


AIRCRAFT SYSTEMS

ICE AND RAIN PROTECTION

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 <p>A318/A319/A320/A321 FLIGHT CREW OPERATING MANUAL</p>	<p>AIRCRAFT SYSTEMS</p> <p>ICE AND RAIN PROTECTION</p> <p>PRELIMINARY PAGES - TABLE OF CONTENTS</p>
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Localization Title	Toc Index	ID	Reason
DSC-30-20-20 OVERHEAD PANEL	A	1	Documentation update: Deletion of information.
			Documentation update: Information "N.00001158.0001001.006" moved from "N.00001158.0001001.003" to "N.00001158.0001001.023"
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			Documentation update: Information "N.00001162.0001001.009" moved from "N.00001162.0004001.003" to "N.00001162.0004001.006"
			Documentation update: Information "N.00001162.0001001.012" moved from "N.00001162.0004001.003" to "N.00001162.0004001.006"
			Documentation update: Information "N.00001162.0003001.005" moved from "N.00001162.0004001.003" to "N.00001162.0004001.006"
DSC-30-50-30 Warnings and Cautions	A	1	Documentation update: Deletion of information.
DSC-30-60-20 OVERHEAD PANEL	A	1	Administrative update: No technical change.
DSC-30-60-20 REAR COCKPIT	B	2	Administrative update: No technical change.
DSC-30-70-10 VISUAL ICE INDICATOR	A	1	Administrative update: No technical change.



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AIRCRAFT SYSTEMS
ICE AND RAIN PROTECTION
GENERAL - DESCRIPTION

GENERAL

Applicable to: ALL

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

ANTI-ICING

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.

