

## DUAL INERTIAL REFERENCE SYSTEM - ADJUSTMENT/TEST

*EFFECTIVITY: ALL*

### 1. General

- A. This section gives the procedures to do a check of the Dual Inertial Reference System - IRS.
- B. The primary IRS components are: the Inertial Reference Unit (IRU), the Mode Select Unit (MSU) and the IRU Mounting Tray.
- C. The procedures in this section are given in the sequence below. The tasks identified with (♦) are part of the Scheduled Maintenance Requirements Document (SMRD).

TASK NUMBER	DESCRIPTION	EFFECTIVITY
34-27-00-700-801-A	DUAL IRS - OPERATIONAL TEST	ALL
34-27-00-700-802-A	DUAL IRS - MOUNTING TRAY LEVELING/ ALIGNMENT	ALL

TASK 34-27-00-700-801-A

EFFECTIVITY: ALL

## 2. DUAL IRS - OPERATIONAL TEST

### A. General

(1) This task gives the procedures to do the operational test of the Dual IRS.

### B. References

REFERENCE	DESIGNATION
AMM SDS 31-42-00/1	
AMM SDS 34-15-00/1	
AMM SDS 34-22-00/1	
AMM SDS 34-61-00/1	
AMM TASK 20-40-01-860-801-A/200	ENERGIZATION OF THE AIRCRAFT WITH AN EXTERNAL POWER SOURCE

### C. Zones and Accesses

Not Applicable

### D. Tools and Equipment

Not Applicable

### E. Auxiliary Items

Not Applicable

### F. Consumable Materials

Not Applicable

### G. Expandable Parts

Not Applicable

### H. Persons Recommended

QTY	FUNCTION	PLACE
1	Does the task	Cockpit

### I. Preparation

#### SUBTASK 841-002-A

- (1) Energize the aircraft with the external DC Power Supply ( [AMM TASK 20-40-01-860-801-A/200](#)).
- (2) Make sure that the systems below are serviceable:
  - Electronic Flight Instrument System (EFIS) ([AMM SDS 34-22-00/1](#)).
  - Integrated Computer System ([AMM SDS 31-42-00/1](#)).
  - Dual FMS (Honeywell) ([AMM SDS 34-61-00/1](#)).

- ADC System ([AMM SDS 34-15-00/1](#)).
- (3) Make sure that the indicated groundspeed on the PFD is lower than 20 knots.
- (4) Make sure that the rotary switch, on MSU1 and MSU2, are in the OFF position.
- (5) Make sure that the IRS1 and IRS2 circuit breakers, on the circuit breaker panel, are closed.

J. Dual IRS - Test Procedures ([Figure 501](#)) ([Figure 502](#))

*SUBTASK 710-002-A*

**NOTE:** During the test, the SPS ADVANCED message can come into view on the EICAS display. After the test, the message must go out of view.

- (1) Do the IRS1 power-up and alignment test:
  - (a) Make sure that PFD1 shows red flags ATT FAIL and HDG FAIL.
  - (b) Make sure that MFD1 shows a red flag HDG FAIL.
  - (c) Turn the MSU1 rotary switch to the ALIGN position.
    - The ALIGN annunciator (amber) lights.
    - The ON BATT and the NO AIR annunciators (amber) may come on momentarily.
  - (d) **NOTE:**
    - The IRS must receive the present position for the alignment to be completed. The FMS position must be updated to permit this data to be read by the IRS.
    - If the aircraft is moved during the alignment, the IRU stops the alignment and starts a full alignment again 30 seconds after the motion stops.

Do the FMS position update as follows:

- 1 On FMS1 or FMS2, push the NAV mode key and the NEXT function key.
  - The NAV INDEX 2/2 page is shown.
- 2 Push the POS INIT (3L) left line select key.
  - The POS INIT 1/1 page is shown.
- 3 Push the LOAD (2R) right line select key to update the FMS position with the last saved position.
  - The CDU shows the LOADED POSITION coordinates.
- (e) Wait until the alignment is completed. The alignment time depends on the local latitude. The time of alignment is less than 10 minutes for latitudes of less than 70.25 degrees.
  - After the alignment of the IRS is completed, the NAV RDY annunciator (green) comes on.

- (f) Turn the MSU1 rotary switch to the NAV position.
  - The ALIGN and NAV RDY annunciators go out of the MSU.
  - The flags ATT FAIL and HDG FAIL go out of PFD1 and MFD1, and a valid attitude and heading data are shown.
- (2) Do the IRS1 test by the MSU1 test switch as follows:
  - (a) On MSU1, push the TEST switch.

