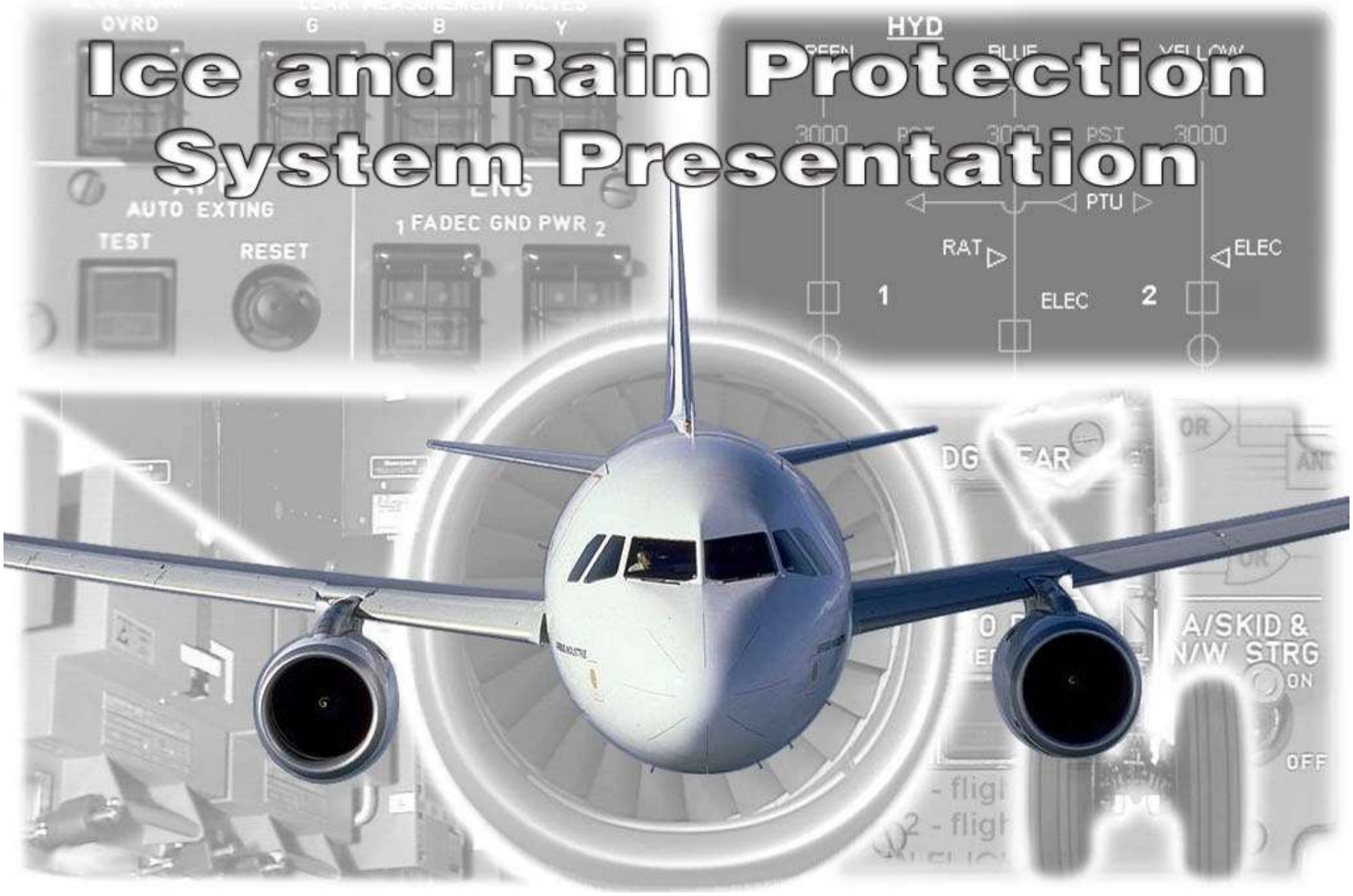
Ice and Rain Protection System Presentation



SYSTEM INTRODUCTION

• Critical areas protected by hot air or electrical heating

The ice and rain protection system enables unrestricted operation in icing conditions and heavy rain.

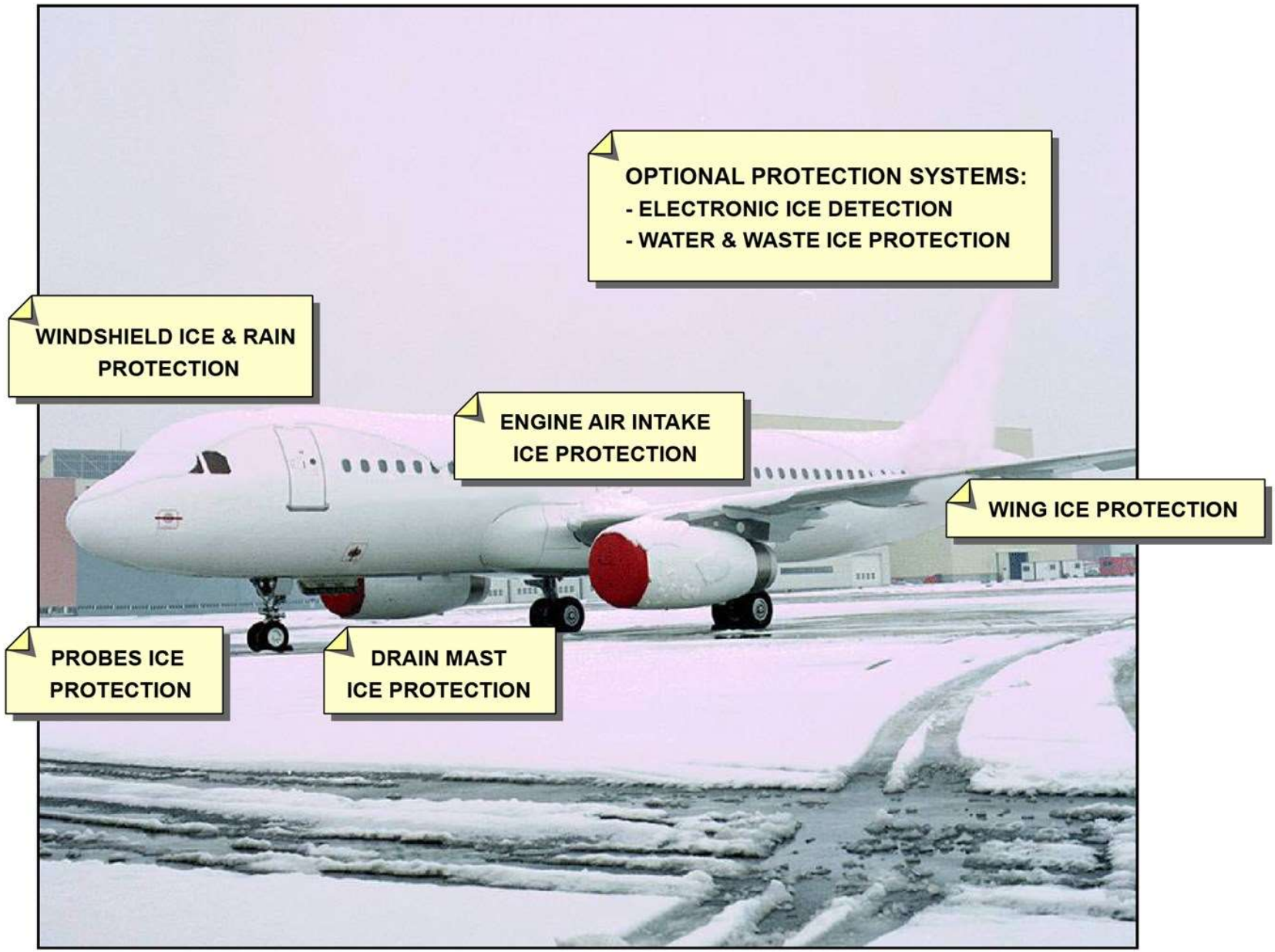
For anti-icing, hot air or electrical heating protects critical areas of the aircraft.

• Subsystems:

- Wing ice protection
- Engine air intake ice protection
- Probe ice protection
- Windshield ice and rain protection
- Drain mast ice protection
- Water and waste system ice protection (some are optional)
- Visual lighted ice detection,
- Electronic ice detection system (optional)

The different subsystems of the ice and rain protection system are:

- Wing ice protection,
- Engine air intake ice protection,
- Probe ice protection,
- Windshield ice and rain protection,
- Drain mast ice protection,
- Water and waste system ice protection (some are optional),
- Visual lighted ice detection,
- Electronic ice detection system (optional).


OPTIONAL PROTECTION SYSTEMS:
- ELECTRONIC ICE DETECTION
- WATER & WASTE ICE PROTECTION
WINDSHIELD ICE & RAIN PROTECTION
ENGINE AIR INTAKE ICE PROTECTION
WING ICE PROTECTION
PROBES ICE PROTECTION
DRAIN MAST ICE PROTECTION

WING ICE PROTECTION

• Manual selection

•WAI available in flight only

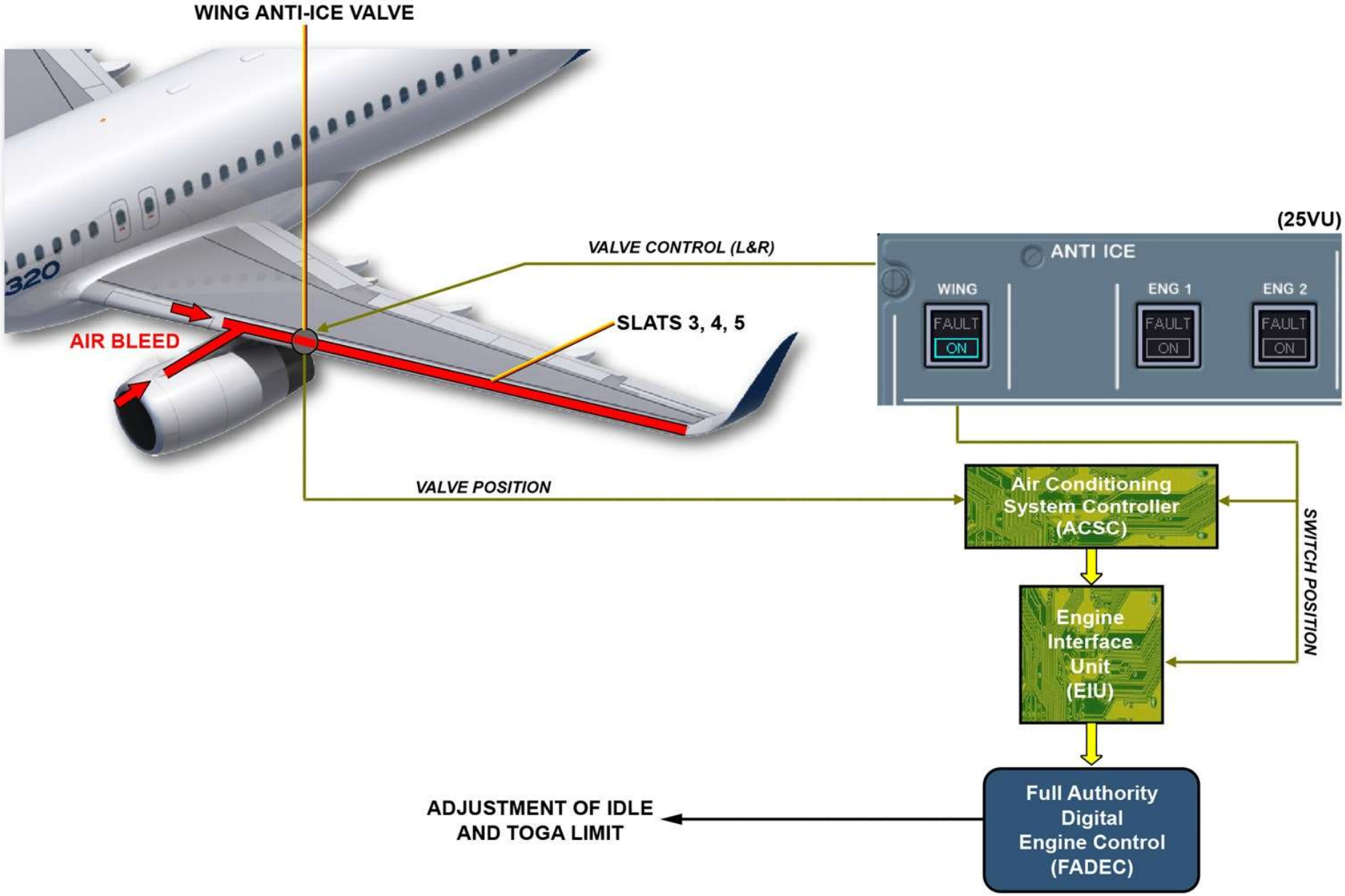
Only one P/BSW on the overhead ANTI ICE panel controls WAI supply to the two wings. WAI must be manually selected by the crew and is available in flight only. For testing functions, the WAI can be selected on the ground but will be automatically limited to 30 seconds operation to prevent damage to the wing leading edge.

•FADEC action

When WAI is selected, the engine idle is increased and the Takeoff/Go Around (TOGA) limit (max thrust) is decreased by the Full Authority Digital Engine Control (FADEC). This signal is sent to the FADEC through the Engine Interface Unit (EIU).

• Three outboard leading edge slats heated by hot air from engines or APU

Hot air from the pneumatic system is supplied for the anti-icing of the three outboard leading edge slats (3, 4 and 5) of each wing. Bleed air from the engines or the APU is supplied to each wing through a pressure regulating and shut off valve called Wing Anti-Ice (WAI) valve.


WING ANTI-ICE VALVE
AIR BLEED
SLATS 3, 4, 5
VALVE CONTROL (L&R)
VALVE POSITION
(25VU)
ANTI ICE
WING
ENG 1
ENG 2
FAULT
ON
Air Conditioning System Controller (ACSC)
Engine Interface Unit (EIU)
Full Authority Digital Engine Control (FADEC)
SWITCH POSITION
ADJUSTMENT OF IDLE AND TOGA LIMIT

NACELLE/ENGINE AIR INTAKE ICE PROTECTION

• CEO OPTION

•Manual selection

•Engine anti-ice available in flight or on ground with engine in operation

Engine anti-ice is manually selected by the crew and is available in flight or on the ground with the engine in operation. After its circulation around the inlet, the air is sent overboard.

Note: With an electrical power supply failure, valves automatically open when the engine operates.