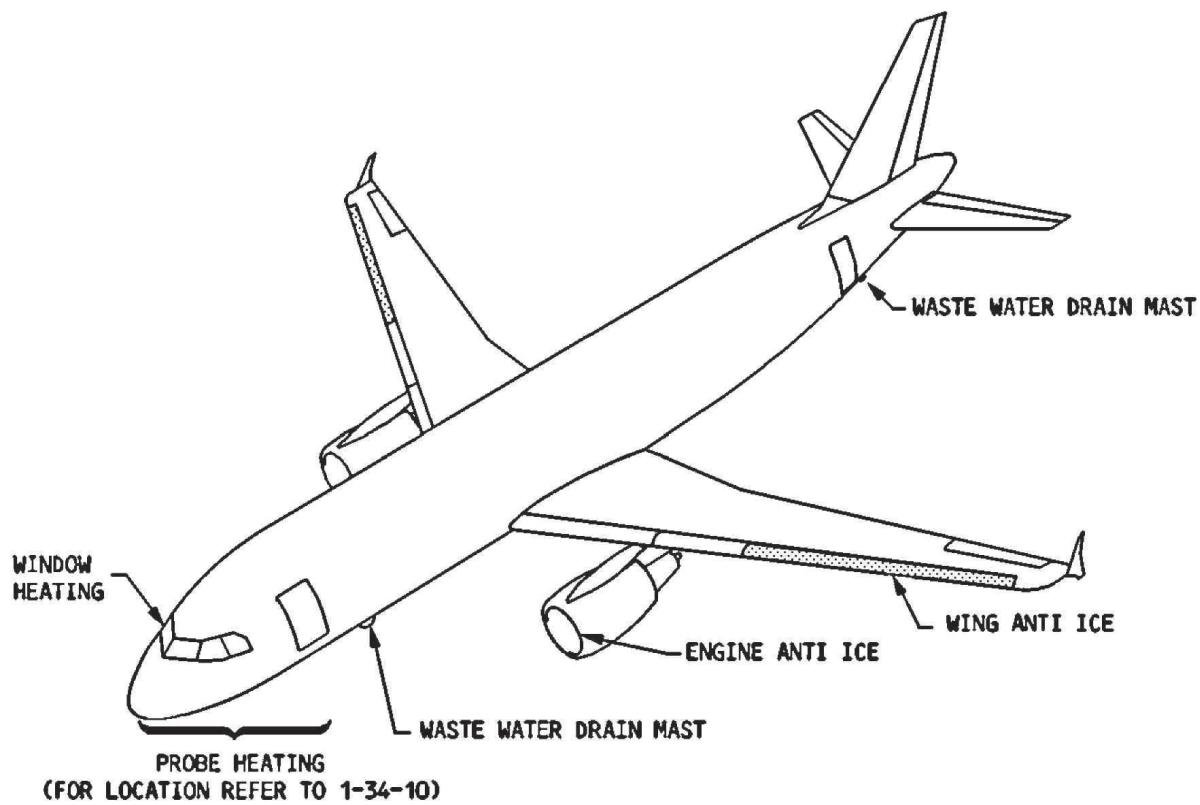
ELECTRICAL HEATING

- flight compartment windows.
- sensors, pitot probes and static ports.
- waste-water drain mast.

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.

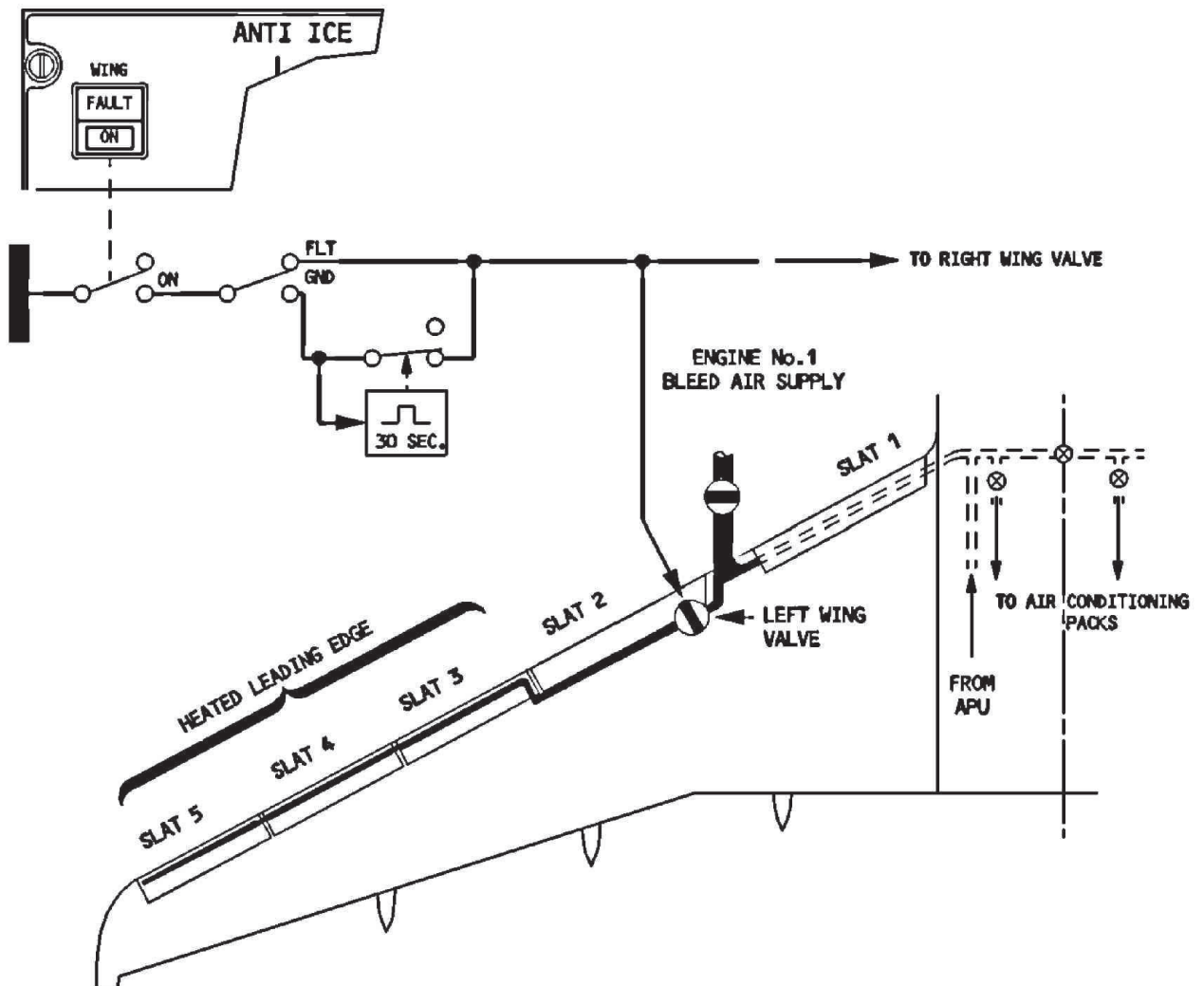
The WING pushbutton on the ANTI ICE panel controls the valves.