Result:

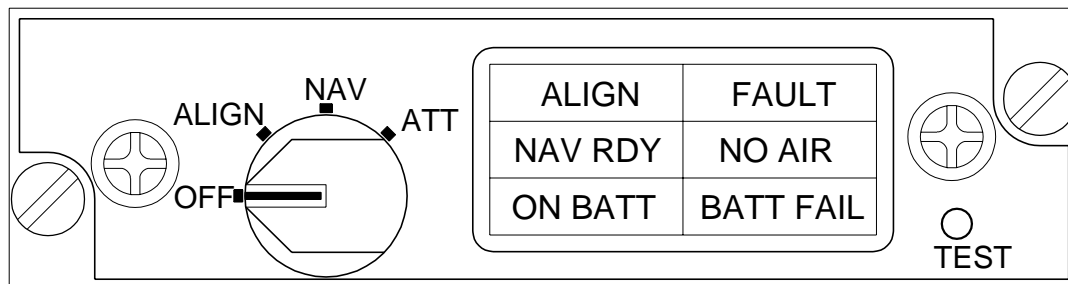
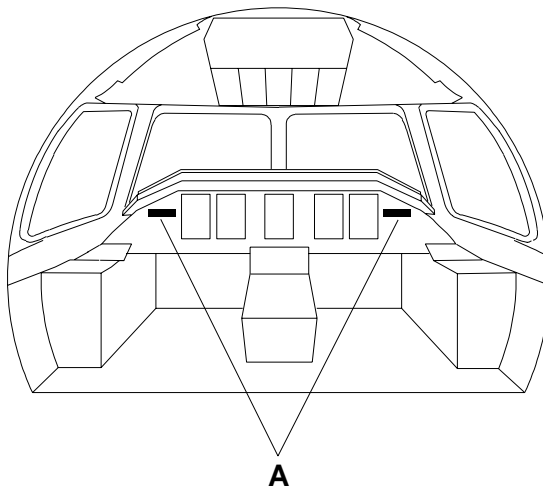
    - 1 All MSU1 annunciators come on for eight seconds.
    - 2 PFD1 shows the ATT TEST and HDG TEST (red) and MFD1 shows HDG TEST (red).
    - 3 PFD 1 shows these indications:
      - 30 degrees for Magnetic Heading.
      - 15 degrees for Pitch Angle.
      - 5 degrees for Roll Angle.
- (3) Do steps (1) and (2) again for IRS2, MSU2, and FMS2.

K. Follow-on

*SUBTASK 842-002-A*

- (1) Set the MSU1/2 rotary switch to the OFF position.
  - The ALIGN annunciator comes on.
  - After 3 seconds, IRU 1/2 disable the outputs, the flags ATT FAIL and HDG FAIL come on, on the PFDs, and the flag HDG FAIL also comes on, on the MFDs.
- (2) Deenergize the aircraft ( [AMM TASK 20-40-01-860-801-A/200](#)).

**EFFECTIVITY: ALL**  
**Mode Select Unit**  
**Figure 501**



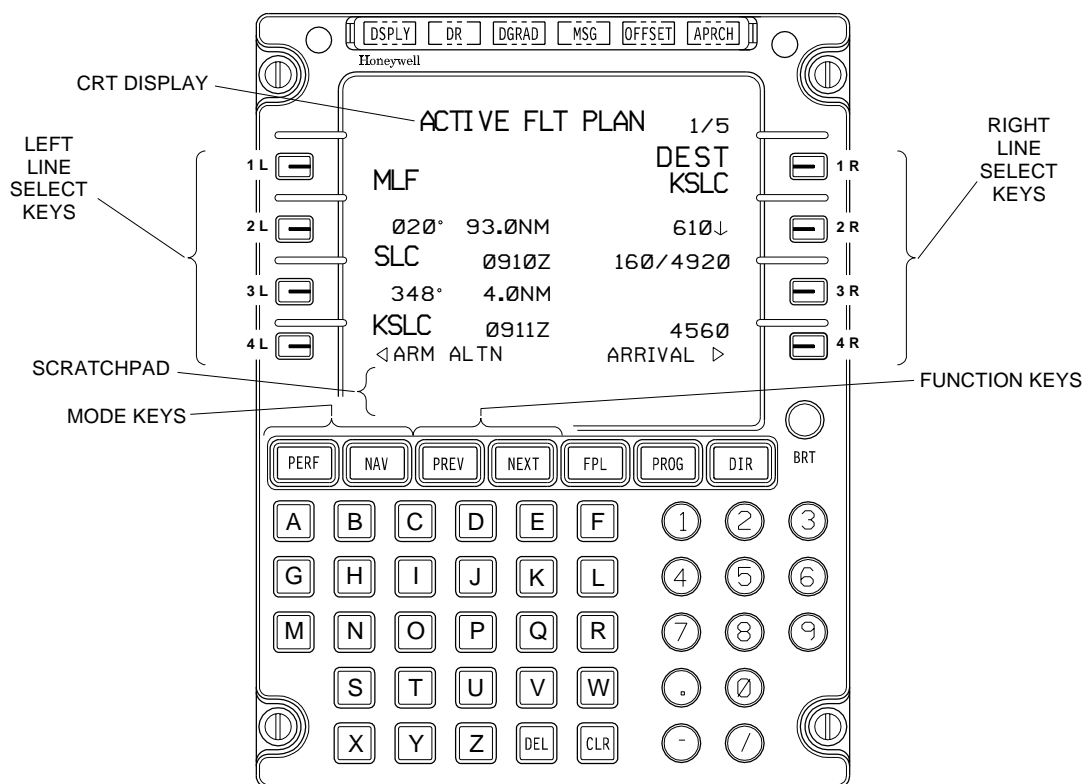
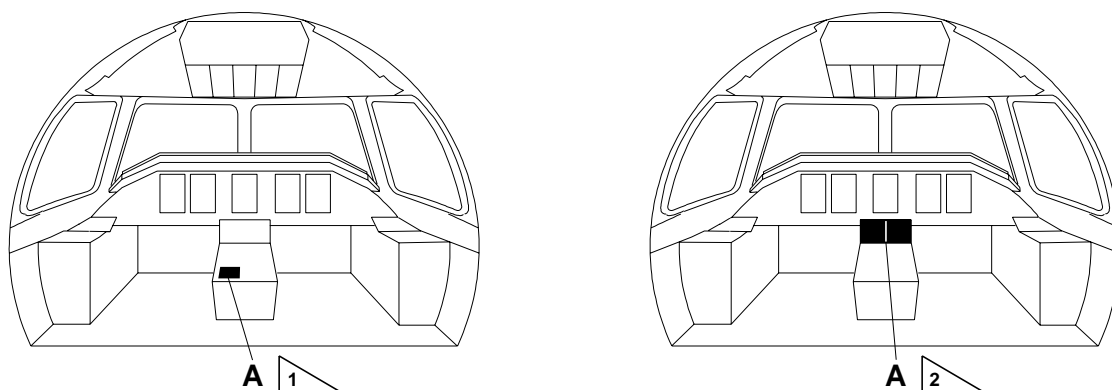
**DET. A**

