

Temporary Maintenance Instruction
TMI109-533

Removal/Installation and Operational Test
of Global Positioning System and
Removal/Installation of Antenna

A109E
Helicopters

The technical content of this document is approved under the authority of DOA nr. EASA.21J.005.

The present TMI will be evaluated for its introduction in the standard set of Technical Publication.

If no further notice is received, the present document expires on: September 22th, 2022.

2021-09-22

Introduction

This TMI provides the instructions to do the removal/installation and operational test of GPS Trimble 2101 and the removal/installation of the related antennas applicable to A109E Helicopters.

This TMI is composed by the annexes that follow:

- Annex 1 – Removal/Installation of GPS Receiver
- Annex 2 – Removal/Installation of Antenna
- Annex 3 – Operational Test of Global Positioning System

The content of this TMI will be endorsed within the A109E Maintenance Manual at the earliest opportunity.

Removal/Installation and Operational Test of Global Positioning System Receiver and Removal/Installation of Antenna

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Annex 1

Removal/Installation of GPS Receiver

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Table 1 References

Data Module	Title
MM - Section 00-20	The helicopter must be safe for maintenance

Preliminary requirements

Required conditions

Table 2 Required conditions

Condition	Data Module/Technical Publication
The helicopter must be safe for maintenance	MM - Section 00-20

Support equipment

Table 3 Support equipment

Nomenclature	Identification No.	Qty
None		

Supplies

<i>Table 4 Supplies</i>		
Nomenclature	Identification No.	Qty
None		

Spares

<i>Table 5 Spares</i>		
Nomenclature	Identification No.	Qty
GPS Receivers	P/N 81440-32-241Q or P/N 81440-42-241Q	1

Procedure

Note

During this procedure, you must put the applicable caps on all the disconnected electrical connectors and properly stow the connectors. Do this immediately after you disconnect each electrical connector.

1. Removal procedure

- 1.1. Pull it out the Circuit Breaker (3) and block it with the applicable collar.
- 1.2. Get access to the GPS receiver (1) on the instrument panel.
- 1.3. Remove the four screws (2) that attach the GPS Receiver (1) to the instrument panel.
- 1.4. Remove the GPS Receiver (1) from the instrument panel as far as the electrical cables will let.
- 1.5. Disconnect the connectors that follow from the GPS Receiver (1):
 - P4701 (4)
 - P4703 (5)
 - P4704 (6)
- 1.6. Remove the GPS Receiver from the helicopter.
- 1.7. Put the applicable caps on the instrument panel.