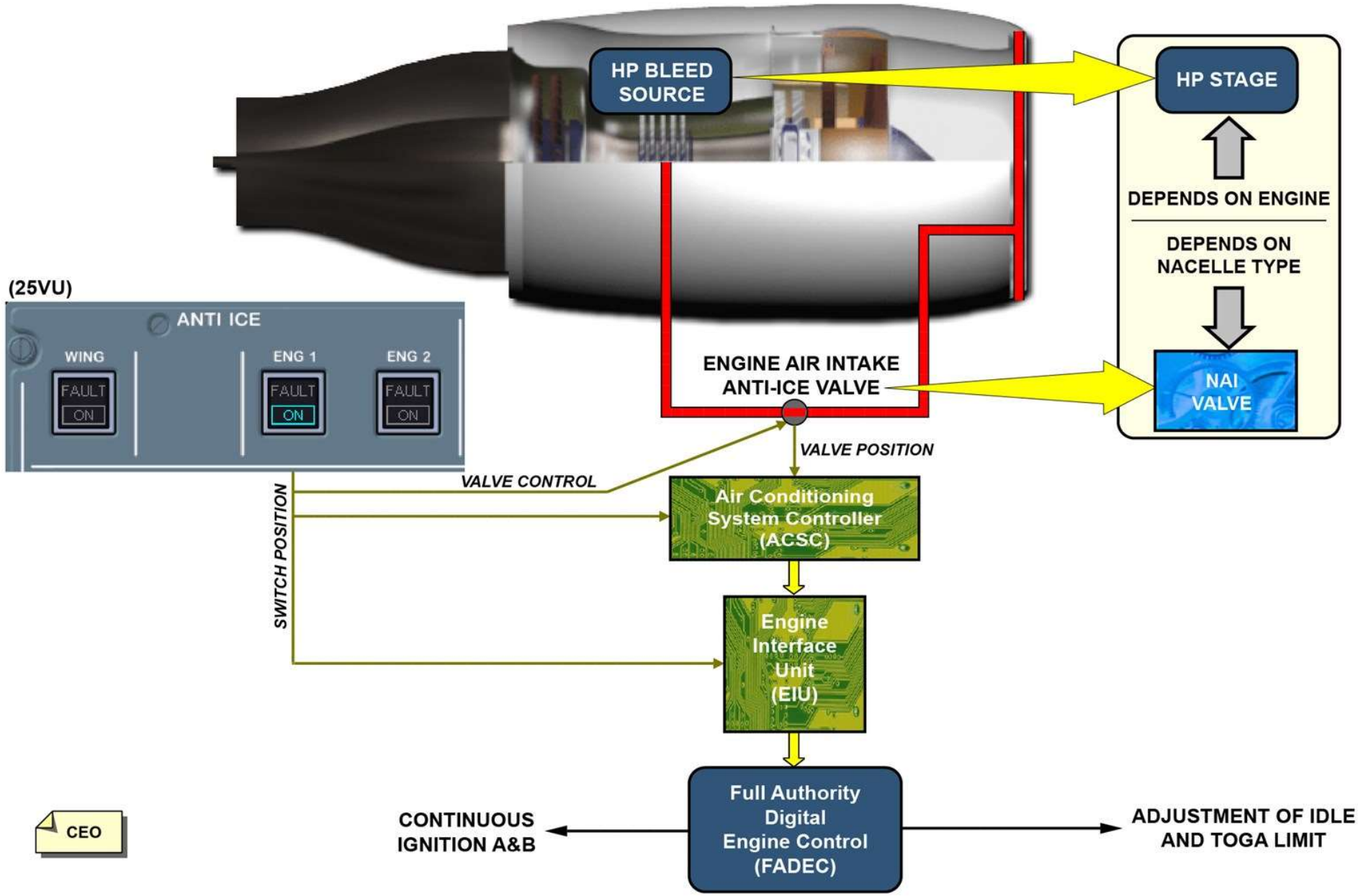
• FADEC action

When engine anti-ice is selected, the engine idle speed is increased and the TOGA limit (max thrust) is decreased by the FADEC. This signal is sent to the FADEC through the EIU. The ignition system is automatically set to on for the PW6000 and V2500 engines. This is not applicable to the CFM engine.

• Engine air intake heated by hot air bled from the HP compressor

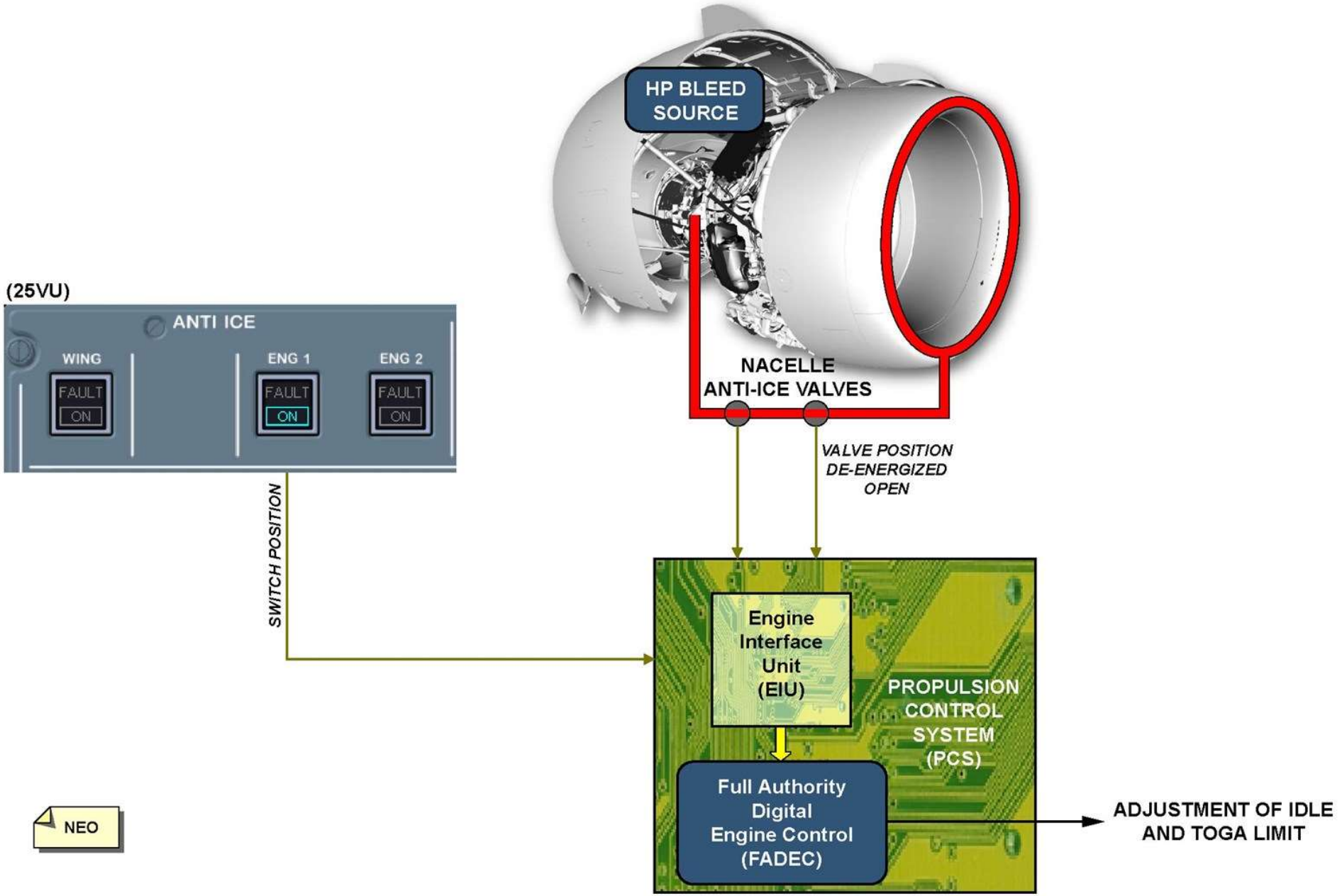
Each engine air intake is protected from ice by an independent air bleed supply from the High Pressure (HP) compressor of that engine.

The air is supplied through the engine air intake anti-ice valve.


HP BLEED SOURCE
HP STAGE
DEPENDS ON ENGINE
DEPENDS ON NACELLE TYPE
NAI VALVE
(25VU)
ANTI ICE
WING
ENG 1
ENG 2
FAULT
ON
ENGINE AIR INTAKE ANTI-ICE VALVE
VALVE POSITION
VALVE CONTROL
SWITCH POSITION
Air Conditioning System Controller (ACSC)
Engine Interface Unit (EIU)
Full Authority Digital Engine Control (FADEC)
CONTINUOUS IGNITION A&B
ADJUSTMENT OF IDLE AND TOGA LIMIT
CEO

•NEO OPTION
•Two Nacelle Anti-Ice valves
•Manual selection
•Nacelle Anti-Ice available in flight or on ground with engine in operation
Nacelle anti-ice is manually selected by the crew and is available in flight or on ground with the engine in operation. After its circulation around the inlet, the air is sent overboard.
Note: With an electrical power supply failure, valves automatically open when the engine operates.

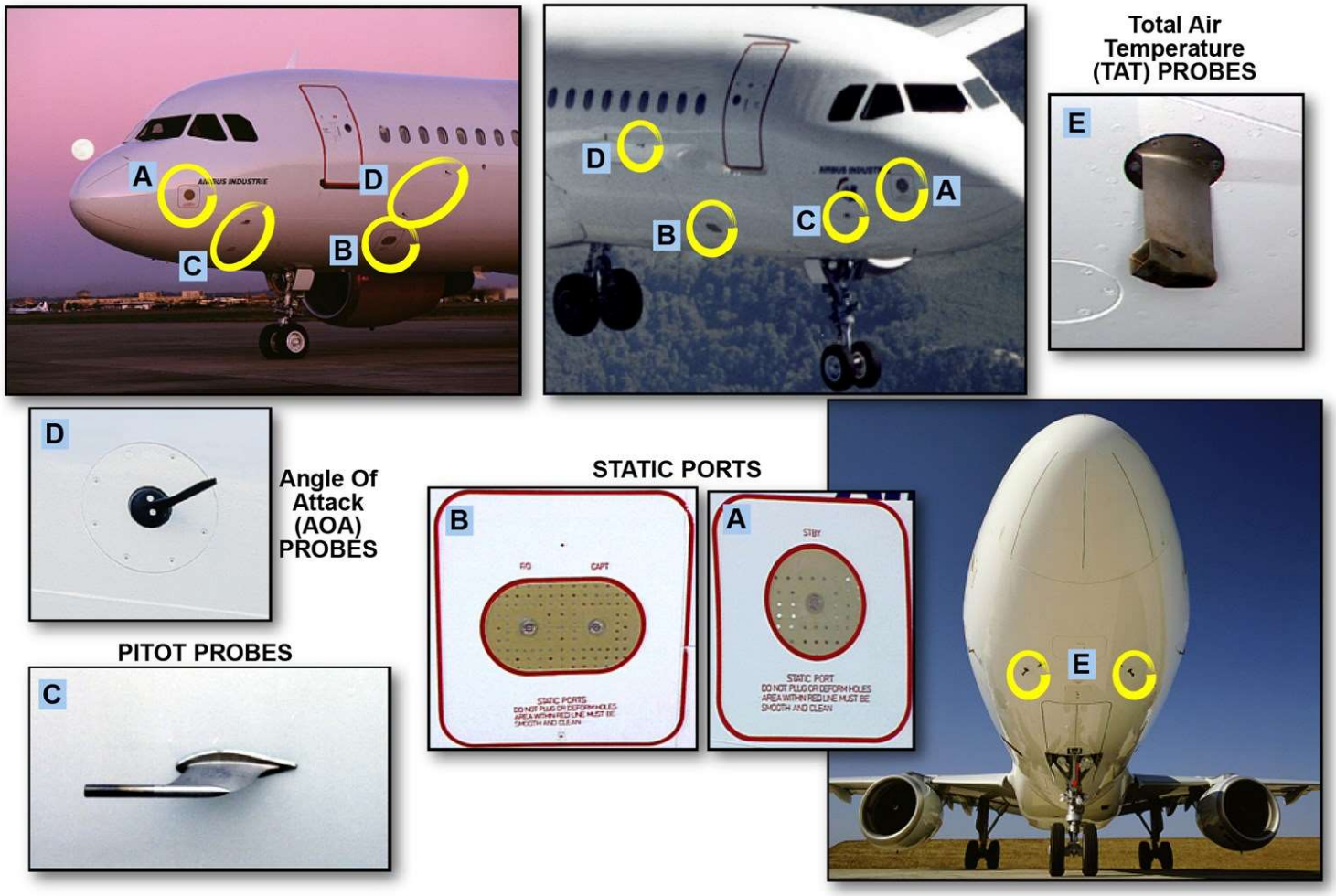
• FADEC action
When the ENG ANTI ICE P/B is selected to ON, a signal to Electronic Engine Computer (EEC) is sent to open both the Nacelle Anti Ice Valves. The position of the P/B and the valve is monitored by the EIU to compute the bleed decrements.


HP BLEED SOURCE
NACELLE ANTI-ICE VALVES
VALVE POSITION DE-ENERGIZED OPEN
(25VU)
ANTI ICE
WING
ENG 1
ENG 2
FAULT
ON
SWITCH POSITION
Engine Interface Unit (EIU)
PROPULSION CONTROL SYSTEM (PCS)
Full Authority Digital Engine Control (FADEC)
ADJUSTMENT OF IDLE AND TOGA LIMIT
NEO

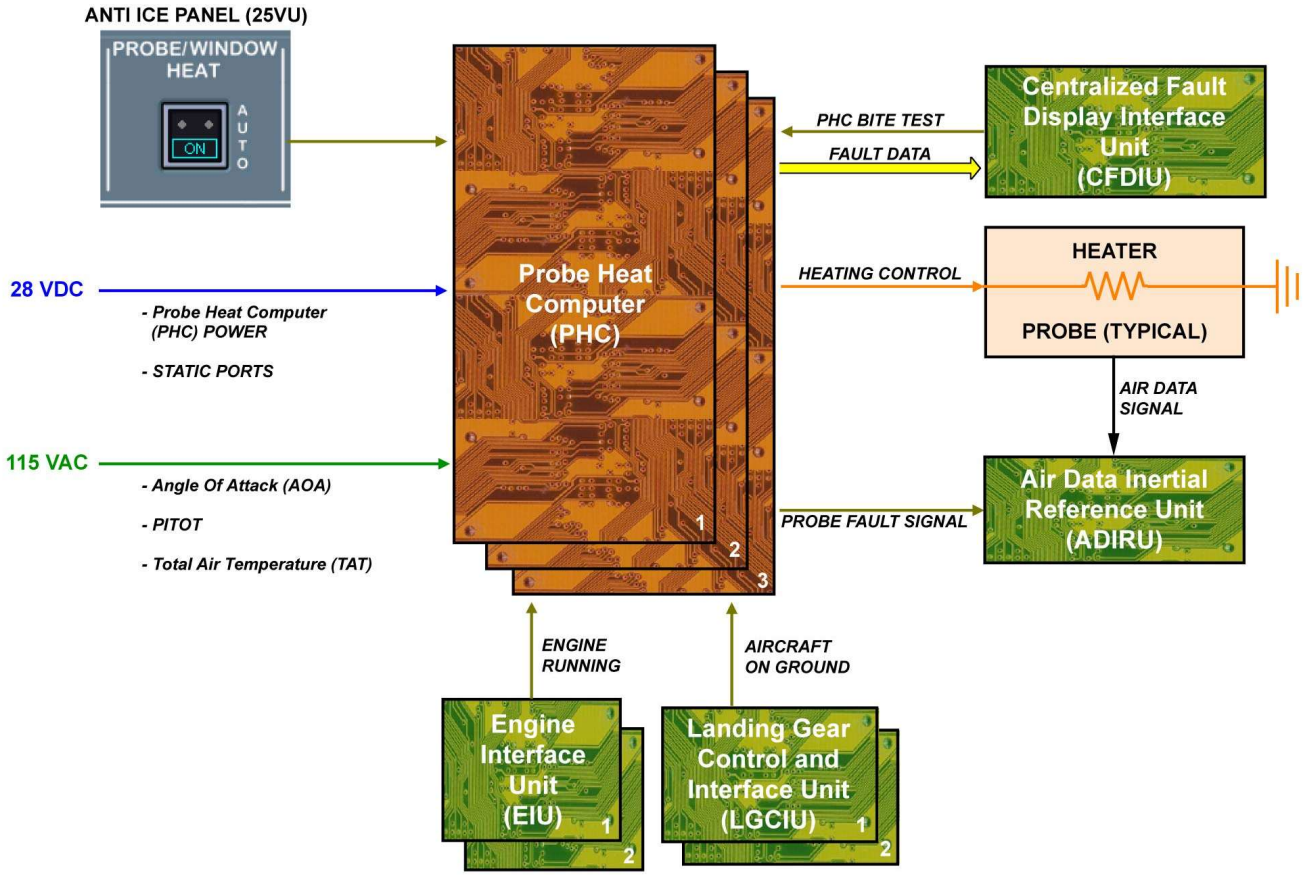
PROBE ICE PROTECTION

• AOA sensors, pitot probes, static ports and TAT probes heated electrically

Ice protection of the Angle Of Attack (AOA) sensors, pitot probes, static ports and Total Air Temperature (TAT) probes is done by electrical heating.