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EFFECTIVITY: ALL

FMS CDU

Figure 502



1 AIRCRAFT WITH SINGLE FMS

2 AIRCRAFT WITH DUAL FMS

EM145AMM341401A.DGN

TASK 34-27-00-700-802-A

EFFECTIVITY: ALL

### 3. DUAL IRS - MOUNTING TRAY LEVELING/ALIGNMENT

#### A. General

(1) This task gives the procedures to level and align the IRU Mounting Tray.

#### B. References

REFERENCE	DESIGNATION
AMM MPP 06-41-01/100	-
AMM TASK 08-20-00-500-801-A/200	AIRCRAFT LEVELING IN THE PASSENGER CABIN
AMM TASK 20-40-01-860-801-A/200	ENERGIZATION OF THE AIRCRAFT WITH AN EXTERNAL POWER SOURCE
AMM TASK 29-10-00-860-802-A/200	HYDRAULIC SYSTEM - PRESSURIZATION WITH EMDP
AMM TASK 32-00-02-910-801-A/200	SAFETY PIN OF THE NLG DOORS SOLENOID VALVE - INSTALLATION AND REMOVAL
AMM TASK 34-27-01-000-801-A/400	IRU - REMOVAL
AMM TASK 34-27-01-400-801-A/400	IRU - INSTALLATION
S.B.145-32-0036	-
WM 32-61-50	-

#### C. Zones and Accesses

ZONE	PANEL/DOOR	LOCATION
213	113CZ	Forward electronic compartment - LH upper side
214	113CZ	Forward electronic compartment - RH upper side

#### D. Tools and Equipment

ITEM	DESCRIPTION	PURPOSE	QTY
GSE 124	Device, Leveling	To make the IRU Mounting Tray level with the aircraft	
GSE 005	Plumb, Aircraft Leveling	To do the projection of the longitudinal axis of the aircraft on the ground	
Commercially available	Torque Wrench	To torque fasteners	

#### E. Auxiliary Items

ITEM	DESCRIPTION	PURPOSE	QTY
Commercially available	Tape measure - from 25 m (82 ft) up, with subdivisions in mm (inches to 8ths)	To measure distances	1

F. Consumable Materials

Not Applicable

G. Expandable Parts

Not Applicable

H. Persons Recommended

QTY	FUNCTION	PLACE
1	Does the task	Forward electronic compartment

I. Preparation

**SUBTASK 841-003-A**

- (1) Put the aircraft as near as possible or over a reference line of true heading and in a position in which its longitudinal axis goes across the reference line of true heading (Figure 503).
- (2) (PRE-MOD. [S.B.145-32-0036](#)) Make sure that the pressure in hydraulic system 1 is fully released ( [AMM TASK 29-10-00-860-802-A/200](#)).
- (3) (POST-MOD. [S.B.145-32-0036](#)) Install the safety pin of the NLG door solenoid valve ([AMM TASK 32-00-02-910-801-A/200](#)).
- (4) Open access door 113CZ (AMM MPP 06-41-01/100).
- (5) Make the aircraft level ( [AMM TASK 08-20-00-500-801-A/200](#)).