2. Installation procedure

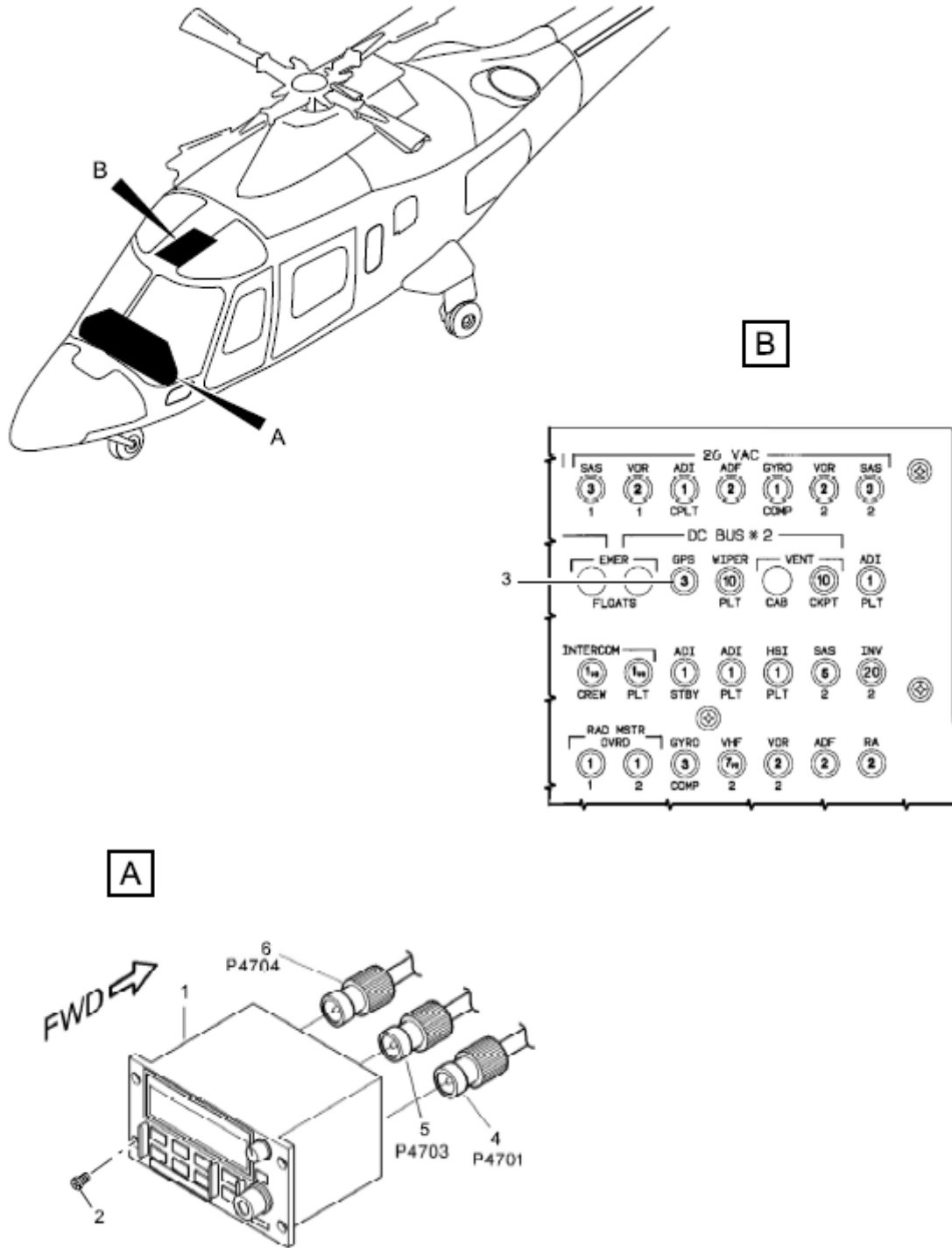
- 2.1. Remove the caps on the instrument panel.
- 2.2. Put the GPS receiver (1) in the position adjacent to its housing on the instrument panel.
- 2.3. Connect the electrical connectors P4701 (4), P4703 (5) and P4704 (6) to the connectors of the GPS

Receiver.

- 2.4. Put the GPS receiver (1) in its housing on the instrument panel.
- 2.5. Attach the GPS receiver (1) to the instrument panel with the four screws (2).
- 2.6. Tighten the four screws (2).
- 2.7. Remove the collar from the Circuit Breaker (3).
- 2.8. Push in the Circuit Breaker (3).

Requirements after job completion

1. Remove all the tools and other items from the work area. Make sure that the work area is clean.
2. Do the operational test of global positioning system. Refer to Annex 3 of this TMI109-533.



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Figure 1 – Removal/Installation of GPS Receiver

Annex 2

Removal/Installation of Antenna

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Table 1 References

Data Module	Title
MM - Section 00-20	The helicopter must be safe for maintenance
MM – Section 34-57-7A para C	Antenna Operational Test

Preliminary requirements

Required conditions

Table 2 Required conditions

Condition	Data Module/Technical Publication
The helicopter must be safe for maintenance	MM - Section 00-20

