ELEVATOR AND TAB - ADJUSTMENT/TEST

EFFECTIVITY: ALL

1. General

   A. This section gives the procedures to do the elevator calibration with control column position transducers.

   B. 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*
27-30-00-700-801-A	ELEVATOR CALIBRATION WITH CONTROL-COLUMN POSITION TRANSDUCERS	ALL

TASK 27-30-00-700-801-A
EFFECTIVITY: ALL

2. ELEVATOR CALIBRATION WITH CONTROL-COLUMN POSITION TRANSDUCERS

A. General

(1) This task gives the procedures to do the elevator calibration with control column position transducers.

(2) (Aircraft with Honeywell FDR installed) In this task you will find the procedure to set the Hand-Held Download Unit (HHDLU) for aircraft.

(3) (Aircraft with L3 FDR installed) In this task you will find the procedure to set the Portable Interface Unit (PIU) for aircraft.

B. References

REFERENCE	*DESIGNATION*
AMM TASK 20-40-01-860-801-A/200	ENERGIZATION OF THE AIRCRAFT WITH AN EXTERNAL POWER SOURCE
AMM TASK 27-31-00-700-802-A/500	ADJUSTMENT OF THE ELEVATOR PRIMARY BACKSTOP AND SECONDARY BACKSTOP
AMM TASK 27-31-01-700-801-A/500	TENSION OF THE ELEVATOR CONTROL CABLES - FUNCTIONAL CHECK
AMM TASK 27-31-08-700-801-A/500	SPRING TAB - ADJUSTMENT
AMM TASK 31-31-00-700-803-A/500	FDR DATA - PERSONAL COMPUTER DOWNLOADING
AMM TASK 31-31-04-700-801-A/500	FDR POTENTIOMETERS - ADJUSTMENT

C. Zones and Accesses

ZONE	*PANEL/DOOR*	*LOCATION*
272	272DR	Rear electronic compartment
223	223LZ	Cockpit, left side

D. Tools and Equipment

ITEM	*DESCRIPTION*	*PURPOSE*	*QTY*
GSE 036	Hydraulic Platform	To get access to the elevator	
GSE 044	Headset, Ramp handling	For communications	
GSE 070	Digital Protractor	To measure the elevator deflections	
GSE 092	Hand-Held Download Unit	To monitor the transducer data in real time	
GSE 464	Portable Interface Unit	To monitor the transducer data in real time	

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	Elevator
1	Helps the other technician	Cockpit
1	As a flight crewmember, tests the aircraft in flight	Cockpit

I. Preparation

SUBTASK 841-002-A

(1) Make sure that the aircraft is safe for maintenance.

(2) Energize the aircraft with the external DC power supply (AMM TASK 20-40-01-860-801-A/200).

(3) Open rear electronic compartment door 272DR.

(4) Make sure that the elevator system is correctly adjusted (AMM TASK 27-31-00-700-802-A/500), (AMM TASK 27-31-01-700-801-A/500), and (AMM TASK 27-31-08-700-801-A/500).

(5) During the ground procedure, make sure that the aircraft does not move because of an external influence, such as wind and/or personnel on board.

(6) Set the horizontal stabilizer to zero. Make sure that the EICAS display shows the zero position for the horizontal stabilizer.

(7) Turn off the red beacon.

(8) Open Maintenance Panel door 223LZ and set the DFDR test switch to the NORM position. Refer to Figure 502.

(9) On the Circuit Breaker Panel, open the FDR circuit breaker.

(10) (Aircraft with Honeywell FDR installed) In the rear electronic compartment, connect the Hand-Held Download Unit (HHDLU) (GSE 092) to the FDR. Refer to Figure 501.

(11) (Aircraft with L3 FDR installed) In the Rear Electronic Compartment, connect the Portable Interface Unit (PIU) (GSE 464) to the FDR. Refer to Figure 501.

J. Calibration of the Elevator with Control-Column Position Transducers - Using Honeywell HHDLU GSE

SUBTASK 720-002-A

NOTE: You must not adjust or change the elevator system after you start this procedure, until you complete the next flight.

(1) On the Circuit Breaker Panel, close the FDR circuit breaker.

(2) On the Maintenance Panel, set the DFDR test switch to the TEST position.

(3) On the HHDLU, push the DSDU option.

- The HHDLU display will show the WORD1, WORD2, WORD3, and EXIT alternatives.

Table 501 - HHDLU DISPLAY INITIAL SETTING

Sφ	W1	# # # # (OCT)	
Sφ	W1	# # # # (OCT)	
Sφ	W1	# # # # (OCT)	
WRD1	WRD2	WRD3	EXIT

(a) Push the WORD1 alternative.

(b) Make sure that for SUBFRAME, ALL is shown.