J. Leveling of the IRU1 and IRU2 Mounting Tray (Figure 504)

**SUBTASK 710-003-A**

- (1) Put the IRU1 Mounting Tray on the mounting surface.
  - (2) Attach the mounting tray to the aircraft structure, but keep the four bolts loose.
- CAUTION:** BE CAREFUL WHEN YOU INSTALL THE LEVELING DEVICE (GSE 124) ON THE MOUNTING TRAY AND WHEN YOU MAKE THE MEASUREMENTS TO PREVENT DAMAGE TO THE PRECISION INSTRUMENT.
- (3) Install the leveling device (GSE 124) in place of the IRU Computer with the three guide pins on the mounting tray.
  - (4) Attach the leveling device with the two knurled clamp knobs over the supporting hooks.
  - (5) Examine the circular level on the leveling device and adjust the IRU Mounting Tray with shims as necessary to get better than  $(0 \pm 0.1)$  degree of level in pitch and roll.
- CAUTION:** MAKE SURE THAT THE IRU MOUNTING TRAY CANNOT "ROCK" ON THE MOUNTING FEET.
- (6) Remove the leveling device from the IRU Mounting Tray.
  - (7) Use the torque wrench to torque the bolts that attach IRU Mounting Tray to the aircraft structure to 2.8 N.m (25 lb.in) in a crisscross pattern.



**NOTE:** It's not necessary to do this step if the alignment of IRU (SUBTASK 34-27-00-710-005-A00) is to be done.

- (8) Make sure that the IRS1 and IRS2 circuit breakers, on the circuit breaker panel, are open.
- (9) Install the IRU1 computer in the IRU1 Mounting Tray ( [AMM TASK 34-27-01-400-801-A/400](#)).
- (10) Energize the aircraft ( [AMM TASK 20-40-01-860-801-A/200](#)).
- (11) Make sure that the indicated groundspeed on the PFD is lower than 20 knots and put the aircraft in the on-ground configuration, as follows:
  - (a) On the circuit breaker panel, open the AIR/GND A, AIR/GND B, AIR/GND C, AIR/GND D, IND 1 and IND 2, AWS 1 and AWS 2 circuit breakers.
  - (b) Remove connectors P7163 and P7164 of the LGEU (WM 32-61-50).
  - (c) Put a jumper between pins C and E and between pins N and J of connector P7163.
  - (d) Put a jumper between pins C and E and between pins N and J of connector P7164.
  - (e) Close the AIR/GND A, AIR/GND B, AIR/GND C and AIR/GND D circuit breakers.
- (12) Make sure that the rotary switch, on the MSU1 and MSU2, are in the OFF position.
- (13) On the circuit breaker panel, close the IRS1 and IRS2 circuit breakers.
- (14) Turn on the FMS CDUs.
- (15) Do the steps below to get the pitch and roll data from the IRU1:
  - (a) Make sure that PFD1 shows red flags ATT FAIL and HDG FAIL.
  - (b) Make sure that MFD1 shows a red flag HDG FAIL.
  - (c) Turn the MSU1 rotary switch to the ALIGN position.
    - The ALIGN annunciator (amber) comes on.
    - The ON BATT and the NO AIR annunciators (amber) may come on momentarily.
  - (d) **NOTE:** • The IRS must receive the present position for the alignment to be completed. The FMS position must be updated to permit this data to be read by the IRS.
    - If the aircraft is moved during the alignment, the IRU stops the alignment and starts a full alignment again 30 seconds after the motion stops.

Do the FMS position update as follows:

- 1 On the FMS CDU1, push the NAV mode key and the NEXT function key.

- The NAV INDEX 2/2 page is shown.
  - 2 Push the POS INIT (3L) left line select key.
    - The POS INIT 1/1 page is shown.
  - 3 Push the LOAD (2R) right line select key to update the FMS position with the last saved position.
    - The FMS CDU shows the LOADED POSITION coordinates.
- (e) Wait until the alignment is completed. The alignment time depends on the local latitude. The time of alignment is less than 10 minutes for latitudes of less than 70.25 degrees.
- After the alignment of the IRS is completed, the NAV RDY annunciator (green) comes on.
- (f) Turn the MSU1 rotary switch to the NAV position.
- The ALIGN and NAV RDY annunciators go out of view on the MSU1.
  - The flags ATT FAIL and HDG FAIL go out of PFD1 and MFD1, and a valid attitude and heading data are shown.
- (16) Make sure that the IRU1 pitch and roll outputs shown on the PFD1 are within  $(0 \pm 0.1)$  degree. If not, use the indicated error to determine the proper pitch and roll leveling to be made to the IRU1 Mounting Tray. Do the leveling of the IRU1 Mounting Tray again until a satisfactory result is achieved.
- (17) Turn the MSU1 rotary switch to the OFF position.
- (18) The ALIGN annunciator comes on.
- (19) After 3 seconds, IRU1 disable the outputs, the flags ATT FAIL and HDG FAIL come on, on the PFDs, and the flag HDG FAIL also comes on, on the MFDs.
- (20) Do steps (1) to (19) again for IRU2 with MSU2, FMS CDU2, PFD2 and MFD2.