•Probes heated automatically with at least one engine in operation
•Heating system controlled by 3 PHCs
In order to give reliable information to the air data systems, the air data probes are heated automatically when at least one engine is in operation. The probes are arranged in three channels related to the three air data systems: CAPT, F/O and STBY (Air Data/Inertial Reference Unit (ADIRU) 1, 2, 3). The heating system for each channel is controlled by a Probe Heat Computer (PHC) 1, 2, 3.
• Manual selection with the engines stopped
The PROBE/WINDOW HEAT P/BSW (normally in the AUTO position) can be used to select the probe heating ON with the engines stopped.

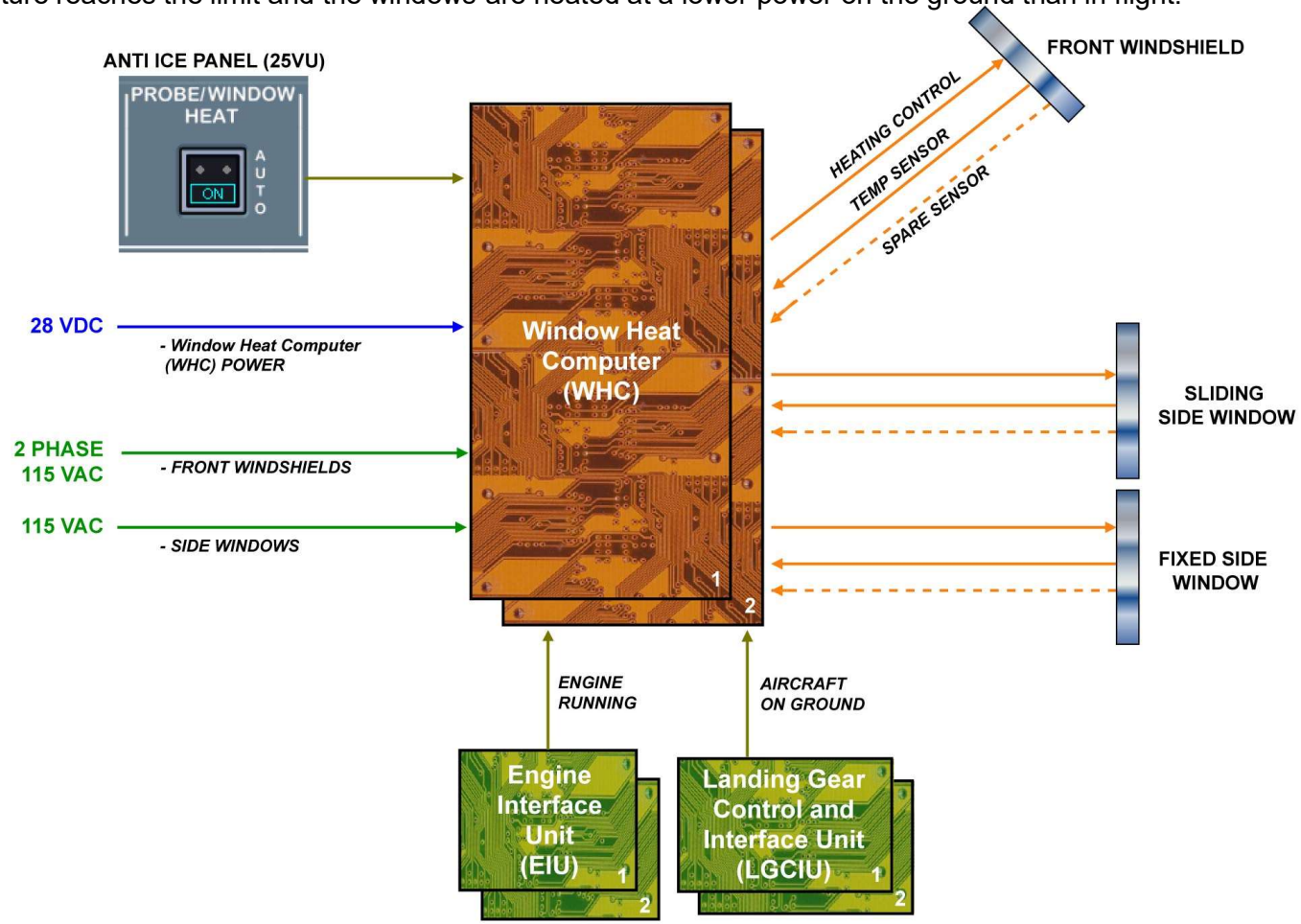


WINDOWS ANTI-ICING AND DEFOGGING

•Electrical heating supplied for windshield anti-icing and cockpit side defogging

Electrical heating is supplied for windshield anti-icing and cockpit side window de-fogging.

•Automatic heating with at least one engine in operation
•Heating system controlled and monitored by 2 WHCs
The front windshields and side windows are heated automatically when at least one engine is in operation. The heating system for each side is controlled and monitored by a Window Heat Computer (WHC) 1, 2.
• Manual selection with the engines stopped
The PROBE/WINDOW HEAT P/BSW (normally in the AUTO position) can be used to select the window heating ON with the engines stopped. The windows are protected against overheat by sensors and flight/ground logic. The sensors turn off the heat when the temperature reaches the limit and the windows are heated at a lower power on the ground than in flight.



WINDSHIELD RAIN SYSTEM PRESENTATION

•Rain removal done by:

- Wiper system
- Rain repellent system

•Can be used at maximum aircraft speed of 230 knots or less

Rain removal from the right and left windshields is done by two systems:

- Wiper system,
- Rain repellent fluid system.

The wiper system will be used satisfactorily at an aircraft speed of 230 knots or less. The rain repellent system is used to have better visibility through the windshield in heavy rain, particularly when the wipers are not satisfactory.

WIPER SYSTEM PRESENTATION

•Two wipers energized by DC motors

Two wipers, one for each windshield, are energized independently by DC motors to remove rain from the windshields.

•Controlled by rotary selector on overhead panel

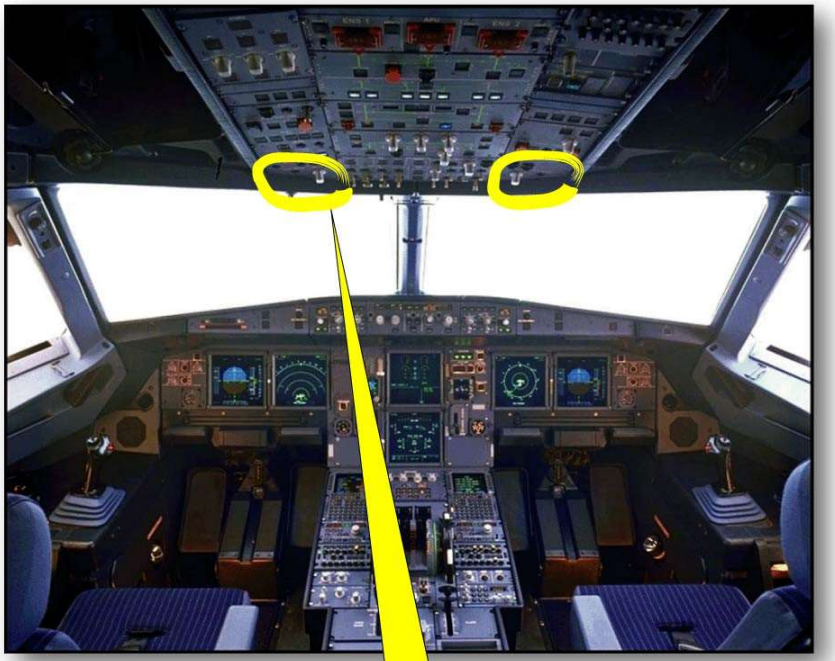
•Speed SLOW or FAST

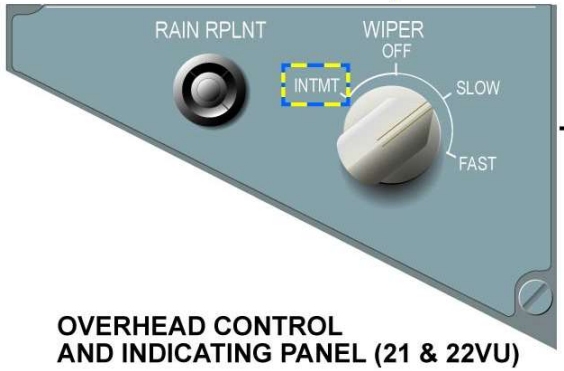
•Intermittent position (Optional) assisted by timer

•"OFF" wiper stop in parking position

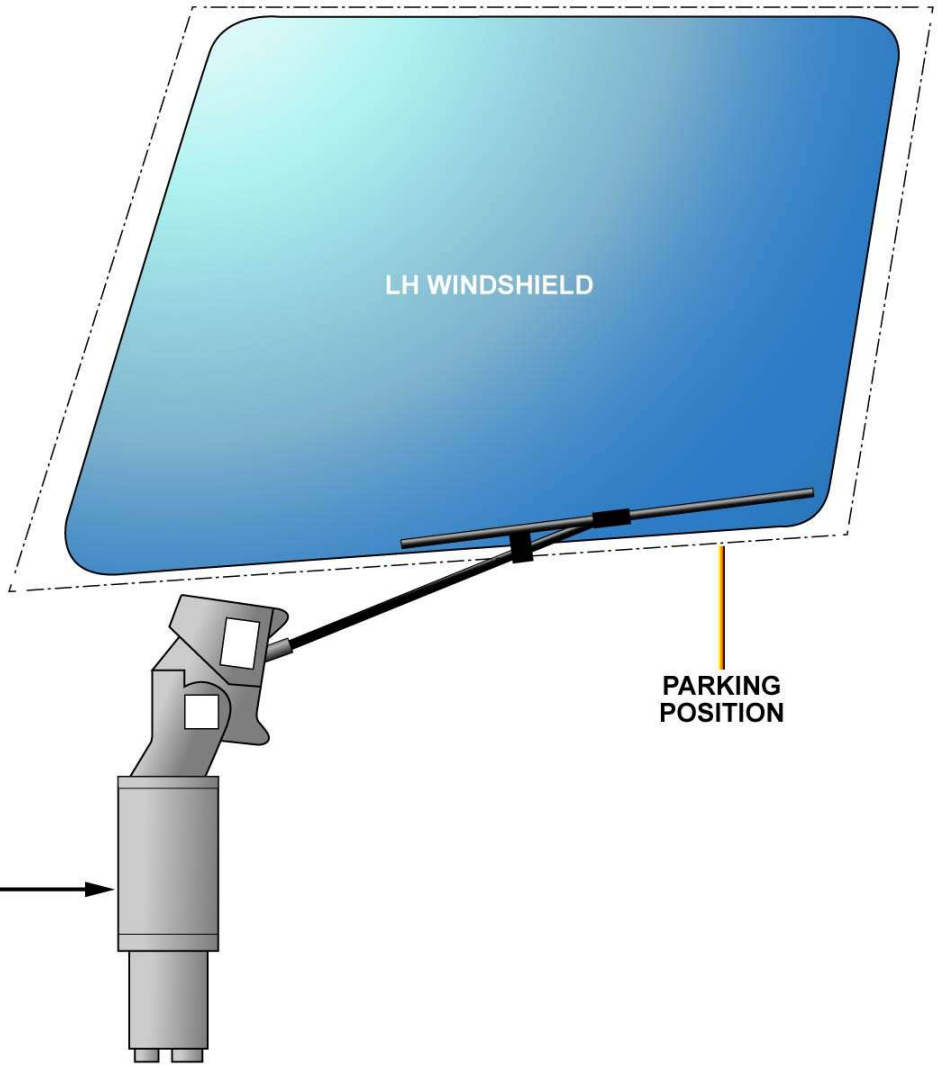
On the overhead panel, a rotary selector controls each wiper. "SLOW" or "FAST" speed can be selected. The selector switch can optionally have an "INTerMiTtent" position. When the selector is set to "OFF", the wiper stops in the parking position. The parking position is at the bottom and away from the windshield. This gives a clear visibility area and prevents dust/sand accumulation which can cause scratches on the windshields.

NOTE: Do not operate the wipers on a dry windshield.





OVERHEAD CONTROL
AND INDICATING PANEL (21 & 22VU)



OPTIONAL

RAIN REPELLENT FLUID SYSTEM

•Repellent fluid stored in a pressurized canister
- Installed in the aft left wall of the cockpit

•Discharged individually on the left/right windshield
- Related "RAIN RPLNT" P/BSW

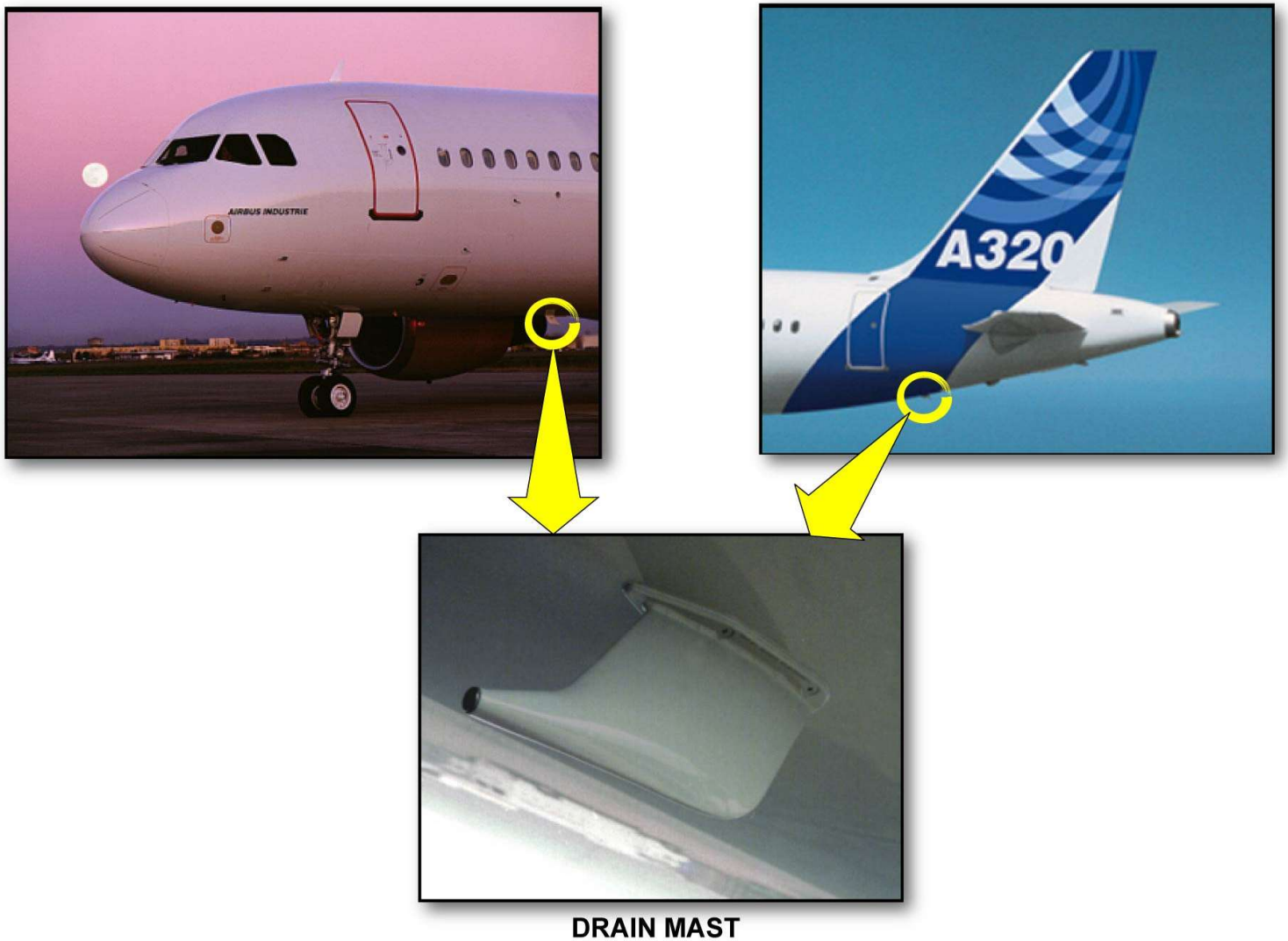
The rain repellent system uses the rain repellent fluid stored in a pressurized canister installed in the aft left wall of the cockpit.
The rain repellent fluid can be discharged individually on the left/right windshield, from its related "RAIN RePeLeNT" pushbutton switch on the overhead panel, adjacent to the wiper selector