(c) Push WORD.

(d) Use ← → to set the correct WORD (see below) and then push SEL.

NOTE:
- For aircraft without AFDAU, select WORD 8;
- For aircraft with AFDAU/AFDAMU, select WORD 15.

(e) Push BASE.

(f) Push DEC and then EXIT.

(g) Push EXIT.

(h) Push the WORD2 alternative.

(i) Make sure that for SUBFRAME, ALL is shown.

(j) Push WORD.

(k) Use ← → to set the WORD indicated below and then push SEL.

NOTE:
- For aircraft without AFDAU, select WORD 24;
- For aircraft with AFDAU/AFDAMU, select WORD 47.

(l) Push BASE.

(m) Push DEC and then EXIT.

(n) Push EXIT.

- After steps (a) thru (n), you will have on the HHDLU display:

Table 502 - HHDLU DISPLAY SUBSEQUENT SETTING

Sφ	W8 (or W15)[1]	# # # # (DEC)	
Sφ	W24 (or W47)[2]	# # # # (DEC)	
Sφ	W1	# # # # (OCT)	
WRD1	WRD2	WRD3	EXIT

[1] For aircraft without AFDAU, the HHDLU display shows W8;
For aircraft with AFDAU/AFDAMU, the HHDLU display shows W15.
[2] For aircraft without AFDAU, the HHDLU display shows W24;
For aircraft with AFDAU/AFDAMU, the HHDLU display shows W47.

(4) Install the rig pin in the rear elevator sector. Refer to Figure 506.

(5) Install the digital protractor to the left elevator. Use double-face adhesive tape. Refer to Figure 503. Set it to zero.

(6) Make sure that the values of W8 or W15 and W24 or W47 displayed on the HHDLU for the control column in neutral position (zero degree) are according to the values given per AMM TASK 31-31-04-700-801-A/500. If the values are not within the tolerance, adjust the potentiometer as necessary.

(7) Remove the rig pin from the rear elevator sector. Refer to Figure 506.

(8) Manually put the elevator in the 10-degree position (trailing edge up) and check the reading value on the digital protractor.

NOTE: Make sure that you will do the calibration with the actual reading value. It is not necessary to put the elevator exactly at the target numbers.

(a) Stop until the HHDLU display becomes stable.

(b) Read the deflection on the digital protractor and write in Table 503 (Figure 504), in the column “Actual Reading”.

(c) Do not change the elevator position and read the W8 or W15 and W24 or W47 values displayed on the HHDLU. Write the values in Table 503 (Figure 504).

(9) Descend the elevator as near the target value in Table 503 (Figure 504) below as possible. Continue down to the lowest elevator position. Fill out the table blanks.

(10) *EFFECTIVITY: PRE-MOD SB145-27-005*

Make sure that the values of W8 or W15 and W24 or W47 for 5 degrees forward (DOWN) and 10 degrees rearward (UP) are according to the values given per AMM TASK 31-31-04-700-801-A/500. If the values are not within the tolerance, adjust the potentiometer as necessary.

(11) *EFFECTIVITY: POST-MOD SB145-27-005*

Make sure that the values of W8 or W15 and W24 or W47 for 5 degrees forward (DOWN) is according to the values given per AMM TASK 31-31-04-700-801-A/500. If the values is not within the tolerance, adjust the potentiometer as necessary.

(12) On the Maintenance Panel, set the DFDR test switch to the NORM position. Refer to Figure 502.

(13) In the Rear Electronic Compartment, disconnect the Hand-Held Download Unit (HHDLU) from the FDR. Refer to Figure 501.

(14) Do a flight TEST and use the flight test card.

(a) As a reference, a flight test card is included to do the check points. Refer to Figure 505.

(15) Immediately after landing, do the download procedure (AMM TASK 31-31-00-700-803-A/500) of the FDR.

NOTE: Add 30 minutes to the actual flight time to do the download.

K. Calibration of the Elevator with Control-Column Position Transducers - Using L3 PIU GSE

SUBTASK 720-003-A

NOTE: You must not adjust or change the elevator system after you start this procedure, until you complete the next flight.

(1) On the Circuit Breaker Panel, close the FDR circuit breaker.

(2) On the Maintenance Panel, set the DFDR test switch to the TEST position. Refer to Figure 502.

(3) Do the steps that follow on the PIU:

(a) On the PIU, use ↑ ↓ to set WORD MONITOR and then push SELECT.