K. Alignment of the IRU1 and IRU2 Mounting Tray

*SUBTASK 710-004-A*

- (1) Note the angle of the true heading of the reference line ( $H_T$ ), in relation to the true north.
- (2) Make sure that the aircraft is level.
- (3) Put plumb bobs at points 1 (Zone 123 and Zone 124) and 9 (Zone 311 and Zone 312) under the fuselage of the aircraft along the longitudinal axis to determine the true heading of the aircraft ( $H_A$ ).

NOTE: The plumb bob must not touch the ground, but it must be as near as possible.

- (4) Wait the plumb bob to stabilize and, after that, mark the projection of its tip on a piece of adhesive tape put on the ground.

- (5) Determine the distances L, D<sub>1</sub>, and D<sub>2</sub>, with a tape measure (Figure 503).

- Where:

L = Length of aircraft between plumb bobs (in. or mm). L is always positive.

D<sub>1</sub> = Displacement of the plumb bob at the front of the aircraft (in. or mm). D<sub>1</sub> is positive if the plumb bob is at the right of the reference line, when you look from the rear to the nose of the aircraft.

D<sub>2</sub> = Displacement of the plumb bob at the rear of the aircraft (in. or mm). D<sub>2</sub> is positive if the plumb bob is at the left of the reference line, when you look from the rear to the nose of the aircraft.

- NOTE:
- D<sub>1</sub> and D<sub>2</sub> must be perpendicular to the reference line (true north or known true heading).
  - D<sub>1</sub> and D<sub>2</sub> must be measured with an accuracy of 1mm (or 1/8 in.).

- (6) Use this equation to determine the true heading of the aircraft (H<sub>A</sub>):

$$H_A = H_T + \sin^{-1}[(D_1 + D_2)/L] \text{ degrees}$$

- Where:

H<sub>A</sub> = True heading of the aircraft (in decimal degrees).

H<sub>T</sub> = True heading of the surveyed line (in decimal degrees).

- (7) Make sure that the aircraft is in the on-ground configuration and the indicated groundspeed on the PFD is lower than 20 knots.
- (8) Make sure that the rotary switch, on the MSU1 and MSU2, are in the OFF position.
- (9) On the circuit breaker panel, make sure that the IRS1 and IRS2 circuit breakers are closed.
- (10) Make sure that the FMS CDUs are operational and on.
- (11) Do the steps below to get the heading data from the IRU1:
- Make sure that PFD1 shows red flags ATT FAIL and HDG FAIL.
  - Make sure that MFD1 shows a red flag HDG FAIL.
  - Turn the MSU1 rotary switch to the ALIGN position.
    - The ALIGN annunciator (amber) comes on.
    - The ON BATT and the NO AIR annunciators (amber) may come on momentarily.
  - NOTE: • The IRS must receive the present position for the alignment to be completed. The FMS position must be updated to permit this data to be read by the IRS.

- If the aircraft is moved during the alignment, the IRU stops the alignment and starts a full alignment again 30 seconds after the motion stops.

Do the FMS position update as follows:

- 1 On the FMS CDU1, push the NAV mode key and the NEXT function key.
    - The NAV INDEX 2/2 page is shown.
  - 2 Push the POS INIT (3L) left line select key.
    - The POS INIT 1/1 page is shown.
  - 3 Push the LOAD (2R) right line select key to update the FMS position with the last saved position.
    - The FMS CDU shows the LOADED POSITION coordinates.
- (e) Keep the MSU1 rotary switch in the ALIGN position for approximately 15 minutes to maximize the heading solution accuracy.
- After the alignment of the IRS is completed, the NAV RDY annunciator (green) comes on.
- (f) Turn the MSU1 rotary switch to the NAV position.
- The ALIGN and NAV RDY annunciators go out of view on the MSU1.
  - The flags ATT FAIL and HDG FAIL go out of view on the PFD1 and MFD1, and a valid attitude and heading data are shown.
- (12) Do the steps below to enter the Maintenance Test Mode on the PFD:
- (a) On the DC-550, select the decision height knob for 690 on the PFD to display the REFERENCE DATA page.
  - (b) Push and hold the TEST button on the DC-550 for approximately 5 to 7 seconds.
  - (c) While you hold the TEST button, push the ET button on the DC-550.
  - (d) Release the TEST button.
- NOTE:** The IC-600 should now be in the maintenance test mode and will remain in test (via software) until it is canceled by another press of the TEST button or selecting a RA setting below 600.
- (13) Note the IRU true heading shown in the field PRI TRUE HDG on the REFERENCE DATA page.

**NOTE:** The true heading value is displayed in degrees from 0.0 to  $\pm 180.0$ .

**NOTE:** The bus status is displayed to the right of the digital readout as follows:

Table 501

LABEL	STATUS DISPLAYED	STATUS COLOR
Valid	V	Green

Table 501 (Continued)

LABEL	STATUS DISPLAYED	STATUS COLOR
Test	V	Green
NCD	I	Red
Fail	I	Red

- (14) Compare the IRU true heading displayed at the field PRI TRUE HDG on the REFERENCE DATA page with the true heading calculated in the step (6).