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.





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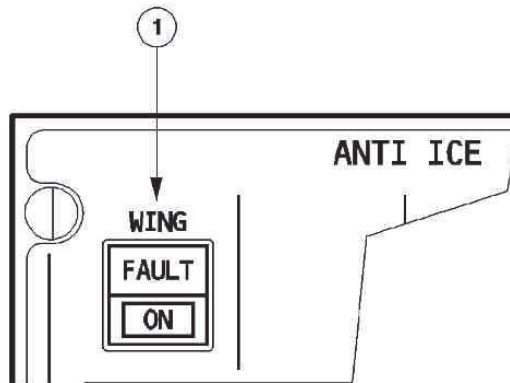
ICE AND RAIN PROTECTION

WING ANTI-ICE - DESCRIPTION

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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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WING ANTI-ICE - CONTROLS AND INDICATORS

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 A318/A319/A320/A321 FLIGHT CREW OPERATING MANUAL	AIRCRAFT SYSTEMS ICE AND RAIN PROTECTION WING ANTI-ICE - WARNINGS AND CAUTIONS
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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 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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WING ANTI-ICE - WARNINGS AND CAUTIONS

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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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WING ANTI-ICE - ELECTRICAL SUPPLY

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DESCRIPTION

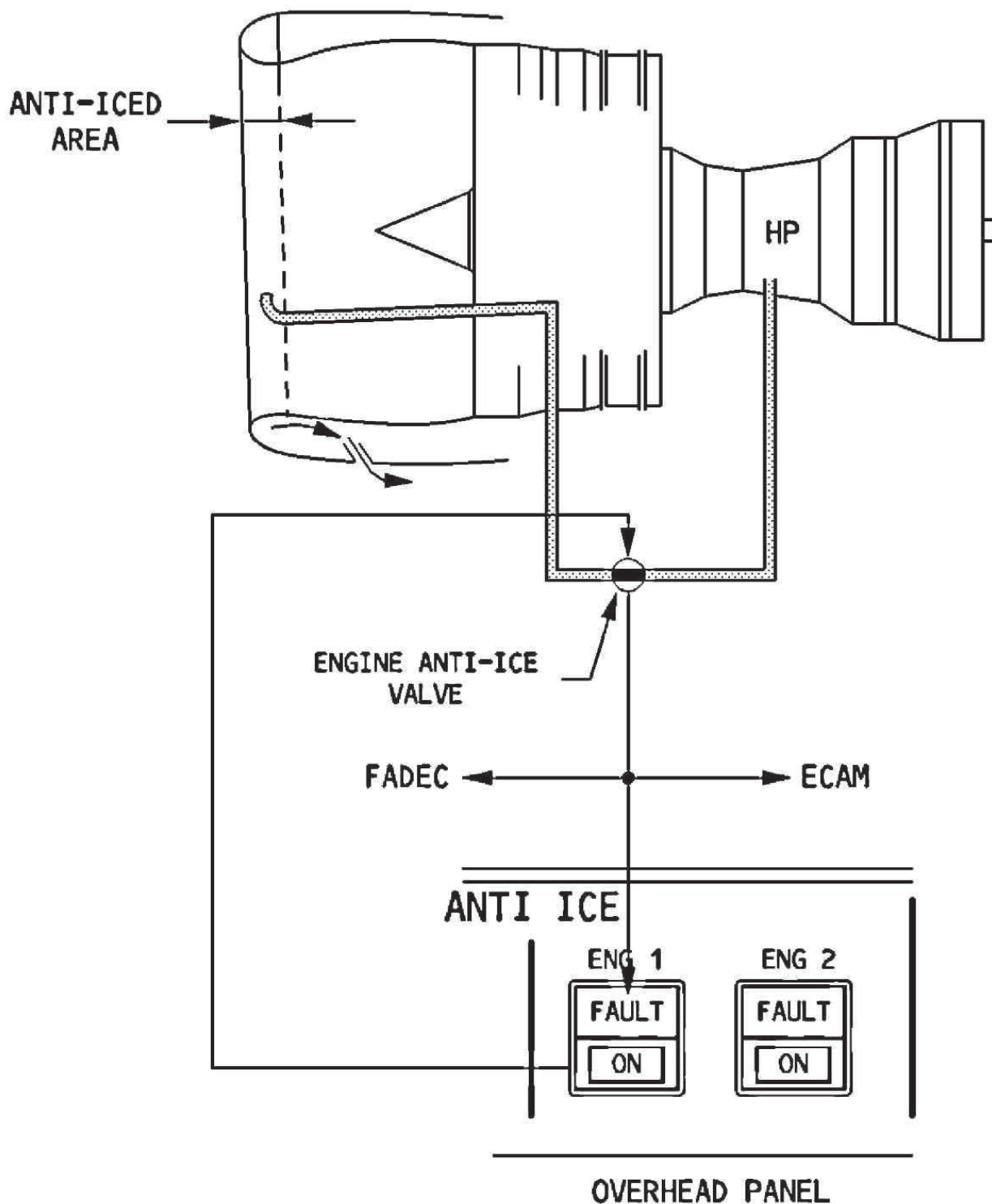