RAIN REPELLENT CANISTER

DRAIN MAST ICE PROTECTION

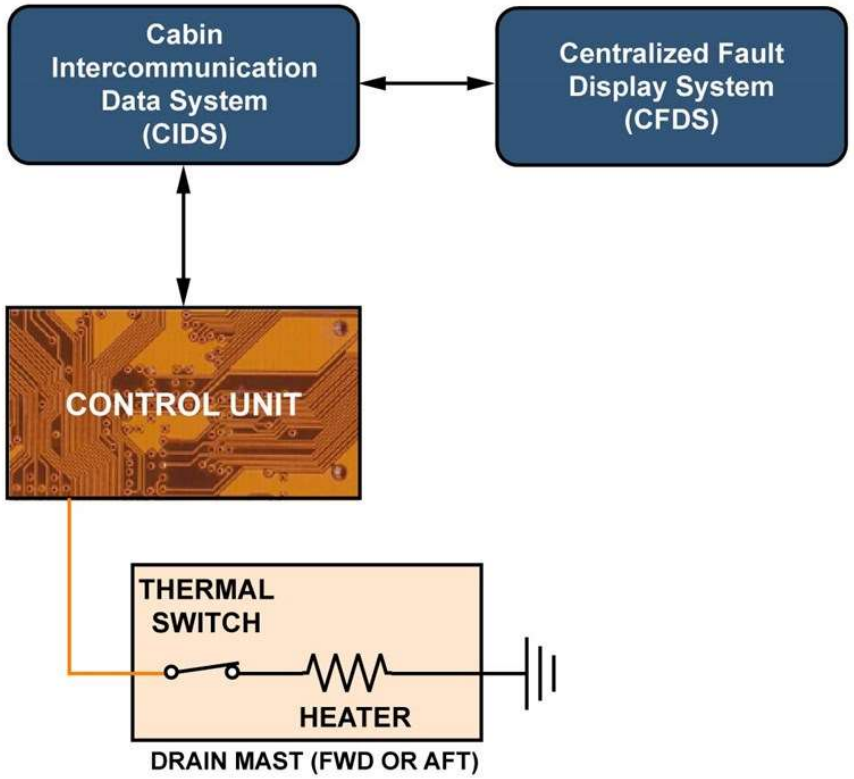
•Two drains mast installed on the lower fuselage

There are two drain masts installed on the lower fuselage forward and aft sections.



DRAIN MAST

•Water waste drain masts electrically heated
•System controlled by 2 ice protection control units
When the electrical system is energized, the waste water drain masts are also electrically heated. Two control units control the heating of the forward and aft drain masts.



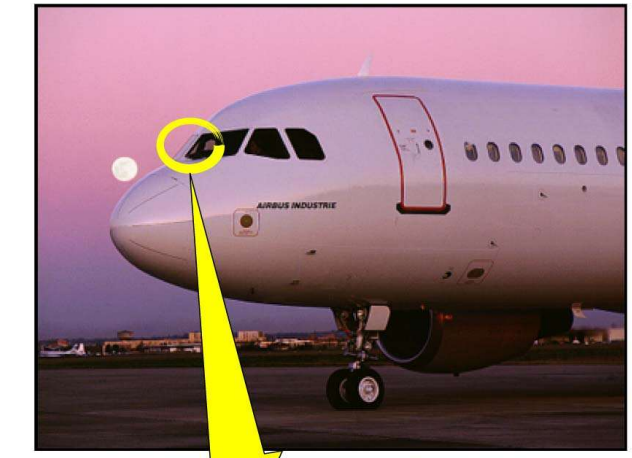
ICE DETECTION

• External visual ice indicator installed between the windshields - Standard

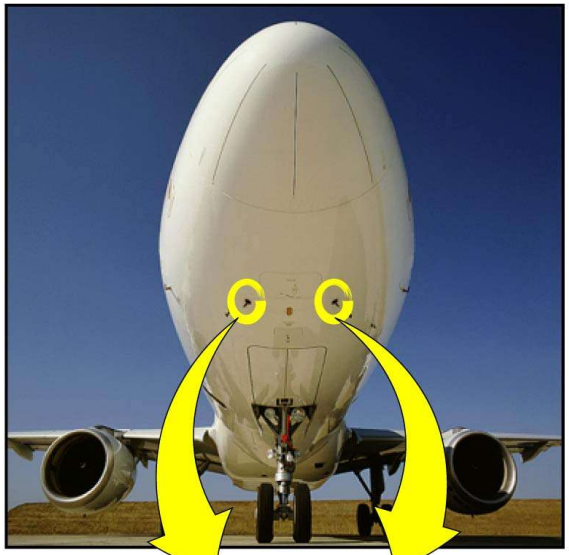
An external visual ice indicator with an integral light is installed between the two windshields.

• Ice detectors on the FWD lower section of the fuselage - Optional

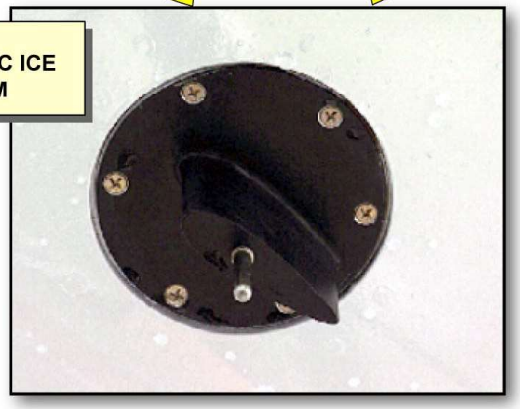
The ice detection system (if installed) has two separate ice detectors on the forward lower section of the fuselage. The ice detectors send an "ice detected" signal directly to the Flight Warning Computers (FWCs).



(STANDARD) VISUAL ICE INDICATOR



(OPTIONAL) ELECTRONIC ICE DETECTION SYSTEM



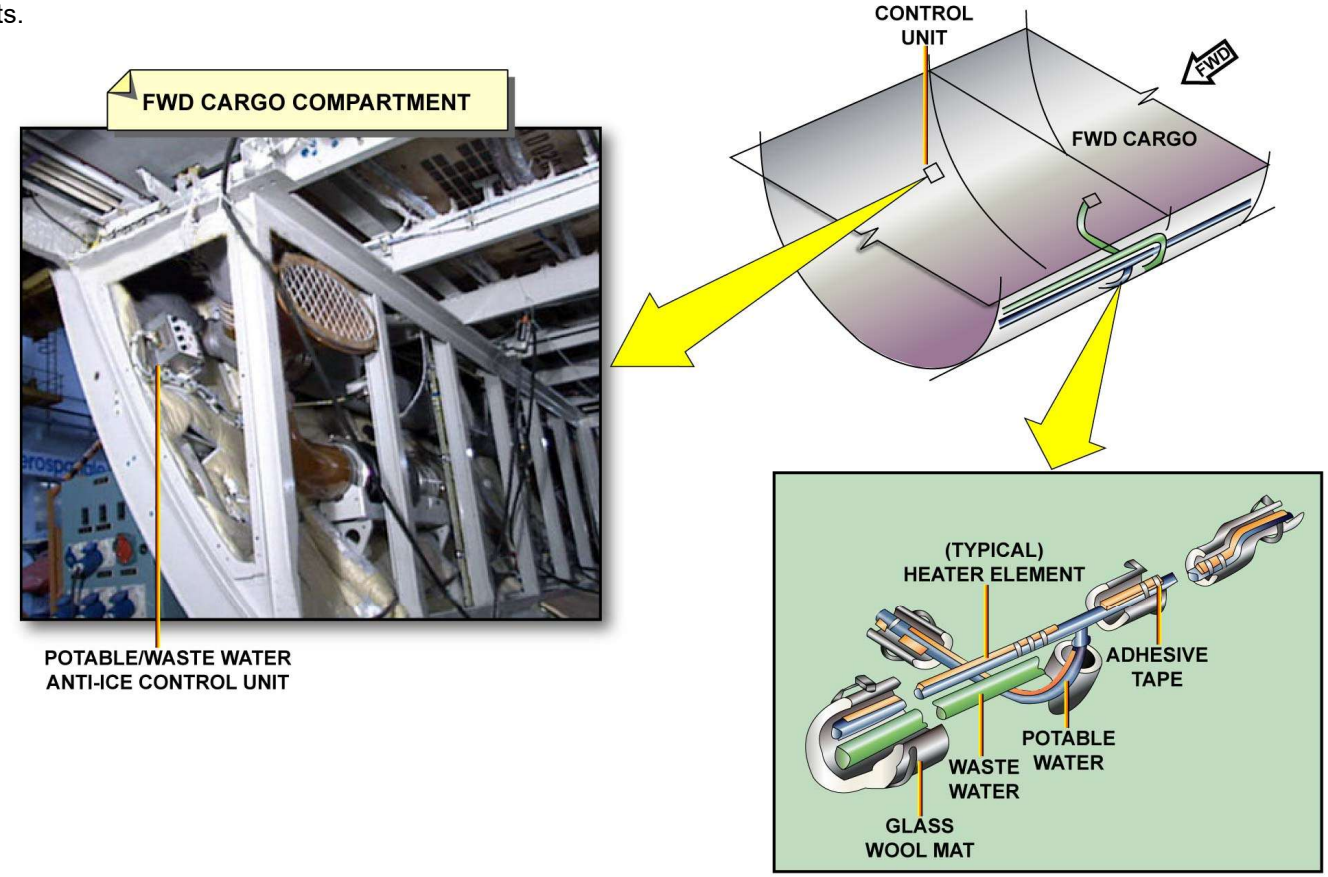
MISCELLANEOUS SYSTEMS

•Potable water supply heating
•Waste water heating
•Water servicing panel heating

- Some systems are optional or optionally modified

The aircraft can also have electrical heating systems for:
- Potable water supply lines,
- Waste water lines,
- Water servicing panels.

Control units are connected to temperature sensors and automatically control these heating systems. The control units control multiple heating elements.



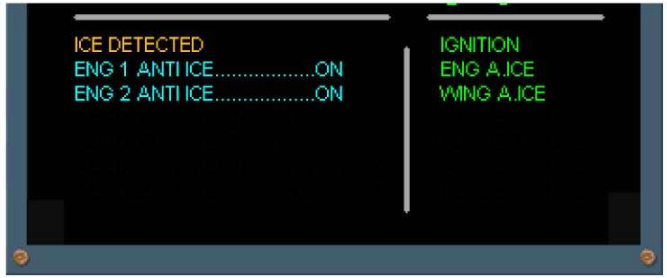
CONTROL AND INDICATING
ECAM INDICATION

•Wing anti-ice valve position indication available on ECAM BLEED page

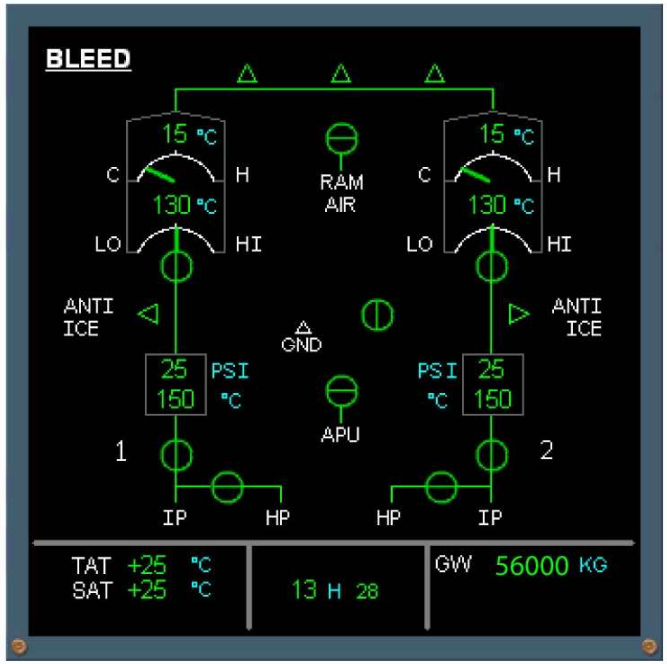
A MEMO is displayed on the upper ECAM when engine anti-ice or WAI is selected. WAI valve position indication is available on the BLEED page when the system is selected.

•Optional Ice Detection warnings
•Warning messages displayed on the E/WD

The optional electronic ice detection system sends warnings directly to the ECAM through the FWCs. The warning messages are displayed on the E/WD.



E/WD



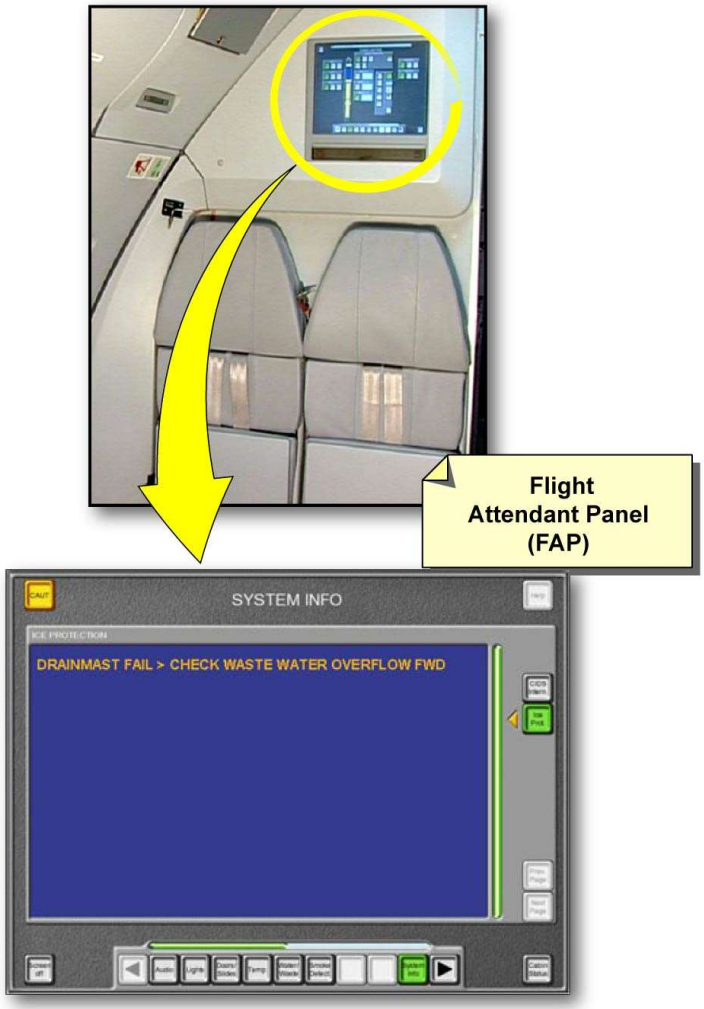
SYSTEM DISPLAY (SD)