1 The PIU display will show the WORD MONITOR page as table below:

Table 503 - PIU WORD MONITOR PAGE

WORD_ _ _ [1]		
SUB Frame 1	XXXX[2]	DEC[3]
SUB Frame 2	XXXX[2]	DEC[3]
SUB Frame 3	XXXX[2]	DEC[3]
SUB Frame 4	XXXX[2]	DEC[3]
0 1 2 3 4 5 6 7 8 9 [4]		

[1] Selected word
[2] Word indication
[3] Sub frame base (OCT, DEC, HEX or OFF)
[4] Word selection - numeric line

(b) On the PIU, use ↑ ↓ ← → to put the cursor on the numeric line to set the following word and push SELECT.

NOTE: On the PIU, if necessary, push DELETE button to erase the word number selection.

- For aircraft without AFDAU, select WORD 8;
- For aircraft with AFDAU/AFDAMU, select WORD 15.

(c) On the PIU, use ↑ ↓ ← → to put the cursor in one of the sub frame base and push SELECT to change it to DEC (Decimal).

1 On the PIU, make sure the subframe base change to DEC.

(d) On the PIU, use ↑ ↓ ← → to put the cursor in the remaining sub frames base and push SELECT to change them to OFF.

1 On the PIU, make sure the remaining subframes base change to OFF.

(4) Install the rig pin in the rear elevator sector. Refer to Figure 506.

(5) Make sure that the values of W8 or W15 and W24 or W47 displayed on the HHDLU for the control column in neutral position (zero degree) are according to the values given per AMM TASK 31-31-04-700-801-A/500. If the values are not within the tolerance, adjust the potentiometer as necessary.

(6) Install the digital protractor to the left elevator. Use double-face adhesive tape. Refer to Figure 503. Set it to zero.

(7) Remove the rig pin from the rear elevator sector. Refer to Figure 506.

(8) Manually put the elevator in the 10-degree position (trailing edge up) and check the reading value on the digital protractor.

NOTE: Make sure that you will do the calibration with the actual reading value. It is not necessary to put the elevator exactly at the target numbers.

(a) Make sure the PIU indication becomes stable.

(b) Read the deflection on the digital protractor and write in Table 503 (Figure 504), in the column “Actual Reading”.

(c) Do not change the elevator position and read the W8 or W15 and W24 or W47 values displayed on the PIU. Write the value in Table 503 (Figure 504).

NOTE: Change the words on the PIU, use ↑ ↓ ← → to put the cursor on the numeric line to set the applicable wording and push SELECT

- For aircraft without AFDAU, select WORD 8 and WORD 24;
- For aircraft with AFDAU/AFDAMU, select WORD 15 and WORD 47.

(d) Make sure the words are in DEC.

(9) Descend the elevator as near the target value in Table 503 (Figure 504) below as possible. Continue down to the lowest elevator position. Fill out the table blanks.

(10) *EFFECTIVITY: PRE-MOD SB145-27-005*

Make sure that the values of W8 or W15 and W24 or W47 for 5 degrees forward (DOWN) and 10 degrees rearward (UP) are according to the values given per AMM TASK 31-31-04-700-801-A/500. If the values are not within the tolerance, adjust the potentiometer as necessary.

(11) *EFFECTIVITY: POST-MOD SB145-27-005*

Make sure that the values of W8 or W15 and W24 or W47 for 5 degrees forward (DOWN) is according to the values given per AMM TASK 31-31-04-700-801-A/500. If the values is not within the tolerance, adjust the potentiometer as necessary.

(12) On the Maintenance Panel, set the DFDR test switch to the NORM position. Refer to Figure 502.

(13) In the Rear Electronic Compartment, disconnect the Portable Interface Unit (PIU) from the FDR. Refer to Figure 501.

(14) Do a flight TEST and use the flight test card.

NOTE: As a reference, a flight test card is included to do the check points. Refer to Figure 505.

(15) Immediately after landing, do the download procedure (AMM TASK 31-31-00-700-803-A/500) of the FDR.

NOTE: Add 30 minutes to the actual flight time to do the download.