**NOTE:**

- If the true heading output calculated in the step (6) is greater than + 180.0 degrees you must add – 360 degrees before you compare this value with the IRU true heading displayed at the field PRI TRUE HDG on the REFERENCE DATA page.
- If the true heading output calculated in the step (6) is less than – 180.0 degrees you must add + 360 degrees before you compare this value with the IRU true heading displayed at the field PRI TRUE HDG on the REFERENCE DATA page.

- (15) If the IRU output is not within the desired accuracy ( $\pm 0.2$  degree), use the indicated error to determine the correct yaw adjustment to be made to the IRU Mounting Tray. Align the IRU Mounting Tray again, until you get a satisfactory alignment result.

- (16) Tighten the two aft bolts of the IRU Mounting Tray and make sure that the true heading indication on the REFERENCE DATA page, on the PFD, continues within the tolerance.

- (17) Turn MSU1 and MSU2 rotary switch to the OFF position.

- (18) The ALIGN annunciator comes on.

- (19) After 3 seconds, IRU1 disable the outputs, the flags ATT FAIL and HDG FAIL come on, on the PFDs, and the flag HDG FAIL also comes on, on the MFDs.

- (20) On the circuit breaker panel, open the IRS1 and IRS2 circuit breakers.

- (21) Remove IRU1 ( [AMM TASK 34-27-01-000-801-A/400](#)) and tighten the two forward bolts of the IRU1 Mounting Tray.

**NOTE:** Do this step carefully so as not to losing the adjustment of the IRU Mounting Tray.

- (22) Use the torque wrench to torque the bolts that attach IRU Mounting Tray to the aircraft structure to 2.8 N.m (25 lb.in) in a crisscross pattern.

- (23) Install IRU1 in its mounting tray again ( [AMM TASK 34-27-01-400-801-A/400](#)).

- (24) On the circuit breaker panel, close IRS1 and IRS2 circuit breakers.

- (25) Do steps (11) to (15) again and make sure that the true heading indication (PRI TRUE HDG) on the REFERENCE DATA page, on the PFD, continues within the tolerance.

- (26) Do steps (7) to (25) again for IRU2.