Support equipment

Table 3 Support equipment

Nomenclature	Identification No.	Qty
None		

Supplies

<i>Table 4 Supplies</i>		
Nomenclature	Identification No.	Qty
None		

Spares

<i>Table 5 Spares</i>		
Nomenclature	Identification No.	Qty
None		

Procedure

1. Removal procedure

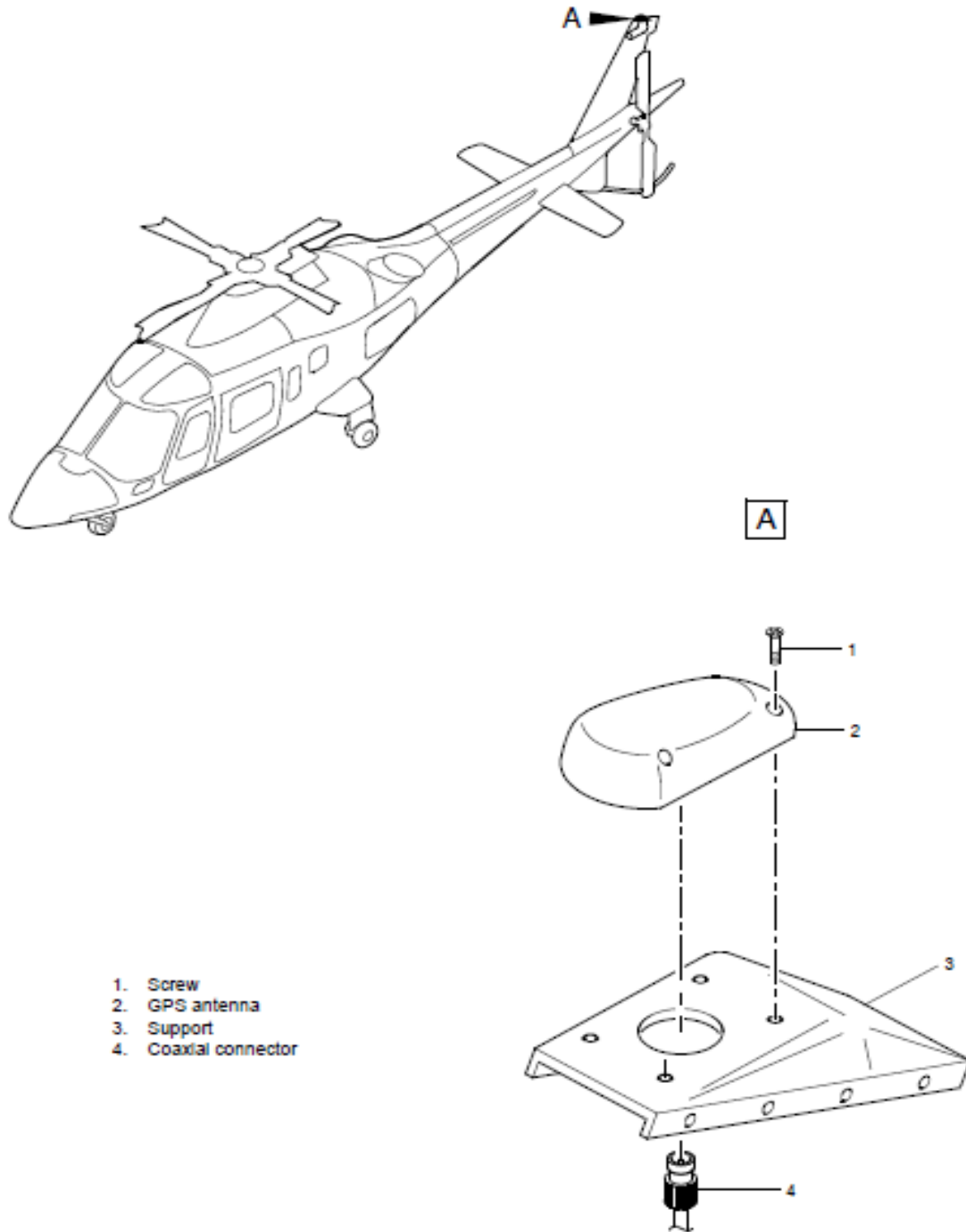
- 1.1. Remove the four screws (1) that attach the GPS antenna (2) to its support (3).
- 1.2. Rise the GPS antenna (2) as far as the coaxial cable will permit.
- 1.3. Disconnect the coaxial connector (4) from the GPS antenna (2).
- 1.4. Remove the GPS antenna (2).