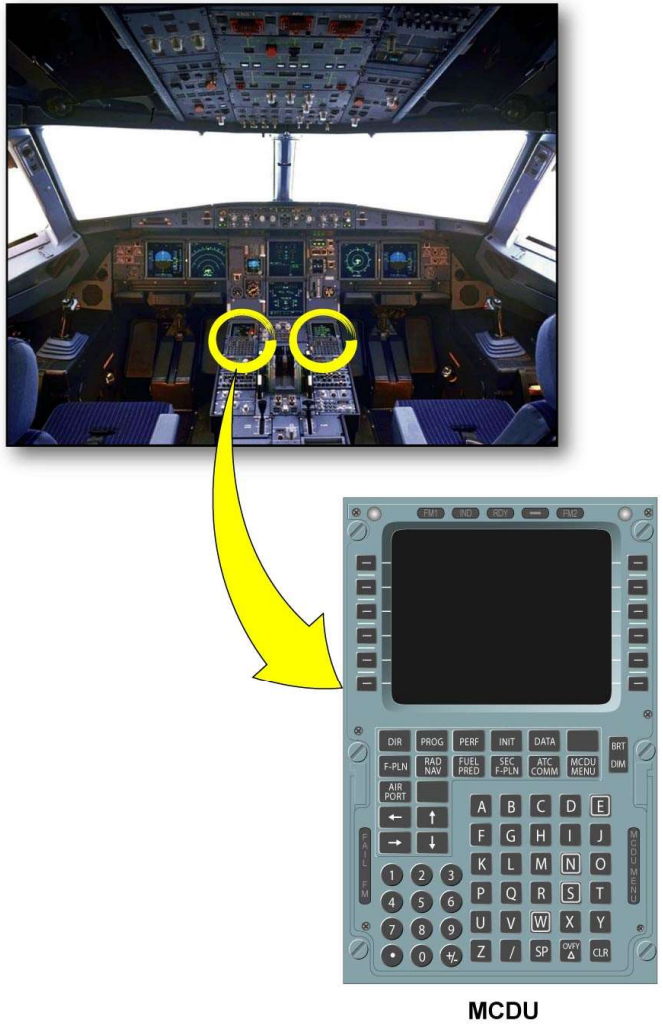
DRAIN MAST MONITORING

•Drain mast heating faults displayed

- On the FAP in the cabin
- On the MCDU via CFDS

Drain mast heating faults can be displayed on the Flight Attendant Panel (FAP) or on the MCDU via the CFDS





MAINTENANCE/TEST FACILITIES

•Wing and Engine anti-ice monitored by ACSC which sends this data to the CFDS

The Air Conditioning System Controller (ACSC) monitors the wing and engine anti-ice valve position and the valves P/BSW position. The ACSC transmits this data to the Centralized Fault Display System (CFDS).

•For NEO only

•Wing anti-ice monitored by ACSC which sends this data to the CFDS

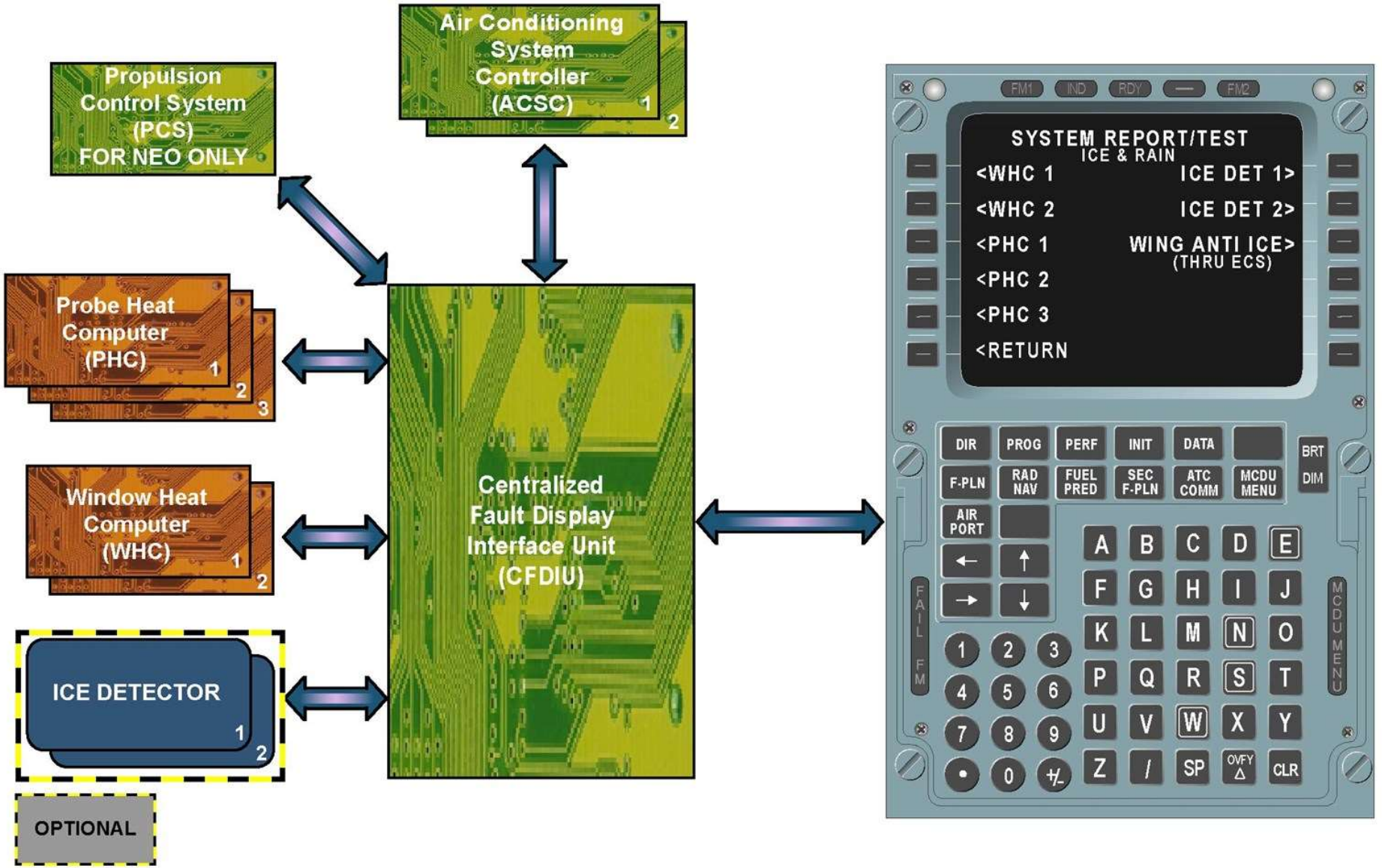
•Engine Anti ice is controlled and monitored by the PCS

Wing anti-ice is monitored by ACSC which sends this data to the CFDS. Wing Anti-Ice P/B SW is monitored by ACSC.

For NEO Engine Anti ice is controlled and monitored by the Propulsion Control System (PCS). Engine anti-ice valve P/B SW is monitored by PCS. The PCS/ACSC transmits this data to the Centralized Fault Display System (CFDS).

•PHCs, WHCs and ice detectors connected to the CFDIU

All 3 PHCs, the two WHCs and the ice detectors are connected directly to the Centralized Fault Display Interface Unit (CFDIU). Each system menu is available through the MCDU.


Air Conditioning System Controller (ACSC)
1
2
Propulsion Control System (PCS) FOR NEO ONLY
Probe Heat Computer (PHC)
1
2
3
Window Heat Computer (WHC)
1
2
ICE DETECTOR
1
2
OPTIONAL
Centralized Fault Display Interface Unit (CFDIU)
FM1
IND
RDY
FM2
SYSTEM REPORT/TEST
ICE & RAIN
<WHC 1
<WHC 2
<PHC 1
<PHC 2
<PHC 3
<RETURN
ICE DET 1>
ICE DET 2>
WING ANTI ICE>
(THRU ECS)
DIR
PROG
PERF
INIT
DATA
F-PLN
RAD NAV
FUEL PRED
SEC F-PLN
ATC COMM
MCDU MENU
BRT
DIM
AIR PORT
FAIL FM
MCDU MENU
A B C D E
F G H I J
K L M N O
P Q R S T
U V W X Y
Z / SP OVFY CLR
1 2 3
4 5 6
7 8 9
• 0 +/-

SAFETY PRECAUTIONS

•Safety procedures for injury prevention

When you do work on the ice and rain protection system, make sure that you obey all Aircraft Manual Maintenance (AMM) safety procedures. This will prevent injury to persons and/or damage to the aircraft. Here is an overview of the main safety precautions related to the ice and rain protection system.

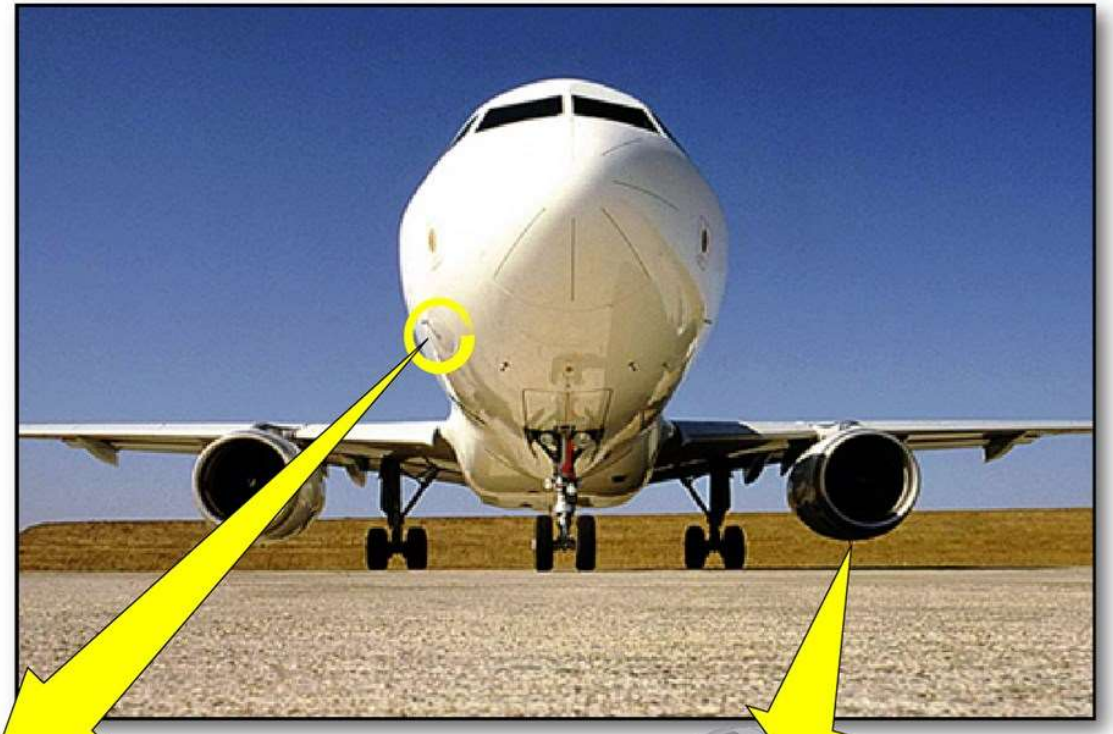
•Probes heat:

- Remove protective covers
- Remove protective covers before ELEC PWR is applied to A/C
- Probes are HOT during or after operation

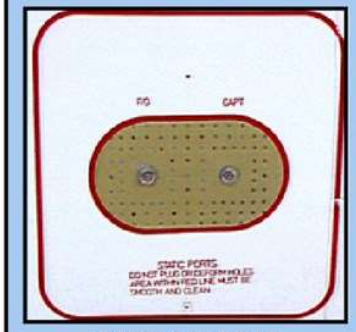
Remove the protective covers from the probes before you activate the probe ice protection system.
If possible, remove the protective covers before electrical power is applied to the aircraft, in case of a system malfunction.
Do not touch the probes during or immediately after operation. The probes are hot and can burn you.

•Anti-ice components hot after flight

Do not touch the anti-ice ducts, slats 3, 4 and 5 and engine air intake lips until they are cool.
These items stay hot for some time after the engine stops.

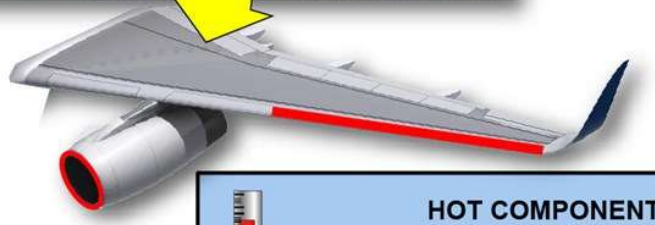


REMOVE ALL PROTECTIVE COVERS BEFORE OPERATION



STATIC PORTS

PITOT PROBE



HOT COMPONENTS

- ✓ PROBES AFTER OPERATION
- ✓ PNEUMATIC ANTI-ICE DUCTS
- ✓ SLATS 3, 4 AND 5
- ✓ ENGINE AIR INTAKE LIPS

WARNINGS ABOUT FAIL SAFE HEATING

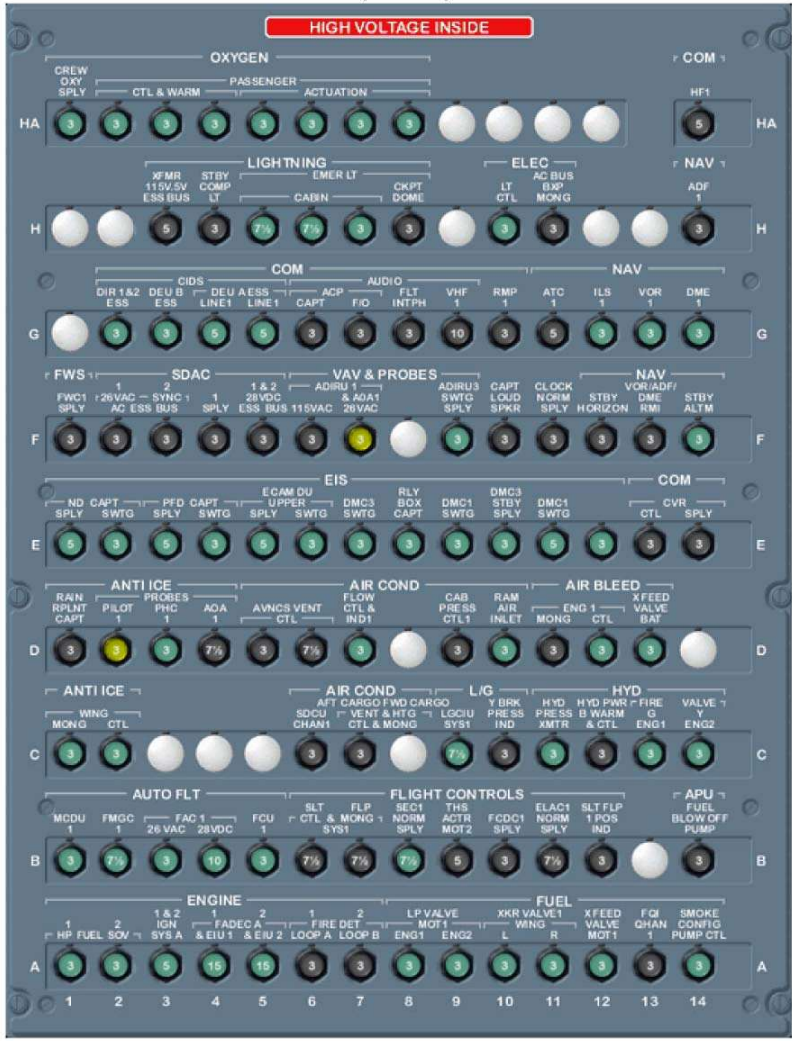
•Probe and window heat systems are fail safe systems

The probe heat system is a fail-safe system used to keep the probes and static ports de-iced (in flight) if a PHC failure occurs.

The window heat system is designed to keep the windows defogged (in flight) if a WHC failure occurs.