L. Follow-on

SUBTASK 842-002-A

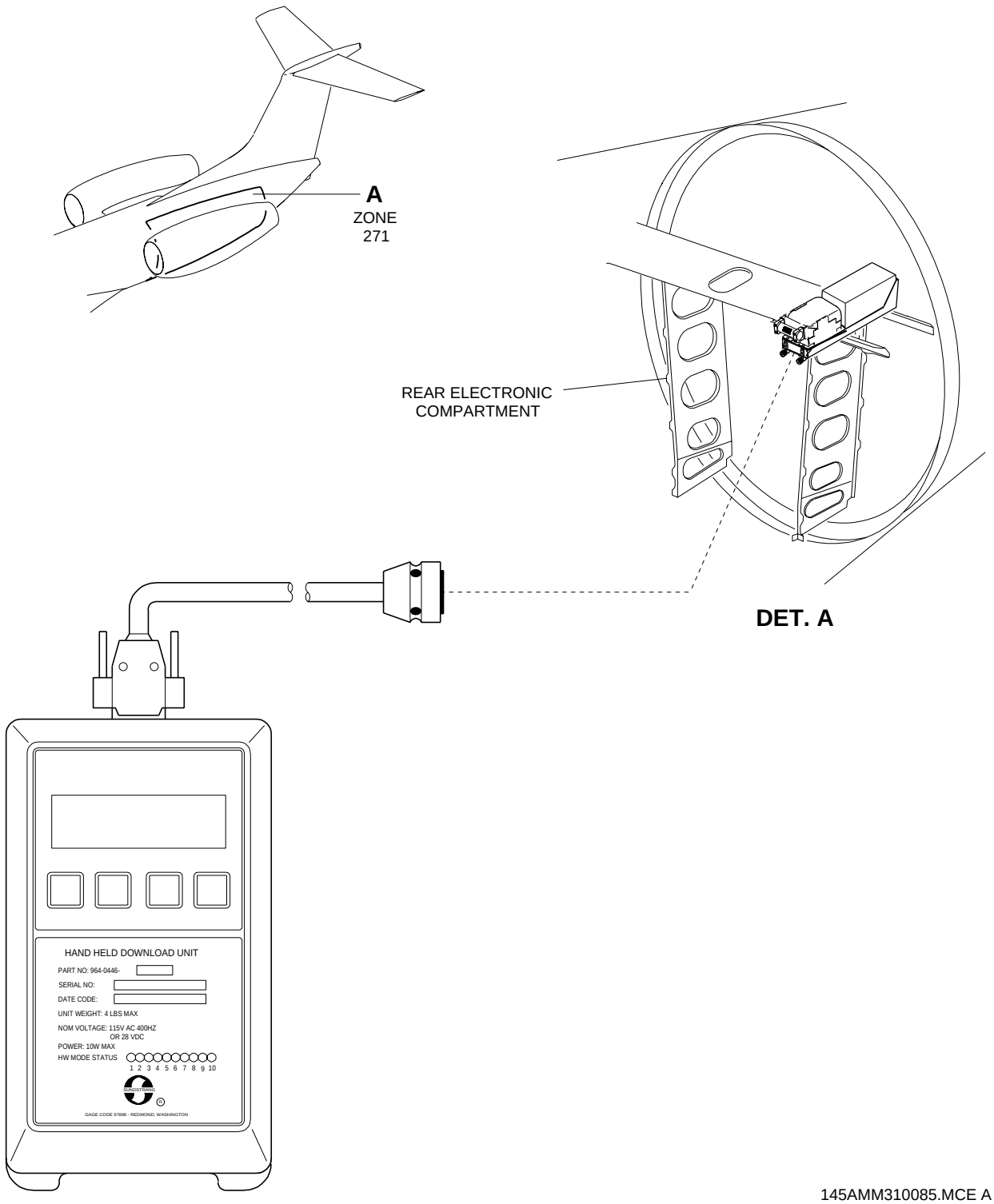
(1) Send the data of Table 503/504/505 (Figure 504 and Figure 505) and FDR data to Technical Support Engineering of Embraer to be analyzed.

NOTE: To send these data to Embraer, take a copy of Figure 504 and Figure 505 and fax it or, use the program file available with Technical Representative or Technical Support Engineering and send it electronically along with DFDR download.

- After Embraer analyzes these data, Embraer will tell you about the necessary actions to do the calibration of the elevator with the control-column position transducers.
- It is necessary to wait the Embraer analysis to put the aircraft back to operation.

EFFECTIVITY: ALL

FDR Word Monitor - Installation in the Rear Electronic Compartment
Figure 501 - Sheet 1



