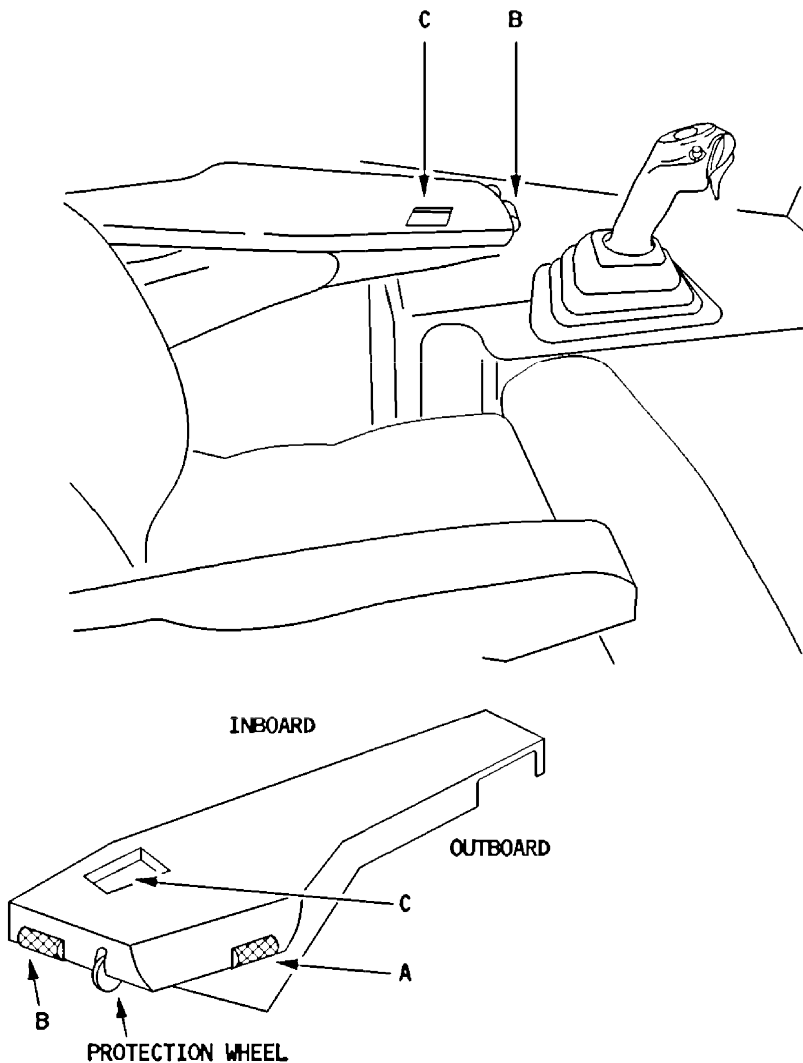


ARM REST

Applicable to: ALL

*Continued on the next page*

The position of the arm rest is adjustable as follows:

- A. Height adjustment
- B. Pitch adjustment

The armrest also has a memory display (C) that shows pitch and height.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-25 – EQUIPMENT

DSC-25-10 – Flight Deck

DSC-25-10-30 – Seats

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GENERAL**Applicable to: ALL**

The cockpit has fixed and sliding windows.

FIXED WINDOWS**Applicable to: ALL**

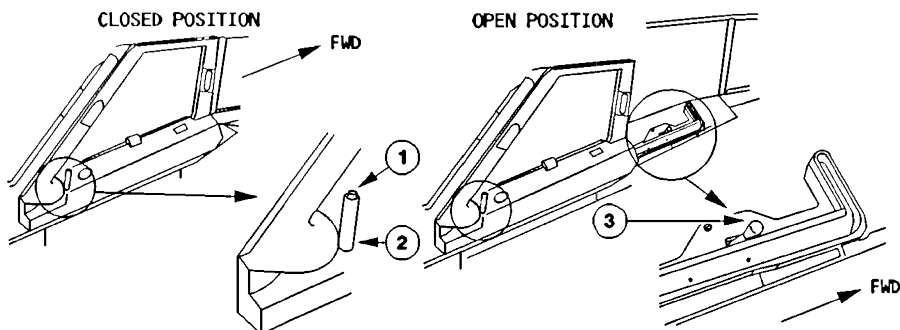
There are four fixed windows :

- two windshields
- two fixed side windows

SLIDING WINDOWS

Applicable to: ALL

The flight crew can use the sliding windows as emergency exits. Therefore they are not permitted to stow any object so that it protrudes into the window area from the side console. Members of the flight crew can use the control handle to slide each of the windows rearward, and can use a locking pin to lock each window open.



(1) Unlocking button

Flight crew presses this button to unlock the control handle.

(2) Control handle

- To open the window, the crew member pulls inward and rearward.
- To close the window, the crew member pushes forward.

(3) Locking pin

This pin locks the window open.

It is near the window's lower guide track and is visible when the window is open.

- Forward

Between the closed position and the one-third open position, the window is free to move forward and aft.

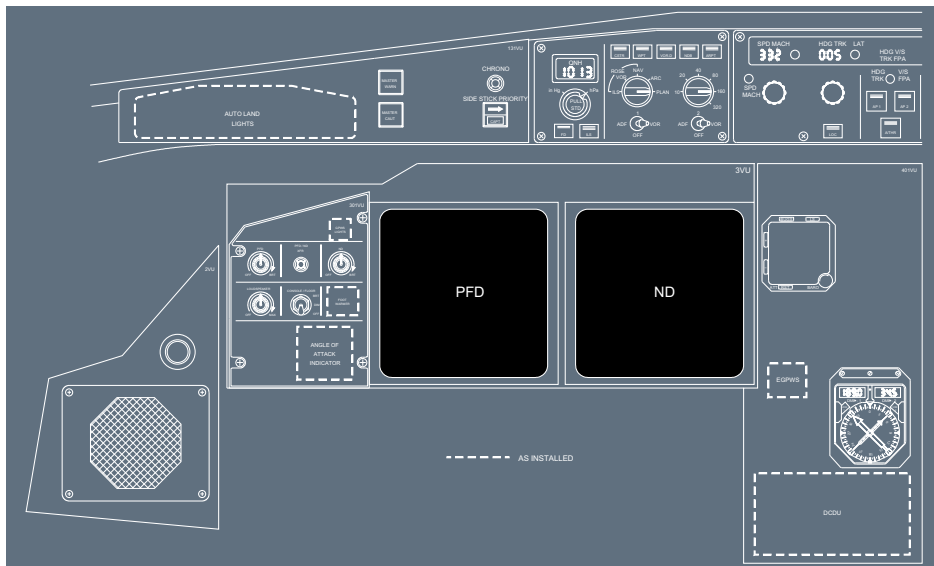
When the window is more than one-third open, this pin prevents it from moving forward.

- Aft

Flight crew must move the locking pin aft in order to close the window. Left sliding window.

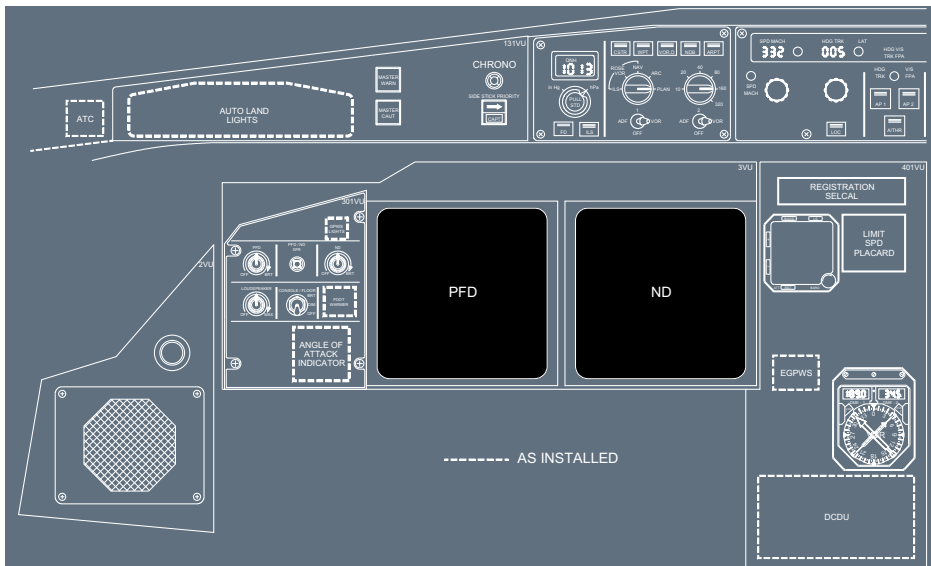
PILOT'S INSTRUMENT PANELS - CAPTAIN SIDE

Applicable to: MSN 2037-3184



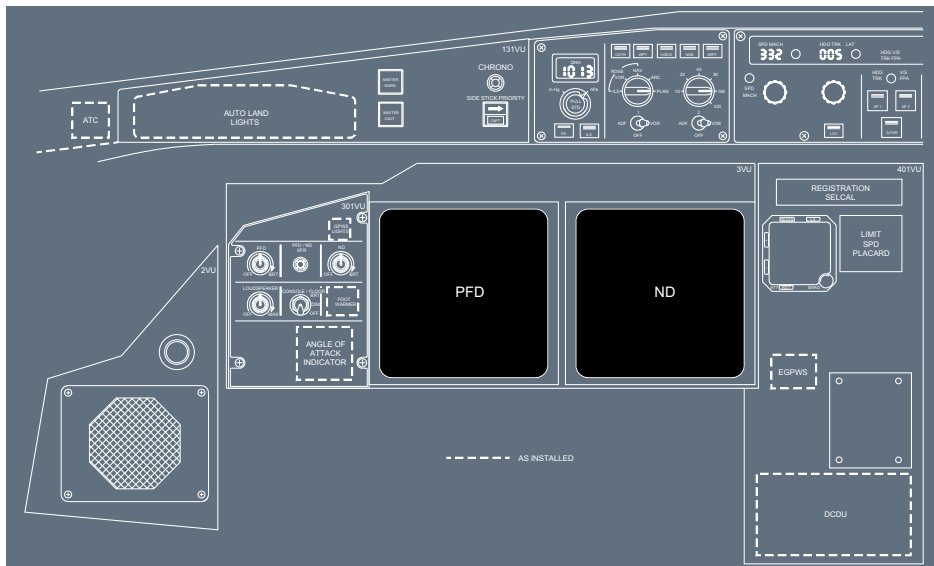
PILOT'S INSTRUMENT PANELS - CAPTAIN SIDE

Applicable to: MSN 3411-5187



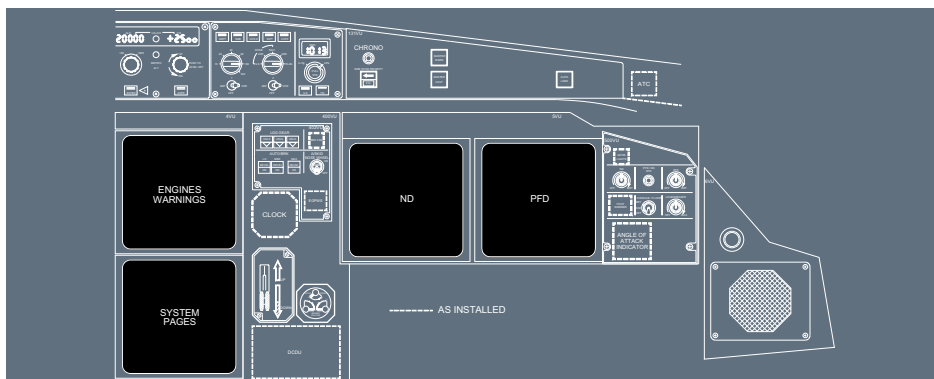
PILOT'S INSTRUMENT PANELS - CAPTAIN SIDE

Applicable to: MSN 5201-5319



PILOT'S INSTRUMENT PANELS - FIRST OFFICER SIDE

Applicable to: ALL





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-25 – EQUIPMENT

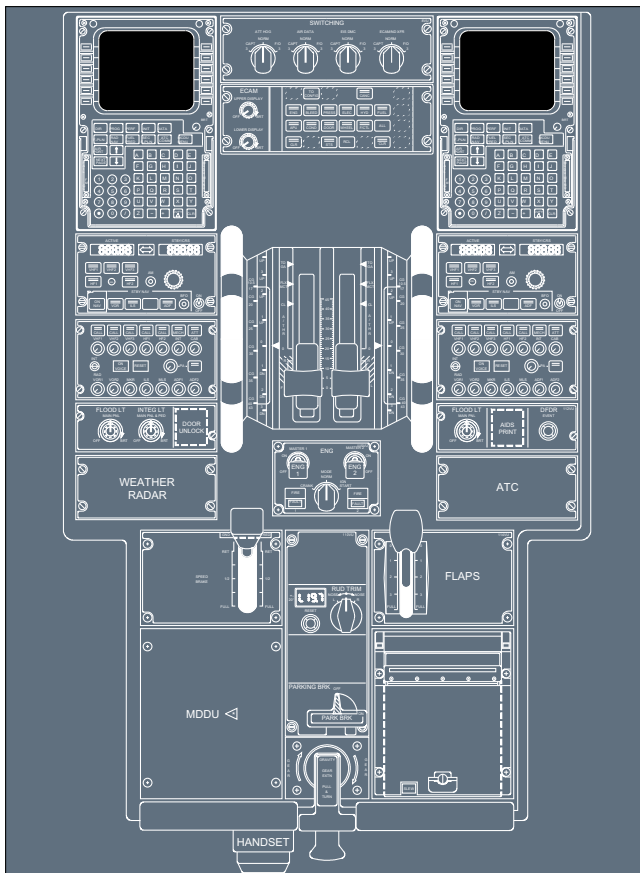
DSC-25-10 – Flight Deck

DSC-25-10-50 – Pilot's Instrument Panels

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PEDESTAL

Applicable to: ALL





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-25 – EQUIPMENT

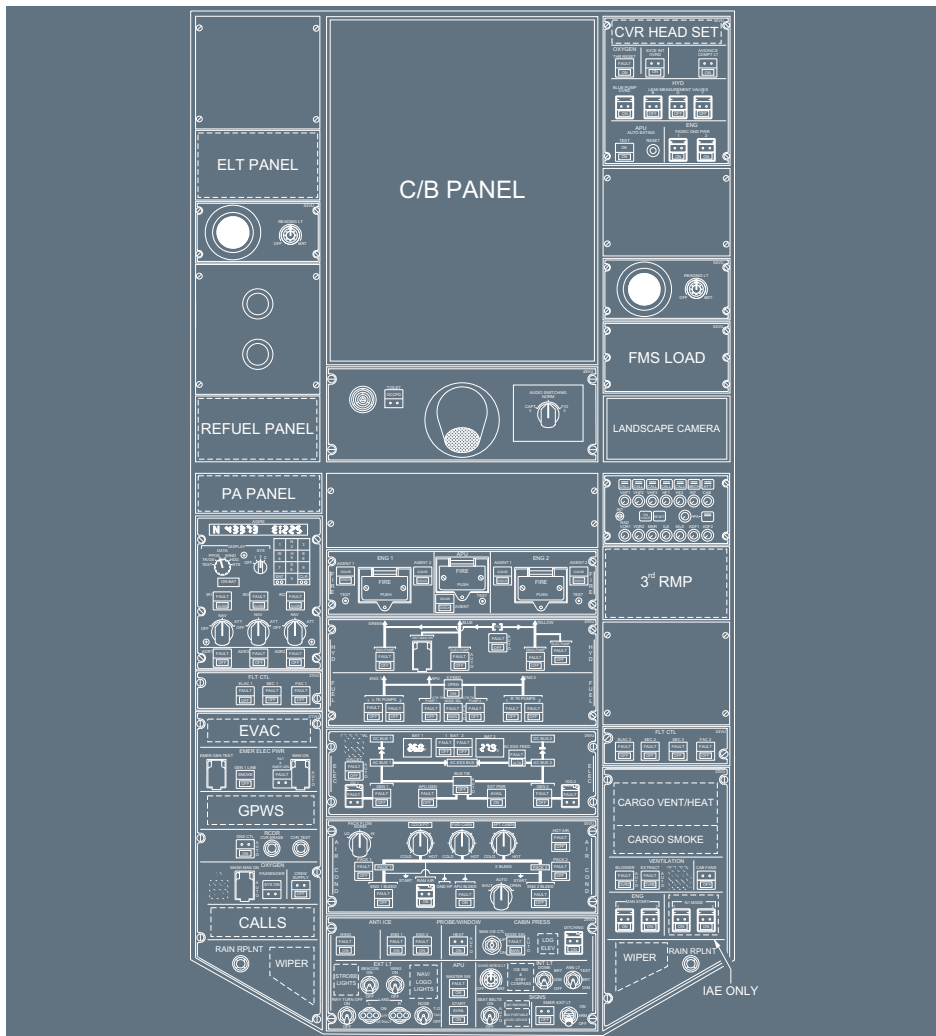
DSC-25-10 – Flight Deck

DSC-25-10-60 – Pedestal

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OVERHEAD PANEL

Applicable to: ALL





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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-25 – EQUIPMENT

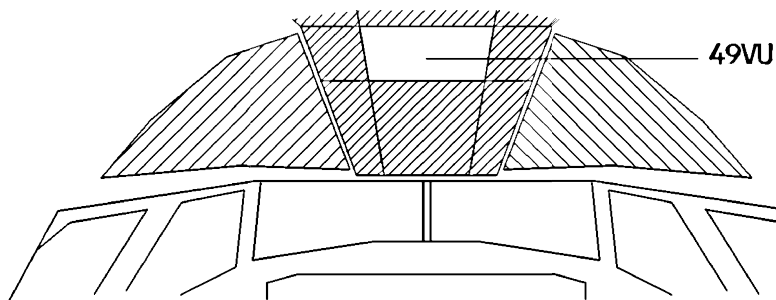
DSC-25-10 – Flight Deck

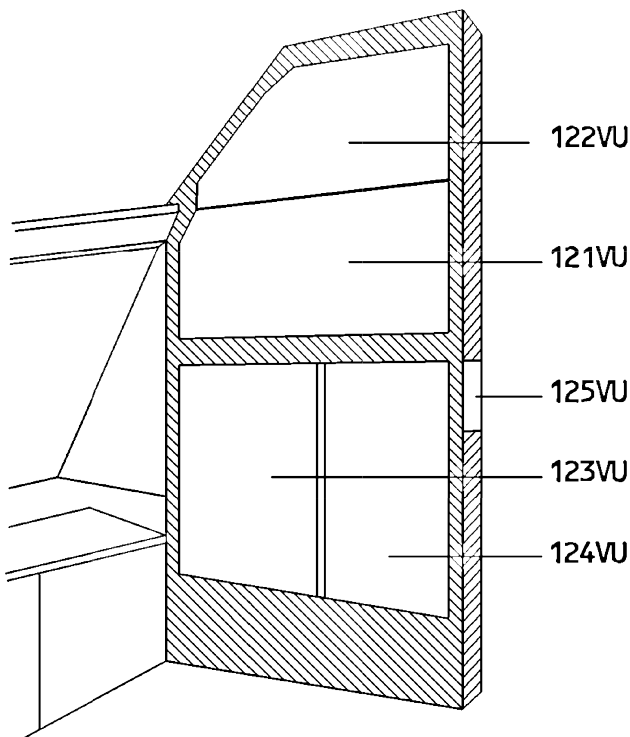
DSC-25-10-70 – Overhead Panel

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C/B PANELS

Applicable to: ALL

OVERHEAD PANEL*Continued on the next page*

RIGHT REAR PANEL

BUS EQUIPMENT LIST

Applicable to: ALL

	NORM			EMER ELEC		
	AC	DC	DC BAT	AC ESS	DC ESS	HOT
CAPTAIN SEAT motors 	AC1					
F/O SEAT motors 	AC2					
FOOT WARMERS 	AC2					



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-25 – EQUIPMENT

DSC-25-10 – Flight Deck

DSC-25-10-100 – Electrical Supply

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COCKPIT DOOR DESCRIPTION

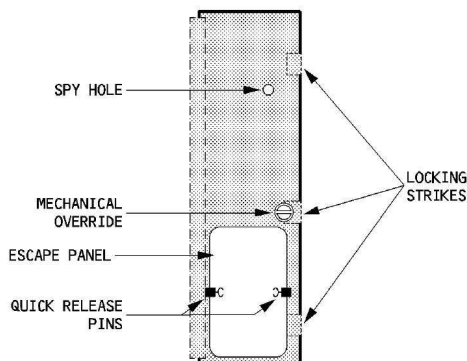
Applicable to: ALL

A forward-opening hinge door separates the cockpit from the passenger compartment. It has three electric locking strikes, controlled by the flight crew. In normal conditions, when the door is closed, they remain locked. When there is a request to enter the cockpit, the flight crew can authorize entry by unlocking the door, that remains closed until it is pushed open.

When the flight crew does not respond to requests for entry, the door can also be unlocked by the cabin crew, by entering a two to seven-digit code (programmed by the airline) on the keypad, installed on the lateral side of the Forward Attendant Panel (FAP).

The door is bulletproof and fully compliant with rapid decompression requirements.

A mechanical override enables the flight crew to open the door from the cockpit side.



- Note:
1. The escape panel enables the flight crew to evacuate the cockpit, in case of an emergency when the door is jammed. This panel can only be removed from the cockpit side by pulling the quick release pins towards the center of the flap and kicking the panel open.
 2. In case of an electrical supply failure, the door is automatically unlocked, but remains closed.

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COCKPIT DOOR LOCKING SYSTEM (CDLS)

Applicable to: ALL

The Cockpit Door Locking System (CDLS) provides a means of electrically locking and unlocking the cockpit door. This system is mainly composed of :

- A keypad, located in the forward cabin, near the cockpit door,
- A toggle switch, located in the center pedestal's Cockpit Door panel,
- A control unit and its CKPT DOOR CONT normal panel, located on the overhead panel,
- A buzzer.

The keypad enables the cabin crew to request access to the cockpit. There are two different access request types : “Routine” and “Emergency” access request (*Refer to PRO-SUP-25 Cockpit Door Operation - General*).

The toggle switch enables the flight crew to lock or unlock the cockpit door, following an access request, thereby allowing or denying the entry to the cockpit.

The cockpit door control unit is the system controller, in charge of :

- Locking or unlocking the door latches, upon flight crew action.
- Unlocking the door, in case of cockpit decompression (the door then opens towards the cockpit under differential pressure).
- Indicating system failures of electrical latches and pressure sensors.
- Activating the access request buzzer and turning on the keypad LEDs.

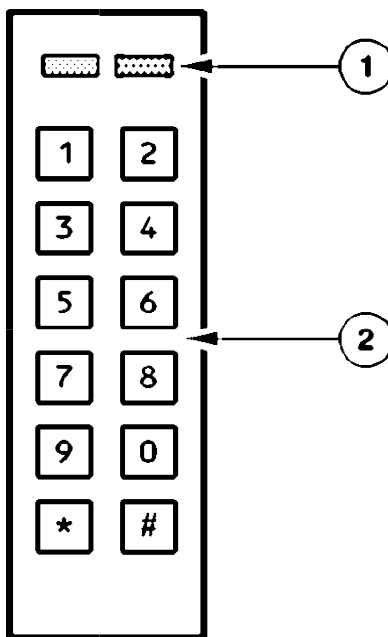
The buzzer sounds in the cockpit for 1 to 9 s to indicate that a routine access request has been made, or sounds continuously if an emergency access procedure has been initiated.

CONTROLS

Applicable to: ALL

KEYPAD

The keypad is used by the cabin crew to request pilots to open the door (*Refer to PRO-SUP-25 Cockpit Door Operation - General*).



(1) Locked/Unlocked Door Indicator

GREEN light ON : The door has been unlocked either by a flight crew action, or automatically (during 5 s) when no flight crew action is performed during the delay following an emergency access request. The door can be pushed open.

GREEN light flashes : An emergency request to enter the cockpit has been made; the buzzer will sound continuously in the cockpit, but no action has yet been taken by the flight crew.

RED light ON : The flight crew has denied access, and the door remains locked.

Continued on the next page

(2) Digital Keypad

The keypad is used to sound the buzzer in the cockpit for 1 to 9 s (3 s by default), by entering a zero to seven-digit code, as programmed by the airline, followed by the '#' key.

It is also used to enter the two to seven-digit emergency code, followed by the '#' key, when the flight crew does not respond.

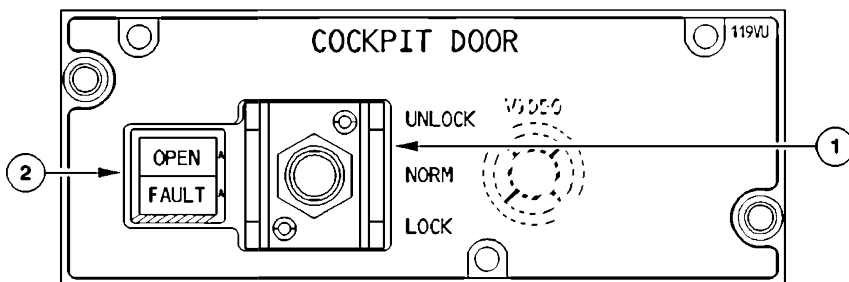
Note: During the test performed by the cockpit door control unit, the CDLS keypad remains operational, and the CDLS operates as follows:

The control unit will store access codes that are entered, and the LOCKED/UNLOCKED DOOR INDICATOR (RED/GREEN LEDs) of the keypad will remain on, as long as the test is running.

- If the correct access code is entered on the keypad, the buzzer will not sound, until the test is completed.
- If the emergency access code is entered, the door will unlock. The cockpit buzzer and the LOCKED/UNLOCKED DOOR INDICATOR will be inoperative.

CENTRAL PEDESTAL COCKPIT DOOR PANEL

The secured cockpit door opening is controlled by a toggle switch, located on the central pedestal.



(1) COCKPIT DOOR toggle switch

UNLOCK position : This position is used to enable the cabin crewmember to open the door. The switch must be pulled and maintained in the unlock position until the door is pushed open.

NORM position : All latches are locked, and EMERGENCY access is possible for the cabin crew.

LOCK position : Once the button has been moved to this position, the door is locked ; emergency access, the buzzer, and the keypad are inhibited for a preselected time (5 to 20 min).

Continued on the next page

- Note:
1. If the **LOCK** position has not been used by the pilot, for at least 5 to 20 min, the cabin crew is able to request emergency access to open the cockpit door.
 2. The **UNLOCK** position overrides and resets any previous selection.
 3. In case of an electrical supply failure, the cockpit door is automatically unlocked, but remains closed.

(2) COCKPIT DOOR Fault Open indicator

OPEN light ON : The door is not closed, or not locked.

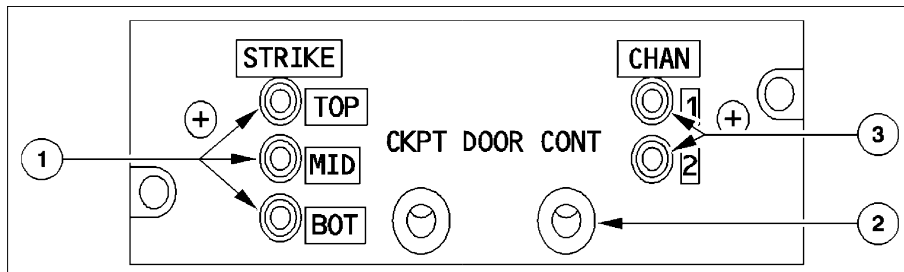
OPEN light flashes : The cabin crew has started an emergency access procedure. If there is no reaction from the flight crew, the door will unlock at the end of the adjustable time delay (15 to 120 s).

FAULT : This light comes on when a system failure has been identified (Example : Latch, pressure sensors, control unit).
The inoperative item can be identified by checking the strike and pressure sensor status lights on the CKPT DOOR CONT panel.

Continued on the next page

OVERHEAD CONTROL PANEL

The Cockpit Door Locking System's control panel is located on the overhead panel.



(1) Strikes' status lights

Off : The corresponding (upper, mid, or lower) locking latch is operative.

On : The corresponding (upper, mid, or lower) locking latch is faulty.

(2) Pressure sensor

Two redundant differential pressure sensors enable rapid pressure variation in the cockpit to be detected, in order to command simultaneous opening of all latches when a defined pressure drop is detected.

(3) Pressure sensor status lights

Off : The corresponding (1 or 2) pressure sensor is operative.

On : The corresponding (1 or 2) pressure sensor is faulty.

Note: *These indicators enable the crew to identify the faulty item, when the Central Pedestal Fault indicator light is ON.*

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GENERAL**Applicable to: ALL**

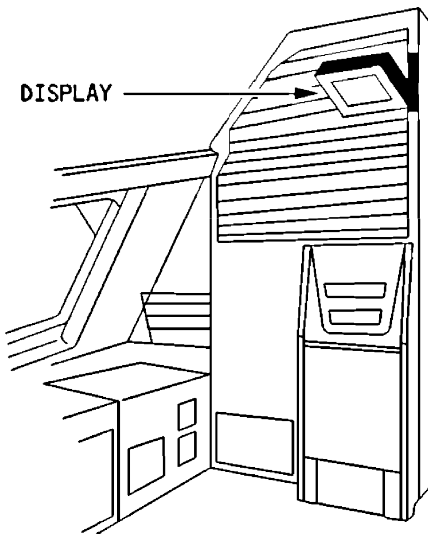
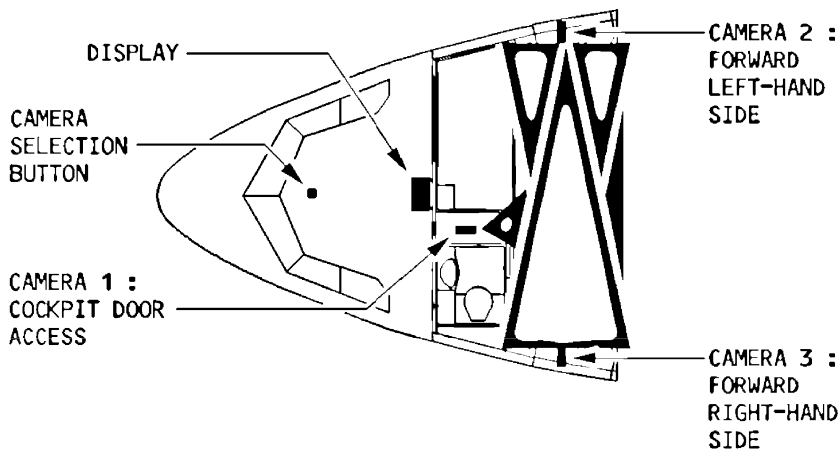
The Cockpit Door Surveillance system consists of three video cameras, which enable the flight crew to identify persons prior to authorizing their entry into the cockpit. An LCD display, located on the rear panel, shows the various camera views. It has automatic brightness adjustment and is activated by the Cockpit Door Video pb.

Continued on the next page

DSC – AIRCRAFT SYSTEMS**DSC-25 – EQUIPMENT**

DSC-25-11 – Cockpit Door Security System

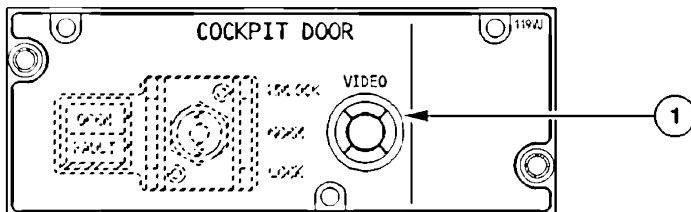
DSC-25-11-30 – Cockpit Door Surveillance System (CDSS)



CONTROLS

Applicable to: MSN 2037-2387

CENTRAL PEDESTAL



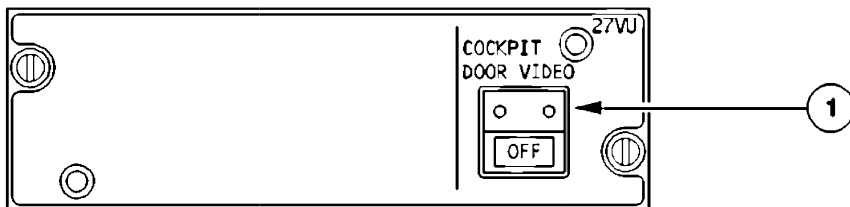
(1) Cockpit Door Video pb

Selects the various camera image displays.

- | | |
|-----------------------|---|
| Camera 1 image | : Displayed by pressing the pushbutton when the screen is on standby, or after Camera 2 and 3 images have been displayed. Automatically displayed, after an entry request is performed on the keypad. |
| Camera 2 and 3 images | : Displayed on a split screen, when the pushbutton is pressed after Camera 1's image has been displayed. |
| Standby | : If no action has been taken for 5 min, the screen goes blank and remains on standby. |

Note: An entry request, performed on the keypad within 30 s following an earlier entry request, will not lead to the automatic selection of Camera 1, since the flight crew is given authority to select any desired camera image via the cockpit door video pb. After these 30 s, the system reverts to its normal operation.

OVERHEAD PANEL



Continued on the next page

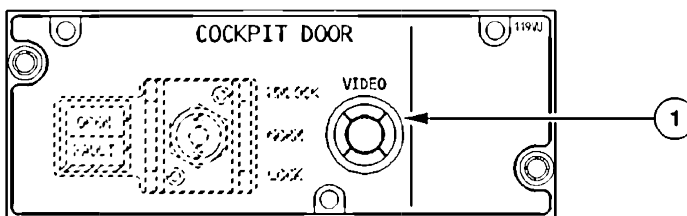
(1) Cockpit Door Video pb

OFF: The Cockpit Door Surveillance System is manually de-energized.

CONTROLS

Applicable to: MSN 2398-5319

CENTRAL PEDESTAL



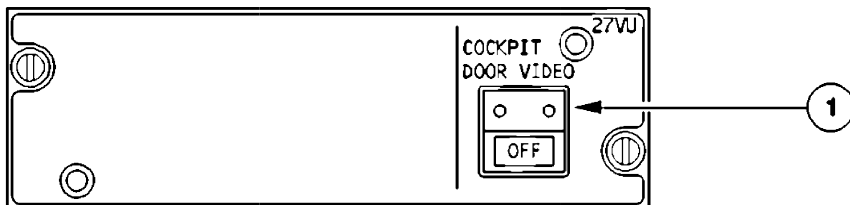
(1) Cockpit Door Video pb

Selects the various camera image displays.

- Camera 1 image : Displayed by pressing the pushbutton when the screen is on standby, or after Camera 2 and 3 images have been displayed. Automatically displayed, after an entry request is performed on the keypad.
- Camera 2 and 3 images : Displayed on a split screen, when the pushbutton is pressed after Camera 1's image has been displayed.
- Standby : If the pushbutton is maintained pressed for at least two seconds, or if no action has been taken for 5 min, the screen goes blank and remains on standby.

Note: An entry request, performed on the keypad within 30 s following an earlier entry request, will not lead to the automatic selection of Camera 1, since the flight crew is given authority to select any desired camera image via the cockpit door video pb. After these 30 s, the system reverts to its normal operation.

Continued on the next page

OVERHEAD PANEL

(1) Cockpit Door Video pb

OFF: The Cockpit Door Surveillance System is manually de-energized.

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BUS EQUIPMENT LIST

Applicable to: ALL

	NORM			EMER ELEC		
	AC	DC	DC BAT	AC ESS	DC ESS	HOT
COCKPIT DOOR LOCKING SYSTEM 		DC2				
COCKPIT DOOR LOCKING SYSTEM BACKUP 		DC1				
COCKPIT DOOR SURVEILLANCE SYSTEM 		DC1				



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-25 – EQUIPMENT

DSC-25-11 – Cockpit Door Security System

DSC-25-11-40 – Electrical Supply

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BUS EQUIPMENT LIST

Applicable to: ALL

	NORM			EMER ELEC		
	AC	DC	DC BAT	AC ESS	DC ESS	HOT
IN SEAT POWER SUPPLY 	AC2					



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-25 – EQUIPMENT

DSC-25-15 – In Seat Power Supply System

DSC-25-15-30 – Electrical Supply

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Description

DESCRIPTION

Applicable to: ALL

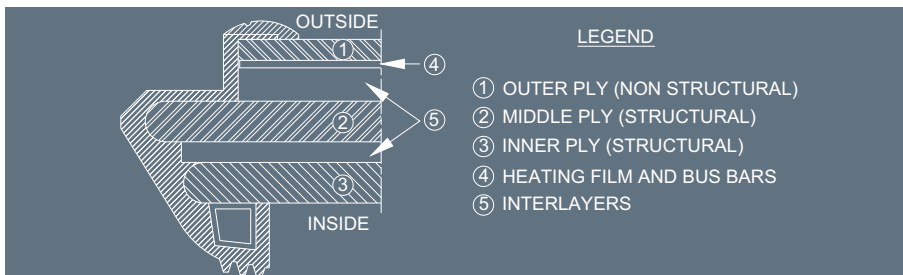
COCKPIT WINDSHIELD AND WINDOWS DESCRIPTION

All cockpit windows are fail-safe design.

The windows are made of:

- A non structural ply, the Outer ply (1), which is only a protective layer
- Two structural plies, the Middle ply (2) and the Inner ply (3)
Each structural ply is able to sustain individually the pressurization loads
- A heating film (4) to defog and/or de-ice the windshield/window
- Two interlayers (5).

Typical Structure Of A Cockpit Window (Cut View)



For information on cockpit window damage procedure, description and evaluation method, *Refer to PRO-ABN-80 COCKPIT WINDSHIELD/WINDOW CRACKED* and, *Refer to FCTM/AO-090 COCKPIT WINDSHIELD/WINDOW CRACKED*.



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-25 – EQUIPMENT

DSC-25-40 – Windows

DSC-25-40-10 – Cockpit

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DSC-26-10	GENERAL	
	DESCRIPTION	1
DSC-26-20	Engine and APU	
DSC-26-20-10	Description	
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	Extinguishing	2
	Fire Warnings and Loop Cautions	2
DSC-26-20-20	Controls and Indicators	
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DSC-26-20-30	Warnings and Cautions	
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DSC-26-30	Avionics Bay	
DSC-26-30-10	Description	
	Description.....	1
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DSC-26-40-10	Description	
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	WASTEBIN FIRE EXTINGUISHING.....	1
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	WARNINGS AND CAUTIONS	1

DSC-26-50	Cargo Compartments	
DSC-26-50-10	Smoke Detection	
	Smoke Detection	1
DSC-26-50-20	Fire Extinguishing	
	Fire Extinguishing.....	1
DSC-26-50-30	Controls and Indicators	
	Overhead Panel	1
DSC-26-50-40	Warnings and Cautions	
	Warnings and Cautions	1
DSC-26-60	Electrical Supply	
	Electrical Supply	1

DESCRIPTION

Applicable to: ALL

Aircraft Fire Protection Systems are comprised of :

- Fire and overheat detection and extinguishing systems for the :
 - Engines
 - APU
- Smoke detection and extinguishing systems for the :
 - Cargo compartments
 - Lavatories
- Smoke detection for the :
 - Avionic bay
- Portable fire extinguishers for the :
 - Flight compartment
 - Passenger cabin



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-26 – FIRE PROTECTION

DSC-26-10 – GENERAL

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DETECTION

Applicable to: ALL

The engines and the APU each have a fire and overheat detection system consisting of:

- Two identical gas detection loops (A and B) mounted in parallel
- A Fire Detection Unit (FDU).

The gas detection loops consist of:

- Three sensing elements for each engine, one in the pylon nacelle, one in the engine core and one in the engine fan section
- One sensing element in the APU compartment.

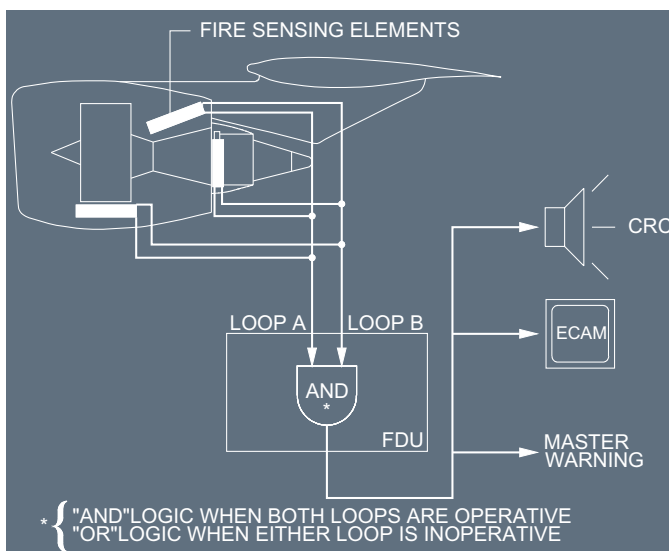
When a sensing element is subjected to heat, it sends a signal to the fire detection unit.

As soon as loops A and B detect temperature at a preset level, they trigger the fire warning system.

A fault in one loop (break or loss of electrical supply) does not affect the warning system.

The unaffected loop still protects the aircraft.

If the system detects an APU fire while the aircraft is on the ground, it shuts down the APU automatically and discharges extinguishing agent.



EXTINGUISHING

Applicable to: ALL

Each engine has two extinguisher bottles equipped with electrically operated squibs to discharge their contents. Each squib has a dual electric supply. The flight crew controls the discharge from the ENG FIRE panel in the cockpit.

The APU has one fire extinguisher bottle that has two electrically operated squibs to discharge its agent. The flight crew controls the discharge from the APU FIRE panel in the cockpit. This bottle also discharges automatically if there is an APU fire when the aircraft is on the ground.

FIRE WARNINGS AND LOOP CAUTIONS

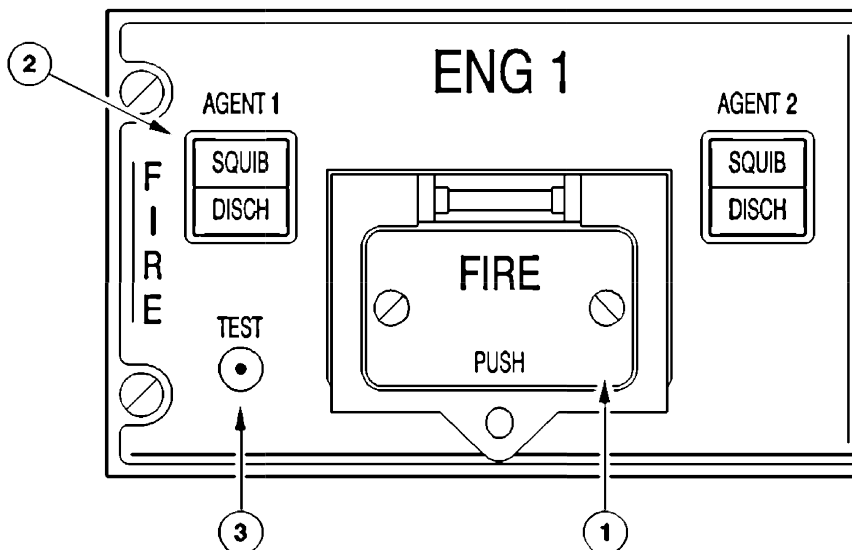
Applicable to: ALL

Fire detection units process all the warnings and cautions originating in the sensing elements :

- The fire warning appears in case of :
 - a fire signal from both loop A and B or,
 - a fire signal from one loop when the other is faulty, or
 - breaks in both loops occurring within 5 s of each other (flame effect), or
 - a test performed on the control panel.
- The loop-fault cautions appear if :
 - one loop is faulty or,
 - both loops are faulty or,
 - the fire detection unit fails.

OVERHEAD PANEL

Applicable to: ALL

ENG FIRE PANEL

The aircraft has two identical ENG FIRE panels, which contain the following switches and indicators:

(1) ENG 1 (2) FIRE pb

This pushbutton's normal position is in, and guarded.

The pilot pushes it to release it. It pops out, sending an electrical signal that performs the following for the corresponding engine :

- Silences the aural fire warning
- Arms the fire extinguisher squibs
- Closes the low-pressure fuel valve
- Closes the hydraulic fire shut off valve
- Closes the engine bleed valve
- Closes the pack flow control valve
- Cuts off the FADEC power supply
- Deactivates the IDG

ENG 1 (2) FIRE It

Continued on the next page

This red light comes on, regardless of the pushbutton's position, whenever the fire warning for the corresponding engine is activated.

(2) AGENT 1 and AGENT 2 pb

Both of these buttons become active when the flight crew pops the ENG FIRE button for their engine.

A brief push on the button discharges the corresponding fire bottle.

- “SQUIB” lights up white when the flight crew pops the ENG FIRE button for its engine to help the flight crew identify the AGENT pushbutton to be activated.
- “DISCH” lights up amber when its fire extinguisher bottle has lost pressure.

(3) TEST pb

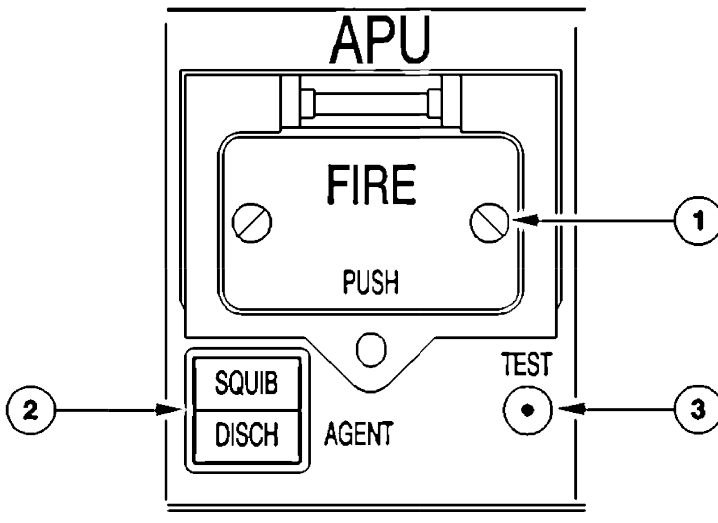
This button permits the flight crew to test the operation of the fire detection and extinguishing system.

When the flight crew presses it :

- A continuous repetitive chime sounds.
- The MASTER WARN lights flash.
- ENG FIRE warning appears on ECAM.
- On the FIRE panel :
 - The ENG FIRE pushbutton lights up red.
 - The SQUIB lights come on white if discharge supplies are available.
 - The DISCH lights come on amber.
- On the ENG panel (pedestal) :
 - The FIRE lights come on red.

APU FIRE PANEL

Applicable to: ALL



(1) APU FIRE pb sw

This pushbutton's normal position is in and guarded.

The pilot pushes it to release it. It pops out, sending an electrical signal that performs the following for the APU :

- shuts down the APU
- silences the aural warning
- arms the squib on the APU fire extinguisher
- closes the low-pressure fuel valve
- shuts off the APU fuel pump
- closes the APU bleed valve and X bleed valve and deactivates the APU generator.

The red APU FIRE light comes on when the APU fire warning is activated, regardless of the position of the pushbutton.

(2) AGENT pb

This pushbutton becomes active when the pilot pops the APU FIRE button.

The flight crew presses it briefly to discharge the fire bottle.

- SQUIB lights up white when the pilot pops the APU FIRE button.

Continued on the next page

- DISCH lights up amber when the fire extinguisher bottle has lost pressure.

Note: *A red disk, which is outside at the rear of the fuselage, signals that the agent is not discharged overboard due to bottle overpressure.*

(3) **TEST pb**

This button permits the flight crew to test the operation of the fire detection and extinguishing system for the APU.

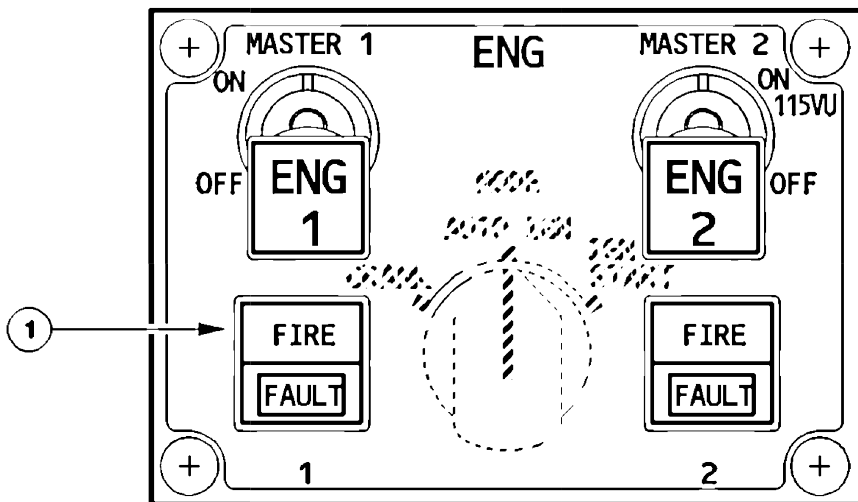
When the flight crew presses it :

- A continuous repetitive chime sounds.
- The MASTER WARN lights flash.
- APU FIRE warning appears on ECAM.
- On the APU FIRE panel :
 - The APU FIRE pushbutton lights up red.
 - The SQUIB light comes on white.
 - The DISCH light comes on amber.

Note: *The automatic shutdown of the APU on the ground will not occur while the flight crew is performing this test.*

PEDESTAL

Applicable to: ALL



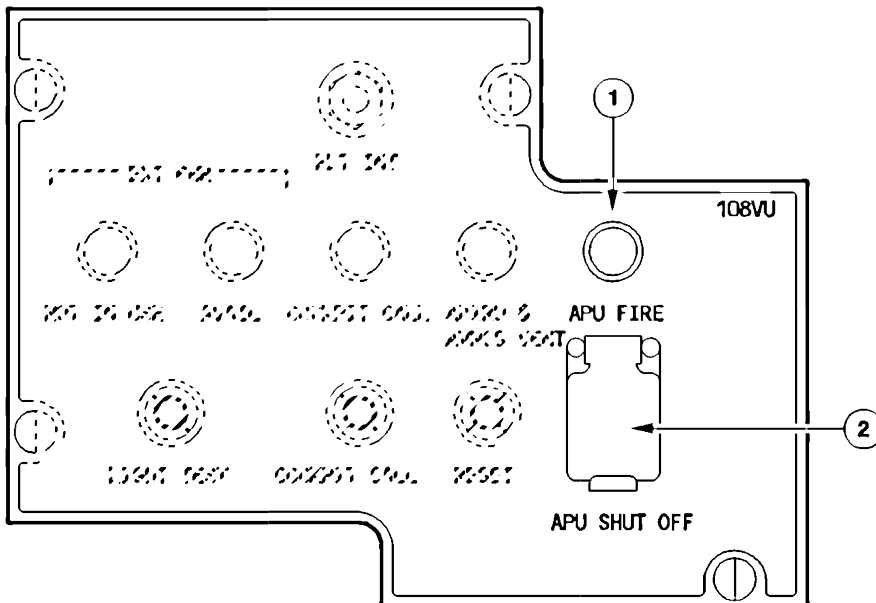
(1) FIRE It

This light identifies the engine to be shutdown because of fire.

Light comes on red when an engine fire warning is triggered.

EXTERNAL POWER PANEL

Applicable to: ALL



When the aircraft is on the ground, an APU fire causes an additional external warning.

(1) APU FIRE lt

The red APU FIRE light comes on and an external warning horn sounds when the system detects an APU fire.

The APU fire extinguisher discharges automatically 3 s after the appearance of the fire warning.

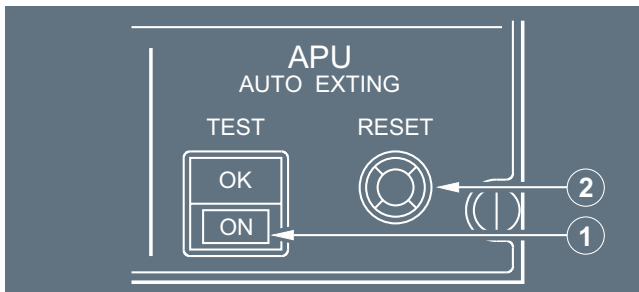
The light goes out when the fire has been extinguished.

(2) APU SHUT OFF pb

This pushbutton is used for manual APU Emergency shutdown, if an emergency situation is detected on ground by the ground crew. When this pushbutton is pressed, the APU low pressure fuel shutoff valve closes, and the ECB receives a signal that starts the shutdown sequence. The shutdown sequence is the same as the APU automatic shutdown sequence, except that there is no cool down cycle. Pressing this pushbutton also silences the external warning horn.

MAINTENANCE PANEL

Applicable to: ALL



(1) TEST pb-sw

Tests the following APU circuits : Fire warning, auto extinguishing, and shutdown.
During the test sequence, the APU MASTER sw must be ON.
If all circuits are operating correctly, the OK light comes on.

Note: If the APU was running, it shuts down.

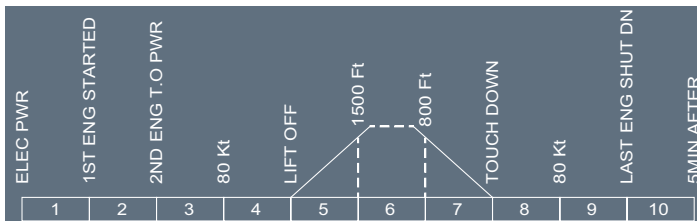
(2) RESET pb

Resets, the test circuit.

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1 (2) FIRE Fire detected by both loops or by one loop, the other one being faulty, or break in both loops occurring within 5 s	CRC	MASTER WARN	ENGINE	FIRE lts on ENG FIRE pb and on ENG panel	NIL
APU FIRE Fire detected by both loops or by one loop, the other one being faulty, or break in both loops occurring within 5 s			APU	FIRE lt on APU FIRE pb	
ENG 1 (2) APU FIRE DET FAULT Both loops inoperative or Fire Detector Unit inoperative	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
ENG 1 (2) APU LOOP A (B) FAULT	NIL	NIL			



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-26 – FIRE PROTECTION

DSC-26-20 – Engine and APU

DSC-26-20-30 – Warnings and Cautions

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DESCRIPTION**Applicable to: ALL**

One smoke detector in the air extraction duct of the avionics ventilation system detects smoke in the avionics compartment.

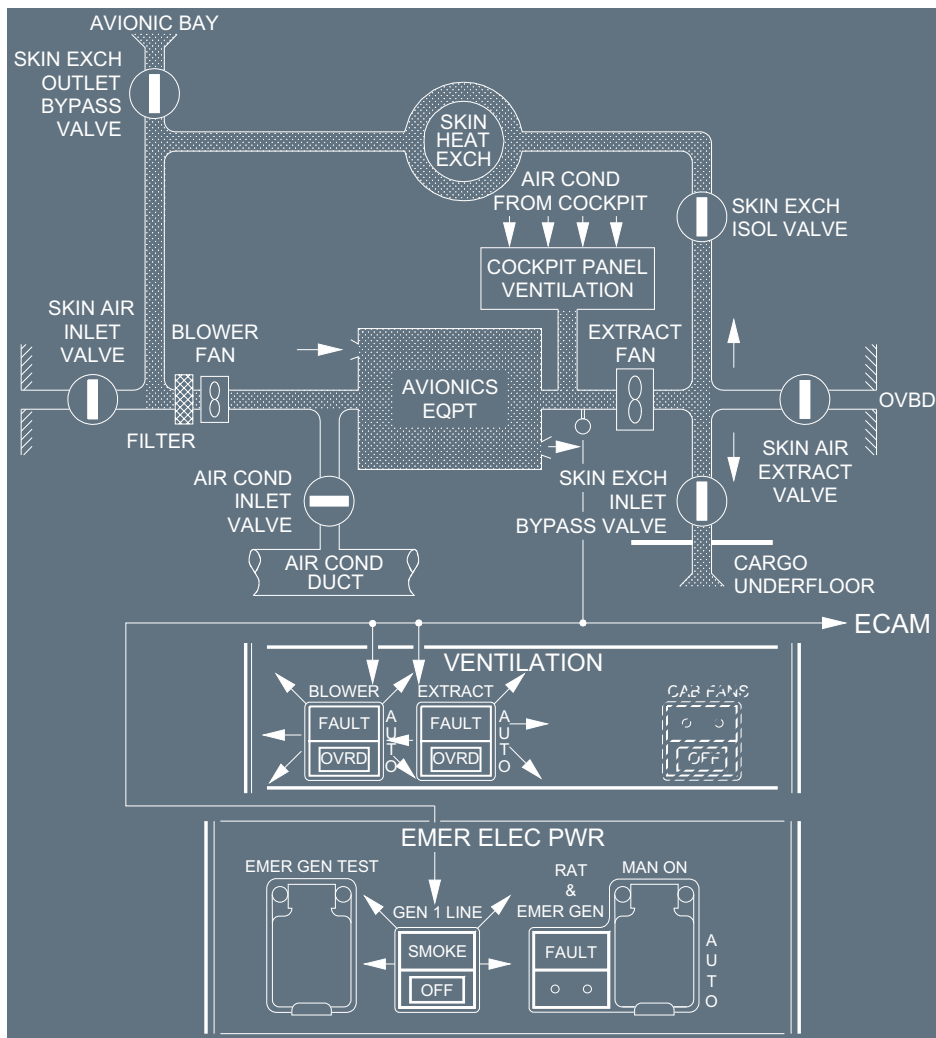
It signals the ECAM to display a warning in the cockpit.

When it detects smoke for more than 5 s:

- A single chime sounds
- The MASTER CAUTION lights, on the glareshield, light up
- The ECAM displays a caution on the E/WD
- The SMOKE light, on the EMER ELEC PWR panel, lights up
- The BLOWER and EXTRACT FAULT, on the VENTILATION panel, light up.

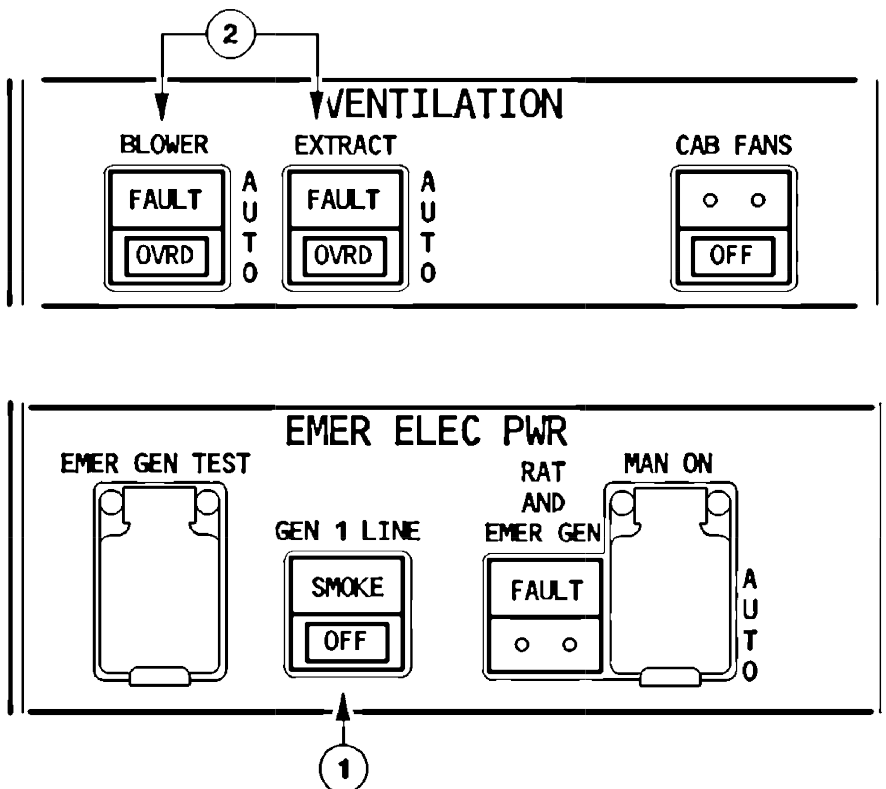
If smoke is detected for more than 5 min, the caution can be cleared; but, it remains latched, and can be recalled. On the ground, a dual FWC reset will unlatch the caution.

Continued on the next page



OVERHEAD PANEL

Applicable to: ALL



- (1) GEN 1 LINE
(Refer to DSC-24-10-20 AC GENERATORS)

SMOKE : Comes on amber, along with a warning on ECAM, when smoke is detected in the avionics ventilation duct.

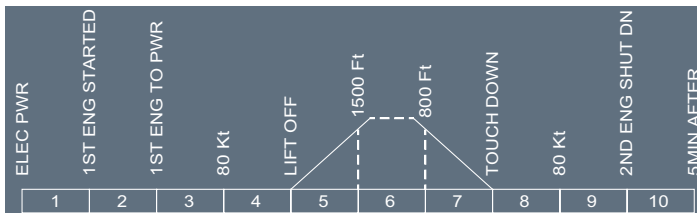
- (2) BLOWER and EXTRACT pb sw
(Refer to DSC-21-30-60 Overhead Panel)

Continued on the next page

FAULT : Both **FAULT** lights come on amber, along with a warning on ECAM, when smoke is
Its detected in the avionics ventilation duct.

WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
AVNCS SMOKE Smoke detected in ventilation extraction duct	SINGLE CHIME	MASTER CAUT	ELEC	- SMOKE It on EMER ELEC PWR panel - FAULT Its on BLOWER and EXTRACT pb sw	4, 5, 7, 8



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-26 – FIRE PROTECTION

DSC-26-30 – Avionics Bay

DSC-26-30-30 – Warnings and Cautions

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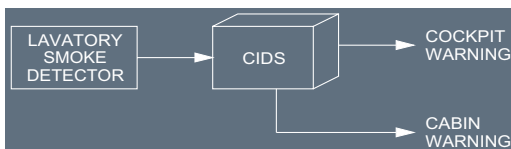
SMOKE DETECTION

Applicable to: ALL

The lavatory smoke detection system consists of :

- One smoke detector in each lavatory.
- A CIDS Decoder Encoder Unit that links the detector to the entire CIDS system.

When a detector finds smoke in a lavatory, it sends a signal to the CIDS, which transmits it to the Flight Warning Computer (FWC), for Warning in the cockpit, and generates an indication in the cabin.



WASTEBIN FIRE EXTINGUISHING

Applicable to: ALL

Each lavatory wastebin has an automatic fire extinguishing system.



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-26 – FIRE PROTECTION

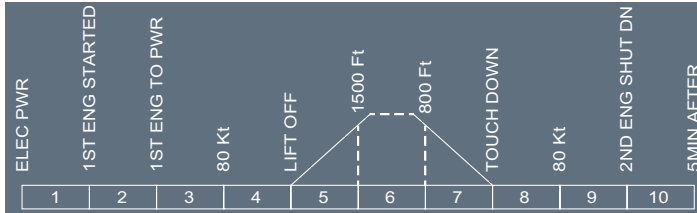
DSC-26-40 – Lavatory

DSC-26-40-10 – Description

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WARNINGS AND CAUTIONS

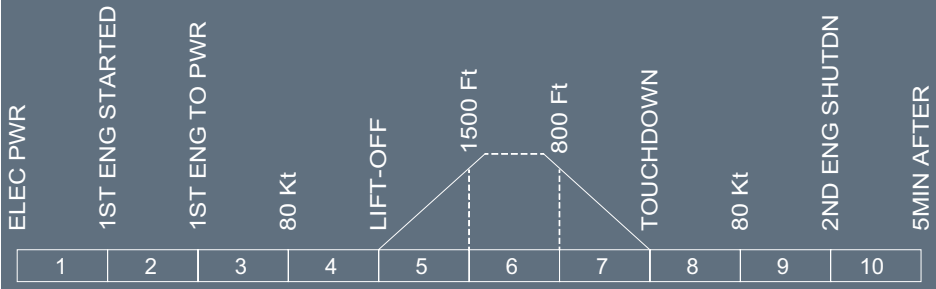
Applicable to: MSN 3411-4006



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
LAVATORY SMOKE Smoke detected in one lavatory.	CRC	MASTER WARN	NIL	NIL	4, 5, 7, 8
LAVATORY DET FAULT Lavatory smoke detection fault	NIL	NIL			3, 4, 5, 7, 8
LAV + CRG DET FAULT Both CIDS Smoke Detection functions are failed.	SINGLE CHIME	MASTER CAUT			

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-3184, 4012-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
LAVATORY SMOKE Smoke detected in one lavatory.	CRC	MASTER WARN	NIL	NIL	4, 5, 7, 8
LAVATORY DET FAULT Lavatory smoke detection fault	NIL	NIL			3, 4, 5, 7, 8
DET FAULT Both CIDS Smoke Detection functions are failed.	SINGLE CHIME	MASTER CAUT			

SMOKE DETECTION

Applicable to: ALL

The cargo compartments have a smoke detection system.

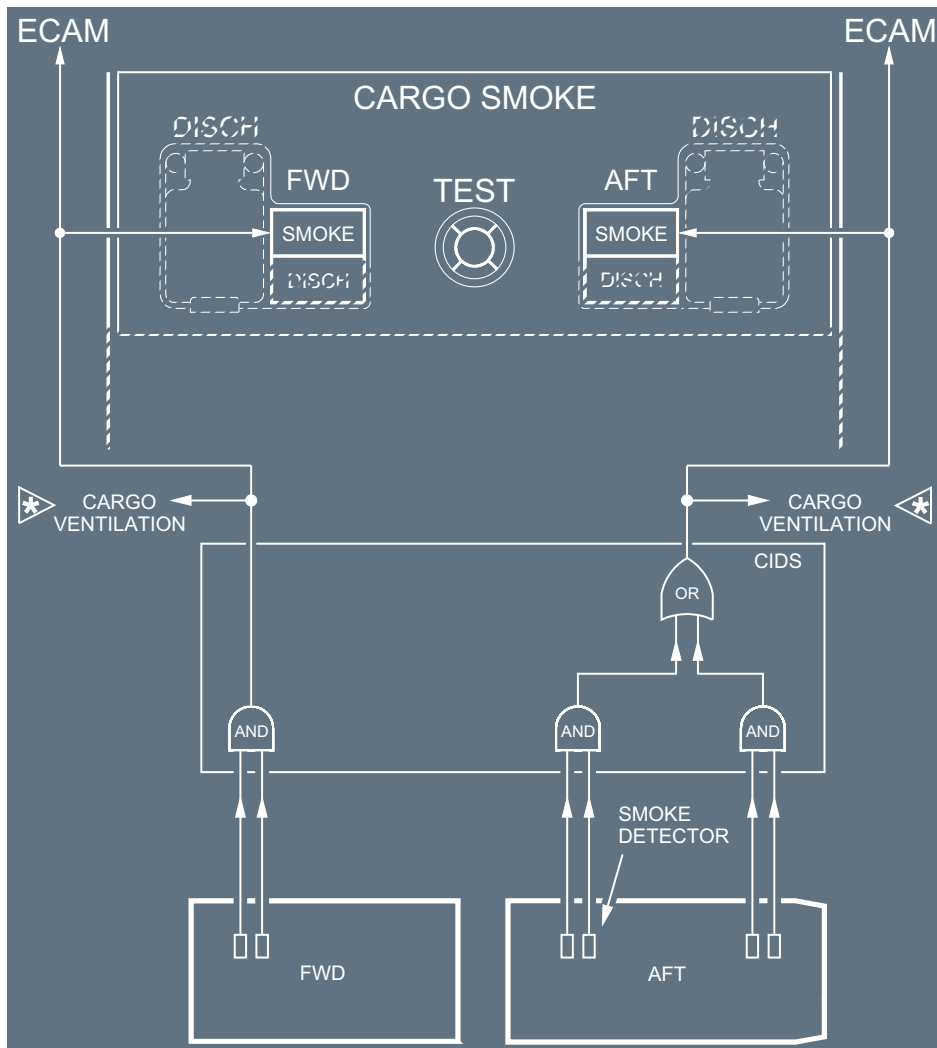
- Cavities in the cargo compartment ceiling panels each hold two smoke detectors. Each detector is linked to one of the two detection loops (dual loop principle).
- The forward cargo compartment has one cavity.
- The aft cargo compartment has two cavities.
- The Cabin Intercommunication Data System (CIDS) receives signals from the detectors and transmits them to the ECAM, which displays a warning in the cockpit. The CIDS has two identical channels.

Smoke in one cavity activates the cargo smoke warning if:

- Both smoke detectors detect it, or
- One smoke detector detects it and the other is inoperative.

Cargo ventilation  , and the cargo smoke warning is activated in either compartment, the associated isolation valves  automatically close and the extraction fan  stops.

Continued on the next page



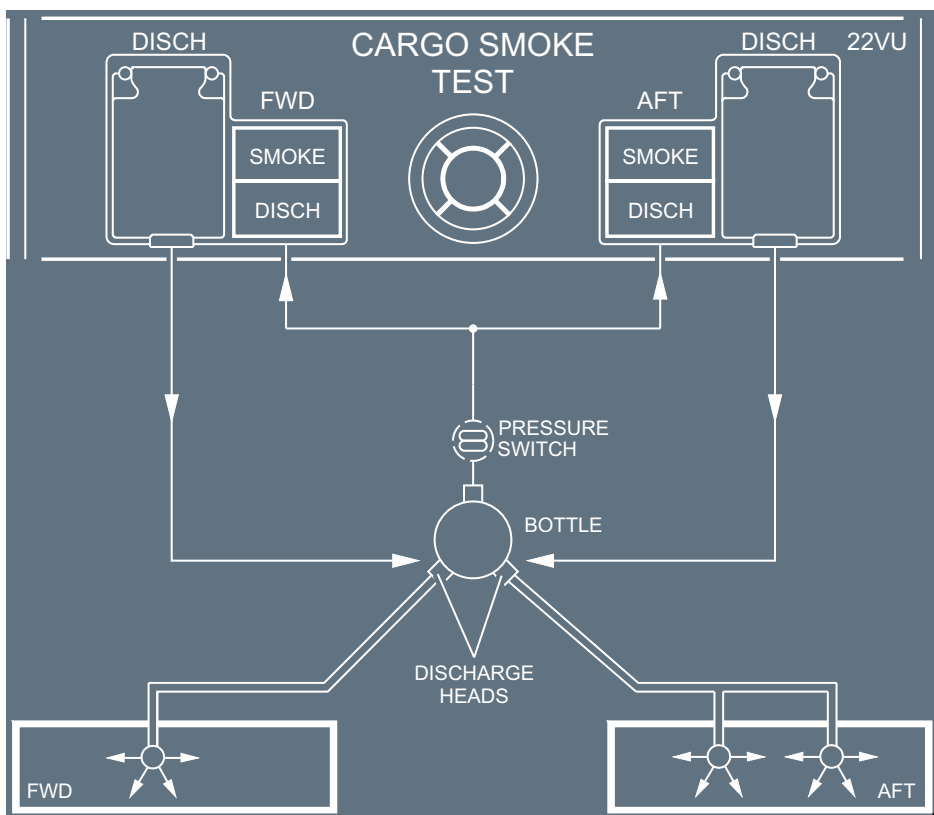
FIRE EXTINGUISHING

Applicable to: ALL

A fire extinguishing system protects the FWD and AFT cargo compartments.

One fire bottle supplies three nozzles (one in FWD compartment and two in AFT compartment). The bottle has two discharge heads, one for each compartment. When a member of the flight crew presses the DISCH pushbutton for either compartment, the action ignites the corresponding squib on the fire bottle, which then discharges extinguishing agent into that compartment.

When the bottle has discharged, the amber DISCH light comes on.





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-26 – FIRE PROTECTION

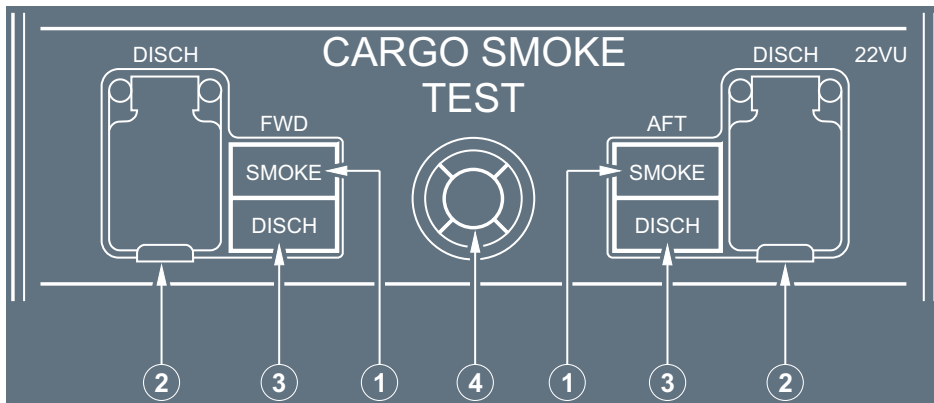
DSC-26-50 – Cargo Compartments

DSC-26-50-20 – Fire Extinguishing

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OVERHEAD PANEL

Applicable to: ALL



(1) SMOKE light

This red light, and the associated ECAM warning, come on when the system detects smoke in the indicated compartment. This light comes on, if:

- Both channels detect smoke, or
- One channel detects smoke and the other channel is faulty.

(2) DISCH pb

This button ignites the squib to discharge the extinguishing agent in the corresponding compartment (FWD or AFT).

(3) DISCH light

Within 60 s after pressing the discharge pushbutton, this amber light comes on, thereby indicating that the agent bottle has fully discharged.

(4) TEST pb

Pressing this button for at least 3 s, and until it is released:

- Tests the smoke detectors in sequence,
- Turns on the red smoke lights twice, and displays the ECAM warning,
- Turns on the amber DISCH light.



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-26 – FIRE PROTECTION

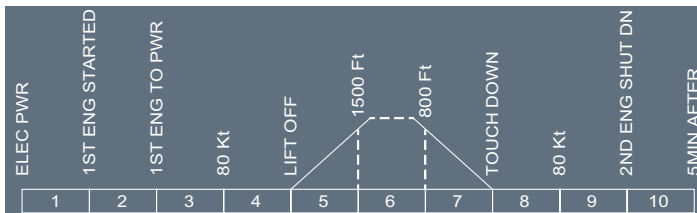
DSC-26-50 – Cargo Compartments

DSC-26-50-30 – Controls and Indicators

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WARNINGS AND CAUTIONS

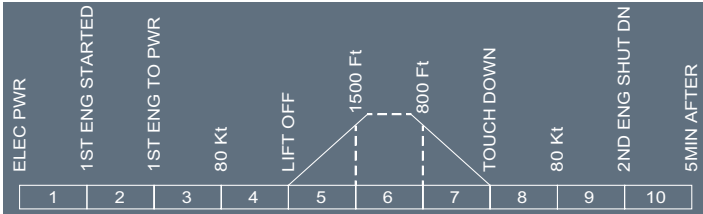
Applicable to: MSN 3411-4006



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
FWD (AFT) CARGO SMOKE Smoke detected	CRC	MASTER WARN	COND	SMOKE light on CARGO SMOKE panel	4, 5, 7, 8
FWD (AFT) CRG DET FAULT Smoke detection fault	NIL	NIL	NIL	NIL	3, 4, 5, 7, 8
LAV + CRG DET FAULT Both CIDS Smoke Detection Functions are failed.	SINGLE CHIME	MASTER CAUTION			
FWD (AFT) CRG BTL FAULT Forward or aft bottle squib failed or bottle on low pressure.					

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-3184, 4012-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
FWD (AFT) CARGO SMOKE Smoke detected	CRC	MASTER WARN	COND	SMOKE light on CARGO SMOKE panel	4, 5, 7, 8
FWD (AFT) CRG DET FAULT Smoke detection fault	NIL	NIL	NIL	NIL	3, 4, 5, 7, 8
DET FAULT Both CIDS Smoke Detection Functions are failed.	SINGLE CHIME	MASTER CAUTION			
FWD (AFT) CARGO BTL FAULT Forward or aft bottle squib failed or bottle on low pressure.					

ELECTRICAL SUPPLY

Applicable to: ALL

			NORM		EMER ELEC		
			AC	DC	AC ESS	DC ESS	HOT
ENG/APU	FIRE DETECTION	ENG 1 LOOP A				X	
		ENG 1 LOOP B		DC2			
		ENG 2 LOOP A		DC2			
		ENG 2 LOOP B				X	
		APU LOOP A		DC BAT			
		APU LOOP B		DC BAT			
	FIRE EXTINGUISHING	ENG 1/2					
		BTL 1 SQUIB A					HOT 1
		BTL 1 SQUIB B					HOT 2
		BTL 2 SQUIB A		DC 2			
		BTL 2 SQUIB B		DC 2			
		APU					
		BTL SQUIB A					HOT 1
		BTL SQUIB B		DC BAT			
		APU AUTO EXT		DC BAT			
CARGO LAVATORIES	CIDS CH 1				X		
	CIDS CH 2		DC 2				
	FWD/AFT CARGO EXTING BOTTLES		DC BAT				



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-26 – FIRE PROTECTION

DSC-26-60 – Electrical Supply

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GENERAL

Applicable to: ALL

The fly-by-wire system was designed and certified to render the new generation of aircraft even more safe, cost effective, and pleasant to fly.

BASIC PRINCIPLE

Applicable to: ALL

Flight control surfaces are all :

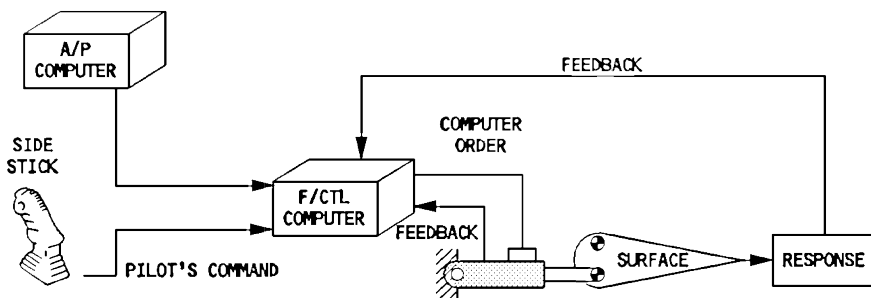
- Electrically-controlled, and
- Hydraulically-activated.

The stabilizer and rudder can also be mechanically-controlled.

Pilots use sidesticks to fly the aircraft in pitch and roll (and in yaw, indirectly, through turn coordination). Computers interpret pilot input and move the flight control surfaces, as necessary, to follow their orders.

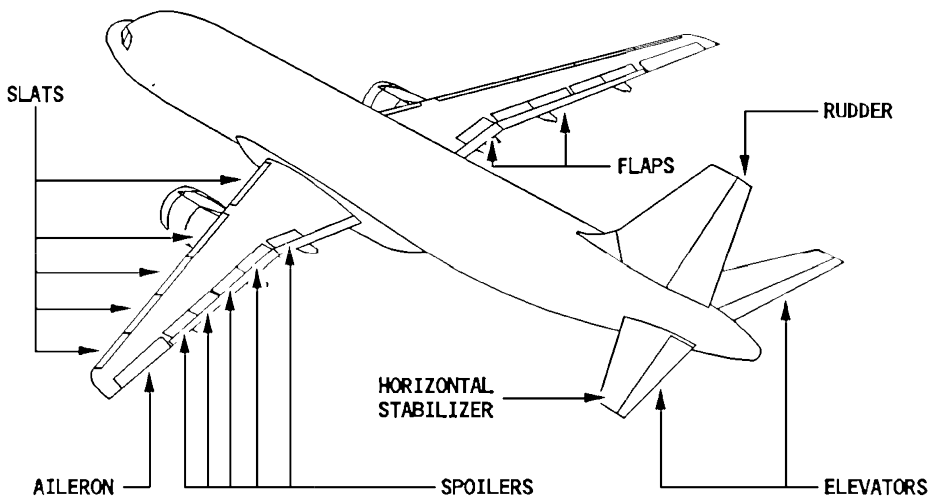
However, when in normal law, regardless of the pilot's input, the computers will prevent excessive maneuvers and exceedance of the safe envelope in pitch and roll axis.

However, as on conventional aircraft, the rudder has no such protection.



CONTROL SURFACES

Applicable to: ALL



The flight controls are electrically or mechanically controlled as follows :

PITCH AXIS

Elevator = Electrical

Stabilizer = Electrical for normal or alternate control. Mechanical for manual trim control

ROLL AXIS

Ailerons = Electrical

Spoilers = Electrical

YAW AXIS

Rudder = Mechanical, however control for yaw damping, turn coordination and trim is electrical.

SPEED BRAKES

Speed
brakes = Electrical

Note: All surfaces are hydraulically actuated.

COCKPIT CONTROLS

Applicable to: ALL

- Each pilot has a sidestick controller with which to exercise manual control of pitch and roll. These are on their respective lateral consoles.
The two sidestick controllers are not coupled mechanically, and they send separate sets of signals to the flight control computers.
- Two pairs of pedals, which are rigidly interconnected, give the pilot mechanical control of the rudder.
- The pilots control speed brakes with a lever on the center pedestal.
- The pilots use mechanically interconnected handwheels on each side of the center pedestal to control the trimmable horizontal stabilizer.
- The pilots use a single switch on the center pedestal to set the rudder trim.
- There is no manual switch for trimming the ailerons.

COMPUTERS

Applicable to: ALL

Seven flight control computers process pilot and autopilot inputs according to normal, alternate, or direct flight control laws.

The computers are :

2 ELACs

(Elevator Aileron Computer)

For : Normal elevator and stabilizer control.
Aileron control.

3 SECs

(Spoilers Elevator Computer)

For : Spoilers control.
Standby elevator and stabilizer control.

2 FACs

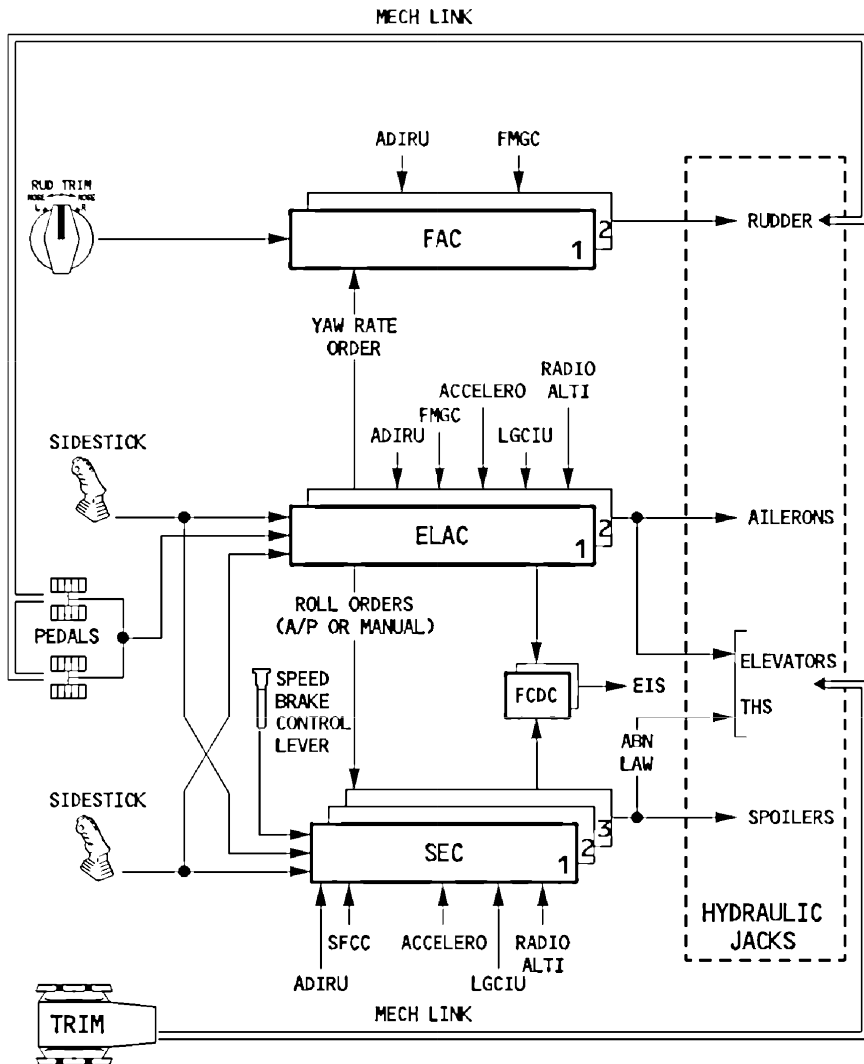
(Flight Augmentation Computer)

For : Electrical rudder control.

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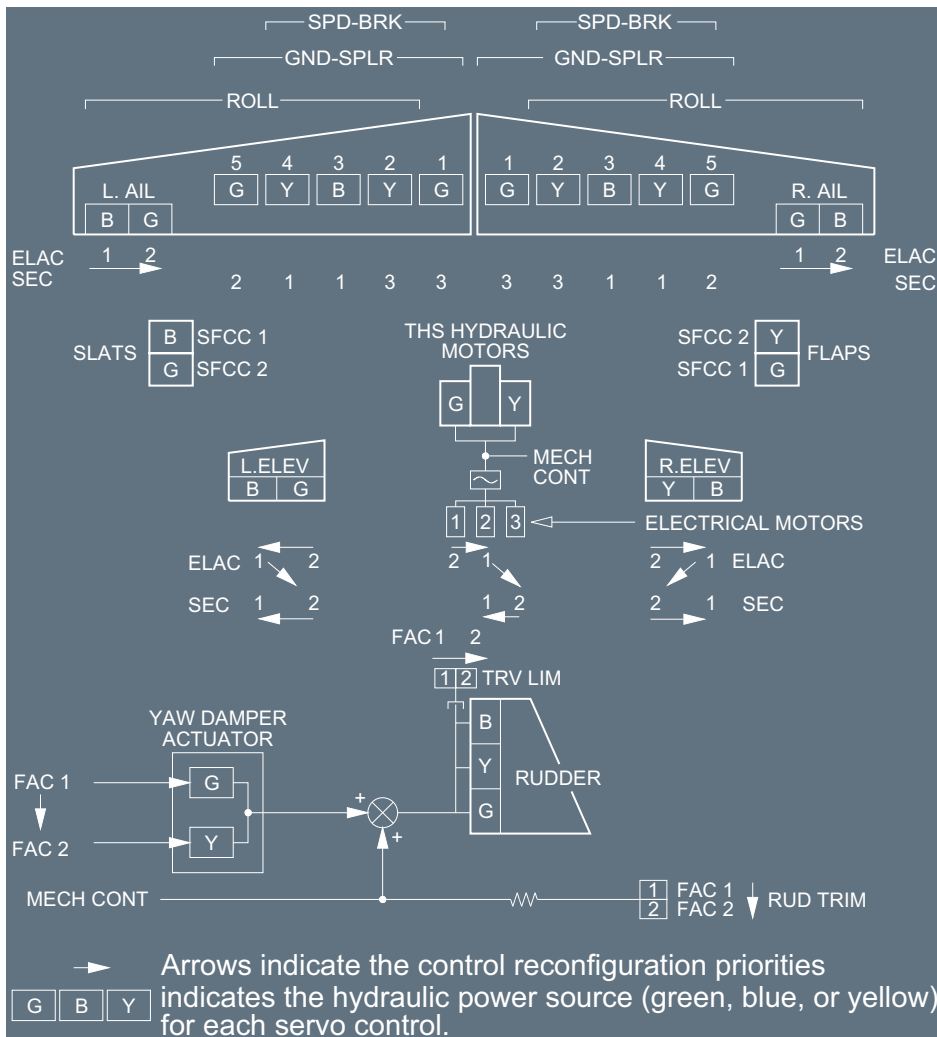
IN ADDITION 2 FCDC

Flight Control Data Concentrators (FCDC) acquire data from the ELACs and SECs and send it to the electronic instrument system (EIS) and the centralized fault display system (CFDS).



GENERAL ARCHITECTURE

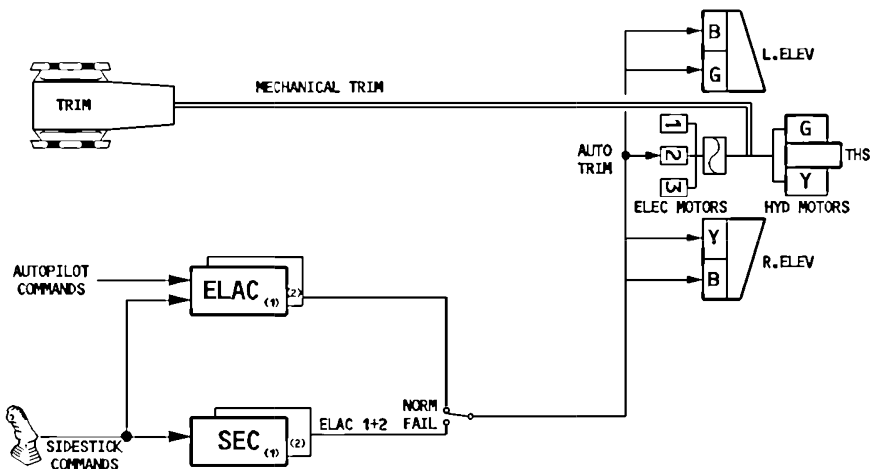
Applicable to: ALL



PITCH CONTROL

Applicable to: ALL

GENERAL



Two elevators and the Trimmable Horizontal Stabilizer (THS) control the aircraft in pitch. The maximum elevator deflection is 30 ° nose up, and 17 ° nose down. The maximum THS deflection is 13.5 ° nose up, and 4 ° nose down.

ELECTRICAL CONTROL

- In normal operations, ELAC2 controls the elevators and the horizontal stabilizer, and the green and yellow hydraulic jacks drive the left and right elevator surfaces respectively. The THS is driven by N° 1 of three electric motors.
- If a failure occurs in ELAC2, or in the associated hydraulic systems, or with the hydraulic jacks, the system shifts pitch control to ELAC1. ELAC1 then controls the elevators via the blue hydraulic jacks and controls the THS via the N° 2 electric motor.
- If neither ELAC1 nor ELAC2 is available, the system shifts pitch control either to SEC1 or to SEC2, (depending on the status of the associated circuits), and to THS motor N° 2 or N° 3.

In case of failure, the actuators are reconfigured, *Refer to DSC-27-10-20 PITCH CONTROL - SCHEMATIC.*

Continued on the next page

MECHANICAL CONTROL

Mechanical control of the THS is available from the pitch trim wheel at any time, if either the green or yellow hydraulic system is functioning.

Mechanical control from the pitch trim wheel has priority over electrical control.

ACTUATION

ELEVATORS

- Two electrically-controlled hydraulic servojacks drive each elevator.

Each servojack has three control modes :

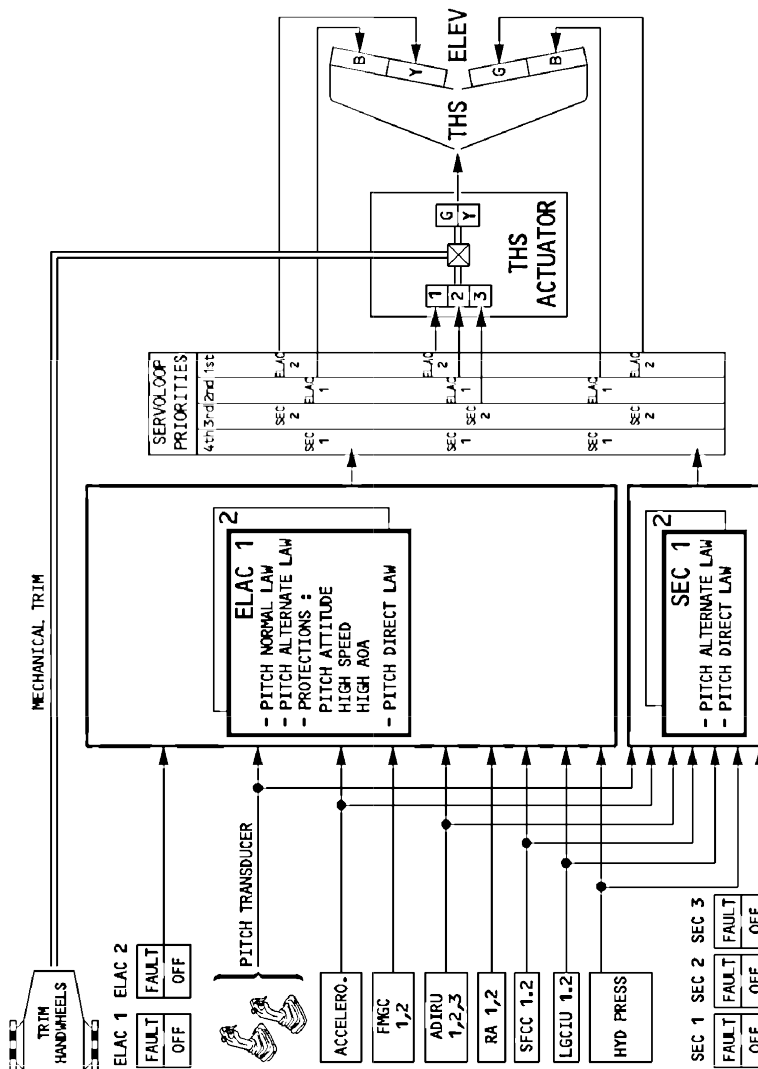
- Active : The jack position is electrically-controlled.
- Damping : The jack follows surface movement.
- Centering : The jack is hydraulically retained in the neutral position.
- In normal operation :
 - One jack is in active mode.
 - The other jack is in damping mode.
 - Some maneuvers cause the second jack to become active.
- If the active servojack fails, the damped one becomes active, and the failed jack is automatically switched to damping mode.
- If neither jack is being controlled electrically, both are automatically switched to the centering mode.
- If neither jack is being controlled hydraulically, both are automatically switched to damping mode.
- If one elevator fails, the deflection of the remaining elevator is limited in order to avoid putting excessive asymmetric loads on the horizontal tailplane or rear fuselage.

STABILIZER

- A screwjack driven by two hydraulic motors drives the stabilizer.
- The two hydraulic motors are controlled by :
 - One of three electric motors, or
 - The mechanical trim wheel.

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SCHEMATIC

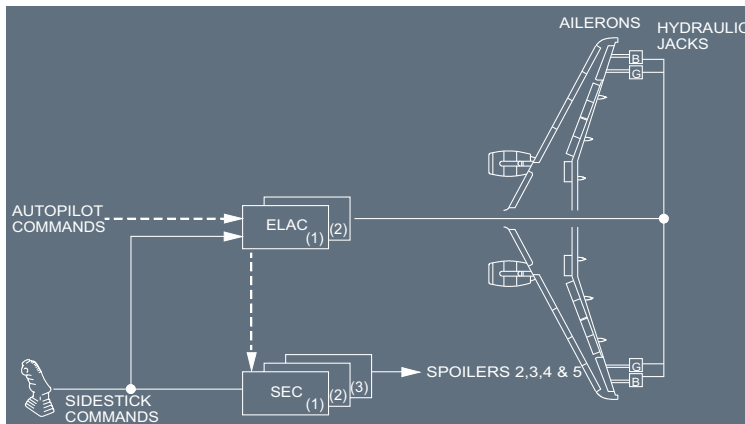


L3

ROLL CONTROL

Applicable to: ALL

GENERAL



One aileron and four spoilers on each wing control the aircraft about the roll axis.

The maximum deflection of the ailerons is 25 °.

The ailerons extend 5 ° down when the flaps are extended (aileron droop).

The maximum deflection of the spoilers is 35 °.

ELECTRIC CONTROL

- The ELAC 1 normally controls the ailerons.
If ELAC1 fails, the system automatically transfers aileron control to ELAC2.
If both ELACs fail, the ailerons revert to the damping mode.
- SEC3 controls the N° 2 spoilers, SEC1 the N° 3 and 4 spoilers, and SEC2 the N° 5 spoilers.
If a SEC fails, the spoilers it controls are automatically retracted.

Continued on the next page

ACTUATION

AILERONS

Each aileron has two electrically controlled hydraulic servojacks.

One of these servojacks per aileron operates at a time.

Each servojack has two control modes :

Active : Jack position is controlled electrically

Damping : Jack follows surface movement.

The system automatically selects damping mode, if both ELACs fail or in the event of blue and green hydraulic low pressure.

SPOILERS

A servojack positions each spoiler. Each servojack receives hydraulic power from either the green, yellow, or blue hydraulic system, controlled by the SEC1, 2 or 3 (*Refer to DSC-27-10-20 General Architecture diagram*).

The system automatically retracts the spoilers to their zero position, if it detects a fault or loses electrical control.

If the system loses hydraulic pressure, the spoiler retains the deflection it had at the time of the loss, or a lesser deflection if aerodynamic forces push it down.

When a spoiler surface on one wing fails, the symmetric one on the other wing is inhibited.

SPEED BRAKES AND GROUND SPOILERS

Applicable to: A320

SPEED BRAKE CONTROL

The pilot controls the speedbrakes with the speed brake lever.

The speedbrakes are actually spoilers 2, 3 and 4.

Speedbrake extension is inhibited, if:

- SEC 1 and SEC 3 both have faults,
- An elevator (L or R) has a fault (in this case only spoilers 3 and 4 are inhibited),
- Angle-of-attack protection is active,
- Flaps are in configuration FULL,
- Thrust levers above MCT position,
- Alpha Floor activation.

If an inhibition occurs when the speedbrakes are extended, they retract automatically and stay retracted until the inhibition condition disappears and the pilots reset the lever. (The speedbrakes can be extended again 10 s or more after the lever is reset).

When a speedbrake surface on one wing fails, the symmetric one on the other wing is inhibited.

- Note:
1. For maintenance purposes, the speedbrake lever will extend the N° 1 surfaces when the aircraft is stopped on ground, whatever the slat/flap configuration.
 2. When the aircraft is flying faster than 315 kt or M 0.75 with the autopilot engaged, the speedbrake retraction rate is reduced (Retraction from FULL to in takes about 25 s).

The maximum speedbrake deflection in manual flight is:

- 40 ° for spoilers 3 and 4
- 20 ° for spoiler 2.

The maximum speedbrake deflection with the autopilot engaged is:

- 25 ° for spoilers 3 and 4
- 12.5 ° for spoiler 2.

The maximum speedbrake deflection achievable with the autopilot engaged is obtained by setting the speedbrake lever to the half way position. On setting the position of the speedbrake lever from half to full, no increase in speedbrake deflection will be achieved.

For these surfaces (which perform both roll and speedbrake functions) the roll function has priority. When the sum of a roll order and a simultaneous speedbrake order on one surface is greater than the maximum deflection available in flight, the same surface on the other wing is retracted until the difference between the two surfaces is equal to the roll order.

Continued on the next page

Applicable to: A319

The pilot controls the speedbrakes with the speedbrake lever.

The speedbrakes are actually spoilers 2, 3 and 4.

Speedbrake extension is inhibited, if :

- SEC1 and SEC3 both have faults.
- An elevator (L or R) has a fault (in this case only spoilers 3 and 4 are inhibited).
- Angle-of-attack protection is active.
- Flaps are in configuration FULL.
- Thrust levers above MCT position.
- Alpha Floor activation.

If an inhibition occurs when the speedbrakes are extended, they automatically retract and remain retracted until the inhibition condition disappears and the pilots reset the lever. (The speedbrakes can be extended again, 10 s or more after the lever is reset).

When a speedbrake surface on one wing fails, the symmetric one on the other wing is inhibited.

Note: 1. For maintenance purposes, the speedbrake lever will extend the N° 1 surfaces when the aircraft is stopped on ground, regardless of the slat/flap configuration.
2. When the aircraft is flying faster than 315 kt or M 0.75 with the autopilot engaged, the speedbrake retraction rate is reduced (Retraction from FULL to in takes about 25 s).

The maximum deflection for the spoilers is:

- 25 ° for spoilers 3 and 4;
- 12.5 ° for spoiler 2 in configuration 3, and 17.5 ° in other configurations.

For these surfaces (which perform both roll and speedbrake functions) the roll function has priority.

When the sum of a roll order and a simultaneous speedbrake order on one surface is greater than the maximum deflection available in flight, the same surface on the other wing is retracted until the difference between the two surfaces is equal to the roll order.

L3

Continued on the next page

Applicable to: MSN 3805, 3843, 3871, 3909-4006, 4157-4286, 5019-5319

GROUND SPOILER CONTROL

Spoilers 1 to 5 act as ground spoilers.

When a ground spoiler surface on one wing fails, the symmetric ground spoiler surface on the other wing is inhibited.

ARMING

The pilot arms the ground spoilers by pulling the speedbrake control lever up into the armed position.

FULL EXTENSION – REJECTED TAKEOFF PHASE

- If the ground spoilers are armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as both thrust levers are reset to idle.
- If the ground spoilers are not armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as reverse is selected on one engine (the other thrust lever remains at idle).

FULL EXTENSION - LANDING PHASE

- If the ground spoilers are armed and all thrust levers are at idle, the ground spoilers will automatically extend as soon as both main landing gears have touched down.
- If the ground spoilers are not armed and both main landing gears have touched down, the ground spoilers will automatically extend as soon as reverse is selected on one engine (the other thrust lever remains at idle).

Note:

- In autoland, the ground spoilers fully extend at half speed one second after both main landing gears touch down.
- The spoiler roll function is inhibited when spoilers are used for the ground spoiler function.

PARTIAL EXTENSION

The ground spoilers partially extend (10 °) when reverse is selected on at least one engine (other engine at idle), and one main landing gear strut is compressed. This partial extension, by decreasing the lift, eases the compression of the second main landing gear strut, and consequently leads to full ground spoiler extension.

RETRACTION

The ground spoilers retract:

- After landing,
- After a rejected takeoff, when the ground spoilers are disarmed.

Continued on the next page

Note: If ground spoilers are not armed, they extend at the reverse selection and retract when idle is selected.

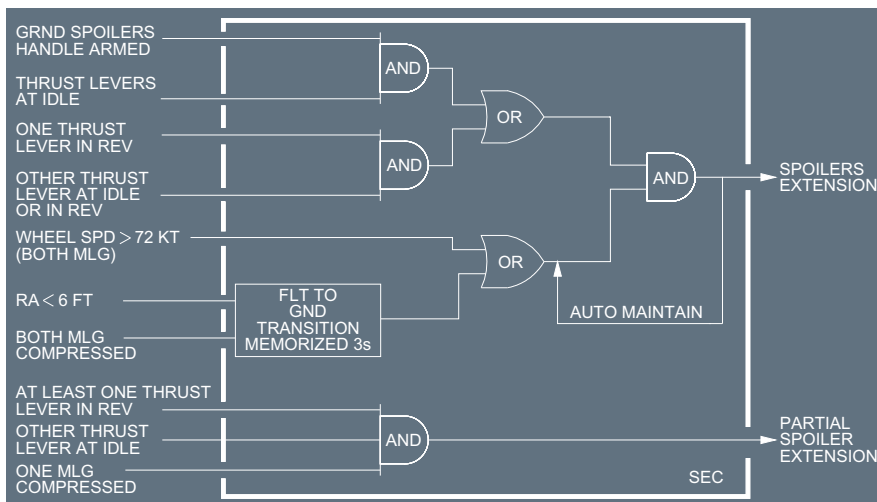
- During a touch and go, when at least one thrust lever is advanced above 20 °.

Note: After an aircraft bounce, the ground spoilers remain extended with the thrust levers at idle.

The landing gear touchdown condition is triggered for both main landing gear, either when their wheel speed is greater than 72 kt, or when their landing gear struts are, confirmed to be compressed by the radio altitude (RA < 6 ft).

The thrust levers are considered to be at idle when they are:

- Below 3 °,
- Below 15 °, when the RA is below 6 ft.



Continued on the next page

Applicable to: MSN 2037-3799, 3808-3824, 3844-3854, 3888, 4125-4132, 4313-4451, 4778-4837

GROUND SPOILER CONTROL

Spoilers 1 to 5 act as ground spoilers.

When a ground spoiler surface on one wing fails, the symmetric ground spoiler surface on the other wing is inhibited.

ARMING

The pilot arms the ground spoilers by pulling the speedbrake control lever up into the armed position.

FULL EXTENSION – REJECTED TAKEOFF PHASE

- If the ground spoilers are armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as both thrust levers are reset to idle.
- If the ground spoilers are not armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as reverse is selected on one engine (the other thrust lever remains at idle).

FULL EXTENSION - LANDING PHASE

- If the ground spoilers are armed and all thrust levers are at idle, the ground spoilers will automatically extend as soon as both main landing gears have touched down.
- If the ground spoilers are not armed and both main landing gears have touched down, the ground spoilers will automatically extend as soon as reverse is selected on one engine (the other thrust lever remains at idle).

Note: The spoiler roll function is inhibited when spoilers are used for the ground spoiler function.

PARTIAL EXTENSION

The ground spoilers partially extend (10 °) when reverse is selected on at least one engine (other engine at idle), and one main landing gear strut is compressed. This partial extension, by decreasing the lift, eases the compression of the second main landing gear strut, and consequently leads to full ground spoiler extension.

RETRACTION

The ground spoilers retract:

- After landing,
- After a rejected takeoff, when the ground spoilers are disarmed.

Note: If ground spoilers are not armed, they extend at the reverse selection and retract when idle is selected.

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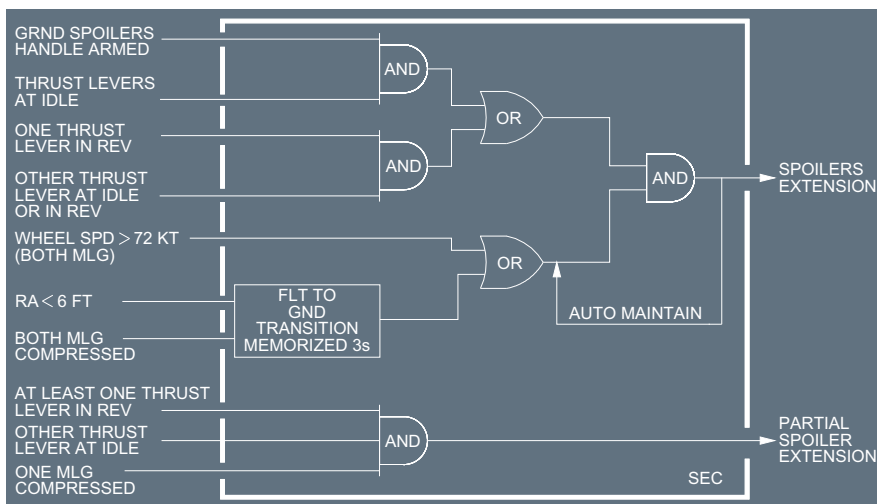
- During a touch and go, when at least one thrust lever is advanced above 20 °.

Note: After an aircraft bounce, the ground spoilers remain extended with the thrust levers at idle.

The landing gear touchdown condition is triggered for both main landing gear, either when their wheel speed is greater than 72 kt, or when their landing gear struts are, confirmed to be compressed by the radio altitude (RA < 6 ft).

The thrust levers are considered to be at idle when they are:

- Below 3 °,
- Below 15 °, when the RA is below 6 ft.



Continued on the next page

Applicable to: MSN 4012-4034, 4554-4591, 4636, 4646, 4676-4680, 4708, 4721-4740, 4749

GROUND SPOILER CONTROL

Spoilers 1 to 5 act as ground spoilers.

When a ground spoiler surface on one wing fails, the symmetric ground spoiler surface on the other wing is inhibited.

ARMING

The pilot arms the ground spoilers by pulling the speedbrake control lever up into the armed position.

FULL EXTENSION – REJECTED TAKEOFF PHASE

- If the ground spoilers are armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as both thrust levers are reset to idle.
- If the ground spoilers are not armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as reverse is selected on one engine (the other thrust lever remains at idle).

FULL EXTENSION - LANDING PHASE

The ground spoilers will automatically extend when the following conditions are met:

- Speed brake lever not in the retracted position or ground spoilers armed and:
 - Both main landing gears on ground,
 - Both thrust levers at or below Idle position, or Reverse selected on at least one engine (and the other thrust lever below MCT position).
- Speed brake lever in the retracted position but ground spoilers not armed and:
 - Both main landing gears on ground,
 - Reverse selected on at least one engine (and the other thrust lever below MCT position).

Note:

- In autoland, the ground spoilers fully extend at half speed one second after both main landing gears touch down.
- The spoiler roll function is inhibited when spoilers are used for the ground spoiler function.

PARTIAL EXTENSION

In order to accelerate the full spoiler extension, the Phased Lift Dumping (PLD) function allows the ground spoilers to deploy with a reduced deflection (10 °) when the following conditions are met:

- Speed brake lever not in the retracted position or ground spoilers armed and:
 - One main landing gear on ground,

Continued on the next page

- Both thrust levers at or below Idle position.
- Speed brake lever in the retracted position but ground spoilers not armed and:
 - One main landing gear on ground,
 - Reverse selected on at least one engine (and the other thrust lever below MCT position).

In order to reduce the bounce severity at landing in the case of an inappropriate thrust lever handling during flare, ground spoilers are also partially deployed when the following conditions are met:

- Ground spoilers armed,
- Both main landing gears on ground,
- Both thrust levers at or below the Climb position.

RETRACTION

The ground spoilers retract:

- After landing,
- After a rejected takeoff, when the ground spoilers are disarmed.

Note: *If ground spoilers are not armed, they extend at the reverse selection and retract when idle is selected.*

- During a touch and go, when at least one thrust lever is advanced above 20 °.

Note: *After an aircraft bounce, the ground spoilers remain extended with the thrust levers at idle.*

The landing gear touchdown condition is triggered for both main landing gear, either when their wheel speed is greater than 72 kt, or when their landing gear struts are, confirmed to be compressed by the radio altitude (RA < 6 ft).

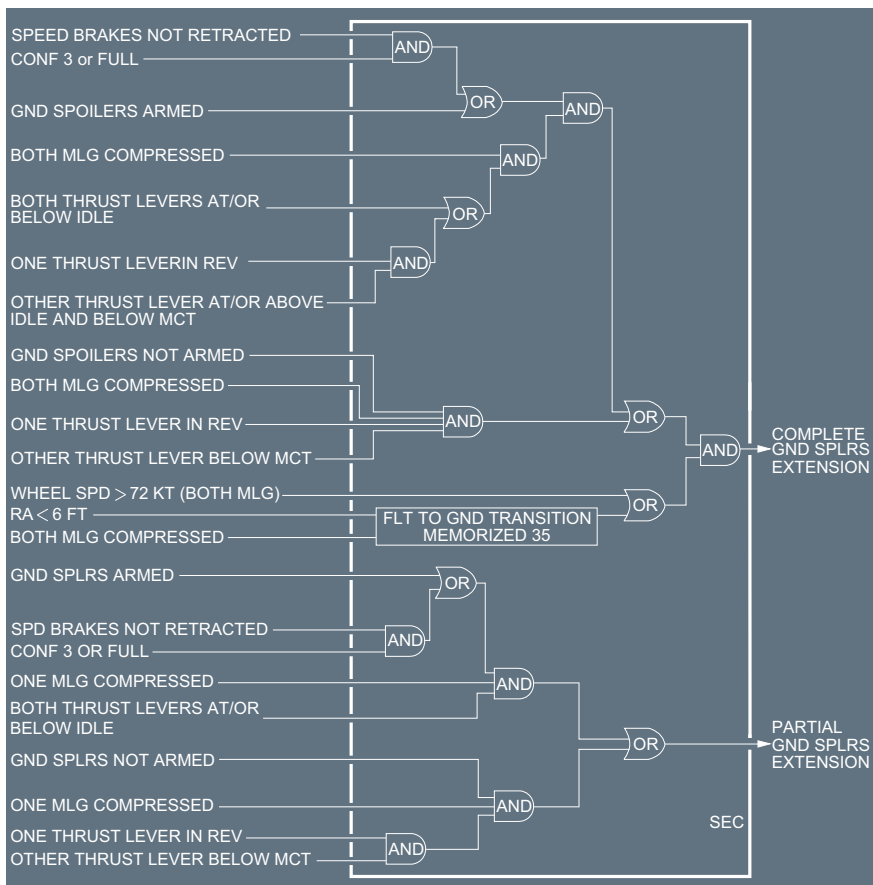
L3

The thrust levers are considered to be at idle when they are:

- Below 3 °,
- Below 15 °, when the RA is below 6 ft.

Continued on the next page

Ground Spoiler extension logic



Continued on the next page

Applicable to: MSN 4040-4087, 4624-4635, 4640, 4667, 4693-4705, 4717, 4744

GROUND SPOILER CONTROL

Spoilers 1 to 5 act as ground spoilers.

When a ground spoiler surface on one wing fails, the symmetric ground spoiler surface on the other wing is inhibited.

ARMING

The pilot arms the ground spoilers by pulling the speedbrake control lever up into the armed position.

FULL EXTENSION – REJECTED TAKEOFF PHASE

- If the ground spoilers are armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as both thrust levers are reset to idle.
- If the ground spoilers are not armed and the speed exceeds 72 kt, the ground spoilers will automatically extend as soon as reverse is selected on one engine (the other thrust lever remains at idle).

FULL EXTENSION - LANDING PHASE

The ground spoilers will automatically extend when the following conditions are met:

- Speed brake lever not in the retracted position or ground spoilers armed and:
 - Both main landing gears on ground,
 - Both thrust levers at or below Idle position, or Reverse selected on at least one engine (and the other thrust lever below MCT position).
- Speed brake lever in the retracted position but ground spoilers not armed and:
 - Both main landing gears on ground,
 - Reverse selected on at least one engine (and the other thrust lever below MCT position).

Note: The spoiler roll function is inhibited when spoilers are used for the ground spoiler function.

PARTIAL EXTENSION

In order to accelerate the full spoiler extension, the Phased Lift Dumping (PLD) function allows the ground spoilers to deploy with a reduced deflection (10 °) when the following conditions are met:

- Speed brake lever not in the retracted position or ground spoilers armed and:
 - One main landing gear on ground,
 - Both thrust levers at or below Idle position.
- Speed brake lever in the retracted position but ground spoilers not armed and:
 - One main landing gear on ground,

Continued on the next page

- Reverse selected on at least one engine (and the other thrust lever below MCT position).

In order to reduce the bounce severity at landing in the case of an inappropriate thrust lever handling during flare, ground spoilers are also partially deployed when the following conditions are met:

- Ground spoilers armed,
- Both main landing gears on ground,
- Both thrust levers at or below the Climb position.

RETRACTION

The ground spoilers retract:

- After landing,
- After a rejected takeoff, when the ground spoilers are disarmed.

Note: *If ground spoilers are not armed, they extend at the reverse selection and retract when idle is selected.*

- During a touch and go, when at least one thrust lever is advanced above 20 °.

Note: *After an aircraft bounce, the ground spoilers remain extended with the thrust levers at idle.*

The landing gear touchdown condition is triggered for both main landing gear, either when their wheel speed is greater than 72 kt, or when their landing gear struts are, confirmed to be compressed by the radio altitude (RA < 6 ft).

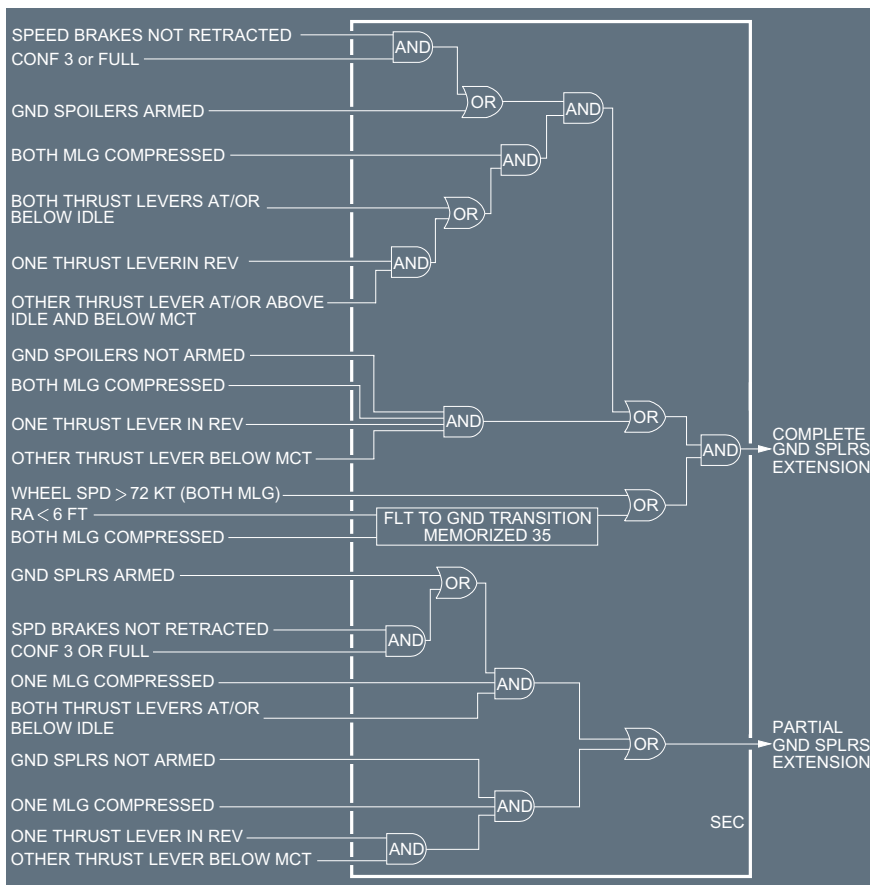
L3

The thrust levers are considered to be at idle when they are:

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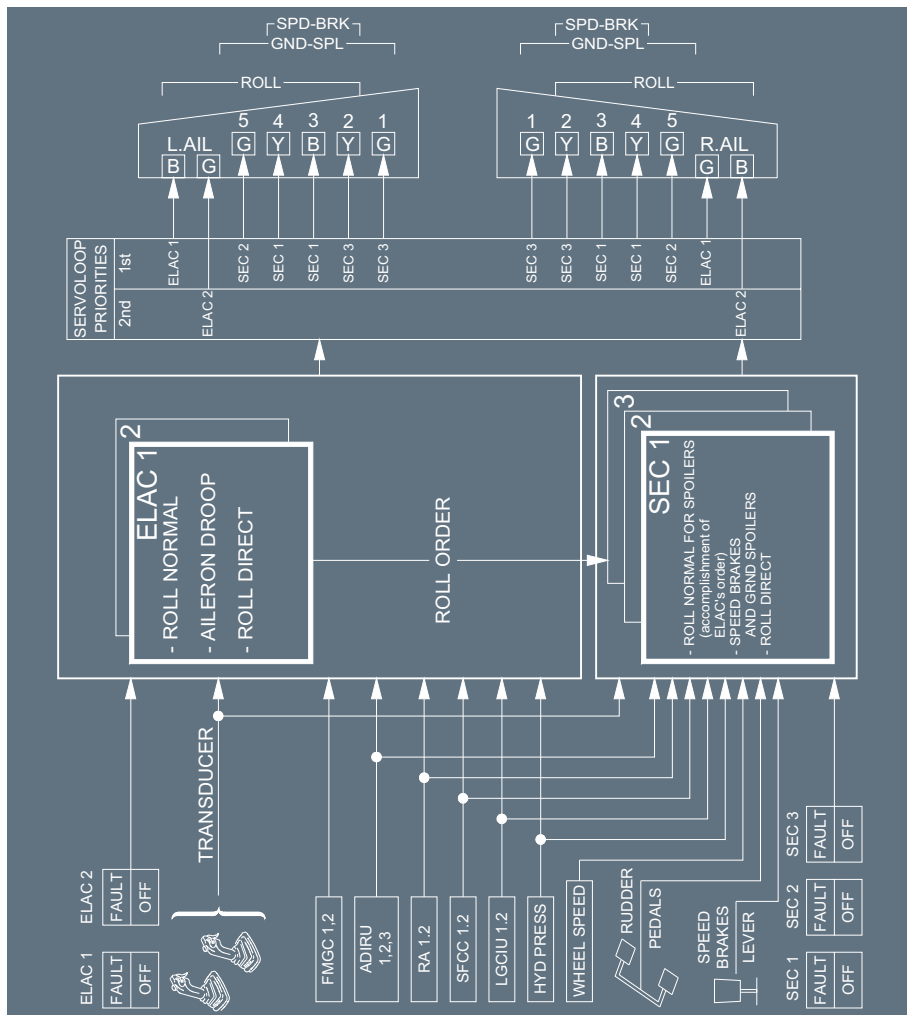
Ground Spoiler extension logic



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Applicable to: ALL

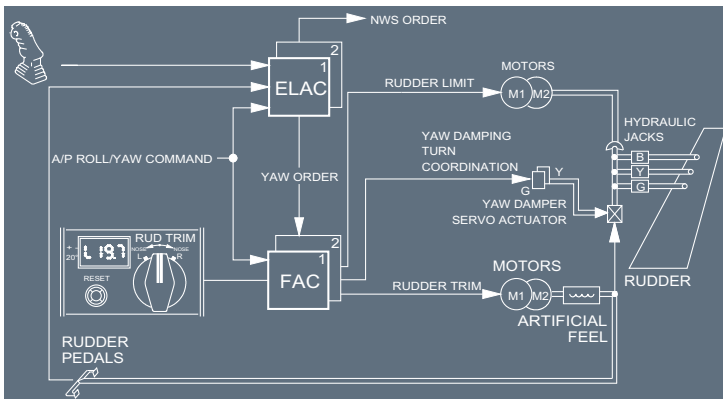
ROLL CONTROL - SCHEMATIC



YAW CONTROL

Applicable to: ALL

GENERAL



One rudder surface controls yaw.

ELECTRICAL RUDDER CONTROL

The yaw damping and turn coordination functions are automatic.

The ELACs compute yaw orders for coordinating turns and damping yaw oscillations, and transmit them to the FACs.

MECHANICAL RUDDER CONTROL

The pilots can use conventional rudder pedals to control the rudder.

RUDDER ACTUATION

Three independent hydraulic servoactuators, operating in parallel, actuate the rudder. In automatic operation (yaw damping, turn coordination) a green servo actuator drives all three servoactuators. A yellow servo actuator remains synchronized and takes over if there is a failure.

There is no feedback to the rudder pedals from the yaw damping and turn coordination functions.

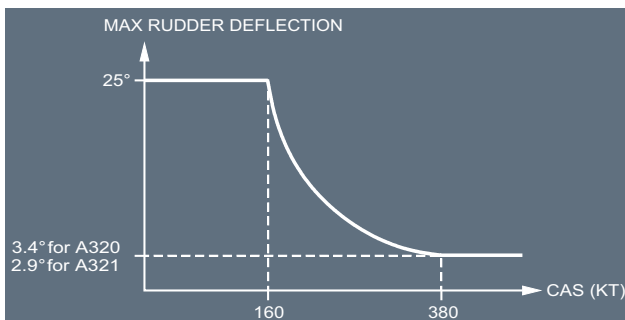
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Applicable to: A320

RUDDER TRAVEL LIMIT

The rudder and pedal deflection limit depends on speed.

Each channel of the limiter is controlled and monitored by its associated FAC. If both FACs fail, maximum deflection is available, when the slats are extended.

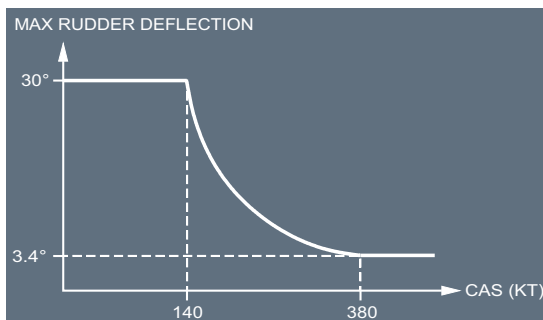


Applicable to: A319

RUDDER TRAVEL LIMIT

The rudder and pedal deflection limit depends on speed.

Each channel of the limiter is controlled and monitored by its associated FAC. If both FACs fail, maximum deflection is available, when the slats are extended.



Continued on the next page

Applicable to: A320

RUDDER TRIM

The two electric motors that position the artificial feel unit also trim the rudder. In normal operation, motor N° 1 (controlled by FAC1), drives the trim, and FAC2 with motor N° 2 remains synchronized as a backup.

In manual flight, the pilot can apply rudder trim with the rotary RUD TRIM switch on the pedestal.

- Maximum deflection is $\pm 20^\circ$.
- Rudder trim speed is $1^\circ/\text{s}$.
- In addition to limitation by the TLU, if rudder trim is applied, maximum rudder deflection may be reduced in the opposite direction.

The pilot can use a button on the RUD TRIM panel to reset the rudder trim to zero.

Note: *With the autopilot engaged, the FMGC computes the rudder trim orders. The rudder trim rotary switch and the rudder trim reset pushbutton are not active.*

Applicable to: A319

RUDDER TRIM

The two electric motors that position the artificial feel unit also trim the rudder. In normal operation, motor N° 1 (controlled by FAC1), drives the trim, and FAC2 with motor N° 2 remains synchronized as a backup.

In manual flight, the pilot can apply rudder trim with the rotary RUD TRIM switch on the pedestal.

- Maximum deflection is $\pm 25^\circ$.
- Rudder trim speed is $1^\circ/\text{s}$.
- In addition to limitation by the TLU, if rudder trim is applied, maximum rudder deflection may be reduced in the opposite direction.

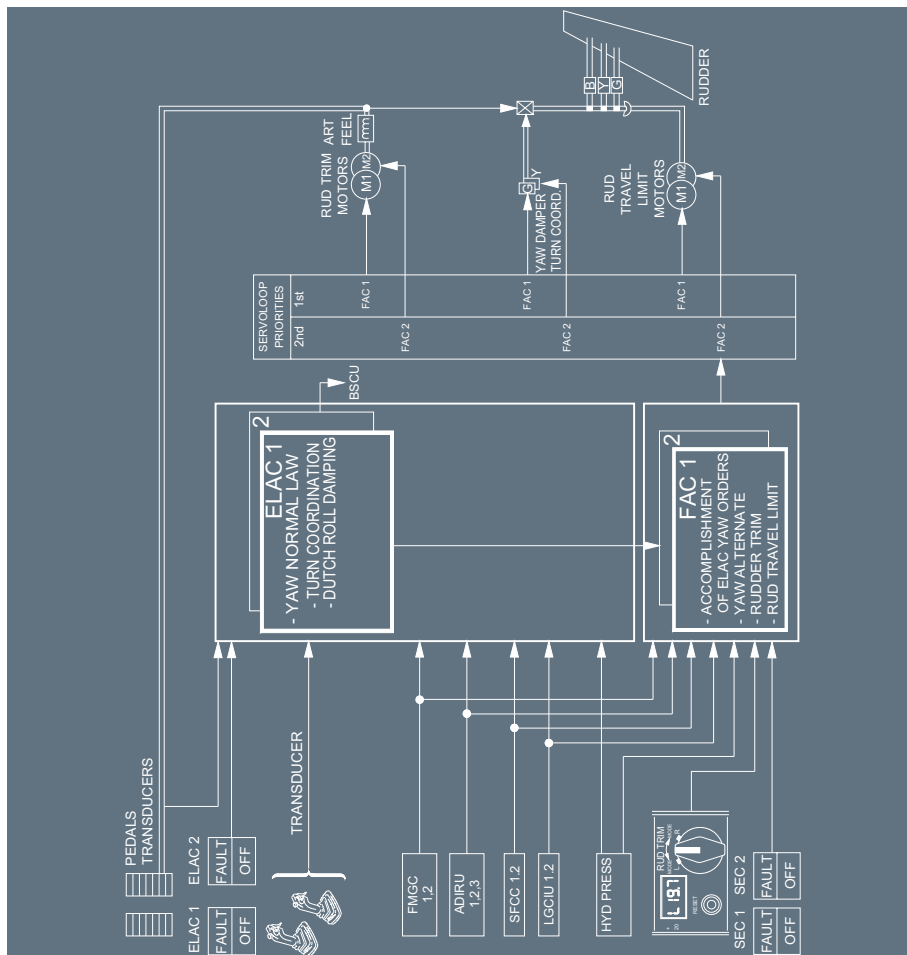
The pilot can use a button on the RUD TRIM panel to reset the rudder trim to zero.

Note: *With the autopilot engaged, the FMGC computes the rudder trim orders. The rudder trim rotary switch and the rudder trim reset pushbutton are not active.*

Continued on the next page

Applicable to: ALL

SCHEMATIC





A319/A320
FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-27 – FLIGHT CONTROLS

DSC-27-10 – General

DSC-27-10-20 – Architecture

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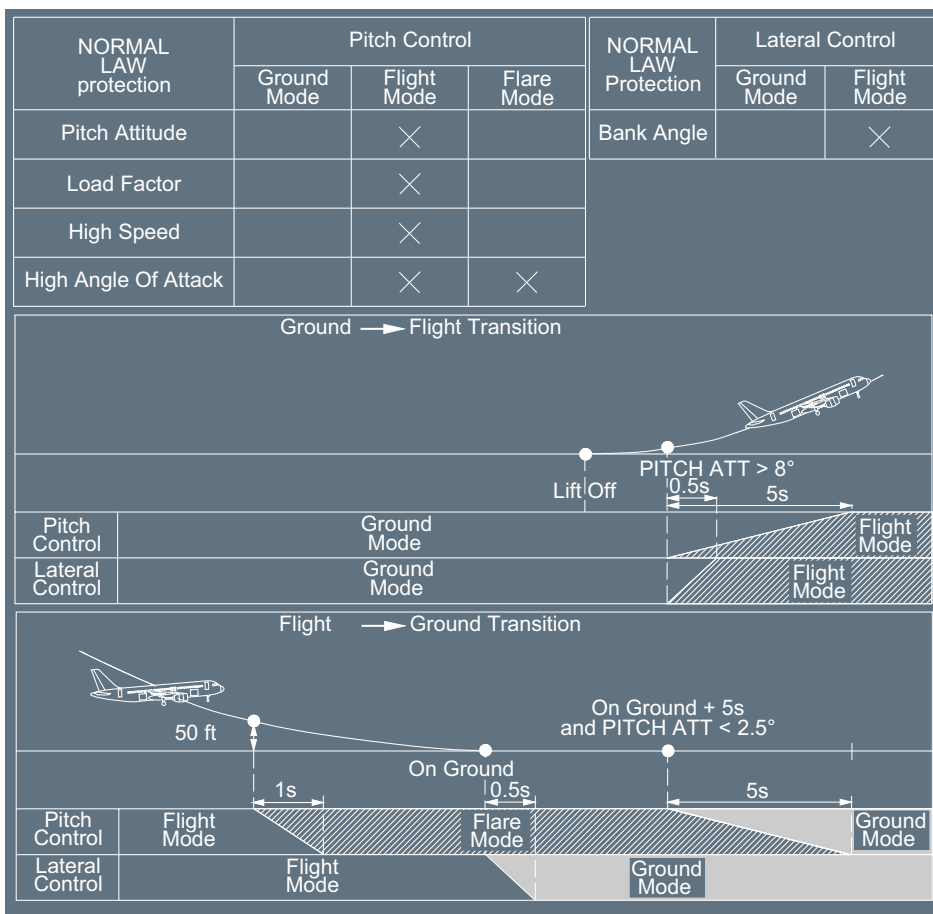
General

GENERAL

Applicable to: ALL

Flight control normal law covers:

- three-axis control
- flight envelope protection
- alleviation of maneuver loads





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-27 – FLIGHT CONTROLS

DSC-27-20 – Flight Control System

DSC-27-20-10 – Normal Law

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Pitch Control

GROUND MODE

Applicable to: ALL

Ground mode is a direct relationship between sidestick deflection and elevator deflection, without auto trim.

It automatically sets the trimmable horizontal stabilizer (THS) at 0 ° (inside the green band).

After landing, the automatic pitch trim resetting to 0 ° stops as soon as the pitch attitude exceeds 2.5 °.

In this case, the THS setting is frozen.

The automatic resetting to 0 ° restarts as soon as the pitch attitude goes below 2.5 °.

A setting that the pilot enters manually to adjust for CG has priority for takeoff.

When the aircraft reaches 75 kt during the takeoff roll, the system reduces the maximum up elevator deflection from 30 ° to 20 °.

FLIGHT MODE

Applicable to: A319

The normal-law flight mode is a load-factor-demand mode with automatic trim and protection throughout the flight envelope.

Following normal law, the sidestick controllers set the elevator and THS to maintain load factor proportional to stick deflection and independent of speed.

With the sidestick at neutral, wings level, the system maintains 1 g in pitch (corrected for pitch attitude), and there is no need for the pilot to trim by changing speed or configuration.

Pitch trim is automatic both in manual mode and when the autopilot is engaged. In normal turns (up to 33 ° of bank) the pilot does not have to make any pitch corrections once the turn is established.

The flight mode is active from takeoff to landing, and follows the logic shown schematically (*Refer to DSC-27-20-10-10 General*).

Automatic pitch trim freezes in the following situations:

- The pilot enters a manual trim order.
- The radio altitude is below 50 ft (100 ft with autopilot engaged).
- The load factor goes below 0.5 g.
- The aircraft is under high-speed or high-Mach protection.

When angle-of-attack protection is active, the THS setting is limited between the setting at the aircraft's entry into this protection and 3.5 ° nose down. (Neither the pilot nor the system can apply additional nose-up trim).

Similarly, when the load factor is higher than 1.25 g or when the aircraft exceeds 33 ° of bank, the THS setting is limited to values between the actual setting and 3.5 ° nose down.

CONTROL WITH AUTOPILOT ENGAGED

- The ELACs and SECs limit what the autopilot can order.
- The pilot has to overcome a restraining force in order to move the sidestick when the autopilot is engaged. If he overcomes this force and does move the sidestick, he disconnects the autopilot.
- The pilot can also disconnect the autopilot by pushing on the rudder pedals (10 ° out of trim), or by moving the pitch trim wheel beyond a certain threshold.
- All protections of normal laws remain effective except pitch attitude protection.

FLIGHT MODE

Applicable to: A320

The normal-law flight mode is a load-factor-demand mode with automatic trim and protection throughout the flight envelope.

Following normal law, the sidestick controllers set the elevator and THS to maintain load factor proportional to stick deflection and independent of speed.

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- The load factor goes below 0.5 g.

When angle-of-attack protection is active, the THS setting is limited between the setting at the aircraft's entry into this protection and 3.5 ° nose down. (Neither the pilot nor the system can apply additional nose-up trim).

Similarly, when the load factor is higher than 1.25 g or when the aircraft exceeds 33 ° of bank, the THS setting is limited to values between the actual setting and 3.5 ° nose down.

When High Speed or High Mach Protection is active, the THS Setting is limited between the setting at the aircraft's entry into this protection and 11 ° nose-up.

CONTROL WITH AUTOPILOT ENGAGED

- The ELACs and SECs limit what the autopilot can order.
- The pilot has to overcome a restraining force in order to move the sidestick when the autopilot is engaged. If he overcomes this force, he disconnects the autopilot.
- The pilot can also disconnect the autopilot by pushing on the rudder pedals (10 ° out of trim), or by moving the pitch trim wheel beyond a certain threshold.
- All protections of normal laws remain effective except pitch attitude protection.

FLARE MODE

Applicable to: ALL

When the aircraft passes 50 ft RA, the THS is frozen and the normal flight mode changes to flare mode as the aircraft descends to land. Flare mode is essentially a direct stick-to-elevator relationship (with some damping provided by the load factor and the pitch rate feedbacks).

The system memorizes the aircraft's attitude at 50 ft, and it becomes the initial reference for pitch attitude control.

As the aircraft descends through 30 ft, the system begins to reduce the pitch attitude to -2 °nose down over a period of 8 s. Consequently, to flare the aircraft, a gentle nose-up action by the pilot is required.

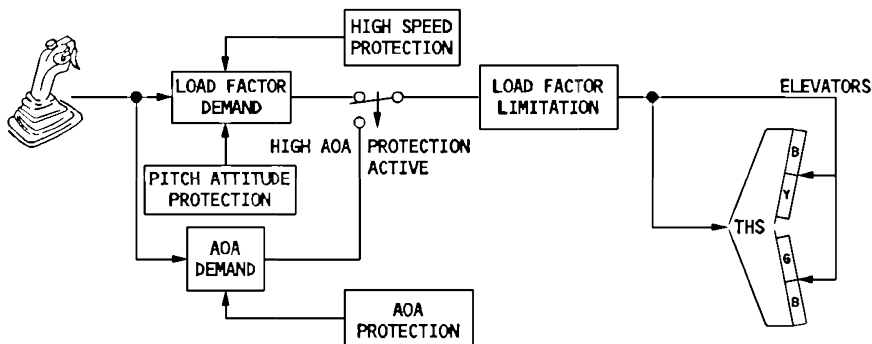
PROTECTIONS

Applicable to: ALL

GENERAL

The normal law protects the aircraft throughout the flight envelope, as follows :

- load factor limitation
- pitch attitude protection
- high-angle-of-attack (AOA) protection
- high-speed protection.



LOAD FACTOR LIMITATION

The load factor is automatically limited to:

- +2.5 g to -1 g for clean configuration.
- +2 g to 0 for other configurations.

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PITCH ATTITUDE PROTECTION

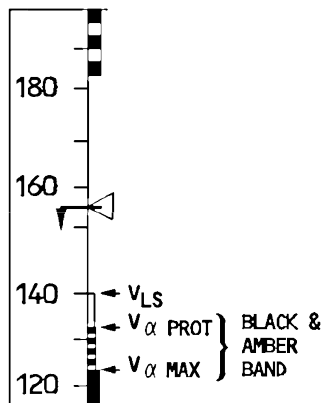
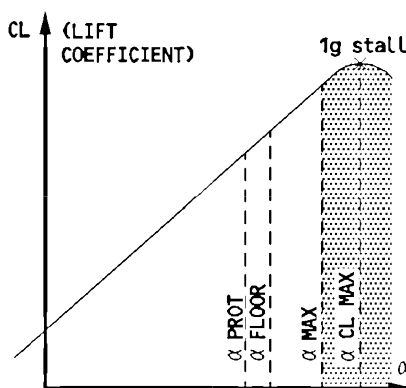
Pitch attitude is limited to :

- 30 ° nose up in conf 0 to 3 (progressively reduced to 25 ° at low speed).
- 25 ° nose up in conf FULL (progressively reduced to 20 ° at low speed).
- 15 ° nose down (indicated by green symbols “=” on the PFD's pitch scale).

The flight director bars disappear from the PFD when the pitch attitude exceeds 25 ° up or 13 ° down. They return to the display when the pitch angle returns to the region between 22 ° up and 10 ° down.

HIGH ANGLE OF ATTACK PROTECTION

Under normal law, when the angle-of-attack becomes greater than α_{prot} , the system switches elevator control from normal mode to a protection mode, in which the angle-of-attack is proportional to sidestick deflection. That is, in the α_{prot} range, from α_{prot} to α_{MAX} , the sidestick commands α directly. However, the angle-of-attack will not exceed α_{MAX} , even if the pilot gently pulls the sidestick all the way back. If the pilot releases the sidestick, the angle-of-attack returns to α_{prot} and stays there. This protection against stall and windshear has priority over all other protections. The autopilot disconnects at $\alpha_{prot} + 1^\circ$.



V_{α prot}, V_{α floor}, V_{α MAX} vary according to weight and configuration.

To deactivate the angle of attack protection, the pilot must push the sidestick:

- Greater than 8 ° forward, or,
- Greater than 0.5 ° for at least 0.5 s when $\alpha < \alpha_{MAX}$.

In addition, below 200 ft, the angle of attack protection is also deactivated, when:

- Sidestick deflection is less than half nose-up, and

Continued on the next page

- Actual α is less than $\alpha_{prot} - 2^\circ$.

Note: 1. At takeoff α_{prot} is equal to α_{MAX} for 5 s.

2. α_{floor} is activated through the A/THR system, when:

- α is greater than α_{floor} (9.5° in configuration 0; 15° in configuration 1, 2; 14° in configuration 3; 13° in configuration FULL) or
- Sidestick deflection is greater than 14° nose up, with either the pitch attitude or the angle-of-attack protection active.

The α_{floor} function is available from lift-off to 100 ft RA before landing.

Applicable to: A319

HIGH SPEED PROTECTION

The aircraft automatically recovers, following a high speed upset. Depending on the flight conditions (high acceleration, low pitch attitude), High Speed Protection is activated at/or above VMO/MMO.

When it is activated, the pitch trim is frozen. Positive spiral static stability is introduced to 0° bank angle (instead of 33° in normal law), so that with the sidestick released, the aircraft always returns to a bank angle of 0° . The bank angle limit is reduced from 67° to 40° .

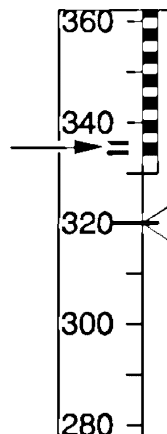
As the speed increases above VMO/MMO, the sidestick nose-down authority is progressively reduced, and a permanent nose-up order is applied to aid recovery to normal flight conditions.

High Speed Protection is deactivated, when the aircraft speed decreases below VMO/MMO, where the usual normal control laws are recovered.

The autopilot disconnects, when High Speed Protection becomes active.

Continued on the next page

High speed protection symbol:
Two green bars at $V_{MO} + 6$



Note: The ECAM displays an “O/SPEED” warning at $V_{MO} + 4$ kt and $MMO + 0.006$.

Continued on the next page

Applicable to: A320

HIGH SPEED PROTECTION

The aircraft automatically recovers, following a high speed upset. Depending on the flight conditions (high acceleration, low pitch attitude), High Speed Protection is activated at/or above VMO/MMO.

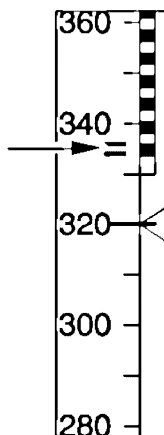
When it is activated, the THS setting is limited between the setting at the aircraft's entry into this protection and 11 ° nose-up. Positive spiral static stability is introduced to 0 ° bank angle (instead of 33 ° in normal law), so that with the sidestick released, the aircraft always returns to a bank angle of 0 °. The bank angle limit is reduced from 67 ° to 40 °.

As the speed increases above VMO/MMO, the sidestick nose-down authority is progressively reduced, and a permanent nose-up order is applied to aid recovery to normal flight conditions.

High Speed Protection is deactivated, when the aircraft speed decreases below VMO/MMO, where the usual normal control laws are recovered.

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High speed protection symbol:
Two green bars at VMO + 6



Note: The ECAM displays an “O/SPEED” warning at VMO + 4 kt and MMO + 0.006.

Applicable to: ALL

LOW ENERGY WARNING (IF INSTALLED)

The low energy warning is computed by the FAC (*Refer to DSC-22_40-10 GENERAL*).

Lateral Control

NORMAL LAW

Applicable to: ALL

When the aircraft is on the ground (in “on ground” mode), the sidestick commands the aileron and roll spoiler surface deflection. The amount of control surface deflection that results from a given amount of sidestick deflection depends upon aircraft speed. The pedals control rudder deflection through a direct mechanical linkage. The aircraft smoothly transitions to “in flight” mode shortly after liftoff.

When the aircraft is in the “in flight” mode, normal law combines control of the ailerons, spoilers (except N° 1 spoilers), and rudder (for turn coordination) in the sidestick. While the system thereby gives the pilot control of the roll and heading, it also limits the roll rate and bank angle, coordinates the turns, and damps the dutch roll.

The roll rate requested by the pilot during flight is proportional to the sidestick deflection, with a maximum rate of 15 °/s when the sidestick is at the stop.

When the aircraft is in “flare” mode, the lateral control is the same as in “in flight” mode.

After touchdown, the aircraft smoothly transitions from “in flight” mode to “ground” mode.

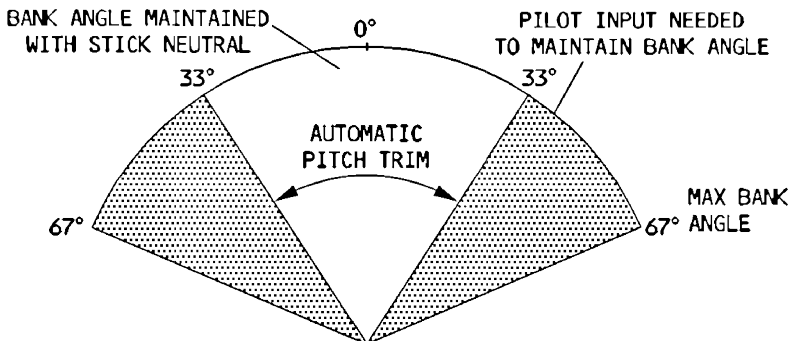
BANK ANGLE PROTECTION

Applicable to: ALL

Inside the normal flight envelope, the system maintains positive spiral static stability for bank angles above 33° . If the pilot releases the sidestick at a bank angle greater than 33° , the bank angle automatically reduces to 33° . Up to 33° , the system holds the roll attitude constant when the sidestick is at neutral. If the pilot holds full lateral sidestick deflection, the bank angle goes to 67° and no further. If Angle-of-Attack protection is active, and the pilot maintains full lateral deflection on the sidestick, the bank angle will not go beyond 45° . If High Speed Protection is active, and the pilot maintains full lateral deflection on the sidestick, the bank angle will not go beyond 40° . If high speed protection is operative, the system maintains positive spiral static stability from a bank angle of 0° , so that with the sidestick released, the aircraft always returns to a bank angle of 0° .

When bank angle protection is active, auto trim is inoperative.

If the bank angle exceeds 45° , the autopilot disconnects and the FD bars disappear. The FD bars return when the bank angle decreases to less than 40° .



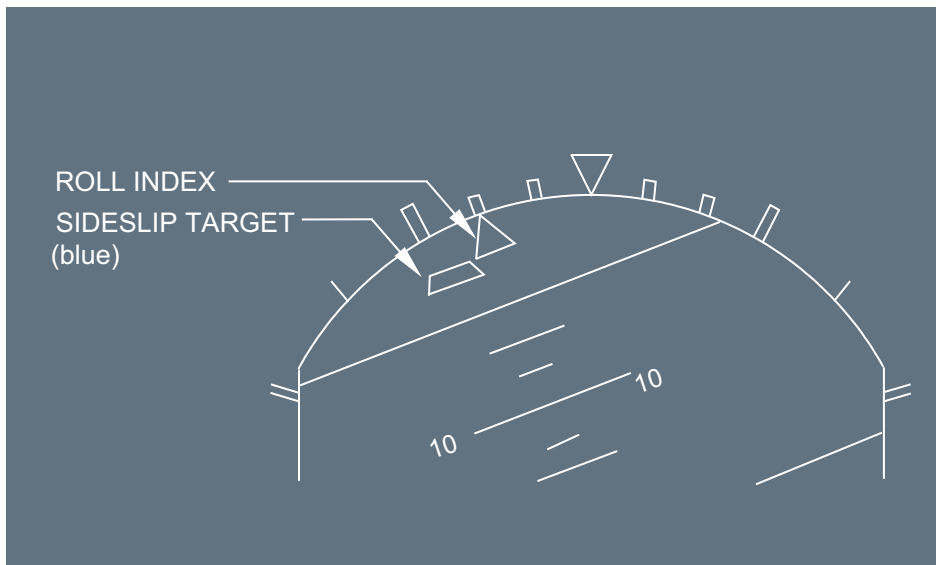
Sideslip Target

SIDESLIP TARGET

Applicable to: ALL

If one engine fails, the FAC modifies the sideslip indication slightly to show the pilot how much rudder to use to get the best climb performance (ailerons to neutral and spoilers retracted).

In the case of an engine failure at takeoff, or at go-around, the sideslip index on the PFD changes from yellow to blue (to provide the conditions for the blue display of the sideslip target, *Refer to DSC-31-40 Attitude Data*).



In flight, the lateral normal law commands some rudder surface deflection to minimize the sideslip. The pilot's response is normal and instinctive: zero the slip indication by applying the right amount of rudder to get the best climb performance.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-27 – FLIGHT CONTROLS

DSC-27-20 – Flight Control System

DSC-27-20-10 – Normal Law

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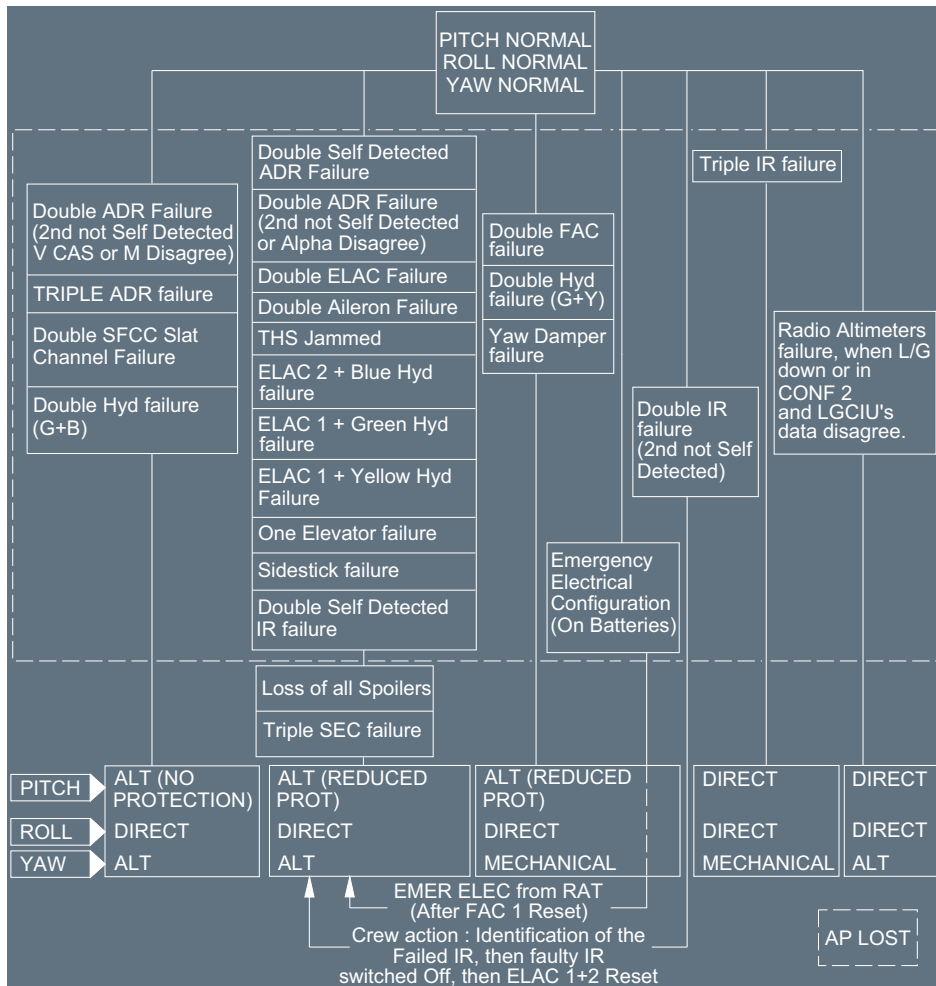
GENERAL**Applicable to: ALL**

Depending on the failures occurring to the flight control system, or on its peripherals, there are 3 levels of reconfiguration :

- Alternate law
They are two levels of alternate law : with and without reduced protections.
- Direct law
- Mechanical

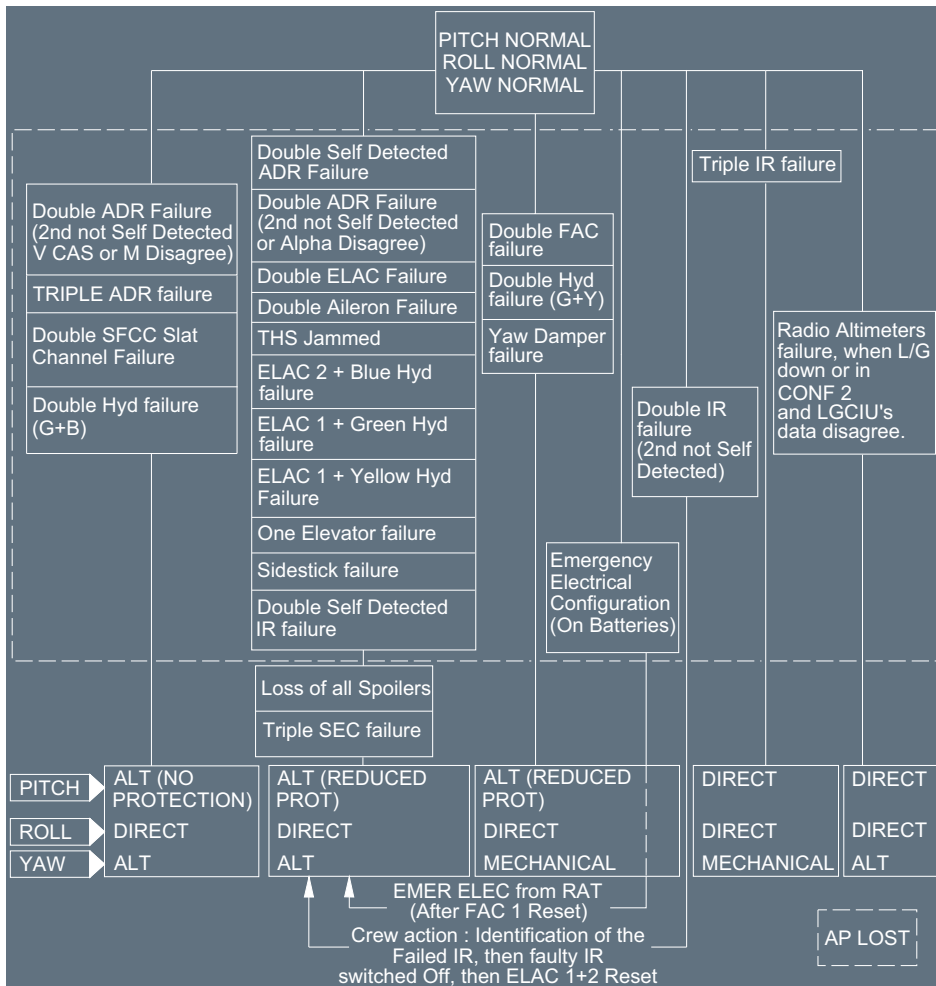
FLIGHT CONTROLS LAW RECONFIGURATION

Applicable to: A320



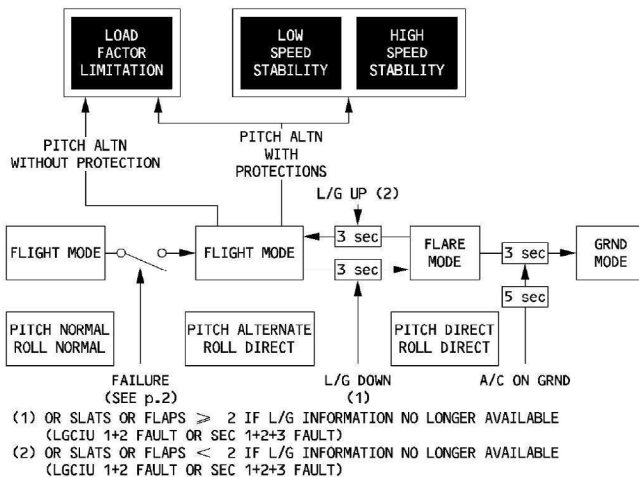
FLIGHT CONTROLS LAW RECONFIGURATION

Applicable to: A319



ALTERNATE LAW

Applicable to: ALL



PITCH CONTROL

GROUND MODE

Under alternate law the ground mode becomes active on the ground 5 s after touchdown. It is identical to the ground mode of the normal law.

FLIGHT MODE

In flight, the alternate law pitch mode follows a load-factor demand law much as the normal law pitch mode does, but it has less built-in protection (reduced protections).

FLARE MORE

In pitch alternate law the flight mode changes to the flare mode when the pilot selects landing gear down. The flare mode is a direct stick-to-elevator relationship. (*Refer to DSC-27-20-20 DIRECT LAW*).

LATERAL CONTROL

When the aircraft flying in pitch alternate law, lateral control follows the roll direct law associated with yaw alternate or mechanical.

Continued on the next page

ROLL DIRECT LAW

Refer to DSC-27-20-20 DIRECT LAW.

YAW ALTERNATE LAW

Only the yaw damping function is available. Damper authority is limited to $\pm 5^\circ$ of rudder deflection.

REDUCED PROTECTIONS**LOAD FACTOR LIMITATION**

The load factor limitation is similar to that under normal law.

PITCH ATTITUDE PROTECTION

There is no pitch attitude protection. Amber Xs replace the green double bars “=” on the PFD.

LOW SPEED STABILITY

An artificial low speed stability replaces the normal angle-of-attack protection. It is available for all slat/flap configurations, and the low speed stability is active from about 5 kt up to about 10 kt above stall warning speed, depending on the aircraft's gross weight and slats/flaps configuration.

A gentle progressive nose down signal is introduced, which tends to keep the speed from falling below these values.

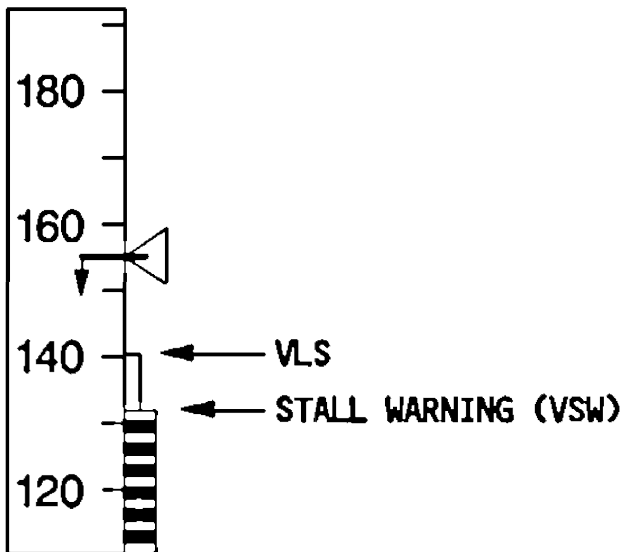
The system also injects bank-angle compensation, so that operation effectively maintains a constant angle of attack.

In addition, audio stall warnings (crickets + “STALL” synthetic voice message) is activated at an appropriate margin from the stall condition.

The PFD speed scale is modified to show a black/red barber pole below the stall warning.

The α floor protection is inoperative.

Continued on the next page



HIGH SPEED STABILITY

Above VMO or MMO, a nose up demand is introduced to avoid an excessive increase in speed. The pilot can override this demand.

In addition, the aural overspeed warning ($VMO + 4$ or $MMO + 0.006$) remains available.

BANK ANGLE PROTECTION

Not provided.

Note: The AP will disconnect, if speed exceeds VMO/MMO, or if the bank angle exceeds 45 °.

ALTERNATE LAW WITHOUT REDUCED PROTECTION

Applicable to: ALL

This is identical to alternate law except that it does not include the low-speed stability or the high-speed stability. It includes only the load factor limitation.

DIRECT LAW

Applicable to: ALL

PITCH CONTROL

The pitch direct law is a direct stick-to-elevator relationship (elevator deflection is proportional to stick deflection).

In all configurations the maximum elevator deflection varies as a function of CG.

It is a compromise between adequate controllability with the CG forward, and not-too-sensitive control with the CG aft.

There is no automatic trim : the pilot must trim manually.

The PFD displays in amber the message “USE MAN PITCH TRIM”.

No protections are operative.

The α floor function is inoperative.

Overspeed and stall warnings are available as for alternate law.

LATERAL CONTROL

When flying in “direct law”, the roll direct law associated with mechanical yaw control governs lateral control.

ROLL DIRECT LAW

The roll direct law is a direct stick-to-surface-position relationship. System gains are set automatically to correspond to slat/flap configuration.

With the aircraft in the clean configuration, the maximum roll rate is about 30 °/s.

With slats extended, it is about 25 °/s.

To limit roll rate, the roll direct law uses only ailerons and spoilers N° 4 and 5.

If spoiler N° 4 has failed, spoiler N° 3 replaces it.

If the ailerons have failed, all roll spoilers become active.

YAW MECHANICAL CONTROL

The pilot controls yaw with the rudder pedals.

The yaw damping and turn coordination functions are lost.

ABNORMAL ATTITUDE LAWS

Applicable to: MSN 2037-2528

The system applies an abnormal-attitude law in pitch and roll, if the aircraft exceeds any of these limits in flight:

- Pitch attitude > 50 ° nose up or 30 ° nose down
- Bank angle > 125 °
- Angle of attack > 30 ° or < -10 ° (-15 ° for A319 and A321)
- Speed > 440 kt or < 60 kt
- Mach > 0.91 or < 0.1

The law in pitch is the alternate law with no protection, except load-factor protection, and without autotrim. In roll, it is a full-authority direct law with a yaw mechanical.

When the aircraft has recovered from its abnormal attitude, the flight control laws in effect are:

- In pitch: Alternate law without protection, with autotrim.
- In roll: Full authority direct law, with yaw alternate law.

There is no reversion to direct law, when the pilot extends the landing gear.

ABNORMAL ATTITUDE LAWS

Applicable to: MSN 2538-5319

The system applies an abnormal-attitude law in pitch and roll, if the aircraft exceeds any of these limits in flight:

- Pitch attitude > 50 ° nose up or 30 ° nose down
- Bank angle > 125 °
- Angle of attack > 30 ° or < -10 ° for the A320 (-15 ° for the A318, A319 and A321)
- Speed > 440 kt or < 70 to 90 kt (depending on the aircraft pitch attitude)
- Mach > 0.91

The law in pitch is the alternate law with no protection, except load-factor protection, and without autotrim. In roll, it is a full-authority direct law with a yaw mechanical.

When the aircraft has recovered from its abnormal attitude, the flight control laws in effect are:

- In pitch: Alternate law without protection, with autotrim.
- In roll: Full authority direct law, with yaw alternate law.

There is no reversion to direct law, when the pilot extends the landing gear.