2. Installation procedure

- 2.1. Connect the coaxial connector (4) to the GPS antenna (2).
- 2.2. Put the GPS antenna (2) on its seat and install the four screws (1) to attach the GPS antenna (2) to its support.

Requirements after job completion

1. Remove all the tools and other items from the work area. Make sure that the work area is clean.
2. Do the antenna operational test. Refer to MM 34-57-7A para. C
3. Do the Operational test of Global Positioning System. Refer to the Annex 3 of this TMI109-533.



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Figure 1 – Removal/Installation of Antenna

Annex 3

Operational Test of Global Positioning System

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Table 1 References

Data Module	Title
MM - Section 00-10-4	Connection/Disconnection of external electrical power
MM - Section 00-20	Helicopter safety

Preliminary requirements

Required conditions

Table 2 Required conditions

Condition	Data Module/Technical Publication
The helicopter must be safe for maintenance	MM - Section 00-20
Connect an external power supply to the helicopter	MM - Section 00-10-4

Support equipment

Table 3 Support equipment

Nomenclature	Identification No.	Qty
None		

Supplies

Table 4 Supplies

Nomenclature	Identification No.	Qty
None		

Spares

Table 5 Spares

Nomenclature	Identification No.	Qty
None		

Procedure

Note

This procedure is also applicable to the GPS receivers P/N 81440-32-241Q or P/N 81440-42-241Q.

1. Test preparation

- 1.1. Move the helicopter away from buildings and others aircraft. Position the helicopter in an area where the coordinates are known.
- 1.2. Make sure that the following circuit breakers: ADIs RAD MSTR OVRD (2 off), HSI PLT and HSI CPLT, GYRO COMP (2 off) and GPS on the overhead console are closed.
- 1.3. Set the RAD-MSTR push-button to ON.
- 1.4. Insert the NAV.DATA card in the slot on lower side of the GPS unit. Make sure the side of the card is correct.
- 1.5. Rotate the ON knob on the upper right corner to switch ON the GPS Receiver and wait that the GPS complete the startup sequence. The message "READY FOR NAVIGATION/SELECT ANY MORE" will indicated startup sequence completed.

2. Display verification & configuration setting

Note

As soon as the CONFIGURE page appears on the display, the next first available menu page automatically appears.

- 2.1. Press the AUX Pushbutton, up to CONFIGURE legend appears on the display.

Note

The small inner knob is used to change the top line of the display or to change data under the cursor.

- 2.2. Rotate the small inner knob up to DISPLAY DIAGNOSTIC page. The “DISPLAY DIAGNOSTIC” message appears briefly. Then the display changes to dashed horizontal lines. Horizontal lines move through all the fields of both lines of the display. The annunciation lights and push-button keys light in sequence. This pattern continues until you turn the selector knobs or press a key. This display allows a visual check to determine if these features are operating properly.
- 2.3. Using a “Spot Light” illuminate the central area of the display and verify that display legends and pushbutton backlight brightness increase to the maximum.
- 2.4. Mask the central area of the display and to verify that display legends and pushbutton backlight brightness decrease.
- 2.5. Enter the following key sequence: “D”, “D”, “ENT”, “D”.
- 2.6. Press “ENT” and use the small knob to select ENABLE. Press “ENT”.
- 2.7. Press “AUX” until the INSTALL SETUP submenu is displayed.
- 2.8. Access the Installation Setup mode and rotate the small knob until the display shows: “AUX I / 0 SETUP - TURN OUTER KNOB”.
- 2.9. Use the following instructions/commands to set GPS as per Step 2.10:
 - Rotate the large, outer selector knob until the desired parameter is shown.
 - To edit any port, press “ENT” when that port is displayed.
 - Choose the field to edit with the large, outer selector knob.
 - Change the settings by rotating the small, inner selector knob.
 - Press “ENT” to complete the entry.
- 2.10. Set the GPS receiver as table contained in Fig. 1:
- 2.11. To set the internal CDI sensitivity follow these steps:
 - Rotate the small knob to display the CDI page.
 - Rotate the large knob one click clockwise (INTERNAL CDI SENSITIVITY), then press “ENT”.
 - Rotate the small knob to select the CDI sensitivity setting (1.0 NM), then press “ENT”.