L. Follow-on

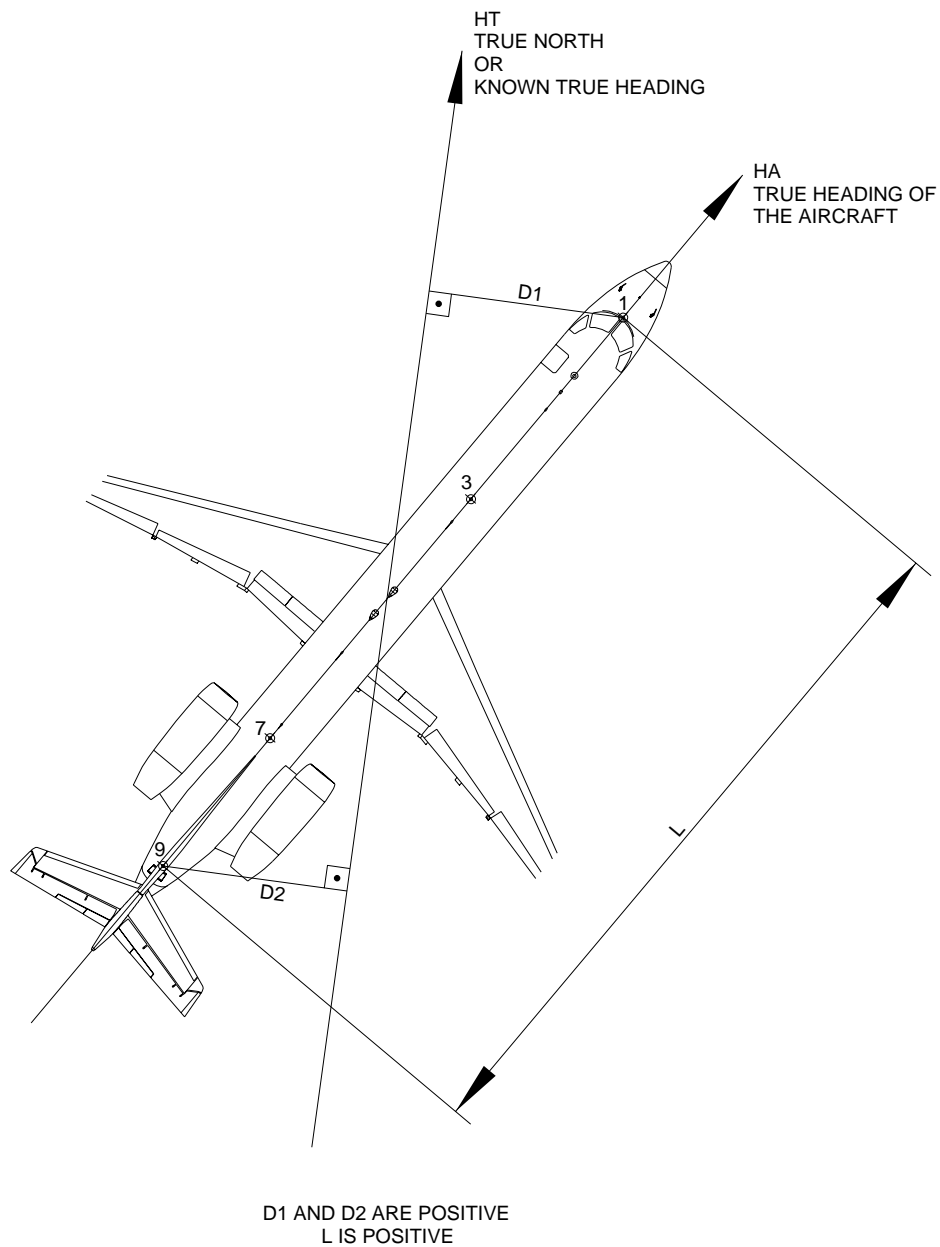
*SUBTASK 842-003-A*

- (1) Set the MSU1 and MSU2 rotary switch to the OFF position.
  - The ALIGN annunciator comes on.
  - After 3 seconds, IRU1 and IRU2 disable the outputs, the flags ATT FAIL and HDG FAIL come on, on the PFDs, and the flag HDG FAIL also comes on, on the MFDs.
- (2) Remove all jumpers installed on connectors P7163 and P7164, and install these connectors on the LGEU.
- (3) On the circuit breaker panel, close the IND 1, IND 2, AWS 1 and AWS 2 circuit breakers.
- (4) Close access door 113CZ (AMM MPP 06-41-01/100).
- (5) (POST-MOD. [S.B.145-32-0036](#)) Remove the safety pin from the NLG door solenoid valve ([AMM TASK 32-00-02-910-801-A/200](#)).
- (6) Deenergize the aircraft ( [AMM TASK 20-40-01-860-801-A/200](#)).