MECHANICAL BACK-UP

Applicable to: ALL

PITCH

Mechanical backup enables the pilot to control the aircraft during a temporary complete loss of electrical power.

He does this in pitch by manually applying trim to the THS.

The PFDs display “MAN PITCH TRIM ONLY” in red.

LATERAL

The pilot uses the rudder pedals as the mechanical backup to laterally control the aircraft .



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-27 – FLIGHT CONTROLS

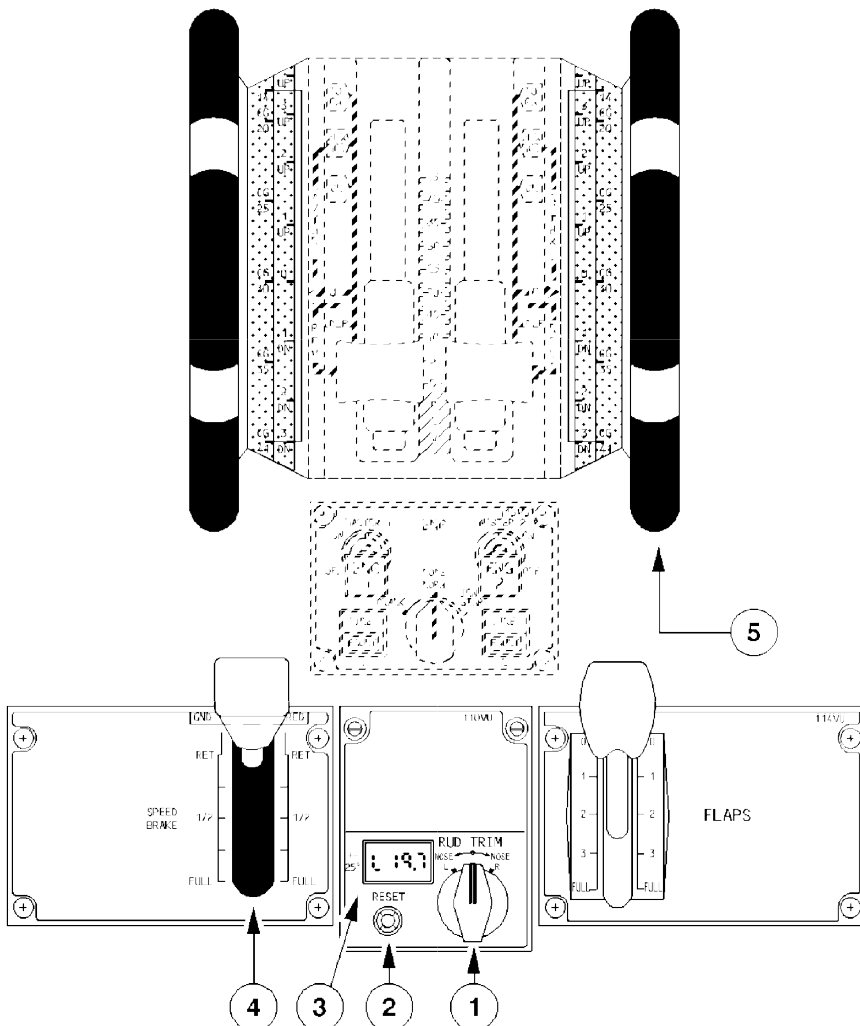
DSC-27-20 – Flight Control System

DSC-27-20-20 – Reconfiguration Control Laws

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PEDESTAL

Applicable to: A320



Continued on the next page

(1) RUD TRIM Rotary Switch

Controls the rudder trim actuator, which moves the neutral point of the artificial feel by the equivalent of one degree of rudder travel per second.

Note: The rudder trim rotary selector has no effect, when the autopilot is engaged.

(2) RESET Pushbutton

By pushing the RESET pushbutton, the zero trim position is ordered at 1.5 °/s.

After the reset, an indication of up to 0.3° (L or R) may be observed in the rudder trim position indication.

Note: The RESET pb is not active, when the autopilot is engaged.

(3) Position Indicator

Displays the rudder trim direction (L or R) and value (0 to 20 °).

(4) SPEEDBRAKE Lever

The lever controls:

- The position of the speedbrake surfaces.

To set speedbrake surfaces to a required position, the lever has to be pushed down and set to the required position. A “hardpoint” is provided at “½” SPEEDBRAKE position.

- The manual preselection of the ground spoilers.

To arm the ground spoilers, the lever must be pulled up when in the RET position.

When the lever is armed (or reverse thrust is selected), all spoiler's surfaces will automatically extend at landing, or in case of a rejected takeoff.

(5) PITCH TRIM Wheel

Both pitch trim wheels provide mechanical control of the THS and have priority over electrical control. A pilot action on the pitch trim wheel disconnects the autopilot.

Note: Crew action on the pitch trim wheel does not disconnect the ELACs (micro-switches, actuated by the override mechanism, ensure that the computers remain synchronized with the manually-selected position).

The THS is manually-controlled on ground for the THS setting, before takeoff and in flight, when in direct law.

- Before takeoff, the pilot sets the THS to the angular value, determined as a function of the aircraft CG, using the CG scale on the wheel. The relationship between the aircraft CG and the THS setting shown on the trim wheel is only applicable for takeoff. The limits of the THS normal setting range for takeoff are indicated by a green band on the pitch trim wheel.

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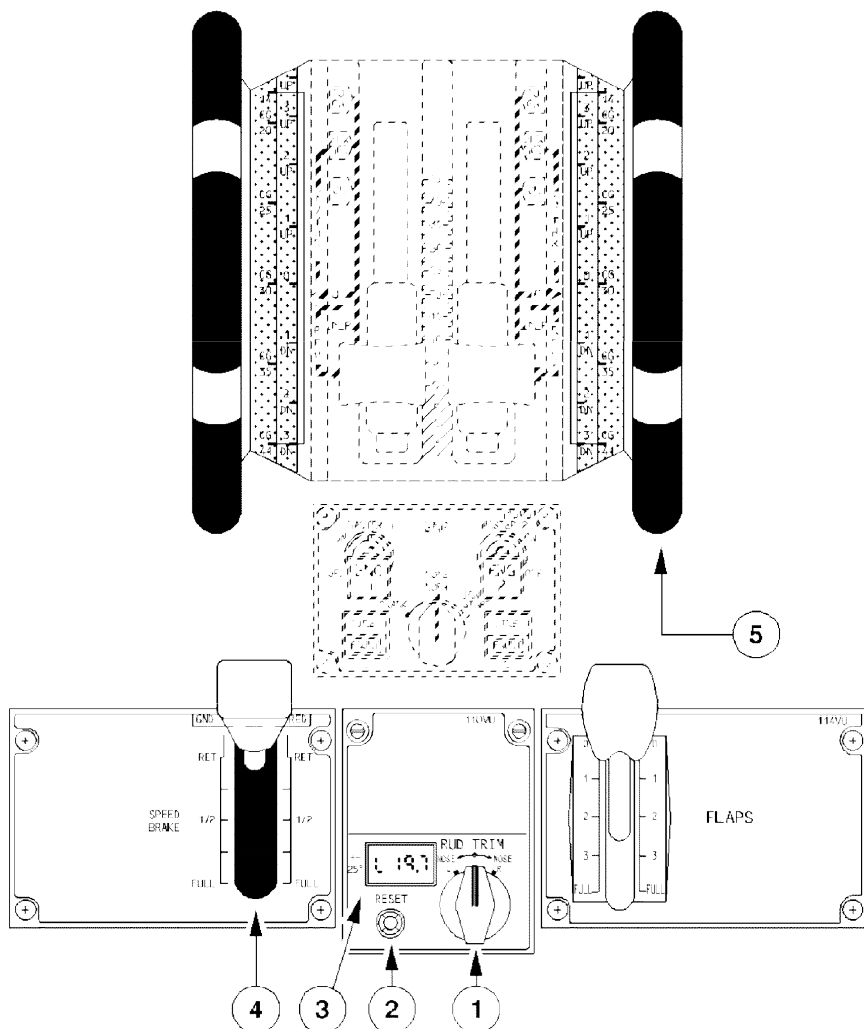
- In flight, when in direct law, the pilot uses the THS conventionally to fly in trim. In flight, the aircraft pitch trim setting depends on aircraft CG, weight, altitude and speed. Consequently, the relation between the aircraft CG, and the THS setting displayed on the pitch trim wheel, does not apply in flight.

Following nosewheel touchdown, as the pitch attitude becomes less than 2.5 ° for more than 5 s, pitch trim is automatically reset to zero.

Note: This function is inoperative, when the green or yellow hydraulic system is not pressurized.

PEDESTAL

Applicable to: A319



Continued on the next page

(1) RUD TRIM rotary selector

Controls the rudder trim actuator, which moves the neutral point of the artificial feel by the equivalent of one degree of rudder travel per second.

Note: The rudder trim rotary selector has no effect, when the autopilot is engaged.

(2) RESET pb

By pushing the RESET pb, the zero trim position is ordered at 1.5 °/s.

After the reset, an indication of up to 0.3° (L or R) may be observed in the rudder trim position indication.

Note: The RESET pb is not active, when the autopilot is engaged.

(3) Position Indicator

Displays the rudder trim direction (L or R) and value (0 to 25 °).

(4) SPEEDBRAKE lever

The lever controls:

- The position of the speedbrake surfaces.

To set speedbrake surfaces to a required position, the lever has to be pushed down and set to the required position. A “hardpoint” is provided at “½” SPEEDBRAKE position.

- The manual preselection of the ground spoilers.

To arm the ground spoilers, the lever must be pulled up when in the RET position.

When the lever is armed (or reverse thrust is selected), all spoiler's surfaces will automatically extend at landing, or in case of a rejected takeoff.

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Continued on the next page

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Following nosewheel touchdown, as the pitch attitude becomes less than 2.5 ° for more than 5 s, pitch trim is automatically reset to zero.

Note: This function is inoperative, when the green or yellow hydraulic system is not pressurized.

LATERAL CONSOLES

Applicable to: ALL

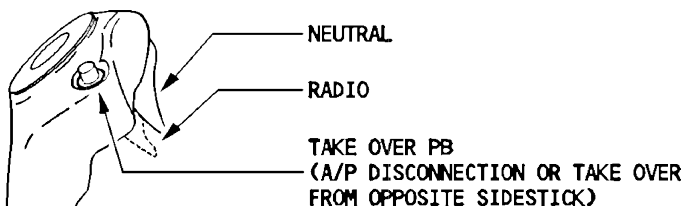
SIDESTICKS

Each pilot has on his lateral console a sidestick he can use to control pitch and roll manually. Each sidestick is springloaded to neutral.

When the autopilot is engaged, a solenoid-operated detent locks both sidesticks in the neutral position. If the pilot applies a force above a given threshold (5 daN in pitch, 3.5 daN in roll) the stick becomes free and the autopilot disengages.

The hand grip has two switches:

- Autopilot disconnect and sidestick takeover pushbutton.
- Push-to-talk button.



Sidestick priority logic

- When only one pilot operates the sidestick, it sends his control signals to the computers.
- When the pilots move both side stick simultaneously in the same or opposite direction and neither takes priority, the system adds the signals of both pilots algebraically. The total is limited to the signal that would result from the maximum deflection of a single sidestick.

Note: In the event of simultaneous input on both sidesticks (2 ° deflection off the neutral position in any direction) the two green SIDE STICK PRIORITY lights on the glareshield come on and “DUAL INPUT” voice message is activated.

Continued on the next page

A pilot can deactivate the other stick and take full control by pressing and keeping pressed his priority takeover pushbutton.

For latching the priority condition, it is recommended to press the takeover push button for more than 40 s.

This allows the pilot to release his takeover push button without losing priority.

However, a pilot can at any time reactivate a deactivated stick by momentarily pressing the takeover push button on either stick.

If both pilots press their takeover pushbuttons, the pilot that presses last gets priority.

Note: If an autopilot is engaged, any action on a takeover pushbutton disengages it.

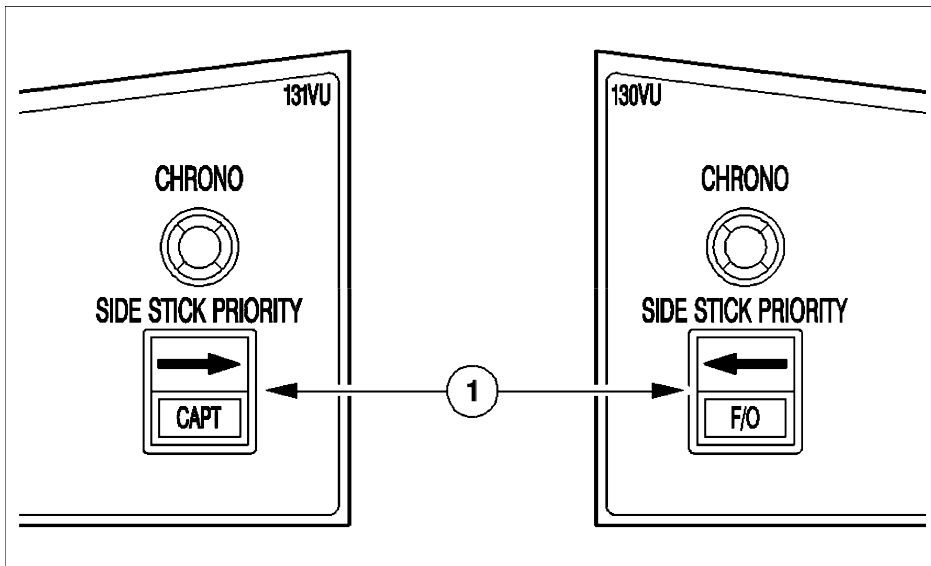
In a priority situation

- A red light comes on in front of the pilot whose stick is deactivated.
- A green light comes on in front of the pilot who has taken control, if the other stick is not in the neutral position (to indicate a potential and unwanted control demand).

Note: If the aircraft is on the ground and commencing its takeoff run and one stick is deactivated, this triggers the takeoff “CONFIG” warning.

GLARESHIELD

Applicable to: ALL



(1) SIDE STICK PRIORITY It

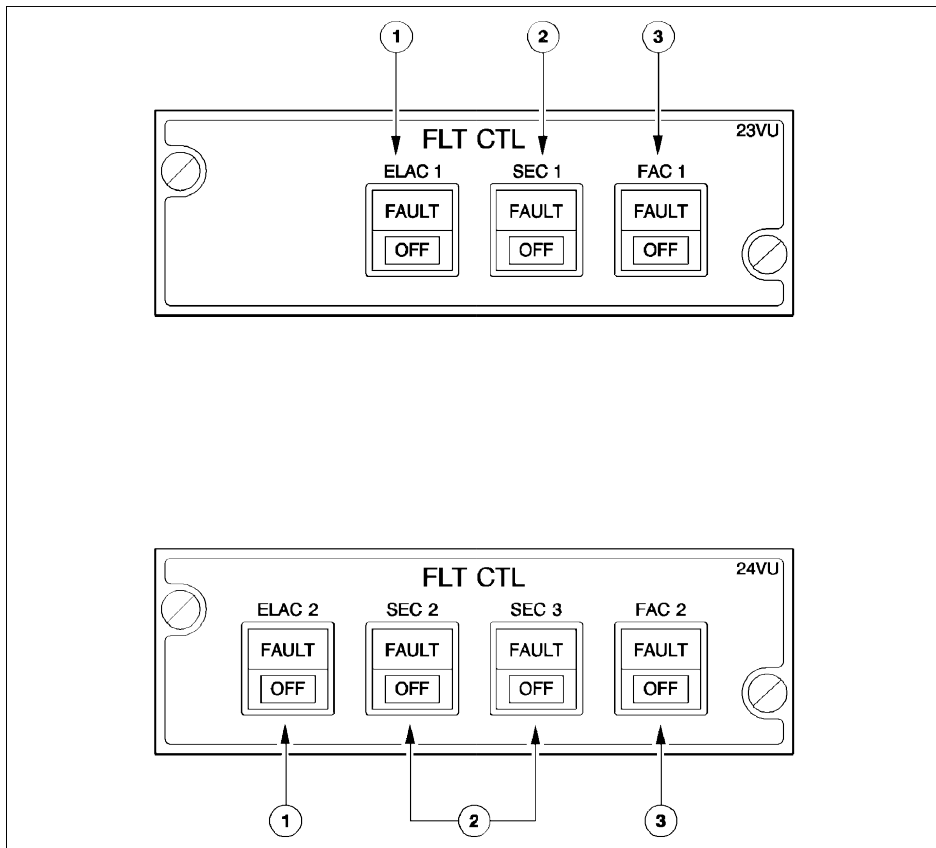
- Red arrow light :
- comes on in front of the pilot losing authority.
 - goes out if he has recovered his authority
 - if the other pilot releases his TAKEOVER pushbutton prior the priority condition is latched.
 - or
 - If he has used his takeover push button to cancel a latched priority situation.
- Sidestick priority audio : A “PRIORITY LEFT” or “PRIORITY RIGHT” audio voice message is given each time priority is taken.

Green CAPT and F/O lights :

- Both lights flash when the pilots move both sidesticks simultaneously and neither takes priority.
- When a pilot has taken priority by pressing the takeover pushbutton and the other pilot's sidestick is not at neutral, the light in front of the pilot with priority lights up. It goes out when the other pilot returns his stick to the neutral position.

OVERHEAD PANEL

Applicable to: ALL



- (1) ELAC 1(2) pushbutton
Controls the Elevator and Aileron Control (ELAC) Computer 1(2).

Continued on the next page

ON : ELAC 1(2) performs the following functions:

- Normal pitch and roll
- Alternate pitch
- Direct pitch and roll
- Abnormal attitude
- Aileron droop
- Acquisition of autopilot orders.

OFF : The corresponding computer is not active. Switching it OFF, then ON, resets the computer.

FAULT : Comes on amber, along with an ECAM caution:

- When a failure is detected
- During ELAC power-up test (eight seconds).

Note: The ELAC power-up test occurs when electrical power is turned on, or after the occurrence of an electrical transient lasting longer than 25 ms.

The FAULT light goes off, when the pilot selects OFF, or at the end of the ELAC power-up test, if its results are satisfactory.

(2) SEC 1(2)(3) pushbutton

Controls the spoiler and elevator (SEC) computers 1(2)(3).

ON : SEC 1(2)(3) performs the following functions:

- Normal roll (by controlling the spoilers)
- Speedbrakes and ground spoilers
- Alternate pitch (SEC 1 and SEC 2 only)
- Direct pitch (SEC 1 and SEC 2 only)
- Direct roll
- Abnormal attitude.

OFF : The corresponding computer is not active. Switching it OFF, then on, resets the computer.

FAULT : Comes on amber, along with an ECAM caution, when a failure is detected.

The FAULT light goes off, when the pilot selects OFF.

(3) FAC 1(2) pb sw

Controls the flight augmentation computer (FAC) 1(2).

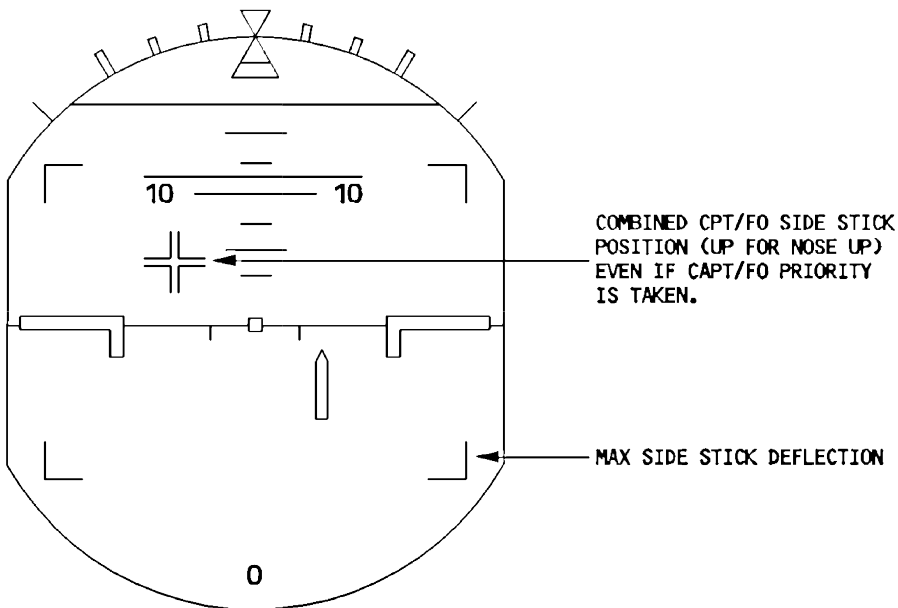
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- ON** : Both FACs perform the following functions:
- Normal roll (coordinating turns and damping dutch roll)
 - Rudder trim
 - Rudder travel limit
 - Alternate yaw
- OFF** : The corresponding computer is not active. Switching it OFF and then ON resets the computer.
- FAULT** : Lights up in amber, along with a caution on ECAM, when a failure is detected. The FAULT light goes out when the pilot selects OFF.

SIDE STICK INDICATIONS ON PFD

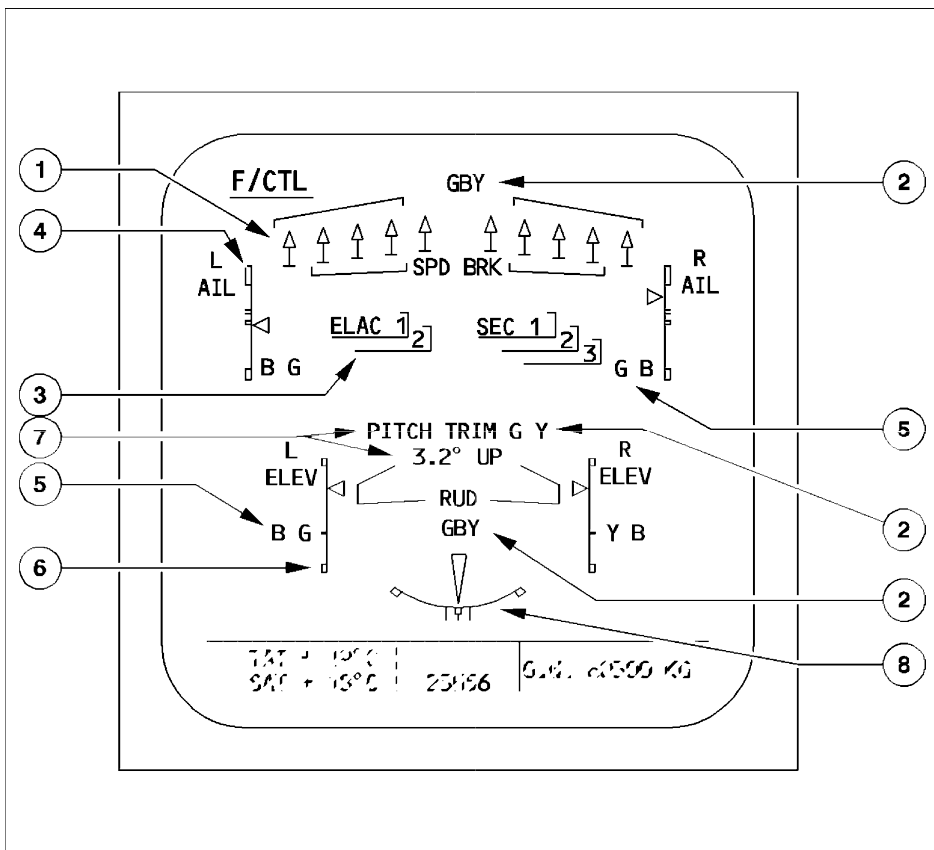
Applicable to: ALL

On the ground, after the first engine start, sidestick position indications appear white on both PFDs. The indications disappear when the aircraft goes from the ground into flight.



ECAM F/CTL PAGE

Applicable to: MSN 2037-2402



(1) Spoilers/Speedbrakes' Indication

	: SPOILER DEFLECTED BY MORE THAN 2.5° (GREEN)
	: SPOILER RETRACTED (GREEN)
	: SPOILER FAULT DEFLECTED (AMBER)
	: SPOILER FAULT RETRACTED (AMBER)

Continued on the next page

(2) Hydraulic System Pressure Indication

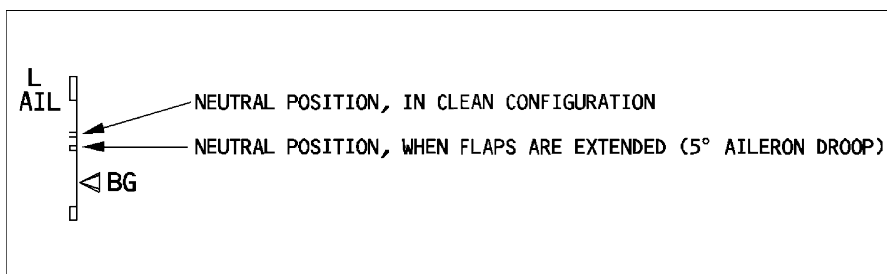
It is normally green. It becomes amber, if the hydraulic system's pressure decreases.

(3) ELAC/SEC Indication

- ELAC and SEC labels are always displayed in white
- The computer number is normally in green, and boxed in grey.
The number and box become amber, if the computer fails, or is switched OFF.

(4) Aileron position indication

It is indicated with a white scale and green index. It changes to amber, when neither (green nor blue) servojack is available.



(5) Aileron and elevator actuator indication

“G” and “B” are normally displayed in green.

They become amber, in the case of a green or blue hydraulic system low pressure. The partial box also becomes amber, if the associated computer or actuator fails.

(6) Elevator position indication

It is indicated with a white scale and green index. The index becomes amber, when both associated actuators are not available.

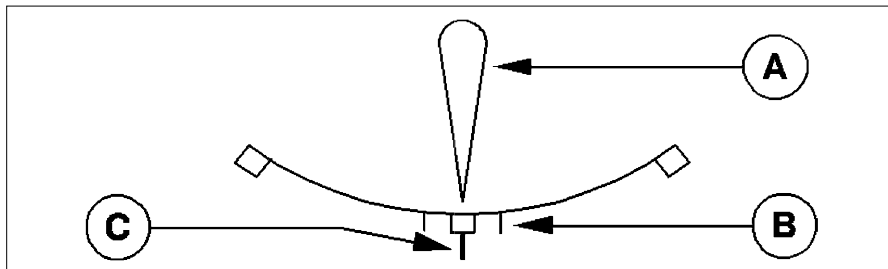
(7) Pitch trim position indication

The pitch trim numbers are in green. They become amber, if green and yellow hydraulic system pressure decreases.

The “PITCH TRIM” legend is in white. It becomes amber, if the pitch trim jams.

Continued on the next page

(8) Yaw control indications



(A) Rudder position indication

It is normally in green. The rudder symbol becomes amber, if the blue, green, and yellow hydraulic pressures are low.

(B) Rudder travel limiter

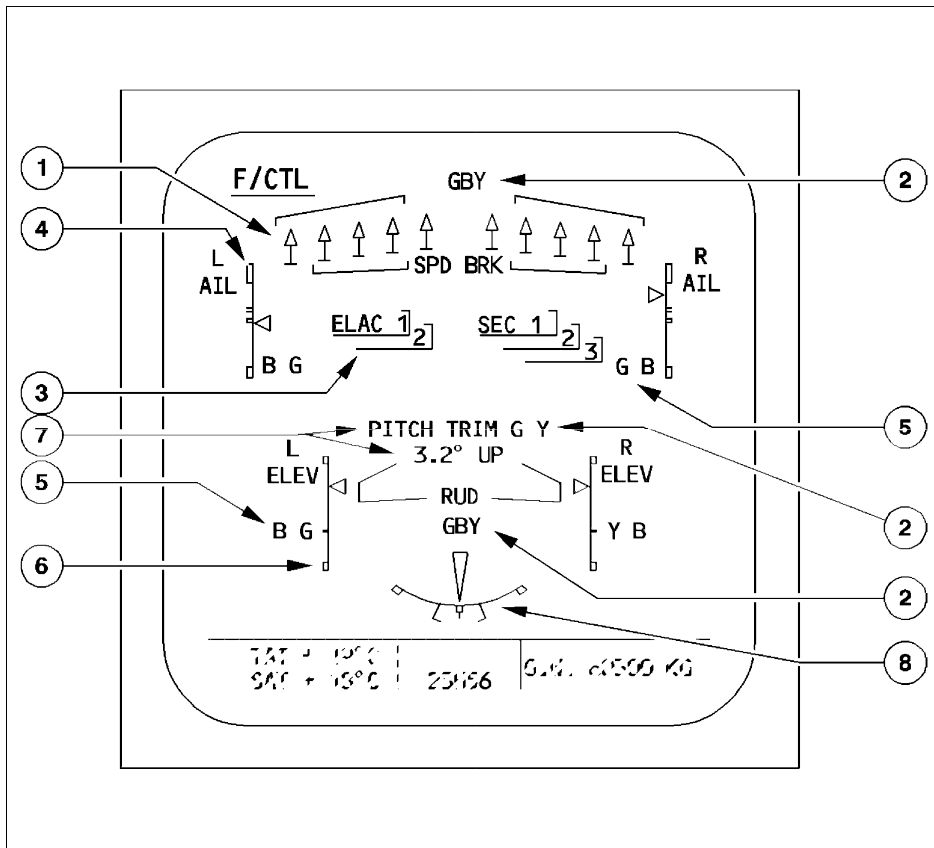
It is normally in green. It becomes amber when travel limiter 1 and 2 are faulty. Two TLU messages are displayed in amber when the TLU indexes are suppressed.

(C) Rudder trim position

It is normally in blue. It becomes amber, if the rudder trim reset fails.

ECAM F/CTL PAGE

Applicable to: MSN 2412-5319



(1) Spoilers/Speedbrakes' Indication

	: SPOILER DEFLECTED BY MORE THAN 2.5° (GREEN)
	: SPOILER RETRACTED (GREEN)
	: SPOILER FAULT DEFLECTED (AMBER)
	: SPOILER FAULT RETRACTED (AMBER)

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(2) Hydraulic System Pressure Indication

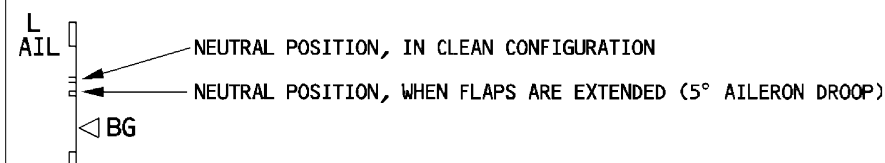
It is normally green. It becomes amber, if the hydraulic system's pressure decreases.

(3) ELAC/SEC Indication

- ELAC and SEC labels are always displayed in white
- The computer number is normally in green, and boxed in grey.
The number and box become amber, if the computer fails, or is switched OFF.

(4) Aileron position indication

It is indicated with a white scale and green index. It changes to amber, when neither (green nor blue) servojack is available.



(5) Aileron and elevator actuator indication

“G” and “B” are normally displayed in green.

They become amber, in the case of a green or blue hydraulic system low pressure. The partial box also becomes amber, if the associated computer or actuator fails.

(6) Elevator position indication

It is indicated with a white scale and green index. The index becomes amber, when both associated actuators are not available.

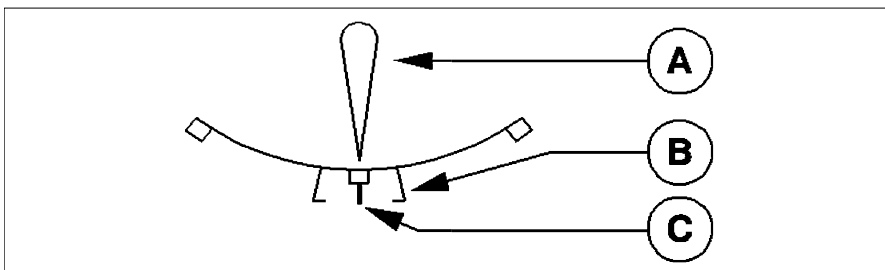
(7) Pitch trim position indication

The pitch trim numbers are in green. They become amber, if green and yellow hydraulic system pressure decreases.

The “PITCH TRIM” legend is in white. It becomes amber, if the pitch trim jams.

Continued on the next page

(8) Yaw control indications



(A) Rudder position indication

It is normally in green. The rudder symbol becomes amber, if the blue, green, and yellow hydraulic pressures are low.

(B) Rudder travel limiter

It is normally in green. It becomes amber when travel limiter 1 and 2 are faulty.

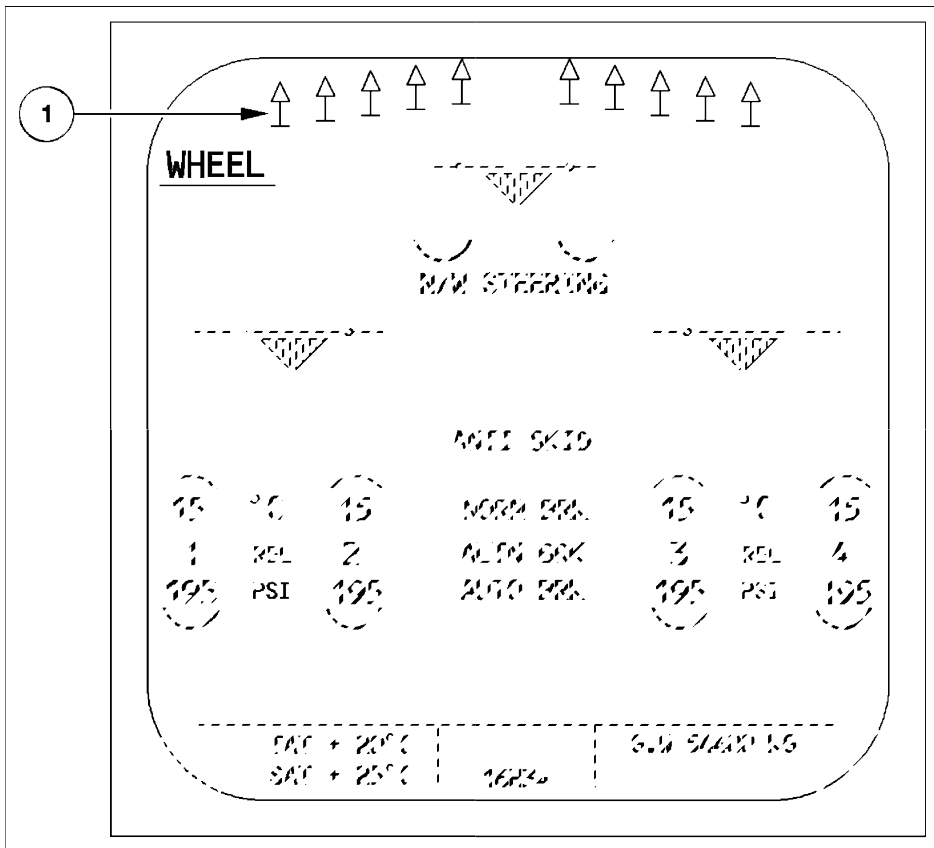
Two TLU messages are displayed in amber when the TLU indexes are suppressed.

(C) Rudder trim position

It is normally in blue. It becomes amber, if the rudder trim reset fails.

ECAM WHEEL PAGE

Applicable to: ALL

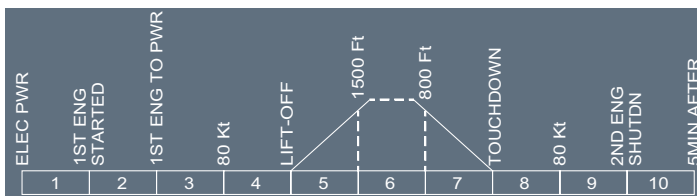


(1) Spoilers/Speedbrakes' Indication

These indications are identical to those displayed on the FLT CTL page.

WARNINGS AND CAUTIONS

Applicable to: ALL



EWD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CONFIG SLATS/FLAPS NOT IN T.O CONFIG, or CONFIG SPD BRK NOT RETRACTED, or CONFIG PITCH TRIM NOT IN TO RANGE, or CONFIG RUD TRIM NOT IN T.O RANGE A/C not in TO configuration when thrust levers are set at TO, or Flex TO, or when pressing TO CONFIG. pb.	CRC	MASTER WARN	NIL	NIL	5, 6, 7, 8
			F/CTL		
			NIL	Red ⁽¹⁾ SIDESTICK PRIORITY It	
L + R ELEV FAULT Loss of both elevators.	SINGLE CHIME	MASTER CAUT	F/CTL	PFD message	NIL
L (R) SIDESTICK FAULT Transducers, on pitch or roll axis, are failed on one sidestick.				NIL	
ELAC 1 (2) FAULT Failure of ELAC				FAULT It on ELAC pb	3, 4, 5, 7, 8
ELAC 1 (2) FAULT One sidestick transducer fault.				NIL	

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB	
SEC 1 (2) (3) FAULT Failure of one SEC.	SINGLE CHIME	MASTER CAUT	F/CTL	FAULT It on SEC pb	3, 4, 5	
FCDC 1 + 2 FAULT Failure of both FCDCs.				NIL	4, 5, 7	
DIRECT LAW Direct laws are active.				PFD message	4, 5, 7, 8	
ALTN LAW Alternate laws are active.			NIL			
DUAL INPUT Both sidesticks are moved simultaneously.	Synthetic voice repeated every 5 s	NIL	NIL	SIDESTICK Priority light	NIL	
GND SPLR FAULT Loss of ground spoiler function in SEC 1 + 3 or 1 + 2 or 2 + 3 or 1 + 2 + 3.	SINGLE CHIME	MASTER CAUTION	F/CTL	NIL	3, 4, 5	
SPD BRK DISAGREE Position disagree between surfaces and lever position.						
SPD BRK FAULT Speedbrake lever transducers to SEC 1 and 3 failed.						
SPD BRK STILL OUT Speedbrake out with at least one engine not at idle.			NIL		1, 2, 3, 4, 5, 8, 9, 10	
STABILIZER JAM Loss of the electrical control of the stabilizer (with or without jamming of the stabilizer)			F/CTL		4, 5	
L (R) ELEV FAULT Loss of both servojacks on one elevator, or activation of elevator flutter protection in ELAC.						
L (R) AIL FAULT Loss of both servojacks on one aileron.						

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
SPLR FAULT Loss of one or more spoilers.	SINGLE CHIME	MASTER CAUTION	F/CTL	NIL	3, 4, 5, 7
ELAC 1 PITCH FAULT Failure of pitch channel in ELAC 1.	NIL	NIL			3, 4, 5, 7, 8
ELAC 2 PITCH FAULT Failure of pitch channel in ELAC 2, or loss of one or both ELAC 2 rudder pedal transducers.					
GND SPLR 1 + 2 (3 + 4) Ground spoiler channel failed in SEC 3 (1).					
ELEV SERVO FAULT Loss of one servojack on one elevator.					
SPD BRK 2 (3 + 4) FAULT Speedbrake lever transducers to SEC 3 (1) failed.					
AIL SERVO FAULT Loss of one servojack on one aileron, or loss of one or both ELAC 1 rudder pedal transducers.					
FCDC 1 (2) FAULT					
SIDESTICK PRIORITY Failure in a sidestick priority logic circuit.			NIL		3, 4, 5, 6, 7, 8, 9

(1) The red **SIDESTICK PRIORITY** light comes on, as soon as the sidestick becomes inoperative.

MEMO DISPLAY

- The “SPEED BRK” memo display logic:
 - When the speedbrakes are extended in Flight Phases 2, 3, 4, and 5, the “SPEED BRK” memo flashes in amber.
 - When the speedbrakes are extended in Flight Phases 6 and 7, the “SPEED BRK” memo appears in green. It flashes in amber, after 50 s, if at least one engine is above idle.
- The “GND SPLRS ARMED” message appears in green, when the ground spoilers are armed.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-27 – FLIGHT CONTROLS

DSC-27-20 – Flight Control System

DSC-27-20-40 – Warnings and Cautions

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BUS EQUIPMENT LIST

Applicable to: ALL

			NORM		EMER ELEC		
			AC	DC	AC ESS	DC ESS	HOT
COMPUTERS	MAIN FLT CTL	ELAC 1				X	HOT 1 (1)
		ELAC 2		DC2			HOT 2 (1)
		SEC 1				X	HOT 1 (1)
		SEC 2		DC2			
		SEC 3		DC2			
		FAC 1			X	SHED	
		FAC 2	AC2	DC2			
		FCDC 1				SHED	
		FCDC 2		DC2			
PITCH TRIM		MOTOR 1		DC2			HOT 2 (1)
		MOTOR 2				X	
		MOTOR 3		DC2			
RUDDER TRIM		MOTOR 1				X	
		MOTOR 2		DC2			
		INDIC		DC2			
RUDDER TRAVEL LIMIT		MOTOR 1				X	
		MOTOR 2		DC2			

(1) standby supply



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-27 – FLIGHT CONTROLS

DSC-27-20 – Flight Control System

DSC-27-20-50 – Electrical Supply

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GENERAL

Applicable to: ALL

Each wing has the following lift augmentation devices :

- Two flap surfaces.
- Five slat surfaces.

These surfaces are electrically controlled and hydraulically operated.

The pilot extends slats and flaps by moving the FLAPS lever on the center pedestal.

It has five positions.

MAIN COMPONENTS

Applicable to: ALL

The slat and flap systems are similar, comprising :

- Two slat flap control computers (SFCCs), each containing one slat channel and one flap channel.
- A power control unit (PCU) consisting of two independent hydraulic motors coupled by a differential gearbox.

The motors use green and blue hydraulic power for the slats and yellow and green power for the flaps.

Pressure-off brakes (POBs) lock the transmission when the slat or flap surfaces have reached the selected position or if hydraulic power fails.

- Five slat surfaces and two flap surfaces per wing.
- An assymetry position pick-off unit (APPU) that measures the assymetry between the left and right wings.
- A flap disconnect detection system, which detects attachment failure and inhibits flap operation in order to prevent further damage. A sensor detects the failure by measuring excessive differential movement between the inner and the outer flaps.
- Wingtip brakes (WTBs), activated in case of assymetry, mechanism overspeed, symmetrical runaway, or uncommanded movement of the surfaces. They cannot be released in flight. They use blue and green hydraulic power for the slats and for the right wing flaps, and blue and yellow hydraulic power for the left wing flaps.
- Feedback position pick-off units (FPPUs) that feed back position information to the SFCCs.
- An instrumentation position pick-off unit (IPPU) that sends position data to the ECAM.

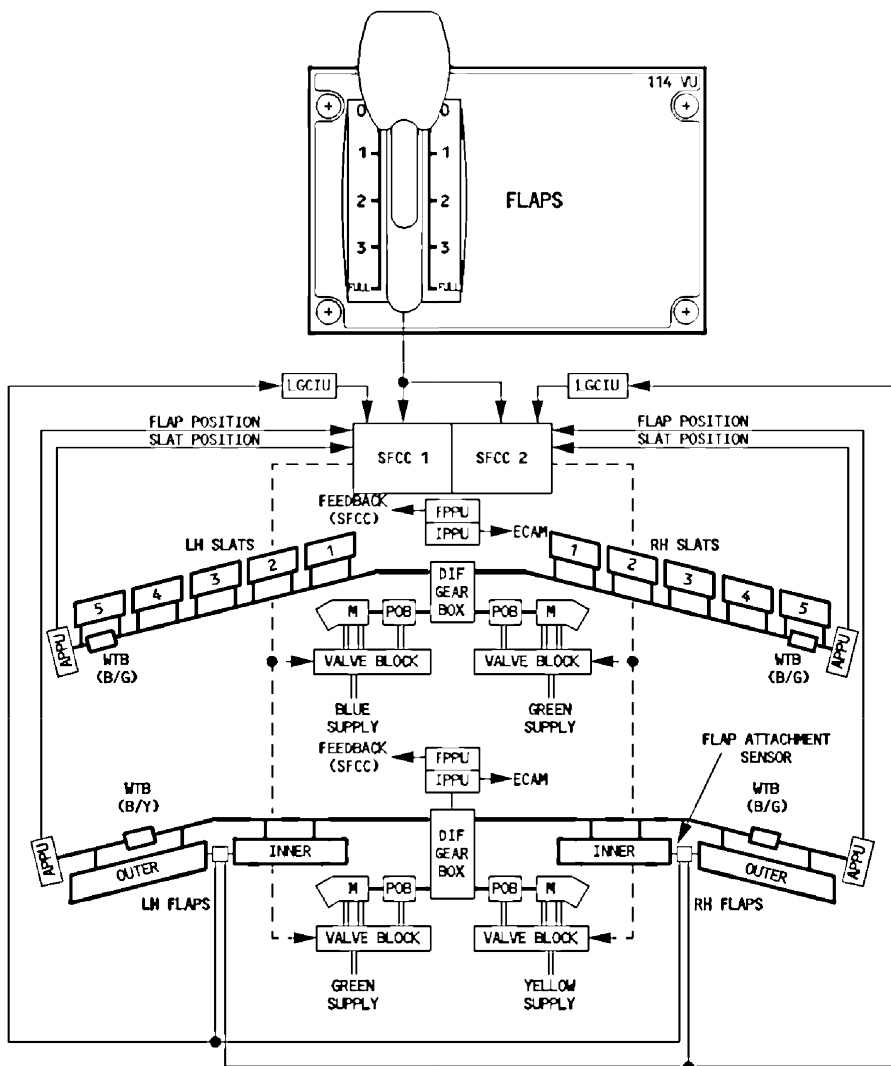
Note: If the flap wingtip brakes are on, the pilot can still operate the slats, and if the slat wingtip brakes are on, he can still operate the flaps.

If one SFCC is inoperative, slats and flaps both operate at half speed.

If one hydraulic system is inoperative, the corresponding surfaces (slats or flaps) operate at half speed.

ARCHITECTURE

Applicable to: ALL



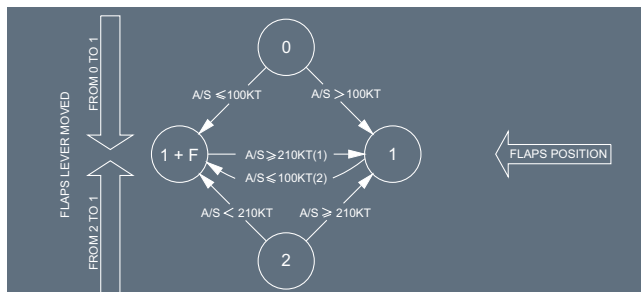
CONFIGURATIONS

Applicable to: ALL

The FLAPS lever has five positions: 0, 1, 2, 3 and FULL.

Two configurations correspond to position 1: Configuration 1 and Configuration 1 + F.

The pilot selects these as follows:



- (1) When in Configuration 1 + F, the flaps retract to 0 ° automatically at 210 kt (before the airspeed reaches VFE).
- (2) When in configuration 1, the flaps extend to 10 ° automatically at 100 kt.

ALPHA/SPEED LOCK FUNCTION (SLATS)

Applicable to: ALL

This function inhibits slat retraction at high angles-of-attack and low speeds.

The SFCCs use corrected angle-of-attack (alpha) or airspeed information from the ADIRUs to inhibit slat retraction.

If alpha exceeds 8.5 ° or the airspeed goes below 148 kt, retraction from position 1 to position 0 is inhibited.

The inhibition is removed when alpha goes below 7.6 ° and, when the speed exceeds 154 kt.

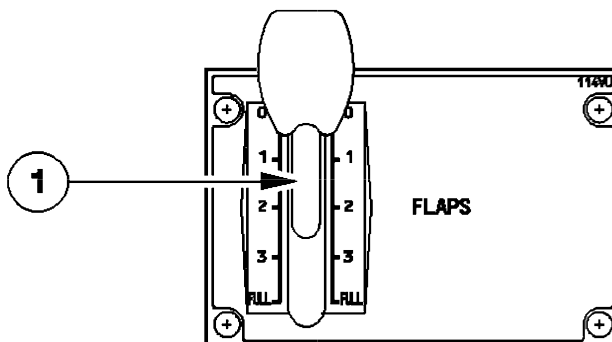
This function is not active if :

- Alpha exceeds 8.5 ° or the airspeed goes below 148 kt, after the flight crew has moved the lever to 0
- The aircraft is on the ground, and its speed is less than 60 kt.

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PEDESTAL

Applicable to: A320



The five lever positions correspond to the following surface positions :

Position	SLATS	FLAPS	Indications on ECAM			
0	0	0		TAKEOFF	CRUISE	HOLD
1	18	0	1			
		10	1 + F			
2	22	15	2		LDG	APPR
3	22	20	3			
FULL	27	35	FULL			

Before selecting any position, the pilot must pull the lever out of the detent. Balks at positions 1 and 3 prevent the pilot from calling for excessive flap/slat travel with a single action.

Note: The pilot cannot select an intermediate lever position.

Continued on the next page

TAKEOFF IN CONFIGURATION 1

1 + F (18 °/10 °) is selected. If the pilot does not select configuration 0 after takeoff, the flaps retract automatically at 210 kt.

TAKEOFF OR GO-AROUND IN CONFIGURATION 2 OR 3

If the pilot selects configuration 1, he gets 1 + F (18 °/10 °) if airspeed is under 210 kt.

If the pilot does not select configuration 0 after takeoff, the flaps retract automatically at 210 kt.

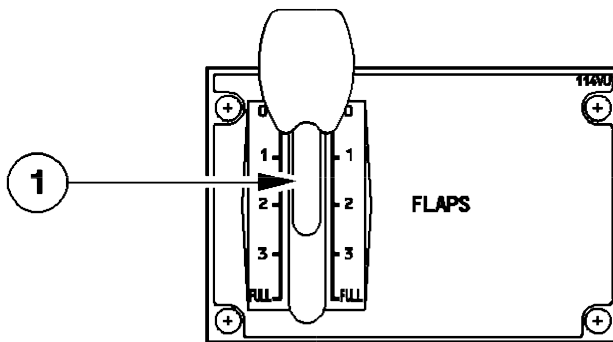
CONFIGURATION 0 TO CONFIGURATION 1 IN FLIGHT

Configuration 1 (18 °/0 °) is selected.

Note: After flap retraction, configuration 1 + F is no longer available until the airspeed is 100 kt or less, unless configuration 2, 3, or FULL has been selected previously.

PEDESTAL

Applicable to: A319



(1) FLAPS lever

The FLAPS lever selects simultaneous operation of the slats and flaps.

Continued on the next page

The five lever positions correspond to the following surface positions:

Position	SLATS	FLAPS	Indications on ECAM			
0	0	0		TAKEOFF	CRUISE	HOLD
1	18	0	1			
		10	1 + F			
2	22	15	2			APPR
3	22	20	3			
FULL	27	40	FULL		LDG	

Before selecting any position, the pilot must pull the lever out of the detent. Balks at positions 1 and 3 prevent the pilot from calling for excessive flap/slat travel with a single action.

Note: The pilot cannot select an intermediate lever position.

TAKEOFF IN CONFIGURATION 1

1 + F (18 °/10 °) is selected. If the pilot does not select configuration 0 after takeoff, the flaps retract automatically at 210 kt.

TAKEOFF OR GO-AROUND IN CONFIGURATION 2 OR 3

If the pilot selects configuration 1, he gets 1 + F (18 °/10 °) if airspeed is under 210 kt.

If the pilot does not select configuration 0 after takeoff, the flaps retract automatically at 210 kt.

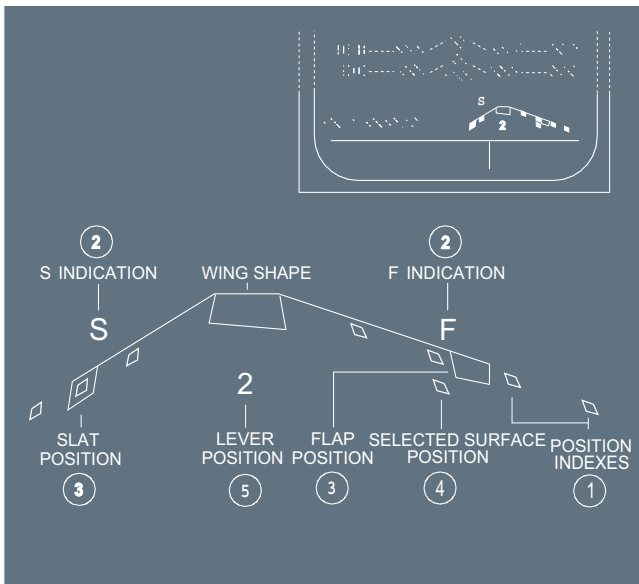
CONFIGURATION 0 TO CONFIGURATION 1 IN FLIGHT

Configuration 1 (18 °/0 °) is selected.

Note: After flap retraction, configuration 1 + F is no longer available until the airspeed is 100 kt or less, unless configuration 2, 3, or FULL has been selected previously.

ECAM UPPER DISPLAY

Applicable to: ALL



(1) Position indexes

These white points indicate that the slats and flaps are in a selectable position. They do not appear, when the aircraft is in clean configuration.

(2) F and S

“F” and “S” normally appear in white. They become amber, if:

- Both relevant hydraulic systems fail, unless the aircraft is on ground with both engines stopped.
- The wingtip brakes are on.
- There is a slats or flaps fault.

“S (F) LOCKED” legend, appears in amber, in association with an ECAM caution, when the wingtip brakes are applied, or when the system detects a non-alignment between two flaps.

The “A-LOCK” legend pulses in green, when the slat alpha/speedlock function is active.

(3) Flaps/Slats' actual position

These green boxes indicate the actual flaps/slats position.

Continued on the next page

They become amber, if:

- Both relevant hydraulic systems fail, unless the aircraft is on ground with both engines stopped.
- The wingtip brakes are on.
- There is a slats or flaps fault.

(4) Selected position

It is in blue, when the surfaces are in transit.

It disappears, when the selected position is reached.

(5) Flap lever position

The “0”, “1 + F”, “1”, “2”, “3”, or “FULL” legend appears.

- It is green, when the slats and flaps are in the selected position. “0” is not displayed, when the aircraft attains clean configuration.
- It becomes cyan, when the slats and flaps are in transit.

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WARNINGS AND CAUTIONS

Applicable to: MSN 5289-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SDPAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CONFIG SLATS (FLAPS) NOT IN TO CONFIG Slats or flaps are not in takeoff configuration, when thrust levers are set at TO or FLEX TO, or when pressing the TO CONFIG pb.	CRC	MASTER WARN	NIL	NIL	5, 6 ⁽¹⁾ , 7, 8
SLATS (FLAPS) FAULT Failure of both slat or flap channels.	SINGLE CHIME	MASTER CAUT			4, 5, 8
SLATS (FLAPS) LOCKED Slats or flaps wing tip brakes applied, or non alignment detected between 2 flaps.					
SLATS SYS 1 (2) FAULT Failure of slat channel in one SFCC.	NIL	NIL			3, 4, 5, 7, 8
FLAP SYS 1 (2) FAULT Failure of flap channel in one SFCC.					
SLAT (FLAP) TIP BRK FAULT Failure of one wing tip brake on slats or flaps, or failure of one wing tip brake solenoid on slats, or flaps.					
FLAPS ATTACH SENSOR Failure of flap attachment's failure detection sensor.					

(1) The warning is automatically recalled by pressing the TO CONFIG pb.

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SDPAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CONFIG SLATS (FLAPS) NOT IN TO CONFIG Slats or flaps are not in takeoff configuration, when thrust levers are set at TO or FLEX TO, or when pressing the TO CONFIG pb.	CRC	MASTER WARN	NIL	NIL	5, 6 ⁽¹⁾ , 7, 8
FLAP LVR NOT ZERO Flap lever is not in the zero position, and the aircraft is above 22 000 ft.					1, 2, 3, 4, 5, 7, 8, 9, 10
SLATS (FLAPS) FAULT Failure of both slat or flap channels.	SINGLE CHIME	MASTER CAUT			4, 5, 8
SLATS (FLAPS) LOCKED Slats or flaps' wing tip brakes applied, or non alignment detected between 2 flaps.					
SLATS SYS 1(2) FAULT Failure of slat channel in one SFCC.	NIL	NIL			3, 4, 5, 7, 8
FLAP SYS 1 (2) FAULT Failure of flap channel in one SFCC.					
SLAT (FLAP) TIP BRK FAULT Failure of one wing tip brake on slats or flaps, or failure of one wing tip brake solenoid on slats, or flaps.					
FLAPS ATTACH SENSOR Failure of flap attachment's failure detection sensor.					

(1) The warning is automatically recalled by pressing the TO CONFIG pb.

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BUS EQUIPMENT LIST

Applicable to: ALL

			NORM		EMER ELEC		
			AC	DC	AC ESS	DC ESS	HOT
COMPUTERS	FLAPS SLATS	SFCC 1 slats				X	
		SFCC 1 flaps				X	
		SFCC 2 slats		DC2			
		SFCC 2 flaps		DC2			

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DSC-28-10	Description	
DSC-28-10-10	General	
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DSC-28-10-20	Tanks	
	Tanks	1
DSC-28-10-30	Engine Feed	
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DSC-28-10-50	APU Feed	
	APU FEED	1
DSC-28-10-60	Fuel Recirculation System	
	Fuel Recirculation System	1
DSC-28-10-70	Refueling and Defueling	
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A319/A320

FLIGHT CREW OPERATING MANUAL

FUEL
TABLE OF CONTENTS

DSC-28-40	ELECTRICAL SUPPLY	
	BUS EQUIPMENT LIST	1

GENERAL**Applicable to: ALL**

The fuel system :

- Stores fuel in the tanks.
- Supplies fuel, in the correct quantities, to the fuel tanks during refueling.
- Supplies fuel to the engines and the Auxiliary Power Unit (APU).
- Circulates fuel to cool the Integrated Drive Generator (IDG).
- Keeps fuel in the outer wing for wing bending and flutter relief.



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-28 – FUEL

DSC-28-10 – Description

DSC-28-10-10 – General

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TANKS

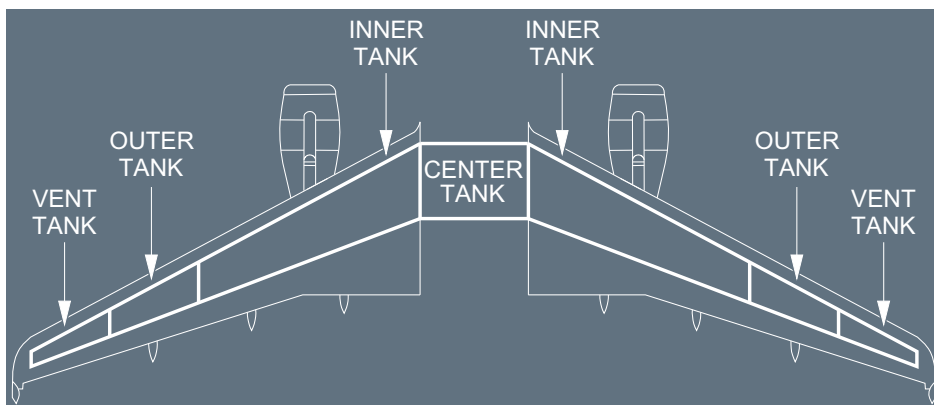
Applicable to: MSN 2037-3184

The fuel is stored in the wings, and the center section. The wings have inner and outer tanks.

There is a vent surge tank outboard of the outer tank in each wing.

When the aircraft has been refueled to maximum capacity, the fuel can expand by 2 % (20 °C temperature rise) without spilling.

There is an overpressure protector in each vent, outer and inner tank and between the center tank and the left inner tank.



USABLE FUEL					
		OUTER TANKS	INNER TANKS	CENTER TANK	TOTAL
VOLUME	(liters)	880 x 2	6 924 x 2	8 250	23 858
	(US gallons)	232 x 2	1 829 x 2	2 180	6 302
WEIGHT (1)	(KG)	691 x 2	5 435 x 2	6 476	18 728
	(LB)	1 520 x 2	11 982 x 2	14 281	41 285

(1) Fuel density : 0.785 kg/l or 6.551 lb/US Gal.

TANKS

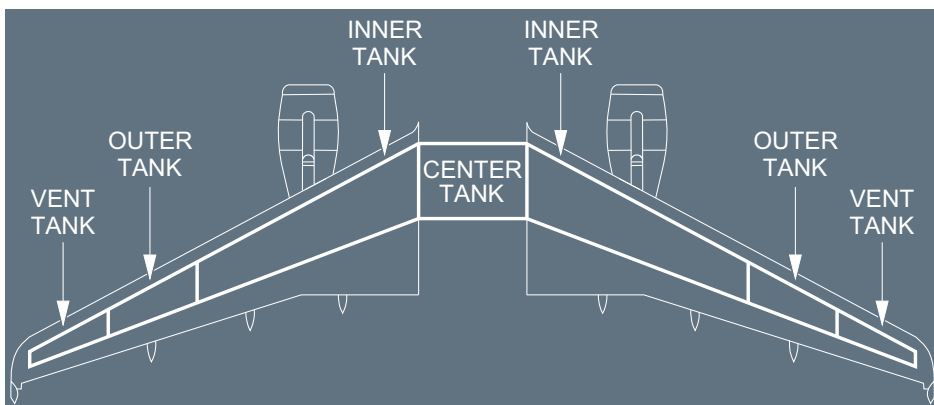
Applicable to: MSN 3411-5319

The fuel is stored in the wings, and the center section. The wings have inner and outer tanks.

There is a vent surge tank outboard of the outer tank in each wing.

When the aircraft has been refueled to maximum capacity, the fuel can expand by 2 % (20 °C temperature rise) without spilling.

There is an overpressure protector in each vent, outer and inner tank and between the center tank and the left inner tank.



USABLE FUEL					
		OUTER TANKS	INNER TANKS	CENTER TANK	TOTAL
VOLUME	(liters)	880 x 2	7 099 x 2	8 250	24 209
	(US gallons)	232 x 2	1 875 x 2	2 180	6 395
WEIGHT ⁽¹⁾	(KG)	691 x 2	5 573 x 2	6 476	19 004
	(LB)	1 520 x 2	12 286 x 2	14 281	41 893

(1) Fuel density : 0.785 kg/l or 6.551 lb/US Gal .

GENERAL

Applicable to: ALL

The main fuel pump system supplies fuel from the center tank or the inner wing tanks to the engines.
The system has six main fuel pumps.

MAIN COMPONENTS

Applicable to: ALL

TANK PUMPS

In normal operation each engine is supplied by one pump in the center tank or two pumps in its own side wing tank.

All wing tank pumps remain on throughout the flight. They are fitted with pressure relief sequence valves which ensure that, when all pumps are running, the center tank pumps will deliver fuel preferentially.

TRANSFER VALVES

Two electrical transfer valves are mounted in each wing to permit fuel transfer from outer to inner tank.

CROSS FEED VALVE

A cross feed valve controlled by a double motor allows both engines to be fed from one side or one engine to be fed from both sides.

ENGINE LP VALVES

The fuel flow to an engine can be stopped by its low pressure (LP) fuel valve, the closure of the LPLP fuel valve is by :

- the engine master switch, or
- the ENG FIRE PUSH pushbutton.

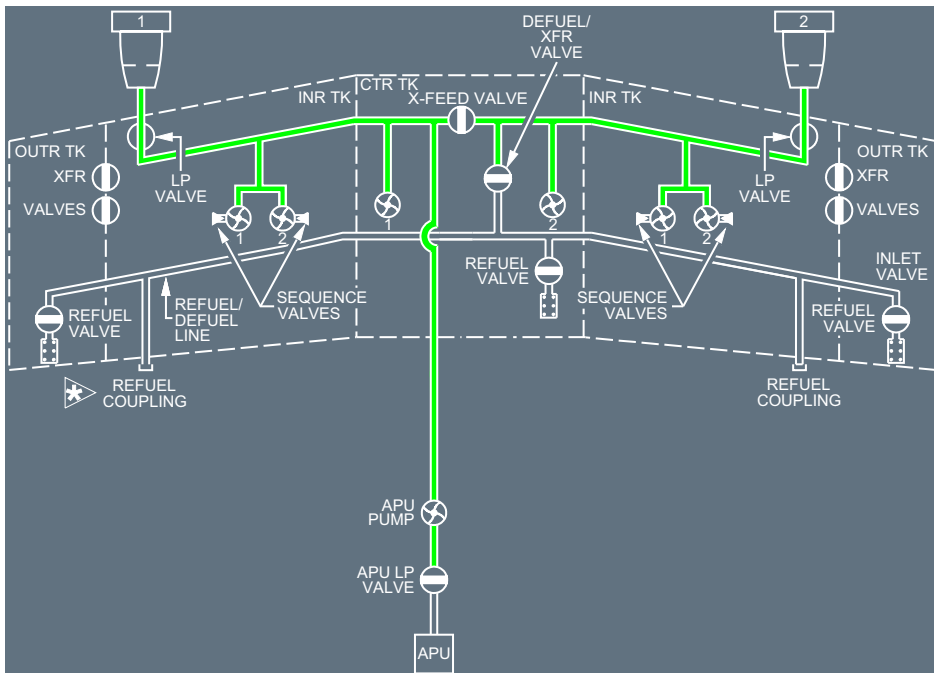
SUCTION VALVES

Closed by pumps pressure in normal operation, they allow engines to be fed by gravity if the inner tank pumps fail.

Note: *Center tank pumps are not fitted with suction valves. Therefore, gravity feeding is not possible from the center tank.*

ENGINE FEED

Applicable to: ALL



FUEL FEED SEQUENCE

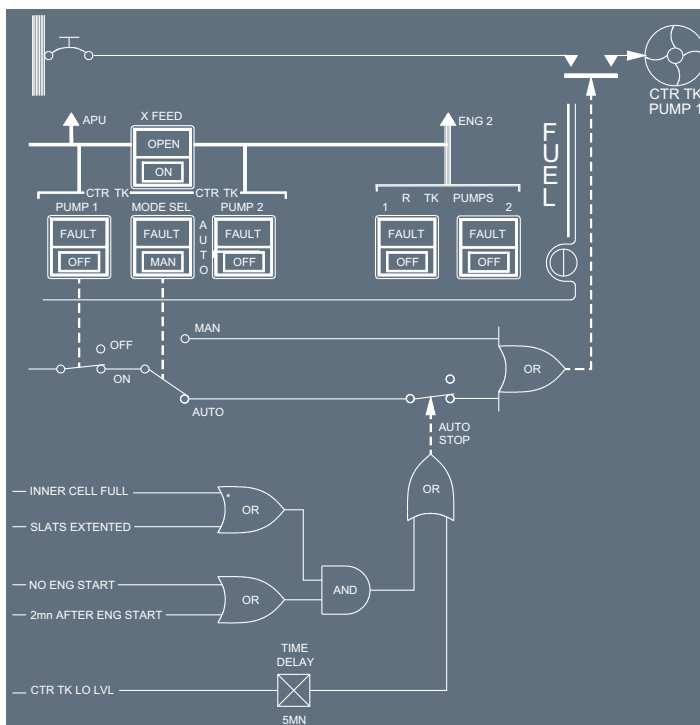
Applicable to: ALL

The tanks empty in the following sequence :

1. The center tank.
2. The inner tanks : Each inner tank empties down to 750 kg (1 650 lb).
3. The outer tanks : Fuel transfers into the inner tanks.

The center tank feeds fuel to the engines, when the center tank pumps are not stopped by the control logic described below. The inner tanks feed the engines when the center tank pumps are stopped.

CENTER TANK PUMPS CONTROL LOGIC



* Each center tank pump stops, until approximately 500 kg (1 100 lb) of the fuel in its associated inner tank fuel has been used (when the fuel level reaches the underfull sensors).

Continued on the next page

With the MODE SEL in the MAN position, the center tank pumps will run. In manual mode, the CTR TK PUMP pb-sw must be selected OFF, when the center tank is empty.

FUEL TRANSFER FROM OUTER TO INNER TANKS

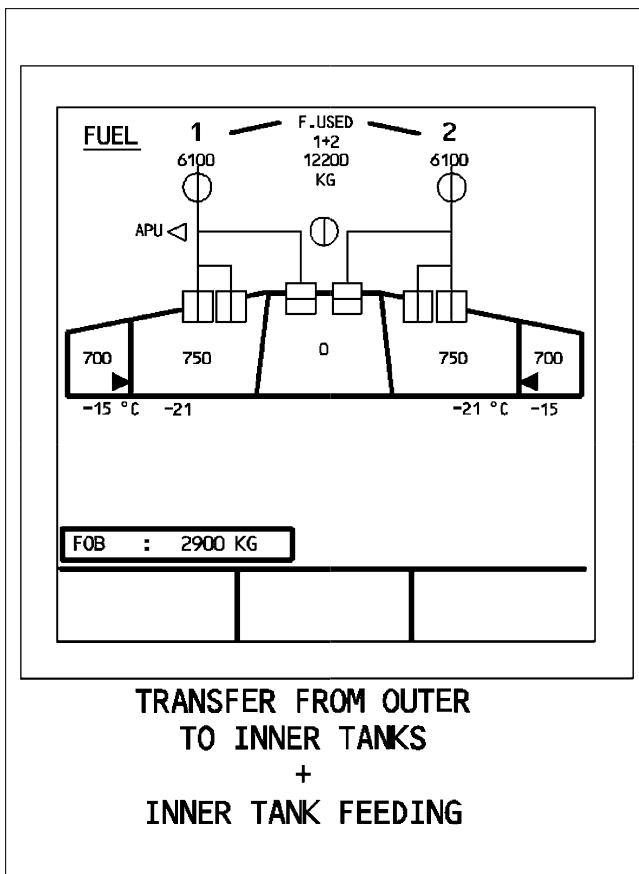
The transfer valves automatically open, when the inner tank fuel reaches the low level (about 750 kg/1 650 lb), thus enabling the fuel to drain from the outer to inner tanks.

When open, the valves are latched open. They will automatically close at the next refueling operation.

- Note:
1. *Two level sensors are installed in each inner tank. Each sensor controls two transfer valves, one in each wing, ensuring simultaneous transfer to both wings.*
 2. *The 750 kg/1 650 lb value is based on a level aircraft attitude, with no acceleration. During steep descent or accelerations/decelerations, the transfer valves may open with more than 750 kg/1 650 lb of fuel in each inner tank, and the low level warning may be triggered.*

Continued on the next page

ECAM INDICATION



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APU FEED**Applicable to: ALL**

A special fuel pump supplies fuel for APU startup when fuel feed pressure is low (due to loss of tank pumps or loss of normal AC electrical supply). This pump normally runs off the AC ESS SHED, but runs off the AC STAT INV BUS if the AC ESS SHED fails.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-28 – FUEL

DSC-28-10 – Description

DSC-28-10-50 – APU Feed

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FUEL RECIRCULATION SYSTEM

Applicable to: ALL

Refer to DSC-70-40-50 IDG Cooling System.

Some of the fuel supplied to each engine goes from the high-pressure fuel line in that engine, through the integrated drive generator (IDG) heat exchanger (where it absorbs heat), to the fuel return valve and to the outer fuel tank.

This operation ensures the IDG cooling when the oil temperature is high or when at low engine power. The FADEC controls the fuel return valve.

If the outer tank is already full, the fuel overflows to the inner tank through a spill pipe. On ground, the fuel recirculation is not inhibited if there is an overflow in the surge tanks (*Refer to DSC-70-40-50 IDG Cooling System*).

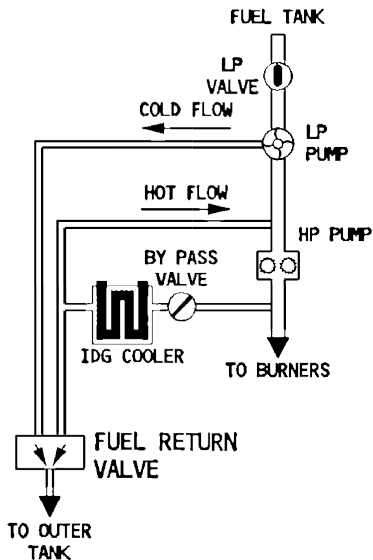
■ **If the FUEL MODE SEL pb-sw is in AUTO mode:**

If center tank is feeding, the wing tank will tend to overfill and the system automatically selects the CTR TK PUMP off when the inner tank is full. The wing tank pumps will feed until the engine have used approximately 500 kg (1 100 lb) of fuel when the fuel level reaches the underfull sensors. The logic circuits then restart the center tank pumps.

■ **If the FUEL MODE SEL pb-sw is in MAN mode:**

If center tank is feeding, the wing tanks will tend to overfill but the system does not automatically select the CTR TK PUMPS OFF when the inner tank is full. Therefore, an overflow of the wing tanks can occur on ground if the CTR TK PUMPS are not switched OFF.

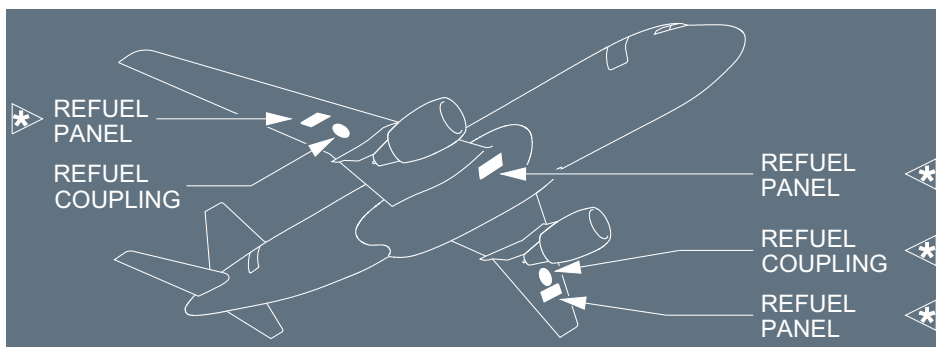
Continued on the next page



REFUELING - DEFUELING

Applicable to: ALL

- One (two) refueling point(s) is (are) installed under the wings, enabling the aircraft to be refueled from either the right or left side.
- A refuel panel is located on the fuselage side beneath the right wing, or under the right or left wing adjacent to the refuel coupling.



A gallery connects the refuel coupling to each tank's refuel valve.

Refueling is normally automatic, the required fuel load being set on the preselector.

Manual control is also available.

Automatic refueling starts with the outer cells. If the selected fuel load exceeds the wing tank capacity, the center tank is simultaneously refueled.

When an outer cell is full the fuel overflows into the inner cell through a spill pipe.

Refuel valves close automatically, when the tanks contain the preselected load, or when sensors detect a high fuel level.

The aircraft can be refueled, when only battery power is available.

The wing tanks can be refueled by gravity, through refueling points on top of the wings.

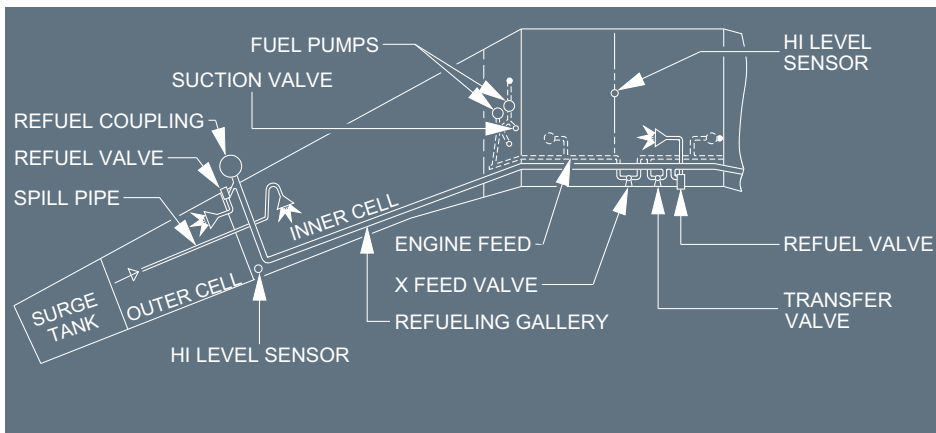
A transfer valve, between the engine feed system and the refueling gallery, allows :

- The tank pumps to transfer fuel from one tank to another.
- Defueling through the refuel coupling.

Approximate refueling time at nominal pressure is :

- 17 min for wing tanks.
- 20 min for all tanks.

Continued on the next page



FUEL QUANTITY INDICATION (FQI) SYSTEM

Applicable to: ALL

The FQI is a computerized system that :

- transmits the actual total fuel mass, as well as the quantity and temperature of fuel in the tanks, to the ECAM.
- controls automatic refueling.

Two channels perform fuel computations : channel 2 activates automatically if channel 1 fails.

The FQI system has :

- an FQI computer.
- a set of capacitance probes in each tank to measure fuel level and temperature.
- one densitometer (cadensicon) sensor in each wing inner tank permitting the calculation of the fuel quantity.
- one Capacitance Index Compensator (CIC) in each inner tank giving the dielectric constant of the fuel in case of cadensicon failure.
- a quantity indicator for each tank installed on the refuel/defuel panel.
- a preselector on the refuel/defuel panel that shows the preselected and actual total fuel quantity.

FUEL LEVEL SENSING CONTROL UNIT (FLSCU)

Applicable to: ALL

The fuel level system generates fuel-level and fuel-temperature signals in order to operate the appropriate switching functions for refueling and defueling and control the IDG cooling recirculation system and the center-tank-to-wing-tank fuel transfer system.

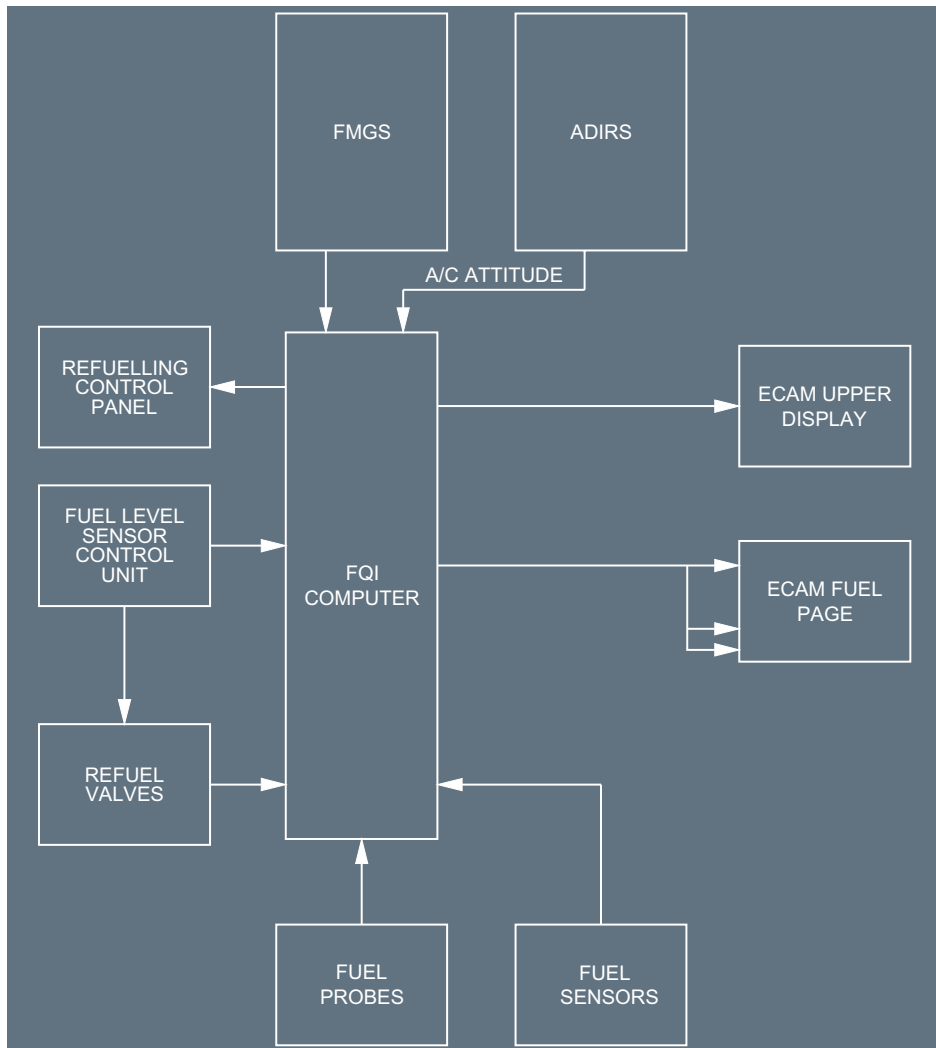
The FLSCU comprises :

- fuel level sensors in the tanks to sense high, low, and overflow levels.
- a fuel temperature sensor to control the IDG cooling recirculation.

When fuel quantity in one wing tank goes below 750 kg (1 650 lb), the low-level sensor triggers the LO LVL warning on ECAM.

FUEL SYSTEM ARCHITECTURE

Applicable to: ALL



FUEL TANK INERTING SYSTEM

Applicable to: MSN 5019-5319

The A318, A319, A320 and A321 aircraft are equipped with a Fuel Tank Inerting System.

The aim of this system is to reduce the flammability in the fuel tanks that have a high flammability exposure.

The fuel center tank is the only one that has a high flammability exposure. Therefore, the Fuel Tank Inerting System only needs to be installed for the center tank. All other tanks do not need Fuel Tank Inerting System installation.

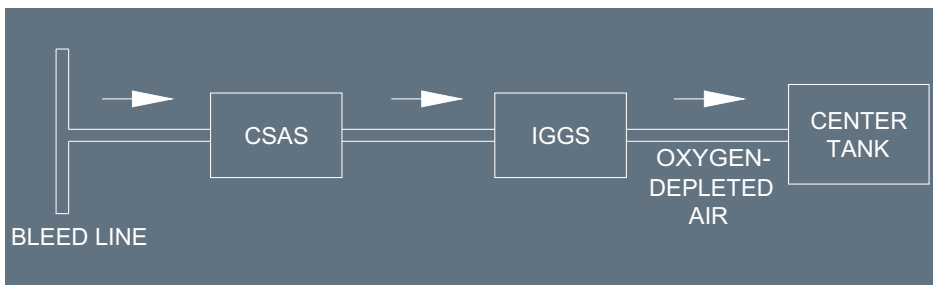
To reduce the flammability in the center tank, the Fuel Tank Inerting System produces an oxygen-depleted air that goes in the center tank to replace the ambient air.

The system is installed in the belly fairing of the aircraft, and is composed by:

- A conditioned Service Air System (CSAS)
- An Inert Gas Generation System (IGGS).

The CSAS extracts and conditions some engine bleed air to adequate pressure and temperature. Then, the air goes through the IGGS where an Air Separation Module taps the nitrogen molecules.

Therefore, an oxygen-depleted air is produced (with less than 12 % of oxygen) and replaces the ambient air of the center tank.



The Fuel Tank Inerting System does not require any flight crew action. It works independently as soon as the engines start and until they stop.



A319/A320
FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-28 – FUEL

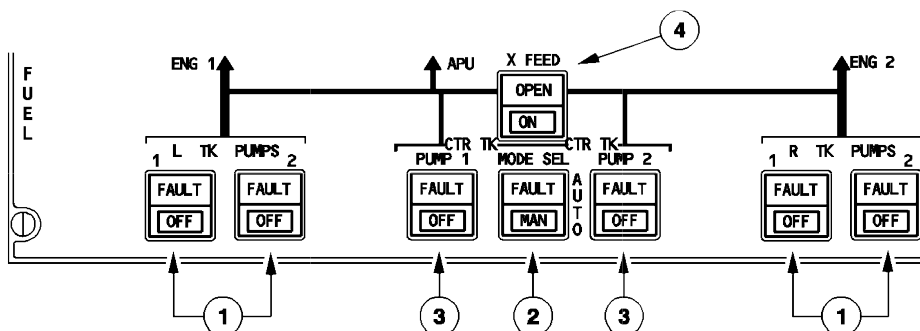
DSC-28-10 – Description

DSC-28-10-90 – Fuel Tank Inerting System

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OVERHEAD PANEL

Applicable to: ALL



(1) L (R) TK PUMPS 1 (2) pushbutton sw

On : Pump is on, but only fuel feeds, when the center tank pumps' delivery pressure drops below the threshold.

OFF : Pump is OFF, and the OFF button comes on white.

FAULT light : Amber light, and ECAM caution, comes on, when the delivery pressure drops. It does not come on when OFF is selected.

(2) MODE SEL pushbutton sw

AUTO : Control of center tank pumps is automatic.

- They run at engine start for 2 min.
- Before or after the engine start sequence, the pumps run if the slats are retracted.
- They stop automatically 5 min after center tank low level is reached.

MAN : Flight crew manually controls the center tank pumps manually with the center tank pumps' pushbutton.

FAULT light : Amber light comes on, and ECAM caution comes on when center tank has more than 250 kg (550 lb) of fuel and the left or right wing tank has less than 5 000 kg (11 000 lb).

(3) CTR TK PUMP 1(2) pushbutton sw

On : Pump runs, if MAN mode is selected on the MODE SEL pushbutton.
 • Pump is automatically controlled when AUTO mode is selected.

Continued on the next page

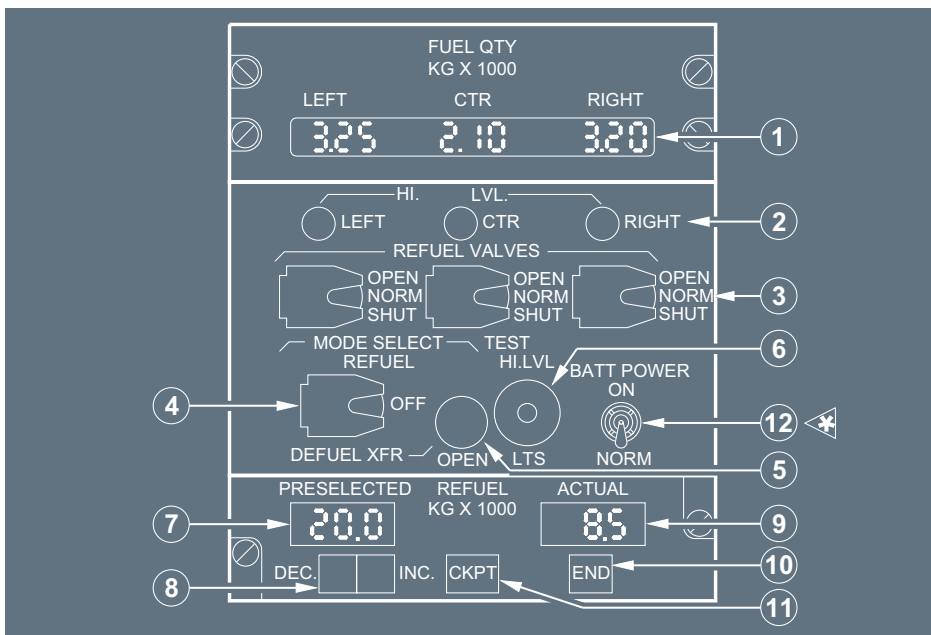
- OFF : Pump is OFF and OFF button comes on white.
- FAULT light : Amber light and associated ECAM caution come on, when the pump is in operation and the delivery pressure drops.

(4) X FEED pushbutton sw

- OFF : The valve closes, and the pushbutton does not come on.
- ON : The valve opens, and the ON pushbutton comes on in white.
- OPEN light : This green light comes on, when the valve is fully open.

REFUELING CONTROL PANEL

Applicable to: ALL



(1) FUEL QUANTITY indicator

The number shows the quantity of fuel in each tank.

(2) HI LVL light

This blue light comes on, when the system detects a high fuel level.
The corresponding refuel valve closes automatically.

Continued on the next page

- (3) REFUEL VALVES selector (guarded in NORM)
NORM : Automatic refueling logic controls the refuel valves.
OPEN : Valves open when the MODE SELECT sw is set to the REFUEL or DEFUEL XFR position. Each refuel valve closes, when the system detects a high level in the associated tank.
SHUT : Valves close.
- (4) MODE SELECT sw (guarded at OFF)
OFF : Refuel system is de-energized. Refuel valves are closed.
REFUEL : Refuel valves operate in automatic or in manual mode depending on the position of REFUEL VALVES sw.
DEFUEL XFR : Refuel/Defuel transfer valve opens.
Refuel valve opens if the associated REFUEL VALVE sw is at OPEN.
- (5) OPEN light
This amber light comes on when the defuel transfer valve is open.
- (6) TEST sw
HI LVL : The HI LVL lights come on if high level sensors and associated circuits are serviceable.

Note: If tanks are full (HI LVL lights on) during this test, the HI LVL lights go out if high level sensors and associated circuits are serviceable.

LTS : Lights on panel and all 8's on FQI and preselector come on.
- (7) PRESELECTED display
This display shows the preselected total fuel quantity in kg (lb) × 1 000 (multiply by 1 000 to get actual amount).
- (8) Preselector sw
Pressing the left or right side of the switch decreases or increases the preselected quantity.
- (9) ACTUAL display
This display shows the total fuel on board.
- (10) END light
- This green light comes on steady when automatic refueling is completed
- It flashes green if refueling is aborted.
- (11) CKPT light
Not used.

Continued on the next page

(12) BATT POWER toggle switch

ON : When the flight crew switches this ON momentarily and releases it, HOT BUS 1 supplies the FQI. After completion of the FQI tests (about 40 s), the fuel quantity indications appear and refuel operation can be selected.

The electrical supply is automatically cut off:

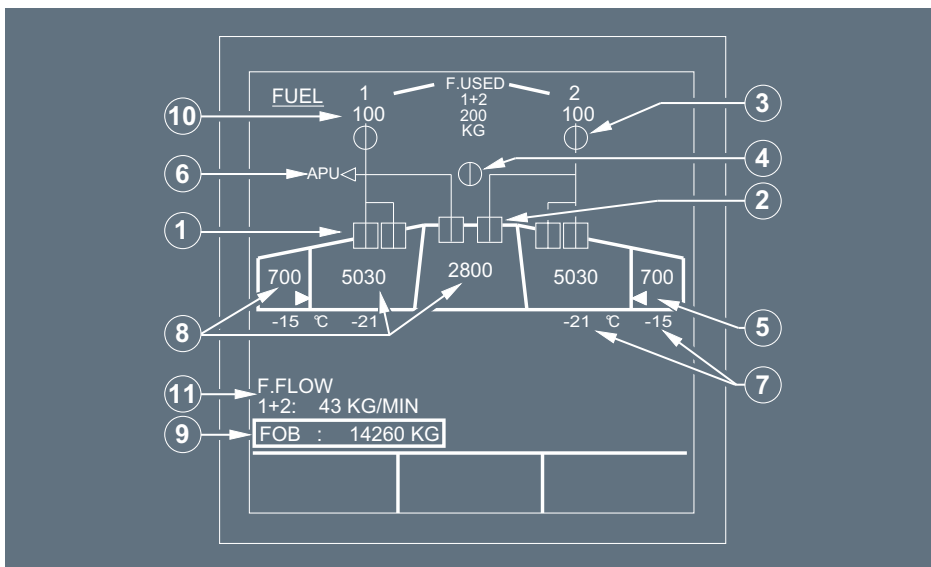
- After 10 min, if no refuel operation is selected, or
- At the end of refueling.

NOR : The FQI is not supplied by batteries.

M

ECAM FUEL PAGE

Applicable to: ALL



(1) Wing pump indications

Inline - Green : Pump pressure is normal (pump contactor on).

“LO” - Amber : Pump pressure is low (pump contactor on).

Crossline - Amber : Pump contactor is off.

Continued on the next page

(2) CTR tank pump indications

- Inline - Green : Pump pressure is normal (pump contactor on).
“LO” - Amber : Pump pressure is low (pump contactor on).
Crossline - Green : Pump contactor is off, and auto shut-off is required.
Crossline - Amber : Pump contactor is off, and auto shut-off is not required.

(3) LP valve (ENG) indications

- Inline - Green : The valve is open.
Inline - Amber : The valve is open, with the ENG MASTER switch OFF.
Crossline - Amber : The ENG valve is fully closed.
Transit - Amber : The valve is in transit.

(4) X feed indications

- Inline - Green : The valve is open.
Inline - Amber : The valve is open, with X Feed pushbutton off.
Crossline - Green : The valve is closed.
Crossline - Amber : The valve is closed with X feed pushbutton ON.
Transit - Amber : The valve is in transit.

(5) Transfer valve indications

Outer to Inner Transfer



- ▷ : The triangle is green, during a transfer to inner.
▶ : The triangle is in solid amber, when the valves are open, while commanded closed.
▷ : The triangle is in amber, when a valve is in transit.

Continued on the next page

(6) APU Indications

APU◀: APU is in white and the triangle is in green: the APU valve is open.

APU◀: APU and solid triangle are in amber : the APU valve is open, with the APU Fire Pushbutton out, or the APU MASTER switch OFF.

APU : APU is in amber : APU valve is closed and APU Fire pushbutton is out / or APU MASTER switch ON.

APU◀ : APU and triangle are in white : the APU valve is closed.

(7) Fuel temperature indication

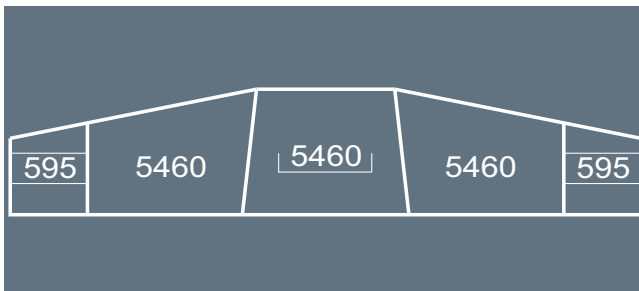
This appears, when its associated temperature sensor is wet. It is normally in green.

An advisory only appears in phases 2 and 6, when the fuel temperature is:

- Above 45 °C for the inner cell, or 55 °C for the outer cell.
- Below -40 °C.

It becomes amber, and the ECAM displays a caution, if the temperature goes above the high limit or below the low limit.

(8) Fuel quantity indication



- It is normally in green.
- An amber line appears across the last two digits, when the FQI is inaccurate (*Refer to PRO-SUP-28 FQI IN DEGRADED MODE*). The outer indication is boxed amber, if both transfer valves fail to open when the inner is at low level.
- The center tank indication is boxed amber, if both center tank pumps are failed, or are switched OFF.

Continued on the next page

- An advisory appears in flight phases 2 and 6, when the difference between the fuel quantities in the two wings is greater than 1 500 kg (3 300 lb). The wing inner and outer tank indications pulse with the highest fuel level.
- Units may either be in KG or LB, depending on the DMC pin program.

(9) Fuel On Board (FOB) indication

It is normally in green.

An amber line appears across the last two digits, when the FQI is inaccurate (*Refer to PRO-SUP-28 FQI IN DEGRADED MODE*).

Units may either be in KG or LB, depending on the DMC pin program.

The indication is half-boxed in amber, if:

- Center tank pumps fail, or are switched OFF.
- Both transfer valves fail to open, when the inner tank is at low level.

(10) Fuel Used indication

F.USED 1

3 100

- The engine identification number is in amber, when the engine is below idle. It is in white, when it is at, or above, idle.
- The fuel used indication is green from flight phase 2, until electrical power is cut off at the end of the flight. It is automatically reset, when the engine is started on ground.
- Units may either be in KG or LB, depending on the DMC pin program.

(11) Fuel Flow indication

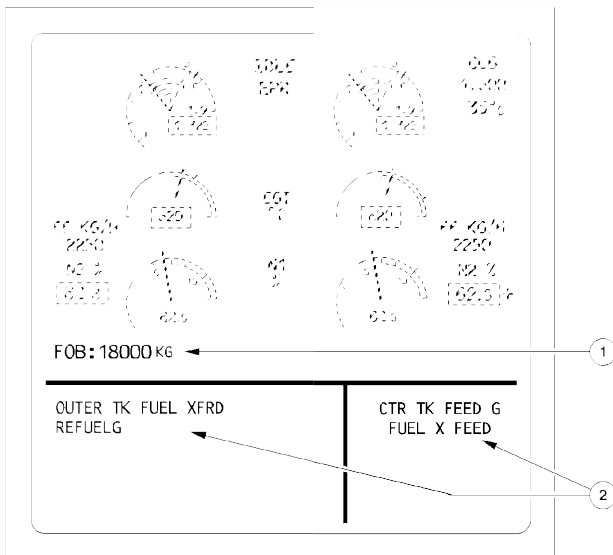
The Total Fuel Flow is displayed in kg/mn.

Units may either be in KG or LB, depending on the DMC pin program.

- It is normally in green.
- It is replaced by an amber XX if there is no valid data.

ECAM UPPER DISPLAY

Applicable to: ALL



(1) Total fuel indication

A half amber box appears around FOB, when the displayed quantity is not all usable (intercell transfer valve failure or loss of center tank pumps).

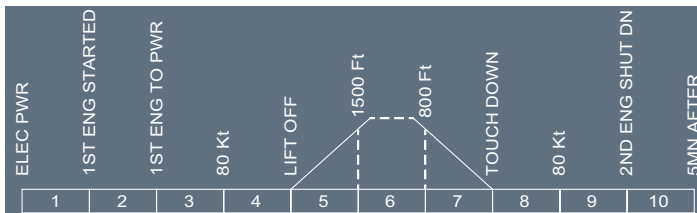
In case of degraded data, the last two significant digits are dashed (*Refer to PRO-SUP-28 FQI IN DEGRADED MODE*).

Units may either be in KG or LB, depending on the DMC pin program.

(2) Memo indications: (green)

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-2402, 3036-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
L(R) TK PUMP 1 + 2 LO PR	SINGLE CHIME	MASTER CAUT	FUEL	L(R) TK PUMP 1 + 2 FAULT It	3, 4, 5, 7, 8 ⁽¹⁾
CTR TK PUMP 1(2) LO PR				CTR TK PUMP 1(2) FAULT It	
CTR TK PUMPS LO PR				CTR TK PUMP FAULT Its	
CTR TK PUMPS OFF CTR TK pb at OFF with no FAULT				OFF It on CTR TK PUMP pb	1, 3, 4, 5, 7, 8, 9, 10
AUTO FEED FAULT (CTR TK > 250 kg (550 lb) and L or R WING TK < 5 000 kg (11 000 lb) ____OR____ (CTR TK pumps do not stop after slat extension or CTR TK low level)				MODE SEL FAULT Its ____ NIL	3, 4, 5, 8
L(R) WING TK LO LVL (750 kg - 1 650 lb)				NIL	3, 4, 5, 7, 8, 9
L + R WING TK LO LVL Low level detected in both wing inner cells (remaining flight time is about 30 min)					

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
L(R) OUTER TK HI TEMP or L(R) INNER TK HI TEMP Fuel temp above: In outer cell, above 55 °C on ground. In outer cell, above 60 °C in flight. In inner cell, above 45 °C on ground. In inner cell, above 54 °C in flight.	SINGLE CHIME	MASTER CAUT	FUEL	NIL	3, 4, 5, 7, 8
L(R) XFR VALVE CLOSED Both transfer valves fail to open after inner cell low level.					
ENG 1(2) LP VALVE OPEN Valve disagree in open position.					4, 5, 7, 8
APU LP VALVE FAULT Valve position disagree.	NIL	NIL		L(R) TK PUMP 1(2) FAULT It	3, 4, 5, 7, 8 (2)
L(R) OUTER TK LO TEMP, or L(R) INNER TK LO TEMP Fuel temperature < approx. -43 °C					
L(R) TK PUMP 1(2) LO PR					
L(R) XFR VALVE OPEN Either transfer valve opens before inner tank reaches low level.					
X FEED VALVE FAULT Valve position disagree.					
FQI CH 1(2) FAULT					

(1) Inhibited if pump selected OFF

(2) PUMP LO PR is inhibited, if the pump is selected OFF in phases 1 and 10.

MEMO DISPLAY

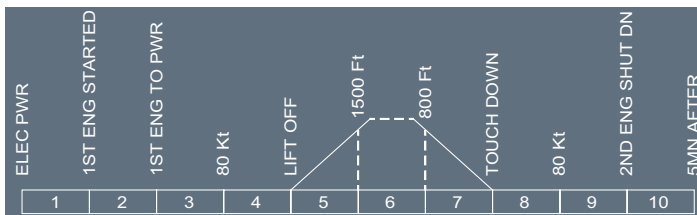
- OUTF TK FUEL XFRD appears in green, if at least one transfer valve is open in one wing tank
- CTR TK FEEDG appears in green, if at least one center tank pump is energized
- FUEL X FEED appears in green, if the fuel X FEED valve pushbutton is ON, and the X FEED valve is not fully closed. It appears in amber in flight phases 3, 4, or 5

Continued on the next page

- REFUELG appears in green, when the door of the refuel control panel  on the fuselage or on the wing is open.

WARNINGS AND CAUTIONS

Applicable to: MSN 2412-3003



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
F. USED/FOB DISAGREE	SINGLE CHIME	MASTER CAUT	FUEL	NIL	1, 2, 3, 4, 5, 6, (3) 7, 8, 9, 10
L(R) TK PUMP 1 + 2 LO PR				L(R) TK PUMP 1 + 2 FAULT It	3, 4, 5, 7, 8 ⁽¹⁾
CTR TK PUMP 1(2) LO PR				CTR TK PUMP 1(2) FAULT It	
CTR TK PUMPS LO PR				CTR TK PUMP FAULT Its	
CTR TK PUMPS OFF CTR TK pb at OFF with no FAULT				OFF It on CTR TK PUMP pb	1, 3, 4, 5, 7, 8, 9, 10

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB	
AUTO FEED FAULT (CTR TK > 250 kg (550 lb) and L or R WING TK < 5 000 kg (11 000 lb) ____OR____ (CTR TK pumps do not stop after slat extension or CTR TK low level)	SINGLE CHIME	MASTER CAUT	FUEL	MODE SEL FAULT lts ____ NIL	3, 4, 5, 8	
L(R) WING TK LO LVL (750 kg - 1 650 lb)				NIL	3, 4, 5, 7, 8, 9	
L + R WING TK LO LVL Low level detected in both wing inner cells (remaining flight time is about 30 min)					3, 4, 5, 7, 8	
L(R) OUTER TK HI TEMP or L(R) INNER TK HI TEMP Fuel TEMP above: In outer cell, above 55 °C on ground. In outer cell, above 60 °C in flight. In inner cell, above 45 °C on ground. In inner cell, above 54 °C in flight.						
L(R) XFR VALVE CLOSED Both transfer valves fail to open after inner cell low level.						
ENG 1(2) LP VALVE OPEN Valve disagree in open position.					4, 5, 7, 8	
APU LP VALVE FAULT Valve position disagree.	NIL	NIL		L(R) TK PUMP 1(2) FAULT lt	3, 4, 5, 7, 8 ⁽²⁾	
L(R) OUTER TK LO TEMP, or L(R) INNER TK LO TEMP Fuel temperature < approx. -43 °C						
L(R) TK PUMP 1(2) LO PR				NIL		
L(R) XFR VALVE OPEN Either transfer valve opens before inner tank reaches low level.						
X FEED VALVE FAULT Valve position disagree.						

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
FQI CH 1(2) FAULT	NIL	NIL	FUEL	NIL	3, 4, 5, 7, 8(2)

(1) *Inhibited if pump selected OFF*

(2) *PUMP LO PR is inhibited, if the pump is selected OFF in phases 1 and 10.*

(3) *Inhibited, only if the APU has been running for more than 30 min after takeoff.*

MEMO DISPLAY

- OUTR TK FUEL XFRD appears in green, if at least one transfer valve is open in one wing tank
- CTR TK FEEDG appears in green, if at least one center tank pump is energized
- FUEL X FEED appears in green, if the fuel X FEED valve pushbutton is ON, and the X FEED valve is not fully closed. It appears in amber in flight phases 3, 4, or 5
- REFUELG appears in green, when the door of the refuel control panel  on the fuselage or on the wing is open.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-28 – FUEL

DSC-28-30 – Warnings and Cautions

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BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
FQI	CH 1				SHED	(1)
	CH 2		DC2			(1)
INNER TANK PUMPS	L 1	AC1 ⁽³⁾	DC1		X ^{(2) (3)}	
	L 2	AC2	DC2			
	R 1	AC1 ⁽³⁾	DC1		X ^{(2) (3)}	
	R 2	AC2	DC2			
CTR TK PUMPS 	1	AC1	DC1			
	2	AC2	DC2			
CROSS FEED VALVE	MOT 1				SHED	
	MOT 2		DC2			
ENGINE LP VALVES	ENG 1 MOT 1				X	
	ENG 1 MOT 2		DC2			
	ENG 2 MOT 1				X	
	ENG 2 MOT 2		DC2			
XFR VALVES	L1				SHED	
	L2		DC2			
	R1				SHED	
	R2		DC2			
APU	PUMP			AC STAT INV or AC ESS SHED		HOT1
	LP VALVE		DC BAT			HOT1
REFUEL VALVES			DC2			(1)

(1) HOT BUS supplies power during refueling on battery.

(2) This occurs, if DC BUS 1 is lost.

(3) In smoke configuration (GEN 1 LINE pushbutton OFF), inner tank pumps 1 are supplied directly by IDG (instead of AC 1) and pump relays by DC ESS (instead of DC 1).



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-28 – FUEL

DSC-28-40 – ELECTRICAL SUPPLY

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DSC-29-10-10	General	
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	BLUE SYSTEM PUMPS	1
	YELLOW SYSTEM PUMPS	1
	POWER TRANSFER UNIT (PTU)	1
	RAM AIR TURBINE (RAT).....	2
	SYSTEM ACCUMULATORS	2
	PRIORITY VALVES	2
	FIRE SHUTOFF VALVES	2
	LEAK MEASUREMENT VALVES	2
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A319/A320
FLIGHT CREW OPERATING MANUAL

HYDRAULIC TABLE OF CONTENTS

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GENERAL**Applicable to: ALL**

The aircraft has three continuously operating hydraulic systems : blue, green, and yellow. Each system has its own hydraulic reservoir. Normal system operating pressure is 3 000 PSI (2 500 PSI when powered by the RAT). Hydraulic fluid cannot be transferred from one system to another.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-29 – HYDRAULIC

DSC-29-10 – Description

DSC-29-10-10 – General

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GREEN SYSTEM PUMP

Applicable to: ALL

A pump driven by engine 1 pressurizes the green system.

BLUE SYSTEM PUMPS

Applicable to: ALL

An electric pump pressurizes the blue system. A pump driven by a ram air turbine (RAT) pressurizes this system in an emergency.

YELLOW SYSTEM PUMPS

Applicable to: ALL

A pump driven by engine 2 pressurizes the yellow system.

An electric pump can also pressurize the yellow system, which allows yellow hydraulics to be used on the ground when the engines are stopped.

Crew members can also use a hand pump to pressurize the yellow system in order to operate the cargo doors when no electrical power is available.

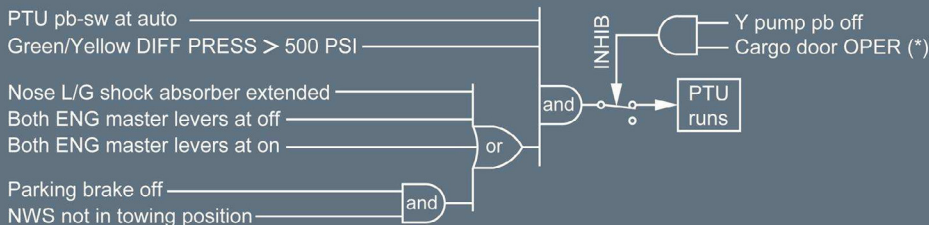
POWER TRANSFER UNIT (PTU)

Applicable to: ALL

A bidirectional power transfer unit enables the yellow system to pressurize the green system and vice versa.

The power transfer unit comes into action automatically when the differential pressure between the green and the yellow systems is greater than 500 PSI.

The PTU therefore allows the green system to be pressurized on the ground when the engines are stopped.



(*) The PTU functioning is kept inhibited 40 seconds after the end of cargo door operation.

RAM AIR TURBINE (RAT)

Applicable to: ALL

A drop-out RAT coupled to a hydraulic pump allows the blue system to function if electrical power is lost or both engines fail. The RAT deploys automatically if AC BUS 1 and AC BUS 2 are both lost. It can be deployed manually from the overhead panel. It can be stowed only when the aircraft is on the ground.

SYSTEM ACCUMULATORS

Applicable to: ALL

An accumulator in each system helps to maintain a constant pressure by covering transient demands during normal operation.

PRIORITY VALVES

Applicable to: ALL

Priority valves cut off hydraulic power to heavy load users if hydraulic pressure in a system gets low.

FIRE SHUTOFF VALVES

Applicable to: ALL

Each of the green and yellow systems has a fire shutoff valve in its line upstream of its engine-driven pump. The flight crew can close it by pushing the ENG 1(2) FIRE pushbutton.

LEAK MEASUREMENT VALVES

Applicable to: ALL

Each system has a leak measurement valve upstream of the primary flight controls. These valves, which measure the leakage in each circuit, are closed by operation of the LEAK MEASUREMENT VALVES pushbutton switch on the maintenance panel.

FILTERS

Applicable to: ALL

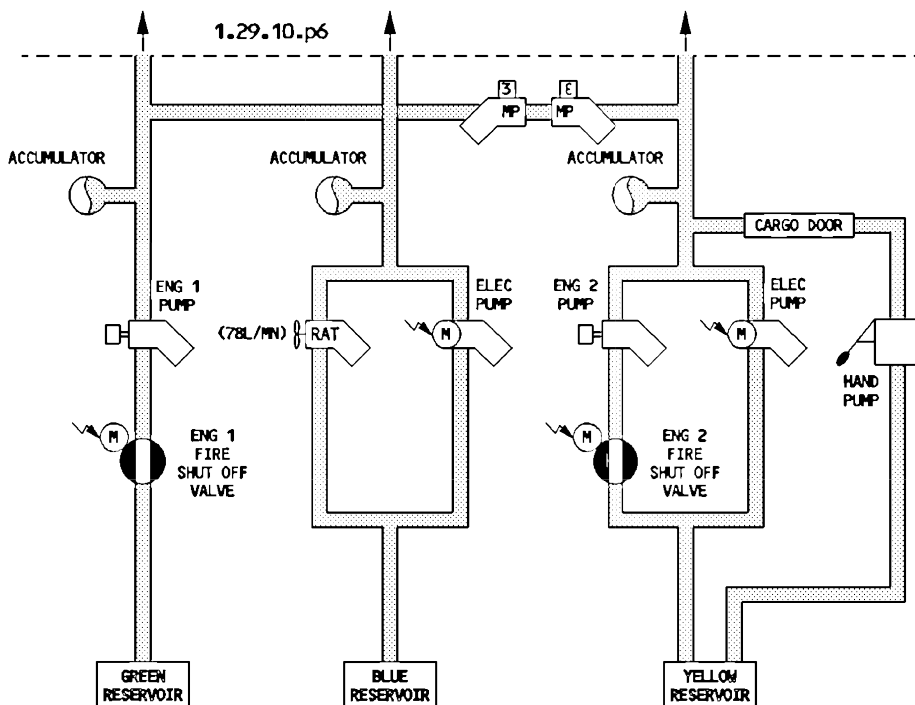
Filters clean the hydraulic fluid as follows :

- HP filters on each system and on the reservoir filling system and the normal braking system
- return line filters on each line
- case drain filters on engine pumps and the blue electric pump (which permit maintenance crew to monitor pump wear by inspecting the filters for the presence of metallic particles).

L3

GENERATION

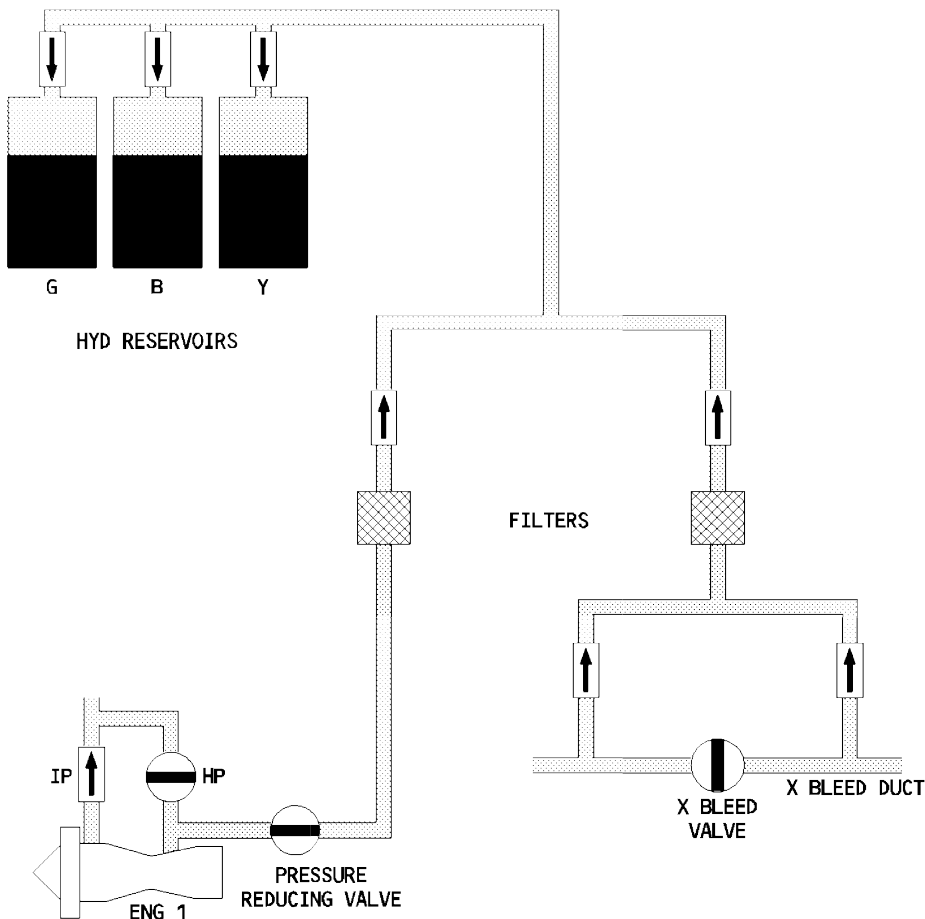
Applicable to: ALL



RESERVOIR PRESSURIZATION

Applicable to: ALL

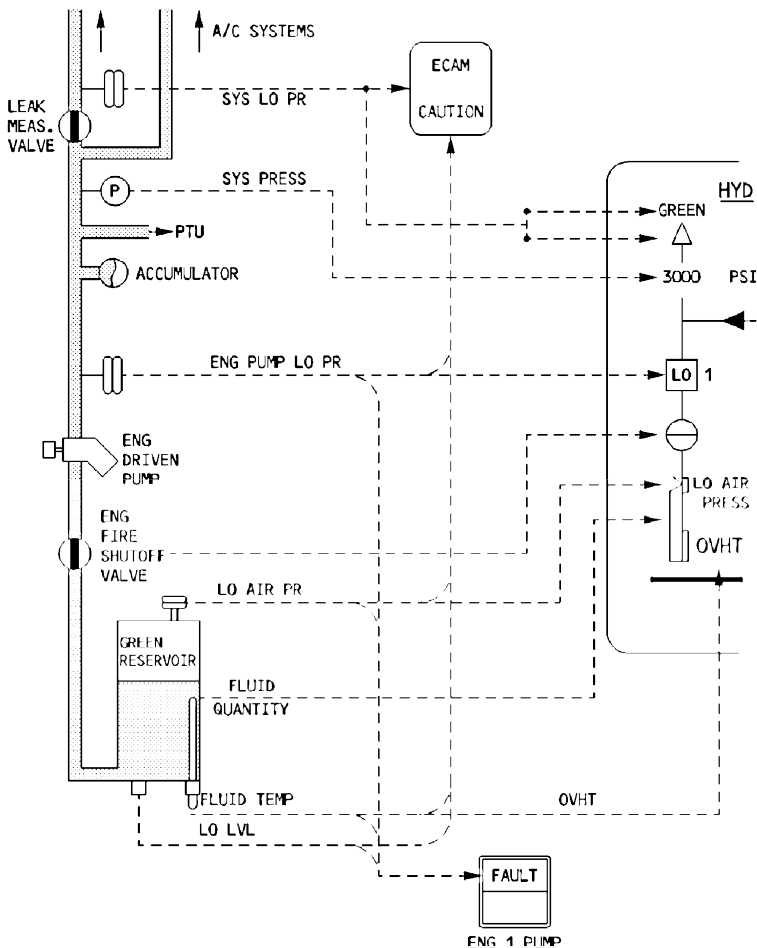
Normally, HP bleed air from engine 1 pressurizes the hydraulic reservoirs automatically.
If the bleed air pressure is too low, the system takes bleed air pressure from the crossbleed duct.
The systems maintain a high enough pressure to prevent their pumps from cavitating.



L3

INDICATIONS

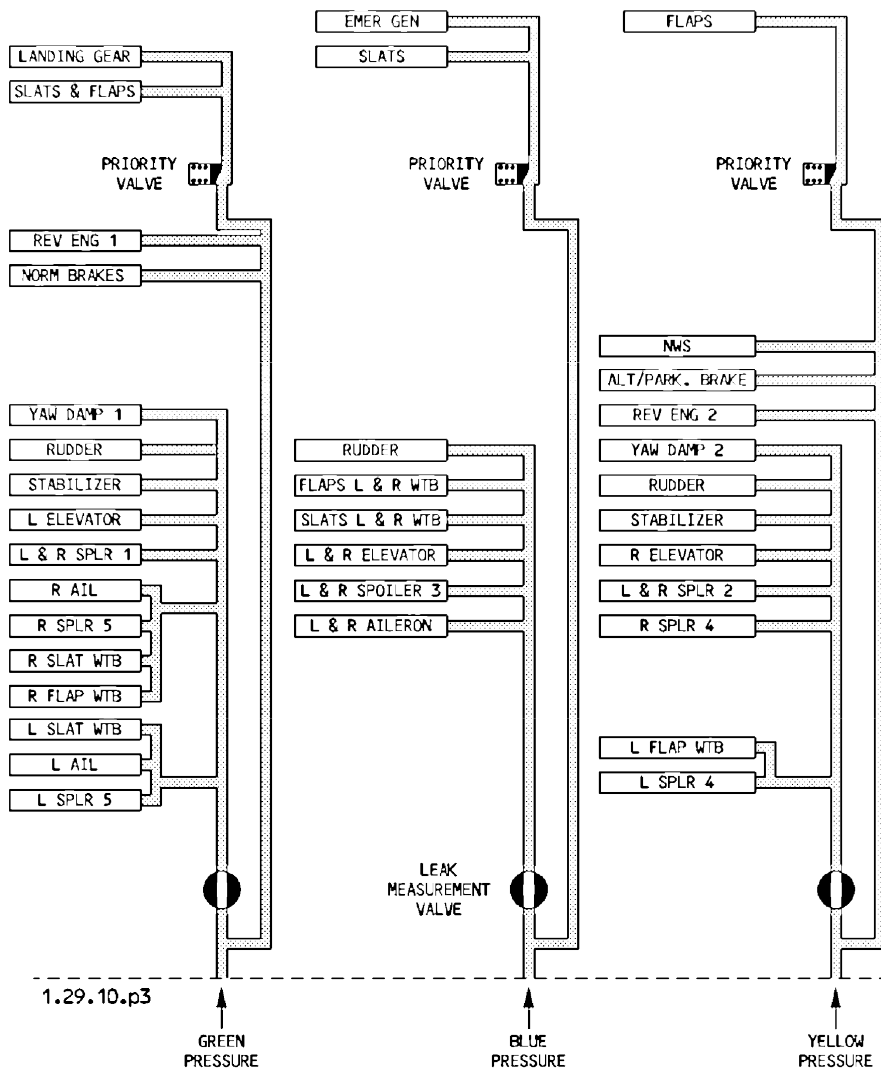
Applicable to: ALL



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DISTRIBUTION

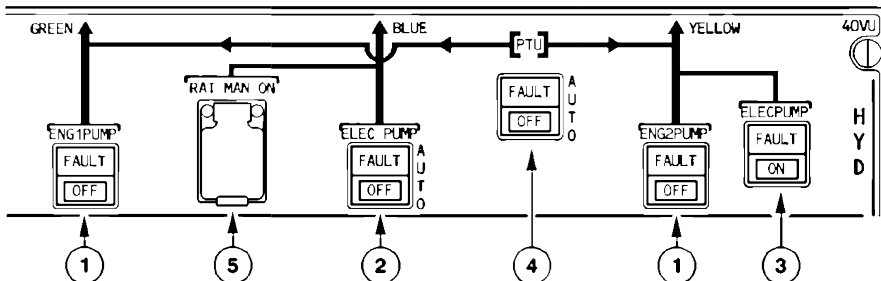
Applicable to: ALL



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OVERHEAD PANEL

Applicable to: ALL



(1) ENG 1 (2) PUMP pb

On : The pump pressurizes the system when the engine is running.

OFF : The pump is depressurized. The generation of hydraulic power stops.

FAULT It : This amber light comes on, and the ECAM caution appears, if :

- The reservoir level is low
- The reservoir overheats
- The reservoir air pressure is low
- The pump pressure is low (inhibited on the ground, when the engine is stopped).

This light goes out, when the crew selects OFF, except during an overheat. (The light stays on as long as the overheat lasts).

(2) BLUE ELEC PUMP pb

AUTO : If AC power is available, the electric pump operates :

- In flight
- On the ground, if one engine is running or if the crew has pressed the BLUE PUMP OVRD pushbutton on the maintenance panel.

OFF : The pump is de-energized.

Continued on the next page

FAULT It : This amber light comes on, and a caution appears on the ECAM, if :

- The reservoir level is low
- The reservoir overheats
- The air pressure in the reservoir is low
- The pump is delivering low pressure (inhibited on the ground, when the engines are stopped)
- The pump overheats.

The light goes out, when the crew selects OFF, except during an overheat. (The light stays on as long as the overheat lasts).

(3) YELLOW ELEC PUMP pb sw (springloaded)

ON : The electric pump is ON.

If the electrical power supply is removed, the pump will remain off when electrical power is applied again.

Off : The pump is off.

It comes on automatically when a crewman sets the lever of the cargo door manual selector valve to OPEN or CLOSE.

This inhibits the operation of other yellow system functions (except alternate braking and engine 2 reverse).

FAULT It : This amber light, accompanied by an ECAM caution, comes on if :

- the reservoir level is low
- air pressure in the reservoir is low
- the reservoir overheats
- pump pressure is low
- the pump overheats.

The light goes out when the crew selects OFF, except during an overheat. (The light stays on as long as the overheat lasts).

(4) PTU pb sw

AUTO : The bidirectional power transfer unit is armed and both the yellow and the green electrohydraulic valves are open.

The power transfer unit runs automatically when the differential pressure between the green and yellow systems is more than 500 PSI.

Note: The PTU is inhibited during the first engine start and automatically tested during the second engine start.

OFF : Both the green and the yellow PTU electrohydraulic valves close. Power transfer stops.

Continued on the next page

FAULT It : This amber light comes on, and a caution appears on the ECAM, if :

- the green or the yellow reservoir overheats
- the green or the yellow reservoir has low air pressure
- the green or the yellow reservoir has a low fluid level.

The light goes out when the crew selects OFF, except during an overheat. (The light stays on as long as the overheat lasts).

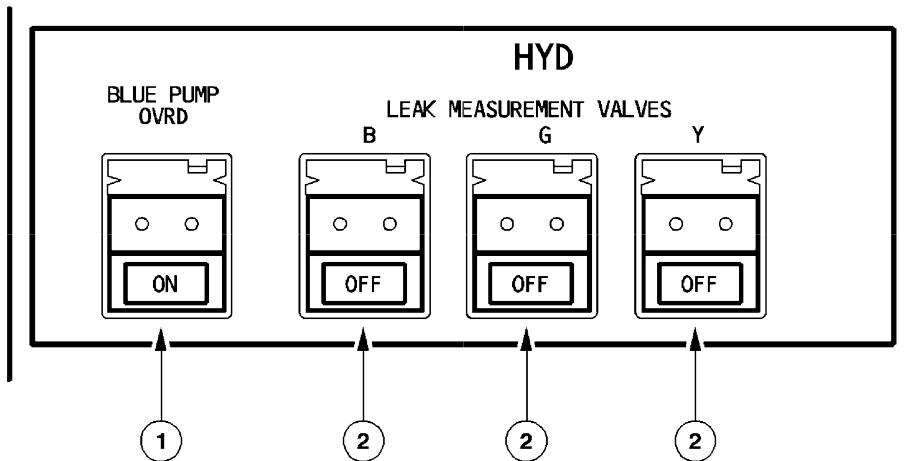
(5) RAT MAN ON pb

The flight crew may extend the RAT at any time by pressing the RAT MAN ON pushbutton.

Note: *The RAT extends automatically if AC BUS 1 and AC BUS 2 are lost. (Refer to DSC-24-20 Overhead Panel (Cont'd)).*

MAINTENANCE PANEL

Applicable to: ALL



(1) BLUE PUMP OVRD pb sw (springloaded)

ON : The blue electric pump is on if the ELEC PUMP pushbutton switch on the HYD panel is at AUTO.

Off : The blue electric pump is off.

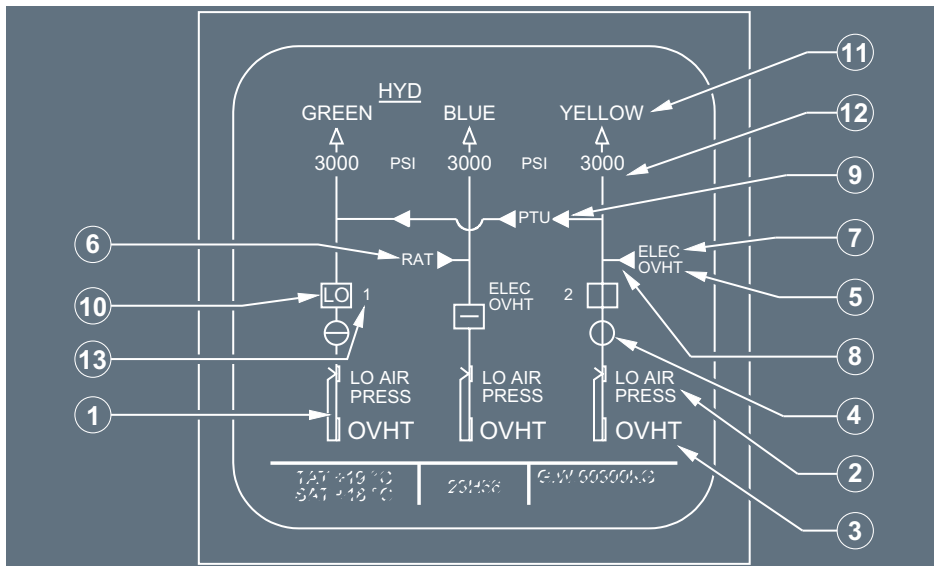
(2) LEAK MEASUREMENT VALVES pb sw

OFF: The corresponding electrohydraulic valve closes and shuts off hydraulic supply to the primary flight controls.

On : The corresponding electrohydraulic valve opens to go back to normal hydraulic supply.

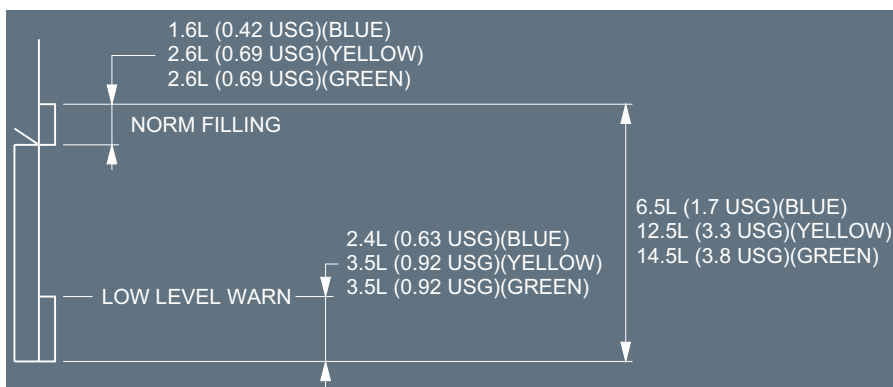
ECAM HYD PAGE

Applicable to: ALL



(1) Reservoir quantity

It is in green, unless the fluid level goes below the warning level, in which case it becomes amber.



L3

Continued on the next page

(2) Reservoir LO AIR PRESS

This appears in amber, and a caution appears on ECAM, if the air pressure for the indicated reservoir drops below normal. L1

(3) Reservoir OVHT

This appears in amber, and a caution appears on ECAM, if the temperature of returning hydraulic fluid temperature at the inlet to its reservoir is above normal.

(4) FIRE VALVE

Cross line - Amber : The valve is fully closed.

In line - Green : The valve is not fully closed.

(5) OVHT

This appears in amber if the electric pump for that system (blue or yellow) overheats.

(6) RAT

RAT ▷ White : The RAT is stowed.

RAT ◻ Green : The RAT is not stowed.

RAT ► Amber : Pressure for stowing the RAT has been applied, or the RAT pump is not available.

(7) ELEC

This legend, normally white, becomes amber if the associated power supply fails.

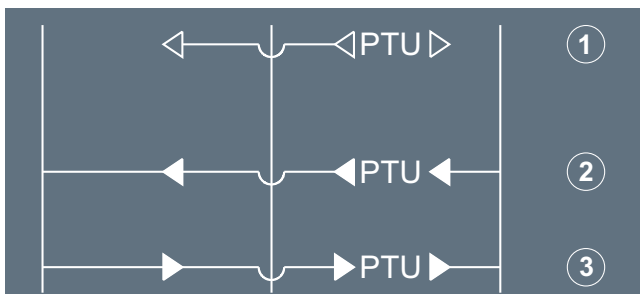
(8) YELLOW ELEC PUMP control

◁ White : The electric pump is off.

◻ Green : The electric pump is ON.

◄ Amber : The electric pump is ON and the yellow system has low pressure.

(9) PTU control



Continued on the next page

- (1) Green : The power transfer unit (PTU) pushbutton switch is in AUTO and the PTU is not transferring pressure.
Amber : The PTU pb-sw is OFF.
- (2) Green : The PTU is supplying the green hydraulic system.
- (3) Green : The PTU is supplying the yellow hydraulic system.
- (10) ENG PUMP control and low pressure indication
In line (Green) : The pushbutton switch for the designated PUMP is on and hydraulic pressure is normal.
Cross line (Amber) : The pushbutton switch for the designated PUMP is OFF.
“LO” (Amber) : The pushbutton switch for the designated PUMP is on and hydraulic pressure is low.

(11) System label

	pressure > 1 450 PSI	pressure < 1 450 PSI
YELLOW	white	amber
△	green	amber

- (12) System pressure
This legend, normally green, becomes amber when system pressure is below 1 450 PSI.
- (13) PUMP
This legend, normally white, becomes amber when N2 is below idle.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

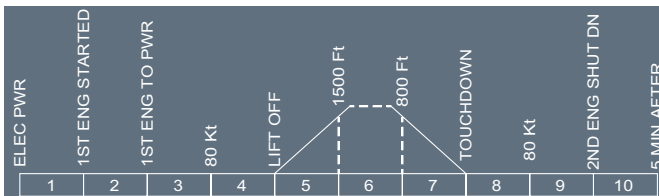
DSC-29 – HYDRAULIC

DSC-29-20 – CONTROLS AND INDICATORS

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WARNINGS AND CAUTIONS

Applicable to: MSN 3411-3799, 3808-3824, 3844-3854, 3888



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
B + Y B + G SYS LO PR Y + G system pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI)	CRC	MASTER WARN	HYD	FAULT It	4, 5 ⁽¹⁾
G (Y)(B) RSVR LO AIR PR reservoir air pressure ≤ 22 PSI (reset if air pressure ≥ 25 PSI)	SINGLE CHIME	MASTER CAUT		FAULT It on associated pump(s) pb and on PTU pb if Y or G sys affected	3, 4, 5, 7, 8
G (Y)(B) RSVR OVHT fluid temperature ≥ 93 °C (reset if temp ≤ 88 °C)					
G (Y)(B) RSVR LO LVL fluid quantity : < 3.5 l (0.92 US Gal) (green-yellow) < 2.4 l (0.63 US Gal) (blue)					
G (Y) ENG 1(2) PUMP LO PR pump outlet pressure ≤ 1 750 PSI (reset if pressure ≥ 2 200 PSI)				FAULT It on affected pump pb	4, 5, 7, 8

Continued on the next page

E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
Y ELEC PUMP LO PR yellow system pressure $\leq 1\,450$ PSI (reset if pressure $\geq 1\,750$ PSI) with - Y ELEC PUMP pb at ON - Y ENG PUMP and PTU not available	SINGLE CHIME	MASTER CAUT	HYD	FAULT It on affected pump pb	4, 5, 7, 8
B ELEC PUMP LO PR pump outlet pressure $\leq 1\,450$ PSI (reset if pressure $\geq 1\,750$ PSI)					3, 4, 5, 7, 8
B ELEC PUMP OVHT Y ELEC PUMP OVHT					4, 5, 7, 8 (1)
G (Y) SYS LO PR pump outlet pressure $\leq 1\,450$ PSI (reset if pressure $\geq 1\,750$ PSI)				NIL	1, 4, 5, 7, 8, 10
B SYS LO PR system pressure $\leq 1\,450$ PSI (reset if pressure $\geq 1\,750$ PSI)					3, 4, 5, 8, 9, 10
PTU FAULT PTU not running on ground in case differential pressure higher than 650 PSI between G and Y system, or in flight PTU still at AUTO position in case of G or Y reservoir low level and G or Y system low pressure.					3, 4, 5, 6, 7, 8, 9
RAT FAULT RAT not fully stowed or pressure present in RAT stowing actuator or RAT pump not available				NIL	

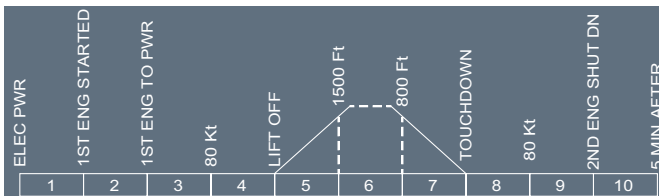
(1) Inhibited on the ground (flight phases 1, 2, 9, 10) when corresponding engine is shut down.

MEMO DISPLAY

- “RAT OUT” appears green, if the ram air turbine is not fully stowed.
The color changes to amber during flight phases 1 and 2.
- “HYD PTU” appears green, when the power transfer unit is running.

WARNINGS AND CAUTIONS

Applicable to: MSN 3805, 3843, 3871, 3909-4006



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
B + Y B + G SYS LO PR Y + G system pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI)	CRC	MASTER WARN	HYD	FAULT It	4, 5 ⁽¹⁾
G (Y) RSVR LO AIR PR reservoir air pressure ≤ 22 PSI (reset if air pressure ≥ 25 PSI)	SINGLE CHIME	MASTER CAUT		FAULT It on associated pump(s) pb and on PTU pb if Y or G sys affected	3, 4, 5, 7, 8
B RSVR LO AIR PR reservoir air pressure ≤ 30 PSI (detected in flight but only displayed on ground after landing)					1, 2, 3, 4, 5, 6, 7
B RSVR LO AIR PR reservoir air pressure ≤ 22 PSI reset if pressure ≥ 25 PSI					3, 4, 5, 7, 8
G (Y)(B) RSVR OVHT fluid temperature ≥ 93 °C (reset if temp ≤ 88 °C)					

Continued on the next page

E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
G (Y)(B) RSVR LO LVL fluid quantity : < 3.5 l (0.92 US Gal) (green-yellow) < 2.4 l (0.63 US Gal) (blue)	SINGLE CHIME	MASTER CAUT	HYD	FAULT It on associated pump(s) pb and on PTU pb if Y or G sys affected	4, 5, 7, 8
G (Y) ENG 1(2) PUMP LO PR pump outlet pressure ≤ 1 750 PSI (reset if pressure ≥ 2 200 PSI)				FAULT It on affected pump pb	
Y ELEC PUMP LO PR yellow system pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI) with - Y ELEC PUMP pb at ON - Y ENG PUMP and PTU not available					
B ELEC PUMP LO PR pump outlet pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI)					
B ELEC PUMP OVHT Y ELEC PUMP OVHT					3, 4, 5, 7, 8
G (Y) SYS LO PR system pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI)				4, 5, 7, 8 (1)	
B SYS LO PR system pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI)				NIL	1, 4, 5, 7, 8, 10
PTU FAULT PTU not running on ground in case differential pressure higher than 650 PSI between G and Y system, or in flight PTU still at AUTO position in case of G or Y reservoir low level and G or Y system low pressure.				FAULT It only in case of G or Y RSVR LO LVL or RSVR LO AIR PR or RSVR OVHT	3, 4, 5, 8, 9, 10

Continued on the next page

E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
RAT FAULT RAT not fully stowed or pressure present in RAT stowing actuator or RAT pump not available	SINGLE CHIME	MASTER CAUT	HYD	NIL	3, 4, 5, 6, 7, 8, 9

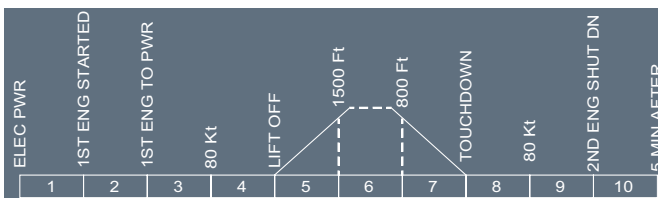
(1) Inhibited on the ground (flight phases 1, 2, 9, 10) when corresponding engine is shut down.

MEMO DISPLAY

- “RAT OUT” appears green, if the ram air turbine is not fully stowed.
The color changes to amber during flight phases 1 and 2.
- “HYD PTU” appears green, when the power transfer unit is running.

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-3184, 4040-4132, 4313-4451, 4624-4635, 4640, 4667, 4693-4705, 4717, 4744, 4778-4837



E/WD : FAILURE TITLE Conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
B + Y B + G SYS LO PR Y + G System pressure $\leq$ 1 450 PSI (reset if pressure $\geq$ 1 750 PSI)	CRC	MASTER WARN	HYD	FAULT It	4, 5 ⁽¹⁾

Continued on the next page

E/WD : FAILURE TITLE Conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
G (Y)(B) RSVR LO AIR PR Air pressure of the reservoir ≤ 22 PSI (reset if air pressure ≥ 25 PSI)	SINGLE CHIME	MASTER CAUT	HYD	FAULT It on associated pump(s) pb and on PTU pb-sw if Y or G SYS affected	3, 4, 5, 7, 8
G (Y)(B) RSVR OVHT Fluid temperature ≥ 93 °C (reset if TEMP ≤ 88 °C)					4, 5 ⁽²⁾ , 7, 8
G (Y)(B) RSVR LO LVL Fluid quantity: < 3.5 l (0.92 US Gal) (green-yellow) < 2.4 l (0.63 US Gal) (blue)				FAULT It on affected pump pb	4, 5, 7, 8
G (Y) ENG 1(2) PUMP LO PR Pump outlet pressure ≤ 1 750 PSI (reset if pressure ≥ 2 200 PSI)					
Y ELEC PUMP LO PR Yellow system pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI) with - YELLOW ELEC PUMP pb-sw at ON - Y ENG PUMP and PTU not available					
B ELEC PUMP LO PR Pump outlet pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI)					
B ELEC PUMP OVHT Y ELEC PUMP OVHT					3, 4, 5, 7, 8
G (Y) SYS LO PR Pump outlet pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI)					4, 5, 7, 8 (1)
B SYS LO PR System pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI)				NIL	1, 4, 5, 7, 8, 10

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E/WD : FAILURE TITLE Conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
PTU FAULT PTU not running on ground in case the differential pressure is above 650 PSI, between G and Y system, or in flight PTU still at AUTO position in case of G or Y reservoir low level and G or Y system low pressure.	SINGLE CHIME	MASTER CAUT	HYD	FAULT It only in case of G or Y RSVR LO LVL or RSVR LO AIR PR or RSVR OVHT	3, 4, 5, 8, 9, 10
RAT FAULT RAT not fully stowed or pressure present in RAT stowing actuator or RAT pump not available				NIL	3, 4, 5, 6, 7, 8, 9

(1) Inhibited on the ground (flight phases 1, 2, 9, 10) when corresponding engine is shut down.

(2) The HYD G(Y) RSVR LO LVL alert is inhibited for the first 15 s of flight phase 5.

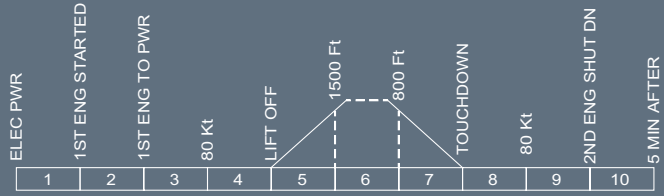
The HYD B RSVR LO LVL alert is inhibited for the entire flight phase 5.

MEMO DISPLAY

- “RAT OUT” appears in green, if the ram air turbine is not fully stowed. The color changes to amber during flight phases 1 and 2.
- “HYD PTU” appears in green, when the power transfer unit is running.

WARNINGS AND CAUTIONS

Applicable to: MSN 4012-4034, 4157-4286, 4554-4591, 4636, 4646, 4676-4680, 4708, 4721-4740, 4749, 5019-5319



Continued on the next page

E/WD: FAILURE TITLE Conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
B + Y B + G SYS LO PR Y + G System pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI)	CRC	MASTER WARN	HYD	FAULT It	4, 5 ⁽¹⁾
G (Y) RSVR LO AIR PR Air pressure of the reservoir ≤ 22 PSI (reset if air pressure ≥ 25 PSI)	SINGLE CHIME	MASTER CAUT		FAULT It on associated pump(s) pb and on PTU pb-sw if Y or G SYS affected	3, 4, 5, 7, 8
B RSVR LO AIR PR Reservoir air pressure ≤ 30 PSI (detected in flight but only displayed on ground after landing)					1, 2, 3, 4, 5, 6, 7
B RSVR LO AIR PR Reservoir air pressure ≤ 22 PSI reset if pressure ≥ 25 PSI					3, 4, 5, 7, 8
G (Y)(B) RSVR OVHT Fluid temperature ≥ 93 °C (reset if TEMP ≤ 88 °C)					4, 5 ⁽²⁾ , 7, 8
G (Y)(B) RSVR LO LVL Fluid quantity: < 3.5 l (0.92 US Gal) (green-yellow) < 2.4 l (0.63 US Gal) (blue)					
G (Y) ENG 1(2) PUMP LO PR Pump outlet pressure ≤ 1 750 PSI (reset if pressure ≥ 2 200 PSI)				FAULT It on affected pump pb	4, 5, 7, 8
Y ELEC PUMP LO PR Yellow system pressure ≤ 1 450 PSI (reset if pressure ≥ 1 750 PSI) with - YELLOW ELEC PUMP pb-sw at ON - Y ENG PUMP and PTU not available					

Continued on the next page

E/WD: FAILURE TITLE Conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
B ELEC PUMP LO PR Pump outlet pressure $\leq$ 1 450 PSI (reset if pressure $\geq$ 1 750 PSI)	SINGLE CHIME	MASTER CAUT	HYD	FAULT It on affected pump pb	4, 5, 7, 8
B ELEC PUMP OVHT					3, 4, 5, 7, 8
Y ELEC PUMP OVHT					4, 5, 7, 8 (1)
G (Y) SYS LO PR System pressure $\leq$ 1 450 PSI (reset if pressure $\geq$ 1 750 PSI)				NIL	1, 4, 5, 7, 8, 10
B SYS LO PR System pressure $\leq$ 1 450 PSI (reset if pressure $\geq$ 1 750 PSI)					
PTU FAULT PTU not running on ground in case the differential pressure is above 650 PSI, between G and Y system, or in flight PTU still at AUTO position in case of G or Y reservoir low level and G or Y system low pressure.					3, 4, 5, 8, 9, 10
RAT FAULT RAT not fully stowed or pressure present in RAT stowing actuator or RAT pump not available				NIL	3, 4, 5, 6, 7, 8, 9

(1) Inhibited on the ground (flight phases 1, 2, 9, 10) when corresponding engine is shut down.

(2) The HYD G(Y) RSVR LO LVL alert is inhibited for the first 15 s of flight phase 5.

The HYD B RSVR LO LVL alert is inhibited for the entire flight phase 5.

MEMO DISPLAY

- “RAT OUT” appears in green, if the ram air turbine is not fully stowed.
The color changes to amber during flight phases 1 and 2.
- “HYD PTU” appears in green, when the power transfer unit is running.

BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
ENG 1 driven PUMP control			DC1			
ENG 2 driven PUMP control			DC2			
ENG 1 FIRE shut off valve					X	
ENG 2 FIRE shut off valve					X	
BLUE ELEC PUMP	power	AC1				
	control				X	
Yellow ELEC PUMP	power	AC2 ⁽¹⁾				
	control		DC2			
Power Transfer Unit			DC2			
LEAK MEASUREMENT VALVES			DC GRND/FLT			
RAT	Manual control					HOT 2
	Auto control					HOT 1

(1) or from external power.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-29 – HYDRAULIC

DSC-29-40 – ELECTRICAL SUPPLY

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DSC-30-10	General	
DSC-30-10-10	Description	
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	Anti-Ice	1
	Rain Removal	2
DSC-30-20	Wing Anti-Ice	
DSC-30-20-10	Description	
	Description	1
DSC-30-20-20	Controls And Indicators	
	OVERHEAD PANEL	1
	ECAM BLEED PAGE	1
DSC-30-20-30	Warnings And Cautions	
	Warnings and Cautions	1
DSC-30-20-40	Electrical Supply	
	BUS EQUIPMENT LIST	1
DSC-30-30	Engine Anti-Ice	
DSC-30-30-10	Description	
	Description	1
DSC-30-30-20	Controls and Indicators	
	Overhead Panel	1
DSC-30-30-30	Warnings and Cautions	
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DSC-30-30-40	Electrical Supply	
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DSC-30-40	WINDOW HEAT	
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	Description	1

DSC-30-40-20	CONTROLS AND INDICATORS	
	OVERHEAD PANEL	1
DSC-30-40-30	WARNINGS AND CAUTIONS	
	WARNINGS AND CAUTIONS	1
DSC-30-40-40	ELECTRICAL SUPPLY	
	BUS EQUIPMENT LIST	1
DSC-30-50	Probes Heat	
DSC-30-50-10	Description	
	Description	1
DSC-30-50-20	Controls and Indicators	
	Overhead Panel	1
DSC-30-50-30	Warnings and Cautions	
	Warnings and Cautions	1
DSC-30-50-40	Electrical Supply	
	Bus Equipment List	1
DSC-30-60	RAIN REMOVAL	
DSC-30-60-10	DESCRIPTION	
	WIPERS	1
	RAIN REPELLENT (if installed)	1
DSC-30-60-20	CONTROLS AND INDICATORS	
	OVERHEAD PANEL	1
	REAR COCKPIT	2
DSC-30-60-30	ELECTRICAL SUPPLY	
	BUS EQUIPMENT LIST	1
DSC-30-70	ICE DETECTION SYSTEM	
DSC-30-70-10	DESCRIPTION	
	VISUAL ICE INDICATOR.....	1

DSC-30-70-30	ELECTRICAL SUPPLY	
	BUS EQUIPMENT LIST.....	1

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GENERAL

Applicable to: ALL

The ice and rain protection system allows unrestricted operation of the aircraft in icing conditions and heavy rain.

ANTI-ICE

Applicable to: ALL

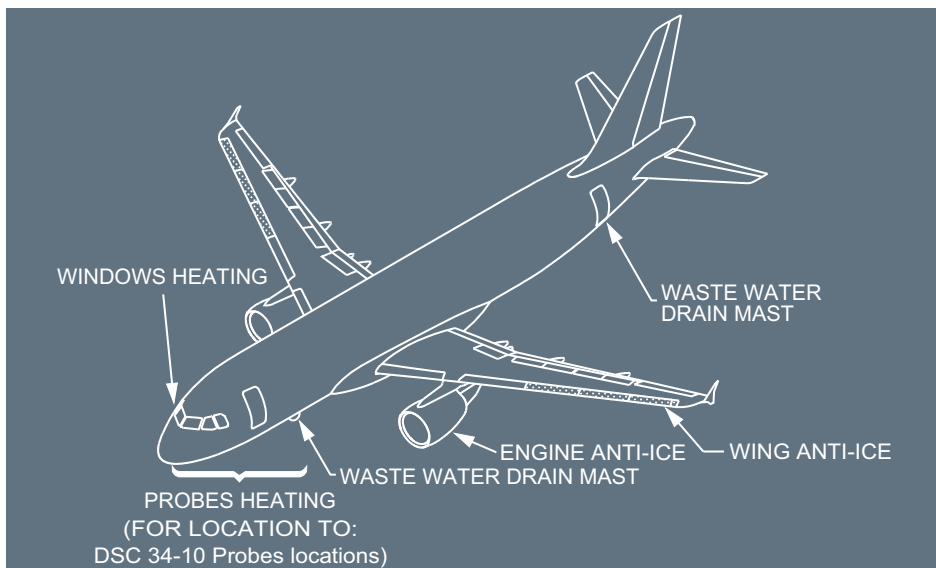
Either hot air or electrical heating protects critical areas of the aircraft as follows:

HOT AIR

- Three outboard leading-edge slats of each wing
- Engine air intakes.

ELECTRICAL HEATING

- Flight compartment windows
- Sensors, pitot probes and static ports
- Waste-water drain mast.





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-30 – ICE AND RAIN PROTECTION

DSC-30-10 – General

DSC-30-10-10 – Description

RAIN REMOVAL

Applicable to: ALL

Wipers and when necessary, fluid rain repellent, remove rain from the front windshield panels.

DESCRIPTION

Applicable to: ALL

In flight, hot air from the pneumatic system heats the three outboard slats (3-4-5) of each wing.

Air is supplied through one valve in each wing.

The WING pushbutton on the ANTI ICE panel controls the valves.

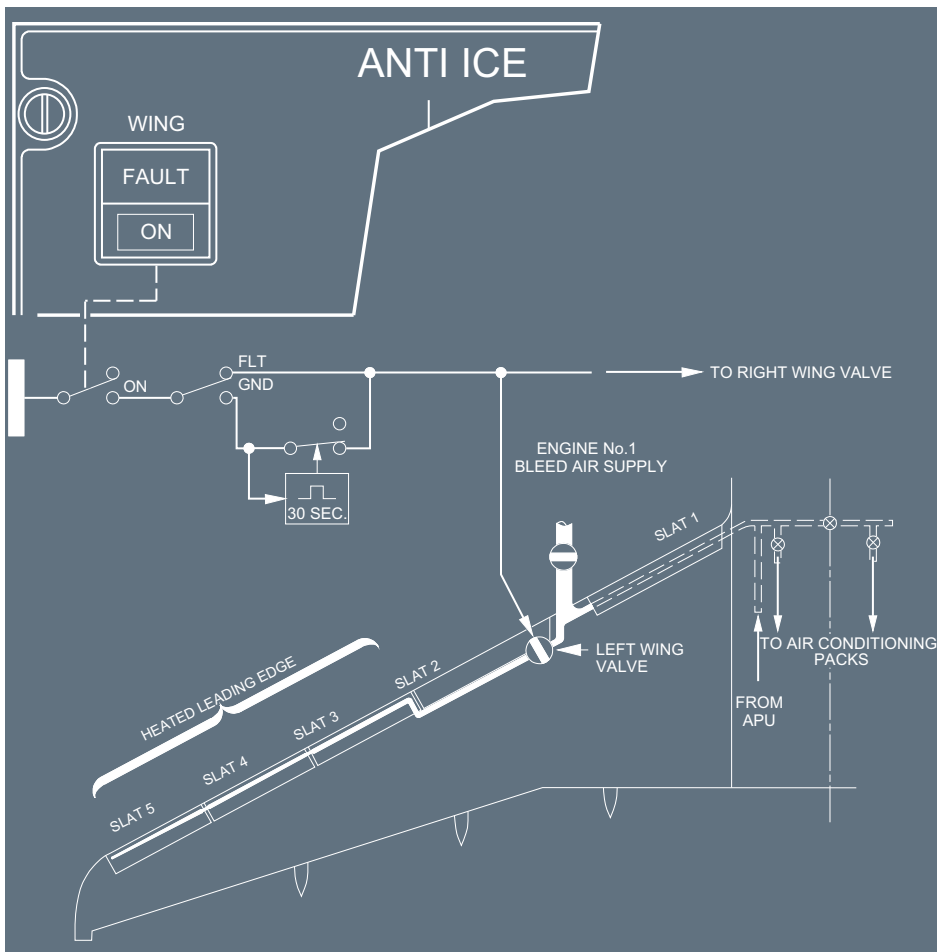
When the aircraft is on ground, the flight crew can initiate a 30 s test sequence by turning the system ON.

If the system detects a leak during normal operation, the affected side's wing anti-ice valve automatically closes (*Refer to DSC-36-10-50 LEAK DETECTION*).

When wing anti-ice is selected, the N1 limit is automatically reduced, and the idle N1 is automatically increased.

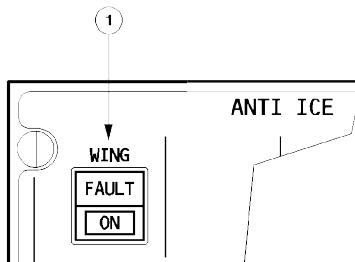
If the electrical power supply fails, the valves close.

Continued on the next page



OVERHEAD PANEL

Applicable to: ALL



(1) WING ANTI ICE pb sw

This switch controls the wing anti ice system on the left and right sides simultaneously.

ON : It lights up blue.

WING A. ICE appears on the ECAM MEMO page.

Wing anti ice control valves open if a pneumatic supply is available.

On the ground the wing anti-icing control valves open for 30 s only (test sequence).

Off : ON light goes off.

Wing anti-icing control valves close.

FAULT : Amber light comes on, and caution appears on ECAM, if:

- the position of the anti-icing control valve is not the required position, or
- low pressure is detected.

Note: The amber FAULT light comes on briefly as the valves transit.

ECAM BLEED PAGE

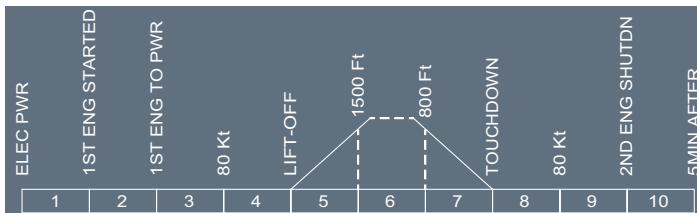
Applicable to: ALL

Refer to DSC-36-20 ECAM Bleed Page

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
WING A. ICE OPEN ON GND On ground, valves remain open more than 35 s after wing anti-ice is selected ON.	SINGLE CHIME	MASTER CAUT	BLEED	NIL	3, 4, 5, 6, 7, 8
SYS FAULT Valve not open when wing anti-ice selected ON.				ANTI ICE WING FAULT It	3, 4, 5, 7, 8
L (R) VALVE OPEN Valve not closed when wing anti-ice selected off					4, 5, 7, 8
HI PR High pressure detected when the wing anti-ice is selected ON.	NIL	NIL		NIL	3, 4, 5, 7, 8

MEMO DISPLAY

The “WING A. ICE” message is displayed in green, if the WING ANTI ICE pb-sw is ON.

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BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
WING ANTI ICE	L and R SHUT-OFF VALVES				SHED	

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DESCRIPTION

Applicable to: ALL

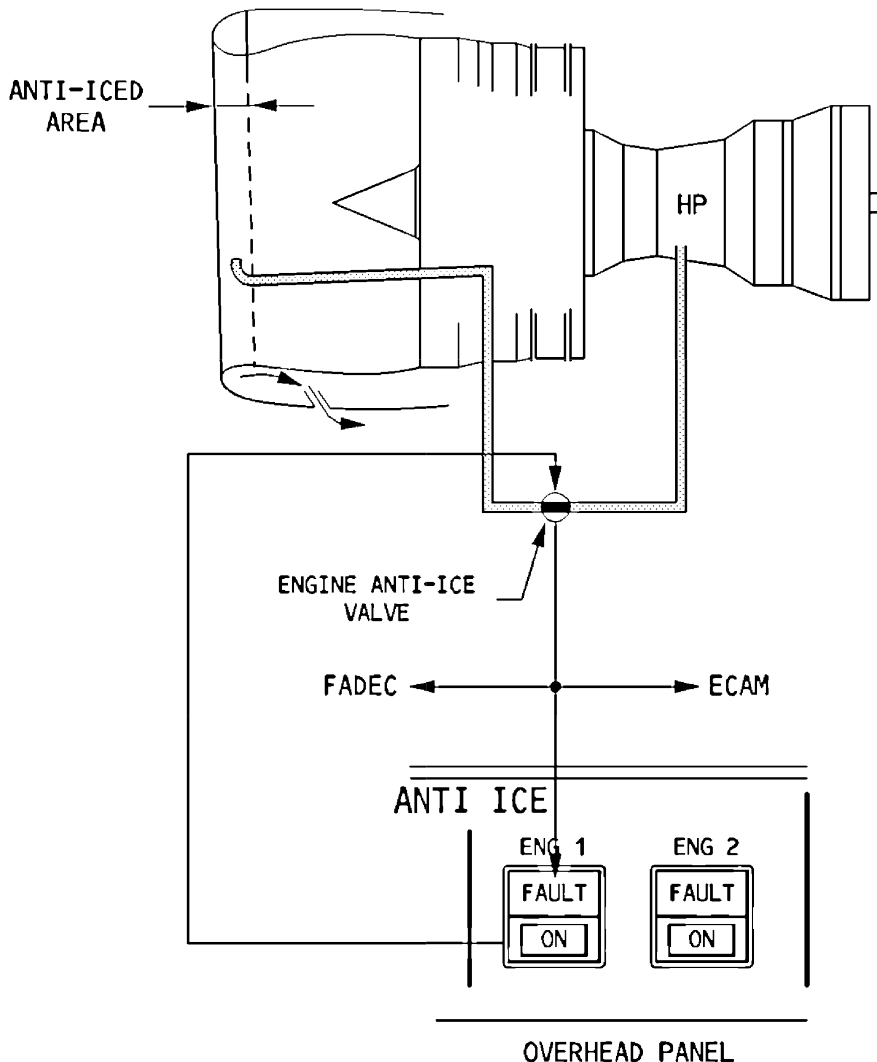
An independent air bleed from the high pressure compressor protects each engine nacelle from ice. Air is supplied through a two-position (open and closed) valve that the flight crew controls with two pushbuttons, one for each engine.

The valve automatically closes, if air is unavailable (engine not running).

When an engine anti-ice valve is open, the N1 limit is automatically reduced and, if necessary, the idle N1 is automatically increased for both engines in order to provide the required pressure.

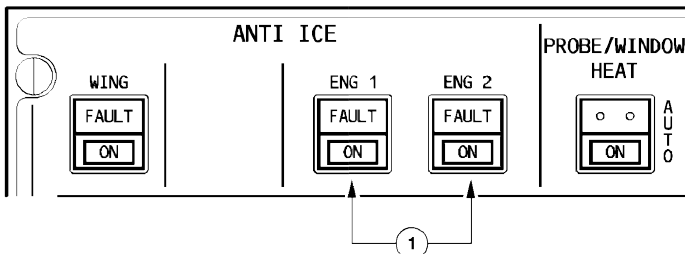
If electrical power fails, the valves open.

Continued on the next page



OVERHEAD PANEL

Applicable to: ALL



(1) ENG 1 (2) ANTI ICE pb-sw

ON : light comes on blue.

ECAM MEMO displays “ENG A. ICE”.

Engine anti-icing valve opens if bleed air is available from the engine.

Off : ON light goes out.

Engine anti-ice valve closes.

FAULT : Amber light comes on, and caution message appears on ECAM, if the position of the anti-ice valve disagrees with the ENG 1 (2) pushbutton selection.

Note: The amber FAULT light comes on briefly as valve transits.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-30 – ICE AND RAIN PROTECTION

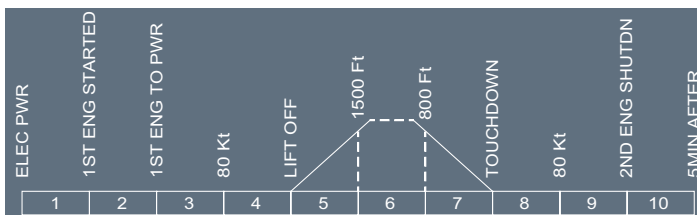
DSC-30-30 – Engine Anti-Ice

DSC-30-30-20 – Controls and Indicators

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLTPHA SE INHIB
ENG 1(2) VALVE OPEN Valve disagree in the open position.	SINGLE CHIME	MASTER CAUT	NIL	ENG 1 (2) ANTI ICE FAULT It	3, 4, 5, 7, 8
ENG 1(2) VALVE CLSD Valve disagree in the closed position.					

MEMO DISPLAY

This display shows “ENG A. ICE” in green, if one or both ENG ANTI ICE pb-sw are ON.

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BUS EQUIPMENT LIST

Applicable to: ALL

			NORM		EMER ELEC		
			AC	DC	AC ESS	DC ESS	HOT
ENG ANTI ICE CLOSURE	VALVE	1		DC1			
		2		DC2			



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-30 – ICE AND RAIN PROTECTION

DSC-30-30 – Engine Anti-Ice

DSC-30-30-40 – Electrical Supply

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DESCRIPTION**Applicable to: ALL**

The aircraft uses electrical heating for anti-icing each windshield and demisting the cockpit side windows.

Two independent Window Heat Computers (WHCs), one on each side, automatically regulate the system, protect it against overheating, and indicate faults.