Applicable to: ALL

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).

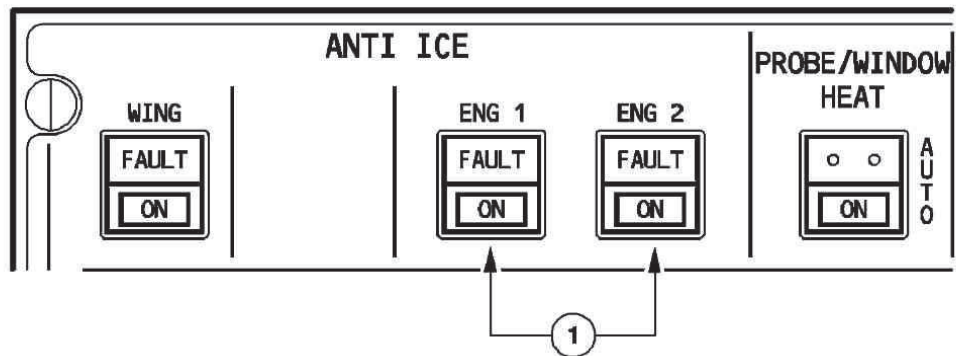
When an engine anti-ice valve is open, the N1 limit is automatically reduced and, if necessary, the idle N1 is automatically increased for both engines in order to provide the required pressure.

If electrical power fails, the valves open.



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.




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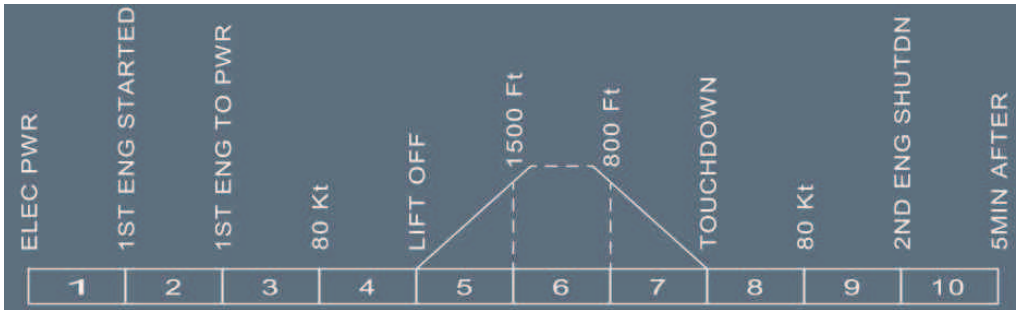
ENGINE ANTI-ICE - CONTROLS AND INDICATORS

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WARNINGS AND CAUTIONS

Applicable to: ALL



E/WD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLTPHASE 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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ENGINE ANTI-ICE - WARNINGS AND CAUTIONS

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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			



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ENGINE ANTI-ICE - 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.

