

A330-200
TECHNICAL TRAINING MANUAL
MECHANICS / ELECTRICS & AVIONICS COURSE
30 ICE AND RAIN PROTECTION
GE Metric

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■ FQW4200

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GENERAL SYSTEM PRESENTATION

- General
- Slats and Engines
- Windows, Probes, Ports and Water Installation
- Rain Removal
- Escape-Slide Locking Mechanism Ice Protection
- Ice Detection (Optional)

GENERAL

The Ice and Rain Protection system permits aircraft operation without restriction in icing conditions or heavy rain.

Critical areas of the aircraft are protected by hot air or electrical heating.

SLATS AND ENGINES

The wing slat leading edges and the engine air intakes are supplied with hot air.

WINDOWS, PROBES, PORTS AND WATER INSTALLATION

The cockpit windows, the probes, ports and the water installation are electrically heated.

RAIN REMOVAL

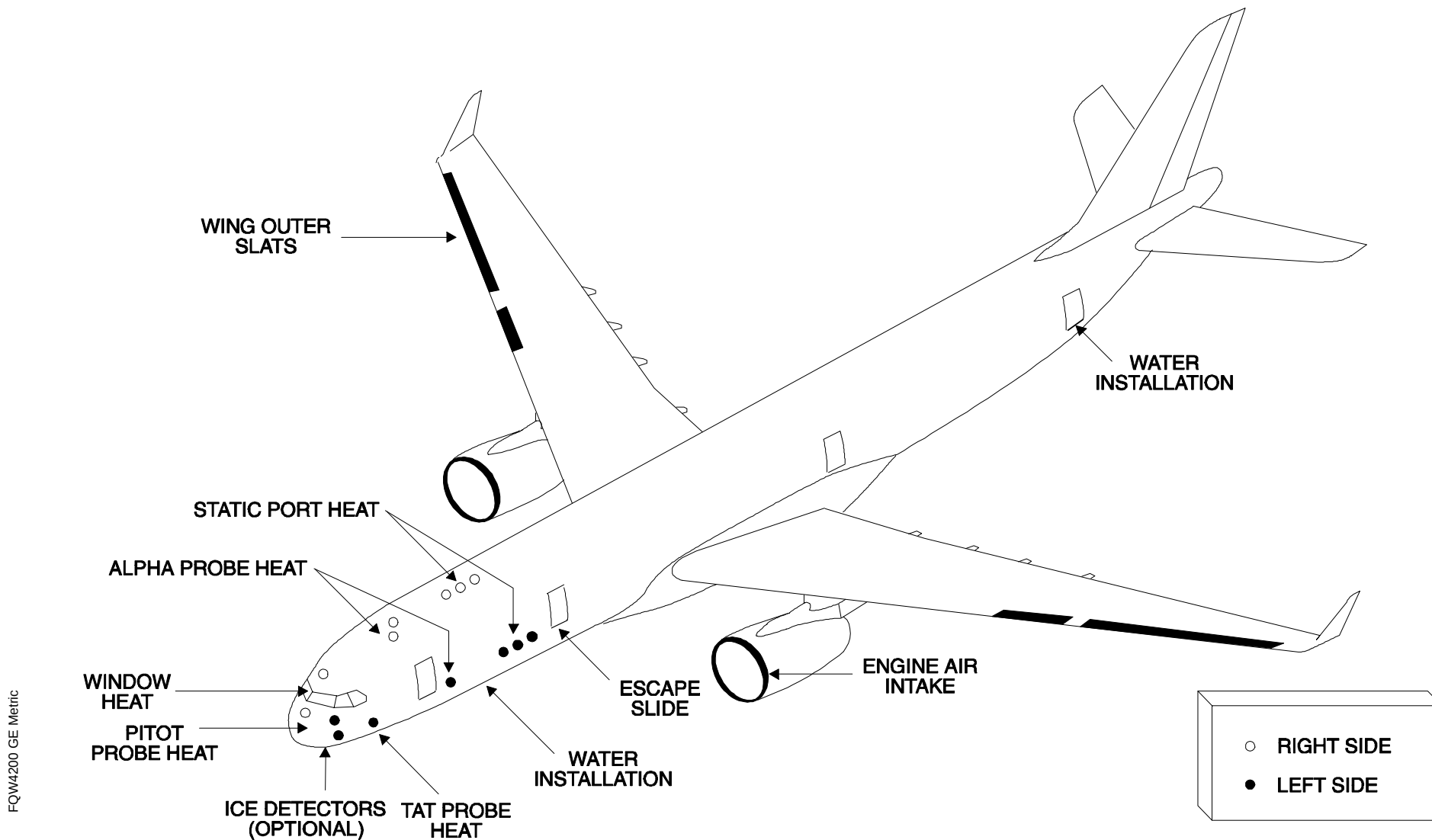
Rain is removed from the front windshield panel by wipers and, in heavy rain only, by the optional rain repellent fluid system.

ESCAPE-SLIDE LOCKING MECHANISM ICE PROTECTION

The locking plates are electrically heated to prevent ice formation so as to make sure that the passenger/crew doors can open in icing conditions.

ICE DETECTION (OPTIONAL)

The dual advisory ice detection system provides a better detection of icing conditions and thus fuel saving.



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STUDENT NOTES

WING ANTI-ICE: SYSTEM PRESENTATION

Sources
Valves
Controls
Test Function

SOURCES

The four outboard slats of each wing are supplied with hot air from the pneumatic system.

VALVES

Hot air is supplied to each wing via two wing anti-ice valves (pressure control shut-off valves) located in the wing leading edge.

The valves are pneumatically operated and electrically controlled.
Two downstream pressure switches (Low & High) monitor the valve regulation.
In case of loss of electrical power supply or lack of pressure, the valve closes.

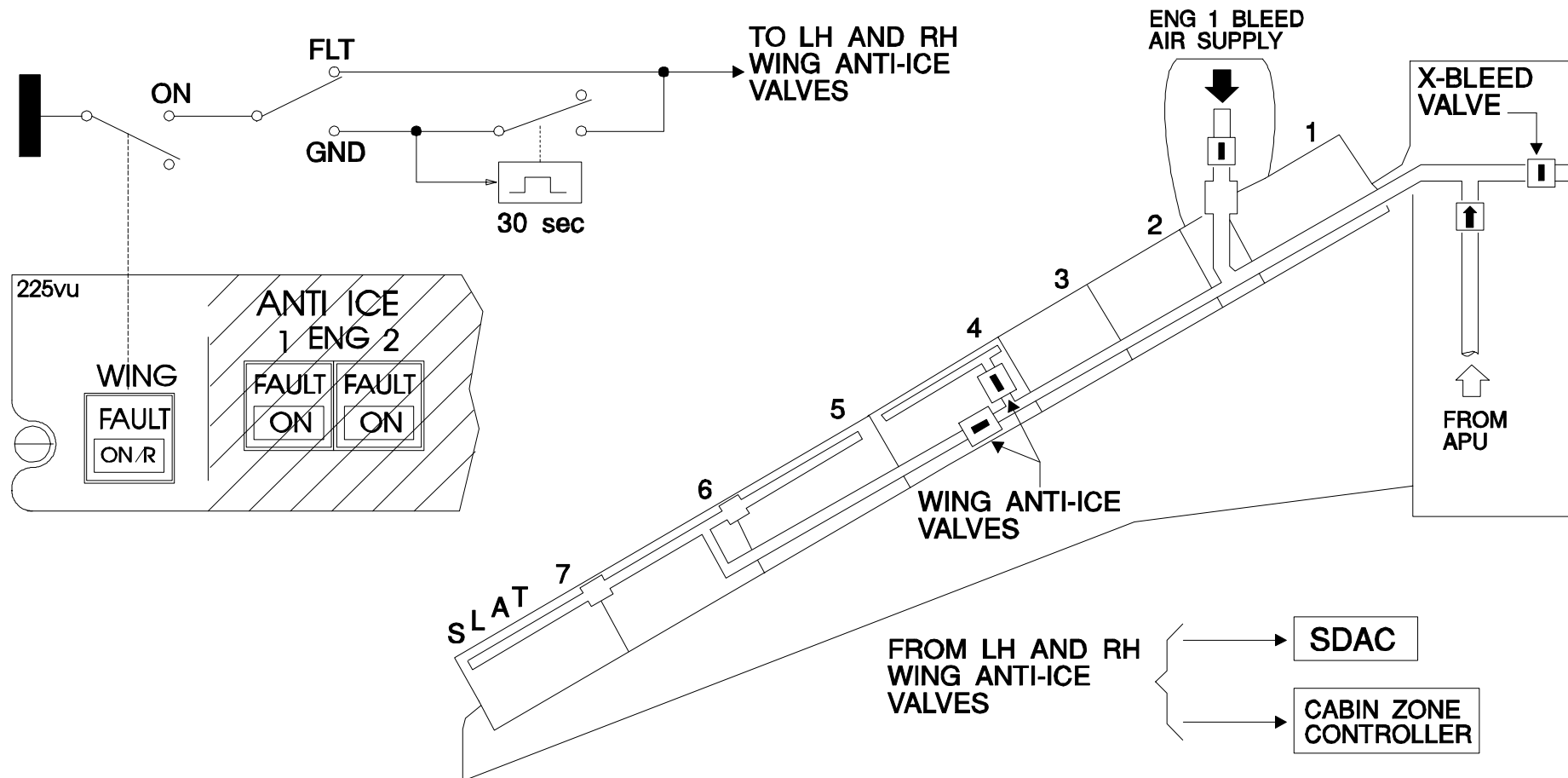
CONTROLS

These valves are electrically controlled by a pushbutton on the "ANTI-ICE" Control Panel, located on the Overhead Panel.
The system operates in flight only.
The "FAULT" light comes on in case of abnormal operation.

When the wing ANTI-ICE pushbutton is "ON", a signal is sent to the "FADEC" in order to decrease the N1 limit relative to the ambient conditions, the engine operating conditions and the load of the anti-ice bleed.

TEST FUNCTION

On ground and only for test purposes, the wing anti-ice pushbutton electrically opens the valves for 30 seconds.



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STUDENT NOTES:

WING ANTI-ICE: ECAM PAGE PRESENTATION

General
Anti-Ice Indication
Wing Anti-Ice Valves Indication

GENERAL

When the WING ANTI-ICE system is set to "ON", information is displayed on the ECAM MEMO display and the BLEED page.

(1) - WING ANTI-ICE is displayed in GREEN, on the Engine/Warning Display, when the WING ANTI-ICE pushbutton is set to "ON".

ANTI-ICE INDICATION

All four valves are simultaneously controlled by a single ON/OFF pushbutton switch on the overhead panel.

ANTI-ICE is displayed WHITE or AMBER according to WING ANTI-ICE pushbutton and valves position.

(2) - ANTI-ICE is displayed in WHITE :

- when the WING ANTI-ICE pushbutton is in "ON" position and all the valves are not closed (open).

ANTI-ICE is displayed in AMBER :

- when the WING ANTI-ICE pushbutton is in "ON" position and at least one valve is closed, or a valve is in high or low pressure, or a valve is not closed on ground for more than 35 seconds,
- when the WING ANTI-ICE pushbutton is set to "OFF" and at least one valve is not closed.

ANTI-ICE is replaced by "XX" in AMBER :

- if the WING ANTI-ICE pushbutton position datum is not available.

If none of the previous conditions are met, nothing is displayed.

WING ANTI-ICE VALVES INDICATION

The triangle symbols represent the flow of engine bleed air to the left and right wing anti-icing systems.

(3) - The triangle is displayed in GREEN :

- when the valve is open and pressure is normally regulated.

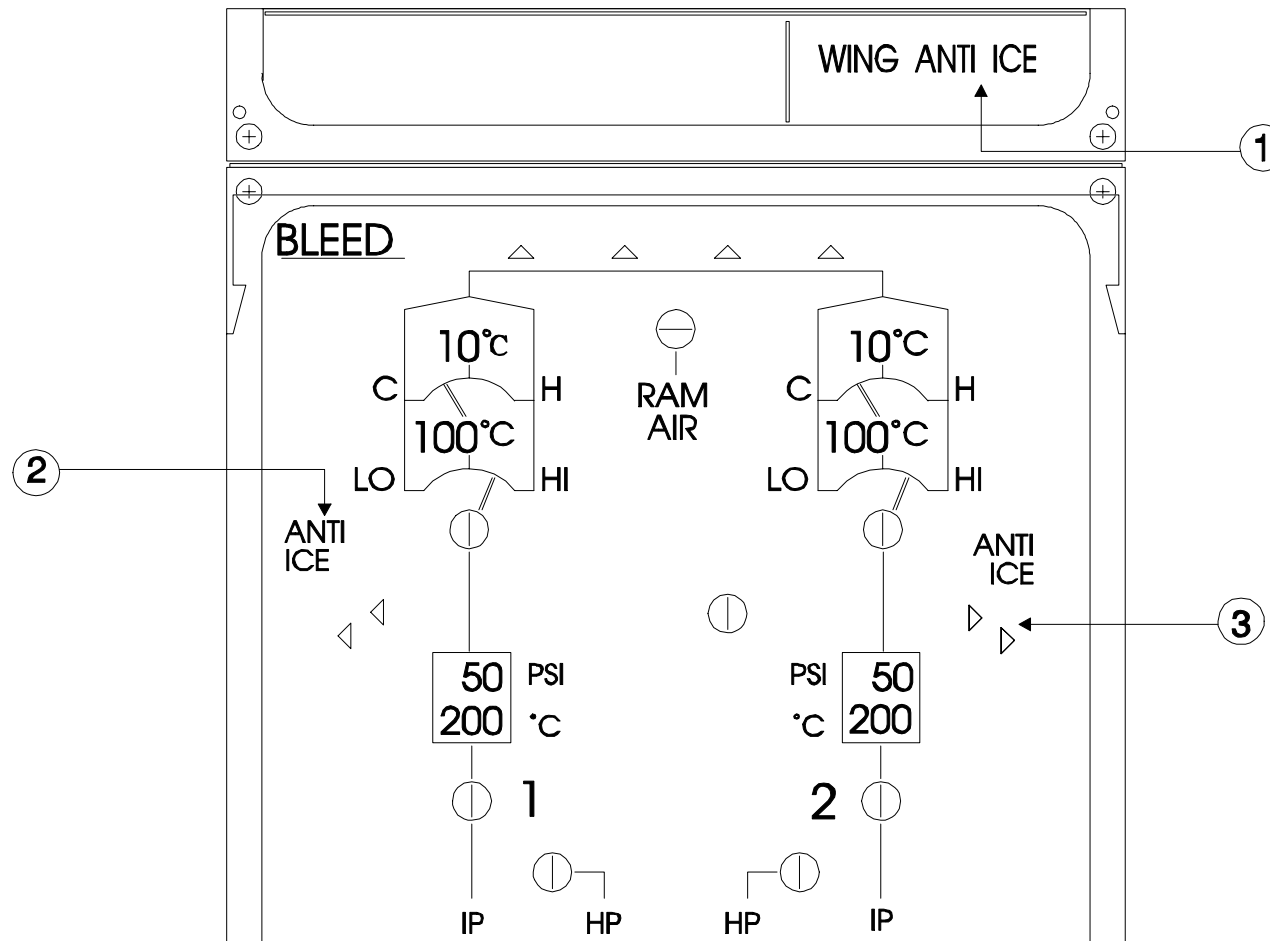
The triangle is displayed in AMBER :

- if the valve is not closed and the respective pressure sensors transmit a high or low pressure information to the SDAC,
- or if the valve is not closed and the WING ANTI-ICE pushbutton is in "OFF" position,
- or if the valve is detected not closed on ground for more than 35 seconds.

The triangle is replaced by "XX" in AMBER :

- if the LH (RH) inner (outer) valve position data is not available, - or when the WING ANTI-ICE pushbutton position data is not available.

No display if the LH (RH) inner (outer) valve is closed.



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STUDENT NOTES

WING ANTI-ICE: INTERFACES

Pushbutton Switch
Engine Interface and Vibration Monitoring Unit (EIVMU)
Landing Gear Control and Interface Unit (LGCIU)
Electronic Control Box (ECB)
System Data Acquisition Concentrator (SDAC)
Zone Controller

PUSHBUTTON SWITCH

The Wing Anti-Ice (WAI) pushbutton switch sends a discrete signal to the wing anti-ice system (control relay, system mode relay, ground test relay, fault relay) to enable control, ground test and monitoring.

It also sends the pushbutton switch configuration to the System Data Acquisition Concentrator (SDAC) for ECAM information display and to the Zone Controller for monitoring and bleed air management.