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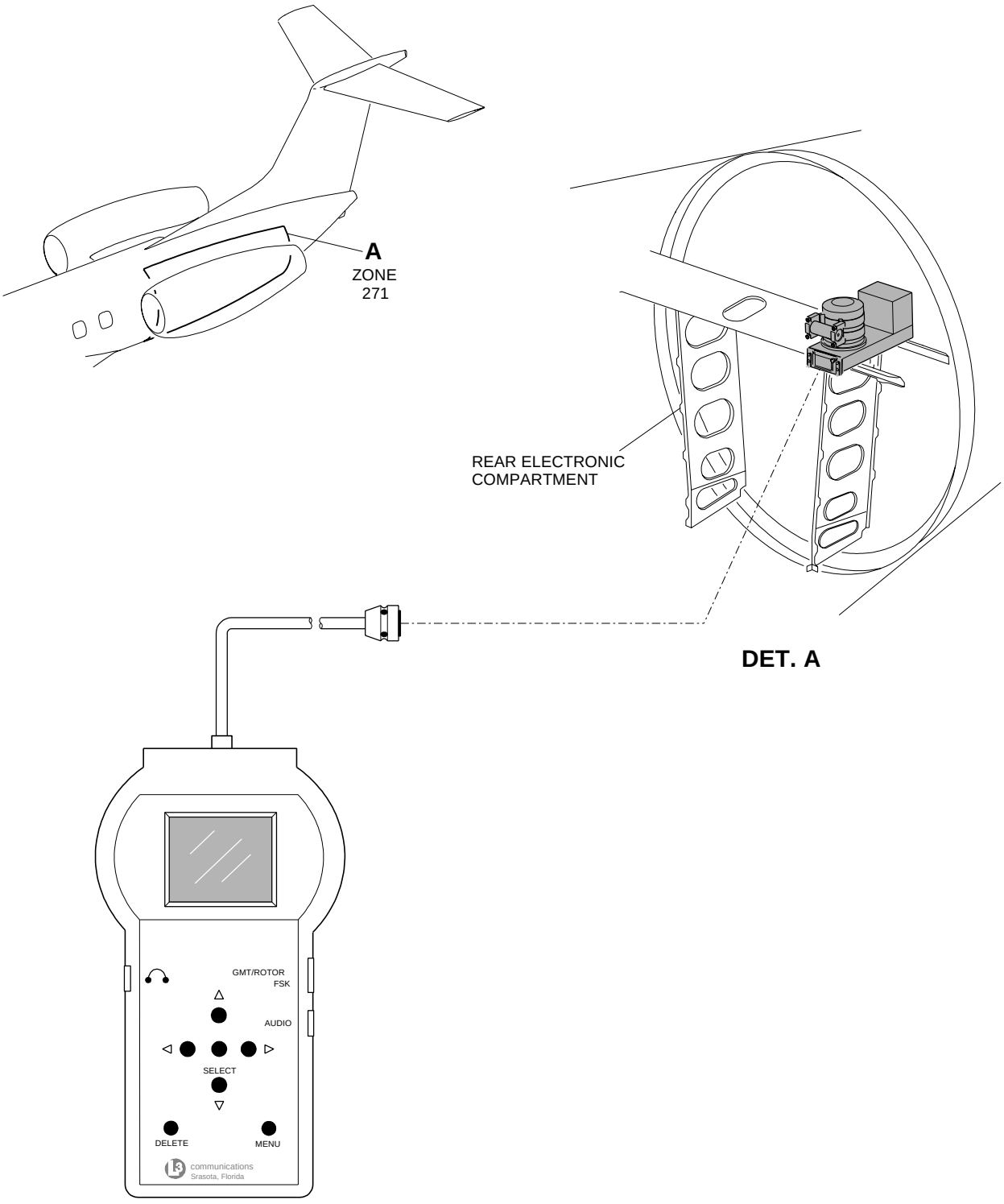
EFFECTIVITY: ALL

FDR Word Monitor - Installation in the Rear Electronic Compartment
Figure 501 - Sheet 2



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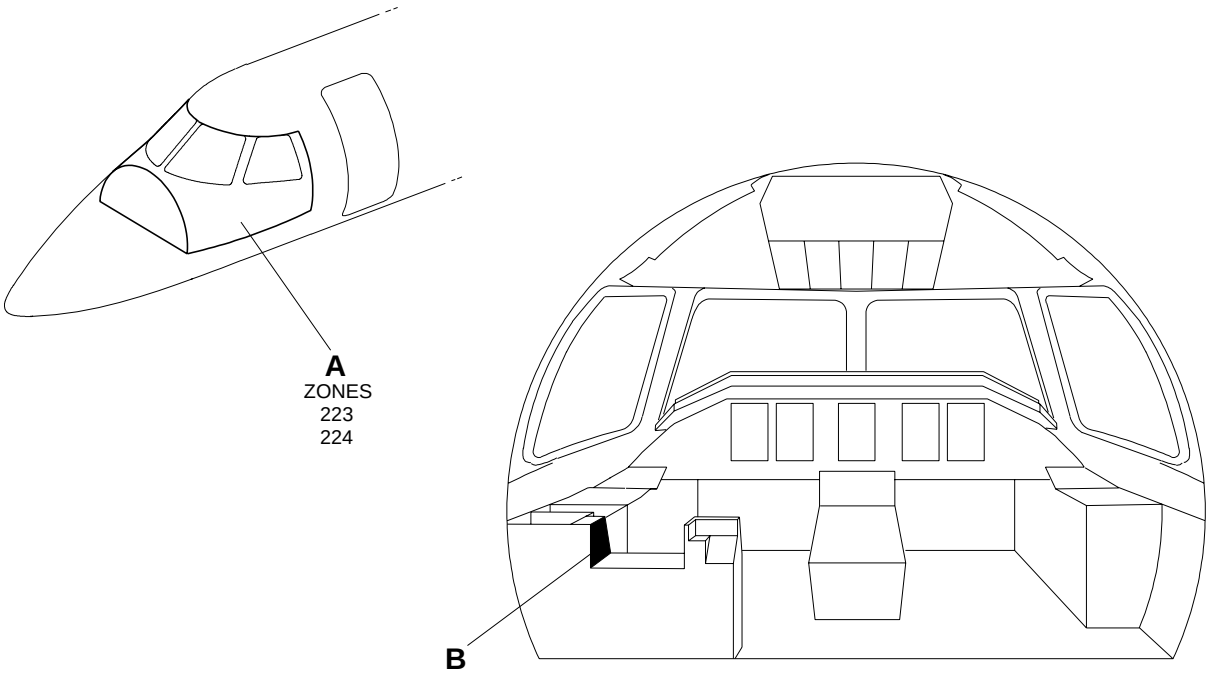
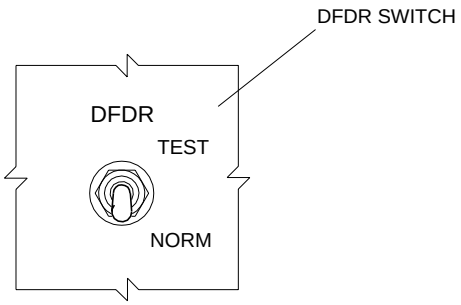
EFFECTIVITY: ALL

