds since a Comm.-B Broadcast is initiated because servicing of BDS 5,F capability has changed..

(1). Verify that the transponder replies with a “DF” = 20 reply.

(2). During replies to this interrogation sequence and subsequent interrogations during this test procedure, monitor the “DR” field. If the “DR” field changes to 4, 5, 6, or 7, then the transponder has initiated a Comm.-B Broadcast.

When the “DR” field changes, start a Test Timer to monitor that the “B”-Timer runs for 18 +/- 1.0 seconds.

“DR”	=	4 or 5	if TCAS IS NOT interfaced to the transponder
	=	6 or 7	if TCAS IS interfaced to the transponder and is functional.

- (3). Verify that the **DF=20** reply “MB” field provides Aircraft Intent Data with:

Part 9.b.(3) DF = 20, Aircraft Intent “MB” Field														
Reply Bits:	33	34 ----- 45	46	47 ----- 58	59	60 ----- 71	72 ---- 79	80	81	82	83	84- 85	86	87 -- 88
“MB” Bits:	1	2 ----- 13	14	15 ----- 26	27	28 ----- 39	40 --- 47	48	49	50	51	52 - 53	54	55 -- 56
Field:	Selected Altitude		Target Altitude		Baro. Pressure Setting		RSVD	MCP	VNAV	A-HLD	APP	RSVD	Target	Target
	Status	Data	Status	Data	Status	Data		Mode	Mode	Mode	Mode		Status	SRC
Data:	0	0000 0000 0000	0	0000 0000 0000	0	0000 0000 0000	00000000	0	0	0	0	00	0	00

- c. **Quasi-Static Parameter Monitoring , BDS 5,F:** (§2.2.25.1.1. and 2.2.25.6.)

Within **0.5** seconds of completing the reply acceptance in Part 8.b., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 5,F Quasi-Static Parameter Monitoring Capability:

BDS 5,F (Quasi-Static Parameter Monitoring Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DF”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	21 (15 hex)	7	0	0	0	0	F

Verify that the transponder replies with a “DF” = **20** reply with:

Bits **33** and **34** (bits **1** and **2** of the “MB” field) are set to “**00**” respectively to indicate that the Selected Altitude parameter in BDS **4,0** is **NOT VALID**.

- d. **Common Usage GICB Capability Report, BDS 1,7:** (§2.2.25.2.)

Within **4.0 +/- 0.5** seconds of the interrogation/reply sequence in Part 8.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,7 Common Usage GICB Capability Report:

BDS 1,7 (Common Usage GICB Capability Report) GICB EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DF”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	17	7	0	0	0	0	7

Verify that the transponder replies with a “DF” = **20** reply with:

- Bit **41** (bit **9** of the “MB” field) set to “**0**” to indicate that BDS **4,0** servicing capability has been lost and that data is NOT VALID.
- Bit **55** (bit **23** of the “MB” field) set to “**1**” to indicate that BDS **5,F** servicing capability has been established and that data is valid.

- e. **Mode S Specific Services GICB Capability, BDS 1,9:** (§2.2.25.3)

Within **4.0 +/- 0.5** seconds of the interrogation/reply sequence in Part 8.c., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,9 Mode S Specific Services GICB Capability:

BDS 1,9 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF” =	“PC” =	“RR” =	“DI” =	“IIS” =	“MBS” =	“MES” =	“LOS” =	“RSS” =
4	0	17	7	0	0	0	0	9

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 80 (bit 49 of the “MB” field) set to “1” to indicate that BDS 4,0 servicing capability has been established during the power on cycle.
- (2). Bit 50 (bit 18 of the “MB” field) set to “1” to indicate that BDS 5,F servicing capability has been established during the power on cycle.

f. **Mode S Specific Services GICB Capability, BDS 1,8:** (§2.2.25.3)

Within 4.0 +/- 0.5 seconds of the interrogation/reply sequence in Part 2.c., Interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 1,8 Mode S Specific Services GICB Capability:

BDS 1,8 (Mode S Specific Services GICB Capability) GICB EXTRACTION INTERROGATION SETUP								
“UF” =	“PC” =	“RR” =	“DI” =	“IIS” =	“MBS” =	“MES” =	“LOS” =	“RSS” =
4	0	17	7	0	0	0	0	8

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). Bit 64 (bit 32 of the “MB” field) set to “1” to indicate that BDS 1,9 servicing capability has been established during the power on cycle.
- (2). Bit 65 (bit 33 of the “MB” field) set to “1” to indicate that BDS 1,8 servicing capability has been established during the power on cycle.
- (3). Bit 66 (bit 34 of the “MB” field) set to “1” to indicate that BDS 1,7 servicing capability has been established during the power on cycle.

g. **Comm.-B Broadcast Validation:** (§2.2.25.1.2)

Continue to interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0_ Aircraft Intent data monitor the “DR” field in the reply.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF” =	“PC” =	“RR” =	“DI” =	“IIS” =	“MBS” =	“MES” =	“LOS” =	“RSS” =
4	0	20	7	0	0	0	0	0

Within 1 minute of the interrogation/reply sequence in Part 8.c:

Verify that the “DR” field in DF=20 replies is set to “DR” = 4, 5, 6, or 7 to indicate that a Comm.-B Broadcast is Active.

h. Comm.-B Broadcast Extraction: (SRS: section §3.2.5.1.12.4.1)

After determining that the “DR” field has been set to “DR”= 4, 5, 6, or 7 in Part 8.g., interrogate the transponder with the following Comm-B Extraction interrogation in order to extract the Comm-B broadcast message which should be the Data Link Capability Report contained in BDS 1,0.