The WAI pushbutton switch acquires a discrete signal from the WAI fault relay for the illumination of the FAULT light on the pushbutton switch in case of disagreement between the pushbutton switch and valve position.

ENGINE INTERFACE AND VIBRATION MONITORING UNIT (EIVMU)

The Engine Interface and Vibration Monitoring Units (EIVMU) acquire the Wing Anti-Ice pushbutton switch configuration for engine power increase according to the bleed demand.

LANDING GEAR CONTROL AND INTERFACE UNIT (LGCIU)

The Landing Gear Control and Interface Unit (LGCIU 1) sends a ground signal to the WAI control relay and ground test relay to enable the system control or ground test according to aircraft configuration.

ELECTRONIC CONTROL BOX (ECB)

The Electronic Control Box receives a discrete input when the wing anti-ice system is selected on ground.

This enables to boost automatically the APU to perform a wing anti-ice test.

SYSTEM DATA ACQUISITION CONCENTRATOR (SDAC)

The System Data Acquisition Concentrator (SDAC) acquires discrete inputs from the wing anti-ice system to display system status on the ECAM and generate warnings.

The discrete inputs are :

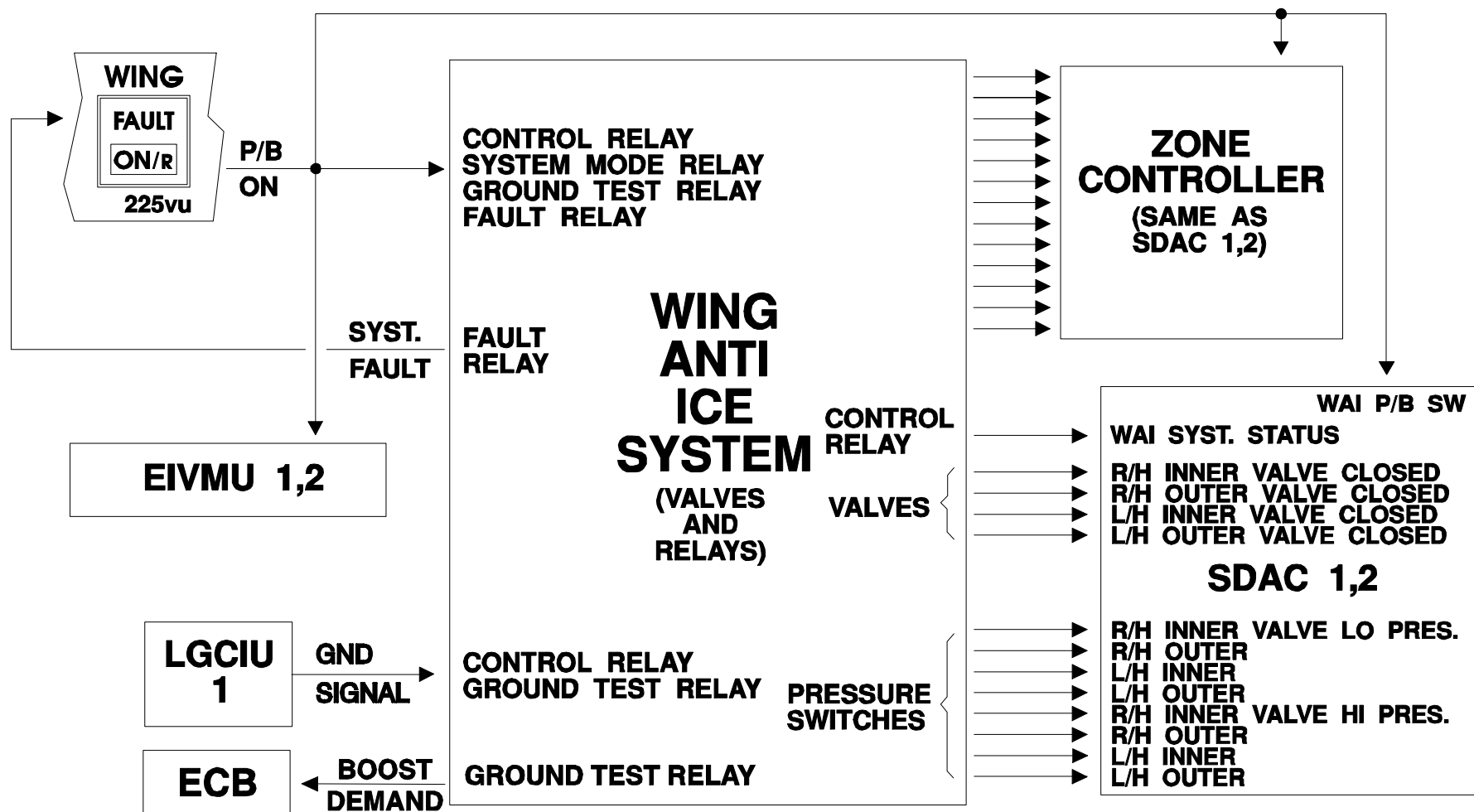
- 1 from the WAI pushbutton switch,
- 1 from the WAI control relay,
- 4 from the WAI valve position switches,
- 8 from the WAI valve pressure switches.

ZONE CONTROLLER

The Zone Controller acquires discrete inputs from the wing anti-ice system to monitor the system and manage the bleed air.

The discrete inputs are :

- 1 from the WAI pushbutton switch,
- 1 from the WAI control relay,
- 4 from the WAI valve position switches,
- 8 from the WAI valve pressure switches.



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STUDENT NOTES

WING ANTI-ICE: WARNINGS

L (R) INR (OUTR) HIGH PRESSURE
L (R) INR (OUTR) LOW PRESSURE
WING OPEN ON GROUND
WING VALVE NOT OPEN
L (R) INR (OUTR) WING OPEN
WAI SYSTEM FAULT

L (R) INR(OUTR) HIGH PRESSURE

High pressure is detected.

L (R) INR(OUTR) LOW PRESSURE

Low pressure is detected.

WING OPEN ON GROUND

The time delay relay has failed.

WING VALVE NOT OPEN

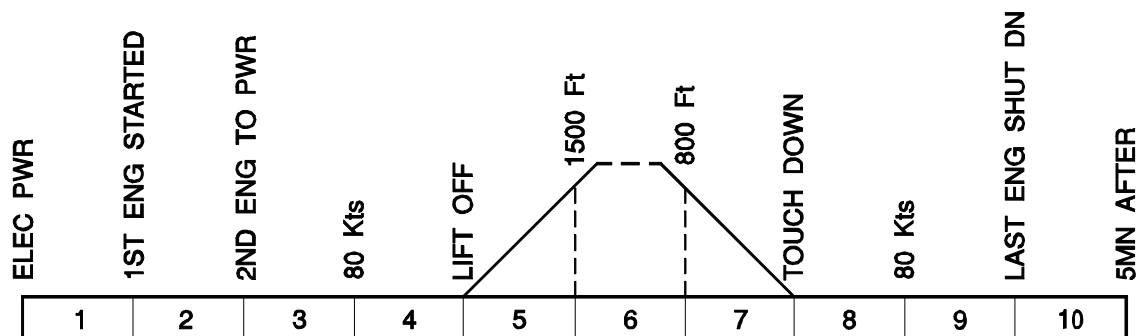
One WAI valve remains closed when WAI P/B is selected ON.

L (R) INR (OUTR) WING OPEN

One WAI valve remains open when WAI P/B is selected off.

WAI SYSTEM FAULT

The WAI relay has failed.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
L(R) INR(OUTR) WING HI PR	NIL	NIL	BLEED	NIL	4, 5, 7, 8
L(R) INR(OUTR) WING LO PR	SINGLE CHIME	MASTER CAUT	BLEED	NIL	3, 4, 5, 7, 8
WING OPEN ON GND	SINGLE CHIME	MASTER CAUT	BLEED	NIL	3, 4, 5, 7, 8
WING VLVE NOT OPEN	SINGLE CHIME	MASTER CAUT	BLEED	WAI FAULT light	3, 4, 5, 7, 8
L(R) INR(OUT) WING OPEN	SINGLE CHIME	MASTER CAUT	BLEED	WAI FAULT light	4, 8
WAI SYS FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 8

STUDENT NOTES

WING ANTI-ICE: COMPONENTS

Wing Anti-Ice Valve

SAFETY PRECAUTIONS

Make sure that the safety devices and the warning notices are in position before you start work.

Make sure that the pneumatic system is depressurized before you start work.

Do not touch the wing anti-ice ducts until they are cool.

STUDENT NOTES

WING ANTI-ICE VALVE

FIN : 9DL1 10DL1 9DL2 10DL2

ZONE : 522 622

DESCRIPTION

The valve is provided with :

- an actuator body,
- a butterfly body,
- a pilot valve assembly,
- a solenoid valve,
- a valve position microswitch,
- two pressure switches,
- two ground test connections,
- a filter element.

REMOVAL INSTALLATION

The valve is line-mounted by means of two couplings and positioned thanks to a locating pin on each side.

The three connectors (high pressure switch, low pressure switch, valve control and position) are of quick-disconnect type.

MANUAL OVERRIDE

Each end of the butterfly shaft has a square nut and a manual device which can lock the valve in the open or closed position (locking pin on one side, locking plate on the other side).

There are indicators on each end of the shaft which show the open or closed position of the butterfly.

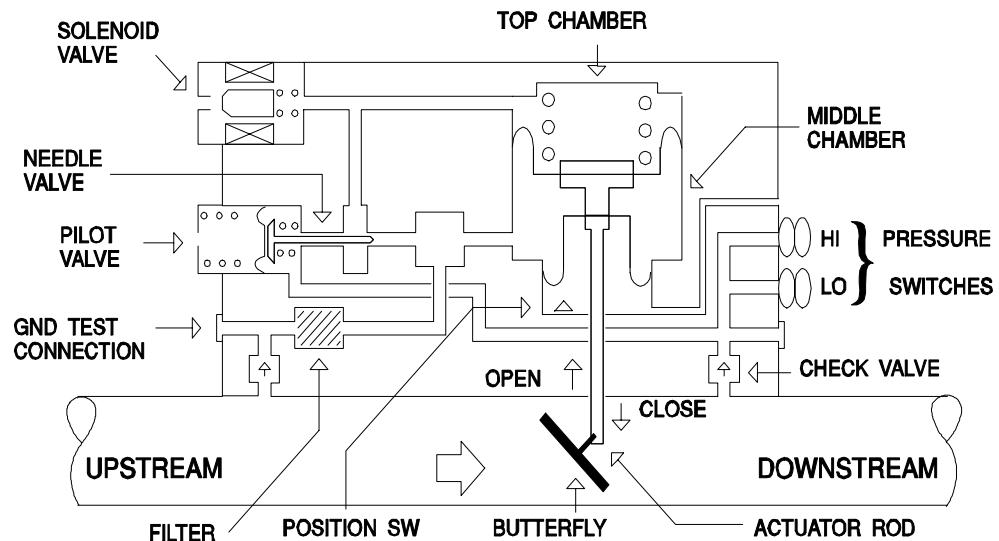
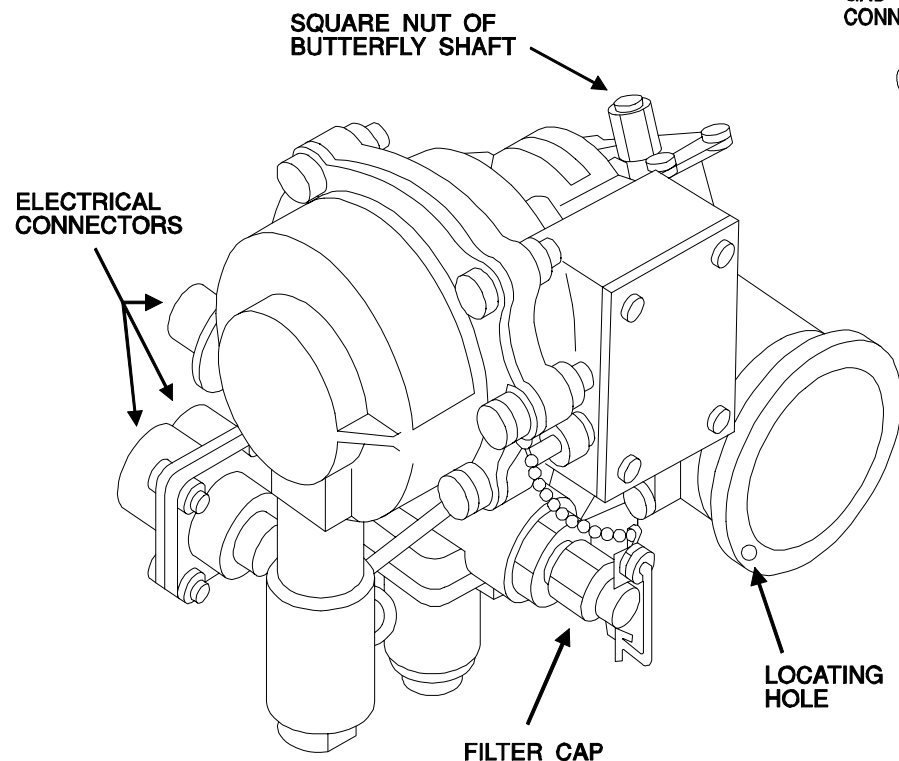
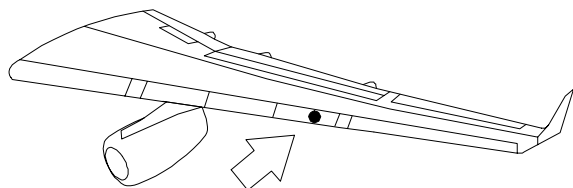
OPERATION

When the solenoid valve is energized (P/B ON), the top chamber is connected to atmosphere , upstream air enters in the middle chamber, moves up the diaphragm and thus opening the butterfly.

When the solenoid valve is de-energized , the top chamber is closed, the needle valve moves onto its seat and spring pressure moves the actuator rod down to close the butterfly.

IN SITU TEST

The valve has two ground-test connections. These make it possible to perform a functional test of the valve without bleed-air pressure in the ducts.



(CROSS SECTION)

WING ANTI-ICE VALVE

STUDENT NOTES

ENGINE AIR INTAKE ANTI-ICE: SYSTEM PRESENTATION

Source
Valve
Control
ECAM Page

SOURCE

Air is bled from the high pressure compressor stage of each engine.

VALVE

For each engine, hot bleed air is ducted via an "ON/OFF" valve.

The valve is pneumatically operated, electrically controlled and spring loaded open.

Upon energization of the solenoid, the valve will close.

In case of loss of electrical power supply, the valve will open .

CONTROL

For each engine, the "ON/OFF" valve is controlled by a pushbutton.