Note

The Internal CDI will always be less than or equal to the external setting. For example, if the internal CDI is set to 2.5 nm and the external CDI is set to 1.0 nm, both will be set to 1.0 nm.

- 2.12. To set the External CDI sensitivity follow these steps:
 - Rotate the small knob to display the CDI Sensitivity page.
 - Rotate the large knob 2 clicks clockwise (EXTERNAL CDI SENSITIVITY) and press “ENT”.
 - Rotate the small knob to select the CDI sensitivity (1,0 NM) and press “ENT”.
- 2.13. On the barometric altimeter, set the QNH value to 29,92 in/Hg.
- 2.14. Press “AUX” until the SYSTEM STATUS submenu is displayed. Rotate the small knob until the PRESENT POSITION page is displayed.

- 2.15. Rotate the Large knob until the ALTITUDE page is displayed. Verify that displayed altitude (PRESSURE ALT) corresponds to the value set on the barometric altimeter. Furthermore, verify that indication PRS/GPS-3D is present (PRS ONLY indication will be displayed in case of GPS satellites signal lack of reception).
- 2.16. Press the pulsating "CALC" up to the page AIR DATA. Rotate the small knob until the WIND-TAS-HDG page is displayed. Verify that Heading data displayed on the GPS screen is consistent with the heading data displayed on both EHSIs.

3. GPS Receiver and present position checks

Note

Before performing GPS Receiver tests, make sure the aircraft is outside and away from any tall buildings or objects which will obstruct line-of-sight communication between the unit's antenna and GPS satellites.

- 3.1. To conduct GPS receiver tests, press "AUX" until the SENSOR STATUS submode is selected.
- 3.2. Rotate the large, outer selector knob until the display shows a message similar to: "GPS TRACK 6: 2 18 19 27 29 31"

Note

This display indicates the number of satellites being tracked (6) as well as identifying each satellite tracked (by number). A flashing satellite number indicates a satellite which is being tracked but not being used in the position solution.

- 3.3. To conduct the GPS Position verification test, press "AUX" until the SYSTEM STATUS submode is selected.
- 3.4. Turn the small knob to display the PRESENT POSITION page.
- 3.5. Verify that the displayed Coordinates will be the same of the actual position (i.e Vergiate Piazzola = N 45° 43' 00" - E 008° 42' 220"). The Position error shall be less than 0.124NM.
- 3.6. If the displayed position is far from the actual position (i.e., First Power ON, with consequently fist satellite signals acquisition) or the GPS has not yet acquired sufficient satellites for a position solution, the actual position coordinates or the airport name can be manually entered.
- 3.7. Press "ENT" and use the small and large knobs to enter the airport or use the large knob to position the flashing cursor in the Lat/Lon field and the small knob to enter the coordinates.
- 3.8. Press "ENT" to update the position. Switch the unit off then back on.
- 3.9. Press "WPT" button multiple times to select the VOR (Waypoints) page.
- 3.10. Press "ENT": Use the large knobs to position the flashing cursor and the small knob to select data. Select a known waypoint (i.s. SRN) and press "ENT" to confirm selection.
- 3.11. Press "D" push-button twice to activate the Direct TO mode.
- 3.12. On EHSI push the NAV MODE to select the LNAV1 navigation mode and check for consistency with the GPS NAV mode page.

4. GPS Receiver and date/time checks

Note

Before performing GPS Receiver tests, make sure the aircraft is outside and away from any tall buildings or objects which will obstruct line-of-sight communication between the unit's antenna and GPS satellites.