If the PHC or WHC power Circuit Breakers (C/Bs) are pulled, the probe or window heat will come on. This will also occur if the EIU C/B is pulled. The EIU controls the "engine running" signal for automatic operation. If one of these C/Bs is pulled, all of the heater C/Bs must also be pulled.

OVERHEAD C/B PANEL (49VU)



WARNING

PULLING THE PROBE HEAT COMPUTER (PHC), THE LANDING GEAR CONTROL AND INTERFACE UNIT (LGCIU) OR THE ENGINE INTERFACE UNIT (EIU) POWER SUPPLY CIRCUIT BREAKERS CAUSES UNWANTED HEATING OF THE PROBES & STATIC PORTS AND / OR THE WINDOWS.
THIS CAN CAUSE INJURY AND BURNS.

Ice and Rain Protection System Component Location

SYSTEM OVERVIEW

Comp loc EXT WING RH WING A/ICE Valve
Comp loc ENG 1 LH Nacelle A/ICE Valve

• Critical areas protected by hot air or electrical heating
The ice and rain protection system enables unrestricted operation in icing conditions and heavy rain.
For anti-icing, hot air or electrical heating protects critical areas of the aircraft.
• Subsystems:

- Wing ice protection
- Engine air intake ice protection
- Probe ice protection
- Windshield ice and rain protection
- Drain mast ice protection
- Water and waste system ice protection (some are optional)
- Visual lighted ice detection
- Electronic ice detection system (optional)

The different subsystems of the ice and rain protection system are:
- wing ice protection,
- engine air intake ice protection,
- probe ice protection,
- windshield ice and rain protection,
- drain mast ice protection,
- water and waste system ice protection (some are optional).
- visual lighted ice detection,
- electronic ice detection system (optional),

WING ANTI ICE PROTECTION

• Three outboard leading edge slats heated by hot air
•Manual selection
Hot air from the pneumatic system is provided for the anti-icing of the three outboard leading edge slats (3, 4 and 5) of each wing. Bleed air from the engines or the APU is supplied to each wing through a pressure regulating and shut off valve. Wing anti-ice supply to both wings is controlled by a single pushbutton switch on the overhead ANTI ICE panel.

ENGINE AIR INTAKE ANTI ICE PROTECTION

•Engine air intake heated by hot air bled from the high pressure compressor
Each engine air intake is protected from ice by an independent air bleed supply from the high-pressure compressor of that engine. The air is supplied through the engine air intake anti-ice valve. Engine anti-ice is manually selected by the crew and is available in flight or on the ground with the engine running.

PROBE ICE PROTECTION

•Automatic heating control
•Probes heated electrically
In order to provide reliable information for the air data systems, the air data probes are heated AUTOMATICALLY when at least one engine is running. Ice protection of the Angle Of Attack (AOA) sensors, pitot probes, static ports, and Total Air Temperature (TAT) probes is achieved by electrical heating. The PROBE/WINDOW HEAT pushbutton switch (normally in the AUTO position) may be used to select the probe heating ON with the engines shut down.

WINDSHIELD ANTI ICE PROTECTION

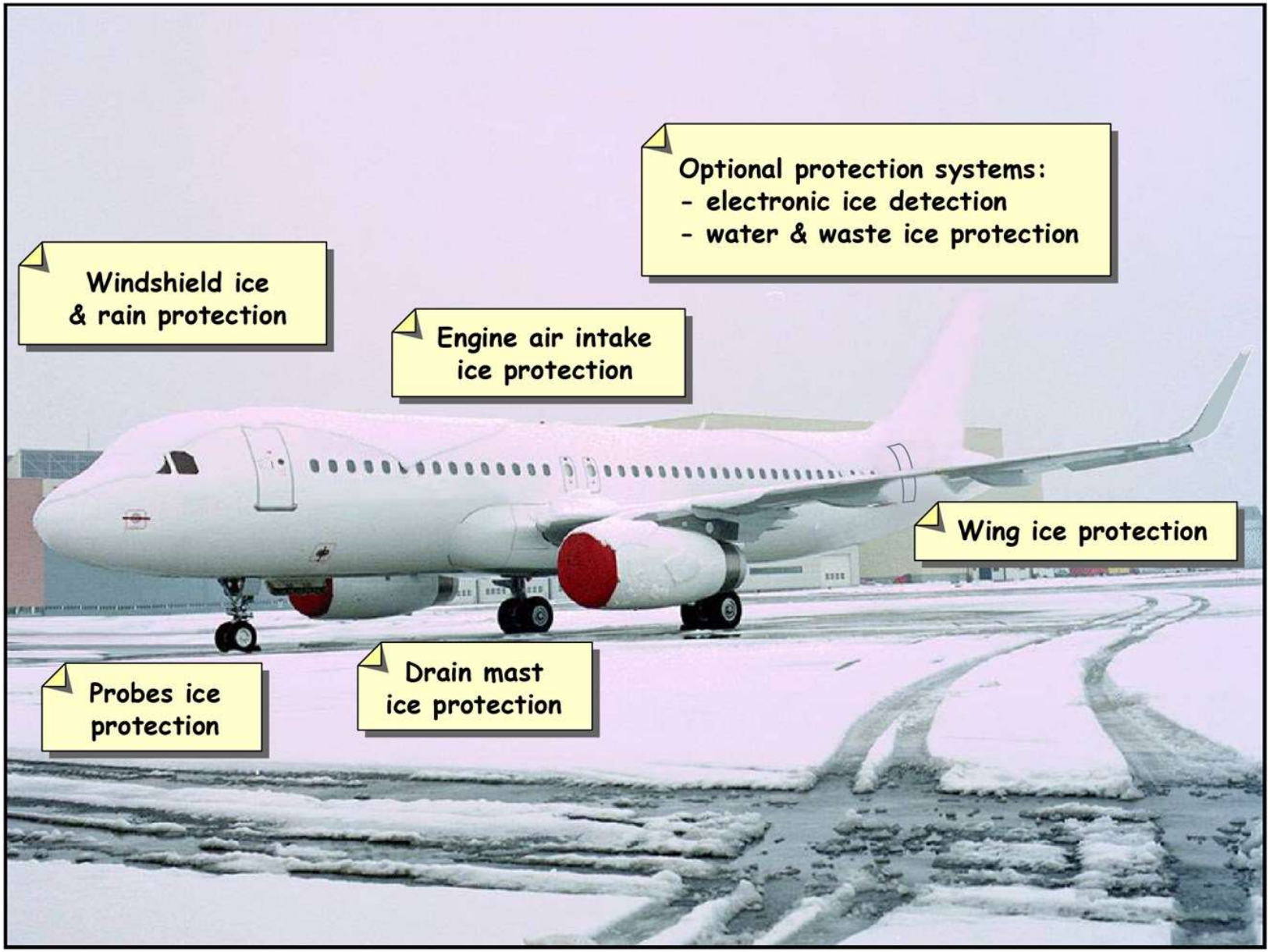
• Electrical heating provided for windshield anti-icing and defogging
• 2 WHCs

Electrical heating is provided for windshield anti-icing and cockpit side window de-fogging. The front windshields and side windows are heated AUTOMATICALLY when at least one engine is running. The PROBE/WINDOW HEAT pushbutton switch (normally in the AUTO position) may be used to select the window heating ON with the engines shut down.

DRAIN MAST ICE PROTECTION

•Water waste drain masts electrically heated

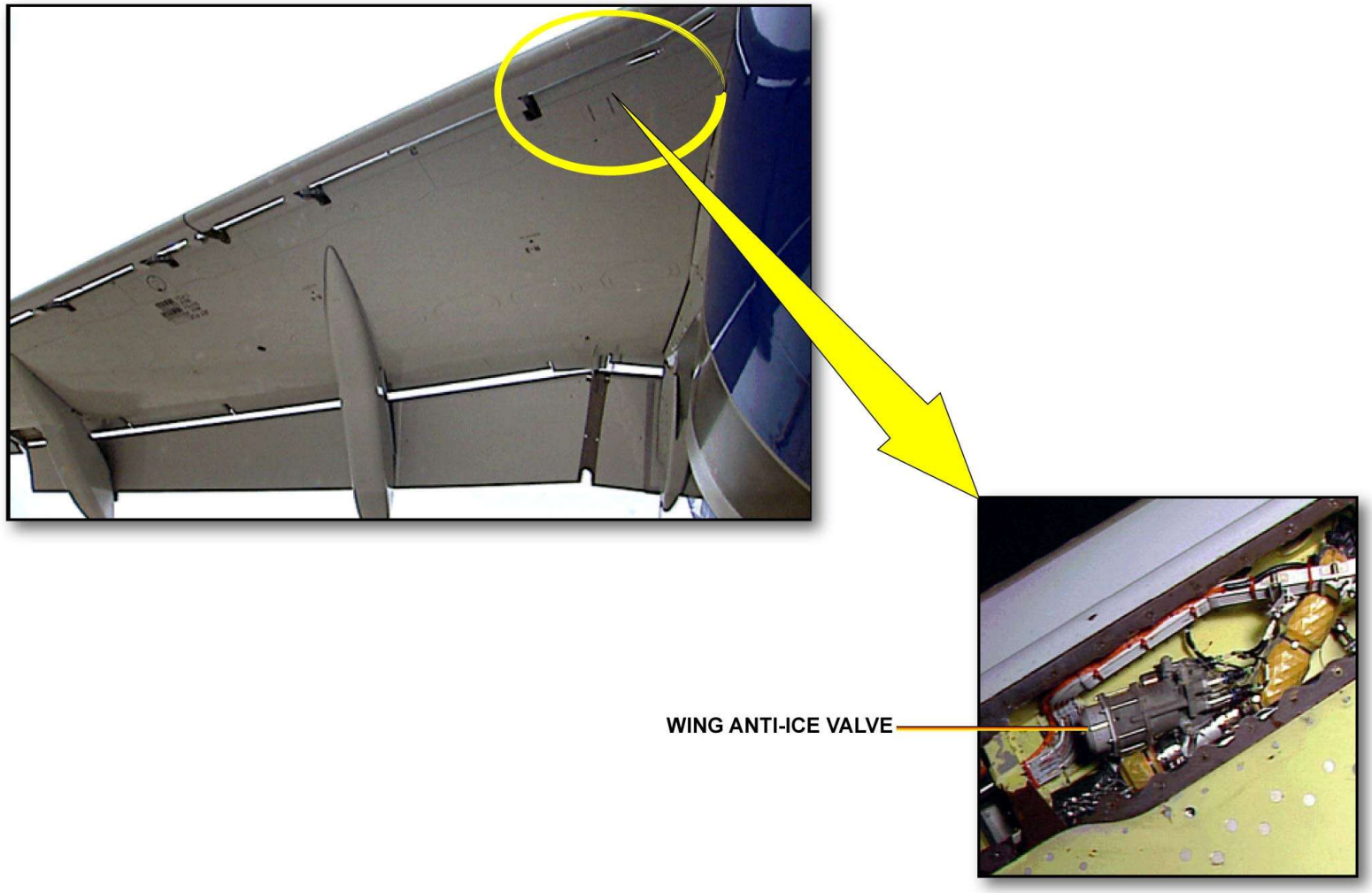
When the electrical system is powered, the waste water Drain Masts are also electrically heated. The Drain Mast Heating is switched ON when the temperature is below a specific value. It is not always in operation. There are two Drain Masts located on the lower fuselage forward and aft sections. Two Control Units, located in the cargo compartments, control the Heating of the FWD and AFT Drain Masts.


Optional protection systems:
- electronic ice detection
- water & waste ice protection
Windshield ice & rain protection
Engine air intake ice protection
Wing ice protection
Probes ice protection
Drain mast ice protection

COMPONENT LOCATION
WING ICE PROTECTION

•Two wing anti-ice valves
- One on each wing leading-edge

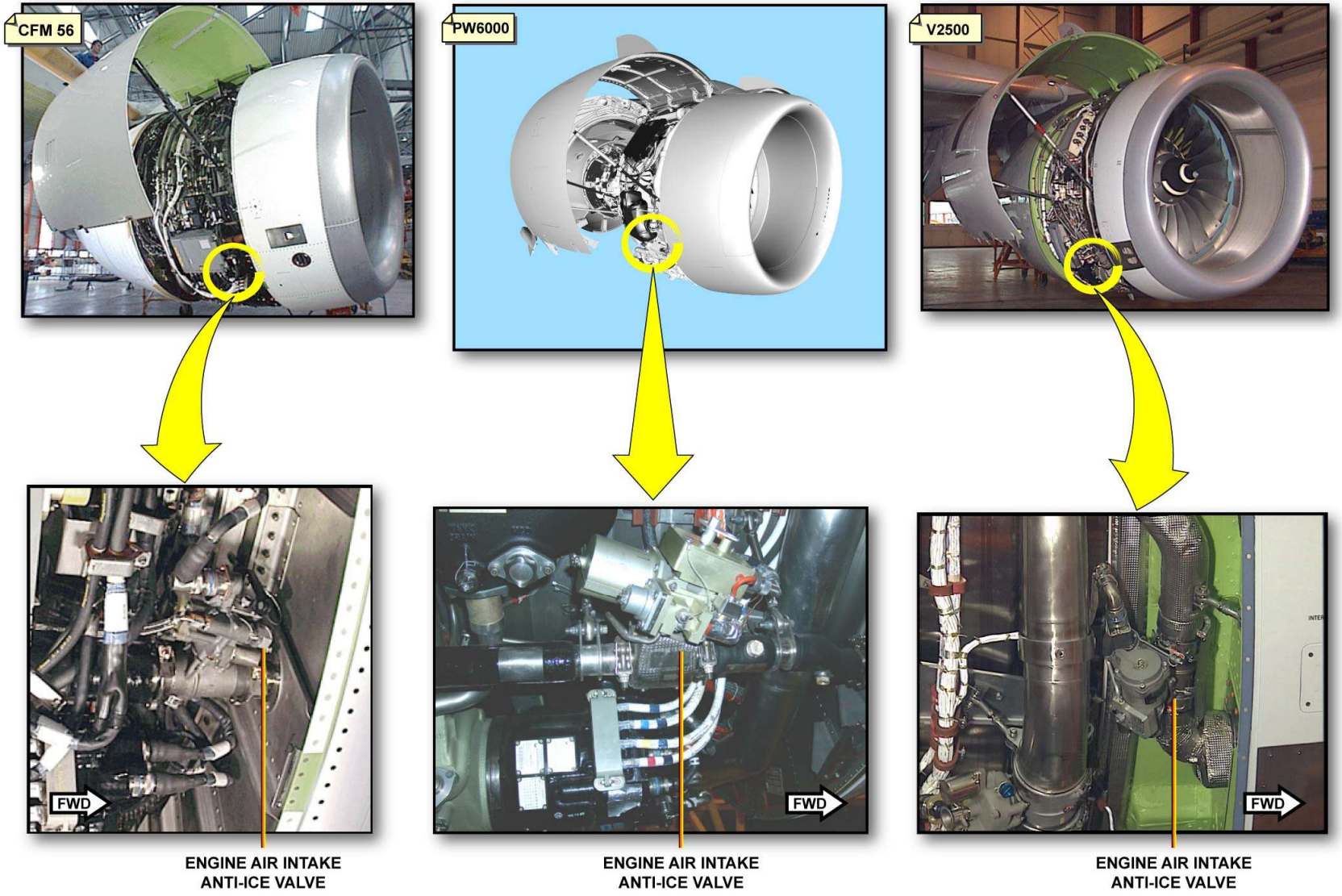
Two wing anti-ice control-valves are installed on the aircraft, one in each wing leading-edge outboard of the engine pylons.



ENGINE AIR INTAKE ICE PROTECTION - CEO

•Engine anti-ice valve is installed on the lower right side of the engine

The engine anti-ice valve is installed on the lower right hand side of the engine.