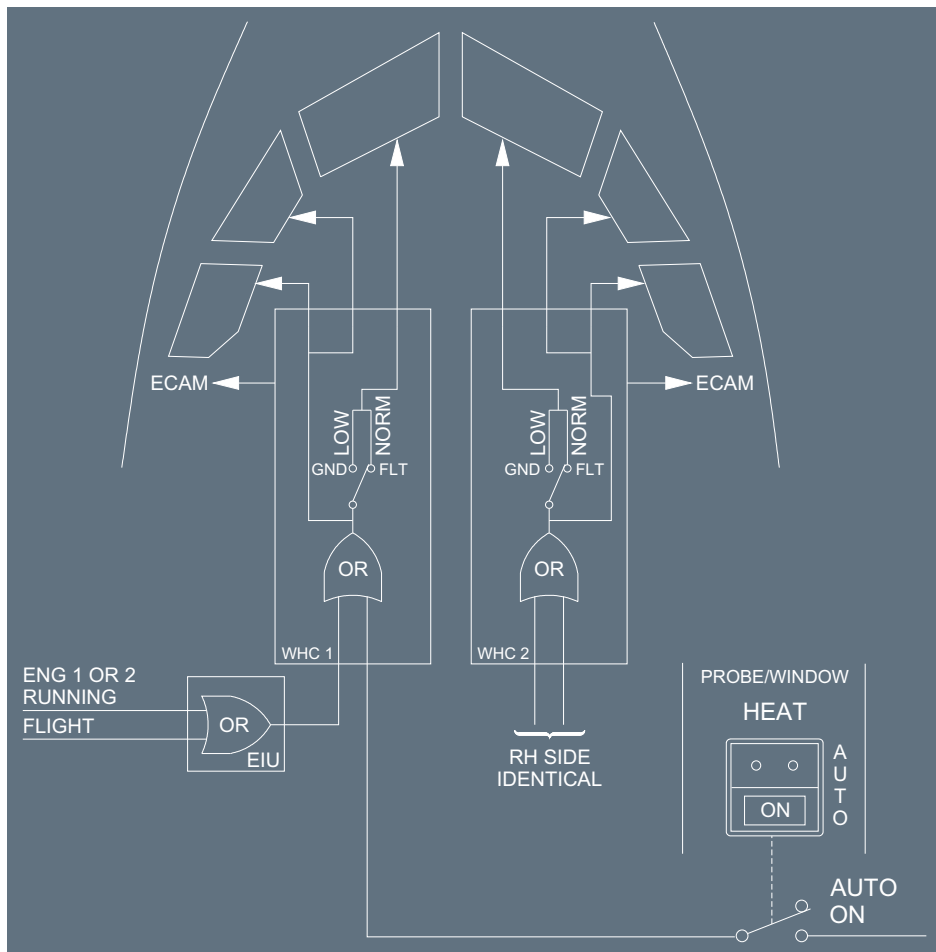
Window heating comes on:

- automatically when at least one engine is running, or when the aircraft is in flight.
- manually, before engine start, when the flight crew switches ON the PROBE/WINDOW HEAT pushbutton switch.

Windshield heating operates at low power on the ground and at normal power in flight. The changeover is automatic.

Only one heating level exists for the windows.

Continued on the next page



easyJet

A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-30 – ICE AND RAIN PROTECTION

DSC-30-40 – WINDOW HEAT

DSC-30-40-20 – CONTROLS AND INDICATORS

OVERHEAD PANEL

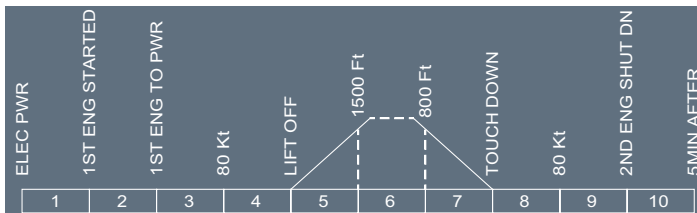
Applicable to: ALL

Refer to DSC-30-50-20 Overhead Panel

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
L(R) WINDSHIELD Failure of L or R windshield heating	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
L+R WINDSHIELD Failure of both windshield heating					
L(R) WINDOW Failure of L or R window heating	NIL	NIL			

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BUS EQUIPMENT LIST

Applicable to: ALL

			NORM		EMER ELEC		
			AC	DC	AC ESS	DC ESS	HOT
WINDOW HEAT	WHC	1		DC1			
		2		DC2			
	HEATING POWER	L	AC1				
		R	AC2				

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DESCRIPTION**Applicable to: ALL**

Electrical heating protects:

- Pitot heads
- Static ports
- Angle-Of-Attack probes (AOAs)
- Total Air Temperature (TAT) probes.

Three independent Probe Heat Computers (PHCs) automatically control and monitor:

- Captain probes
- F/O probes
- STBY probes.

They protect against overheating and indicate faults.

The probes are heated:

- Automatically when at least one engine is running, or when the aircraft is in flight.
- Manually, when the flight crew switches ON the PROBE/WINDOW HEAT pb.

On the ground, the TAT probes are not heated and pitot heating operates at a low level (the changeover to normal power in flight is automatic).

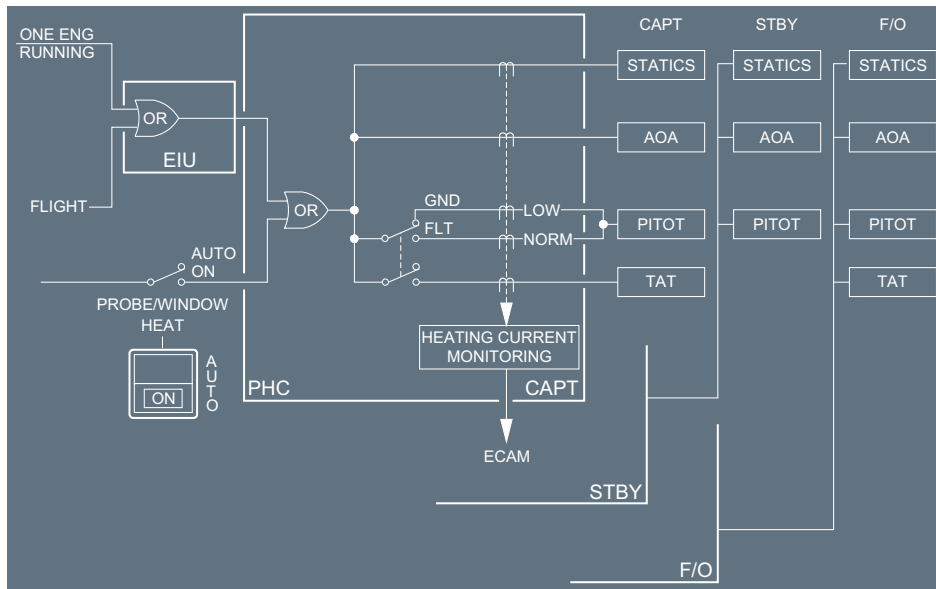
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DSC – AIRCRAFT SYSTEMS DSC-30 – ICE AND RAIN PROTECTION

DSC-30-50 – Probes Heat

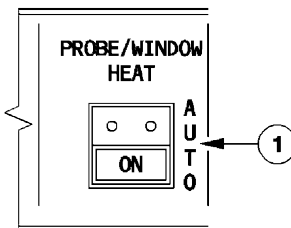
DSC-30-50-10 – Description

L3



OVERHEAD PANEL

Applicable to: ALL

(1) PROBE/WINDOW HEAT pb

AUTO : Probes/Windows are heated automatically :

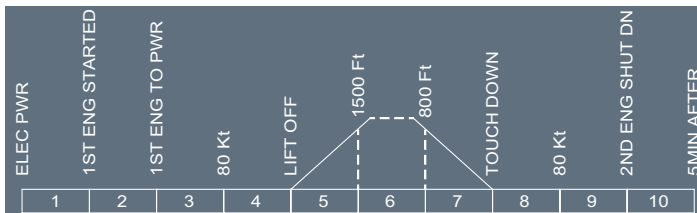
- In flight, or
- On the ground (except TAT probes) provided one engine is running.

ON : Probes and windows are heated permanently. Blue light comes on.

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WARNINGS AND CAUTIONS

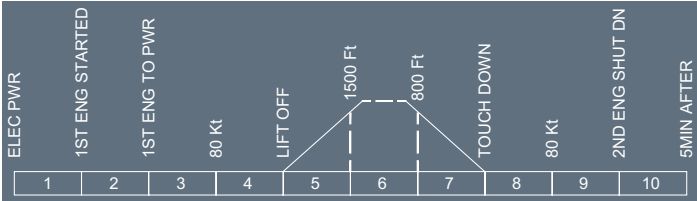
Applicable to: MSN 5289-5319



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CAPT (F/O) PITOT CAPT (F/O) L(R) STAT CAPT (F/O) AOA CAPT (F/O) TAT Failure of corresponding probe heating	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
STBY PITOT STBY L(R) STAT STBY AOA Failure of corresponding probe heating					
CAPT (F/O) (STBY) PROBES Failure of one probe heat channel/computer					

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-5249



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CAPT (F/O) PITOT CAPT (F/O) L(R) STAT CAPT (F/O) AOA CAPT (F/O) TAT Failure of corresponding probe heating	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
STBY PITOT STBY L(R) STAT STBY AOA Failure of corresponding probe heating					
CAPT (F/O) (STBY) PROBES Failure of one probe heat channel/computer					
CAPT + F/O PITOT CAPT+ STBY PITOT F/O + STBY PITOT Failure of the corresponding probes heating					4, 5, 8
ALL PITOT Failure of CAPT, F/O and STBY probes heating					

BUS EQUIPMENT LIST

Applicable to: ALL

			NORM		EMER ELEC		
			AC	DC	AC ESS	DC ESS	HOT
PROBE HEAT	PHC	CAPT				X	
		F/O		DC2			
		STBY		DC1			
	STATICS	CAPT and STBY		DC1			
		F/O		DC2			
	PITOT	CAPT			X ⁽¹⁾		
		F/O	AC2				
		STBY	AC1				
	AOA	CAPT			SHED		
		F/O	AC2				
		STBY	AC1				
	TAT	CAPT	AC1				
		F/O	AC2				

- (1) When AC1 and AC2 are lost and AIR DATA is switched to "CAPT 3", the STBY pitot is switched to AC ESS bus and CAPT pitot heating is lost.

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WIPERS**Applicable to: ALL**

Each front windshield has a dual-speed electric wiper, which are each controlled by a rotary selector.

RAIN REPELLENT (IF INSTALLED)**Applicable to: ALL**

In moderate to heavy rain, the flight crew can spray a rain repellent liquid on the windshield to improve visibility.

After about 30 s, the windows are covered with spray.

Separate pushbuttons control rain repellent application on each side of the windshield.

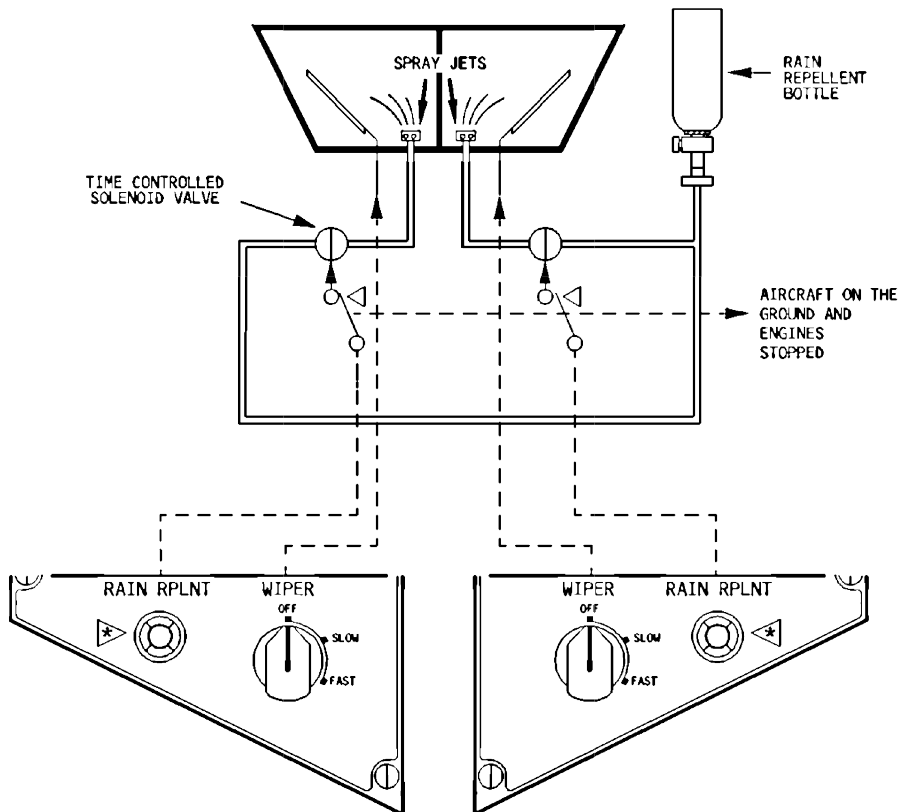
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DSC – AIRCRAFT SYSTEMS

DSC-30 – ICE AND RAIN PROTECTION

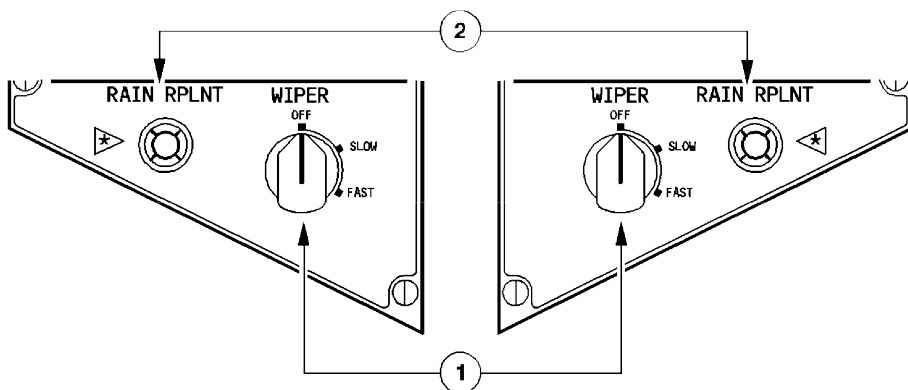
DSC-30-60 – RAIN REMOVAL

DSC-30-60-10 – DESCRIPTION



OVERHEAD PANEL

Applicable to: ALL



(1) WIPER rotary selector

Each rotary selector controls its wiper at low or high speed. When turned off, the wiper stops out of view.

(2) RAIN RPLNT pushbuttons

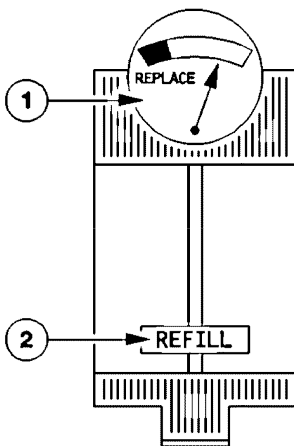
Each of these buttons controls the application of rain repellent fluid to the corresponding side of the front windshield.

When the flight crew pushes the button, the timer applies a measured quantity of rain repellent to the windshield. To repeat the cycle, the flight crew must push the button again.

This function is inhibited when the aircraft is on the ground and the engines are stopped.

REAR COCKPIT

Applicable to: ALL



(1) RAIN RPLNT pressure indicator

This gauge shows the nitrogen pressure in the rain repellent bottle. When the needle is in the yellow sector the bottle should be replaced.

(2) RAIN RPLNT quantity indicator

When the REFILL float is in view the bottle should be replaced.

BUS EQUIPMENT LIST

Applicable to: ALL

			NORM		EMER ELEC		
			AC	DC	AC ESS	DC ESS	HOT
RAIN REMOVAL	WIPER	CAPT		DC1			
		F/O		DC2			
	RAIN REPELLENT 	CAPT				X	
		F/O		DC2			



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DSC – AIRCRAFT SYSTEMS

DSC-30 – ICE AND RAIN PROTECTION

DSC-30-60 – RAIN REMOVAL

DSC-30-60-30 – ELECTRICAL SUPPLY

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VISUAL ICE INDICATOR**Applicable to: ALL**

An external visual ice indicator is installed between the two windshields.

The indicator has also a light.

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BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
ICE DETECT SYSTEM 	DETECTOR 1	AC1				
	DETECTOR 2	AC2				

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INTRODUCTION

Applicable to: ALL

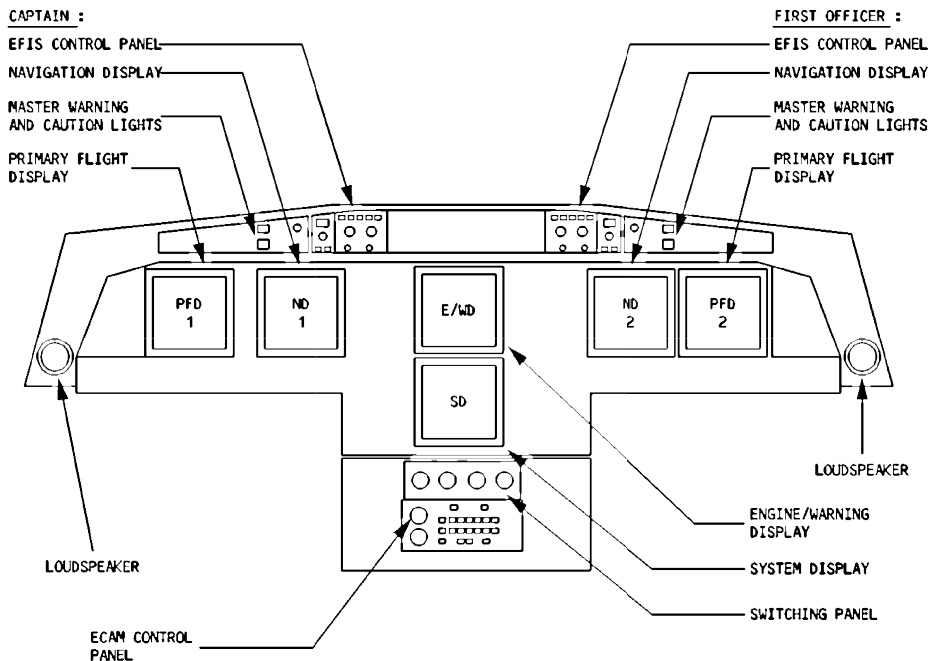
The Electronic Instrument System (EIS) presents data on six identical Display Units (DUs):

- The Electronic Flight Instrument System (EFIS) displays mostly flight parameters and navigation data on the Primary Flight Displays (PFDs) and Navigation Displays (NDs).
- The Electronic Centralized Aircraft Monitor (ECAM) presents data on the Engine/Warning Display (E/WD) and System Display (SD) :
 - Primary engine indications, fuel quantity, flap and slat position
 - Warning and caution alerts, or memos
 - Synoptic diagrams of aircraft systems, and status messages
 - Permanent flight data

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COCKPIT ARRANGEMENT

Applicable to: ALL



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DISPLAY UNIT (DU)

Applicable to: ALL

The instrument panels have six identical units.
These DUs are full-color Liquid Crystal Displays (LCD).

DISPLAY MANAGEMENT COMPUTER (DMC)

Applicable to: ALL

Three identical Display Management Computers (DMCs) obtain data from the different sensors and computers, and send it to the display units. The display units then generate and display the applicable images. Each DMC has a single DMC channel, and can simultaneously supply one PFD, one ND and both ECAM display units (E/WD and SD).

SYSTEM DATA ACQUISITION CONCENTRATOR (SDAC)

Applicable to: ALL

The two identical SDACs acquire data, then generate signals. Some of these signals go to the three DMCs, which use them to generate displays of system pages and engines parameters. Others go to the flight warning computers, which use them to generate ECAM messages and aural alerts.

FLIGHT WARNING COMPUTER (FWC)

Applicable to: ALL

The two identical FWCs generate alert messages, memos, aural alerts, and synthetic voice messages. For this purpose they acquire data :

- Directly from aircraft sensors, or systems, to generate red warnings.
- Through the SDACs to generate amber cautions.

The ECAM display units display the alert messages generated by the FWCs.

The FWCs also generate :

- Radio altitude callouts
- Decision height callouts
- Landing distance and landing speed increments.

ATTENTION - GETTERS**Applicable to: ALL**

The FWCs also drive the attention-getters. Each pilot has a set of these on the panel under the glareshield. They are :

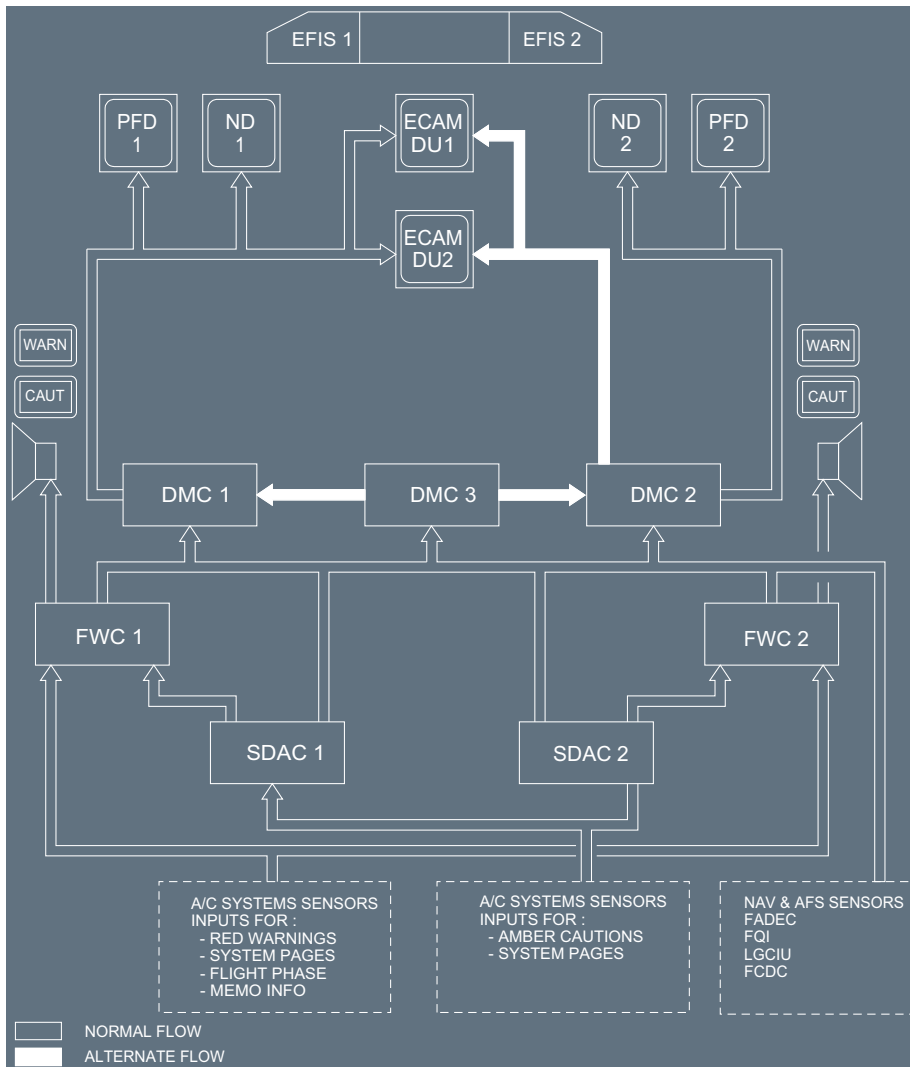
- A master warning light, that flashes “MASTER WARN” in red, for red warnings.
- A master caution light, that illuminates “MASTER CAUT” in amber, for amber cautions.

LOUDSPEAKER**Applicable to: ALL**

The communications loudspeakers announce aural alerts and voice messages, and do so even when they are turned off.

EIS BLOCK DIAGRAM

Applicable to: ALL





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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-31 – INDICATING / RECORDING SYSTEMS

DSC-31-05 – EIS General

DSC-31-05-30 – Architecture

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ECAM CONTROL PANEL (ECP)

Applicable to: ALL

The ECAM Control Panel, located on the pedestal, includes :

- Such E/WD controls, as CLR, STS, and the brightness control knob.
- Such SD controls, as ENG, BLEED, PRESS..., system page selector, and the brightness control knob.

EIS DMC SWITCHING SELECTOR

Applicable to: ALL

A switch near the center of the SWITCHING panel which is located just above the ECAM control panel, enables the flight crew to replace the Captain or First Officer's Display Management Computer (DMC 1, or DMC 2) by DMC 3.

ECAM/ND SWITCHING

Applicable to: ALL

A switch on the right-hand side of the SWITCHING panel enables the flight crew to transfer the ECAM System Display to either the Captain or First Officer's Navigation Display.

EFIS SWITCHING

Applicable to: ALL

A PFD/ND XFR pushbutton on each side console enables the pilot to swap displays to the respective outside DUs.

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RECONFIGURING THE DISPLAY MANAGEMENT COMPUTER (DMC)**Applicable to: ALL**

In normal operation, each DMC drives the following Display Units :

- DMC 1 drives the CAPT PFD, CAPT ND the ECAM DUs.
- DMC 2 drives the F/O PFD and F/O ND.
- DMC 3 is on standby, ready to drive any DU.

If DMC 1 or 2 fails (the “INVALID DATA” message is displayed on the DUs), the crew manually selects the DMC 3 source (“CAPT 3” or “F/O 3”).

If DMC 1 fails (or DMC 3, if “CAPT 3” was selected), DMC 2 automatically drives the ECAM.

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FAILURE OF UPPER ECAM DU (OR CTL/BRIGHTNESS KNOB TURNED TO OFF)

Applicable to: ALL

If the upper ECAM display fails, or is switched off :

- The engine/warning page automatically replaces the system/status page on the lower ECAM DU.

The flight crew can display the system/status page by :

- Using the "ECAM/ND XFR" switch, on the SWITCHING panel, to move it to a Navigation Display Unit (NDU), or
- Pushing and holding (for a maximum of 3 min) the related system page pushbutton, on the ECAM control panel, to temporarily display it on the lower ECAM DU (instead of the engine/warning page).

FAILURE OF LOWER ECAM DU (OR CTL/BRIGHTNESS KNOB TURNED TO OFF)

Applicable to: ALL

If the lower ECAM display fails, or is switched off, the flight crew can display the system/status page by :

- Using the "ECAM/ND XFR" switch, on the SWITCHING panel, to display it on the NDU, or
- Pushing and holding (for a maximum of 3 min) the related system page pushbutton, on the ECAM control panel, to temporarily display it on the upper ECAM DU (instead of the engine/warning page).

FAILURE OF BOTH ECAM DUs

Applicable to: ALL

If both ECAM displays fail, the flight crew may :

- Use the "ECAM/ND XFR", on the SWITCHING panel, to display the engine/warning page on a navigation display and, if needed,
- Push and hold (for a maximum of 3 min) the related system page pushbutton, on the ECAM control panel, to temporarily display the system/status page on an ND.

PFDU/NDU RECONFIGURATION**Applicable to: ALL**

If a PFDU fails, the system automatically transfers the PFD image to the NDU.

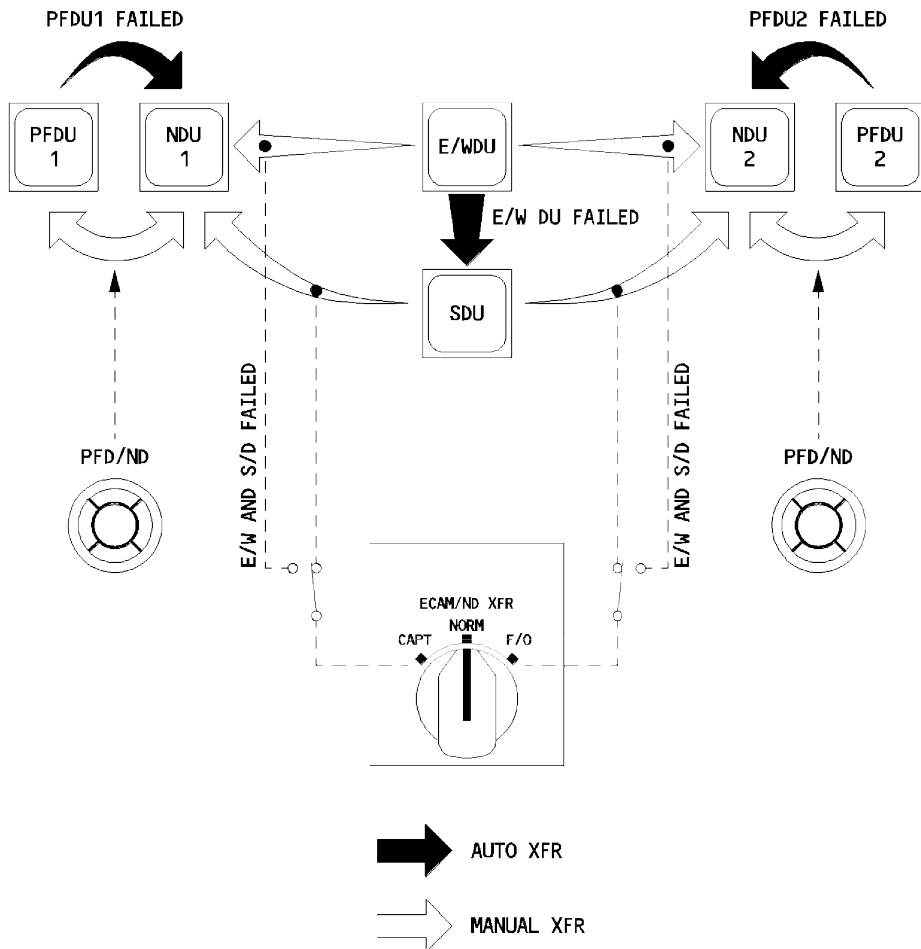
The pilot can also make this transfer manually by :

- turning the PFD ON-OFF/brightness control OFF, or
- pressing the PFD/ND/XFR pushbutton, which cross-changes the images between the PFDU and the NDU.

If an NDU fails, the pilot can use the PFD/ND/XFR pushbutton to transfer the ND image to the PFDU.

DU RECONFIGURATION

Applicable to: ALL



GENERAL**Applicable to: ALL**

These messages are displayed on either the EFIS or the ECAM Display Unit (DU) depending on the current EFIS or ECAM configuration.

FAILURE OF A DU**Applicable to: ALL**

If a DU fails, the flight crew may find one of the following displays:

- A blank screen with an “F” letter in amber, or
- A distorted display, or
- A blank screen with the “INVALID DISPLAY UNIT” message in amber.

FEEDBACK MESSAGES**Applicable to: ALL**

The DU displays the following messages in amber when the Display Management Computer (DMC) detects a discrepancy between the parameters obtained by the DMC and the operational parameters displayed on the DU:

- “CHECK CAPT PFD” (“CHECK F/O PFD”) if the discrepancy concerns the PFD parameters
- “CHECK CAPT ND” (“CHECK F/O ND”) if the discrepancy concerns the ND parameters
- “CHECK EWD” if the discrepancy concerns the E/WD parameters
- “CHECK SD” if the discrepancy concerns the SD parameters.

In addition, if the aircraft is on ground, the “DU NOT MONITORED” message is displayed in amber when there is only one DMC, instead of two DMCs, that provides the affected DU with feedback information.

This message means that there is either a DMC test in progress or that there is an EIS failure. In the case of an EIS failure, a maintenance action is necessary.

SIDE1/SIDE2 DISCREPANCY MESSAGES

Applicable to: ALL

The DU displays the following messages along with a caution on the ECAM E/WD when there is a discrepancy between the parameters displayed on the Captain's EFIS and the First Officer's EFIS:

- Both PFDs display the message "CHECK ATT" if there is a discrepancy of at least 5 ° between the attitude values, pitch and/or roll
- Both PFDs display the message "CHECK ALT" if there is a discrepancy between the altitude values greater than 250 ft when the flight crew selects a QNH different from STD, or 500 ft when the flight crew selects a QNH STD
- Both PFDs and NDs display the message "CHECK HDG" if there is a discrepancy of at least 5 ° between the heading values.

Note: The message "CHECK HDG" flashes for a few seconds on the NDs, and then it remains steady. If the flight crew selects the PLAN mode on the NDs the message "CHECK HDG" does not appear.

DU RESET

Applicable to: ALL

In the case of a DU reset, the message "SELF TEST IN PROGRESS" can be displayed in green and/or the message "WAITING FOR DATA" may be displayed in green during the EIS initialization.

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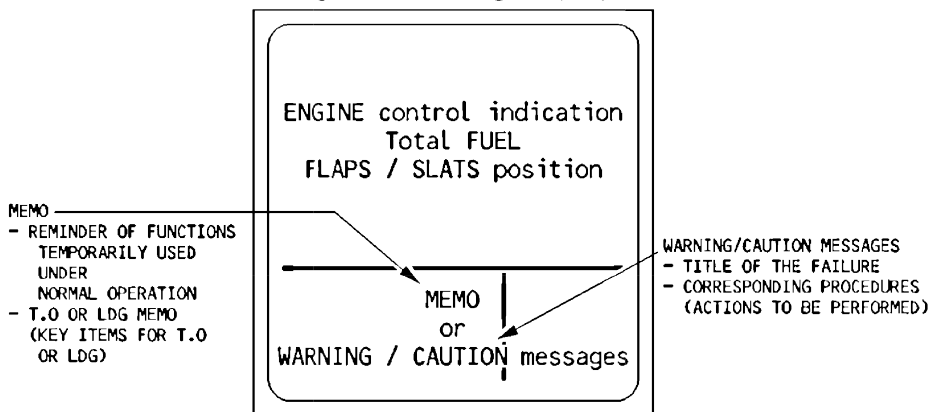
ECAM DU ARRANGEMENT

Applicable to: ALL

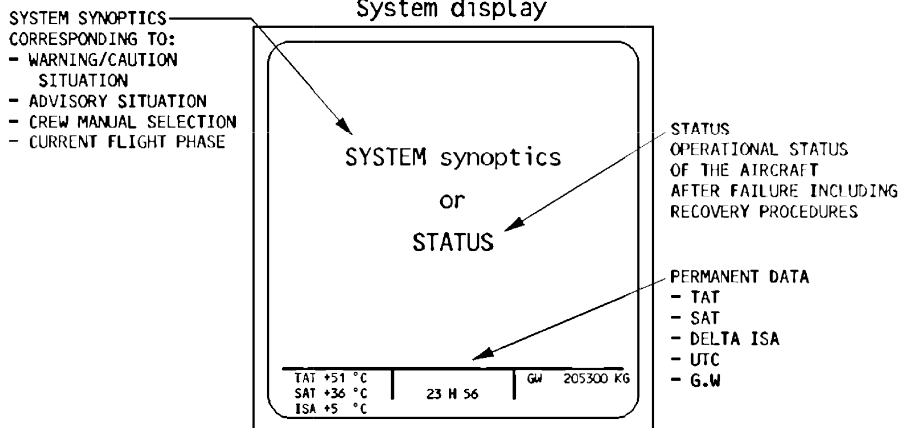
The ECAM has two display units :

- one for the engine/warning display (E/WD).
- one for the system/status display (SD).

Engine / warning display



System display



COLOR CODE**Applicable to: ALL**

The ECAM display uses a color code that indicates the importance of the failure or the indication.

RED : The configuration or failure requires immediate action.

AMBER : The flight crew should be aware of the configuration or failure, but need not take immediate action.

GREEN : The item is operating normally.

WHITE : These titles and remarks guide the flight crew, as they execute various procedures.

BLUE : These are actions to be carried out, or limitations.

MAGENTA : These are particular messages that apply to particular pieces of equipment or situations (inhibition messages, for example).

WARNING/CAUTION CLASSIFICATION

Applicable to: ALL

	LEVEL	SIGNIFICATION	AURAL	VISUAL
FAILURE MODE	Level 3	Red warning : The configuration, or failure requires immediate action : - Aircraft in dangerous configuration, or limit flight conditions (eg: stall, o/speed) - System failure altering flight safety (eg : Eng fire, excess cab alt)	Continuous Repetitive Chime (CRC) or specific sound or synthetic voice	- MASTER WARN light red flashing or specific red light - Warning message (red) on E/WD - Automatic call of the relevant system page on the S/D ⁽¹⁾.
	Level 2	Amber caution : The flight crew should be aware of the configuration or failure, but does not need to take any immediate action. However, time and situation permitting, these cautions should be considered without delay to prevent any further degradation of the affected system : - System failure without any direct consequence on the flight safety (eg: HYD G SYS LO PR)	Single Chime (SC)	- MASTER CAUT light amber steady - Caution message (amber) on E/WD - Automatic call of the relevant system page on the S/D ⁽¹⁾.
	Level 1	Amber caution : Requires crew monitoring : - Failures leading to a loss of redundancy or system degradation (eg : FCDC fault)	NONE	- Caution message (amber) on E/WD generally without procedure.

Continued on the next page

	LEVEL	SIGNIFICATION	AURAL	VISUAL
INFORMATION	ADVISORY	System parameters monitoring	NONE	- Automatic call of the relevant system page on the S/D. The affected parameter pulses green.
	MEMO	Information : Recalls normal or automatic selection of functions which are temporarily used	NONE	- Green, Amber, or Magenta message on EWD

(1) *except in some cases*

PRIORITY RULES

Applicable to: ALL

There are three priority levels for warnings and cautions :

- A level 3 warning has priority over a level 2 caution which has priority over a level 1 caution.
- The FWC observes these priorities.

TYPES OF FAILURES

Applicable to: ALL

Independent : a failure that affects an isolated system or item of equipment without degrading the performance of others in the aircraft.

Primary : a failure of a system or an item of equipment that costs the aircraft the use of other systems or items of equipment.

Secondary : the loss of a system or an item of equipment resulting from a primary failure.

AUDIO INDICATORS

Applicable to: A319

AUDIO INDICATOR	MEANING	DURATION	AUDIO INDICATOR CANCELLATION ⁽¹⁾
CONTINUOUS REPETITIVE CHIME	RED WARNINGS	PERMANENT	Press ⁽¹⁾ MASTER WARN It
SINGLE CHIME	AMBER CAUTION	0.5 s	
CAVALRY CHARGE ⁽³⁾	A/P DISCONNECTION BY TAKE OVER pb	1.5 s	Second push on TAKE OVER pb
	A/P DISCONNECTION DUE TO FAILURE	PERMANENT	Press MASTER WARN It or TAKE OVER pb
TRIPLE CLICK	Landing capability downgrade or "GPS PRIMARY LOST" in approach, or mode reversion	0.5 s. (3 pulses)	
CRICKET + "STALL" message (synthetic voice)	STALL	PERMANENT	NIL
BUZZER	CABIN CALL	3 s	NIL
	EMER CABIN CALL	3 s REPEATED 3 TIMES	NIL
	MECH CALL ⁽²⁾	As long as outside pb pressed	NIL
CONTINUOUS BUZZER ⁽²⁾	SELCAL CALL	PERMANENT	Press RESET key on ACP
"WINDSHEAR" (synthetic voice)	WINDSHEAR	REPEATED 3 TIMES	NIL
"GO AROUND WINDSHEAR AHEAD" (synthetic voice)	Windshear ahead detected during the landing phase	PERMANENT	NIL
"WINDSHEAR AHEAD" (twice) (synthetic voice)	Windshear ahead detected during the takeoff phase	PERMANENT	NIL

Continued on the next page

AUDIO INDICATOR	MEANING	DURATION	AUDIO INDICATOR CANCELLATION ⁽¹⁾
"MONITOR RADAR DISPLAY" (synthetic voice)	Windshear ahead detected caution message	PERMANENT	NIL
C CHORD	ALTITUDE ALERT (Refer to DSC-31-40 <i>Altitude Alert</i>)	1.5 s or PERMANENT	new ALTITUDE selection or press MASTER WARN pb
AUTO CALL OUT (synthetic voice)	HEIGHT ANNOUNCEMENT BELOW 2 500 ft (Refer to DSC-34-40-10 <i>AUTOMATIC CALL OUT - GENERAL</i>)	PERMANENT	NIL
GROUND PROXIMITY WARNING (synthetic voice)	(Refer to DSC-34-70-10 <i>Description</i>)	PERMANENT	NIL
"PRIORITY LEFT" "PRIORITY RIGHT" (synthetic voice)	A/P TAKE OVER pb	1 s	NIL
"RETARD" (synthetic voice)	Thrust levers not in IDLE position for landing	ONE TIME at 20 ft (10 ft in autoland with A/THR ON), then PERMANENT until thrust levers are set to IDLE	NIL
TCAS (synthetic voice)	(Refer to DSC-34-80-20 <i>Aural Messages</i>)	PERMANENT	NIL
"SPEED, SPEED, SPEED" (Synthetic voice)	Current thrust is not sufficient to recover a positive flight through pitch control	Every 5 s until thrust is increased	THRUST LEVER(s)
"DUAL INPUT" (synthetic voice)	Both sidesticks are moved simultaneously	Every 5 s	One sidestick deactivated

- (1) The pilot can cancel any audio indicator, by pressing the:
- The EMER CANC pb on the ECAM control panel, or
 - The MASTER WARN pushbutton, except for OVERSPEED or L/G NOT DOWN warnings.
- (2) The pilot can cancel the continuous buzzer, by pressing the MASTER CAUT pushbutton.

Continued on the next page

- (3) When the flight crew presses the MASTER WARN pushbutton (following a warning that leads to an AP disconnection), the Cavalry Charge sound is only inhibited when it has been emitted in order to avoid an unintended cancellation.

AUDIO INDICATORS

Applicable to: A320

AUDIO INDICATOR	MEANING	DURATION	AUDIO INDICATOR CANCELLATION ⁽¹⁾
CONTINUOUS REPETITIVE CHIME	RED WARNINGS	PERMANENT	Press ⁽¹⁾ MASTER WARN It
SINGLE CHIME	AMBER CAUTION	0.5 s	
CAVALRY CHARGE ⁽³⁾	A/P DISCONNECTION BY TAKE OVER pb	1.5 s	Second push on TAKE OVER pb
	A/P DISCONNECTION DUE TO FAILURE	PERMANENT	Press MASTER WARN It or TAKE OVER pb
TRIPLE CLICK	Landing capability downgrade or "GPS PRIMARY LOST" in approach, or mode reversion	0.5 s. (3 pulses)	
CRICKET + "STALL" message (synthetic voice)	STALL	PERMANENT	NIL
BUZZER	CABIN CALL	3 s	NIL
	EMER CABIN CALL	3 s REPEATED 3 TIMES	NIL
	MECH CALL ⁽²⁾	As long as outside pb pressed	NIL
CONTINUOUS BUZZER ⁽²⁾	SELCAL CALL	PERMANENT	Press RESET key on ACP
"WINDSHEAR" (synthetic voice)	WINDSHEAR	REPEATED 3 TIMES	NIL
"GO AROUND WIND SHEAR AHEAD" (synthetic voice)	Windshear ahead detected during the landing phase	PERMANENT	NIL

Continued on the next page

AUDIO INDICATOR	MEANING	DURATION	AUDIO INDICATOR CANCELLATION ⁽¹⁾
"WINDSHEAR AHEAD" (twice) (synthetic voice)	Windshear ahead detected during the takeoff phase	PERMANENT	NIL
"MONITOR RADAR DISPLAY" (synthetic voice)	Windshear ahead detected caution message	PERMANENT	NIL
C CHORD	ALTITUDE ALERT (Refer to DSC-31-40 <i>Altitude Alert</i>)	1.5 s or PERMANENT	new ALTITUDE selection or press MASTER WARN pb
AUTO CALL OUT (synthetic voice)	HEIGHT ANNOUNCEMENT BELOW 2 500 ft (Refer to DSC-34-40-10 <i>AUTOMATIC CALL OUT - GENERAL</i>)	PERMANENT	NIL
GROUND PROXIMITY WARNING (synthetic voice)	(Refer to DSC-34-70-10 <i>Description</i>)	PERMANENT	NIL
"PRIORITY LEFT" "PRIORITY RIGHT" (synthetic voice)	A/P TAKE OVER pb	1 s	NIL
"RETARD" (synthetic voice)	Thrust levers not in IDLE position for landing	ONE TIME at 20 ft (10 ft in autoland with A/THR ON), then PERMANENT until thrust levers are set to IDLE	NIL
TCAS (synthetic voice)	(Refer to DSC-34-80-20 <i>Aural Messages</i>)	PERMANENT	NIL
"SPEED, SPEED, SPEED" (Synthetic voice)	Current thrust is not sufficient to recover a positive flight through pitch control	Every 5 s until thrust is increased	THRUST LEVER(s)
"DUAL INPUT" (synthetic voice)	Both sidesticks are moved simultaneously	Every 5 s	One sidestick deactivated

Continued on the next page

AUDIO INDICATOR	MEANING	DURATION	AUDIO INDICATOR CANCELLATION ⁽¹⁾
“PITCH, PITCH” (Synthetic voice)	The aircraft pitch attitude is becoming excessive during flare and landing.	one time	NIL

- (1) The pilot can cancel any audio indicator, by pressing the:
- The EMER CANC pb on the ECAM control panel, or
 - The MASTER WARN pushbutton, except for OVERSPEED or L/G NOT DOWN warnings.
- (2) The pilot can cancel the continuous buzzer, by pressing the MASTER CAUT pushbutton.
- (3) When the flight crew presses the MASTER WARN pushbutton (following a warning that leads to an AP disconnection), the Cavalry Charge sound is only inhibited when it has been emitted in order to avoid an unintended cancellation.

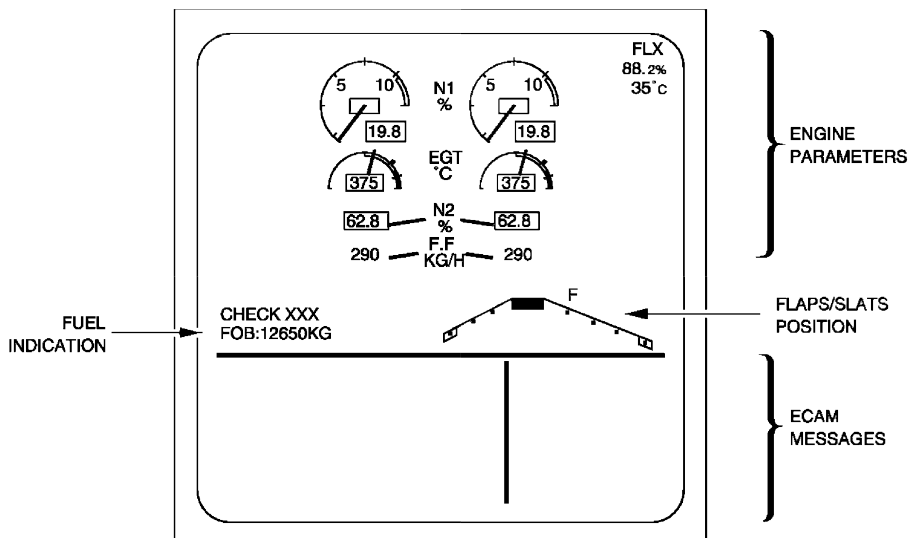
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GENERAL

Applicable to: ALL

The Engine Warning Display (E/WD) appears on the ECAM's upper Display Unit (DU).

- The upper part of this DU displays:
 - Engine parameters (*Refer to DSC-70-90 ECAM - Primary Parameter*)
 - Feedback messages (*Refer to DSC-31-05-60 Feedback Messages*)
 - Fuel On Board (FOB) (*Refer to DSC-28-20 ECAM Upper Display*)
 - Slats/Flaps' position (*Refer to DSC-27-20-30 ECAM F/CTL Page*)
- The lower part of this DU displays messages generated by the FWC:
 - Warning and caution messages, when a failure occurs
 - Memos when there is no failure.



The lower part of the DU, dedicated to ECAM messages, is divided into two sections that have several lines each.

- Bottom left : -Primary or independent warnings and cautions, or
 - Memo information.
- Bottom right : -Title of the system affected by a primary or independent warning or caution, in the case of overflow on the bottom left part, or
 - Secondary failure, or

Continued on the next page

- Memo, or
- Special lines (such as “AP OFF”, “LAND ASAP”).

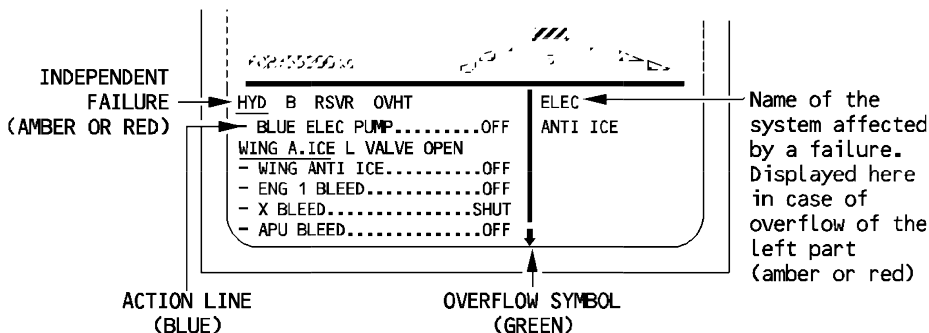
As soon as the FWC detects a failure, and if there is no flight phase inhibition active, the E/WD displays the title of the failure and actions that the flight crew must perform.

The action line automatically clears, when the flight crew has performed the necessary action.

Note: Some action lines do not disappear from the E/WD even after the flight crew performs the necessary action.

INDEPENDENT FAILURE

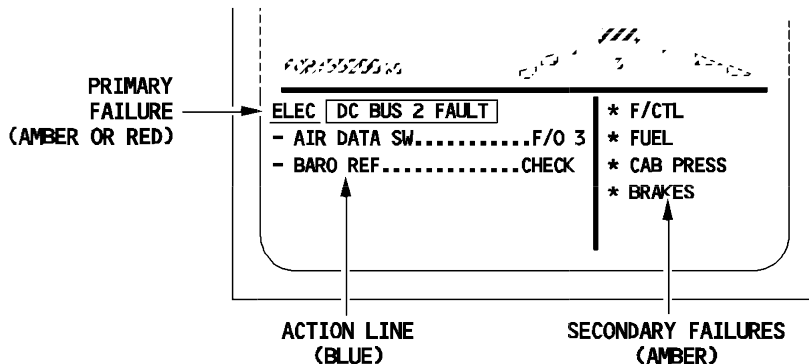
Applicable to: ALL



If there are too many ECAM messages for the amount of space available in the lower part of the E/WD, a green arrow appears at the bottom of the display, pointing down to show that the information has overflowed off the screen. The pilot can scroll down to view additional messages by pushing the CLR pushbutton on the ECAM control panel (on the pedestal, just below the lower ECAM DU).

PRIMARY AND SECONDARY FAILURE

Applicable to: ALL



The ECAM DU displays a primary failure as a boxed title.

It identifies a secondary failure by putting a star in front of the title of the affected system.

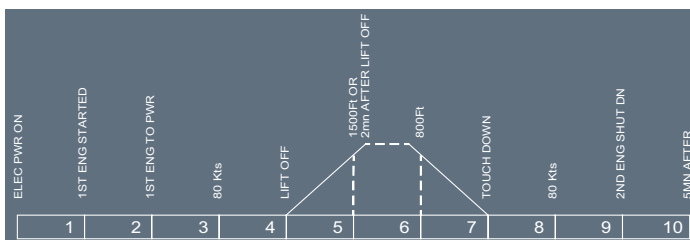
Note: The DU displays the overflow symbol, if primary or secondary failures overflow. In case of ELEC EMER CONFIG, the secondary failures are inhibited.

FLIGHT PHASES

Applicable to: ALL

GENERAL

The FWC divides its functions according to these ten flight phases :

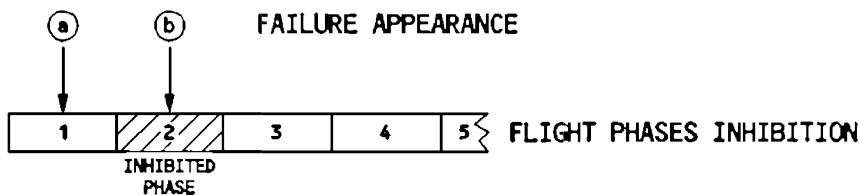


To improve its operational efficacy, the computer inhibits some warnings and cautions for certain flight phases. It does so to avoid alerting the pilots unnecessarily at times when they have high workloads, such as during takeoff or landing. In these two phases, the DU displays magenta memos : “T.O. INHIBIT” (flight phases 3, 4, and 5), and “LDG INHIBIT” (flight phases 7 and 8).

Note: These flight phases are different from and independent of the ones that the FMGC uses.

FLIGHT PHASE INHIBITION

Two cases are possible (for instance) :



Effect on E/WD :

- (a) The failure occurs during phase 1. The E/WD displays the warning immediately and continues to display it as long as the failure is present, even in phase 2.
- (b) The failure occurs during phase 2. The E/WD displays the warning only when the aircraft has entered phase 3, where it is not inhibited. Then the warning remains displayed as long as the failure is present.

MEMOS

Applicable to: ALL

DISPLAY

Memos appear in the lower part of the E/WD. They are normally in green, but may be amber in abnormal situations.

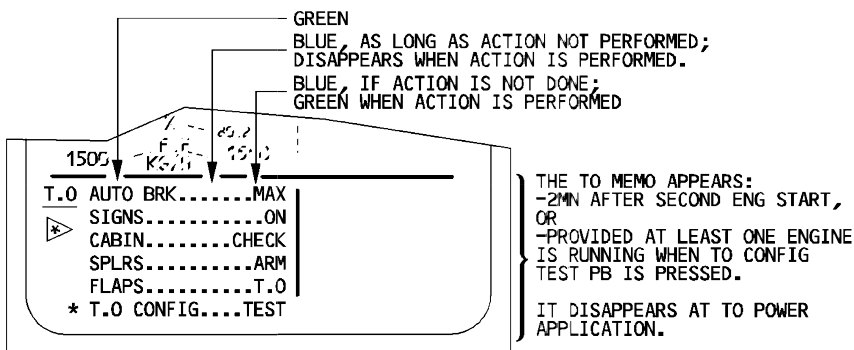
Memos list functions or systems that are temporarily used in normal operations.

Each chapter of the “Warning and Cautions” section of this manual lists memo messages.

TO AND LDG MEMOS

During the takeoff and landing phases, the right side of the memo area displays specific TO INHIBIT or LDG INHIBIT (magenta) memos.

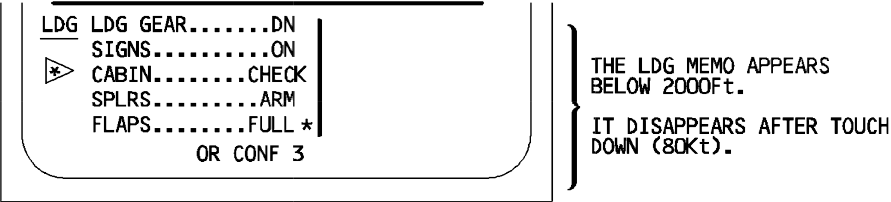
Takeoff and landing memos are displayed, as follows, during the related flight phases:



(*) This line disappears when the test is completed. It is replaced by “TO CONFIG NORMAL”, if aircraft configuration is correct.

The test is requested again, if the configuration becomes abnormal.

Continued on the next page



(*) “CONF 3” is displayed in alternate or direct law, or if the GPWS LDG FLAP 3 pushbutton is ON.

CONFIGURATION WARNINGS

Applicable to: MSN 3411

The following warnings and cautions appear in the lower part of the E/WD if the aircraft is not in takeoff configuration when the flight crew presses the TO CONFIG pushbutton on the ECAM control panel or applies takeoff power.

WARNINGS/CAUTIONS	TO CONFIG TEST	TO POWER
CONFIG RUD TRIM NOT IN TO RANGE (R)	TRIGGERED	TRIGGERED
CONFIG PITCH TRIM NOT IN TO RANGE (R)		
CONFIG FLAPS NOT IN TO CONFIG (R)		
CONFIG SPD BRK NOT RETRACTED (R)		
CONFIG SLATS NOT IN TO CONFIG (R)		
CONFIG L SIDESTICK FAULT (R)		
CONFIG R SIDESTICK FAULT (R)		
DOOR (A)		
FWS OEB/FWC DISCREPANCY (A)		
BRAKES HOT (A)		
CONFIG PARK BRK ON (R)	NOT TRIGGERED	
ENG FLEX TEMP NOT SET (A)		

- (R) Red warning
- (A) Amber caution

CONFIGURATION WARNINGS

Applicable to: MSN 3413-4006

The following warnings and cautions appear in the lower part of the E/WD if the aircraft is not in takeoff configuration when the flight crew presses the TO CONFIG pushbutton on the ECAM control panel or applies takeoff power.

WARNINGS/CAUTIONS	TO CONFIG TEST	TO POWER
CONFIG RUD TRIM NOT IN TO RANGE (R)	TRIGGERED	TRIGGERED
CONFIG PITCH TRIM NOT IN TO RANGE (R)		
CONFIG FLAPS NOT IN TO CONFIG (R)		
CONFIG SPD BRK NOT RETRACTED (R)		
CONFIG SLATS NOT IN TO CONFIG (R)		
CONFIG L SIDESTICK FAULT (R)		
CONFIG R SIDESTICK FAULT (R)		
DOOR (A)		
FWS OEB/FWC DISCREPANCY (A)		
BRAKES HOT (A)		
CONFIG PARK BRK ON (R)	NOT TRIGGERED	
ENG THR LEVERS NOT SET (A)		

(R) Red warning

(A) Amber caution

CONFIGURATION WARNINGS

Applicable to: MSN 2037-3184, 4012-5319

The following warnings and cautions appear in the lower part of the E/WD if the aircraft is not in takeoff configuration when the flight crew presses the TO CONFIG pushbutton on the ECAM control panel or applies takeoff power.

WARNINGS/CAUTIONS	TO CONFIG TEST	TO POWER
CONFIG RUD TRIM NOT IN TO RANGE (R)	TRIGGERED	TRIGGERED
CONFIG PITCH TRIM NOT IN TO RANGE (R)		
CONFIG FLAPS NOT IN TO CONFIG (R)		
CONFIG SPD BRK NOT RETRACTED (R)		
CONFIG SLATS NOT IN TO CONFIG (R)		
CONFIG L SIDESTICK FAULT (R)		
CONFIG R SIDESTICK FAULT (R)		
DOOR (A)		
FWS OEB/FWC DISCREPANCY (A)		
BRAKES HOT (A)		
FUEL R(L) TK PUMP 1+2 LO PR (A)		NOT TRIGGERED
HYD G(Y) ENG 1(2) PUMP LO PR (A)		
HYD G(Y)(B) SYS LO PR (A)		
ELEC IDG 1(2) DISCONNECTED (A)		
ELEC GEN 1(2) FAULT (A)	TRIGGERED if the two GENs are inop.	
ELEC GEN 1(2) OFF (A)		
CONFIG PARK BRK ON (R)	NOT TRIGGERED	TRIGGERED
ENG THR LEVERS NOT SET (A)		

(R) Red warning

(A) Amber caution

GENERAL

Applicable to: ALL

The system/status display (SD) uses the lower ECAM DU to display :

- pages showing synoptic diagrams of the aircraft systems, or
- the status page.

SYSTEM PAGES

Applicable to: ALL

The lower ECAM DU can display 12 system pages (For description see relevant FCOM chapter):

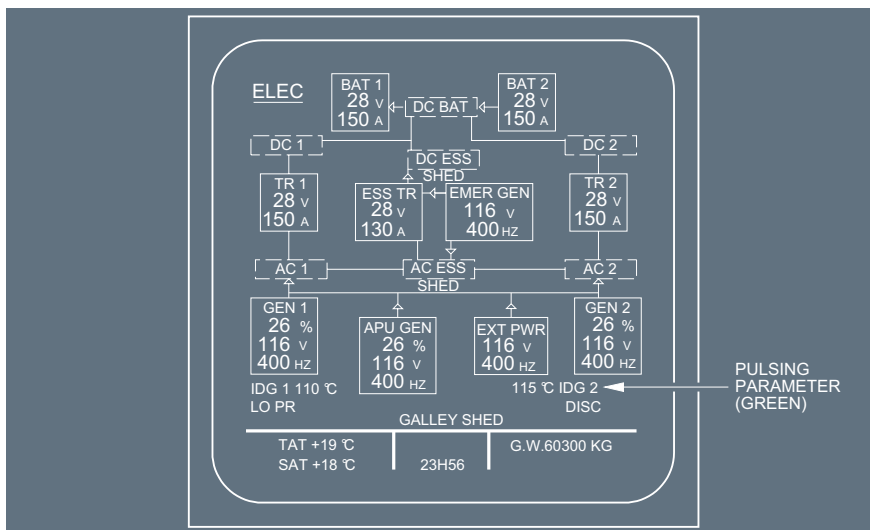
- ENGINE (secondary engine parameters)
- BLEED (air bleed)
- CAB PRESS (cabin pressurization)
- ELEC (electric power)
- HYD (hydraulic)
- FUEL (fuel)
- APU (auxiliary power unit)
- COND (air conditioning)
- DOOR/OXY (doors/oxygen)
- WHEEL (landing gear, braking, ground spoilers, etc.)
- F/CTL (flight controls)
- CRUISE (cruise)

The pilot may manually call up a system page for display on the lower ECAM DU, or the system may automatically display a page.

- Manual:
 - The pilot can, at any time, use the pushbutton on the ECAM's control panel to call up and display any system page, except the CRUISE page.
 - The corresponding pushbutton on the ECAM control panel lights up.
 - A failure-related or advisory display automatically replaces a page the pilot has manually called up.
- Automatic, related to a failure:
 - The relevant system page automatically appears, as soon as any fault or malfunction triggers a caution or warning message.
- Automatic, advisory:
 - The relevant system page automatically appears, when a parameter drifts out of its normal range.
 - The value (shown in green) pulses, as long as it is outside its limits.

Continued on the next page

- The advisory mode is inhibited in some flight phases.

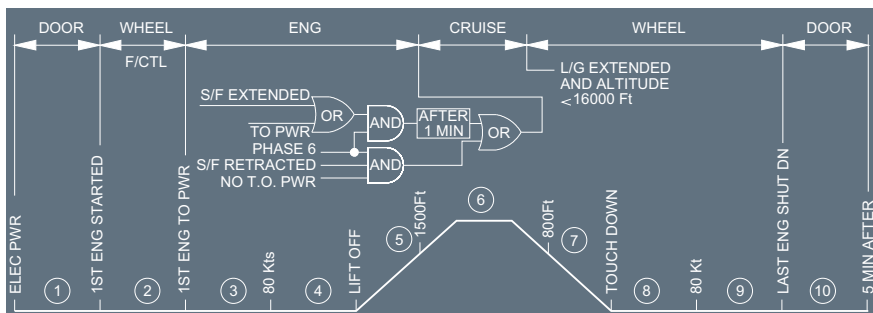


Note: If an advisory is triggered, when the ECAM is in the single-display configuration, an advisory message appears on the upper part of the E/WD, and the associated key on the ECAM control panel flashes to identify the appropriate system page.



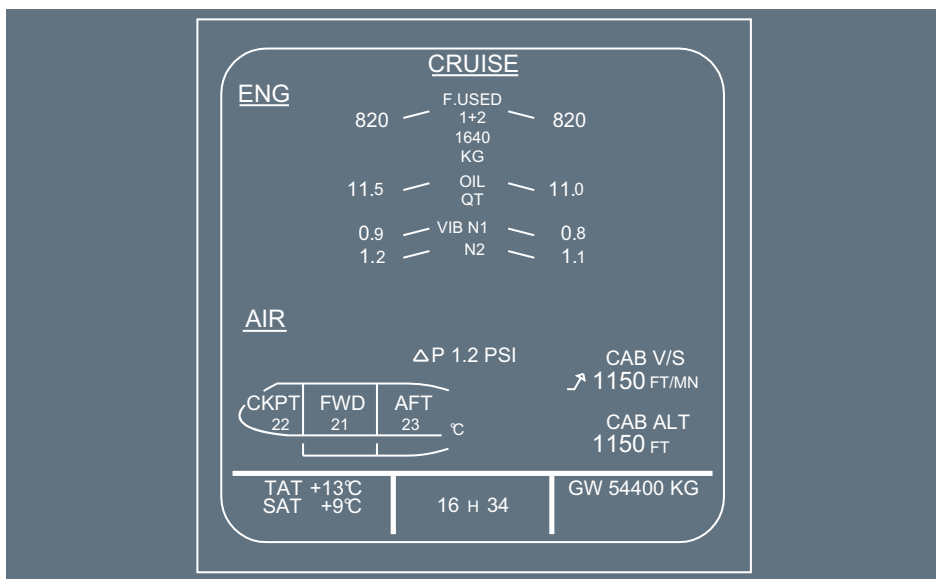
- Automatic, flight phase mode
 - If no other mode is engaged, the SD displays the system page related to the present flight phase, as shown in the following diagram.

Continued on the next page



- Phase 2 : The F/CTL page replaces the WHEEL page for 20 s when either pilot moves his sidestick (more than 3 ° in pitch or roll) or when the rudder pedal deflection is more than 22 °.
- The APU page appears when the APU MASTER switch is ON. It disappears when APU RPM has been above 95 % for 10 s, or when the APU MASTER switch is switched OFF.
- The ENGINE page appears at the beginning of start sequence or when a pilot selects “CRANK”. It disappears 10 s after the end of the start sequence, when the ENG MODE sel is set to NORM.

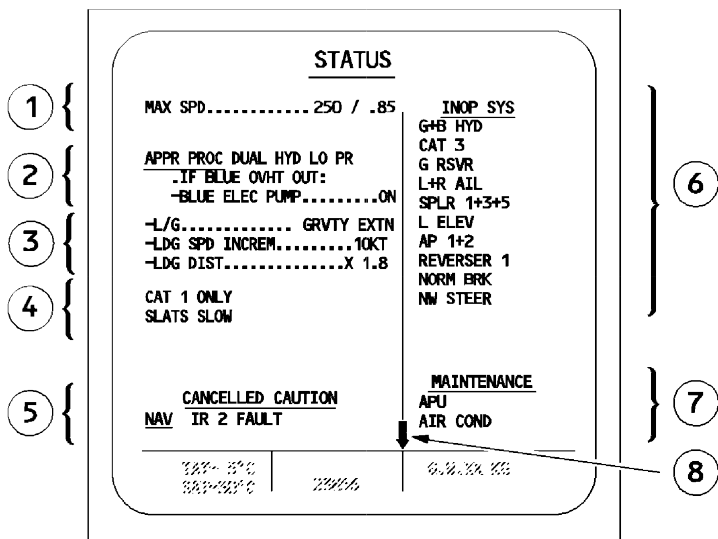
For a description of the ENGINE and AIR indications that appear when the SD is displaying the CRUISE page, see the relevant FCOM chapter.



STATUS PAGE

Applicable to: ALL

The status page displays an operational summary of the aircraft status after the SD has displayed a failure. As shown in the illustration above, the summary includes :



- (1) Limitations (speed, flight level) : Blue
- (2) Approach procedures : White/Red or Amber
- (3) Procedures (corrections to apply for landing) : Blue
- (4) Information : Green
- (5) Cancelled caution : White
- (6) Inoperative system : Amber
- (7) Maintenance status : White
- (8) Symbol displayed if data overflows the left or right area.

The pilot scrolls the display to view overflow by pressing the CLR pushbutton.

Note: The titles of the different parts of the display are white and underlined.

Continued on the next page

The STATUS page automatically appears, once the crew has cleared all the pages corresponding to the current failure. The STATUS page also appears automatically during descent, when the slats are extended, unless the page is empty. The pilot may manually call up the status page by pressing the STS key on the ECAM control panel.

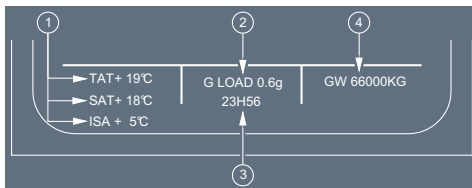
If the STATUS page holds messages other than “CANCELLED CAUTION”, or the MAINTENANCE part, the E/WD screen shows “STS” (status reminder).

If the STATUS page holds messages in the MAINTENANCE, part on engine shutdown, the “STS” (status reminder) flashes on the E/WD screen.

The screen displays the MAINTENANCE, only when the aircraft is on ground, before engine start-up or after engine shutdown (Phases 1 and 10).

PERMANENT DATA

Applicable to: ALL



- (1) Temperature
The screen displays the Total Air Temperature (TAT) and Static Air Temperature (SAT) in green. International Standard Atmosphere temperature (ISA) is displayed in GREEN, in standard altitude mode and when the SAT is valid.
- (2) G LOAD
The screen displays the load factor (G LOAD) in amber, when the value is above 1.4 g or below 0.7 g. The display of the load factor is inhibited during flight phases 1, 2 and 3.
- (3) UTC
The screen displays the Universal Time Coordinated (UTC), synchronized with the cockpit clock, in green.
- (4) GW
The screen displays the Gross Weight (GW) in green, as soon as the flight crew starts the first engine. The last two digits are dashed, if accuracy is degraded. On ground, blue dashes are displayed instead of the indication, if no computed data is available.

***Note:** When the Fuel On Board (FOB) indicated on the ECAM exceeds 23 200 kg (51 147 lb), the GW indication is inaccurate. When the FOB on the ECAM goes below 23 200 kg (51 147 lb) GW accuracy is recovered.*

AMBER CROSSES "XX" ON THE SD

Applicable to: ALL

If a parameter value on any SD page is not available for display, amber crosses "XX" appear instead of the value.

GENERAL**Applicable to: ALL**

If ECAM detects a failure :

- The E/WD displays warning or caution messages.
- The master warning or master caution lights light up (except in the case of a level 1 caution).
- The system sounds an aural signal (except in the case of a level 1 caution).
- The system display (SD) shows the system page for the affected system.
- The CLR pushbutton on the ECAM control panel lights up.

In addition, a local warning light controlled directly by the affected system can light up.

After completing remedial procedures, the flight crew must push the CLR pushbutton repeatedly until the displays return to their normal configurations :

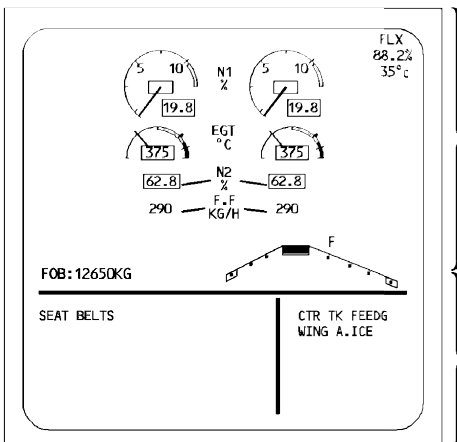
- MEMO messages on the E/WD
- The system page related to the present flight phase on the SD.
- The CLR light on the ECAM control panel turned off.

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1 - THE ECAM DETECTS NO FAILURE

Applicable to: ALL

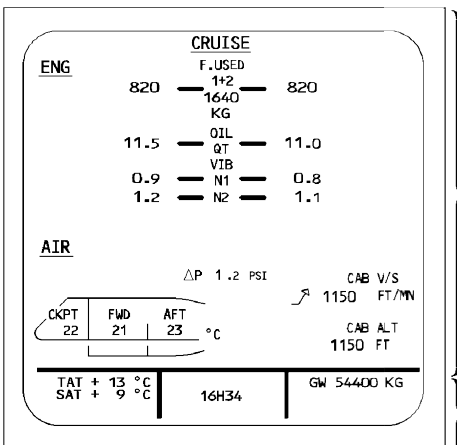
ECAM UPPER DISPLAY (E/WD)



- ENGINE CONTROL PARAMETERS
- FUEL QUANTITY INDICATION
- FLAPS/SLATS POSITION

- MEMO INFORMATION

ECAM LOWER DISPLAY (SD)



- FLIGHT PHASE RELATED SYSTEM PAGE (CRUISE PAGE IN THIS EXAMPLE)

- PERMANENT DATA

2 - THE ECAM DETECTS A FAILURE

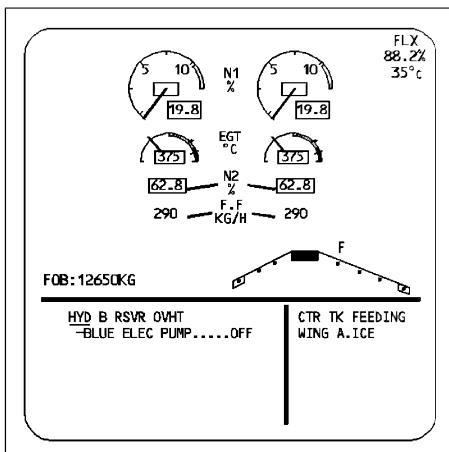
Applicable to: ALL

For example, a hydraulic reservoir is overheat.

COCKPIT INDICATIONS

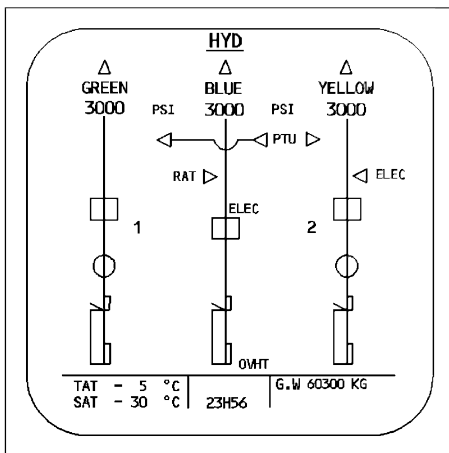
- A single chime sounds.
- Both MASTER CAUTION lights come on, and stay on.
- A FAULT light, on the overhead HYD panel, comes on.
- The memo space on the E/WD displays the “HYD B RSVR OVHT” message, and the “BLUE ELEC PUMP OFF” instruction.
- The lower ECAM display (SD) automatically calls up the hydraulic system's diagram, and displays “OVHT” in amber next to the blue system.
- The ECAM's CLR pushbutton lights up.

Continued on the next page



ECAM UPPER DISPLAY (E/WD)

- BOTTOM LEFT
 - . INDEPENDENT FAILURE
 - TITLE OF THE FAILURE
 - ACTIONS TO BE PERFORMED
- BOTTOM RIGHT
 - .MEMO INFORMATION



ECAM LOWER DISPLAY (SD)

- SUMMARY OF THE AFFECTED SYSTEM AUTOMATICALLY DISPLAYED.
- OVHT IS DISPLAYED IN AMBER.

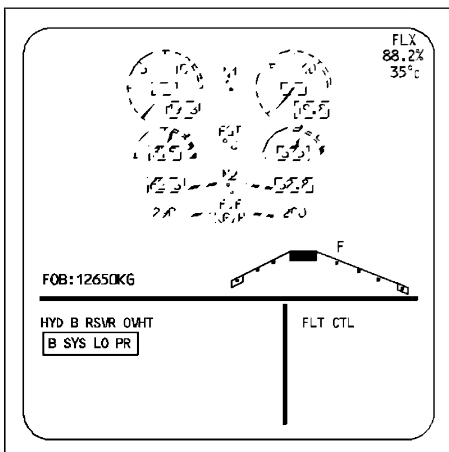
3 - THE FLIGHT CREW FOLLOWS THE INSTRUCTION DISPLAYED ON THE E/WD**Applicable to: ALL**

The flight crew switches off the BLUE ELEC PUMP pushbutton, depressurizing the blue hydraulic circuit.

COCKPIT INDICATIONS

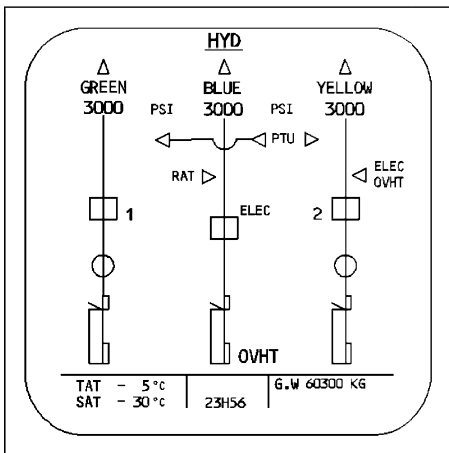
- A single chime sounds.
- Both MASTER CAUTION lights stay on.
- A FAULT/OFF light, on the overhead panel, comes on.
- The second part of the message on the E/WD changes to “B SYS LO PR”.
- The SD's system diagram shows an amber zero for the pressure in the blue system, along with the amber “OVHT”.
- The right side of the memo area indicates a secondary failure in the flight control system.
- The ECAM control panel's CLR pushbutton remains on.

Continued on the next page



ECAM UPPER DISPLAY (E/WD)

- BOTTOM LEFT
 - . INDEPENDENT FAILURE AND PRIMARY FAILURE
- BOTTOM RIGHT
 - . SECONDARY FAILURE



ECAM LOWER DISPLAY (SD)

- THE SYNOPTIC OF THE SYSTEM PAGE IS CHANGED ACCORDING TO THE NEW SYSTEM CONFIGURATION
- OVHT AND THE PRESSURE ARE DISPLAYED IN AMBER

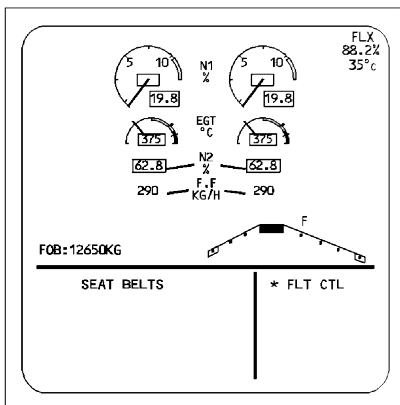
4 - ONE OF THE PILOTS PUSHES THE CLR PUSHBUTTON ON THE ECP

Applicable to: ALL

COCKPIT INDICATIONS

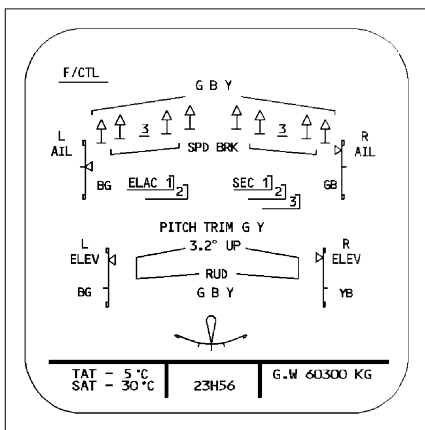
- The CLR pushbutton stays on.
- The FAULT/OFF light stays on.
- Hydraulic system messages disappear from the E/WD, and the right side of the memo area indicates a secondary failure in the flight control system.
- The SD automatically calls up the flight control system page, with surface actuator indications (associated with the blue hydraulic system) shown in amber.

Continued on the next page



ECAM UPPER DISPLAY (E/WD)

- BOTTOM LEFT
MEMO INFORMATION
- BOTTOM RIGHT
SECONDARY FAILURE



ECAM LOWER DISPLAY (SD)

- F/CTL SYSTEM PAGE
AUTOMATICALLY DISPLAYS
FAULTY SPOILERS (n°3)
AND SURFACE ACTUATOR B PRESSURE
INDICATIONS IN AMBER

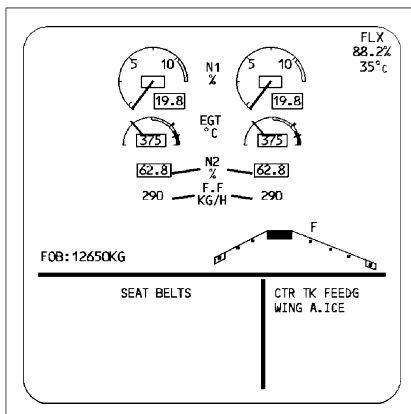
5 - ONE OF THE PILOTS PUSHES THE CLR PUSHBUTTON A SECOND TIME

Applicable to: ALL

COCKPIT INDICATIONS

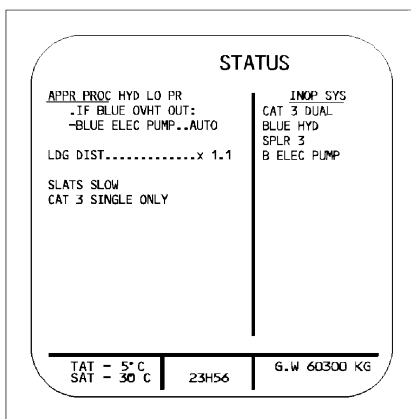
- The ECP's CLR and STS pushbuttons light up.
- The FAULT/OFF lights stay on.
- The E/WD's memo area returns to normal.
- The STATUS page automatically appears on the SD, displaying the procedures for completing the flight with a faulty blue system.

Continued on the next page



ECAM UPPER DISPLAY (E/WD)

- FULL MEMO DISPLAYED



ECAM LOWER DISPLAY (SD)

-THE STATUS PAGE IS AUTOMATICALLY
DISPLAYED TO:
.PROVIDE THE PROCEDURE TO BE APPLIED
FOR APPROACH.
.PROVIDE LANDING DISTANCE
FACTORS AND INFORMATION.
.LIST THE INOPERATIVE SYSTEMS.

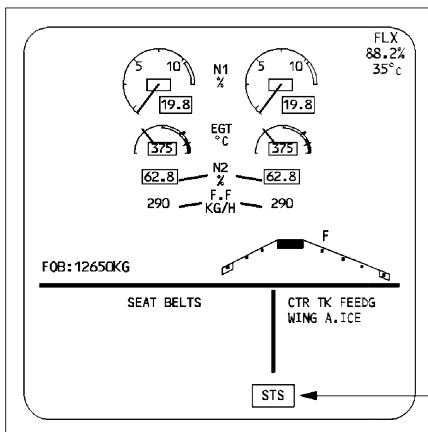
6 - ONE OF THE PILOTS PUSHES THE CLR PUSHBUTTON A THIRD TIME

Applicable to: ALL

COCKPIT INDICATIONS

- The CLR pushbutton light goes off.
- The FAULT/OFF lights stay on.
- A status reminder appears at the bottom of the E/WD.
- The SD automatically displays the system page corresponding to the flight phase.

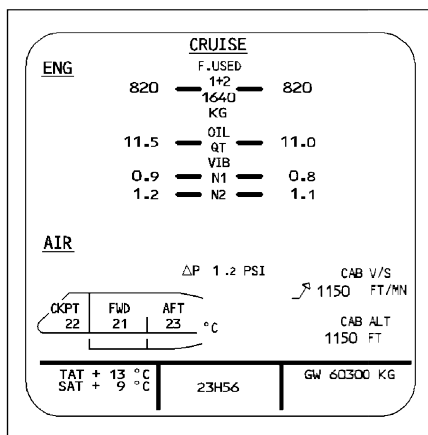
Continued on the next page



ECAM UPPER DISPLAY (E/WD)

- FULL MEMO DISPLAYED

- STATUS REMINDER



ECAM LOWER DISPLAY (SD)

- RETURN TO THE FLIGHT PHASE
RELATED SYSTEM PAGE :
CRUISE PAGE



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-31 – INDICATING / RECORDING SYSTEMS

DSC-31-25 – ECAM Sequence

DSC-31-25-20 – Example

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GENERAL

Applicable to: ALL

The OEB reminder function provides operational help to the crew by enabling them to clearly identify (on the ECAM) all procedures and status messages affected by an OEB.

When a situation leading to a warning/caution occurs, a message informs the crew in real time that an OEB exists for the displayed warning and/or status and, consequently, that the procedure and/or status presented on the ECAM is not applicable.

Then the crew must refer to the QRH where the correct information is provided.

DESCRIPTION

Applicable to: MSN 3411-4006

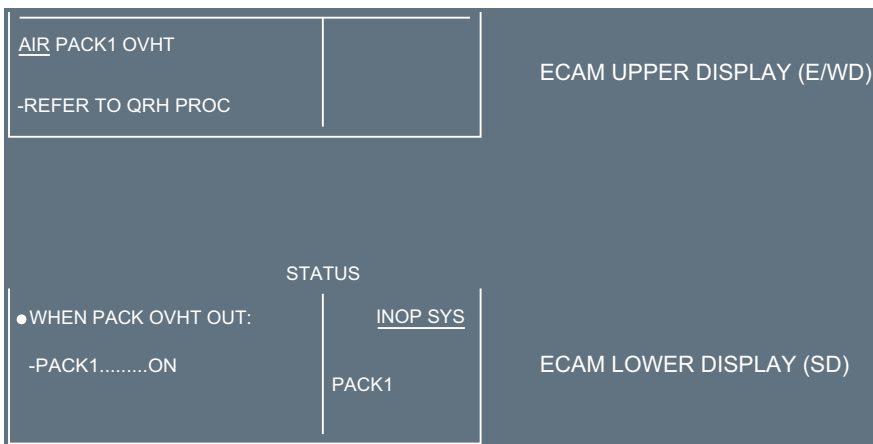
The OEB reminder flag may apply to the:

- ECAM procedure only,
- ECAM procedure and corresponding status messages,
- Status message only.

PROCEDURE ONLY AFFECTED

- The ECAM warning title remains unaltered,
- All corresponding actions are suppressed and replaced by the “REFER TO QRH PROC” message,
- The related status messages on the ECAM system display remains unaltered.

COCKPIT INDICATION

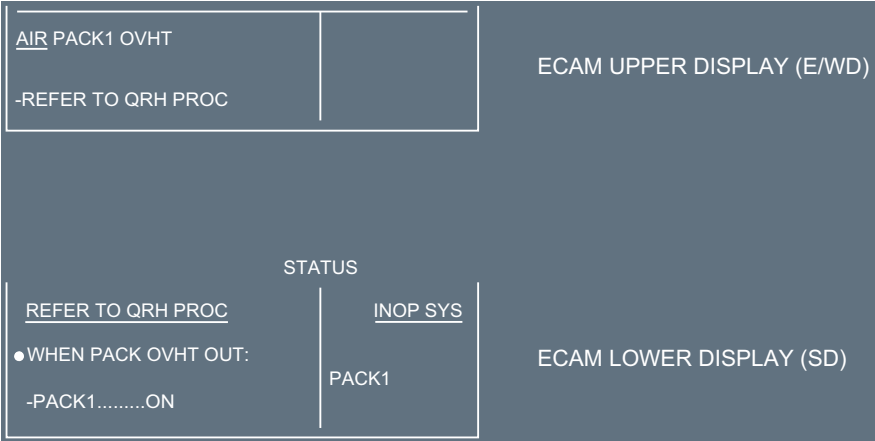


Continued on the next page

PROCEDURE AND STATUS AFFECTED

- The ECAM warning title remains unaltered,
- All corresponding actions are suppressed and replaced by the “REFER TO QRH PROC” message,
- The related status messages on the ECAM system display remains unchanged, except for the additional “REFER TO QRH PROC” title.

COCKPIT INDICATION



STATUS MESSAGE ONLY AFFECTED

- The ECAM warning title remains unaltered,
- The corresponding procedure remains unchanged, except for the additional “FOR STS REFER TO QRH” line.
- The related status messages on the ECAM system display remains unchanged, except for the additional “REFER TO QRH PROC” title.

Continued on the next page

COCKPIT INDICATION

<u>AIR PACK1 OVHT</u> -PACK1.....OFF ● WHEN PACK OVHT OUT: -PACK1.....ON -FOR STS REFER TO QRH		ECAM UPPER DISPLAY (E/WD)
<u>REFER TO QRH PROC</u> ● WHEN PACK OVHT OUT: -PACK1.....ON	STATUS <u>INOP SYS</u> PACK1	ECAM LOWER DISPLAY (SD)

DESCRIPTION

Applicable to: MSN 2037-3184, 4012-5319

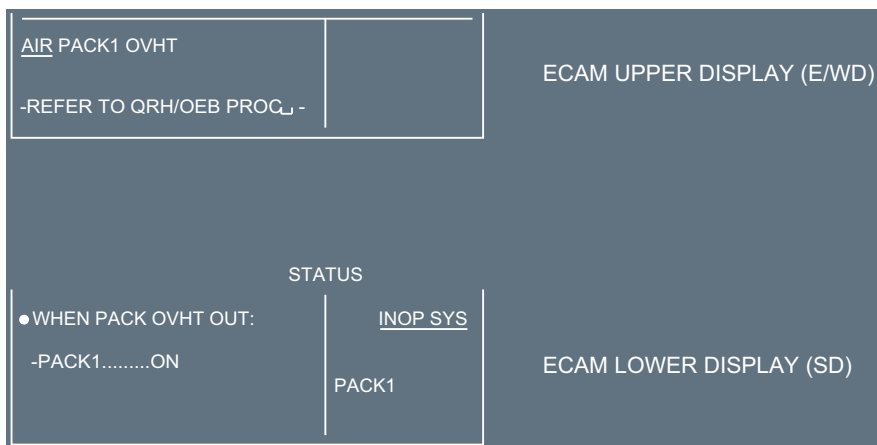
The OEB reminder flag may apply to the:

- ECAM procedure only,
- ECAM procedure and corresponding status messages,
- Status message only.

PROCEDURE ONLY AFFECTED

- The ECAM warning title remains unaltered,
- All corresponding actions are suppressed and replaced by the “REFER TO QRH/OEB PROC” message,
- The related status messages on the ECAM system display remains unaltered.

COCKPIT INDICATION

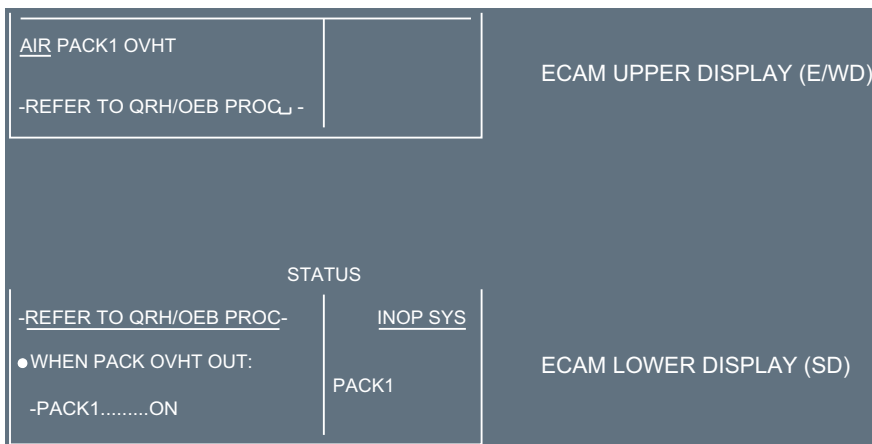


PROCEDURE AND STATUS AFFECTED

- The ECAM warning title remains unaltered,
- All corresponding actions are suppressed and replaced by the “REFER TO QRH/OEB PROC” message,
- The related status messages on the ECAM system display remains unchanged, except for the additional “REFER TO QRH/OEB PROC” title.

Continued on the next page

COCKPIT INDICATION

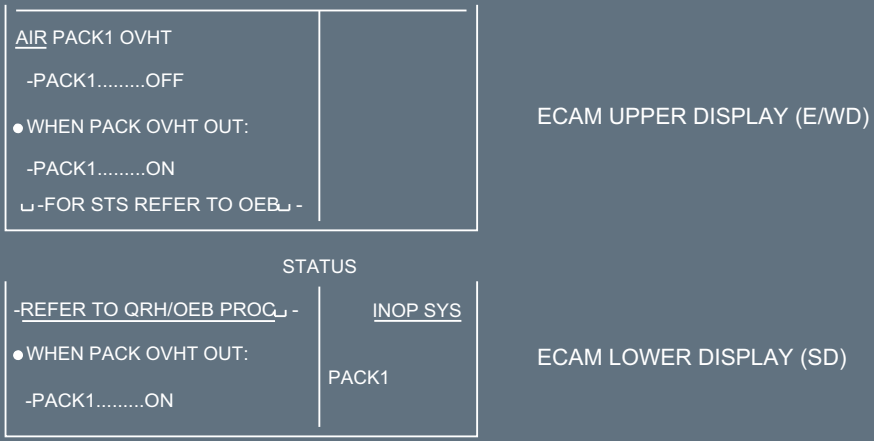


STATUS MESSAGE ONLY AFFECTED

- The ECAM warning title remains unaltered,
- The corresponding procedure remains unchanged, except for the additional "FOR STS REFER TO OEB" line.
- The related status messages on the ECAM system display remains unchanged, except for the additional "REFER TO QRH/OEB PROC" title.

Continued on the next page

COCKPIT INDICATION



OEB DATABASE

Applicable to: ALL

The OEB database lists the warnings and cautions affected by an OEB.

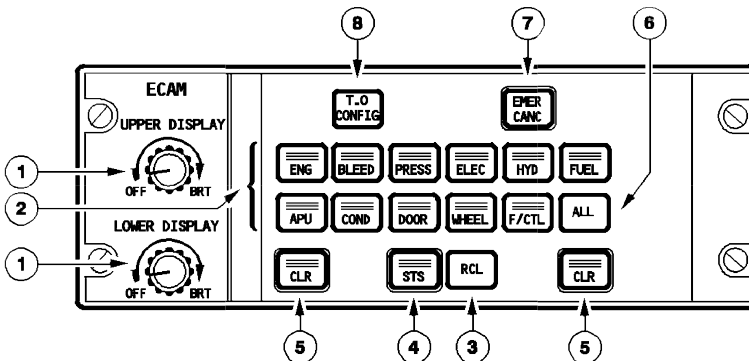
The OEB database can be :

- Loaded manually on the aircraft via the MCDU, and stored in both FWCs.
- Crossloaded from one FWC to the other FWC.
- Updated by entering a code via the MCDU.
- Checked via the MCDU.

Note: The code provided on the OEB is designed to ensure that the OEB database is not updated before the OEB is available.

ECAM CONTROL PANEL

Applicable to: ALL



(1) OFF / BRT knobs

Used to turn the ECAM DUs on and off, and to control their brightness (automatic adjustment of brightness for ambient light conditions is superimposed on this manual control).

Note: When the pilot turns the UPPER DISPLAY knob to OFF, the engine/warning (E/W) display appears on the lower display unit (automatic transfer).

(2) System page pushbuttons

- Call up the corresponding system pages on the SD
- Light up, when pushed for manual selection, or when an advisory is detected
- Call up the aircraft system page corresponding to the present flight phase or the current warning when pushed a second time.

When only one ECAM display is on, the pilot can display a system page for up to 3 min by pushing and holding the system page pushbutton.

- If an advisory condition arises, the relevant system page is not automatically displayed, but the pushbutton light pulses
- If an ECAM warning is triggered, the relevant system page is not automatically displayed, and the system page pushbutton does not light up.

(3) RCL pb

If the flight crew pushes the RCL pb, the E/WD displays:

- All warning, caution messages, and status pages that have been suppressed by the activation of the CLR pb, and

Continued on the next page

- All the alerts that are still active but inhibited in the whole active flight phase.

If there are no suppressed warnings or cautions, the E/WD shows “NORMAL” for 5 s.

If the flight crew holds this pushbutton down for more than 3 s, the E/WD displays any caution messages that were suppressed by the EMER CANC pb.

(4) STS pb

The pilot pushes this pushbutton to display the STATUS page on the lower SD. The pushbutton remains lit, as long as the SD displays the STS page. If the system has no status messages, the status page displays “NORMAL” for 5 s.

The pilot can clear the STATUS page by pushing the CLR pb, or by pushing the STS pb a second time.

When only one ECAM display is on :

- It displays the STATUS page only when the pilot pushes the STATUS pushbutton and holds it. He can display the next STATUS page, if any, by releasing the pushbutton and pushing it again (before 2 s have elapsed). The new page then appears after a short delay.
- The pilot can keep the STS pb pressed to display the STATUS page for a maximum of 3 min, after which the ECAM automatically displays the engine/warning page.

(5) CLR pb

This pushbutton remains lit as long as the E/WD is displaying a warning or caution message, or a status message on the SD.

If it is lit, pressing it changes the ECAM display.

(6) ALL pb

When this pushbutton is pressed and held down, the SD successively displays all the system pages at one-second intervals.

If the ECAM control panel fails, the pilot can use this pushbutton to page through the system pages until he comes to the one he wants to look at. He then releases the pushbutton to select that page.

(7) EMER CANC pb

This pushbutton affects the following :

- Warnings :
 - Cancel (stop) an aural warning for as long as the failure condition continues
 - Extinguishes the MASTER WARNINGS lights
 - Does not affect the ECAM message display.
- Cautions :
 - Cancel any present caution (single chime, MASTER CAUTION lights, ECAM message) for the rest of the flight

Continued on the next page

- Automatically calls up the STATUS page, which displays “CANCELLED CAUTION” and the title of the failure that is inhibited.

The inhibition is automatically suppressed when Flight Phase 1 is initiated. The pilot may restore it manually by pressing the RCL pb for more than 3 s.

Note: This pushbutton should only be used to suppress spurious MASTER CAUTIONS.

(8) T.O CONFIG pb

This pushbutton simulates the application of takeoff power. This is a test that triggers a warning, if the aircraft is not in takeoff configuration. (*Refer to DSC-31-15 Configuration Warnings*).

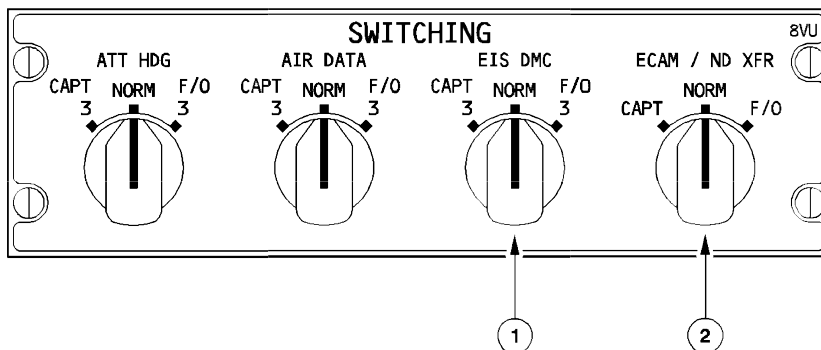
If the configuration is correct, the E/WD displays the “TO CONFIG NORMAL” message in the TO MEMO section.

Note: If the ECAM control panel fails, the CLR, RCL, STS, EMER CANC, and ALL pushbuttons remain operative, because their contacts are directly wired to the flight warning and display management computers.

SWITCHING PANEL

Applicable to: ALL

ON PEDESTAL



(1) EIS DMC rotary selector

NORM : DMC 1 supplies the CAPT's PFD, the CAPT's ND, and the ECAM's DUs.

DMC 2 supplies the F/O's PFD and the F/O's ND.

CAPT 3 : DMC 3 replaces DMC 1.

F/O 3 : DMC 3 replaces DMC 2.

Note: If a DMC fails, each of its associated DUs displays an "INVALID DATA" message.

(2) ECAM/ND XFR rotary selector

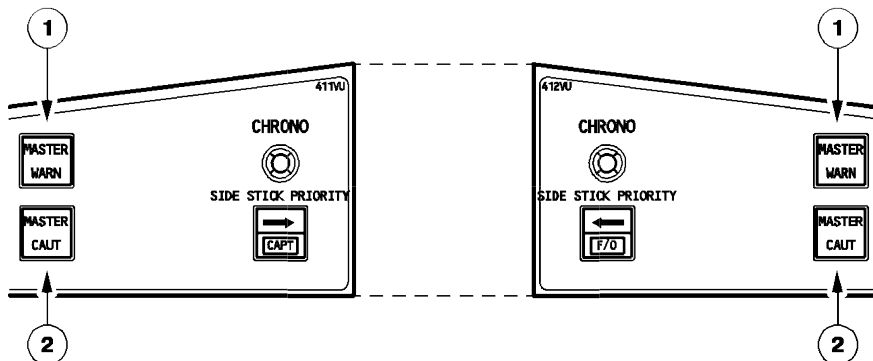
Transfers the system/status display to either the Captain's or the First Officer's ND.

The "ECAM ON ND" message is displayed on the lower ECAM display.

Note: If both ECAM DUs (E/WD and SD) fail, the flight crew may use this switch to transfer the E/WD display to either navigation display. In this case, the "ECAM ON ND" message is not displayed.

ATTENTION GETTERS

Applicable to: ALL



(1) MASTER WARN lights

- Flash red for level 3 warning
- Accompanied by an aural warning (continuous repetitive chime, specific sounds or synthetic voice).

(2) MASTER CAUT lights

- Light up steady amber for a level 2 caution
- Accompanied by a single chime.

These lights go out when :

- One pilot presses the light (except for some red warnings, such as the overspeed and stall warnings)
- The warning/caution situation is over
- The pilot presses the CLR pb on the ECAM control panel (except for some red warnings, such as the overspeed and stall warnings).
- The pilot presses the EMER CANC pb on the ECAM control panel.

The aural warnings cease when :

- One pilot presses the MASTER WARN light (except for some red warnings, such as the overspeed and stall warnings)
- The warning situation is over
- The pilot presses the EMER CANC pb on the ECAM control panel.

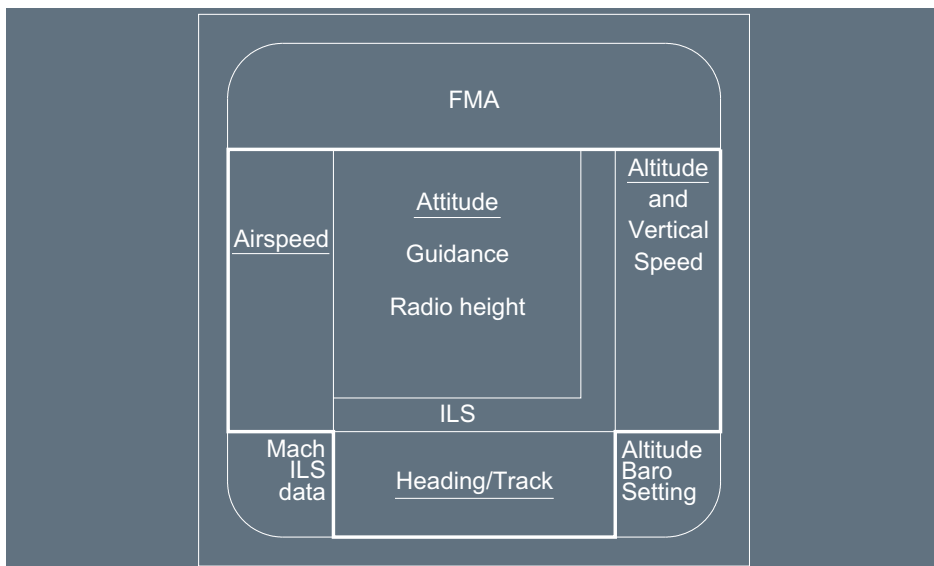
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GENERAL

Applicable to: ALL

The Primary Flight Display (PFD) provides the following information to the flight crew:

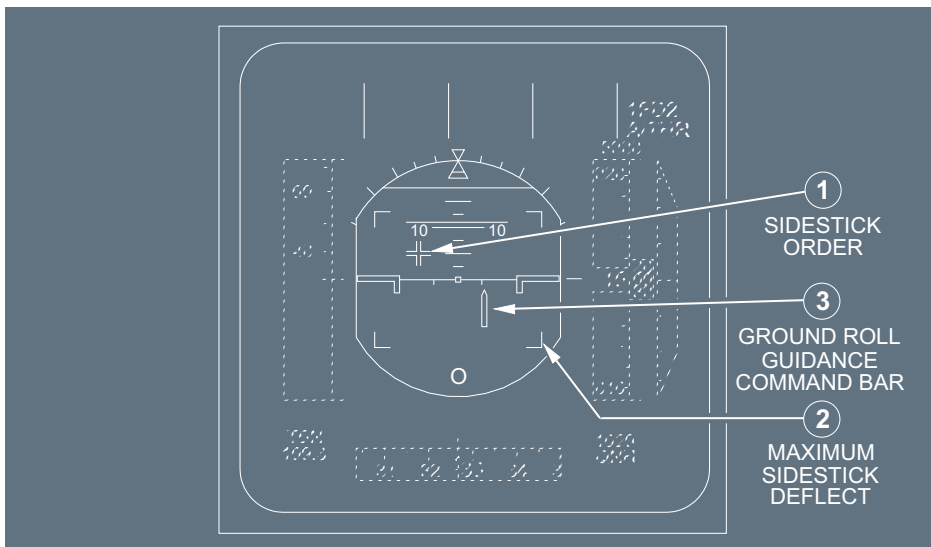
- Attitude and guidance
- Airspeed
- Altitude (BARO and radio) and vertical speed
- Heading and track
- FMGS modes (Flight Mode Annunciator)
- Vertical and lateral deviations
- Radio navigation information (ILS, DME).



The FWC monitors main parameters such as attitude, heading, and altitude. For more information, Refer to DSC-31-40 *Flags and Messages Displayed on PFD*.

SPECIFIC GROUND INDICATIONS

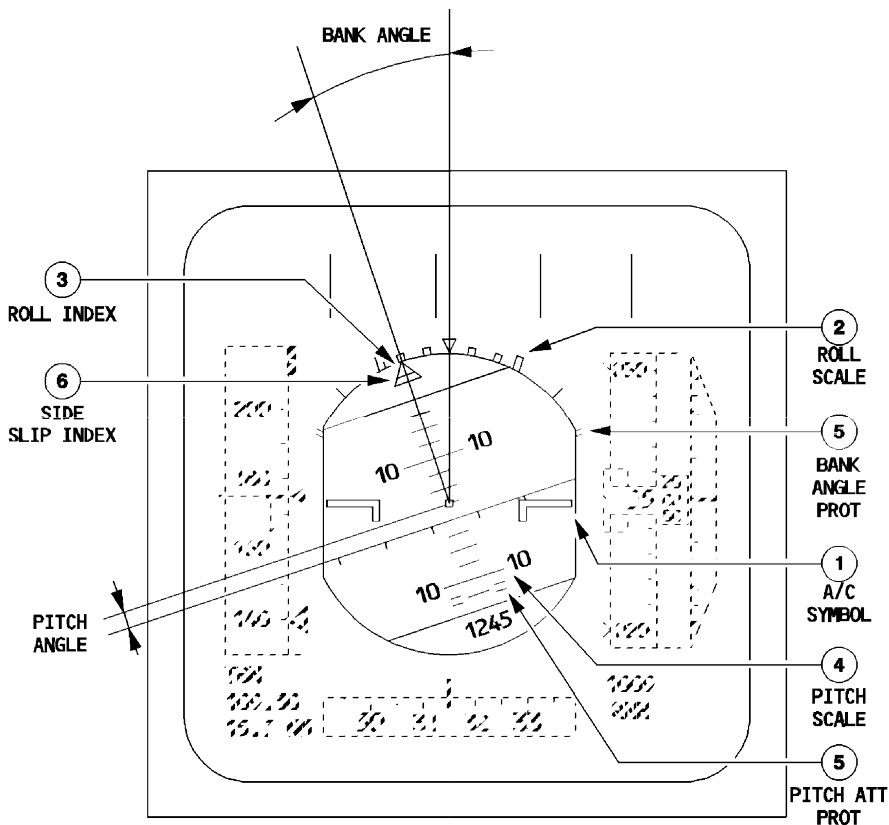
Applicable to: ALL



- (1) Sidestick order indication
This symbol is in white, and appears as soon as one engine is started. It indicates the total of the Captain's and First Officer's sidestick orders (shown here as left wing down, pitch up).
- (2) Max Sidestick Deflection
This symbol is in white, and appears as soon as one engine is started.
- (3) Ground Roll Guidance Command Bar
This symbol is in green, and appears when the aircraft is on ground, or below 30 ft radio altitude, provided that a localizer signal is available. It indicates the Flight Director yaw orders, to maintain the aircraft on the runway centerline.

ATTITUDE DATA

Applicable to: MSN 2037-2402



(1) Fixed Aircraft Symbol

This symbol is in black, and outlined in yellow. The yellow outline is dimmed if the flight crew selects TRK-FPA, unless the FMA is in TOGA or FLX mode.

(2) Roll Scale

This scale is in white, and has markers at 0, 10, 20, 30, and 45 ° of bank.

Continued on the next page

(3) Roll Index (yellow)

This pointer indicates the bank angle. When the bank angle exceeds 45 °, all the PFD symbols, except those for attitude, speed, heading, altitude, and vertical speed, disappear. The display returns to normal when the bank angle decreases below 40 °.

(4) Pitch Scale (white)

This scale has markers every 10 ° between 80 ° nose up and 80 ° nose down (every 2.5 ° between 10 ° nose down and 30 ° nose up). When pitch angle exceeds 25 ° nose up or 13 ° nose down, all the PFD displays except attitude, speed, speed trend, heading, altitude, and vertical speed disappear. Beyond 30 °, large red arrowheads indicate that the attitude has become excessive and show the direction to move the nose in order to reduce it. The display returns to normal when pitch angle becomes less than 22 ° nose up or 10 ° nose down.

(5) Flight Control Protection Symbols

The display shows these symbols (=) in green:

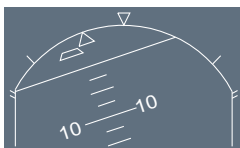
- On the roll scale to mark the bank angle protection availability.
- On the pitch scale at 15 ° nose down or 30 ° nose up to mark the pitch limits.

An amber x replaces these symbols if the corresponding protection is lost.

(Refer to DSC-27-20-10-20 PROTECTIONS - GENERAL)

(6) Sideslip Index (yellow)

This trapezoidal index moves beneath the roll index. On ground it represents the lateral acceleration of the aircraft. In flight it shows sideslip (as computed by the FAC). One centimeter of displacement indicates 0.2 g. The sideslip index is against its stop at 0.3 g.



In case of engine failure at takeoff or go around, the sideslip index changes from yellow to blue.

Note: The sideslip target is blue, if :

- CONF 1, 2, or 3 is selected, and
- Any ENG N1 > 80 %, and
- The difference between the ENG N1's exceeds 35 %.

In this case, the sideslip index is called β target.

When this index is centered with the roll index, the sideslip equals the sideslip target for optimum aircraft performance.

(3) Roll Index (yellow)

This pointer indicates the bank angle. When the bank angle exceeds 45° , all the PFD symbols, except those for attitude, speed, heading, altitude, and vertical speed, disappear. The display returns to normal when the bank angle decreases below 40° .

(4) Pitch Scale (white)

This scale has markers every 10° between 80° nose up and 80° nose down (every 2.5° between 10° nose down and 30° nose up). When pitch angle exceeds 25° nose up or 13° nose down, all the PFD displays except attitude, speed, speed trend, heading, altitude, and vertical speed disappear. Beyond 30° , large red arrowheads indicate that the attitude has become excessive and show the direction to move the nose in order to reduce it. The display returns to normal when pitch angle becomes less than 22° nose up or 10° nose down.

(5) Flight Control Protection Symbols

The display shows these symbols (=) in green:

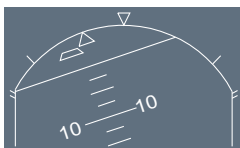
- On the roll scale to mark the bank angle protection availability.
- On the pitch scale at 15° nose down or 30° nose up to mark the pitch limits.

An amber x replaces these symbols if the corresponding protection is lost.

(Refer to DSC-27-20-10-20 PROTECTIONS - GENERAL)

(6) Sideslip Index (yellow)

This trapezoidal index moves beneath the roll index. On ground, it represents the lateral acceleration of the aircraft. In flight, it shows sideslip (as computed by the FAC). One centimeter of displacement indicates 0.2 g. The sideslip index is against its stop at 0.3 g.



In case of engine failure at takeoff or go around, the sideslip index changes from yellow to blue.

Note: The sideslip target is blue, if:

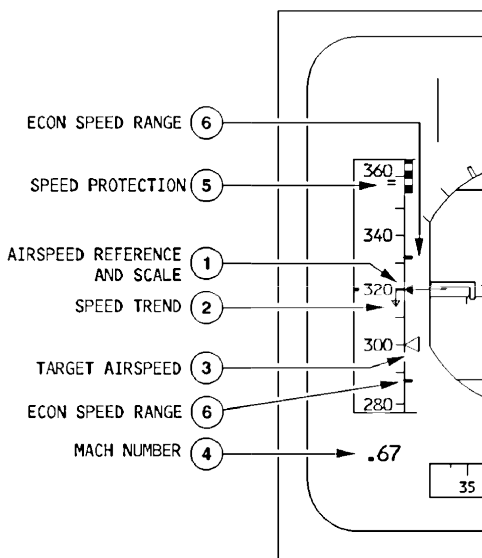
- CONF 1, 2, or 3 is selected, and
- Any ENG N1 > 80 % or one Thrust Lever > MCT ($\geq$ FLX if FLX or DERATED TO), and
- The difference between the ENG N1's exceeds 35 %.

In this case, the sideslip index is called β target.

When this index is centered with the roll index, the sideslip equals the sideslip target for optimum aircraft performance.

AIRSPEED

Applicable to: ALL



(1) Actual Airspeed Reference Line and Scale

A white scale, on a grey background, moves in front of a fixed yellow reference line (next to a yellow triangle) to indicate airspeed. The minimum airspeed indication is 30 kt.

(2) Speed Trend (yellow)

This pointer starts at the speed symbol. The tip indicates the speed the aircraft will reach in 10 s, if its acceleration remains constant. The pointer only appears, when it is greater than 2 kt, and disappears when it is less than 1 kt. It also disappears, if the FACs fail.

(3) Target Airspeed (magenta or blue)

This symbol gives the target airspeed, or the airspeed corresponding to the target Mach number. The target airspeed is the airspeed computed by FMGC in managed speed mode (magenta), or the airspeed manually entered on the FCU in selected speed mode (blue). The target speed is indicated by a magenta or blue triangle.

When the target speed is off the speed scale, its value is displayed as numbers, either above or below the speed scale.

Continued on the next page

(4) Mach Number (green)

It is displayed, when it is greater than 0.5.

(5) Speed Protection (green)

This symbol indicates the speed (VMO +6 kt or MMO +0.01) at which overspeed protection becomes active (*Refer to DSC-27-20-10-20 PROTECTIONS - GENERAL*).

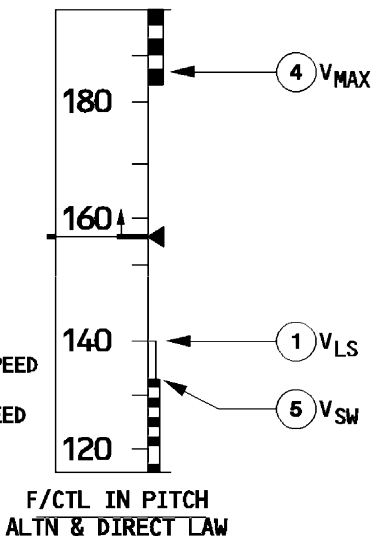
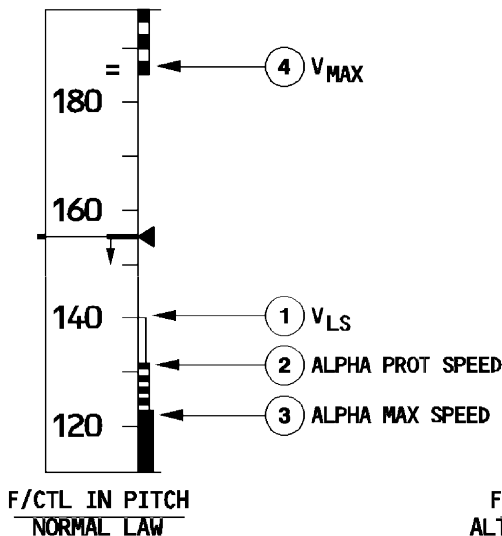
(6) ECON Speed Range (magenta)

In descent mode with the ECON/AUTO SPD mode active, these two thick lines replace the selected speed symbol. It shows the upper and lower limits, calculated by the FMGC.

- The upper speed is target speed +20 kt, limited to VMAX or VMO -3 kt or MMO -0.006, whichever is lowest.

If a speed limit or a speed constraint applies, the upper margin is limited to ECON SPD +5 kt.

- The lower speed margin is the target speed -20 kt, limited to green dot, F, S, or VLS, whichever is higher.



(1) Minimum Selectable Speed (VLS)

The top of the amber strip along the speed scale indicates this speed. It represents the lowest selectable speed providing an appropriate margin to the stall speed. (*Refer to PRO-SUP-10 Characteristic Speeds*)

VLS information is inhibited from touchdown until 10 s after liftoff.

Continued on the next page

(2) Alpha Protection Speed

The top of a black and amber strip along the speed scale indicates this speed.

It represents the speed corresponding to the angle of attack at which alpha protection becomes active (*Refer to DSC-27-20-10-20 PROTECTIONS - GENERAL*).

It is displayed when in pitch normal law.

(3) Alpha MAX Speed

The top of a red strip along the speed scale indicates this speed. It represents the speed corresponding to the maximum angle of attack that the aircraft can attain in pitch normal law (*Refer to DSC-27-20-10-20 PROTECTIONS - GENERAL*).

It is displayed when in pitch normal law.

(4) VMAX

The lower end of a red and black strip along the speed scale defines this speed.

It is the lowest of the following:

- VMO or the speed corresponding to MMO
- VLE
- VFE

(*Refer to PRO-SUP-10 Characteristic Speeds*)

(5) Stall Warning Speed (VSW)

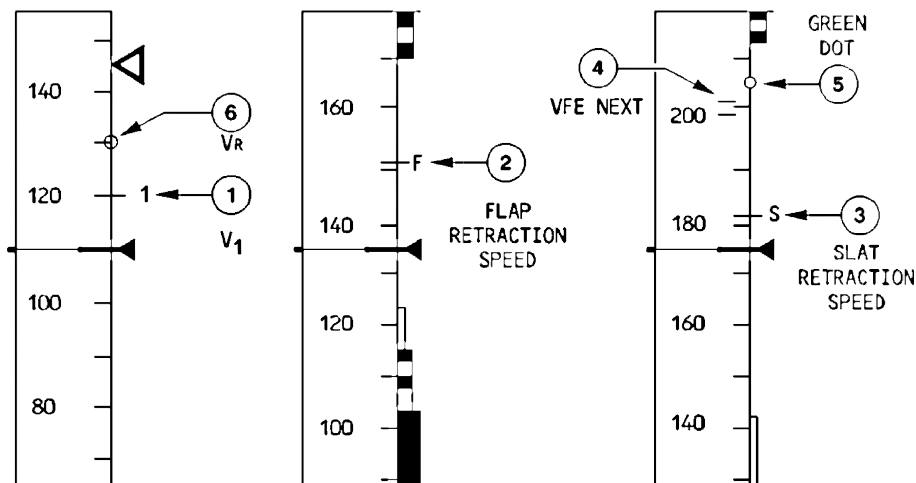
The top of a red and black strip along the speed scale defines this speed.

It is the speed corresponding to the stall warning. (*Refer to DSC-27-20-10-20 PROTECTIONS - GENERAL*).

VSW information is inhibited from touchdown until 5 s after liftoff.

It is displayed when operating in pitch alternate or pitch direct law.

Continued on the next page



(1) Decision Speed (V1)

This is a blue symbol (numeral one) that the crew manually inserts via the MCDU. When it is off the scale, the upper part of the scale shows it in numbers.

It disappears after liftoff. (Refer to *PRO-SUP-10 OTHER SPEEDS*).

(2) Minimum Flap Retraction Speed

This is a green symbol (letter F).

It appears when the flap selector is in position 3 or 2. (Refer to *PRO-SUP-10 Characteristic Speeds*).

(3) Minimum Slat Retraction Speed

This is a green symbol (letter S).

It appears when the flap selector is in position 1. (Refer to *PRO-SUP-10 Characteristic Speeds*).

(4) VFE NEXT

The VFE next symbol is an amber equal sign showing the VFE corresponding to the next flap lever position.

It appears when the aircraft altitude is below 15 000 ft or 20 000 ft, depending upon the FAC standard. (Refer to *PRO-SUP-10 PROTECTION SPEEDS*).

(5) Green Dot (Engine-out operating speed in clean configuration)

This green dot appears, when the aircraft is flying in the clean configuration.

Continued on the next page

It shows the speed corresponding to the best lift-to-drag ratio.

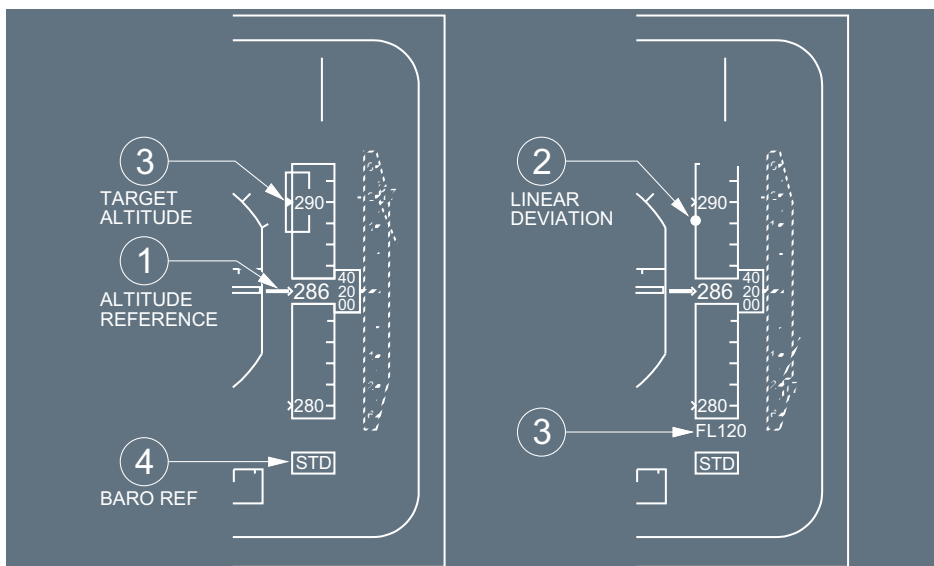
(6) Rotation speed: (VR)

VR is entered on the PERF takeoff page of the MCDU, and is indicated by a cyan circle. This cyan circle is visible during takeoff.

Note: V2 is represented by the target speed index during takeoff.
V2 is manually inserted by the crew via the MCDU.

ALTITUDE

Applicable to: MSN 2265, 2370, 2387, 2427, 2450, 3084, 4034, 4717-5319



(1) Altitude Indication

This appears both as a white moving scale, and as a green digital readout on a grey background. Small white marks are positioned on the scale against the round values (e.g. 280, 290...). "NEG" appears in the window in white for negative values. The altitude window changes from yellow to amber, if the aircraft deviates from the FCU-selected altitude or flight level.

On any approach for which a minimum is entered in the FMGC, the altitude numbers change from green to amber, when the aircraft goes below the minimum.

Continued on the next page

(2) Linear Deviation (green filled circle)

This symbol appears next to the altitude corresponding to the theoretical vertical profile computed by the FMGC. It is displayed from the top of descent down to the MAP altitude.

The flight crew can read the linear deviation directly from the altitude scale. The range is ± 500 ft. When the linear deviation value exceeds ± 500 ft, the symbol stays at the range limit but changes to a half filled circle and the PROG page displays the exact value.

(3) Target Altitude or Selected Flight Level Symbol (blue)

This symbol shows the FCU selected altitude (if QNH BARO reference is selected) or the selected flight level (if STD BARO reference is selected.)

When the FMGC operates in the vertical managed mode, this symbol is magenta if it represents a flight plan altitude constraint that the FMGC will follow. If the target altitude or flight level is on the scale, the symbol is displayed and the numerical value appears inside the symbol.

If it is off the scale, the symbol is not displayed, and the numerical value appears above or underneath the scale.

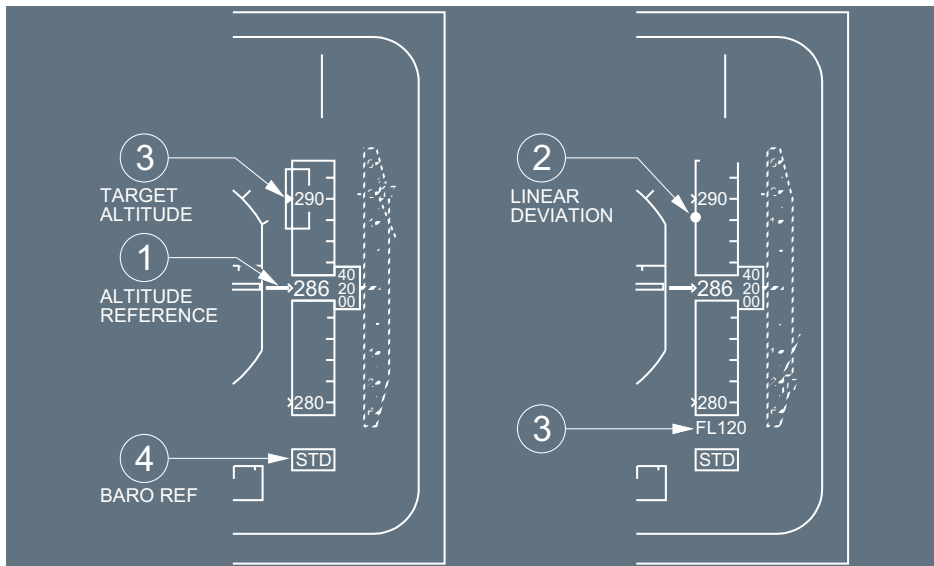
(4) Barometric Reference

The display shows “STD” or it shows “QNH” and the numerical setting in hectoPascals or inches of mercury.

It pulses when the selection made by the flight crew is not correct (STD not selected above transition altitude in climb or STD still selected in approach below transition level).

ALTITUDE

Applicable to: MSN 2398



(1) Altitude Indication

This appears both as a white moving scale, and as a green digital readout on a grey background. Small white marks are positioned on the scale against the round values (e.g. 280, 290...). “NEG” appears in the window in white for negative values. The altitude window changes from yellow to amber, if the aircraft deviates from the FCU-selected altitude or flight level.

On any approach for which an MDA (MDH) is entered in the FMGS, the altitude numbers change from green to amber, when the aircraft goes below the MDA (MDH).

(2) Linear Deviation (green filled circle)

This symbol appears next to the altitude corresponding to the theoretical vertical profile computed by the FMGC. It is displayed from the top of descent down to the MAP altitude.

The flight crew can read the linear deviation directly from the altitude scale. The range is ± 500 ft. When the linear deviation value exceeds ± 500 ft, the symbol stays at the range limit but changes to a half filled circle and the PROG page displays the exact value.

(3) Target Altitude or Selected Flight Level Symbol (blue)

This symbol shows the FCU selected altitude (if QNH BARO reference is selected) or the selected flight level (if STD BARO reference is selected.)

Continued on the next page

When the FMGC operates in the vertical managed mode, this symbol is magenta if it represents a flight plan altitude constraint that the FMGC will follow. If the target altitude or flight level is on the scale, the symbol is displayed and the numerical value appears inside the symbol.

If the target altitude is off the scale, the symbol is not displayed, and the numerical value appears above or underneath the scale.

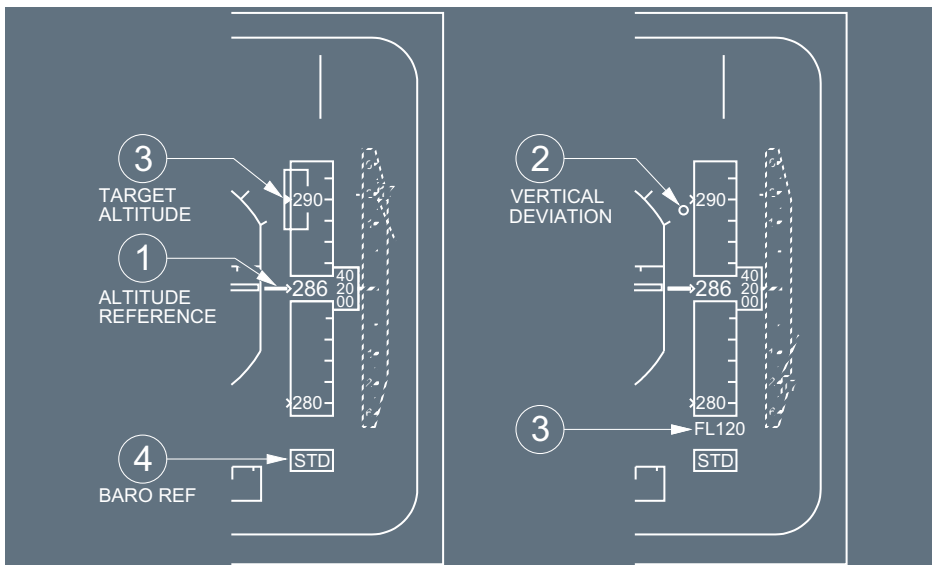
(4) Barometric Reference

The display shows “STD” or it shows “QNH” and the numerical setting in hectoPascals or inches of mercury.

It pulses when the selection made by the flight crew is not correct (STD not selected above transition altitude in climb or STD still selected in approach below transition level).

ALTITUDE

Applicable to: MSN 2512, 2548-2565, 2765-2769, 2854, 2866, 2923, 3053, 3082, 3118, 3571, 3991, 4040, 4125, 4234, 4640



(1) Altitude Indication

This appears both as a white moving scale, and as a green digital readout on a grey background. Small white marks are positioned on the scale against the round values (e.g. 280, 290...). “NEG” appears in the window in white for negative values. The altitude window changes from yellow to amber, if the aircraft deviates from the FCU-selected altitude or flight level.

Continued on the next page

On any approach for which an MDA (MDH) is entered in the FMGS, the altitude numbers change from green to amber, when the aircraft goes below the MDA (MDH).

(2) Vertical Deviation (magenta)

This symbol appears next to the altitude corresponding to the theoretical vertical profile computed by the FMGC. It is displayed from the top of descent down to the MAP altitude.

The pilot can read the VDEV directly from the altitude scale. The range is ± 500 ft. When the VDEV value exceeds ± 500 ft, the symbol stays at the range limit and the PROG page displays the exact value.

(3) Target Altitude or Selected Flight Level Symbol (blue)

This symbol shows the FCU selected altitude (if QNH BARO reference is selected) or the selected flight level (if STD BARO reference is selected.)

When the FMGC operates in the vertical managed mode, this symbol is magenta if it represents a flight plan altitude constraint that the FMGC will follow. If the target altitude or flight level is on the scale, the symbol is displayed and the numerical value appears inside the symbol.

If it is off the scale, the symbol is not displayed, and the numerical value appears above or underneath the scale.

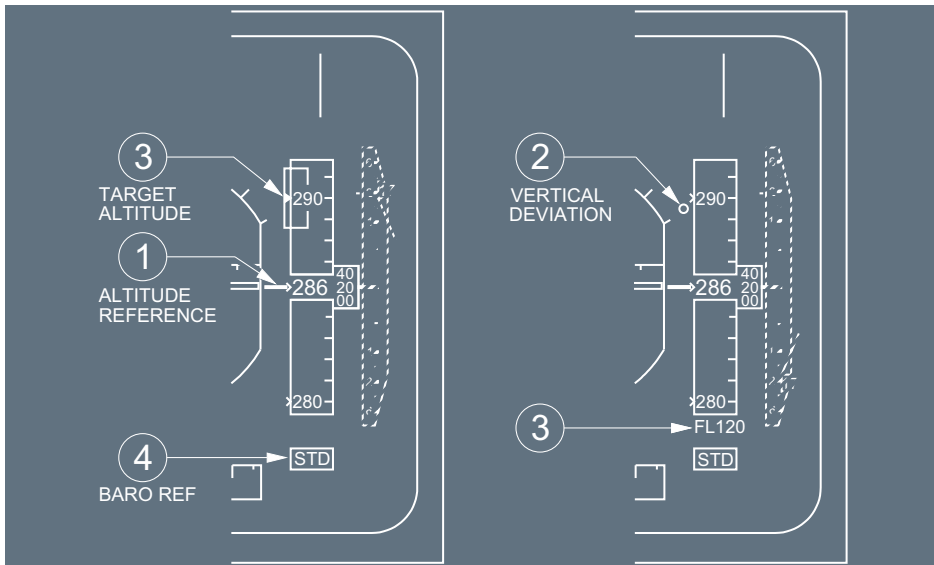
(4) Barometric Reference

The display shows “STD” or it shows “QNH” and the numerical setting in hectoPascals or inches of mercury.

It pulses when the selection made by the pilot is not correct (STD not selected above transition altitude in climb or STD still selected in approach below transition level).

ALTITUDE

Applicable to: MSN 2037-2251, 2271-2360, 2378-2385, 2402-2420, 2436, 2463-2503, 2514-2538, 2578-2754, 2777-2829, 2860, 2873-2884, 2946-3041, 3059-3061, 3088-3090, 3122-3569, 3608-3979, 4006-4014, 4048-4087, 4129-4233, 4250-4636, 4646-4708



(1) Altitude Indication

This appears both as a white moving scale, and as a green digital readout on a grey background. Small white marks are positioned on the scale against the round values (e.g. 280, 290...). "NEG" appears in the window in white for negative values. The altitude window changes from yellow to amber, if the aircraft deviates from the FCU-selected altitude or flight level.

On any approach for which an minimum is entered in the FMGS, the altitude numbers change from green to amber, when the aircraft goes below the minimum.

(2) Vertical Deviation (magenta)

This symbol appears next to the altitude corresponding to the theoretical vertical profile computed by the FMGC. It is displayed from the top of descent down to the MAP altitude.

The pilot can read the VDEV directly from the altitude scale. The range is ± 500 ft. When the VDEV value exceeds ± 500 ft, the symbol stays at the range limit and the PROG page displays the exact value.

Continued on the next page

(3) Target Altitude or Selected Flight Level Symbol (blue)

This symbol shows the FCU selected altitude (if QNH BARO reference is selected) or the selected flight level (if STD BARO reference is selected.)

When the FMGC operates in the vertical managed mode, this symbol is magenta if it represents a flight plan altitude constraint that the FMGC will follow. If the target altitude or flight level is on the scale, the symbol is displayed and the numerical value appears inside the symbol.

If it is off the scale, the symbol is not displayed, and the numerical value appears above or underneath the scale.

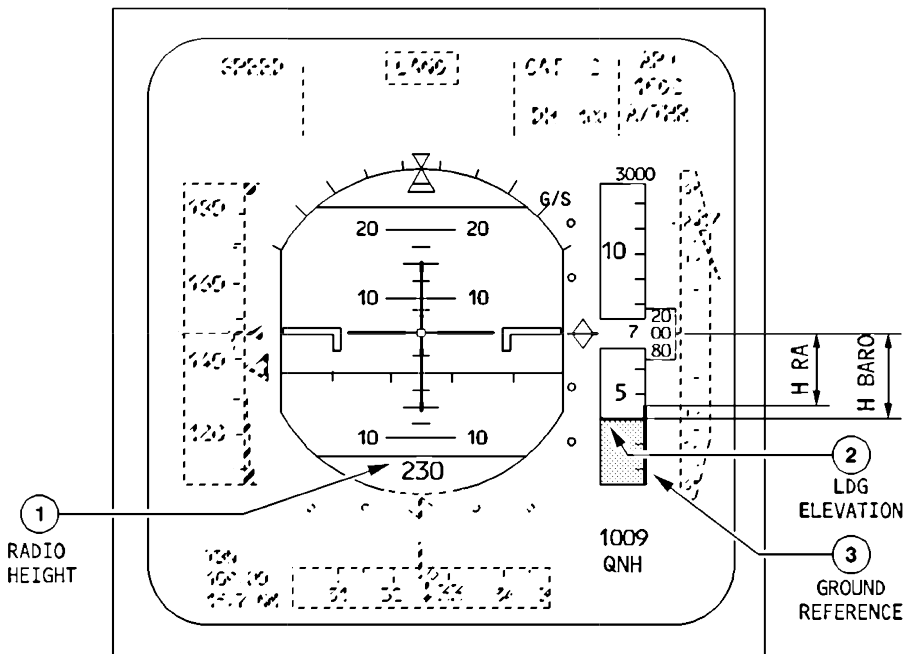
(4) Barometric Reference

The display shows “STD” or it shows “QNH” and the numerical setting in hectoPascals or inches of mercury.

It pulses when the selection made by the pilot is not correct (STD not selected above transition altitude in climb or STD still selected in approach below transition level).

ALTITUDE (CONT'D)

Applicable to: ALL



(1) Radio Height

A value appears, when the aircraft is lower than 2 500 ft.

- If a DH has been entered, the radio height appears :

- In green, when $DH + 100 \text{ ft} < RA < 2\,500 \text{ ft}$
- In amber, when $RA < DH + 100 \text{ ft}$

If "NO" is entered as the DH on the MCDU APPROACH page, 0 ft becomes a default value.

When the aircraft reaches the decision height selected on the MCDU, DH letters flash amber for 9 s, then remain amber above the radio height indication.

- If no DH has been entered, or if both FMGCs fail, the radio height appears :

- In green, when $400 \text{ ft} < RA < 2\,500 \text{ ft}$
- In amber, when $RA \leq 400 \text{ ft}$

Continued on the next page

The radio altitude indication changes every 10 ft down to 50 ft, then every 5 ft down to 10 ft, then every foot.

(2) Landing Elevation (blue)

The top of the brown surface on the altitude scale represents the landing elevation at the flight-planned destination.

It is displayed :

- during flight phases 7 and 8 and
- if the STD reference mode is not selected.

(3) Ground reference

A red ribbon on the right of the altitude scale represents the field elevation. This ribbon, which is driven by the radio altimeter signal, is displayed below 570 ft.

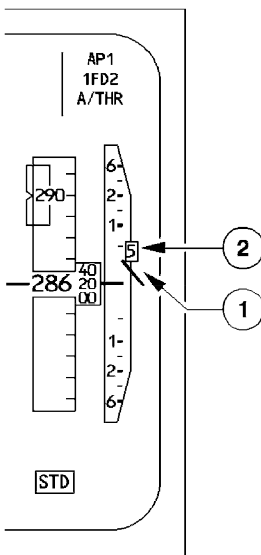
It moves up, as does the lower line of the attitude sphere, with the altitude scale as the aircraft descends. When the aircraft has touched down, the top of this ribbon is at the middle of the altitude window.

VERTICAL SPEED

Applicable to: ALL

The displayed vertical speed information is normally based on both inertial and barometric data. If inertial data is not available, it is automatically replaced by barometric information. In this case, the window around the numerical value becomes amber.

Continued on the next page



(1) Analog pointer

This pointer, which is normally in green, points to a white vertical speed scale, displayed on a grey background and graduated at intervals of 500 ft/min.

If the V/S is greater than 6 000 ft/min, the pointer stays at the end of the scale.

(2) Digital indication

This number, normally in green, is the vertical speed in hundreds of feet per minute.

It disappears, if the vertical speed is less than 200 ft/min.

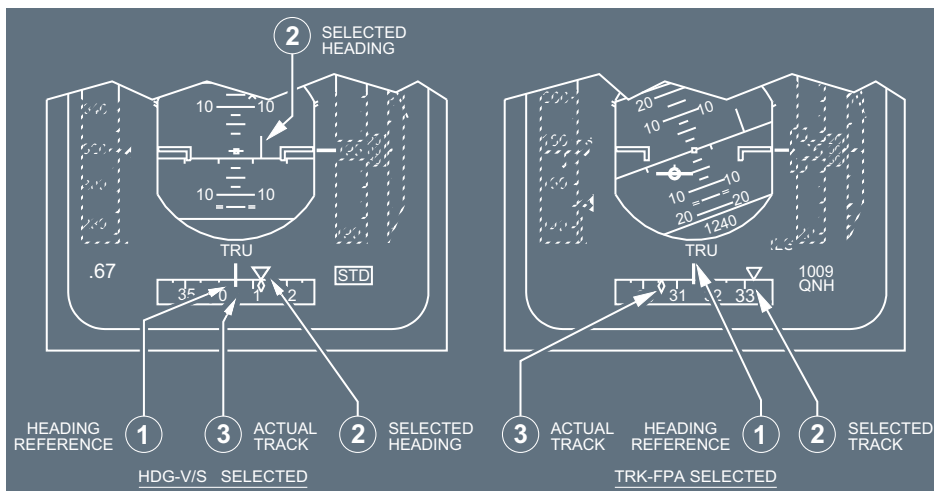
The analog pointer and the digital indication become amber, if:

- V/S is greater than 6 000 ft/min, (climb or descent)
- V/S is greater than 2 000 ft/min, during descent when $1\ 000\text{ ft} < \text{RA} < 2\ 500\text{ ft}$, or
- V/S is greater than 1 200 ft/min, during descent and $\text{RA} < 1\ 000\text{ ft}$.

Note: For TCAS, refer to DSC / 34.Navigation / 80.TCAS / 20.Controls and Indicators.

HEADING

Applicable to: ALL



(1) Heading Reference Line and Scale

A white scale on a grey background moves in front of a fixed yellow reference line to indicate the actual magnetic heading.

“TRUE” appears, when the display indicates the true heading, rather than the magnetic heading (latitude above 73 ° North or below 60 ° South).

(2) Selected Heading or Track Index (blue)

This pointer is in blue, and indicates the heading or track displayed on the FCU HDG-TRK window.

The index is replaced by digits on the right or left side of the scale, when the selected value is off the scale.

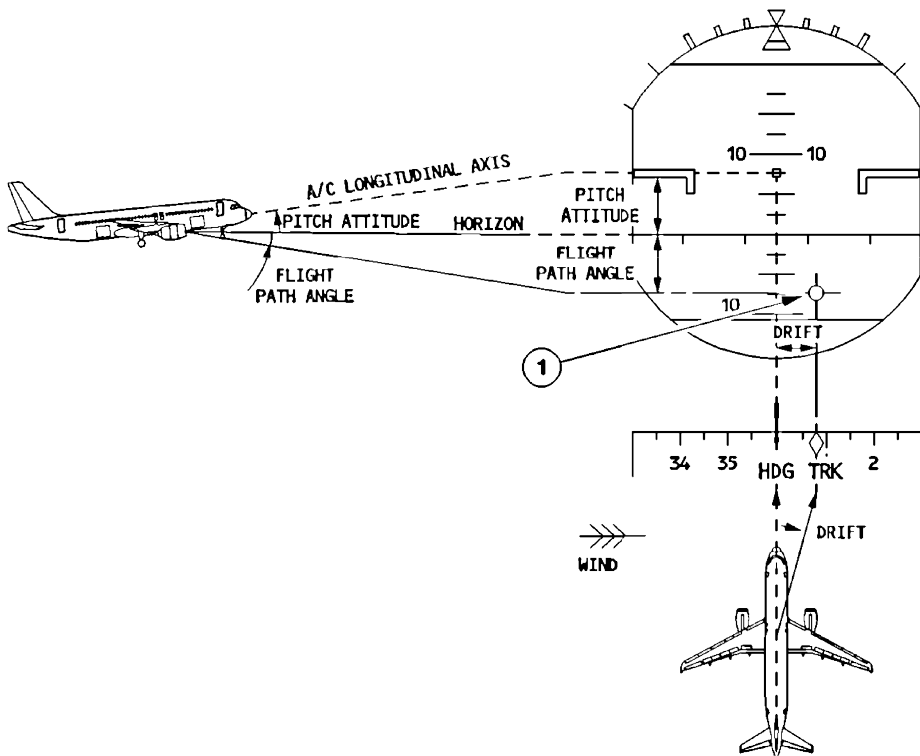
If the FD pushbutton is OFF, a second heading/track symbol appears on the horizon line, and markers are displayed every 10 °.

(3) Actual Track Symbol

This symbol is a small green diamond.

FLIGHT PATH VECTOR

Applicable to: ALL



(1) Flight Path Vector (FPV)

This symbol appears, when the pilot selects TRK/FPA on the FCU.

The flight path vector represents the lateral and vertical trajectory of the aircraft with respect to the ground.

- On the lateral scale, it indicates the aircraft's track.
- On the vertical scale, it indicates the aircraft's flight path angle.

Example : The aircraft flies a track of 009 ° (heading 360 °, wind from west) and descends with a flight path angle of minus 7.5 °.

GUIDANCE**Applicable to: ALL**

Two completely different flight director modes are available, each with its own characteristic symbols. The symbol displayed corresponds to the basic operating reference the pilot has selected – either HDG V/S or TRK FPA.

In normal operation, PFD1 displays FD1 orders.

If FD1 fails, PFD1 automatically displays FD2 orders on PFD1, the FD2 indication in the right column of the FMA flashes for a few seconds.

This is also applicable to FD2 orders, that are displayed on PFD2.

IF THE CREW HAS SELECTED HDG V/S TO BE THE BASIC REFERENCE :

The PFD displays FD bars in green. They automatically move out of view at touchdown in ROLL OUT mode.

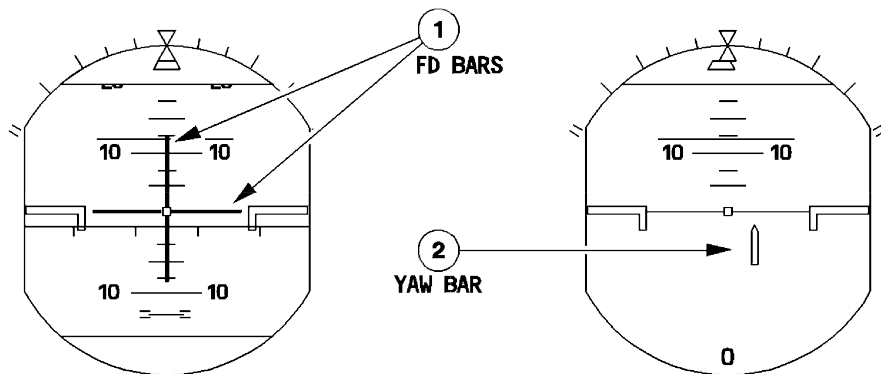
They flash for 10 s, and then remain steady, if the following occur :

- A reversion to the HDG V/S basic mode (manual or automatic), or
- The selected flight level is changed, when ALT CAPTURE mode is engaged, or
- The loss of LOC or G/S in LAND mode or loss of LAND mode, or
- At the first AP or FD engagement.

The PFD displays a yaw bar in green below 30 ft radio altitude, if a localizer signal is available:

- During takeoff (in RWY mode)
- Upon landing (in FLARE and ROLL OUT mode).

Continued on the next page



(1) FD Crossed Bars (green)

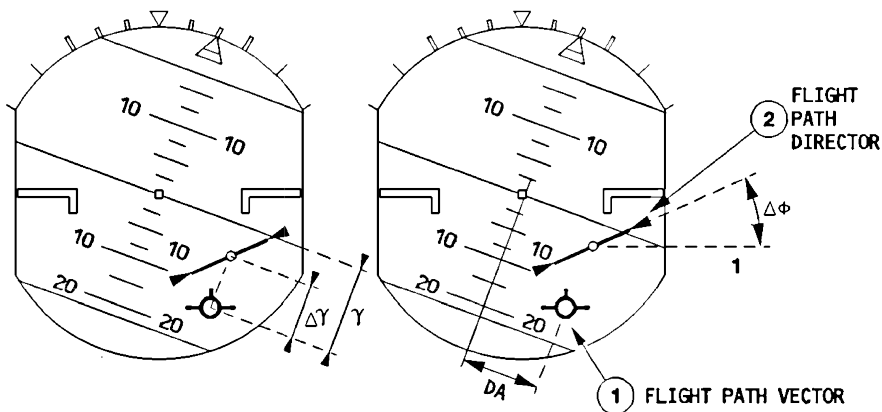
(2) Yaw Bar (green)

THE CREW HAS SELECTED TRK FPA AS THE BASIC REFERENCE :

An inertial flight path vector defines the aircraft's horizontal and vertical track, taking wind effect into account.

An associated flight path director symbol guides the flight crew onto the vertical and horizontal flight path targets.

Continued on the next page



γ REPRESENTS THE FLIGHT PATH ANGLE

DA REPRESENTS THE DRIFT ANGLE

$\Delta\gamma$ REPRESENTS THE DIFFERENCE BETWEEN THE ORDERED FLIGHT PATH ANGLE AND THE ACTUAL ONE

$\Delta\phi$ REPRESENTS THE DIFFERENCE BETWEEN THE ORDERED ROLL ANGLE AND THE ACTUAL ONE

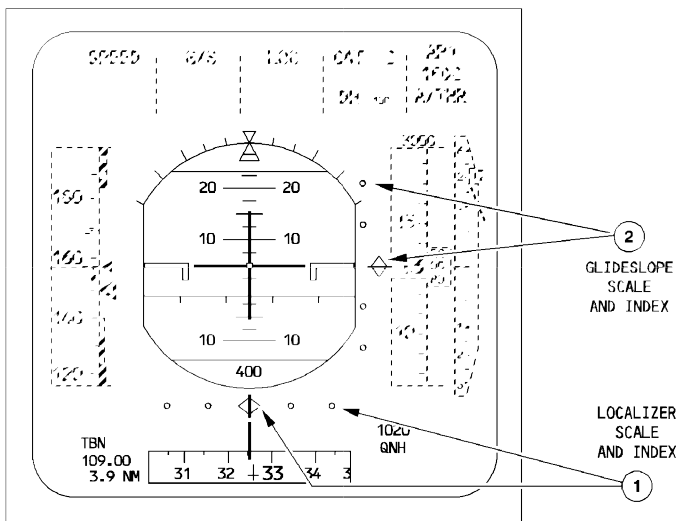
(1) Flight Path Vector (green)

(2) Flight Path Director (green)

TRAJECTORY DEVIATION

Applicable to: ALL

ILS APPROACH



- (1) Localizer Deviation Scale and Index
- (2) Glideslope Deviation Scale and Index

Deviation scales appear as soon as the flight crew pushes an LS pushbutton on the EFIS control panel. Deviation indexes appear, when the glideslope and localizer signals are valid, if deviation scales are displayed.

When a deviation index is out of the displayed range, only half a symbol appears at the end of the scale.

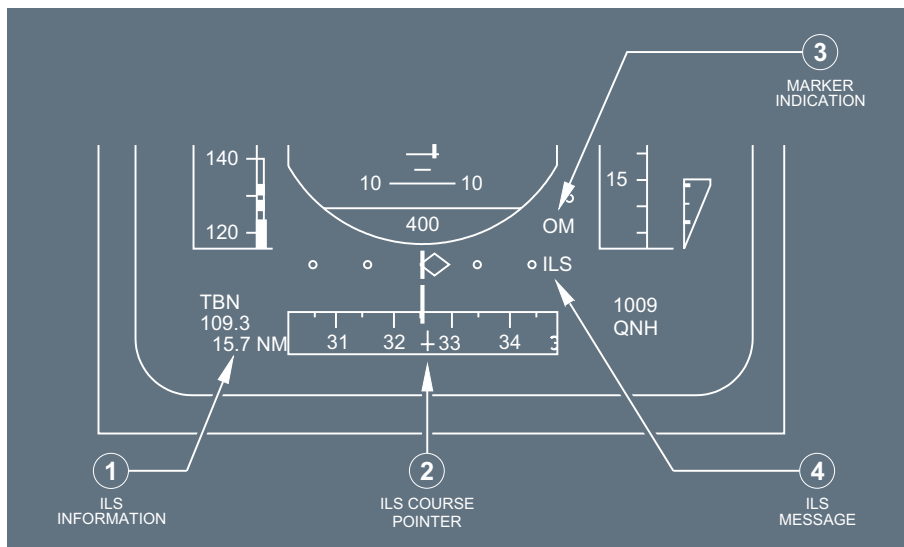
The LOC scale flashes and continues to flash if the deviation exceeds 1/4 dot for two seconds while the aircraft is between 15 ft and 1 000 ft and CAT2 or CAT3 capability displayed on the FMA, and either LOC, LAND, or FLARE is engaged. The glideslope scale flashes and continues to flash, if the deviation exceeds one dot for two seconds (above 100 ft RA).

“LOC” and the glideslope scale half index symbols flash and continue to flash, when the deviation exceeds two dots for two seconds.

One dot represents a deviation of $\pm 0.8^\circ$ on the localizer scale, and $\pm 0.4^\circ$ on the glideslope scale.

Continued on the next page

ILS APPROACH (CONT'D)



(1) ILS information (magenta)

The following information appears on the PFD, when the crew has selected an ILS frequency and course, and pushed the LS pb:

- ILS identification, as decoded by the ILS receiver;
- ILS frequency;
- DME distance, if the ILS has a DME

(2) ILS course Pointer (magenta)

This pointer appears on the PFD, when the crew has selected an ILS frequency and course, and pushed the LS pb.

It is a dagger-shaped symbol on the heading scale.

The ILS course pointer is replaced by digits on the right or left hand of the heading scale (in a white box) when the ILS course value is outside the displayed portion of the heading scale.

(3) Marker Indications

OM appears in blue, when the aircraft flies over the outer marker.

MM appears in amber, when it flies over the middle marker.

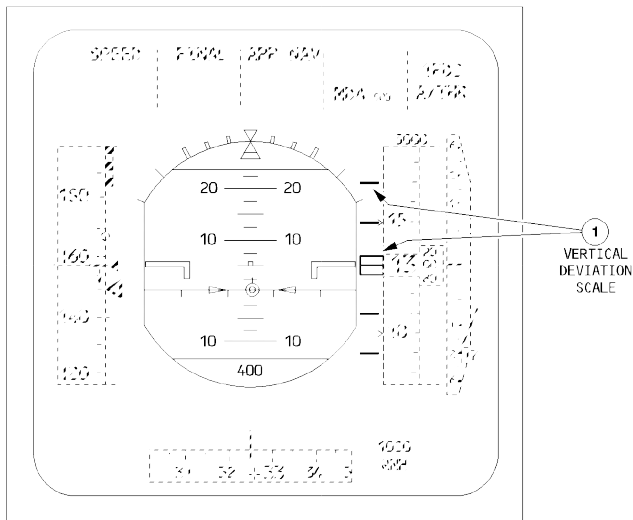
IM appears in white, when it flies over an airways marker beacon or the ILS inner marker.

Continued on the next page

(4) ILS Message

This flashes amber, when the APPR mode is armed and the ILS display is not selected.

NON PRECISION APPROACH



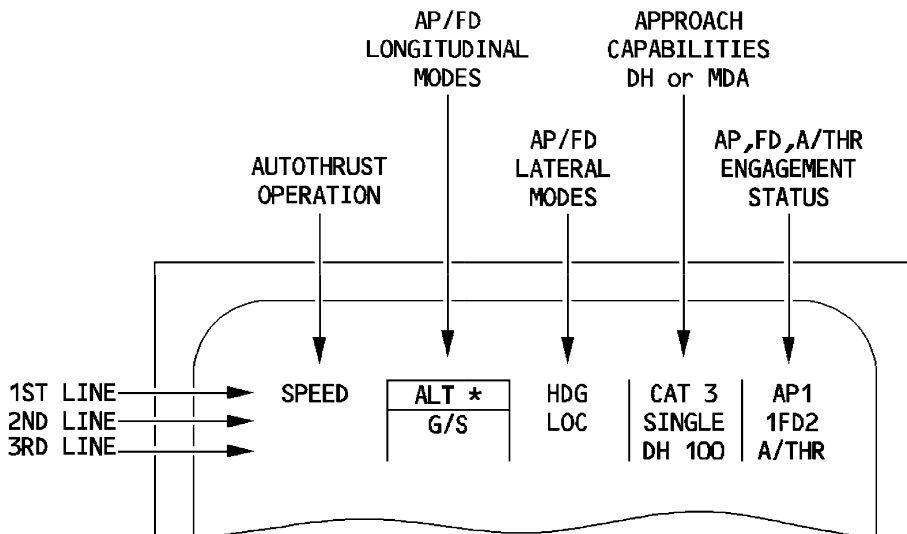
(1) Vertical Deviation Scale and Index

These symbols appear when in the approach phase and, when either FINAL is armed/engaged or a non-LS approach has been entered. They are displayed in the approach or go-around phase, until the MDA has been reached, or the MAP or the runway has been sequenced. They give the vertical deviation from the trajectory defined by the FMGC. Each index scale graduation represents 100 ft. The range is ± 200 ft.

Note: If the LS pb is pressed, glide deviation has priority over vertical deviation information. As long as VDEV display conditions are met, and the LS pb is selected, an amber VDEV message flashes above the glide scale.

FLIGHT MODE ANNUNCIATOR

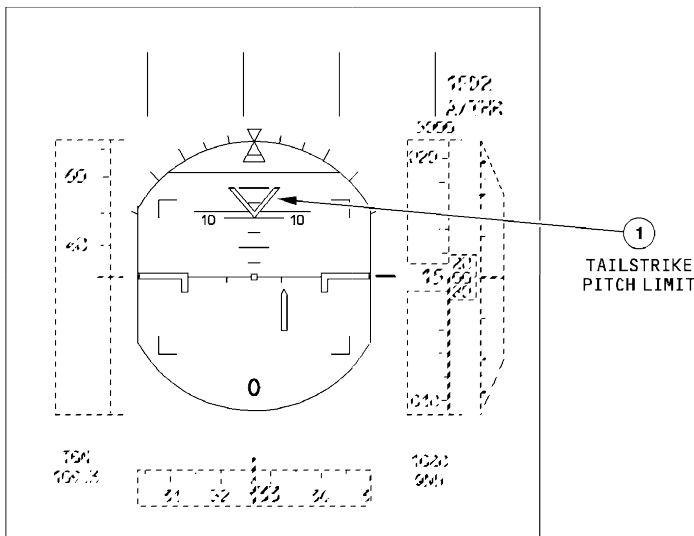
Applicable to: ALL



For a detailed discussion of legends and messages that may appear during FMGS operations, see FLIGHT GUIDANCE chapter (*Refer to DSC-22_30-100 Flight Mode Annunciator (FMA) - General*).

TAILSTRIKE PITCH LIMIT INDICATOR

Applicable to: A320



(1) Tailstrike Pitch Limit

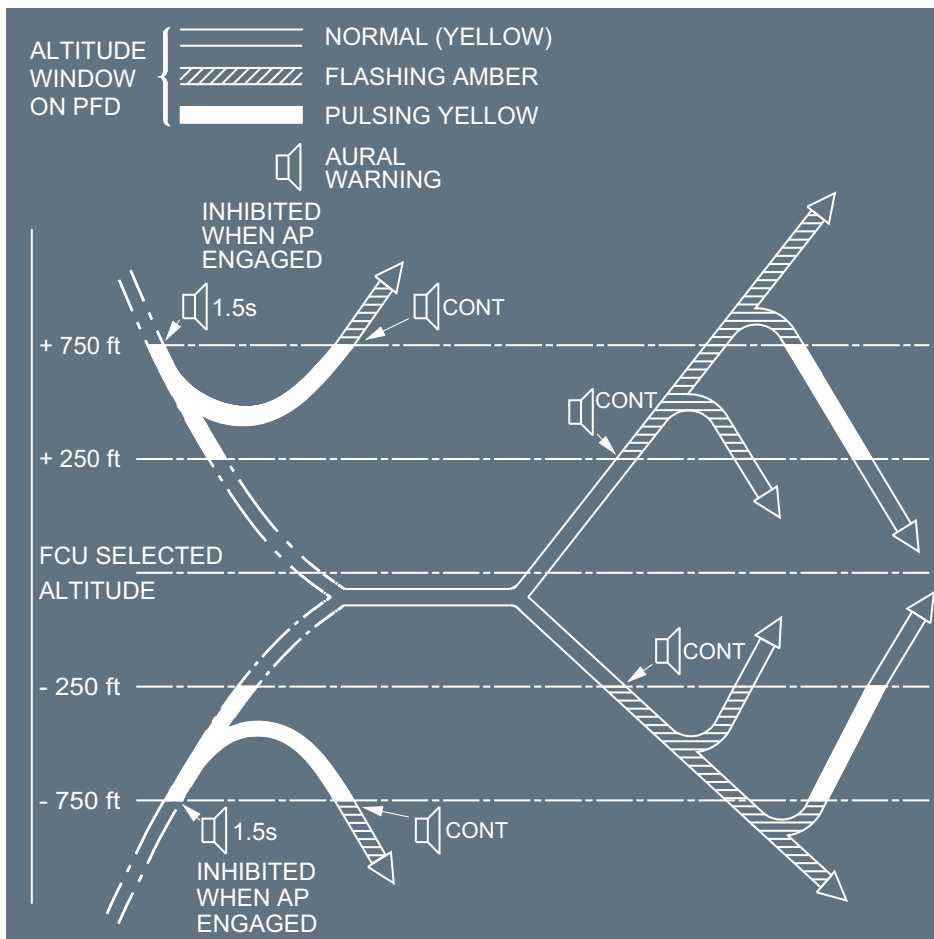
The pitch limit indicates the maximum pitch attitude to avoid the tailstrike risk at landing. The indication is a fixed value corresponding to the main landing gear compressed. The indication appears at 400 ft radio height. The indication disappears, when there is no longer a risk of tailstrike.

ALTITUDE ALERT

Applicable to: MSN 3411

The FWC generates an altitude warning (C chord sound and PFD's altitude window pulses in yellow or flashes in amber), when the aircraft approaches a preselected altitude or flight level, or when it deviates from its selected altitude or flight level.

This warning results from a comparison between the altitude (ADIRS) and the preselected altitude displayed on FCU.



Continued on the next page

- Selecting a new altitude, or pushing the ECAM's EMER CANC pushbutton, or pressing either MASTER WARN pushbutton, cancels the continuous C chord.
- Selecting a new altitude stops the flashing of the altitude window.
- The altitude alert is inhibited:
 - When the slats are out, with the landing gear is selected down, or
 - In approach after the aircraft captures the glideslope, or
 - When the landing gear is locked down.