- 4.1. To conduct GPS Data/Time tests, press "AUX" until the SYSTEM STATUS submode is selected.
- 4.2. Turn the small knob to display the DATE/TIME page (i.e.: the DATE/TIME page should be the first one displayed). (See Fig. 2).
- 4.3. Verify that the System Status DATE/TIME page displays the following information:
 - Local Date
 - Zulu (UTC) time
 - Time Zone
 - Local Time

Note 1

The zones are selected from the list contained in Fig. 3

Note 2

Pre-programmed time zones are not available for International use. For operation outside of North America, enter the time offset from UTC. For example, the time offset for Melbourne, Australia would be UTC+10.

Note 3

When the GPS Satellites are available, the Time and Date are set automatically.

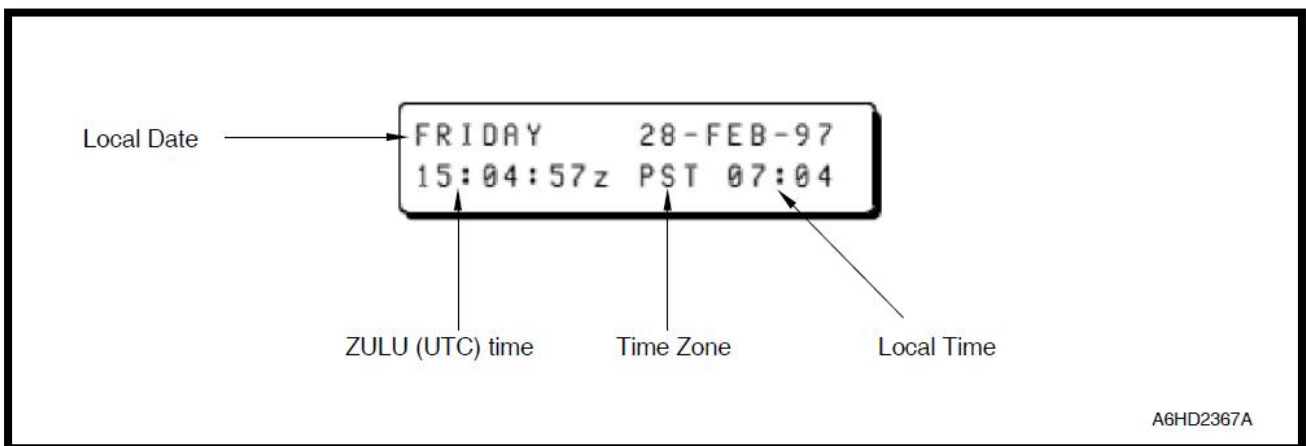
- 4.4. Verify that the Date and Time presented on GPS display are consistent with the current Date and Time.

Requirements after job completion

1. Remove all the tools and other items from the work area. Make sure that the work area is clean.
2. Restore the helicopter initial conditions.
3. Disconnect the external electrical power from the helicopter. Refer to MM 00-10-4.

TAS INPUT	None	FUEL FLOW INPUT:	None
HEADING INPUT	XYZ Mag	OLEO INPUT:	GND
PRESSURE ALT. INPUT:	Digital	SYNCHRO OUTPUT:	Off
BAR ALTITUDE INPUT:	None	AUTOPILOT ROLL ST.:	Off
RAT INPUT:	None	DIGITAL OUTPUT 2:	429GAMA Low
DADS	429	low	

Figure 1 – GPS Operational Test



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Figure 2 – GPS Operational Test

PST	Pacific Standard Time
PDT	Pacific Daylight Savings Time
MST	Mountain Standard Time
MDT	Mountain Daylight Savings Time
CST	Central Standard Time
CDT	Central Daylight Savings Time
EST	Eastern Standard Time
EDT	Eastern Daylight Savings Time
AST	Atlantic Standard Time
ADT	Atlantic Daylight Savings Time

Figure 3 – GPS Operational Test 3- Fuselage on transport platform