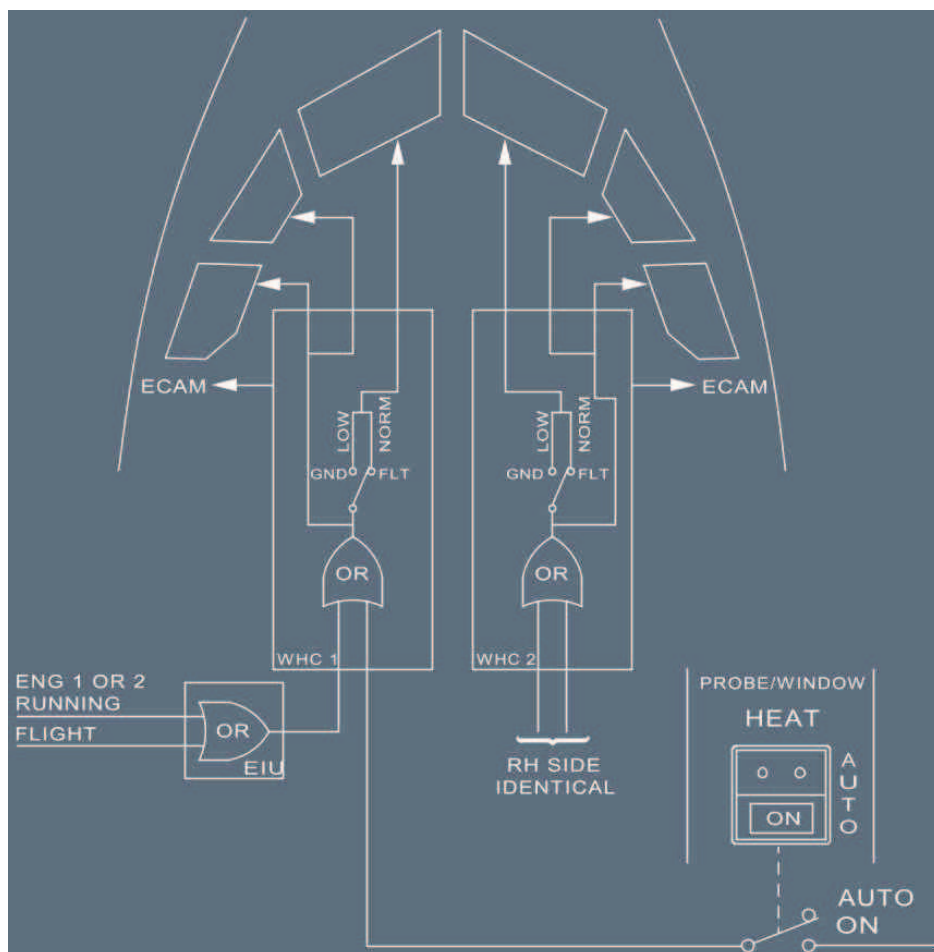
Two independent Window Heat Computers (WHCs), one on each side, automatically regulate the system, protect it against overheating, and indicate faults.

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.