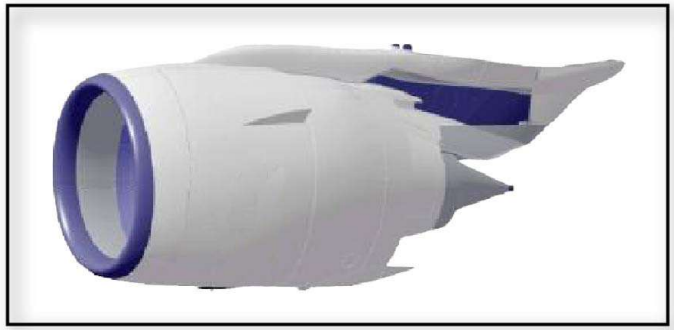


ENGINE AIR INTAKE ICE PROTECTION - NEO

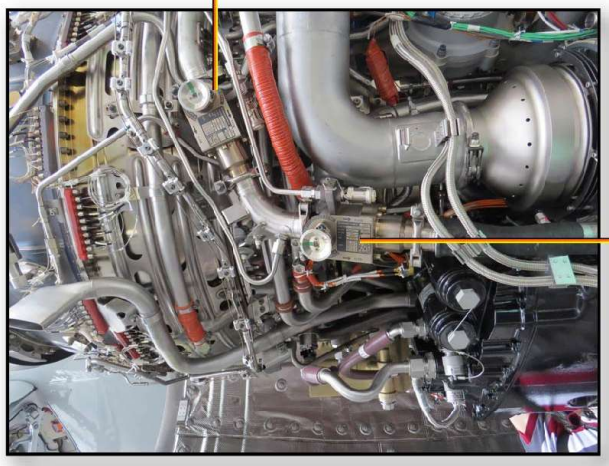
•2 engine Anti-Ice valves right side for NEO engines

Two engine anti-ice valves are installed on the lower right hand side of the engine core.

PW1100G



CFM LEAP



Engine Air Intake Ice Protection System Description

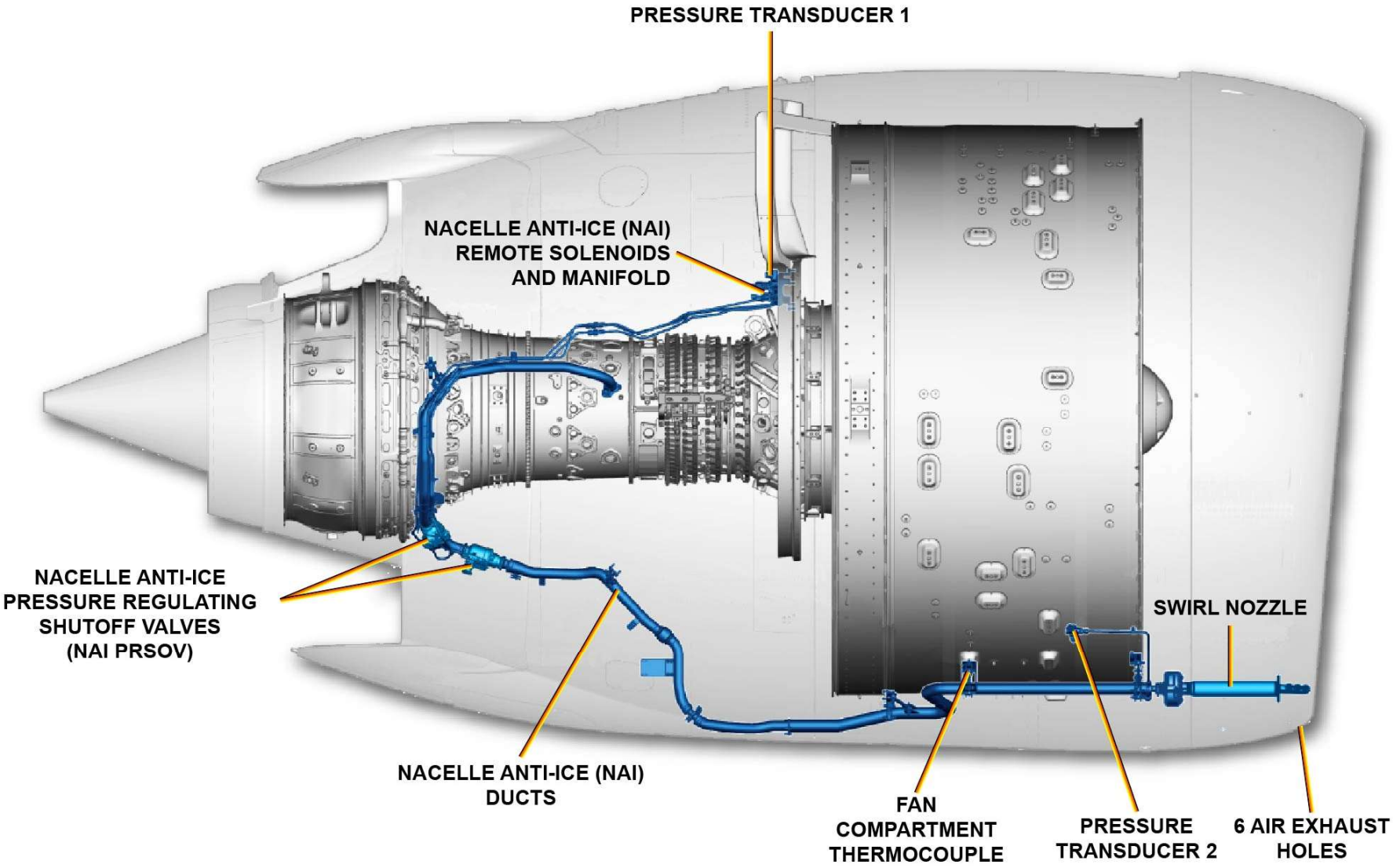
NAI SYSTEM

•Each engine air intake has its own independent NAI protection system
•6th stage High Pressure Compressor for PW1100G
Each engine air intake has its own independent Nacelle Anti-Ice (NAI) protection system.
NAI System uses the hot bleed air from a dedicated engine bleed port (6th stage High Pressure Compressor (HPC) for PW1100G).

This bleed air is lead to engine air inlet through a feed duct which passes along the RH side of the engine core and fan case.
•Two PRSOVs, two
•Pressure Transducers
•Both PRSOVs are located on the Core engine, RH side
Each engine NAI system consists of one command P/B SW but two Pressure Regulating and Shut -Off Valves (PRSOVs) for good operability, two
Pressure Transducers (PTs), temperature protection and supply ducts.
Both PRSOVs are located on the engine core, Right Hand (RH) side.

AIR INLET COWL

•Air is sprayed into the air intake lip (D Duct) through a swirl system
•Air exits the lip through 6 oval in line holes at the bottom of the air inlet cowl
The air is released into the air intake lip (D-Duct) through a swirl system which mixes the air and injects it in a specific pattern for effective heating.
The airflow exits the air intake lip by a single exhaust grid at the bottom of the nacelle outside the fan which has 6 oval holes.


PRESSURE TRANSDUCER 1
NACELLE ANTI-ICE (NAI)
REMOTE SOLENOIDS
AND MANIFOLD
NACELLE ANTI-ICE
PRESSURE REGULATING
SHUTOFF VALVES
(NAI PRSOV)
SWIRL NOZZLE
NACELLE ANTI-ICE (NAI)
DUCTS
FAN
COMPARTMENT
THERMOCOUPLE
PRESSURE
TRANSDUCER 2
6 AIR EXHAUST
HOLES

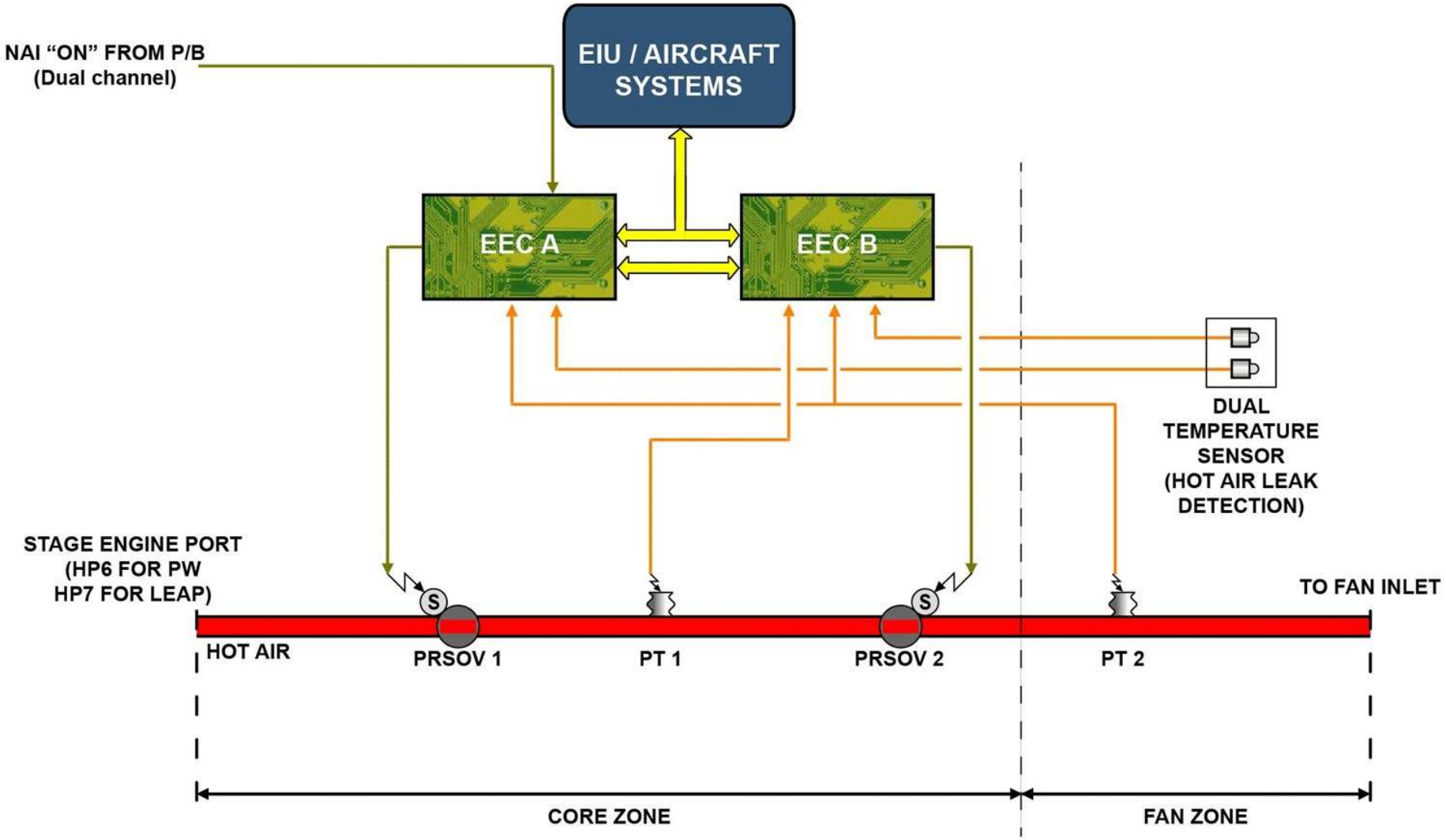
PW1100G

PRSOV CONTROL AND OPERATION

•NAI system is controlled and monitored by the PCS (EEC and EIU)
•PRSOV 1 controlled by EEC Channel A and PRSOV 2 by Channel B
•NAI PB S/W selected to 'ON' position, the EEC de-energizes the solenoid valves of PRSOVs to OPEN the valves
PW PRSOV 1 regulates pressure around 104 +/-11 psig and PRSOV 2 to 80 +/-7 psig.
The NAI system is controlled and monitored by the Propulsion Control System (PCS) (Engine Electronic Controller (EEC) and Engine Interface Unit (EIU)).The EEC controls the PRSOV operation by energizing/de-energizing the solenoids. PRSOV 1 is controlled by EEC Channel A and PRSOV 2 is controlled by Channel B. Each PRSOV pneumatically regulates the downstream air pressure.
When the NAI PB S/W is selected to 'ON' position, the EEC de-energizes the solenoid valves of PRSOV to OPEN the valves. Only when both the valves are open the bleed air is fed to the engine intake lip.
The PRSOV 1 regulates the upstream pressure then in cascade PRSOV 2 the downstream pressure at different threshold.

MONITORING

• EEC monitors both the PRSOV through PTs (PT1 & PT2)
•PT1 is gives feedback to EEC Channel B and PT2 to both Channels A and B
•PT1 is located in the core engine area and PT2 in the fan case
•A dual temperature (one per EEC channel) for NAI leakage detection
The EEC does a detailed monitoring of the PRSOVs with two PTs (PT1 & PT2) located downstream each PRSOV.
PT1 is located in between the PRSOVs in the core engine area. It gives the feedback to channel B only and use for trouble shooting.
PT2 is located downstream of PRSOV 2 in the fan case. It gives the feedback to both the EEC channels for monitoring function in case of single failure of EEC channel.
A dual temperature sensor located in the fan case, provides the EEC (one per channel) with the fan compartment temperature measurement for NAI leakage detection.
When the engine is running and a "Hot Air Leakage" event is detected, the EEC energizes PRSOVs solenoids, which provide insulation function.



EEC: Engine Electronic Controller
EIU: Engine Interface Unit
NAI: Nacelle Anti-Ice
PRSOV: Pressure Regulating Shut-Off Valve
PT: Pressure Transducer

ENGINE ANTI ICE P/BSW

•The P/BSW sends a discrete signal to the EEC to operate the PRSOVs
•The P/BSW sends a discrete signal to the EIU for computing bleed decrements
•"FAULT" light is triggered by the EIU in case of malfunction

The P/B SW sends a discrete signal to the EEC to operate the PRSOVs.
The P/B SW position and the opposite engine P/B SW position are monitored by the EIU for computing the bleed decrements.
The "FAULT" light is triggered by the EIU based on the input from EEC. It appears when the engine is running and NAI is failed in OPEN or CLOSED. It also appears in case of monitoring fault.

PCS (EEC and EIU)

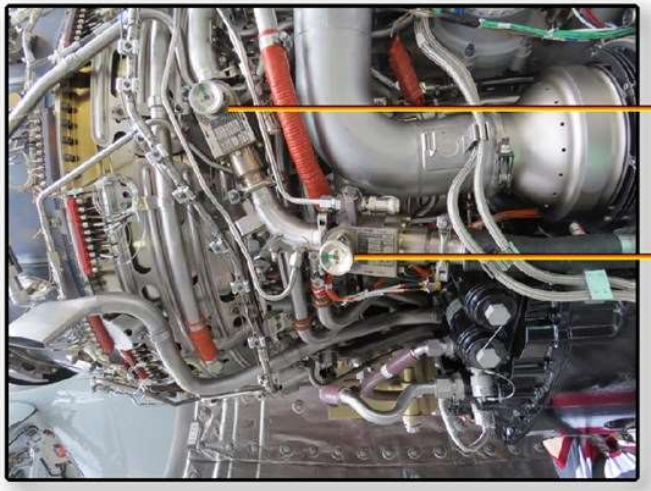
•The EEC controls the PRSOV to open when the P/B SW is set to ON
•EEC monitors the position of PRSOV by the two NAI transducers
•The SDAC/FWS, FDIMU and CFDIU interfaces with the PCS

The EEC controls the PRSOV to open when the P/B SW is set to ON. The EEC monitors the position of the PRSOV by the two NAI transducers to trigger associated fault messages.
The System Data Acquisition Concentrator/Flight Warning System (SDAC/FWS), Flight Data Interface and Management Unit (FDIMU) and Centralized Fault Display Interface Unit (CFDIU) interfaces with the PCS.