EFFECTIVITY: ALL

Determination of the True Heading

Figure 503 - Sheet 1

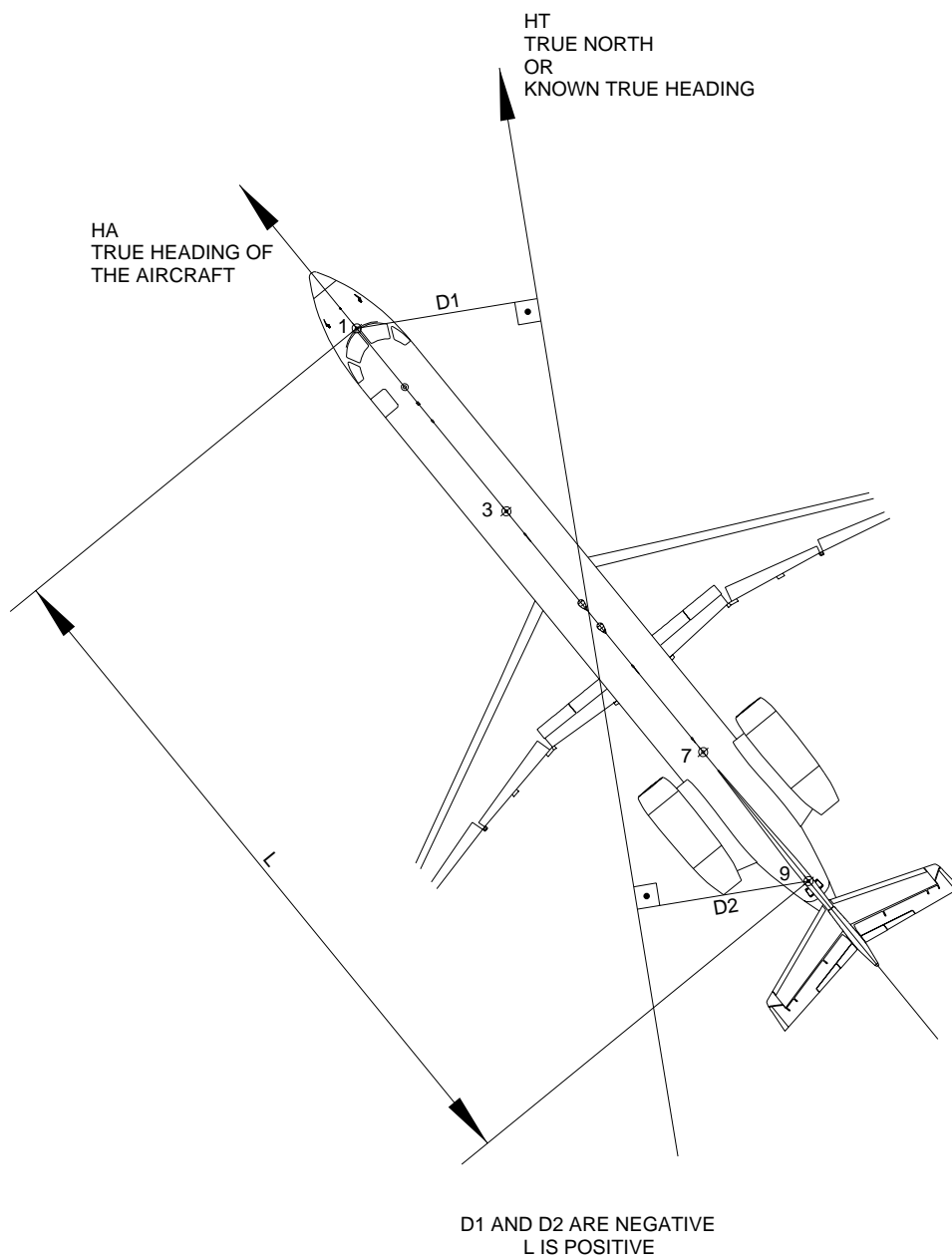


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EFFECTIVITY: ALL

Determination of the True Heading

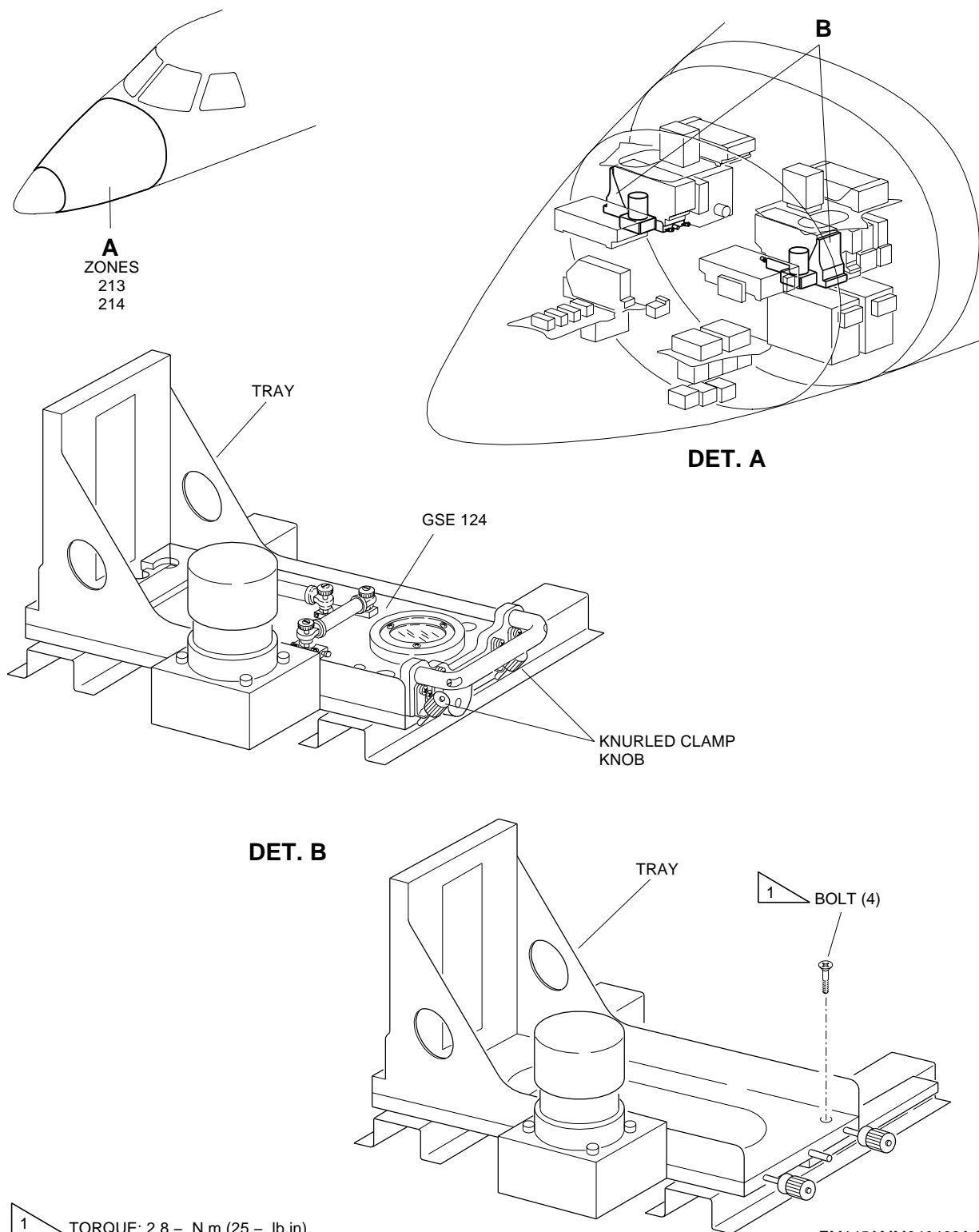
Figure 503 - Sheet 2



145AMM340451.MCE A



EFFECTIVITY: ALL  
IRU Mounting Tray Leveling  
Figure 504



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