Maintenance Panel - DFDR Switch
Figure 502



DET. A



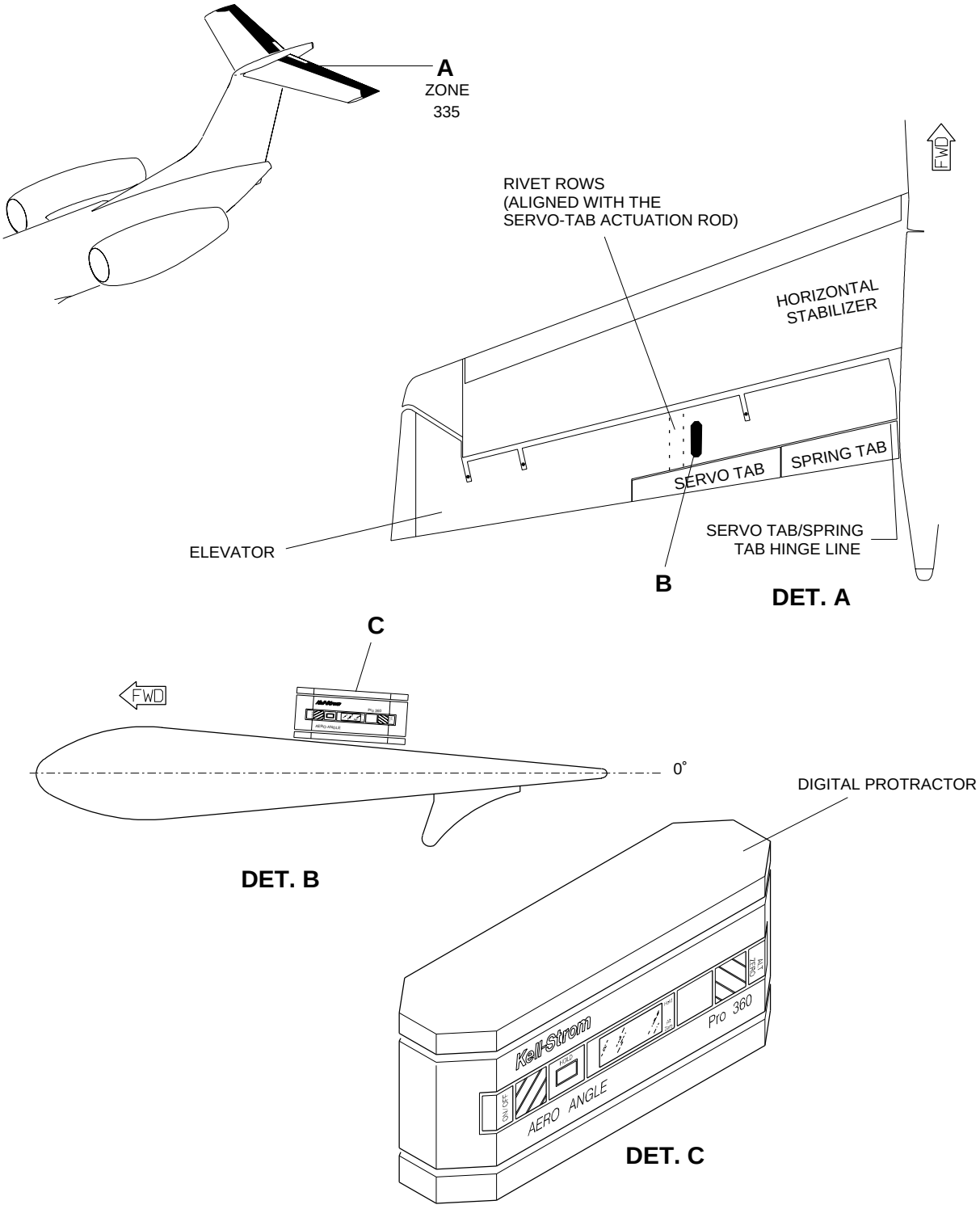
DET. B
MAINTENANCE PANEL

145AMM310147.MCE

EFFECTIVITY: ALL

Digital Protractor - Location

Figure 503



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EFFECTIVITY: ALL
Tables 503 and 504
Figure 504

AIRCRAFT: _____ TAIL NUMBER: _____ DATE: _____ COMPANY: _____

TABLE 503 − FDR WORD MONITOR (GSE) SHOWS VALUES FOR ELEVATOR DEFLECTIONS

TARGET VALUE	ACTUAL READING [1]	SØW8 OR SØW15 [2]	SØW24 OR SØW47 [3]	TARGET VALUE	ACTUAL READING [1]	SØW8 OR SØW15 [2]	SØW24 OR SØW47 [3]
10° UP	−			0°			
9.0° UP	−			0.5° DOWN	+		
8.0° UP	−			1.0° DOWN	+		
7.0° UP	−			1.5° DOWN	+		
6.0° UP	−			2.0° DOWN	+		
5.0° UP	−			2.5° DOWN	+		
4.5° UP	−			3.0° DOWN	+		
4.0° UP	−			3.5° DOWN	+		
3.5° UP	−			4.0° DOWN	+		
3.0° UP	−			4.5° DOWN	+		
2.5° UP	−			5.0° DOWN	+		
2.0° UP	−			6.0° DOWN	+		
1.5° UP	−			7.0° DOWN	+		
1.0° UP	−			8.0° DOWN	+		
0.5° UP	−			9.0° DOWN	+		
0				10° DOWN	+		

[1] READ DEFLECTION ON THE DIGITAL PROTRACTOR. NOSE UP IS PRESENTED AS "NEGATIVE VALUE", AND NOSE DOWN AS "POSITIVE VALUE".

[2] FOR ACFT WITHOUT AFDAU, THE FDR WORD MONITOR (GSE) SHOWS VALUES TO SØW8; FOR ACFT WITH AFDAU, THE FDR WORD MONITOR (GSE) SHOWS VALUES TO SØW15.

[3] FOR ACFT WITHOUT AFDAU, THE FDR WORD MONITOR (GSE) SHOWS VALUES TO SØW24; FOR ACFT WITH AFDAU, THE FDR WORD MONITOR (GSE) SHOWS VALUES TO SØW47.