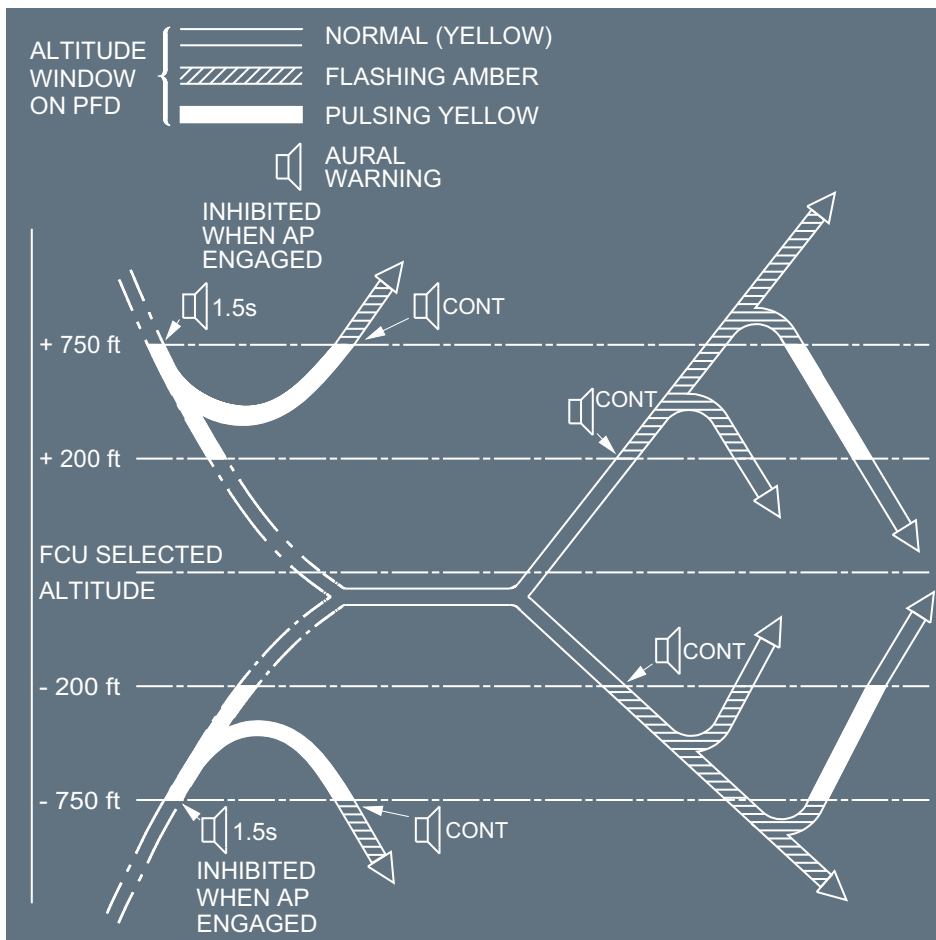
ALTITUDE ALERT

Applicable to: ALL except MSN 3411

The FWC generates an altitude warning (C chord sound and PFD's altitude window pulses in yellow or flashes in amber), when the aircraft approaches a preselected altitude or flight level, or when it deviates from its selected altitude or flight level.

This warning results from a comparison between the altitude (ADIRS) and the preselected altitude displayed on FCU.

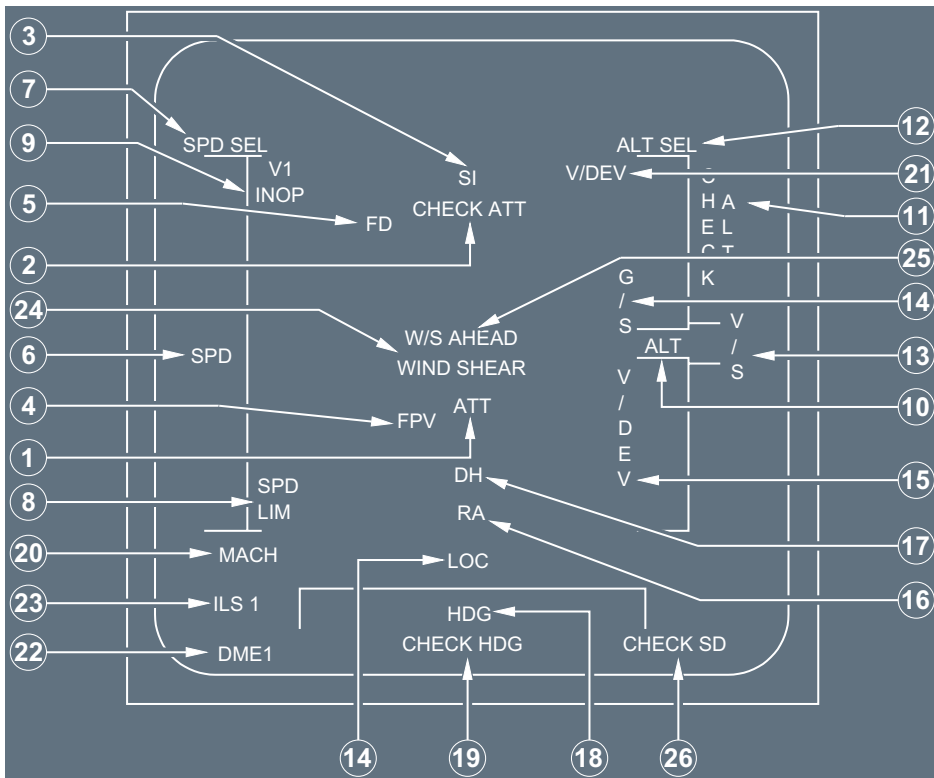
Continued on the next page



- Selecting a new altitude, or pushing the ECAM's EMER CANC pushbutton, or pressing either MASTER WARN pushbutton, cancels the continuous C chord.
- Selecting a new altitude stops the flashing of the altitude window.
- The altitude alert is inhibited:
 - When the slats are out, with the landing gear is selected down, or
 - In approach after the aircraft captures the glideslope, or
 - When the landing gear is locked down.

FLAGS AND MESSAGES DISPLAYED ON PFD

Applicable to: ALL



- (1) **ATT flag (red)**
If the PFD loses all attitude data, its entire sphere is cleared to display the ATT flag.
- (2) **CHECK ATT, CHECK CAPT (F/O) PFD, CHECK EWD, DU NOT MONITORED (amber)**
For more information, *Refer to DSC-31-05-10 INTRODUCTION*
- (3) **SI flag (red)**
If the sideslip information is lost or any reverse is deployed in flight, the index disappears and a red SI flag appears.

Continued on the next page

- (4) FPV flag (red)
In the TRK FPA mode, when the drift angle or flight path angle is not valid, an FPV flag appears.
- (5) FD flag (red)
If both FMGCs fail, or if both FDs are disengaged and the FD pushbutton is on and the attitude is valid, a red FD flag appears.
- (6) SPD flag (red)
If the speed information fails, a SPD flag replaces the speed scale.
- (7) SPD SEL flag (red)
If the selected speed information fails, a SPD SEL flag appears.
- (8) SPD LIM flag (red)
This flag appears when both FACs are inoperative, or in case of SFCC dual flap/slat channel failure.
In this case, the following PFD information is lost : VLS, S, F, Green Dot, Vtrend, Vmax, VFE next, VSW.
- (9) V1 INOP flag (red)
When the V1 signal is not valid, a V1 INOP flag replaces the digital value.
- (10) ALT flag (red)
If the altitude information fails, the ALT flag replaces the altitude scale.
- (11) CHECK ALT flag (amber)
For more information, *Refer to DSC-31-05-10 INTRODUCTION*
- (12) ALT SEL flag (red)
If the selected altitude information fails, an ALT SEL flag appears.
- (13) V/S flag (red)
If the vertical speed information fails, the V/S flag replaces the vertical speed scale.
- (14) LOC and G/S flags (red)
If the localizer or glideslope receiver fails, a LOC or G/S flag appears on the deviation scale.
- (15) VDEV flag (red)
If the vertical deviation information fails, and the LS pb is not pressed, a VDEV flag replaces the VDEV scale.
- (16) RA flag (red)
If both radio altimeters fail, this flag appears in place of the radio height indication.

Continued on the next page

(17) DH flag (amber)

A DH flag appears, when the aircraft reaches the selected DH.

(18) HDG flag (red)

If the heading information fails, the HDG flag replaces the heading scale.

(19) CHECK HDG flag (amber)

For more information, *Refer to DSC-31-05-10 INTRODUCTION*

(20) MACH flag (red)

This flag appears, if the Mach data fails.

(21) VDEV (amber)

At the top of the glide scale, this message flashes in approach phase and, when either the FINAL mode is armed/engaged, or a non-LS approach has been selected, and the LS pushbutton is selected.

(22) DME 1 flag (red)

When the DME distance is not valid, a DME1 (on PFD1) or DME2 (on PFD2) flag replaces the DME distance indication.

(23) ILS1 flag (red)

If an ILS frequency fails, or if either the LOC or G/S signals fail, an ILS1 (on PFD1) or ILS2 (on PFD2) flag replaces the ILS frequency indication.

(24) WINDSHEAR warning (red)

This message is displayed, when windshear is detected (reactive windshear warning) by the FAC.

Refer to DSC-22_40-40 Windshear Detection Function

(25) W/S AHEAD

This message is displayed, when the predictive windshear system has detected windshear ahead of the aircraft.

The message is in amber or red, depending on the alert level.

Refer to DSC-34-60-30 Windshear Alerts Inhibition

Note: 1. All flags, except, V1 INOP which is steady, flash for 9 s, then remain steady.
2. For information on the TCAS flag, *Refer to DSC-34-80-20 PFD Indications.*

(26) CHECK SD, CHECK CAPT (F/O) ND (amber)

For more information, *Refer to DSC-31-05-10 INTRODUCTION.*

BACKUP SPEED/ALTITUDE SCALE

Applicable to: MSN 4012-4034, 4157-5319

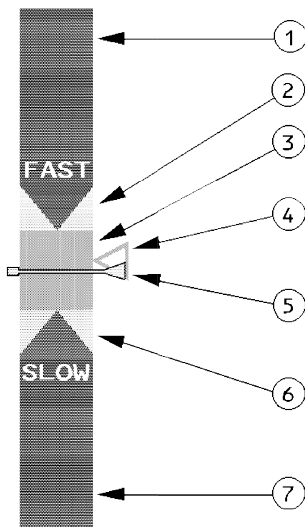
GENERAL

A backup speed scale and a backup altitude scale replace simultaneously the normal speed and altitude scales when all the three ADRs are switched OFF. This enables the flight crew to fly at a safe speed and altitude in case of an unreliable speed/altitude indication.

The backup speed scale information is based on the angle-of-attack, and depends on the slat/flap configuration.

The backup altitude scale displays the GPS altitude.

BACKUP SPEED SCALE

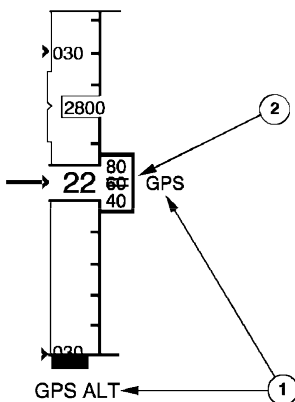


- (1) Red FAST area:
This red area indicates excessive speed range.
- (2) Amber area:
This amber area indicates excessive speed range while keeping an appropriate margin to the maximum structural speeds.

Continued on the next page

- (3) GREEN area:
The green area indicates the safe speed range.
- (4) Target speed (green):
This symbol indicates the optimum target speed.
During approach, it indicates the target speed for the approach.
- (5) Actual Speed Reference Line (Yellow):
This fixed reference line, next to a yellow triangle, indicates the aircraft's current speed.
- (6) Amber area:
The amber area indicates too low speed while keeping an appropriate margin to the stall speed.
- (7) Red SLOW area:
The red SLOW area indicates the speeds that are lower than the stall speed.

BACKUP ALTITUDE SCALE



- (1) GPS ALT and GPS flags (White):
These flags appear to highlight the fact that the barometric altitude is replaced by the GPS altitude.

Continued on the next page

(2) Altitude indication:

Amber dashes appear over the last two digits to indicate a degraded altitude display mode.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-31 – INDICATING / RECORDING SYSTEMS

DSC-31-40 – Indications on PFD

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GENERAL**Applicable to: ALL**

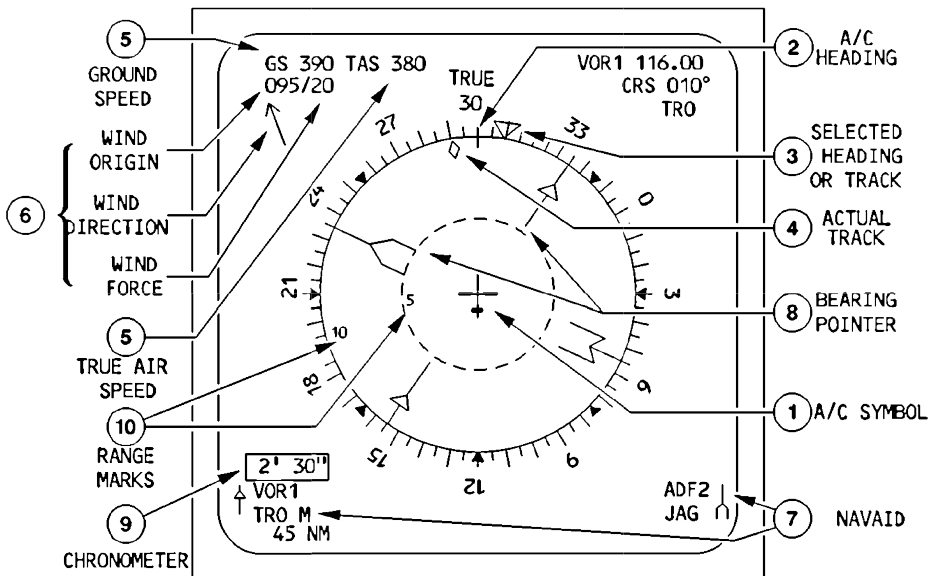
There are five different displays (five modes to display navigation information) :

- ROSE LS
- ROSE VOR
- ROSE NAV
- ARC
- PLAN

The Navigation Display (ND) can provide a weather radar image in all modes, except PLAN.

ROSE MODES

Applicable to: ALL



- (1) Aircraft symbol (yellow)
Fixed and centered in the display, this symbol points to the yellow lubber line.
- (2) Aircraft heading
The fixed yellow lubber line points to the aircraft magnetic heading on the moving white compass rose. Small white triangles are fixed at 45 ° intervals on the circumference of the compass rose. "TRUE" appears at the top of the compass rose, when it is displaying true heading instead of magnetic heading (latitude above 73 ° North or 60 ° South).
- (3) Selected heading or track (blue)
This pointer shows the heading or track indicated on the FCU's HDG TRK counter.
- (4) Actual aircraft track (green)
This symbol is a small green diamond.
- (5) Ground speed and true air speed (green)
ADIRS furnishes these speeds.

Continued on the next page

(6) Wind direction and speed

ADIRS provides the wind direction and speed. The digital direction and the analog direction (green arrow) indicate the north reference that is in use. The green arrow only appears, if the wind speed is above two knots.

If the display does not receive either wind speed or direction, dashes replace the numbers on the display.

(7) NAVAIDs

When the ADF-OFF-VOR selector switch on either the pilot's or copilot's EFIS control panel is set to ADF or VOR, the onside ND displays the following characteristics of the corresponding NAVAID in white for VOR or in green for ADF (left side for receiver 1 and right side for receiver 2):

- Type of NAVAID (ADF or VOR)
- Shape and color of the associated bearing pointer (if the bearing pointer is in view).
- NAVAID identification (or frequency by default)
- DME distance if a DME is collocated with the selected VOR. ADF and DME distance are never displayed at the same time.
- Mode of tuning
 - M for a NAVAID tuned manually by the pilot through the MCDU (underlined and dimmed),
 - R for a NAVAID tuned from an RMP (Radio Management Panel) (underlined and dimmed),
 - Nothing for a NAVAID tuned automatically by the FMGC.

If reception fails, the ND stops displaying the associated data (except for the identification or frequency).

(8) Bearing pointer (green for ADF, white for VOR)

This pointer appears when bearing data is available.

If the aircraft is not receiving the beacon or if a receiver fails, the associated bearing pointer disappears.

(9) Chronometer Indication (white)

These numbers appear when the onside chronometer is started.

They display the elapsed time.

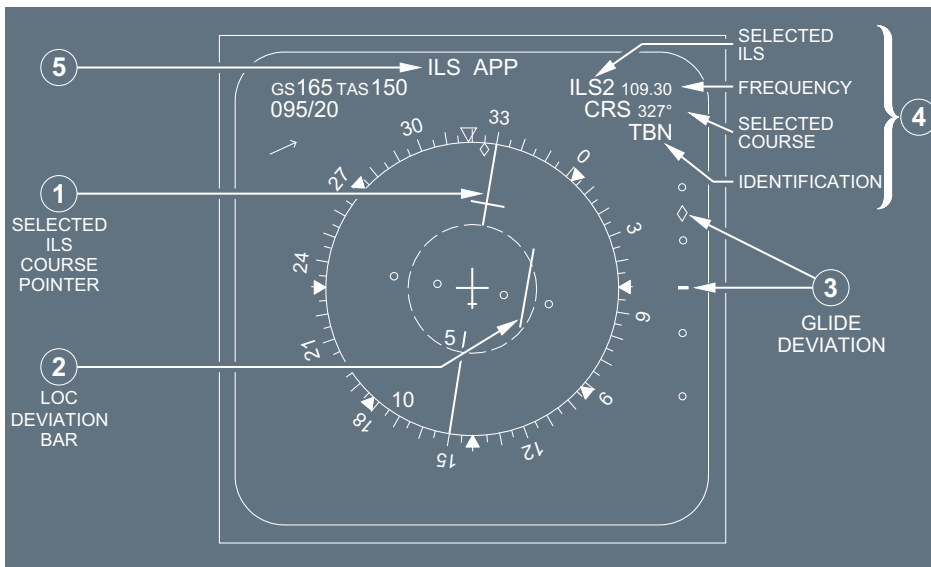
The indication is in minutes and seconds from 0 to 59 min 59 s, and in hours and minutes from 1 h to 99 h 59 min (Seconds are not displayed beyond 59 min 59 s).

(10) Range marks

The range scale value selected on the EFIS control panel (10 to 320 nm) governs the scale of the ND.

ROSE LS MODE

Applicable to: MSN 2398, 2512, 2548-2565, 2765-2769, 2854, 2866, 2923, 3053, 3082, 3118, 3571, 3991, 4040, 4125, 4234, 4640



(1) ILS course pointer (magenta)

This dagger-shaped symbol points to the selected ILS course.

The ILS is selected either by the FMGC (autotuned or manually) or through the RMP in backup mode. If no course has been entered, the value defaults to 360°.

(2) Localizer deviation bar (magenta)

This bar moves laterally with respect to the course pointer. Its scale consists of two dots on each side of zero deviation. Each dot represents a deviation of about $\pm 0.8^\circ$.

If the deviation becomes excessive ($1/4$ dot, 0.2°) above 15 ft RA, the bar and the scale pulse.

(3) Glide deviation (magenta)

This diamond moves on a vertical scale that has two white dots on each side of the yellow reference line. Each dot represents a deviation of about $\pm 0.4^\circ$.

If the deviation becomes greater than one dot above 100 ft RA, the scale and the diamond flash.

(4) Selected ILS information

This display shows the ILS frequency (magenta), selected course (blue), and identification (magenta).

Continued on the next page

(5) ILS APP message (green)

This message appears:

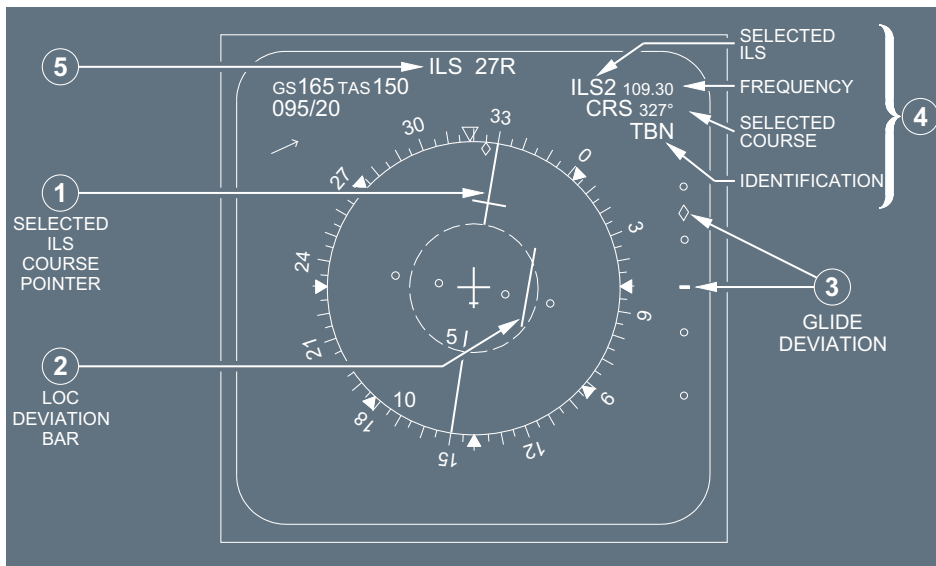
- When the flight crew selects an ILS approach on the MCDU, and
- When the FMS flight phase is DES, APP or GA, or the FMS phase is CRZ and the along track distance to destination is less then 250 nm.

Note: ILS 1 information appears on PFD 1 and ND 2.

ILS 2 information appears on PFD 2 and ND 1.

ROSE LS MODE

Applicable to: MSN 2037-2387, 2402-2503, 2514-2538, 2578-2754, 2777-2829, 2860, 2873-2884, 2946-3041, 3059-3061, 3084-3090, 3122-3569, 3608-3979, 4006-4034, 4048-4087, 4129-4233, 4250-4636, 4646-5319



(1) ILS course pointer (magenta)

This dagger-shaped symbol points to the selected ILS course.

The ILS is selected either by the FMGC (autotuned or manually) or through the RMP in backup mode. If no course has been entered, the value defaults to 360 °.

(2) Localizer deviation bar (magenta)

This bar moves laterally with respect to the course pointer. Its scale consists of two dots on each side of zero deviation. Each dot represents a deviation of about $\pm 0.8^\circ$.

Continued on the next page

If the deviation becomes excessive (1/4 dot, 0.2 °) above 15 ft RA, the bar and the scale pulse.

(3) Glide deviation (magenta)

This diamond moves on a vertical scale that has two white dots on each side of the yellow reference line. Each dot represents a deviation of about $\pm 0.4^\circ$.

If the deviation becomes greater than one dot above 100 ft RA, the scale and the diamond flash.

(4) Selected ILS information

This display shows the ILS frequency (magenta), selected course (blue), and identification (magenta).

(5) ILS message (green)

This message shows the full runway name of the selected approach. It appears:

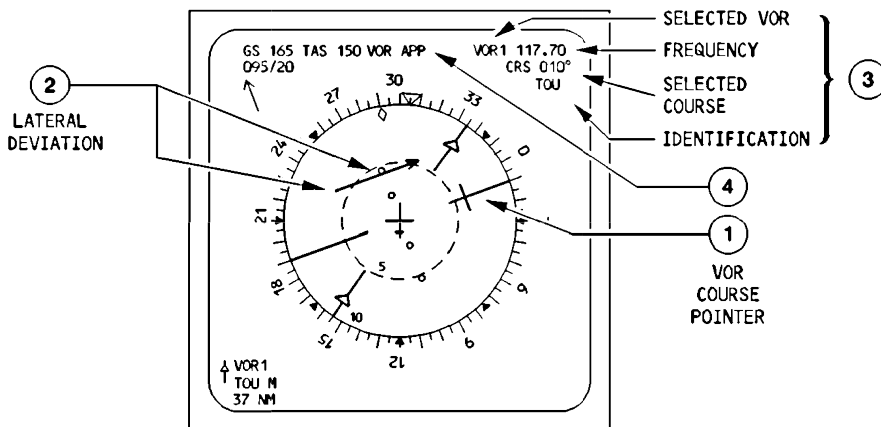
- When the flight crew selects an ILS approach on the MCDU, and
- When the FMS flight phase is DES, APP or GA, or the FMS phase is CRZ and the along track distance to destination is less than 250 nm.

Note: ILS 1 information appears on PFD 1 and ND 2.

ILS 2 information appears on PFD 2 and ND 1.

ROSE VOR MODE

Applicable to: MSN 2398, 2512, 2548-2565, 2765-2769, 2854, 2866, 2923, 3053, 3082, 3118, 3571, 3991, 4040, 4125, 4234, 4640



(1) VOR course pointer (blue)

This dagger-shaped symbol points to the selected VOR course.

The VOR course is automatically selected by the FMGC or manually by the crew using the MCDU pages or the RMP backup mode.

(2) Lateral deviation bar (blue)

This bar shows the VOR deviation on a lateral scale.

Each dot represents 5°. When the lateral deviation exceeds 10°, the bar remains displayed on the outer dot.

The arrow on the bar gives the TO/FROM indication.

(3) VOR information (white)

This area displays the frequency of the selected VOR and its identification (if decoded by the receiver), the selected course.

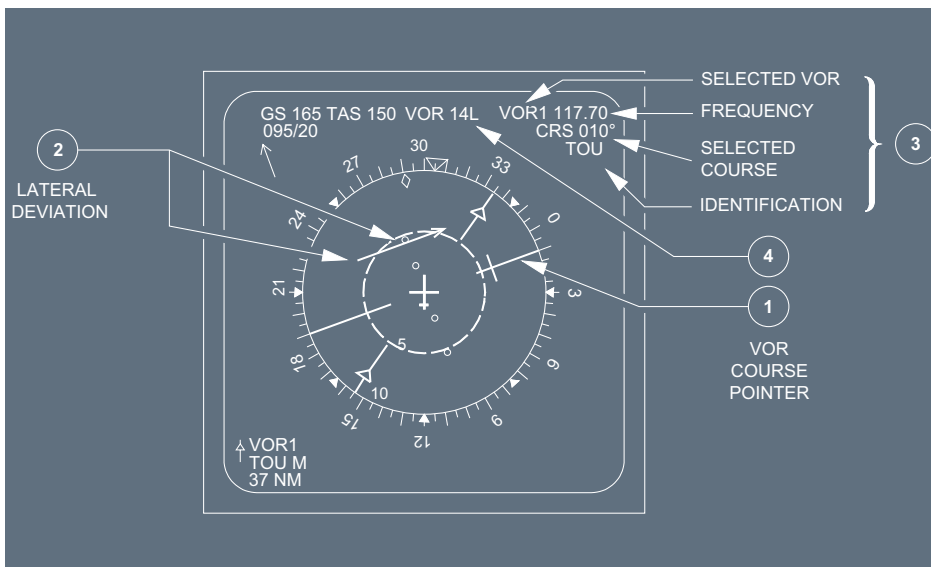
(4) VOR APP or GPS APP messages (green)

VOR APPR appears when the flight crew has selected a VOR approach on the MCDU.

GPS APP appears when the crew has selected a GPS approach.

ROSE VOR MODE

Applicable to: MSN 2037-2387, 2402-2503, 2514-2538, 2578-2754, 2777-2829, 2860, 2873-2884, 2946-3041, 3059-3061, 3084-3090, 3122-3569, 3608-3979, 4006-4034, 4048-4087, 4129-4233, 4250-4636, 4646-5319



(1) VOR course pointer (blue)

This dagger-shaped symbol points to the selected VOR course.

The VOR course is automatically selected by the FMGC or manually by the crew using the MCDU pages or the RMP backup mode.

(2) Lateral deviation bar (blue)

This bar shows the VOR deviation on a lateral scale.

Each dot represents 5°. When the lateral deviation exceeds 10°, the bar remains displayed on the outer dot.

The arrow on the bar gives the TO/FROM indication.

(3) VOR information (white)

This area displays the frequency of the selected VOR and its identification (if decoded by the receiver), the selected course.

(4) VOR or GPS message (green)

VOR 14L appears when the flight crew has selected a VOR approach on the MCDU.

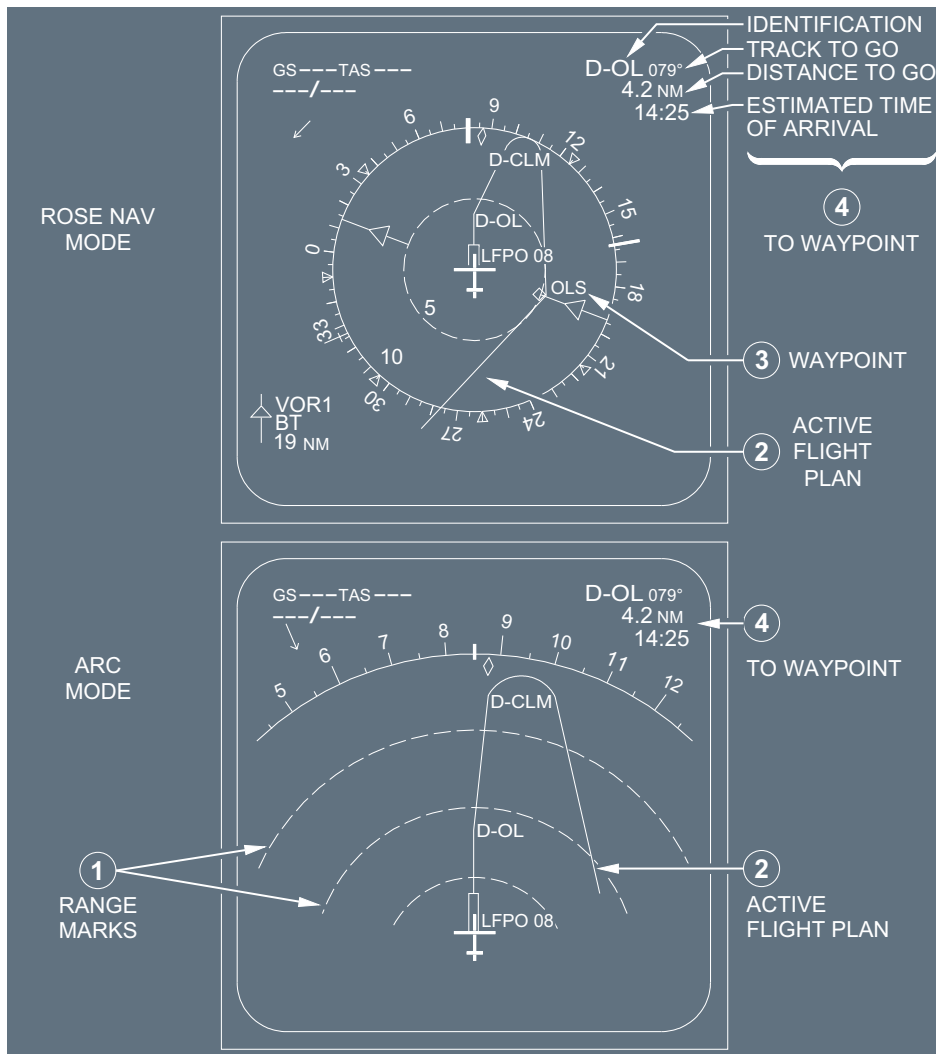
GPS 14L appears when the crew has selected a GPS approach.

ROSE NAV MODE/ARC MODE

Applicable to: MSN 2398, 2512, 2548-2565, 2765-2769, 2854, 2866, 2923, 3053, 3082, 3118, 3571, 3991, 4040, 4125, 4234, 4640

ROSE NAV and ARC modes give the pilot the same information, but ARC mode limits it to the forward 90 ° sector.

Continued on the next page



(1) Range Marks and Values

The values displayed on the ND are:

In ROSE NAV mode 1/4 of the selected range for the inner circle.

1/2 of the selected range for the heading scale circle.

Continued on the next page

In ARC mode 1/4 of the selected range for the first inner arc.

1/2 of the selected range for the second inner arc.

3/4 of the selected range for the third inner arc.

(2) Flight Plan

The crew can use the MCDU to select various types of flight plan:

- The active flight plan (the flight plan the aircraft is actually following when the NAV mode is engaged) is represented by a continuous green line. The ND shows only the part of the flight plan that is ahead of the aircraft, as well as the waypoints that are still to be overflown and the waypoint from which the aircraft is coming.

The ND does not show a SID or a STAR, except for the last waypoint of the SID and the first waypoint of the STAR, when the selected range is 160 or 320 nm.

If the primary flight plan is not active, it is represented by a dotted green line.

- A continuous blue line portrays the missed approach procedure, and a dashed blue line portrays the flight plan to the alternate.

The missed approach and the alternate flight plan are displayed when:

- In ARC or ROSE NAV mode, a missed approach waypoint or an alternate flight plan waypoint is displayed on the onside MCDU.
- In PLAN mode a missed approach or alternate waypoint is displayed in the 2L field of the onside MCDU.

- The secondary flight plan is represented by a continuous white line. The ND continues to display the active flight plan

- Temporary flight plan

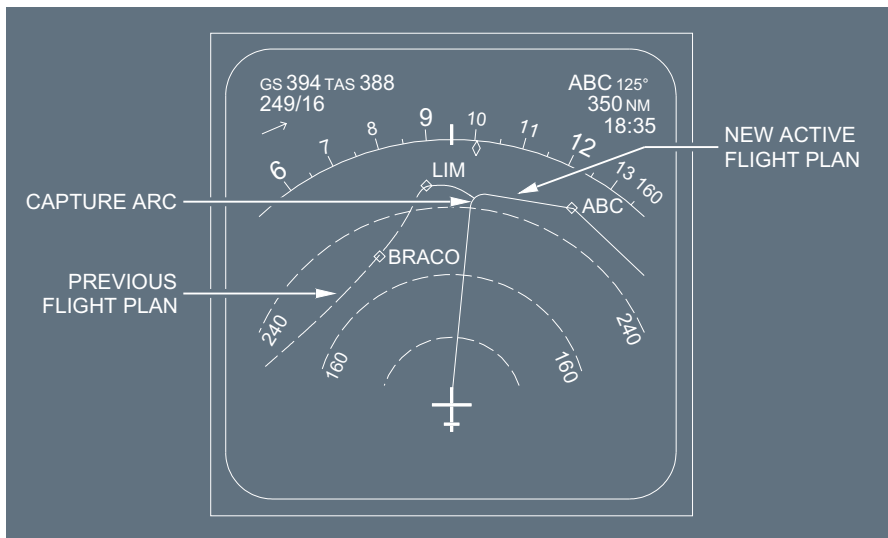
The revised portion of the flight plan is represented by a dotted yellow line

- Flight plan capture

When the aircraft is off the primary flight plan and is flying toward it in HDG mode with the NAV mode armed, the ND shows the new active flight plan as a continuous green line if the FMGC has computed the intercept path.

The part of the flight plan before the interception point shows as a dotted green line.

Continued on the next page



(3) Waypoint

The ND can display various kinds of waypoints:

Flight plan waypoints

The ND displays these as green diamonds (white, for TO waypoints). When the flight crew selects the WPT option on his EFIS control panel, all waypoints other than flight plan waypoints are displayed in magenta.

Pseudo waypoint

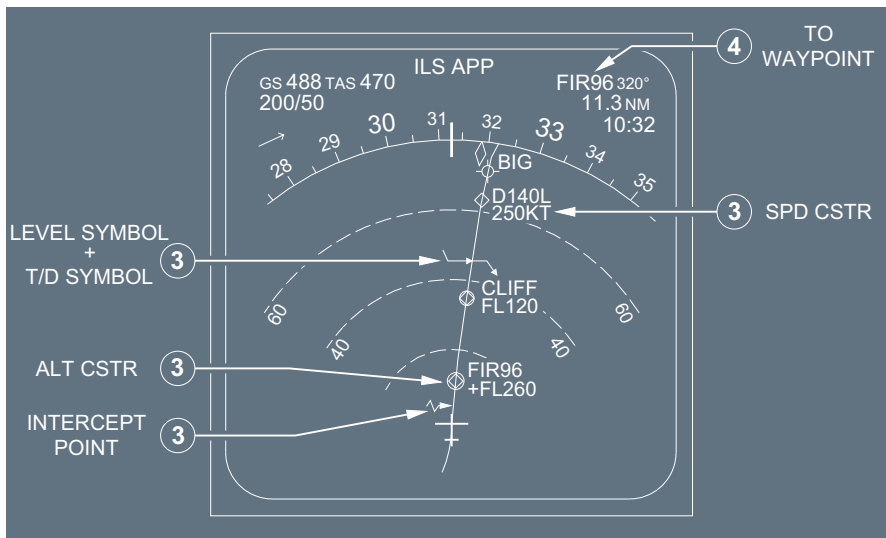
Point of the flight path where the aircraft is predicted to reach a selected altitude or speed.

Pseudo waypoint	Definition
	Level symbol (top of climb or level-off position), when the aircraft reaches: - The FCU-selected altitude (blue arrow), or - The constrained altitude, if it is more restrictive than the FCU altitude and if appropriate modes are engaged (magenta) - It does not appear when the aircraft is within 100 ft above, or below, the selected altitude.
	Top of descent symbol, or continue descent symbol: - White, if DES is not armed - Blue, if DES is armed.

Continued on the next page

Pseudo waypoint	Definition
	Start of CLIMB symbol: - White, if CLB is not armed - Blue, if CLB is armed.
	Intercept point symbol: - White, if only the NAV mode is engaged - Blue, if DES mode is engaged - Indicates the point at which the aircraft is predicted to intercept the descent path, if there is any vertical deviation while the aircraft is in DES mode.
	Speed change symbol (magenta): Indicates the point at which the aircraft will start an automatic acceleration or deceleration from the current speed to a new computed speed for SPD LIM, SPD CSTR, or HOLDING SPD.
	Decelerate point symbol: - Indicates the point at which the aircraft is predicted to decelerate for approach (and thus switch to the approach phase) - Magenta, if in managed speed and NAV or approach mode is engaged - White, if in selected speed or HDG/TRK mode - Automatic decelerations only occur when displayed in magenta.
	ALT CSTR symbol set around the constrained waypoint: - Magenta, when the ALT CSTR is predicted to be met - Amber, when the ALT CSTR is predicted to be missed - White, when the ALT CSTR is not taken into account by the FMGS, and NAV mode is engaged.
	Energy circle symbol (green arc) centered on the aircraft position and oriented to the current track line. Represents the Required Distance to Land. Only displayed if the lateral guidance mode is heading or track, and the current FMS flight phase is in cruise, descent or approach, and the aircraft is within 180 nm of the destination.

Continued on the next page



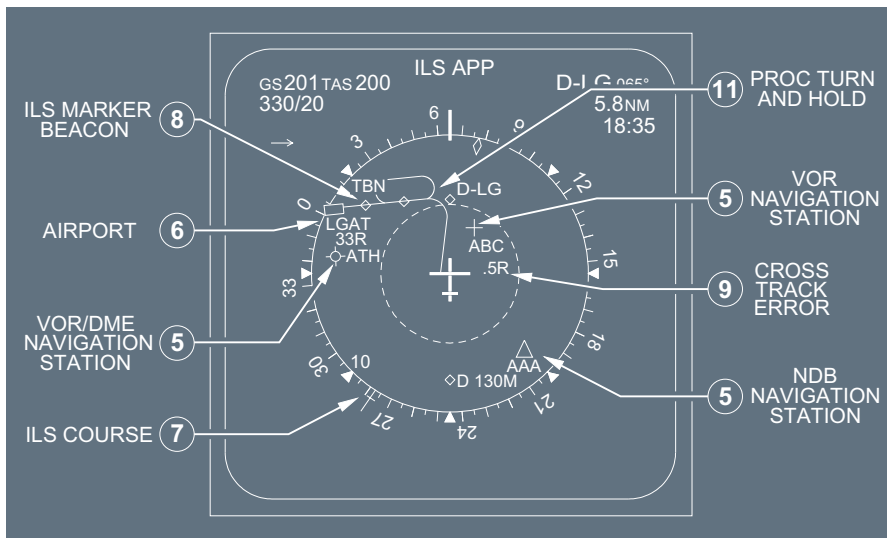
(4) TO waypoint

This is the next waypoint to be overflown.

This area of the screen also shows:

- Waypoint identification (white)
- Track to go (green)
- Distance to go (green)
- Estimated time of arrival (green), assuming the aircraft will fly directly from its present position to the TO waypoint at the current ground speed.

Continued on the next page



(5) NAVAIDs

The display uses specific symbols for NAVAIDs:

- ◻ DME or TACAN
- + VOR
- ◻ VOR/DME
- △ NDB

The symbol appears:

- In green if the NAVAID is a current waypoint of the flight plan
- In white if it is the TO waypoint
- In blue when the NAVAID is tuned for display either automatically by the FMGC or manually through the MCDU
- In magenta when the NAVAID is not part of the flight plan and is called for display as an option (corresponding option pushbutton pressed on the FCU EFIS control panel).

(6) Airport

Airport included in the flight plan:

- If the runway is not specified, the airport is represented by a star and the identification is displayed in white.

Example: * LSGG

Continued on the next page

- If the runway is specified, it is represented by an oriented runway symbol in white.

LSGG
33R

The runway is drawn to scale (paved length) if the selected range is 10, 20 or 40 NM.

Optional airport information

The airports that are not displayed as part of the flight plan may be called for display (ARPT pushbutton on the EFIS control panel).

They are represented by a star and the identification in magenta.

(7) ILS Course (Magenta)

When the pilot pushes the LS pb-sw on the EFIS control panel, and if an ILS station has been selected, the display shows an ILS course symbol.

(8) ILS Marker Beacons

The screen shows these as waypoints (diamonds).

When the aircraft overflies a marker beacon, the corresponding symbol flashes:

Blue for the outer marker.

Amber for the middle marker.

White for the inner marker.

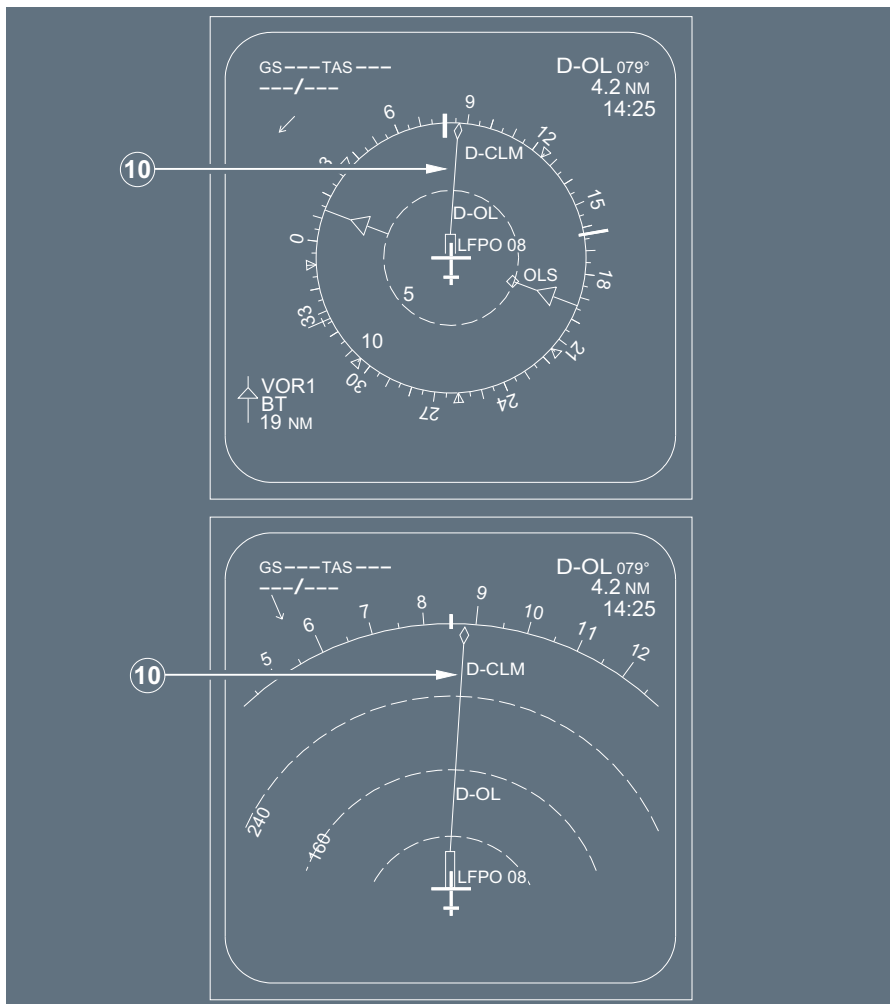
(9) Cross Track Error

This is the aircraft's lateral deviation from the active leg of the flight plan (related to the great circle route). It is indicated in nautical miles (NM), with the letter R (right) or L (left), according to the position of the aircraft with respect to the flight plan.

(10) Track line

This line appears in green only in the ROSE NAV or ARC mode when HDG or TRK has been selected on the FCU.

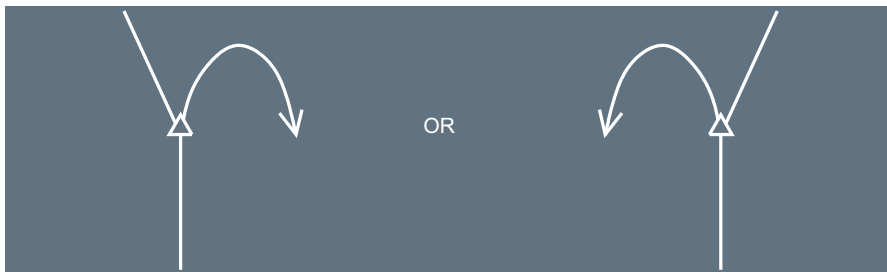
Continued on the next page



(11) Procedure turns and holding patterns

These only appear when they are part of the flight plan. For the 160 and 320 nm range scales, each one is represented by a white arrow that originates at the associated fix and indicates the direction of the turn.

Continued on the next page



For shorter range scales, and if the procedure turn or the holding pattern is in the next or the active leg, the display shows the full circuit or pattern.

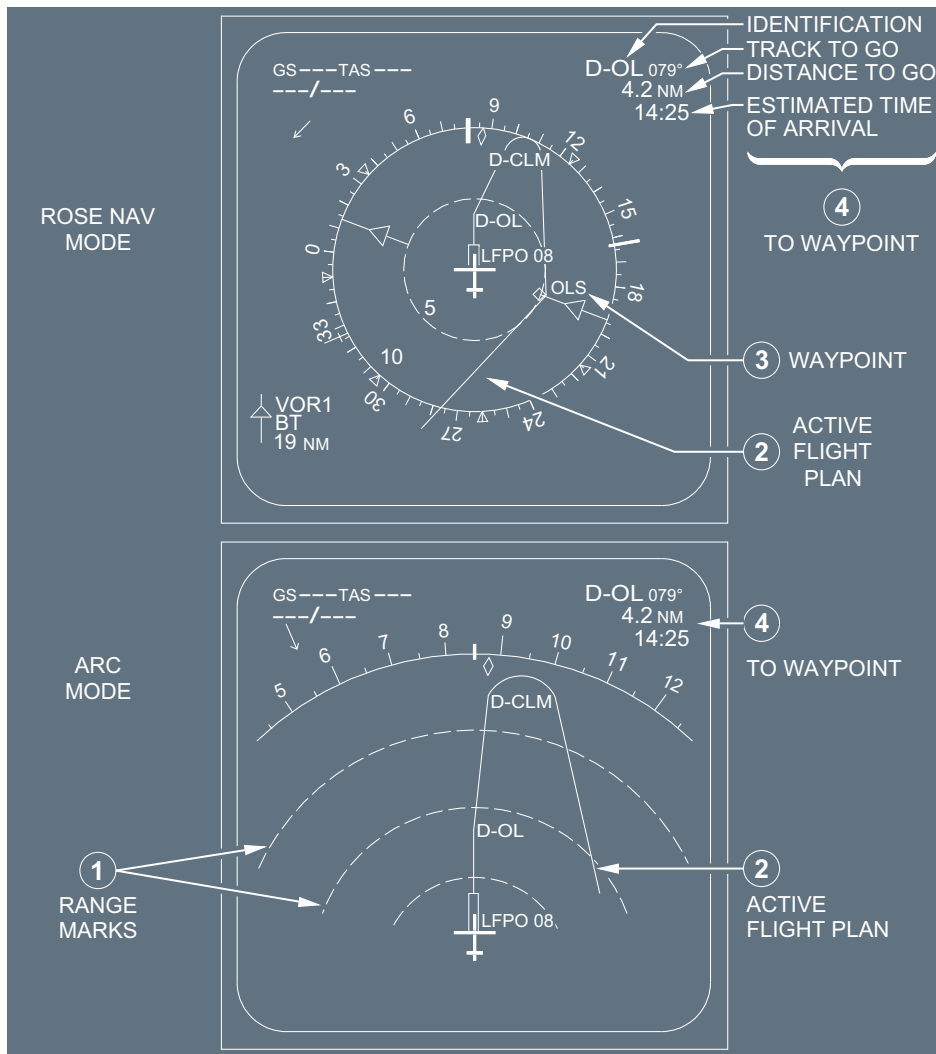


ROSE NAV MODE/ARC MODE

Applicable to: MSN 2037-2387, 2402-2503, 2514-2538, 2578-2754, 2777-2829, 2860, 2873-2884, 2946-3041, 3059-3061, 3084-3090, 3122-3569, 3608-3979, 4006-4034, 4048-4087, 4129-4233, 4250-4636, 4646-5319

ROSE NAV and ARC modes give the pilot the same information, but ARC mode limits it to the forward 90 ° sector.

Continued on the next page



(1) Range Marks and Values

The values displayed on the ND are:

In ROSE NAV mode 1/4 of the selected range for the inner circle.

1/2 of the selected range for the heading scale circle.

Continued on the next page

In ARC mode 1/4 of the selected range for the first inner arc.
1/2 of the selected range for the second inner arc.
3/4 of the selected range for the third inner arc.

(2) Flight Plan

The crew can use the MCDU to select various types of flight plan:

- The active flight plan (the flight plan the aircraft is actually following when the NAV mode is engaged) is represented by a continuous green line. The ND shows only the part of the flight plan that is ahead of the aircraft, as well as the waypoints that are still to be overflown and the waypoint from which the aircraft is coming.

The ND does not show a SID or a STAR, except for the last waypoint of the SID and the first waypoint of the STAR, when the selected range is 160 or 320 nm.

If the primary flight plan is not active, it is represented by a dotted green line.

- A continuous blue line portrays the missed approach procedure, and a dashed blue line portrays the flight plan to the alternate.

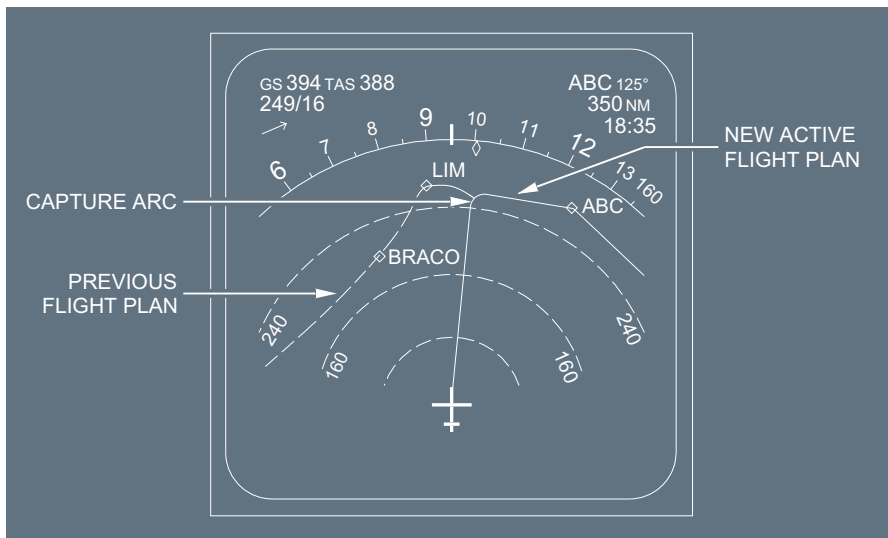
The missed approach and the alternate flight plan are displayed when:

- In ARC or ROSE NAV mode, a missed approach waypoint or an alternate flight plan waypoint is displayed on the onside MCDU.
- In PLAN mode a missed approach or alternate waypoint is displayed in the 2L field of the onside MCDU.
- The secondary flight plan is represented by a continuous white line. The ND continues to display the active flight plan
- Temporary flight plan
The revised portion of the flight plan is represented by a dotted yellow line
- Flight plan capture

When the aircraft is off the primary flight plan and is flying toward it in HDG mode with the NAV mode armed, the ND shows the new active flight plan as a continuous green line if the FMGC has computed the intercept path.

The part of the flight plan before the interception point shows as a dotted green line.

Continued on the next page



(3) Waypoint

The ND can display various kinds of waypoints:

Flight plan waypoints

The ND displays these as green diamonds (white, for TO waypoints). When the flight crew selects the WPT option on his EFIS control panel, all waypoints other than flight plan waypoints are displayed in magenta.

Pseudo waypoint

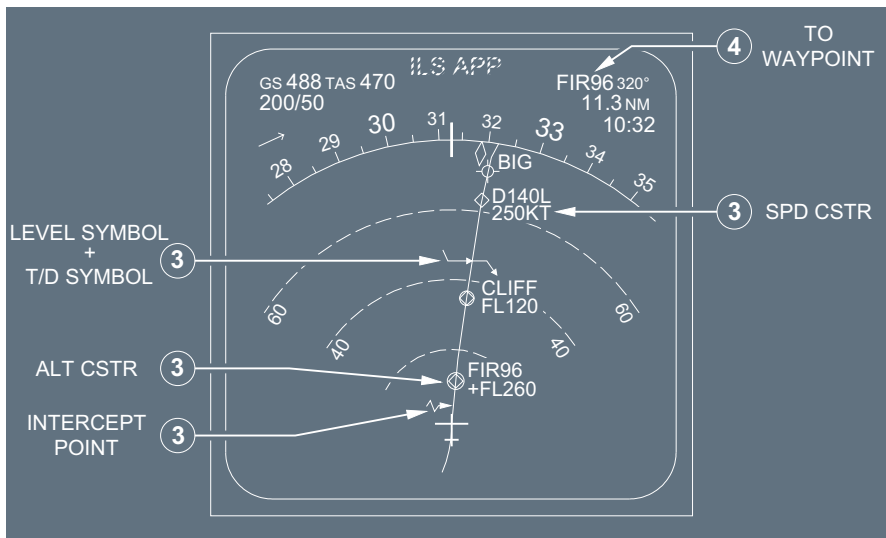
Point of the flight path where the aircraft is predicted to reach a selected altitude or speed.

Pseudo waypoint	Definition
	Level symbol (top of climb or level-off position), when the aircraft reaches: - The FCU-selected altitude (blue arrow), or - The constrained altitude, if it is more restrictive than the FCU altitude and if appropriate modes are engaged (magenta) - It does not appear when the aircraft is within 100 ft above, or below, the selected altitude.
	Top of descent symbol, or continue descent symbol: - White, if DES is not armed - Blue, if DES is armed.

Continued on the next page

Pseudo waypoint	Definition
	Start of CLIMB symbol: - White, if CLB is not armed - Blue, if CLB is armed.
	Intercept point symbol: - White, if only the NAV mode is engaged - Blue, if DES mode is engaged - Indicates the point at which the aircraft is predicted to intercept the descent path, if there is any vertical deviation while the aircraft is in DES mode.
	Speed change symbol (magenta): Indicates the point at which the aircraft will start an automatic acceleration or deceleration from the current speed to a new computed speed for SPD LIM, SPD CSTR, or HOLDING SPD.
	Decelerate point symbol: - Indicates the point at which the aircraft is predicted to decelerate for approach (and thus switch to the approach phase) - Magenta, if in managed speed and NAV or approach mode is engaged - White, if in selected speed or HDG/TRK mode - Automatic decelerations only occur when displayed in magenta.
	ALT CSTR symbol set around the constrained waypoint: - Magenta, when the ALT CSTR is predicted to be met - Amber, when the ALT CSTR is predicted to be missed - White, when the ALT CSTR is not taken into account by the FMGS, and NAV mode is engaged.
	Energy circle symbol (green arc) centered on the aircraft position and oriented to the current track line. Represents the Required Distance to Land. Only displayed if the lateral guidance mode is heading or track, and the current FMS flight phase is in cruise, descent or approach, and the aircraft is within 180 nm of the destination.

Continued on the next page



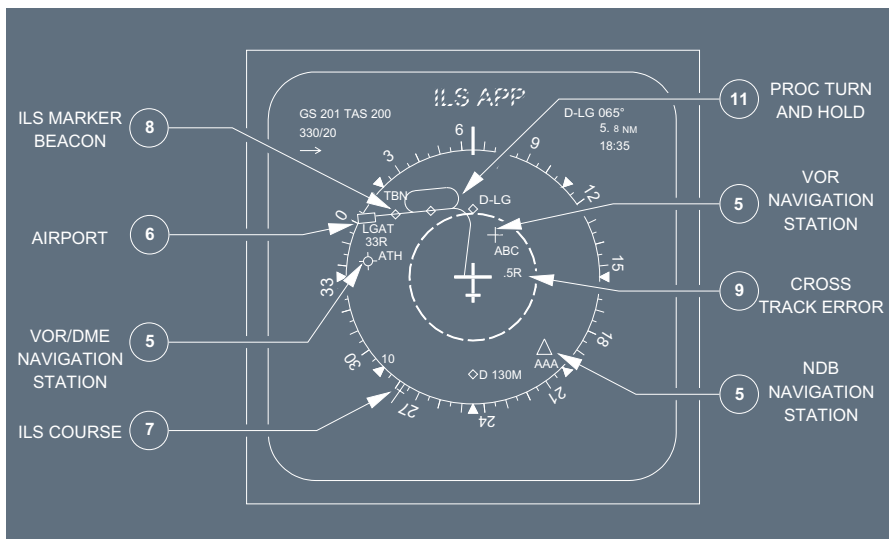
(4) TO waypoint

This is the next waypoint to be overflown.

This area of the screen also shows:

- Waypoint identification (white)
- Track to go (green)
- Distance to go (green)
- Estimated time of arrival (green), assuming the aircraft will fly directly from its present position to the TO waypoint at the current ground speed.

Continued on the next page



(5) NAVAIDs

The display uses specific symbols for NAVAIDs:

- ◉ DME or TACAN
- + VOR
- ◉ VOR/DME
- △ NDB

The symbol appears:

- In green if the NAVAID is a current waypoint of the flight plan
- In white if it is the TO waypoint
- In blue when the NAVAID is tuned for display either automatically by the FMGC or manually through the MCDU
- In magenta when the NAVAID is not part of the flight plan and is called for display as an option (corresponding option pushbutton pressed on the FCU EFIS control panel).

(6) Airport

Airport included in the flight plan:

- If the runway is not specified, the airport is represented by a star and the identification is displayed in white.
Example: * LSGG

Continued on the next page

- If the runway is specified, it is represented by an oriented runway symbol in white.

LSGG
33R

The runway is drawn to scale (paved length) if the selected range is 10, 20 or 40 NM.

Optional airport information

The airports that are not displayed as part of the flight plan may be called for display (ARPT pushbutton on the EFIS control panel).

They are represented by a star and the identification in magenta.

(7) ILS Course (Magenta)

When the pilot pushes the LS pb-sw on the EFIS control panel, and if an ILS station has been selected, the display shows an ILS course symbol.

(8) ILS Marker Beacons

The screen shows these as waypoints (diamonds).

When the aircraft overflies a marker beacon, the corresponding symbol flashes:

Blue for the outer marker.

Amber for the middle marker.

White for the inner marker.

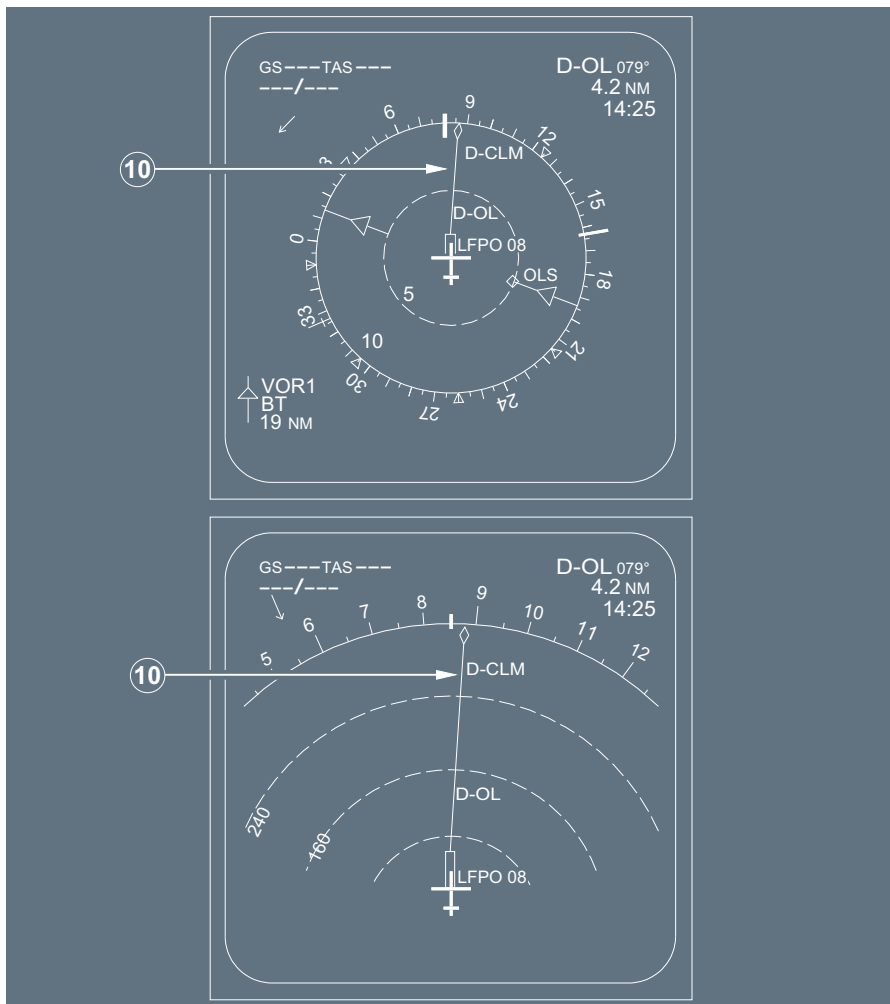
(9) Cross Track Error

This is the aircraft's lateral deviation from the active leg of the flight plan (related to the great circle route). It is indicated in nautical miles (NM), with the letter R (right) or L (left), according to the position of the aircraft with respect to the flight plan.

(10) Track Line

This line appears in green only in the ROSE NAV or ARC mode when HDG or TRK has been selected on the FCU.

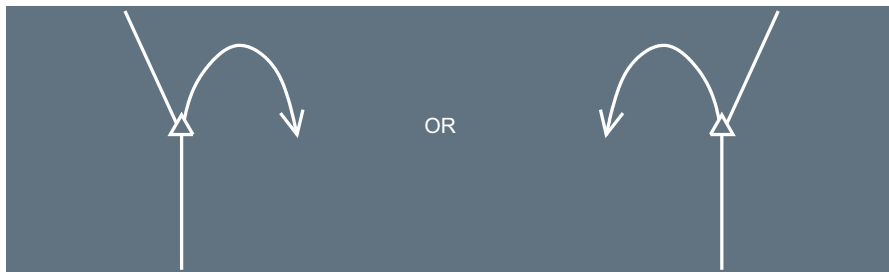
Continued on the next page



(11) Procedure turns and holding patterns

These only appear when they are part of the flight plan. For the 160 and 320 nm range scales, each one is represented by a white arrow that originates at the associated fix and indicates the direction of the turn.

Continued on the next page



For shorter range scales, and if the procedure turn or the holding pattern is in the next or the active leg, the display shows the full circuit or pattern.



PLAN MODE

Applicable to: ALL

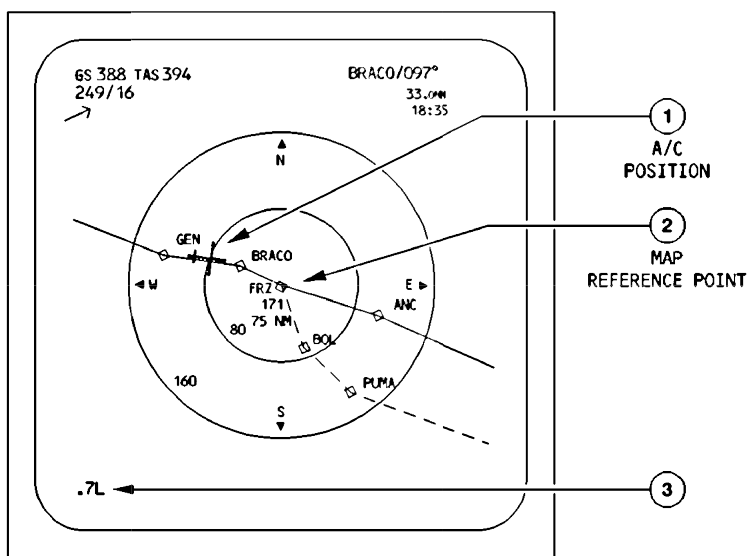
This mode statically displays the flight plan legs on a map oriented to true north. The map is centered on a map reference point, that the pilot selects by scrolling to it on his MCDU.

The map reference point is the waypoint displayed on the second line of the MCDU's F-PLN page. It can either be the active waypoint (next waypoint to be overflown), or any other waypoint of the flight plan.

The pilot can scroll through the overall flight plan, and display it in PLAN mode.

The pilot chooses the scale of the map with the range selector (the diameter of the outer circle corresponds to the selected range).

Data on NAVAIDs and on their characteristics and associated bearing pointers are not available in this mode.



(1) Aircraft Position and True Track

The orientation of the yellow aircraft symbol always indicates the true track of the aircraft. Its position represents the aircraft position given by the FMGS.

(2) Map Reference Point

If the CSTR option is not selected, the track and distance from the map reference point to the next F-PLN waypoint is displayed in magenta.

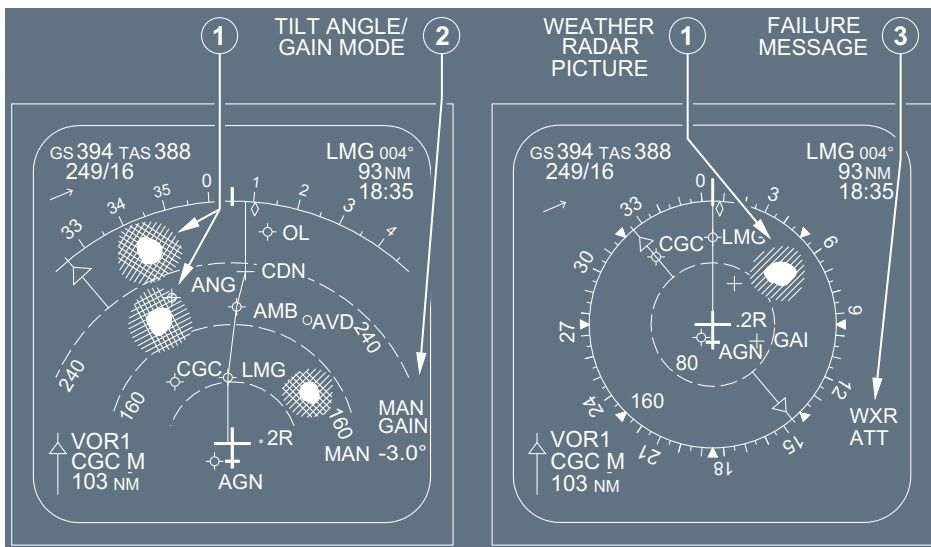
Continued on the next page

(3) Cross Track Error

Refer to DSC-31-45 ROSE NAV Mode/ARC Mode.

WEATHER RADAR

Applicable to: ALL



(1) Weather Radar Picture

- When the radar is operating, and when the ND is not in PLAN mode, the ND displays the weather radar picture.
- The echoes appear in different colors, depending on the precipitation rates (black, green, yellow, red or magenta).
- The selected ND range will determine how often the image is refreshed.

(2) Tilt Angle and Gain Mode

- The value of the tilt angle is in degrees, and quarters of a degree. It appears in blue in the lower right-hand corner of the screen along with MAN indication. This angle is the angle between the horizon and the radar beam axis.
- "MAN GAIN" appears in white, when the manual gain mode is selected.

(3) Failure Messages

The ND lists the detected failures.

If the message is in "red", the ND does not display a radar image.

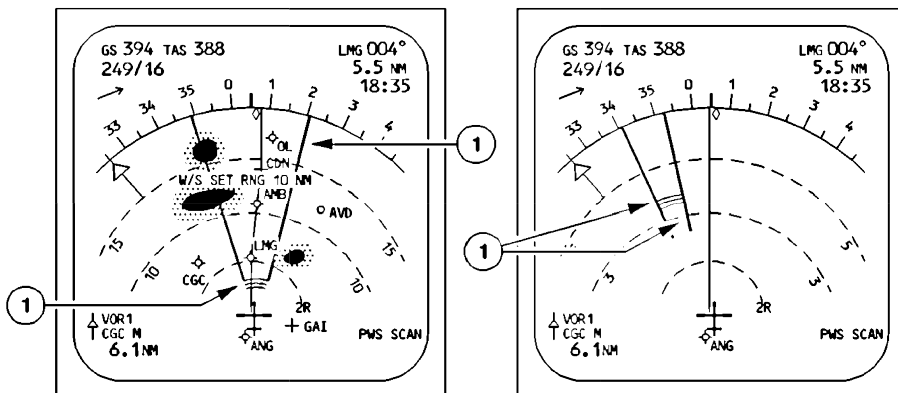
Continued on the next page

If the message is in “amber”, the image is not affected.

WXR RT (red)	: Radar transceiver failure.
WXR ANT (red)	: Radar antenna failure.
WXR CTL (red)	: Radar control unit failure.
WXR RNG (red)	: Range error.
WXR WEAK (amber)	: Calibration failure.
WXR ATT (amber)	: Attitude control failure.
WXR STAB (amber)	: Antenna stabilization failure.

PREDICTIVE WINDSHEAR SYSTEM

Applicable to: ALL



(1) Predictive windshear area indication

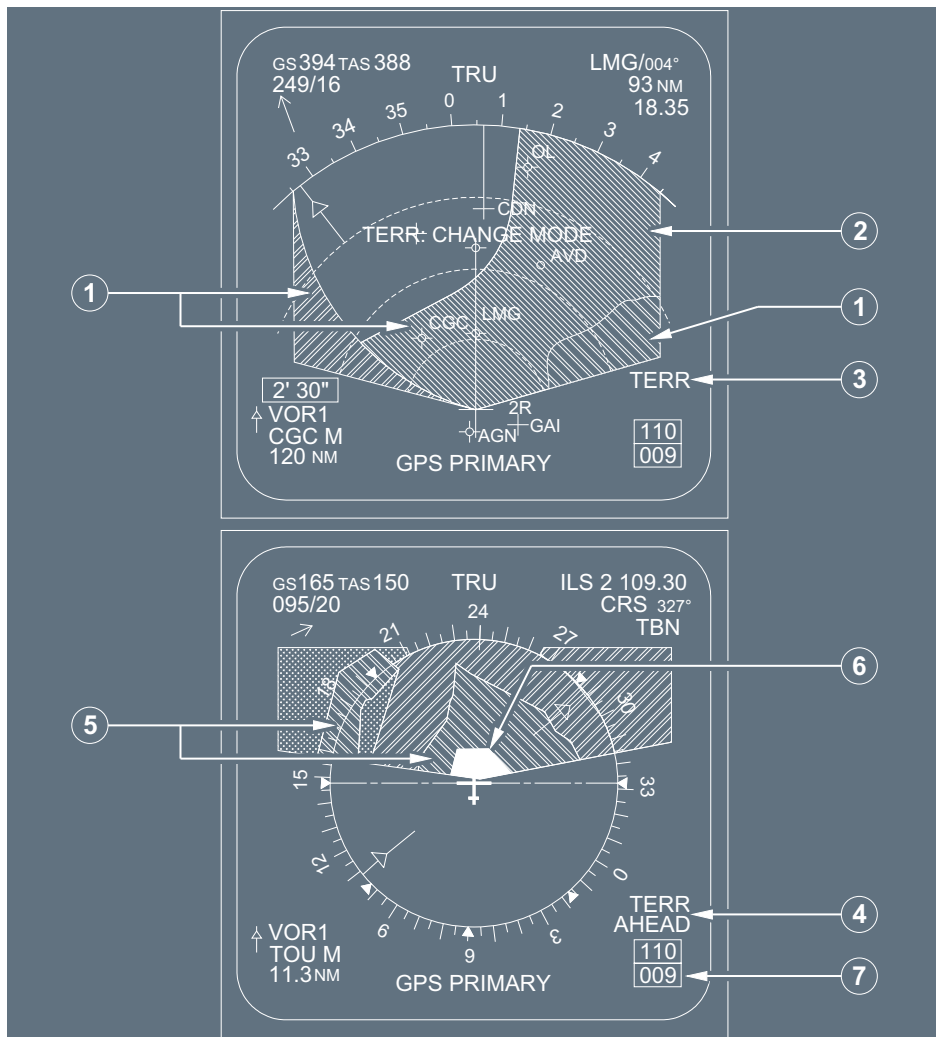
A PWS SCAN message is displayed when the Predictive Windshear system is active on the ND. The predicted windshear area is indicated by a red and black icon and two yellow radial lines. Windshear information is available in ARC and ROSE ND modes.

When the ND range is set above 10 nm, a W/S SET RNG 10 nm (Windshear, set range 10 nm) message appears, requesting the crew to adjust the ND range. It is displayed even if the weather radar is switched off, provided the WINDSHEAR switch on the weather radar panel is set to AUTO.

Depending on the windshear alert level, ND indication may be completed with a PFD message (Refer to DSC-31-40 Flags and Messages Displayed on PFD).

EGPWS

Applicable to: ALL

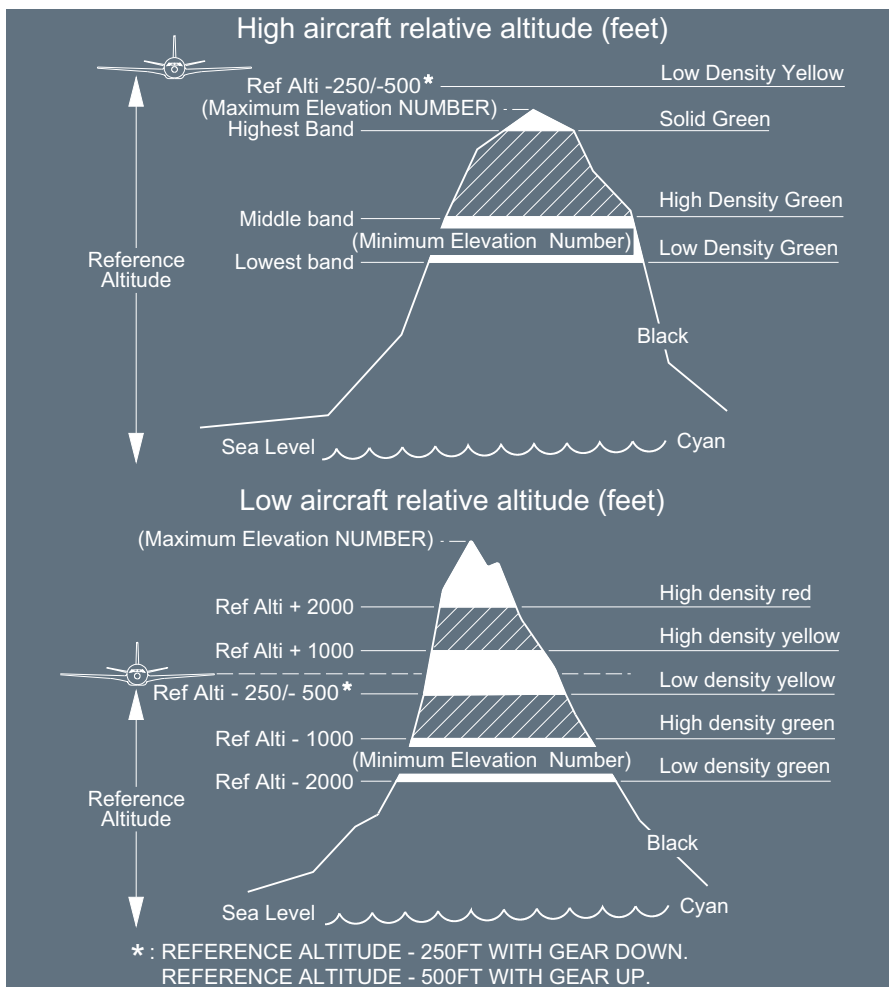


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(1) EGPWS terrain picture

The ND displays the EGPWS terrain picture, when the TERR ON ND switch is selected ON, and the ND is not in PLAN mode. The terrain picture replaces the weather radar image. Terrain data is displayed independently of the aircraft relative altitude.

The terrain appears in different colors and densities, in accordance with its relative height:



Note: - Areas without available terrain data in the EGPWS database appear in magenta

Continued on the next page

- *The reference altitude is computed based on the current aircraft altitude or, if descending more than 1 000 ft/min, the altitude expected in 30 s*
- *In case of flight above the maximum elevation number, the relief between the minimum and maximum displayed elevations is displayed by using three different green levels.*

(2) Center Part Messages

- The “TERR CHANGE MODE” indication is displayed in red (or amber), in the case of a Terrain Awareness Display (TAD) warning (or caution) alert, if the current selected display mode is PLAN
- The “TERR REDUCE RANGE” indication is displayed in red (or amber), in the case of a Terrain Awareness Display (TAD) warning (or caution) alert, if the selected range is 160 nm or 320 nm.

(3) TERR indication

To differentiate between the terrain and the weather display, the weather radar TILT is replaced by a blue TERR, and the terrain display sweeps from the center outward to both ND sides.

(4) Warning and caution messages

TERR AHEAD or OBST AHEAD : For a caution.
(amber)

TERR AHEAD or OBST AHEAD : For a warning.
(red)

When triggered, these messages flash for 9 s, then remain steady until the caution or warning alert condition disappears.

TERR RNG (red) : For a RANGE error warning.

TERR TST (amber) : Appears during the EGPWS test, when the terrain pattern is displayed, and there is no failure.

(5) Terrain or obstacle caution alert

Generated when a conflict exists between the terrain caution envelope, ahead of the aircraft, and database-stored terrain/obstacles. The conflict area is shown in solid yellow.

(6) Terrain or obstacle warning alert

Generated when a conflict exists between the terrain warning envelope, ahead of the aircraft, and terrain/obstacles data stored in the database. The conflict area is shown in solid red.

Note: *When an alert is generated (either caution or warning) and TERR ON ND is not selected, the terrain is automatically displayed and the TERR ON ND's pushbutton ON light comes on.*

Continued on the next page

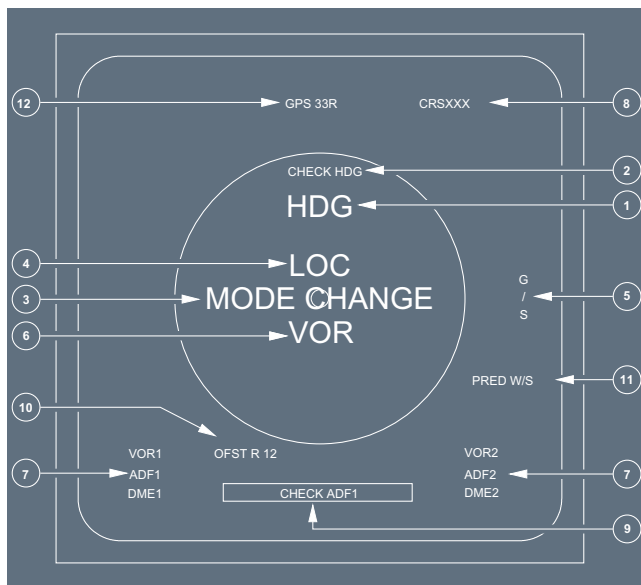
(7) Lowest and highest elevations

Minimum and maximum elevations encountered within the selected range, are respectively displayed in this square, using the color code of paragraph 1.

Note: The elevations shown on the ND correspond to the terrain included in the selected ND range, ahead of the aircraft. In ARC mode, the elevations are linked with the terrain displayed on the ND. In ROSE mode, the elevations may not represent the lowest and highest terrain currently displayed on the ND.

FLAGS AND MESSAGES DISPLAYED ON ND

Applicable to: MSN 2119-2184



(1) HDG Flag (red)

If the heading data fails, the rose, arc and associated symbols disappear. A HDG flag flashes for 9 s, then remains steady in the upper part of the ND.

(2) CHECK HDG Flag (amber)

When the flight warning computer detects a disagree (5 °) between sides 1 and 2, a CHECK HDG flag appears on both NDs, and a caution appears on the ECAM.

Continued on the next page

(3) Center Part Messages

- The screen displays a MODE CHANGE message in green if there is a discrepancy between the selected mode on the EFIS control panel and the mode sent from the outside FMGC, or while the DMC is preparing a new page for display
- The screen displays a RANGE CHANGE message in green if there is a discrepancy between the range selected on the EFIS control panel and the range sent from the outside FMGC. A MODE CHANGE message has priority over a RANGE CHANGE message
- The screen displays a MAP NOT AVAIL message in red for several reasons:
 - The MODE CHANGE or RANGE CHANGE message has been displayed more than 6 s, or
 - The FMGC has failed, or
 - The FMGC has delivered an invalid aircraft position.
- The screen displays a W/S SET RNG 10 nm message if a predictive windshear alert is triggered and the range is above 10 nm.
The message is displayed in the color corresponding to the windshear alert: red for a warning, amber for a caution
- The screen displays a W/S CHANGE MODE message if a predictive windshear alert is triggered and the ND is not in ARC or ROSE mode. The message appears in red for a warning, or amber for a caution.

(4) LOC Flag (red)

If LOC data fails, this flag flashes for 9 s, then remains steady.

(5) G/S Flag (red)

If G/S data fails, this flag flashes for 9 s, then remains steady.

(6) VOR Flag (red)

In ROSE VOR mode, when the VOR bearing is not valid, this flag flashes for 9 s, then remains steady.

(7) VOR 1(2) or ADF 1(2) or DME 1 Flag (red)

If a navigation receiver fails, the appropriate one of these flags flashes for 9 s, then remains steady.

(8) VOR Course Flag

If the VOR course fails, a red CRSXXX flag appears.

If there is non-computed data (NCD), a blue CRS - - - flag appears.

Continued on the next page

- (9) Other messages
- MAP PARTLY
DISPLAYED (amber)
- : In case of incomplete data transmission between the FMGC (priority criteria) and the DMC, or if the DMC cannot draw the complete MAP.
This message is also displayed when a very long leg exists in the flight plan. A leg is considered as “very long” when the starting point (or endpoint) is located at more than 45 ° from the aircraft location (45 ° of longitude or latitude).
This DMC limitation results from a compromise between accurate drawing precision and maximum leg length that can be displayed.
- NAV ACCUR UPGRAD, or: Signals a change in navigation accuracy.
(white) NAV ACCUR
DOWNGRAD (amber)
- SPECIFIC VOR/D
UNAVAIL (amber)
- : If the NAVAID, that is tuned for the selected approach or departure, is not available.
- SET OFFSIDE
RNG/MODE (amber)
- : Displayed on ND 1(2), in case of an FMGC 1(2) failure when the two ND ranges or modes selected on the EFIS control panels are different.
- GPS PRIMARY (white,
boxed white)
- : This message appears when GPS PRIMARY mode is available, or has been recovered. The pilot can clear this message by pressing the CLR key on the MCDU.
- GPS PRIMARY LOST
(amber, boxed white)
- : This message appears when GPS PRIMARY is not available, and not clearable by pilot action.
- ↓ (green)
- : Overflow arrow, displayed when more than one of the following messages are present at the same time:
- NAV ACCUR DOWNGRAD (inhibited when the navigation mode is IRS/GPS)
 - NAV ACCUR UPGRAD (inhibited when the navigation mode is IRS/GPS)
 - SPECIF VOR-D UNAVAIL
 - MAP PARTLY DISPLAYED
 - SET OFFSIDE RNG/MODE
 - GPS PRIMARY
 - GPS PRIMARY LOST.

Note: For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.

Continued on the next page

(10) OFST R(L) XX message (yellow)

The screen displays this message, when a temporary or an offset flight plan is entered.
The offset value is given in NM.

Note: For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.

(11) PRED W/S flag (amber)

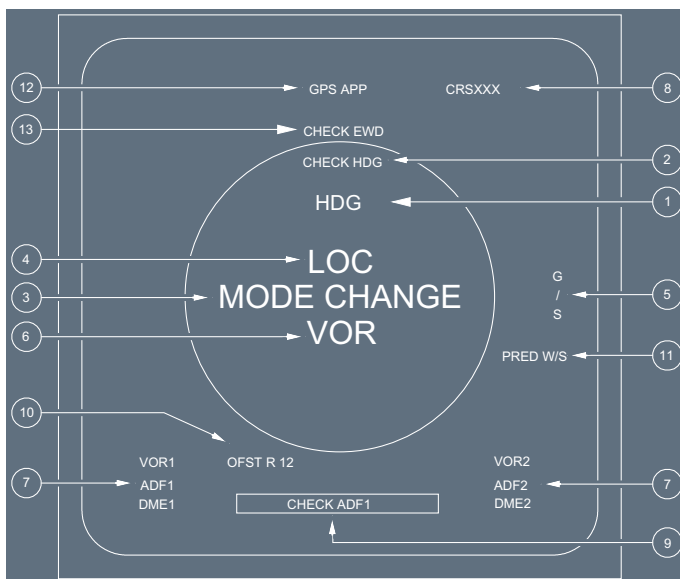
The WINDSHEAR sw on the weather radar panel is set to AUTO, and a Predictive Windshear System fault is detected. This message appears on ground, or when flaps and slats are extended. It is associated with a single chime. The radar image remains available, provided that the fault does not affect the radar mode.

(12) GPS APP (green)

This message is displayed, when a GPS approach has been selected.

FLAGS AND MESSAGES DISPLAYED ON ND

Applicable to: MSN 2398, 2512, 2548-2565



(1) HDG Flag (red)

If the heading data fails, the rose, arc and associated symbols disappear.
A HDG flag flashes for 9 s, then remains steady in the upper part of the ND.

Continued on the next page

(2) CHECK HDG Flag (amber)

For more information: *Refer to DSC-31-05-60 Side1/Side2 Discrepancy Messages*

(3) Center Part Messages

- The screen displays a MODE CHANGE message in green if there is a discrepancy between the selected mode on the EFIS control panel and the mode sent from the outside FMGC, or while the DMC is preparing a new page for display
- The screen displays a RANGE CHANGE message in green if there is a discrepancy between the range selected on the EFIS control panel and the range sent from the outside FMGC. A MODE CHANGE message has priority over a RANGE CHANGE message
- The screen displays a MAP NOT AVAIL message in red for several reasons:
 - The MODE CHANGE or RANGE CHANGE message has been displayed more than 6 s, or
 - The FMGC has failed, or
 - The FMGC has delivered an invalid aircraft position.
- The screen displays a W/S SET RNG 10 nm message if a predictive windshear alert is triggered and the range is above 10 nm.

The message is displayed in the color corresponding to the windshear alert: red for a warning, amber for a caution
- The screen displays a W/S CHANGE MODE message if a predictive windshear alert is triggered and the ND is not in ARC or ROSE mode. The message appears in red for a warning, or amber for a caution.

(4) LOC Flag (red)

If LOC data fails, this flag flashes for 9 s, then remains steady.

(5) G/S Flag (red)

If G/S data fails, this flag flashes for 9 s, then remains steady.

(6) VOR Flag (red)

In ROSE VOR mode, when the VOR bearing is not valid, this flag flashes for 9 s, then remains steady.

(7) VOR 1(2) or ADF 1(2) or DME 1 Flag (red)

If a navigation receiver fails, the appropriate one of these flags flashes for 9 s, then remains steady.

(8) VOR Course Flag

If the VOR course fails, a red CRSXXX flag appears.

If there is non-computed data (NCD), a blue CRS - - - flag appears.

Continued on the next page

(9) Other Messages

MAP PARTLY
DISPLAYED (amber)

: In case of incomplete data transmission between the FMGC (priority criteria) and the DMC, or if the DMC cannot draw the complete MAP.

This message is also displayed when a very long leg exists in the flight plan. A leg is considered as “very long” when the starting point (or endpoint) is located at more than 45 ° from the aircraft location (45 ° of longitude or latitude).

This DMC limitation results from a compromise between accurate drawing precision and maximum leg length that can be displayed.

NAV ACCUR UPGRAD, or : Signals a change in navigation accuracy.
(white) NAV ACCUR
DOWNGRAD (amber)

SPECIFIC VOR/D : If the NAVAID, that is tuned for the selected approach or departure, UNAVAIL (amber) is not available.

SET OFFSIDE : Displayed on ND 1(2), in case of an FMGC 1(2) failure when the RNG/MODE (amber) two ND ranges or modes selected on the EFIS control panels are different.

OFFSIDE FM CONTROL : If the offside FM supplies the onside ND.
(amber)

GPS PRIMARY (white, : This message appears when GPS PRIMARY mode is available, or boxed white) has been recovered. The pilot can clear this message by pressing the CLR key on the MCDU.

GPS PRIMARY LOST : This message appears when GPS PRIMARY is not available, and (amber, boxed white) not clearable by pilot action.

↓ (green) : Overflow arrow, displayed when more than one of the following messages are present at the same time:

- NAV ACCUR DOWNGRAD
- NAV ACCUR UPGRAD
- SPECIF VOR-D UNAVAIL
- MAP PARTLY DISPLAYED
- SET OFFSIDE RNG/MODE
- GPS PRIMARY
- GPS PRIMARY LOST

Note: For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.

Continued on the next page

(10) OFST R(L) XX message (yellow)

The screen displays this message, when a temporary or an offset flight plan is entered.

The offset value is given in NM.

Note: For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.

(11) PRED W/S flag (amber)

The WINDSHEAR sw on the weather radar panel is set to AUTO, and a Predictive Windshear System fault is detected. This message appears on ground, or when flaps and slats are extended. It is associated with a single chime. The radar image remains available, provided that the fault does not affect the radar mode.

(12) GPS message (green)

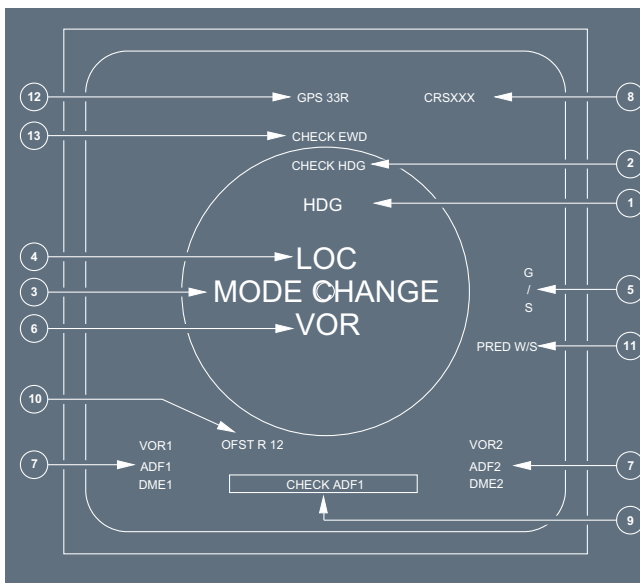
This message shows the full runway name of the selected approach. It is displayed, when the flight crew selects a GPS approach.

(13) CHECK EWD, CHECK CAPT (F/O) PFD, CHECK SD, CHECK CAPT (F/O) ND (amber)

For more information: *Refer to DSC-31-05-60 Feedback Messages*

FLAGS AND MESSAGES DISPLAYED ON ND

Applicable to: MSN 2037-2062, 2245-2387, 2402-2503, 2514-2538, 2578-2754, 2777-2829, 2860, 2873-2884, 2946-3041, 3059-3061, 3084-3090, 3122-3555



(1) HDG Flag (red)

If the heading data fails, the rose, arc and associated symbols disappear.

A HDG flag flashes for 9 s, then remains steady in the upper part of the ND.

(2) CHECK HDG Flag (amber)

For more information: *Refer to DSC-31-05-60 Side1/Side2 Discrepancy Messages*

(3) Center Part Messages

- The screen displays a **MODE CHANGE** message in green if there is a discrepancy between the selected mode on the EFIS control panel and the mode sent from the outside FMGC, or while the DMC is preparing a new page for display
- The screen displays a **RANGE CHANGE** message in green if there is a discrepancy between the range selected on the EFIS control panel and the range sent from the outside FMGC. A **MODE CHANGE** message has priority over a **RANGE CHANGE** message
- The screen displays a **MAP NOT AVAIL** message in red for several reasons:
 - The **MODE CHANGE** or **RANGE CHANGE** message has been displayed more than six seconds, or

Continued on the next page

- The FMGC has failed, or
 - The FMGC has delivered an invalid aircraft position.
 - The screen displays a W/S SET RNG 10 nm message if a predictive windshear alert is triggered and the range is above 10 nm.
The message is displayed in the color corresponding to the windshear alert : red for a warning, amber for a caution.
 - The screen displays a W/S CHANGE MODE message if a predictive windshear alert is triggered and the ND is not in ARC or ROSE mode. The message appears in red for a warning, or amber for a caution.
- (4) LOC Flag (red)
If LOC data fails, this flag flashes for 9 s, then remains steady.
- (5) G/S Flag (red)
If G/S data fails, this flag flashes for 9 s, then remains steady.
- (6) VOR Flag (red)
In ROSE VOR mode, when the VOR bearing is not valid, this flag flashes for 9 s, then remains steady.
- (7) VOR 1(2) or ADF 1(2) or DME 1 Flag (red)
If a navigation receiver fails, the appropriate one of these flags flashes for 9 s, then remains steady.
- (8) VOR Course Flag
If the VOR course fails, a red CRSXXX flag appears.
If there is non-computed data (NCD), a blue CRS - - - flag appears.
- (9) Other Messages
MAP PARTLY : In case of incomplete data transmission between the FMGC
DISPLAYED (amber) (priority criteria) and the DMC, or if the DMC cannot draw the complete MAP.
This message is also displayed when a very long leg exists in the flight plan. A leg is considered as “very long” when the starting point (or endpoint) is located at more than 45 ° from the aircraft location (45 ° of longitude or latitude).
This DMC limitation results from a compromise between accurate drawing precision and maximum leg length that can be displayed.
- NAV ACCUR UPGRAD, or : Signals a change in navigation accuracy.
(white) NAV ACCUR
DOWNGRAD (amber)

Continued on the next page

- SPECIFIC VOR/D : If the NAVAID, that is tuned for the selected approach or departure, UNAVAIL (amber) is not available.
- SET OFFSIDE : Displayed on ND 1(2), in case of an FMGC 1(2) failure when the RNG/MODE (amber) two ND ranges or modes selected on the EFIS control panels are different.
- OFFSIDE FM CONTROL : If the offside FM supplies the onside ND. (amber)
- GPS PRIMARY (white, : This message appears when GPS PRIMARY mode is available, or boxed white) has been recovered. The pilot can clear this message by pressing the CLR key on the MCDU.
- GPS PRIMARY LOST : This message appears when GPS PRIMARY is not available, and (amber, boxed white) not clearable by pilot action.
- ↓ (green) : Overflow arrow, displayed when more than one of the following messages are present at the same time:
- NAV ACCUR DOWNGRAD
 - NAV ACCUR UPGRAD
 - SPECIF VOR-D UNAVAIL
 - MAP PARTLY DISPLAYED
 - SET OFFSIDE RNG/MODE
 - GPS PRIMARY
 - GPS PRIMARY LOST

Note: For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.

(10) OFST R(L) XX message (yellow)

The screen displays this message, when a temporary or an offset flight plan is entered. The offset value is given in NM.

Note: For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.

(11) PRED W/S flag (amber)

The WINDSHEAR sw on the weather radar panel is set to AUTO, and a Predictive Windshear System fault is detected. This message appears on ground, or when flaps and slats are extended. It is associated with a single chime. The radar image remains available, provided that the fault does not affect the radar mode.

(12) GPS message (green)

This message shows the full runway name of the selected approach. It is displayed, when the flight crew selects a GPS approach.

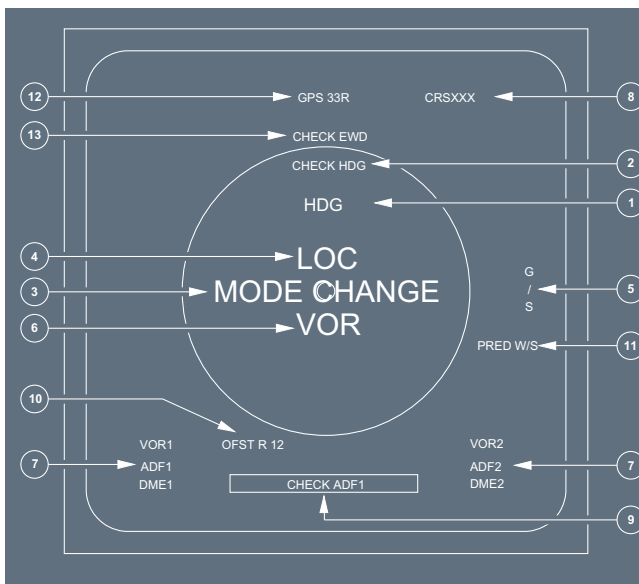
Continued on the next page

- (13) CHECK EWD. CHECK CAPT (F/O) PFD. CHECK SD. CHECK CAPT (F/O) ND (amber)

For more information: *Refer to DSC-31-05-60 Feedback Messages*

FLAGS AND MESSAGES DISPLAYED ON ND

Applicable to: MSN 3805, 3843, 3871, 3909-3979, 4006-4034, 4157-4233, 4250-4286, 4554-4591, 4636, 4646, 4676-4680, 4708, 4721-4740, 4749, 5019-5319



- (1) HDG Flag (red)

If the heading data fails, the rose, arc and associated symbols disappear.

A HDG flag flashes for 9 s, then remains steady in the upper part of the ND.

- (2) CHECK HDG Flag (amber)

For more information: *Refer to DSC-31-05-60 Side1/Side2 Discrepancy Messages*

- (3) Center Part Messages

- The screen displays a MODE CHANGE message in green if there is a discrepancy between the selected mode on the EFIS control panel and the mode sent from the onside FMGC, or while the DMC is preparing a new page for display
- The screen displays a RANGE CHANGE message in green if there is a discrepancy between the range selected on the EFIS control panel and the range sent from the onside FMGC. A MODE CHANGE message has priority over a RANGE CHANGE message

Continued on the next page

- The screen displays a MAP NOT AVAIL message in red for several reasons:
 - The MODE CHANGE or RANGE CHANGE message has been displayed more than 6 s, or
 - The FMGC has failed, or
 - The FMGC has delivered an invalid aircraft position.
- The screen displays a W/S SET RNG 10 nm message if a predictive windshear alert is triggered and the range is above 10 nm.
The message is displayed in the color corresponding to the windshear alert: red for a warning, amber for a caution
- The screen displays a W/S CHANGE MODE message if a predictive windshear alert is triggered and the ND is not in ARC or ROSE mode. The message appears in red for a warning, or amber for a caution.

(4) LOC Flag (red)

If LOC data fails, this flag flashes for 9 s, then remains steady.

(5) G/S Flag (red)

If G/S data fails, this flag flashes for 9 s, then remains steady.

(6) VOR Flag (red)

In ROSE VOR mode, when the VOR bearing is not valid, this flag flashes for 9 s, then remains steady.

(7) VOR 1(2) or ADF 1(2) or DME 1 Flag (red)

If a navigation receiver fails, the appropriate one of these flags flashes for 9 s, then remains steady.

(8) VOR Course Flag

If the VOR course fails, a red CRSXXX flag appears.

If there is non-computed data (NCD), a blue CRS - - - flag appears.

(9) Other messages

MAP PARTLY

DISPLAYED (amber)

: In case of incomplete data transmission between the FMGC (priority criteria) and the DMC, or if the DMC cannot draw the complete MAP.

This message is also displayed when a very long leg exists in the flight plan. A leg is considered as “very long” when the starting point (or endpoint) is located at more than 45 ° from the aircraft location (45 ° of longitude or latitude).

This DMC limitation results from a compromise between accurate drawing precision and maximum leg length that can be displayed.

Continued on the next page

NAV ACCUR UPGRAD, or : Signals a change in navigation accuracy.

(white) NAV ACCUR

DOWNGRAD (amber)

SPECIFIC VOR/D : If the NAVAID, that is tuned for the selected approach or departure,
UNAVAIL (amber) is not available.

BACK-UP NAV (amber) : If the MCDU back-up navigation mode is activated (*Refer to DSC-22_10-40-10 MCDU - MCDU Interface*)

SET OFFSIDE : Displayed on ND 1(2), in case of an FMGC 1(2) failure when the
RNG/MODE (amber) two ND ranges or modes selected on the EFIS control panels are different.

OFFSIDE FM CONTROL : If the offside FM supplies the onside ND.
(amber)

GPS PRIMARY (white, : This message appears when GPS PRIMARY mode is available, or
boxed white) has been recovered. The pilot can clear this message by pressing the CLR key on the MCDU.

GPS PRIMARY LOST : This message appears when GPS PRIMARY is not available, and
(amber, boxed white) not clearable by pilot action.

↓ (green) : Overflow arrow, displayed when more than one of the following messages are present at the same time:

- NAV ACCUR DOWNGRAD
- NAV ACCUR UPGRAD
- SPECIF VOR-D UNAVAIL
- MAP PARTLY DISPLAYED
- SET OFFSIDE RNG/MODE
- GPS PRIMARY
- GPS PRIMARY LOST

***Note:** For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.*

(10) OFST R(L) XX message (yellow)

The screen displays this message, when a temporary or an offset flight plan is entered.
The offset value is given in NM.

***Note:** For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.*

(11) PRED W/S flag (amber)

The WINDSHEAR sw on the weather radar panel is set to AUTO, and a Predictive Windshear System fault is detected. This message appears on ground, or when flaps and slats are extended.

Continued on the next page

It is associated with a single chime. The radar image remains available, provided that the fault does not affect the radar mode.

(12) GPS message (green)

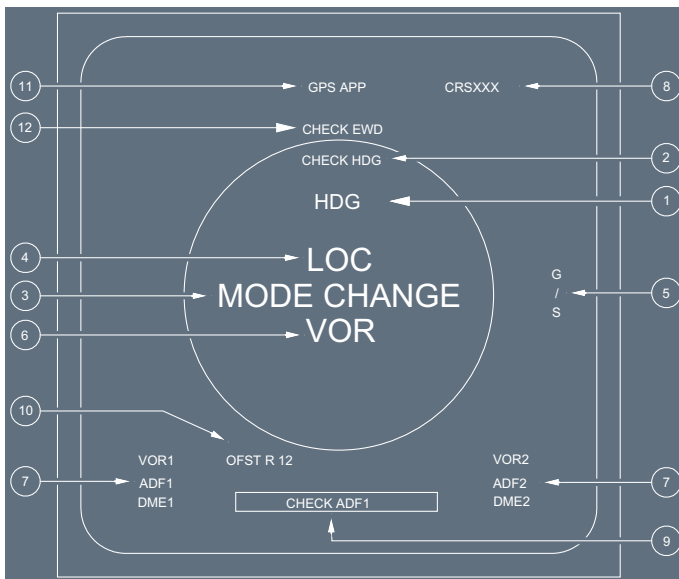
This message shows the full runway name of the selected approach. It is displayed, when the flight crew selects a GPS approach.

(13) CHECK EWD, CHECK CAPT (F/O) PFD, CHECK SD, CHECK CAPT (F/O) ND (amber)

For more information: *Refer to DSC-31-05-60 Feedback Messages*

FLAGS AND MESSAGES DISPLAYED ON ND

Applicable to: MSN 3569-3799, 3808-3824, 3844-3854, 3888, 3991, 4040-4132, 4234, 4313-4451, 4624-4635, 4640, 4667, 4693-4705, 4717, 4744, 4778-4837



(1) HDG Flag (red)

If the heading data fails, the rose, arc and associated symbols disappear.

A HDG flag flashes for 9 s, then remains steady in the upper part of the ND.

(2) CHECK HDG Flag (amber)

For more information: *Refer to DSC-31-05-60 Side1/Side2 Discrepancy Messages*

Continued on the next page

(3) Center Part Messages

- The screen displays a MODE CHANGE message in green if there is a discrepancy between the selected mode on the EFIS control panel and the mode sent from the onside FMGC, or while the DMC is preparing a new page for display
- The screen displays a RANGE CHANGE message in green if there is a discrepancy between the range selected on the EFIS control panel and the range sent from the onside FMGC. A MODE CHANGE message has priority over a RANGE CHANGE message
- The screen displays a MAP NOT AVAIL message in red for several reasons:
 - The MODE CHANGE or RANGE CHANGE message has been displayed more than 6 s, or
 - The FMGC has failed, or
 - The FMGC has delivered an invalid aircraft position.
- The screen displays a W/S SET RNG 10 nm message if a predictive windshear alert is triggered and the range is above 10 nm.
The message is displayed in the color corresponding to the windshear alert: red for a warning, amber for a caution
- The screen displays a W/S CHANGE MODE message if a predictive windshear alert is triggered and the ND is not in ARC or ROSE mode. The message appears in red for a warning, or amber for a caution.

(4) LOC Flag (red)

If LOC data fails, this flag flashes for 9 s, then remains steady.

(5) G/S Flag (red)

If G/S data fails, this flag flashes for 9 s, then remains steady.

(6) VOR Flag (red)

In ROSE VOR mode, when the VOR bearing is not valid, this flag flashes for 9 s, then remains steady.

(7) VOR 1(2) or ADF 1(2) or DME 1 Flag (red)

If a navigation receiver fails, the appropriate one of these flags flashes for 9 s, then remains steady.

(8) VOR Course Flag

If the VOR course fails, a red CRSXXX flag appears.

If there is non-computed data (NCD), a blue CRS - - - flag appears.

Continued on the next page

(9) Other messages

MAP PARTLY
DISPLAYED (amber)

: In case of incomplete data transmission between the FMGC (priority criteria) and the DMC, or if the DMC cannot draw the complete MAP.

This message is also displayed when a very long leg exists in the flight plan. A leg is considered as “very long” when the starting point (or endpoint) is located at more than 45 ° from the aircraft location (45 ° of longitude or latitude).

This DMC limitation results from a compromise between accurate drawing precision and maximum leg length that can be displayed.

NAV ACCUR UPGRAD, or : Signals a change in navigation accuracy.
(white) NAV ACCUR
DOWNGRAD (amber)

SPECIFIC VOR/D : If the NAVAID, that is tuned for the selected approach or departure,
UNAVAIL (amber) is not available.

BACK-UP NAV (amber) : If the MCDU back-up navigation mode is activated (*Refer to DSC-22_10-40-10 MCDU - MCDU Interface*)

SET OFFSIDE : Displayed on ND 1(2), in case of an FMGC 1(2) failure when the
RNG/MODE (amber) two ND ranges or modes selected on the EFIS control panels are different.

OFFSIDE FM CONTROL : If the offside FM supplies the onside ND.
(amber)

GPS PRIMARY (white, : This message appears when GPS PRIMARY mode is available, or
boxed white) has been recovered. The pilot can clear this message by pressing the CLR key on the MCDU.

GPS PRIMARY LOST : This message appears when GPS PRIMARY is not available, and
(amber, boxed white) not clearable by pilot action.

↓ (green) : Overflow arrow, displayed when more than one of the following messages are present at the same time:

- NAV ACCUR DOWNGRAD
- NAV ACCUR UPGRAD
- SPECIF VOR-D UNAVAIL
- MAP PARTLY DISPLAYED
- SET OFFSIDE RNG/MODE
- GPS PRIMARY
- GPS PRIMARY LOST

Continued on the next page

Note: For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.

(10) OFST R(L) XX message (yellow)

The screen displays this message, when a temporary or an offset flight plan is entered.
The offset value is given in NM.

Note: For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.

(11) PRED W/S flag (amber)

The WINDSHEAR sw on the weather radar panel is set to AUTO, and a Predictive Windshear System fault is detected. This message appears on ground, or when flaps and slats are extended. It is associated with a single chime. The radar image remains available, provided that the fault does not affect the radar mode.

(12) GPS message (green)

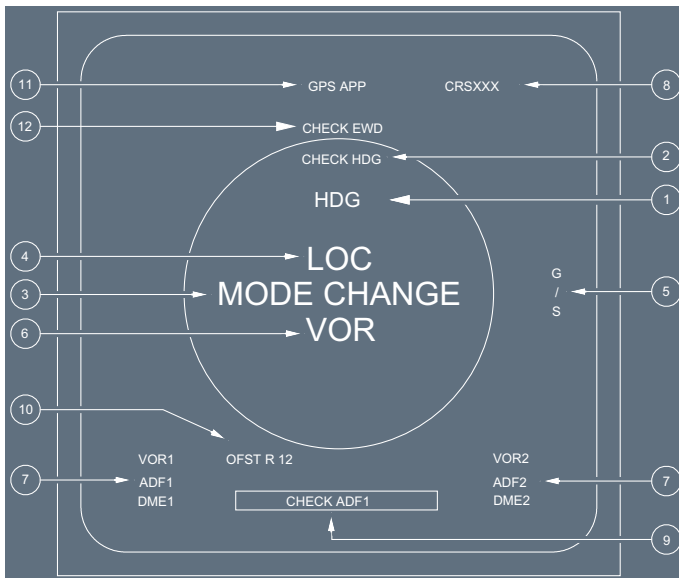
This message shows the full runway name of the selected approach. It is displayed, when the flight crew selects a GPS approach.

(13) CHECK EWD, CHECK CAPT (F/O) PFD, CHECK SD, CHECK CAPT (F/O) ND (amber)

For more information: Refer to DSC-31-05-60 Feedback Messages

FLAGS AND MESSAGES DISPLAYED ON ND

Applicable to: MSN 2765-2769, 2854, 2866, 2923, 3053, 3082, 3118



(1) HDG Flag (red)

If the heading data fails, the rose, arc and associated symbols disappear.

A HDG flag flashes for 9 s, then remains steady in the upper part of the ND.

(2) CHECK HDG Flag (amber)

For more information: *Refer to DSC-31-05-60 Side1/Side2 Discrepancy Messages*

(3) Center Part Messages

- The screen displays a MODE CHANGE message in green if there is a discrepancy between the selected mode on the EFIS control panel and the mode sent from the outside FMGC, or while the DMC is preparing a new page for display
- The screen displays a RANGE CHANGE message in green if there is a discrepancy between the range selected on the EFIS control panel and the range sent from the outside FMGC. A MODE CHANGE message has priority over a RANGE CHANGE message
- The screen displays a MAP NOT AVAIL message in red for several reasons:
 - The MODE CHANGE or RANGE CHANGE message has been displayed more than 6 s, or
 - The FMGC has failed, or
 - The FMGC has delivered an invalid aircraft position.

Continued on the next page

- The screen displays a W/S SET RNG 10 nm message if a predictive windshear alert is triggered and the range is above 10 nm.
The message is displayed in the color corresponding to the windshear alert: red for a warning, amber for a caution
- The screen displays a W/S CHANGE MODE message if a predictive windshear alert is triggered and the ND is not in ARC or ROSE mode. The message appears in red for a warning, or amber for a caution.

(4) LOC Flag (red)

If LOC data fails, this flag flashes for 9 s, then remains steady.

(5) G/S Flag (red)

If G/S data fails, this flag flashes for 9 s, then remains steady.

(6) VOR Flag (red)

In ROSE VOR mode, when the VOR bearing is not valid, this flag flashes for 9 s, then remains steady.

(7) VOR 1(2) or ADF 1(2) or DME 1 Flag (red)

If a navigation receiver fails, the appropriate one of these flags flashes for 9 s, then remains steady.

(8) VOR Course Flag

If the VOR course fails, a red CRSXXX flag appears.

If there is non-computed data (NCD), a blue CRS - - - flag appears.

(9) Other Messages

MAP PARTLY

DISPLAYED (amber)

: In case of incomplete data transmission between the FMGC (priority criteria) and the DMC, or if the DMC cannot draw the complete MAP.

This message is also displayed when a very long leg exists in the flight plan. A leg is considered as “very long” when the starting point (or endpoint) is located at more than 45 ° from the aircraft location (45 ° of longitude or latitude).

This DMC limitation results from a compromise between accurate drawing precision and maximum leg length that can be displayed.

NAV ACCUR UPGRAD, or : Signals a change in navigation accuracy.

(white) NAV ACCUR

DOWNGRAD (amber)

SPECIFIC VOR/D

UNAVAIL (amber)

: If the NAVAID, that is tuned for the selected approach or departure, is not available.

Continued on the next page

SET OFFSIDE RNG/MODE (amber) : Displayed on ND 1(2), in case of an FMGC 1(2) failure when the two ND ranges or modes selected on the EFIS control panels are different.

OFFSIDE FM CONTROL (amber) : If the offside FM supplies the onside ND.

GPS PRIMARY (white, boxed white) : This message appears when GPS PRIMARY mode is available, or has been recovered. The pilot can clear this message by pressing the CLR key on the MCDU.

GPS PRIMARY LOST (amber, boxed white) : This message appears when GPS PRIMARY is not available, and not clearable by pilot action.

↓ (green) : Overflow arrow, displayed when more than one of the following messages are present at the same time:

- NAV ACCUR DOWNGRAD
- NAV ACCUR UPGRAD
- SPECIF VOR-D UNAVAIL
- MAP PARTLY DISPLAYED
- SET OFFSIDE RNG/MODE
- GPS PRIMARY
- GPS PRIMARY LOST

***Note:** For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.*

(10) OFST R(L) XX message (yellow)

The screen displays this message, when a temporary or an offset flight plan is entered. The offset value is given in NM.

***Note:** For information about the TCAS messages: Refer to DSC-34-80-20 TCAS Messages.*

(11) PRED W/S flag (amber)

The WINDSHEAR sw on the weather radar panel is set to AUTO, and a Predictive Windshear System fault is detected. This message appears on ground, or when flaps and slats are extended. It is associated with a single chime. The radar image remains available, provided that the fault does not affect the radar mode.

(12) GPS message (green)

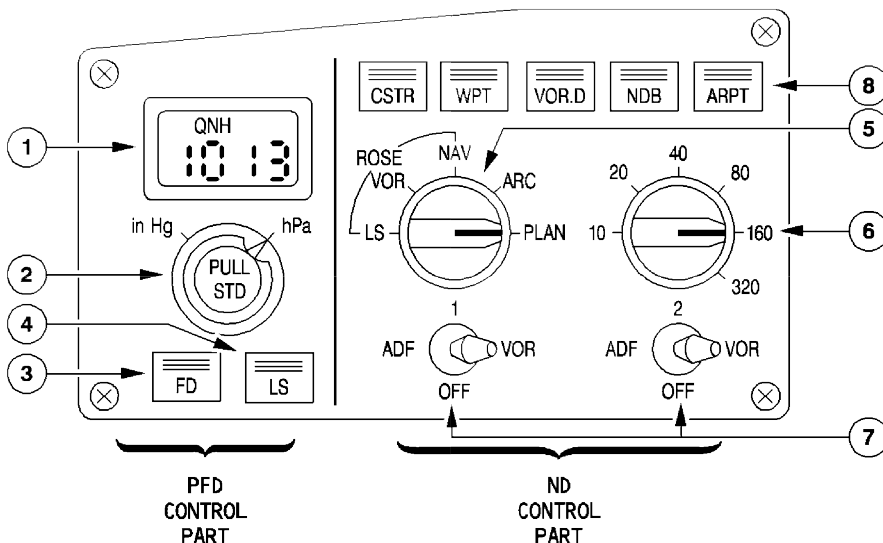
This message shows the full runway name of the selected approach. It is displayed, when the flight crew selects a GPS approach.

(13) CHECK EWD. CHECK CAPT (F/O) PFD. CHECK SD. CHECK CAPT (F/O) ND (amber)

For more information: *Refer to DSC-31-05-60 Feedback Messages*

EFIS CONTROL PANEL

Applicable to: ALL



(1) Barometer Reference Display Window

Range : 745 hPa to 1 100 hPa.

(2) Barometer Reference Selector

- Outer ring : For selection of the units for the barometer reference-either hectoPascals or inches of mercury.

Note: The unit selected does not appear on the PFD.

- Inner knob : For selection of the reference value displayed in the barometer reference display window and on the PFD below the altitude scale.

At FCU initialization, the window displays 1 013 or 29.92, depending on the unit selected.

- Pulling the knob selects the standard BARO reference setting. The PFD then displays "STD." (Rotating the knob has no effect.)
- Pushing the knob from the STD position makes the last selected QNH BARO setting available.

Continued on the next page

(3) FD Pushbutton

Pushing this button removes the FD bars from the associated PFD (or removes the flight path director symbol if the TRK FPA reference is selected).

The pushbutton light goes out.

Pushing it again restores the FD bars (or the FPD symbol) and the green pushbutton light comes on.

(4) LS Pushbutton

Pushing this button displays the localizer and glide slope scales on the PFD.

Deviation symbols appear if there is a valid ILS signal.

The green pushbutton light comes on.

(5) Mode Select Switch

This switch selects a navigation display for the onside ND.

(6) Range Select Switch

This switch selects a range scale for the onside ND.

Note: If the mode or the range data fails, the default selection is the ROSE NAV mode and 80 nm range.

(7) ADF-VOR Select Switches

These switches select ADF or VOR bearing pointers and DME distance on the onside ND, as well as the corresponding NAVAID data characteristics in any mode except PLAN mode.

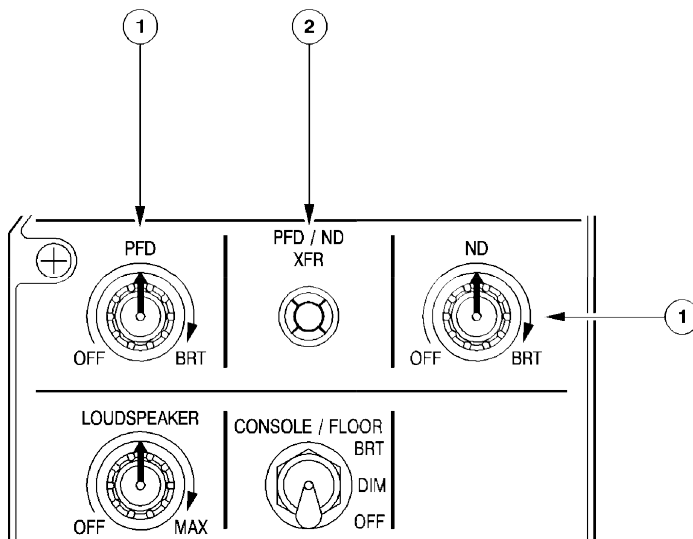
(8) Optional Data Display Pushbutton

Pushing this button displays optional data in addition to the data permanently displayed in PLAN, ARC, or ROSE NAV modes. The green pushbutton light comes on.

Only one option can be activated at a time.

OTHER EFIS CONTROLS

Applicable to: ALL



(1) OFF/BRT knobs

- These knobs turn the PFD and ND display units on and off, and control their brightness.
- The display brightness adjusts automatically for changing light conditions, and is also adjusted manually.

PFD Brightness Control Knob

Rotating this knob all the way counterclockwise switches off the PFD. In this case, the PFD image is automatically displayed on the NDU, but the pilot may recover the ND by means of the PFD-ND XFR pushbutton .

ND Brightness Control Knob

The outer knob controls the brightness of both the weather radar image and EGPWS terrain display.

The inner knob controls the general brightness of the ND symbols.

Rotating this knob all the way counterclockwise switches off the NDU.

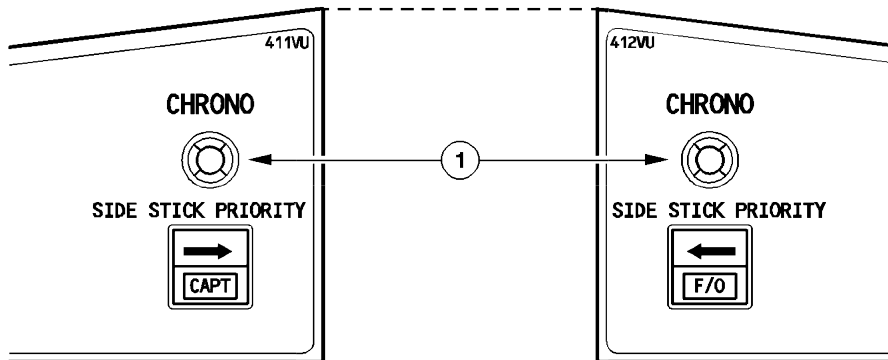
(2) PFD/ND Pushbutton

Pushing this button interchanges the PFD and the ND.

If the PFDU fails, the PFD automatically transfers to the NDU.

CHRONOMETER

Applicable to: ALL

**(1) CHRONO Pushbutton**

Pushing this button displays chronometer time on the onside ND.

Pushing it again freezes the displayed value.

Pushing it a third time resets the chronometer, and the chronometer time disappears from the display.

GENERAL

Applicable to: ALL

A fully independent clock is on the right side of the control panel.

It sends time to the centralized fault data interface unit, the flight data interface unit, and the flight management and guidance computer.

The clock has two electrical supplies, one of which is a direct connection to the aircraft battery hot bus.

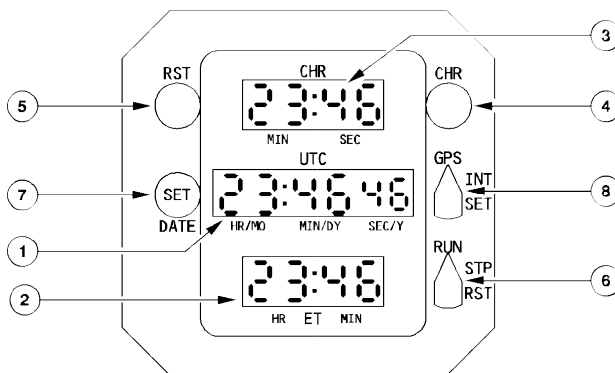
The clock performs four functions :

- It displays “UTC” (GMT) time in hours, minutes and seconds on the center counter.
- It displays elapsed time (ET) (from engine startup) in hours and minutes on the lower counter.
- It drives the chronometer (CHR), which measures a time interval (from the pushing of the CHRONO button) in minutes and seconds.
- It can replace the UTC with the date.

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GENERAL

Applicable to: ALL



- (1) UTC (GMT) counter
This counter displays the present time in 24 h format from 0 to 23 h 59 min 59 s.
- (2) Elapsed Time (ET)
This counter registers the elapsed time up to 99 h and 59 min.
- (3) Chrono (CHR) counter
This Counter registers elapsed time from 0 to 99 min 59 s. It is controlled by the CHR pushbutton.
- (4) CHR pushbutton
First push : starts the CHR counter
Second push : stops the CHR counter, keeps the display at its last indication.
- (5) Reset (RST) pushbutton
When pressed, the CHR counter restarts from 0 if the chrono is running.
- (6) ET selector
"RUN" : the ET counter starts

Continued on the next page

“STP” : the ET counter stops counting

spring loaded “RST” : the ET counter is blanked. The selector returns to its STP position when the selector is released.

Note: *A cumulative elapsed time can be realized by alternatively setting this switch in “RUN” and “STP” position.*

(7) DATE/SET pushbutton

First push : sets the clock to date mode. The UTC time display is replaced by the date (day month year).

Second push : sets the clock to time mode. The date display disappears.

Note: *in order to select the date mode, the UTC selector must be set on “GPS” or “INT” position.*

(8) UTC selector

“GPS” : Time (or date, if selected) is displayed, and this data is synchronized on GPS information.

Note:

- *If the signal between the GPS and the clock is not detected, dashes are displayed. Only the “INT” and “SET” positions are then available.*
- *If the signal is detected, but GPS data is invalid, the clock automatically runs on its internal time.*
- *The clock will automatically resynchronize on the GPS information, as soon as the GPS data becomes available.*

“INT” : Internal time (or date, if selected) is displayed.

Note:

- *The clock's internal time is initialized with the latest valid GPS information.*
- *If there is no valid GPS information at power up, the internal time will be 00:00:00, until the clock is initialized.*

“SET” : Allows the internal time and date to be initialized.

INTERNAL TIME AND DATE INITIALIZATION

Applicable to: ALL

Set the UTC selector on “SET”. The minute digits flash, and the seconds’ digits are blank.

To increase data, turn the DATE/SET button clockwise.

To decrease data, turn the DATE/SET button counterclockwise.

- First, push on DATE/SET : To set the hour.
- Second, push on DATE/SET : To set the year.
- Third, push on DATE/SET : To set the month.
- Fourth, push on DATE/SET : To set the day.

Switch the UTC selector to the “INT” position, and the clock starts with the seconds’ digits at 00.

Note: *This process must be completed in less than one minute. Otherwise, it will be necessary to reset the CFDS in order to synchronize the lower ECAM time display with the cockpit clock display. Resetting the CFDS is a maintenance operation.*

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DESCRIPTION

Applicable to: ALL

The Flight Data Recording System, which records the mandatory parameters, consists of the following components:

- A Flight Data Interface and Management Unit (FDIMU)
- A Digital Flight Data Recorder (DFDR)
- A three-axis Linear Accelerometer (LA)

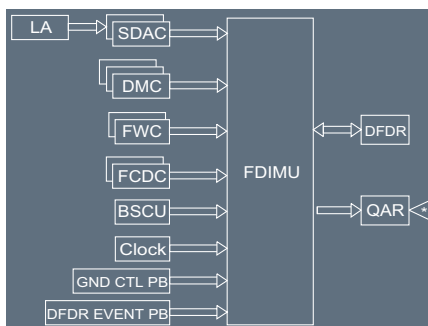
The FDIMU collects and processes parameters from the SDACs, DMCs, FWCs, FCDCs, BSCU, the DFDR event pushbutton, the GND CTL pushbutton and the Clock.

It stores the mandatory flight parameters in the DFDR.

The DFDR can store the last 25 h data, at least. It stores this data on a fireproof and shockproof device. An underwater locator beacon is attached to the DFDR.

The linear accelerometer measures the acceleration of the aircraft along each of the three axes.

The QAR is an operational recorder that stores the same data as the DFDR. However the QAR is more accessible for the maintenance crew.



The recording system is automatically active :

- On the ground, during the first five minutes after the aircraft electric network is energized.
- On the ground, after the first engine start.
- In flight (whether the engines are running or not).

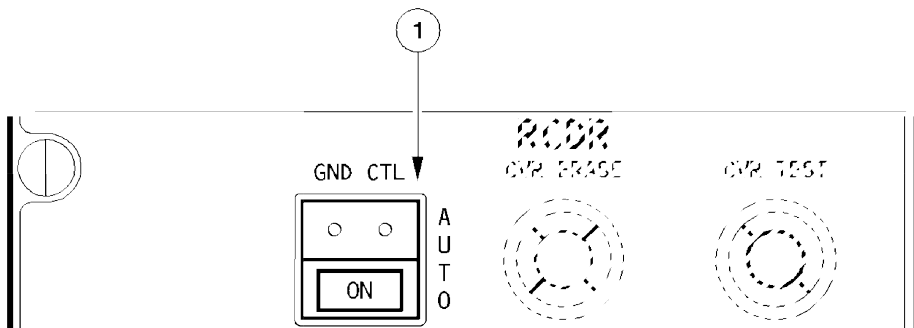
On the ground, the recording system stops automatically five minutes after the second engine shuts down.

On the ground, the crew can start the recording system manually by pressing the GND CTL pushbutton.

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OVERHEAD PANEL

Applicable to: ALL



(1) GND CTL pushbutton (springloaded)

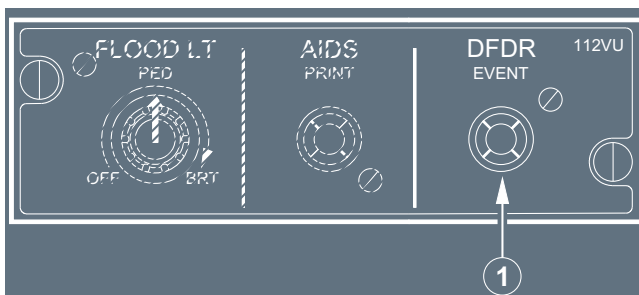
ON : The Cockpit Voice Recorder (CVR) and the Flight Data Recorders are active. The ON light is on.

AUTO : The Cockpit Voice Recorder (CVR) and the Flight Data Recorders are active, according to the logic.

The system automatically switches from ON to AUTO at the first engine start, and also in case of an electrical transient.

PEDESTAL

Applicable to: ALL



(1) DFDR EVENT pushbutton

Pressing this button (briefly) sets an event mark on the Flight Data records.

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DESCRIPTION

Applicable to: ALL

The AIDS is used to monitor various aircraft system parameters in order to make maintenance easier and to allow formulating operational recommendations.

The AIDS can generate system reports. The Airbus Standard Reports are preprogrammed reports available at aircraft delivery. The operator can create its own reports.

The AIDS uses the Flight Data Interface and Management Unit (FDIMU) to acquire the relevant aircraft system parameters. The FDIMU is connected to the rest of the AIDS as shown below.

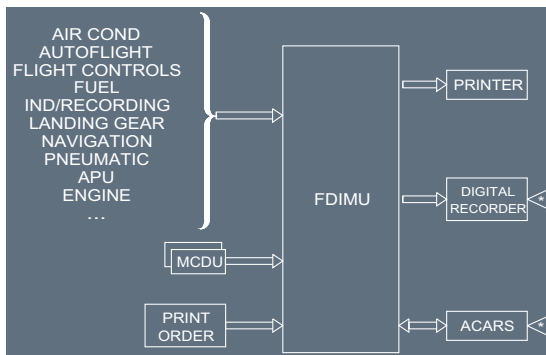
The system may be programmed using the MCDUs. The crew can select any report to be displayed on the MCDUs.

The Printer prints the flight phase programmed reports or any report selected on the MCDU.

This printing may be automatic or in response to the AIDS PRINT pushbutton.

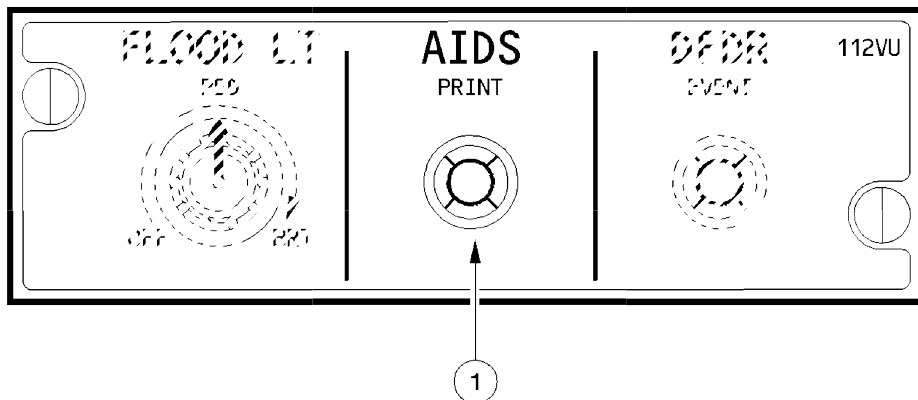
The AIDS may send automatic reports via ACARS .

An optional Digital Recorder may be installed to extend the recording capacity.



CONTROLS ON PEDESTAL

Applicable to: ALL

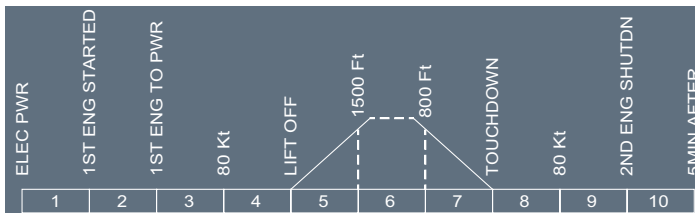


(1) AIDS PRINT pushbutton

Pushing this pushbutton causes the immediate printing of a specific report, depending on the flight phase. The crew may then use the MCDU to select another report for immediate printing.

WARNINGS AND CAUTIONS

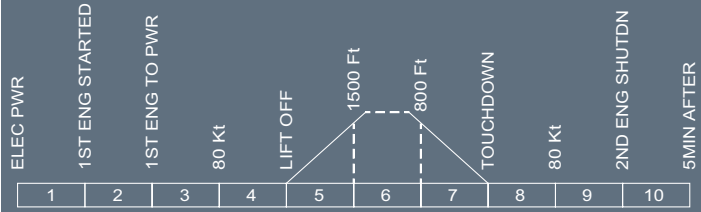
Applicable to: MSN 3411-4006



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB	
SDAC 1 + 2 FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 5, 7, 8	
DMC 1 (2) FAULT						
DMC 3 FAULT						
SDAC 1 (2) FAULT	NIL	NIL			NIL	3, 4, 5, 7, 8
FWC 1 (2) FAULT						
FWC 1 + 2 FAULT						
DFDR FAULT						
RECORDER SYS FAULT						
OEB/FWC DISCREPANCY FWC 1 and FWC 2 do not have the same OEBs listed in their OEB reminder database.	SINGLE CHIME	MASTER CAUT			3 to 8	

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-3184, 4012-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB	
SDAC 1 + 2 FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 5, 7, 8	
DMC 1 (2) FAULT					3, 4, 5 ⁽¹⁾ , 7, 8	
DMC 3 FAULT						
SDAC 1 (2) FAULT	NIL	NIL			3, 4, 5, 7, 8	
FWC 1 (2) FAULT						
FWC 1 + 2 FAULT					NIL	
DFDR FAULT					3, 4, 5, 7, 8	
RECORDER SYS FAULT						
OEB/FWC DISCREPANCY FWC 1 and FWC 2 do not have the same OEBs listed in their OEB reminder database.	SINGLE CHIME	MASTER CAUT				

⁽¹⁾ Inhibited only during first 15 s of Flight Phase 5.

BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
DU	CAPT PFD			X		
	CAPT ND			SHED		
	F/O PFD	AC2				
	F/O ND	AC2				
	UPPER ECAM DU			X		
	LOWER ECAM DU	AC2				
DMC	DMC 1			X		
	DMC 2	AC2				
	DMC 3	AC1		X ⁽¹⁾		
FWC	FWC 1			X		
	FWC 2	AC2				
SDAC	SDAC 1			X		
	SDAC 2	AC2				
ECP	ECP				X	
FDIU/QAR 		AC2				
CLOCK					X	X

(1) in case of EIS DMC switching to CAPT/3, with AC BUS 1 failed.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-31 – INDICATING / RECORDING SYSTEMS

DSC-31-75 – Electrical Supply

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DSC-32-10 **Gears and Doors**

DSC-32-10-10	Description	
	GENERAL.....	1
	MAIN GEAR.....	1
	NOSE GEAR	1
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DSC-32-40-40	Electrical Supply		
	BUS EQUIPMENT LIST	1	

GENERAL

Applicable to: ALL

The landing gear consists of :

- two main gear that retract inboard,
- a nose gear that retracts forward.

Doors enclose the landing gear bays. Gear and doors are electrically controlled and hydraulically operated.

The doors, which are fitted to the landing gear struts, are operated mechanically by the gear and close at the end of gear retraction.

All gear doors open while the gear is retracting or extending.

Two Landing Gear Control and Interface Units (LGCIs) control the extension and retraction of the gear and the operation of the doors. They also supply information about the landing gear to ECAM for display, and send signals indicating whether the aircraft is in flight or on the ground to other aircraft systems.

A hand crank on the center pedestal allows the flight crew to extend the landing gear if the aircraft loses hydraulic systems or electrical power.

MAIN GEAR

Applicable to: ALL

Each main gear has twin wheels and an oleopneumatic shock absorber.

Each main wheel has an antiskid brake.

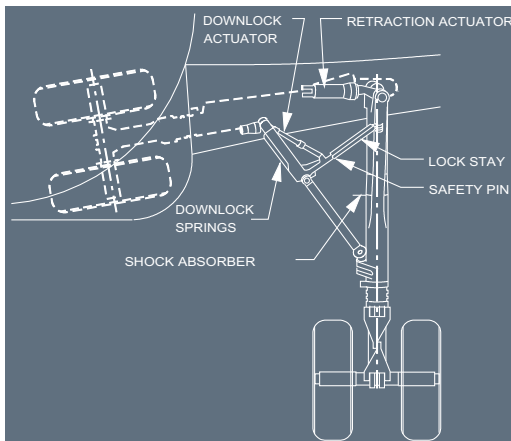
NOSE GEAR

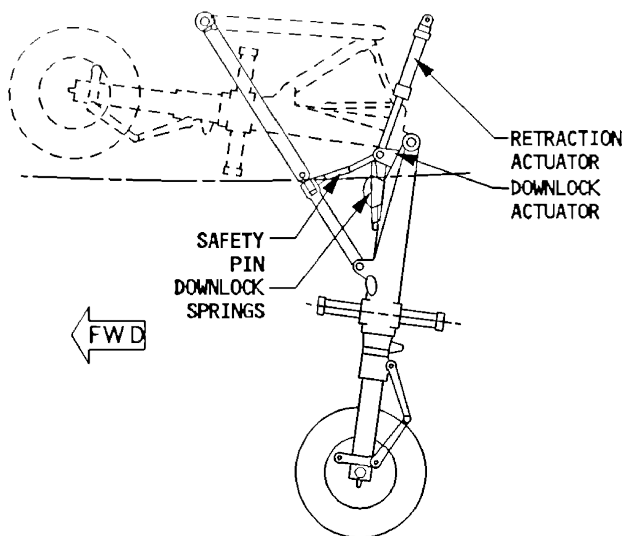
Applicable to: ALL

The two-wheeled nose gear has an oleopneumatic shock strut and a nose wheel steering system.

DRAWINGS

Applicable to: ALL

MAIN LANDING GEAR*Continued on the next page*

NOSE GEAR

OPERATION OF GEAR AND DOORS

Applicable to: ALL

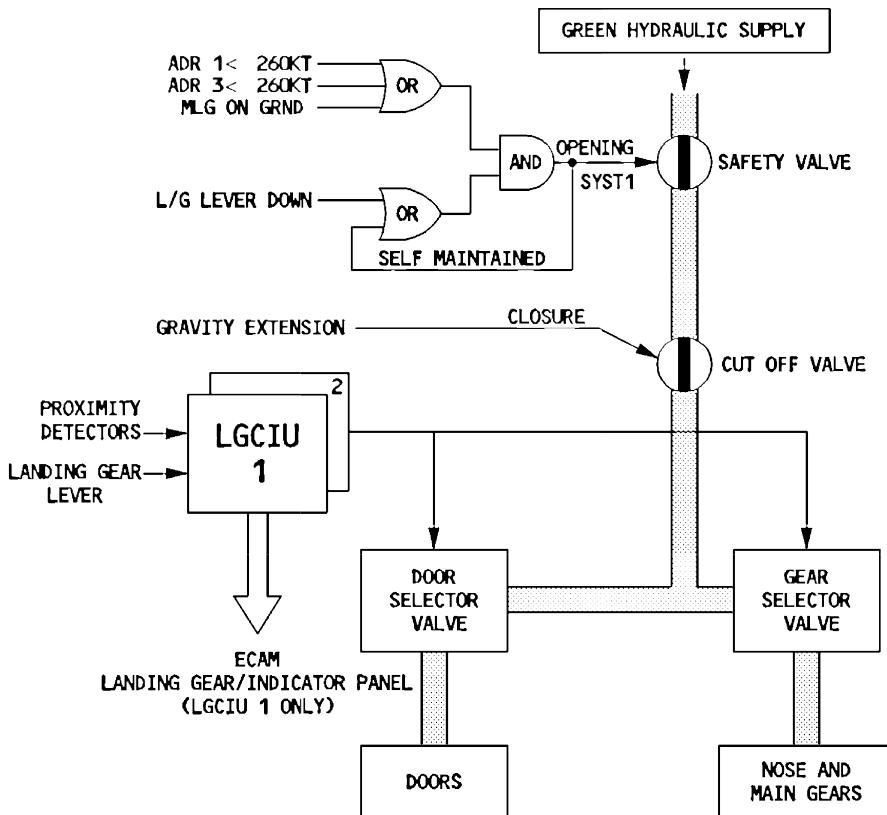
NORMAL OPERATION

The flight crew normally operates the landing gear by means of the lever on the center instrument panel.

The LGCIUs control the sequencing of gear and doors electrically. One LGCIU controls one complete gear cycle, then switches over automatically to the other LGCIU at the completion of the retraction cycle. It also switches over in case of failure.

The green hydraulic system actuates all gear and doors. When the aircraft is flying faster than 260 kt, a safety valve automatically cuts off hydraulic supply to the landing gear system. Below 260 kt, the hydraulic supply remains cut off as long as the landing gear lever is up.

Continued on the next page



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EMERGENCY EXTENSION

If the normal system fails to extend the gear hydraulically, the flight crew can use a crank to extend it mechanically.

When a crew member turns the crank, it :

- isolates the landing gear hydraulics from the green hydraulic system,
- unlocks the landing gear doors and the main and nose main gear,
- allows gravity to drop the gear into the extended position.

Locking springs help the crew to crank the main gear into the locked condition, and aerodynamic forces assist in the locking of the nose gear.

The gear doors remain open.

The flight crew can reset the emergency extension system in flight after using it for training (if green hydraulic pressure is available).

LGCIU

Applicable to: ALL

GENERAL

The LGCIUs receive position information from the landing gear, cargo door, and landing flap systems.

LANDING GEAR

The LGCIUs receive the following information about the landing gear from proximity detectors :

- gear locked down or up,
- shock absorbers compressed or extended,
- landing gear door open or closed.

Failure of a proximity detector :

- The LGCIU detects any electrical failure in a proximity detector, and signals the associated output to the flight position (shock absorber not compressed or landing gear uplocked).
The other LGCIU then automatically takes over control of the landing gear operation.
- In case of mechanical failure, the LGCIU does not modify the associated output. The effect that such a failure has on the system depends upon which condition is signalled incorrectly.

Electrical failure of an LGCIU :

- The other (healthy) LGCIU takes control of the landing gear.
- The system does not force the outputs of the failed LGCIU to the safe (flight) condition.
 - Some users will see “flight” condition.
 - Some users will see “ground” condition.

CARGO DOORS

Sensors send to the LGCIUs the position of the following components :

- manuel selector valves,
- locking shaft,
- locking handle,
- safety shaft,
- door sills. 

The LGCIUs detect electrical failures only in certain proximity switches in the cargo door system :

- locking shaft,
- locking handle,
- safety shaft.

When an LGCIU makes such a detection, it indicates the NON LOCKED condition for that component.

Continued on the next page

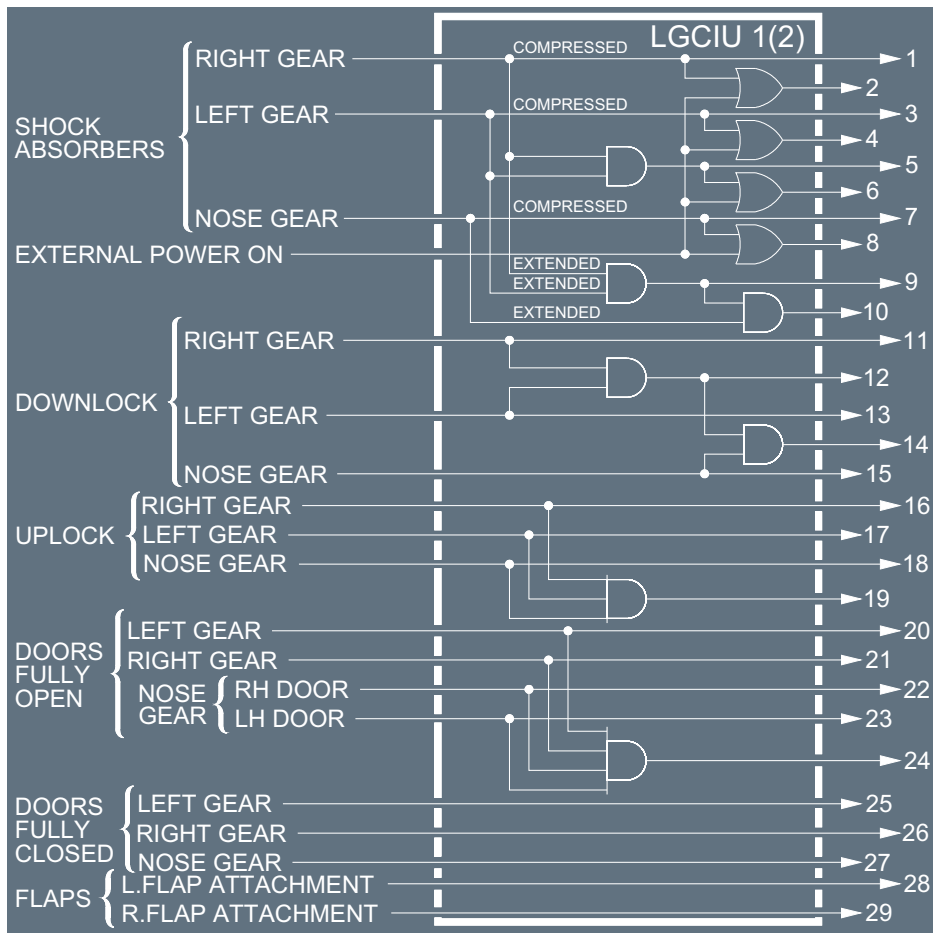
FLAPS

The LGCIUs process the signals from four flap disconnect proximity switches, then send them to the Slat/Flap Control Computers (SFCCs).

The LGCIUs do not monitor failures in the SFCC system.

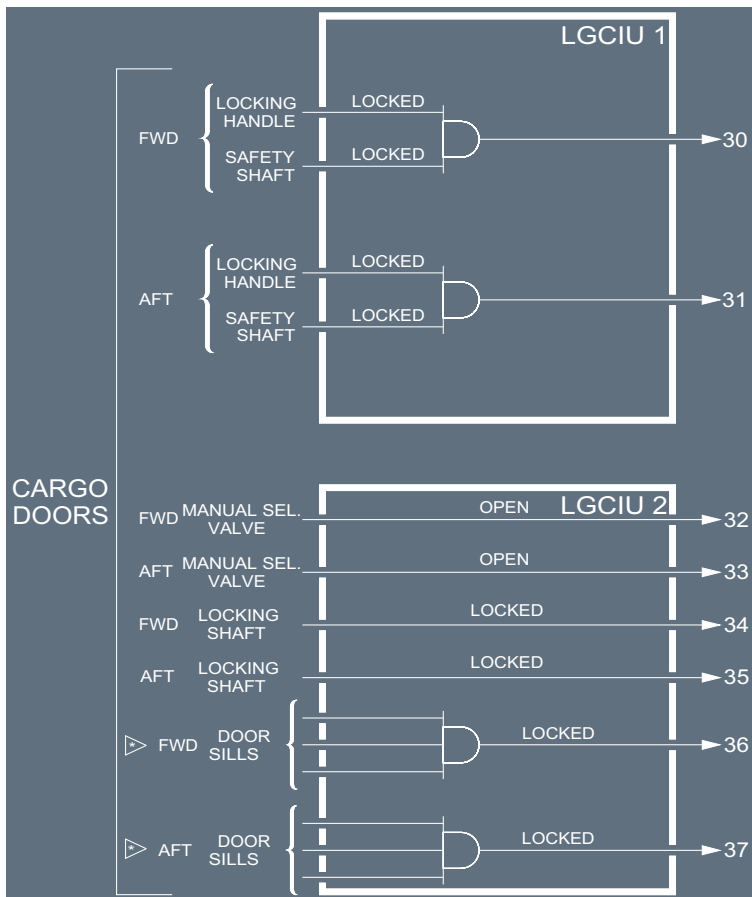
PROXIMITY DETECTOR OUTPUT SIGNALS

Applicable to: ALL



PROXIMITY DETECTOR OUTPUT SIGNALS (CONT'D)

Applicable to: ALL





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-32 – LANDING GEAR

DSC-32-10 – Gears and Doors

DSC-32-10-20 – Landing Gear System/Interface

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GENERAL

Applicable to: ALL

The following tables present the operational effects of the proximity detectors on aircraft systems.
How to read the tables :

SYSTEM	LGCIU 1	LGCIU 2	A/C IN FLT	A/C ON GROUND
SERVICE INTERPHONE	6	6		
SFCC 1(2)	5	(5)		

The above lines mean that the service interphone receives the output n° 6 from both LGCIUs, while SFCC 1 receive the output 5 from LGCIU 1 and SFCC 2 the output 5 from LGCIU 2.

The two additional columns give the system functioning when the aircraft is in flight and on the ground.

PROXIMITY DETECTORS ON SHOCK ABSORBERS

Applicable to: ALL

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
GENERAL	STROBE lts		5	On when AUTO selected	Off when AUTO selected
	LOGO lts		5	Off when flaps retracted	On
	AIRSTAIRS 	3	1	Control inhibited ⁽¹⁾	Control not inhibited ⁽²⁾
	CARGO DOOR ⁽⁵⁾		5	normal control not available	normal control available
	WATER FILLING		5	Preselect water servicing inhibited	Preselect water servicing available

Continued on the next page

	SYSTEM	LGCIU 1 OUTPU T	LGCIU 2 OUTPU T	A/C IN FLT	A/C ON GRND
AIR COND	AVNCS COOLING	5	5	- Skin temp. < 35 °C : The system is in closed conf.⁽¹⁾ - Skin temp. > 35 °C : The system is in intermediate conf.⁽¹⁾	- Skin temp. < 5 °C : The system is in closed conf.⁽²⁾ - Skin temp. > 5 °C : The system is in open conf.⁽²⁾
	GRND COOLING 	1 3	1 3	Inhibited ⁽¹⁾	Not inhibited ⁽²⁾
	FWD CARGO VENT		5	Extract fan stopped when $\Delta P > 1$ PSI	Extract fan on
	CAB PRESS	5	5	Climb mode active ⁽⁴⁾	- Prepressurization active before TO ⁽³⁾ - Depressurization active after LDG ⁽³⁾
	PACK 1(2) TEMP CONTROL		3 (1)	Pack air inlet flaps opened.	Pack air inlet flap fully closed at TO and LDG
APU	APU AUTO SHUTDOWN	5		In case of oil low press, automatic shutdown is delayed by 15.5 s	In case of oil low press, the automatic shutdown is delayed by: 15.5 s if the oil temp < -4 °C 0.05 s if oil temp > -4 °C
	APU SPEED CONTROL			Speed is controlled at 101 %	Speed is controlled at 99 % (101 % for ENG start or when ambient temp ≥ 30 °C)

Continued on the next page

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
COMMUNICATIONS	SERVICE INTERPHONE	6	6	Inhibited ⁽⁶⁾	Available ⁽⁷⁾
	PUBLIC ADDRESS	1 3	1 3	P.A. increased level ⁽⁶⁾	P.A. low level ⁽⁷⁾
	ADIRU and AVIONICS ground warning	1 3	1 3	External horn and light inhibited ⁽⁶⁾	External horn and light not inhibited ⁽⁷⁾
	FLT INTERPHONE	9		Communication with ground mechanic inhibited	Communication with ground mechanic available
	COCKPIT CALL LIGHT	9		Inhibited	Not inhibited
	ACARS (ACARS MU or ATSU)	7		Available	Available
	CVR	1 3 7	1 3	Runs ⁽⁶⁾	Runs : ⁽⁷⁾ - During the first 5 min following energization - With at least one engine running Stops : ⁽⁷⁾ 5 min after second engine shutdown
	CVR		5	- ERASE function inhibited - No low frequency signal in the loudspeakers if test performed	- ERASE function not inhibited - Low frequency signal in the loudspeakers if test performed

Continued on the next page

DSC – AIRCRAFT SYSTEMS

DSC-32 – LANDING GEAR

DSC-32-10 – Gears and Doors

DSC-32-10-30 – Interactions between Landing Gear and Aircraft Systems

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
ELEC	DC generation	5		APU start on batteries only, is delayed by 45 s	No APU start delay when on batteries only
	GALLEY supply		5	Main galley not supplied when APU GEN only is supplying	Main galley supplied when APU GEN only is supplying
EIS	EIS	5		Display test inhibited when ANN LT TEST is selected	Display test not inhibited
FIRE	APU	5		No APU fire automatic extinguishing	Automatic extinguishing not inhibited
FLT CTL	SFCC 1(2)	5	(5)	- For SFCC 1(2): Slats alpha/speed lock function active - For SFCC(2): No flaps movement inhibition if the cargo door is opened	- For SFCC 1(2): Slats alpha/speed lock function active if speed > 60 kt - For SFCC (2): Flaps movement inhibition if cargo door is opened
FLT INST	- DFDR - QAR 	1 3 7	1 3	Runs ⁽⁶⁾	<u>Runs:</u> ⁽⁷⁾ - During the first 5 min following energization - With one engine running <u>Stops:</u> ⁽⁷⁾ 5 min after second engine shut down
FUEL	FQI	5		FQI uses flight attitude correction due to wing bending	FQI uses ground attitude correction

Continued on the next page

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
HYD	BLUE and GREEN pumps	1 3		Blue or green pump "FAULT" light not inhibited when related pump is stopped ⁽⁶⁾	Blue or green pump "FAULT" light inhibited when related pump is stopped ⁽⁷⁾
	BLUE pump	7		Runs when electrical power is available	Runs when at least one engine is running
	BLUE and YELLOW pumps		1 3	Blue or yellow pump "FAULT" light not inhibited when related pump is stopped ⁽⁶⁾	Blue or yellow pump "FAULT" light inhibited when related pump is stopped ⁽⁸⁾
	PTU		7	PTU runs if green/yellow diff. press > 500 PSI	PTU runs if green/yellow diff. press > 500 PSI and - Both MASTER LEVERS are at OFF or - Both MASTER LEVERS are at ON or - Nose wheel steering is not in towing position with parking brake released. PTU is inhibited during the use of the cargo door hand pump and for 40 s after its use.

Continued on the next page

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
ICE RAIN PROT	CAPT, (F/O), ((STBY)) probes and CAPT, (F/O) windows heating	4, (2) (8)	4, (2) (8)	- CAPT, (F/O), ((STBY)) pitots and CAPT, (F/O) windows : high heating level applied - All other probes and windows are heated⁽⁶⁾	- With engines stopped: no heating⁽⁸⁾ - With at least one engine running: - CAPT, (F/O), ((STBY)) pitots and CAPT, (F/O) windows are heated at low level⁽⁸⁾
	WING ANTI ICE	3	1	Wing anti ice valves open when the WING ANTI ICE pb is at ON ⁽⁶⁾	Wing anti ice valves open for 30 s when the WING ANTI ICE pb is at ON ⁽⁸⁾
	RAIN REPELLENT	1 3	1 3	Not inhibited ⁽⁶⁾	Inhibited if engines are stopped ⁽⁷⁾
	DRAIN MAST ⁽¹⁰⁾		9	High heating level is applied	Low heating level is applied
LANDING GEAR	L/G SAFETY VALVE	6		Safety valve closes if aircraft speed > 260 kt	Safety valve opened
	L/G control	10	10	Retraction not inhibited ⁽⁹⁾	Retraction inhibited ⁽⁹⁾
	TIRE PRESS 		5	"TYRE LO PRESS" warning threshold set to its flight level	"TYRE LO PRESS" warning threshold set to its ground level
NAVIGATION	STAND BY ALTI	5		VIBRATION function active	Vibration function inhibited
	ATC 1(2)	3	(1)	ATC 1(2) available in AUTO mode	ATC 1(2) inhibited in AUTO mode
	ADIRU 1 ⁽¹⁰⁾	7		No external horn when ADIRU supplied from batteries only	External horn not inhibited

Continued on the next page

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	A/C IN FLT	A/C ON GRND
POWER PLANT	FADEC 1(2)	1 3 8	(1) (3) (8)	On ENG 1(2): ⁽⁶⁾ - Reverse inhibited - No automatic start abort - FADEC always supplied - FLEX not available - If installed, BUMP not selectable	On ENG 1(2): ⁽⁸⁾ - Reverse available - Automatic start abort available 5 min after eng-shut down FADEC 1(2) no more supplied - FLEX available - If installed, BUMP selectable
		1 3 8	(1) (3) (8)	Modulated idle and approach idle are available ⁽⁶⁾	Modulated idle only available ⁽⁷⁾

- (1) When either LGCIU indicates flight.
 (2) When both LGCIU indicate ground.
 (3) When either LGCIU indicates ground.
 (4) When both LGCIU indicate flight.
 (5) Valid from MSN 44.
 (6) When either output indicates flight.
 (7) When all outputs indicate ground.
 (8) When both outputs indicate ground.
 (9) One valid output is sufficient.
 (10) Valid from MSN 22.

PROXIMITY DETECTORS ON UPLOCKS

Applicable to: ALL

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	L/G UNLOCKED	L/G NOT UNLOCKED
LANDING GEAR	L/G control	19	19	If UP selected : ⁽¹⁾ L/G doors will close	If UP selected : ⁽¹⁾ L/G doors will not close
	ECAM WHEEL page	16 17 18	16 17 18	If UP selected : ⁽²⁾ L/G unlocked indications	If UP selected : ⁽²⁾ L/G in transit indications
	L/G indicator panel	16 17 18		If UP selected : ⁽²⁾ no indication	If UP selected : ⁽²⁾ "UNLK" red indications

⁽¹⁾ One valid output is sufficient.

⁽²⁾ When all outputs indicate the same position.

DOORS PROX DET

Applicable to: ALL

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	DOORS FULLY OPENED	DOORS CLOSED
LANDING GEAR	L/G control	24	24	L/G extension or retraction possible ⁽¹⁾	L/G extension or retraction inhibited ⁽¹⁾
	ECAM WHEEL page	20 21 22 23	20 21 22 23	Doors fully opened indication	Doors closed indication

⁽¹⁾ One valid output is sufficient.

PROXIMITY DETECTORS ON DOWNLOCKS

Applicable to: ALL

	SYSTEM	LGCIU 1 OUTPUT	LGCIU 2 OUTPUT	L/G DOWNLOCKED	L/G NOT DOWNLOCKED
GEN	TAXI/T.O lights		15	lights not inhibited	lights inhibited
COMM	SIGNS	12	12	"NO SMOKING" and "EXIT" signs on when AUTO selected ⁽¹⁾	"NO SMOKING" and "EXIT" signs inhibited when AUTO selected ⁽²⁾
FLT INST	WBS 	15	15	active ⁽³⁾	inhibited ⁽⁴⁾
FMGS	FAC 1(2)	12	12	VLE indication displayed on PFD 1(2)	no VLE indication
LANDING GEAR	L/G control	14	14	If DOWN selected : ⁽⁵⁾ L/G doors will close	If DOWN selected : ⁽⁵⁾ L/G doors will not close
	ECAM WHEEL page	11 13 15	11 13 15	If DOWN selected : ⁽⁶⁾ L/G down indications	If DOWN selected : ⁽⁶⁾ L/G in transit indications
	L/G INDIC panel	11 13 15		If DOWN selected : ⁽⁶⁾ L/G down indications	If DOWN selected : ⁽⁶⁾ L/G in transit indications
	BRAKING STEERIN G	15	15	BSCU test operative ⁽¹⁾	BSCU test inhibited ⁽¹⁾
	BRAKES COOLING 		13	Cooling available when ON selected	Cooling inhibited when ON selected
NAV	GPWS	13		"TOO LOW-FLAPS" or "TOO LOW TERRAIN" warning operative	"TOO LOW-GEAR" or "TOO LOW TERRAIN" warning operative

- (1) When either output indicates DOWNLOCK.
 (2) When both outputs indicate NOT DOWNLOCK.
 (3) When both outputs indicate DOWNLOCK.
 (4) When either output indicates NOT DOWNLOCK.
 (5) One valid output is sufficient.
 (6) When all outputs indicate the same position.

 A319/A320 FLIGHT CREW OPERATING MANUAL	DSC – AIRCRAFT SYSTEMS DSC-32 – LANDING GEAR DSC-32-10 – Gears and Doors DSC-32-10-30 – Interactions between Landing Gear and Aircraft Systems
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PROXIMITY DETECTORS ON CARGO DOORS

Applicable to: ALL

LOCKING HANDLE OR SHAFT, DOOR SILLS

	SYSTEM	LGCIU1 OUTPU T	LGCIU 2 OUTPU T	LOCKED	UNLOCKED
CRG DOORS	ECAM DOOR PAGE	30 (31)		Forward (aft) door symbol appears green	Forward (aft) door symbol appears amber, associated with "CARGO" amber.
	CARGO DOOR OPERATI ON		34 (35)	Forward (aft) door normal opening inhibition	Forward (aft) door normal opening possible
			36  (37) 	Forward (aft) door normal operation possible	Forward (aft) door normal operation inhibited

MANUAL SELECTOR VALVE

	SYSTEM	LGCIU1 OUTPU T	LGCIU 2 OUTPU T	CLOSE	OPEN
CRG DOORS	CARGO DOOR OPERATI ON		32 (33)	Forward (aft) door normal opening inhibition	Forward (aft) door normal opening possible

PROXIMITY DETECTORS ON FLAP ATTACHMENTS

Applicable to: ALL

	SYSTEM	LGCIU1 OUTPUT	LGCIU2 OUTPUT	FLAP ATTACHMENT	FLAP ATTACHMENT FAILURE
FLT CTL	SFCC	28 (29)	28 (29)	L(R) FLAPS normal operation ⁽¹⁾	"FLAPS LOCKED" warning ⁽²⁾

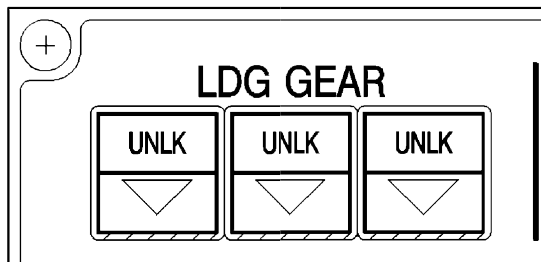
⁽¹⁾ When at least one SFCC detects normal operation

⁽²⁾ When both SFCCs detect attachment failure

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LANDING GEAR INDICATOR PANEL

Applicable to: ALL



This panel is connected to LGCIU1, which receives signals from proximity detectors.