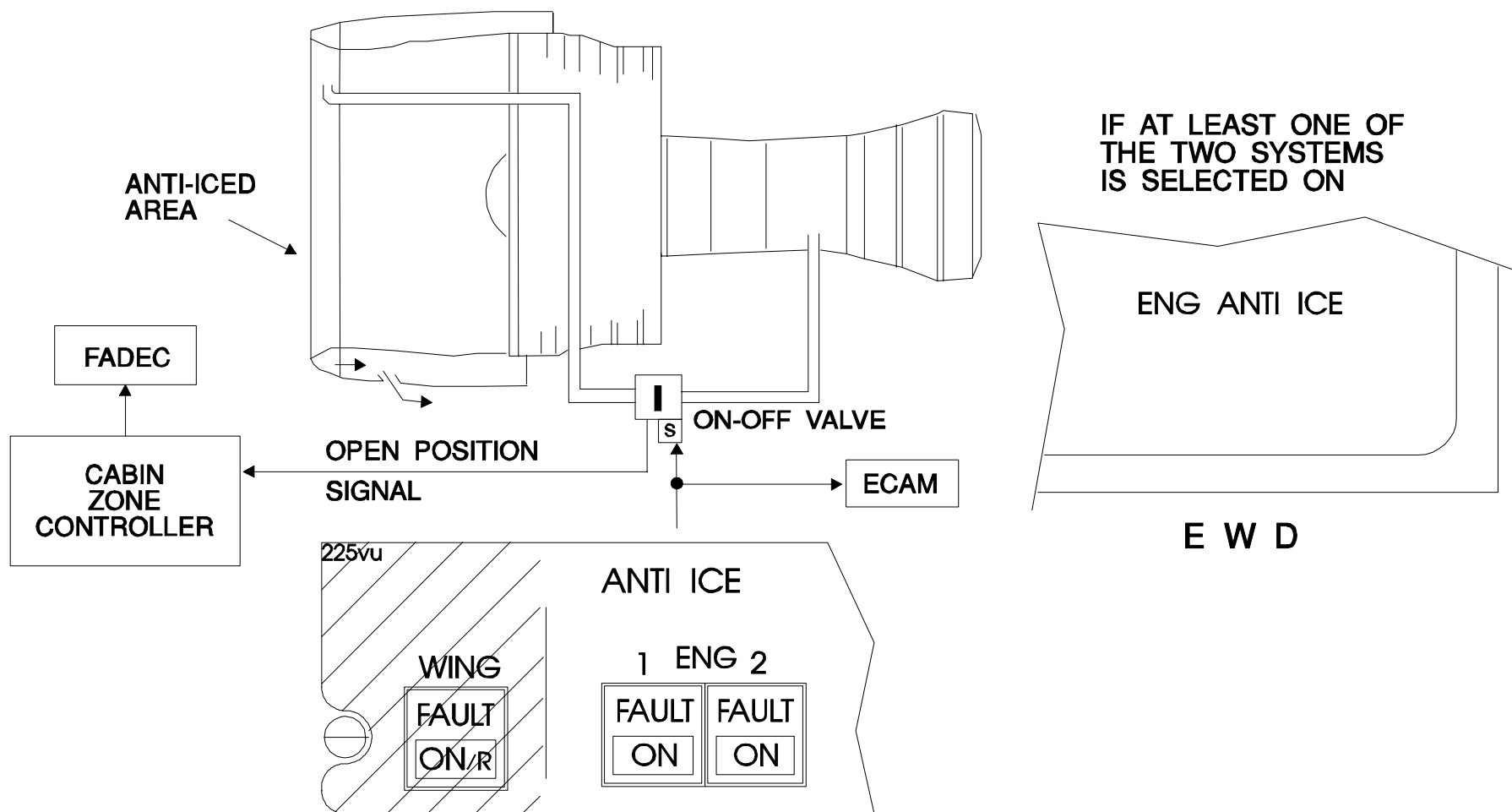
Continuous ignition is automatically activated when the engine anti-ice system is selected ON.

The "FAULT" light comes on during transit or in case of abnormal operation.

When the anti-ice valve is open, the Cabin Zone Controller determines the bleed air demand for the Full Authority Digital Engine Control (FADEC) system.

ECAM PAGE

If at least one of the two engine air intake anti-ice systems is selected "ON", a message appears in GREEN on the "ECAM MEMO" display.



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STUDENT NOTES:

ENGINE AIR INTAKE ANTI-ICE: INTERFACES

Pushbutton Switch
System Data Acquisition Concentrator (SDAC)
Zone Controller
Engine Interface and Vibration Monitoring Unit
(EIVMU)

PUSHBUTTON SWITCH

The pushbutton switch sends a discrete signal to the control solenoid to open or close the valve, this information is also sent to the Engine Interface and Vibration Monitoring Units (EIVMU), to the Zone Controller and to the System Data Acquisition Concentrator (SDAC).

The FAULT light comes ON in case of disagreement between the pushbutton switch configuration and the valve position.

SYSTEM DATA ACQUISITION CONCENTRATOR (SDAC)

The SDAC acquires the pushbutton switch configuration and the fault condition information to display the system status on the ECAM and generate warnings.

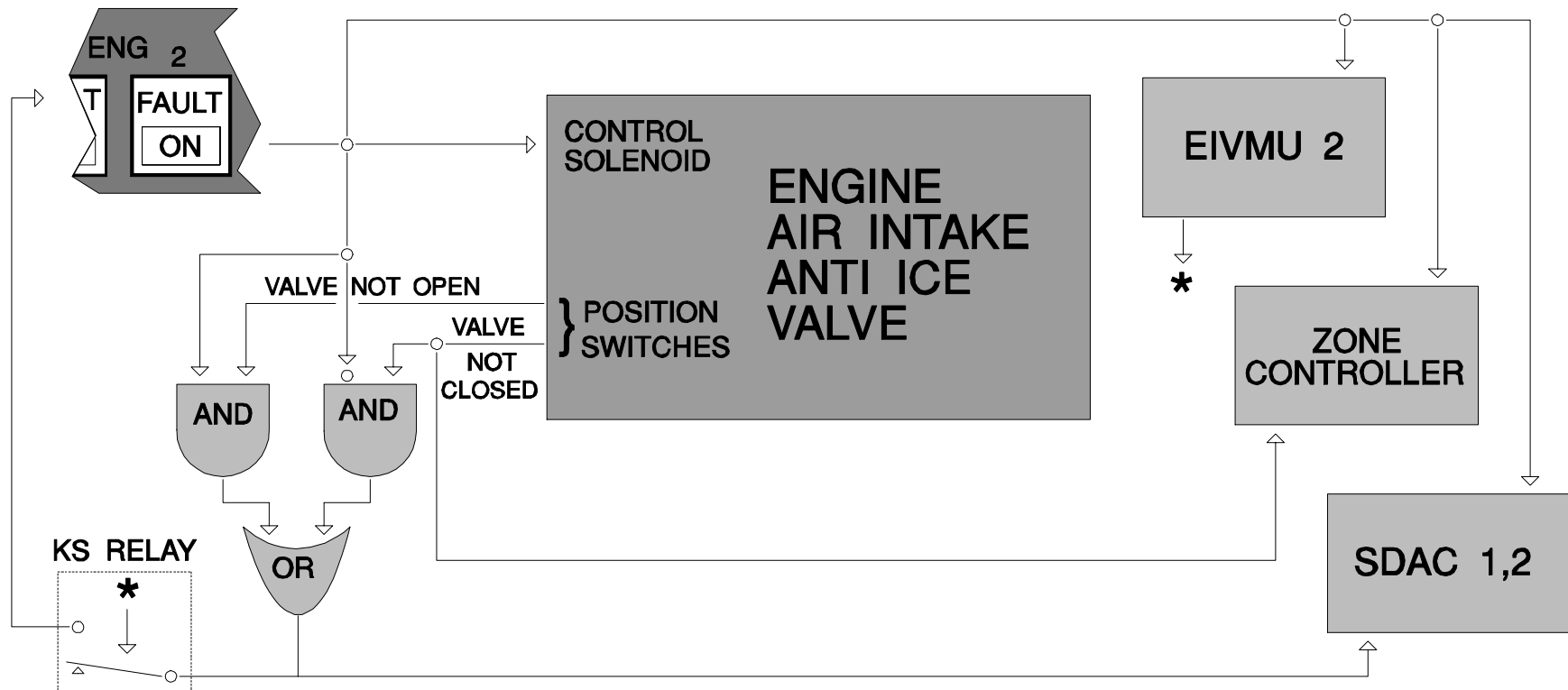
ZONE CONTROLLER

The Zone Controller acquires the pushbutton switch configuration and the "valve not closed" information from the valve position switch for air bleed status computation.

ENGINE INTERFACE AND VIBRATION MONITORING UNIT (EIVMU)

The EIVMU acquires the configuration of the associated pushbutton switch and transmits it to the Full Authority Digital Engine Control System (FADEC) via an ARINC 429 bus for selecting the continuous ignition.

The EIVMU sends the "oil low press and ground information" via the KS relay to avoid an unwanted illumination of the FAULT light on ground, engines not running.



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STUDENT NOTES

ENGINE AIR INTAKE ANTI-ICE: WARNINGS

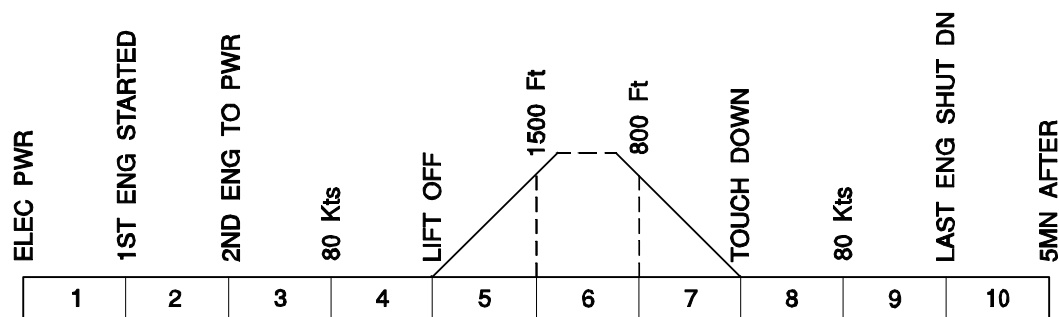
ENG 1(2) VALVE CLOSED
ENG 1(2) VALVE OPEN

ENG 1(2) VALVE CLOSED

The valve has failed in the closed position.

ENG 1(2) VALVE OPEN

The valve has failed in the open position.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
ENG 1(2) VALVE CLOSED	SINGLE CHIME	MASTER CAUT	NIL	ENG affected ANTH-ICE FAULT light	4, 5, 7, 8
ENG 1(2) VALVE OPEN	SINGLE CHIME	MASTER CAUT	NIL	ENG affected ANTH-ICE FAULT light	4, 5, 7, 8

STUDENT NOTES

ENGINE AIR INTAKE ANTI-ICE: COMPONENTS

Engine Air Intake Anti-Ice Valve

SAFETY PRECAUTIONS

Make sure that the associated circuit breaker is open.

STUDENT NOTES

ENGINE AIR INTAKE ANTI-ICE VALVE

FIN : 4000DN

ZONE : 410 420

VALVE DESCRIPTION

The butterfly shut-off valve is line mounted and provided with an electrical connector and a pneumatic connector for operating muscle pressure.

MANUAL OVERRIDE

Without motive pressure, it is possible to manually move and lock the valve in the desired position (open or close), by application of a torque to a standard square nut attached to the butterfly shaft.

Insertion of the locking pin through the locking hole on the valve body locks the valve in the desired position.

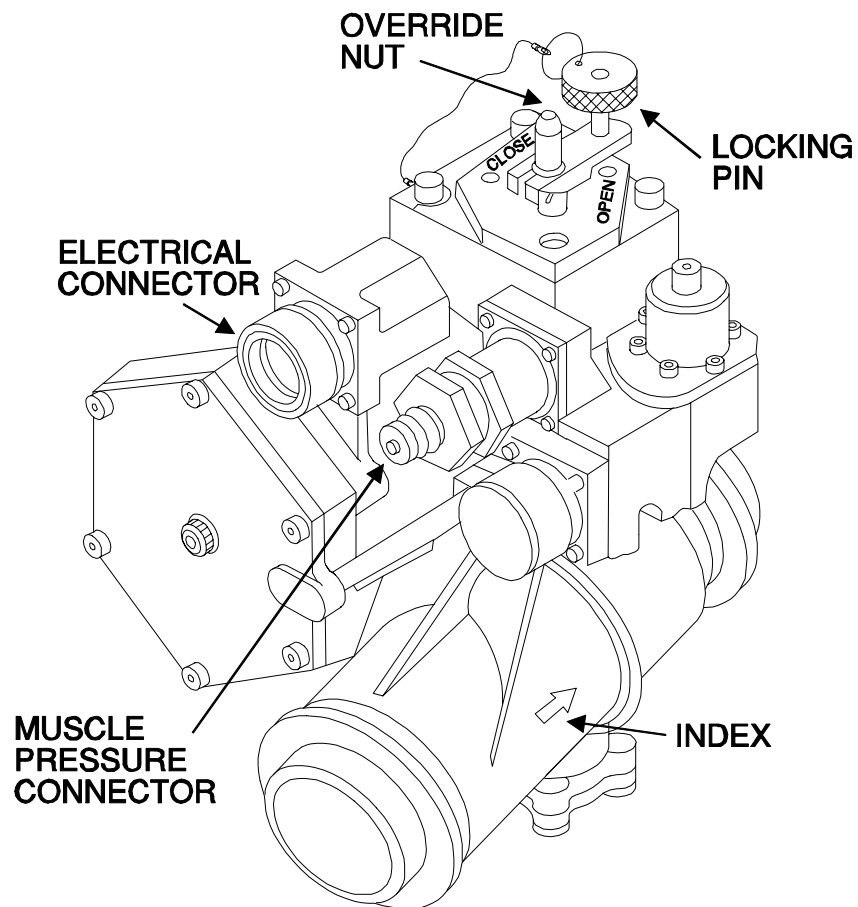
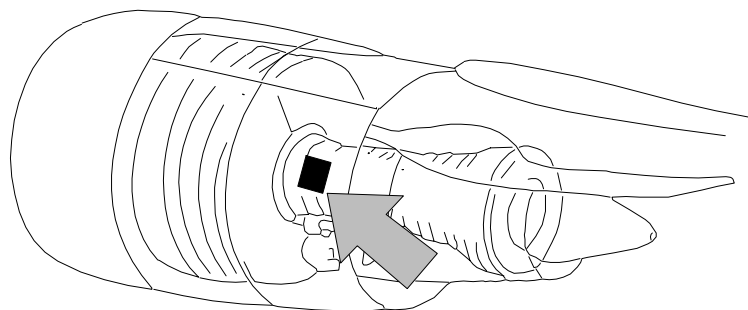
REMOVAL INSTALLATION

The valve is installed between the inlet duct and the outlet duct by means of two couplings.

The muscle pressure hose and its coupling must be tightened at a precise torque.

CAUTION

Make sure that the flow arrow on the valve points to the outlet duct.



STUDENT NOTES

PROBE ICE PROTECTION: SYSTEM PRESENTATION

Function
Control
Probe Heat Computer (PHC)
Caution

FUNCTION

The static ports, Angle Of Attack, pitot and Total Air Temperature probes are electrically heated to prevent ice formation.

The Captain, First Officer and Standby Probe Heat Systems are independent. Each one consists of one Probe Heat Computer (PHC) which controls probe and static port heating.

The Standby system has no TAT probe.

CONTROL

Probes and static ports are automatically heated when engine 1 or 2 is started on ground or in flight.

The PROBES/WINDOW "HEAT" pushbutton overrides the automatic operation.

On ground, pitot heating is reduced and TAT heating is cut off.

PROBE HEAT COMPUTER (PHC)

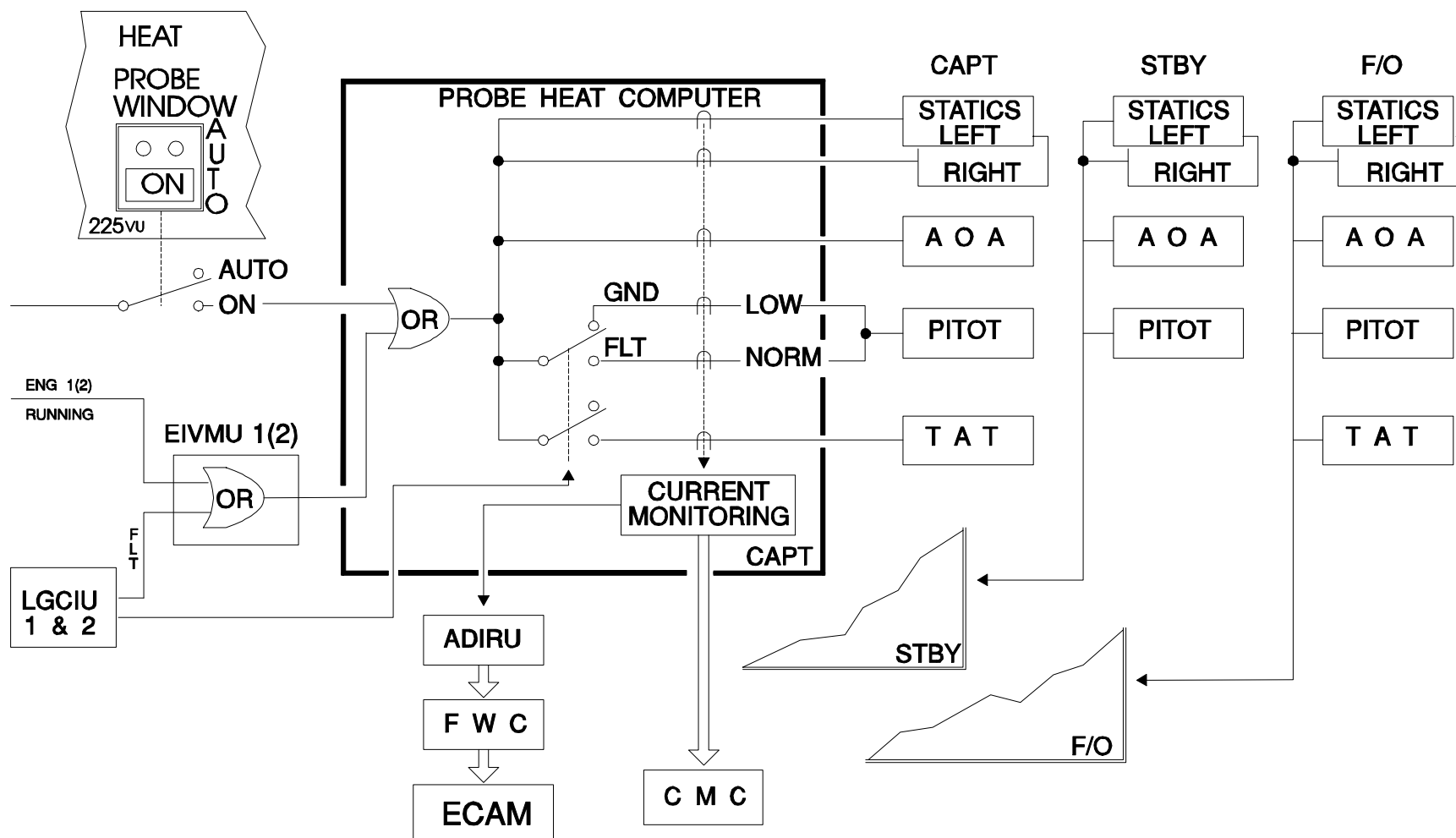
The Probe Heat Computer monitors the heating current and triggers a warning if the preset threshold is reached.