TABLE 504 − "YES"/"NO" ANSWER REQUIRED

AIRCRAFT WITH EICAS VERSION 20.5 OR HIGHER (SB 145−31−0042)
AIRCRAFT EQUIPPED WITH AFDAU:
AIRCRAFT CONFIGURED WITH GUST LOCK PROVISIONS:

(THIS FORM SHOULD BE FAXED TO EMBRAER S.A. − TECHNICAL SUPPORT ENGINEERING, OR SENT ELECTRONICALLY ALONG WITH DFDR DOWNLOADING)

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EFFECTIVITY: ALL
Table 505
Figure 505

OPERATIONAL TEST CARD

Flight Level.....12000 ft

NOTE: Because of an ATC demand, weather conditions, or excessive turbulence, it is permitted to stabilize at a different Flight Level > 8000 feet.

Autopilot..... ON

HDG mode..... ACTIVE

ALT mode..... ACTIVE

Flaps position..... ZERO

With the aircraft stabilized, use thrust to adjust the speed as indicated in Table 505.

NOTE: This procedure must be accomplished for each target speed given in Table 505 (180 KIAS, 200 KIAS and 250 KIAS).

After the aircraft is stabilized at least 2 minutes around the target speed:

AP button (Glareshield Panel)..... PRESS (AP OFF)

Clock Time (GMT).....Write the time displayed (GMTI − TABLE 505)

Chronometer.....START

Do not touch the control column, trims, and engine thrust levers in the subsequent minute. It will invalidate the flight results.

NOTE: The airspeed can change around the trim speed by ± 2 knots up to ± 5 knots, as a function of the turbulence.