UNLK: comes on red if the gear is not locked in the selected position.

▽ : comes on green if the gear is locked down.

Note: This panel is connected to the LGCIU1 only, therefore, the lights on the LDG GEAR indicator panel come on as long as the LGCIU1 is electrically supplied.

If one UNLK indication remains on, the landing gear position can be confirmed using the WHEEL SD PAGE (information from LGCIU 1 & 2). Only one green triangle on each landing gear is sufficient to confirm that the landing gear is downlocked.

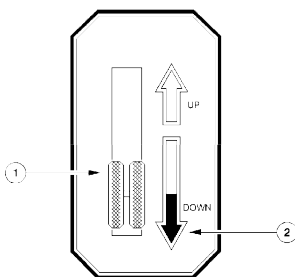
LANDING GEAR SELECTOR LEVER

Applicable to: ALL

A two-position selector lever sends electrical signals to the two LGCIUs. These control the green hydraulic supply to the landing gear system by means of selector valves.

When the flight crew selects UP or DOWN (and if the airspeed is below 260 kt) :

- All landing gear doors open.
- Each landing gear moves to the selected position.
- All landing gear doors close.



(1) L/G LEVER

UP : This position selects landing gear retraction.

While the landing gear doors are opening, the normal brake system brakes the wheels of the main gear automatically.

Continued on the next page

DOWN : This position selects landing gear extension.

An interlock mechanism prevents anyone from accidentally retracting the gear while the aircraft is on the ground. It does so by locking the lever in DOWN position when the shock absorber on either main gear is compressed (aircraft on ground) or the nose wheel steering is not centered.

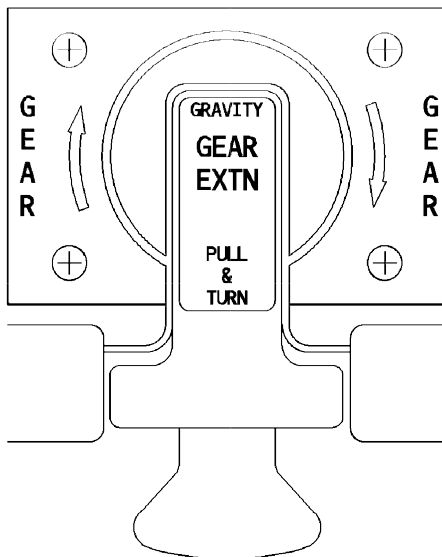
The landing gear hydraulic system remains pressurized as long as the landing gear is extended (if green hydraulic pressure is available).

(2) **RED ARROW**

This red arrow lights up if the landing gear is not locked down when the aircraft is in the landing configuration, and a red warning appears on ECAM.

EMERGENCY EXTENSION

Applicable to: ALL

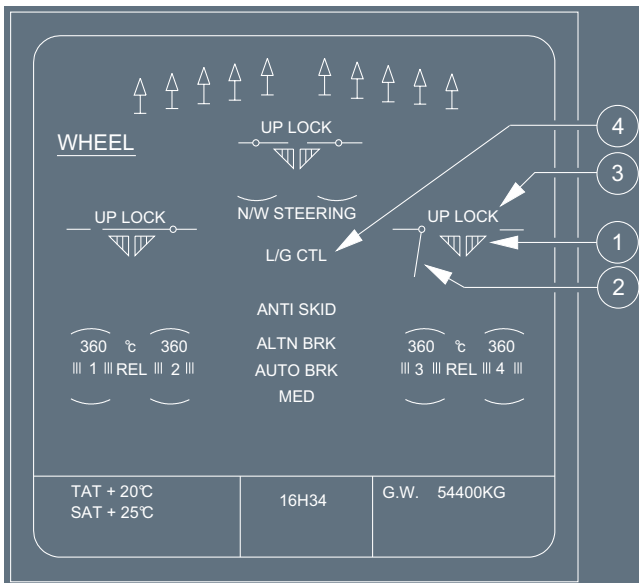


To put the landing gear down by gravity, the flight crew must pull the gear crank out, then turn it clockwise for 3 turns.

When the flight crew operates the crank handle, the cutout valve shuts off hydraulic pressure to the landing gear system and depressurizes it.

ECAM WHEEL PAGE

Applicable to: MSN 2037-2251, 2271-2360, 2378-2385, 2402-2420, 2436, 2463-3082, 3088-4014, 4040-4708



(1) Landing gear position indication

The landing gear positions are indicated by 2 triangles for each gear.

- A green triangle indicates that one LGCIU detects a landing gear downlocked,
- A red triangle indicates that one LGCIU detects a landing gear in transit,
- No triangle indicates that one LGCIU detects a landing gear uplocked,
- Amber crosses on one triangle indicate that LGCIU1 or LGCIU2 is failed.

Note: Only one green triangle on each landing gear strut is sufficient to confirm that the landing gear is downlocked.

Continued on the next page

(2) Landing gear door position indication



(3) UP LOCK

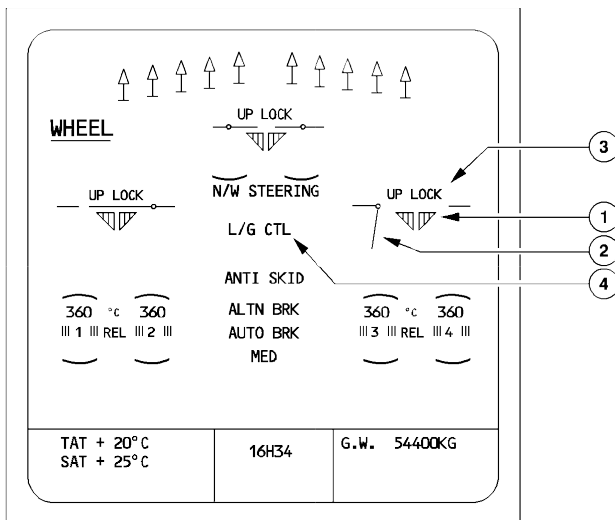
This legend appears amber along with a caution on the ECAM if the landing gear uplock is engaged when the landing gear is down locked.

(4) L/G CTL

This legend appears amber along with an ECAM caution if the landing gear lever and the landing gear position do not agree. This legend only appears when the landing gear is moving to the selected position.

ECAM WHEEL PAGE

Applicable to: MSN 2265, 2370, 2387-2398, 2427, 2450, 3084, 4034, 4717-5319



(1) Landing gear position indication

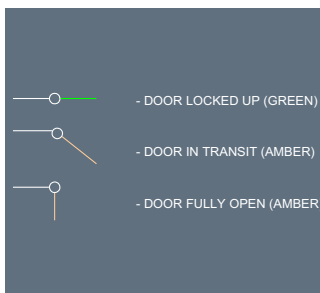
The landing gear positions are indicated by 2 triangles for each gear.

- A green triangle indicates that one LGCIU detects a landing gear downlocked,
- A red triangle indicates that one LGCIU detects a landing gear in transit,
- No triangle indicates that one LGCIU detects a landing gear uplocked,
- Amber crosses will replace the right triangle to indicate that LGCIU 1 or LGCIU 2 has failed.

Note: Only one green triangle on each landing gear strut is sufficient to confirm that the landing gear is downlocked.

Continued on the next page

(2) Landing gear door position indication



(3) UP LOCK

This legend appears amber along with a caution on the ECAM if the landing gear uplock is engaged when the landing gear is down locked.

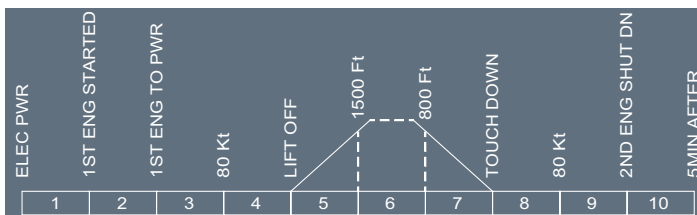
(4) L/G CTL

This legend appears in amber along when the landing gear lever and the landing gear position do not agree. This legend only appears when the landing gear is moving to the selected position.

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
GEAR NOT DOWNLOCKED One gear not downlocked and L/G selected down			WHEEL	UNLK It on	
GEAR NOT DOWN 1. L/G not downlocked and radio height lower than 750 ft and both engines N1 lower than 75 % (or if engine shut down N1 of remaining engine lower than 97 %) or 2. L/G not downlocked and radio height lower than 750 ft and both engines not at T.O. power and flaps at 1, 2, 3 or FULL or 3. L/G not downlocked and flaps at 3 or FULL and both radio altimeters failed <i>Note: In the cases 2 and 3 above, the aural warning can only be cancelled by the emergency cancel pushbutton.</i>	CRC	MASTER WARN	NIL	DOWN ARROW It on LDG GEAR panel	3, 4, 5
SHOCK ABSORBER FAULT One shock absorber not extended when airborne or not compressed after landing	SINGLE CHIME	MASTER CAUT		NIL	1, 3, 4

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
DOORS NOT CLOSED One gear door is not uplocked	SINGLE CHIME	MASTER CAUT	WHEEL	NIL	1, 3, 4, 5, 8, 9, 10
GEAR NOT UPLOCKED One gear not uplocked and L/G not selected down				UNLK It on LDG GEAR panel	3, 4, 7, 8, 9, 10
GEAR UPLOCK FAULT One gear uplock engaged with corresponding gear downlocked					4
LGCIU 1 (2) FAULT	NIL	NIL		NIL	4, 5, 7, 8
SYS DISAGREE Disagree between L/G positions detected by the two LGCIU's					3, 4, 5, 6, 7, 8

BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
LANDING GEAR	LGCIU 1		GRND/ FLT		X	
	LGCIU 2		GRND/ FLT			
	SAFETY VALVE				X	
	L/G INDICATOR PANEL			SHED ⁽¹⁾	X	

⁽¹⁾ The AC STAT INV supplies the landing gear indicator panel when the main generators are lost and the emergency generator is not running.

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DESCRIPTION

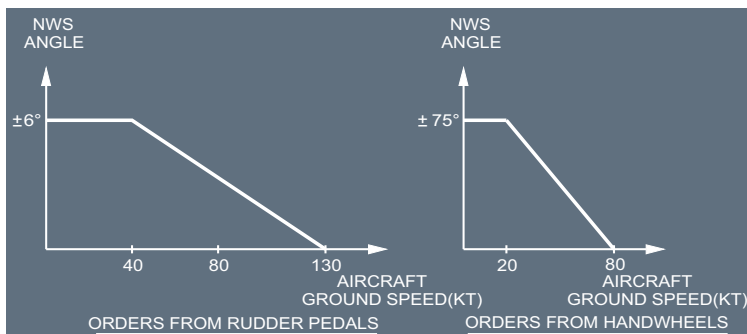
Applicable to: ALL

A hydraulic actuating cylinder steers the nose wheel. The yellow hydraulic system supplies pressure to the cylinder, and electric signals from the Brake and Steering Control Unit (BSCU) control it.

The BSCU receives orders from:

- The Captain's and the First Officer's steering hand wheels (orders added algebraically),
- The rudder pedals,
- The autopilot.

The BSCU transforms these orders into nose wheel steering angle. That angle has the following limits, which depend on ground speed and the origin of the orders.



The steering system receives actuating hydraulic pressure when:

- The A/SKID & N/W STRG switch is on and,
- The towing control lever is in normal position and,
- At least one engine is running and,
- The aircraft is on ground.

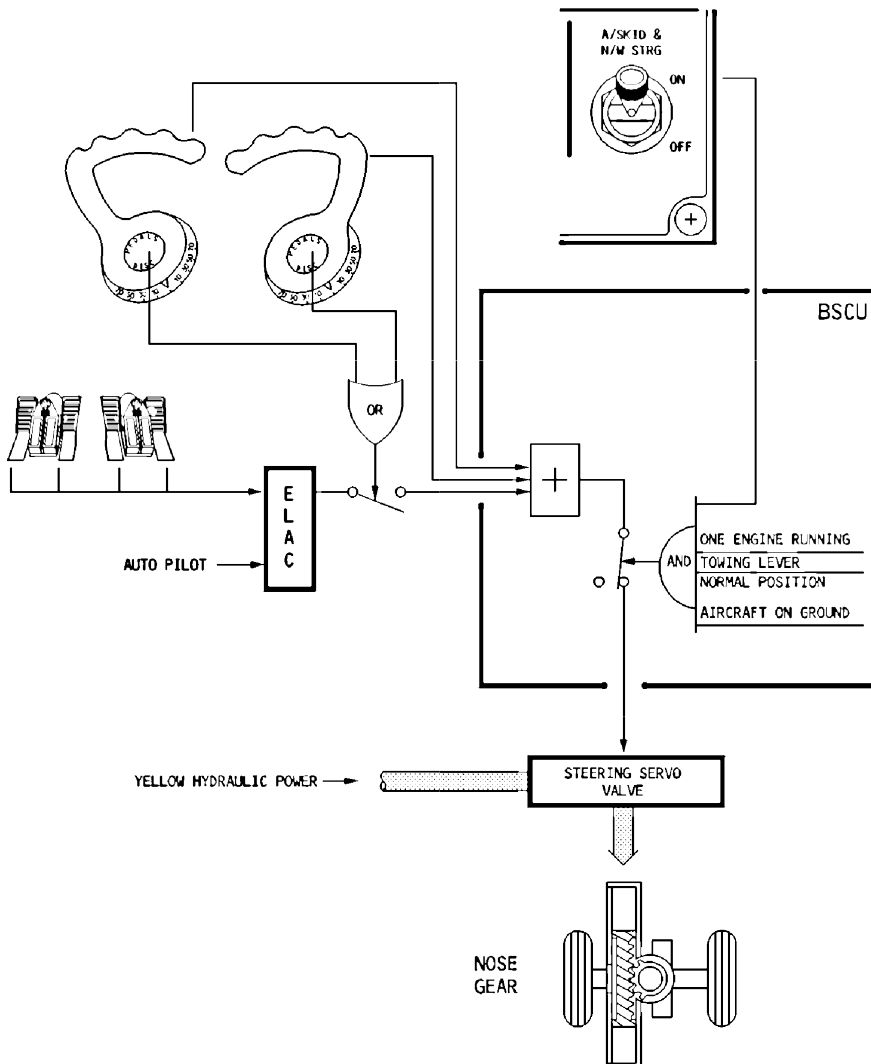
The handwheel can turn the nosewheel up to 75° in either direction. A lever, on the towing electrical box (on nose landing gear), enables ground crew to deactivate the steering system for towing. Then the wheel can be turned 95° in either direction.

To prevent rudder pedal orders, or autopilot orders, from going to the BSCU, the pilots can use the pushbutton on either steering handwheel.

An internal cam mechanism returns the nose wheel to the centered position after takeoff.

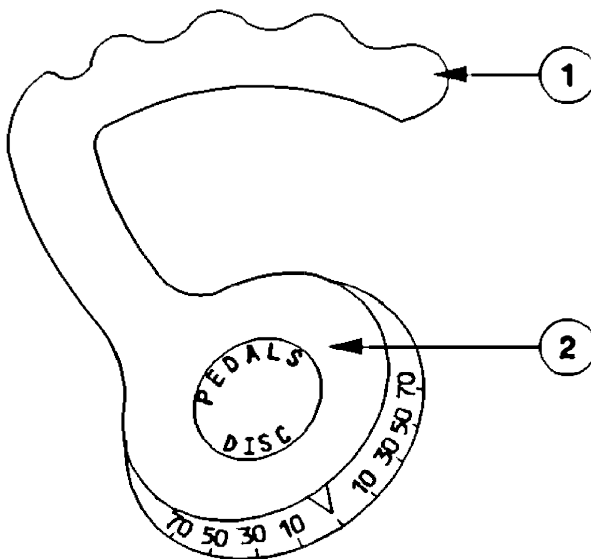
ARCHITECTURE

Applicable to: ALL



SIDE CONSOLES

Applicable to: ALL



(1) Steering handwheels

The steering handwheels, which are interconnected, can steer the nose wheel up to 75 ° in either direction.

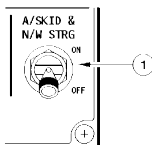
Note: The steering system centers the nose wheel automatically after liftoff.

(2) Rudder PEDAL DISC pb

Pressing this button on either handwheel removes control of nose wheel steering from the rudder pedals until the button is released.

CENTER INSTRUMENT PANEL

Applicable to: ALL

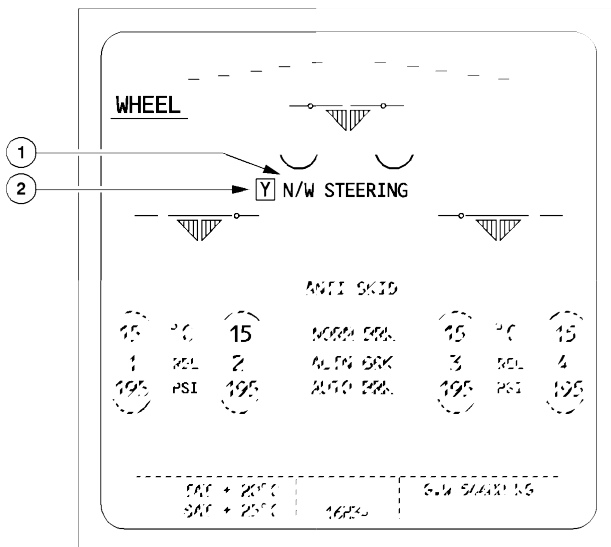


(1) A/SKID & N/W STRG sw

This ON/OFF switch activates or deactivates the nose wheel steering and anti-skid. (*Refer to DSC-32-30-10 General*).

ECAM WHEEL PAGE

Applicable to: ALL



(1) N/W STEERING label

It appears in amber, when nosewheel steering is lost, due to failure of the nosewheel steering system, or of both BSCU channels, or in case of a yellow hydraulic system low pressure, or if the A/SKID & N/W STRG switch is OFF.

(2) N/W STEERING hydraulic supply indication :

Only when the N/W STEERING label is displayed :

- Y is displayed in green in case the yellow hydraulic system is not failed.
- Y is displayed in amber in case of yellow hydraulic system low pressure.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-32 – LANDING GEAR

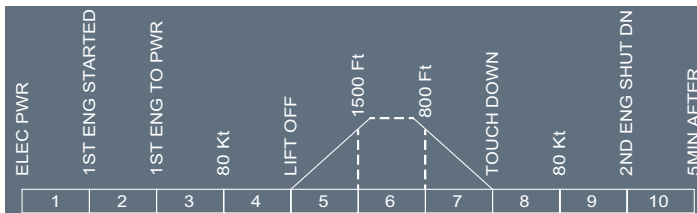
DSC-32-20 – Nose Wheel Steering

DSC-32-20-20 – Controls and Indicators

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
NW STRG FAULT detected by BSCU	SINGLE CHIME	MASTER CAUT	WHEEL	NIL	3, 4, 5, 8

MEMO DISPLAY

When the nose wheel steering selector is in the towing position, this display shows “NW STRG DISC” in green. The legend is amber if one engine is running.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-32 – LANDING GEAR

DSC-32-20 – Nose Wheel Steering

DSC-32-20-30 – Warnings and Cautions

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BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
BRAKES	BSCU CH 1	AC1	DC1			
	BSCU CH 2	AC2	DC2			



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-32 – LANDING GEAR

DSC-32-20 – Nose Wheel Steering

DSC-32-20-40 – Electrical Supply

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GENERAL

Applicable to: ALL

The main wheels are equipped with carbon multidisc brakes, which can be actuated by either of two independent brake systems.

The normal system uses green hydraulic pressure, whereas the alternate system uses the yellow hydraulic system backed up by the hydraulic accumulator.

An anti-skid and autobrake system is also provided.

Braking commands come from either the brake pedals (pilot action), or the autobrake system (deceleration rate selected by the crew).

In normal operation, a dual channel Brake and Steering Control Unit (BSCU) controls normal braking and antiskid.

Depending on the failure, braking may revert to:

- Alternate braking with antiskid. This braking mode is controlled by the Alternate Braking Control Unit (ABCU). The antiskid is controlled by the BSCU.
- Alternate braking without antiskid. This braking mode is fully-controlled by the ABCU.
- Alternate braking without antiskid on accumulator. This braking mode is fully-controlled by the ABCU.

All the normal and alternate braking components are fully-monitored. Any detected failure is signaled to the crew via ECAM warnings.

The BSCU performs the following secondary functions:

- It checks the residual pressure in the brakes,
- It monitors the brake temperature,
- It provides discrete wheel speed information to other aircraft systems.

A changeover between the two BSCU channels takes place at each DOWN landing gear lever selection, or in case one channel fails.

The main gear wheels are fitted with fusible plugs which protect against tire burst, in the event of overheat.

Main gear wheels are also equipped with brake cooling fans  , which permit a high speed cooling of brakes.

ANTI-SKID SYSTEM**Applicable to: ALL**

The antiskid system provides maximum braking efficiency by maintaining the wheels at the limit of an impending skid.

At skid onset, brake release orders are sent to the normal and alternate servovalves, as well as to the ECAM system which displays the released brakes.

Full braking performance is achieved only with brake pedals at full deflection.

The antiskid system is deactivated below 20 kt (ground speed).

An ON/OFF switch activates, or deactivates, the antiskid and nosewheel steering systems.

PRINCIPLE

The speed of each main gear wheel (given by a tachometer) is compared to the aircraft speed (reference speed). When the speed of a wheel decreases below approximately 0.87 times (depending on conditions) reference speed, brake release orders are given to maintain the wheel slip at that value (best braking efficiency).

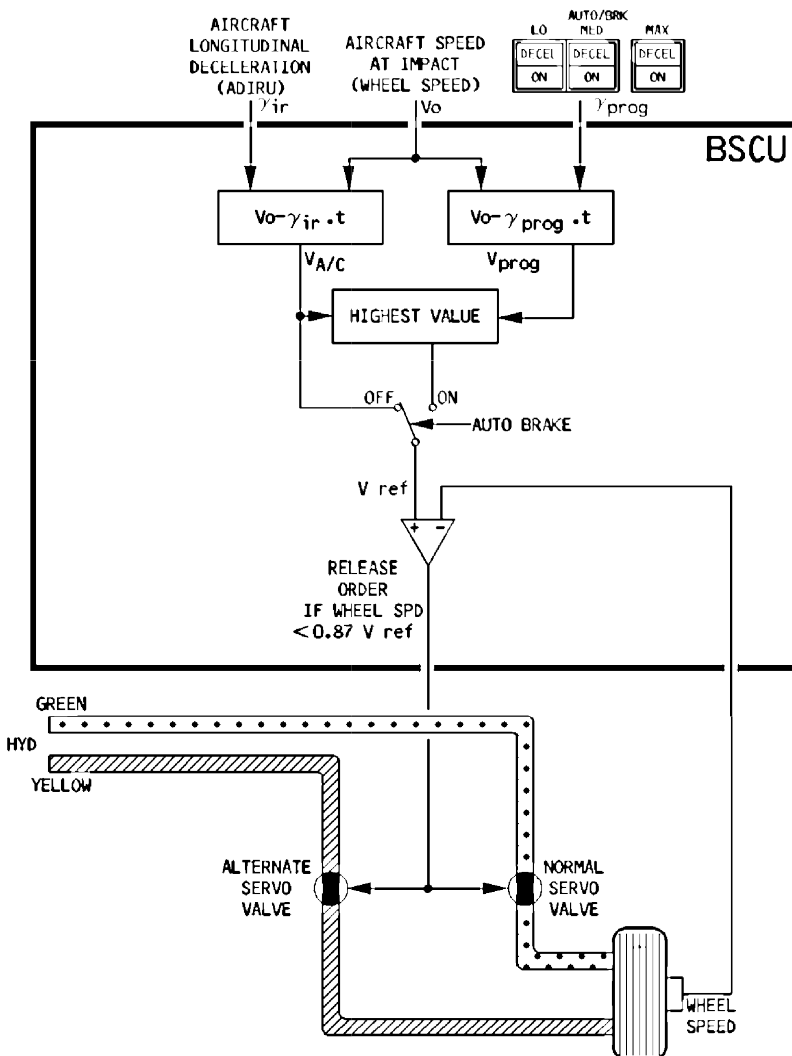
In normal operation, the reference speed is determined by the BSCU from the horizontal acceleration of ADIRU 1, 2 or 3.

In case all ADIRUs fail, reference speed equals the maximum of either main landing gear wheel speeds.

ANTI-SKID PRINCIPLE

Applicable to: ALL

L3



AUTO BRAKE - GENERAL

Applicable to: ALL

GENERAL

The purposes of this system are :

- to reduce the braking distance in case of an aborted takeoff
- to establish and maintain a selected deceleration rate during landing, thereby improving passenger comfort and reducing crew workload.

SYSTEM ARMING

The system arms when the crew presses the LO, MED, or MAX pushbutton switch if:

- Green pressure is available.
- The anti-skid system has electric power.
- There is no failure in the braking system.
- At least one ADIRS is functioning.

Note: 1. Auto brake may be armed with the parking brake on.
2. MAX autobrake mode cannot be armed in flight.

SYSTEM ACTIVATION

Automatic braking is activated:

- at the command for ground spoilers extension (*Refer to DSC-27-10-20 Speed Brakes and Ground Spoilers - Speed Brake Control*), for LO and MED mode.
- at the command for ground spoilers extension and the aircraft speed is above 40 kt, for MAX mode.

Therefore, if the aircraft makes an acceleration stop and begins to decelerate when its speed is under 72 kt, the automatic braking will not activate because the ground spoilers will not extend.

For autobrake to activate, at least two SEC's must be operative.

SYSTEM DEACTIVATION

The system deactivates :

- When it is disarmed (*Refer to DSC-32-30-10 Auto Brake - System Disarming*).
- When the ground spoilers retract. In this case it remains armed.

Continued on the next page

SYSTEM DISARMING

The system disarms when:

- Flight crew presses the pushbutton switch or,
- One or more arming conditions is lost or,
- Flight crew applies enough deflection to at least one brake pedal when autobrake is active in MAX, MED or LO mode.
- After take-off/touch and go.

OPERATION - GENERAL

Applicable to: ALL

GENERAL

There are four modes of operation :

- Normal braking,
- Alternate braking with antiskid,
- Alternate braking without antiskid,
- Parking brake.

NORMAL BRAKING

Braking is normal when :

- Green hydraulic pressure is available.
- The A/SKID & N/W STRG switch is ON.

During normal braking, antiskid operates and autobrake is available.

Braking is electrically-controlled through the BSCU :

- From the pilot's pedals, or
- Automatically :
 - On ground by the autobrake system,
 - In flight when the landing gear lever is up.

The antiskid system is controlled by the BSCU via the normal servo valves.

There is no brake pressure indication in the cockpit.

Continued on the next page

ALTERNATE BRAKING WITH ANTI-SKID

Autobrake is inoperative.

Braking uses this mode when green hydraulic pressure is insufficient, and :

- Yellow hydraulic pressure is available.
- The A/SKID & N/W STRG switch is ON.
- The parking brake is not ON.

Braking inputs are made by the brake pedals and sent to the ABCU. Then, taking into account the brake pedal input, the ABCU:

- Energizes the alternate brake selector valve to pressurize the yellow hydraulic circuit,
- Electrically controls the Alternate Servo Valve to obtain the correct pressure for the related brakes.

Antiskid is controlled by the BSCU.

Brake pressure, as well as accumulator pressure, are indicated on a triple indicator located on the center instrument panel.

ALTERNATE BRAKING WITHOUT ANTI-SKID

Autobrake and antiskid are inoperative.

The antiskid system is either deactivated:

- Electrically (A/SKID & N/W STRG sw OFF, or power supply failure, or BSCU failure), or
- Hydraulically (Y + G system low pressure, the brakes are supplied by the brake accumulator only).

Depending on the brake pedals' demand, the ABCU controls the alternate brake selector and the alternate servovalves.

Brake pressure and accumulator pressure are indicated on a triple indicator, located on the center instrument panel.

To avoid wheel locking and limit the risk of tire burst, brake pressure is automatically limited to 1 000 PSI.

Accumulators are designed to supply at least seven full brake applications.

PARKING BRAKE

Brakes are supplied by the yellow hydraulic system, or by accumulator pressure via the parking brake control valve, which opens allowing full pressure application on the main gear wheel brakes.

The accumulator maintains the parking pressure for at least 12 h.

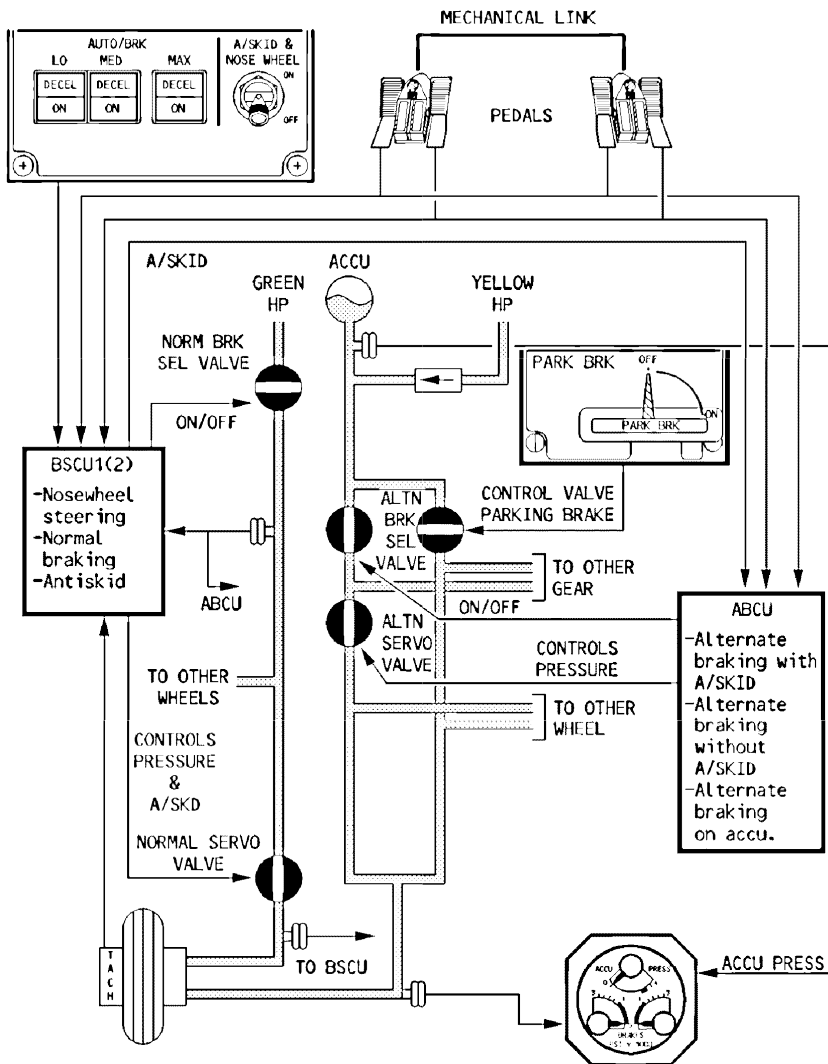
If the parking brake is activated and no yellow hydraulic or accumulator brake pressure is available, then the normal braking system can be applied via the brake pedals.

Yellow accumulators can be pressurized by pressing the yellow electrical pump switch.

Brake pressure and accumulator pressure are indicated on a triple indicator, located on the center instrument panel.

BRAKING SCHEMATIC

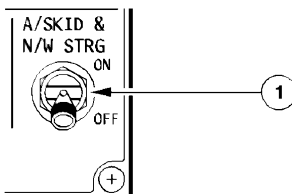
Applicable to: ALL



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CENTER INSTRUMENT PANEL

Applicable to: ALL



(1) A/SKID & N/W STRG sw

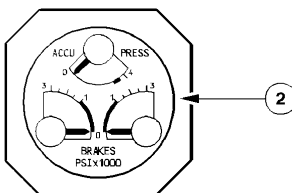
ON : If green hydraulic pressure is available, then antiskid is available.

If green hydraulic pressure is lost, then :

- Yellow hydraulic pressure automatically takes over to supply the brakes,
- Antiskid and nosewheel steering remain available.
- The triple indicator shows yellow system brake pressure.

OFF : The yellow hydraulic system supplies pressure to the brakes.

- Antiskid is deactivated. The pilot must refer to the triple indicator to limit brake pressure and avoid locking a wheel.
- Nosewheel steering is lost.
- Differential braking remains available through the pedals.
- The triple indicator displays yellow system brake pressure.



Continued on the next page

(2) BRAKES and ACCU PRESS indicator

Brake pressure is only indicated when the yellow hydraulic system controls the brake pressure, which means when the :

- Alternate braking system is activated, or
- Parking brake is applied.

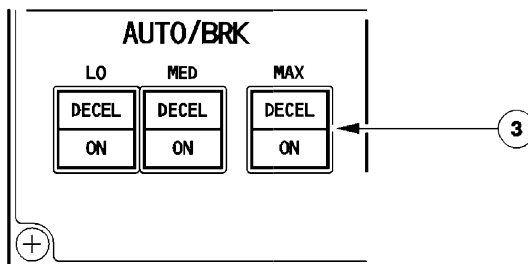
ACCU : Indicates the pressure in the yellow brake accumulator.

PRESS

BRAKES : Indicates the yellow pressure delivered to the left and right brakes, as measured upstream of the alternate servovalves.

AUTO BRK PANEL

Applicable to: ALL



(3) AUTO/BRK panel

The springloaded MAX, MED, and LO pushbutton switches arm the appropriate deceleration rate:

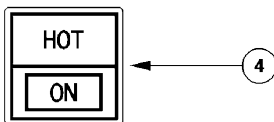
- MAX mode is normally selected for takeoff.
In the case of an aborted takeoff, maximum pressure goes to the brakes, as soon as the system generates the ground spoiler deployment order.
- MED or LO mode is normally selected for landing:
 - LO mode sends progressive pressure to the brakes 4 s after the ground spoilers deploy, in order to decelerate the aircraft at 1.7 m/s^2 (5.6 ft/s^2).
 - MED mode sends progressive pressure to the brakes 2 s after the ground spoilers deploy in order to decelerate the aircraft at 3 m/s^2 (9.8 ft/s^2).
- Lights:
 - The blue ON light comes on to indicate positive arming.
 - The green DECEL light comes on when the actual deceleration is 80 % of the selected rate.

Note: *On slippery runways, the predetermined deceleration may not be reached, due to antiskid operation. In this case, the DECEL light will not come on. This does not mean that autobrake is not working.*

- Off : The corresponding autobrake mode is not armed.

BRAKE FANS

Applicable to: ALL

BRK FAN

(4) BRK FAN pb sw

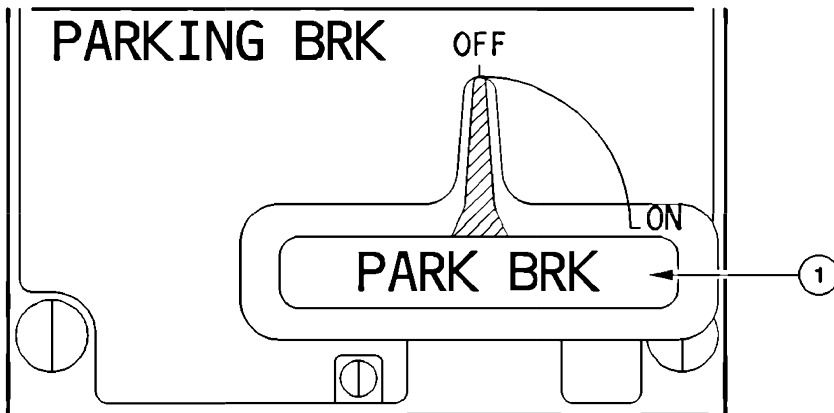
ON : The brake fans run if the lefthand main landing gear is down and locked.

OFF : The brake fans stop.

HOT It : This amber light comes on when the brakes get too hot. (A caution appears on ECAM, also).

PEDESTAL

Applicable to: ALL



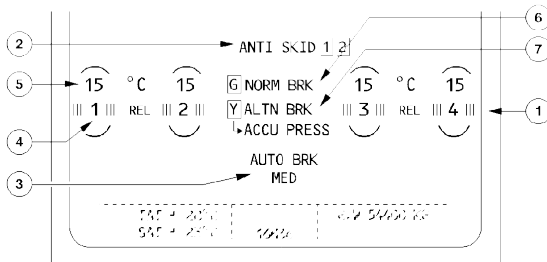
(1) PARKING BRK handle

Flight crew pulls this handle, then turns it clockwise, to apply the parking brake. The ECAM memo page displays "PARK BRK".

CAUTION If the pointer is not at ON, the parking brake is not on.

ECAM WHEEL PAGE

Applicable to: ALL



- (1) Release indicators
■ It appears in amber in case of brake released fault.
- (2) ANTI SKID indication



(A) ANTISKID label

It appears in amber, a long with an ECAM caution, in case of a total BSCU failure, or when the A/SKID & N/W STRG switch is OFF, or if the BSCU detects an ANTI-SKID failure, or in case of normal braking and yellow hydraulic system low pressure.

It appears in green in case of autobrake, normal braking, or alternate braking failure, and antiskid is still available.

(B) BSCU channel indication

When ANTISKID label is displayed, the number of the failed system(s) is (are) displayed in amber, if any.

(3) AUTO BRK

This legend appears:

- in green when auto brake is armed,
- flashing green for 10 s after autobrake disengagement.
- in amber, along with an ECAM caution, to indicate a system failure.

Continued on the next page

MED, LO, or MAX appears underneath in green to show which rate has been selected.

(4) Wheel number

This white number identifies individual wheels of the main landing gear.

(5) Brake temperature

- The temperature normally appears in green.
- The green arc appears on the hottest wheel when one brake temperature exceeds 100 °C.
- The green arc becomes amber, and an ECAM caution appears, when the corresponding brake temperature exceeds 300 °C.

(6) NORM BRK indication



(A) NORM BRK label

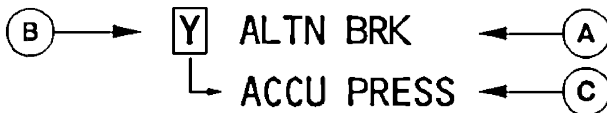
This indication appears in green when autobrake or alternate braking is failed, and normal braking is still available.

The legend appears in amber when normal braking is failed due to total BSCU failure, or to the loss of the green hydraulic pressure, or to the loss of antiskid.

(B) NORM BRK hydraulic supply indication

G is displayed when the NORM BRK label is displayed. It is green when green hydraulic pressure is available and amber, in case of green hydraulic low pressure.

(7)



(A) ALTN BRK label

This indication appears in green, if the braking system is in alternate mode and not failed, or in case autobrake or normal braking is failed and alternate braking is still available.

This indication appears in amber when alternate braking is failed.

(B) ALTN BRK hydraulic supply indication

Y is displayed when the ALTN BRK label is displayed. It is green when yellow hydraulic pressure is available and amber, in case of yellow hydraulic low pressure.

Continued on the next page

(C) ACCU indications

 ALTN BRK
*  ACCU PR

 ALTN BRK
**  ACCU ONLY

- (*) Appears in green, when the ALTN BRK label is displayed, and the yellow hydraulic pressure is available.
Appears in amber, with no arrow, when the yellow hydraulic system and the accumulator are in low pressure.
- (**) Appears in green when the alternate braking is pressurized by the yellow accumulator.

WARNINGS AND CAUTIONS

Applicable to: MSN 4554-5319



E/WD: FAILURE TITLE condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CONFIG PARK BRK ON parking brake is on when thrust levers are set at TO or FLX TO power position	CRC	MASTER WARN	NIL	NIL	1, 2, 4 to 10
PARK BRK ON Parking brake is ON during flight.	SINGLE CHIME	MASTER CAUT	WHEEL	HOT It on BRK FAN pb sw	1 to 5, 8 to 10
BRAKES HOT It is triggered when one brake temperature is higher than 300 °C and off when the highest brake temperature is lower than 290 °C.					4, 8 to 10
AUTO BRK FAULT failure of autobrake when armed					3 to 5
A/SKID NWS FAULT - Loss of normal brake system associated with Y HYD SYS lo PRESS or - Failure of both BSCU channels			NIL	NIL	4, 5
ANTI SKID/NWS OFF switch at OFF position					4, 5
HYD SEL FAULT failure of brake normal selector valve or NWS selector valve in open position					3 to 5, 7, 8
SYS 1 (2) FAULT failure of one BSCU channel	NIL	NIL			

Continued on the next page

E/WD: FAILURE TITLE condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
RELEASED Brake of one wheel is released. It is detected when the landing gear is downlocked and, at least one engine is running, and normal braking is active.	SINGLE CHIME	MASTER CAUT	WHEEL	NIL	4, 5
NORM BRK FAULT Normal braking function is lost.					3 to 5
ALTN BRK FAULT Alternate braking function is lost.	NIL	NIL	3, 4, 5, 7, 8		
ALTN L(R) RELEASED Brakes of one gear is released. It is triggered when the landing gear is downlocked, and at least one engine is running, and alternate braking is active.	SINGLE CHIME	MASTER CAUT	NIL		3, 4, 5
NORM + ALTN FAULT Normal and alternate functions are lost. Parking brake available.			WHEEL		4, 5
BRK Y ACCU LO PR The yellow accumulator is in low pressure.					3, 4, 5, 7, 8
PARK BRK LO PR The yellow accumulator and hydraulic system pressures are low with parking brake on					3 to 8
BRAKES-NWS MINOR FAULT Single system failure, loss of redundancy	NIL	NIL	NIL		2 to 9
PARK BRK FAULT	SINGLE CHIME	MASTER CAUT	WHEEL		3 to 8

MEMO DISPLAY

- If the parking brake is ON, the "PARK BRK" memo appears in green, during flight phases 1, 2, 9, and 10.
- If the autobrake is armed, AUTO BRK LO, AUTO BRK MED, or AUTO BRK MAX appears.
- If the autobrake is faulty, "AUTO BRK OFF" appears.
- "BRK FAN" appears in green, if the BRK FAN  pushbutton is ON.

WARNINGS AND CAUTIONS

Applicable to: MSN 3411



E/WD: FAILURE TITLE condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CONFIG PARK BRK ON parking brake is on when thrust levers are set at TO or FLX TO power position	CRC	MASTER WARN	NIL	NIL	1, 2, 5 to 10
BRAKES HOT It is triggered when one brake temperature is higher than 300 °C and off when the highest brake temperature is lower than 290 °C.	SINGLE CHIME	MASTER CAUT	WHEEL	HOT It on BRK FAN pb sw	4, 8 to 10
AUTO BRK FAULT failure of autobrake when armed				NIL	3 to 5
A/SKID NWS FAULT - Loss of normal brake system associated with Y HYD SYS lo PRESS, or - Failure of both BSCU channels.					4, 5
ANTI SKID/NWS OFF switch at OFF position					4, 5
HYD SEL FAULT failure of brake normal selector valve or NWS selector valve in open position			NIL		3 to 5, 7, 8
SYS 1 (2) FAULT failure of one BSCU channel	NIL	NIL			

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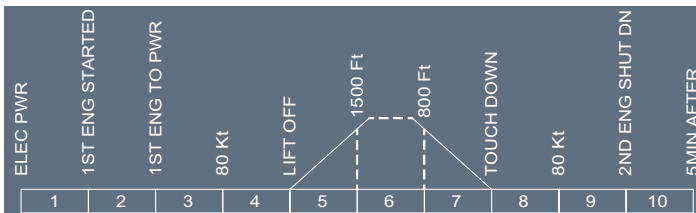
E/WD: FAILURE TITLE condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
RELEASED Brake of one wheel is released. It is detected when the landing gear is downlocked and, at least one engine is running, and normal braking is active.	SINGLE CHIME	MASTER CAUT	WHEEL	NIL	4, 5
NORM BRK FAULT Normal braking function is lost.					3 to 5
ALTN BRK FAULT Alternate braking function is lost.	NIL	NIL	3, 4, 5, 7, 8		
ALTN L(R) RELEASED Brakes of one gear is released. It is triggered when the landing gear is downlocked, and at least one engine is running, and alternate braking is active.	SINGLE CHIME	MASTER CAUT	NIL		3, 4, 5
NORM + ALTN FAULT Normal and alternate functions are lost. Parking brake available.			WHEEL		4, 5
BRK Y ACCU LO PR The yellow accumulator is in low pressure.					3, 4, 5, 7, 8
BRAKES-NWS MINOR FAULT Single system failure, loss of redundancy	NIL	NIL	NIL		2 to 9

MEMO DISPLAY

- If the parking brake is on, the "PARK BRK" memo appears:
 - In green, during flight phases 1, 2, 9, and 10.
 - In amber, during flight phases 4 to 8.
 It does not display this message during flight phase 3.
- If the autobrake is armed, AUTO BRK LO, AUTO BRK MED, or AUTO BRK MAX appears.
- If the autobrake is faulty, "AUTO BRK OFF" appears.
- "BRK FAN" appears in green, if the BRK FAN  pushbutton is ON.

WARNINGS AND CAUTIONS

Applicable to: MSN 3413-4006



E/WD: FAILURE TITLE condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CONFIG PARK BRK ON parking brake is on when thrust levers are set at TO or FLX TO power position	CRC	MASTER WARN	NIL	NIL	1, 2, 5 to 10
PARK BRK ON Parking brake is ON during flight.	SINGLE CHIME	MASTER CAUT			WHEEL
BRAKES HOT It is triggered when one brake temperature is higher than 300 °C and off when the highest brake temperature is lower than 290 °C.			4, 8 to 10		
AUTO BRK FAULT failure of autobrake when armed				3 to 5	
A/SKID NWS FAULT - Loss of normal brake system associated with Y HYD SYS lo PRESS, or - Failure of both BSCU channels.					
ANTI SKID/NWS OFF switch at OFF position			NIL		3 to 5, 7, 8
HYD SEL FAULT failure of brake normal selector valve or NWS selector valve in open position					
SYS 1 (2) FAULT failure of one BSCU channel	NIL	NIL			

Continued on the next page

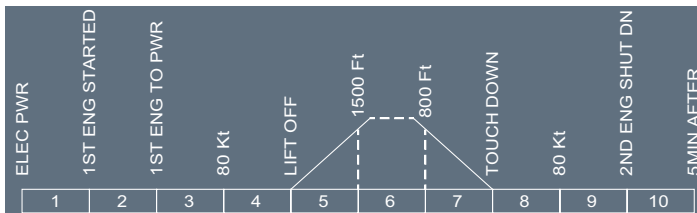
E/WD: FAILURE TITLE condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
RELEASED Brake of one wheel is released. It is detected when the landing gear is downlocked and, at least one engine is running, and normal braking is active.	SINGLE CHIME	MASTER CAUT	WHEEL	NIL	4, 5
NORM BRK FAULT Normal braking function is lost.					3 to 5
ALTN BRK FAULT Alternate braking function is lost.	NIL	NIL	3, 4, 5, 7, 8		
ALTN L(R) RELEASED Brakes of one gear is released. It is triggered when the landing gear is downlocked, and at least one engine is running, and alternate braking is active.	SINGLE CHIME	MASTER CAUT	NIL		3, 4, 5
NORM + ALTN FAULT Normal and alternate functions are lost. Parking brake available.			WHEEL		4, 5
BRK Y ACCU LO PR The yellow accumulator is in low pressure.					3, 4, 5, 7, 8
BRAKES-NWS MINOR FAULT Single system failure, loss of redundancy	NIL	NIL	NIL		2 to 9

MEMO DISPLAY

- If the parking brake is ON, the "PARK BRK" memo appears in green, during flight phases 1, 2, 9, and 10.
- If the autobrake is armed, AUTO BRK LO, AUTO BRK MED, or AUTO BRK MAX appears.
- If the autobrake is faulty, "AUTO BRK OFF" appears.
- "BRK FAN" appears in green, if the BRK FAN  pushbutton is ON.

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-3184, 4012-4451



E/WD: FAILURE TITLE condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
CONFIG PARK BRK ON parking brake is on when thrust levers are set at TO or FLX TO power position	CRC	MASTER WARN	NIL	NIL	1, 2, 4 to 10
PARK BRK ON Parking brake is ON during flight.	SINGLE CHIME	MASTER CAUT	WHEEL	HOT It on BRK FAN pb sw	1 to 5, 8 to 10
BRAKES HOT It is triggered when one brake temperature is higher than 300 °C and off when the highest brake temperature is lower than 290 °C.					4, 8 to 10
AUTO BRK FAULT failure of autobrake when armed					3 to 5
A/SKID NWS FAULT - Loss of normal brake system associated with Y HYD SYS lo PRESS or - Failure of both BSCU channels			NIL	NIL	4, 5
ANTI SKID/NWS OFF switch at OFF position					4, 5
HYD SEL FAULT failure of brake normal selector valve or NWS selector valve in open position					3 to 5, 7, 8
SYS 1 (2) FAULT failure of one BSCU channel	NIL	NIL			

Continued on the next page

E/WD: FAILURE TITLE condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
RELEASED Brake of one wheel is released. It is detected when the landing gear is downlocked and, at least one engine is running, and normal braking is active.	SINGLE CHIME	MASTER CAUT	WHEEL	NIL	4, 5
NORM BRK FAULT Normal braking function is lost.					3 to 5
ALTN BRK FAULT Alternate braking function is lost.	NIL	NIL	3, 4, 5, 7, 8		
ALTN L(R) RELEASED Brakes of one gear is released. It is triggered when the landing gear is downlocked, and at least one engine is running, and alternate braking is active.	SINGLE CHIME	MASTER CAUT	NIL		3, 4, 5
NORM + ALTN FAULT Normal and alternate functions are lost. Parking brake available.			WHEEL		4, 5
BRK Y ACCU LO PR The yellow accumulator is in low pressure.					3, 4, 5, 7, 8
PARK BRK LO PR The yellow accumulator and hydraulic system pressures are low with parking brake on					3 to 8
BRAKES-NWS MINOR FAULT Single system failure, loss of redundancy	NIL	NIL	NIL		2 to 9

MEMO DISPLAY

- If the parking brake is ON, the "PARK BRK" memo appears in green, during flight phases 1, 2, 9, and 10.
- If the autobrake is armed, AUTO BRK LO, AUTO BRK MED, or AUTO BRK MAX appears.
- If the autobrake is faulty, "AUTO BRK OFF" appears.
- "BRK FAN" appears in green, if the BRK FAN  pushbutton is ON.

BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
BRAKES	BSCU CH 1	AC1	DC1			
	BSCU CH 2	AC2	DC2			
	ABCU				X	X
	PARK BRK CTL		GRND/ FLT			HOT1
	PRESS INDICATOR				X	
	BRK FAN CTL 		DC2			
	COOLING FANS  (Wheels 1, 2, 3, 4)	AC2	DC2			
	COOLING FANS  (bogie : Wheels 5, 6, 7, 8)	AC1	DC1			

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BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
TYRE PRESS	TIRE PRESS IND UNIT 		DC1			

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DSC-33-10 Cockpit Lighting

DSC-33-10-10	General	General	1
DSC-33-10-20	Description	Description	1
	Schematic		2
DSC-33-10-30	Controls and Indicators		
	Overhead Panel		1
	Maintenance Panel		2
	Lateral Window		2
	Pedestal		3
	Glareshield		4
	Main Inst Panel		5
DSC-33-10-40	Electrical Supply		
	BUS EQUIPMENT LIST		1

DSC-33-20 Exterior Lighting

DSC-33-20-10	General	GENERAL	1
DSC-33-20-20	Controls and Indicators		
	SCHEMATIC		1
	Overhead Panel		2
DSC-33-20-30	Electrical Supply		
	BUS EQUIPMENT LIST		1

DSC-33-30 Emergency Lighting

DSC-33-30-10	Description		
	General		1
	PROXIMITY EMERGENCY ESCAPE PATH MARKING SYSTEM/EXIT SIGNS		2
	Emergency Lighting Control Logic		4
DSC-33-30-20	Controls and Indicators		
	CONTROLS AND INDICATORS		1

DSC-33-30-30	Electrical Supply	
	BUS EQUIPMENT LIST	1
DSC-33-40	Signs	
DSC-33-40-10	Controls and Indicators	
	Overhead Panel	1
	Memo Display.....	2

GENERAL**Applicable to: ALL**

The instrument panel has both integral instrument lighting and flood lighting.

The brightness of all panel lighting is adjustable.

Incandescent spot lights and flood lights illuminate all work surfaces and the side consoles.

Two dimmable dome lights illuminate the overall cockpit. When the batteries are supplying all electrical power, only the righthand dome light is on line.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-33 – LIGHTS

DSC-33-10 – Cockpit Lighting

DSC-33-10-10 – General

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DESCRIPTION

Applicable to: ALL

INTEGRATED LIGHTING FOR INSTRUMENTS AND PANELS

All instruments and panels in the cockpit (other than display units) have integral lighting.
The brightness of all integral lighting is adjustable.

ANNUNCIATOR LIGHTS

The ANN LT selector on the overhead panel controls the brightness of all the annunciator lights on the flight deck.

It sets the brightness of all annunciator lights at the same level.

Flight crew can test the annunciator lights by selecting the TEST position on the ANN LT selector and checking to see that all the annunciator lights come on.

DOME LIGHTS

Two dome lights give the cockpit shadow-free illumination.

MAPHOLDER LIGHTING

Each pilot's station has a lighted map and chart holder.

CONSOLE AND BRIEFCASE LIGHTING

Each pilot's station has lighting for the briefcase stowage, the side console, and the floor.

CENTER INSTRUMENT PANEL

Lights under the glareshield illuminate the center instrument panel.

STANDBY COMPASS

The standby compass has integral lighting.

READING LIGHTS

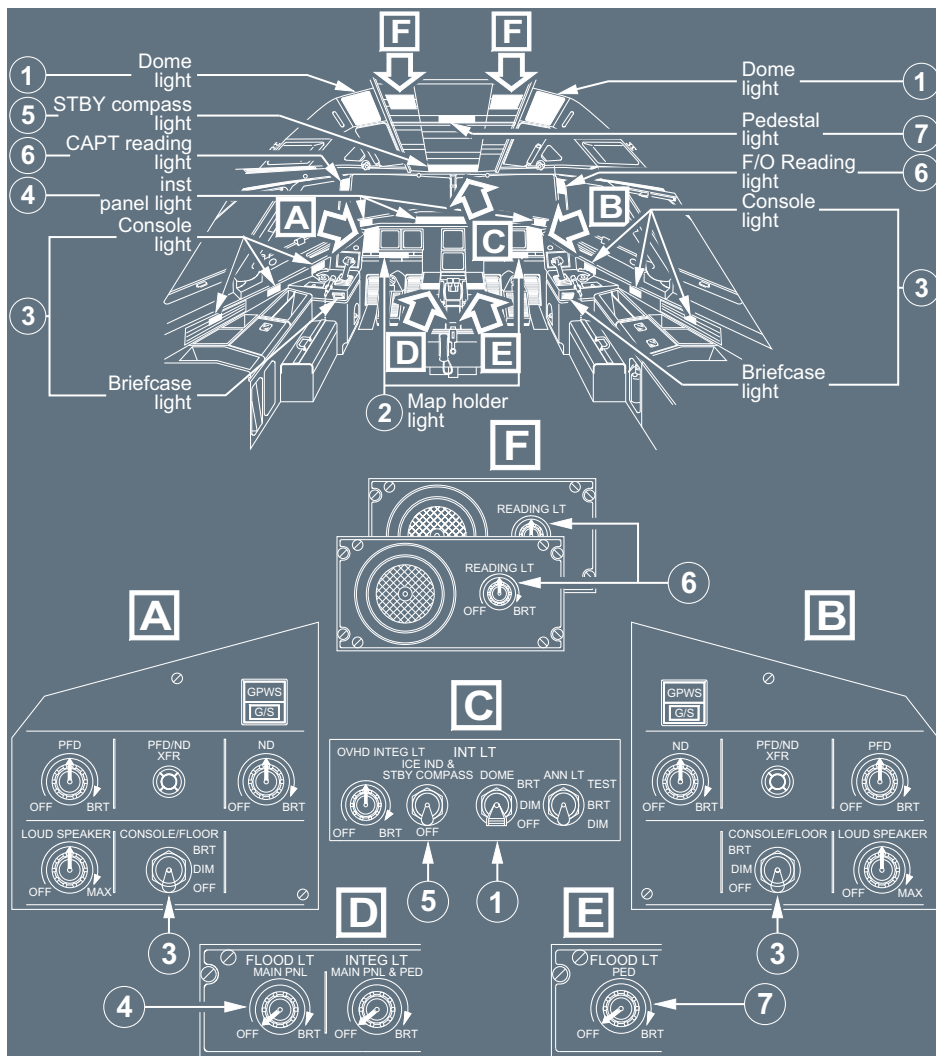
Each pilot's station has a reading light.

PEDESTAL LIGHTING

A flood light in the middle of the overhead panel illuminates the center pedestal.

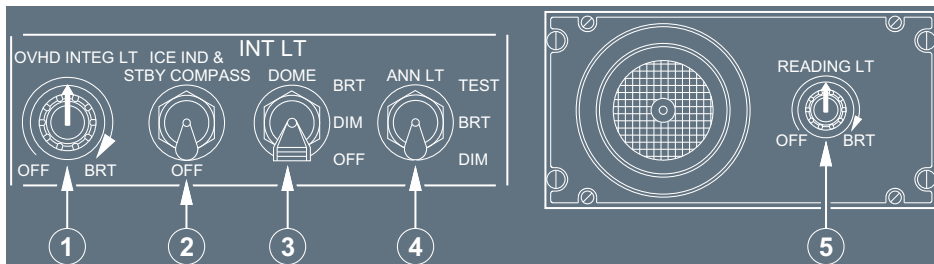
SCHEMATIC

Applicable to: ALL



OVERHEAD PANEL

Applicable to: ALL



- (1) OVHD INTEG LT knob
This knob turns the overhead panel's integral lighting on and off, and adjusts its brightness.
- (2) ICE IND & STBY COMPASS sw
This switch turns the integral lighting for the standby compass and the visual indicator on and off.
- (3) DOME selector
This switch controls both dome lights.

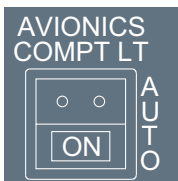
BRT : Both dome lights are on and bright.
DIM : Both dome lights are on and dim.
OFF : Both dome lights are off.
- (4) ANN LT selector
This switch sets the brightness of all the cockpit annunciator lights at either "bright" or "dim", and also tests them.

TEST : Turns on all flight deck annunciator lights.
Displays 8's in all Liquid Crystal Displays (LCDs).
DIM : Reduces voltage to all annunciator lights.
BRT : Allows annunciators to function normally.

Note: Data transfer between the ECAM and the ND, and switching between the Electronic Instrument System and the Display Management Computer are not allowed during the ANN LT test.
- (5) READING LT knob
The reading light on each side of the overhead panel has its own control knob that turns it on and off and adjusts its brightness.

MAINTENANCE PANEL

Applicable to: ALL

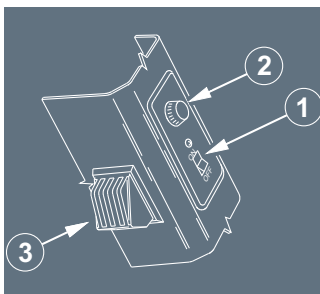
(1) AVIONICS COMPT LT pushbutton switch

AUTO : avionic compartment lighting is automatically controlled by door opening.

ON : avionic compartment lighting is on.

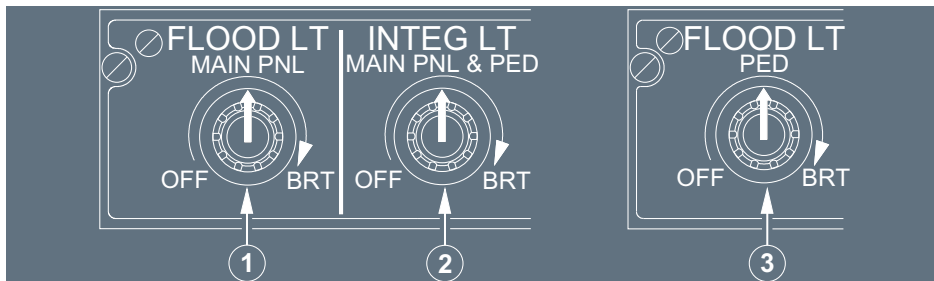
LATERAL WINDOW

Applicable to: ALL

(1) Reading LT knob (Captain and F/O).(2) Brightness adjustment(3) Light

PEDESTAL

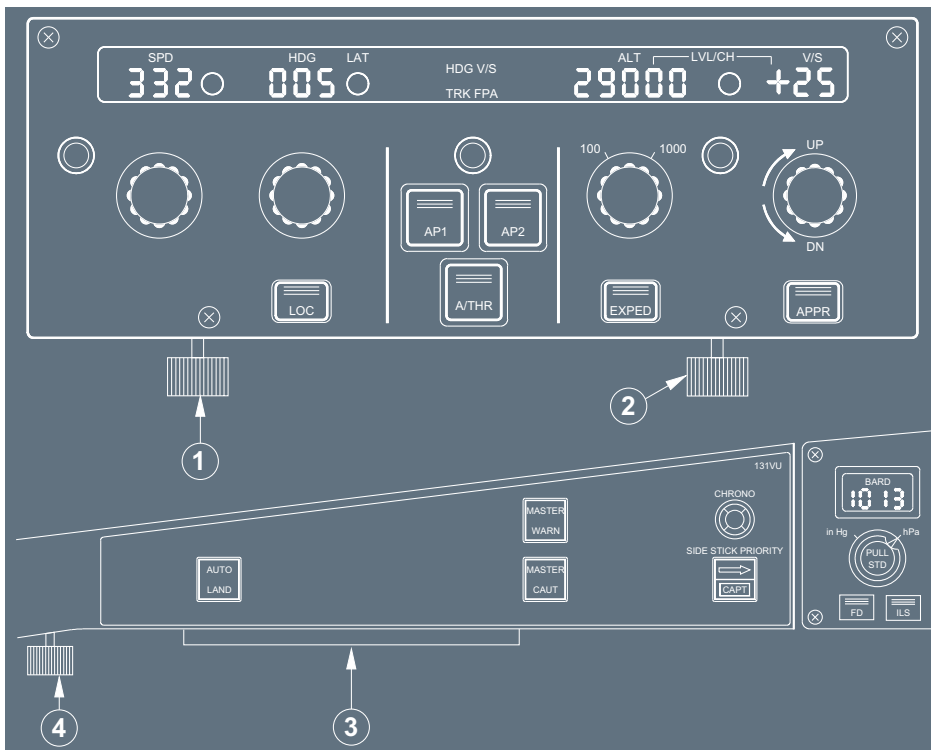
Applicable to: ALL



- (1) FLOOD LT MAIN PANL knob
This knob adjusts the brightness of the flood lighting for the center instrument panel, and turns it on and off.
- (2) INTEG LT MAIN PNL & PED knob
This knob adjusts the brightness of integral lighting for the main panel and pedestal, and turns it on and off.
- (3) FLOOD LT PED knob
This knob adjusts the brightness of the flood lighting for the pedestal, and turns it on and off.

GLARESHIELD

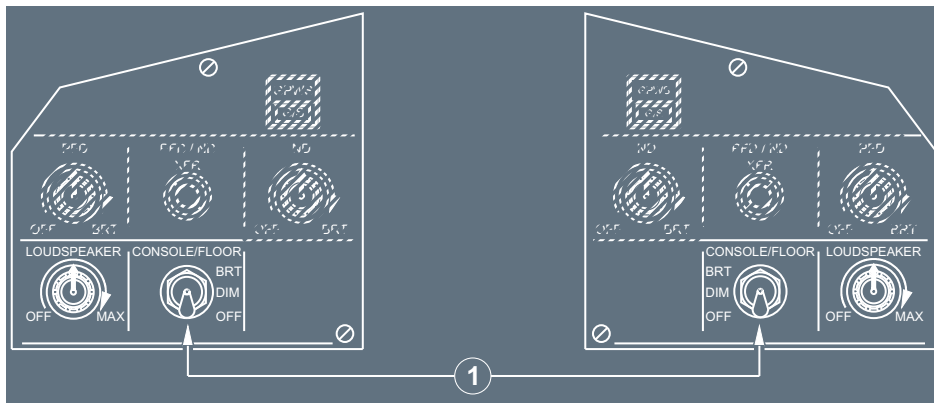
Applicable to: ALL



- (1) This knob adjusts the brightness of the integral lighting on the glareshield, and of the LEDs on the FCU.
- (2) This knob adjusts the brightness of the FCU displays.
- (3) This lighting illuminates the sliding table and map holder.
- (4) This knob adjusts the brightness of the sliding table and map holder lighting.

MAIN INST PANEL

Applicable to: ALL



(1) CONSOLE/FLOOR switch

Each of these switches controls the lights for the side console and briefcase on one side of the cockpit, and for the floor around one of the pilot's seats. The lights can either be bright, dim, or off.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-33 – LIGHTS

DSC-33-10 – Cockpit Lighting

DSC-33-10-30 – Controls and Indicators

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BUS EQUIPMENT LIST

Applicable to: ALL

			NORM		EMER ELEC		
			AC	DC	AC ESS	DC ESS	HOT
COCKPIT LIGHTS	Dome light	L		DC GND/FLT			
		R				X	
	Console light	L		DC1			
		R		DC2			
	Main INST panel	L				X	
		R		DC1			
	STBY compass/ice ind					X	
	Supplementary reading light			DC1			
	Pedestal light			DC1			
	Reading light	L		DC1			
		R		DC2			
	Briefcase light	L		DC1			
		R		DC2			
	Map holder light	L		DC1			
		R		DC2			
	Floor light			DC1			
	INST, panels-integral light		AC1				
	Annunciator light		AC1, 2 and AC STAT INV				
	Annunciator light test/dim			DC2			



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-33 – LIGHTS

DSC-33-10 – Cockpit Lighting

DSC-33-10-40 – Electrical Supply

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GENERAL**Applicable to: ALL**

Exterior lighting includes :

- navigation lights
- landing lights
- runway turn off lights
- TO and TAXI lights
- logo lights
- anticollision lights
- wing and engine scan lights

Switches on the overhead panel control the exterior lighting.



A319/A320
FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-33 – LIGHTS

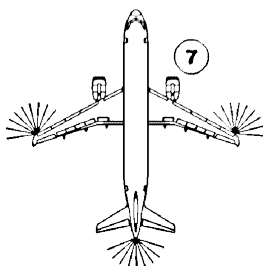
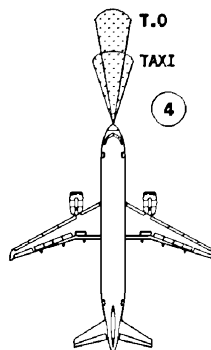
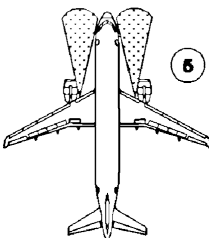
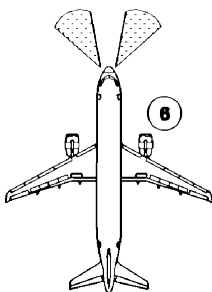
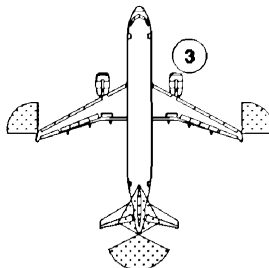
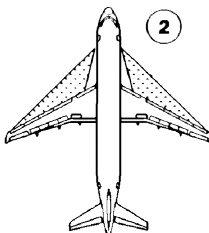
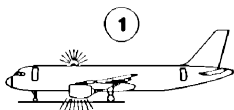
DSC-33-20 – Exterior Lighting

DSC-33-20-10 – General

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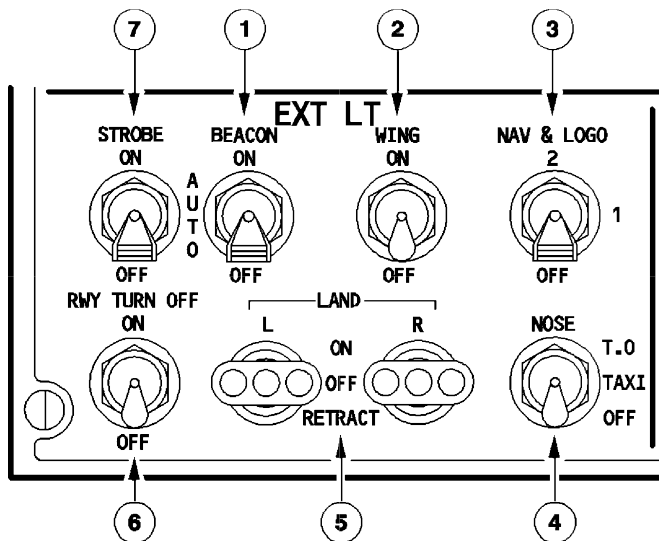
SCHEMATIC

Applicable to: ALL



OVERHEAD PANEL

Applicable to: ALL



(1) BEACON sw

This switch turns on and off the two flashing red lights, one on top and one on the bottom of the fuselage.

(2) WING sw

This switch turns on and off two beam lights on each side of the fuselage. These lights illuminate the leading edge of the wing and the engine air intake to show if ice is accumulating there.

(3) NAV and LOGO sw

This switch turns the navigation lights on and off.

There are dual navigation lights on each wing tip and in the APU tail cone.

Logo lights are installed in the upper surface of each horizontal stabilizer to illuminate the company logo on the vertical stabilizer provided the main gear struts are compressed or the flaps are extended at least 15 °.

1 : Turns on the logo lights and the first set of navigation lights.

2 : Turns on the logo lights and the second set of navigation lights.

OFF : All lights are off.

Continued on the next page

(4) NOSE sw

This switch turns the taxi and takeoff lights on and off.

TO : Turns on both taxi and takeoff lights.

TAXI : Turns on only taxi light.

OFF : Taxi and takeoff lights off.

Note: These two lights, attached to the nose gear strut, go off automatically when landing gear is retracted.

(5) L and R LAND sel

These selectors control the landing light.

ON : Extends the (left or right) landing light which comes on automatically when fully extended.

OFF : Shut off the landing light but leaves it extended.

RETRACT : Retracts the landing light and shuts it off.

(6) RWY TURN OFF sw

This switch turns the runway turn-off lights on and off.

Note: These lights go off automatically when landing gear is retracted.

(7) STROBE sw

This switch turns on and off the three synchronized strobe lights, one on each wing tip and one below the tail cone.

ON : The strobe lights flash white.

AUTO : The strobe lights come on automatically when the main gear strut is not compressed.

OFF : The strobe light are off.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-33 – LIGHTS

DSC-33-20 – Exterior Lighting

DSC-33-20-20 – Controls and Indicators

Intentionally left blank

BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
EXTERIOR LIGHTS	Navigation lights	GRD/FLT				
	Landing lights L	AC1				
	Landing lights R	AC2				
	RWY turn off lights L	AC1	DC 2 ⁽¹⁾			
	RWY turn off lights R	AC2	DC 2 ⁽¹⁾			
	Taxi and TO lights	AC1	DC 2 ⁽¹⁾			
	Taxi and TO lights	AC2	DC 2 ⁽¹⁾			
	Logo lights L 	AC1	DC 2 ⁽¹⁾			
	Logo lights R 	AC2	DC 2 ⁽¹⁾			
	Beacon lights Upper	AC1				
	Beacon lights Lower	AC2				
	Strobe lights 	AC2				
	Wing lights R	AC1				
	Wing lights L	AC2				

⁽¹⁾ Supply for the light control



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-33 – LIGHTS

DSC-33-20 – Exterior Lighting

DSC-33-20-30 – Electrical Supply

Intentionally left blank

GENERAL

Applicable to: ALL

The emergency lighting system has:

- Proximity emergency escape path marking systems (escape path and exit markers)
- Overhead emergency lights
- EXIT signs
- Lavatory auxiliary lights
- Overwing escape route lighting
- Escape slide lighting.

EXIT signs come on, if the cabin altitude gets too high, or (depending on the CIDS/CAM programming) if the NO SMOKING signs come on.

The floor proximity emergency escape path marking is a self-luminescent system.

The exit marker, overhead emergency lighting, and EXIT signs come on, if the EMER EXIT LT selector is ON, or if the Purser panel's EMER pb is pressed.

- With the EMER EXIT LT selector at ARM:
 - The exit markers of the proximity emergency escape path marking system comes on, if:
 - Normal aircraft electrical power fails, or
 - DC SHED ESS BUS is lost.
 - The overhead emergency lights come on, if:
 - Normal aircraft electrical power system fails, or
 - DC SHED ESS BUS fails, or
 - AC BUS 1 fails.
 - Exit signs automatically come on, if:
 - Normal aircraft electrical power system fails, or
 - DC SHED ESS BUS fails.
- When lit:
 - The exit markers of the proximity emergency escape path marking system are powered by internal batteries for at least 12 min.
 - DC SHED ESS BUS supply the overhead emergency lights and the EXIT signs.
If DC SHED ESS BUS fails, batteries inside the light fixtures power all the lights.
 - DC SHED ESS BUS charge the internal batteries, if:
 - EMER LT selector is not at ON, and
 - The Purser panel's EMER pb is not pressed, and
 - DC SHED ESS BUS is supplied, and
 - The NO SMOKING selector is OFF, or at AUTO with the landing gear retracted.

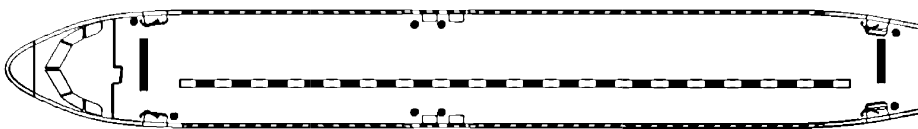
Lavatory auxiliary lights are always on. They are supplied by 28 V DC ESS BUS.

Continued on the next page

The escape slides have an integral lighting system. The escape slide lights and the overwing route lights come on automatically, when the slide is armed and the door or emergency exit is open. They are supplied by the internal batteries.

PROXIMITY EMERGENCY ESCAPE PATH MARKING SYSTEM/EXIT SIGNS

Applicable to: A320

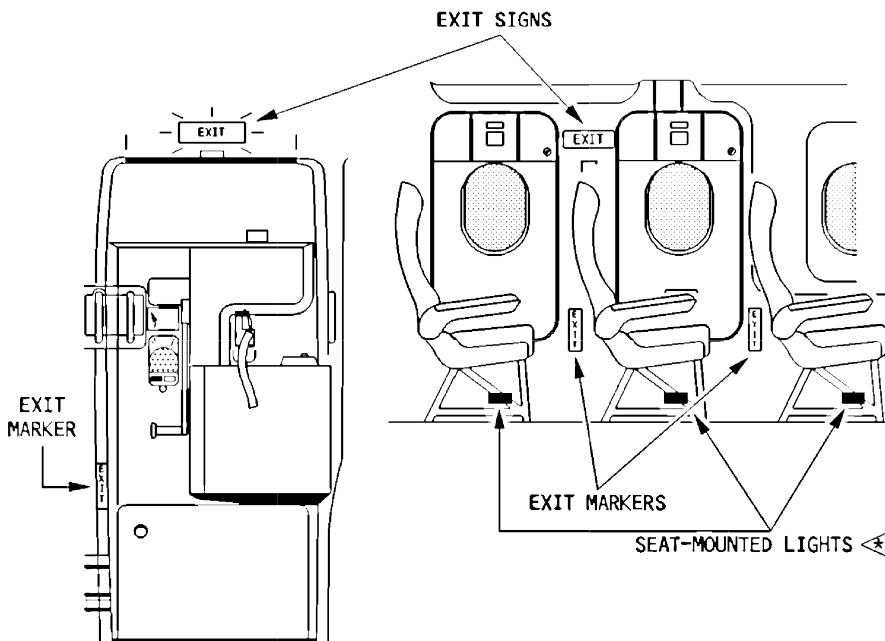


LEGEND

— PROXIMITY EMERGENCY ESCAPE PATH MARKING SYSTEM

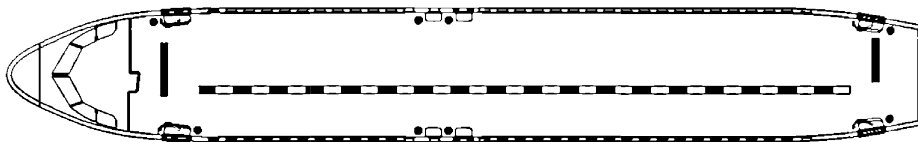
— LIGHT STRIPS IN GALLEY AREA 

- EXIT MARKERS



PROXIMITY EMERGENCY ESCAPE PATH MARKING SYSTEM/EXIT SIGNS

Applicable to: A319

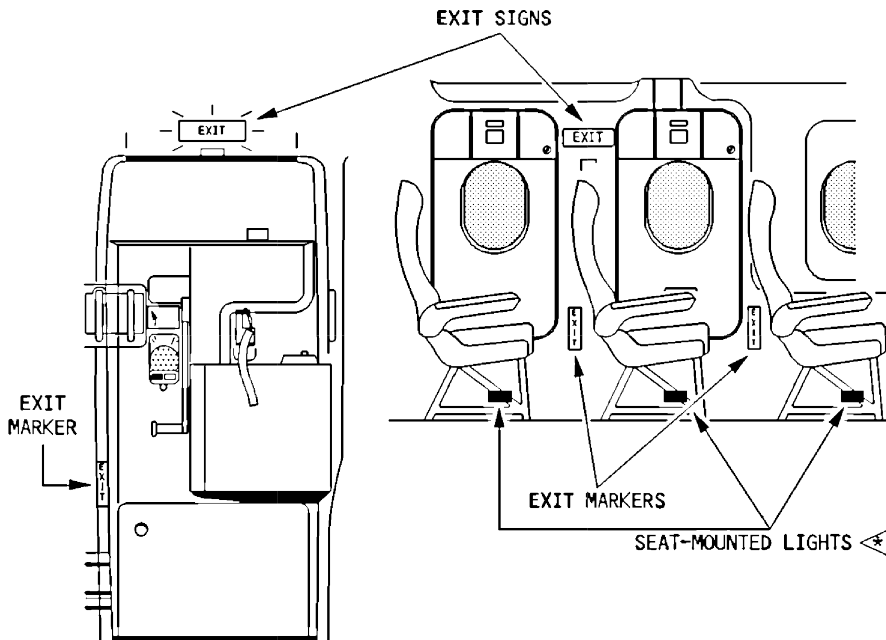


LEGEND

— PROXIMITY EMERGENCY ESCAPE PATH MARKING SYSTEM

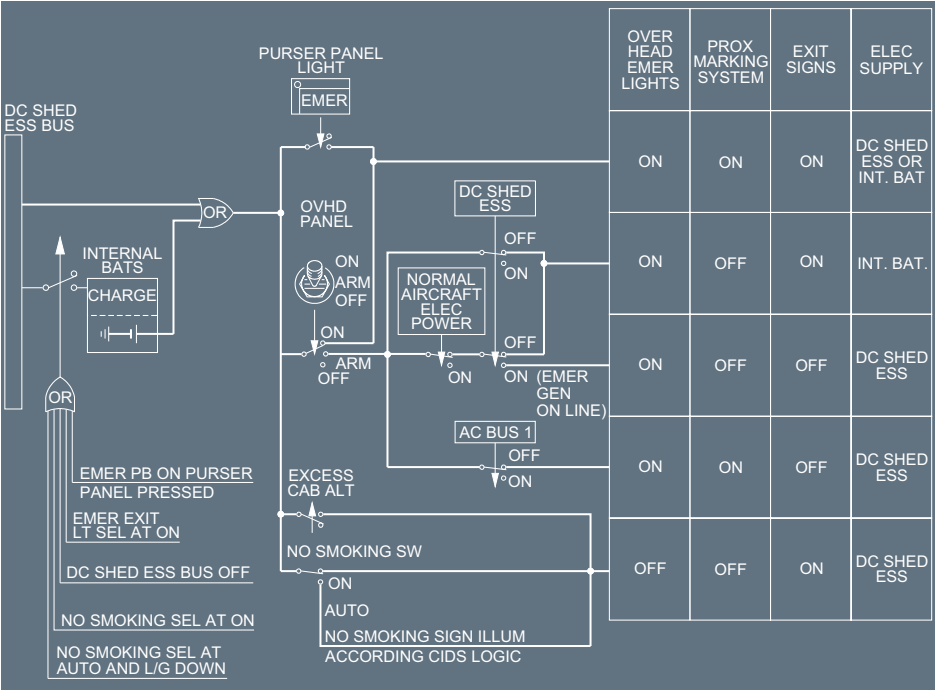
— LIGHT STRIPS IN GALLEY AREA 

- EXIT MARKERS



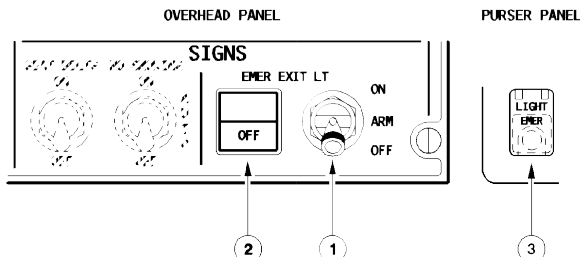
EMERGENCY LIGHTING CONTROL LOGIC

Applicable to: ALL



CONTROLS AND INDICATORS

Applicable to: ALL



(1) EMER EXIT LT selector

The selector has three detent positions.

ON : Overhead emergency lights, EXIT signs and proximity marking system come on.

OFF : Above lights are off.

- ARM :
- Exit markers comes on when the normal aircraft electrical power or DC SHED ESS BUS is lost.
 - The overhead emergency lights come on if:
 - Normal aircraft electrical power system fails or
 - DC SHED ESS BUS fails or
 - AC BUS 1 fails.
 - Exit signs come on if:
 - Normal aircraft electrical power system fails or
 - DC SHED ESS BUS fails or

Note: The *LIGHT EMER pb* on the purser's panel can turn on the emergency lighting independently of the positions of this selector switch.

(2) EMER EXIT LT-OFF It

This light comes on amber when the EMER EXIT LT selector is selected OFF.

(3) LIGHT EMER pb

When pressed, this button performs the same function as the EMER EXIT LT switch when it is ON.

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BUS EQUIPMENT LIST

Applicable to: ALL

	NORM		EMER ELEC		
	AC	DC	AC ESS	DC ESS	HOT
CABIN LIGHTING	AC1 AC2 and GRND/ FLT			SHED ⁽¹⁾	

(1) Standby supply (Refer to DSC-33-30-10 Emergency Lighting Control Logic)



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-33 – LIGHTS

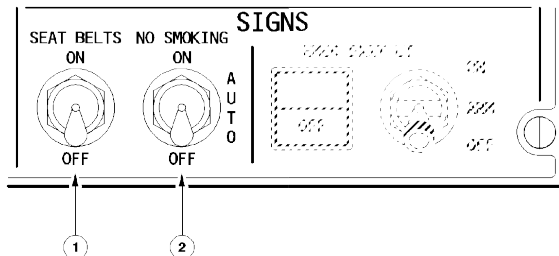
DSC-33-30 – Emergency Lighting

DSC-33-30-30 – Electrical Supply

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OVERHEAD PANEL

Applicable to: A320



(1) SEAT BELTS sw

ON : FASTEN SEAT BELT and RETURN TO SEAT signs come on simultaneously, with a low tone chime.

OFF : Signs are off. The low tone chime sounds when the lights turn off (depending on the CIDS/CAM programming).

(2) NO SMOKING selector

ON : NO SMOKING and EXIT signs come on simultaneously with a low tone chime.

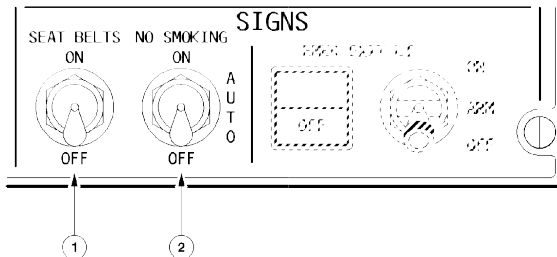
AUTO : NO SMOKING and EXIT signs come on when the landing gear is extended, and turn off when the landing gear is retracted. The low tone chime sounds (depending on the CIDS/CAM programming) when the lights go on or off.

OFF : Signs are off. The low tone chime sounds when the lights turn off (depending on the CIDS/CAM programming).

Note: If the cabin altitude goes above 11 300 ft ($\pm$ 350 ft), the cabin illuminates (depending on the CIDS/CAM programming) and the NO SMOKING, FASTEN SEAT BELT, EXIT signs come on, regardless of the SEAT BELTS and NO SMOKING selector switches.

OVERHEAD PANEL

Applicable to: A319



(1) SEAT BELTS sw

ON : FASTEN SEAT BELT and RETURN TO SEAT signs come on simultaneously, with a low tone chime.

OFF : Signs are off. The low tone chime sounds when the lights turn off (depending on the CIDS/CAM programming).

(2) NO SMOKING sw

ON : NO SMOKING and EXIT signs come on simultaneously with a low tone chime.

AUTO : The EXIT signs come on when the landing gear is extended, and turn off when the landing gear is retracted. The low tone chime sounds (depending on the CIDS/CAM programming) when the lights go on or off. The NO SMOKING signs are on.

OFF : The EXIT and NO SMOKING signs are off. The low tone chime sounds when the lights turn off (depending on the CIDS/CAM programming).

Note: If the cabin altitude goes above 11 300 ft ($\pm$ 350 ft), the cabin illuminates (depending on the CIDS/CAM programming) and the NO SMOKING, FASTEN SEAT BELT, EXIT signs come on, regardless of the SEAT BELTS and NO SMOKING selector switches.

MEMO DISPLAY

Applicable to: ALL

- Displays “LDG LT” in green, if one landing light is extended.
- Displays “STROBE LT OFF” in green, if the STROBE switch is OFF in flight.
- Displays “SEAT BELTS” and “NO SMOKING” messages in green, when the corresponding sign is on.

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A319/A320
FLIGHT CREW OPERATING MANUAL

NAVIGATION
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GENERAL

Applicable to: MSN 2037-3555

The Air Data and Inertial Reference System (ADIRS) supplies temperature, anemometric, barometric and inertial parameters to the EFIS system (PFD and ND) and to other user systems (FMGC, FADEC, ELAC, SEC, FAC, FWC, SFCC, ATC, GPWS, CFDIU, CPC).

The system includes:

- Three identical ADIRU's (Air Data and Inertial Reference Units).

Each ADIRU is divided in two parts, either of which can work separately in case of failure in the other:

- The ADR part (Air Data Reference) which supplies barometric altitude, airspeed, mach, angle of attack, temperature and overspeed warnings.
- The IR part (Inertial Reference) which supplies attitude, flight path vector, track, heading, accelerations, angular rates, ground speed and aircraft position.

Note: Above 73 ° North and above 60 ° South, the ADIRU gives true heading instead of magnetic heading.

- One ADIRS control panel (ADIRS CDU) on the overhead panel for selection of modes (NAV, ATT, OFF) and indications of failures.

The IR is normally initialized through the FMGS, but the ADIRS CDU may be used as a back up.

- Two GPS receivers, which are connected to the IR part of the ADIRU's for GP/IR hybrid position calculation.
- Four types of sensors:
 - Pitot probes (3)
 - Static pressure probes (STAT) (6)
 - Angle of attack sensors (AOA) (3)
 - Total air temperature probes (TAT) (2)

These sensors are electrically heated to prevent from icing up.

- Eight ADMs (Air Data Modules) which convert pneumatic data from PITOT and STAT probes into numerical data for the ADIRUs.
- A switching facility for selecting ADR 3 or IR 3 for instrument displays in case of ADIRU 1 or 2 failure.

GENERAL

Applicable to: MSN 3569-4591, 4636, 4646, 4676-4680, 4708, 4721-4740, 4749, 5019-5319

The Air Data and Inertial Reference System (ADIRS) supplies temperature, anemometric, barometric and inertial parameters to the EFIS system (PFD and ND) and to other user systems (FMGC, FADEC, ELAC, SEC, FAC, FWC, SFCC, ATC, GPWS, CFDIU, CPC).

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Note: Above 73 ° North and above 60 ° South, the ADIRU gives true heading instead of magnetic heading.

- One ADIRS control panel (ADIRS MSU) on the overhead panel for selection of modes (NAV, ATT, OFF).

The IR is initialized with the FMGS.

- Two GPS receivers, which are connected to the IR part of the ADIRU's for GP/IR hybrid position calculation.
- Four types of sensors:
 - Pitot probes (3)
 - Static pressure probes (STAT) (6)
 - Angle of attack sensors (AOA) (3)
 - Total air temperature probes (TAT) (2)

These sensors are electrically heated to prevent from icing up.

- Eight ADMs (Air Data Modules) which convert pneumatic data from PITOT and STAT probes into numerical data for the ADIRUs.
- A switching facility for selecting ADR 3 or IR 3 for instrument displays in case of ADIRU 1 or 2 failure.

GENERAL

Applicable to: MSN 4624-4635, 4640, 4667, 4693-4705, 4717, 4744, 4778-4837

The Air Data and Inertial Reference System (ADIRS) supplies temperature, anemometric, barometric and inertial parameters to the EFIS system (PFD and ND) and to other user systems (FMGC, FADEC, ELAC, SEC, FAC, FWC, SFCC, ATC, GPWS, CFDIU, CPC).

The system includes:

- Three identical ADIRU's (Air Data and Inertial Reference Units).

Each ADIRU is divided in two parts, either of which can work separately in case of failure in the other:

- The ADR part (Air Data Reference) which supplies barometric altitude, airspeed, mach, angle of attack, temperature and overspeed warnings.
- The IR part (Inertial Reference) which supplies attitude, flight path vector, track, heading, accelerations, angular rates, ground speed and aircraft position.

Note: The ADIRU gives true heading instead of magnetic heading:

- Above 82 ° North
- Above 73 ° North between 90 ° and 120 ° West (magnetic polar region)
- Above 60 ° South

- One ADIRS control panel (ADIRS MSU) on the overhead panel for selection of modes (NAV, ATT, OFF).

The IR is initialized with the FMGS.

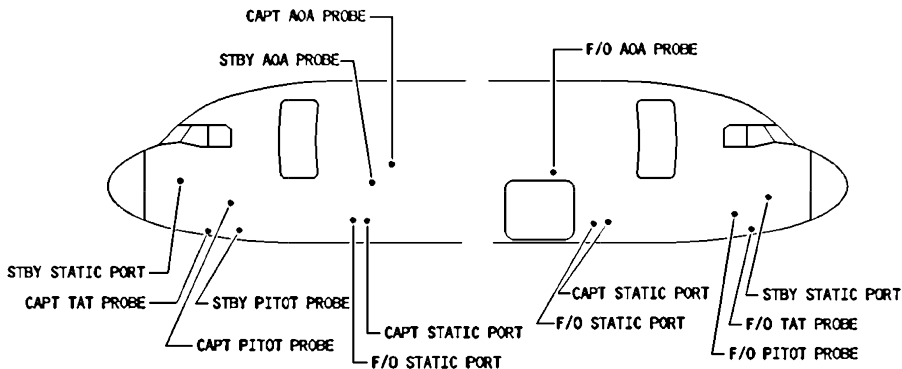
- Two GPS receivers, which are connected to the IR part of the ADIRU's for GP/IR hybrid position calculation.
- Four types of sensors:
 - Pitot probes (3)
 - Static pressure probes (STAT) (6)
 - Angle of attack sensors (AOA) (3)
 - Total air temperature probes (TAT) (2)

These sensors are electrically heated to prevent from icing up.

- Eight ADMs (Air Data Modules) which convert pneumatic data from PITOT and STAT probes into numerical data for the ADIRUs.
- A switching facility for selecting ADR 3 or IR 3 for instrument displays in case of ADIRU 1 or 2 failure.

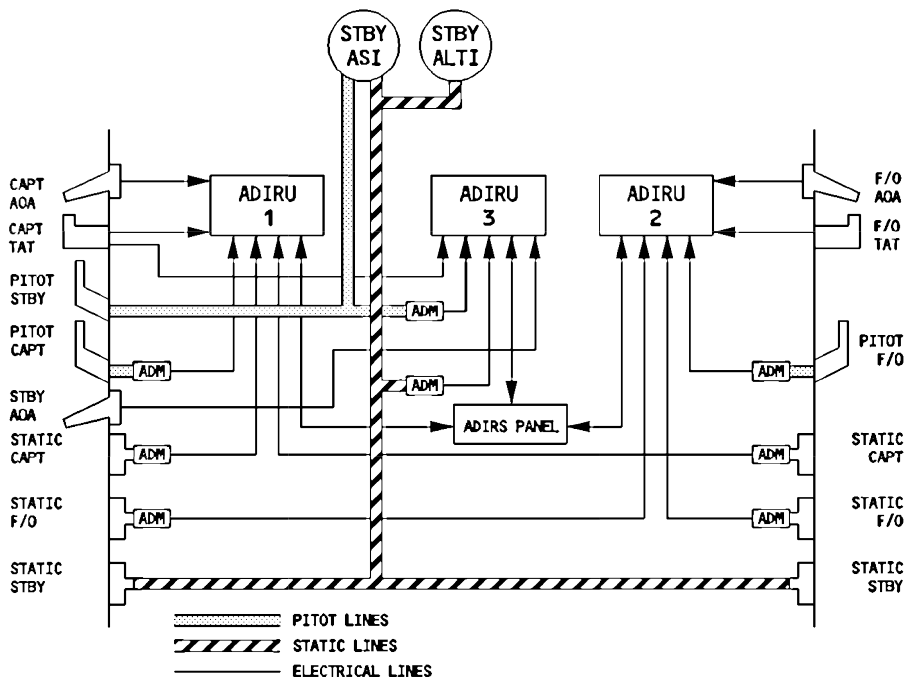
PROBES LOCATION

Applicable to: ALL



PROBES SCHEMATIC

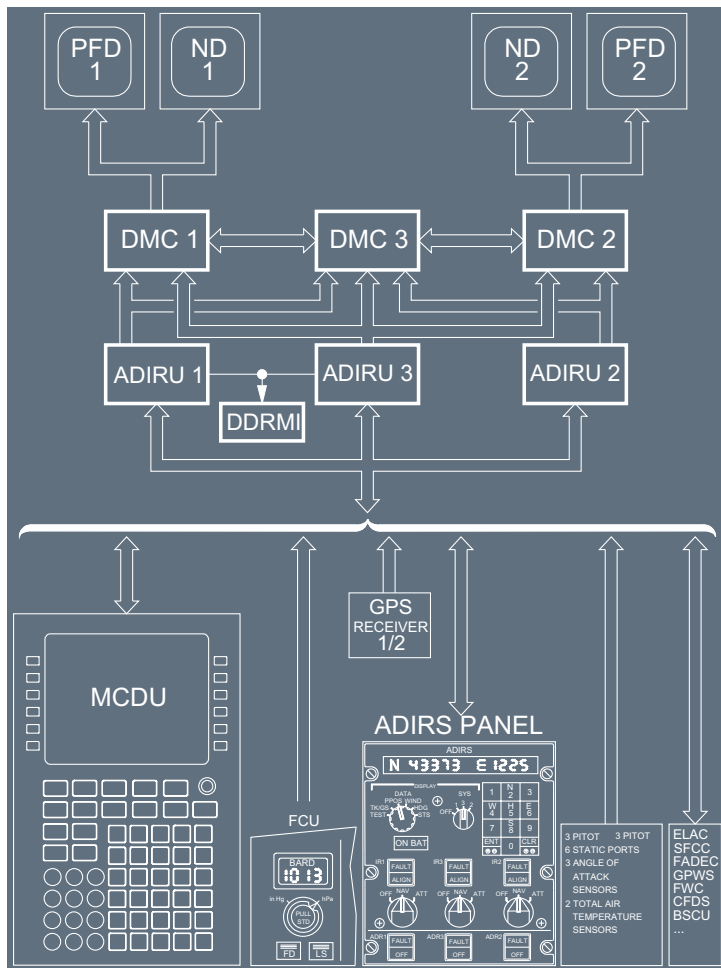
Applicable to: ALL



Note: ADIRU (1) is supplied by CAPT probes,
ADIRU (2) is supplied by F/O probes,
ADIRU (3) is supplied by STBY probes and CAPT TAT.

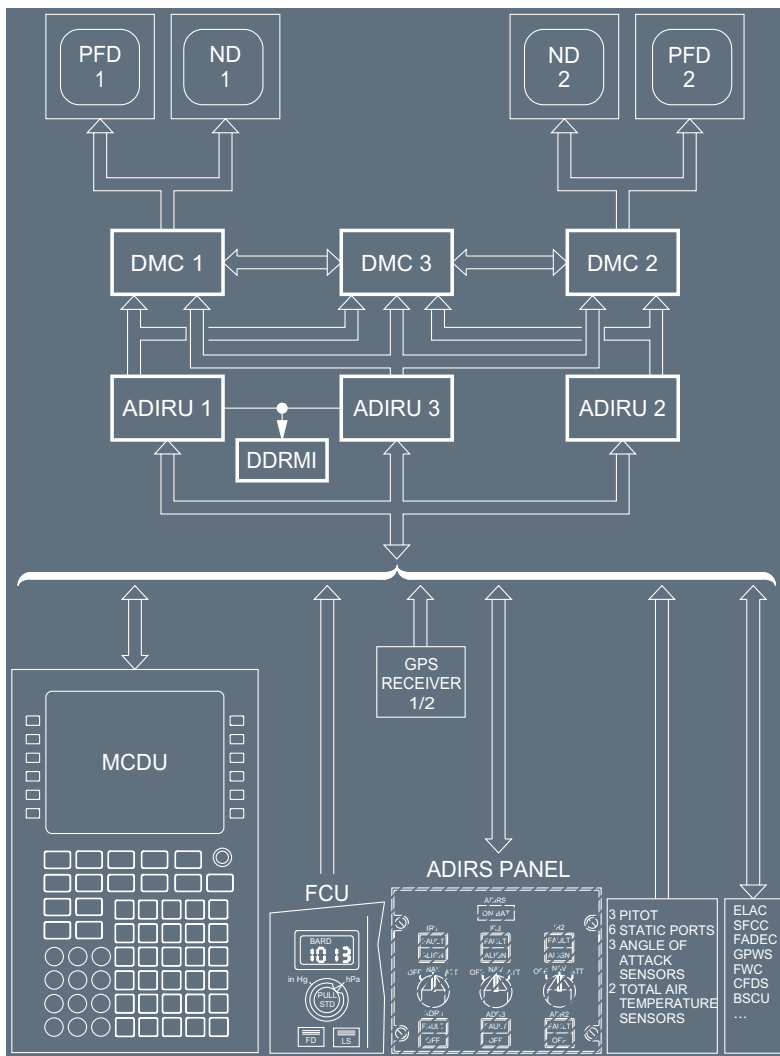
ADIRS SCHEMATIC

Applicable to: MSN 2037-3555



ADIRS SCHEMATIC

Applicable to: MSN 3569-5187

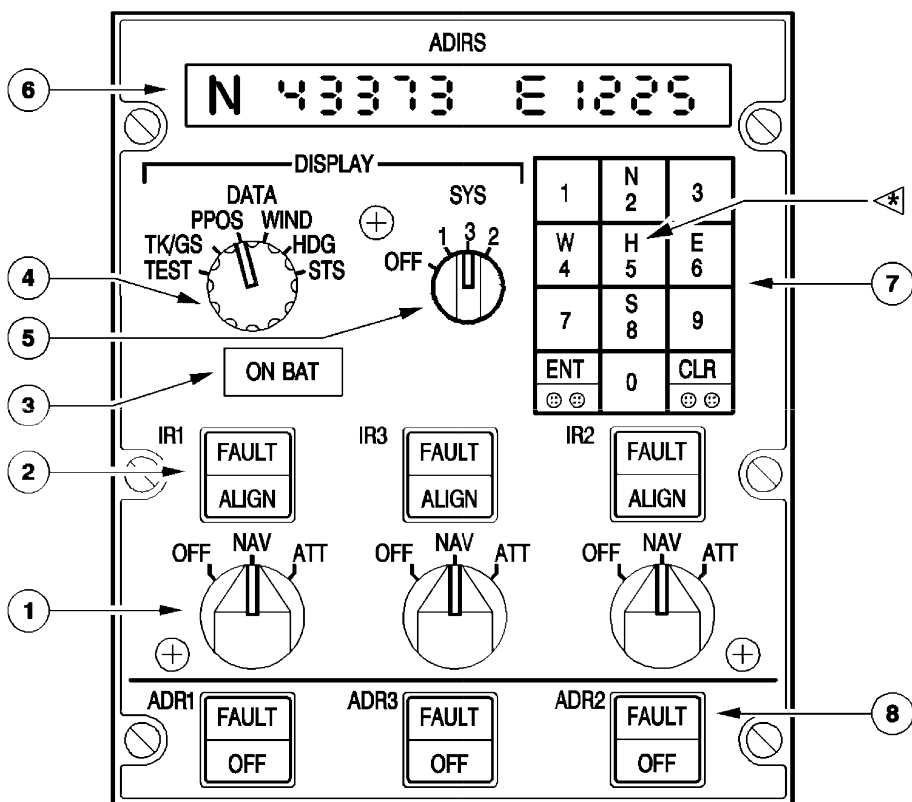


OVERHEAD PANEL

Applicable to: MSN 2037-3555

The ADIRS CDU on the overhead panel provides the controls and indicators to permit:

- Selection of power supplies to the ADR and IR systems
- Selection and display of navigation data
- Manual initialization (normally performed through the FMGC)
- Status and fault indication of IRs or ADRs.



(1) IR 1(2)(3) Mode rotary sel

OFF : The ADIRU is not energized. ADR and IR data are not available.

Continued on the next page

NAV : Normal mode of operation. Supplies full inertial data to aircraft systems.

ATT : IR mode supplying only attitude and heading information, if the system loses its ability to navigate.

The heading must be entered through the CDU keyboard and has to be reset frequently (about every 10 min)

(2) IR 1 (2) (3) It

FAUL : Comes on amber associated with an ECAM caution when a fault affects the respective T IR.

Steady : The respective IR is lost.

Flashing : The attitude and heading information may be recovered in ATT mode.

ALIG : Steady : The respective IR is operating normally in align mode.

N Flashing if : IR alignment fault, or no present position entry after 10 min, or difference between position at shutdown and entered position exceeds 1 ° of latitude or longitude.

Extinguished : Alignment has been completed.

(3) ON BAT It

Comes on amber when one or more IRs is supplied only by the A/C battery. It also comes on for a few sec at the beginning of the alignment, but not for a fast realignment.

Note: If, when the aircraft is on the ground, at least one ADIRU is supplied by aircraft batteries:

- An external horn sounds
- The ADIRU and AVNCS light comes on amber on the EXTERNAL POWER panel.

(4) DATA selector knob

This knob selects the information to be displayed in the ADIRS display window.

TEST The ENT and CLR buttons on the keyboard come on, and the display shows all 8's.

TK/G The display shows true track and ground speed.

S

PPOS The display shows present latitude and longitude

WIND The display shows true wind direction and speed.

HDG The display shows true heading and the minutes remaining until alignment is completed.

STS The display shows an action code.

(5) SYS selector knob

OFF : The CDU display is not energized. ADIRS are still energized if the associated IR mode rotary selectors are not at OFF.

Continued on the next page

1.2.3 : System selected for data display.

(6) Display

The display presents the data selected by the DATA selector.

A keyboard entry overrides the selected display.

(7) Keyboard

The flight crew can use the keyboard to enter the present position, or the heading in ATT mode, into the selected system.

Letter keys : Used to enter N, S, E, or W for position, or entering H  for heading (ATT mode).

Number keys : Used to enter the present position (or the present magnetic heading in ATT mode).

CLR key : The integral cue light comes on after an entry operation, if the data has an unreasonable value.
Pressing this key clears the data display, that has been keyed in but not yet entered.

ENT Key : The integral cue light comes on when a crew member has keyed in a number for N, S, W, E or H .
Pressing the key enters data into the ADIRS.

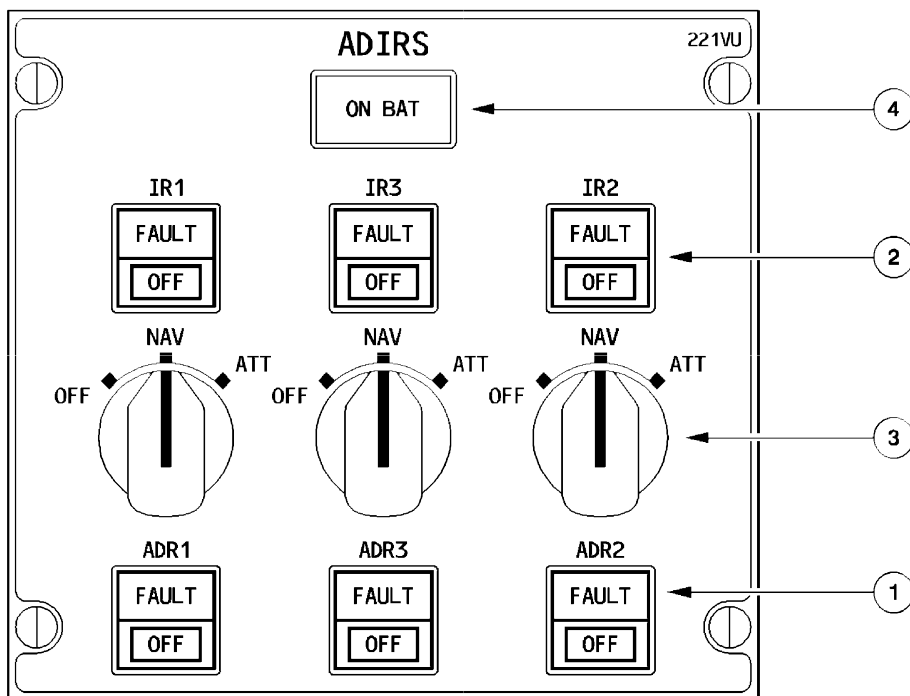
(8) ADR 1 (2) (3) pb (momentary action)

OFF Air data output disconnected.

FAUL This amber light comes on with an ECAM caution, if a fault is detected in the air data
T reference part.

OVERHEAD PANEL

Applicable to: MSN 3569-5319



(1) ADR 1 (2) (3) pushbutton

OFF : Air data output disconnected.

FAULT light : This amber light comes on with an ECAM caution if a fault is detected in the air data reference part.

(2) IR 1 (2) (3) pushbutton

OFF : Inertial data output disconnected.

Continued on the next page

FAULT light : This amber light comes on with an ECAM caution when a fault affects the respective IR.

Steady : The respective IR is lost.

Flashing : The attitude and heading information may be recovered in ATT mode.

(3) IR 1 (2) (3) mode rotary selector

OFF : The ADIRU is not energized.

ADR and IR data are not available.

NAV : Normal mode of operation.

Supplies full inertial data to aircraft systems.

ATT : IR mode supplying only attitude and heading information if the system loses its ability to navigate.

The heading must be entered through the MCDU and has to be reset frequently (about every 10 min).

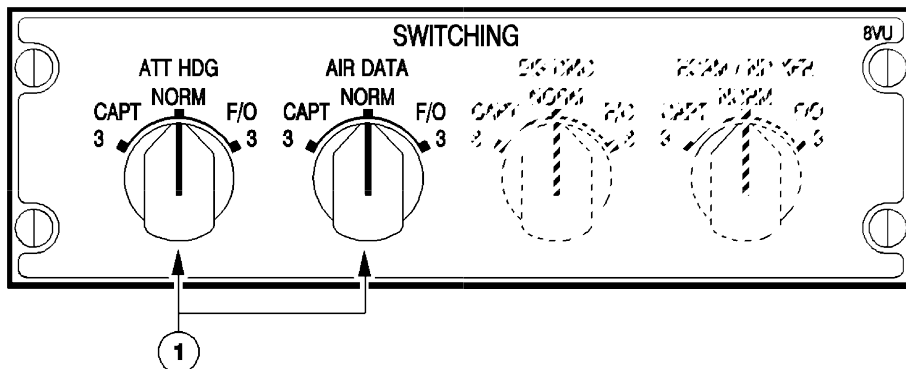
(4) ON BAT light

The ON BAT light come on in amber when the aircraft battery supplies at least one IRS. The ON BAT light also comes on for a few seconds at the beginning of a complete IRS alignment.

Its does not come on in the case of a fast alignment.

PEDESTAL

Applicable to: ALL



(1) ATT HDG and AIR DATA sel

NORM : ADIRU 1 supplies data to PFD 1, ND 1, RMI and VOR/DME.

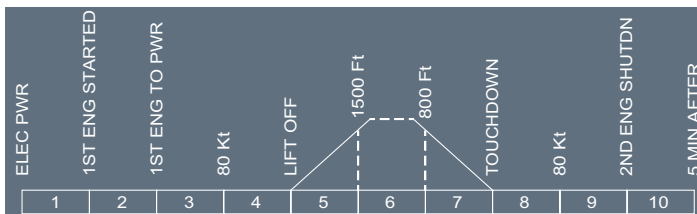
ADIRU 2 supplies data to PFD 2, and ND2.

CAPT 3 : ADR 3 or IR 3 replaces ADR 1 or IR 1.

F/O 3 : ADR 3 or IR 3 replaces ADR 2 or IR 2.

WARNINGS AND CAUTIONS

Applicable to: MSN 3411-3555



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
STALL WARNING (No ECAM message) An aural stall warning is triggered when the AOA is greater than a predetermined angle This angle depends on the: - Slats/Flap position - Speed/Mach - F/CTL law (normal, alternate/direct)	CRICKET + STALL (SYNTHETIC VOICE)				GND
OVERSPEED - VMO/MMO Aircraft speed/mach greater than VMO + 4 kt/MMO + 0.006 - VLE Aircraft speed greater than VLE + 4 kt, with L/G not unlocked, or L/G doors not closed - VFE Aircraft speed greater than VFE + 4 kt, with slats or/and flaps extended	CRC	MASTER WARN	NIL	NIL	2, 3, 4, 8, 9, 10
ADR 1 (2) FAULT					1, 4, 8, 10
ADR 3 FAULT	SINGLE CHIME	MASTER CAUT		ADR FAULT It	1, 4, 5, 7, 8, 10
ADR (1+2) (1+3) (2+3) FAULT					1, 4, 8, 10

Continued on the next page

 A319/A320 FLIGHT CREW OPERATING MANUAL	DSC – AIRCRAFT SYSTEMS DSC-34 – NAVIGATION DSC-34-10 – ADIRS DSC-34-10-30 – Warnings and Cautions
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E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
IR 1 (2) FAULT	SINGLE CHIME	MASTER CAUT	NIL	IR FAULT It	4, 5, 7, 8
IR 3 FAULT					4, 5, 7, 8
IR (1+3) (2+3) FAULT					4, 8
IR 1+2 FAULT					
HDG DISCREPANCY Difference between the heading on CAPT and F/O displays is greater than 5 °.				CHECK HDG (on PFD and ND)	4, 8
ATT DISCREPANCY Difference between roll or pitch angle, displayed on the CAPT and F/O PFD greater than 5 °.				CHECK ATT (on PFD)	3, 4, 8
ALTI DISCREPANCY Difference between the altitude displayed on the CAPT and F/O PFD is greater than: - 500 ft, if BARO ref STD is selected - 250 ft, if QNH (or QFE) is selected				CHECK ALT (on PFD)	
ADR DISAGREE One ADR is faulty or has been rejected by the ELAC and there is a speed or angle-of-attack disagree between the two remaining ADR.				FAULT Its on ELAC pbs	
IR DISAGREE Disagree between two IR, with the third one failed.				PFD message	

MEMO DISPLAY

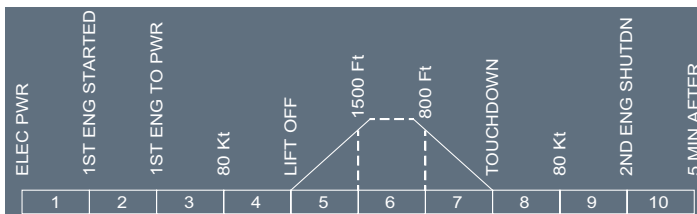
- This displays "IRS IN ALIGN X MN" during phase 1 or 2, if:
 - At least one active IRS is in ALIGN submode
 - The time remaining until NAV mode is obtained, is X minutes ($1 < x < 10$).
- "IRS IN ALIGN" appears if one of the 3 IRS is still in alignment

These two messages are displayed:

- In green, if both engines are stopped
- In amber, if one engine is running.

WARNINGS AND CAUTIONS

Applicable to: MSN 3569-4006



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SDPAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
STALL WARNING (No ECAM message) An aural stall warning is triggered when the AOA is greater than a predetermined angle This angle depends on the: - Slats/Flap position - Speed/Mach - F/CTL law (normal, alternate/direct)	CRICKET + STALL (SYNTHETIC VOICE)				GND
OVERSPEED - VMO/MMO Aircraft speed/mach greater than VMO + 4 kt/MMO + 0.006 - VLE Aircraft speed greater than VLE + 4 kt, with L/G not unlocked, or L/G doors not closed - VFE Aircraft speed greater than VFE + 4 kt, with slats or/and flaps extended	CRC	MASTER WARN	NIL	NIL	2, 3, 4, 8, 9, 10
ADR 1 (2) FAULT	SINGLE CHIME	MASTER CAUT		ADR FAULT It	1, 4, 8, 10
ADR 3 FAULT					1, 4, 5, 7, 8, 10
ADR (1+2) (1+3) (2+3) FAULT					1, 4, 8, 10

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
IR 1 (2) FAULT	SINGLE CHIME	MASTER CAUT	NIL	IR FAULT It	4, 5, 7, 8
IR 3 FAULT					4, 5, 7, 8
IR (1+3) (2+3) FAULT					4, 8
IR 1+2 FAULT					
HDG DISCREPANCY Difference between the heading on CAPT and F/O displays is greater than 5 °.	SINGLE CHIME	MASTER CAUT		CHECK HDG (on PFD and ND)	4, 8
ATT DISCREPANCY Difference between roll or pitch angle, displayed on the CAPT and F/O PFD greater than 5 °.				CHECK ATT (on PFD)	3, 4, 8
ALTI DISCREPANCY Difference between the altitude displayed on the CAPT and F/O PFD is greater than: - 500 ft, if BARO ref STD is selected - 250 ft, if QNH (or QFE) is selected				CHECK ALT (on PFD)	
IAS DISCREPANCY Caution activated when there is a discrepancy between the speeds displayed on the PFDs.				NIL	
ADR DISAGREE One ADR is faulty, or has been rejected by the ELAC, and there is a speed or angle-of-attack disagree between the two remaining ADR.				FAULT Its on ELAC pbs	3, 4, 5, 7
IR DISAGREE Disagree between two IR, with the third one failed.				PFD message	
IR NOT ALIGNED Problem detected during IR alignment				NIL	1

MEMO DISPLAY

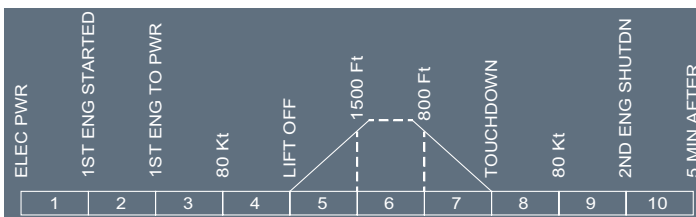
- "IRS IN ALIGN X MN" memo appears during phase 1 or 2, during IRS alignment. X MN indicates the number of minutes remaining ($1 < X < 10$), until NAV mode is reached.

Continued on the next page

- Before any engine is started, “IRS IN ALIGN X MN” memo:
 - Appears in green when at least one active IRS is being aligned,
 - Pulses in green if the alignment of one IRS is faulty.
- When one engine is started, “IRS IN ALIGN X MN” memo appears in amber during IRS alignment. If the alignment of one IRS is faulty, “IRS IN ALIGN X MN” memo is replaced by the “IR NOT ALIGNED” ECAM caution.
- “IR IN ATT ALIGN” appears in green during the IR alignment in Attitude mode.

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-3184



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SDPAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
STALL WARNING (No ECAM message) An aural stall warning is triggered when the AOA is greater than a predetermined angle This angle depends on the: - Slats/Flap position - Speed/Mach - F/CTL law (normal, alternate/direct)	CRICKET + STALL (SYNTHETIC VOICE)	MASTER WARN	NIL	NIL	GND

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
OVERSPEED - VMO/MMO Aircraft speed/mach greater than VMO + 4 kt/MMO + 0.006 - VLE Aircraft speed greater than VLE + 4 kt, with L/G not unlocked, or L/G doors not closed - VFE Aircraft speed greater than VFE + 4 kt, with slats or/and flaps extended	CRC	MASTER WARN	NIL	NIL	2, 3, 4, 8, 9, 10
ADR 1 (2) FAULT	SINGLE CHIME	MASTER CAUT		ADR FAULT lt	1, 4, 8, 10
ADR 3 FAULT					1, 4, 5, 7, 8, 10
ADR (1+2) (1+3) (2+3) FAULT					1, 4, 8, 10
IR 1 (2) FAULT				IR FAULT lt	4, 5, 7, 8
IR 3 FAULT					4, 5, 7, 8
IR (1+3) (2+3) FAULT					4, 8
IR 1+2 FAULT					
CAPT (F/O) (STBY) AOA FAULT	NIL	NIL		NIL	2 to 9
HDG DISCREPANCY Difference between the heading on CAPT and F/O displays is greater than 5 °.	SINGLE CHIME	MASTER CAUT		CHECK HDG (on PFD and ND)	4, 8
ATT DISCREPANCY Difference between roll or pitch angle, displayed on the CAPT and F/O PFD greater than 5 °.				CHECK ATT (on PFD)	3, 4, 8

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SDPAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
ALTI DISCREPANCY Difference between the altitude displayed on the CAPT and F/O PFD is greater than: - 500 ft, if BARO ref STD is selected - 250 ft, if QNH (or QFE) is selected	SINGLE CHIME	MASTER CAUT	NIL	CHECK ALT (on PFD)	3, 4, 8
IAS DISCREPANCY Caution activated when there is a discrepancy between the speeds displayed on the PFDs.				NIL	4, 5, 7, 8
ADR DISAGREE One ADR is faulty, or has been rejected by the ELAC, and there is a speed or angle-of-attack disagree between the two remaining ADRs.				FAULT Its on ELAC pbs	3, 4, 5, 7
IR DISAGREE Disagree between two IRs, with the third one failed.				PFD message	

MEMO DISPLAY

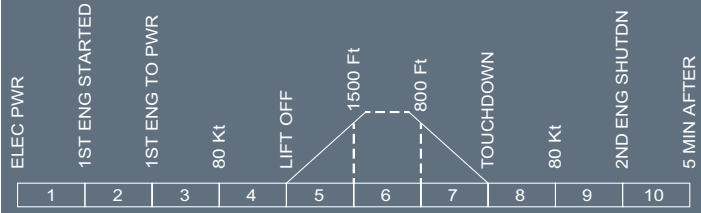
- This displays "IRS IN ALIGN X MN" during phase 1 or 2, if:
 - At least one active IRS is in ALIGN submode
 - The time remaining until NAV mode is obtained, is X minutes ($1 < x < 10$).
- "IRS IN ALIGN" appears if one of the 3 IRS is still in alignment

These two messages are displayed:

- In green, if both engines are stopped
- In amber, if one engine is running.

WARNINGS AND CAUTIONS

Applicable to: MSN 5289-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
STALL WARNING (No ECAM message) An aural stall warning is triggered when the AOA is greater than a predetermined angle This angle depends on the: - Slats/Flap position - Speed/Mach - F/CTL law (normal, alternate/direct)	CRICKET + STALL (SYNTHETIC VOICE)	MASTER WARN	NIL	NIL	GND
OVERSPEED - VMO/MMO Aircraft speed/mach greater than VMO + 4 kt/MMO + 0.006 - VLE Aircraft speed greater than VLE + 4 kt, with L/G not uplocked, or L/G doors not closed - VFE Aircraft speed greater than VFE + 4 kt, with slats or/and flaps extended	CRC				2, 3, 4, 8, 9, 10
ADR 1 (2) FAULT	SINGLE CHIME	MASTER CAUT		ADR FAULT lt	1, 4, 8, 10
ADR 3 FAULT			1, 4, 5, 7, 8, 10		
ADR (1+2) (1+3) (2+3) FAULT			1, 4, 8, 10		

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
ADR 1+2+3 FAULT	CRC	MASTER WARN	NIL	NIL	1, 4, 8, 10
IR 1 (2) FAULT	SINGLE CHIME	MASTER CAUT		IR FAULT It	4, 5, 7, 8
IR 3 FAULT					4, 5, 7, 8
IR (1+3) (2+3) FAULT					4, 8
IR 1+2 FAULT					
CAPT (F/O) (STBY) AOA FAULT	NIL	NIL		NIL	2 to 9
HDG DISCREPANCY Difference between the heading on CAPT and F/O displays is greater than 5 °.	SINGLE CHIME	MASTER CAUT		CHECK HDG (on PFD and ND)	4, 8
ATT DISCREPANCY Difference between roll or pitch angle, displayed on the CAPT and F/O PFD greater than 5 °.				CHECK ATT (on PFD)	3, 4, 8
ALTI DISCREPANCY Difference between the altitude displayed on the CAPT and F/O PFD is greater than: - 500 ft, if BARO ref STD is selected - 250 ft, if QNH (or QFE) is selected				CHECK ALT (on PFD)	
ADR DISAGREE One ADR is faulty or has been rejected by the ELAC and there is a speed or angle-of-attack disagree between the two remaining ADR.				FAULT Its on ELAC pbs	3, 4, 5, 7
IR DISAGREE Disagree between two IR, with the third one failed.				PFD message	
IR NOT ALIGNED Problem detected during IR alignment				NIL	1, 4, 5, 6, 7, 8, 10

MEMO DISPLAY

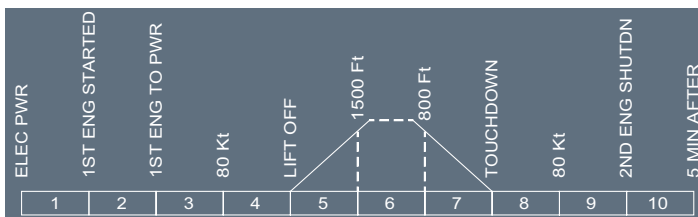
- "IRS IN ALIGN X MN" memo appears during phase 1 or 2, during IRS alignment. X MN indicates the number of minutes remaining ($1 < X < 10$), until NAV mode is reached.

Continued on the next page

- Before any engine is started, “IRS IN ALIGN X MN” memo:
 - Appears in green when at least one active IRS is being aligned,
 - Pulses in green if the alignment of one IRS is faulty.
- When one engine is started, “IRS IN ALIGN X MN” memo appears in amber during IRS alignment. If the alignment of one IRS is faulty, “IRS IN ALIGN X MN” memo is replaced by the “IR NOT ALIGNED” ECAM caution.
- “IR IN ATT ALIGN” appears in green during the IR alignment in Attitude mode.

WARNINGS AND CAUTIONS

Applicable to: MSN 4040-4132



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SDPAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
STALL WARNING (No ECAM message) An aural stall warning is triggered when the AOA is greater than a predetermined angle This angle depends on the: - Slats/Flap position - Speed/Mach - F/CTL law (normal, alternate/direct)	CRICKET + STALL (SYNTHETIC VOICE)	MASTER WARN	NIL	NIL	GND

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
OVERSPEED - VMO/MMO Aircraft speed/mach greater than VMO + 4 kt/MMO + 0.006 - VLE Aircraft speed greater than VLE + 4 kt, with L/G not unlocked, or L/G doors not closed - VFE Aircraft speed greater than VFE + 4 kt, with slats or/and flaps extended	CRC	MASTER WARN	NIL	NIL	2, 3, 4, 8, 9, 10
ADR 1 (2) FAULT	SINGLE CHIME	MASTER CAUT		ADR FAULT It	1, 4, 8, 10
ADR 3 FAULT					1, 4, 5, 7, 8, 10
ADR (1+2) (1+3) (2+3) FAULT					1, 4, 8, 10
IR 1 (2) FAULT				IR FAULT It	4, 5, 7, 8
IR 3 FAULT					4, 5, 7, 8
IR (1+3) (2+3) FAULT					4, 8
IR 1+2 FAULT					
CAPT (F/O) (STBY) AOA FAULT	NIL	NIL		NIL	2 to 9
HDG DISCREPANCY Difference between the heading on CAPT and F/O displays is greater than 5 °.	SINGLE CHIME	MASTER CAUT		CHECK HDG (on PFD and ND)	4, 8
ATT DISCREPANCY Difference between roll or pitch angle, displayed on the CAPT and F/O PFD greater than 5 °.				CHECK ATT (on PFD)	3, 4, 8

Continued on the next page

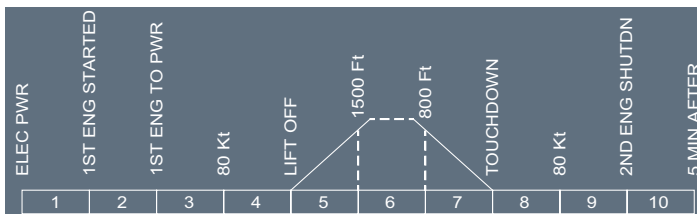
E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
ALTI DISCREPANCY Difference between the altitude displayed on the CAPT and F/O PFD is greater than: - 500 ft, if BARO ref STD is selected - 250 ft, if QNH (or QFE) is selected	SINGLE CHIME	MASTER CAUT	NIL	CHECK ALT (on PFD)	3, 4, 8
IAS DISCREPANCY Caution activated when there is a discrepancy between the speeds displayed on the PFDs.				NIL	4, 5, 7, 8
ADR DISAGREE One ADR is faulty, or has been rejected by the ELAC, and there is a speed or angle-of-attack disagree between the two remaining ADR.				FAULT Its on ELAC pbs	3, 4, 5, 7
IR DISAGREE Disagree between two IR, with the third one failed.				PFD message	
IR NOT ALIGNED Problem detected during IR alignment				NIL	1, 4, 5, 6, 7, 8, 10

MEMO DISPLAY

- "IRS IN ALIGN X MN" memo appears during phase 1 or 2, during IRS alignment. X MN indicates the number of minutes remaining ($1 < X < 10$), until NAV mode is reached.
 - Before any engine is started, "IRS IN ALIGN X MN" memo:
 - Appears in green when at least one active IRS is being aligned,
 - Pulses in green if the alignment of one IRS is faulty.
 - When one engine is started, "IRS IN ALIGN X MN" memo appears in amber during IRS alignment. If the alignment of one IRS is faulty, "IRS IN ALIGN X MN" memo is replaced by the "IR NOT ALIGNED" ECAM caution.
- "IR IN ATT ALIGN" appears in green during the IR alignment in Attitude mode.

WARNINGS AND CAUTIONS

Applicable to: MSN 4012-4034, 4157-5249



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SDPAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
STALL WARNING (No ECAM message) An aural stall warning is triggered when the AOA is greater than a predetermined angle This angle depends on the: - Slats/Flap position - Speed/Mach - F/CTL law (normal, alternate/direct)	CRICKET + STALL (SYNTHETIC VOICE)				GND
OVERSPEED - VMO/MMO Aircraft speed/mach greater than VMO + 4 kt/MMO + 0.006 - VLE Aircraft speed greater than VLE + 4 kt, with L/G not unlocked, or L/G doors not closed - VFE Aircraft speed greater than VFE + 4 kt, with slats or/and flaps extended	CRC	MASTER WARN	NIL	NIL	2, 3, 4, 8, 9, 10
ADR 1 (2) FAULT	SINGLE CHIME	MASTER CAUT		ADR FAULT It	1, 4, 8, 10
ADR 3 FAULT					1, 4, 5, 7, 8, 10
ADR (1+2) (1+3) (2+3) FAULT					1, 4, 8, 10

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNIN G	FLT PHASE INHIB
ADR 1+2+3 FAULT	CRC	MASTER WARN	NIL	NIL	1, 4, 8, 10
IR 1 (2) FAULT	SINGLE CHIME	MASTER CAUT		IR FAULT It	4, 5, 7, 8
IR 3 FAULT					4, 5, 7, 8
IR (1+3) (2+3) FAULT					4, 8
IR 1+2 FAULT				NIL	2 to 9
CAPT (F/O) (STBY) AOA FAULT	NIL	NIL			
HDG DISCREPANCY Difference between the heading on CAPT and F/O displays is greater than 5 °.	SINGLE CHIME	MASTER CAUT		CHECK HDG (on PFD and ND)	4, 8
ATT DISCREPANCY Difference between roll or pitch angle, displayed on the CAPT and F/O PFD greater than 5 °.				CHECK ATT (on PFD)	3, 4, 8
ALTI DISCREPANCY Difference between the altitude displayed on the CAPT and F/O PFD is greater than: - 500 ft, if BARO ref STD is selected - 250 ft, if QNH (or QFE) is selected				CHECK ALT (on PFD)	
IAS DISCREPANCY Caution activated when there is a discrepancy between the speeds displayed on the PFDs.				NIL	4, 5, 7, 8
ADR DISAGREE One ADR is faulty, or has been rejected by the ELAC, and there is a speed or angle-of-attack disagree between the two remaining ADR.				FAULT Its on ELAC pbs	3, 4, 5, 7
IR DISAGREE Disagree between two IR, with the third one failed.				PFD message	
IR NOT ALIGNED Problem detected during IR alignment	SINGLE CHIME	MASTER CAUT	NIL	NIL	1, 4, 5, 6, 7, 8, 10

Continued on the next page

MEMO DISPLAY

- "IRS IN ALIGN X MN" memo appears during phase 1 or 2, during IRS alignment. X MN indicates the number of minutes remaining ($1 < X < 10$), until NAV mode is reached.
- Before any engine is started, "IRS IN ALIGN X MN" memo:
 - Appears in green when at least one active IRS is being aligned,
 - Pulses in green if the alignment of one IRS is faulty.
- When one engine is started, "IRS IN ALIGN X MN" memo appears in amber during IRS alignment. If the alignment of one IRS is faulty, "IRS IN ALIGN X MN" memo is replaced by the "IR NOT ALIGNED" ECAM caution.
- "IR IN ATT ALIGN" appears in green during the IR alignment in Attitude mode.



A319/A320
FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-10 – ADIRS

DSC-34-10-30 – Warnings and Cautions

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BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
ADIRU	ADIRU 1			X		HOT 2 ⁽¹⁾
	AOA RESOLVER 1			X		
	ADIRU 2	AC2				HOT 2 ⁽²⁾ during 5 min
	AOA RESOLVER 2	AC2				
	ADIRU 3	AC1				HOT 1 ⁽³⁾
	AOA RESOLVER 3	AC1				

(1) Backup supply.

(2) Backup supply for 5 min.

(3) Backup supply, when ATT HDG is in the CAPT 3 position.

Backup supply for 5 min, when the ATT HDG is in the NORM or F/03 position.



A319/A320
FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-10 – ADIRS

DSC-34-10-40 – Electrical Supply

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DESCRIPTION

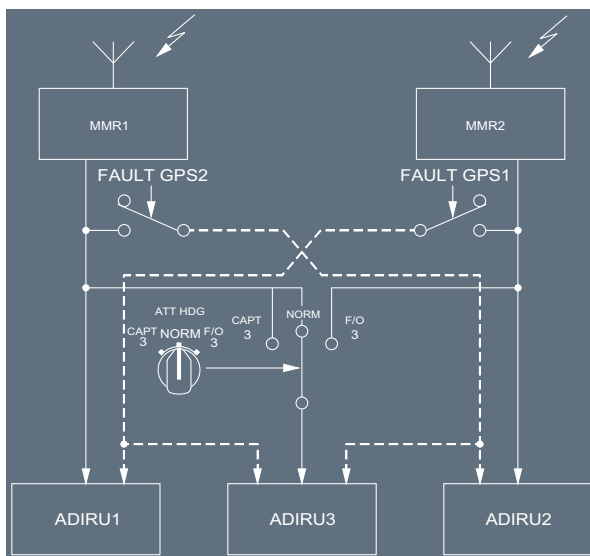
Applicable to: ALL

The Global Positioning System (GPS) is a satellite-based radio navigation aid.

Worldwide, 24 satellites broadcast accurate navigation data that aircraft can use for precise determination of its position.

The aircraft has two independent GPS receivers. Each GPS receiver is integrated in a modular avionics unit called MMR (Multi Mode Receiver) (GPS 1 receiver in MMR 1, GPS 2 receiver in MMR 2). The MMR processes the data received and transfers them to the ADIRUs, which then perform a GP-IRS hybrid position calculation. The FMGCs use the hybrid position. The GPS MONITOR page on MCDU 1 or MCDU 2 can display pure GPS position, true track, ground speed, estimated position, accuracy level, and mode of operation for the information and use of the flight crew.

Note: Flight crew can use the MCDU NAVAID page to deselect the use of GPS data for calculating position (Refer to DSC-22_20-50-10-25 Selected NAVAIDS Page).



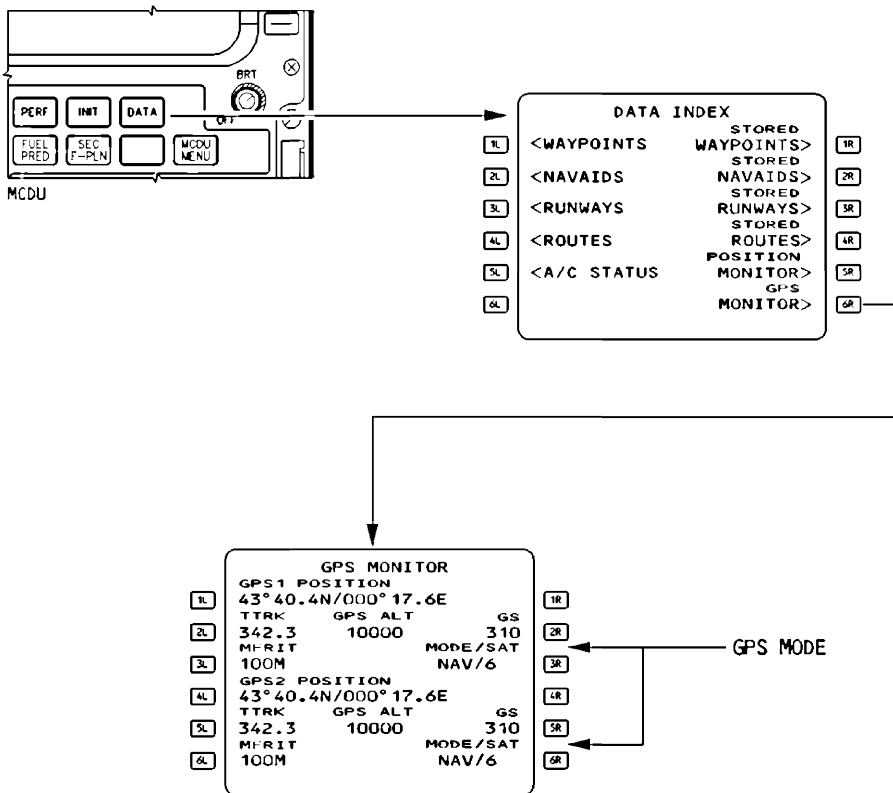
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NORMAL OPERATION

Applicable to: ALL

In normal operation, the GPS receiver 1 supplies ADIRU 1 and ADIRU 3, the GPS receiver 2 supplies ADIRU 2.

The MMR operates in different modes which are indicated on the GPS MONITOR page:



INITIALIZATION MODE (INIT)

When this mode is entered, the GPS hardware and software are initialized.

ACQUISITION MODE (ACQ)

The MMR enters in this mode after power-up or during long periods of lost satellite signal.

Continued on the next page

It remains in this mode until it is able to track at least 4 satellites, then transfers to NAV mode. To enter navigation mode more quickly, MMR uses initial position, time and altitude from IRS.

NAVIGATION MODE (NAV)

When the MMR can track 4 or more satellites, it enters NAV mode and continuously supplies data to the ADIRUs.

ALTITUDE AIDING (ALTAID)

If the MMR can track at least 4 satellites, it uses the GPS altitude and the IR altitude to calculate an altitude bias.

If the number of satellites drops to three, the altitude bias is frozen, and the MMR enters ALTAID mode, using the IR altitude (corrected with the bias).

FAULT MODE (FAULT)

The fault mode is entered when a failure, which may prevent the MMR from transmitting valid data, has been detected.

OPERATION IN CASE OF FAILURE**Applicable to: ALL**

If one GPS receiver fails, the three ADIRUs automatically select the only operative GPS receiver.

If ADIRU 1 fails, ADIRU 3 is supplied by MMR 1, and ADIRU 2 by MMR 2.

To maintain Side 1 and Side 2 segregation, in case ADIRU 2 fails, the ATT HDG selector has to be set to F/O 3, so that ADIRU 3 will be supplied with MMR 2 data.

If two ADIRUs fail, the remaining ADIRU is supplied by its own side GPS receiver.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

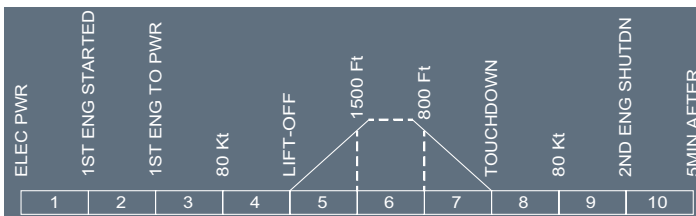
DSC-34-15 – GPS

DSC-34-15-30 – Operation in Case of Failure

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WARNINGS AND CAUTIONS

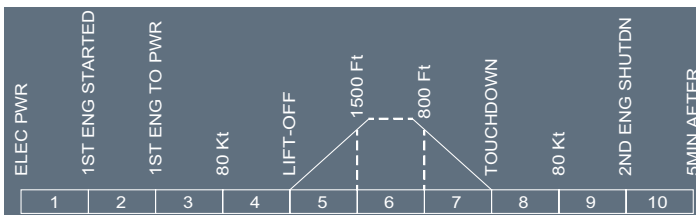
Applicable to: MSN 2265, 2370, 2387-2398, 2427, 2450, 3084, 4034, 4717-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
GPS 1 (2) FAULT	SINGLE CHIME	MASTER CAUTION	NIL	NIL	4, 5, 7, 8
FM/GPS POS DISAGREE					1, 3, 4, 10

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-2251, 2271-2360, 2378-2385, 2402-2420, 2436, 2463-3082, 3088-4014, 4040-4708



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
GPS 1 (2) FAULT	SINGLE CHIME	MASTER CAUTION	NIL	NIL	4, 5, 7, 8
FM/GPS POS DISAGREE					1, 3, 4, 10
GPS PRIMARY LOST (No ECAM warning)	TRIPLE CLICK During non ILS approach only	NIL			2, 3, 4, 5, 8, 9, 10



A319/A320
FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-15 – GPS

DSC-34-15-40 – Warnings and Cautions

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BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
NAVAIDS	MMR 1			X		
	MMR 2	AC 2				



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-15 – GPS

DSC-34-15-50 – Electrical Supply

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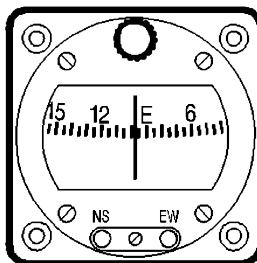
COMPASS

Applicable to: ALL

There is a compass located on top of the windshield center post.

The deviation card is located above the compass.

Note: Because of the location of the APU power on contactor in the cockpit, the APU start sequence may disturb the compass reading.



BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
STD BY INST	HORIZON				X	HOT 1 ⁽¹⁾
	ALTIMETER				SHED	
	COMPASS				X	

⁽¹⁾ Backup supply.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

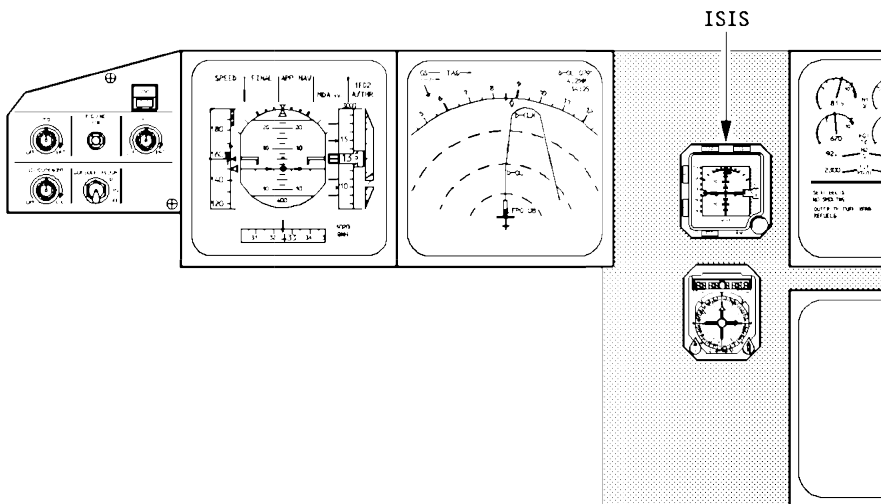
DSC-34-20 – Standby Instruments

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INTRODUCTION

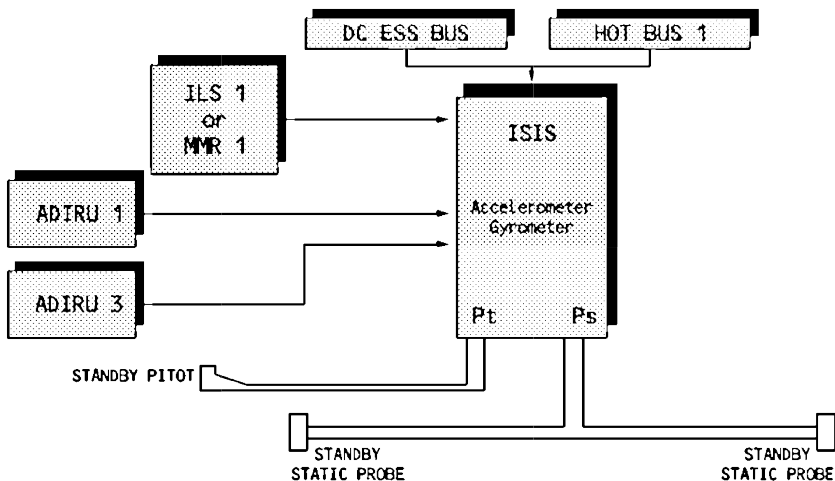
Applicable to: ALL

The Integrated Standby Instrument System (ISIS) provides a third source of information and display to the crew. It is mounted in the center of the instrument panel.



ARCHITECTURE

Applicable to: ALL



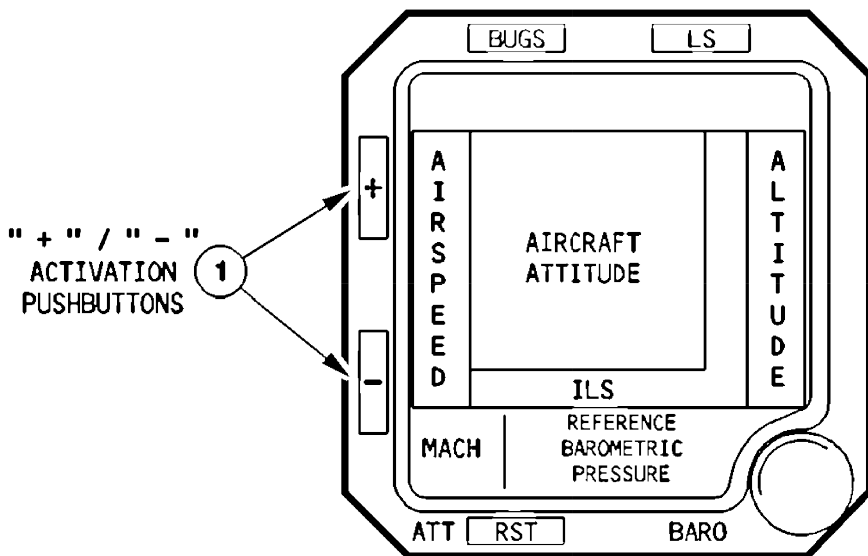
GENERAL

Applicable to: ALL

The ISIS system displays the following information:

- Attitude
- Airspeed and mach
- Altitude
- Barometric pressure
- LS function
- Bugs

Note: When leveling the wings after performing a small turn of a small bank angle, the displayed roll attitude may temporarily be incorrect by a few degrees.



(1) "+" / "-" activation pushbuttons

Two pushbuttons labelled "+" and "-" are used to adjust the level of brightness.

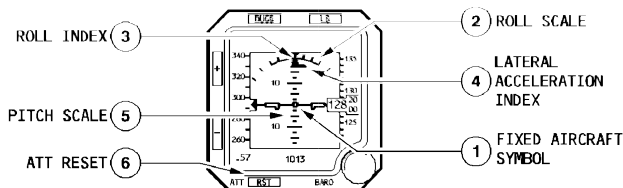
The brightness of the screen automatically adjusts after power-up tests.

This is because of the photosensitive cell located on the surface of the ISIS system display.

The "+" and "-" pushbuttons then allow this initial brightness to be manually adjusted and changed.

ATTITUDE

Applicable to: ALL



(1) Fixed aircraft symbol

The fixed aircraft symbol is in black, and outlined in yellow.

(2) Roll scale

The roll scale is in white.

The markers are at 0 (small yellow triangle), 10, 20, 30, 45, 60 ° of bank.

(3) Roll index

The roll index indicates the bank angle. It is in black, and outlined in white.

(4) Lateral acceleration index

Lateral acceleration index indicates the aircraft's lateral acceleration. It is represented by a trapezoidal index that moves beneath the roll index.

(5) Pitch scale

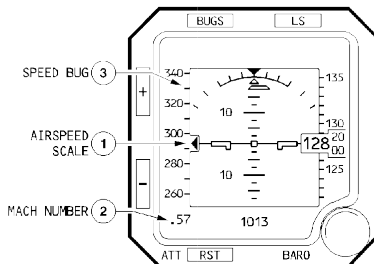
The pitch scale indicates the aircraft attitude, and it is in white. The scale has markers every 2.5 °, between 30 ° nose up and 30 ° nose down. If the pitch exceeds 30 °, large (V-shaped) red arrowheads indicate that the attitude is excessive. They also indicate the direction to follow, to resume normal attitude. The minimum displayed pitch scale is -17.5 ° +15 ° at 0 ° pitch.

(6) ATT RST pushbutton

Attitude indication is reset, by pressing “ATT RST” for at least 2 s. The aircraft must be level during this procedure. During the reset time (approx. 10 s), the “ATT 10 s” message is displayed on the screen. “ATT RST” is also used to realign the system, if excessive aircraft movement is detected during the alignment phase, or after 350 h of continuous electrical supply.

AIRSPEED

Applicable to: ALL



(1) Airspeed scale

A white scale moves in front of a yellow triangle indicating the airspeed. The scale ranges from 5 to 250 kt, with a mark every 5 kt, and from 250 to 520 kt, with a mark every 10 kt.

(2) Mach Number

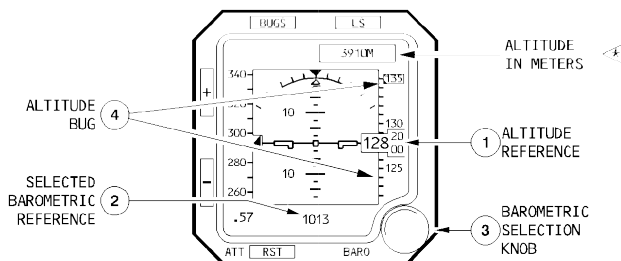
The Mach number is displayed in green, when greater than 0.5, but disappears only when it goes lower than 0.45.

(3) Speed bug

When a speed bug is entered via the BUGS function, the corresponding speed mark is indicated by a cyan dash.

ALTITUDE

Applicable to: ALL



(1) Altitude indication

The altitude indication is given as a white moving scale, and a green digital readout on a gray background.

The altitude scale ranges from -2 000 to 50 000 ft every 100 ft, with altitude digital indications every 500 ft. “NEG” appears in white in the negative altitudes window.

If the option is installed, the altitude is also given in meters.

The altitude box changes to cyan, when it also corresponds to a bug value.

(2) Barometric reference

The barometric reference pressure is displayed in cyan, in hectoPascal (hPa). It corresponds to either the selected barometric pressure, or the standard pressure. The barometric pressure ranges from 745 to 1 100 hPa.

(3) Barometric selection knob

It enables the selection of a barometric pressure, setting a variation of 10 hPa per rotation of the knob.

The standard barometric pressure can be selected by pressing the barometric knob. “STD” is then displayed in place of the pressure value.

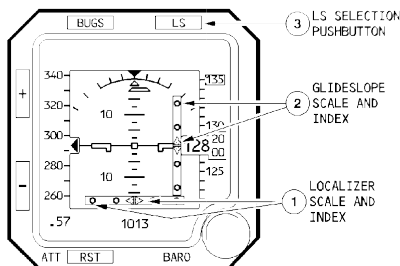
Pressing the knob again will display the selected barometric pressure.

(4) Altitude bug

When an altitude bug is entered through the bugs function, the corresponding altitude mark is indicated by a cyan dash, or a cyan box, when the dash covers the digital indication on the scale.

LANDING SYSTEM FUNCTION

Applicable to: ALL



(1) Localizer scale and index

(2) Glideslope scale and index

The deviation scales appear when the LS pushbutton is pressed. The indexes appear when the Glideslope and Localizer signals are valid and deviation scales are displayed.

(3) LS selection pushbutton

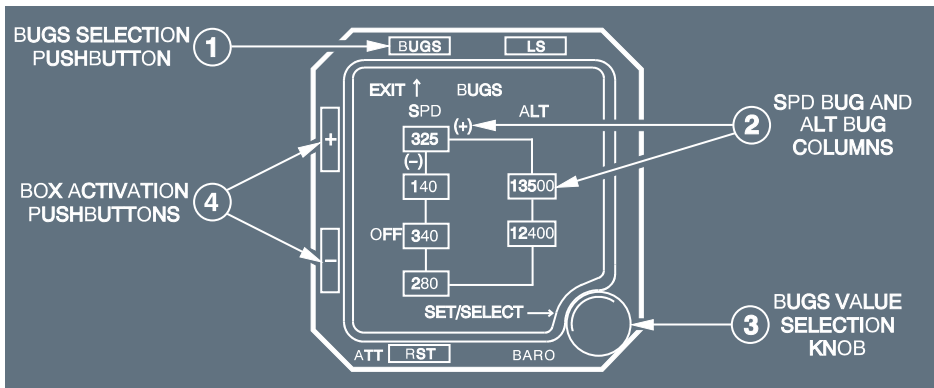
Pressing the LS pushbutton will display the ILS scales. Pressing it again will de-select the ILS scales.

CAUTION

Do not use the ISIS LS for takeoff using the localizer of the opposite runway, or for a back-course localizer approach. The LOC deviations are given in the wrong sense.

BUGS FUNCTION

Applicable to: ALL



(1) BUGS function selection pushbutton

Pressing the BUGS pushbutton will activate the BUGS function and display the bug values to be selected.

(2) SPD BUG and ALT BUG columns

The SPD BUG column gives four speed values (in knots) that can be selected by the crew. The ALT BUG column gives two altitude values (feet) to be selected by the crew.

(3) BUGS value selection knob

It allows the bug value to be set by rotating the BARO knob. This value cannot be lower than 30 kt for a speed bug, or a negative value for an altitude bug.

Pressing the BARO setting knob, once a bug value box is activated, will deselect the bug value. The “OFF” label comes on close to the activated box.

The entered values are memorized by the system, when exiting the screen, by pressing the BUGS pushbutton (1), or after 15 s without any pilot action.

(4) “+”/“-” box activation buttons

Access from one box to another is obtained by pressing the “+” or “-” pushbutton.

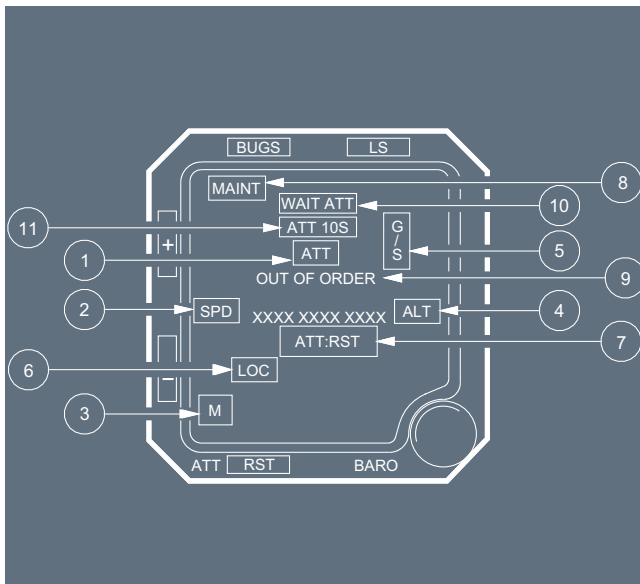
When a bug value is entered, access to the next box is obtained by pressing the “-” pushbutton. The box becomes active and flashes.

The “+” pushbutton can be used to return to a previous box.

Note: Use of the ISIS bugs function is not recommended because, in the event that both PFDs are lost in flight, when the ISIS bugs were previously set for takeoff, then for the approach, the bugs would remain at the takeoff characteristic speed settings.

FLAGS

Applicable to: ALL



- (1) ATT flag (red)
When attitude data is lost, the red ATT flag appears.
- (2) SPD flag (red)
When airspeed data is lost, the red SPD flag appears.
- (3) M flag (red)
When mach number is lost, the red M flag appears.
- (4) ALT flag (red)
When altitude data is lost, the red ALT flag appears.
- (5) G/S flag (red)
When glideslope information is lost, the red G/S flag appears.
- (6) LOC flag (red)
When localizer data is lost, the red LOC flag appears.

Continued on the next page

(7) ATT: RST (yellow)

The “ATT: RST” flag appears:

- When excessive aircraft movement is detected during the alignment phase, or
- After 350 h of continuous electrical supply, or
- When the “WAIT ATT” flag is displayed during more than 10 s .

In both cases, press the ATT RST pb to reset/realign and recover the attitude indication.

(8) MAINT flag (white)

Failure not affecting ISIS operation. Service ISIS, when convenient.

(9) OUT OF ORDER (white)

When an internal failure of the ISIS indicator occurs, the “OUT OF ORDER” message appears, accompanied by a fault code.

(10) WAIT ATT flag (yellow)

If the ISIS loses attitude data, its entire sphere is cleared to display the: “WAIT ATT” flag.

- If the “WAIT ATT” flag is displayed during less than 10 s, a normal operation is recovered.
- If attitude data are lost for more than 10 s, the “WAIT ATT” flag is then replaced by the “ATT: RST” flag.

(11) ATT 10 s flag (yellow)

This count down flag appears, when the flight crew press the ATT RST pb, in order to indicate that the attitude reset function is in progress.

GENERAL

Applicable to: ALL

The FMGC is the basic means for tuning nav aids.

Three modes of tuning are available.

AUTOMATIC TUNING

Applicable to: ALL

In normal operation, the FMGC tunes nav aids automatically, with each FMGC controlling its own receivers.

If one FMGC fails, the remaining one controls both sides receivers.

MANUAL TUNING

Applicable to: ALL

The crew can use the MCDU to override the FMGC's automatic selection and tuning of nav aids and select a specific nav aid for visual display.

This does not affect the automatic function of the FMGC. Any entry on one MCDU is sent to both FMGC in dual mode, or the remaining FMGC in single.

BACK UP TUNING

Applicable to: ALL

If both FMGCs fail, the flight crew can use the RMPs (Radio Management Panels 1 and 2) on the pedestal for back up tuning.

The CAPT RMP controls VOR 1 and ADF 1 .

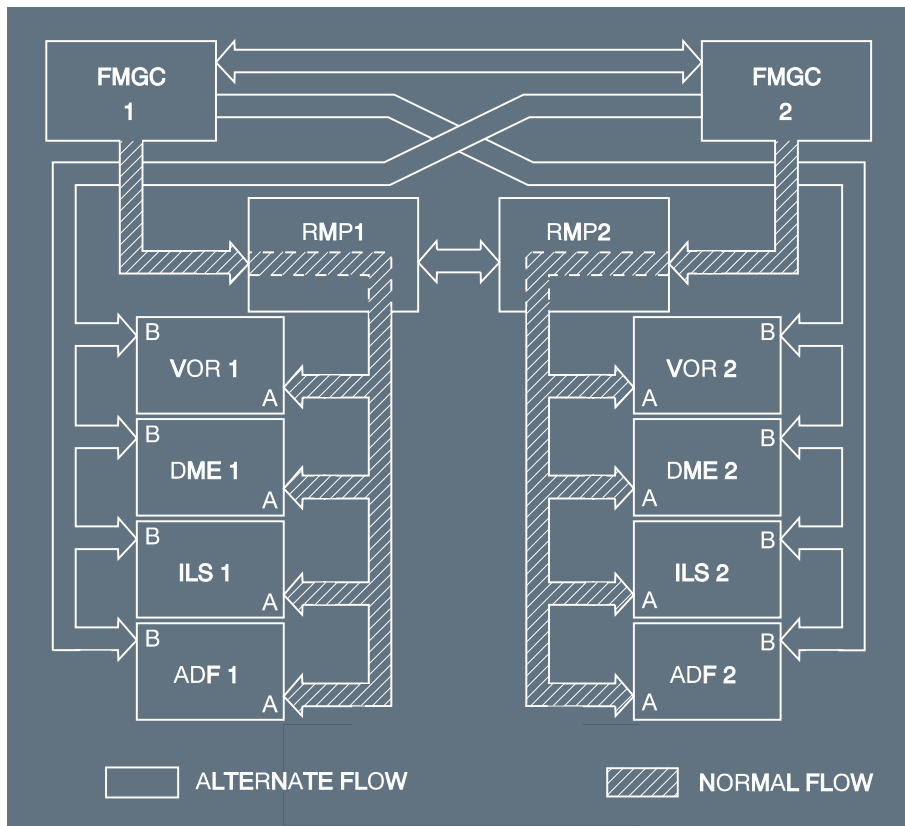
The F/O RMP controls VOR 2 and ADF 2 .

Either RMP controls both ILSs (provided NAV back up is selected on RMP 1 and RMP 2). RMP 3  is not used for nav aids tuning.