In case of a probe heating fault the Probe Heat Computers (PHCs) send an output to the ECAM via Air Data Inertial Reference Units (ADIRU) and Flight Warning Computers (FWC).

The PHCs also transmit fault messages to the Centralized Maintenance Computers (CMC).

CAUTION

Pulling the Probe Heat Computer or Engine Interface Vibration Monitoring Unit or Landing Gear Control Interface Unit power supply circuit breakers causes the flight mode heating of the probes and static ports.



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STUDENT NOTES:

PROBE ICE PROTECTION: INTERFACES

Pushbutton Switch
Pin Programming
Landing Gear Control and Interface Unit (LGCIU)
Engine Interface and Vibration Monitoring Unit
(EIVMU)
Central Maintenance Computer (CMC)
Reset Circuit Breaker
Power Supply
Air Data Inertial Reference Unit (ADIRU)
System Data Acquisition Concentrator (SDAC)

PUSHBUTTON SWITCH

The PROBE/WINDOW HEAT pushbutton switch overrides the automatic heating control.

PIN PROGRAMMING

One of the pins is used for probe and sensor heating level, the other for the aircraft type.

LANDING GEAR CONTROL AND INTERFACE UNIT (LGCIU)

The Landing Gear Control and Interface Units LGCIU1 and LGCIU2 send ground or flight signals to the Probe Heat Computer (PHC) to select the heating level of the pitot probe and the TAT sensor.

The LGCIUs also send a validity signal.

ENGINE INTERFACE AND VIBRATION MONITORING UNIT (EIVMU)

The Engine Interface and Vibration Monitoring Units EIVMU1 and EIVMU2 send engine shut down and ground information via the engine relays to the PHC to enable the heating control.

CENTRAL MAINTENANCE COMPUTER (CMC)

The Central Maintenance Computers (CMC) are connected to the PHC for system monitoring.

The PHC is a type 2 system (ARINC 429 output, test maintenance discrete input).

RESET CIRCUIT BREAKER

The reset circuit breaker on the overhead panel sends a ground signal to the associated PHC for reinitialization.

POWER SUPPLY

The PHC is supplied with 28 Volts DC to operate its own components.

The static ports are supplied with 28 Volts DC ;
the AOA sensor, TAT sensor and pitot probe are supplied with 115 Volts AC.

AIR DATA INERTIAL REFERENCE UNIT (ADIRU)

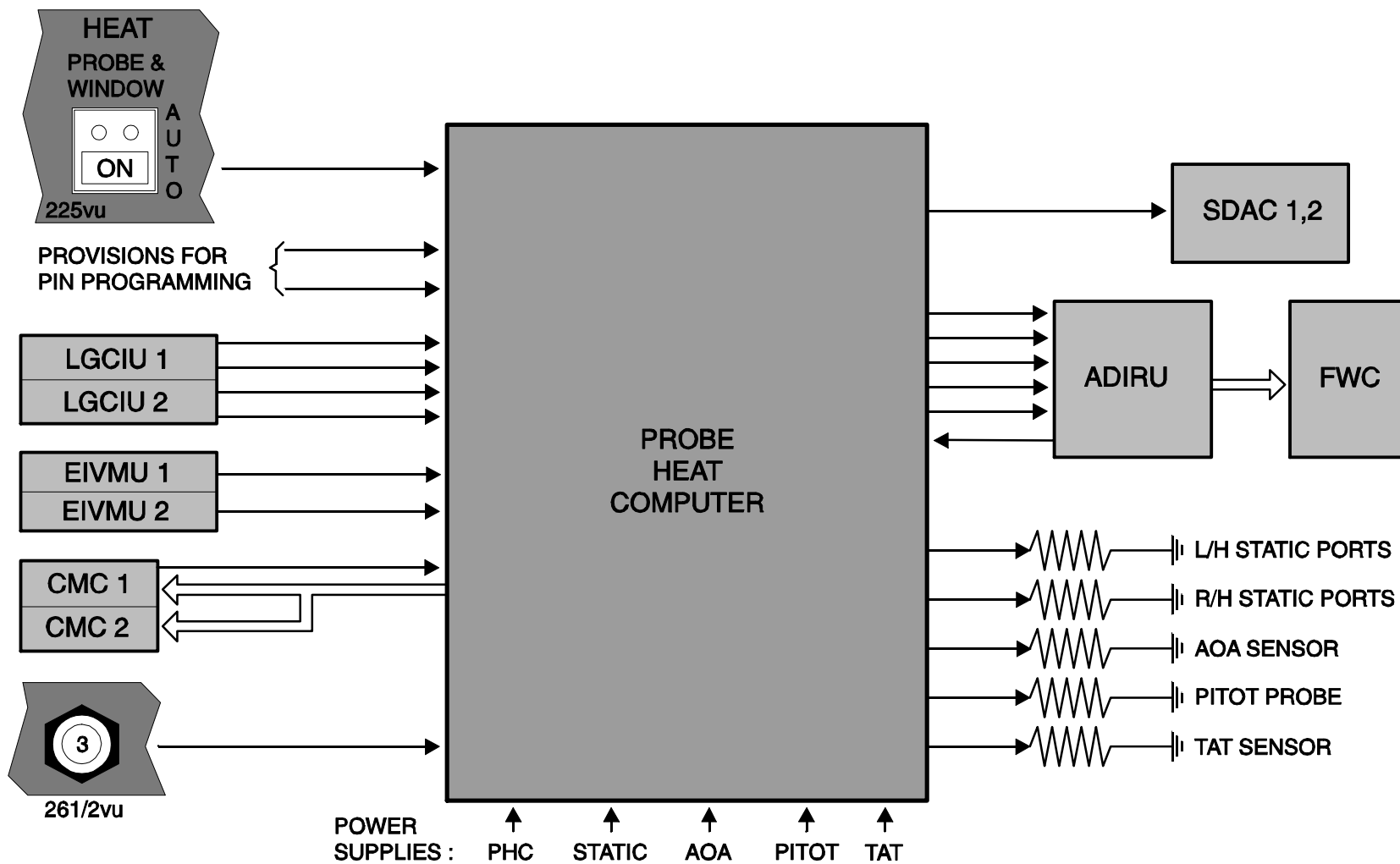
The PHC sends five discrete outputs to the Flight Warning Computer (FWC) via the Air Data Inertial Reference Unit (ADIRU) :

- one for pitot heating fault indication,
- one for AOA heating fault indication,
- one for TAT heating fault indication,
- two for static probe heating fault indication.

The ADIRU sends a low speed warning signal to the PHC to select the heating level of the pitot probe and TAT sensor under V=50 kts.

SYSTEM DATA ACQUISITION CONCENTRATOR (SDAC)

The PHC sends a heating availability discrete output directly to the System Data Acquisition Concentrator (SDAC).



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STUDENT NOTES

PROBE ICE PROTECTION: WARNINGS

CAPT (F/O)(STBY) PROBES HEAT

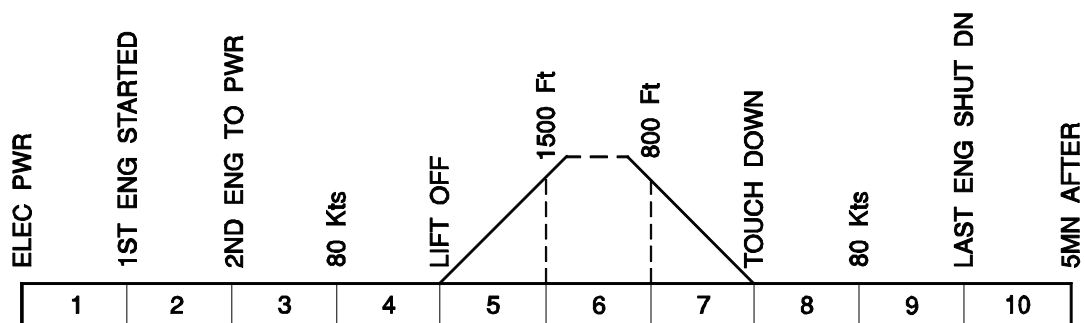
CAPT (F/O)(STBY) PITOT (AOA)(L STAT)
(R STAT)(TAT) HEAT

CAPT (F/O)(STBY) PROBES HEAT

The CAPT (F/O)(STBY) probe heat channel has failed.

CAPT (F/O)(STBY) PITOT (AOA)(L STAT)(R STAT)(TAT) HEAT

The corresponding probe heating has failed.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
CAPT(F/O)(STBY) PROBES HEAT	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 5, 7, 8
CAPT(F/O)(STBY) PITOT(AOA) (L STAT)(R STAT)(TAT) HEAT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8

STUDENT NOTES

PROBE ICE PROTECTION: COMPONENTS

Probe Heat Computer

SAFETY PRECAUTIONS

Pulling the Probe Heat Computer or Engine Interface and Vibration Monitoring Unit or Landing Gear Control and Interface Unit power supply circuit breakers causes the flight mode heating of the probes and static ports.

STUDENT NOTES

PROBE HEAT COMPUTER

FIN : 6DA1 6DA2 6DA3

ZONE : 121 122 121

PHC DESCRIPTION

PHC 3 (6DA3 : standby channel) is located on the left side of the avionics compartment near PHC 1 (6DA1 : capt channel).

Each unit is equipped with a connector.

All units having the same supplier part number are fully interchangeable.

PIN PROGRAM

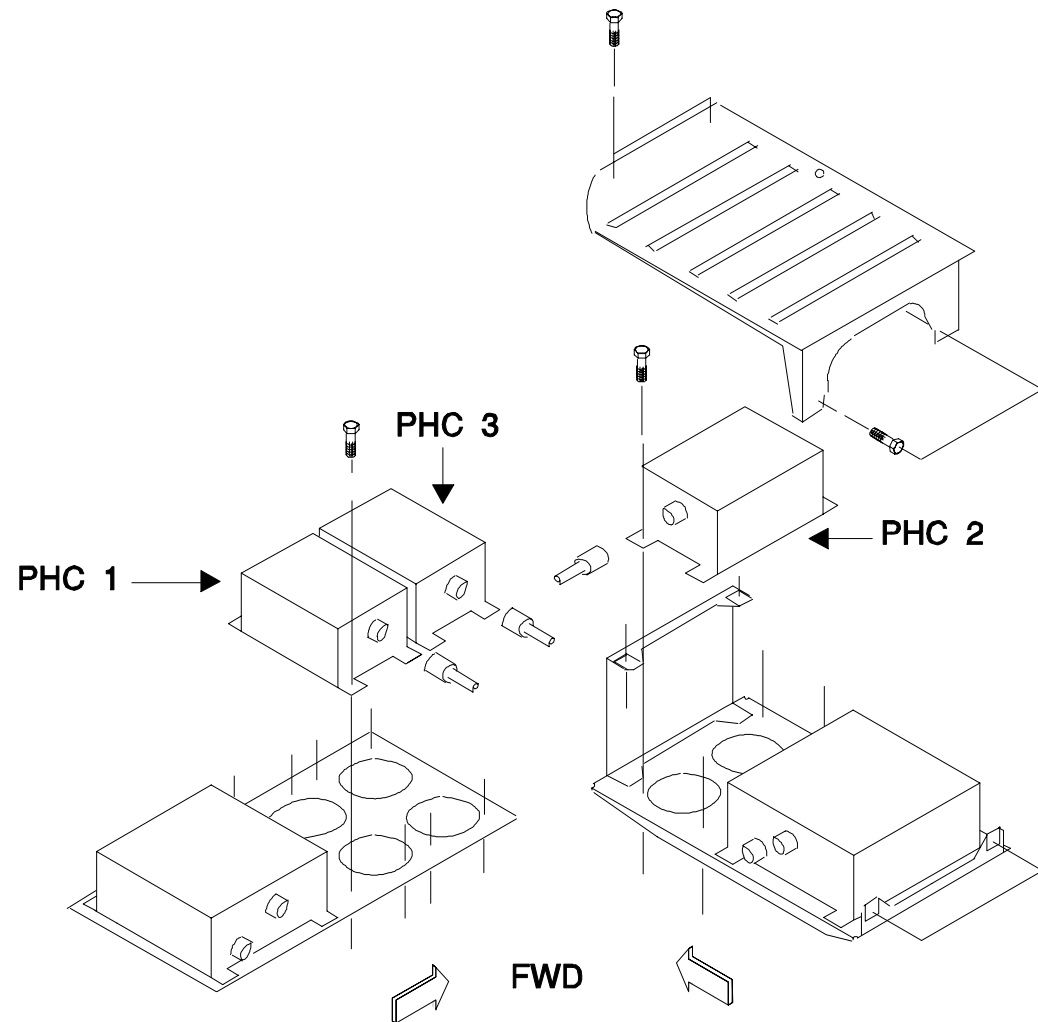
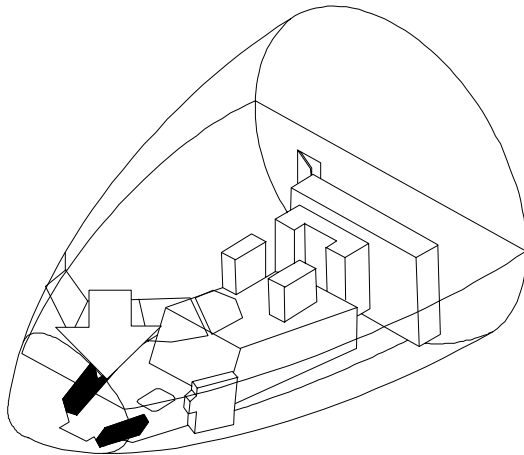
Depending on the A/C type and the identification of the probes and sensors, the pin programming is used to adapt the probe and sensor heating monitoring levels and the heating control ratio (pitot probe heating half reduced on ground).

The position of each PHC on the A/C is determined by the connection of the power supply to one of three different pins on the PHC.

REMOVAL INSTAL

Each unit is installed on a bracket by means of four screws.

No special tool is required to install the unit or remove it from the A/C.



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STUDENT NOTES

WINDOWS ANTI-ICING AND DEFOGGING: SYSTEM PRESENTATION

Function
Control
Window Heat Computer (WHC)
Caution

FUNCTION

Windshields and side windows are electrically heated to maintain clear visibility in icing or misting conditions.

Windshields are de-iced and side windows are dimisted.

The windshield heating operates intermittently on ground and continuously in flight.

CONTROL

Heating is automatically initiated at engine 1 or 2 start-up and stopped at last engine shut-down.

The PROBE & WINDOW HEAT pushbutton overrides the automatic operation.