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WINDOW HEAT - DESCRIPTION

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OVERHEAD PANEL

Applicable to: ALL

Refer to DSC-30-50-20 Overhead Panel




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WINDOW HEAT - 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 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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WINDOW HEAT - WARNINGS AND CAUTIONS

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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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WINDOW HEAT - ELECTRICAL SUPPLY

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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 :

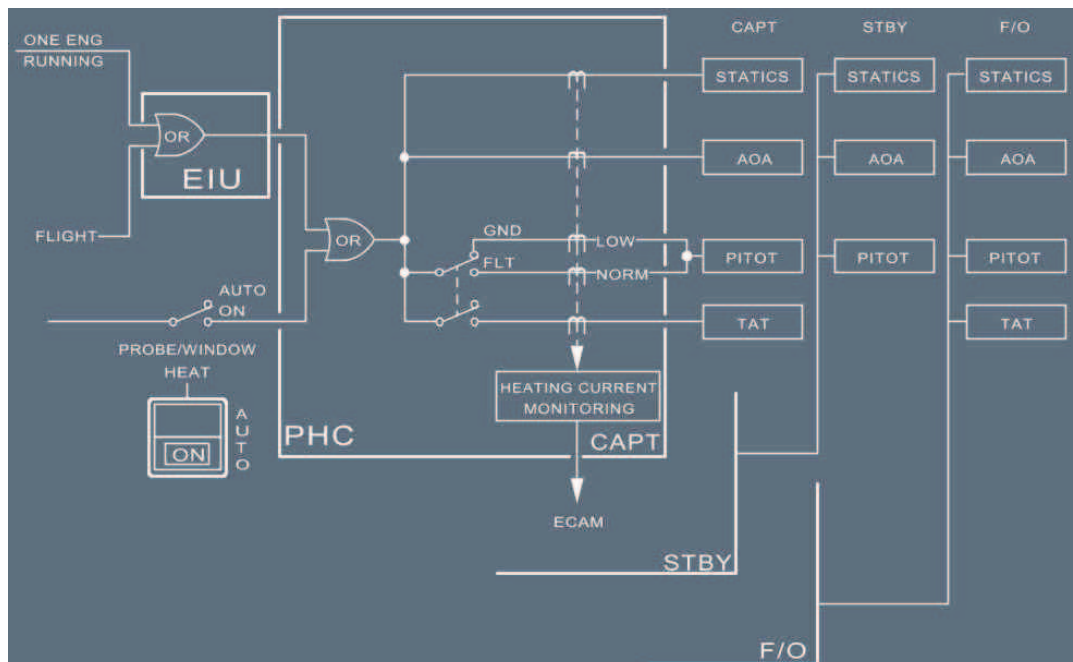
- Captain probes
- F/O probes
- STBY probes.

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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PROBES HEAT - DESCRIPTION

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OPERATING MANUAL

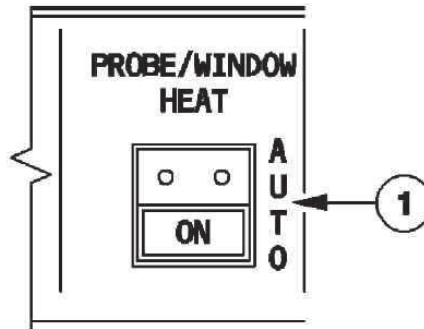
AIRCRAFT SYSTEMS

ICE AND RAIN PROTECTION

PROBES HEAT - CONTROLS AND INDICATORS

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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PROBES HEAT - CONTROLS AND INDICATORS

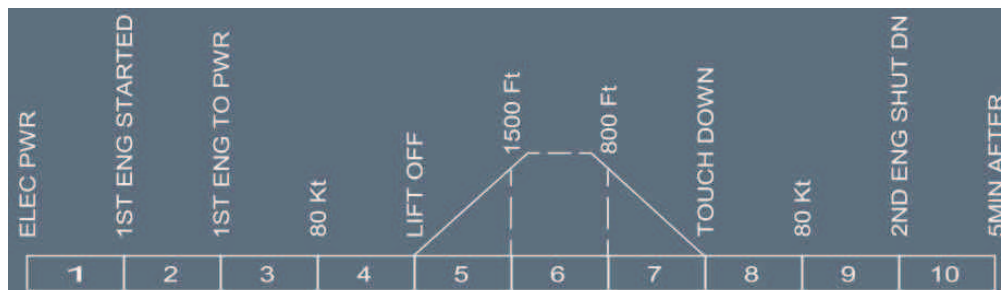
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WARNINGS AND CAUTIONS

Applicable to: ALL

1



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					




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PROBES HEAT - WARNINGS AND CAUTIONS

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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 pilot is switched to AC ESS bus and CAPT pitot heating is lost.