Even with this speed change, do not touch the control column, trims, and engine thrust levers in the subsequent minute.

If any control column, trims, or engine thrust levers action is required, the test must be revalidated.

Any moment within 01 minute from the chronometer start:

Write the Actual Speed.....TABLE 505

Write the Pitch Trim position.....TABLE 505

After 01 minute from the chronometer start:

Clock Time (GMT) .....Write the time displayed (GMTF − TABLE 505)

Repeat the procedure for the remaining target speeds given in TABLE 505.

TABLE 505 − GMT READING

TARGET SPEED (KIAS)	GMTI	ACTUAL SPEED	PITCH TRIM POSITION (UP/DOWN)	GMTF
180				
200				
250				
FLIGHT NUMBER:				

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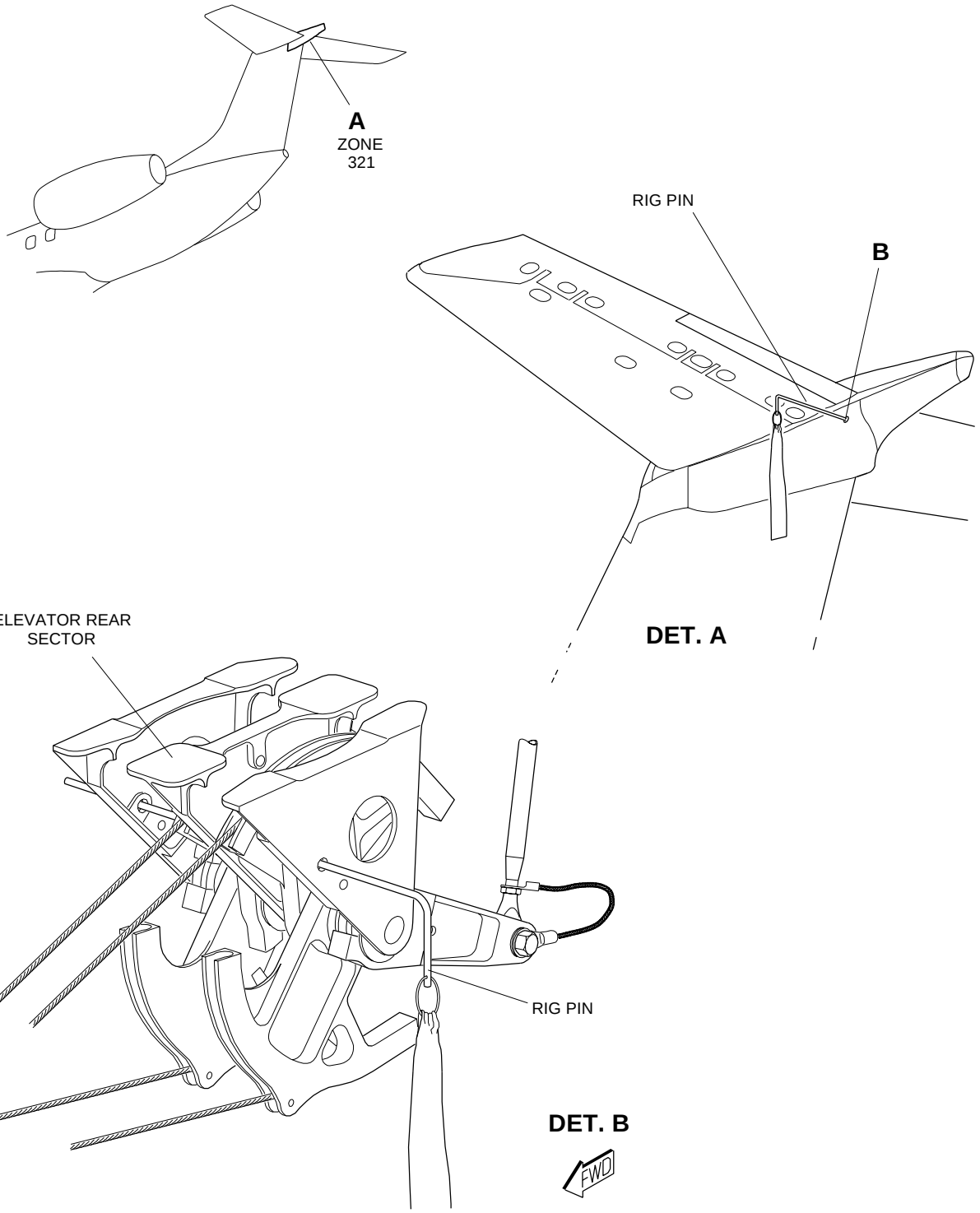
EFFECTIVITY: ALL
Rig Pin - Location
Figure 506



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