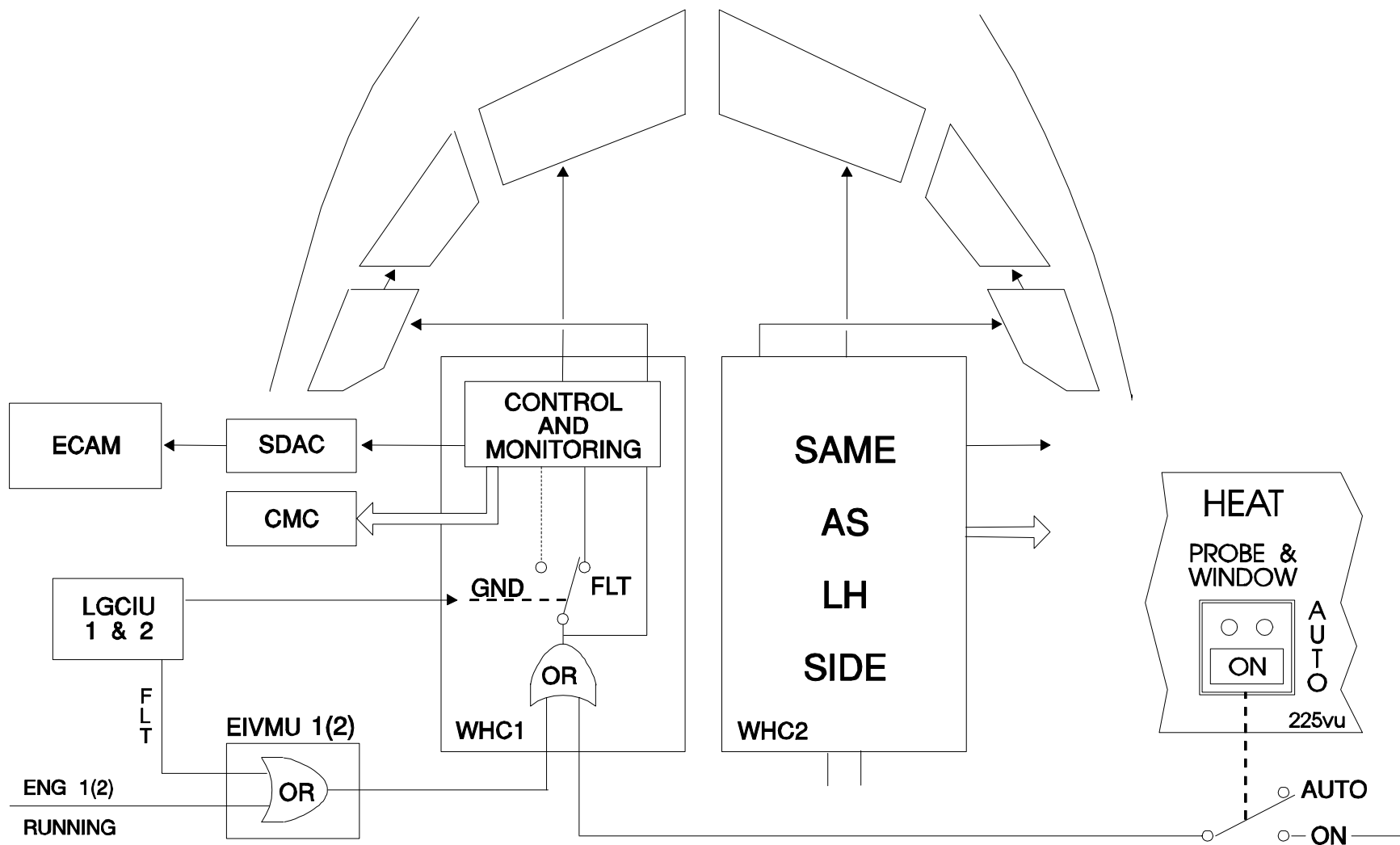
WINDOW HEAT COMPUTER (WHC)

Two fully independent Window Heat Computers, one on each side, ensure both the heat system monitoring and the overheat protection of their respective windshield and windows.

In case of a window heating fault, the Window Heat Computer (WHC) sends an output to ECAM via the System Data Acquisition Concentrator (SDAC). The WHCs also transmit fault messages to the Centralized Maintenance Computers (CMC).

CAUTION

Pulling the Engine Interface Vibration Monitoring Unit or Landing Gear Control Interface Unit power supply circuit breakers causes the heating of the windshield and the side windows.



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STUDENT NOTES:

WINDOWS ANTI-ICING AND DEFOGGING: SYSTEM DESCRIPTION AND OPERATION

General
Windshield
Windows
Note
Window Heat Computer (WHC)
Operation

GENERAL

The Anti-Icing and Defogging System of the windshield and windows is electrically controlled and operated.

The LH and RH sides are independently controlled by Window Heat Computers WHC1 and WHC2 respectively.

WINDSHIELD

The windshield heating element is made up of a conductive film supplied with AC power.

The heating is reduced by half on ground.

Two single-loop sensors (one is a spare) installed in each windshield enable WHC monitoring and temperature control.

WINDOWS

The side windows heating elements are made up of resistance wires supplied with AC power and connected in series.

Only the fixed window is provided with two single-loop sensors (one is a spare) for temperature control and monitoring of the two side windows.

NOTE

In case of temperature sensor failure, the switch over can only be done on ground.

WINDOW HEAT COMPUTER (WHC)

The Window Heat Computers (WHCs) are installed in the avionics compartment.

The WHC provides the following functions :

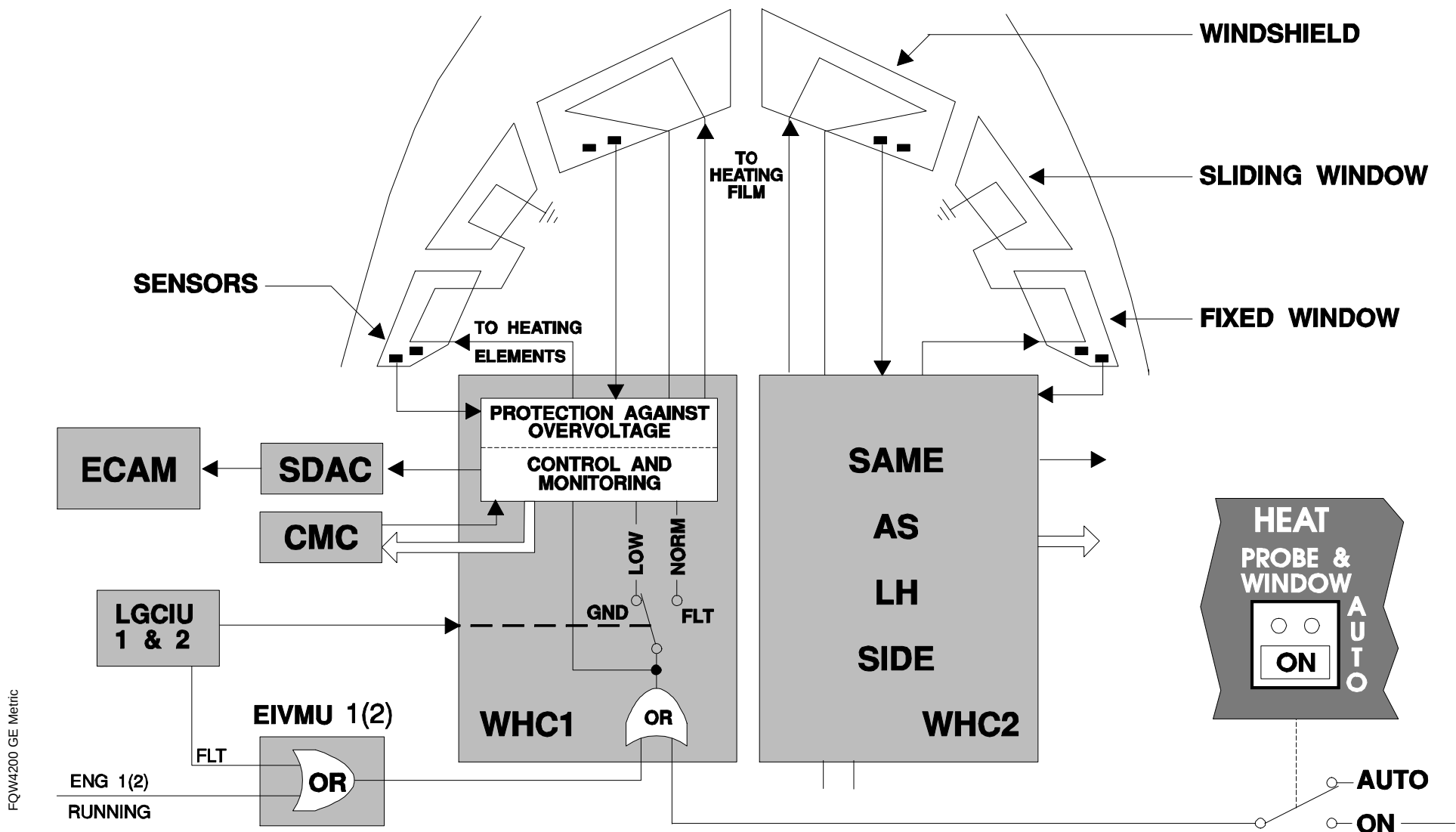
- windows and windshield heating control,
- monitoring of the system and generation of warnings,
- test and maintenance.

OPERATION

The WHC supplies the heating elements of the corresponding windows and windshield with AC power according to the information from the temperature sensors.

The regulation range is between 31 and 48°C (88 and 118°F).

A hardware device cuts off the heating when the temperature reaches +60°C (140°F).



STUDENT NOTES:

WINDOWS ANTI-ICE AND DEFOGGING: WARNINGS

L (R) WSHLD HEAT
L + R WSHLD HEAT
L (R) (L + R) WINDOW HEAT

L (R) WSHLD HEAT

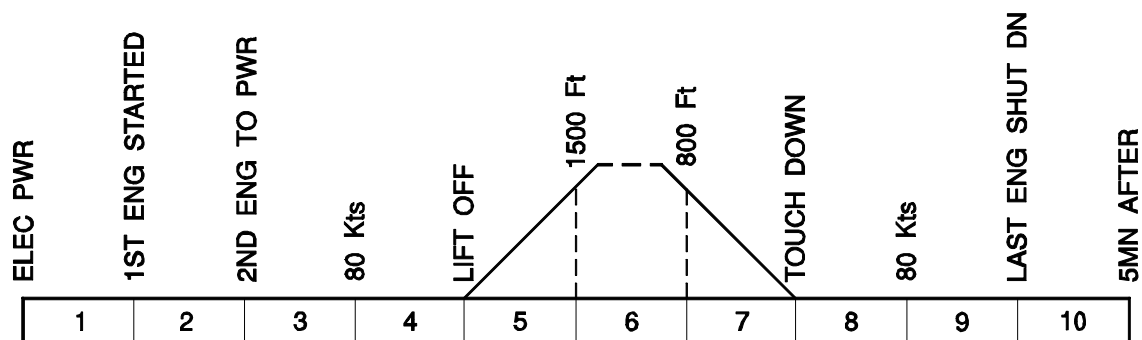
The Left or the Right windshield heating system has failed.

L + R WSHLD HEAT

Both windshield heating systems have failed.

L (R) (L+R) WINDOW HEAT

The Left or the Right window heating system or both window heating systems have failed.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
L (R) WSHLD HEAT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
L + R WSHLD HEAT	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 5, 7, 8
L (R) (L + R) WINDOW HEAT	NIL	NIL	NIL	NIL	3, 4, 5, 7, 8

STUDENT NOTES

WINDOWS ANTI-ICE AND DEFOGGING: COMPONENTS

Window Heat Computer

SAFETY PRECAUTIONS

Pulling the Engine Interface and Vibration Monitoring Unit or Landing Gear Control and Interface Unit power supply circuit breakers causes the heating of the windshield and side windows.

STUDENT NOTES

WINDOW HEAT COMPUTER

FIN : 2DG1 2DG2

ZONE : 121 122

WINDOW HEAT COMPUTER DESCRIPTION

Each unit is equipped with two connectors.

All units having the same supplier part number are fully interchangeable.

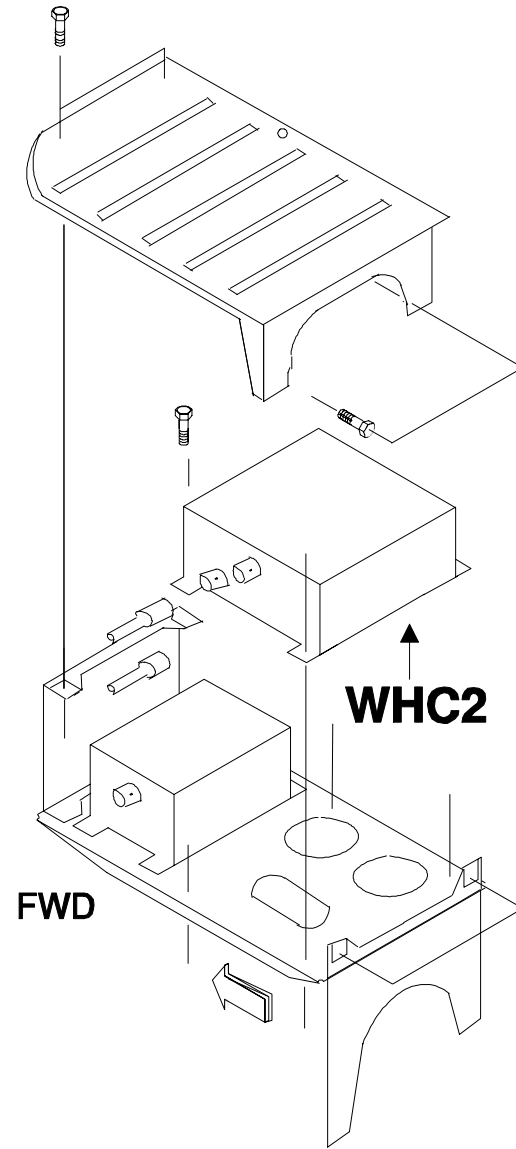
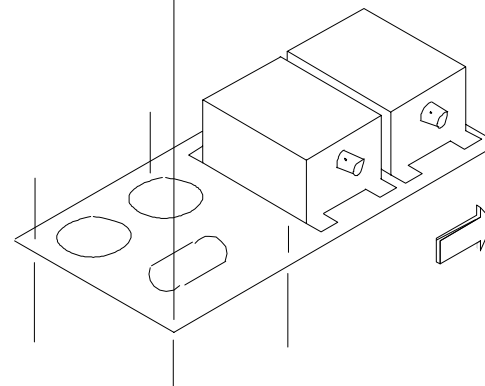
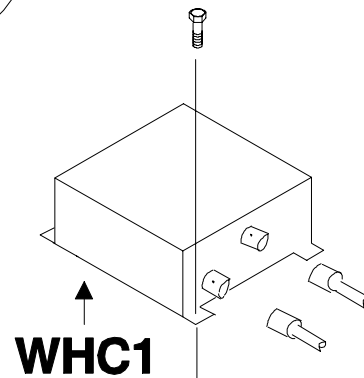
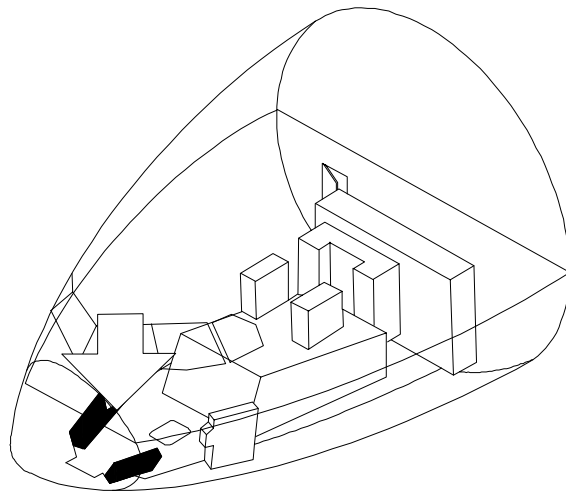
PIN PROGRAMMING

Pin programming is used to identify the A/C configuration.

The position of each Window Heat Computer (WHC) on the A/C is given by the application of the WHC power supply on one of the two provided pins.

REMOVAL INSTAL

Each unit is installed on a bracket by means of four screws. No special tool is required to install the unit or remove it from the A/C



STUDENT NOTES

WINDOWS ANTI-ICE AND DEFOGGING: INTERFACES

Pushbutton Switch
Pin Programming
Landing Gear Control and Interface Unit (LGCIU)
Engine Interface and Vibration Monitoring Unit
(EIVMU)
Central Maintenance Computer (CMC)
Reset Circuit Breaker
Power Supply
Temperature Sensor
System Data Acquisition Concentrator (SDAC)

PUSHBUTTON SWITCH

The PROBE/WINDOW HEAT pushbutton switch overrides the automatic heating control.

PIN PROGRAMMING

The pin programming is used for sending the aircraft type to the Window Heat Computer (WHC) and for evolution.

LANDING GEAR CONTROL AND INTERFACE UNIT (LGCIU)

The Landing Gear Control and Interface Units LGCIU1 and LGCIU2 send ground or flight signals to the WHC to select the heating level of the windshield only.

