

- 794 to 994 milliseconds after UTC time

Step 3: Verify All Four Possible Timing Alignments

Without powering-off the UAT equipment, repeat Step 2 as necessary to verify that the UAT equipment can transmit messages when in the ON-GROUND condition using all four possible timing alignments.

Step 4: Verify ON-GROUND Startup Condition

With the UAT equipment powered-off, apply an ON-GROUND indication to the Vertical Status input interface. Power-up the UAT equipment. Verify that the time of transmission for all messages remains within one of the time intervals specified in Step 2. Repeat this Step as necessary to verify that the UAT equipment can transmit messages using all four possible timing alignments.

2.4.6.2.2 Verification of Relationship of the MSO to the Modulated Data (§2.2.6.2.2)

Purpose/Introduction:

The optimum sample point of the first bit of the UAT synchronization sequence at the antenna terminal of the UAT equipment **shall** occur at T_{TX} microseconds after the 1 second UTC epoch, as supplied to the UAT Transmitting Subsystem, according to the following formula:

$$T_{TX} \text{ (microseconds)} = 6000 + (250 * \text{MSO})$$

within the following tolerances:

- +/- 500 nanoseconds for UAT equipment with an internal UTC coupled time source,
- +/- 500 nanoseconds for UAT equipment with an external UTC coupled time source.

Notes:

- This is required to support ADS-B range validation by a receiving application. This requirement sets the ultimate timing accuracy of the transmitted messages under the UTC Coupled condition. See Appendix I for a discussion of UAT Timing Considerations.*
- Referencing this measurement to the optimum sampling point is convenient since this is the point in time identified during the synchronization process.*
- There is no requirement to demonstrate this relationship when in the non-UTC Coupled condition.*

This test procedure verifies that the timing relationship between the Transmit MSO number and the data modulation complies with the requirements of §2.2.6.2.2.

Equipment Required:

Supply the UUT with a pseudorandom stream of payload data.

Provide a ~~UTC 1 second timing reference signal.~~ 1 PPS timing signal to act as a reference for that being used by the UUT.

Provide a Vector Signal Analyzer (VSA), per §2.4.2.1, configured per [Table 2-71](#) excepting use of external trigger mode.

Provide a trigger timing delay generator connected between the UTC 1 second timing source, and the VSA external trigger input. Timing delay range is from 194.000 milliseconds to 993.750 milliseconds.

Provide access to GPS constellation signals or a simulated signal source.

~~Provide an external GPS receiver if necessary for the intended application.~~

Measurement Procedure:

Step 1: Configure the UUT transmitter

Configure the UUT in a test mode that causes the Transmitted MSO to be selected in sequence from the following list: MSO = (752, 2352, 3951).

Note: *This sequence causes the UUT transmitter to transmit at the earliest, middle, and latest possible MSOs in the Air segment.*

Step 2: Trigger delay setup.

Set the trigger delay generator so that the 1 PPS timing source is delayed by 194.000 milliseconds for MSO 752, 594.000 milliseconds for MSO 2352, or 993.750 milliseconds for MSO 3951.

Step 3: Measure the Modulated Data Timing

On Trace A on the VSA, find the optimum sample point of the first bit of ~~pseudorandom data that follows~~ the 36-bit synchronization ~~pattern~~sequence. The time offset between the trigger point and this optimum sample point, minus 34.56 microseconds, should meet the timing requirements of §2.2.6.2.2.a or 'b' as appropriate (i.e., +/- 500 nanoseconds).

Note: ~~The modulation timing is based on measurement to the first bit following the synchronization pattern, because there is no clear eye pattern opening available with the static data of the synchronization pattern.~~ Measurement to other reference points within the modulation data stream may be used to verify the timing requirements. Apply time compensation as necessary from the measurement point to the optimum sample point of the first bit of the synchronization sequence applied at the receiver terminals.

~~Step 4: Repeat test with external GPS receiver~~

~~If the equipment is intended for use with an external GPS source, repeat step 3 with the external GPS receiver. The timing requirement of §2.2.6.2.2.b should be met.~~