ARCHITECTURE

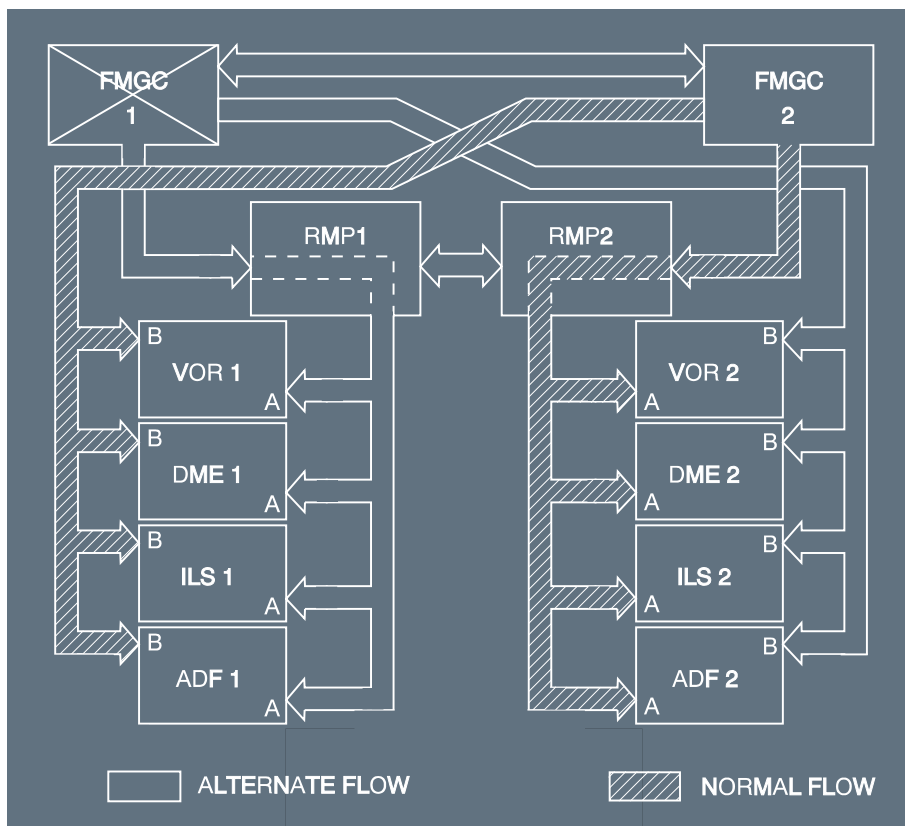
Applicable to: ALL

NORMAL OPERATION



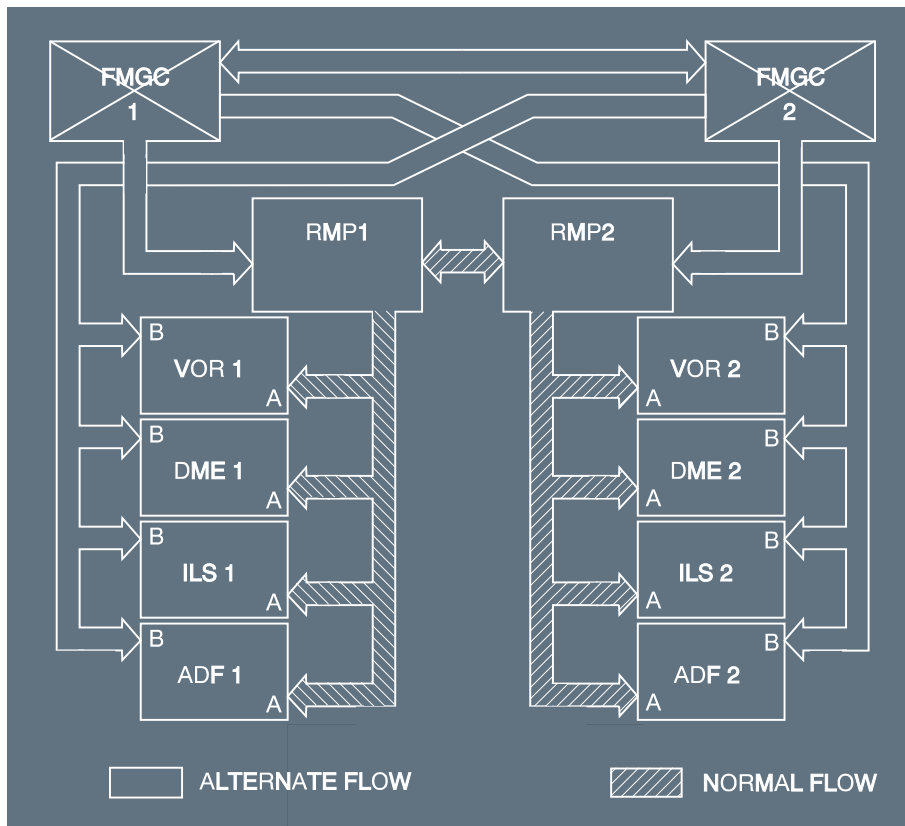
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FMGC 1 FAILURE



Continued on the next page

BACK UP TUNING



VOR**Applicable to: MSN 2037-3184**

The aircraft has two VOR receivers.

(For tuning instructions, *Refer to DSC-34-30-10 GENERAL*).

- The Navigation Displays (NDs) show VOR1 and VOR2 information, in accordance with the position of the ADF/VOR selectors on the EFIS control panel (*Refer to DSC-31-45 ROSE Modes*).
- The DDRMI on the center panel also displays VOR1 and VOR2 bearings, if the heading signal is valid.

VOR**Applicable to: MSN 3411-5319**

The aircraft has two VOR receivers.

(For tuning instructions, *Refer to DSC-34-30-10 GENERAL*).

The Navigation Displays (NDs) show VOR1 and VOR2 information, in accordance with the position of the ADF/VOR selectors on the EFIS control panel (*Refer to DSC-31-45 ROSE Modes*).

ILS**Applicable to: ALL**

The aircraft has two ILS receivers. Each ILS receiver is integrated in a modular avionics unit called MMR (Multi Mode Receiver) (ILS1 receiver in MMR1, ILS2 receiver in MMR2).

(For tuning instructions, *Refer to DSC-34-30-10 GENERAL*).

- PFD1 and ND2 display ILS1 information.
- PFD2 and ND1 display ILS2 information.
- The flight crew can put the same ILS information on each PFD by pressing the LS button on the EFIS control panel (the green bars come on).
- The NDs display ILS information, if the flight crew selects the ROSE LS mode on the EFIS control panel (*Refer to DSC-31-50 EFIS Control Panel*).

ADF**Applicable to: MSN 2037-3184**

The aircraft has 1 ADF system.

(For tuning instructions, *Refer to DSC-34-30-10 GENERAL*).

The NDs display ADF information, depending on the position of the ADF/VOR selectors on the EFIS control panel (*Refer to DSC-31-45 ROSE Modes*).

The DDRMI  also displays ADF bearing, depending on the position of the ADF/VOR selector (on the DDRMI).

ADF**Applicable to: MSN 3411-5319**

The aircraft has 1 ADF system.

(For tuning instructions, *Refer to DSC-34-30-10 GENERAL*).

The NDs display ADF information, depending on the position of the ADF/VOR selectors on the EFIS control panel (*Refer to DSC-31-45 ROSE Modes*).

DME**Applicable to: MSN 2037-3184**

The aircraft has two DMEs.

The frequency that is automatically set on the DME corresponds to the one that is set on the VOR or ILS.

The NDs and the DDRMI can display VOR DME information, and the PFDs can display ILS DME information (*Refer to DSC-31-40 Trajectory Deviation - ILS Approach*).

DME**Applicable to: MSN 3411-5319**

The aircraft has two DMEs.

The frequency that is automatically set on the DME corresponds to the one that is set on the VOR or ILS.

The NDs can display VOR DME information, and the PFDs can display ILS/MLS DME information (*Refer to DSC-31-40 Trajectory Deviation - ILS Approach*).

MARKER BEACON**Applicable to: ALL**

One marker beacon system is included in VOR receiver 1.

The PFD displays the outer, middle, and inner marker signals (*Refer to DSC-31-40 Trajectory Deviation - ILS Approach*).



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

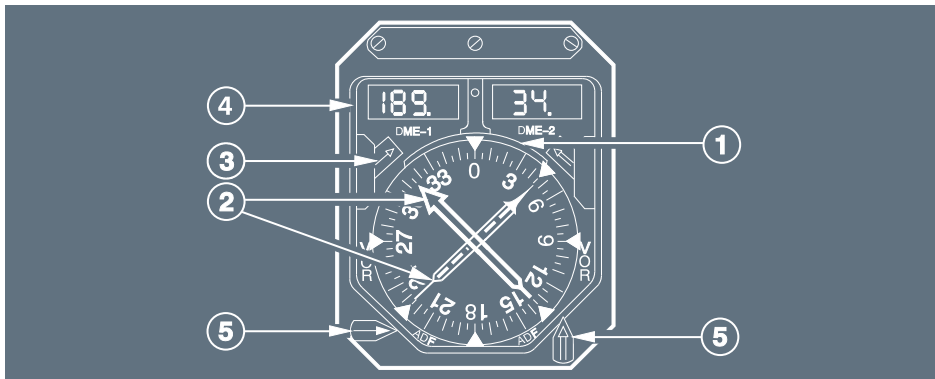
DSC-34-30 – Radio NAV

DSC-34-30-20 – Nav aids

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DIGITAL DISTANCE AND RADIO MAGNETIC INDICATOR (DDRMI)

Applicable to: MSN 2037-5187



(1) Compass card

ADIRU 1 normally supplies the signal that positions the compass card. ADIRU 3 supplies it when selected by the ATT HDG SWITCHING selector.

(2) Bearings pointers

Indicate the magnetic bearing to the station received by VOR 1 or ADF 1 (dashed pointer) and VOR 2 or ADF 2 (double pointer).

Note: Depending on the quality of the VOR beacon's signal, and mainly at distances greater than 25 nm from the station, the processing of the signal, on aircraft equipped with COLLINS or BENDIX VOR may lead to bearing pointer oscillations.

(3) VOR/ADF flags

The indicators display these flags if:

- the VOR or ADF receiver fails (VOR/ADF selector position indicates the failed receiver)
- the RMI has an internal failure
- the heading signal from ADIRS is not valid
- the power supply fails.

As long as the flag shows, the relevant pointer moves into horizontal position.

(4) DME 1(2) counters

The counters indicate distances in NM and 1/10th at less than 20 nm.

At less than 1 nm, 0 is shown.

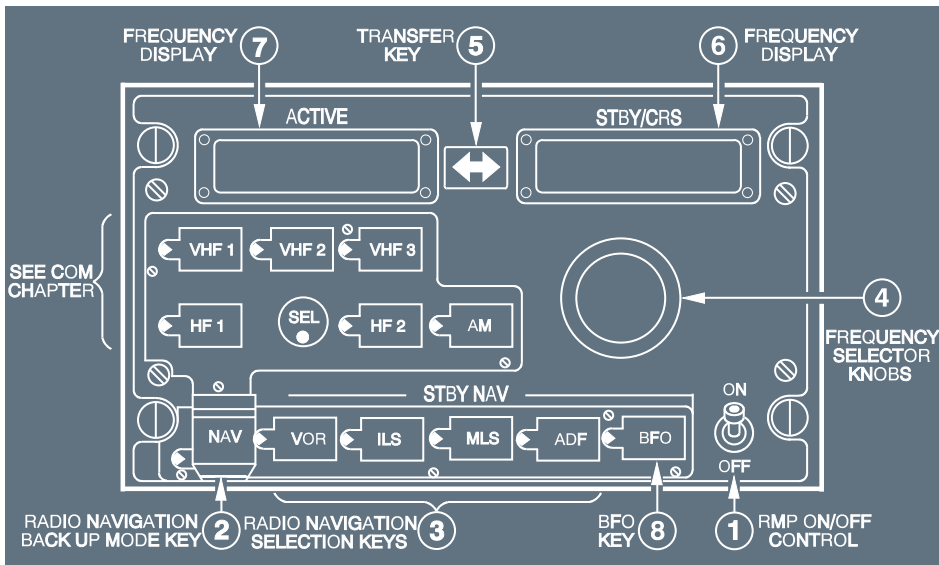
Continued on the next page

(5) VOR/ADF sel

- VOR 1 or ADF 1 on the dashed pointer.
- VOR 2 or ADF 2 ∇ (if not installed, then ADF 1) on the double pointer.

RADIO MANAGEMENT PANEL (RMP)

Applicable to: ALL



(1) ON/OFF sw

This switch controls the power supply to the panel.

(2) NAV key (transparent switchguard)

- Pressing this key engages the radio navigation backup mode. It takes control of the VOR, ILS, MLS, and ADF ∇ receivers away from the FMGC and gives it to the RMP.
- The green monitor light comes on.
- Pressing the NAV key a second time returns control of the navigation radios to the FMGC.

Note:

- The flight crew must select this backup tuning mode on both RMP1 and RMP2 if both FMGCs or both MCDUs fail. In the emergency electrical configuration, only RMP1 receives power
- Pressing the NAV key on RMP3 ∇ has no effect

Continued on the next page

- In the NAV backup mode, the flight crew can select radio communication systems as it would in the normal mode.

Setting one RMP to NAV backup mode removes nav aids tuning from both FMGCs.

- When the flight crew uses an RMP to turn an ILS/DME, the PFDs do not display the DME distance.

(3) STBY NAV keys

When the NAV key is on and the flight crew presses one of these STBY NAV keys, the ACTIVE window displays the frequency to which that receiver is tuned. The green monitor light on the selected key comes on, and the one on the previously selected STBY NAV or COM key goes out.

(4) Frequency selector knob

Two concentric knobs allow the flight crew to preselect frequencies for communication radios and stand-by navigation systems and select courses for VOR and ILS.

The desired frequency or course is set in the STBY/CRS window.

- Setting frequency :

The outer knob controls the most significant digits, the inner knob controls the least significant digits. A rate multiplier speeds up the tuning when the knob is rotated rapidly.

- Setting course :

Selected by inner knob only.

(5) Transfer key

The flight crew presses this key to interchange ACTIVE and STBY frequencies. This action tunes the selected receiver to the new ACTIVE frequency.

(6) STBY/CRS window

The flight crew can make the frequency displayed in this window become the active frequency by pressing the transfer key, or change it by rotating the tuning knob.

If this window displays a course, then the ACTIVE window displays the associated frequency.

Note: *If the STBY/CRS window is displaying a course, then pressing the transfer key displays the active frequency in both windows.*



Continued on the next page

(7) ACTIVE window

This window displays the frequency of the selected navaid, which is identified by a green monitor light on the selection key.

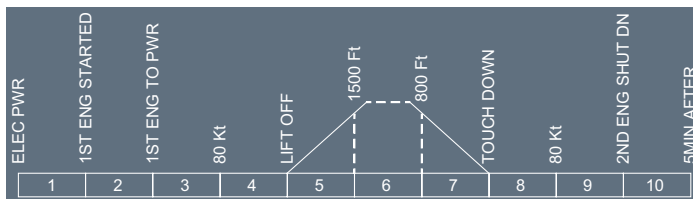
(8) BFO key

Pressing this key activates the BFO (Beat Frequency Oscillator), if the ADF receiver is selected. The green monitor light comes on.

For most ADF, with BFO activated, the audio identification is heard. However there are some ADF where the BFO must be deactivated in order to hear the audio identification.

WARNINGS AND CAUTIONS

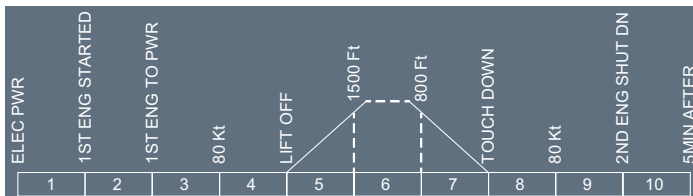
Applicable to: ALL except MSN 3411



E/W/D: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ILS 1(2)/(1+2) FAULT	SINGLE CHIME	MASTER CAUT	NIL	Flag on PFD and ND	3, 4, 5
MLS 1(2) FAULT					

WARNINGS AND CAUTIONS

Applicable to: MSN 3411



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ILS 1(2) FAULT	SINGLE CHIME	MASTER CAUT	NIL	Flag on PFD and ND	3, 4, 5



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-30 – Radio NAV

DSC-34-30-30 – Controls and Indicators

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BUS EQUIPMENT LIST

Applicable to: MSN 2037-3184

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
NAVAIDS	VOR 1			X		
	VOR 2	AC 2				
	MMR 1			X		
	MMR 2	AC 2				
	ADF 1			SHED		
	ADF 2 	AC 2				
	DDRM1			X		
	DME 1			SHED		
	DME 2	AC 2				

BUS EQUIPMENT LIST

Applicable to: MSN 3411-5319

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
NAVAIDS	VOR 1			X		
	VOR 2	AC 2				
	MMR 1			X		
	MMR 2	AC 2				
	ADF 1			SHED		
	ADF 2 	AC 2				
	DME 1			SHED		
	DME 2	AC 2				



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-30 – Radio NAV

DSC-34-30-40 – Electrical Supply

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GENERAL

Applicable to: ALL

The aircraft has two radio altimeters.

Normally, CAPT's PFD displays the RA1 height, and the F/O's PFD displays the RA2 height. If either radio altimeter fails, both PFDs display the height from the remaining one.

INDICATIONS ON PFD

Applicable to: ALL

(Refer to DSC-31-40 General).

AUTOMATIC CALL OUT

Applicable to: ALL

GENERAL

The FWC generates a synthetic voice for radio height announcement below 2 500 ft. These announcements come through the cockpit loudspeakers, even if the speakers are turned off.

Continued on the next page

PREDETERMINED CALL OUT

The altitude call out uses the following predetermined threshold:

Height (ft)	Callout
2 500	TWO THOUSAND FIVE HUNDRED OR TWENTY FIVE HUNDRED
2 000	TWO THOUSAND
1 000	ONE THOUSAND
500	FIVE HUNDRED
400	FOUR HUNDRED
300	THREE HUNDRED
200	TWO HUNDRED
100	ONE HUNDRED
50	FIFTY
40	FORTY
30	THIRTY
20	TWENTY
10	TEN
5	FIVE
DH (or MDA/MDH) + 100 DH (or MDA/MDH)	HUNDRED ABOVE MINIMUM

Note: The reference altitude for callouts is the radio altitude for precision approaches (DH), and baro altitude (MDA/MDH) for non precision approaches.

Pin programming enables Operators to select the required callouts. If the aircraft remains at a height that is in the detection zone for a height callout, the corresponding message is repeated at regular intervals.

INTERMEDIATE CALL OUT

If time between two consecutive predetermined call outs exceeds a certain threshold, the present height is repeated at regular intervals.

The threshold is : 11 s above 50 ft
4 s below 50 ft

The repeating interval is 4 s.

Continued on the next page

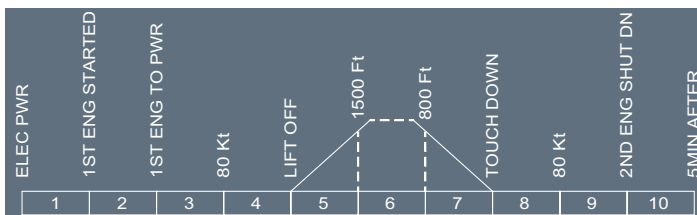
RETARD ANNOUNCEMENT

The loudspeaker announces RETARD at 20 ft or at 10 ft if autothrust is active and one autopilot is in LAND mode.

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WARNINGS AND CAUTIONS

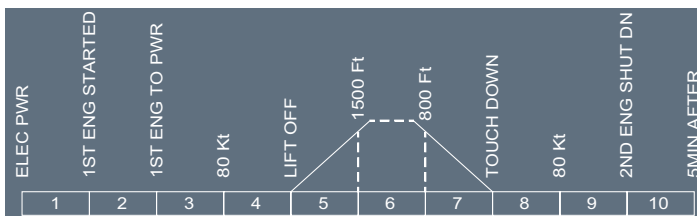
Applicable to: MSN 3411-4006



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
RA 1 (2) FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 8

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-3184, 4012-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
RA 1(2) FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 8
RA DEGRADED In case a significant discrepancy occurs in flight between the two radio-altimeters.	NIL	NIL			2 to 8



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-40 – Radio Altimeter

DSC-34-40-20 – Warnings and Cautions

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BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
RADIO ALTIMETER	RA 1	AC1				
	RA 2	AC2				



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-40 – Radio Altimeter

DSC-34-40-30 – Electrical Supply

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DESCRIPTION**Applicable to: ALL**

The aircraft has two ATC transponders which are controlled by a dual control box on the center pedestal.

Only the selected ATC transponder operates.

The associated ADIRS (1 for transponder 1, etc ...) supplies the altitude for altitude reporting.

The ATC transponder is capable of enhanced surveillance: It transmits the following parameters upon ground request:

- Indicated airspeed, Mach number, and baro vertical speed, that are all supplied by the ADRs.
- Magnetic heading, roll angle, ground speed, track angle, track angle rate, and inertial vertical speed, that are all supplied by the IRs.
- Selected altitude and barometric reference settings supplied by the FCUs.

In the case of an ADR (1 or 2) failure, ADR 3 replaces the faulty ADR, when the AIR DATA SWITCHING Selector is set to CAP on 3 or F/O on 3.

IR/FCU parameters are only transmitted to:

- ATC 1 by IR 1/FCU 1
- ATC 2 by IR 2/FCU 2



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

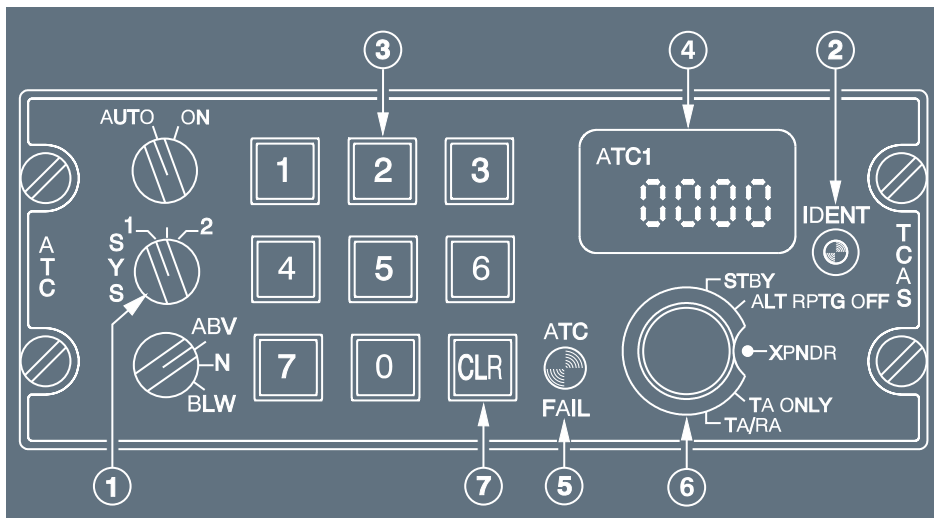
DSC-34-50 – ATC

DSC-34-50-10 – Description

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CONTROL PANEL

Applicable to: ALL



- (1) XPNDR sel
Selects ATC transponder 1 or 2.
- (2) IDENT sw
The flight crew presses this button to send the aircraft identification signal.
- (3) Keyboard
The flight crew uses these pushbuttons to set the code assigned by ATC.
- (4) Code display
The window displays the selected code.
- (5) ATC FAIL
This light comes on if the selected transponder fails.
- (6) Mode sel
 - STBY : Both ATC transponders and TCAS are electrically-supplied, but are on standby.
 - ALT RPTG : No altitude data is transmitted.
 - OFF

Continued on the next page

XPNDR : In flight : Selected ATC transponder operates in all modes.
Baro altitude data is transmitted.
ATC 1 uses ADR 1 or ADR 3. ATC 2 uses ADR 2 or ADR 3.
The TCAS is on standby.

On ground : Selected ATC transponder only operates in mode S (Selective aircraft interrogation mode).

TA-RA/TA : *Refer to DSC-34-80-20 ATC/TCAS Panel.*

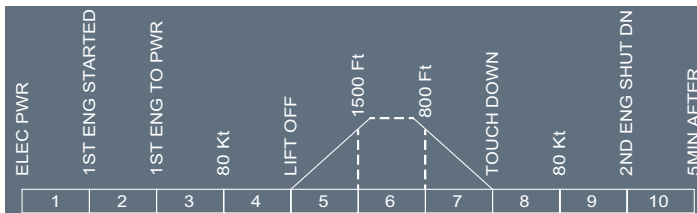
(7) CLR pb

The flight crew uses this pushbutton to clear the code display.

Note: *As long as the four figures of the new code are not entirely written, the previous code remains.*

WARNINGS AND CAUTIONS

Applicable to: MSN 4554-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ATC/XPDR 1(2) FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
ATC/XPDR 1+2 FAULT					1 to 5, 7 to 10
ATC/XPDR STBY					10

Intentionally left blank

BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
ATC	ATC 1			SHED		
	ATC 2	AC 2				



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-50 – ATC

DSC-34-50-50 – Electrical Supply

Intentionally left blank

DESCRIPTION

Applicable to: ALL

The aircraft has two weather radar systems. Only one receiver in working at a time.

It can display the weather image on the ND, in any ND mode except PLAN.

Each pilot may remove the weather image from their ND by setting the associated brightness control to the minimum (*Refer to DSC-31-50 Other EFIS Controls*).

Note: Some aircraft may be fitted with one weather radar only.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

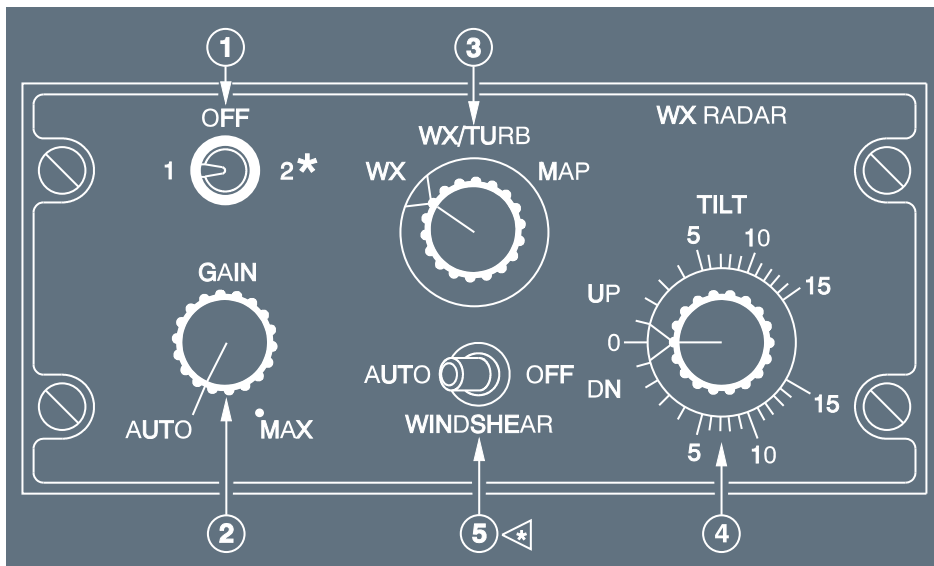
DSC-34-60 – Weather Radar

DSC-34-60-10 – Description

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CONTROL PANEL

Applicable to: MSN 2037-4837



(*) If only one radar system is installed, “2” is replaced by an “INOP” sticker.

(1) Transceiver 1-2 switch

This switch allow to select one radar or to turn both radars to off.

Note: If there is only one radar on the aircraft, no weather image is displayed when system 2 is switched on.

(2) GAIN knob

This knob adjusts the sensitivity of the receiver in all modes.

AUTO : Automatically adjusts the gain to the optimum setting.

(3) Mode selector

WX : Weather mode: Weather mode: colors indicate the density of precipitation (black for the lowest intensity, green, amber and red indicating progressively for higher intensities).

WX + TURB: The screen shows turbulence areas (in precipitation areas) in magenta (within 40 nm).

Continued on the next page

MAP : Radar operates in ground mapping mode: black indicates water, green indicates the ground, and amber indicates cities and mountains.

(4) TILT knob

This knob controls antenna tilt.

Radar 1 depends on ADIRS 1, radar 2  on ADIRS 2. ADIRS 3 replaces either ADIRS if ATT HDG selector is used.

Zero represents the horizon as seen by ADIRS.

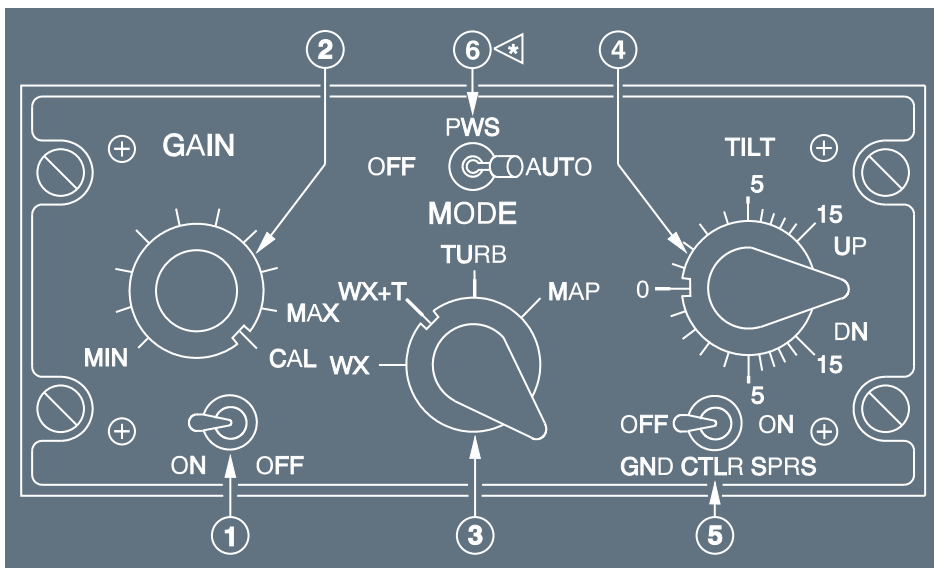
(5) WINDSHEAR switch (operative only if the predictive windshear function is embodied)

AUTO : Activates the predictive windshear function. Windshear areas are detected by antenna scanning below 2 300 ft RA, even if the transceiver 1-2 selector is set to OFF. They are displayed on the ND, if below 1 500 ft.

OFF : The predictive windshear function is off.

CONTROL PANEL

Applicable to: MSN 5019-5319



(1) SYS toggle switch

This switch turns the radar ON or OFF.

Continued on the next page

(2) GAIN knob

This knob is used to adjust the sensitivity of the receiver in all modes.

CAL is the normal position. It adjusts the gain to a calibrated setting.

(3) Mode selector

WX : Weather mode: Weather mode: colors indicate the density of precipitation (black for the lowest intensity, green, amber and red indicating progressively for higher intensities).

WX + T : The screen only displays turbulence areas (in precipitation areas) in magenta (within 40 nm).

TURB : The screen only shows turbulence areas.

MAP : Radar operates in ground mapping mode: black indicates water, green indicates the ground, and amber indicates cities and mountains.

(4) TILT knob

This knob controls antenna tilt. Zero represents the horizon as ADIRS 1 sees it (or ADIRS 3 if ATT HDG selector is at CAPT 3).

(5) GND CLTR SPRS switch

ON : Suppresses the ground echo on the screen.

OFF : Normal use of the radar.

(5) PWS switch (only operative, if the predictive windshear function is installed)

AUTO : Activates the predictive windshear function: windshear areas are detected by antenna scanning below 2 300 ft RA, even if the SYS switch is set to OFF. They are displayed on the ND, if below 1 500 ft.

OFF : The predictive windshear function is off.

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GENERAL

Applicable to: ALL

The weather radars have a Predictive Windshear System (PWS) that operates when:

- The PWS switch is in the AUTO position (Even if the weather radar is OFF), and
- The aircraft is below 2 300 ft AGL, and
- The ATC is switched to the ON, or AUTO, or XPDR, or XPNDR, position (depending on the ATC panel), and
- Either engine is running.

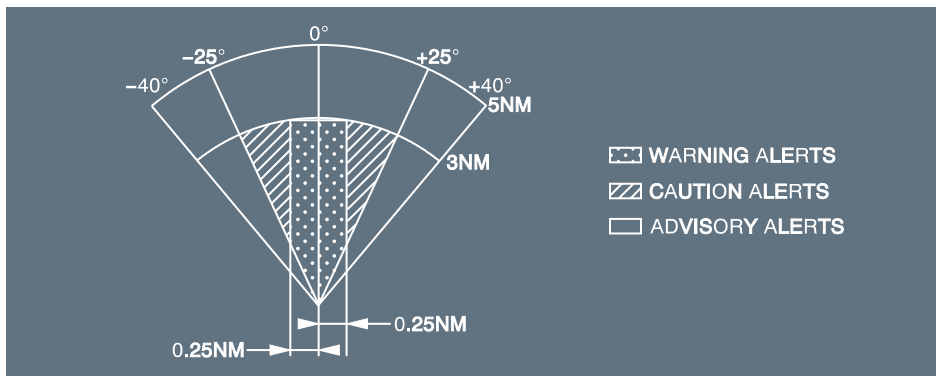
Note: When two weather radars are installed, if the selected weather radar fails, the PWS function is recovered by selecting the non-failed weather radar on the control panel.

The system scans the airspace, within a range of 5 nm ahead of the aircraft, for windshears. Below 1 500 ft, when the system detects windshear, depending on the range selected on the ND, a warning, caution, or advisory message appears on the ND. Predictive windshear warnings and cautions are associated with an aural warning.

WINDSHEAR ALERTS DURING TAKEOFF ROLL, UP TO 100 KNOTS

Applicable to: ALL

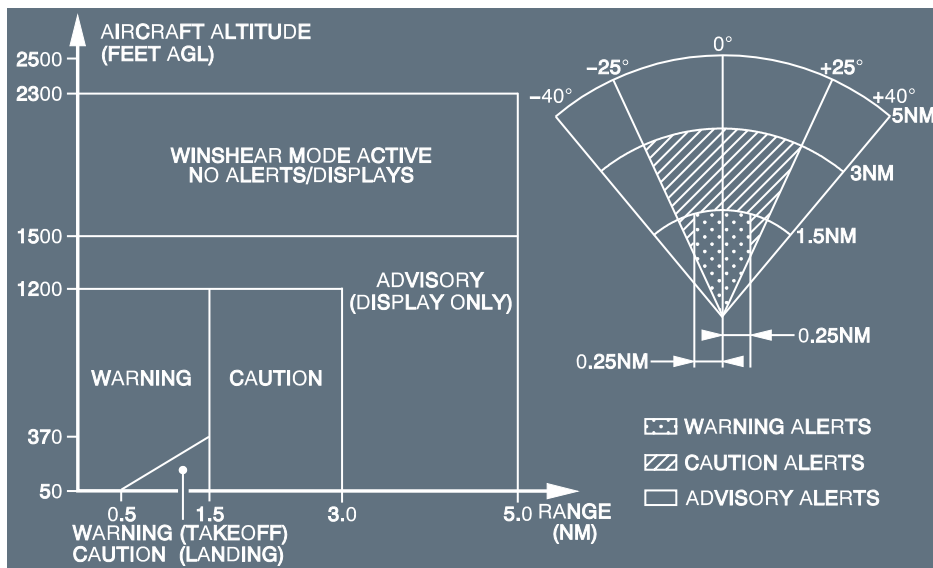
WINDSHEAR ALERTS during takeoff roll, up to 100 knots



During the takeoff roll, up to 100 kt, both warnings and cautions are available within a range of 3 nm.

WINDSHEAR ALERTS ABOVE 50 FEET

Applicable to: ALL



During final approach, the visual and aural warning alerts are downgraded to caution alerts between 370 ft AGL and 50 ft AGL, and range between 1.5 nm and 0.5 nm.

WINDSHEAR ALERTS INHIBITION

Applicable to: ALL

At takeoff, alerts are inhibited above 100 kt and up to 50 ft. During landing, alerts are inhibited below 50 ft.

Alert Level	Aural Warning	PFD	ND (<i>Refer to DSC-31-45 Predictive Windshear System</i>)
Warning (Approach)	«GO AROUND WINDSHEAR AHEAD»	W/S AHEAD (red)	Windshear icon
Warning (Takeoff)	«WINDSHEAR AHEAD» (twice)	W/S AHEAD (red)	Windshear icon
Caution	«MONITOR RADAR DISPLAY»	W/S AHEAD (amber)	Windshear icon
Advisory	Nil	Nil	Windshear icon

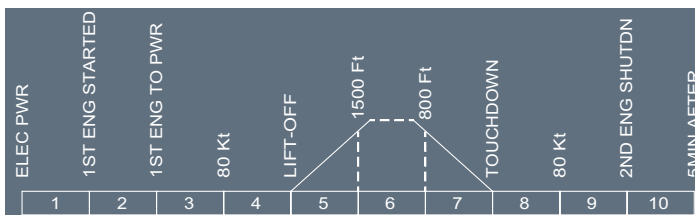
The aural alerts of the Predictive Windshear System (PWS):

- Have priority over TCAS, GPWS, and other FWC aural warnings
- Are inhibited by windshear detection, via the FAC, stall warnings and aural messages.

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD: FAILURE TITLE Conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
PRED. W/S DET FAULT	SINGLE CHIME	MASTER CAUTION	NIL	NIL	3, 4, 5, 8

MEMO DISPLAY

The “PRED W/S OFF” message appears, when windshear is set to OFF on the weather radar panel.
The “PRED W/S OFF”, message appears in green during flight phases 2 and 6.

It appears in amber:

- In flight phases 3, 4, 5, 7, 8, and 9
- When the T.O. CONFIG pb is pressed during phase 2.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-60 – Weather Radar

DSC-34-60-40 – Warnings and Cautions

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BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
WEATHER RADAR	WX 1	AC1				
	WX 2 	AC2				



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-60 – Weather Radar

DSC-34-60-50 – ELECTRICAL SUPPLY

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DESCRIPTION

Applicable to: ALL

The Ground Proximity Warning System (GPWS) generates aural and visual warnings, when one of the following conditions occurs between radio altitudes 30 ft and 2 450 ft.

- Mode 1: Excessive rate of descent.
- Mode 2: Excessive terrain closure rate.
- Mode 3: Altitude loss after takeoff, or go-around.
- Mode 4: Unsafe terrain clearance when not in landing configuration.
- Mode 5: Too far below glideslope.

In addition to the basic GPWS functions, the GPWS has an enhanced function (EGPWS) which provides, based on a worldwide terrain database:

- A Terrain Awareness Display (TAD), which predicts the terrain conflict, and displays the terrain on the ND.
- A Terrain Clearance Floor (TCF), which improves the low terrain warning during landing.

The EGPWS uses the geometric altitude. The geometric altitude is calculated by means of a specific algorithm that uses the following as inputs: The pressure altitude, GPS altitude, radio altitude, and data from the terrain database.

The cockpit loudspeakers broadcast, even if turned off, the aural warning or caution messages associated with each mode. The audio volume of these messages is not controlled by the loudspeaker volume knobs. (These knobs only allow volume adjustment for radio communication).

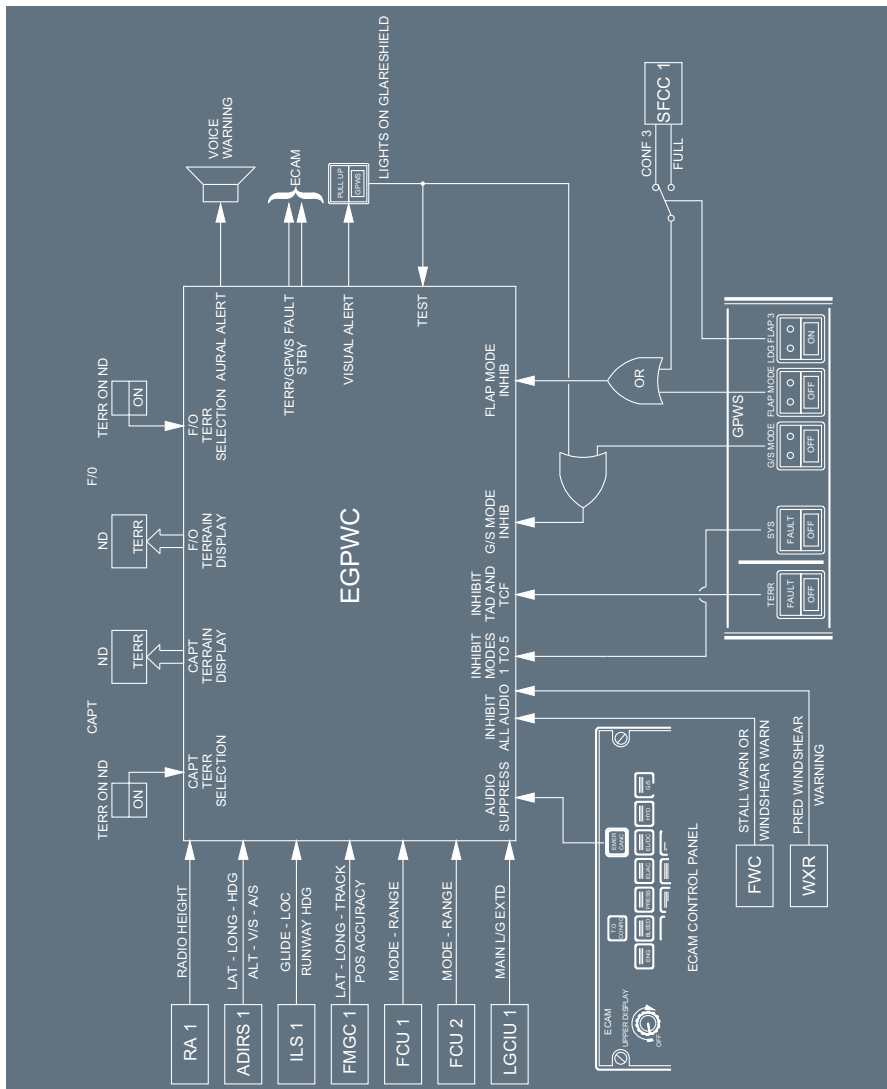
PULL UP or GPWS lights, on the Captain and First Officer instrument panels, come on to give a visual indication depending on the engaged GPWS mode.

Note: *A number of airports throughout the world have approaches or departures that are not entirely compatible with standard GPWS operation. These airports are identified in the envelope modulation database, in such a way that, when the GPWS recognizes such an airport, it modifies the profile to avoid nuisance warnings.*

SCHEMATIC

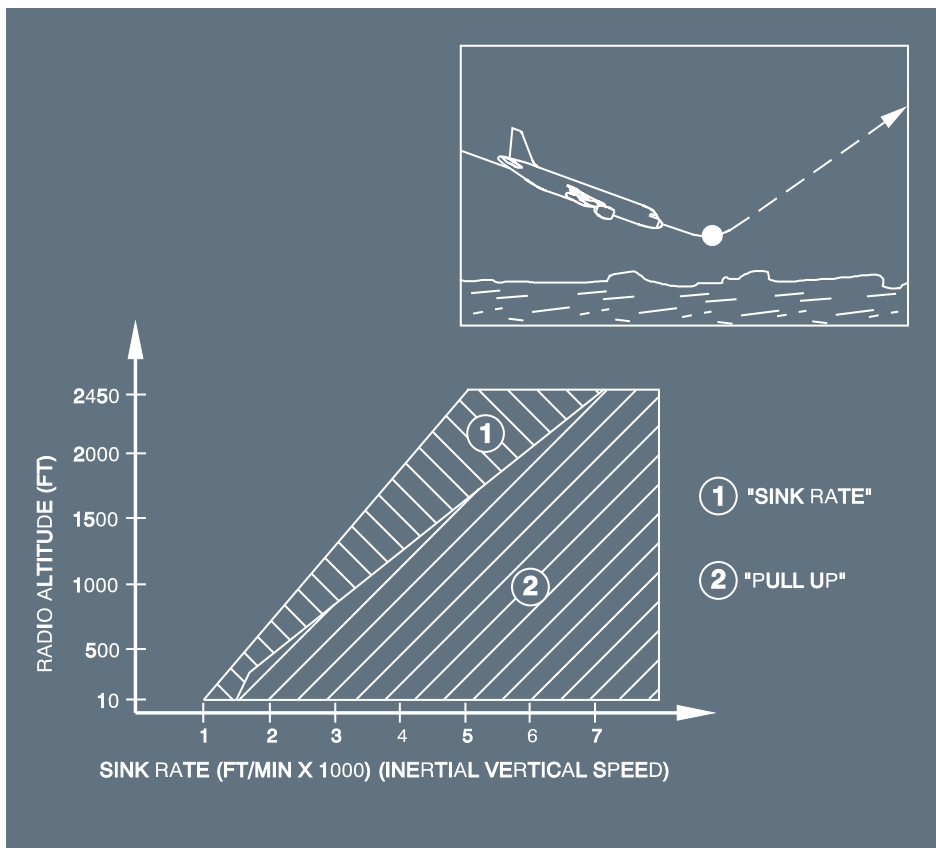
Applicable to: ALL

L3



MODE 1 : EXCESSIVE RATE OF DESCENT

Applicable to: ALL



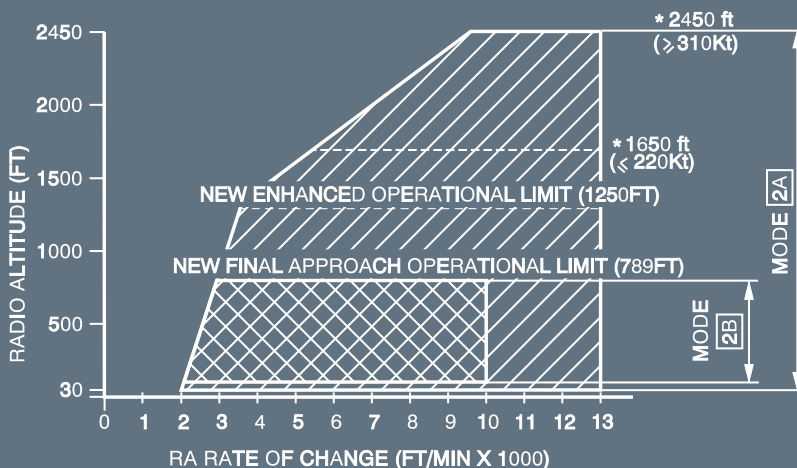
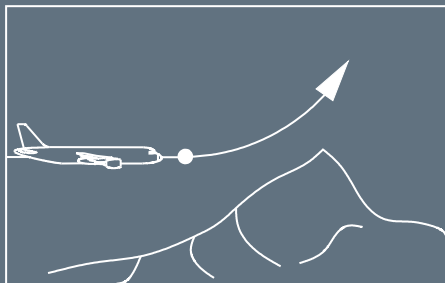
Mode 1 has two boundaries. Penetration of the first boundary generates a repeated aural alert "SINK RATE" and causes the GPWS lights to come on. Penetration of the second boundary generates a repetitive "PULL UP" and illuminates both PULL UP lights.

The upper cut-off limit is 2 450 ft radio altitude.

The lower cut-off limit is 10 ft radio altitude.

MODE 2 : EXCESSIVE TERRAIN CLOSURE RATE

Applicable to: ALL



- (*) The upper cut-off limit varies from 1 650 to 2 450 ft radio altitude, depending on speed (between 220 to 310 kt). At certain airports, the upper boundary may be lowered down to 1 250 ft to reduce the warning sensitivity and minimize the nuisance warnings.

2A — FLAPS NOT IN LANDING CONFIGURATION, AND AIRCRAFT NOT ON THE GLIDESLOPE BEAM

Penetration of the boundary causes the GPWS lights to come on, and generates the repeated aural alert: "TERRAIN".

Continued on the next page

After “TERRAIN” has sounded twice, the warning switches to “PULL UP”, and is continually repeated until the aircraft leaves the warning envelope. In addition, the PULL UP lights come on.

After the aircraft leaves the boundary, the GPWS lights stay on and the “TERRAIN” aural message persists. These alerts stop when the aircraft increases either the barometric or inertial altitude by 300 ft. If it enters another alert region during this altitude-gain time, then the whole process begins again with a new reference altitude for the 300 ft altitude gain.

The new enhanced operational upper limit is reduced to 1 250 ft and to 789 ft in final approach, when the enhanced functions and the Geometric Altitude are of high integrity.

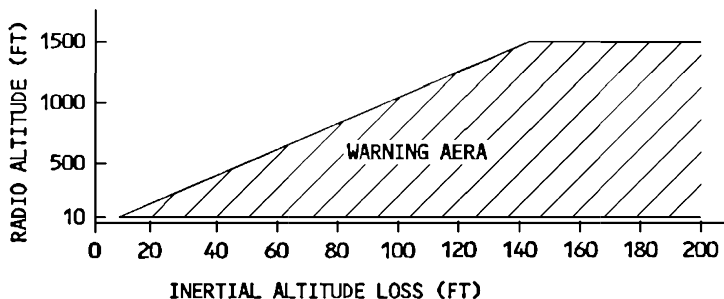
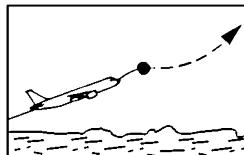
2B — FLAPS ARE IN LANDING CONFIGURATION

Lowering the flaps to the landing position automatically switches GPWS to Mode 2B. In this case lower boundary varies between 200 ft and 600 ft depending on radio altitude rate of change. In ILS approach (glide slope deviation < ± 2 dots) the lower boundary is fixed at 30 ft .

When the aircraft enters the envelope, the alert is the same as for mode 2A. When gear and flaps are in the landing configuration, the aural message is “TERRAIN” only and is not followed by “PULL UP” if the aircraft remains within the envelope.

MODE 3 : ALTITUDE LOSS AFTER TAKEOFF

Applicable to: ALL



If the aircraft descends during the initial takeoff climb or during a go around, the PULL UP light come on and the aural alert “DON'T SINK” sounds repeatedly.

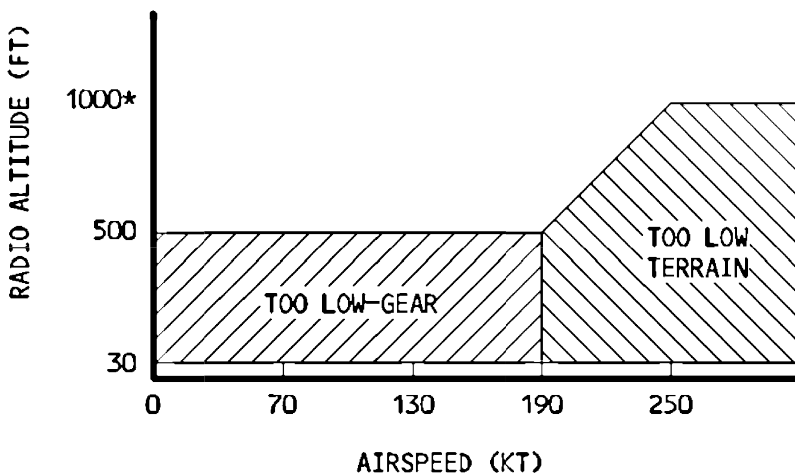
The lower cut-off limit is 10 ft radio altitude.

Mode 3 is desensitized in accordance with the time accumulated after departure and the radio altitude.

MODE 4 : UNSAFE TERRAIN CLEARANCE WHEN NOT IN LANDING CONFIGURATION

Applicable to: ALL

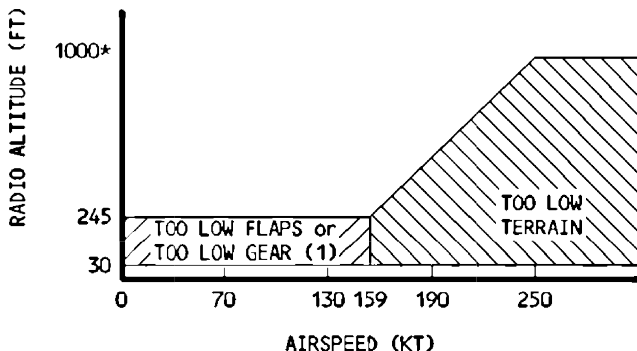
4A - LANDING GEAR UP AND FLAPS NOT IN LANDING CONFIGURATION.



Two aural warnings may be triggered, depending on the area: “TOO LOW-GEAR” or “TOO LOW-TERRAIN”. In addition, the GPWS lights come on.

Continued on the next page

4B - LANDING GEAR DOWN, AND FLAPS NOT IN LANDING CONFIGURATION OR, LANDING GEAR UP, AND FLAPS IN LANDING CONFIGURATION.

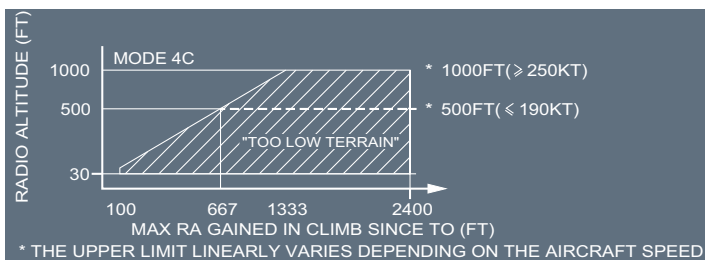


* : OTHER MAXIMUMS ARE USED AT CERTAIN AIRPORTS TO MINIMIZE NUISANCE WARNING.

(1) "TOO LOW FLAPS" (If flaps not in landing configuration)
or
"TOO LOW GEAR" (If GEAR not extended)

Three aural warnings may be generated, depending on the area and configuration: "TOO LOW-GEAR", "TOO LOW-FLAPS", or "TOO LOW-TERRAIN". In addition, the GPWS lights come on. If the enhanced GPWS functions and the geometric altitude are of high integrity, the upper operational limit is reduced to 500 ft. If not, it is only reduced to 800 ft when an overflight is detected.

4C — LANDING GEAR UP, OR FLAPS NOT IN LANDING CONFIGURATION.

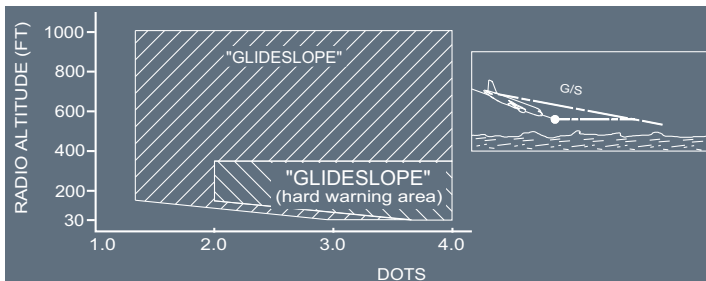


* THE UPPER LIMIT LINEARLY VARIES DEPENDING ON THE AIRCRAFT SPEED.

If the aircraft starts an inadvertent controlled flight into the ground, during takeoff and climb, and penetrates the boundary, then the GPWS lights come on, and the "TOO LOW TERRAIN" aural alert sounds repeatedly.

MODE 5 : DESCENT BELOW GLIDESLOPE

Applicable to: ALL



Note: Normally, the glideslope alert is only triggered with the gear down. For a few airports, the gear down logic requirement is deleted and other upper limits are used to increase the warning envelope.

In both areas, the alert is a repeated "GLIDESLOPE" aural message, and the GPWS lights come on. The loudness of the aural message increases, when the aircraft enters the hard warning areas. The mode is armed, when ILS 1 receives a valid signal. Pressing the GPWS pushbutton cancels the warning. This is temporary; the mode is automatically reactivated for a new envelope. The upper cut-off limit is 1 000 ft radio altitude. The lower cut-off limit is 30 ft radio altitude.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-70 – GPWS

DSC-34-70-20 – GPWS Basics Modes

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TERRAIN AWARENESS AND DISPLAY

Applicable to: ALL

The Terrain Awareness and Display (TAD) function computes a caution and a warning envelope in front of the aircraft, depending on the aircraft altitude, the nearest runway altitude, the distance to the nearest runway threshold, the ground speed, and the turn rate. When the boundary of these envelopes conflicts with the terrain, or with an obstacle memorized in the database, the system generates the relevant alert:

Alert Level	Aural Warning	ND (<i>Refer to DSC-31-45 Flags and Messages Displayed on ND</i>)	Local Warning
Warning	TERRAIN AHEAD, PULL UP	- Automatic terrain display * - Solid red areas - TERR AHEAD (red)	On each pilot's instrument panel, The pushbutton light comes on.
	OBSTACLE AHEAD, PULL UP	- Automatic terrain display * - Solid red areas - OBST AHEAD (red)	
Caution	TERRAIN AHEAD	- Automatic terrain display * - Solid yellow areas - TERR AHEAD (amber)	
	OBSTACLE AHEAD	- Automatic terrain display * - Solid yellow areas - OBST AHEAD (amber)	

* When the TERR pb-sw ON ND is set to ON, and ARC or ROSE mode is selected, the ND displays the terrain and the obstacles memorized in the database, depending on the aircraft's position. The terrain is displayed in various densities of green, yellow, red, or magenta, depending on the threat (*Refer to DSC-31-45 Flags and Messages Displayed on ND*). If an alert is generated (caution or warning), and TERR pb-sw ON ND is not selected, the terrain and the obstacles are automatically displayed, and the ON light of the TERR pb-sw ON ND comes on.

Note:

1. When TERR pb-sw ON ND is selected, the weather radar image is not displayed.
2. The Geometric Altitude function can protect against certain BARO setting errors, provided the components used to compute the Geometric Altitude are valid and accurate enough.

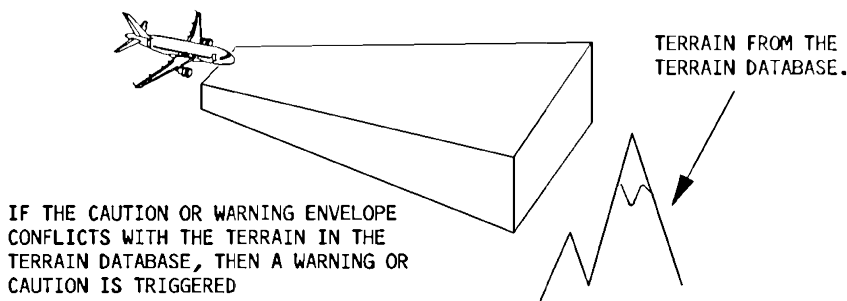
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3. The TAD and Terrain Clearance Floor (TCF) functions operate using the pure lateral GPS position and, the FMS1 position as backup.

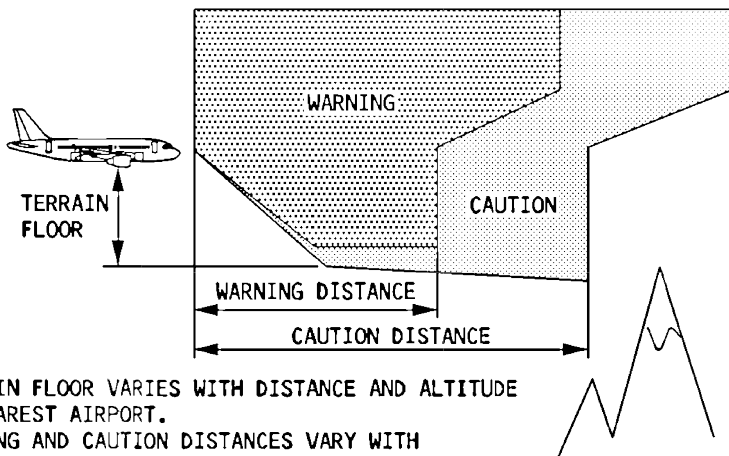
In case of low accuracy of the aircraft position computed by the EGPWS, the enhanced modes of the EGPWS are automatically deactivated. The five GPWS modes remain active.

TERRAIN CAUTION AND WARNING ENVELOPE

Applicable to: ALL



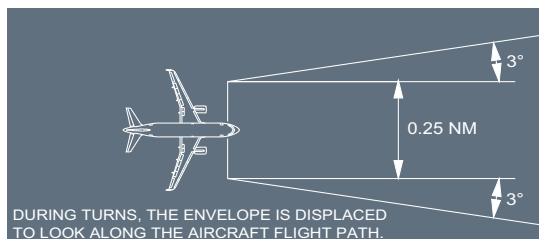
VERTICAL ENVELOPE



TERRAIN FLOOR VARIES WITH DISTANCE AND ALTITUDE TO NEAREST AIRPORT.
WARNING AND CAUTION DISTANCES VARY WITH GROUND SPEED AND TURN RATE. WARNING DISTANCE IS APPROX. 30 SECONDS. CAUTION DISTANCE IS APPROX. 60 SECONDS.

Continued on the next page

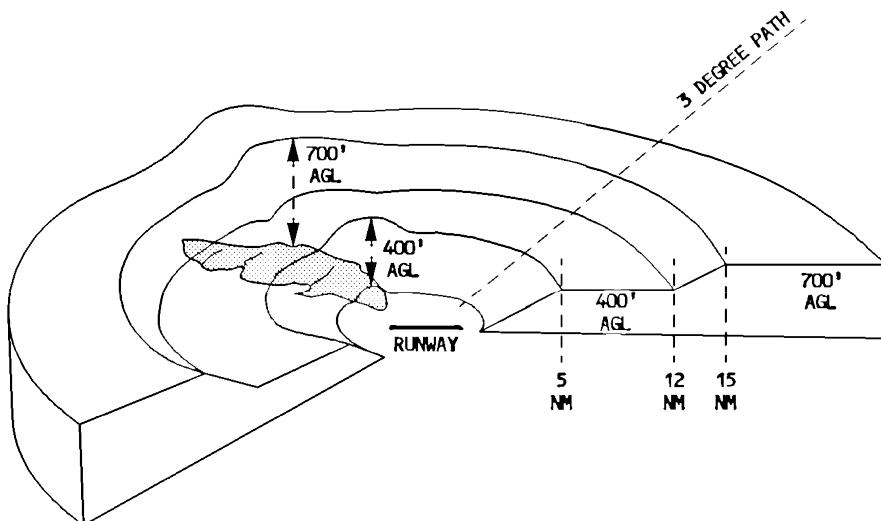
HORIZONTAL ENVELOPE



TERRAIN CLEARANCE FLOOR

Applicable to: ALL

A terrain clearance floor envelope is stored in the database for each runway for which terrain data exist. The Terrain Clearance Floor (TCF) function warns of a premature descent below this floor, regardless of aircraft configuration.

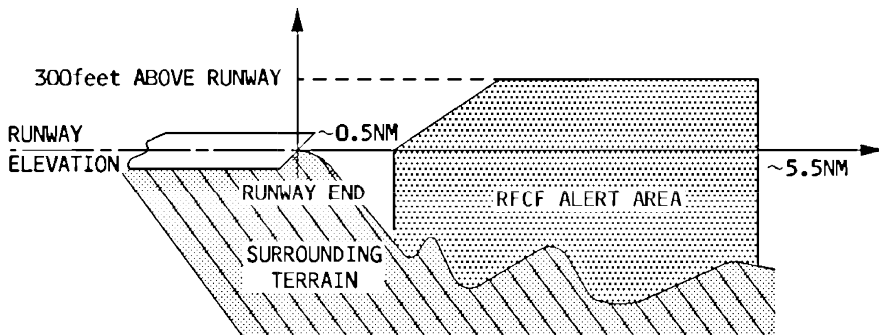


If the airplane descends below this floor, a TOO LOW TERRAIN aural warning is announced, and the pushbutton light comes on, on the glare shield.

RUNWAY FIELD CLEARANCE FLOOR

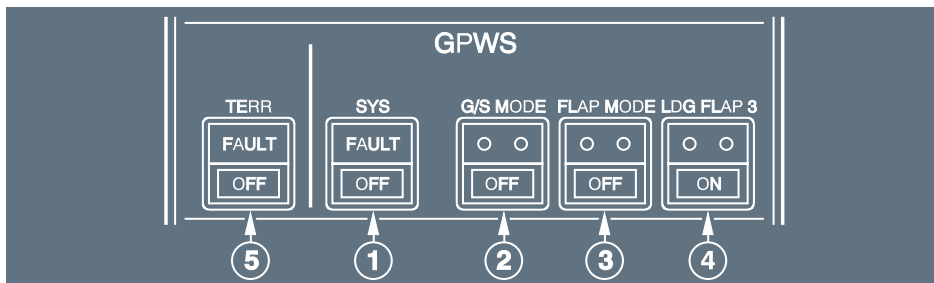
Applicable to: ALL

The Runway Field Clearance Floor (RFCF) provides an additional envelope protection, for runways that are significantly higher than the surrounding terrain. It is contained in a circle within the 5.5 nm of the runway threshold and it is based on the geometric altitude and the runway elevation.



OVERHEAD PANEL

Applicable to: ALL



(1) SYS pushbutton

OFF : All basic GPWS alerts (Mode 1 to 5) are inhibited.

FAULT light : This amber light comes on, along with an ECAM caution, if the basic GPWS mode 1 to 5 malfunction.

Note: If ILS 1 fails, only mode 5 is inhibited. Consequently, the FAULT light does not come on and the GPWS FAULT warning is not triggered.

(2) G / S MODE pushbutton

OFF : Glideslope mode (mode 5) is inhibited.

(3) FLAP MODE pusbutton

OFF : Flap mode (“TOO LOW FLAPS” mode 4) is inhibited.
(To avoid nuisance warning in case of landing with flaps setting reduced).

(4) LDG FLAP 3 pushbutton

ON : Flap mode is inhibited when FLAPS CONF 3 is selected (to avoid nuisance warning in case of landing in CONF 3).
In this case, LDG MEMO displays “FLAPS ... 3” instead of “CONF ... FULL”.

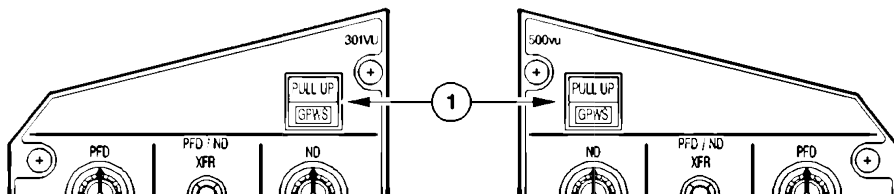
(5) TERR pushbutton

OFF : Inhibits the Terrain Awareness Display (TAD) and Terrain Clearance Floor (TCF) modes, and does not affect the basic GPWS mode 1 to 5. If OFF is selected the ECAM caution NAV GPWS TERR DET FAULT is displayed.

FAULT light : This amber light comes on, along with an ECAM caution, if the TAD or TCF mode fails. The terrain is not shown on the ND. The basic GPWS mode 1 to mode 5 are still operative if the SYS pushbutton OFF or FAULT lights are not illuminated.

INSTRUMENT PANELS

Applicable to: ALL

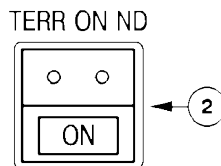
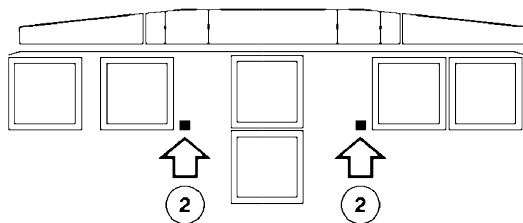


(1) PULL UP – GPWS pb

PULL : Comes on to give a visual indication, when a PULL UP warning is triggered in Modes UP 1, 2, and TAD. The corresponding aural warning sounds.

GPWS : Comes on amber, when any other mode is activated. The corresponding aural warning sounds.

- Note:
1. If the flight crew briefly presses this button when one of these modes is activated, the GPWS light goes out and the voice warning stops.
 2. On ground, the GPWS can be tested by pressing this pushbutton. If the pushbutton is pressed briefly, some of the aural warnings sound and pushbutton captions, related to the GPWS, come on. If the pushbutton is pressed continuously, then all the aural warnings sound.



(2) TERR ON ND pb

These pushbutton are located on either side of the ECAM. Each pushbutton controls the onside terrain display.

Continued on the next page

ON : The terrain is displayed on the ND if the:

- TERR pb-sw is selected ON, and
- TERR FAULT light is not on.

The ON light comes on.

OFF : The terrain data is not displayed on the ND.

- Note:
- *If the Terrain Awareness Display (TAD) mode generates a caution, or a warning while the TERR ON ND is not switched ON, the terrain data is automatically displayed on the NDs (see EGPWS specific caution and warning due to TAD mode) and the ON light of the, TERR ON ND pushbutton comes on.*
 - *To differentiate between the terrain and the weather display, the terrain display sweeps from the center outward to both sides of the ND.*



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

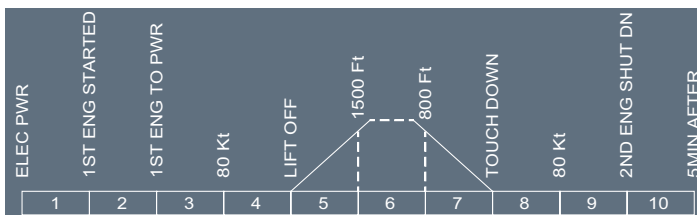
DSC-34-70 – GPWS

DSC-34-70-40 – Controls and Indicators

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WARNINGS AND CAUTIONS

Applicable to: MSN 3411



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
GPWS FAULT	SINGLE CHIME	MASTER CAUT	NIL	GPWSSYS FAULT It	1, 3, 4, 5, 8, 9, 10
GPWS TERR DET FAULT The enhanced terrain detection function is inoperative. The basic GPWS mode 1 to 5 are still operative.				GPWS TERR FAULT It	1, 3, 4, 5 8,10

MEMO DISPLAY

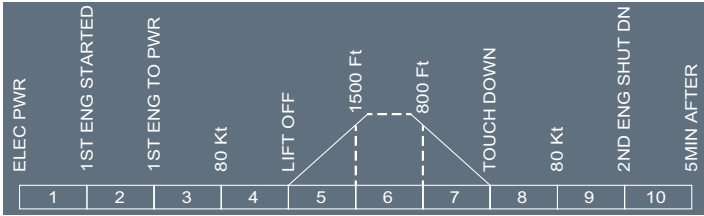
GPWS FLAP 3 is displayed in green when GPWS LDG FLAP 3 pb-sw is ON.

GPWS FLAP MODE OFF is displayed in green when GPWS FLAP MODE pb-sw is OFF.

Airborne TERR STBY appears in green when the aircraft position accuracy (computed by the EGPWS) is not sufficient to allow the enhanced TCF and TAD modes to operate. These modes are not available until the TERR STBY memo disappears. If selected, the terrain data display on ND is automatically deselected when the TERR STBY memo is triggered.”

WARNINGS AND CAUTIONS

Applicable to: ALL except MSN 3411



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
GPWS FAULT	SINGLE CHIME	MASTER CAUT	NIL	GPWSSYS FAULT lt	1, 3, 4, 5, 8, 9, 10
GPWS TERR DET FAULT The enhanced terrain detection function is inoperative. The basic GPWS mode 1 to 5 are still operative.				GPWS TERR FAULT lt	1, 3, 4, 5 8,10

MEMO DISPLAY

GPWS FLAP 3 is displayed in green when GPWS LDG FLAP 3 pb-sw is ON.
GPWS FLAP MODE OFF is displayed in green when GPWS FLAP MODE pb-sw is OFF.
Airborne TERR STBY appears in green when the aircraft position accuracy (computed by the EGPWS) is not sufficient to allow the enhanced TCF and TAD modes to operate. These modes are not available until the TERR STBY memo disappears. If selected, the terrain data display on ND is automatically deselected when the TERR STBY memo is triggered.”

- TERR OFF is displayed when the TERR pb-sw is switched OFF:
- It appears in green in flight phase 2, before the Take Off Configuration test is launched, and in flight phase 6.
 - It appears in amber in flight phase 2, after the Take Off Configuration test, and in flight phases 3, 4, 5, 7, 8 and 9.

BUS EQUIPMENT LIST

Applicable to: ALL

	NORM		EMER ELEC		
	AC	DC	AC ESS	DC ESS	HOT
GPWS	AC1				



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-70 – GPWS

DSC-34-70-60 – Electrical Supply

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GENERAL

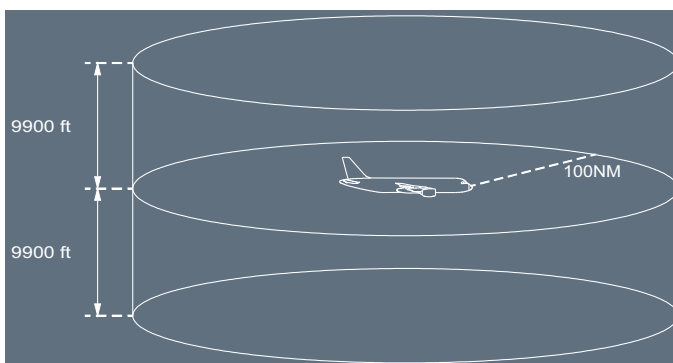
Applicable to: ALL

The Traffic alert and Collision Avoidance System (TCAS):

- Detects any aircraft, that is equipped with transponders and is flying in the vicinity
- Displays potential and predicted collision targets
- Issues vertical orders to avoid conflict.

The TCAS is normally independent of the ground-based air traffic control system.

The TCAS detection capability is limited to intruders flying within a maximum range of 100 nm (depending on aircraft configuration and external conditions), and within a maximum altitude range of 9 900 ft (above and below the threatened aircraft).



MAIN COMPONENTS

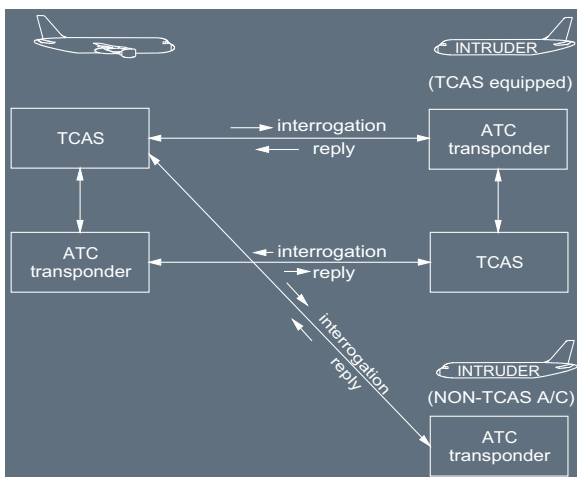
Applicable to: ALL

The system includes:

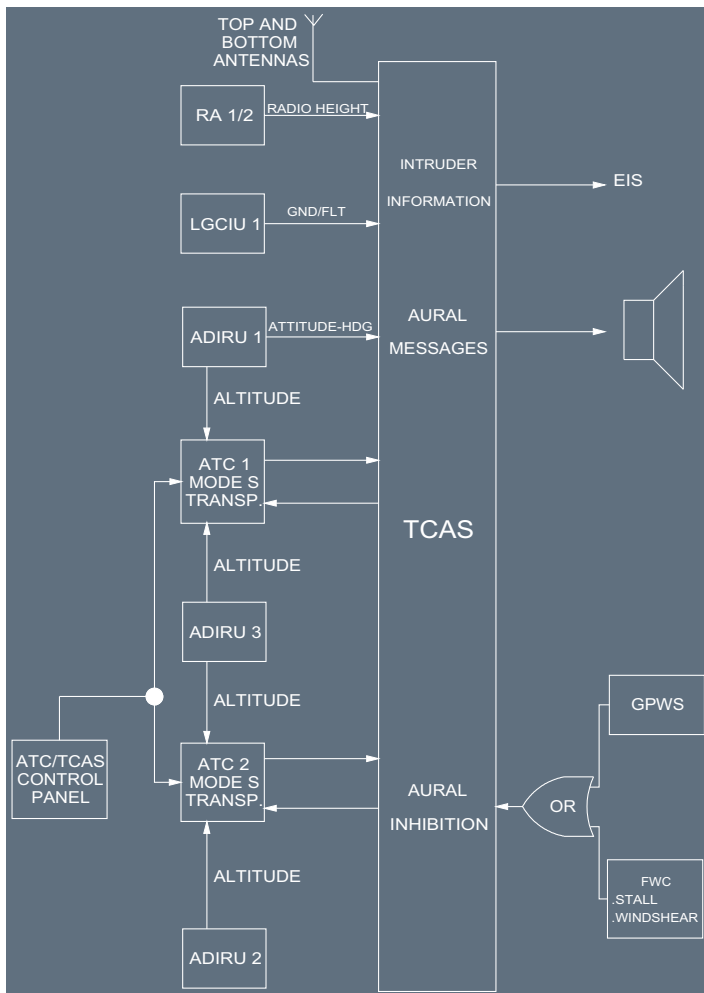
- A single channel TCAS computer
- Two TCAS antennas
- Two mode S ATC transponders, one active the other in standby.

These transponders allow:

- Interface between the ATC/TCAS control panel and the TCAS computer
- Communication between the aircraft and intruders equipped with a TCAS system
- An ATC/TCAS control panel.



Continued on the next page



PRINCIPLE**Applicable to: ALL**

The TCAS interrogates transponder of intruders. From the transponder replies, the TCAS determines for each intruder:

- Its relative bearing
- Its range and closure rate
- Its relative altitude if available (ATC mode C or S)

Then the TCAS computes the intruder trajectory, the Closest Point of Approach (CPA) and the estimated time (TAU) before reaching the CPA.

Each time the relative position of the intruder presents a collision threat, aural and visual advisories are triggered.

TCAS optimizes vertical orders to ensure a sufficient trajectory separation and a minimal vertical speed variation considering all intruders.

INTRUDER CLASSIFICATION

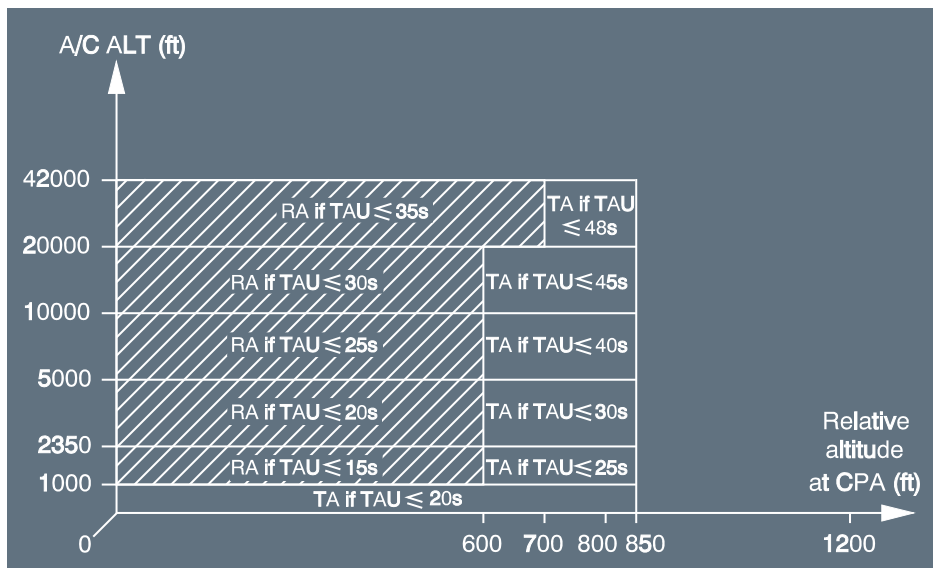
Applicable to: ALL

The intruders are classified in four levels:

LEVEL	INTRUDER POSITION	DISPLAYED INFORMATION
Proximate	- No collision threat - Intruder in the vicinity of the A/C (closer than 6 nm laterally and ± 1 200 ft vertically)	- ND: intruder position
Traffic Advisory (TA)	- Potential collision threat - TAU is about 40 s	- ND: intruder position - Aural messages
Resolution Advisory (RA)	- Real collision threat - TAU is about 25 s	- ND: intruder position - Aural messages - PFD: vertical orders • Maintain actual V/S (Preventive Advisory) or • Modify V/S (Corrective Advisory)
Other intruders 	- No collision threat - Any non proximate, TA, RA within the surveillance envelope (lateral range: closer than 30 nm. vertical range: <i>Refer to DSC-34-80-20 ATC/TCAS Panel</i>)	- ND: Intruder position

TA/RA THRESHOLDS

Applicable to: ALL



TCAS MODES

Applicable to: ALL

The TCAS has two modes of operation:

- TA/RA : This mode allows the display of all intruders
- TA : Can be selected by:
 - The crew, on the ATC/TCAS panel, in case of aircraft degraded performance (engine failure, landing gear extended), or when operating near closely-spaced parallel runways, or
 - Automatically, if TA/RA is previously selected, and:
 - The windshear  message is triggered
 - The stall message is triggered
 - GPWS messages are triggered
 - Aircraft is below 1 000 ft AGL.

Consequently:

- All RAs are inhibited and converted into TAs
- TA threshold is set to TAU ≤ 20 s, irrespective of the aircraft's altitude
- No vertical speed advisories are indicated on the PFDs
- "TA ONLY" is displayed on the NDs.

If windshear, stall, or GPWS messages are triggered, or aircraft below 500 ft AGL, all the TCAS aural messages are suppressed.

ADVISORY INHIBITION

Applicable to: ALL

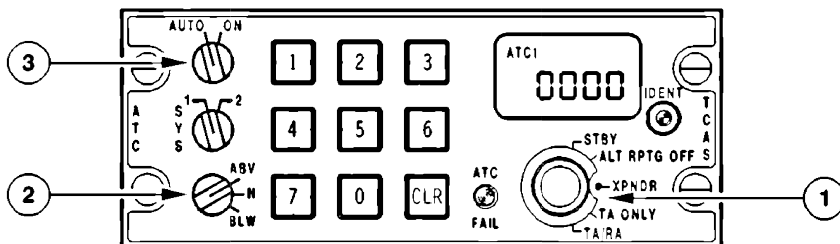
Some advisories are inhibited depending on the aircraft altitude:

- All intruders flying below 380 ft AGL when the own aircraft altitude is below 1 700 ft AGL.
- All RA below 1 100 ft in climb and 900 ft in descent. In this case, the RAs are converted into TAs.
- "Descend" type advisory below 1 200 ft AGL at takeoff or 1 000 ft AGL in approach.
- "Increase Descent" RA below 1 450 ft.
- All TA aural messages below 600 ft AGL in climb and below 400 ft AGL in descent.

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ATC/TCAS PANEL

Applicable to: ALL



(1) Mode selector

TA/RA : Normal position.

TAs, RAs, proximate and other intruders are displayed.

TA ONLY : This mode should be used, in case of degraded aircraft performance (engine failure, landing gear extended, or approach on parallel runways).

All RAs are converted into TAs. TAs, proximate and other intruders are displayed.

STBY : The TCAS and ATC are on standby.

XPND R : - The TCAS is on standby

- On ground : The selected ATC Transponder only operates in the selective aircraft interrogation mode of Mode S

- In flight : The selected ATC Transponder operates.

(2) TRAFFIC selector

ABV : The altitude range is set to +7 000 ft above the aircraft, and -2 700 ft below the aircraft.

N : The altitude range is set to -2 700 ft below the aircraft, and +2 700 ft above the aircraft.

BLW : The altitude range is set to -7 000 ft below the aircraft, and +2 700 ft above the aircraft.

(3) AUTO/ON selector or THRT/ALL selector

ON (or ALL) : All intruders are displayed.

AUTO (or THRT) : Proximate and other intruders are only displayed, if a TA or RA is already presented.

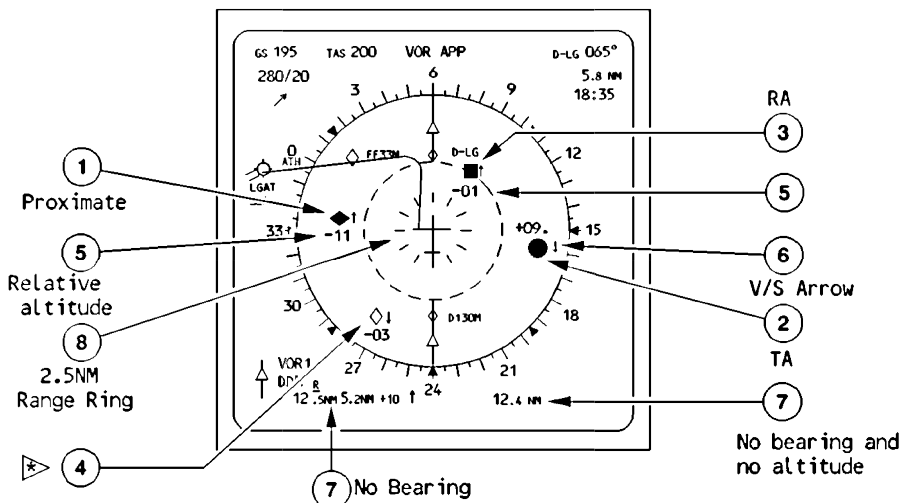
Continued on the next page

Note: Some TCAS control panels are equipped with a THRT/ALL selector, instead of the AUTO/ON selector. The associated functions remain unchanged.

ND INDICATIONS

Applicable to: ALL

The traffic is displayed in all ROSE modes and ARC mode. Only the 8 most threatening intruders are displayed.



- (1) Proximate intruder
Indicated by a white filled diamond.
- (2) TA intruder
Indicated by an amber circle.
Associated with the TRAFFIC-TRAFFIC aural message.
- (3) RA intruder
Indicated by a red square.
Associated with vertical orders displayed on the PFD and aural messages.
- (4) Other intruders
Indicated by a white empty diamond.

Continued on the next page

Note: If the range of an intruder is not available, the intruder is not displayed. An intruder may be partially displayed when its range is out of scale.

(5) Relative altitude

Indicated in hundred of feet above or below the symbol depending on the intruder position.

(6) Vertical speed arrow

Displayed only if the intruder V/S > 500 ft/min

Relative altitude and vertical speed arrow are displayed in the same color as the associated intruder symbol.

Note: If the altitude of an intruder is not available, neither altitude nor vertical speed indications are displayed.

(7) No bearing intruder

If the bearing of TA or RA intruder is not available the following data is presented in digital form at the bottom of the ND:

- range
- relative altitude and vertical speed arrow if available.

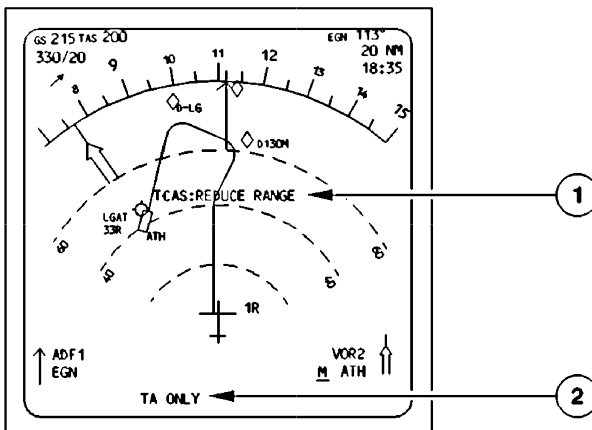
Displayed amber or red according to threat level.

(8) Range ring

A 2.5 nm white range ring is displayed when a 10 nm or 20 nm range is selected.

TCAS MESSAGES

Applicable to: ALL



(1) Mode and range messages

Following messages can be displayed to draw pilot's attention:

TCAS : REDUCE RANGE : Displayed when a TA or RA is detected and ND range above 40 nm

TCAS : CHANGE MODE : Displayed when a TA or RA is detected and ND mode is PLAN.

Displayed amber or red depending on the advisory level (TA or RA).

(2) TCAS operation messages

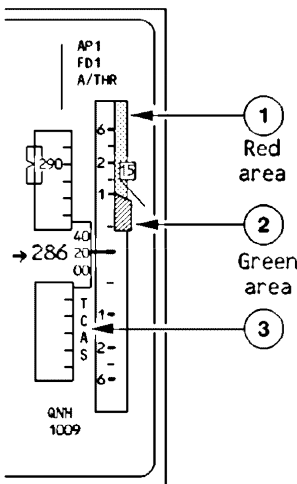
TCAS : Displayed in amber in case of TCAS internal failure.

TA ONLY : Displayed white when the TA mode is selected automatically, or manually by the flight crew.

PFD INDICATIONS

Applicable to: ALL

In case of RA detection, the vertical speed scale becomes rectangular and the PFD presents vertical orders on the vertical speed scale. The vertical speed scale background is normally grey, but may be partially replaced by green and/or red areas.



- (1) Red area
Indicates the vertical speed range, when there is a high risk of conflict.

- (2) Green area
Indicates the recommended vertical speed range. It is wider than the red area.

Note:

- The aircraft can also fly in the grey vertical speed range, without the risk of conflict (preventive RA)
- The color of the digits corresponds to the appropriate area
- In case of RA detection, the vertical speed needle that is normally green, becomes white.

Continued on the next page

(3) TCAS message

Appears in amber provided that the TCAS is not in standby, when the TCAS cannot deliver RA data, or in case of an internal TCAS failure.

AURAL MESSAGES

Applicable to: MSN 5046-5319

TA/RA detection is associated with the following messages:

"TRAFFIC TRAFFIC" : Only in case of TA detection.

"CLIMB CLIMB" : Climb at the vertical speed indicated by the green area on the PFD.

"CLIMB, CROSSING CLIMB" (twice) : Same as above. Indicates that you will cross through the intruder altitude.

"INCREASE CLIMB" (twice) : Triggered after the CLIMB message, if vertical speed is insufficient to achieve safe vertical separation.

"DESCEND DESCEND" : Descend at the vertical speed indicated by the green area on the PFD.

"DESCEND, CROSSING DESCEND" (twice) : Same as above. Indicates that you will cross through the intruder altitude.

"INCREASE DESCEND" (twice) : Triggered after the DESCEND message, if the vertical speed is insufficient to achieve safe vertical separation.

"LEVEL OFF" : Set the Vertical Speed to 0.

"CLIMB CLIMB NOW" (twice) : Triggered after the DESCEND message, if the intruder trajectory has changed.

"DESCEND DESCEND NOW" (twice) : Triggered after the CLIMB message, if the intruder trajectory has changed.

"MONITOR VERTICAL SPEED" : Ensure that the vertical speed remains outside the red area. Triggered only once, in case of preventive RA.

"MAINTAIN VERTICAL SPEED, MAINTAIN" : Maintain the vertical speed indicated on the green area of the PFD.

"MAINTAIN VERTICAL SPEED, CROSSING MAINTAIN" : Maintain the vertical speed indicated on the green area of the PFD.

Indicates that you will cross through the intruder altitude.

"CLEAR OF CONFLICT" : The range increases and separation is adequate.

Return to assigned clearance.

AURAL MESSAGES

Applicable to: MSN 2037-5020

TA/RA detection is associated with the following messages:

"TRAFFIC TRAFFIC" : Only in case of TA detection.

"CLIMB CLIMB" : Climb at the vertical speed indicated by the green area on the PFD.

"CLIMB, CROSSING CLIMB" (twice) : Same as above. Indicates that you will cross through the intruder altitude.

"INCREASE CLIMB" (twice) : Triggered after the CLIMB message, if vertical speed is insufficient to achieve safe vertical separation.

"DESCEND DESCEND" : Descend at the vertical speed indicated by the green area on the PFD.

"DESCEND, CROSSING DESCEND" (twice) : Same as above. Indicates that you will cross through the intruder altitude.

"INCREASE DESCEND" (twice) : Triggered after the DESCEND message, if the vertical speed is insufficient to achieve safe vertical separation.

"ADJUST VERTICAL SPEED, ADJUST" : Adjust the vertical speed to that indicated on the green area of the PFD, reducing climb vertical speed or descent vertical speed, as appropriate.

"CLIMB CLIMB NOW" (twice) : Triggered after the DESCEND message, if the intruder trajectory has changed.

"DESCEND DESCEND NOW" (twice) : Triggered after the CLIMB message, if the intruder trajectory has changed.

"MONITOR VERTICAL SPEED" : Ensure that the vertical speed remains outside the red area. Triggered only once, in case of preventive RA.

"MAINTAIN VERTICAL SPEED, MAINTAIN" : Maintain the vertical speed indicated on the green area of the PFD.

"MAINTAIN VERTICAL SPEED, CROSSING MAINTAIN" : Maintain the vertical speed indicated on the green area of the PFD. Indicates that you will cross through the intruder altitude.

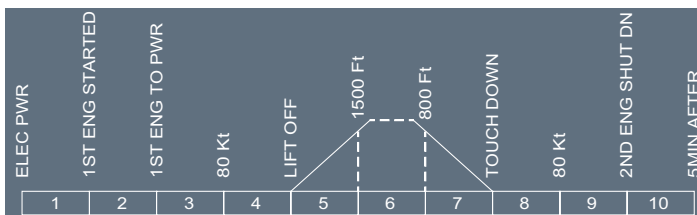
"CLEAR OF CONFLICT" : The range increases and separation is adequate.

Return to assigned clearance.

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WARNINGS AND CAUTIONS

Applicable to: MSN 3411-4006



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
TCAS FAULT in case of TCAS internal failure	NIL	NIL	NIL	Flag on PFD and ND	3, 4, 5, 7

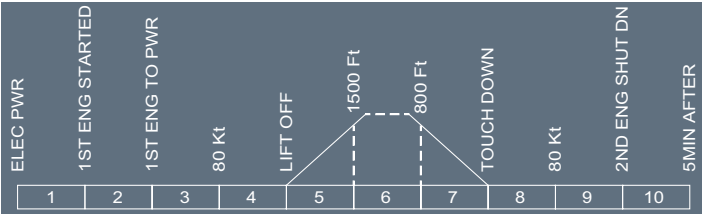
MEMO DISPLAY

TCAS STBY is displayed green when:

- ATC STBY or TCAS STBY is selected by the crew, or
- ALT RPTG is selected at off, or
- both ATC or both RA are failed.

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-3184, 4040-4132



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
TCAS FAULT in case of TCAS internal failure	SINGLE CHIME	MASTER CAUT	NIL	Flag on PFD and ND	3, 4, 5, 7
TCAS STBY in the case where the flight crew sets the TCAS on STBY in flight.	SINGLE CHIME	MASTER CAUT		NIL	ALL, except 6

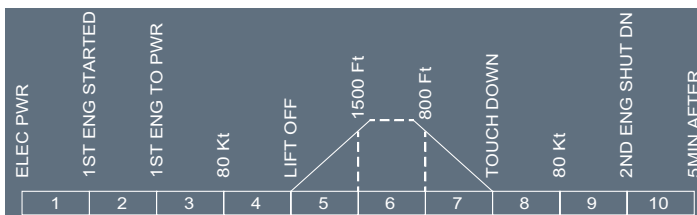
MEMO DISPLAY

- TCAS STBY is displayed in green, when:
- ATC STBY is selected by the crew, or
 - TCAS STBY is selected by the crew during flight phases other than 6, or
 - ALT RPTG is selected at off, or
 - both ATC or both RA are failed.

TCAS STBY is displayed in amber, when the flight crew sets the TCAS on STBY in flight phase 6.

WARNINGS AND CAUTIONS

Applicable to: MSN 4012-4034, 4157-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
TCAS FAULT in case of TCAS internal failure	SINGLE CHIME	MASTER CAUT	NIL	Flag on PFD and ND	3, 4, 5, 7
TCAS STBY in the case where the flight crew sets the TCAS on STBY in flight.	SINGLE CHIME	MASTER CAUT		NIL	ALL, except 6

MEMO DISPLAY

TCAS STBY is displayed in green, when:

- ATC STBY is selected by the crew, or
- TCAS STBY is selected by the crew during flight phases other than 6, or
- ALT RPTG is selected at off, or
- both ATC or both RA are failed.
- In the case of a triple ADR failure.

TCAS STBY is displayed in amber, when the flight crew sets the TCAS on STBY in flight phase 6.

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BUS EQUIPMENT LIST

Applicable to: ALL

	NORM		EMER ELEC		
	AC	DC	AC ESS	DC ESS	HOT
TCAS 	AC1				



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-34 – NAVIGATION

DSC-34-80 – TCAS

DSC-34-80-40 – Electrical Supply

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DSC-35-20	Fixed Oxygen System for Cockpit	
DSC-35-20-10	Description	
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OXYGEN
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DESCRIPTION

Applicable to: ALL

The oxygen system consists of:

- A cockpit-fixed oxygen system, which supplies adequate breathing oxygen to the cockpit occupants in case of depressurization, or emission of smoke and noxious gases.
- A cabin-fixed oxygen system, which supplies oxygen for cabin occupants (passengers and cabin crew) in case of depressurization.
- A portable oxygen system, which is provided in both the cockpit and cabin and is to be used:
 - As PROTECTION for the crew during on board emergencies.
 - For FIRST AID purposes.

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GENERAL

Applicable to: ALL

The cockpit's fixed oxygen system consists of :

- A high-pressure cylinder, in the left-hand lower fuselage.
- A pressure regulator, connected directly to the cylinder that delivers oxygen, at a pressure suitable for users.
- Two overpressure safety systems to vent oxygen overboard, through a safety port, if the pressure gets too high.
- A supply solenoid valve that allows the crew to shut off the distribution system.
- Three full-face quick-donning masks, stowed in readily-accessible boxes adjacent to the crewmembers' seats (one at each seat).

OPERATION

Applicable to: ALL

The crewmember squeezes the red grips to pull the mask out of its box, and this action causes the mask harness to inflate.

A mask-mounted regulator supplies a mixture of air and oxygen or pure oxygen, or performs emergency pressure control. With the regulator set to NORMAL, the user breathes a mixture of cabin air and oxygen up to the cabin altitude at which the regulator supplies 100 % oxygen. The user can select 100 %, in which case the regulator supplies pure oxygen at all cabin altitudes.

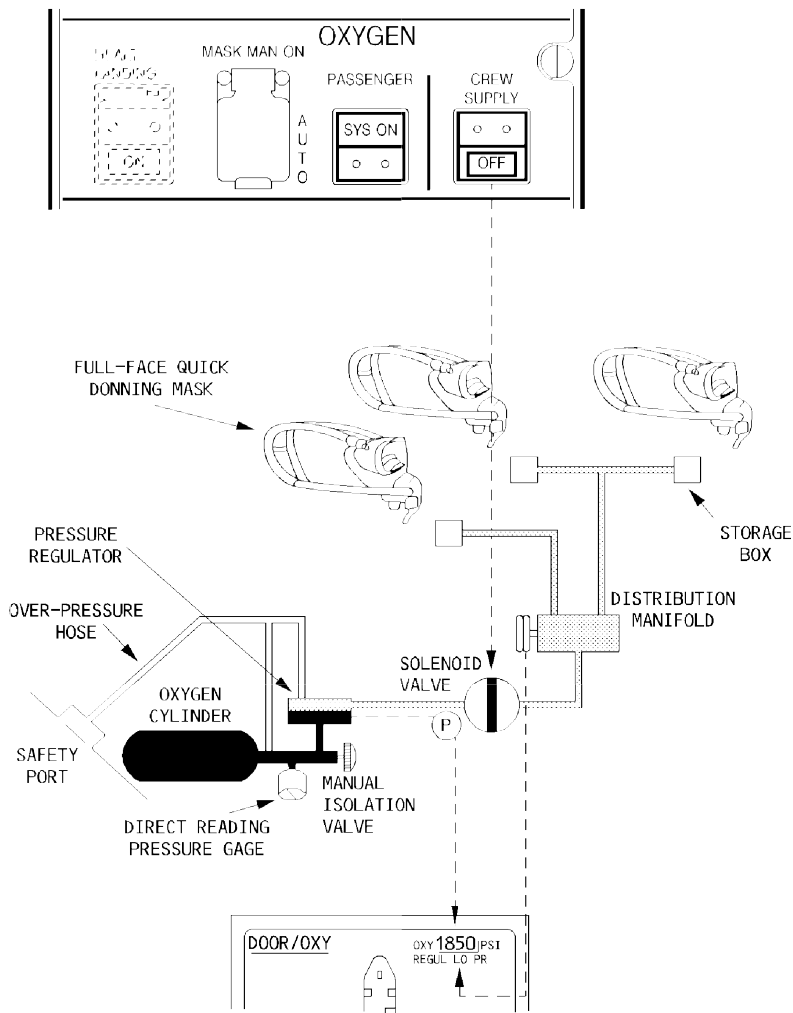
If the situation calls for it, the user can use the emergency overpressure rotating knob and receive pure oxygen at positive pressure.

The storage box contains a microphone lead, with a quick-disconnect, for connection to the appropriate mask microphone cable.

Note: *Each mask may have a removable film that protects the visor against scratches.
This strip is optional and may be removed from the mask at any time.*

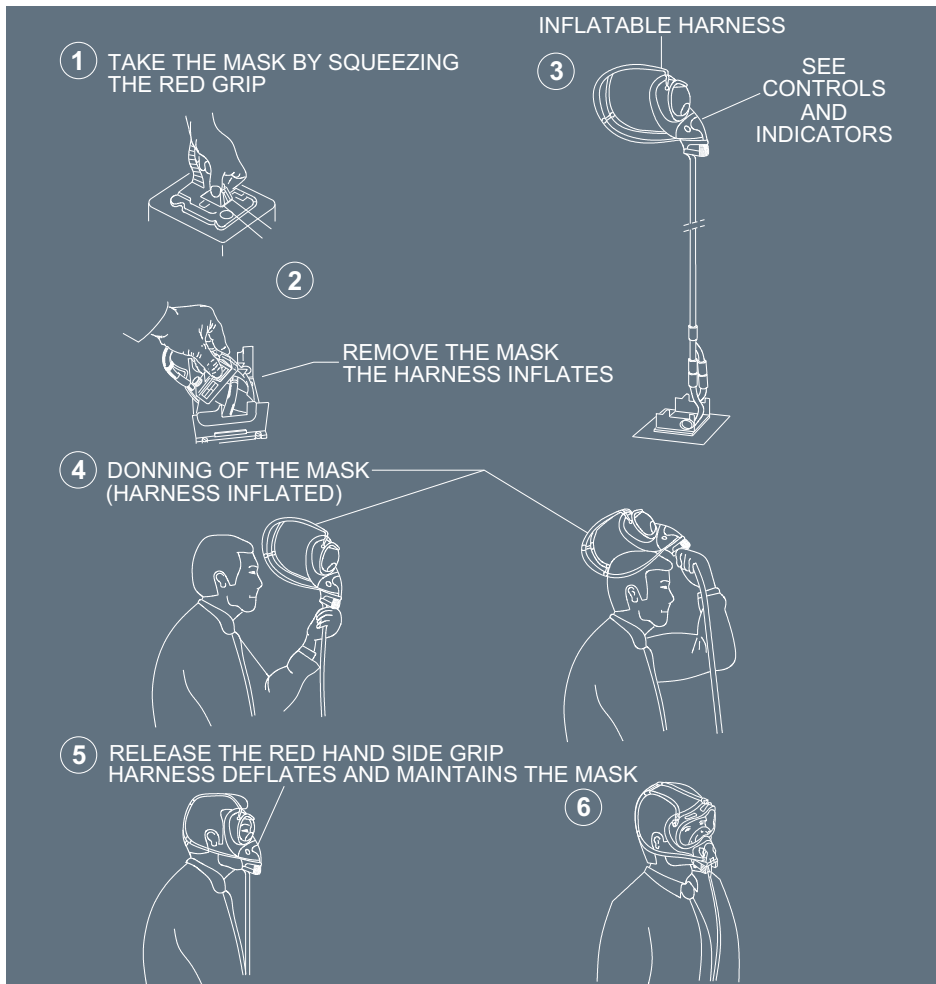
SCHEMATIC

Applicable to: ALL



MASK SETTING

Applicable to: ALL



MASK STOWAGE

Applicable to: ALL

- ① - COIL THE HOSE, AND PLACE IT IN THE BOTTOM OF THE STOWAGE BOX.



- ③ - PLACE THE MASK IN THE STOWAGE BOX.
- MAKE SURE THE MASK REGULATOR IS FULLY SEATED AGAINST THE STOP IN THE STOWAGE BOX.



- ② - POSITION THE REMAINING HOSE IN THE MIDDLE OF THE MASK.
- FOLD THE TWO HARNESS PORTIONS TOGETHER.



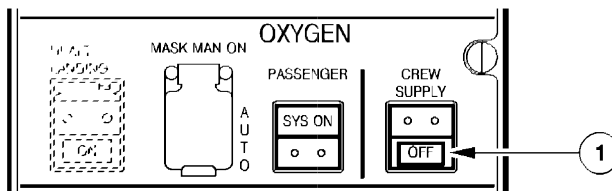
- ④ - CLOSE THE DOORS, THEN FULLY PRESS THE "RESET TEST" BUTTON.
- ONCE THE "RESET TEST" BUTTON IS RELEASED, CHECK THAT THE "OXY ON" FLAG COMPLETELY DISAPPEARS.
- PRESS THE EMERGENCY PRESSURE SELECTOR, AND CHECK THAT THE BLINKER REMAINS BLACK.
- THEN, RETURN THE N/100% SELECTOR AT THE 100% POSITION.

CAUTION: Maintaining the pressure selector in the "EMERGENCY" position can deplete the crew oxygen cylinder.



OVERHEAD PANEL

Applicable to: ALL



(1) CREW SUPPLY pb

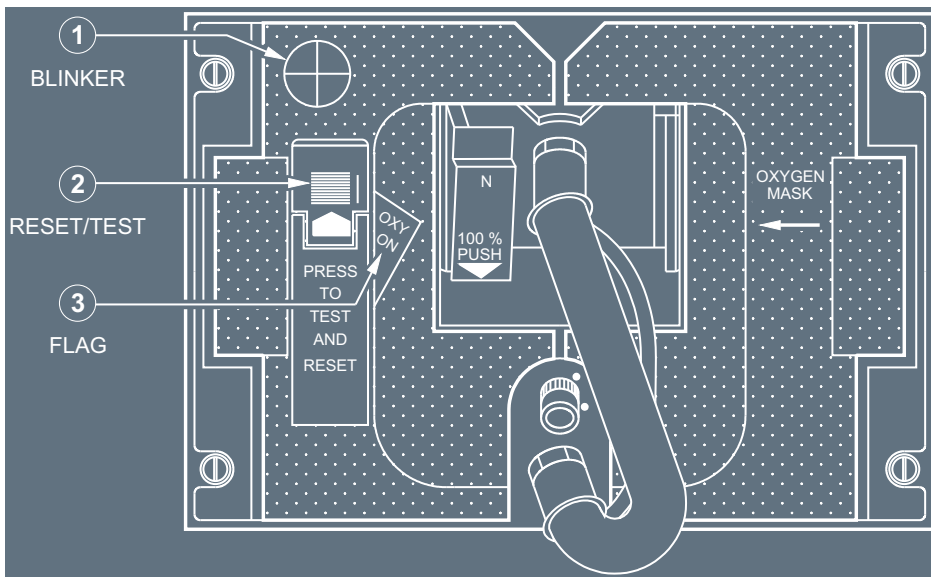
This pushbutton controls the solenoid valve.

On : The valve is open, and supplies low pressure oxygen to the masks (normal position in flight).

OFF: The valve is closed, and the white light comes on.

STOWAGE BOX

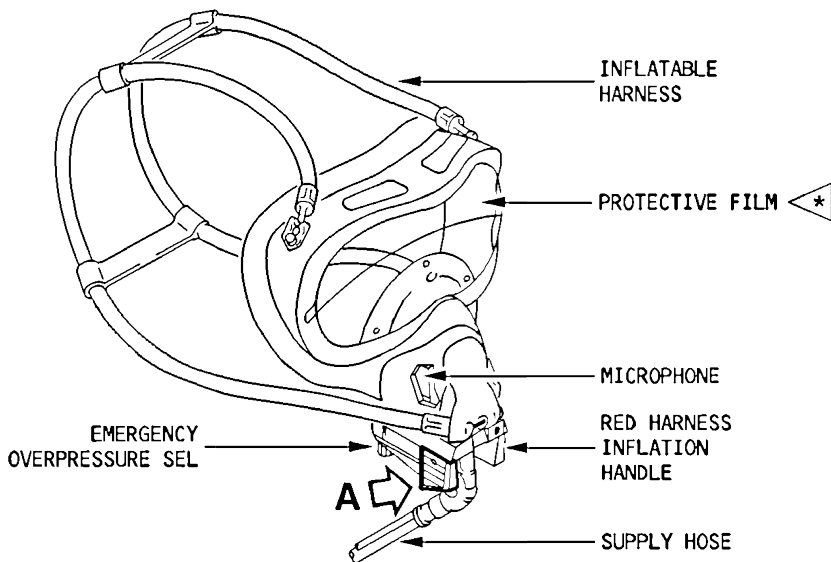
Applicable to: ALL



- (1) Blinker flowmeter (yellow)
This indicator flashes when oxygen is flowing.
- (2) RESET/TEST control slide
The crewmember presses the slide, and pushes it in the direction of the arrow to test: the operation of the blinker; the regulator supply; system sealing downstream of the valve; and the regulator sealing and system operation. Pressing the RESET control slide, after the oxygen mask has been used, cuts off the oxygen, and the mask microphone.
- (3) OXY ON flag
As soon as the left flap door opens, the mask is supplied with oxygen and, once it closes (mask still supplied with oxygen), the “OXY ON” flag appears.

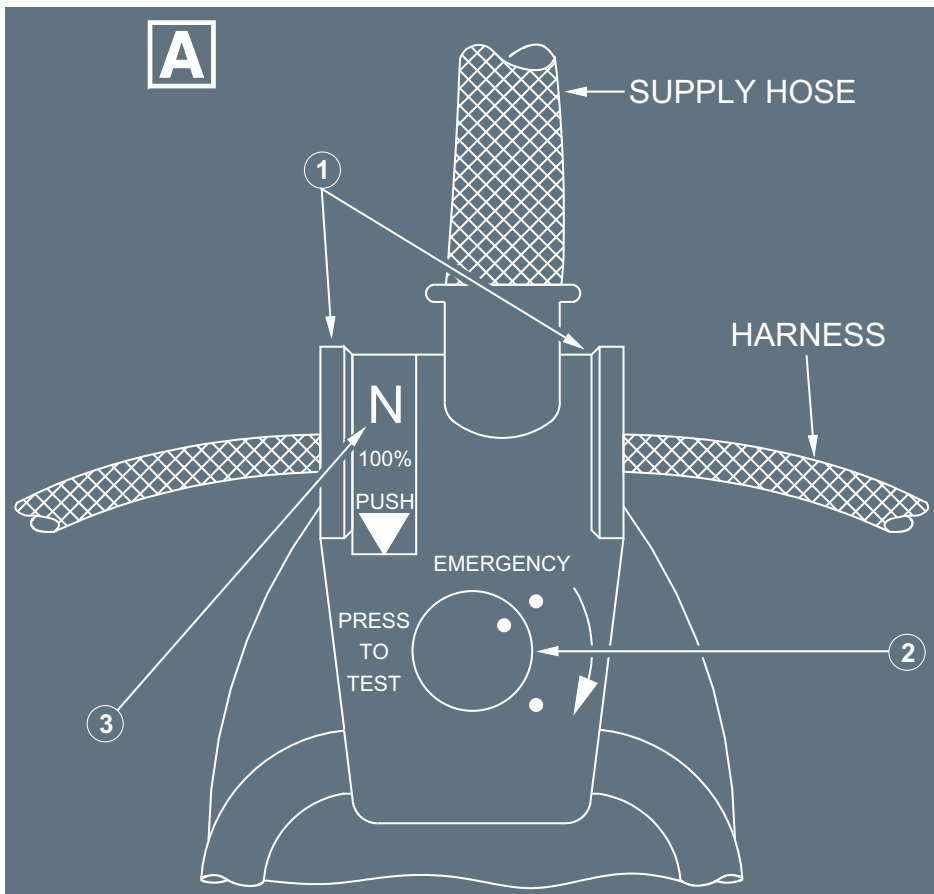
CREW OXYGEN MASK

Applicable to: ALL



PRESSURE REGULATOR

Applicable to: ALL



(1) Red grips

Squeezing the right-hand side grip unlocks the two-flap door, and permits the harness to inflate.

Continued on the next page

(2) EMERGENCY pressure selector

Use of this selector creates an overpressure which eliminates condensation or fogging of the mask, and prevents smoke, smell or ashes from entering the mask.

- Pressing this knob generates an overpressure for a few seconds.
- Turning the knob, in the direction of the arrow, generates a permanent overpressure.

Note:

1. *Overpressure supply is automatically started, when cabin altitude exceeds 30 000 ft.*
2. *Overpressure supply is available only when the N/100% selector is set on the on the 100 % position.*

(3) N/100 % selector

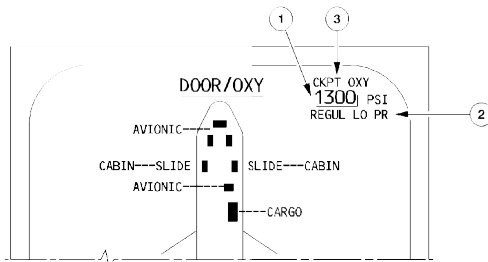
Pushing the button up from underneath releases it, and it pops up to the N (normal) position. Pressing it again returns it to 100 %.

100 % : The mask delivers 100 % oxygen.

N : The mask delivers a mixture of air and oxygen, the content of which varies with cabin altitude. When cabin altitude goes above 35 000 ft, the air inlet closes and the wearer breathes 100 % oxygen.

DOOR/OXY ECAM PAGE

Applicable to: ALL



(1) OXY high pressure indication

It is in green, when the pressure is ≥ 800 PSI.

It pulses in green, when the pressure is < 800 PSI (the DOOR/OXY SD PAGE is automatically displayed).

It is in amber, when the pressure is < 400 PSI.

On ground, an amber half frame appears when oxygen pressure is $< 1\ 500$ PSI.

In this case, the flight crew must check that the remaining quantity is not below the minimum (*Refer to LIM-35 Cockpit Fixed Oxygen System*).

(2) REGUL LO PR indication

It is in amber, if oxygen pressure on the low-pressure circuit is low (50 PSI).

(3) CKPT OXY indication

It is normally in white.

It becomes amber, when:

- Pressure goes below 400 PSI
- Low oxygen pressure is detected
- The overhead panel's OXYGEN CREW SUPPLY pb is OFF.

BUS EQUIPMENT LIST

Applicable to: ALL

	NORM			EMER ELEC		
	AC	DC	DC BAT	AC ESS	DC ESS	HOT
CREW OXY CTL					SHED	

L3



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DSC – AIRCRAFT SYSTEMS

DSC-35 – OXYGEN

DSC-35-20 – Fixed Oxygen System for Cockpit

DSC-35-20-30 – Electrical Supply

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GENERAL

Applicable to: ALL

The cabin's fixed oxygen system supplies oxygen to the occupants, in case of cabin depressurization. Chemical generators produce the oxygen. Each generator feeds a group of 2, 3, or 4 masks. Generators and masks are in containers above the passenger seats, in the lavatories, in each galley , and at each cabin crew station.

OPERATION

Applicable to: ALL

Each container has an electrical latching mechanism that opens automatically to allow the masks to drop, if the cabin pressure altitude exceeds 14 000 ft (+ 250, -750 ft). The flight crew can override the automatic control.

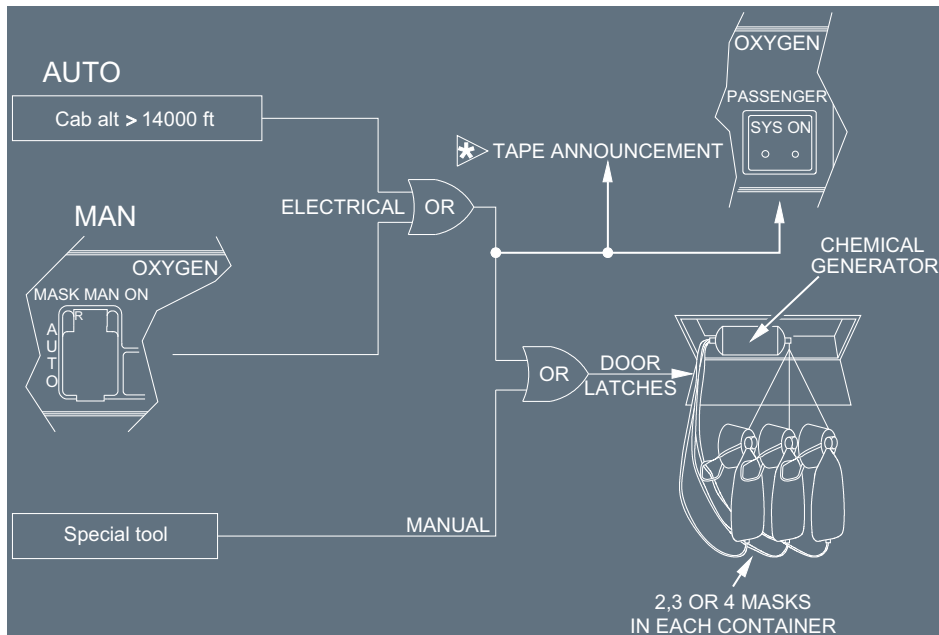
When the masks are released, the passenger address system automatically broadcasts prerecorded instructions  for their use.

The generation of oxygen begins when the passenger pulls the mask towards the passenger seat. The chemical reaction used for oxygen generation creates heat. Therefore, the smell of burning or smoke, and cabin temperature increase, may be associated with the normal operation of the oxygen generators. The mask receives pure oxygen under positive pressure for about 15 min, until the generator is exhausted.

A reset is available for the rearming of the system after the masks are restowed. A manual release tool allows crew members to manually open the doors in case of electrical failure.

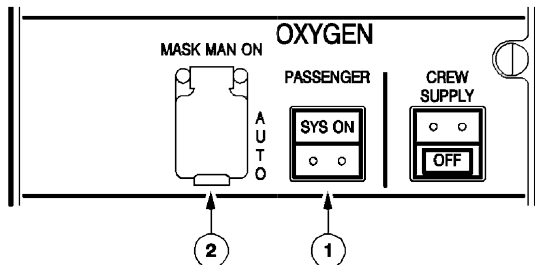
SCHEMATIC

Applicable to: ALL



OVERHEAD PANEL

Applicable to: ALL



(1) PASSENGER SYS ON light

This light comes on in white, when the control for the oxygen mask doors is activated, and it remains on until the TMR RESET pushbutton is pressed (*Refer to DSC-35-30-20 Overhead Maintenance Panel*).

(2) MASK MAN ON pushbutton

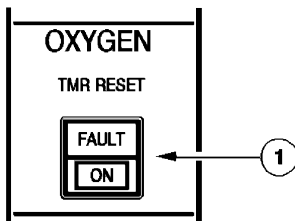
The guard keeps this button in the AUTO position.

AUTO : The mask doors open automatically, when the cabin altitude exceeds 14 000 ft.

Pressed : The mask doors open.

OVERHEAD MAINTENANCE PANEL

Applicable to: ALL



(1) TMR RESET pushbutton

The maintenance crew uses this pushbutton to reset the control circuit, after the system has operated.

ON : The PASSENGER SYS ON light goes off.

FAULT : This light comes on in white, when the door latch solenoids are energized for more than 30 s.

BUS EQUIPMENT LIST

Applicable to: ALL

		NORM			EMER ELEC		
		AC	DC	DC BAT	AC ESS	DC ESS	HOT
PAX OXYGEN	ACTUATION				SHED		
	AUTOCONTROL					SHED	

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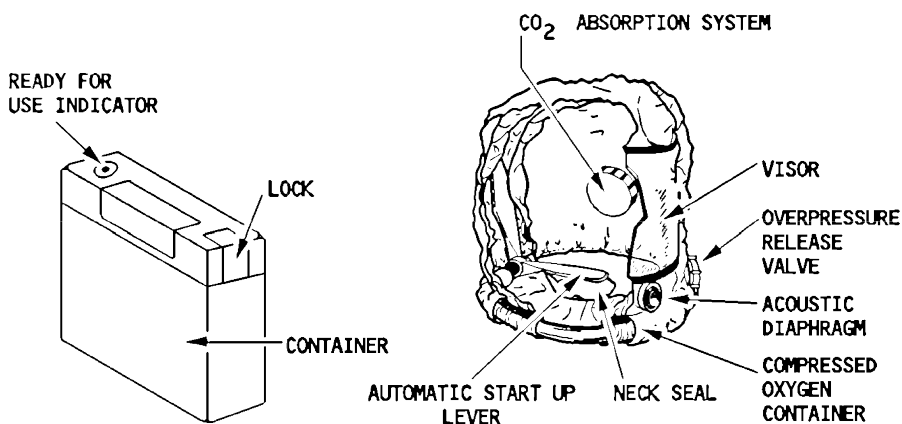
FLIGHT CREWS PORTABLE OXYGEN SYSTEM

Applicable to: ALL

The flight crew smoke hood located on the right back side of the cockpit, ensures the eyes and respiratory system protection of one flight crew member when fighting a fire and in case of smoke or noxious gas emissions or cabin depressurization.

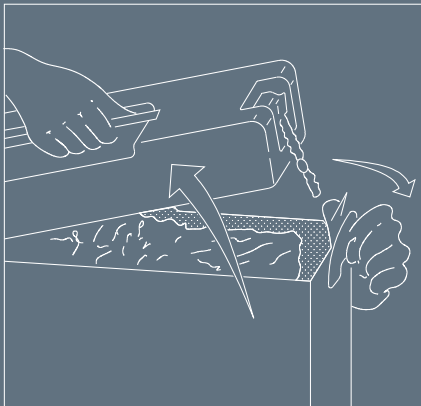
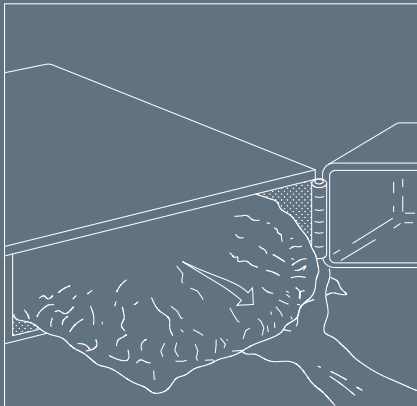
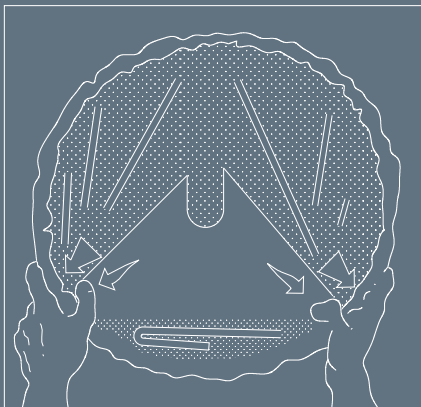
The smoke hood is equipped with one oxygen cylinder and one CO₂ absorption system which furnish an effective time of use of 15 min.

A « ready for use » status of the hood is ensured by checking that the indicator mounted on the hood container is not red.



USING THE HOOD

Applicable to: ALL

1 OPEN THE HOOD CONTAINER**2 REMOVE THE HOOD AND OPEN THE PROTECTIVE BAG****3 ENLARGE THE NECKSEAL AS INDICATED****4 THE OXYGEN SUPPLY IS AUTOMATICALLY ACTIVATED WHEN THE HOOD IS PUT.**

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GENERAL

Applicable to: ALL

The pneumatic system supplies high-pressure air for :

- air conditioning
- engine starting
- wing anti-icing
- water pressurization
- hydraulic reservoir pressurization

High-pressure air has three sources :

- engine bleed systems
- APU load compressor
- HP ground connection

A crossbleed duct interconnects the engine bleed systems and receives air from the APU and ground sources when appropriate.

A valve mounted on the crossbleed duct allows the left side (engine 1) and right side (engine 2) to be interconnected.

Two Bleed Monitoring Computers (BMC1 and BMC2), the overhead control panel, and the ECAM control and monitor the operation of the pneumatic system.

A leak detection system detects any overheating in the vicinity of hot air ducts.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-36 – PNEUMATIC

DSC-36-10 – Description

DSC-36-10-10 – General

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GENERAL

Applicable to: ALL

The aircraft has two similar engine bleed air systems.

Each system is designed to :

- select the compressor stage to use as a source of air
- regulate the bleed air temperature
- regulate the bleed air pressure.

A Bleed Monitoring Computer (BMC) controls and monitors each system.

Each BMC receives information about bleed pressure and temperature and valve position.

Each is connected with :

- other systems using air or information from the bleed system
- the other BMC.

Each supplies indications and warnings to the ECAM and CFDS.

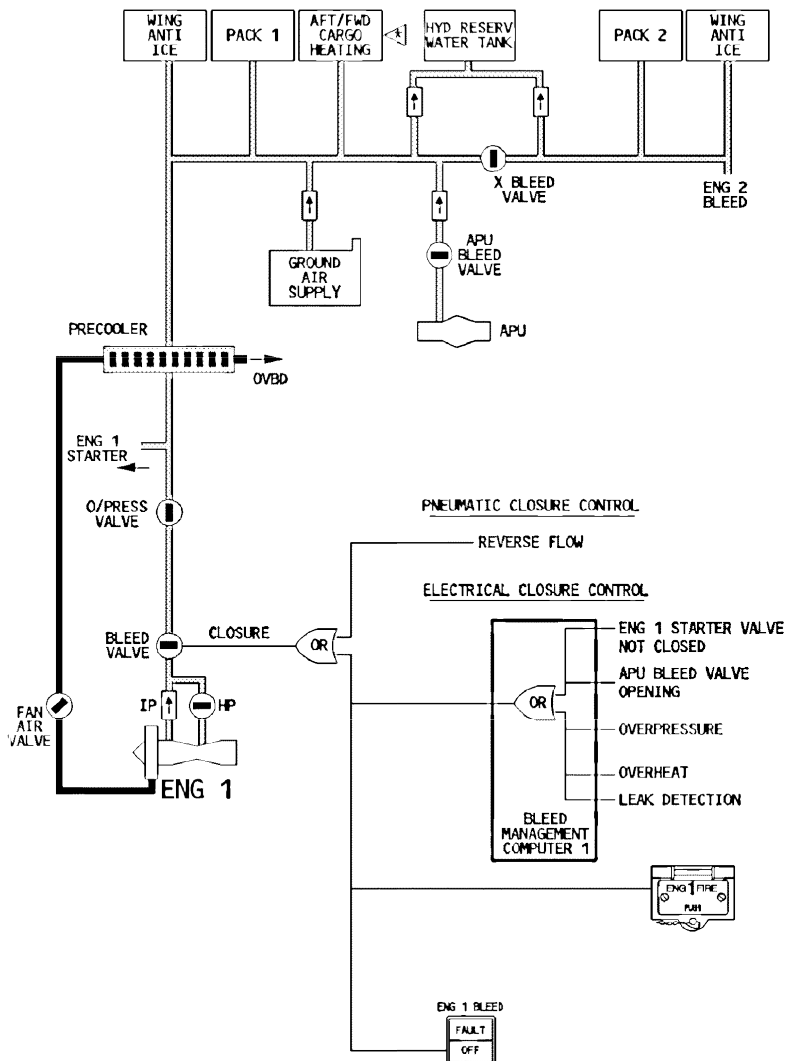
If one BMC fails, the other one takes over most of the monitoring functions.

Each bleed valve is pneumatically operated and controlled electrically by its associated BMC.

ARCHITECTURE

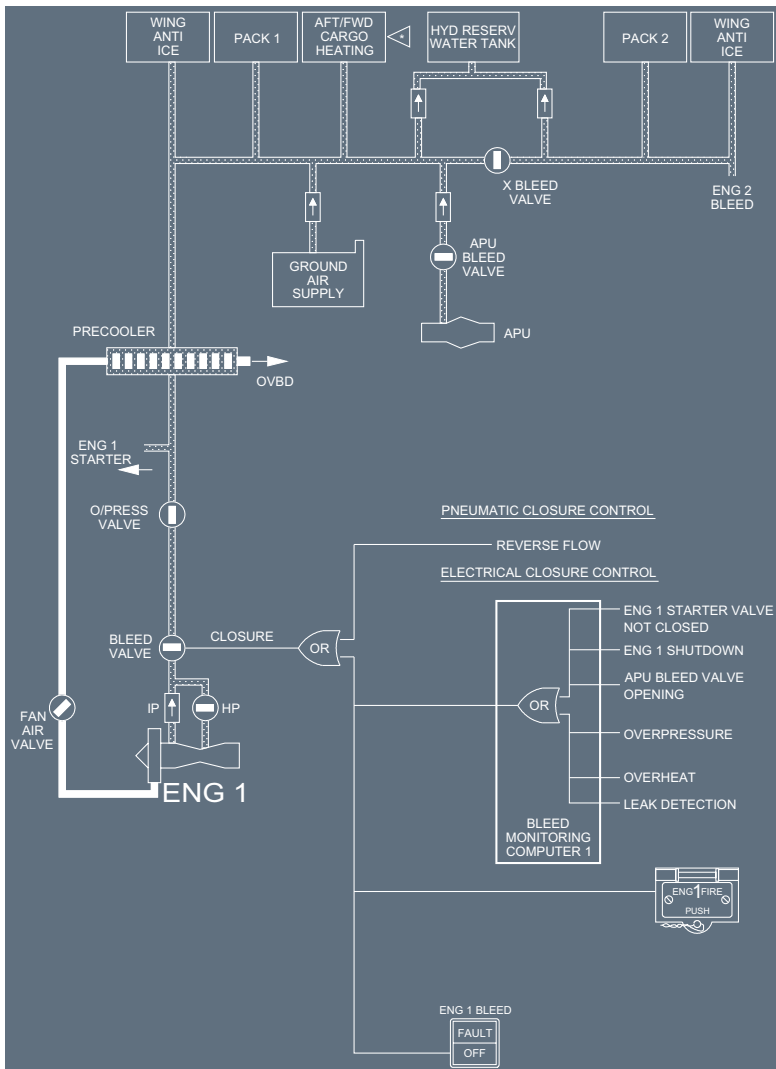
Applicable to: MSN 2037-3184

L3



ARCHITECTURE

Applicable to: MSN 3411-5319



AIR BLEED SELECTION

Applicable to: A320

Air is normally bled from the intermediate pressure stage (IP) of engine's high-pressure (HP) compressor to minimize fuel penalty.

At low engine speed, when the pressure and temperature of the IP air are too low, the system bleeds air from the HP stage and maintains it at 36 ± 4 PSI.

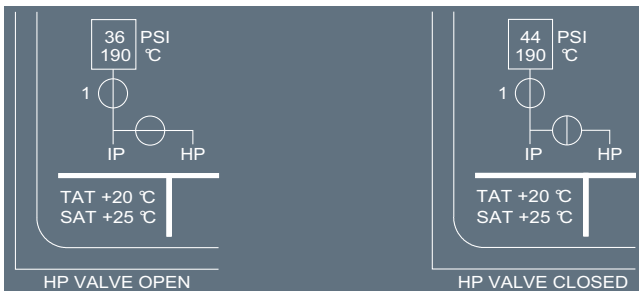
An intermediate pressure check valve downstream of the IP port closes to prevent air from the HP stage from being circulated to the IP stage.

The HP valve closes automatically

- In case of low upstream pressure
- in case of excessive upstream pressure
- electrically when the bleed valve is closed electrically.

L3

ECAM INDICATION



AIR BLEED SELECTION

Applicable to: A319

Air is normally bled from the intermediate pressure stage (IP) of engine's high-pressure (HP) compressor to minimize fuel penalty.

At low engine speed, when the pressure and temperature of the IP air are too low, the system bleeds air from the HP stage and maintains it at 36 ± 4 PSI.

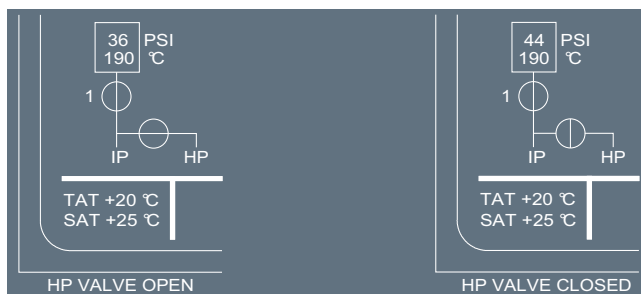
An intermediate pressure check valve downstream of the IP port closes to prevent air from the HP stage from being circulated to the IP stage.

The HP valve closes automatically

- In case of low upstream pressure
- in case of excessive upstream pressure
- electrically :
 - when the bleed valve is closed electrically
 - in case of overpressure upstream of the HP valve with wing anti-ice off, two packs on and aircraft altitude above 15 000 ft.

L3

ECAM INDICATION



PRESSURE REGULATION AND LIMITATION

Applicable to: ALL

The bleed valve, which is downstream of the junction of HP and IP ducting, acts as a shut-off and pressure regulating valve.

It maintains delivery pressure at 45 ± 5 PSI.

Note: Bleed pressure may fluctuate between 38 and 56 PSI (with a maximum peak to peak pressure of 16 PSI) particularly at high engine power (takeoff or climb) up to FL 100.

The bleed valve is fully closed:

- Pneumatically:
 - If upstream pressure goes below 8 PSI
 - If there is return flow
- Electrically by means of:
 - The BLEED pushbutton switch (switched OFF)
 - The ENG FIRE pushbutton (pushed)
 - The Bleed air Monitoring Computer (BMC) in the following cases:
 - Overtemperature
 - Overpressure
 - Leak
 - Open starter valve
 - APU bleed being ON.

If pressure regulation fails, the overpressure valve closes when the pressure goes over 85 PSI.

Note: If APU Bleed is ON and the crossbleed valve is SHUT, the Engine bleed valve 2, remains open.

TEMPERATURE REGULATION AND LIMITATION

Applicable to: ALL

A precooler downstream of the bleed valve regulates the temperature of the bleed air.

The precooler is an air-to-air heat exchanger that uses cooling air bleed from the engine fan to regulate the temperature to approximately 200 °C.

The fan air valve controls fan air flow.

A spring keeps the fan air valve closed in the absence of pressure.

GENERAL

Applicable to: ALL

Air from the APU load compressor is available on ground and in flight.

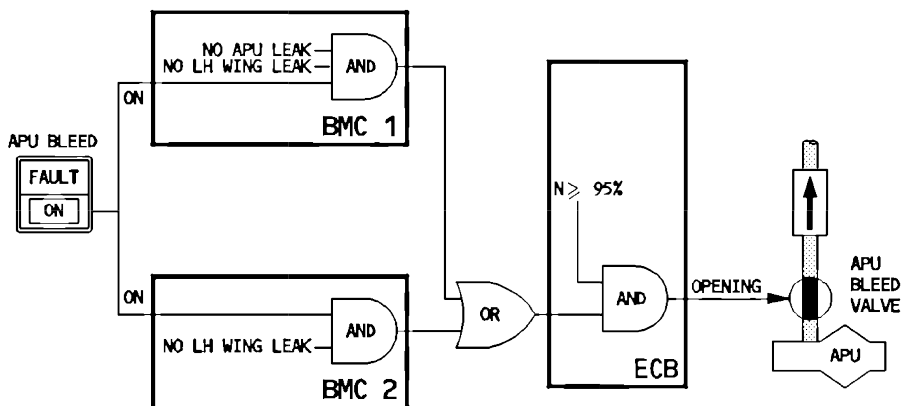
The APU bleed valve operates as a shut-off valve to control APU bleed air. It is electrically controlled and pneumatically operated.

The APU BLEED pb-sw, on the AIR COND panel, controls the APU bleed valve. When the flight crew selects ON with the pushbutton, APU bleed air supplies the pneumatic system, if the APU speed is above 95 %. This opens the crossbleed valve and closes the engine bleed automatically.

A check valve near the crossbleed duct protects the APU, when bleed air comes from another source.

APU BLEED VALVE OPENING LOGIC

Applicable to: ALL



- Note:
1. Leak detection is disregarded during an engine start.
 2. APU leak detection is lost, if BMC1 is lost.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-36 – PNEUMATIC

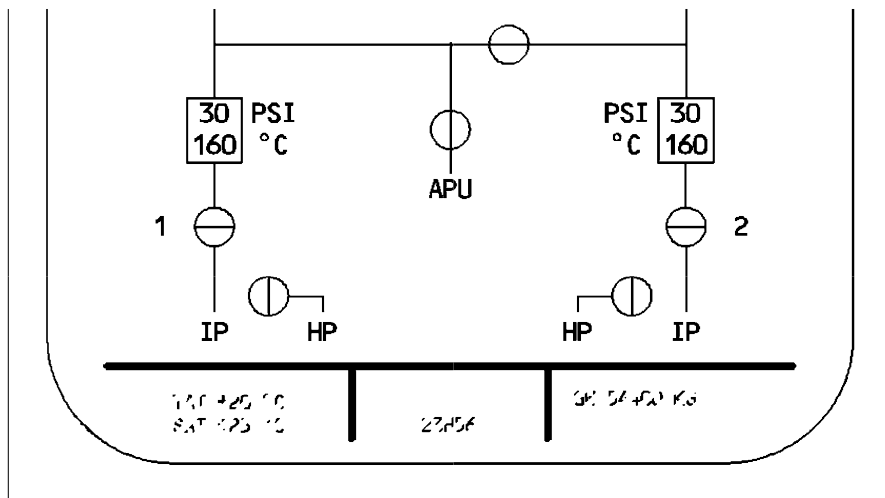
DSC-36-10 – Description

DSC-36-10-30 – Apu Bleed Air Supply

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ECAM INDICATION

Applicable to: ALL



X-BLEED VALVE OPEN.AIR SUPPLIED FROM APU

LEAK DETECTION

Applicable to: ALL

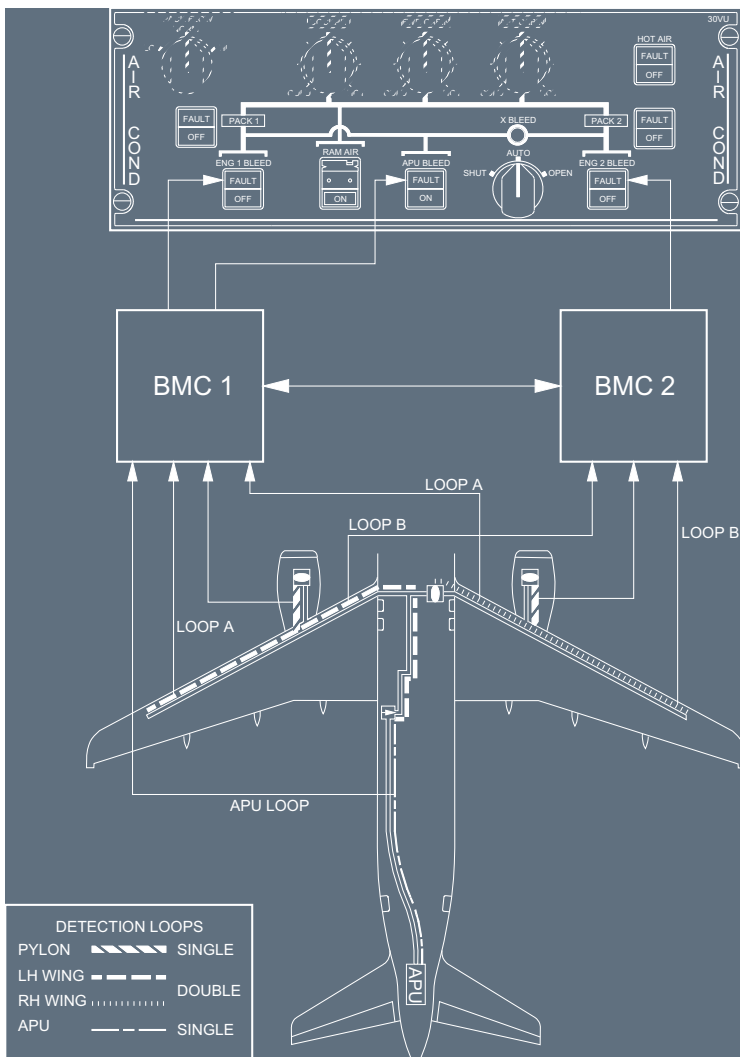
Leak detection loops detect any overheating near the hot air ducts in the fuselage, pylons, and wings. For the pylon and APU, the sensing elements are tied to form a single loop and for the wing, a double loop.

When the two wing loops detect a leak, or when one loop detects the leak and the other one is inoperative, they activate a wing leak signal.

BMC1 and BMC2 each contain identical control logic for the system.

- A wing leak signal causes :
 - the bleed valve on the related side to close automatically
 - the associated FAULT light on the AIR COND panel to come on
 - the x-bleed valve to close automatically (except during an engine start)
 - the APU bleed valve to close automatically (if it is open, and if the leak concerns the left wing) (except during engine start)
- A pylon leak signal causes :
 - the bleed valve on the related side to close automatically
 - the FAULT light for the related engine on the AIR COND panel to come on
 - the x-bleed valve to close automatically (except during an engine start).
- An APU leak signal causes :
 - the APU bleed valve to close automatically (except during engine start).
 - the FAULT light the APU BLEED pushbutton switch on the AIR COND panel to come on
 - the x-bleed valve to close automatically (except during an engine start).

Continued on the next page



BMC FAILURE**Applicable to: ALL**

If one BMC fails, the adjacent BMC takes over the monitoring of the bleed system to issue the following ECAM warnings if necessary :

- overpressure
- overtemperature
- wing leak.

Nevertheless, the associated FAULT light on the AIR COND panel is lost, and the associated bleed valve does not close automatically.

ENG BLEED LEAK warning is lost for the associated engine, as is also the APU BLEED LEAK warning if BMC1 has failed.



A319/A320
FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-36 – PNEUMATIC

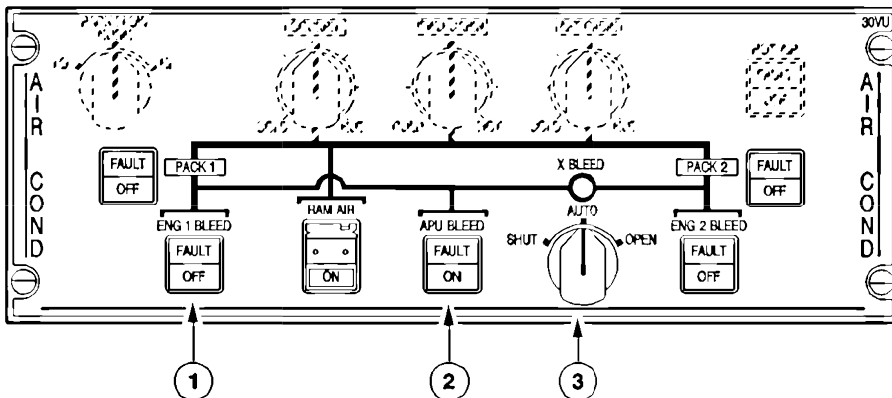
DSC-36-10 – Description

DSC-36-10-60 – Operation Following Failures

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OVERHEAD PANEL

Applicable to: ALL



(1) ENG 1 and ENG 2 BLEED pb sw

On : Bleed valve opens if :

- Upstream pressure is above 8 PSI.
- APU BLEED pushbutton switch is off or APU bleed valve is closed.
- There is no outside wing or pylon leak, and no overpressure or overtemperature has been detected.
- The ENG FIRE pushbutton has not been popped out.
- The engine start valve is closed.

FAULT It : This amber light comes on, and an ECAM caution appears, if :

- There is an overpressure downstream of the bleed valve.
- There is a bleed air overheat.
- There is a wing or engine leak on the related side.
- The bleed valve is not closed during engine start.
- The bleed valve is not closed with APU bleed ON.

It goes out when the ENG BLEED pushbutton switch is OFF if the fault has disappeared.

OFF : The bleed valve and HP valve close. The white OFF light comes on.

Continued on the next page

(2) APU BLEED pb sw

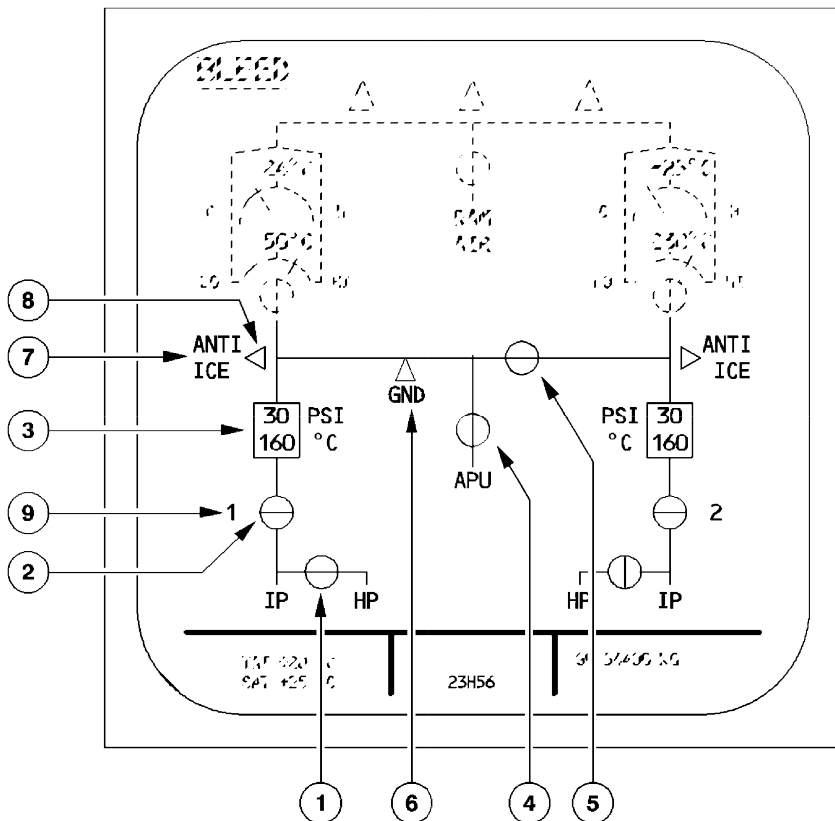
- ON : The APU valve opens if N > 95 % and there is no leak in the APU or in the left side bleed. (If there is a leak on the right side, the x-bleed valve closes.)
The blue ON light comes on.
- Off : The APU valve closes.
- FAULT light : This amber light comes on, and an ECAM caution appears, when the system detects an APU leak.

(3) X-BLEED selector sw

- AUTO : The crossbleed valve is open if the APU bleed valve is open.
The crossbleed valve is closed if the APU bleed valve is closed or, in case of a wing, pylon, or APU leak (except during engine start).
- OPEN : The crossbleed valve is open.
- CLOSE : The crossbleed valve is closed.

ECAM BLEED PAGE

Applicable to: ALL



(1) HP VALVES

- Crossline - Green : HP valve normally fully closed
- In line - Green : HP valve not fully closed
- Crossline - Amber : HP valve not in commanded (closed) position

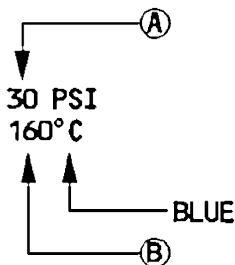
(2) ENGINE BLEED VALVES

- In line - Green : BLEED valve normally open

Continued on the next page

- Crossline - Green : BLEED valve normally fully closed
- In line - Amber : BLEED valve not in commanded (open) position
- Crossline - Amber : BLEED valve not in commanded (closed) position

(3) ENGINE BLEED INDICATIONS



(A) Precooler inlet pressure

It is normally in green.

It becomes amber, if under 4 PSI, or if overpressure is detected by the BMC (threshold between 57 and 60 PSI).

(B) Precooler outlet temperature

It is normally in green.

It becomes amber, if the BMC detects an overheat or low temperature.

Overheat: Temperature exceeds:

- 290 °C for more than 5 s, or
- 270 °C for more than 15 s, or
- 257 °C for more than 55 s

Low temperature is detected, if the temperature is lower than 150 °C.

Note: When the engines are at idle, and depending on the ambient temperature, the precooler outlet temperature may be below 150 °C (displayed amber).

(4) APU BLEED VALVE

- Crossline - Green : The APU valve is not fully open, and the APU master switch is ON.
- In line - Green : The APU valve is fully open, and the APU master switch is ON.
- Crossline - Amber : The APU valve is fully closed, the APU master switch is ON, and the APU bleed switch is ON for more than 10 s.

Continued on the next page

(5) CROSSBLEED VALVE

Crossline - Green : The crossbleed valve is normally closed.

In line - Green : The crossbleed valve is normally open.

Crossline - Amber : The crossbleed valve is not in the commanded (closed) position.

In line - Amber : The crossbleed valve is not in the commanded (open) position.

Transit - Amber : The crossbleed valve is in transit.

(6) GND HP ground connection indication



: Displayed in white when the aircraft is on ground.

(7) ANTI ICE indication

It is displayed in white, when the WING pushbutton on the ANTI-ICE panel is ON.

(8) Arrow



- : - It is normally not displayed, when the corresponding valve is closed.
- It is normally displayed in green, when the corresponding valve is open.
- It becomes amber, when the
 - Valve is open and air pressure is low or high, or
 - Valve is open on ground for more than 10 s.

(9) Engine identification (1-2)

It is normally in white.

It becomes amber, when engine N2 is below idle.



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-36 – PNEUMATIC

DSC-36-20 – Controls and Indicators

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1 (2) BLEED FAULT engine 1 (2) running and bleed air pressure > 57 PSI (+3/-0) or temperature: > 257 °C for more than 55 s or > 270 °C for more than 15 s or > 290 °C for more than 5 s	SINGLE CHIME	MASTER CAUT	BLEED	ENG BLEED FAULT It	1, 3, 4, 5, 7, 8, 10
L (R) WING LEAK temperature > 124 °C detected by the loops					3, 4, 5, 7, 8
ENG 1 (2) BLEED LEAK temperature > 204 °C detected by the loop and engine 1 (2) running					
ENG 1 (2) BLEED NOT CLSD bleed valve not automatically closed during engine start or with APU bleed selected				ENG BLEED OFF It	1, 3, 4, 5, 7, 8, 9, 10
BLEED 1 (2) OFF one engine bleed switched off with no fault					
APU BLEED FAULT APU available and APU bleed valve position disagrees with selected position.					3, 4, 5, 7, 8
APU BLEED LEAK temperature > 124 °C detected by the loop				APU BLEED FAULT It	
ENG 1 (2) BLEED ABNORM PR regulated pressure is abnormal				NIL	1, 3, 4, 5, 7, 8, 10

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB			
ENG 1 (2) (1+2) BLEED LO TEMP one (both) engine bleed below 150 °C in flight with wing anti ice ON	SINGLE CHIME	MASTER CAUT	BLEED	NIL	3, 4, 5, 8			
X BLEED FAULT position disagree with selected position					3, 4, 5, 7, 8			
ENG 1 (2) HP VALVE FAULT HP valve is abnormally closed	NIL	NIL						
BLEED MONITORING FAULT Both BMC faulty								
L(R) WING LEAK DET FAULT Both detection loops inop in one wing								

MEMO DISPLAY

APU BLEED appears in green if the APU is available and the APU BLEED pb-sw is ON.

BUS EQUIPMENT LIST

Applicable to: ALL

		NORM		EMER ELEC		
		AC	DC	AC ESS	DC ESS	HOT
BMC	1				SHED	
	2		DC2			
BLEED VALVES, HP VALVES AND FAN AIR VALVES	ENG 1				SHED	
	ENG 2		DC2			
X-BLEED VALVE	AUTO CONTROL		DC2			
	MANUAL CONTROL				SHED	



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-36 – PNEUMATIC

DSC-36-40 – Electrical Supply

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	General	1
	Potable Water	1
	Wastewater System	4
	Toilet System	5
DSC-38-20	ELECTRICAL SUPPLY	
	BUS EQUIPMENT LIST	1



A319/A320

FLIGHT CREW OPERATING MANUAL

**WATER / WASTE
TABLE OF CONTENTS**

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GENERAL

Applicable to: ALL

The water and waste system :

- distributes potable water to the toilets and the galleys.
- disposes waste water.
- stores toilet wastes.

The system is insulated to prevent water leaks and ice build up.

The water and waste control panel is on the forward cabin attendant's panel.

POTABLE WATER

Applicable to: A319

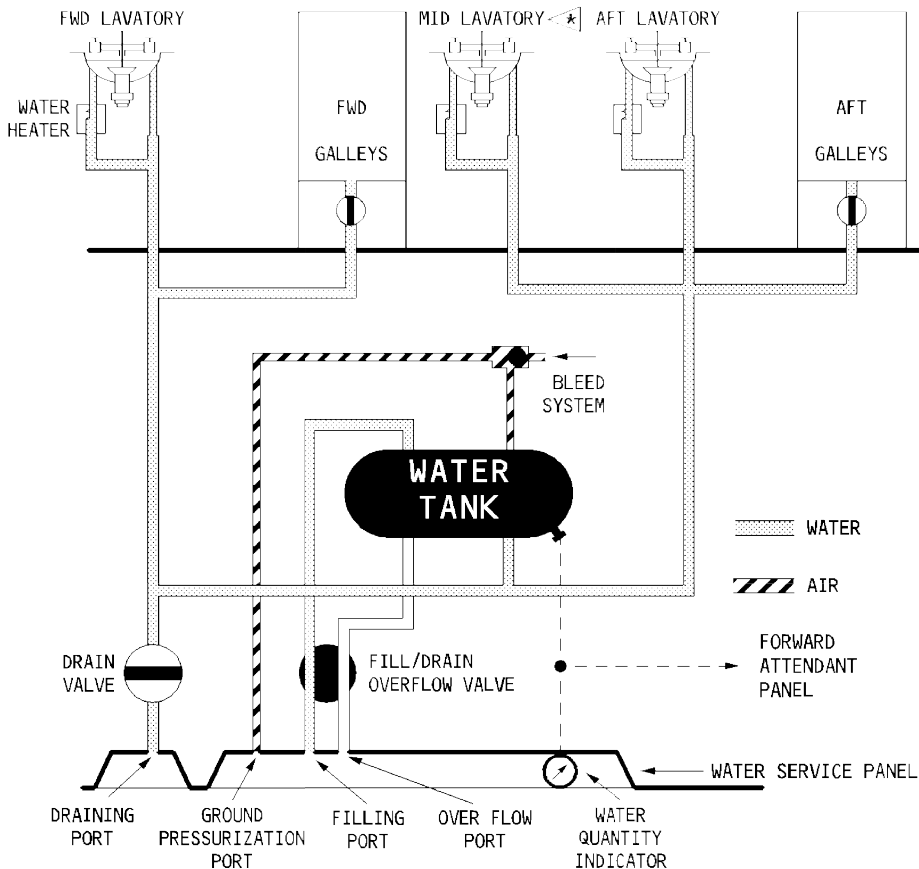
Potable water is stored in a 200 l tank (135 l ) in the left hand side wall behind the aft cargo compartment.

While airborne, the aircraft uses bleed air to pressurize the water system ; on the ground, it uses air from the service panel pressure port.

Potable water is piped to the galleys and lavatories.

The system can be filled or drained from the service panel at the bottom of the fuselage. Indicators on the forward attendant's panel and the aft service panel show how much water the water tank contains.

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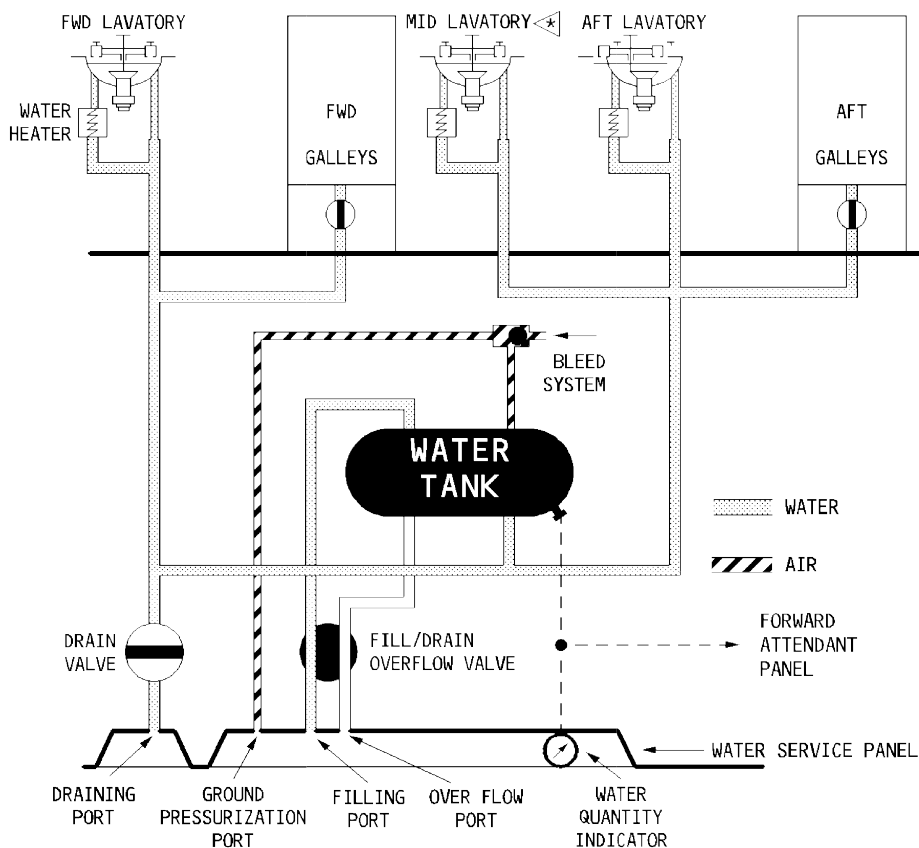
POTABLE WATER

Applicable to: A320

Potable water is stored in a 200 l tank in front of the wing box behind the forward cargo compartment. While airborne, the aircraft uses bleed air to pressurize the water system ; on the ground, it uses air from the service panel pressure port.

Potable water is piped to the galleys and lavatories.

The system can be filled or drained from the service panel under the fuselage. Indicators on the forward attendant's panel and the aft service panel show how much water is in the water tank.



L3

WASTEWATER SYSTEM

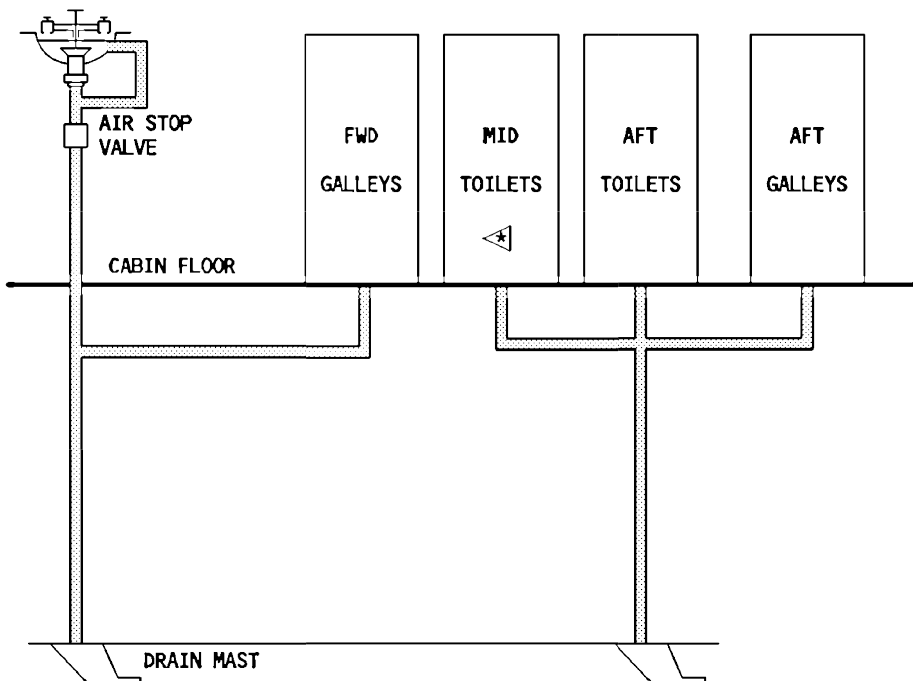
Applicable to: ALL

Wastewater from the galleys and from the sinks in the lavatories, drains overboard through two anti-iced drain masts.

The forward mast drains wastewater from the forward cabin; the aft mast drains it from the aft cabin. Differential pressure discharges the wastewater in flight, and gravity does so on the ground.

L3

FWD TOILETS



TOILET SYSTEM

Applicable to: ALL

Differential pressure forces waste from the toilet bowls into the waste storage tank. On ground, and at altitudes below 16 000 ft , a vacuum generator produces the necessary pressure differential.

Clear water from the potable water system flushes the toilets.

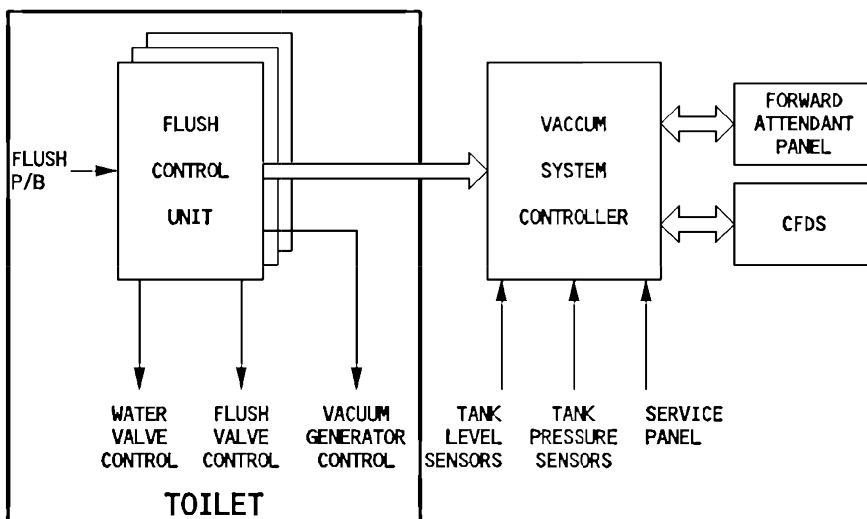
A flush control unit, within each toilet, controls the flush sequence.

The Vacuum System Controller (VSC) furnishes operational information, such as the waste level in the storage tank, to the Flight Attendants' panel, and maintenance information and a test program to the Centralized Fault Display System.

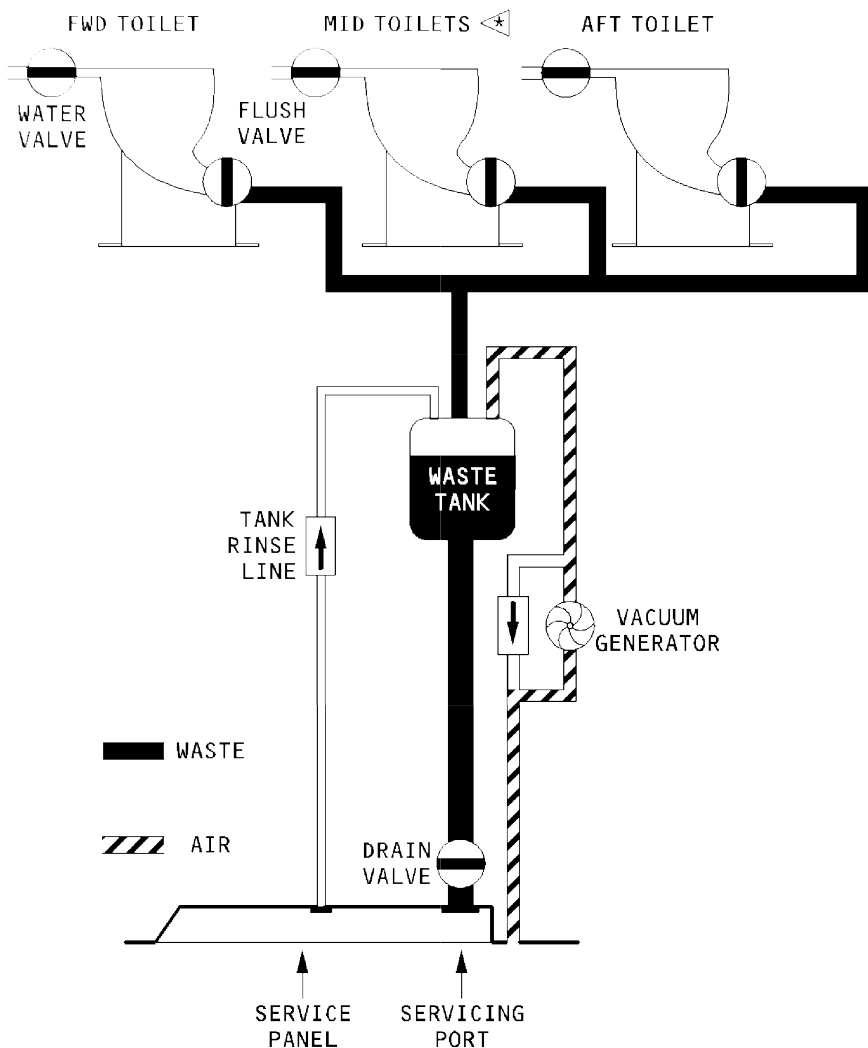
The waste tank has a usable capacity of 170 l .