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PROBES HEAT - ELECTRICAL SUPPLY

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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.

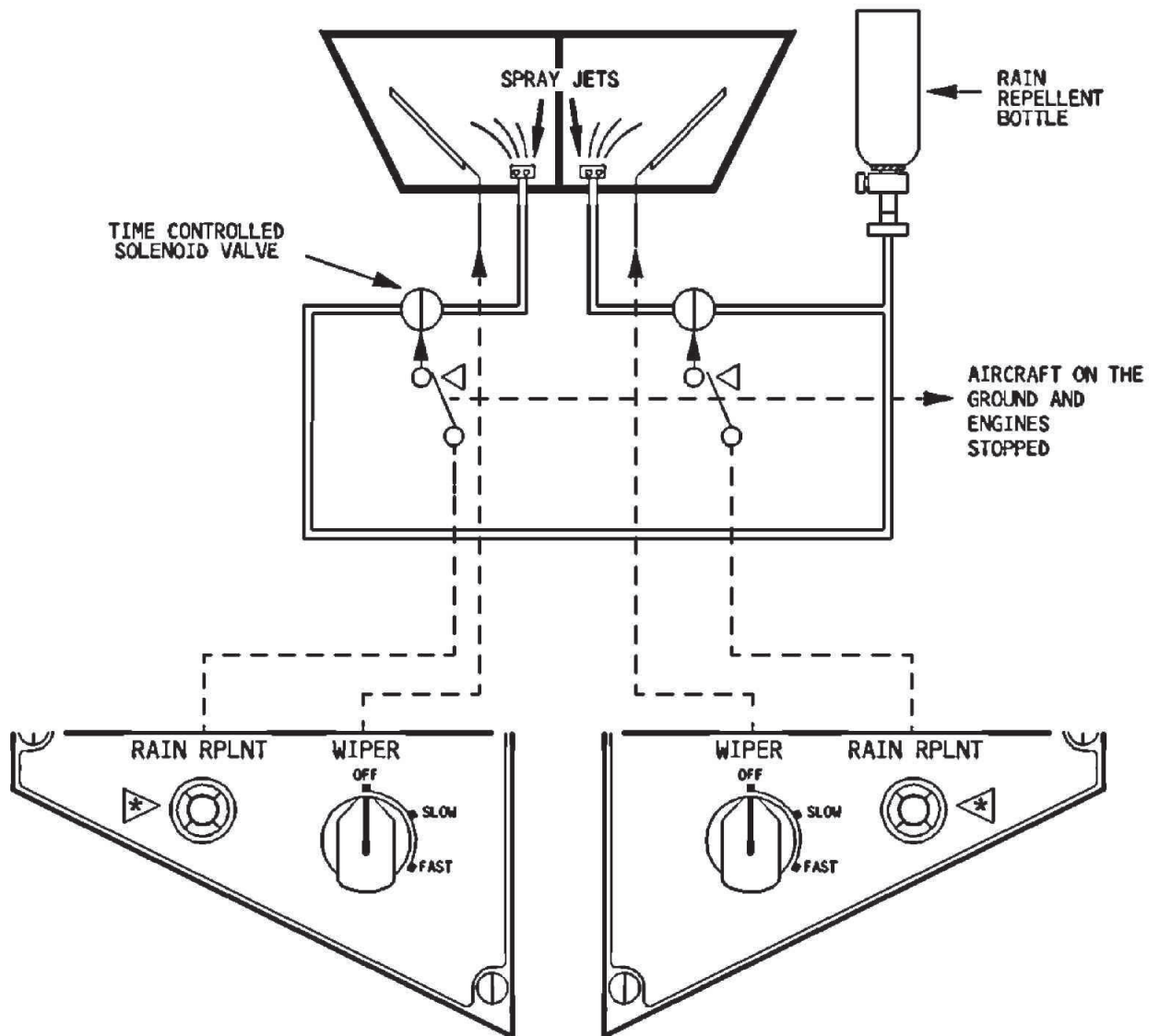
RAIN REPELLENT (IF INSTALLED)