ENGINE INTERFACE AND VIBRATION MONITORING UNIT (EIVMU)

The Engine Interface and Vibration Monitoring Units EIVMU1 and EIVMU2 send engine shut down and ground information via the engine relays to the WHC to enable the heating control.

CENTRAL MAINTENANCE COMPUTER (CMC)

The Central Maintenance Computers (CMCs) are connected to the WHC for system monitoring.

The WHC is a type 2 system (ARINC 429 output, test maintenance discrete input).

RESET CIRCUIT BREAKER

The reset circuit breaker on the overhead panel sends a ground signal to the associated WHC for reinitialization.

POWER SUPPLY

The WHC is supplied with 28 Volts DC to operate its own components.

The side windows are supplied with 115 Volts AC ;
the windshield is supplied with 200 Volts AC.

TEMPERATURE SENSOR

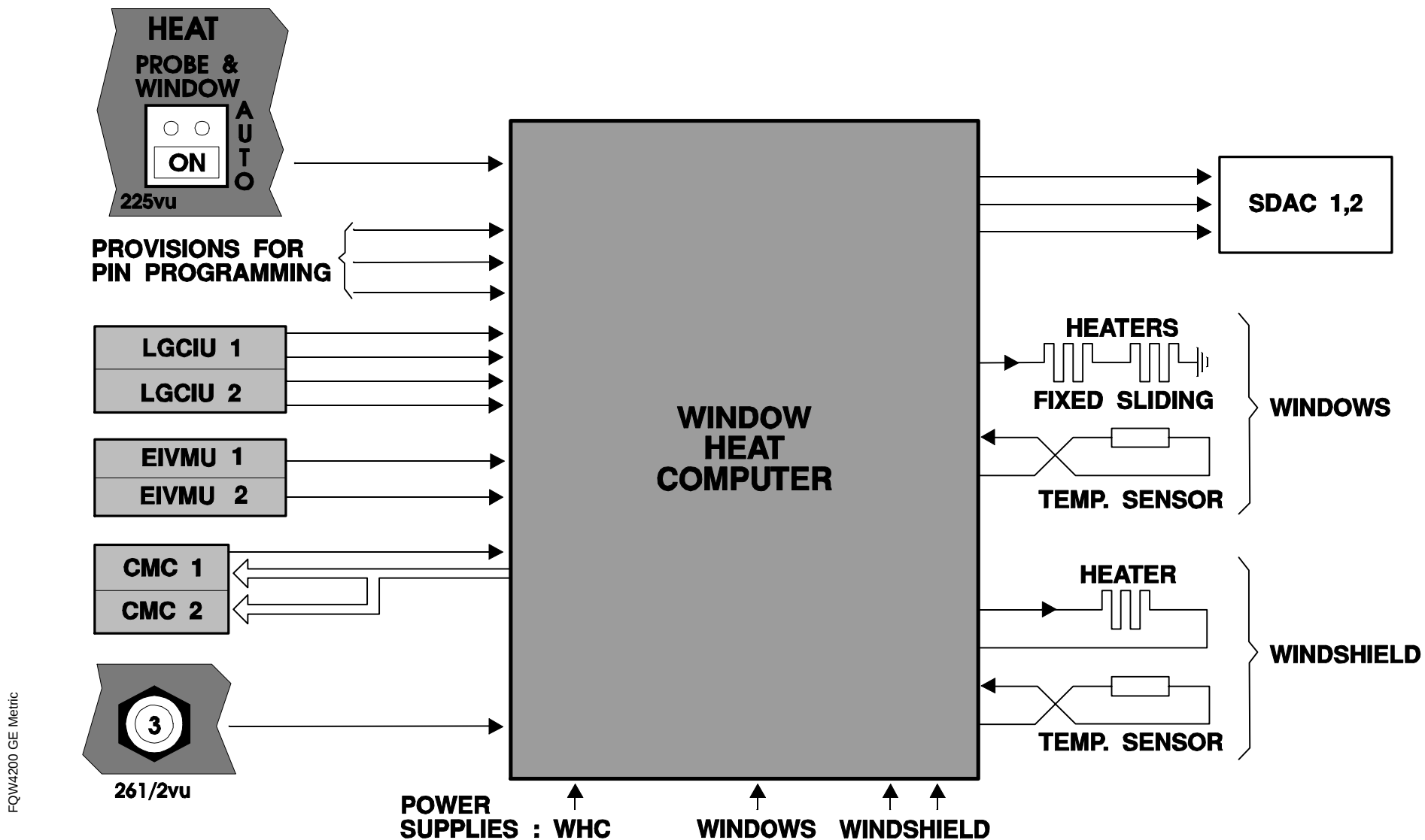
The temperature sensors transmit analog inputs to the WHC to achieve the heating control.

SYSTEM DATA ACQUISITION CONCENTRATOR (SDAC)

The WHC sends three discrete outputs to the System Data Acquisition Concentrator (SDAC) to generate system fault messages and display information.

The 3 discrete outputs are :

- windshield heating failure,
- side windows heating failure and
- heating availability.



FQW4200 GE Metric

STUDENT NOTES

WINDSHIELD RAIN PROTECTION - WIPER: SYSTEM PRESENTATION

Function
Control
Caution

FUNCTION

Rain removal from the windshield is ensured by two independent wipers powered by DC motors.

The wiper system operates efficiently up to a calibrated speed (Vc) of 255 kts.

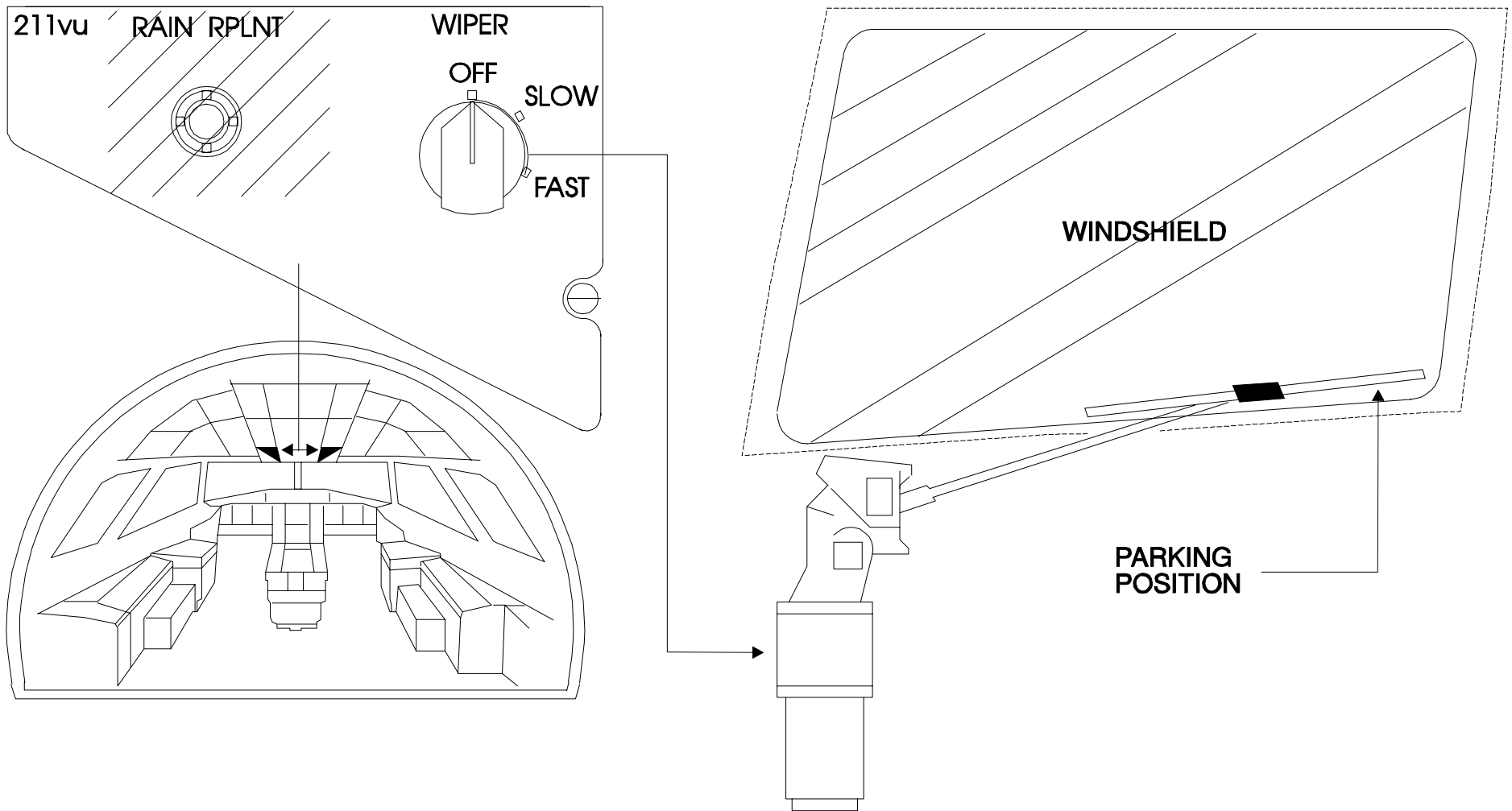
CONTROL

Each wiper is controlled by a rotary selector located on the overhead panel. "SLOW" or "FAST" speed can be selected.

When the selector is set to "OFF", the wiper stops in the parking position, lifted off with respect to the A/C structure, at the windshield lower part.

CAUTION

Do not operate the wipers on a dry windshield.



FQW4200 GE Metric

STUDENT NOTES:

WINDSHIELD RAIN PROTECTION - WIPER: COMPONENTS /1

Wiper Arm
Wiper Blade

SAFETY PRECAUTIONS

Before any action on the wiper arm-blade assembly, pull the associated power supply circuit breakers.

STUDENT NOTES

WIPER ARM

FIN : 5001DG 5002DG

ZONE : 211 212

ARM DESCRIPTION

The arm is coated with a dull-black anti-reflective paint.
The arm is fixed to the motor-converter splined shaft by means of a screw.

IN SITU TEST

The pressure of the wiper arm is adjustable thanks to an adjustment bolt.
The equivalent force necessary to lift the wiper from the windshield surface must be 4.5 daN, standard value read on a spring scale.

REMOVAL INSTAL

The splines are used to adjust the parking position angle.
The screw must be tightened with a torque wrench.

PARKING POSITION

The wipers have a parking position clear of the area of visibility below the bottom of the windshield.
The wiper blades are lifted onto two lifting ramps to avoid sand and dust accumulation which could scratch the windshield.

WIPER BLADE

FIN : 5003DG 5004DG

ZONE : 211 212

BLADE DESCRIPTION

The dull-black blade is installed on the arm by means of a screw.

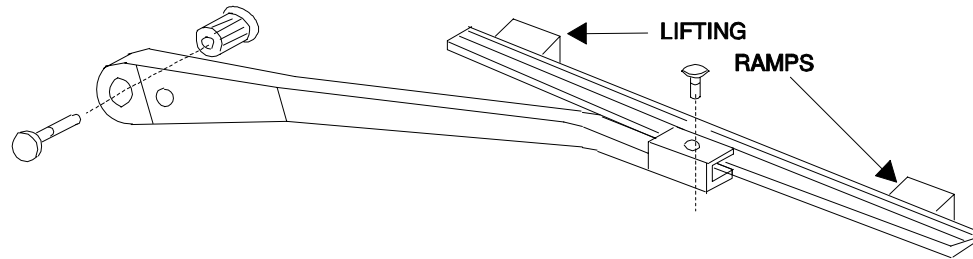
REMOVAL INSTAL

It is possible to replace the blade without removing the arm.
Make sure that the blade does not overlap onto the metal frame of the windshield during operation.

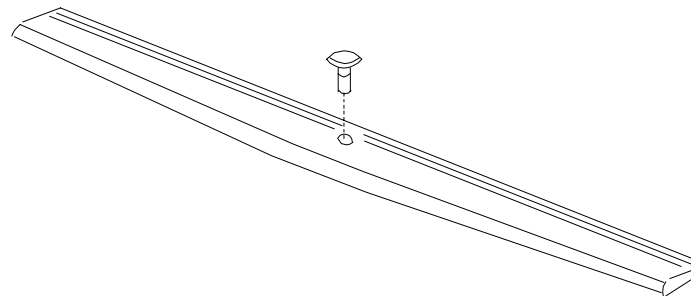
CAUTION

Do not let the wiper arm touch the windshield surface.
Do not operate the wipers on a dry windshield.

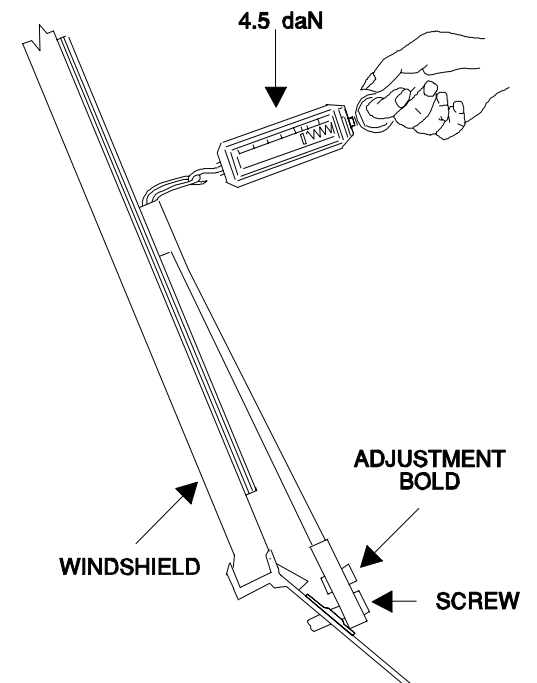
WIPER ARM



WIPER BLADE



IN SITU TEST



STUDENT NOTES

WINDSHIELD RAIN PROTECTION - WIPER: COMPONENTS /2

Motor Converter

SAFETY PRECAUTIONS

Before any removal of the motor converters, pull the associated power supply circuit breakers.

STUDENT NOTES

MOTOR CONVERTER

FIN : 1DB1 1DB 2

ZONE : 121 122

MOTOR CONVERTER DESCRIPTION

The motor and converter form a single assembly.

The converter changes the rotary motion of the motor into an oscillary motion of the wiper arm.

The motor features are :

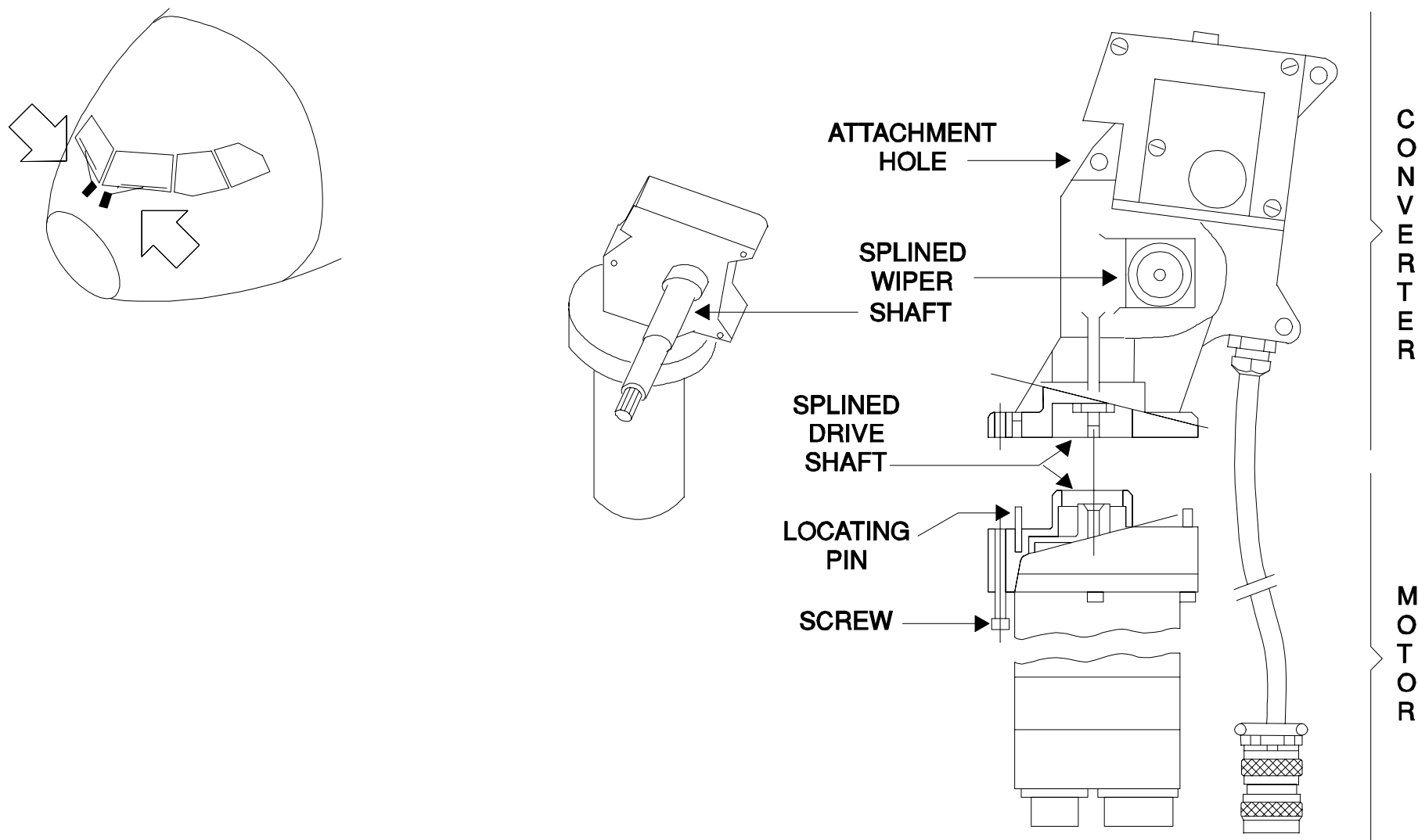
- direct current(28 volts DC),
- permanent magnet,
- two rotation speeds for sweeping,
- one slow inverted speed for the parking position.