Ground personnel services the waste tank via a single service panel under the fuselage.

A manual shut-off valve isolates an inoperative toilet.

ARCHITECTURE*Continued on the next page*

SCHEMATIC



BUS EQUIPMENT LIST

Applicable to: ALL

	NORM			EMER ELEC		
	AC	DC	DC BAT	AC ESS	DC ESS	HOT
POTABLE WATER SYS		GND/FLT				
WATER HEATER	AC2					
WATER DRAINING		GND/FLT				
VACUUM GENERATOR	AC2					
PRESSURIZED WATER SYS	AC2					
FLUSH CONTROL UNITS		GND/FLT				
VACUUM SYS CONTROLLER		GND/FLT				



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-38 – WATER / WASTE

DSC-38-20 – ELECTRICAL SUPPLY

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	GENERAL.....	1
	COMPONENTS	1
	MODES OF OPERATION	1
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	FAILURE/FAULT CLASSIFICATION.....	3
	FUNCTIONS OF THE CENTRALIZED FAULT DISPLAY SYSTEM (CFDS)	4
	COCKPIT/CFDS INTERFACE.....	5
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	PREVIOUS LEGS REPORT.....	6
	AVIONICS STATUS	6
	SYSTEM REPORT/TEST	7
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DSC-45-40	ELECTRICAL SUPPLY	
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A319/A320
FLIGHT CREW OPERATING MANUAL

**MAINTENANCE SYSTEM
TABLE OF CONTENTS**

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GENERAL

Applicable to: ALL

The purpose of the Centralized Fault Display System (CFDS) is to make the maintenance task easier by displaying fault messages in the cockpit and permitting the flight crew to make some specific tests.

There are two levels of maintenance :

- at the line stop : removal and replacement of equipment
- at the main base : troubleshooting

COMPONENTS

Applicable to: ALL

The CFDS includes :

- the BITE (Built-In Test Equipment) for each electronic system
- a central computer, the Centralized Fault Display Interface Unit (CFDIU)
- two MCDUs (Multipurpose Control and Display Units), used also for FMGS (Flight Management and Guidance System), AIDS (Aircraft Integrated Data System), and ACARS (Aircraft Communication And Reporting System, if installed), which work with the CFDIU to display information or initiate tests
- one printer.

If a main channel of the CFDIU fails, the backup channel takes over.

MODES OF OPERATION

Applicable to: ALL

The CFDS operates in two main modes :

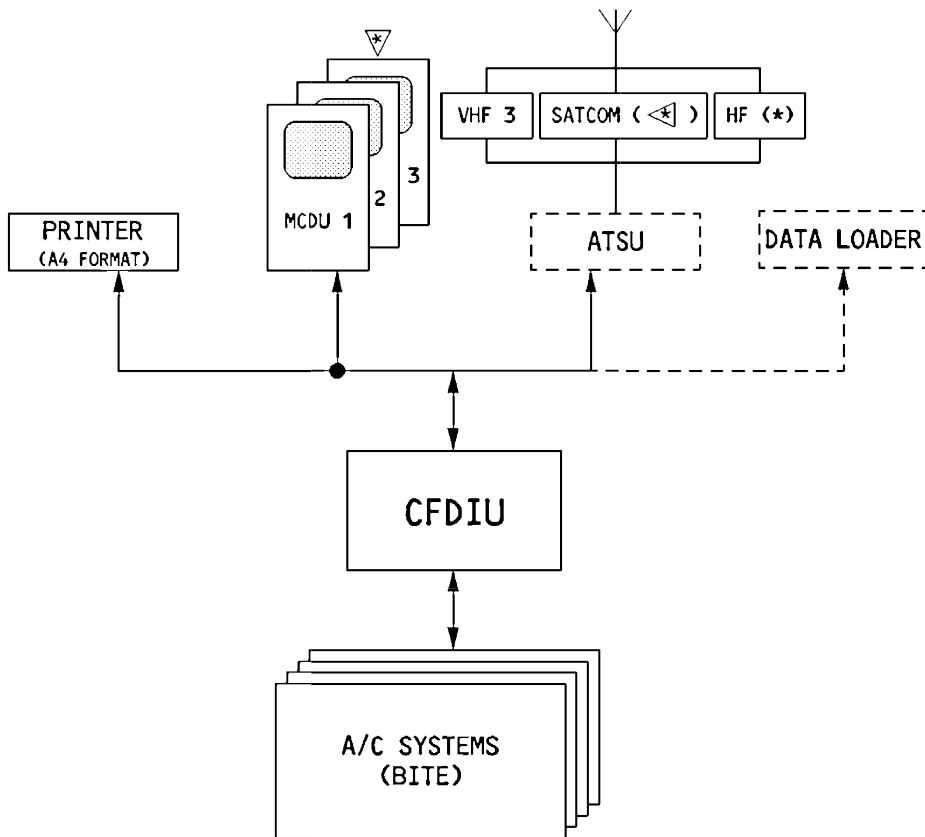
- the NORMAL mode or REPORTING mode (in flight)
- the INTERACTIVE mode or MENU mode (on ground).

In NORMAL mode, the CFDS records and displays the failure messages transmitted by each system BITE.

In INTERACTIVE mode, the CFDS allows any BITE to be connected with the MCDU in order to display the maintenance data stored and formatted by the BITE or to initiate a test.

ARCHITECTURE

Applicable to: ALL



* NOT YET INSTALLED FOR ATSU COMMUNICATIONS

FAILURE/FAULT CLASSIFICATION

Applicable to: ALL

The Centralized Fault Display System (CFDS) identifies the faulty system and puts any failures or faults into one of three classes :

Class 1 : Failures indicated to the flight crew by means of the ECAM, or other flight deck effect. They must be repaired or entered in the MEL (Minimum Equipment List) before the aircraft can depart.

Class 2 : Faults indicated to maintenance personnel by the CFDS and which trigger a MAINT status entry on the maintenance part of the ECAM status page. The aircraft can operate with these faults, but they must be rectified within the timescale defined in the Trouble Shooting Manual (TSM).

Class 3 : Faults indicated to maintenance personnel by the CFDS, but which do not trigger a MAINT status. The operator may have these faults corrected at his convenience.

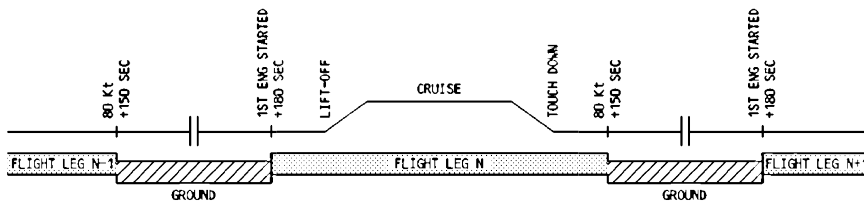
Failure/fault classes	Class 1	Class 2	Class 3
Operational consequences	YES	NO	NO
Indication to the flight crew	YES Automatically displayed - Warning or caution messages on Engine Warning Display - Flag or indication in the flight deck.	YES Available on ECAM status page.	NO
Dispatch consequences	Refer to MEL may be : "GO" "GO IF" "NO GO"	<i>Refer to MEL/MI-00-08 ECAM and MAINTENANCE STATUS</i>	MEL not applicable
Indication to the maintenance team	YES Automatically print out at the end of each flight : Fault messages on the CFDS Post Flight Report.		YES Available on request through system report/Test

FUNCTIONS OF THE CENTRALIZED FAULT DISPLAY SYSTEM (CFDS)

Applicable to: ALL

The main functions of the CFDS are :

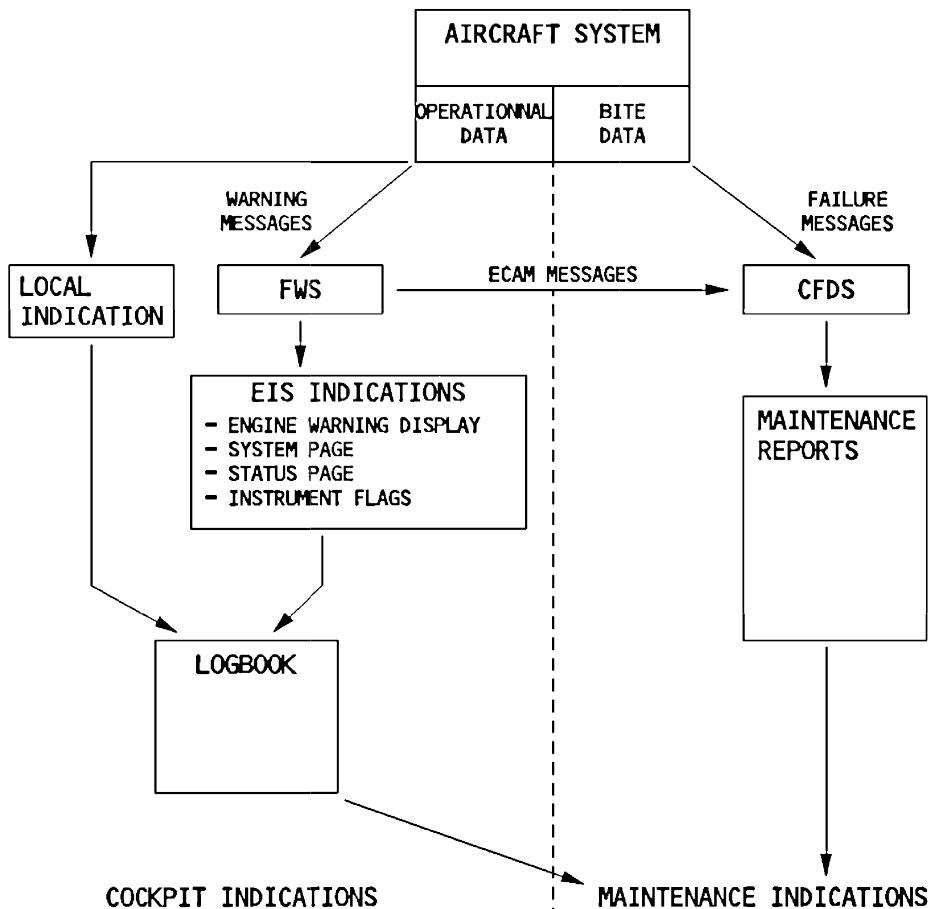
- obtaining and storing messages transmitted by the connected system BITEs, or by the Flight Warning Computer (Warning and Caution titles)
- Detailing the maintenance phases.



- Presenting maintenance reports :
 - Last leg report
 - Last leg ECAM report
 - Previous leg report
 - Avionics status
 - System report test
 - Post-flight report.

COCKPIT/CFDS INTERFACE

Applicable to: ALL





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-45 – MAINTENANCE SYSTEM
DSC-45-10 – Description

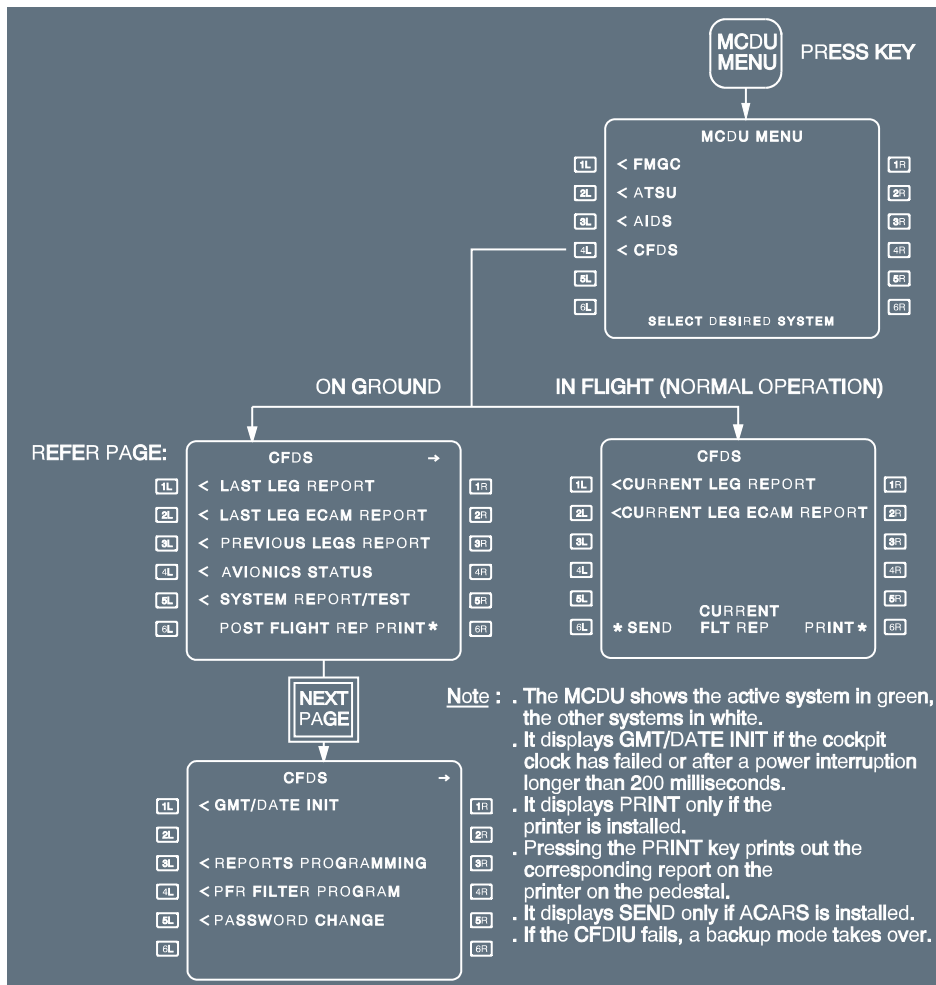
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MAINTENANCE MENU**Applicable to: ALL**

The CFDS uses menus displayed on the MCDU. The operator selects functions or reports from these menus.

Pressing the MCDU MENU key and then selecting CFDS brings up the MAINTENANCE MENU page (different pages for the aircraft in flight and the aircraft on the ground).

Continued on the next page



LAST (OR CURRENT) LEG REPORT

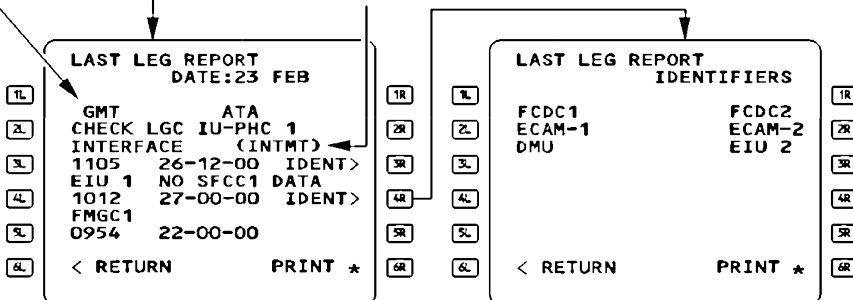
Applicable to: ALL

The LAST LEG REPORT (on the ground) or the CURRENT LEG REPORT (in flight), list all class 1 failures and class 2 faults and all system failure and system fault messages received by the CFDS during the last flight leg or the current flight leg. Pressing the IDENT key displays a list of the systems (called identifiers) affected by the failure or fault, which helps the pilot or maintenance person to identify the failure or fault.

TIME AT WHICH CFDS
RECEIVES THE
FAILURE/FAULT

CFDS MENU

DENOTES AN
INTERMITTENT
FAILURE/FAULT

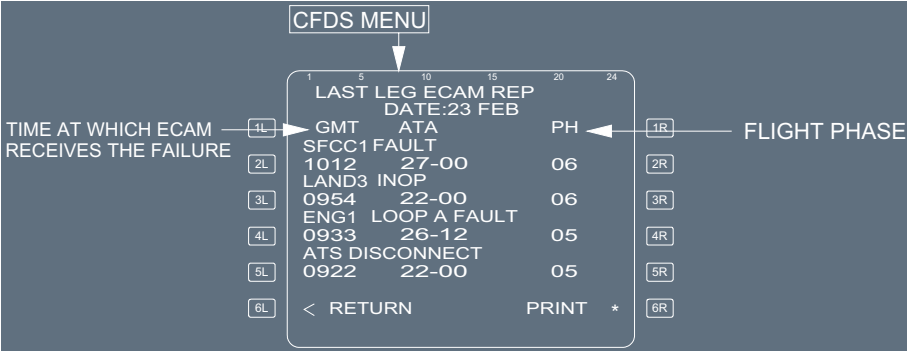


LAST (OR CURRENT) LEG ECAM REPORT

Applicable to: ALL

GENERAL

- In flight
:
The CURRENT LEG ECAM REPORT displays the primary and independent warning (class I) messages and MAINTENANCE STATUS (class II) messages of the current flight leg.
- On the ground
:
The LAST LEG ECAM REPORT displays the primary and independent warning (class I) messages plus MAINTENANCE STATUS (class II) messages of the last flight leg.



Note: This screen displays **PRINT** only if the printer is installed.

Continued on the next page

POST FLIGHT REPORT PRINT

At the end of a flight, LAST LEG and LAST LEG ECAM REPORTS are printed out automatically after the last engine shutdown. The flight or ground crew can also print them out by selecting POST FLIGHT REP PRINT.

The report first lists the ECAM warnings, then the FAULT messages.

CFDS POST FLIGHT REPORT

A/C IDENT	DATE	GMT	FLTN	CITY PAIR
XY-ABCD	FEB23	2355	XY-1234	LFBG/LFPO

ECAM WARNINGS

GMT	ATA PH	
1012	27-00 06	SFCC 1 FAULT
0954	22-00 06	LAND3 INOP
0933	26-12 05	ENG 1 LOOP A FAULT
0922	22-00 05	ATS DISCONNECT
0915	28-21 04	FUEL L TK PUMP 1 LO PR
0904	36-22 04	BLEED LOOP

FAULT MESSAGES

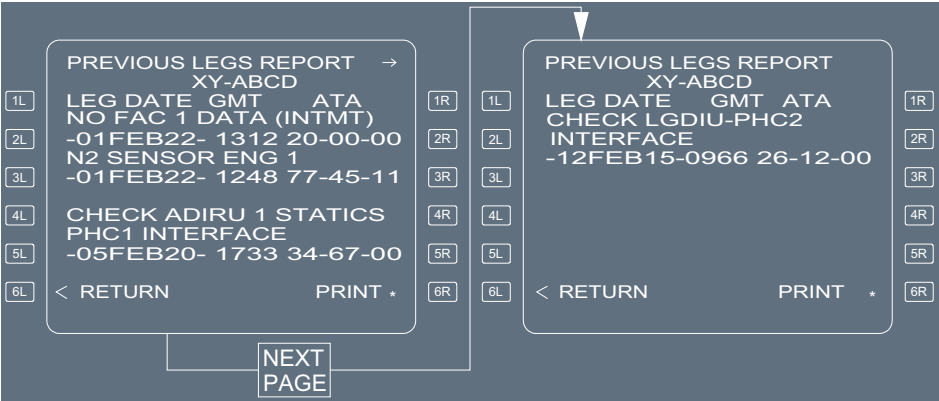
GMT	ATA	
1105	26-12-00	CHECK LGCIU-PHC 1 INTERFACE (INTMT)
1012	27-00-00	EIU 1-NO SFCC 1 DATA
0954	22-00-00	FMGC 1
0933	36-11-00	BMC 1
0915	28-21-00	FUEL L TK PUMP 1 QM
0904	26-12-00	CHECK R WING LOOP A

COMMENTS

PREVIOUS LEGS REPORT

Applicable to: ALL

This report gives access to the POST FLIGHT REPORTS of the previous 63 flight legs.

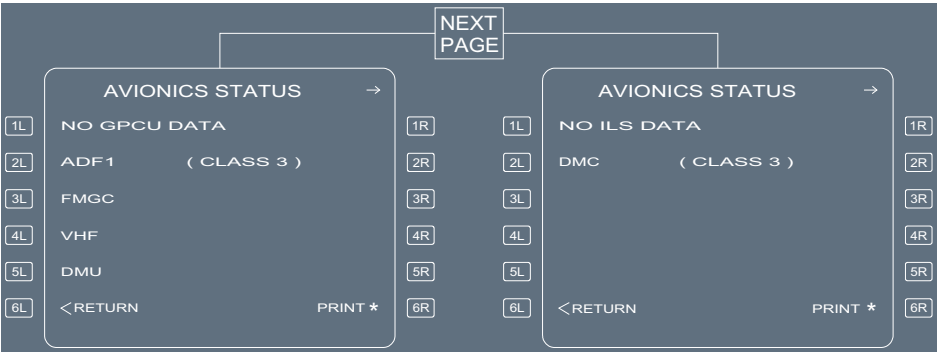


On ground, the Operator can print copies of the screen. If ACARS is installed, the Operator can send the flight report (*Refer to DSC-45-20 Last (or Current) Leg ECAM Report - Post Flight Report Print*).

AVIONICS STATUS

Applicable to: ALL

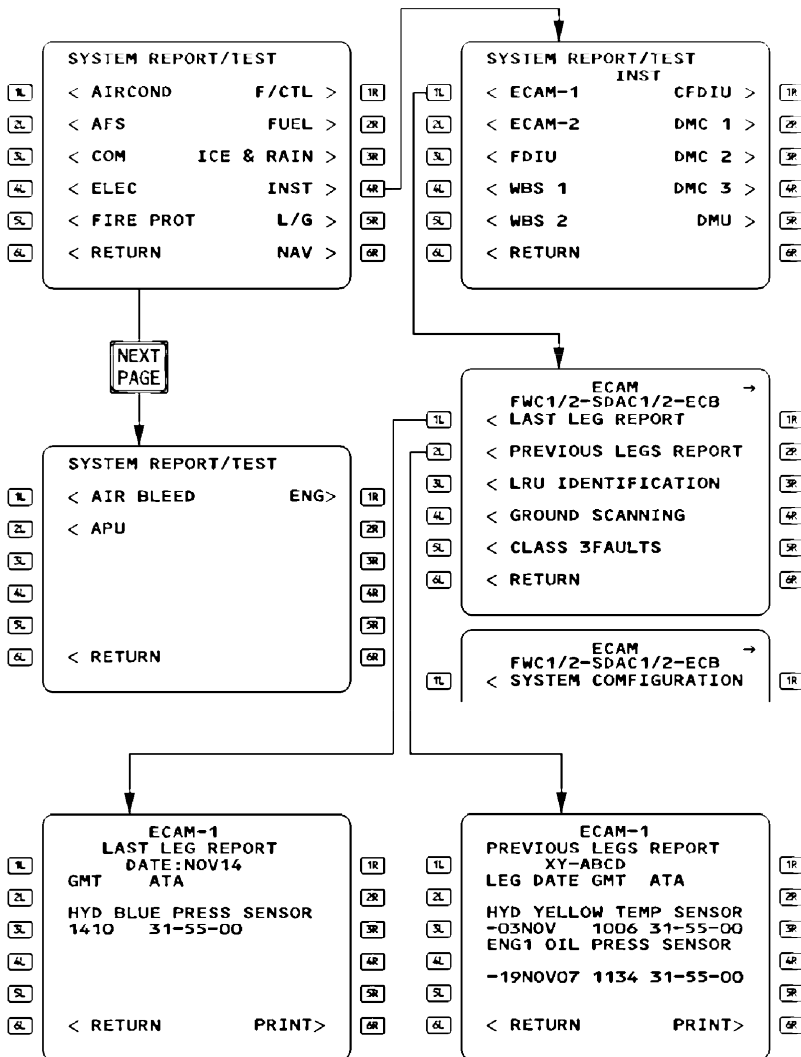
This screen displays the list of systems affected by a failure or fault. If a system is affected by at least a Class 3 fault, CLASS 3 appears beside it. The display is continuously updated.



SYSTEM REPORT/TEST**Applicable to: ALL**

This screen gives the operator access to all electronic systems. The CFDIU enters into interactive dialogue with the selected system.

Continued on the next page



In the above example, the operator has called up menus of the selected systems :

- LAST or PREVIOUS LEG REPORT presents the list of Line-Replaceable Units (LRUs) affected by a failure.

Continued on the next page

- LRU IDENTIFICATION contains the part numbers of all LRUs in the system.
- GND SCANNING runs the flight monitoring on the ground and indicates the faulty LRU.
- CLASS 3 FAULTS lists class 3 faults detected by the system during the last flight leg.
- SYSTEM CONFIGURATION presents the system configuration in a digital form.

Note: These screens (except LAST or PREVIOUS LEG REPORT) are not shown above.

GMT/DATE INITIALIZATION

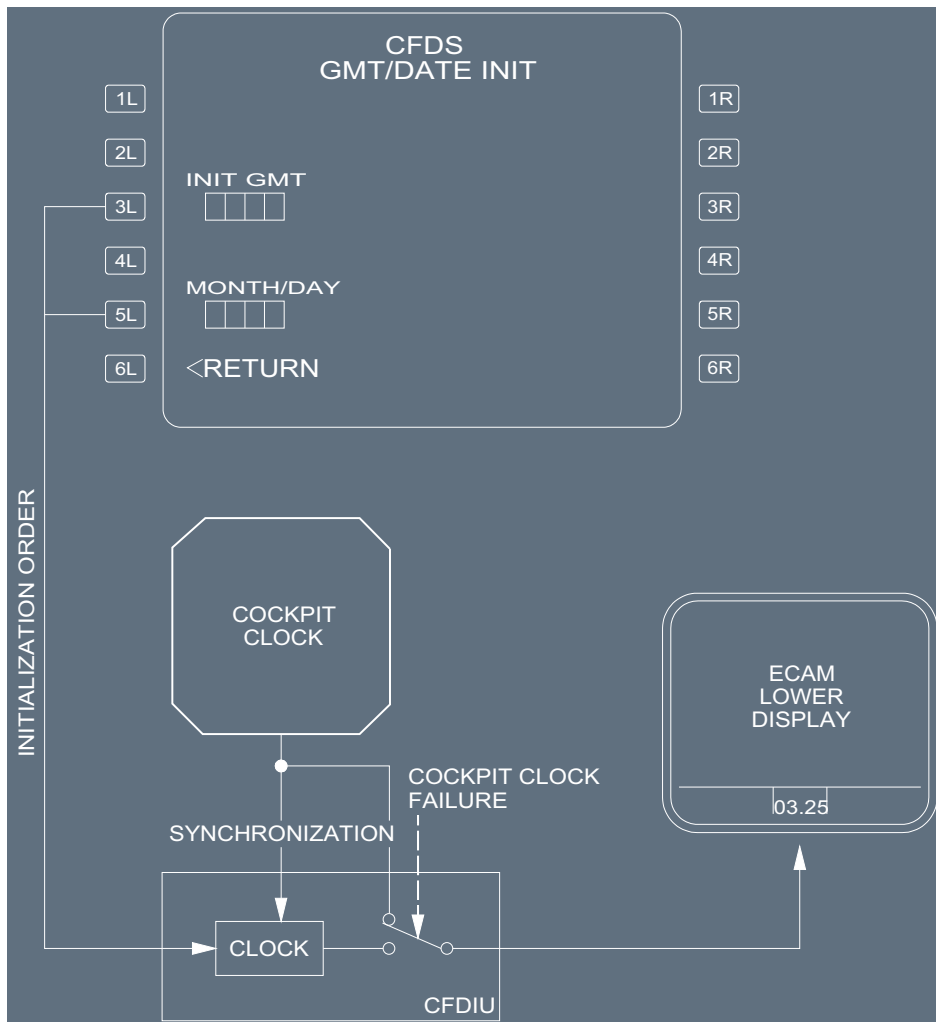
Applicable to: ALL

A CFDIU clock is synchronized with the cockpit clock in order to keep GMT (UTC) displayed on the ECAM lower display (except in flight Phases 1 and 2, if the weight and balance system is installed). If the cockpit clock fails, the CFDIU clock continues to display GMT (UTC) on the ECAM lower display.

If electrical power is interrupted for more than 200 ms, the crew initializes GMT (UTC) and the DATE via the MCDU :

- Write GMT (UTC) in the scratchpad, then press the "INIT GMT" key.
- Do the same for the month and day.

Continued on the next page



BACK UP MODE**Applicable to: ALL**

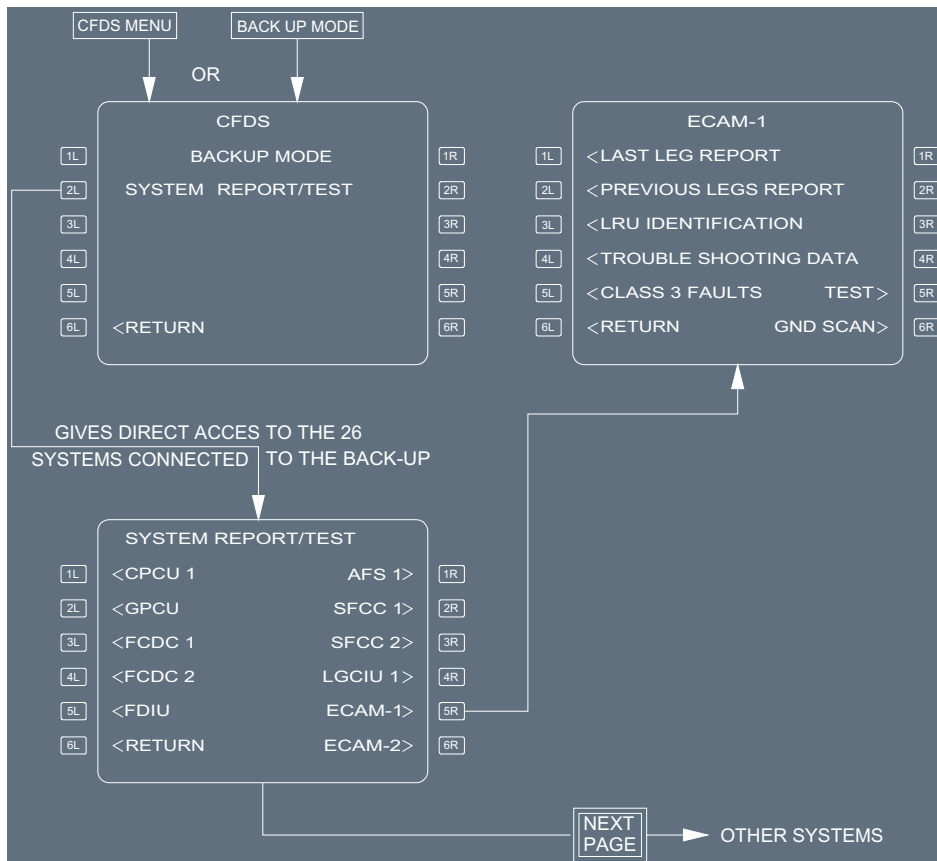
If the CFDIU's main channel fails, the backup channel allows the CFDS to operate in backup mode :

- on the ground only
- through MCDU1
- in one mode of operation only : SYSTEM REPORT/TEST
- without the PRINTER or ACARS.

The system changes over from main channel to backup channel :

- Automatically in case of an important failure (power supply, for example). In this case, when the operator selects CFDS on the MCDU MENU, it displays the BACKUP MODE page.
- Manually if the operator selects BACKUP MODE on the CFDS menu after a minor failure.

Continued on the next page



ACARS PRINT PROGRAM

Applicable to: ALL

This function gives access to reprogramming page.

The programming is provided by the ACARS or manually (on the ground or in flight) :

No star indicates an ACARS programming. The YES indicates that the REAL TIME FAIL will be automatically transmitted to the ACARS.

The star indicates a manually modified programming: pressing the corresponding key changes the YES into a NO. The YES indicates that the REAL TIME FAIL page will be printed simultaneously with the transmission to the ACARS.

ACARS/PRINT PROGRAM	
SEND	PRINT
1L NO	1R POST
2L YES	2R REAL TIME FAIL YES*
3L YES	3R REAL TIME WARN NO*
4L *YES	4R AVIONICS DATA YES
5L	5R
6L <RETURN	6R PRINT *

Note: The CFDIU memorizes all manual programming so that at initialisation the last configuration will be retained.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-45 – MAINTENANCE SYSTEM
DSC-45-20 – System Operation

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GENERAL

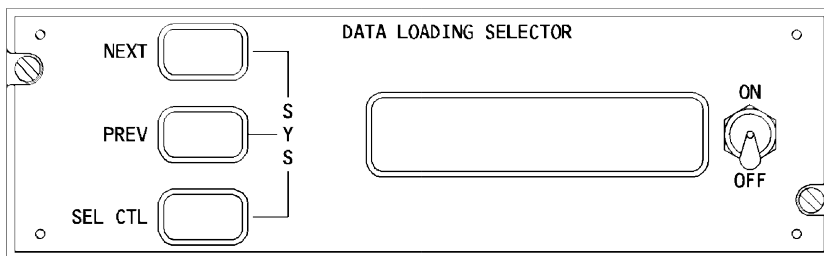
Applicable to: ALL

With the data loading system, it is possible to upload databases and operational software, or to download system reports from various onboard computers.

The data transfer is performed via 3.5 in disks and a portable data loader, or the aircraft fixed Multipurpose Disk Drive Unit  (MDDU).

DATA LOADING SELECTOR ON THE OVERHEAD PANEL

Applicable to: ALL



When the data loading selector is ON, the 3 keys (NEXT, PREV, SEL CTRL) enable the display and selection of various applicable aircraft systems (FMGC, TCAS  etc...).



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-45 – MAINTENANCE SYSTEM
DSC-45-25 – Data Loading

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GENERAL

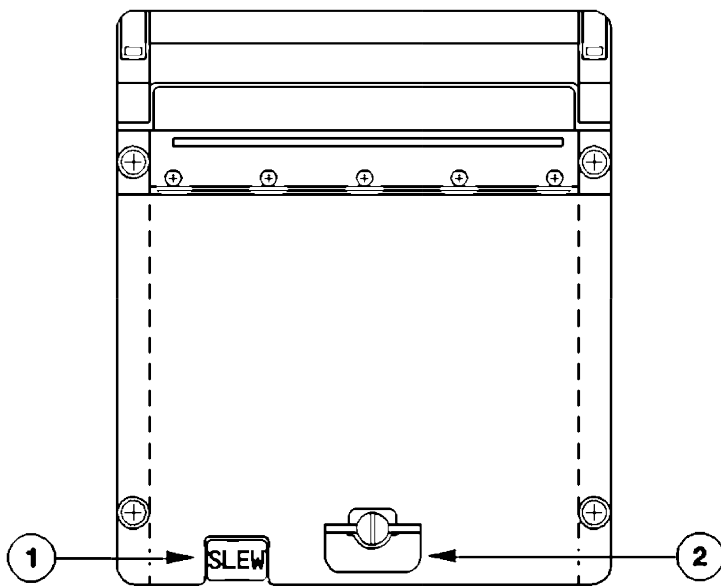
Applicable to: ALL

The printer prints reports from the following systems (if installed) : ACARS, AIDS, FMGC, CFDIU and EVMU. It prints these on paper, and does so either on the ground or in flight.

The printer is installed at the rear of the pedestal on the right side.

SYSTEM DESCRIPTION

Applicable to: ALL



- (1) SLEW sw. :
The SLEW switch is used to feed paper after having loaded a new roll.
- (2) PRINTER DOOR LATCH :
The printer door latch locks the door used for loading paper.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-45 – MAINTENANCE SYSTEM
DSC-45-30 – PRINTER

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easyJet

A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-45 – MAINTENANCE SYSTEM
DSC-45-40 – ELECTRICAL SUPPLY

BUS EQUIPMENT LIST

Applicable to: ALL

	NORM		EMER ELEC		
	AC	DC	AC ESS	DC ESS	HOT
CFDS		DC1			



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-45 – MAINTENANCE SYSTEM
DSC-45-40 – ELECTRICAL SUPPLY

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A319/A320

FLIGHT CREW OPERATING MANUAL

**INFORMATION SYSTEMS
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INTRODUCTION

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3184

The information system manages the datalink communication and provides the flight crew with information coming from the airline.

It consists mainly of an Air Traffic Service Unit (ATSU).

The ATSU manages:

- The Air-Ground communications through the appropriate communication media (VHF data radio or HF  data radio).
- The exchange of information between the aircraft and the airline according to the Airline Operational Control (AOC) applications defined in the ATSU.
- The information display via the MCDU.
- The appropriate warning for flight crew information.

The ACARS functions are included in the ATSU.

INTRODUCTION

Applicable to: MSN 3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

The information system manages the datalink communication and provides the flight crew with information coming from the airline and from the Air Traffic Control (ATC).

The information system consists mainly of an Air Traffic Service Unit (ATSU), two Data-link Control and Display Units (DCDU ) located on the left and right central panels, and two illuminated pushbuttons  “ATC MSG”.

The ATSU manages:

- The Air-Ground communications through the appropriate communication media (SATCOM  or VHF data radio or HF  data radio).
- The exchange of information between the aircraft and:
 - The Operator according to the Airline Operational Control (AOC) applications defined in the ATSU, or
 - The Air Traffic Control.
- The information display via the MCDU and the DCDU .
- The appropriate warning for flight crew information.

The ACARS functions are included in the ATSU.

INTRODUCTION

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

The information system manages the datalink communications and provides the crew with information coming from the airline and from the Air Traffic Control (ATC).

The information system mainly consists of an Air Traffic Service Unit (ATSU), two Datalink Control and Display Units (DCDU), located on the left and right central panels, and two illuminated “ATC MSG pb”.

The ATSU manages:

- Air-Ground communications via the appropriate communication media (SATCOM  or VHF data radio or HF  data radio).
- The exchange of information between the aircraft and:
 - The airline, according to Airline Operational Control (AOC) applications, defined in the ATSU, or
 - Air Traffic Control.
- The information display, via the MCDU and the DCDU.
- The appropriate warning for crew information.

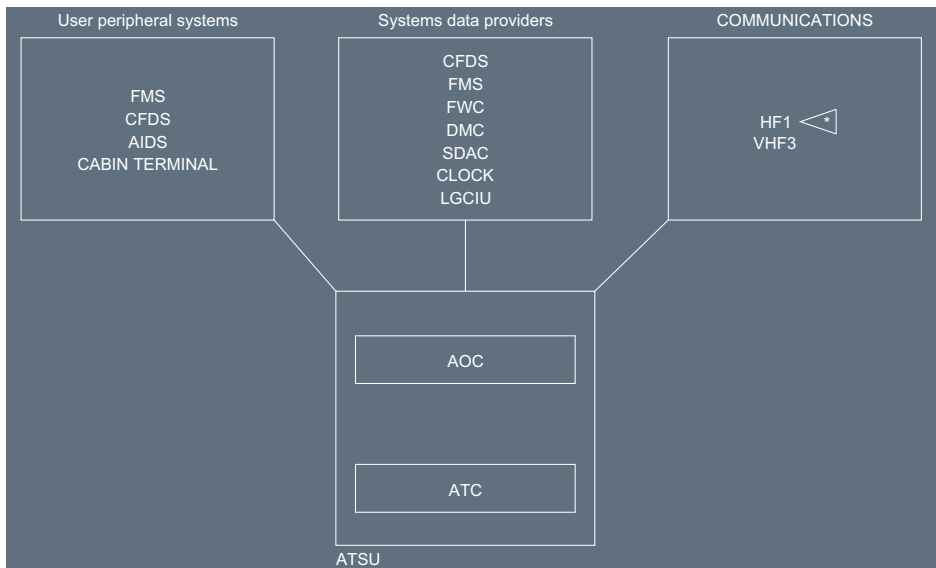
The ACARS and ATN functions are included in the ATSU.

SYSTEM ARCHITECTURE

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3184

The ATSU is connected to the following systems:

Continued on the next page



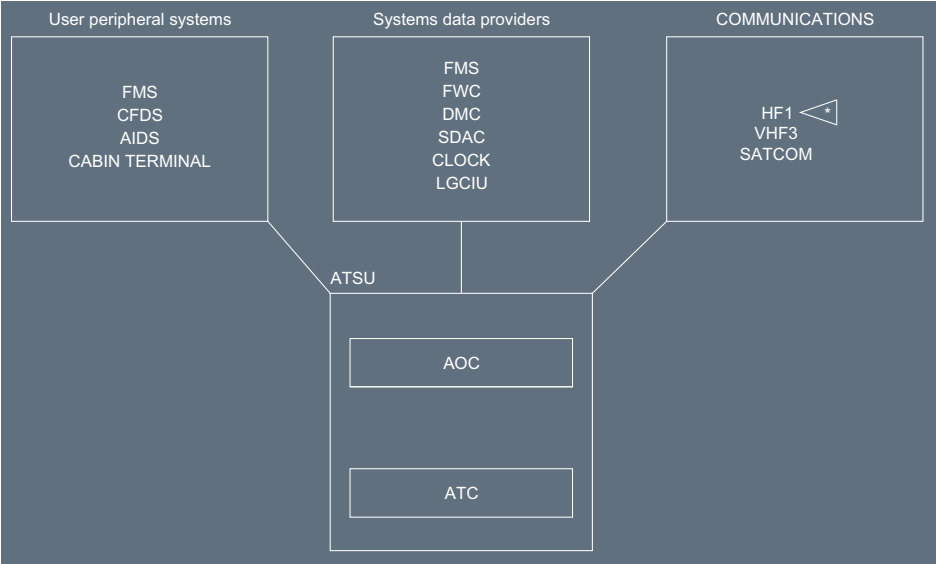
The ATSU supports uplink and downlink messages.

They may be either automatically or manually handled, with or without information to the crew.

SYSTEM ARCHITECTURE

Applicable to: MSN 3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

The ATSU is connected to the following systems:

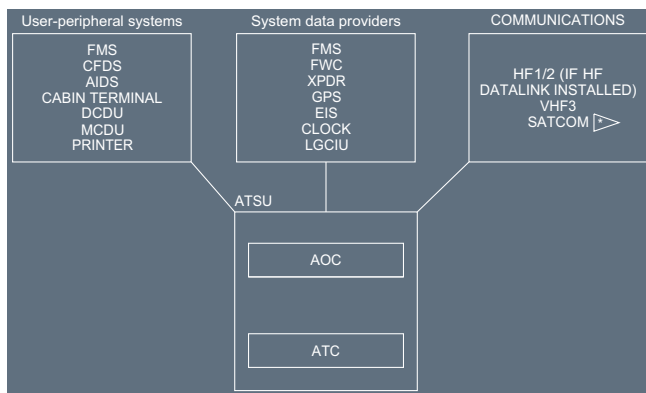


The ATSU supports uplink and downlink messages.
They may be either automatically or manually handled, with or without information to the crew.

SYSTEM ARCHITECTURE

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

The ATSU is connected to the following systems:

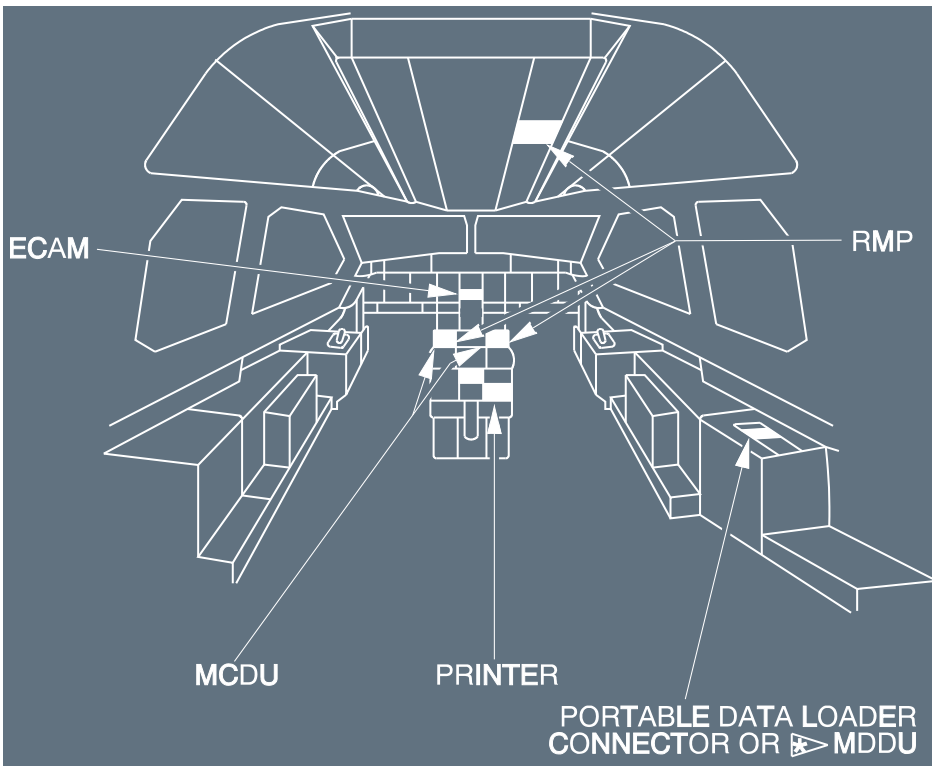


The ATSU supports uplink and downlink messages.

They may be either automatically or manually handled, with or without information to the crew.

COCKPIT ARRANGEMENT

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3184

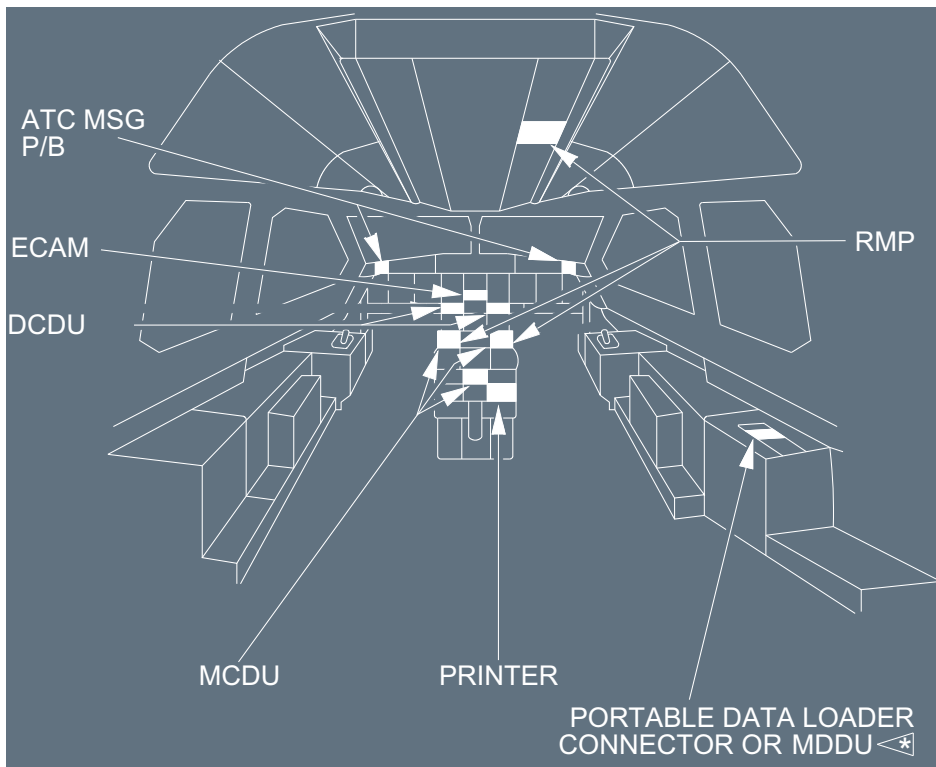


The pilot interface consists of:

- The MCDU to handle the AOC functions.
- The PRINTER to print any type of messages.
- The ECAM for operational information.
- The RMP to allow frequencies tuning.

COCKPIT ARRANGEMENT

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

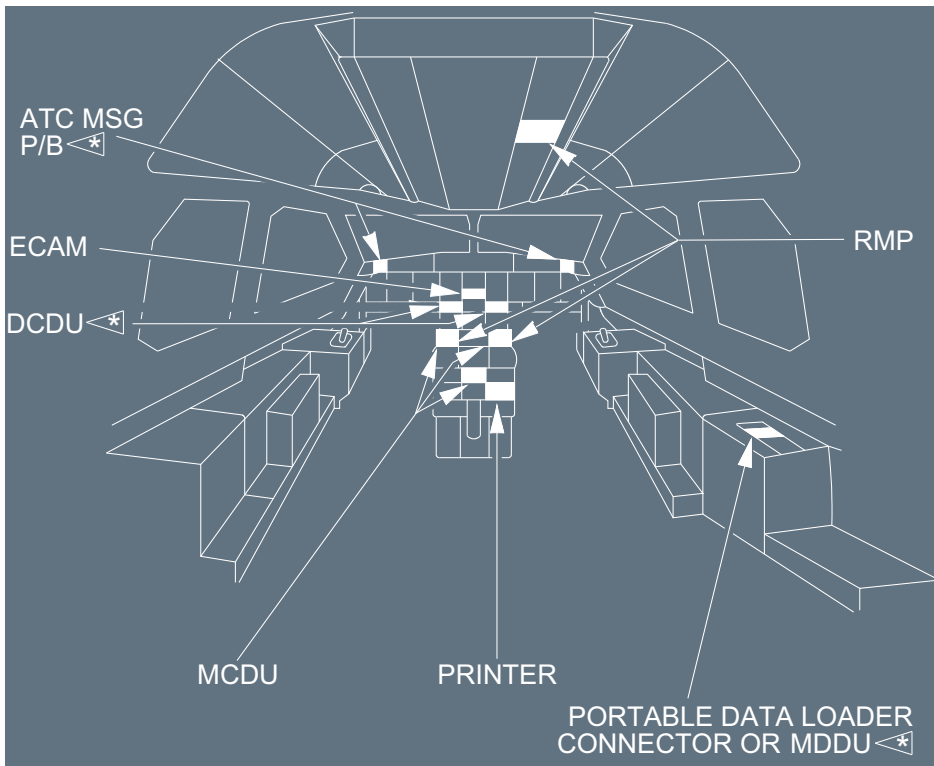


The pilot interface consists of:

- The DCDU, to display any up and downlink ATC messages.
- The “ATC MSG pb”, to alert the crew of any ATC uplink arrivals, associated with a dedicated chime.
- The MCDU, to handle the AOC and ATC functions and data transfer with the DCDU.
- The PRINTER, to print any type of messages.
- The ECAM, for operational information.
- The RMP, to allow frequencies’ tuning.

COCKPIT ARRANGEMENT

Applicable to: MSN 3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

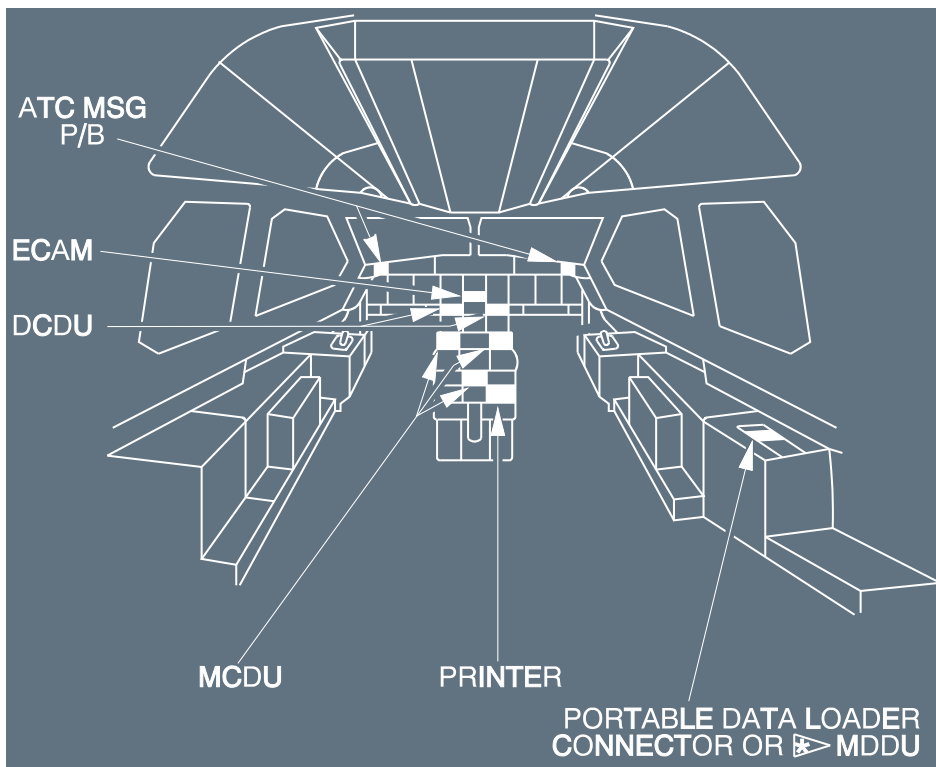


The pilot interface consists of:

- The DCDU , to display any up and downlink ATC messages.
- The “ATC MSG pb ”, to alert the crew of any ATC uplink arrivals , associated with a dedicated chime .
- The MCDU, to handle the AOC and ATC functions and data transfer with the DCDU .
- The PRINTER, to print any type of messages.
- The ECAM, for operational information.
- The RMP, to allow frequencies’ tuning.

COCKPIT ARRANGEMENT

Applicable to: MSN 2742, 3913, 4554-4787



The pilot interface consists of:

- The DCDU, to display any up and downlink ATC messages.
- The “ATC MSG pb”, to alert the crew of any ATC uplink arrivals, associated with a dedicated chime.
- The MCDU, to handle the AOC and ATC functions and data transfer with the DCDU for ATC.
- The PRINTER, to print any type of messages.
- The ECAM, for operational information.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-46 – INFORMATION SYSTEMS
DSC-46-10 – General

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INTRODUCTION

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

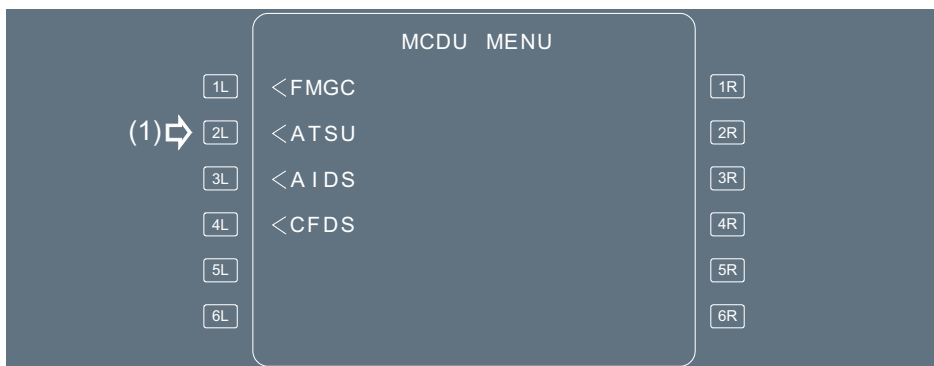
The ATSU Communication Function manages communications between aircraft and ground. This is achieved:

- Automatically without pilot action, or
- Manually using MCDU pages and/or RMP.

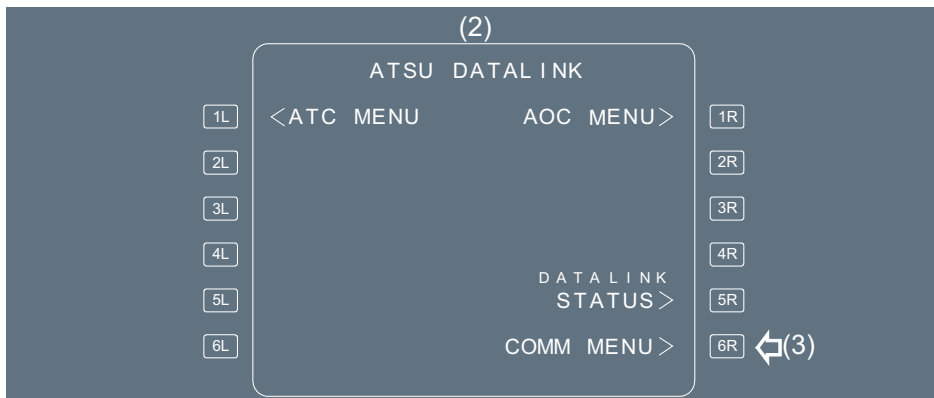
The pilot controls communications from the MCDUs COMM MENU page.

The MCDU's COMM MENU page is accessible through the following selections:

On the MCDU MENU page, the [2L] key (1) enables to access the ATSU DATALINK page (2).



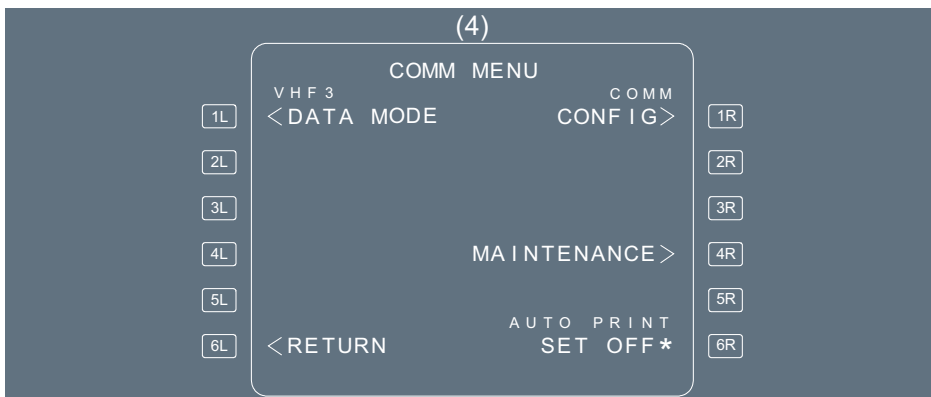
On the ATSU DATALINK page, the [6R] key (3) enables to access the COMM MENU page (4).



Continued on the next page

Note: The [1R], [2R], [3R] fields from the ATSU DATALINK page are customized according to the airline's AOC programming.

The COMM MENU page is as following:



INTRODUCTION

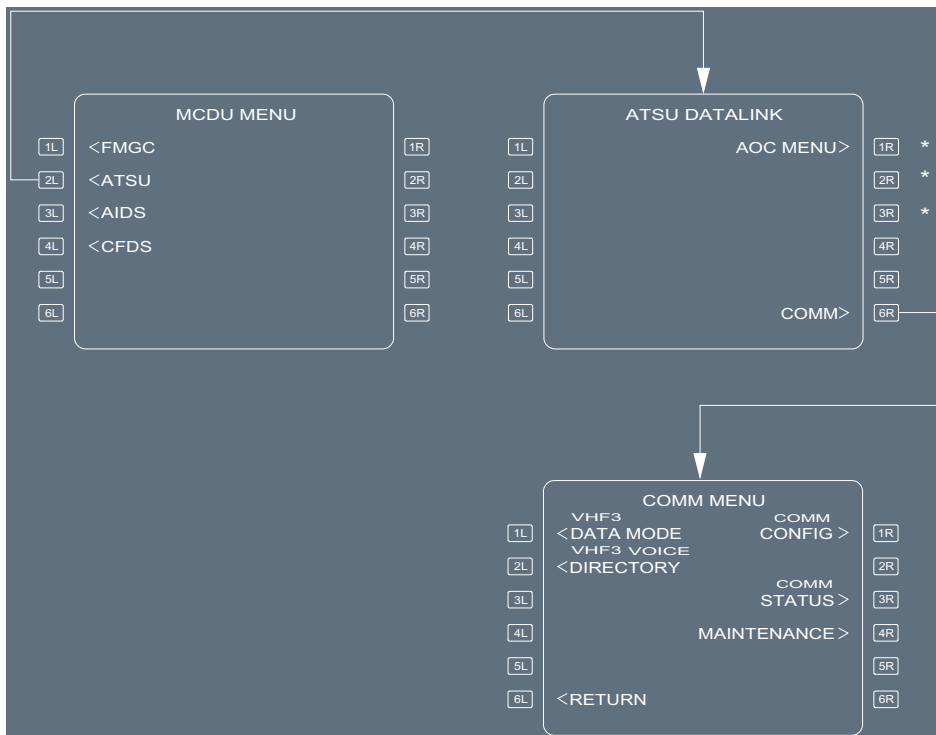
Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

The Air-Ground communications are managed by the ATSU communication function either:

- automatically without pilot action,
- or manually using MCDU pages and/or RMPs.

The pilot controls the communications through the COMM MENU page on MCDU.

Continued on the next page



(*) These fields are customized according to the AOC programming.

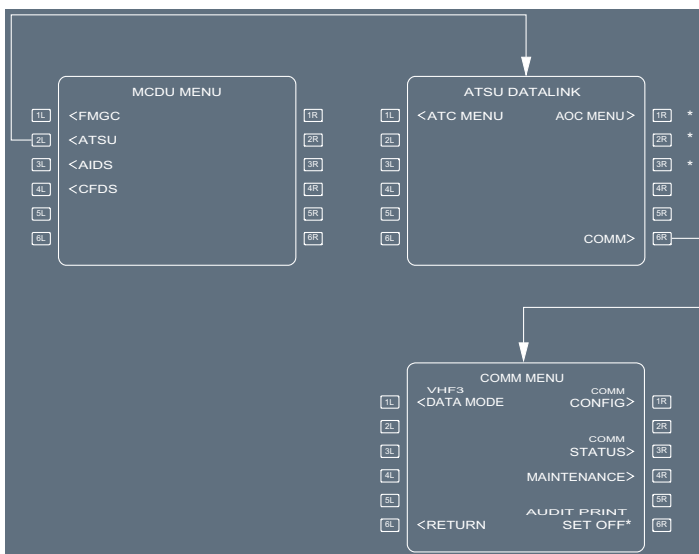
INTRODUCTION

Applicable to: MSN 2742, 3913, 4554-4787

The ATSU Communication Function manages communications between aircraft and ground. This is achieved:

- Automatically without pilot action, or
- Manually using MCDU pages and/or RMPs.

The pilot controls the communications through the COMM MENU page on MCDU.



(*) These fields are customized according to the AOC programming.

DOWNLINK AND UPLINK MESSAGES

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

DOWNLINK MESSAGES

Aircraft to ground messages (downlink) comprise maintenance, monitoring, operational, performance and cabin data.

Reports generated by a peripheral (CFDS, AIDS, FMS, CABIN TERMINAL) system can be automatically downlinked by the ATSU depending on each airline AOC programming.

Continued on the next page

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

DOWNLINK MESSAGES

Aircraft to ground messages (downlink) include : Maintenance, monitoring, operational, performance and cabin data and ATC messages.

A report that is generated by a peripheral system (CFDS, AIDS, FMS, CABIN TERMINAL) can be automatically-downlinked by ATSU , depending on each airline's AOC programming.

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

UPLINK MESSAGES

Ground to aircraft messages (uplink) contain either crew information (wind, for example) or data to be uploaded into the FMS (Flight plan, for example). Uplinks can also include requests for the transmission of specific downlink reports.

Messages are indicated (this does not include ATC messages) to the crew by a:

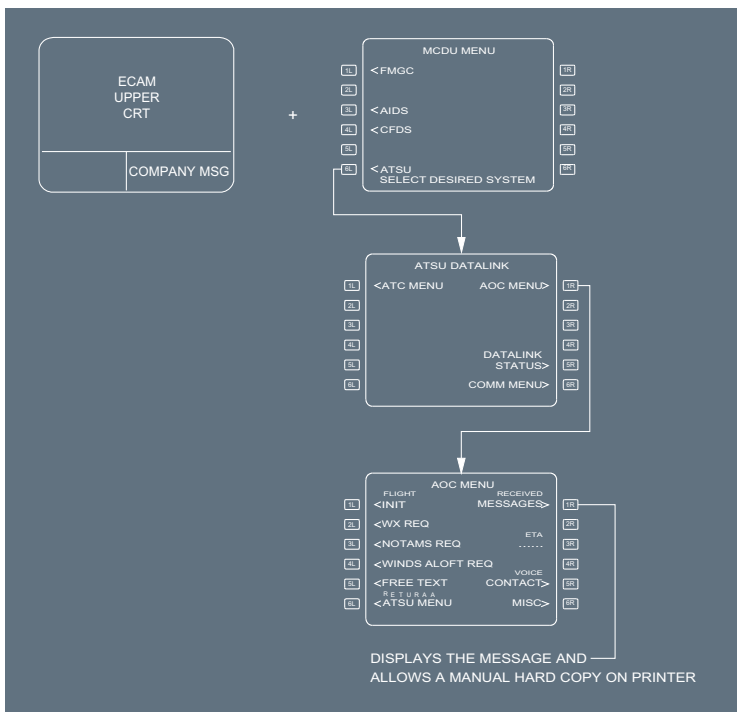
- "COMPANY MSG" memo, in green on the ECAM memo, or
- "COMPANY ALERT" memo (pulses green for around 3 min, then remains steady, and is associated with a buzzer sound for 1 s) on the ECAM memo, or
- "COMPANY CALL" memo, in green on the ECAM memo, or
- MCDU MENU light comes on, if the MCDU is not in the mode where the uplink message can be displayed, or
- Hardcopy on the cockpit printer, depending on the airline's AOC programming.

- Note:**
1. A steady green "DATALINK STBY" memo is displayed in case of communications loss between aircraft and ground.
 2. The way to access to those COMPANY CALL messages is not presented, since they are accessed via the AOC MENU page, which is customized according to the airline's AOC programming.

Depending on the memo displayed on the ECAM, the uplink message indications are available, as the following examples:

- For a "COMPANY MSG" or a "COMPANY ALERT" ECAM memo:

Continued on the next page



On the AOC MENU page, pressing the [1R] key displays the received message and clears the ECAM memo.

Note: AOC MENU page is customized, according to AOC programming.

Continued on the next page

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

UPLINK MESSAGES

Ground to aircraft messages (uplink) either contain crew information (wind for example) or data to be uploaded into the FMS (Flight plan for example). Uplinks can also contain requests for transmission of specific downlink reports.

Messages are indicated to the crew by:

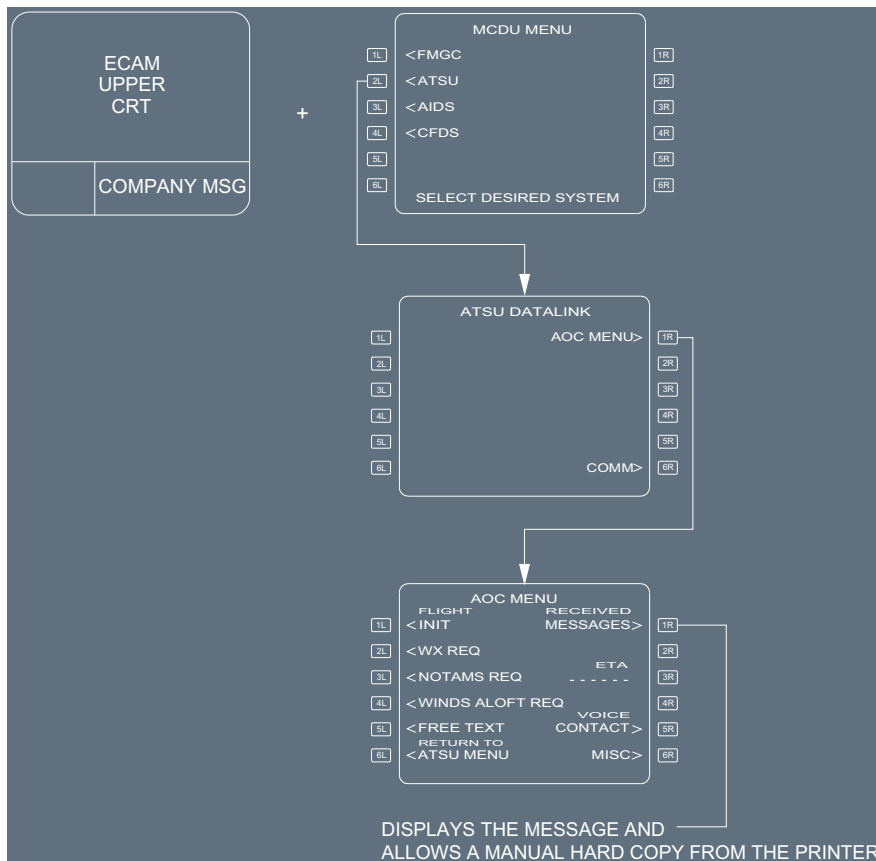
- “COMPANY MSG” memo (in green) on the ECAM memo, or
- “COMPANY CALL” memo (in green) on the ECAM memo, or
- “COMPANY ALERT” memo (pulses green for around 180 s , then remains steady, and is associated with a buzzer sound for 1 s) on the ECAM memo, or
- The MCDU MENU light comes on, if the MCDU is not in the mode where the uplink message can be displayed, or
- A Hard copy from the cockpit printer, depending on airline's AOC programming.

Note: A steady green “COMPANY DATALINK STBY” memo is displayed, when the AOC datalink air-ground communication is temporarily unavailable, but not lost.

Depending on the memo displayed on the ECAM, the uplink message indications are available, as the following examples:

- For a “COMPANY MSG” ECAM memo:

Continued on the next page



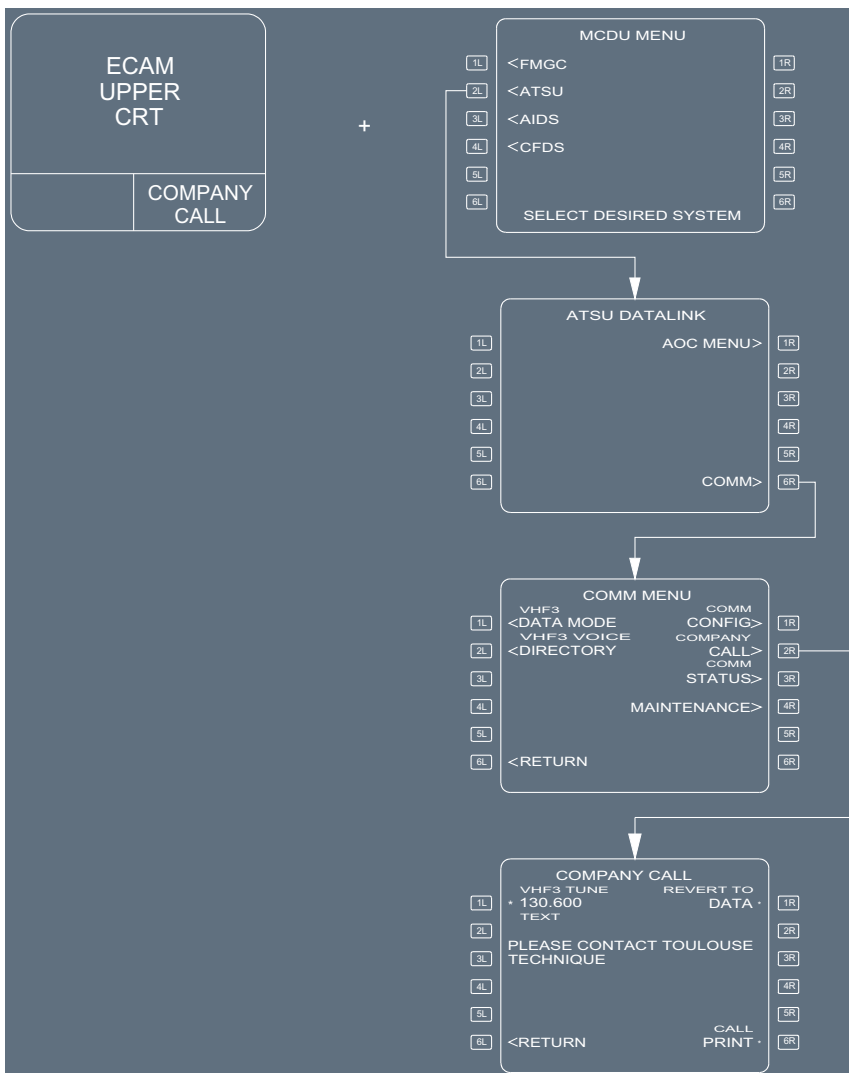
On the AOC MENU page, pressing the [1R] key displays the received message and clears the ECAM memo.

Note:

1. AOC MENU page is customized, according to AOC programming.
2. A "COMPANY ALERT" ECAM memo is processed in the same way.

- For a "COMPANY CALL" ECAM memo:

Continued on the next page



On the MCDU's COMPANY CALL page:

Pressing the [1L] key clears the ACARS CALL memo and activates the VHF voice frequency on VHF 3 associated with the memo.

Continued on the next page

When in VHF 3 voice mode, pressing the [1R] key reverts VHF 3 to DATALINK mode.

Applicable to: MSN 2742, 3913, 4554-4787

UPLINK MESSAGES

Ground to aircraft messages (uplink) either contain crew information (wind for example) or data to be uploaded into the FMS (Flight plan for example). Uplinks can also contain requests for transmission of specific downlink reports.

Messages are indicated (this does not include ATC messages) to the crew by a:

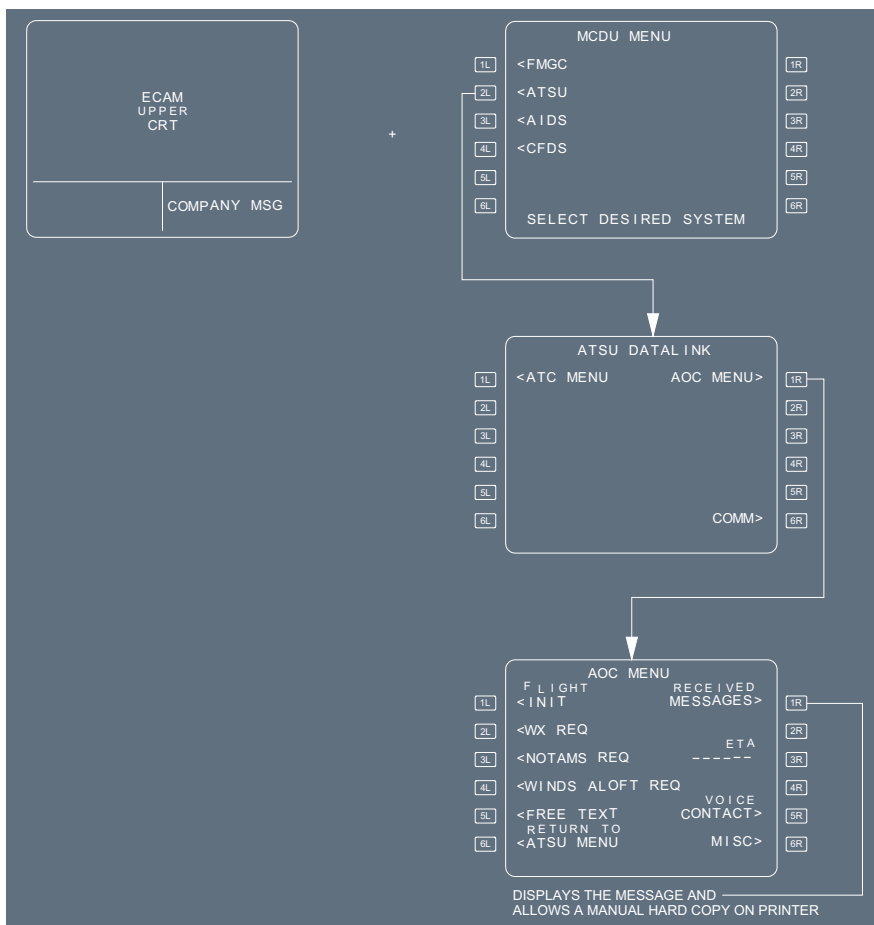
- "COMPANY MSG" memo, in green on the ECAM memo, or
- "COMPANY ALERT" memo (pulses green for around 3 min, then remains steady, and is associated with a buzzer sound for 1 s) on the ECAM memo, or
- "COMPANY CALL" memo, in green on the ECAM memo, or
- The MCDU MENU light comes on, if the MCDU is not in the mode where the uplink message can be displayed, or
- A Hard copy from the cockpit printer, depending on airline AOC programming.

Note: 1. A steady green "DATALINK STBY" memo is displayed in case of communications loss between aircraft and ground.
2. The way to access to those COMPANY CALL messages is not presented, since they are accessed via the AOC MENU page, which is customized according to the airline's AOC programming.

Depending on the memo displayed on the ECAM, the uplink message indications are available, as the following examples:

- For a "COMPANY MSG" or a "COMPANY ALERT" ECAM memo:

Continued on the next page



On the AOC MENU page, pressing the [1R] key displays the received message and clears the ECAM memo.

Note: AOC MENU page is customized, according to AOC programming.

DATALINK/VOICE TRANSFER ON VHF 3

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

GENERAL

VHF 3 can be used in voice mode in case of a:

- VHF 1 or VHF 2 failure, or
- COMPANY CALL.

The green “COMPANY CALL” memo indicates that a request for voice contact was received from the ground.

The green “VHF 3 VOICE” memo indicates that the VHF 3 transceiver operates in voice mode.

Therefore, datalink communication is interrupted.

The voice frequency may be either tuned by the ATSU or tuned by the crew through the RMP. The DATALINK/VOICE transfer can be done either from any of the RMPs or from the ATSU through the VHF 3 VOICE DIRECTORY MCDU page.

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

GENERAL

VHF 3 can be used in voice mode in case of a:

- VHF 1 or VHF 2 failure, or
- COMPANY CALL.

The green “COMPANY CALL” memo indicates that a request for voice contact was received from the ground.

The green “VHF 3 VOICE” memo indicates that the VHF 3 transceiver operates in voice mode.

Therefore, datalink communication is interrupted.

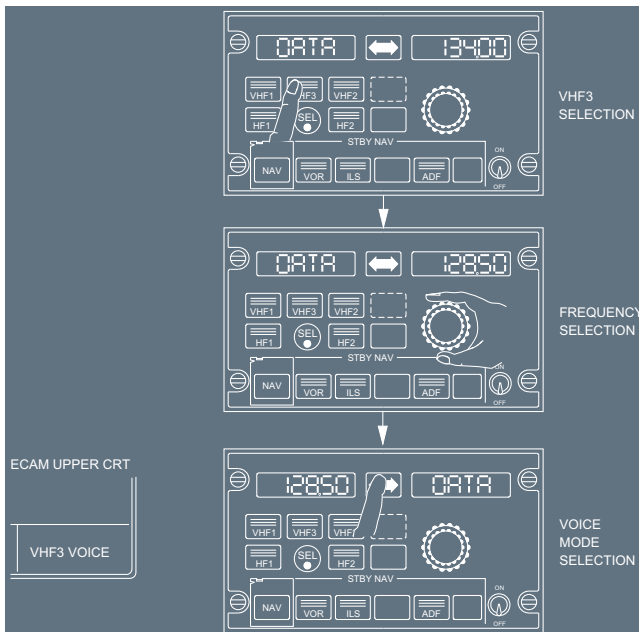
The VHF 3 frequency may be tuned by the crew, via the RMP. The DATALINK/VOICE transfer can be done from any of the RMPs.

Continued on the next page

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

RMP

DATALINK/VOICE TRANSFER FROM A RMP



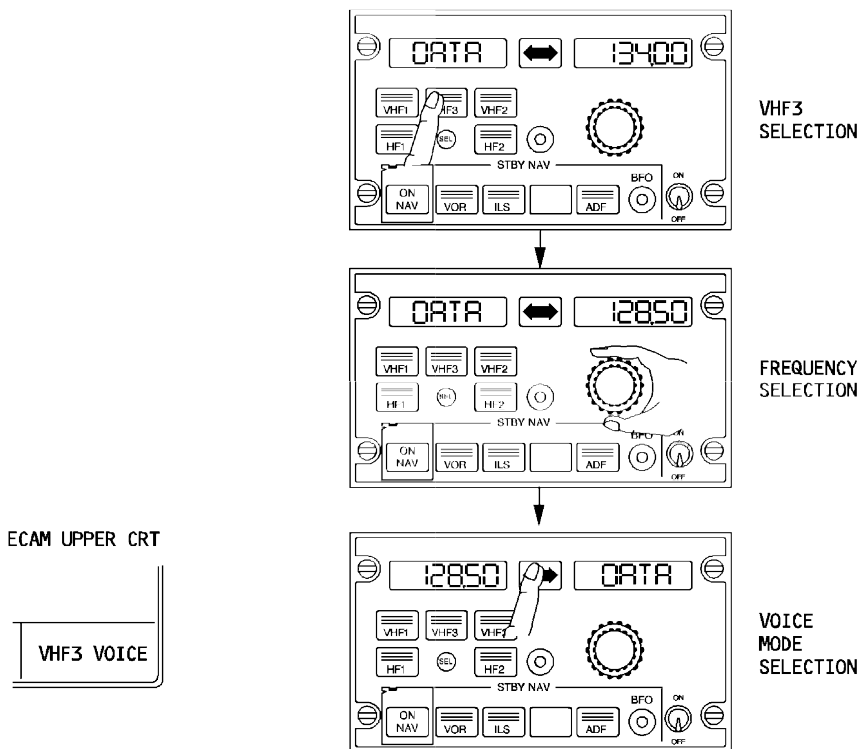
DATALINK mode resumes, when the transfer key on the RMP is pressed again.

Continued on the next page

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2742, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3913, 3953-3979, 4012-4219, 4234-4313, 4380-4787

RMP

DATALINK/VOICE TRANSFER FROM A RMP



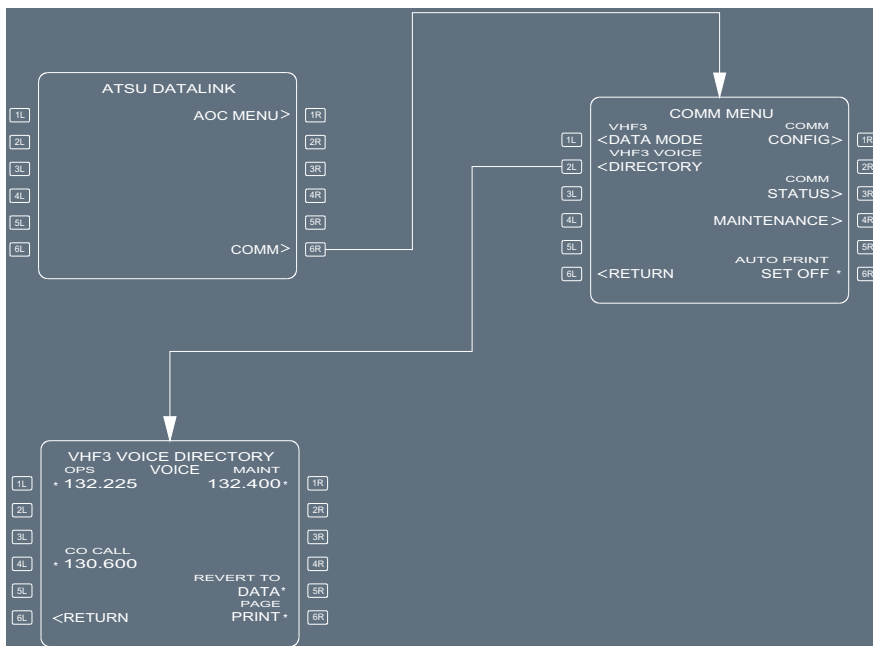
Pressing again the transfer key on RMP returns to DATALINK mode.

Continued on the next page

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

ATSU

DATALINK/VOICE TRANSFER FROM THE ATSU THROUGH THE VHF 3 VOICE DIRECTORY PAGE



On the VHF 3 VOICE DIRECTORY MCDU page:

- Below the title, it is indicated whether VHF 3 is in “VOICE”, or “DATA” mode.
- Fields [1L] to [3L] and [1R] to [3R] display the voice frequencies defined in the airline database. Pressing one of the adjacent keys activates the corresponding preselected voice frequency.
- Field [4L] displays the voice frequency provided in the last received COMPANY CALL message. Pressing the adjacent key deletes the adjacent COMPANY CALL memo and activates the voice frequency on VHF 3.

Note: After the activation of the voice frequency, DATA remains displayed in the active window of the RMP.

Pressing the [5R] key returns to DATALINK mode.

DATALINK/VOICE TRANSFER ON HF 1

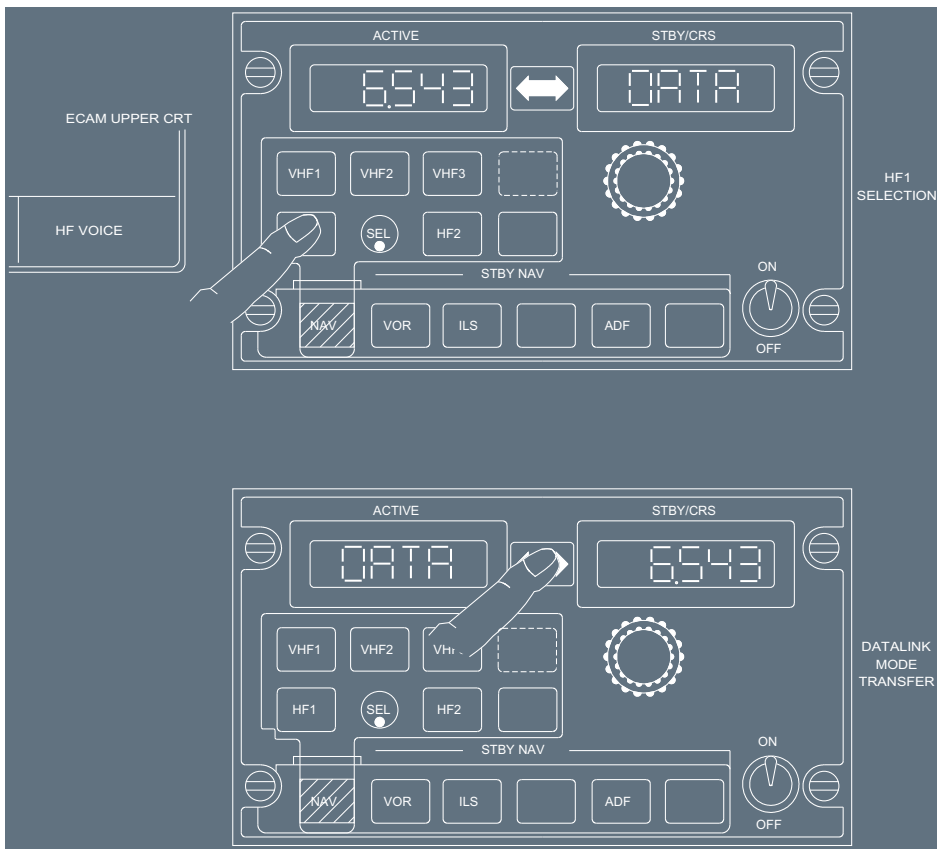
Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

HF 1 can also be used in data mode. It constitutes an alternative to VHF 3 and SATCOM.

The datalink HF frequency tuning is automatically managed.

The green HF VOICE memo indicates that the HF transceiver operates in voice mode, therefore, datalink communications are interrupted.

The datalink/voice transfer can be done from any of the RMPs as follows:



Pressing the transfer key on the RMP again returns to voice mode.

SCRATCHPAD MESSAGES ON THE COMM MENU

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

MESSAGE	COLOR	CONDITIONS
NOT ALLOWED	W	It is not permitted to press this key.
ENTER A/C REGISTR	A	The aircraft registration number is not valid. To enter this parameter, <i>Refer to PRO-SUP-46 ATSU Initialization.</i>
PRINT FAILED	W	A print command was unsuccessful.
FORMAT ERROR	W	The message was entered in an inappropriate format.
VHF 3 SWITCH IMPOSSIBLE	A	It is not possible to switch from VHF 3 voice mode to VHF 3 data mode.
DEFAULT VHF SP LIST ⁽¹⁾	A	The new SCAN MASK is not available. The system displays the default SCAN MASK instead.
SYSTEM BUSY-TRY LATER	W	The system is busy. The command, selected by the flight crew, cannot currently be performed.
COMMAND NOT AVAIL	W	The command is not available.
ENTER VHF 3 SCAN SELECT ⁽¹⁾	A	No service provider has been selected.
ENTER ACARS A/L ID	A	The airline identification number is not valid. To enter this parameter, <i>Refer to PRO-SUP-46 ATSU Initialization.</i>
ENTER A/C ICAO CODE	W	The aircraft ICAO code is not valid. To enter the A/C ICAO code, <i>Refer to PRO-SUP-46 ATSU Initialization</i>
ENTER STANDARD A/L ID	A	The airline identification on 3 characters is not valid.
KEY NOT ACTIVE	W	The flight crew has pressed on MCDU a non allocated/non active key.
PRESS CONFIG ACTIVATE	A	Parameters of COMM MENU page have been modified. It is required to activate the new configuration.
MULTICAST IGNORED	W	The multicast address is invalid (because equal to a/c ARN).

⁽¹⁾ Depending on airline customization, access to the SCAN SELECT menu may not be possible. If it is not, the DEFAULT VHF SP LIST and ENTER VHF 3 SCAN SELECT scratchpad messages are not applicable.

SCRATCHPAD MESSAGES ON THE COMM MENU

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

MESSAGE	COLOR	CONDITIONS
NOT ALLOWED	W	It is not permitted to press this key.
ENTER A/C REGISTR	A	The aircraft registration number is not valid. To enter this parameter, <i>Refer to PRO-SUP-46 ATSU Initialization.</i>
PRINT FAILED	W	A print command is not successful.
FORMAT ERROR	W	The message was entered in an inappropriate format.
VHF 3 SWITCH IMPOSSIBLE	A	It is not possible to switch from VHF 3 voice mode to VHF 3 data mode.
DEFAULT VHF SP LIST ⁽¹⁾	A	The new SCAN MASK is not available. The system displays the default SCAN MASK instead.
SYSTEM BUSY-TRY LATER	W	The system is busy. The command, selected by the flight crew, cannot currently be performed.
COMMAND NOT AVAIL	W	The command is not available.
VHF 3 CAN BE SET IN VOICE	A	VHF 3 datalink communications are lost. However, VHF 3 can be used in voice mode.
ENTER VHF 3 SCAN SELECT ⁽¹⁾	A	No service provider has been selected. To select a service provider, <i>Refer to PRO-SUP-46 ATSU Initialization.</i>
ENTER A/L ID	A	The airline identification number is not valid. To enter this parameter, <i>Refer to PRO-SUP-46 ATSU Initialization.</i>
PRT MSG PRINT FAIL	W	Automatic print of an AOC uplink message was not successful.

⁽¹⁾ Depending on airline customization, access to the SCAN SELECT menu may not be possible. If it is not, the DEFAULT VHF SP LIST and ENTER VHF 3 SCAN SELECT scratchpad messages are not applicable.

SCRATCHPAD MESSAGES ON THE COMM MENU

Applicable to: MSN 2742, 3913, 4554-4787

MESSAGE	COLOR	CONDITIONS
NOT ALLOWED	W	It is not permitted to press this key.
ENTER A/C REGISTR	A	The aircraft registration number is not valid. To enter this parameter, <i>Refer to PRO-SUP-46 ATSU Initialization.</i>
PRINT FAILED	W	A print command is not successful.
FORMAT ERROR	W	The message was entered in an inappropriate format.
VHF 3 SWITCH IMPOSSIBLE	A	It is not possible to switch from VHF 3 voice mode to VHF 3 data mode.
DEFAULT VHF SP LIST ⁽¹⁾	A	The new SCAN MASK is not available. The system displays the default SCAN MASK instead.
SYSTEM BUSY-TRY LATER	W	The system is busy. The command, selected by the flight crew, cannot currently be performed.
COMMAND NOT AVAIL	W	The command is not available.
VHF 3 CAN BE SET IN VOICE	A	VHF 3 datalink communications are lost. However, VHF 3 can be used in voice mode.
ENTER VHF 3 SCAN SELECT ⁽¹⁾	A	No service provider has been selected.
ENTER A/L ID	A	The airline identification number is not valid. To enter this parameter, <i>Refer to PRO-SUP-46 ATSU Initialization.</i>
ENTER A/C ICAO CODE	W	The aircraft ICAO code is not valid. To enter the A/C ICAO code, <i>Refer to PRO-SUP-46 ATSU Initialization</i>

- ⁽¹⁾ Depending on airline customization, access to the SCAN SELECT menu may not be possible. If it is not, the DEFAULT VHF SP LIST and ENTER VHF 3 SCAN SELECT scratchpad messages are not applicable.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-46 – INFORMATION SYSTEMS
DSC-46-20 – ATSU Communications Function

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INTRODUCTION

Applicable to: ALL

Two kinds of Airline Operational Control (AOC) applications are provided:

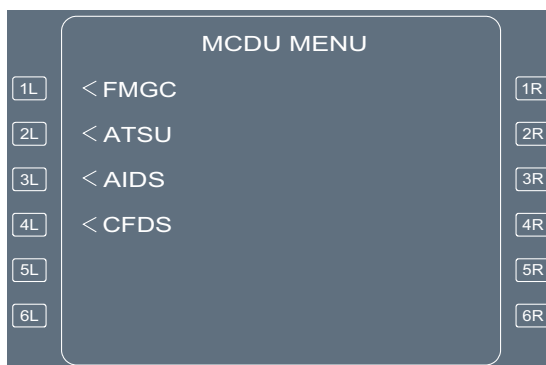
- Remote AOC applications embedded in systems peripheral to ATSU (AIDS, CFDS, FMGC, CABIN TERMINAL)
- Hosted AOC applications uploaded into the ATSU.

Due to the highly customized aspect of the hosted AOC applications, only the remote AOC applications are described in this chapter.

REMOTE APPLICATIONS

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2742, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3913, 3953-3979, 4012-4219, 4234-4313, 4380-4787

The remote AOC applications are accessible by pressing the related system key on the MCDU MENU page.



Message/reports are processed by the AOC peripherals (FMGC, AIDS, CFDS) ; the ATSU communication function only routes the request according to the company routing policy.

FLIGHT MANAGEMENT SYSTEM (FMGC)

Refer to DSC-22_45 General

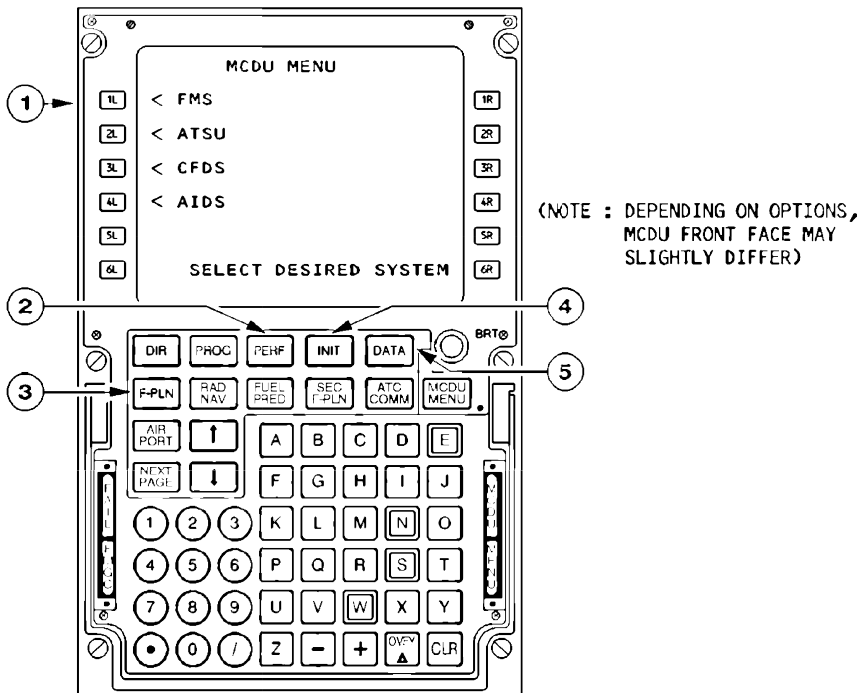
Through the FMGC interface it is possible to access the following data:

- Wind data (F-PLN page)
- Takeoff data (uplink only)
- F-PLN initialization (uplink only)

Continued on the next page

- Pre-flight, post-flight report and ACARS print/program (downlink only).

Refer to DSC-22_20-70 Flight Plan Initialization Through ACARS



- (1) Pressing key selects related system then
- (2) Pressing key gives access to takeoff data (Uplink only)
- (3) Pressing key gives access to wind data (F-PLN page)
- (4) Pressing key gives access to F-PLN initialisation and wind data (Uplink only)
- (5) Pressing key gives access to Pre-flight, Post-flight report and ACARS print/program (downlink only).

Refer to DSC-22_20-70 Flight Plan Initialization Through ACARS.

CENTRALIZED FAULT DISPLAY SYSTEM (CFDS)

(Refer to DSC-45-20 Maintenance Menu)

Continued on the next page

Through the CFDS interface it is possible to downlink the following data:

- Post flight report (on the ground) or current flight report (in flight) which includes:
 - All failure messages detected by the BITEs
 - The warnings displayed to the crew during the last or current flight leg.Report can be downlinked upon crew action or upon ground request or automatically.
- Previous Flight Report (on the ground)
- Real-time failure and warning messages (in flight)
- Class 3 report (on the ground) containing all class 3 failures detected during the last flight leg. The report can be downlinked upon crew action or automatically.

AIRCRAFT INTEGRATED DATA SYSTEM (AIDS)

The AIDS interface provides ATSU with the data for the following applications:

- Aircraft Performance Monitoring (APM)
- Engine Condition Monitoring (ECM)
- APU Health Monitoring (AHM).

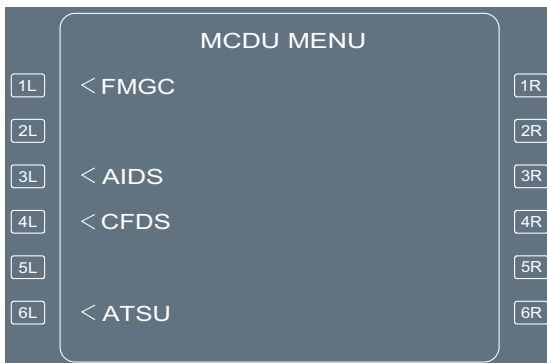
Any of the AIDS DMU reports can be downlinked (through ATSU):

- Manually on the ground or in flight
- Automatically in real-time
- Upon ground request or upon automatic request from the ATSU.

REMOTE APPLICATIONS

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

The remote AOC applications are accessible by pressing the related system key on the MCDU MENU page.



Message/reports are processed by the AOC peripherals (FMGC, AIDS, CFDS) ; the ATSU communication function only routes the request according to the company routing policy.

FLIGHT MANAGEMENT SYSTEM (FMGC)

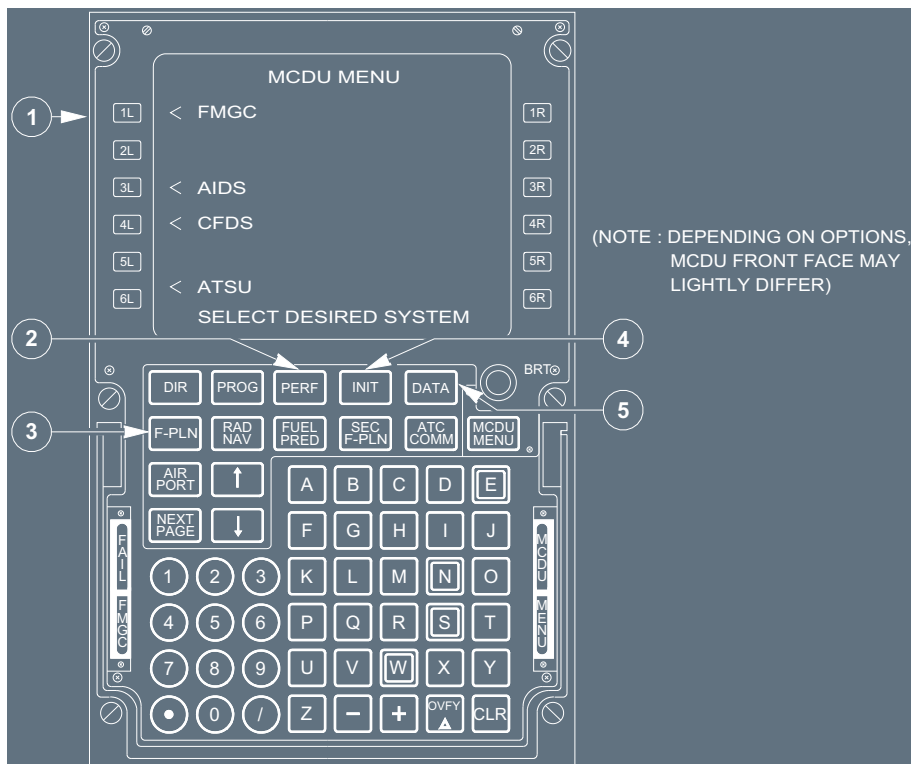
Refer to DSC-22_45 General

Through the FMGC interface it is possible to access the following data:

- Wind data (F-PLN page)
- Takeoff data (uplink only)
- F-PLN initialization (uplink only)
- Pre-flight, post-flight report and ACARS print/program (downlink only).

Refer to DSC-22_20-70 Flight Plan Initialization Through ACARS

Continued on the next page



CENTRALIZED FAULT DISPLAY SYSTEM (CFDS)

(Refer to DSC-45-20 Maintenance Menu)

Through the CFDS interface it is possible to downlink the following data:

- Post flight report (on the ground) or current flight report (in flight) which includes:
 - All failure messages detected by the BITes
 - The warnings displayed to the crew during the last or current flight leg.
 Report can be downlinked upon crew action or upon ground request or automatically.
- Previous Flight Report (on the ground)
- Real-time failure and warning messages (in flight)
- Class 3 report (on the ground) containing all class 3 failures detected during the last flight leg. The report can be downlinked upon crew action or automatically.

Continued on the next page

AIRCRAFT INTEGRATED DATA SYSTEM (AIDS)

The AIDS interface provides ATSU with the data for the following applications:

- Aircraft Performance Monitoring (APM)
- Engine Condition Monitoring (ECM)
- APU Health Monitoring (AHM).

Any of the AIDS DMU reports can be downlinked (through ATSU):

- Manually on the ground or in flight
- Automatically in real-time
- Upon ground request or upon automatic request from the ATSU.

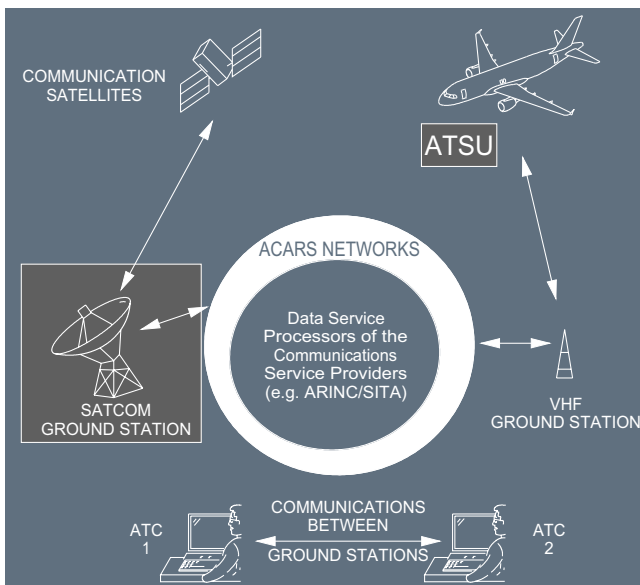
INTRODUCTION

Applicable to: MSN 3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

The global Communications Navigation Surveillance/Air Traffic Management (CNS/ATM) system is made up of the C (Communications), N (Navigation) and S (Surveillance) tools, developed to provide efficient Air Traffic Management methods.

Such methods include the introduction of datalink communication between pilots and controllers. This is considered to be the primary means of communication over oceans and in remote areas.

The current CNS/ATM system uses ACARS network: These networks are mainly ARINC, and SITA (*Refer to DSC-23-40-40 World Map ACARS Frequencies*). The related data communications are managed by the Air Traffic System Unit (ATSU), and can be supported by the SATCOM or the VHF.



The CNS/ATM system includes the following applications:

- The ATS Facilities Notification (AFN)
- The Controller Pilot Data Link Communications (CPDLC)
- The Automatic Dependent Surveillance-Contract (ADS-C).

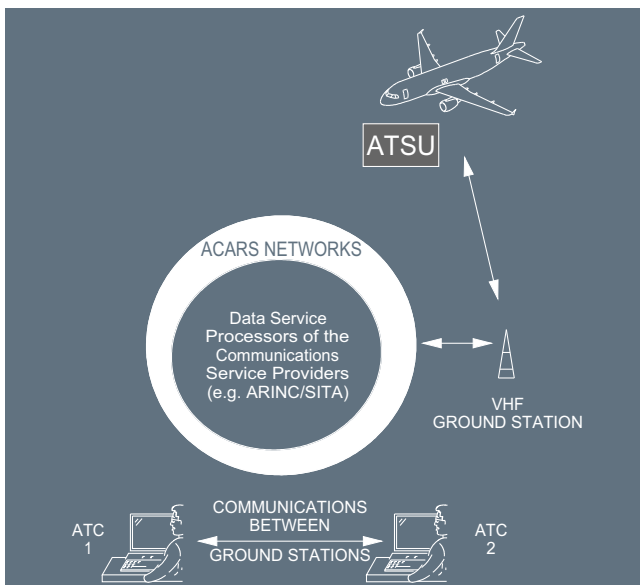
INTRODUCTION

Applicable to: MSN 2742, 3913, 4554-4787

The global Communications Navigation Surveillance/Air Traffic Management (CNS/ATM) system is made up of the C (Communications), N (Navigation) and S (Surveillance) tools, developed to provide efficient Air Traffic Management methods.

Such methods include the introduction of datalink communication between pilots and controllers. The initial use of datalink in continental area (high density airspaces with radar surveillance) is introduced with FANS B. It will be used as a supplemental means in addition to voice communications.

The current FANS B system uses the ATN network and through VDL Mode 2 subnetwork: These networks are mainly ARINC and SITA (*Refer to DSC-23-40-40 World Map ACARS Frequencies*). The related data communications are managed by the Air Traffic System Unit (ATSU).



The FANS B system includes the following functions:

- The Context Management Application (CMA)
- The Controller Pilot Link Communications (CPDLC)

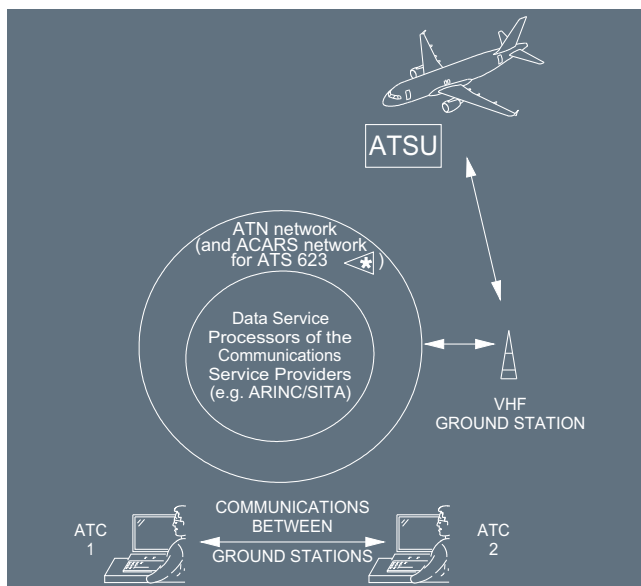
INTRODUCTION

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

The global Communications Navigation Surveillance/Air Traffic Management (CNS/ATM) system is made up of the C (Communications), N (Navigation) and S (Surveillance) tools, developed to provide efficient Air Traffic Management methods.

Such methods include the introduction of datalink communication between pilots and controllers. The use of datalink in continental area (high density airspace with radar surveillance) is supported by FANS B+. It will be used as a supplemental means in addition to voice communications.

Overview



The FANS B+ system includes the following functions:

- The Context Management Application (CMA)
- The Controller Pilot Data Link Communications (CPDLC).

The FANS B+ also proposes two options:

- The Air Traffic Services 623 (ATS 623) including Departure Clearance (DCL) and Automatic Terminal Information Service (ATIS) functions
- The capability to LOAD on the RMP the voice frequencies received by CPDLC (*Refer to DSC-23-10-30 Radio Management Panel*).

Continued on the next page

The FANS B+ uses:

- The ATN network, for CMA and CPDLC functions
- The ACARS network, for ATS 623 option.

These networks are mainly ARINC and SITA (*Refer to DSC-23-40-40 World Map ACARS Frequencies*). The related data communications are managed by the Air Traffic System Unit (ATSU).

CONTEXT MANGEMENT APPLICATION (CMA)

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

Context Management Application (CMA) is necessary in order to inform the ATC that the aircraft is capable of datalink communications, and to exchange address information. It is initiated by the pilot (*Refer to PRO-SUP-46 Notification Procedure and Connection*)

CONTROLLER PILOT DATA LINK COMMUNICATIONS (CPDLC)

Applicable to: MSN 2742, 3913, 4554-4787

The CPDLC application enables the flight crew and the ATC center to communicate with pre-formatted messages.

Note: The ATC center initiates a CPDLC connection with the aircraft after the flight crew notification.

The flight crew and the ATC center use a set of predefined messages.

All ATC messages, either coming from the ATC center (uplink) or to be sent to the ATC center (downlink), transit through the DCDU.

Both the flight crew and the ATC center are also able to send freetext messages.

UPLINK MESSAGES (FROM THE ATC TO THE CREW)

The following message categories can be uplinked:

1. Clearances (immediate or deferred, speed, heading, altitude, offset, direct to, route clearance or constraint etc...)
2. Report requests (confirm, position reports...)
3. Negotiation requests (ex: Can you accept ... ?)
4. Information messages.

Upon message reception, the ATSU triggers the ATC chime and the flashing blue "ATC MSG pb" on the glareshield.

The ATC chime is either triggered every 15 s (normal message) or every 5 s (urgent message).

Note: Urgent messages are automatically displayed to the crew, even if normal messages were already present in the DCDU. In this case, normal messages stay in the file queue.

Continued on the next page

Pushing one of the two "ATC MSG pb" on the glareshield stops the alert. The alert can also be stopped, when the pilot performs any action regarding the latter uplink message displayed on the DCDU.

To answer the message:

- Manually prepare the message by selecting the appropriate function key (WILCO, ROGER, AFFIRM, NEGATIVE...)
- Send the message to the ground by using the SEND key.

Once the message is sent, the screen should be cleared by pressing the CLOSE key.

The RECALL function key can be used to display the last closed message.

Other messages can be reviewed from the MCDU MSG RECORD page.

To allow some delay in answering, the pilot may answer STBY. In this case, the message cannot be removed until the final answer is sent.

DOWNLINK MESSAGES (FROM THE CREW TO THE ATC)

All downlink messages must be displayed on the DCDU before being sent. This allows the crew to visualize the exact message (concatenated) that will be displayed on the controller screen.

The following message categories can be downlinked:

1. Answers to ATC messages by using the DCDU function keys (WILCO, UNABLE, AFFIRM...)
2. Standard requests (vertical, lateral, speed)
3. Confirm (immediate confirm or reports).

All messages, not in direct response to an ATC uplink message, are prepared on the MCDU. The crew selects the appropriate key to transfer the messages prior to appearing on the DCDU and then can review them before sending.

Standard requests are prepared on the MCDU ATC MENU page (through the prompt REQUEST).

Then, they are displayed on the DCDU using the MCDU's XFR TO DCDU prompt.

Reports or confirm answers have to be prepared by the crew using the DCDU EDIT key which calls for the MCDU EDIT page.

The crew must then send the DCDU-displayed messages by using the SEND key.

The message may be removed from the screen by using the CLOSE key.

CONTROLLER PILOT DATA LINK COMMUNICATIONS (CPDLC)

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

The CPDLC application enables the flight crew and the ATC center to communicate with pre-formatted messages.

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The flight crew and the ATC center use a set of predefined messages.

All ATC messages, either coming from the ATC center (uplink) or to be sent to the ATC center (downlink), transit through the DCDU.

Both the flight crew and the ATC center are also able to send freetext messages.

UPLINK MESSAGES (FROM THE ATC TO THE CREW)

The following message categories can be uplinked:

1. Clearances (immediate or deferred, speed, heading, altitude, offset, direct to, route clearance or constraint etc...)
2. Report requests (confirm, position reports...)
3. Negotiation requests (ex: Can you accept ... ?)
4. Information messages.

Upon message reception, the ATSU triggers the ATC chime and the flashing blue "ATC MSG pb" on the glareshield.

The ATC chime is either triggered every 10 s (normal message) or every 5 s (urgent message).

Note: Urgent messages are automatically displayed to the crew, even if normal messages were already present in the DCDU. In this case, normal messages stay in the file queue.

Pushing one of the two "ATC MSG pb" on the glareshield stops the alert. The alert can also be stopped, when the pilot performs any action regarding the latter uplink message displayed on the DCDU.

To answer the message:

- Manually prepare the message by selecting the appropriate function key (WILCO, ROGER, AFFIRM, NEGATIVE...)
- Send the message to the ground by using the SEND key.

The system automatically removes messages (all uplink messages except clearances and information messages not requiring a flight crew answer) from the DCDU, 5 s after successful reception of the answer by the ATC center. In this case, the message are closed.

For clearances and information messages, the flight crew must manually close the message by using the CLOSE key.

Continued on the next page

The RECALL function key can be used to display the last message closed within 5 min.

Other messages can be reviewed from the MCDU MSG RECORD page.

To allow some delay in answering, the pilot may answer STBY. In this case, the message cannot be removed until the final answer is sent.

DOWNLINK MESSAGES (FROM THE CREW TO THE ATC)

All downlink messages must be displayed on the DCDU before being sent. This allows the crew to visualize the exact message (concatenated) that will be displayed on the controller screen.

The following message categories can be downlinked:

1. Answers to ATC messages by using the DCDU function keys (WILCO, UNABLE, AFFIRM...)
2. Standard requests (vertical, lateral, speed)
3. Confirm (immediate confirm or reports).

All messages, not in direct response to an ATC uplink message, are prepared on the MCDU. The crew selects the appropriate key to transfer the messages prior to appearing on the DCDU and then can review them before sending.

Standard requests are prepared on the MCDU ATC MENU page (through the prompt REQUEST).

Then, they are displayed on the DCDU using the MCDU's XFR TO DCDU prompt.

Reports or confirm answers have to be prepared by the crew using the DCDU EDIT key which calls for the MCDU EDIT page.

The crew must then send the DCDU-displayed messages by using the SEND key.

The system automatically removes messages from the DCDU, 5 s after successful reception by the ATC center. In this case, the messages are closed.



A319/A320

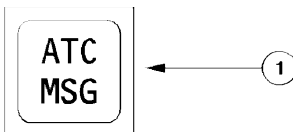
FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-46 – INFORMATION SYSTEMS
DSC-46-40 – CNS/ATM

Intentionally left blank

GLARESHIELD

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319



(1) ATC MSG pb

It flashes in blue, when a message, associated to an aural alert, is received.

Press : To stop the aural alert and the flashing light.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-46 – INFORMATION SYSTEMS

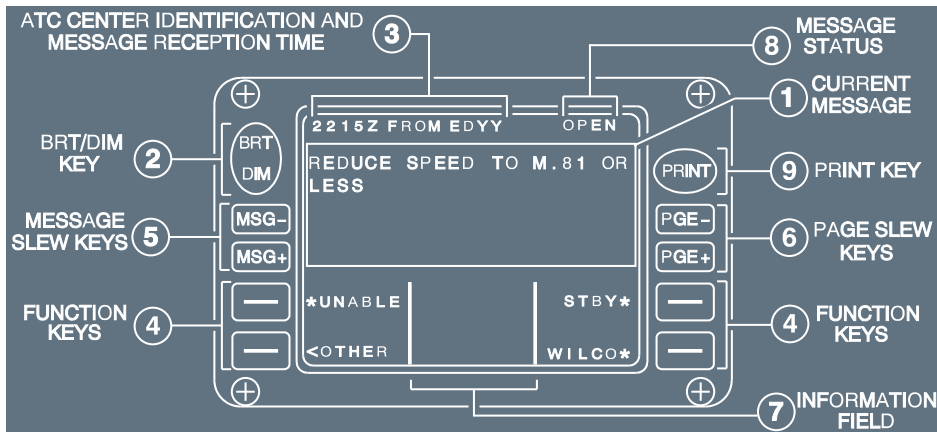
DSC-46-55 – CNS/ATM Controls/Indicators

DSC-46-55-10 – Glareshield

Intentionally left blank

DATALINK CONTROL AND DISPLAY UNIT (DCDU)

Applicable to: MSN 2742, 3913, 4554-4787



(1) Current Message Indication

Displays uplink and downlink messages.

Uplink messages:

- Are displayed on a black background.
- When received, the message appears in white and the main parameters in blue.
- When answered, the message becomes green.
- When monitored, the parameters appear in magenta and indicate that they are being monitored by the FMGS.
- When the value is attained, the parameters become green.
- When monitoring fails, the parameters become amber.

Downlink messages:

- Are displayed in black, on a colored background.
- Before sending, the background is blue.
- When sent, the background becomes green.

(2) BRT/DIM key

Adjusts the brightness of the DCDU.

(3) ATC Center Identification and Message Reception Time

- Identifies the ATC Center

Continued on the next page

- Indicates the time at which the ATC Center sends the message or the time at which the pilot transfers the message from the MCDU.

(4) Function Keys

The function keys are only operative, if a star or a prompt is visible.

Depending on the nature of the message, the system automatically proposes an appropriate function (Example: WILCO, or AFFIRM, or ROGER).

1. WILCO : To accept an ATC clearance.
2. ROGER : To confirm reception, and understanding of an ATC information or report request.
3. UNABLE : To reject an ATC clearance.
4. AFFIRM : To answer “yes” to an ATC question.
5. NEGATIV : To answer “no” to an ATC question.
6. STBY : To inform the ATC that you need to delay the answer.
7. CANCEL : To remove a prepared downlink message from the DCDU, or to cancel a selected reply to an uplink message.
8. SEND : To send a message or an answer, that was prepared by using the other function keys (Example: WILCO, ROGER, AFFIRMATIVE, STBY...).
9. CLOSE : To erase a message (from the screen) which has been sent to the ATC, or to erase a message from the ATC which has been answered, and send it to the MSG RECORD. This is not applicable when the answer is on STBY.
10. RECALL : To recall the last message that was removed from the screen, using the CLOSE function.
11. CANNOT : Negative answer to an OPEN negotiation message from the ATC.
12. OTHER : To display the other functions that could be applicable to the current message, but are not currently displayed.
13. ANSWER : Default reply for an uplink message with two or more confirm/open negotiation message elements.
14. EDIT : To access to the EDIT page on the MCDU.

(5) Message Slew Key

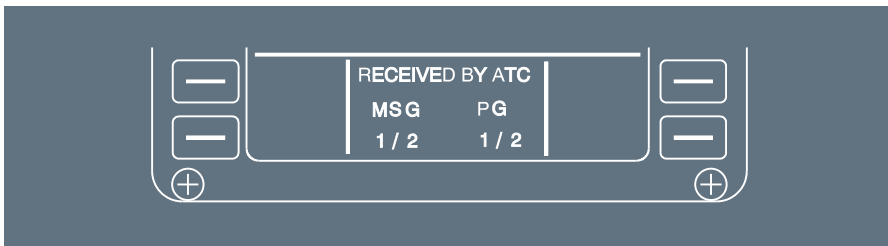
To scroll from one message to another.

(6) Page Slew Key

To scroll through the different pages of a message.

Continued on the next page

(7) Information Field



MSG 1/2

- Displayed, when several messages are available on the DCDU.
- Flashes, when a new message is received.

PG 1/2

- Displayed, when the current message contains several pages.

Miscellaneous Information

SENDING (white) : The current message is being sent.

SENT (white) : The current message was sent, but not necessarily received.

RECEIVED BY ATC (white) : The current message has been received by the controller.

REJ BY ATC (amber) : Message rejected by the ATC system, controller not aware of this message.

COM FAULT (amber) : ATC communication means faulty.

LINK LOST (amber) : Communication with the ATC is unavailable (displayed on any message pending when the loss occurred).

COM NOT AVAIL (amber) : Communication means temporarily unavailable.

SEND FAILED (amber) : Transmission of a request or a reply to an uplink message are unsuccessful.

NO ATC REPLY (amber) : No answer received within 270 s.

PRINTING (white) : Printing was requested from the DCDUs and printing is in progress.

PRINT FAILED (amber) : Printing was requested from the DCDUs and printing failed.

PRINTING UNAVAIL (white) : Printing was requested from the DCDUs, but the printer is unavailable.

NO MORE MSG (white) : Follows pressing of the “MSG +” or “MSG -” key, when no more messages are accessible.

NO MORE PGE (white) : Follows pressing of the “PGE +” or “PGE -” key, when no more pages are accessible.

RECALL MODE (white) : Recalls the last stored message.

ANSWER MSG (amber) : Maximum number of pending uplink messages is reached.

Continued on the next page

FILE FULL (amber) : Maximum number of downlink messages, accessible on the DCDUs, is reached.

OVERFLW CLOSED (amber) : Maximum number of non-pending messages is reached, and a new non-pending message is registered in the file.

MCDU FOR EDIT (white) : Follows pressing of the “EDIT” key.

COM NOT INIT (amber) : Router not initialized.

REPLY: TIME OUT (amber) : Crew answers have to be delivered within 100 s.

NO ATC DLK (white) : ATC communication means temporarily unavailable.

(8) Message status

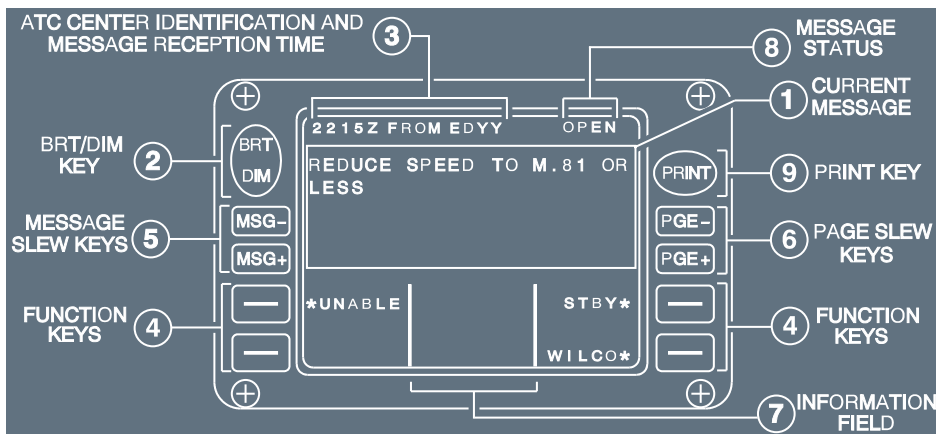
OPEN	Blue fonts on a black background: The current uplinked message has not been answered, or the current downlink message has not been sent.
WILCO	
ROGER	
UNABLE	Black fonts on a blue background: The crew has answered the uplinked message, but the answer has not been sent. Black fonts on a green background: The answer has been sent.
STBY	
NEGATV	
AFFIRM	
CANNOT	
OPEN	Amber fonts on a black background: Transmission failure.
ABORT	

(9) Print key

To print the current message.

DATALINK CONTROL AND DISPLAY UNIT (DCDU)

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319



(1) Current Message Indication

Displays uplink and downlink messages.

Uplink messages:

- Are displayed on a black background.
- When received, the message appears in white and the main parameters in blue.
- When answered, the message become green.

Downlink messages:

- Are displayed in black, on a colored background.
- Before sending, the background is blue.
- When sent, the background becomes green.

(2) BRT/DIM key

Adjusts the brightness of the DCDU

(3) ATC Center Identification and Message Reception Time

- Identifies the ATC Center
- Indicates the time at which the ATC Center sends the message or the time at which the pilot transfers the message from the MCDU.

(4) Function Keys

The function keys are only operative, if a star or a prompt is visible.

Continued on the next page

Depending on the nature of the message, the system automatically proposes an appropriate function (Example: WILCO, or AFFIRM, or ROGER).

1. WILCO : To accept an ATC clearance.
2. ROGER : To confirm reception, and understanding of an ATC information or report request.
3. UNABLE : To reject an ATC clearance.
4. AFFIRM : To answer "yes" to an ATC question.
5. NEGATV : To answer "no" to an ATC question.
6. STBY : To inform the ATC that you need to delay the answer.
7. CANCEL : To remove a prepared downlink message from the DCDU, or to cancel a selected reply to an uplink message.
8. SEND : To send a message or an answer, that was prepared by using the other function keys (Example: WILCO, ROGER, AFFIRMATIVE, STBY...).
9. CLOSE : To erase a message (from the screen) which has been sent to the ATC, or to erase a message from the ATC which has been answered, and send it to the MSG RECORD. This is not applicable when the answer is on STBY.
10. RECALL : To recall the last message if it was closed within the last 5 minutes. If the flight crew presses the "RECALL" key more than 5 minutes after the last message was closed, the "RECALL EMPTY CONSULT MSGRECORD" message appears.
11. CANNOT : Negative answer to an OPEN negotiation message from the ATC.
12. ANSWER : Default reply for an uplink message with two or more confirm/open negotiation message elements.
13. EDIT : To access the EDIT page on the MCDU.

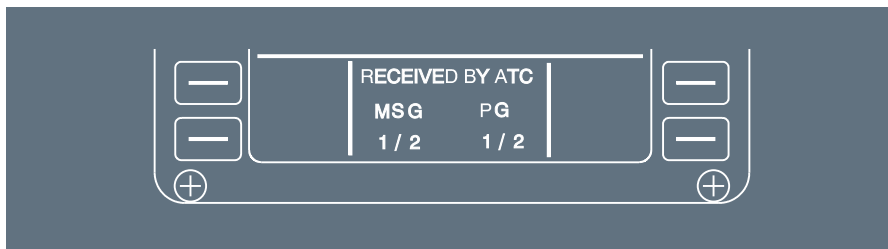
(5) Message Slew Key

To scroll from one message to another.

(6) Page Slew Key

To scroll through the different pages of a message.

(7) Information Field



Continued on the next page

MSG 1/2

- Displayed, when several messages are available on the DCDU.
- Flashes, when a new message is received.

PG 1/2

- Displayed, when the current message contains several pages.

Miscellaneous Information

SENDING (white) : The current message is being sent.

SENT (white) : The current message was sent, but not necessarily received.

RECEIVED BY ATC (white) : The current message has been received by the controller.

REJ BY ATC (amber) : Message rejected by the ATC system, controller not aware of this message.

COM FAULT (amber) : ATC communication means faulty.

LINK LOST (amber) : Communication with the ATC is unavailable (displayed on any message pending when the loss occurred).

COM NOT AVAIL (amber) : Communication means temporarily unavailable.

SEND FAILED (amber) : Transmission of a request or a reply to an uplink message are unsuccessful.

NO ATC REPLY (amber) : No answer received within 270 s.

PRINTING (white) : Printing was requested from the DCDUs and printing is in progress.

PRINT FAILED (amber) : Printing was requested from the DCDUs and printing failed.

PRINTING UNAVAIL (white) : Printing was requested from the DCDUs, but the printer is unavailable.

NO MORE MSG (white) : Follows pressing of the “MSG +” or “MSG -” key, when no more messages are accessible.

NO MORE PGE (white) : Follows pressing of the “PGE +” or “PGE -” key, when no more pages are accessible.

RECALL MODE (white) : If the flight crew has pressed the RECALL key and the last message was closed within the last 5 minutes.

RECALL EMPTY CONSULT MSG RECORD (white) : If the flight crew has pressed the RECALL key, and the last message was closed more than 5 minutes before.

ANSWER MSG (amber) : Maximum number of pending uplink messages is reached.

FILE FULL (amber) : Maximum number of downlink messages, accessible on the DCDUs, is reached.

OVERFLW CLOSED (amber) : Maximum number of non-pending messages is reached, and a new non-pending message is registered in the file.

MCDU FOR EDIT (white) : Follows pressing of the “EDIT” key.

MCDU FOR TEXT (white) : Follows pressing of the UNABLE key.

COM NOT INIT (amber) : Router not initialized.

Continued on the next page

REPLY: TIME OUT (amber) : Crew answers have to be delivered within 100 s.

NO ATC DLK (white) : ATC communication means temporarily unavailable.

(8) Message status

OPEN	Blue fonts on a black background: The current uplinked message has not been answered, or the current downlink message has not been sent.
WILCO	
ROGER	
UNABLE	
STBY	
NEGATV	
AFFIRM	Black fonts on a blue background: The crew has answered the uplinked message, but the answer has not been sent. Black fonts on a green background: The answer has been sent.
CANNOT	
OPEN	Amber fonts on a black background: Transmission failure.
ABORT	

(9) Print key

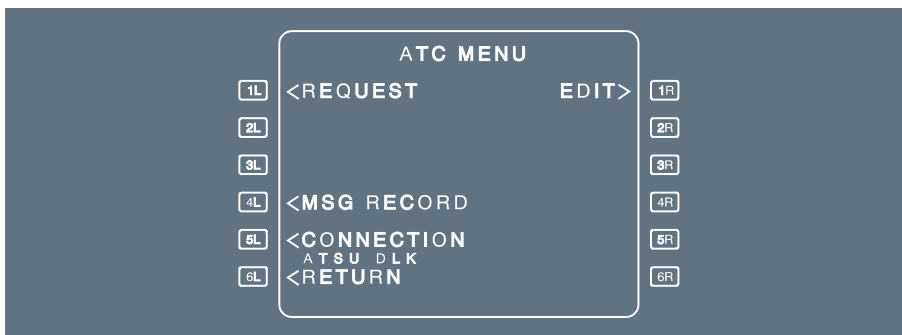
To print the current message.

ATC MENU PAGE

Applicable to: MSN 2742, 3913, 4554-4787

ATC MENU PAGE

To call up the ATC MENU page, press the ATC prompt on the ATSU DATALINK page, or the ATC COMM key on the MCDU keyboard. The ATC MENU page is used to access the different functions for the ATC applications:



[1L] REQUEST

To call up the REQUEST page

[4L] MSG RECORD

To call up the MSG RECORD page

[5L] CONNECTION

To call up the CONNECTION page

[6L] ATSU DLK
RETURN

To call up the ATSU DATALINK page

[1R] EDIT

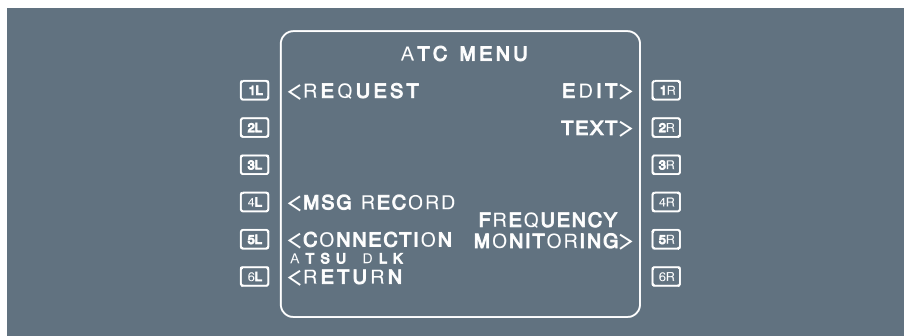
To call up the EDIT page (Displayed when the EDIT key on the DCDU is pressed)

Continued on the next page

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

ATC MENU PAGE

To call up the ATC MENU page, press the ATC prompt on the ATSU DATALINK page, or the ATC COMM key on the MCDU keyboard. The ATC MENU page is used to access the different functions for the ATC applications:



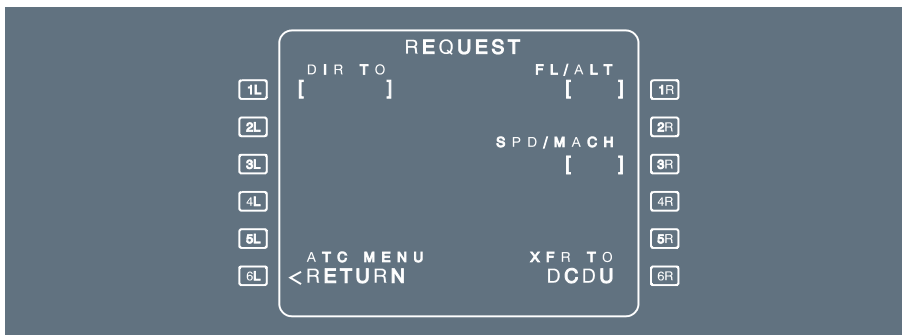
[1L] REQUEST	To call up the REQUEST page
[4L] MSG RECORD	To call up the MSG RECORD page
[5L] CONNECTION	To call up the CONNECTION page
[6L] ATSU DLK RETURN	To call up the ATSU DATALINK page
[1R] EDIT	To call up the EDIT page (Displayed when the EDIT key on the DCDU is pressed)
[2R] TEXT	To call up the TEXT page (Displayed when the UNABLE key is pressed on the DCDU)
[5R] FREQUENCY MONITORING	To call up the FREQUENCY MONITORING page

Continued on the next page

Applicable to: MSN 2742, 3913, 4554-4787

REQUEST PAGE

To prepare downlink CPDLC requests to ATC.



- | | |
|-------------------------|--|
| [1L] DIR TO | To prepare a request to go from the present position to a selected waypoint. |
| [6L] ATC MENU
RETURN | To call up the ATC MENU page. |
| [1R] FL/ALT | To prepare a request for a new altitude. |
| [3R] SPD/MACH | To prepare a request for a new speed. |
| [6R] XFRTO DCDU | To transfer the message from the MCDU to the DCDU. |

Continued on the next page

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

REQUEST PAGE

To prepare dowlink CPDLC requests to ATC.

The REQUEST PAGE is displayed on the MCDU. It features a central menu with several options, each associated with a line selector (1L, 2L, 3L, 4L, 5L, 6L on the left; 1R, 2R, 3R, 4R, 5R, 6R on the right). The options are:

- DIR TO** (1L): To prepare a request to go from the present position to a selected waypoint.
- FL/ALT** (1R): To prepare a request for a new altitude.
- SPD/MACH** (2R): To prepare a request for a new speed.
- DUE TO WEATHER** (4L): To indicate that the request is due to weather conditions.
- DUE TO A/C PERF** (4R): To indicate that the request is due to aircraft performance.
- ATC MENU** (6L): To call up the ATC MENU page.
- XFR TO DCDU*** (6R): To transfer the message from the MCDU to the DCDU.

The central menu also includes a **<RETURN** option at the bottom left.

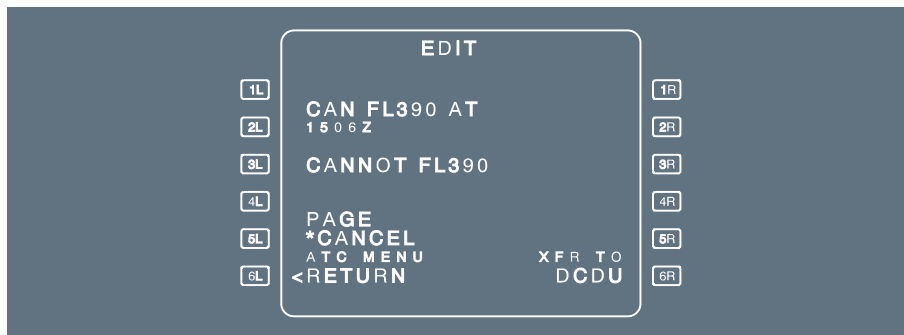
- | | |
|----------------------|--|
| [1L] DIR TO | To prepare a request to go from the present position to a selected waypoint. |
| [4L] DUE TO WEATHER | To indicate that the request is due to weather conditions. |
| [6L] ATC MENU RETURN | To call up the ATC MENU page. |
| [1R] FL/ALT | To prepare a request for a new altitude. |
| [2R] SPD/MACH | To prepare a request for a new speed. |
| [4R] DUE TO A/C PERF | To indicate that the request is due to aircraft performance. |
| [6R] XFR TO DCDU | To transfer the message from the MCDU to the DCDU. |

Continued on the next page

Applicable to: MSN 2742, 3913, 4554-4787

EDIT PAGE

To edit and complete the donwlink messages displayed on the DCDU before sending to ATC.



Depending on the type of message and response on the DCDU, the message to edit can be associated to several line keys.

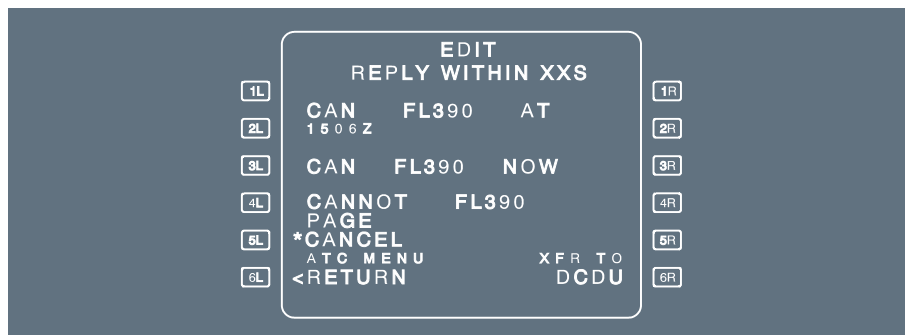
- | | |
|----------------------|--|
| [2L] PRESENT LEVEL | To notify the present level. |
| ASSIGNED LEVEL | To read-back the assigned level. |
| CAN (AT) | To accept the specified level (at the specified time). |
| CAN BLOCK LEVEL (AT) | To accept the specified block level (at the specified time). |
| PREFERRED LEVEL | To notify the preferred level. |
| TOP OF DESCENT | To notify the preferred time to commence descent for approach. |
| [3L] CANNOT | To refuse the specified level. |
| CANNOT BLOCK LEVEL | To refuse the specified block level. |
| [5L] PAGE CANCEL | To reset the EDIT page. |
| [6L] ATC MENU RETURN | To call up the ATC MENU page. |
| [6R] XFR TO DCDU | To transfer the message from the MCDU to the DCDU. |

Continued on the next page

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

EDIT PAGE

To edit and complete the downlink messages displayed on the DCDU before sending to ATC. When the remaining time to answer is less than 30 s, the 'REPLY WITHIN XXS' appears for 5 s. XX represents the number of remaining seconds before the timer expires.



Depending on the type of message and response on the DCDU, the message to edit can be associated to several line keys.

- | | |
|----------------------|--|
| [2L] PRESENT LEVEL | To notify the present level. |
| ASSIGNED LEVEL | To read-back the assigned level. |
| CAN (AT) | To accept the specified level (at the specified time). |
| CAN BLOCK LEVEL (AT) | To accept the specified block level (at the specified time). |
| PREFERRED LEVEL | To notify the preferred level. |
| TOP OF DESCENT | To notify the preferred time to commence descent for approach. |
| [3L] CAN LEVEL NOW | To accept the specified level right now. |
| [4L] CANNOT | To refuse the specified level. |
| CANNOT BLOCK LEVEL | To refuse the specified block level. |
| [5L] PAGE CANCEL | To reset the EDIT page. |
| [6L] ATC MENU RETURN | To call up the ATC MENU page. |

Continued on the next page

[6R] XFR TO DCDU To transfer the message from the MCDU to the DCDU.

TEXT PAGE

This page allows to add justifications (due to A/C performance or due to weather) when the flight crew is unable to perform an ATC clearance.

When the remaining time to answer is less than 30 s, the "REPLY WITHIN XXS" appears for 5 s. XX represents the number of remaining seconds before the timer expires.

1L 2L 3L 4L 5L 6L

1R 2R 3R 4R 5R 6R

TEXT
REPLY WITHIN 20S

DUE TO
← A/C PERFORMANCE

DUE TO
← WEATHER

ATC MENU XFR TO
<RETURN DCDU

[2L] DUE TO A/C PERFORMANCE Use this field, when the justification is due to weather condition.

[3L] DUE TO WEATHER Use this field when the justification is due to aircraft performance.

[6L] ATC MENU RETURN To call up the ATC menu page.

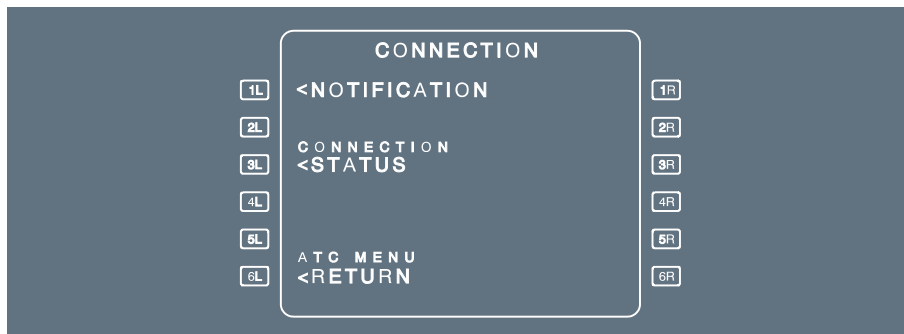
[6R] XFR TO DCDU To transfer the message from the MCDU to the DCDU.

Continued on the next page

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

CONNECTION PAGE

To provide access to the NOTIFICATION and CONNECTION STATUS page.



- | | |
|------------------------|--|
| [1L] NOTIFICATION | To display the NOTIFICATION page. |
| [3L] CONNECTION STATUS | To display the CONNECTION STATUS page. |
| [6L] ATC MENU RETURN | To call up the ATC MENU page. |

Continued on the next page

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

FREQUENCY MONITORING PAGE

In some regions, a downlink monitoring message to the local ATC center is requested. This page allows to prepare this downlink message, then to send it through the DCDU. The data fields on this MCDU are automatically filled when there is an uplink monitoring message.

In absence of this uplink message, the flight crew should manually enter the data fields.

- | | |
|------|---|
| [2L] | To enter the ICAO code of the ATC center. |
| [3L] | To enter the ATC facility. |
| [4L] | To enter the ATC function name. |
| [6L] | To call up the ATC MENU page. |
| [2R] | To enter the voice frequency of the ATC center. |
| [6R] | To enter the message from the MCDU to the DCDU. |

Continued on the next page

Applicable to: MSN 2742, 3913, 4554-4787

NOTIFICATION PAGE

To initiate notification and provide information on the logon process and the last successfully notified ATC.

[1L] ATC FLT NBR To display the flight number that comes from the FMGS. It cannot be modified via this page.

Line 2 ATC CENTER Displays the logon status in front of the “ATC CENTER”. The status is either “NOTIFYING” in small white font, or “NOTIF FAILED” in small amber font:

- NOTIFYING indicates that the logon is in progress.
- NOTIF FAILED indicates that the logon has failed.

The logon status disappears, when the logon notification is completed.

[2L] ATC CENTER To enter the ATC’s ICAO code for notification. A correctly entered ATC code is displayed in large cyan font. When the logon procedure is successfully completed, 8 amber boxes will be shown.

Note: At initialization, a default code is displayed in small cyan font, and corresponds to:

- Last manually-entered ATC code,
- Otherwise: 8 amber boxes appear.

Lines 3 to 5 Display the last ATC centers (up to 3) for which a successful logon notification has been performed. Once a CPDLC connection is established, the indication disappears.

Note: “NOTIFICATION UNAVAILABLE” is displayed in Line 5, if the communication means, or the flight number are unavailable.

Continued on the next page

[1R] FROM/TO	To display the departure and destination airports.
[2R] NOTIFY	To send a notification to the ATC. It is not active during a notification process, or if the communication means, ATC center, flight number, or departure/destination airport are unavailable.
[6L] ATC MENU RETURN	To call up the ATC MENU page.
[6R] CONNECTION STATUS	To call up the CONNECTION STATUS page.

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

NOTIFICATION PAGE

To initiate notification and provide information on the logon process and the last successfully notified ATC.

[1L] ATC FLT NBR To display the flight number that comes from the FMGS. It cannot be modified via this page.

Line 2 ATC CENTER Displays the logon status in front of the “ATC CENTER”. The status is either “NOTIFYING” in small white font, or “NOTIF FAILED” in small amber font:

- NOTIFYING indicates that the logon is in progress.
- NOTIF FAILED indicates that the logon has failed.

The logon status disappears, when the logon notification is completed.

Continued on the next page

[2L] ATC CENTER To enter the ATC's ICAO code for notification. A correctly entered ATC code is displayed in large cyan font. When the logon procedure is successfully completed, 8 amber boxes will be shown.

Note: At initialization, a default code is displayed in small cyan font, and corresponds to:

- Last manually-entered ATC code, or
- The last ATC code associated to an established CPDLC connection, if no ATC code was manually entered,
- Otherwise: 8 amber boxes appear.

Lines 3 to 5 Display the last ATC centers for which a manual and successful logon notification has been performed. Once a CPDLC connection is established, the indication disappears.

Note: "NOTIFICATION UNAVAILABLE" is displayed in Line 5, if the communication means, or the flight number are unavailable.

[1R] FROM/TO To display the departure and destination airports.

[2R] NOTIFY To send a notification to the ATC. It is not active during a notification process, or if the communication means, ATC center, flight number, or departure/destination airport are unavailable.

[6L] ATC MENU
RETURN To call up the ATC MENU page.

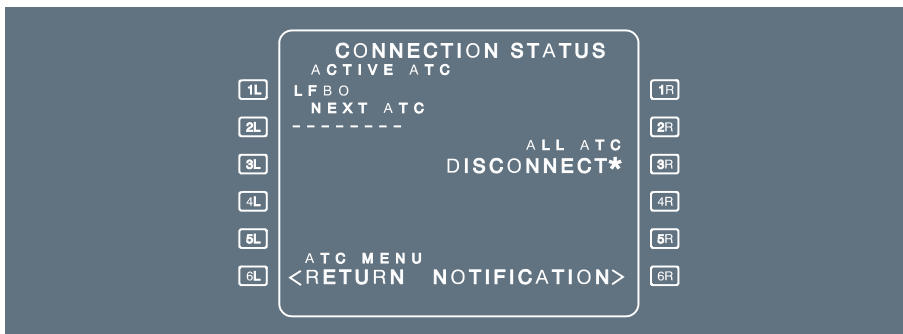
[6R]
CONNECTION
STATUS To call up the CONNECTION STATUS page.

Continued on the next page

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

CONNECTION STATUS PAGE

To display the status of CPDLC connections, and enable the crew to activate and deactivate the ADS-C function.



[1L] ACTIVE To display the currently active ATC for CPDLC connection.
ATC

[2L] NEXT To display the next ATC for CPDLC connection.
ATC

[6L] ATC To call up the ATC MENU page.
MENU
RETURN

[3R] ALL ATC To disconnect all established CPDLC connections. When selected, DISCONNECT DISCONNEC CONFIRM will be displayed to confirm disconnection.
T

[6R] To call up the NOTIFICATION page.
NOTIFICATIO
N

Continued on the next page

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-4787

MSG RECORD PAGES

The Message Record application enables to store messages exchanged between the aircraft and the ATC center, and enables the flight crew to retrieve and display these recorded messages at any time. When the flight crew closes a message in the DCDU, the message is stored and disappears from the DCDU. The flight crew can access the stored message via the MSG RECORD page on the MCDU. The messages are stored in chronological order and grouped by flight number.

Note: When the maximum number of stored messages is reached (up to 99 messages), any new message will be stored and the oldest message will be deleted.

The MSG RECORD page enables the flight crew to:

- Access the ATC messages previously exchanged, including the associated responses. The displayed message on the MSG RECORD page may not be fully displayed. To display the full message, the flight crew must select the left key, adjacent to the message title. The message will appear on a new page.

Note: If the sending of a downlink message fails, the message appears in white on the MSG RECORD page.

- Print one or several messages
- Erase all recorded messages.

1L

2L

3L

4L

5L

6L

MSG RECORD 1/2 ↑↓

1526z FROM EDYY WILC

<CONTACT LFPG APPROACH

1520Z FROM EDYY

<STATE PREFERRED LEVEL

1518Z TO EDYY

<REQUEST M.75

1512Z FROM EDYY WILC

<SQUAWK 7234

MSG RECORD

* ERASE

ATC MENU

<RETURN

1R

2R

3R

4R

5R

6R

Continued on the next page

Lines 1 to 4

Display a summary of each recorded message: Time, ATC center, message status, and the beginning of the message.
The latest recorded message is displayed at the top of the Message Record list.
Pressing the left key, adjacent to the message title, displays the full recorded message.

Note: Due to line length limitation, the messages status are abbreviated as following:

- "WILC" for WILCO
- "UNBL" for UNABLE
- "ABRT" for ABORT
- "ROGR" for ROGER
- "AFRM" for AFFIRM
- "NEG" for NEGATIVE
- "STBY" for STANDBY

[5L] MSG RECORD
ERASE

To clear all the recorded messages.
When pressing this key, MSG RECORD ERASE is replaced by ERASE MSG RECORD CONFIRM
to prevent an inadvertent erase.

[6L] ATC MENU
RETURN

To call up the ATC MENU page.

[6R] MSG RECORD
PRINT

To print all the recorded messages.

Continued on the next page

Applicable to: MSN 4837-5319

MSG RECORD PAGES

The Message Record application enables to store messages exchanged between the aircraft and the ATC center, and enables the flight crew to retrieve and display these recorded messages at any time. When the flight crew closes a message in the DCDU, the message is stored and disappears from the DCDU. The flight crew can access the stored message via the MSG RECORD page on the MCDU. The messages are stored in chronological order and grouped by flight number.

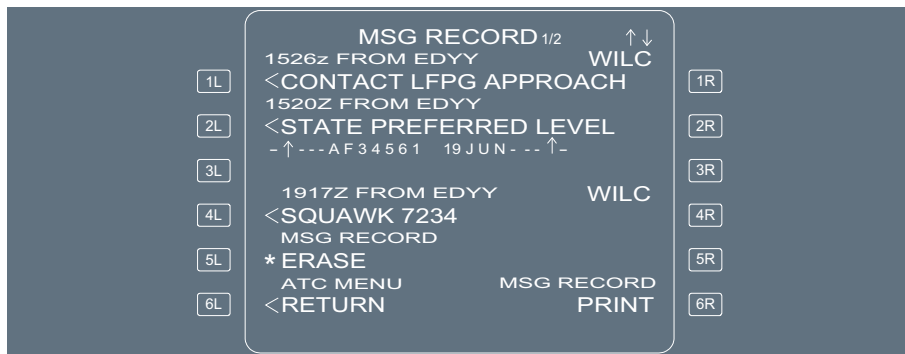
Note: When the maximum number of stored messages is reached (up to 99 messages), any new message will be stored and the oldest message will be deleted.

The MSG RECORD page enables the flight crew to:

- Access the ATC messages previously exchanged, including the associated responses.
The displayed message on the MSG RECORD page may not be fully displayed. To display the full message, the flight crew must select the left key, adjacent to the message title. The message will appear on a new page.

Note: If the sending of a downlink message fails, the message appears in white on the MSG RECORD page.

- Print one or several messages
- Erase all recorded messages.



Lines 1 to 4

Display a summary of each recorded message: Time, ATC center, message status, and the beginning of the message.
The latest recorded message is displayed at the top of the Message Record list.
Pressing the left key, adjacent to the message title, displays the full recorded message.

Continued on the next page

Note: Due to line length limitation, the messages status are abbreviated as following:

- "WILC" for WILCO
- "UNBL" for UNABLE
- "ABRT" for ABORT
- "ROGR" for ROGER
- "AFRM" for AFFIRM
- "NEG" for NEGATIVE
- "STBY" for STANDBY

[5L] MSG RECORD ERASE	To clear all the recorded messages. When pressing this key, MSG RECORD ERASE is replaced by ERASE MSG RECORD CONFIRM to prevent an inadvertent erase.
[6L] ATC MENU RETURN	To call up the ATC MENU page.
[6R] MSG RECORD PRINT	To print all the recorded messages.

When the flight number changes, a specific message with the new flight number value is stored. This recorded "flight number change" message gives the capability to the crew to identify the messages filed during the current flight.

Line 3 Example of the "flight number change" specific message, displaying the new flight number and the date of change.

SCRATCHPAD MESSAGES ON THE ATC MENU FOR CMA AND CPDLC

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

MESSAGE	CONDITIONS
FORMAT: _ _ _	The acquisition format is not valid. An example of the required format is displayed (FORMAT: NNN, FORMAT : XXXX, etc), where: - N : Numerical data (0 to 9) - X : Alphanumeric data (0 to 9, or A to Z). To display the required format of specific data on the scratchpad message field, press on the corresponding empty field. This serves as a reference to the crew.
ENTRY OUT OF RANGE	The single value that was entered is out of range.
OUT OF RANGE	A single value of double data is out of range.
TWO ENTRIES OUT OF RANGE	The double value that was entered is out of range.
NOT ALLOWED	It is not allowed to enter data.
NON MODIFIABLE FIELD	A non-modifiable field was selected.
KEY NOT ACTIVE	It is not allowed to press this key.
ALREADY SELECTED	The selectable key has already been selected.
NOT ALLOWED	Data entry not allowed, or deselection of a selectable key not yet selected, or selection of a selectable key with any entry on the scratchpad other than CLR.
CLR NOT ALLOWED	An available key has been selected, but the function is not available due to CLR still displayed on the scratchpad field.
FLIGHT NBR UNAVAILABLE	Notification is not available, because the flight number is unavailable.
ENTER MANDATORY FIELDS	Selection of a command is not available, because mandatory fields are not filled in.
NO WHOLE MSG PREPARED	Selection of the ATC DISPL or ADD TEXT command is not available, because the message is not completely prepared.
COM UNAVAILABLE	The selected command is not available, because datalink communications means are currently unavailable.
DCDU FILE FULL	The selected command is not available, because the DCDU file is full.
MSG ALREADY DISPLAYED	The XFR to DCDU command is not available, because the message is already displayed on the DCDU.

Continued on the next page

MESSAGE	CONDITIONS
NO MSG TO PRINT	The PRINT key was selected, but the function is currently unavailable because there is no message to be printed.
PRINTER UNAVAILABLE	The PRINT key was selected, but the printer is currently unavailable.
LAST MSG ELEMENT	Maximum number of message elements for a given downlink message is reached.
TOO MANY MSG ELEMENTS	Entry of a new parameter is not allowed, because the maximum number of message elements has been reached.
NO ACTIVE ATC	The XFR to DCDU key was selected, but the function is currently unavailable because there is no active CPDLC connection.
LAT/LON DISPL ABBREVIATED	The LAT/LONG display is abbreviated only on the MCDU display field, because there is lack of space.
MSG RECORD NOT RELIABLE	Due to a technical problem, the list of messages recorded is not reliable. All CPDLC messages are deleted and new messages should not be recorded.
MSG RECORD IS EMPTY	The MSG RECORD ERASE command is not available, because there are no messages recorded.
NOT IN DATABASE	Entry not in database.

MCDU DATA FORMAT LIST FOR CMA AND CPDLC

Applicable to: MSN 2742, 3913, 4554-4787

The following chart lists all the data the pilot may enter on the MCDU.

It also shows the acceptable format for the various data items, the acceptable range, the units of entry, and the MCDU pages on which the data can be entered.

The following codes are used to indicate various data formats:

- A : Letters
- N : Numbers
- X : Letters and Numbers

DATA NAME	FORMAT	RANGE	UNIT	DISPLAY PAGE
A/C ICAO CODE	XXXXXXXX	8 characters		COMM CONFIG
A/C REGISTR	XXXXXXX	7 characters		COMM CONFIG
ACARS A/L ID	AA	2 letters		COMM CONFIG
ASSIGNED ALT	Same as ALT			EDIT
ATC CENTER	AAAA	4 letters		NOTIFICATION
DIR TO	XXXXX (Fixname)	Min 1 alphanumeric Max 5 alphanumeric		REQUEST
	DDMM.MB/ EEEMM.MC (LAT/LONG)	DD: 0-89 B: N or S	Degrees	
	"DD" = LAT degrees "EEE" = LONG degrees	MM.M: 0-59,9	Minutes	
	"MM.M" = LAT and LONG minutes Leading zeros may be omitted	EEE: 0-179 C: E or W	Degrees	
DISTANCE	NNN.NNM or NNN.N Leading zeros may be omitted	0-999.9	NM	MESSAGE MODIFY
	NNNNKM "KM" must be written. Leading zeros may be omitted	0-2 000	KM	

Continued on the next page

DATA NAME	FORMAT	RANGE	UNIT	DISPLAY PAGE
FL/ALT	FLNNN or NNN Leading zeros on NNN may be omitted	30-410	Hundreds of feet (MSL)	REQUEST
	NNNNNFT or NNNNN Between 0 and 410 feet, "FT" must be written. Leading zeros may be omitted.	-600-41 000	Feet	
	NNNNNM or -NNNNNM or +NNNNNM Leading zeros may be omitted	-30-12 500	Meters	
FROM	Same as DIR TO			MESSAGE MODIFY
FROM/TO	AAAA			NOTIFICATION
PRESENT ALT	Same as ALT			EDIT
PREFERRED	Same as ALT			EDIT
SPD/MACH	NNN or NNNKT Leading zeros may be omitted	0-350	Kt	REQUEST
	M.NN or .NN The decimal point must be written, trailing zeros may be omitted	0.5-0.92	Mach	
STANDARD A/L ID	AAA			COMM CONFIG
TOD	HHMM "HH" = NN or NNH "MM" = NN or NNMIN "MIN" = "MIN" or "MN" or "M" or "Z"	HH: 0-23 MM: 0-59	Hours Minutes	EDIT

MCDU DATA FORMAT LIST FOR CMA AND CPDLC

Applicable to: MSN 2477, 2538, 2636-2735, 2744-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3922-3946, 3991-4006, 4233, 4327, 4837-5319

The following chart lists all the data the pilot may enter on the MCDU.

It also shows the acceptable format for the various data items, the acceptable range, the units of entry, and the MCDU pages on which the data can be entered.

The following codes are used to indicate various data formats:

- A : Letters
- N : Numbers
- X : Letters and Numbers

DATA NAME	FORMAT	RANGE	UNIT	DISPLAY PAGE
A/C ICAO CODE	XXXXXXXX	8 characters		COMM CONFIG
A/C REGISTR	XXXXXXX	7 characters		COMM CONFIG
ACARS A/L ID	AA	2 letters		COMM CONFIG
ASSIGNED ALT	Same as ALT			EDIT
ATC CENTER	XXXXXXXX	4 to 8 characters		NOTIFICATION or FREQUENCY MONITORING
ATC NAME	AAAAAAAAAAAAAAAAAAAA	3 to 18 letters		FREQUENCY MONITORING
ATC FUNCTION	CTR/APP/TWR/FNL/GND/CLR/ DEP/CTL/RAD	3 letters		FREQUENCY MONITORING
DIR TO	XXXXX (Fixname)	Min 1 alphanumeric Max 5 alphanumeric		REQUEST
	DDMM.MB/ EEEMM.MC (LAT/LONG)	DD: 0-89 B: N or S	Degrees	
	"DD" = LAT degrees "EEE" = LONG degrees	MM.M: 0-59,9	Minutes	
	"MM.M" = LAT and LONG minutes Leading zeros may be omitted	EEE: 0-179 C: E or W	Degrees	

Continued on the next page

DATA NAME	FORMAT	RANGE	UNIT	DISPLAY PAGE
FL/ALT	FLNNN or NNN Leading zeros on NNN may be omitted	30-410	Hundreds of feet (MSL)	REQUEST
	NNNNNFT or NNNNN Between 0 and 410 feet, "FT" must be written. Leading zeros may be omitted.	-600-41 000	Feet	
	NNNNNM or -NNNNNM or +NNNNNM Leading zeros may be omitted	-30-12 500	Meters	
FROM/TO	AAAA			NOTIFICATION
PRESENT ALT	Same as ALT			EDIT
PREFERRED	Same as ALT			EDIT
SPD/MACH	NNN or NNNKT Leading zeros may be omitted	0-350	Kt	REQUEST
	M.NN or .NN The decimal point must be written, trailing zeros may be omitted	0.5-0.92	Mach	
STANDARD A/L ID	AAA			COMM CONFIG
TOD	HHMM "HH" = NN or NNH "MM" = NN or NNMIN "MIN" = "MIN" or "MN" or "M" or "Z"	HH: 0-23 MM: 0-59	Hours Minutes	EDIT
VOICE FREQ	NNN.NNN	118.000 to 136.975	MHz	FREQUENCY MONITORING



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-46 – INFORMATION SYSTEMS

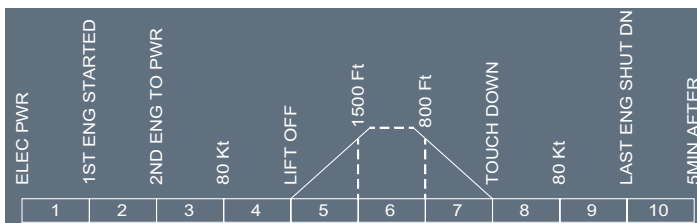
DSC-46-55 – CNS/ATM Controls/Indicators

DSC-46-55-30 – MCDU

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WARNINGS AND CAUTIONS

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451



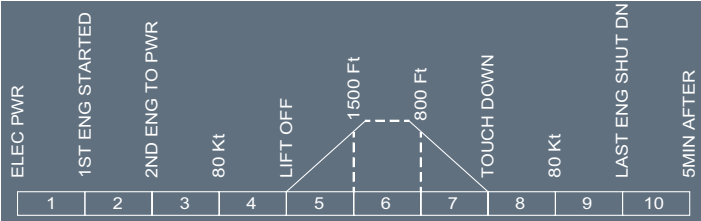
E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ATSU FAULT (Failure at ATSU initialization, if associated with ATSU INIT FAULT ECAM message).	SINGLE CHIME	MASTER CAUTION	NIL	NIL	3, 4, 5, 7, 8
COMPANY FAULT AOC datalink communications failure.	NIL	NIL			

MEMO DISPLAY

- The COMPANY DATALINK STBY message is displayed in green, when AOC datalink air-ground communication is temporarily unavailable, but not lost.
- The COMPANY CALL message is displayed in green, when the aircraft receives a message from the ground requesting voice communication on VHF.
- The COMPANY MSG message is displayed in green, when the aircraft receives a message from the ground.
- The COMPANY ALERT message is displayed in green, when the aircraft receives an uplink alert message, or when an AOC special condition requires a pilot action on the MCDU (depends on AOC programming). This message pulses green for 180 s, then remains steady. It is associated with a buzzer for 1 s.