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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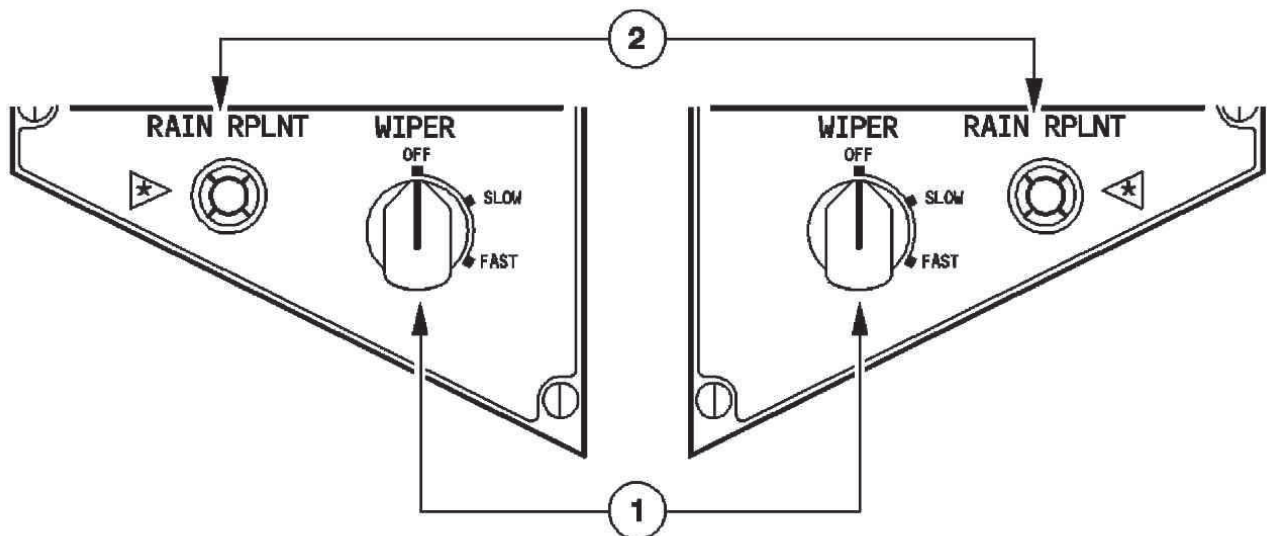
RAIN REMOVAL - DESCRIPTION

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OVERHEAD PANEL

Applicable to: ALL

1



(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

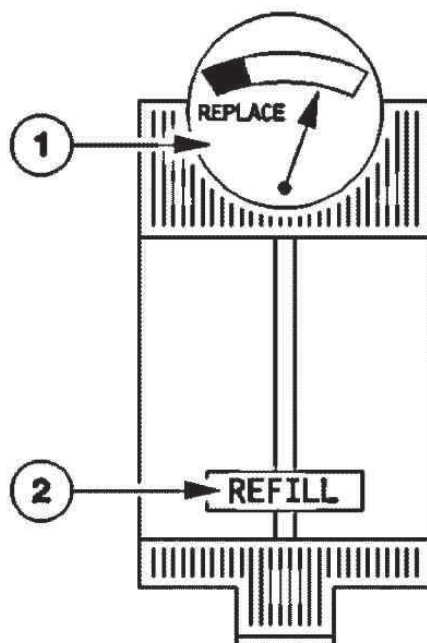
Each of these buttons controls the application of rain repellent fluid to the corresponding side of the front windshield.

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.

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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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RAIN REMOVAL - ELECTRICAL SUPPLY

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 A318/A319/A320/A321 FLIGHT CREW OPERATING MANUAL	AIRCRAFT SYSTEMS ICE AND RAIN PROTECTION ICE DETECTION SYSTEM - DESCRIPTION
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VISUAL ICE INDICATOR

Applicable to: ALL

1

An external visual ice indicator is installed between the two windshields.
 The indicator has also a light.




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ICE DETECTION SYSTEM - DESCRIPTION

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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				