THERMAL SWITCH

The motor is provided with a thermal switch to protect the mechanism and electrical components of the system.

REMOVAL INSTAL

Each motor is installed on the A/C structure by means of three screws. Without removing the entire assembly from the A/C, it is possible to replace the motor only.



FQW4200 GE Metric

STUDENT NOTES

WINDSHIELD RAIN PROTECTION - RAIN REPELLENT: SYSTEM PRESENTATION

Function
Control
Caution

FUNCTION

In heavy rain conditions, a rain repellent liquid stored in a pressurized bottle may be sprayed on the windshield to improve visibility.

The spray nozzles are permanently purged by air from hot air manifold.

CONTROL

When the rain repellent pushbutton is pressed in, the solenoid valve opens for a short time.

This causes a measured quantity of rain repellent liquid to be sprayed onto the related windshield.

To repeat the cycle, the pushbutton must be pressed again.

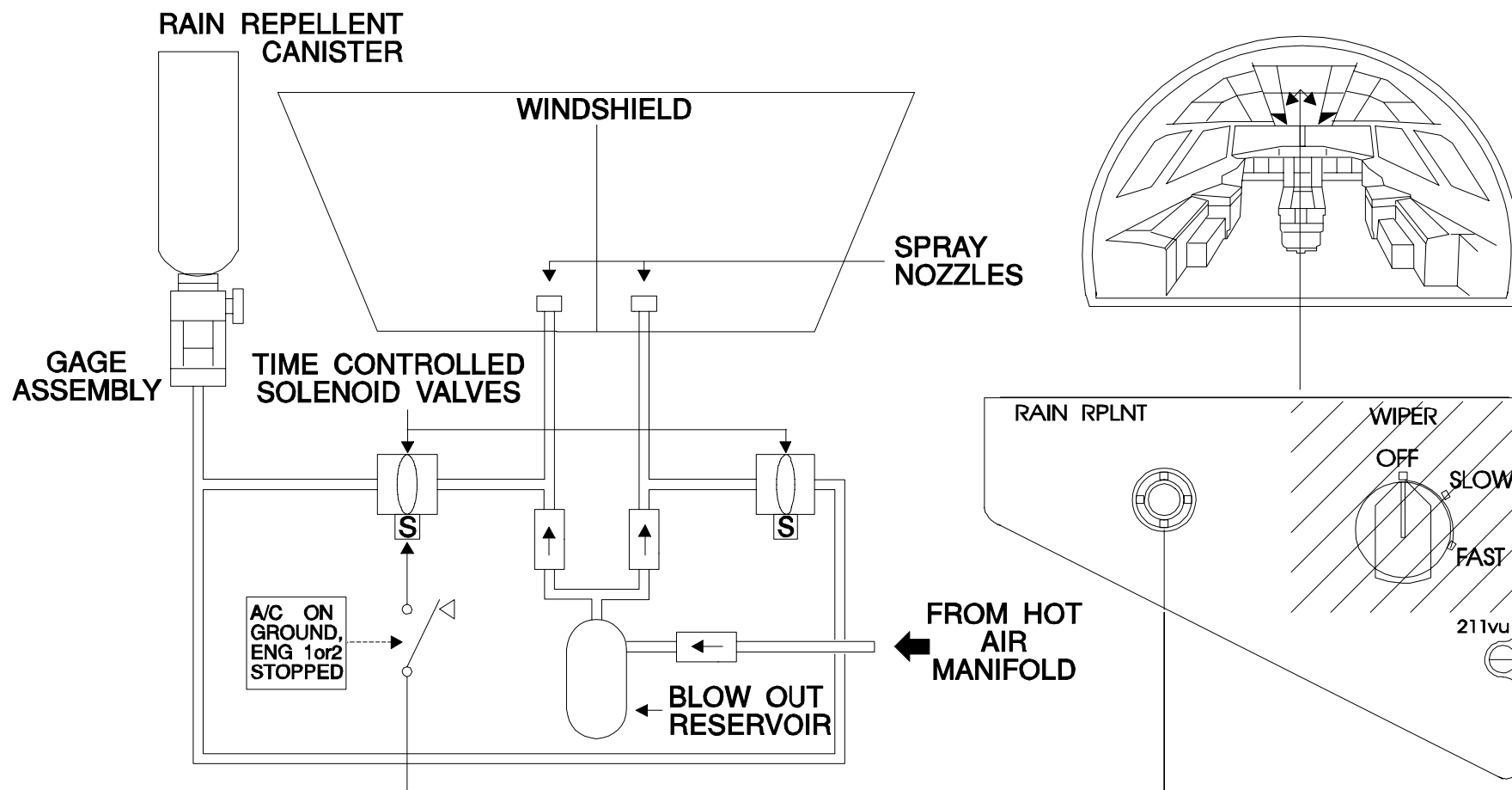
On ground, the rain repellent system is inhibited when the engine 1 or 2 is shut down.

CAUTION

The rain repellent liquid is very corrosive.

So do not use rain repellent liquid on a dry windshield.

In event of inadvertent application, wash at the earliest opportunity.



FQW4200 GE Metric

STUDENT NOTES:

WINDSHIELD RAIN PROTECTION - RAIN REPELLENT: COMPONENTS /1

Can Assembly
Gage Assembly

SAFETY PRECAUTIONS

Make sure that the fluid does not get on your skin or in your eyes.

If you get the fluid on your skin or in your eyes, flush it away immediately with clean water.

Make sure that the fluid does not stay on the A/C structure.

If the fluid gets on the A/C structure, wash it off immediately with soap and water.

STUDENT NOTES

CAN ASSEMBLY

FIN : 5101DG

ZONE : 211

CAN DESCRIPTION

The nitrogen pressurized can contains 475 cm³ of usable type 3 rain repellent fluid.

A valve held closed under the load of internal pressure seals the can when not installed.

CAN LOCATION

The pressurized can is directly fitted to the gage assembly and attached to the aft right wall of the cockpit by means of a clamp.

INSPECTION

If the pressure indicator of the gage assembly shows the yellow sector or if the refill float appears, replace the can.

REMOVAL INSTALLATION

Depressurize the system by using the purge pushbutton and the drain valve on the gage assembly.

Use a new seal before installing the can and tightening the clamp. After the can replacement, use the purge pushbutton and check the fluid level increases.

CAUTION

Make sure that the system is depressurized before the can is removed.

GAGE ASSEMBLY

FIN : 5102DG

ZONE : 211

GAGE DESCRIPTION

The gage forms the can receptacle and includes a thin pin provided for displacement of the rain repellent can assembly valve.

GAGE LOCATION

The gage assembly is attached to the right wall of the cockpit by means of four screws.

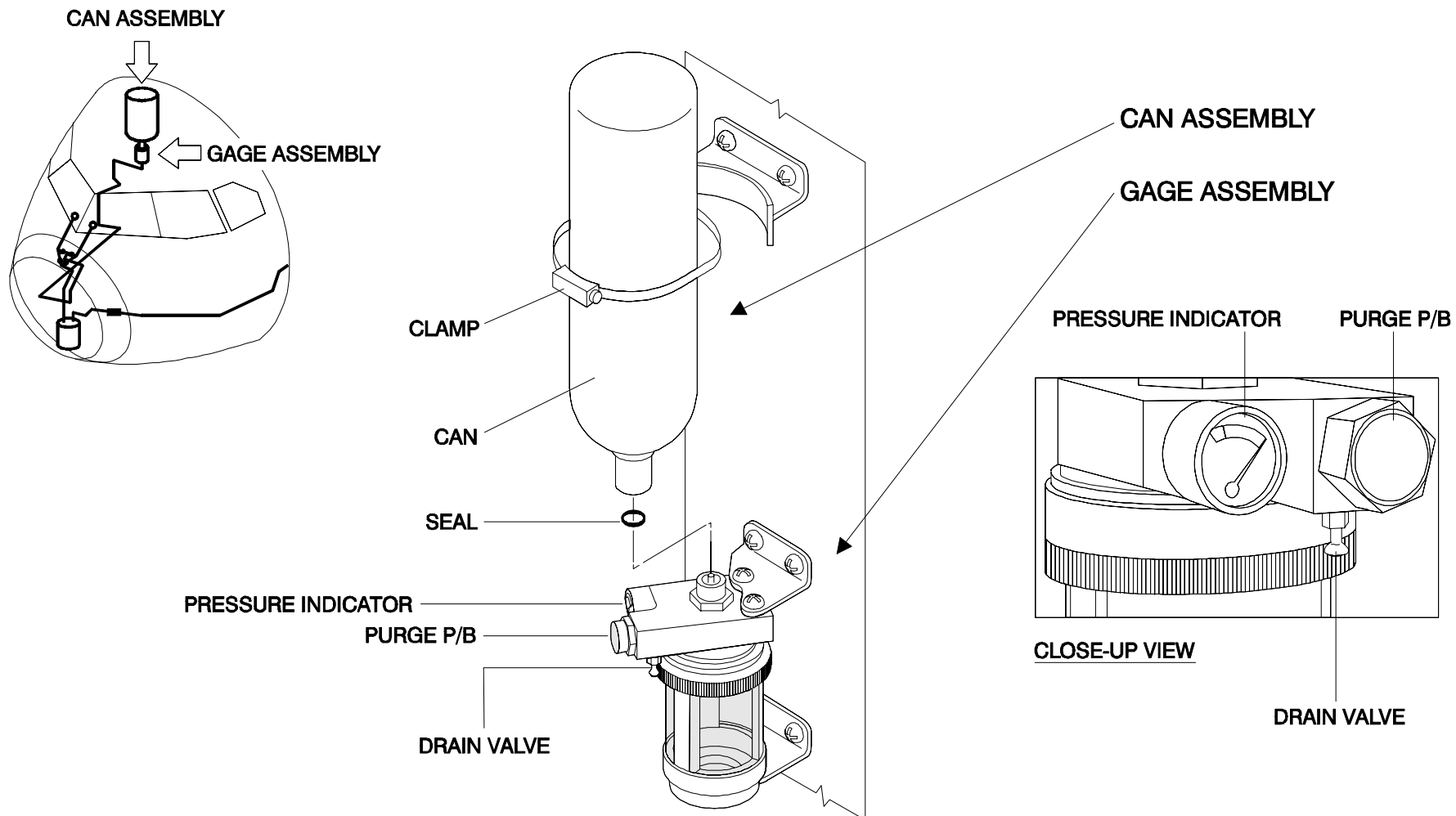
INSPECTION

The gage assembly comprises a pressure indicator with a green and a yellow sector and a transparent chamber in which appears the fluid level.

Both are used to check the can capacity.

PURGE

The gage assembly comprises a purge pushbutton and a drain valve. Purge the system by connecting a hose to the drain valve and putting the outlet in a container and by pushing the purge pushbutton.



STUDENT NOTES

WINDSHIELD RAIN PROTECTION - RAIN REPELLENT: COMPONENTS /2

Spray Nozzle
Purge Check Valve
Solenoid Valve
Check Valve
Blowout Reservoir

SAFETY PRECAUTIONS

Make sure that the fluid does not get on your skin or in your eyes.

If you get the fluid on your skin or in your eyes, flush it away immediately with clean water.

Make sure that the fluid does not stay on the A/C structure.

If the fluid gets on the A/C structure, wash it off immediately with soap and water.

STUDENT NOTES

SPRAY NOZZLE

FIN : TBD

ZONE : 211 212

DESCRIPTION

Each spray nozzle incorporates four directional orifices.
The two nozzles are symmetrical but not interchangeable.

LOCATION

The spray nozzles protrude from the A/C skin below the windshield.

REMOVAL/INSTALLATION

The removal/installation procedure is done from outside the A/C.
A precise angular positioning is required.
Make sure that the four holes in the nozzle are not clogged.

SAFETY PRECAUTIONS

Make sure that the associated circuit breaker is open.

PURGE CHECK VALVE

FIN : 5103DG 5104DG

ZONE : 121 122

DESCRIPTION

The purge check valve prevents the rain repellent fluid from flowing in the purge air lines and in the blowout reservoir.

LOCATION

Each purge check valve is fitted on a T-coupling under the A/C skin.

REMOVAL/INSTALLATION

The valve is installed by means of two unions.
No special tool is required.

SAFETY PRECAUTIONS

Make sure that the system is depressurized when the can is removed.

SOLENOID VALVE

FIN : 4DB1 4DB2

ZONE : 211 212

DESCRIPTION

The time-controlled solenoid valve enables fluid release to the spray nozzle for a period of 0.4 s.
The valve is equipped with a time-controlled solenoid and an electrical connector.

LOCATION

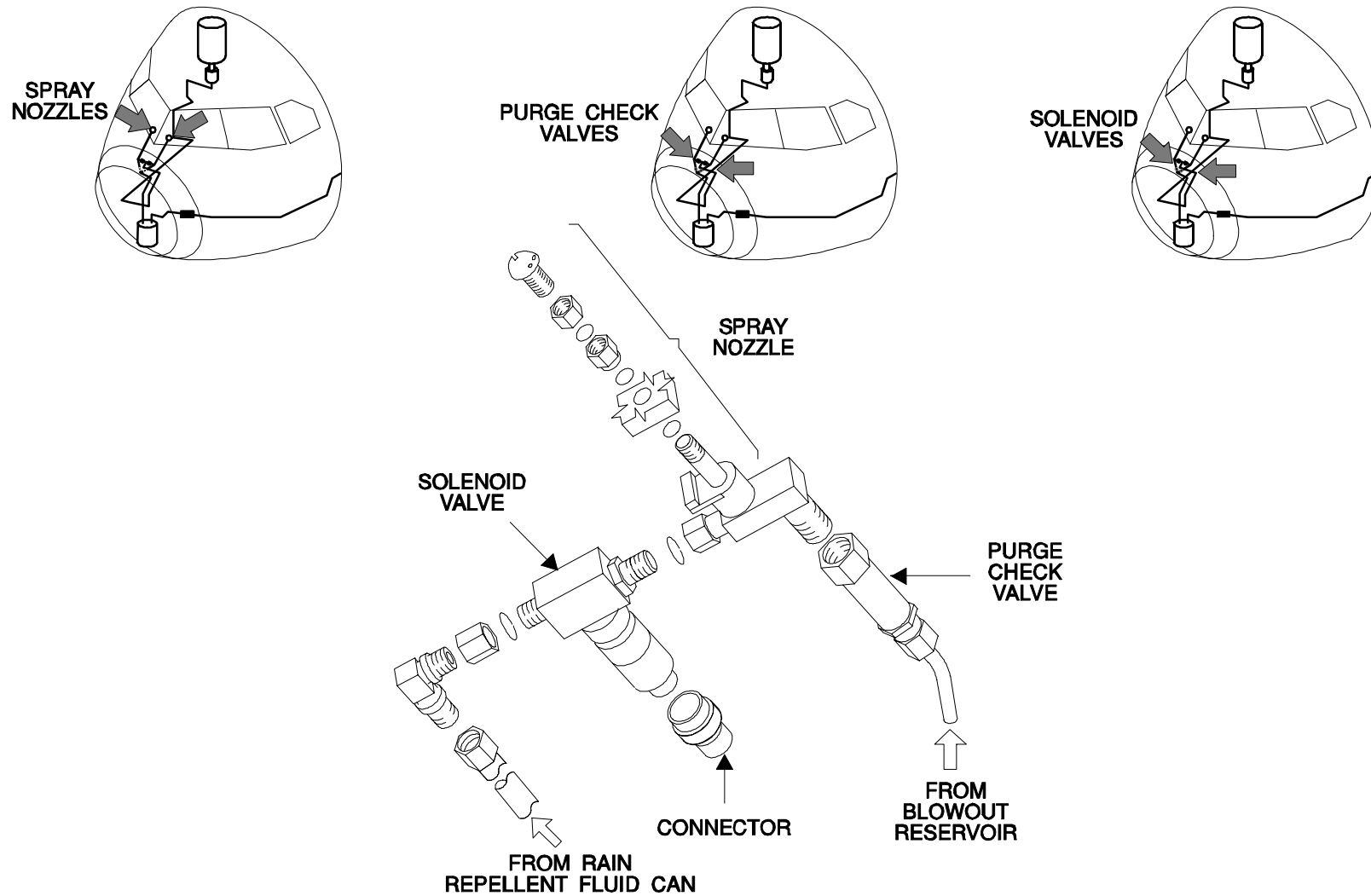
Each solenoid valve is fitted on a T-coupling under the A/C skin.