FAILURE CONDITION

•In case of EEC dual channel failure the valves go to its fail safe OPEN position
•With single valve failure, the system is operative
•The EEC monitors leak or burst scenarios and generates warning messages to the FWS

The fail safe position of the valves in case of EEC dual channel failure is OPEN.
In case of a single valve failure, the corresponding valve being failed open, the anti-ice function is still available.
The two pressure Transducers (PT1 for core zone and PT2 for fan zone) monitors leak or burst scenarios and a dual fan case thermocouple helps in identifying over temperature conditions due to leaks or burst. The EEC monitors the same and generates warning messages to the FWS.
Master Minimum Equipment List (MMEL) IMPACT- In case of both NAI valve failures, dispatching with one of the two valves locked close will not be possible.



PRSOV 1

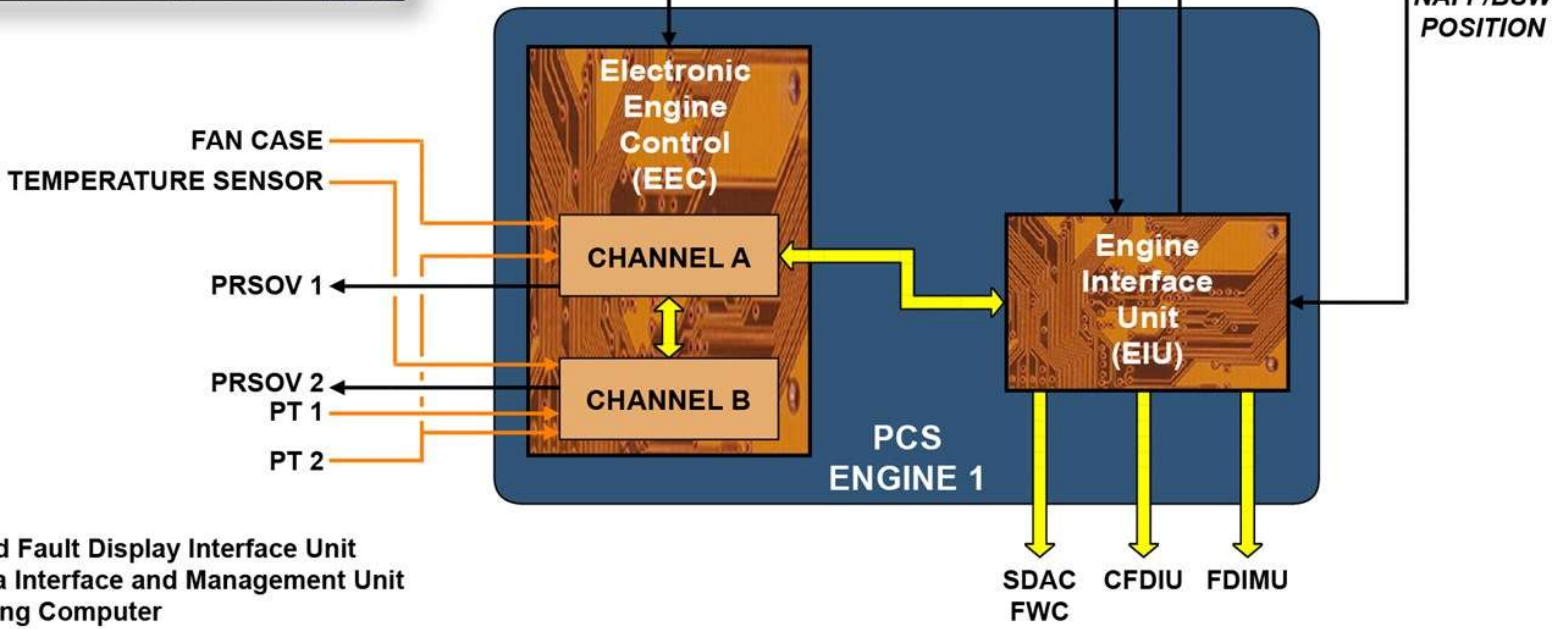
PRSOV 2

(25VU)

P/BSW POSITION

FAULT

OPPOSITE ENGINE NAI P/BSW POSITION



CFDIU: Centralized Fault Display Interface Unit
FDIMU: Flight Data Interface and Management Unit
FWC: Flight Warning Computer
PCS: Propulsion Control System
PRSOV: Pressure Regulating Shut-Off Valve
PT: Pressure Transducer
SDAC: System Data Acquisition Concentrator

Drain Mast Ice Protection System Presentation

GENERAL

Comp loc AFT CARGO Compartment
Drain Mast Heat CTL Unit
• Wastewater dumped overboard by drain masts
The wastewater from the galley and lavatory compartment washbasins is dumped overboard through drain masts.

CONTROL SUPPLY

• With A/C electrically supplied, electrical heating automatically controlled to protect drain mast against ice formation
To protect drain masts against ice formation, electrical heating, through an automatically controlled system, is supplied when the A/C is electrically supplied.

USERS

• Flexible heater foil bonded on the drain mast tube
•Temperature regulated via a sensor
•Powered by the drain mast heating CU
The flexible heater foil, bonded on the drain mast tube, is temperature regulated via a sensor and powered by the drain mast heating Control Unit (CU). The AC power supply line, within the drain mast, is installed with a thermal switch opening at 120ºC (250F). It will regulate the temperature in case of normal temperature control failure.

CONTROL UNIT

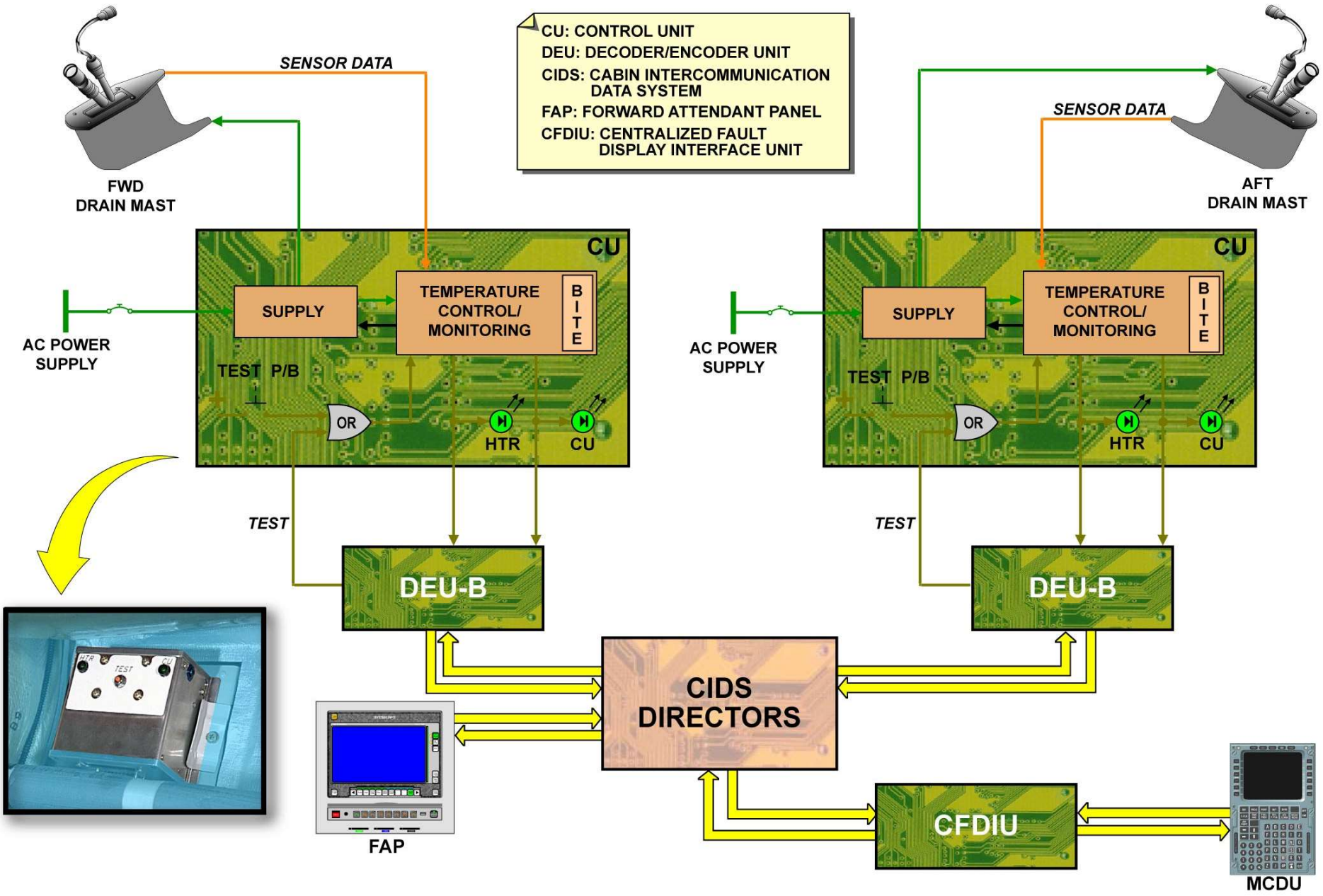
• Regulation of the drain mast tube temperature
•Monitoring by the BITE function
•One CU per drain mast
•Temperature regulation between 6ºC (43F) and 10ºC (50F)
The CU regulates the temperature of the drain mast tube. The correct operation of the system is monitored by the BITE function of the CU. Each CU regulates the heating temperature of the associated drain mast tube between 6ºC (43F) and 10ºC (50F).

MONITORING

• System status sent to the CIDS for indication on the FAP
•Failure of the CU or HTR indicated on the FAP, and on the CU front face
•Drain mast data stored in the CFDIU
The system status is sent to the Cabin Intercommunication Data System (CIDS) for indication on the Flight Attendant Panel (FAP). The failure of the Heater (HTR) or CU is indicated on the FAP by a CIDS CAUTion light, and on the front face of the CU by HTR and CU lights. The drain mast data is stored in the Centralized Fault Display Interface Unit (CFDIU).

TEST

• Two tests
•One from the MCDU, the other from the CU:
  - For the drain mast test, "TEST OK" is displayed on the MCDU
  - HTR and CU lights are ON if the test is satisfactory as long as TEST P/BSW is pressed in
•Indication of a fault
To perform a complete test of the drain mast system, two tests must be carried out, one from the MCDU, and the second one on each CU. If the test is satisfactory:
- on the MCDU, the message "TEST OK" is displayed,
- on the front face of the CU, the HTR and CU lights are ON as long as the associated TEST P/BSW is pressed in.
If we have a fault on that system, the information is indicated by a CAUT light on the FAP and can be seen on the SYSTEM INFO, on page:
"DRAINMASTS FAIL>
- CHECK WASTE WATER OVERFLOW FWD (AFT)".


CU: CONTROL UNIT
DEU: DECODER/ENCODER UNIT
CIDS: CABIN INTERCOMMUNICATION DATA SYSTEM
FAP: FORWARD ATTENDANT PANEL
CFDIU: CENTRALIZED FAULT DISPLAY INTERFACE UNIT
SENSOR DATA
FWD DRAIN MAST
AFT DRAIN MAST
CU
SUPPLY
TEMPERATURE CONTROL/ MONITORING
BITE
AC POWER SUPPLY
TEST P/B
OR
HTR
CU
TEST
DEU-B
CIDS DIRECTORS
FAP
CFDIU
MCDU

Potable/Waste Water Lines Anti-Ice System Presentation

GENERAL

Comp loc FWD CARGO Compartment
Pot Water lines Heat CTL Unit
•3 Potable/waste water lines insulated and electrically heated
•System composed of 1 CU, heater assemblies, and 2 sensors
The potable and waste water lines in sections 13 and 14 are insulated and electrically heated to prevent ice formation in or around the water lines. The system comprises a control unit and heater assemblies associated to two sensors.

CONTROL SUPPLY

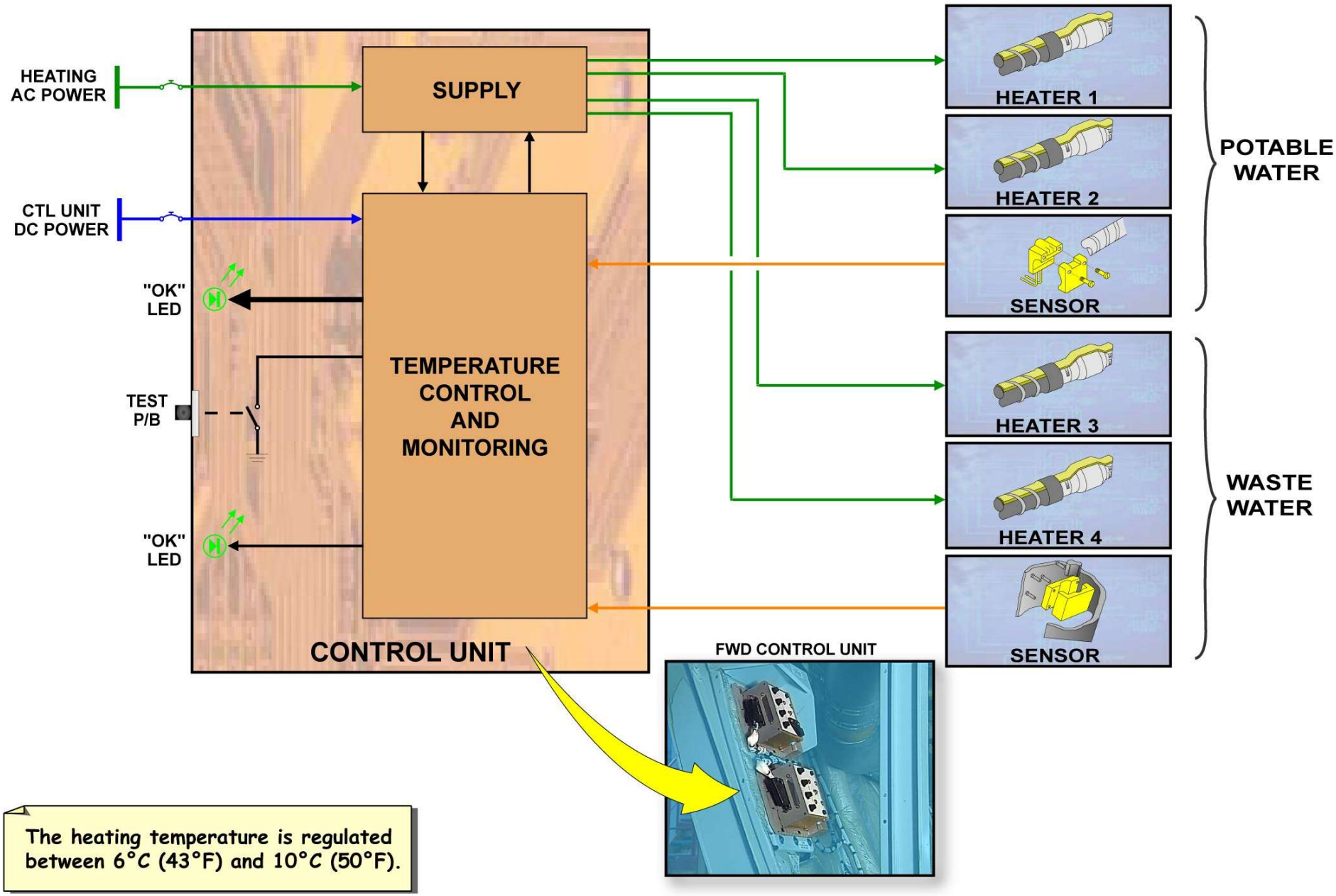
As soon as A/C electrically energized
Each system operates as soon as the A/C is electrically supplied.

CONTROL UNIT

• Regulates range of each group of heater via sensors
Each control unit regulates the temperature range of each group of heater assemblies via their respective sensor.

TEST

• Manual test on the CU via P/B
•2 green "OK" LEDs
A manual test of the system is available via a P/B located on the control unit. On the front face of the control unit, two green "OK" LEDs come on if the test is satisfactory.



The heating temperature is regulated between 6°C (43°F) and 10°C (50°F).

END