COMM.-B BROADCAST EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	16	7	0	0	0	0	0

Verify that the transponder replies with a “DF” = 20 reply having:

- (1). “DR” = 4 or 5 if TCAS IS NOT interfaced to the transponder
 = 6 or 7 if TCAS IS interfaced to the transponder and is functional.
- (2). Bit 68 [Common Usage GICB Capability Report Bit (bit 36 of the “MB” field)] toggled to “0” (from “1”) to indicate that BDS 1,7 has changed.

i. Comm.-B Broadcast Termination: (SRS: section §3.2.5.1.12.4.1)

Continue to interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0_ Aircraft Intent data monitor the “DR” field in the reply.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

Verify that the “DR” field in DF=20 replies is set to “DR” = 4, 5, 6, or 7 for 18 +/- 1.0 seconds and then reverts to “DR” other than “DR” = 4, 5, 6, or 7 to indicate that the “B”-Timer has expired.

PART 9: BDS 4,0_ Aircraft Intention Data Change Validation Sets 8

Note: Review all subparagraphs of Part 8 prior to performing tests. This is necessary to establish the appropriate timing between changing data inputs and interrogations.

a. Data Input Initialization: (§2.2.25.4.1 and §2.2.25.4.2)

- (1). Mode Control Panel Selected Altitude:

For each line Item # in the following table (Table 9.a(1)), provide the transponder with Mode Control Panel Selected Altitude having a value as indicated in the “Data Value” (feet) Column in the table.

Table 9.a(1): Register 40₁₆ MCP/FCU Selected Altitude (ARINC label 102)						
Item #	Type of Value	Generic MCP/FCU Selected Altitude Input (BNR)		Register 40 ₁₆ MCP/FCU Selected Altitude		
		Status	Data Value (feet)	Status (bit 1)	Decimal Value (feet)	Binary Value (bit 2 ----- 13)
1	Basic	Valid	43,680.00	1	43,680.00	1010 1010 1010
2	Basic	Valid	21,840.00	1	21,840.00	0101 0101 0101
3	Basic	Valid	30,576.00	1	30,576.00	0111 0111 0111
4	Basic	Valid	48,048.00	1	48,048.00	1011 1011 1011
5	Basic	Valid	56,784.00	1	56,784.00	1101 1101 1101
6	Basic	Valid	61,152.00	1	61,152.00	1110 1110 1110
7	Max	Valid	65,530.00	1	65,520.00	1111 1111 1111
8	Min	Valid	0.00	1	0.00	0000 0000 0000
9	Rounded (1/2 LSB)	Valid	21,864.00	1	21,872.00	0101 0101 0111
10	Rounded (1/4 LSB)	Valid	21,844.00	1	21,840.00	0101 0101 0101
11	Invalid	Invalid	43,680.00	0	0.00	0000 0000 0000

(2). Flight Management System (FMS) Selected Altitude:

For each line Item # in the following table (Table 9.a(2)), provide the transponder with FMS Selected Altitude having a value as indicated in the “Data Value” (feet) Column in the table.

Table 9.a(2): Register 40₁₆ FMS Selected Altitude (ARINC label 102)						
Item #	Type of Value	Generic FMS Selected Altitude Input (BNR)		Register 40 ₁₆ FMS Selected Altitude		
		Status	Data Value (feet)	Status (bit 14)	Decimal Value (feet)	Binary Value (bit 15 ----- 26)
1	Basic	Valid	43,680.00	1	43,680.00	1010 1010 1010
2	Basic	Valid	21,840.00	1	21,840.00	0101 0101 0101
3	Basic	Valid	30,576.00	1	30,576.00	0111 0111 0111
4	Basic	Valid	48,048.00	1	48,048.00	1011 1011 1011
5	Basic	Valid	56,784.00	1	56,784.00	1101 1101 1101
6	Basic	Valid	61,152.00	1	61,152.00	1110 1110 1110
7	Max	Valid	65,530.00	1	65,520.00	1111 1111 1111
8	Min	Valid	0.00	1	0.00	0000 0000 0000
9	Rounded (1/2 LSB)	Valid	21,864.00	1	21,872.00	0101 0101 0111
10	Rounded (1/4 LSB)	Valid	21,844.00	1	21,840.00	0101 0101 0101
11	Invalid	Invalid	43,680.00	0	0.00	0000 0000 0000

(3). Air Data System (ADS) input of Barometric Correction:

For each line Item # in the following table (Table 9.a(3)), provide the transponder with Barometric Correction data having a value as indicated in the “Data Value” (+800 millibars) Column in the table.