WARNINGS AND CAUTIONS

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SDPAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ATSU FAULT Failure at ATSU initialization, if associated with ATSU INIT FAULT ECAM message.	SINGLE CHIME	MASTER CAUTION	NIL	NIL	3, 4, 5, 7, 8
ATC FAULT ATC datalink Communications failure, or ATC datalink application loss.					
COMPANY FAULT AOC datalink communications failure.	NIL	NIL			

MEMO DISPLAY

- The COMPANY DATALINK STBY message is displayed in green, when AOC datalink air-ground communication is temporarily unavailable, but not lost.
- The COMPANY CALL message is displayed in green, when the aircraft receives a message from the ground requesting voice communication on VHF.
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- The COMPANY ALERT message is displayed in green, when the aircraft receives an uplink alert message, or when an AOC special condition requires a pilot action on the MCDU (depends on AOC programming). This message pulses green for 180 s, then remains steady. It is associated with a buzzer for 1 s.

ATC MSG ALERT

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

	AURAL ALERT	VISUAL ALERT	FLT PHASE INHIB
ATC MSG alert When a new ATC message arrives from the ground, or a reminder message is automatically presented within the DCDU message file.	RING	"ATC MSG" pushbuttons flashing	3, 4, 5, 7, 8



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-46 – INFORMATION SYSTEMS
DSC-46-60 – Warnings and Cautions

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**A319/A320**

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-46 – INFORMATION SYSTEMS
DSC-46-70 – Electrical Supply**BUS EQUIPMENT LIST**

Applicable to: MSN 2037-2471, 2481-2528, 2548-2605, 2765, 2779, 2873-3411, 3426-3442, 3544-3675, 3702-3735, 3746-3909, 3953-3979, 4012-4219, 4234-4313, 4380-4451

		NORM			EMER ELEC		
		AC	DC	DC BAT	AC ESS	DC ESS	HOT
ATSU	ATSU 1	AC1	DC1				

BUS EQUIPMENT LIST

Applicable to: MSN 2477, 2538, 2636-2754, 2769-2777, 2782-2866, 3413, 3466-3537, 3683, 3742, 3913-3946, 3991-4006, 4233, 4327, 4554-5319

		NORM			EMER ELEC		
		AC	DC	DC BAT	AC ESS	DC ESS	HOT
ATSU	ATSU 1	AC1	DC1				
	DCDU-1		DC1				
	DCDU-2		DC2				



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DSC – AIRCRAFT SYSTEMS
DSC-46 – INFORMATION SYSTEMS
DSC-46-70 – Electrical Supply

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DSC-49-10	Description	
DSC-49-10-10	General	1
DSC-49-10-20	Main Components	
	APU ENGINE.....	1
	ELECTRONIC CONTROL BOX	1
	AIR INTAKE SYSTEM	1
	STARTER	1
	FUEL SYSTEM	1
	OIL SYSTEM	2
	INLET GUIDE VANES (IGV).....	2
	Air Bleed System	2
	CONTROLS.....	2
	GROUND OPERATION SAFETY DEVICES.....	2
DSC-49-20	Controls and Indicators	
	Overhead Panel.....	1
	EXTERNAL CONTROLS.....	3
	ECAM APU Page.....	4
DSC-49-30	Warnings and Cautions	
	Warnings and Cautions	1
DSC-49-40	Electrical Supply	
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A319/A320
FLIGHT CREW OPERATING MANUAL

APU
TABLE OF CONTENTS

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GENERAL

Applicable to: ALL

GENERAL

The Auxiliary Power Unit (APU) is a self-contained unit that makes the aircraft independent of external pneumatic and electrical power supplies.

On the ground

- It supplies bleed air for starting the engines and for the air conditioning system
- It supplies electrical power to the electrical system.

During takeoff

- It supplies bleed air for air conditioning, thus avoiding a reduction in engine thrust caused by the use of engine bleed air for this purpose when optimum aircraft performance is required.

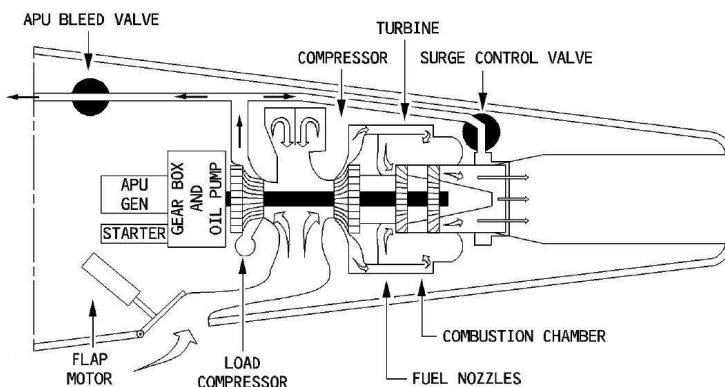
In flight

- It backs up the electrical system
- It backs up the air conditioning
- It can be used to start the engines.

The APU may obtain power for starting from the aircraft's batteries or normal electrical system, or from ground service.

APU starting is permitted throughout the normal flight envelope (*Refer to LIM-49-20 Envelope*).

The ECAM displays APU parameters.



L3



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-49 – APU

DSC-49-10 – Description

DSC-49-10-10 – General

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APU ENGINE

Applicable to: ALL

The basic element of the APU is a single-shaft gas turbine that delivers mechanical shaft power for driving the accessory gearbox (electrical generator, starter, etc.) and produces bleed air (engine starting and pneumatic supply).

ELECTRONIC CONTROL BOX

Applicable to: ALL

The Electronic Control Box (ECB) is a full-authority digital electronic controller that performs the bulk of the APU system logic for all modes of engine operation, such as :

- Sequences the start and monitors it.
- Monitors speed and temperature.
- Monitors bleed air.
- Sequences the shutdown.
- Controls the automatic shutdown.

AIR INTAKE SYSTEM

Applicable to: ALL

The air intake and an electrically operated flap allow external air to reach the compressor inlet.

STARTER

Applicable to: ALL

The ECB controls the electric starter. The starter engages if the air intake is fully open and the MASTER SW and the START pushbutton are ON.

FUEL SYSTEM

Applicable to: ALL

The left fuel feed line supplies the APU.

The required pressure is normally available from tank pumps.

If pressure is not available (batteries only or pumps off) the APU FUEL PUMP starts automatically.

The ECB controls the fuel flow.

OIL SYSTEM

Applicable to: ALL

The APU has an integral independent lubrication system (for lubrication and cooling).

INLET GUIDE VANES (IGV)

Applicable to: ALL

The IGVs control bleed air flow, and a fuel-pressure-powered actuator positions the IGVs.
The ECB controls the actuator in response to aircraft demand.

AIR BLEED SYSTEM

Applicable to: ALL

The air bleed system is fully automatic.

The ECB always sets the APU speed to 100 % except for air conditioning demand, if the ambient temperature is between -18 °C and 35 °C. In this case, the ECB sets the APU speed to 99 %. For all other ambient temperatures (less than -18 °C or more than 35 °C), the ECB sets the APU speed to 100 %.

CONTROLS

Applicable to: ALL

The flight crew uses the controls on the APU panel for routine shutdown. For emergency shutdown :

- the flight crew can push the APU FIRE handle, or
- the ground crew can push the APU SHUT OFF pushbutton on the interphone panel under the nose fuselage.

GROUND OPERATION SAFETY DEVICES

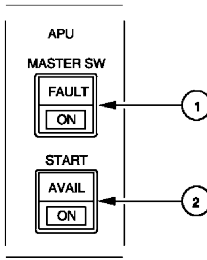
Applicable to: ALL

The APU may run without cockpit crew supervision when the aircraft is on the ground. In case of fire in the APU compartment :

- APU fire warnings operate in the cockpit.
- A horn in the nose gear bay sounds.
- The AVAIL light goes out.
- The FAULT light in the MASTER SW lights up.
- The APU shuts down.
- The APU fire extinguisher discharges.

OVERHEAD PANEL

Applicable to: ALL



(1) MASTER SW pb

This switch controls the electric power supply for APU operation, and its protective features. It also controls the starting and shutdown sequences.

ON : The blue ON light comes on.

Electric power goes to the APU system; the ECB performs a power-up test.

The APU air intake flap opens.

The APU fuel isolation valve opens.

If no fuel tank pump is running, the APU fuel pump operates.

If the aircraft has ground power or main generator power, the APU page appears on the ECAM display.

OFF : Manual shutdown sequence.

- The ON light on the MASTER SW pb, and the AVAIL light on the START pb, go off.
- If the aircraft was using APU bleed air, the APU keeps running for a cooling period of 60 s.
- At 7 %, the air inlet flap closes.

Continued on the next page

FAULT It : This amber light comes on, and a caution appears on ECAM, when an automatic APU shutdown occurs, which happens in case of:

- Fire (on ground only)
- Air inlet flap closed
- Overspeed
- No acceleration
- No speed
- EGT overtemperature
- No flame
- Underspeed
- Reverse flow
- Low oil pressure
- High oil temperature
- DC power lost (BAT OFF when aircraft on batteries only)
- ECB failure
- Loss of overspeed protection
- Oil system shutdown
- Inlet overheat
- Clogged oil filter
- Loss of EGT thermocouples

Note: *In the case of an automatic, non-emergency shutdown, the air inlet flap closes 15 min after the APU speed is lower than 7 %. If an automatic, non-emergency shutdown happens on ground, the 15 min countdown starts after liftoff.*

(2) **START pb-sw**

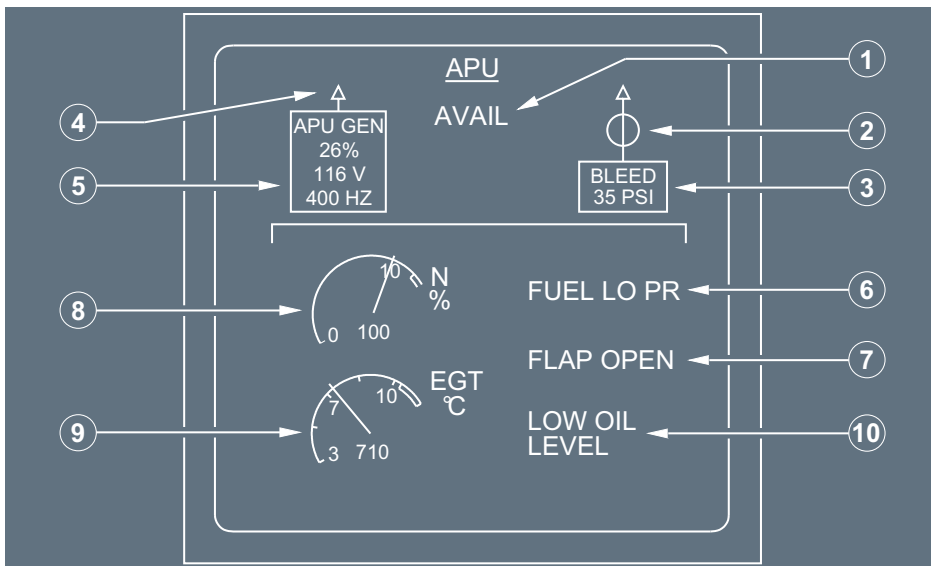
ON : Blue ON light comes on.

- When the flap is completely open, the starter is energized.
- 1.5 s after the starter is energized, the ignition turns on.
- When N = 60 %. The APU starter is de-energized. The ignition is turned off.
- 2 s after N reached 95 %, or when N is above 99.5 %:
The ON light on the START pb goes out.
The APU may now supply bleed air and electrical power to the aircraft systems.
- 10 s later, the APU page disappears from the ECAM display.

AVAIL It : This green light comes on when N is above 99.5 % or 2 s after N reaches 95 %.

ECAM APU PAGE

Applicable to: ALL



- (1) AVAIL
Displayed in green when APU N is above 95 %.
- (2) APU bleed air valve position
 - Inline-Green : The APU bleed air valve is not closed.
 - Crossline-Green : The APU bleed air valve is closed.
 - Crossline-Amber : The APU bleed air valve is closed and the APU bleed is ON.
 - XX-Amber : The APU bleed air valve status information is not available, or the APU BLEED pb status is not available.
- (3) APU bleed air pressure

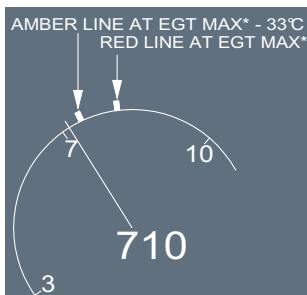
This box displays the relative bleed air pressure in green.

It shows an amber XX when the ADIRS1 is not available or selected OFF or the data from the ECB are invalid or not transmitted.
- (4) APU GEN line contactor indication

Displayed in green when the APU GEN line contactor is closed.

Continued on the next page

- (5) APU GEN parameters
Identical to the APU GEN parameters on the ELEC page.
- (6) FUEL LO PR
Displayed in amber if APU fuel pressure gets low.
- (7) FLAP OPEN
Displayed in green when APU air intake flap is fully open.
- (8) APU N
 - Displays APU speed in green.
 - Becomes amber when $N \geq 102\%$.
 - Becomes red when $N \geq 107\%$.
- (9) APU EGT



- Displays APU EGT in green.
 - Becomes amber when $EGT \geq EGT\ MAX\ See\ *-33\ ^\circ C$.
 - Becomes red when $EGT \geq EGT\ MAX\ See\ *$ (automatic shutdown begins).
- * ECB calculates EGT MAX and transmits it to the ECAM. It is a function of N during start, and a function of ambient temperature when the APU is running.
Maximum EGT during start: 1 090 °C.
Maximum EGT with APU running: 675 °C.
- (10) LOW OIL LEVEL
Advisory: Displayed if the ECB detects a low APU oil level when the aircraft is on the ground, and the APU is not running.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

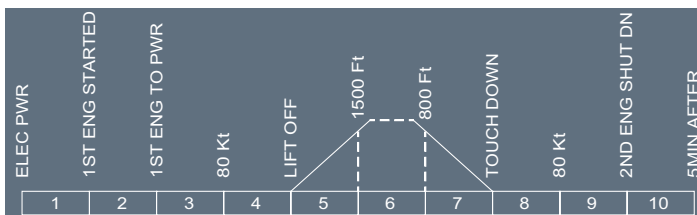
DSC-49 – APU

DSC-49-20 – Controls and Indicators

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
AUTO SHUT DOWN automatic shut down of APU for a reason other than a fire.	SINGLE CHIME	MASTER CAUT	APU	APU MASTER SW FAULT It	3, 4, 5, 7, 8
EMER SHUT DOWN use of APU shut off pushbutton on external power panel or APU FIRE pushbutton pushed. In case of APU fire on ground, the APU FIRE warning is triggered.					

MEMO DISPLAY

APU AVAIL appears in green when APU N is above 95 %.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-49 – APU

DSC-49-30 – Warnings and Cautions

Intentionally left blank

BUS EQUIPMENT LIST

Applicable to: ALL

	NORM			EMER ELEC		
	AC	DC	DC BAT	AC ESS	DC ESS	HOT
ECB SUPPLY			X			
STARTER MOTOR			X			

Note: When the system is in electrical emergency configuration, battery contactors automatically close for a maximum of 3 min when the APU MASTER SW is ON.
When the aircraft is in flight, and when the system is in electrical emergency configuration, the APU start is inhibited for 45 s.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-49 – APU

DSC-49-40 – Electrical Supply

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DSC-52-10	Description	
DSC-52-10-10	General	
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DSC-52-10-20	Passenger Doors	
	General	1
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DSC-52-10-30	Emergency Exits	
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	CABIN.....	3
DSC-52-10-40	Cargo Doors	
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DSC-52-10-50	Avionics Compartment Access Door	
	AVIONICS COMPARTMENT ACCESS DOOR.....	1
DSC-52-10-60	Cockpit Door	
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DSC-52-20	Controls and Indicators	
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DSC-52-30	Warnings and Cautions	
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DSC-52-50	ELECTRICAL SUPPLY	
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A319/A320
FLIGHT CREW OPERATING MANUAL

DOORS
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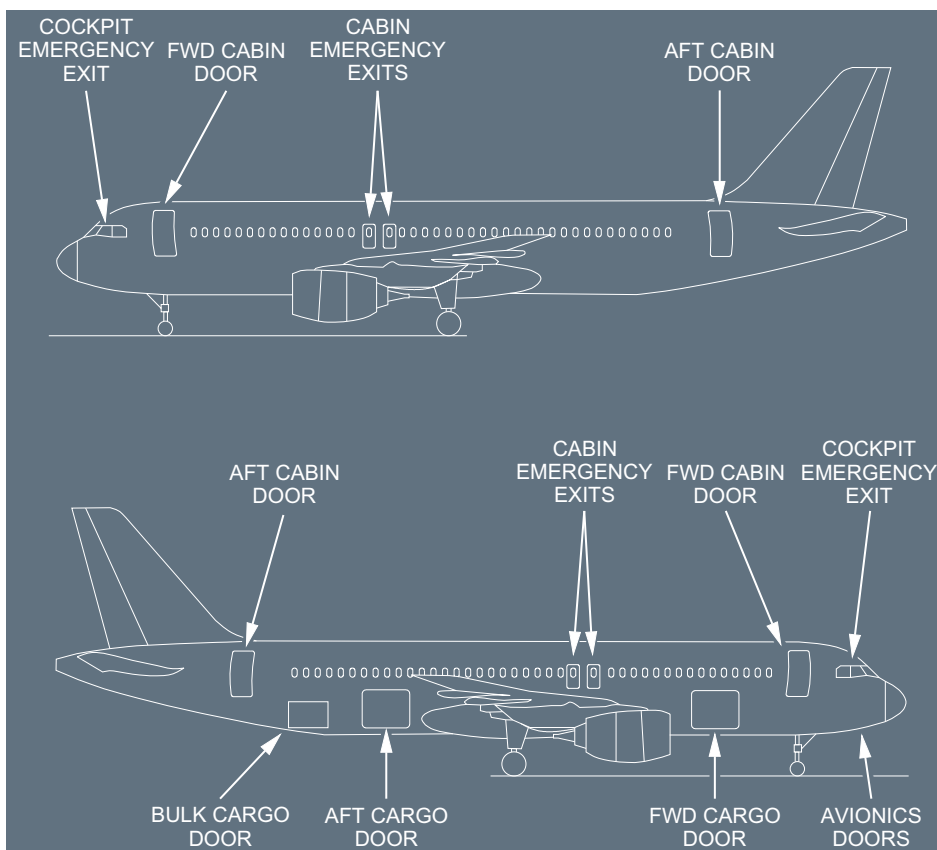
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DESCRIPTION

Applicable to: A320

The A320's fuselage has:

- Four passenger doors
- Four emergency exits in the cabin
- Cockpit emergency exits (two sliding windows)
- Three cargo compartment doors
- Four avionic compartment access doors.

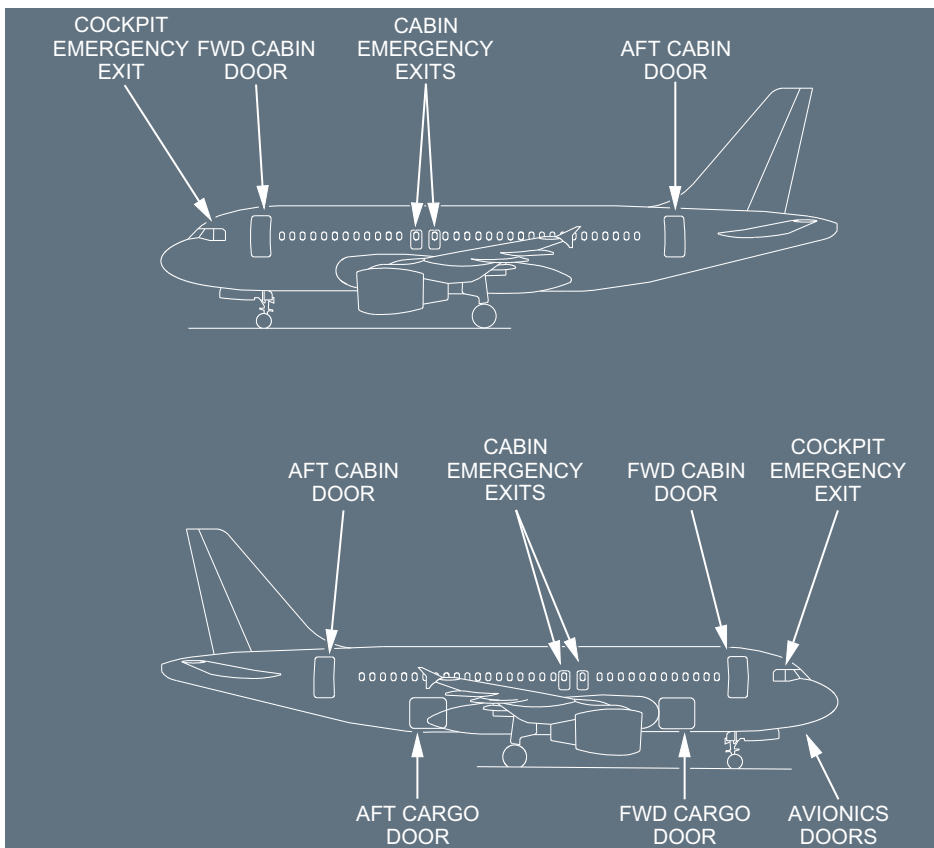


DESCRIPTION

Applicable to: A319

The A319's fuselage has:

- Four passenger doors
- Four emergency exits in the cabin
- Cockpit emergency exits (two sliding windows)
- Two cargo compartment doors
- Four avionic compartment access doors.



GENERAL

Applicable to: ALL

The aircraft has four plug-type doors that open outward and forward. There are two of these on each side of the fuselage (two forward, two aft).

They can be operated from inside or outside the aircraft. Normal operation is manual, with hydraulic damping.

Each door has features that tailor it to emergency situations :

- An escape slide stowed in a container attached to the inboard lower side of the door
- A damper actuator that limits door travel in normal mode, but in an emergency acts as an actuator for automatic door opening
- A slide arming lever.

When the slide arming lever is in the ARMED position, the slide is connected to the floor brackets on both sides of the door. When the door is opened, the slide inflates and deploys automatically. If the inflation bottle fails to discharge automatically, a crew member can open its valve to make it perform its function.

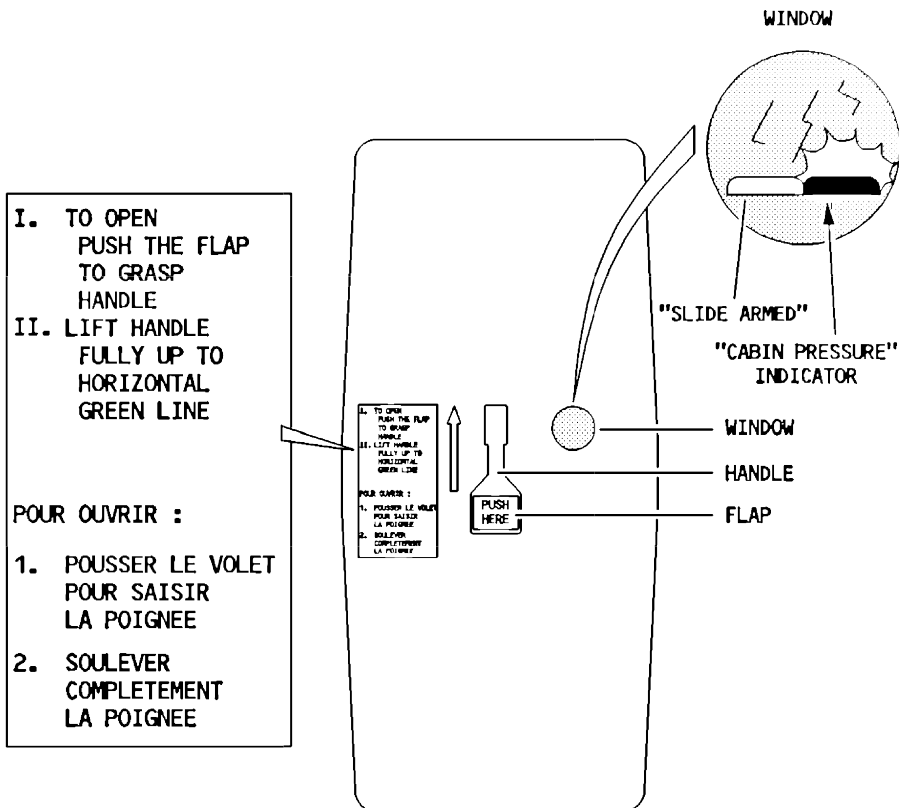
Opening the door from the outside disarms the door and the escape slide.

Each passenger door has :

- A mechanical locking indicator that shows whether the door is locked or unlocked
- One warning light to show whether the escape slide is ARMED or DISARMED
- One CABIN PRESSURE warning light that warns of residual pressure in the cabin.

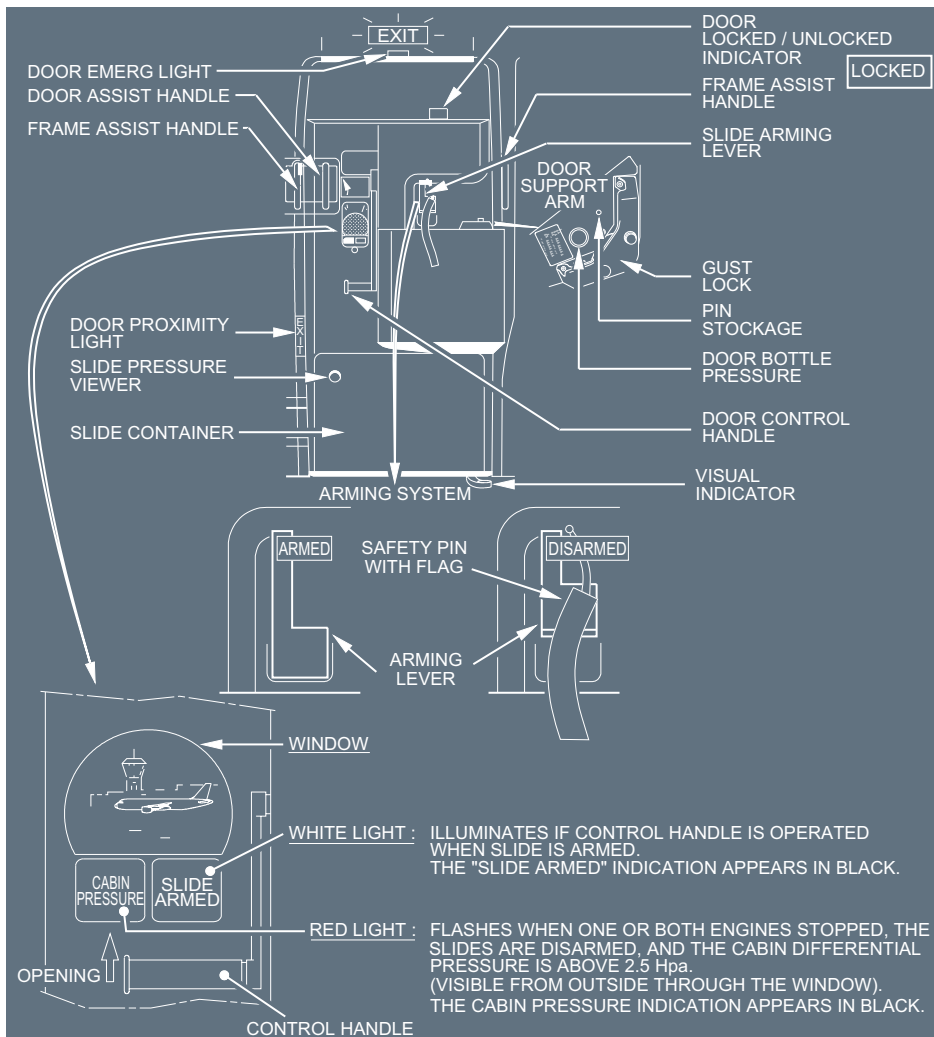
OUTSIDE

Applicable to: ALL



INSIDE

Applicable to: ALL



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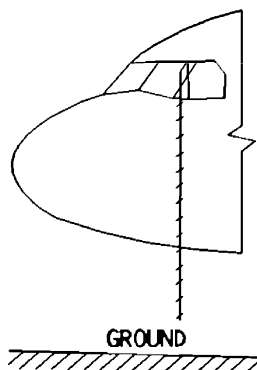
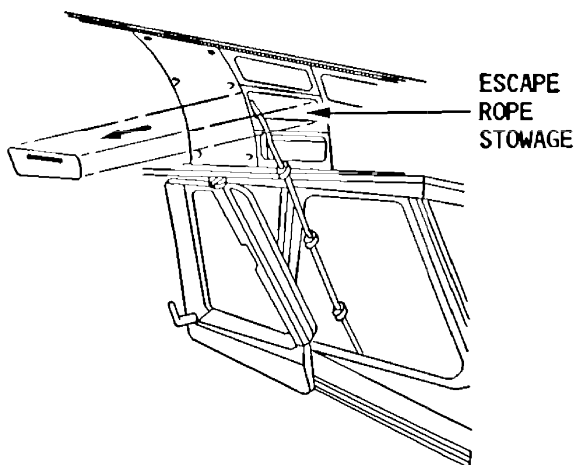
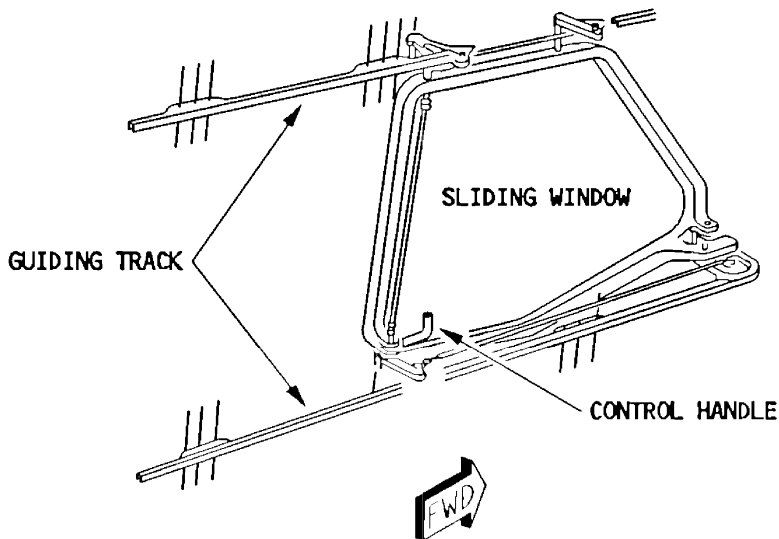
COCKPIT**Applicable to: ALL**

The two sliding windows in the cockpit are flight crew emergency exits.

A small compartment, located above each window, contains an escape rope that is long enough to reach the ground when lowered through either sliding window.

The cockpit windows can only be opened from the inside.

Continued on the next page

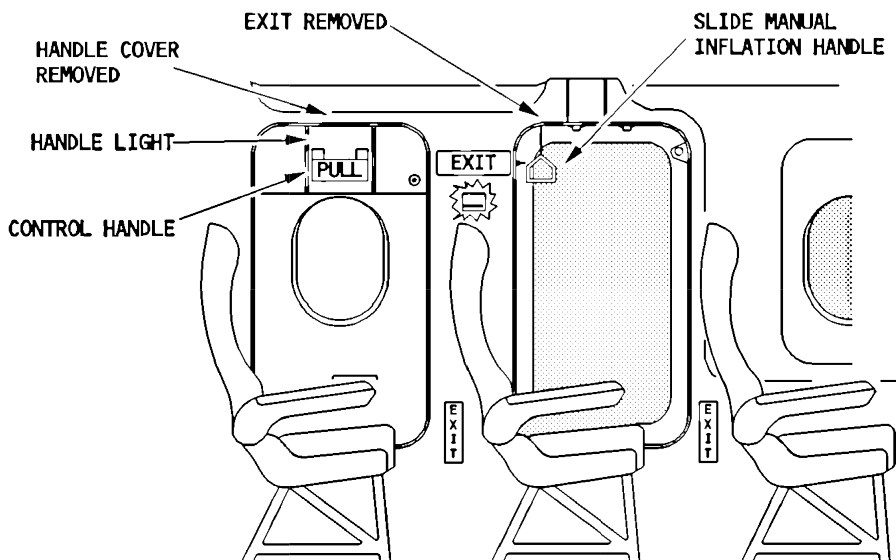


Emergency cockpit evacuation is also possible through the cockpit door escape panel. It is designed to be pushed open in the direction of the cabin after removal of the quick-release pins.

CABIN

Applicable to: A320

In case of an emergency, two inward opening emergency exits are provided on each side of the cabin, in addition to the regular cabin doors. They are also equipped with an escape slide.

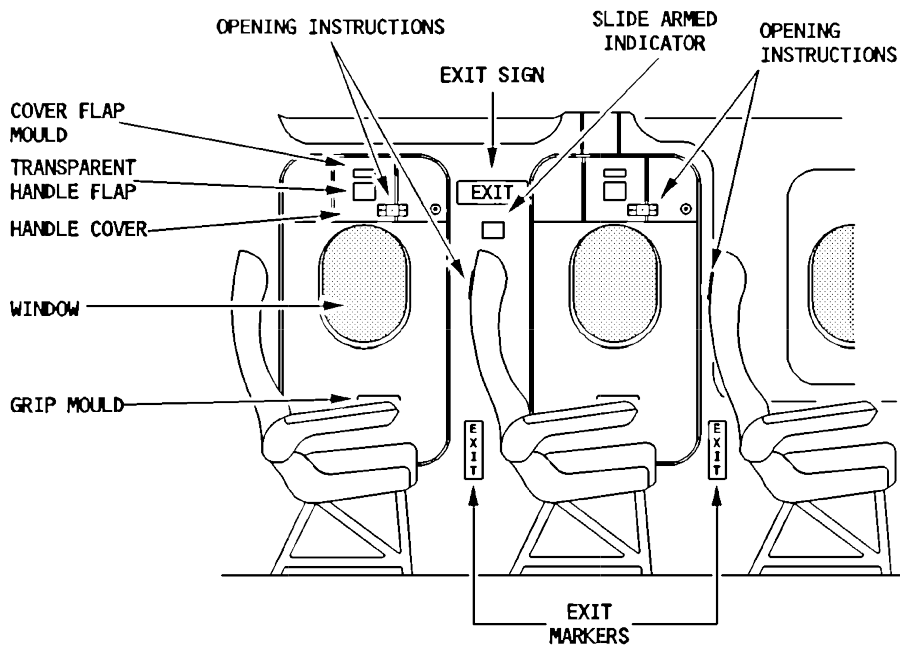


The slides of the overwing emergency exits are always in armed configuration.

To open :

- Remove **HANDLE COVER** : The **HANDLE LIGHT** and **SLIDE ARMED** indicator illuminate.
- Pull **CONTROL HANDLE** : The **EXIT** moves inwards.
- Lift **EXIT** from frame by holding the **GRIPMOULD**.
- Throw **EXIT** out.

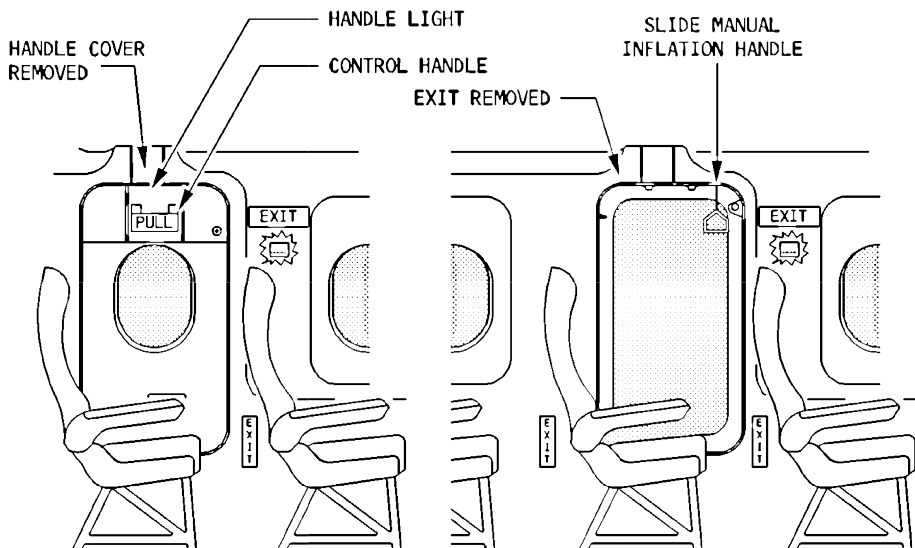
Continued on the next page



CABIN

Applicable to: A319

In case of an emergency, two inward opening emergency exits are provided on each side of the cabin, in addition to the regular cabin doors. They are also equipped with an escape slide.

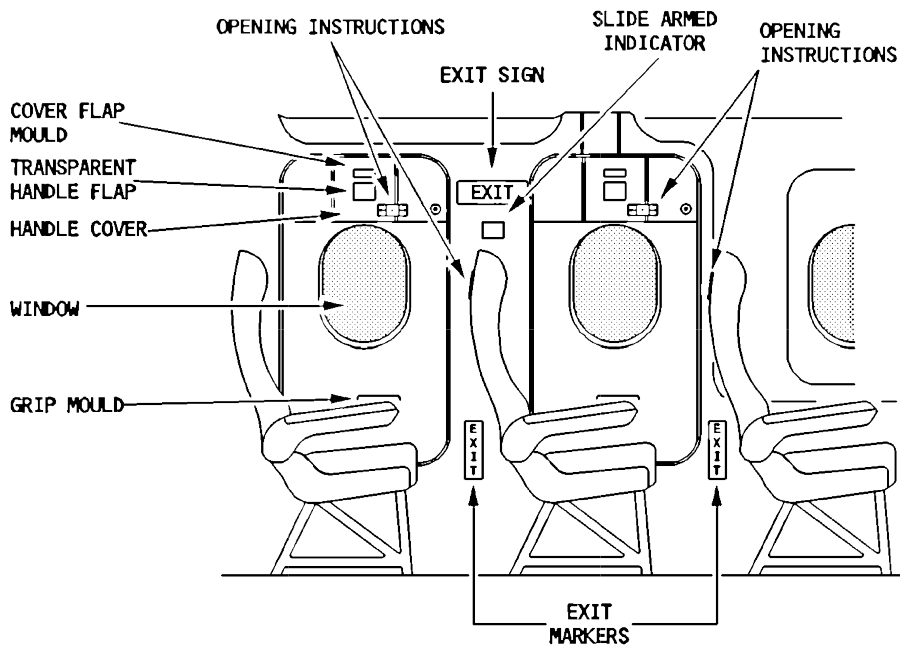


The slides of the overwing emergency exits are always in armed configuration.

To open :

- Remove HANDLE COVER : The HANDLE LIGHT and SLIDE ARMED indicator illuminate.
- Pull CONTROL HANDLE : The EXIT moves inwards.
- Lift EXIT from frame by holding the GRIPMOULD.
- Throw EXIT out.

Continued on the next page



GENERAL

Applicable to: ALL

The aircraft has two cargo doors (three cargo doors ) on the right side of the fuselage below the cabin floor.

FWD AND AFT CARGO DOORS

Applicable to: ALL

The yellow hydraulic system opens these doors outward and upward. They lock open or closed mechanically.

If the yellow system's electric pump fails, crewmen can use a hand pump to pressurize the system.

This hand pump is on the hydraulic maintenance panel.

The FWD and AFT cargo doors can be opened from the outside only.

Note: When the electric pump is operating the FWD or AFT cargo doors, the only other yellow system devices that can operate are braking and engine 2 reverse.

BULK CARGO DOOR (IF INSTALLED)

Applicable to: ALL

The bulk cargo door opens inward and upward. It is a plug-type door that is mechanically locked and manually operated.

This door can be opened from the outside or from the inside.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-52 – DOORS

DSC-52-10 – Description

DSC-52-10-40 – Cargo Doors

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AVIONICS COMPARTMENT ACCESS DOOR**Applicable to: ALL**

Four inward opening, manually operated, hinged doors give external access to the avionics compartments. These doors are in the lower fuselage, around the nose landing gear bay.

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COCKPIT DOOR**Applicable to: ALL**

Refer to DSC-25-11-10 Cockpit Door Description for information about the secured cockpit door.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-52 – DOORS

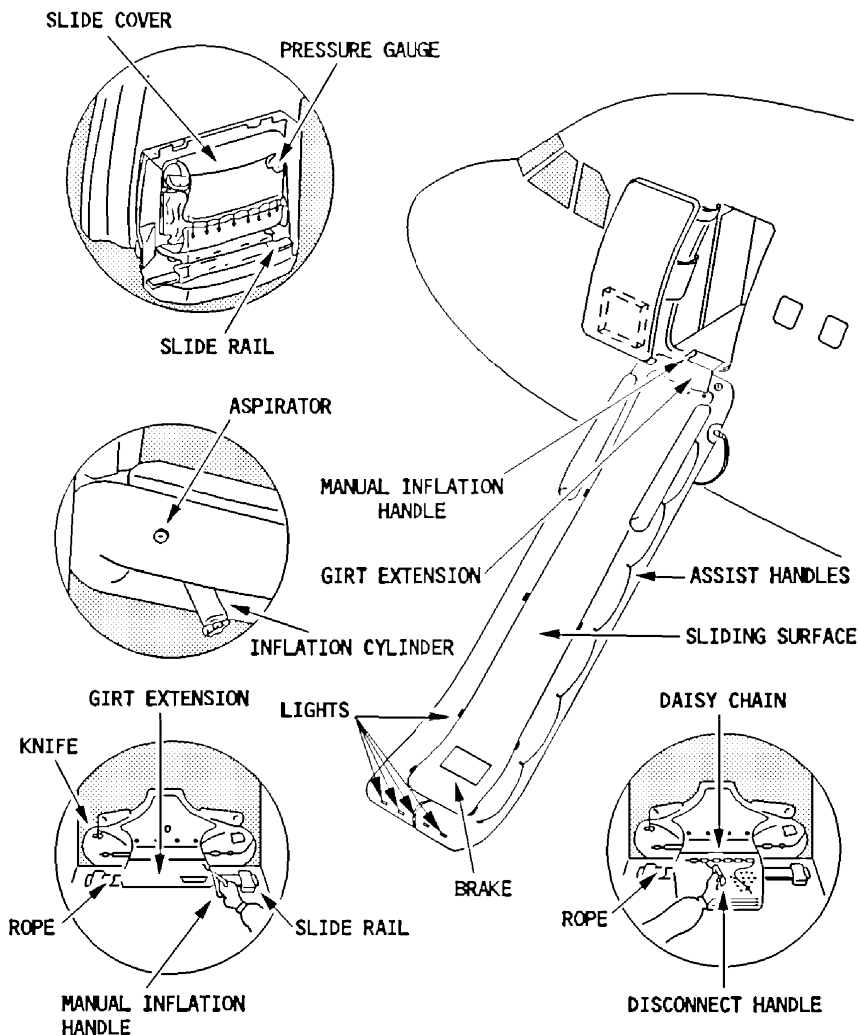
DSC-52-10 – Description

DSC-52-10-60 – Cockpit Door

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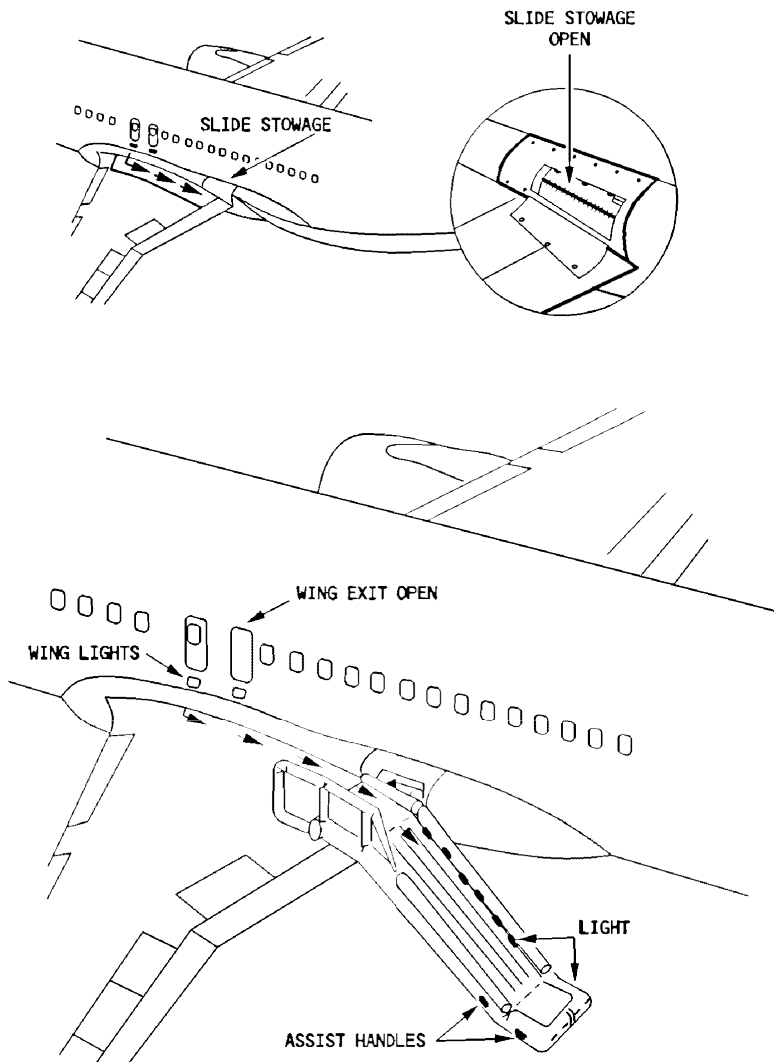
DOOR SLIDES

Applicable to: ALL

**NOTE : THE ROPE MUST BE CUT AFTER DISCONNECTION**

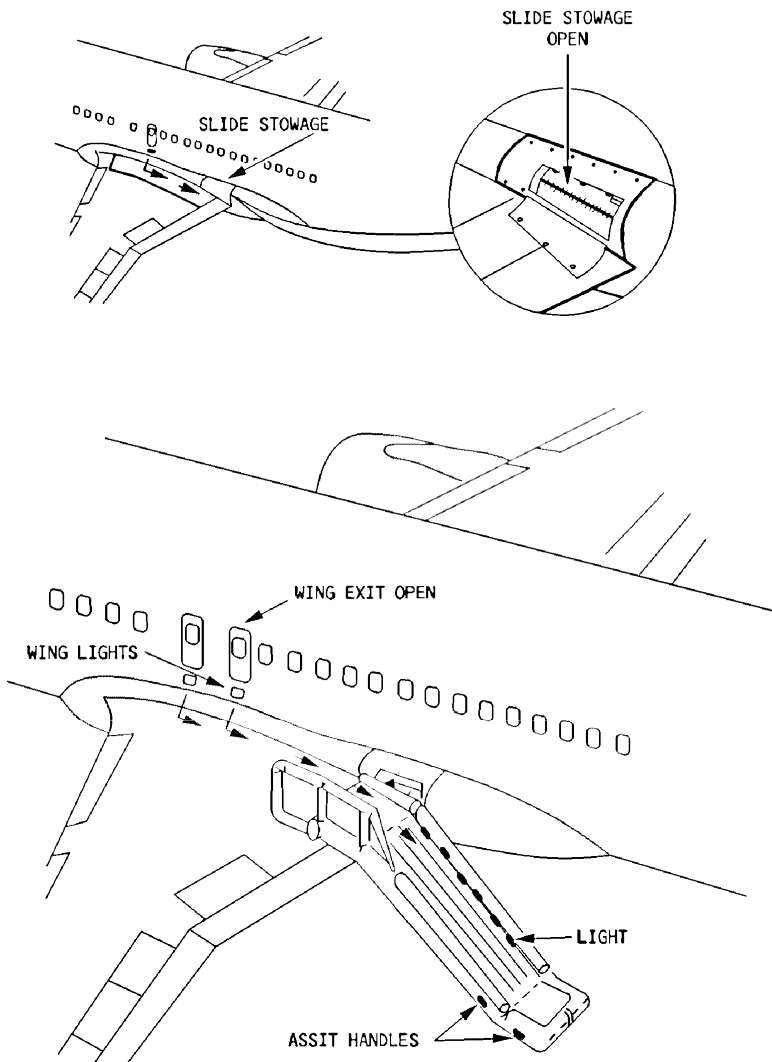
WING SLIDES

Applicable to: A320



WING SLIDES

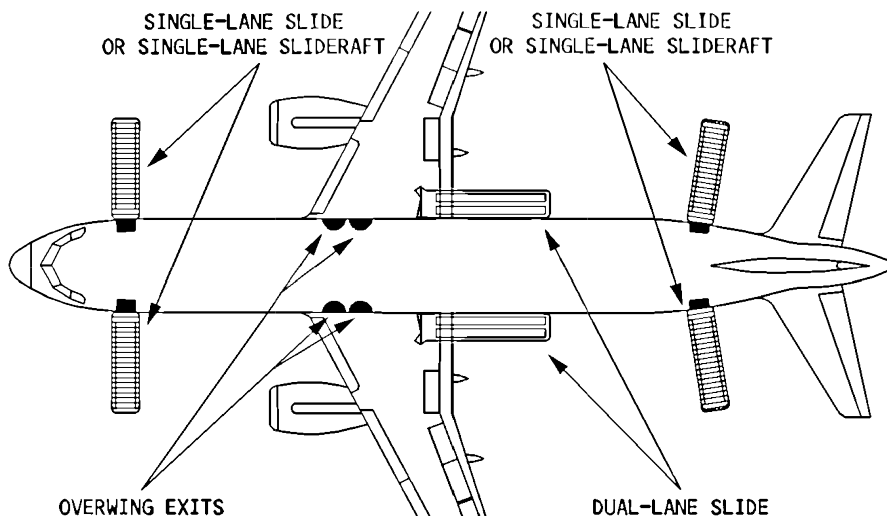
Applicable to: A319



ESCAPE SLIDE ARRANGEMENT

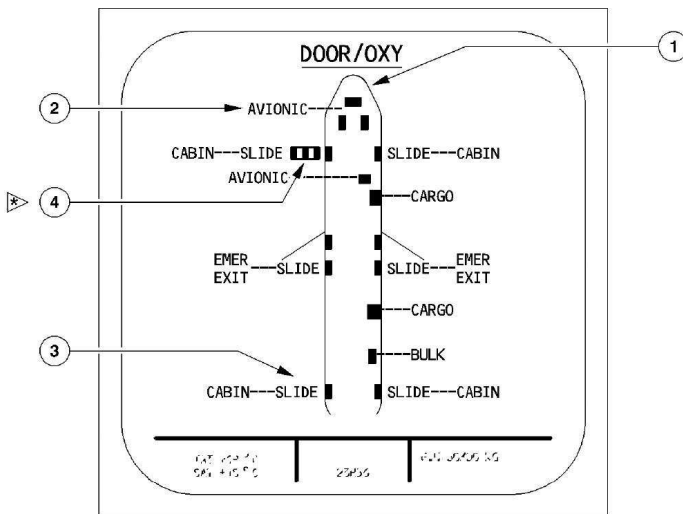
Applicable to: ALL

Each passenger door either has a single-lane escape slide, or a single-lane slideraft, and each emergency exit has a dual-lane escape slide.



DOOR/OXY SD PAGE

Applicable to: A320



(1) Door Symbol

Green ☐ : The door is closed and locked.

Amber ☐ : The door is not locked.

(2) Door Indication

This appears in amber, when the door is not locked.

(3) Slide Indication

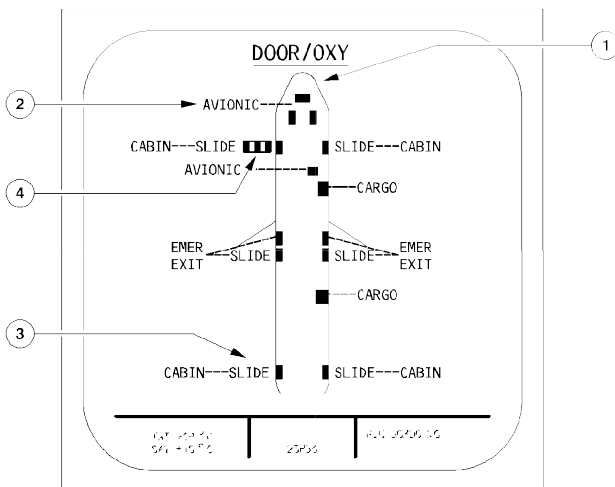
This appears in white, when the slide is armed.

(4) Stair Symbol

This appears in amber, when the stair door is not closed.

DOOR/OXY SD PAGE

Applicable to: A319



(1) Door symbol

Green ☐ : The door is closed and locked.

Amber ☐ : The door is not locked.

(2) Door indication

This appears in amber, when the door is not locked.

(3) SLIDE indication

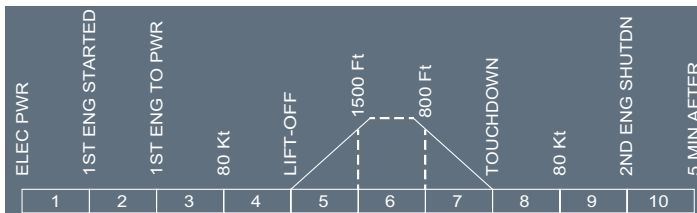
This appears in white, when the slide is armed.

(4) Stair symbol

This appears in amber, when the stair door is not closed.

WARNINGS AND CAUTIONS

Applicable to: ALL



EWD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
L(R) FWD (AFT) AVIONICS L(R) FWD CABIN L(R) AFT CABIN L(R) FWD EMER EXIT L(R) AFT EMER EXIT FWD CARGO AFT CARGO BULK CARGO  STAIRS  Affected door not closed (proximity detectors)	SINGLE CHIME	MASTER CAUT	DOOR	NIL	1, 4, 5, 7, 8, 10



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-52 – DOORS

DSC-52-30 – Warnings and Cautions

Intentionally left blank

BUS EQUIPMENT LIST

Applicable to: ALL

	NORM		EMER ELEC		
	AC	DC	AC ESS	DC ESS	HOT
DOORS and SLIDES CTL		DC BAT ⁽¹⁾			HOT2 ⁽¹⁾
CARGO DOORS		DC GRND FLT			
AIR STAIRS		DC2			HOT2 ⁽²⁾

(1) STBY supply (normally supplied by the EMER PWR SUPPLY UNIT)

(2) STBY supply



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-52 – DOORS

DSC-52-50 – ELECTRICAL SUPPLY

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	Power Supply	4
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DSC-70-98 ELECTRICAL SUPPLY

ELECTRICAL SUPPLY..... 1



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FLIGHT CREW OPERATING MANUAL

**POWER PLANT
TABLE OF CONTENTS**

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easyJet

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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

DSC-70-10 – Engine

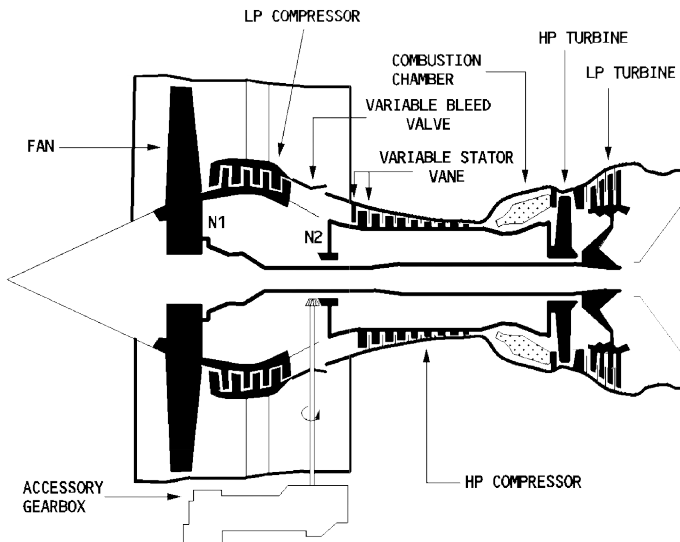
GENERAL

Applicable to: ALL

The CFM 56-5B engine is a high bypass ratio turbofan.

DESCRIPTION

Applicable to: ALL

**LOW-PRESSURE (LP) COMPRESSOR/TURBINE**

The low-speed rotor (N1) consists of a front fan (single-stage) and a four-stage LP compressor connected to a four-stage LP turbine.

HIGH-PRESSURE (HP) COMPRESSOR/TURBINE

The high-speed rotor (N2) consists of a nine-stage HP compressor connected to a single-stage HP turbine.

COMBUSTION CHAMBER

The annular combustion chamber is fitted with 20 fuel nozzles and 2 igniters.

ACCESSORY GEARBOX

The accessory gearbox, located at the bottom of the fan case, receives torque from horizontal HP rotor drive shaft and drives gearbox mounted accessories.

GENERAL**Applicable to: ALL**

Each powerplant has a FADEC (Full Authority Digital Engine Control) system.

FADEC, also called the Electronic Control Unit (ECU), is a digital control system that performs complete engine management.

FADEC has two-channel redundancy, with one channel active and one in standby.

If one channel fails, the other automatically takes control.

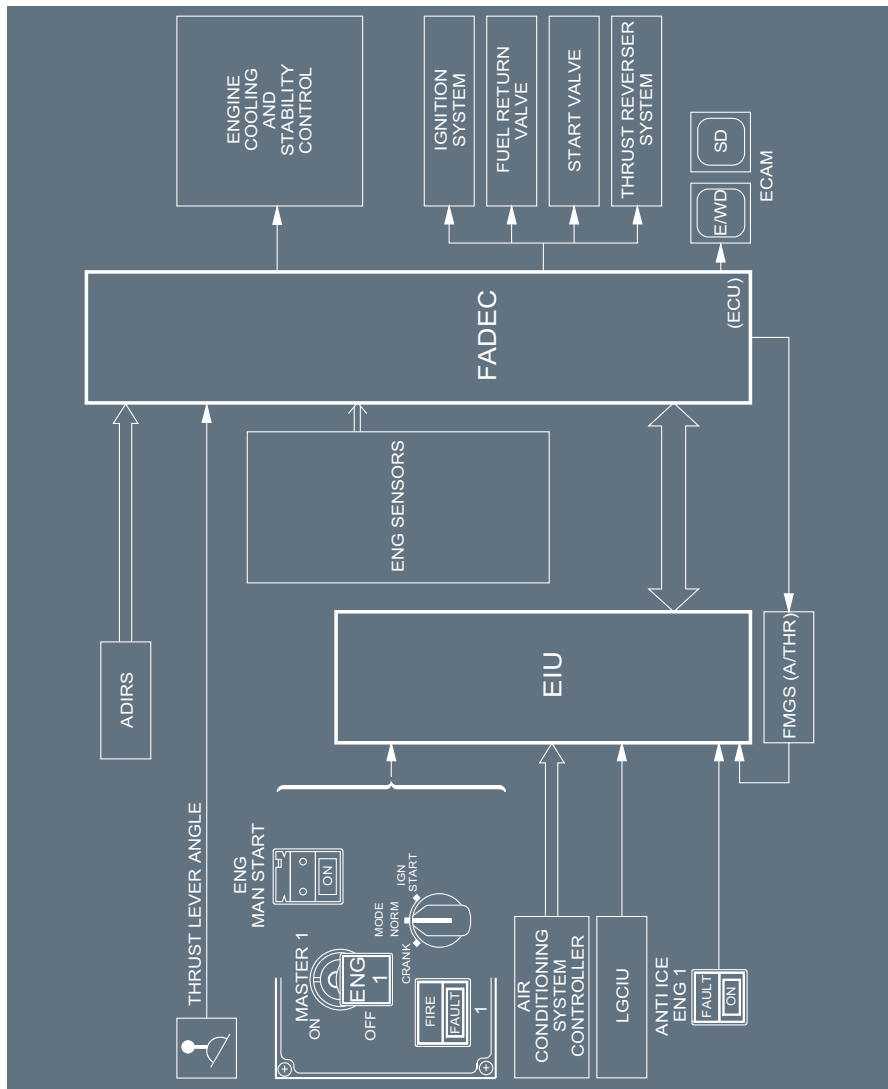
The system has a magnetic alternator for an internal power source.

FADEC is mounted on the fan case.

The Engine Interface Unit (EIU) transmits to FADEC the data it uses for engine management.

ARCHITECTURE

Applicable to: ALL



FUNCTIONS

Applicable to: ALL

The FADEC system performs the following functions :

Control of gas generator

- control of fuel flow
- acceleration and deceleration schedules
- variable bleed valve and variable stator vane schedules
- control of turbine clearance
- idle setting

Protection against engine exceeding limits

- protection against N1 and N2 overspeed
- monitoring of EGT during engine start

Power management

- automatic control of engine thrust rating
- computation of thrust parameter limits
- manual management of power as a function of thrust lever position
- automatic management of power (A/THR demand).

Automatic engine starting sequence

- control of :
 - the start valve (ON/OFF)
 - the HP fuel valve
 - the fuel flow
 - the ignition (ON/OFF)
- monitoring of N1, N2, FF and EGT
- initiation of abort and recycle (on the ground only)

Manual engine starting sequence

- passive monitoring of engine
- control of :
 - the start valve
 - the HP fuel valve
 - the ignition

Thrust reverser control

- Actuation of the blocker doors
- Engine setting during reverser operation

Continued on the next page

Fuel recirculation control

- Recirculation of fuel to the fuel tanks, depending on the engine oil temperature, the fuel system configuration, and the flight phase.

Transmission of engine parameters and engine monitoring information to cockpit indicators

- Primary engine parameters
- Starting system status
- Thrust reverser system status
- FADEC system status

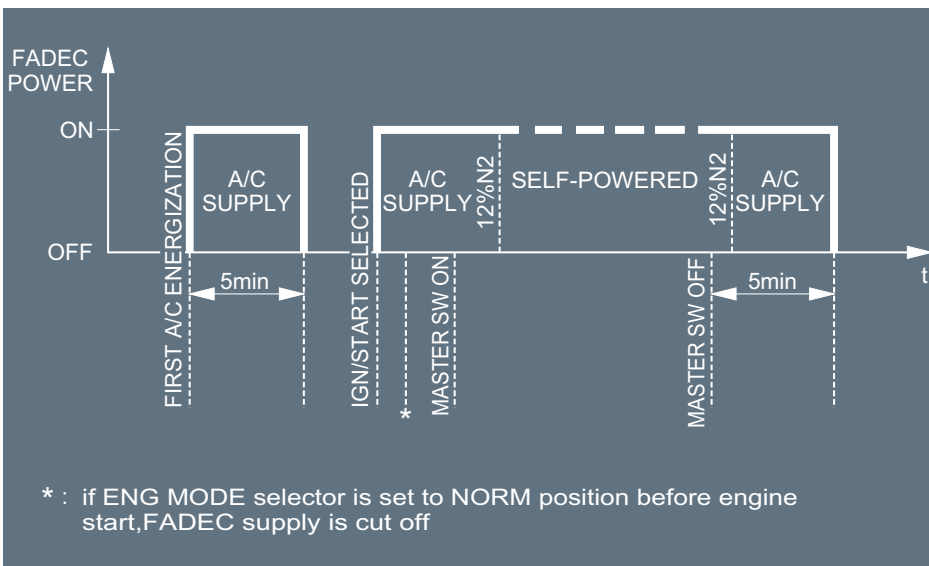
Detection, isolation, and recording of failures

FADEC cooling

POWER SUPPLY

Applicable to: ALL

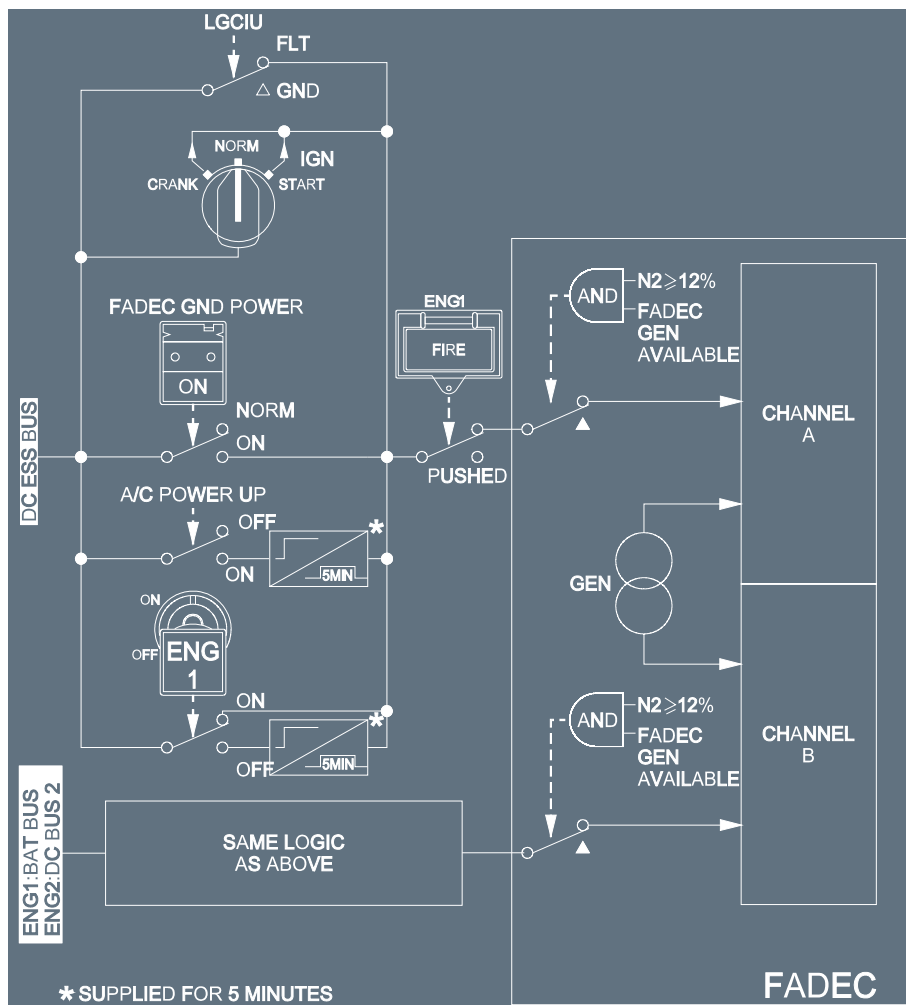
The FADEC system is self-powered above 12 % N2.



Continued on the next page

FADEC POWER SUPPLY

L3





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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

DSC-70-20 – Fadec

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GENERAL**Applicable to: ALL**

A FADEC dedicated to each engine controls thrust.

The pilot uses the thrust levers to set the thrust in manual mode, and the FMGS sets the thrust in automatic mode.

The FADEC prevents the thrust from exceeding the limit for the thrust lever position in both manual and automatic modes.



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

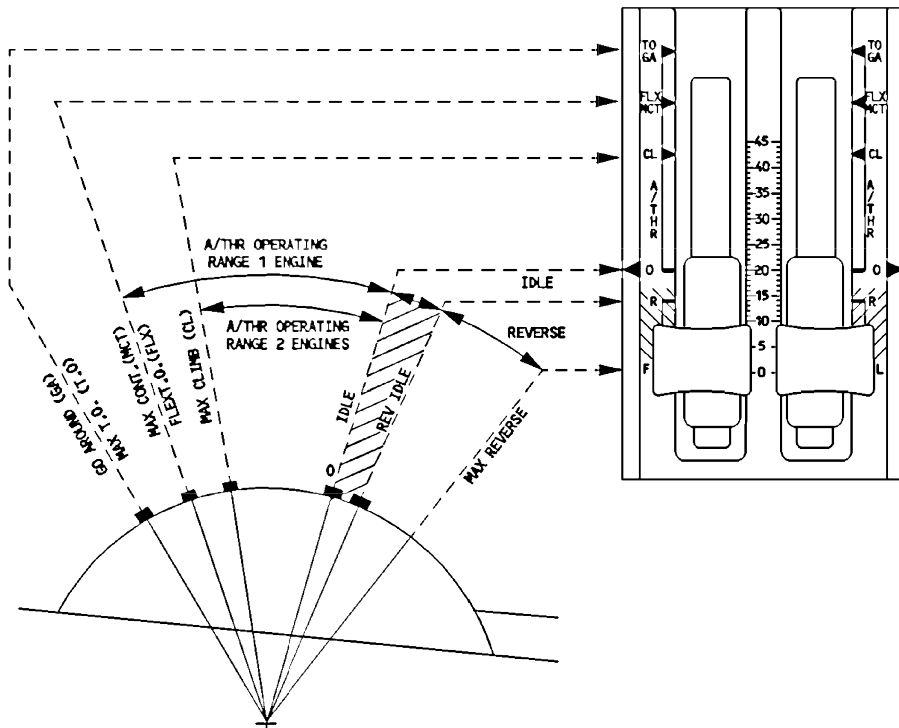
DSC-70-30 – Thrust Control System (CFM+PW)

DSC-70-30-10 – General

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THRUST LEVERS

Applicable to: ALL



The thrust levers can only be moved manually.

They move over a sector that is divided into four operating segments.

The sector has five positions defined by detents or stops.

Thrust lever position is transmitted to the FADEC, which computes and displays the thrust rating limit and the N1 for that Thrust Lever Angle (TLA).

Note: There is no reverse idle detent. When the pilot moves the lever out of the idle stop by pulling up the reverse lever on the front of the thrust lever, he selects reverse idle.



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

DSC-70-30 – Thrust Control System (CFM+PW)

DSC-70-30-20 – Thrust Levers

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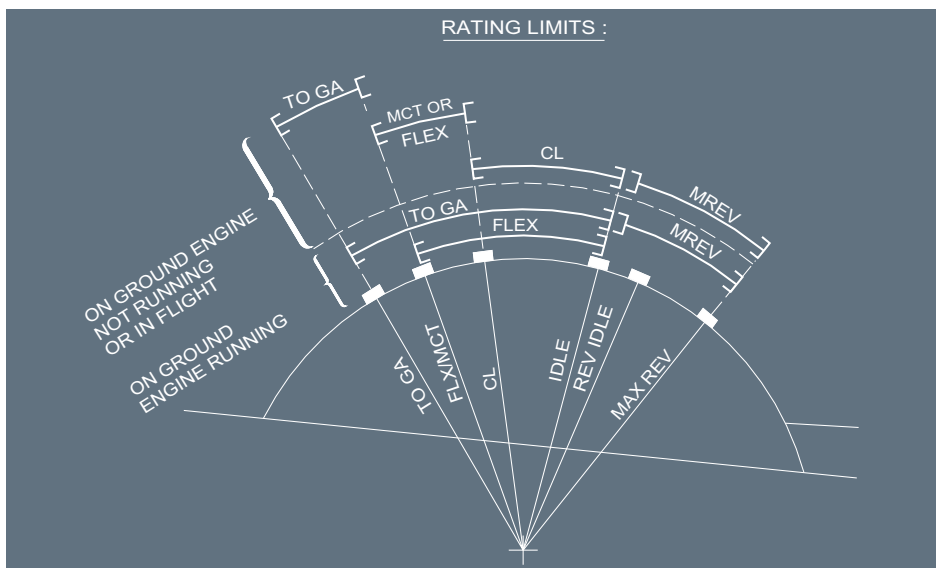
THRUST RATING LIMIT

Applicable to: ALL

The FADEC computes the thrust rating limit for each thrust lever position, as shown below.

If the thrust lever is set in a detent, the FADEC selects the rating limit corresponding to this detent.

If the thrust lever is set between two detents, the FADEC selects the rating limit corresponding to the higher detent.





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

DSC-70-30 – Thrust Control System (CFM+PW)

DSC-70-30-30 – Thrust Rating Limit

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MANUAL MODE

Applicable to: ALL

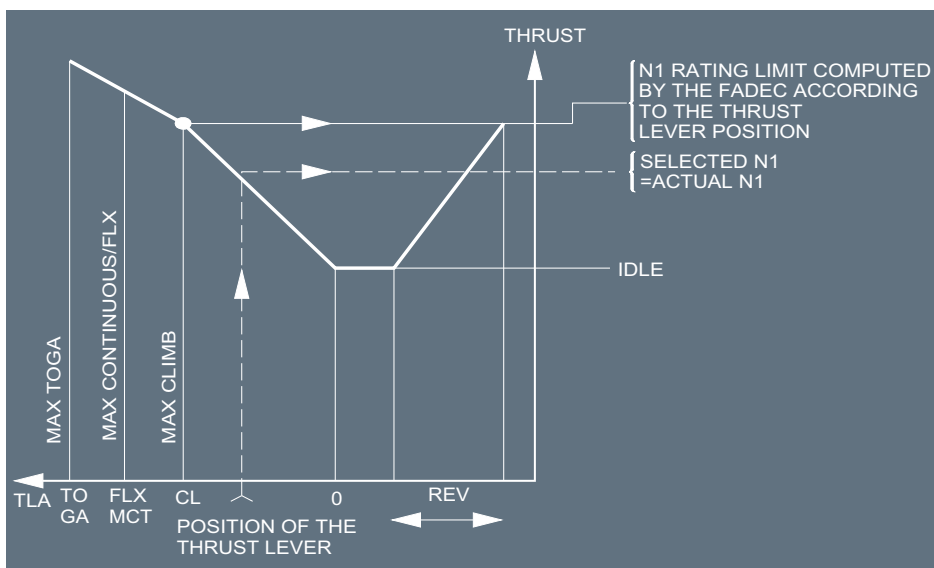
The engines are in the manual mode provided the A/THR function is :

- not armed or
- armed and not active (thrust lever not in the A/THR operating range and no alpha floor).

In these conditions, each engine is controlled by the position of its thrust lever.

The pilot controls thrust by moving the thrust lever between the IDLE and TOGA positions. Each position of the thrust lever within these limits corresponds to an N1.

When the thrust lever is in a detent, the corresponding N1 is equal to the N1 rating limit computed by the FADEC for that engine.



When the thrust lever is in the FLX/MCT detent :

- **On the ground**

The engine runs at the flex takeoff thrust rating if the crew has selected a flex takeoff temperature on the MCDU that is higher than the current Total Air Temperature (TAT). Otherwise the engine produces Maximum Continuous Thrust (MCT).

Note: A change in FLEX TEMP during the takeoff has no effect on the thrust.

- **After takeoff**

Continued on the next page

The pilot can change from FLX to MCT by moving the thrust lever to TOGA or CL, then back to MCT. After that, he cannot use the FLX rating.

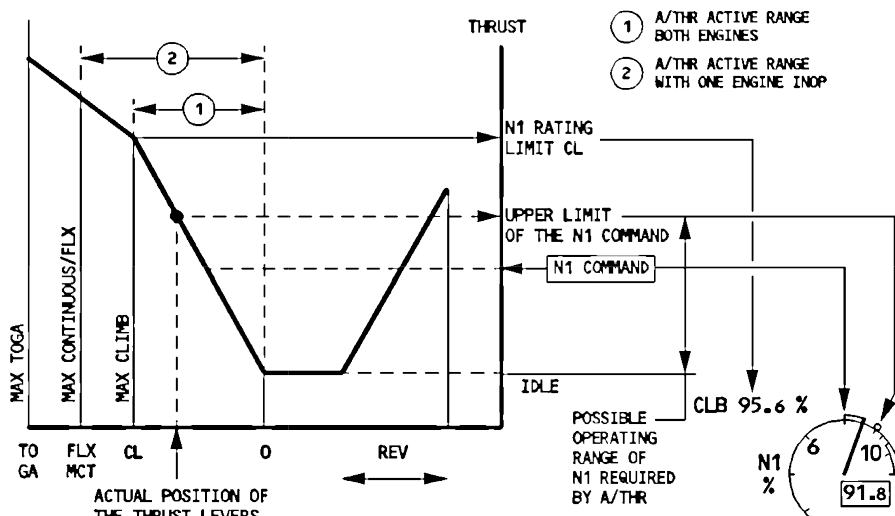
Note: *Setting the thrust lever out of FLX/MCT detent without reaching TOGA or CL detent has no effect.*

The pilot can always get MAX TO thrust by pushing the thrust lever all the way forward.

AUTOMATIC MODE

Applicable to: ALL

In the autothrust mode (A/THR function active), the FMGC computes the thrust which is limited to the value corresponding to the thrust lever position (unless the alpha-floor mode is activated).



INDICATIONS ON FMA

The FADECs monitor the positions of the thrust levers, and trigger appropriate indications on the FMA.

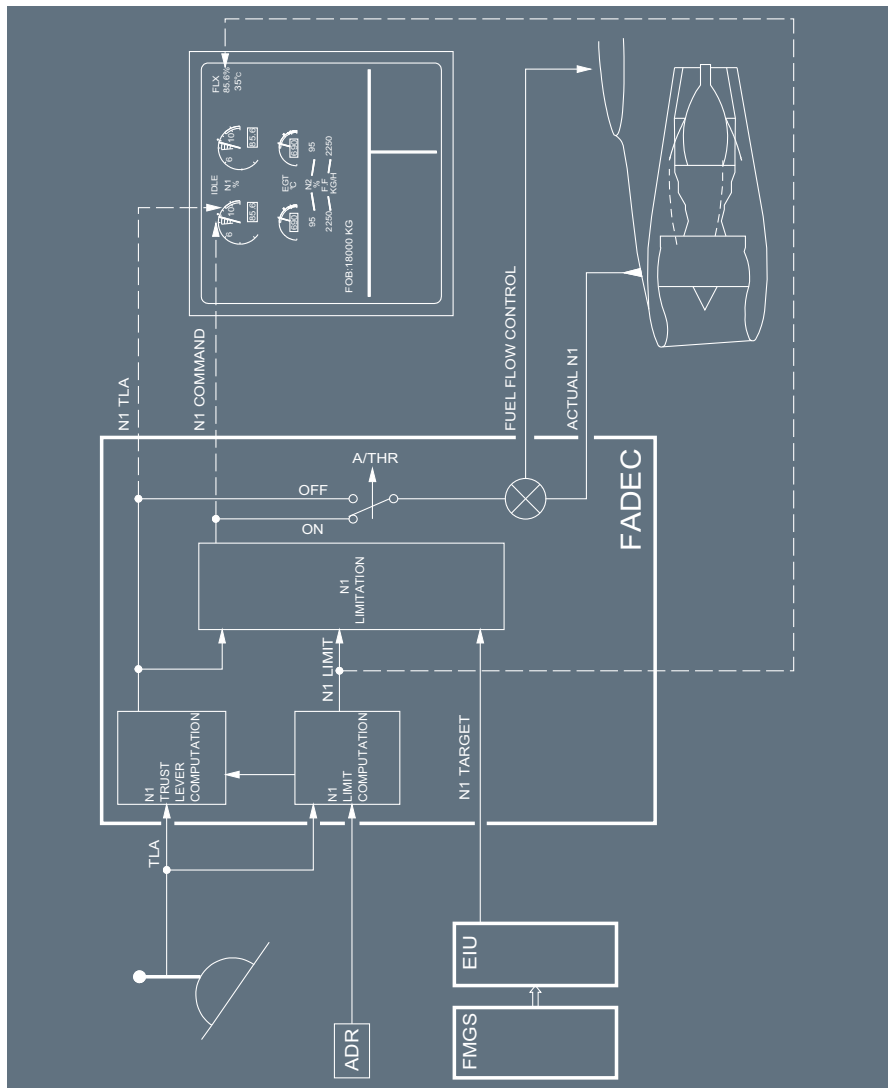
LVR : appears in amber (3rd line on the FMA) if, with A/THR active and both engines running, **ASYM** one thrust lever is set out of the CLB detent.

LVR : flashes white (3rd line on the FMA) if the thrust levers are not in CL position while the **CLB** aircraft is above the altitude of thrust reduction with both engines running.

LVR : flashes white (3rd line on the FMA) if the thrust levers are not in MCT position after an **MCT** engine failure (with speed above green dot).

THRUST CONTROL

Applicable to: ALL

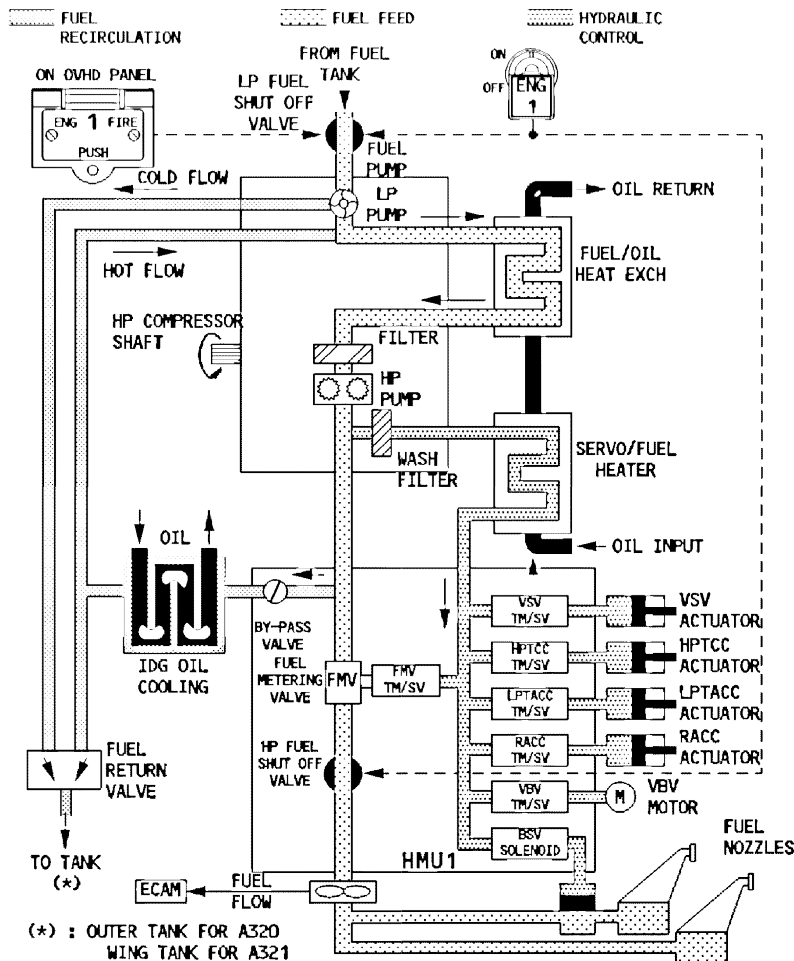


GENERAL**Applicable to: ALL**

The fuel system supplies fuel to the combustion chamber at the required flow rate, pressure, and temperature.

The fuel flows from the tank, via the fuel pump unit and the fuel/oil heat exchanger, to the Hydromechanical Unit (HMU) and to the fuel nozzles.

Continued on the next page



FUEL PUMP UNIT**Applicable to: ALL**

The HP compressor shaft drives the HP fuel pump assembly. Fuel flows through the LP pump, then through the fuel/oil heat exchanger and the HP pump (gear pump).

The fuel then divides into a filtered flow for the servo fuel heater and the servo valves of the HMU, and an unfiltered flow for the metering valve of the HMU.

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SHUT-OFF VALVES**Applicable to: ALL**

Moving the ENG1 (ENG2) MASTER switch to OFF directly commands the closing of the LP and HP fuel shut off valves for that engine's fuel system.

It also closes the fuel return valve and opens the bypass valve.



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

DSC-70-40 – Fuel System (CFM)

DSC-70-40-30 – Shut-Off Valves

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GENERAL

Applicable to: ALL

The FADEC controls the HMU, which :

- controls fuel flow to the engine combustion chamber
- controls fuel hydraulic signals to actuators
- protects against overspeeding.

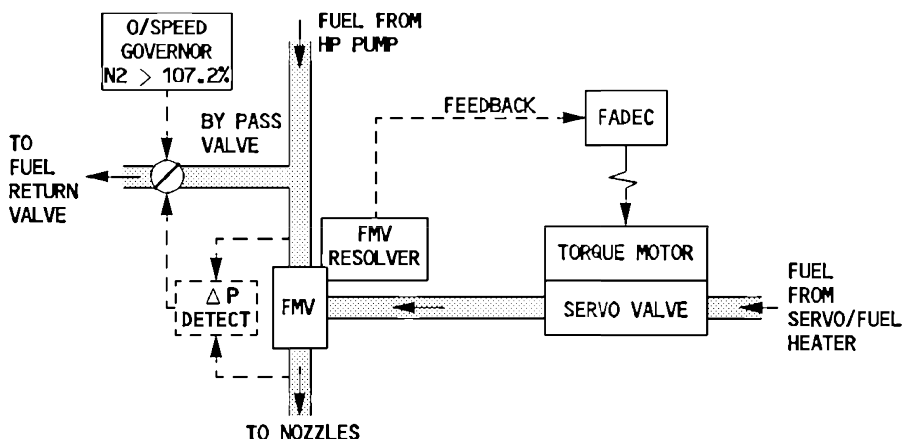
FUEL FLOW

Applicable to: ALL

The Fuel Metering Valve (FMV) transforms FADEC orders through a torque motor and servo valve into fuel flow to the engine fuel nozzles. L3

The FMV resolver generates a feedback signal proportional to the FMV position.

The bypass valve maintains a constant pressure drop across the FMV to ensure that the metered fuel flow is proportional to the FMV position.



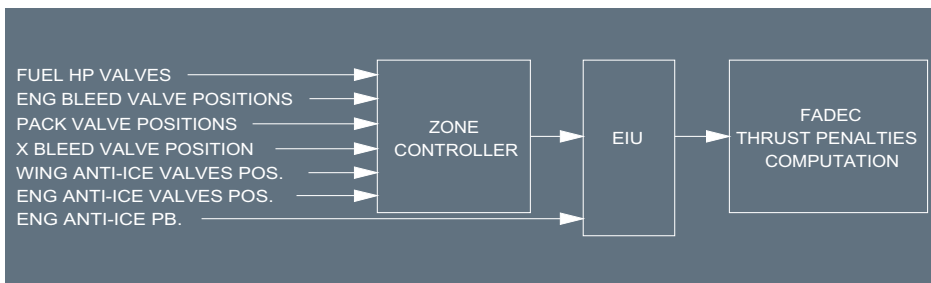
The FADEC computes the fuel flow that will maintain the target N1. L1

As the FADEC maintains this N1, it allows N2 to vary while remaining between N2 minimum and N2 maximum. The FADEC also controls the engine parameters to :

- Limit acceleration and deceleration ;
- Avoid engine stall or flameout ;
- Limit maximum N1 and N2 ;
- Maintain air bleed pressure requirement.

Continued on the next page

The FADEC computes an N2 correction according to the bleed configuration.



OVERSPEED GOVERNOR SYSTEM

Applicable to: ALL

Independent of the FADEC, the overspeed governor limits the N2 by opening the fuel bypass valve, in the event of a malfunction that could lead to an overspeed condition.

IDLE CONTROL

Applicable to: ALL

The FADEC has the following three idle modes :

Modulated idle

- Is regulated according to :
 - bleed system demand
- Is selected :
 - In flight, when the flaps are retracted (FLAPS lever at zero position),
 - On ground, provided reverse is not selected.

Approach idle :

- Is regulated according to aircraft altitude, regardless of bleed system demand.
- Is selected in flight, when the flaps are extended (FLAPS lever not at zero position)
- Allows the engine to accelerate rapidly from idle to go-around thrust

Reverse idle :

- Is selected on ground, when the thrust lever is in REV IDLE position.
- Is slightly higher than forward idle thrust.

FUEL HYDRAULIC SIGNALS

Applicable to: ALL

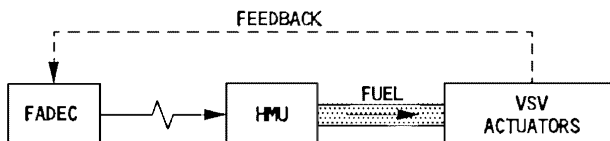
Fuel hydraulic signals go to :

- Low Pressure Turbine Clearance Control (LPTCC) valves
(Refer to DSC-70-60 General)
- High Pressure Turbine Clearance Control (HPTCC) valves
(Refer to DSC-70-60 General)
- Rotor Active Clearance Control (RACC) system
(Refer to DSC-70-60 General)
- Variable Stator Vanes (VSV)

The VSV system positions the compressor variable vanes.

The FADEC maintains optimum compressor efficiency at a steady state and an adequate stall margin for transient engine operation.

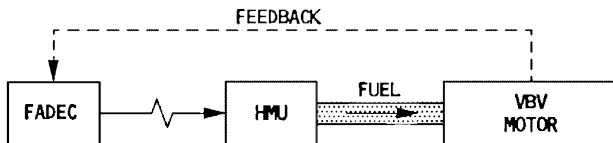
VSVs are fully closed during engine start and are fully open at high thrust.



- Variable Bleed Valves (VBV)

The FADEC controls the VBVs, upstream of the HP compressor. Their setting depends on compressor inlet temperature and on N2. It varies between full open (start, low thrust, and during fast deceleration) and full closed (high thrust) positions.

Continued on the next page



IDG COOLING SYSTEM

Applicable to: ALL

Some of the fuel flowing out of the HMU goes to cool the oil systems of the Integrated Drive Generators (IDGs). It then returns to the fuel pump unit or to the tank.

The Fuel Return Valve (FRV), controlled by the FADEC, ensures that this flow is adequate.

At low engine thrust, if the oil going into the IDG is too hot, the cooling fuel is sent back to the tank (300 kg/h).

If oil temperature continues to rise, the ECU increases the minimum N2.

If oil temperature still keeps rising, the FADEC increases the fuel flow to the tank (from 300 to 600 kg/h, depending on fuel return temperature).

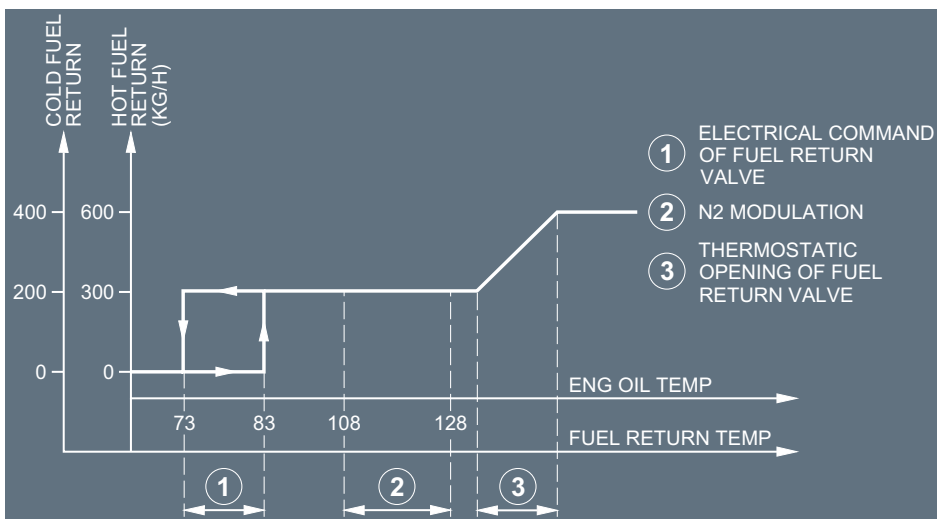
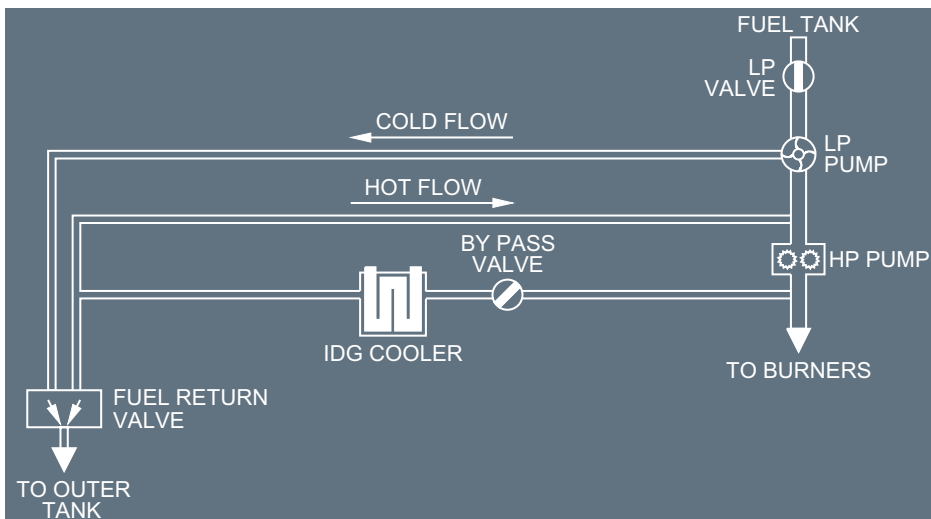
The fuel return valve is always mixing hot fuel with cold fuel so that the temperature of fuel returning to the tank stays below 100 °C (from 200 to 400 kg/h, depending on fuel return temperature).

Fuel recirculation to the tank is inhibited (FRV closed) in the following cases :

- at engine shutdown
- during takeoff and climb
- if :
 - wing tank level is below about 300 kg (660 lb).
 - there is fuel overflow in the surge tank
 - fuel feed is by gravity only.
- when fuel temperature in the wing tank in flight is above 52.5 °C

Note: On the ground, high fuel temperature in the wing tank or fuel overflow in the surge tank does not inhibit the fuel recirculation to the wing tank (FRV remains open).

Continued on the next page



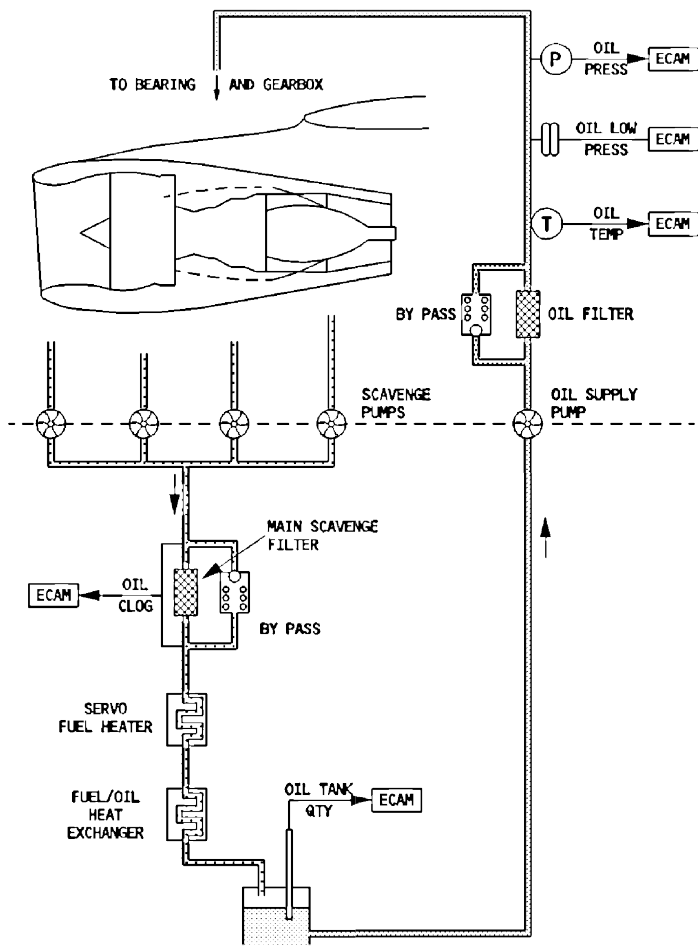
GENERAL**Applicable to: ALL**

The oil system lubricates the engine components.

It contains :

- the oil tank
- the lube and scavenge pump modules
- the fuel/oil heat exchanger
- the filters, chip detectors, pressure relief and bypass valves.

Continued on the next page



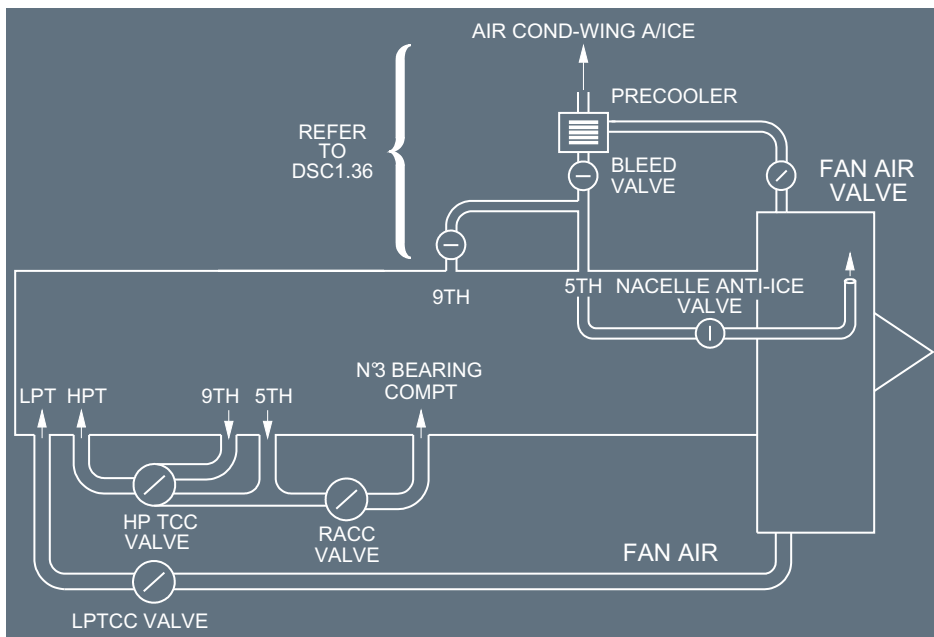
GENERAL

Applicable to: ALL

The air bleed system supplies the aircraft with compressed air.

It uses the air for:

- pneumatic system (*Refer to DSC-36-10-10 GENERAL*)
- cooling the engine compartment and the turbines.



COOLING

Applicable to: ALL

ROTOR ACTIVE CLEARANCE CONTROL (RACC) SYSTEM

The FADEC controls the RACC system through the HMU. The RACC system controls the clearance between the rotor blades of the HP compressor and its stator case.

The RACC system uses fifth-stage compressor bleed air that has been modulated according to the N2 and the flight parameters. The bleed air goes to the N°3 bearing compartment, where it is mixed with fan boost discharge.

Clearances are at the maximum when the RACC valve is closed.

HP TURBINE CLEARANCE CONTROL (HPTCC) SYSTEM

The FADEC controls the HPTCC system through the HMU. The HPTCC system controls the HP turbine clearance by modulating the HP compressor bleed air flow for cooling the HP turbine case. It optimizes HP turbine performance and reduces exhaust gas temperature.

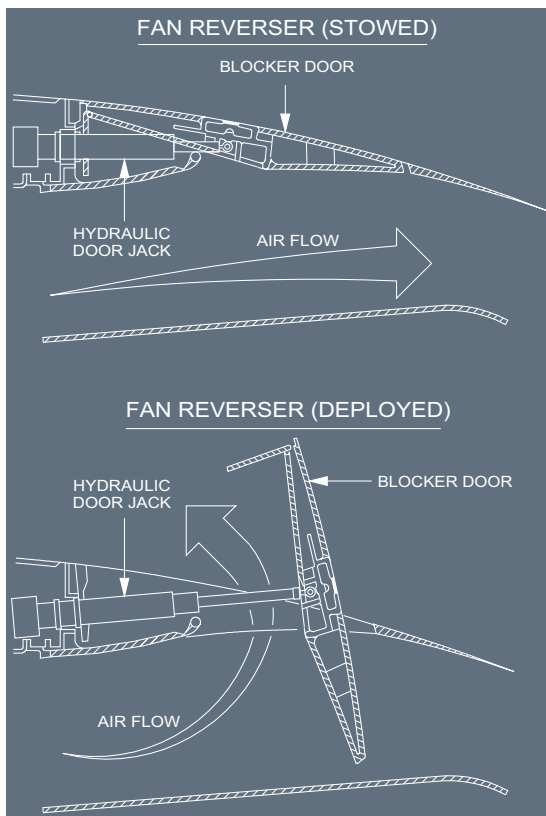
LP TURBINE CLEARANCE CONTROL (LPTCC) SYSTEM

The FADEC controls the LPTCC system through the HMU. The LPTCC system controls LP turbine clearance by modulating the fan bleed air flow for cooling the LP turbine case.

GENERAL

Applicable to: ALL

The aircraft reverses engine thrust by using four pivoting blocker doors on each engine to deflect the fan airstream.



A hydraulic door jack positions each door.

- The green circuit powers the doors on ENG 1.
- The yellow circuit powers the doors on ENG 2.

The associated FADEC controls the thrust reverser system. Each FADEC channel performs control and monitoring functions. The systems for the two engines are independent of each other.

Continued on the next page

The thrust reverser system on each engine has :

- 4 actuators,
- 4 latches,
- Door position switches,
- A Hydraulic Control Unit (HCU) that :
 - Pressurizes the thrust reverser hydraulic system,
 - Regulates the speed of the blocker doors, and
 - Supplies actuators with hydraulic power.
- A hydraulic shutoff valve which allows hydraulic pressure to the HCU.

Each pivoting door moves independently (the doors are not synchronized).

The total actuation time is less than two seconds.

ACTUATION LOGIC

Applicable to: ALL

Deployment requires :

- One FADEC channel, operating with its associated throttle reverse signal ;
- Right and left main gear compressed signal from the corresponding LGCIUs ;
- A Thrust Lever Angle (TLA) reverse signals from at least one Spoiler Elevator Computer (SEC).

Before deployment is completed, the FADEC sets reverse idle thrust on the engine that is having its thrust reversed.

PROTECTION

Applicable to: ALL

- AUTO RESTOW FUNCTION

The FADEC will automatically command the reverse to stow, if at least one door is unstowed and reverse thrust is not selected while the engine is running.

Auto restow is totally inhibited in flight, and on ground, with N1 greater than 70 %.

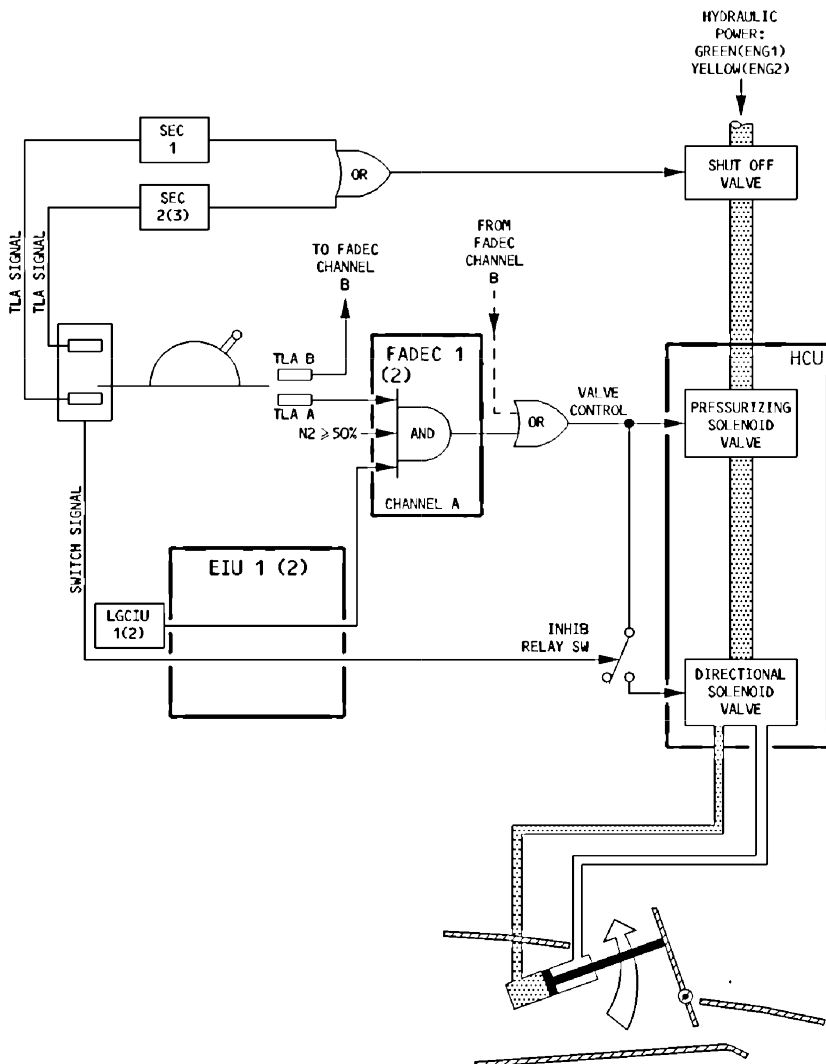
- IDLE PROTECTION

The FADEC will automatically select idle thrust if reverse thrust is not selected and :

- The four doors are detected unstowed, or
- At least one door is detected unstowed, and hydraulic pressure is detected in the HCU (downstream of the pressurizing valve), or
- The door position is indefinite, and hydraulic pressure is detected in the HCU (downstream of the pressurizing valve).

SCHEMATIC

Applicable to: ALL





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-70 – POWER PLANT
DSC-70-70 – THRUST REVERSER SYSTEM

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GENERAL**Applicable to: ALL**

The FADEC controls the ignition and starting system according to:

- the position of the engine start selector
- the position of the ENG MASTER sw
- the position of the ENG MAN START pb-sw
- the aircraft status (flight or ground).

The FADEC receives its inputs from the Engine Interface Unit (EIU).



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

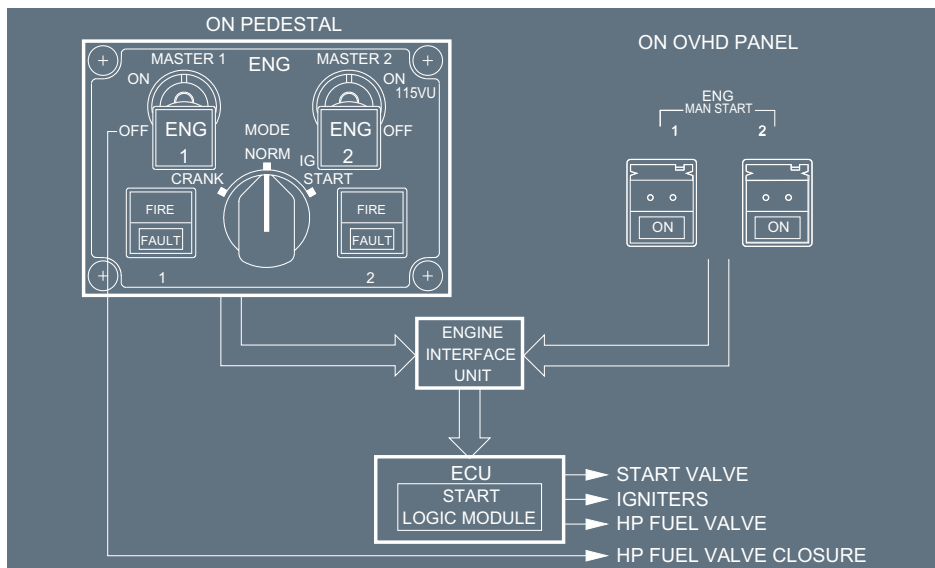
DSC-70-80 – Ignition and Starting

DSC-70-80-10 – General

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ARCHITECTURE

Applicable to: ALL





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

DSC-70-80 – Ignition and Starting

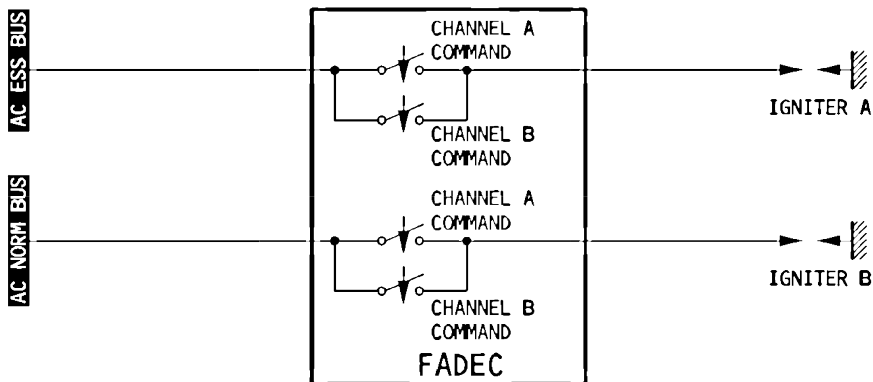
DSC-70-80-20 – Architecture

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GENERAL

Applicable to: ALL

The ignition system is for engine starting on the ground and restarting in flight. It consists of two identical independent circuits for each engine, normally controlled by the FADEC channel A and channel B. Each FADEC channel can control both igniters.



Note: Supply for igniter A switches to the STAT INV BUS BAR as soon as the static inverter is operative.

IGNITION FOR STARTING

Applicable to: ALL

ON THE GROUND

- Automatic start:
 - Only one igniter is supplied.
 - The FADEC automatically alternates the use of igniters for the engine start of the successive flights following the sequence below:
 - channel A, igniter A
 - channel B, igniter A
 - channel A, igniter B
 - channel B, igniter B
 - The ignition comes on automatically when N2 reaches 16 % and cuts off automatically when N2 reaches 50 %.

If the automatic start fails, the FADEC energizes both igniters at the same time during the second attempt at an engine start.
- Manual start:
 - Both igniters start firing when the ENG MASTER sw is set to ON.
 - Both igniters are cut off when N2 reaches approximately 50 %.

IN FLIGHT

Both igniters are supplied when the ENG MASTER sw is set to ON.

CONTINUOUS IGNITION

Applicable to: ALL

Continuous ignition may be selected either manually or automatically to maintain engine combustion.

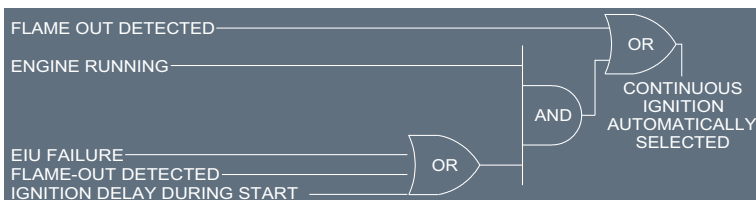
MANUAL SELECTION

In flight, continuous ignition is on when the ENG START selector is on IGN/START, if the corresponding engine is running.

Only one igniter is selected. If failed, both igniters are automatically selected.

On the ground after the engine is started, because ignition cuts off automatically, the flight crew must switch the ENG MODE selector to NORM then back to IGN/START to turn on continuous ignition.

AUTOMATIC SELECTION





A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

DSC-70-80 – Ignition and Starting

DSC-70-80-30 – Ignition System

Intentionally left blank

GENERAL

Applicable to: ALL

The engine starting system consists of an air turbine starter and a start valve.

The start valve admits air supplied by the pneumatic system to operate the starter.

The FADEC controls the start valve electrically. If electrical control fails when the aircraft is on the ground, a handle allows the start valve to be operated manually.

AUTOMATIC STARTING

Applicable to: ALL

This sequence is under the full authority of the FADEC, which controls:

- the start valve
- the igniters
- the fuel HP valves

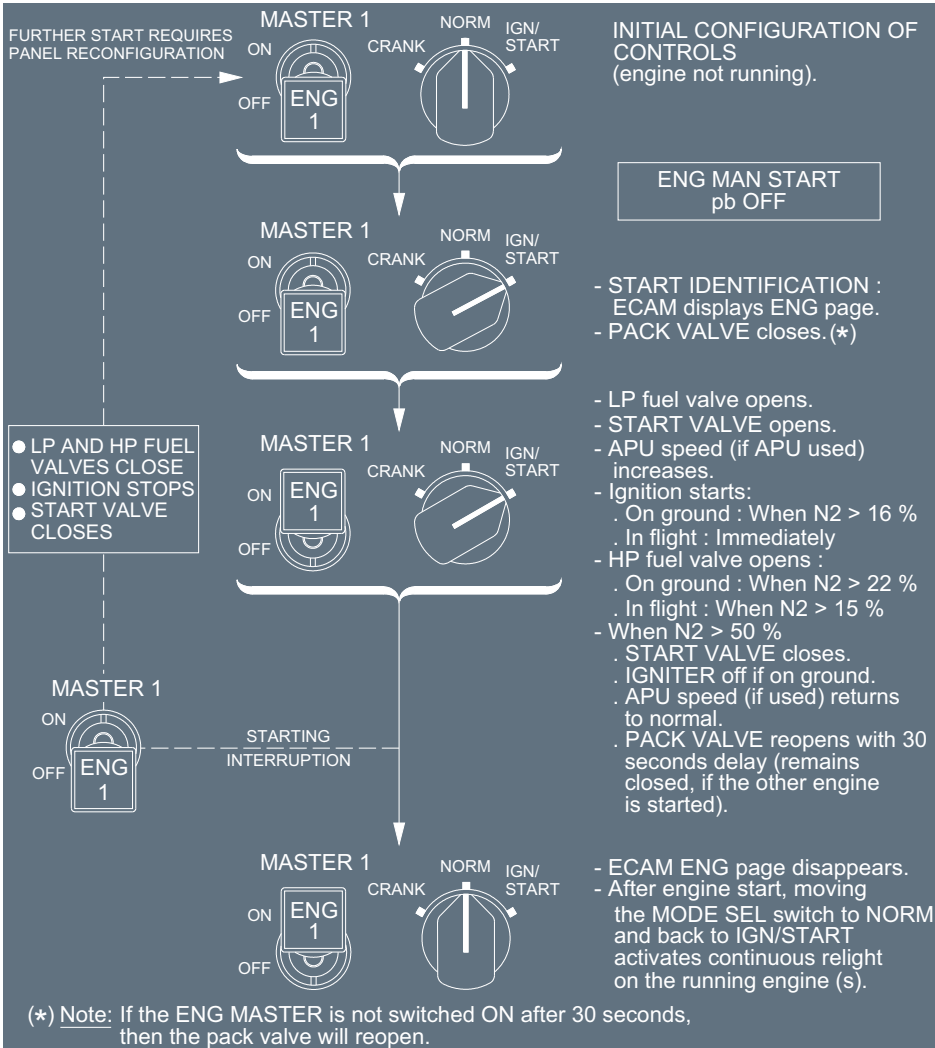
The FADEC:

- detects a hot start, a hung start, a stall, or no light up
- announces **FAULT** and identifies the fault in an ECAM message
- runs an abort sequence if a start aborts on the ground
 - closes the HP valve
 - closes the start valve
 - turns off ignition
 - cranks the engine crank after the start abort in order to clear out fuel vapors
 - controls any additional start attempts.

For an inflight start, the FADEC decides whether the engine is windmilling fast enough or needs assistance from the starter in view of current engine parameters and flight environment parameters. Flight crew may interrupt this start sequence by moving the MASTER switch to OFF.

AUTOMATIC STARTING SEQUENCE

Applicable to: ALL



MANUAL STARTING

Applicable to: ALL

The FADEC has limited authority over manual starting controlling :

- the opening of the start valve when the ENG MODE selector is set to IGN/START and the MAN START pushbutton switch is pressed.
- the position of the HP fuel valve and the operation of both igniters, when the master switch is turned ON
- the closing of the start valve at approximately 50 % N2, and, on the ground, the cutting off of ignition.

The FADEC makes a passive survey of the engine during the starting sequence : the flight crew is made aware of an abnormal start by a proper ECAM warning and has to interrupt the start sequence. The FADEC has not the authority to abort the manual start :

- in flight
- on ground, except if the start EGT limit is exceeded before reaching 50 % N2. In this case only, the FADEC aborts the start.

Flight crew may interrupt the starting sequence :

- before the MASTER switch is set to ON, by switching the MAN START pushbutton switch to OFF
- after the MASTER switch set to ON, by switching the MAN START pushbutton and the MASTER switch to OFF (flight crew must perform a dry cranking cycle).

In flight, the FADEC always commands a starter-assisted air start.

ENGINE VENTILATION (DRY CRANKING)

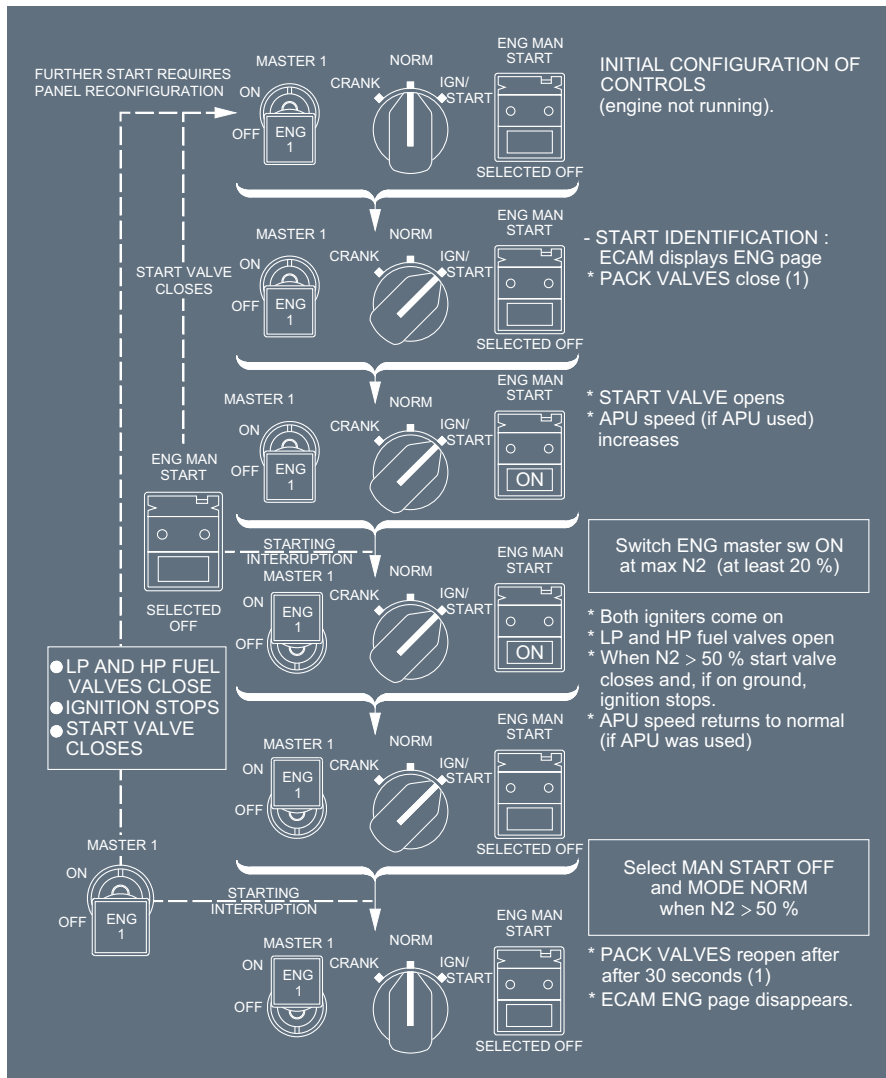
Applicable to: ALL

A dry cranking cycle ventilates the engine to remove fuel vapors after an unsuccessful start attempt on the ground.

The flight crew can manually select cranking by setting the ENG MODE selector to CRANK and the MAN START pushbutton switch to ON (MASTER switch OFF). Flight crew can stop the cranking by setting the MAN START pushbutton switch to OFF.

MANUAL STARTING SEQUENCE

Applicable to: ALL



Continued on the next page

(1) *Refer to DSC-21-10-20 PACK FLOW CONTROL VALVE*



A319/A320

FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

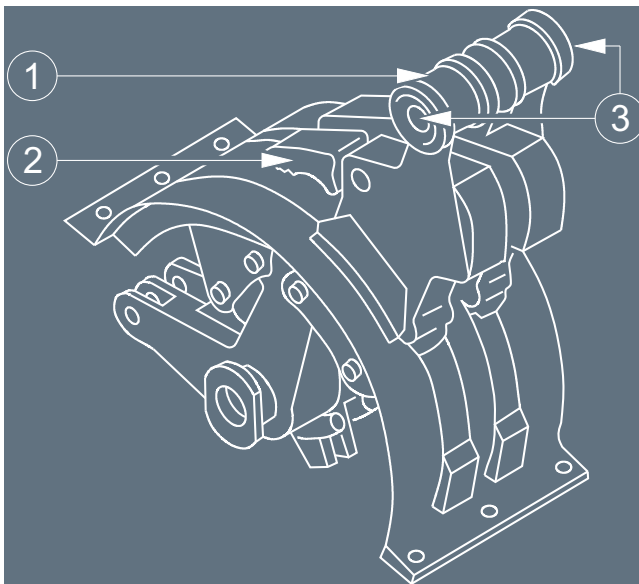
DSC-70-80 – Ignition and Starting

DSC-70-80-40 – Engine Starting System

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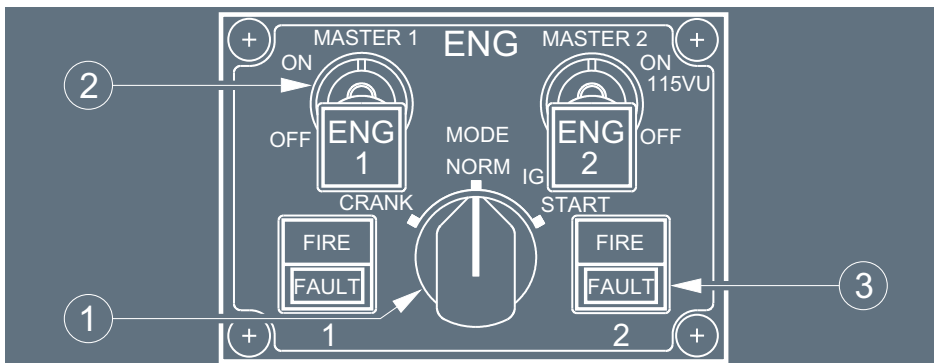
PEDESTAL

Applicable to: ALL



- (1) Thrust levers
(Refer to DSC-70-30-20 THRUST LEVERS).
- (2) Reverser latching levers
These permit the pilot to override the stop at the forward idle position to select reverse thrust. This stop resets when the pilot moves the lever back into the forward thrust area.
- (3) Autothrust instinctive disconnect pb
(Refer to DSC-22_30-90 A/THR Disconnection - General).

Continued on the next page



(1) ENG MODE selector

CRANK : The start valve opens, if the MAN START pb-sw is ON. Ignition does not fire.

NORM : This turns on continuous ignition (A and B) when the engine is running, and:

- A flame-out is detected, or
- An EIU fails.

IGN : If the MASTER sw is ON and $N_2 \geq \text{idle}$, this position selects continuous ignition (A and B):

- During an automatic start:
 - On ground, when N_2 passes 16 %, ignition switches to A or B. However, if there is an ignition delay during the start sequence, ignition is continuous (A and B)
 - In flight, continuous ignition (A and B) begins when the start sequence begins.
- During a manual start, ignition begins when the MASTER sw is turned ON.

The pack valve closes automatically during the start sequence. (*Refer to DSC-21-10-10 General*).

Note: On ground, ignition shuts off automatically at the end of the start sequence ($N_2 > 50 \%$).

Continued on the next page

(2) ENG 1 (2) MASTER sw

ON : LP fuel valve opens (if the ENG FIRE pb is in):

- During an automatic start, the HP fuel valve opens if:
 - The ENG MODE selector is at IGN/START.
 - N2 is above the following threshold:
 - 22 % on the ground
 - 15 % in flight
- During a manual start, the HP FUEL valve opens if:
 - The ENG MODE selector is at IGN/START.
 - The MAN START pb-sw is ON.

OFF: Close signals go directly to the HP fuel valve and the LP fuel valve. These signals cause both channels of the FADEC to be reset.

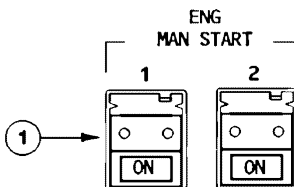
(3) ENG 1 (2) FAULT light

FAULT ligh: This amber light comes on, and a caution appears on ECAM, if there is:

- t
- an automatic start abort
 - a disagreement between the HP fuel valve position and its commanded position.

OVERHEAD PANEL

Applicable to: ALL



(1) ENG MAN START pb sw

ON : The start valve opens if the ENG MODE selector is set to CRANK or IGN/START and N2 < 20 %.

Both pack valves close during the start sequence.

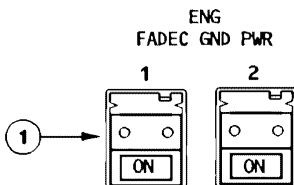
Note: The start valve closes automatically when $N2 \geq 50 \%$.

The blue ON light comes on.

Off : When the ENG MAN START pushbutton switch is set to OFF during a manual engine start, the start valve closes if the MASTER switch is OFF.

MAINTENANCE PANEL

Applicable to: ALL



(1) FADEC GND PWR pb sw

ON : FADEC has electrical power on the ground if the ENG FIRE pushbutton is not released.

ECAM

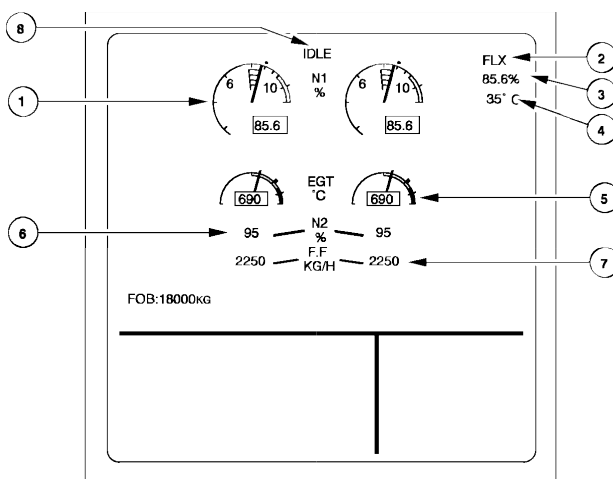
Applicable to: ALL

GENERAL

The ECAM's upper E/WD permanently displays the engines' primary parameters. The ECAM's lower SD displays the secondary parameters, either when they are automatically selected by the system, or manually selected by the flight crew.

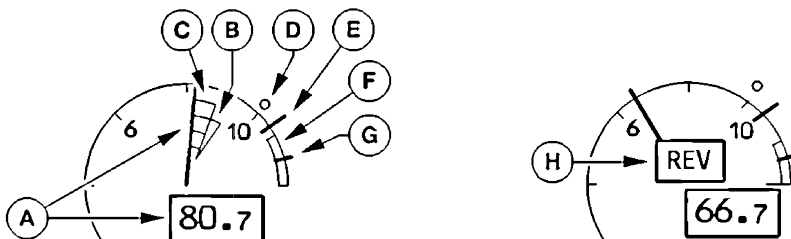
Applicable to: MSN 2037-3571

PRIMARY PARAMETER



Continued on the next page

(1) LP rotor speed (N1)



(A) Actual N1

The N1 needle and N1 digital indication are normally in green. They pulse in:

- Amber, when the actual N1 is above the N1 MAX (See (E));
- Red, when the actual N1 is above the N1 RED line (104 %).

When the N1 is degraded (in case both N1 sensors fail), the last digit of the digital display is dashed in amber.

(B) N1 Command (N1 trend)

The green needle corresponds to the N1 demanded by the FADEC. In addition, next to the N1 trend needle, a green triangle indicates the tendency of N1 command. These symbols are displayed when A/THR is active.

(C) Transient N1

Symbolizes the difference between the N1 command and the actual N1. It is only displayed when A/THR is active.

(D) N1 TLA (blue circle)

N1 corresponding to the thrust lever position.

(E) MAX N1

the MAX N1 amber index displays the N1 that the engine produces when the thrust levers are in full forward position or when MAX REVERSE is set.

(F) MAX permissible N1

This red arc, showing the prohibited or “redline” area of operation, begins at 104 %.

(G) N1 exceedance

if N1 exceeds 104 % during a flight, this red mark appears and remains at the highest N1 attained. It disappears after a new start on the ground or after maintenance action through the MCDU.

Continued on the next page

(H) REV

Appears in amber when any one blocker door is unstowed or unlocked.

It changes to green when all four blocker doors are fully deployed.

(If a door unlocks in flight the indication first flashes for 9 s seconds, then remains steady).

(2) Thrust limit mode

TOGA, FLX, CL, MCT, or MREV limit mode, selected by the position of whichever thrust lever is farther forward, is displayed in blue.

(3) N1 rating limit

It is computed by the FADEC for the present thrust lever angle, and is displayed in green.

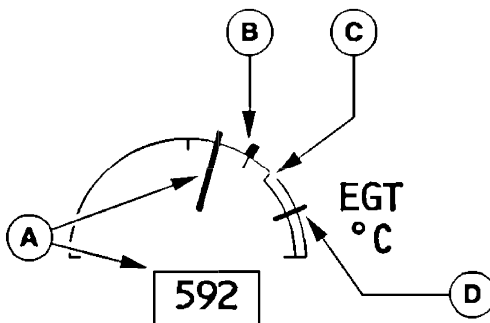
Note: When the aircraft is on ground with the engines running, the N1 rating limit displayed here corresponds to the TOGA thrust limit, regardless of the thrust lever position.

When the aircraft is on ground with the engines running and FLEX mode is selected, this number is the FLEX N1, regardless of the thrust lever position between idle and FLX/MCT.

(4) FLEX temperature

If FLX mode is selected, the flexible takeoff temperature selected through the MCDUs is displayed in blue.

(5) EGT indicator



(A) Actual EGT

- It is normally green.
- It pulses amber above 915 °C, except for high power operation (FLEX TO or thrust lever above MCT or at MAX REV, or activation of alpha floor).
- It pulses amber above 725 °C during start sequence.
- It pulses red above 950 °C, and the numerical value becomes red.

Continued on the next page

(B) MAX EGT

The amber index appears at 725 °C during engine start, then at 915 °C.

(C) MAX permissible EGT

The EGT red line is at 950 °C. Display shows red arc from 950 °C to the end of the scale.

(D) EGT exceedance

If the EGT goes over 950 °C, a red mark appears at its maximum value. It disappears after a new takeoff, or after a maintenance action through the MCDU.

(6) HP rotor speed N2

The numbers are normally green. (During start sequence, they are green on a grey background). When N2 is above 105 %, the indication turns red and a red cross appears next to it. When the N2 value is degraded (if both N2 sensors fail), the last digit is amber and is dashed.

(7) Fuel flow

These numbers are green.

Note: If the system detects a discrepancy between the N1, N2, EGT and fuel flow values on the FADEC-DMC bus and the corresponding displayed values, an amber CHECK appears underneath the affected parameter.

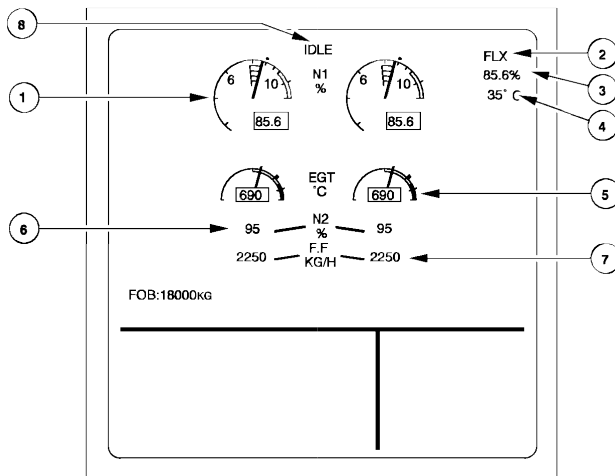
(8) IDLE indication

This legend appears in green when both engines are at idle. It flashes for 10 s, then remains steady.

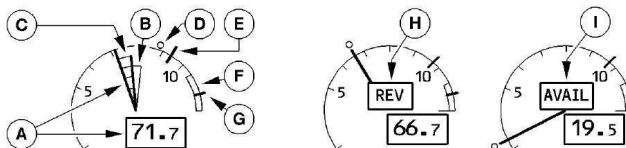
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Applicable to: MSN 3608-5319

PRIMARY PARAMETER



(1) LP rotor speed (N1)



(A) Actual N1

The N1 needle and N1 digital indication are normally in green. They pulse in:

- Amber, when the actual N1 is above the N1 MAX (See (E));
- Red, when the actual N1 is above the N1 RED line (104 %).

When the N1 is degraded (in case both N1 sensors fail), the last digit of the digital display is dashed in amber.

Continued on the next page

(B) N1 Command (N1 trend)

The green needle corresponds to the N1 demanded by the FADEC. In addition, next to the N1 trend needle, a green triangle indicates the tendency of N1 command. These symbols are displayed when A/THR is active.

(C) Transient N1

Symbolizes the difference between the N1 command and the actual N1. It is only displayed when A/THR is active.

(D) N1 TLA (blue circle)

N1 corresponding to the thrust lever position.

(E) MAX N1

the MAX N1 amber index displays the N1 that the engine produces when the thrust levers are in full forward position or when MAX REVERSE is set.

(F) MAX permissible N1

This red arc, showing the prohibited or “redline” area of operation, begins at 104 %.

(G) N1 exceedance

If N1 exceeds 104 % during a flight, this red mark appears and remains at the highest N1 attained. It disappears after a new start on the ground or after maintenance action through the MCDU.

(H) REV

Appears in amber when any one blocker door is unstowed or unlocked.

It changes to green when all four blocker doors are fully deployed.

(If a door unlocks in flight the indication first flashes for 9 s seconds, then remains steady).

(I) AVAIL indication

Displayed in green to indicate a successful engine start on ground. It pulses in green to indicate a successful engine relight in flight. It is triggered when the engine is at, or above, idle.

(2) Thrust limit mode

TOGA, FLX, CL, MCT, or MREV limit mode, selected by the position of whichever thrust lever is farther forward, is displayed in blue.

(3) N1 rating limit

It is computed by the FADEC for the present thrust lever angle, and is displayed in green.

Note: When the aircraft is on ground with the engines running, the N1 rating limit displayed here corresponds to the TOGA thrust limit, regardless of the thrust lever position.

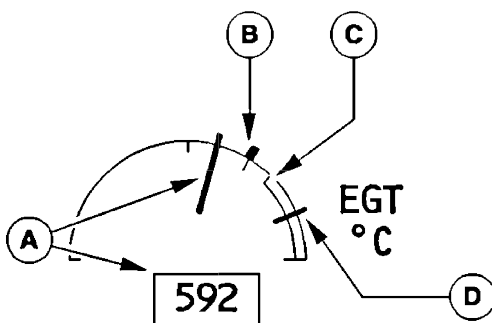
Continued on the next page

When the aircraft is on ground with the engines running and FLEX mode is selected, this number is the FLEX N1, regardless of the thrust lever position between idle and FLX/MCT.

(4) FLEX temperature

If FLX mode is selected, the flexible takeoff temperature selected through the MCDUs is displayed in blue.

(5) EGT indicator



(A) Actual EGT

- It is normally green.
- It pulses amber above 915 °C, except for high power operation (FLEX TO or thrust lever above MCT or at MAX REV, or activation of alpha floor).
- It pulses amber above 725 °C during start sequence.
- It pulses red above 950 °C, and the numerical value becomes red.

(B) MAX EGT

The amber index appears at 725 °C during engine start, then at 915 °C.

(C) MAX permissible EGT

The EGT red line is at 950 °C. Display shows red arc from 950 °C to the end of the scale.

(D) EGT exceedance

If the EGT goes over 950 °C, a red mark appears at its maximum value. It disappears after a new takeoff, or after a maintenance action through the MCDU.

(6) HP rotor speed N2

The numbers are normally green. (During start sequence, they are green on a grey background). When N2 is above 105 %, the indication turns red and a red cross appears next to it. When the N2 value is degraded (if both N2 sensors fail), the last digit is amber and is dashed.

Continued on the next page

(7) Fuel flow

These numbers are green.

Note: If the system detects a discrepancy between the N1, N2, EGT and fuel flow values on the FADEC-DMC bus and the corresponding displayed values, an amber CHECK appears underneath the affected parameter.

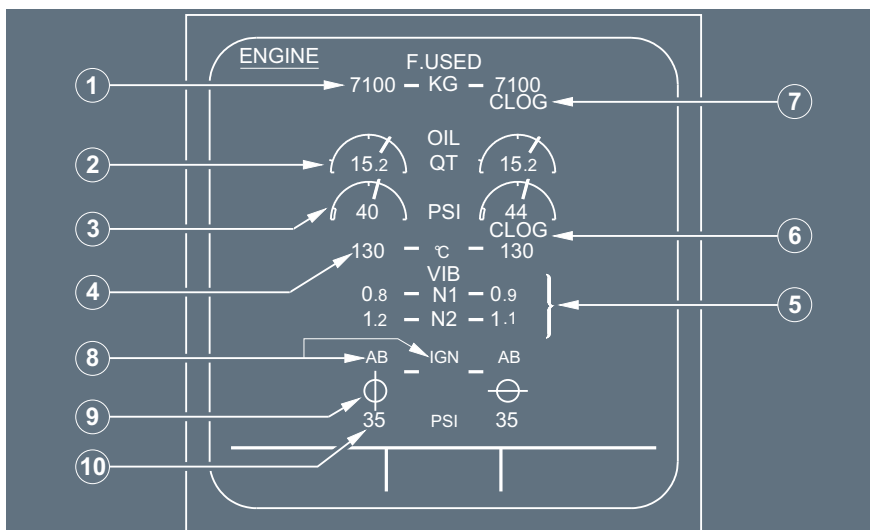
(8) IDLE indication

This legend appears in green when both engines are at idle. It flashes for 10 s, then remains steady.

Applicable to: ALL

SECONDARY PARAMETERS

START CONFIGURATION



(1) Fuel used

The green number is the fuel used as computed by the FADEC.

The green number resets, when the engine starts (MASTER switch ON) on the ground.

The green number is frozen at the last value (until the next engine start), when the engine shuts down. (The CRUISE SD PAGE also displays the last value).

The two last digits are dashed, if the fuel-used indication is inaccurate due to the loss of fuel flow data for more than 1 min.

Continued on the next page

(2) Oil quantity

The oil quantity indicators (needle and values) are green.

The indication pulses, when oil quantity decreases below three quarts or increases above five quarts.

(3) Oil pressure

The oil pressure indicators (needle and values) are green.

If the oil pressure:

- Exceeds 90 PSI, the indicators begin to pulse
The indicators stop pulsing, when the oil pressure goes below 85 PSI.
- Goes below 16 PSI, the indicators begin to pulse
The indicators stop pulsing, when the oil pressure returns above 20 PSI.
- Goes below 13 PSI, the indicators become red, and the ECAM displays the **ENG 1(2) OIL LO PR** alert.

(4) Oil temperature

The oil temperature values are green.

If the oil temperature:

- Exceeds 140 °C, the value begins to pulse
The value stops pulsing, when the oil temperature goes below 135 °C.
- Exceeds 140 °C for more than 15 min, the value becomes amber, and the ECAM displays the **ENG 1(2) OIL HI TEMP** alert
- Rapidly exceeds 155 °C, the value becomes amber, and the ECAM displays the **ENG 1(2) OIL HI TEMP** alert.

(5) VIB

The legend is green.

VIB N1 pulses above 6.

VIB N2 pulses above 4.3.

(These numbers also appear on the CRUISE SD PAGE).

(6) Oil filter clog

CLOG appears in amber, if there is an excessive pressure loss across the main oil scavenge filter.

(7) Fuel filter clog

CLOG appears in amber, if there is an excessive pressure loss across the fuel filter.

(8) Ignition

IGN appears in white during the start sequence.

The letters A, B, or AB appear in green, when the respective igniters are firing.

Continued on the next page

(9) Start valve position

In line – Green : The valve is fully open.

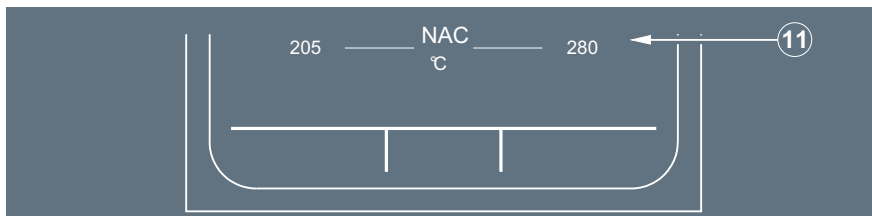
Crossline – Green : The valve is fully closed.

(10) Engine bleed pressure

The green numbers indicate the bleed pressure upstream of the precooler.

They become amber, when the pressure drops below 21 PSI with $N_2 \geq 10\%$, or if there is an overpressure.

AFTER START CONFIGURATION



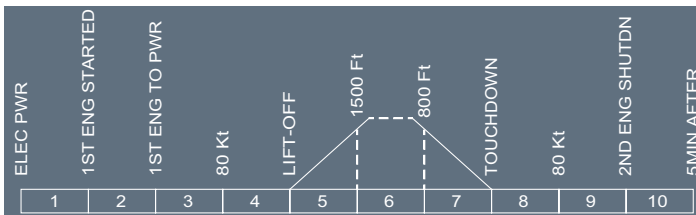
(11) Nacelle temperature

The values in green indicate the nacelle temperature. These values are displayed if not during start sequence, and if one nacelle temperature is at, or above, the advisory threshold (240 °C).

The nacelle temperature pulses in green at, or above, the advisory threshold.

WARNINGS AND CAUTIONS

Applicable to: MSN 3411



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG DUAL FAILURE	CRC	MASTER WARN	ENG	Associated with GEN FAULT Its and PACK FAULT It	NIL
ENG 1(2) OIL LO PR Oil low pressure triggered at 13 PSI by the oil pressure switch.				NIL	1, 10

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG STALL	SINGLE CHIME	MASTER CAUT	ENG	NIL	3, 4, 5, 7, 8
ENG 1(2) HP FUEL VALVE HP fuel valve failed closed.				Associated FAULT It on ENG panel on pedestal (exception case of starter time exceeded)	3, 4, 5, 6, 7, 8
ENG 1(2) START FAULT Start fault due to: - No light up, or - ENG stall or over TEMP (above 725 °C), or - Starter time exceeded - Low start air PRESS					
ENG 1(2) START VALVE FAULT Position disagree.					3, 4, 5, 7, 8
ENG 1(2) THR LEVER DISAGREE Disagree between both resolvers of a thrust lever.				NIL	4, 5, 8
ENG 1(2) OIL HI TEMP Oil TEMP between 140 and 155 °C for more than 15 min, or oil TEMP above 155 °C.					4, 5, 7, 8
ENG 1(2) FADEC FAULT Both channels failed.					4, 5, 6, 7, 8, 9, 10
ENG 1(2) LOW N1 No N1 rotation during start.					1, 2, 3, 4, 8, 9, 10
ENG THRUST LOCKED Thrust levers are not moved within 5 s, following an involuntary disconnection of the A/THR (or disconnection through the FCU pb).	SINGLE CHIME every 5 s	MASTER CAUT every 5 s	NIL	NIL	1, 4, 5, 6, 7, 8, 10
ENG FLEX TEMP NOT SET Flex TEMP has not been entered on the MCDU.	SINGLE CHIME	MASTER CAUT	NIL		

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) FADEC HI TEMP	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
ENG TYPE DISAGREE Rating discrepancy between the two engines.					3 to 10
ENG 1(2) THR LEVER FAULT Both resolvers on one thrust lever have failed.					5
ENG 1(2) FAIL ENG core speed below idle, with master sw ON and fire pb not pushed.					1, 10
ENG 1(2) SHUT DOWN ENG master at off in phases 3 to 8, or ENG FIRE pb pushed in phases 1, 2, 9 and 10.					4, 8 (⁽¹⁾)
ENG 1(2) REVERSE UNLOCKED One or more reverser doors not locked in stowed position in flight, or on ground with no deploy order.					4, 5, 8
ENG 1(2) REV PRESSURIZED Reverser system is pressurized, while rev doors are stowed and locked with no deploy order.					4, 5, 7, 8
ENG 1(2) COMPRESSOR VANE Variable bleed valve SYS or variable stator vane SYS fault.					4, 8
ENG 1(2) N1 or N2 or EGT OVER LIMIT N1 above 104 % N2 above 105.0 % EGT above 950 °C					3, 4, 5, 7, 8
ENG 1(2) IGN A + B FAULT Both ignition circuits are failed.					

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) CTL VALVE FAULT Burn stag valve failure or HPTC, or RAC system failure.	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 5, 7, 8
ENG 1(2) FUEL CTL FAULT Fuel metering valve position disagree.					
ENG 1(2) SENSOR FAULT PS3 or T25 or T3 or N1 or N2 data unavailable on both channels.					
ENG 1(2) PROBES FAULT T12 or PO PT 2 data unavailable on both channels.					3, 4, 5, 8
ENG 1(2) N1 (N2, EGT, FF) DISCREPANCY Discrepancy between real and displayed values.					
ENG 1(2) BLEED STATUS FAULT Bleed, X Bleed, pack, anti-ice valve position status not received by FADEC active channel.					
ENG 1(2) FUEL FILTER CLOG	NIL	NIL	ENG	NIL	4, 5, 7, 8
ENG 1(2) OIL FILTER CLOG			NIL		3, 4, 5, 6, 7, 8, 9
ENG VIB SYS FAULT Failure of vibration detection system.					
ENG 1(2) OVSPD PROT FAULT Loss of overspeed protection.					
ENG 1(2) IGN A(B) FAULT Ignition circuit A or B failed.	NIL	NIL	NIL	NIL	3, 4, 5, 6, 7, 8
ENG 1(2) FADEC ALTERNATOR Loss of electrical auto supply of either FADEC channel.					
ENG COMPRESSOR VANE Engine 1 and 2 VBV or VSV fault.					
ENG 1(2) FUEL RETURN VALVE Fuel return valve is failed in the not open, or not closed position.					

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) FADEC A(B) FAULT One FADEC channel failed.	NIL	NIL	NIL	NIL	4, 5, 7, 8
ENG 1(2) EIU FAULT Data bus between EIU and ECU failed.					1, 3, 4, 5, 7, 8, 10
ENG 1(2) REVERSER FAULT Loss of thrust reverser on one engine due to system components or input faults					3, 4, 5
ENG 1(2) REV ISOL FAULT	SC	CAUT			3 to 7
ENG 1(2) REV SWITCH FAULT Failure of reverser permission switch	NIL	NIL			3, 4, 5, 6, 7, 8
ENG REV SET Reverse thrust has been selected in flight.					1 to 4 8 to 10
ENG 1(2) ONE TLA FAULT					3, 4, 5, 6, 7, 8

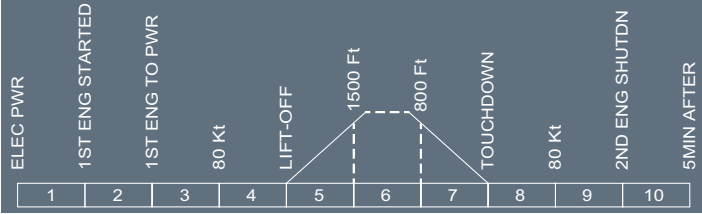
(1) Alert not inhibited in the flight phases 4, if the engine thrust is automatically set to idle.

MEMO DISPLAY

IGNITION appears in green, when continuous ignition is activated on either engine.

WARNINGS AND CAUTIONS

Applicable to: MSN 3413-4006



Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG DUAL FAILURE	CRC	MASTER WARN	ENG	Associated with GEN FAULT Its and PACK FAULT It	NIL
ENG 1(2) OIL LO PR Oil low pressure triggered at 13 PSI by the oil pressure switch.			NIL	NIL	1, 10
ENG 1(2) THR LEVER ABV IDLE One thrust lever is above idle while the other thrust lever is in the reverse detent at landing.					1, 2, 3, 4, 5, 6, 7, 10
ENG STALL	SINGLE CHIME	MASTER CAUT	ENG	Associated FAULT It on ENG panel on pedestal (exception case of starter time exceeded)	3, 4, 5, 7, 8
ENG 1(2) HP FUEL VALVE HP fuel valve failed closed.					3, 4, 5, 6, 7, 8
ENG 1(2) START FAULT Start fault due to: - No light up, or - ENG stall or over TEMP (above 725 °C), or - Starter time exceeded - Thrust lever not at idle - Low start air PRESS				NIL	3, 4, 5, 6, 7, 8
ENG 1(2) START VALVE FAULT Position disagree.					3, 4, 5, 7, 8
ENG 1(2) THR LEVER DISAGREE Disagree between both resolvers of a thrust lever.					4, 5, 8

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) OIL HI TEMP Oil TEMP between 140 and 155 °C for more than 15 min, or oil TEMP above 155 °C.	SINGLE CHIME	MASTER CAUT	ENG	NIL	4, 5, 7, 8
ENG 1(2) FADEC FAULT Both channels failed.					
ENG 1(2) LOW N1 No N1 rotation during start.					4, 5, 6, 7, 8, 9, 10
ENG THRUST LOCKED Thrust levers are not moved within 5 s, following an involuntary disconnection of the A/THR (or disconnection through the FCU pb).	SINGLE CHIME every 5 s	MASTER CAUT every 5 s	NIL		1, 2, 3, 4, 8, 9, 10
ENG THR LEVERS NOT SET The levers position does not correspond to T.O power mode.	SINGLE CHIME	MASTER CAUT			1, 4, 5, 6, 7, 8, 10
ENG 1(2) FADEC HI TEMP	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
ENG TYPE DISAGREE Rating discrepancy between the two engines.					3 to 10
ENG 1(2) THR LEVER FAULT Both resolvers on one thrust lever have failed.					
ENG 1(2) FAIL ENG core speed below idle, with master sw ON and fire pb not pushed.					1, 10
ENG 1(2) SHUT DOWN ENG master at off in phases 3 to 8, or ENG FIRE pb pushed in phases 1, 2, 9 and 10.					
ENG 1(2) REVERSE UNLOCKED One or more reverser doors not locked in stowed position in flight, or on ground with no deploy order.					

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) REV PRESSURIZED Reverser system is pressurized, while rev doors are stowed and locked with no deploy order.	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 5, 8
ENG 1(2) COMPRESSOR VANE Variable bleed valve SYS or variable stator vane SYS fault.					4, 5, 7, 8
ENG 1(2) N1 or N2 or EGT OVER LIMIT N1 above 104 % N2 above 105.0 % EGT above 950 °C					4, 8
ENG 1(2) IGN A + B FAULT Both ignition circuits are failed.					3, 4, 5, 7, 8
ENG 1(2) CTL VALVE FAULT Burn stag valve failure or HPTC, or RAC system failure.					4, 5, 7, 8
ENG 1(2) FUEL CTL FAULT Fuel metering valve position disagree.					
ENG 1(2) SENSOR FAULT PS3 or T25 or T3 or N1 or N2 data unavailable on both channels.					
ENG 1(2) PROBES FAULT T12 or PO PT 2 data unavailable on both channels.					
ENG 1(2) N1 (N2, EGT, FF) DISCREPANCY Discrepancy between real and displayed values.					3, 4, 5, 8
ENG 1(2) BLEED STATUS FAULT Bleed, X Bleed, pack, anti-ice valve position status not received by FADEC active channel.					3, 4, 5, 7, 8
ENG 1(2) FUEL FILTER CLOG	NIL	NIL	ENG		3, 4, 5, 7, 8
ENG 1(2) OIL FILTER CLOG					

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG VIB SYS FAULT Failure of vibration detection system.	NIL	NIL	NIL	NIL	3, 4, 5, 6, 7, 8, 9
ENG 1(2) OVSPD PROT FAULT Loss of overspeed protection.					3, 4, 5, 7, 8
ENG 1(2) IGN A(B) FAULT Ignition circuit A or B failed.	NIL	NIL	NIL	NIL	3, 4, 5, 6, 7, 8
ENG 1(2) FADEC ALTERNATOR Loss of electrical auto supply of either FADEC channel.					3, 4, 5, 7, 8
ENG COMPRESSOR VANE Engine 1 and 2 VBV or VSV fault.					
ENG 1(2) FUEL RETURN VALVE Fuel return valve is failed in the not open, or not closed position.					
ENG 1(2) FADEC A(B) FAULT One FADEC channel failed.					4, 5, 7, 8
ENG 1(2) EIU FAULT Data bus between EIU and ECU failed.					1, 3, 4, 5, 7, 8, 10
ENG 1(2) REVERSER FAULT Loss of thrust reverser on one engine, due to system components or input faults.					3, 4, 5
ENG 1(2) REV ISOL FAULT					3 to 7
ENG 1(2) REV SWITCH FAULT Failure of reverser permission switch.					3, 4, 5, 6, 7, 8
ENG REV SET Reverse thrust has been selected in flight.					1 to 4 8 to 10
ENG 1(2) ONE TLA FAULT					3, 4, 5, 6, 7, 8

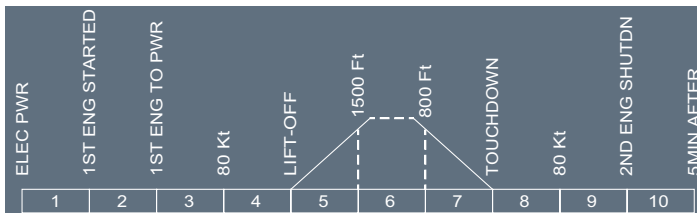
(1) Alert not inhibited in the flight phases 4, if the engine thrust is automatically set to idle.

MEMO DISPLAY

IGNITION appears in green, when continuous ignition is activated on either engine.

WARNINGS AND CAUTIONS

Applicable to: MSN 2037-3184, 4012-5319



E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG DUAL FAILURE	CRC	MASTER WARN	ENG	Associated with GEN FAULT Its and PACK FAULT It	NIL
ENG 1(2) OIL LO PR Oil low pressure triggered at 13 PSI by the oil pressure switch.				NIL	1, 10
ENG 1(2) THR LEVER ABV IDLE - One thrust lever is above idle while the other thrust lever is in the reverse detent at landing. - One thrust lever is above idle while the other thrust lever is at idle, at reverser deselection during landing roll.	RETARD		NIL		1, 2, 3, 4, 5, 6, 7, 10
ENG STALL	SINGLE CHIME	MASTER CAUT		ENG	Associated FAULT It on ENG panel on pedestal (exception case of starter time exceeded)
ENG 1(2) HP FUEL VALVE HP fuel valve failed closed.					

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) START FAULT Start fault due to: - No light up, or - ENG stall or over TEMP (above 725 °C), or - Starter time exceeded - Thrust lever not at idle - Low start air PRESS	SINGLE CHIME	MASTER CAUT	ENG	Associated FAULT It on ENG panel on pedestal (exception case of starter time exceeded)	3, 4, 5, 6, 7, 8
ENG 1(2) START VALVE FAULT Position disagree.					3, 4, 5, 7, 8
ENG 1(2) OIL HI TEMP Oil TEMP between 140 and 155 °C for more than 15 min, or oil TEMP above 155 °C.				NIL	4, 5, 7, 8
ENG 1(2) FADEC FAULT Both channels failed.					4, 5, 6, 7, 8, 9, 10
ENG 1(2) LOW N1 No N1 rotation during start.					1, 2, 3, 4, 8, 9, 10
ENG THRUST LOCKED Thrust levers are not moved within 5 s, following an involuntary disconnection of the A/THR (or disconnection through the FCU pb).	SINGLE CHIME every 5 s	MASTER CAUT every 5 s	NIL		1, 4, 5, 6, 7, 8, 10
ENG THR LEVERS NOT SET The levers position does not correspond to T.O power mode.	SINGLE CHIME	MASTER CAUT			3, 4, 5, 7, 8
ENG 1(2) FADEC HI TEMP	SINGLE CHIME	MASTER CAUT	NIL	NIL	3 to 10
ENG TYPE DISAGREE Rating discrepancy between the two engines.			ENG		4, 5 (⁽¹⁾)
ENG 1(2) THR LEVER DISAGREE Disagree between both resolvers of a thrust lever					

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) THR LEVER FAULT Both resolvers on one thrust lever have failed.	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 5((1))
ENG 1(2) FAIL ENG core speed below idle, with master sw ON and fire pb not pushed.					1, 10
ENG 1(2) SHUT DOWN ENG master at off in phases 3 to 8, or ENG FIRE pb pushed in phases 1, 2, 9 and 10.					4, 8 (²)
ENG 1(2) REVERSE UNLOCKED One or more reverser doors not locked in stowed position in flight, or on ground with no deploy order.					4, 5, 8
ENG 1(2) REV PRESSURIZED Reverser system is pressurized, while rev doors are stowed and locked with no deploy order.					4, 5, 7, 8
ENG 1(2) COMPRESSOR VANE Variable bleed valve SYS or variable stator vane SYS fault.					4, 8
ENG 1(2) N1 or N2 or EGT OVER LIMIT N1 above 104 % N2 above 105.0 % EGT above 950 °C					3, 4, 5, 7, 8
ENG 1(2) IGN A + B FAULT Both ignition circuits are failed.					4, 5, 7, 8
ENG 1(2) CTL VALVE FAULT Burn stag valve failure or HPTC, or RAC system failure.					
ENG 1(2) FUEL CTL FAULT Fuel metering valve position disagree.					
ENG 1(2) SENSOR FAULT PS3 or T25 or T3 or N1 or N2 data unavailable on both channels.					

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) PROBES FAULT T12 or PO PT 2 data unavailable on both channels.	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 5, 7, 8
ENG 1(2) N1 (N2, EGT, FF) DISCREPANCY Discrepancy between real and displayed values.					3, 4, 5, 8
ENG 1(2) BLEED STATUS FAULT Bleed, X Bleed, pack, anti-ice valve position status not received by FADEC active channel.					3, 4, 5, 7, 8
ENG 1(2) FUEL FILTER CLOG	NIL	NIL	ENG	NIL	3, 4, 5, 7, 8
ENG 1(2) OIL FILTER CLOG			NIL		3, 4, 5, 6, 7, 8, 9
ENG VIB SYS FAULT Failure of vibration detection system.					3, 4, 5, 7, 8
ENG 1(2) OVSPD PROT FAULT Loss of overspeed protection.					
ENG 1(2) IGN A(B) FAULT Ignition circuit A or B failed.	NIL	NIL	NIL	NIL	3, 4, 5, 6, 7, 8
ENG 1(2) FADEC ALTERNATOR Loss of electrical auto supply of either FADEC channel.					3, 4, 5, 7, 8
ENG COMPRESSOR VANE Engine 1 and 2 VBV or VSV fault.					
ENG 1(2) FUEL RETURN VALVE Fuel return valve is failed in the not open, or not closed position.					
ENG 1(2) FADEC A(B) FAULT One FADEC channel failed.					4, 5, 7, 8
ENG 1(2) EIU FAULT Data bus between EIU and ECU failed.					1, 3, 4, 5, 7, 8, 10
ENG 1(2) REVERSER FAULT Loss of thrust reverser on one engine, due to system components or input faults.					3, 4, 5

Continued on the next page

E/WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ENG 1(2) REV ISOL FAULT	SC	CAUT	NIL	NIL	3 to 7
ENG 1(2) REV SWITCH FAULT Failure of reverser permission switch.	NIL	NIL			3, 4, 5, 6, 7, 8
ENG REV SET Reverse thrust has been selected in flight.					1 to 4 8 to 10
ENG 1(2) ONE TLA FAULT					3, 4, 5, 6, 7, 8

- (1) Alert not inhibited in the flight phases 4 and 5, if the FADEC automatically selects IDLE thrust.
- (2) Alert not inhibited in the flight phase 4, if the engine thrust is automatically set to idle.

MEMO DISPLAY

IGNITION appears in green, when continuous ignition is activated on either engine.



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS

DSC-70 – POWER PLANT

DSC-70-90 – Controls and Indicators (CFM)

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ELECTRICAL SUPPLY

Applicable to: ALL

			NORM		EMER ELEC		
			AC	DC	AC ESS	DC ESS	HOT
FADEC	CHANNEL A	ENG 1 and 2				X	
	CHANNEL B	ENG 1		BAT			
		ENG 2		DC2			
EIU		ENG 1		BAT		X	
		ENG 2				X	
HP VALVES						X	
LP VALVES				DC2		X	
OIL PRESS/QTY		ENG 1		DC1			
		ENG 2		DC2			
IGNITION	A	ENG 1 and 2	AC ESS		AC ESS or AC STAT INV during RAT extension		
	B	ENG 1	AC1				
		ENG 2	AC2				
EVMU		ENG 1 and 2	AC1				



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FLIGHT CREW OPERATING MANUAL

DSC – AIRCRAFT SYSTEMS
DSC-70 – POWER PLANT
DSC-70-98 – ELECTRICAL SUPPLY

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