Table 9.a(3) : Register 40₁₆ Barometric Correction (pressure) (ARINC label 234)						
Item #	Type of Value	ARINC Barometric pressure setting minus 800mb (BCD)		Register 40 ₁₆ Barometric pressure setting minus 800mb		
		Status	Data Value +800 millibars	Status (bit 27)	Decimal Value +800 millibars	Binary Value (bit 28 ----- 39)
1	Basic	Valid	936.50	1	936.50	0101 0101 0101
2	Basic	Valid	991.10	1	991.10	0111 0111 0111
3	Max	Valid	1050	1	1050	1001 1100 0100
4	Min	Valid	800	1	0.00	0000 0000 0000
5	Invalid	Invalid	991.10	0	0.00	0000 0000 0000
6	Baro min	Valid	750	0	0	0000 0000 0000

b. **BDS 4,0 Verification:** (§2.2.25.1.2 and 2.2.25.4)

Within **one second** of providing the transponder with data as detailed for each line Item # in the tables given in Part 9.a., interrogate the transponder with the following GICB Extraction interrogation in order to extract the BDS 4,0 Aircraft Intent data.

BDS 4,0 AIRCRAFT INTENT EXTRACTION INTERROGATION SETUP								
“UF”	“PC”	“RR”	“DI”	“IIS”	“MBS”	“MES”	“LOS”	“RSS”
=	=	=	=	=	=	=	=	=
4	0	20	7	0	0	0	0	0

Note: The interrogation should initiate the “B” timer for 18 +/- 1.0 seconds since a Comm.-B Broadcast is initiated because servicing of BDS 5,F capability has changed..

Verify that the transponder replies with a “DF” = 20 reply with:

- (1). For each line Item # in Table 9.a(1) with “MB” field Status (bit 1) equivalent to that shown in the Status (bit 1) column of Table 9.a(1).
- (2). For each line Item # in Table 9.a(1), with “MB” field bit 2 –through- 13 equivalent to that shown in the Binary Value (bit 2—13) column of Table 9.a(1).
- (3). For each line Item # in Table 9.a(2) with “MB” field Status (bit 14) equivalent to that shown in the Status (bit 14) column of Table 9.a(2).
- (4). For each line Item # in Table 9.a(2), with “MB” field bit 15 –through- 26 equivalent to that shown in the Binary Value (bit 15—26) column of Table 9.a(2).
- (5). For each line Item # in Table 9.a(3) with “MB” field Status (bit 27) equivalent to that shown in the Status (bit 27) column of Table 9.a(3).
- (6). For each line Item # in Table 9.a(3), with “MB” field bit 28 –through- 39 equivalent to that shown in the Binary Value (bit 28—39) column of Table 9.a(3).

Note: Cumulative results are as shown in the following table.

Part 9.b. DF = 20, Aircraft Intent “MB” Field														
Reply Bits:	33	34 ----- 45	46	47 ----- 58	59	60 ----- 71	72 --- 79	80	81	82	83	84- 85	86	87 -- 88
“MB” Bits:	1	2 ----- 13	14	15 ----- 26	27	28 ----- 39	40 --- 47	48	49	50	51	52 - 53	54	55 -- 56
Field:	Selected Altitude		FMS Selected Altitude		Baro. Pressure Setting		RSVD	MCP	VNAV	A-HLD	APP	RSVD	Target	Target
Data:	Status	Data	Status	Data	Status	Data		Mode	Mode	Mode	Mode		Status	SRC
Item #														
1	1	1010 1010 1010	1	1010 1010 1010	1	0101 0101 0101	00000000	0	0	0	0	00	0	00
2	1	0101 0101 0101	1	0101 0101 0101	1	0111 0111 0111	00000000	0	0	0	0	00	0	00
3	1	0111 0111 0111	1	0111 0111 0111	1	1001 1100 0100	00000000	0	0	0	0	00	0	00
4	1	1011 1011 1011	1	1011 1011 1011	1	0000 0000 0000	00000000	0	0	0	0	00	0	00
5	1	1101 1101 1101	1	1101 1101 1101	0	0000 0000 0000	00000000	0	0	0	0	00	0	00
6	1	1110 1110 1110	1	1110 1110 1110	0	0000 0000 0000	00000000	0	0	0	0	00	0	00
7	1	1111 1111 1111	1	1111 1111 1111			00000000	0	0	0	0	00	0	00
8	1	0000 0000 0000	1	0000 0000 0000			00000000	0	0	0	0	00	0	00
9	1	0101 0101 0111	1	0101 0101 0111			00000000	0	0	0	0	00	0	00
10	1	0101 0101 0101	1	0101 0101 0101			00000000	0	0	0	0	00	0	00
11	0	0000 0000 0000	0	0000 0000 0000			00000000	0	0	0	0	00	0	00