REMOVAL/INSTALLATION

The valve is installed by means of two unions.
No special tool is required.

SAFETY PRECAUTIONS

Make sure that the system is depressurized when the can is removed.
Make sure that the associated circuit breaker is open.



CHECK VALVE

FIN : 5105DG

ZONE : 121

DESCRIPTION

The check valve is designed to prevent rain repellent fluid from flowing into the air conditioning system.

LOCATION

The check valve is installed between the hot air manifold and the inlet of the blowout reservoir.

REMOVAL/INSTALLATION

The check valve is installed by means of two unions.
No special tool is required.

BLOWOUT RESERVOIR

FIN : TBD

ZONE : 121

DESCRIPTION

During application of the rain repellent fluid onto the windshield, the reservoir provides an increase in transient pressure which serves to purge the lines of the system after each application of the fluid.

LOCATION

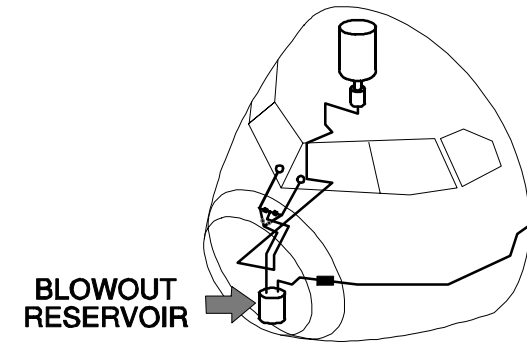
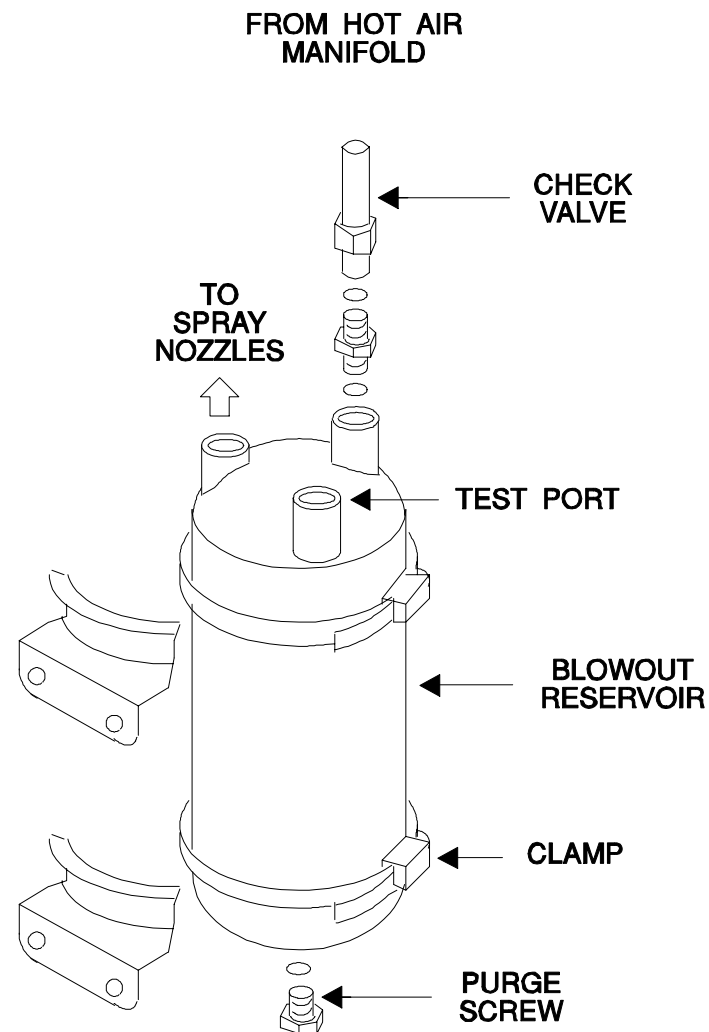
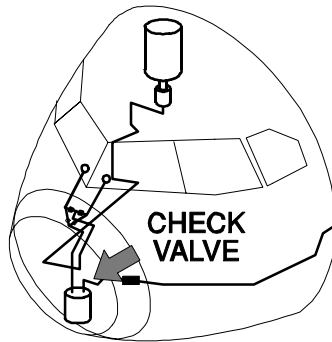
The reservoir is attached to the A/C structure by means of two clamps.

DECANTATION DEVICE

The blowout reservoir constitutes a decantation reservoir for the rain repellent fluid in the event of possible leakage of valves and for the water which could remain in the air conditioning system and freeze in the nozzle orifices.

TEST DEVICE

The reservoir can serve as a test connector to check for clogging of the nozzles, using an appropriate pressurization tool which is connected to the test port of the reservoir.



STUDENT NOTES

POTABLE AND WASTE WATER ICE PROTECTION: SYSTEM PRESENTATION

Function
Control
Water Ice Protection Control Unit (WIPCU)

FUNCTION

An automatic electrical water ice protection system is installed to prevent ice formation in the water pipes and drain masts in flight or on ground at freezing temperatures.

Electrical heating elements equipped with temperature sensors are fitted on the following components :

- water lines,
- drain masts,
- potable water drain valves,
- water service panel,
- aft potable water tank,
- waste tank drain tubes and valve.

They are controlled and monitored by two Water Ice Protection Control Units (WIPCU).

CONTROL

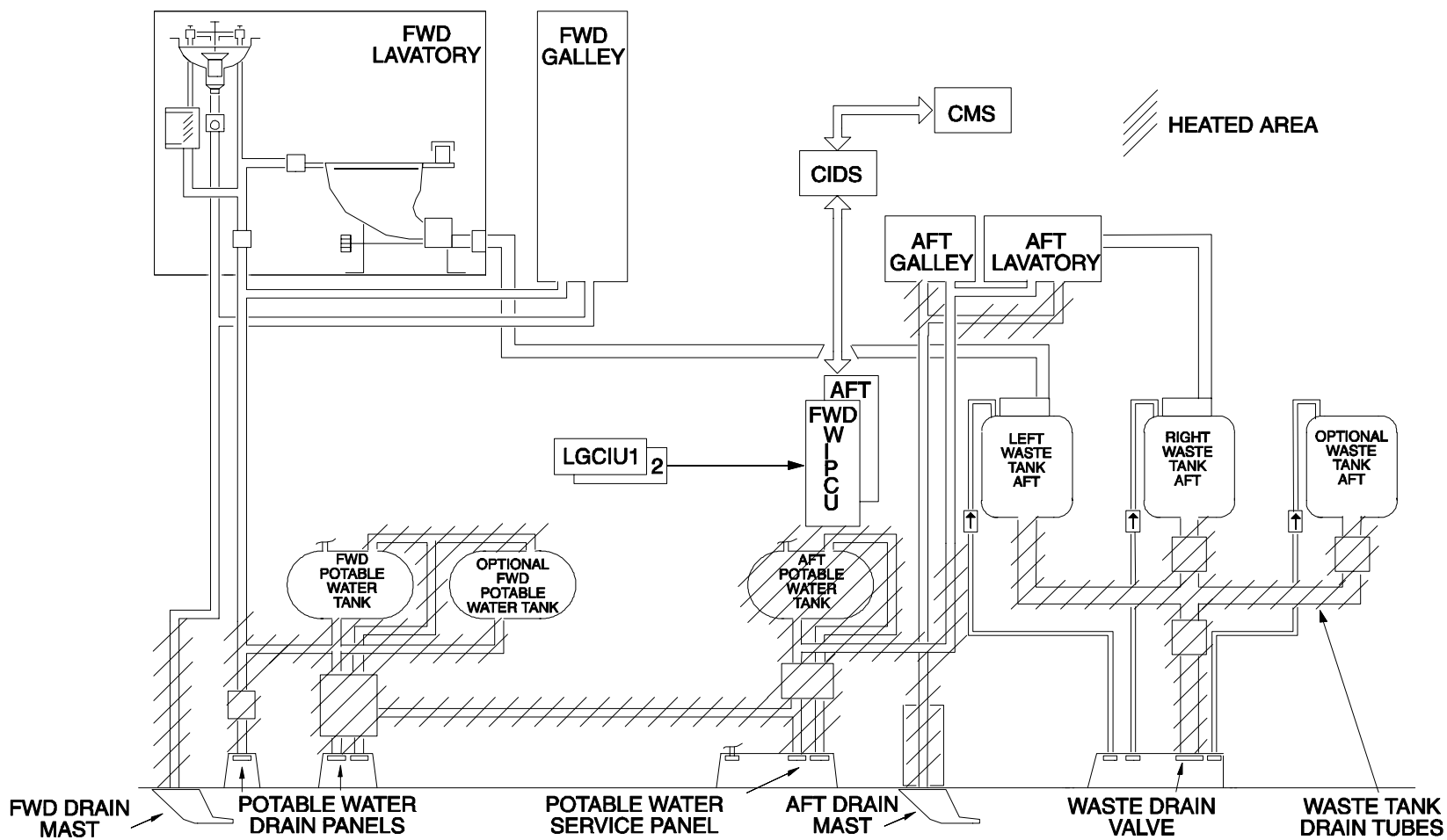
The Water Ice Protection Control Units turn the electrical heating on or off depending on temperature sensors information.

Programmable temperature thresholds are stored in the WIPCU, standard values are :

	Drain Masts	All other heating circuits
Heater ON :	10°C (50°F)	6°C (42.8°F)
Heater OFF :	15°C (59°F)	10°C (50°F)

WATER ICE PROTECTION CONTROL UNIT

A BITE test is performed every 5 minutes by the Water Ice Protection Control Unit which transmits the system status to the Cabin Intercommunication Data System and to the Centralized Maintenance System.



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STUDENT NOTES:

POTABLE AND WASTE WATER ICE PROTECTION: INTERFACES

Water Ice Protection Data Unit
Landing Gear Control Interface Unit
Cabin Intercommunication Data System
Connector
Power Supply
Heating

WATER ICE PROTECTION DATA UNIT

The Water Ice Protection Data Unit sends adjustable current thresholds to the Water Ice Protection Control Unit, which are used as reference limits during the test of the heating circuits.

The WIPDU is supplied through the WIPCU with 28 and 12 Volts DC.

LANDING GEAR CONTROL INTERFACE UNIT

Landing Gear Control and Interface Unit 2 sends a ground signal to the Water Ice Protection Control Unit to provide heating control in flight or on ground or both.

CABIN INTERCOMMUNICATION DATA SYSTEM

The actual contents of the Water Ice Protection Control Unit BITE memory are continuously transmitted to the Cabin Intercommunication Data System through Decoder Encoder Unit B via a data line.

This data is kept in the BITE memory of the CIDS directors and used to monitor and display the system status on the Forward Attendant Panel and on the MCDU.

It is also possible to initiate the BITE test of the system from the MCDU.

CONNECTOR

The Water Ice Protection Control Unit is provided with a connector for shop maintenance.

POWER SUPPLY

The Water Ice Protection Control Unit is supplied with 28 Volts DC to operate its own components.

The heaters are supplied with 115 Volts AC via WIPCU relays.

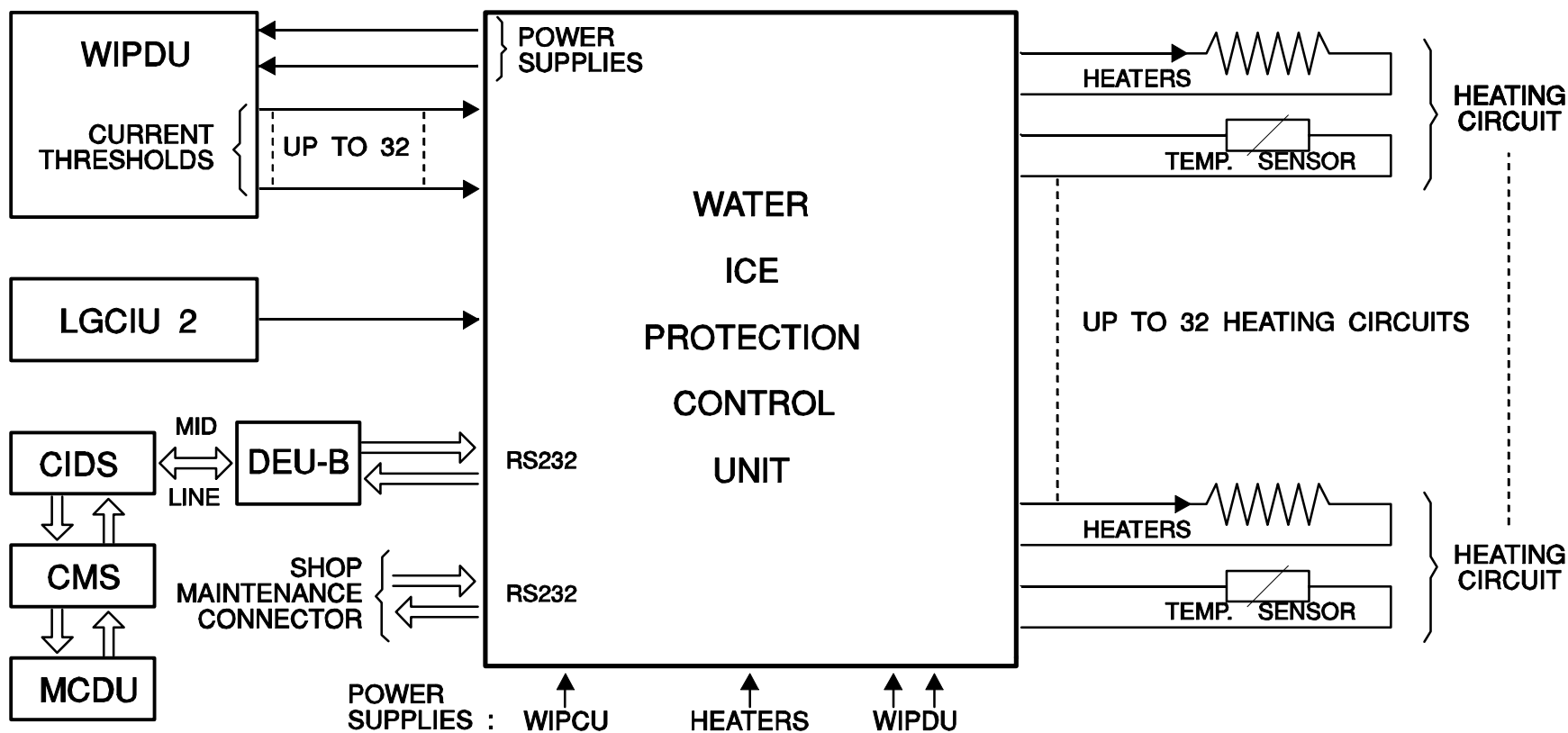
The WIPDU is supplied with 28 and 12 Volts DC through the WIPCU.

HEATING

Each Water Ice Protection Control Unit manages up to 32 heating circuits. Each heating circuit comprises several heaters and a temperature sensor.

The temperature sensor enables the WIPCU to control the corresponding heaters.

Heaters and temperature sensors are monitored by the WIPCU during the BITE test.



FQW4200 GE Metric

STUDENT NOTES

POTABLE AND WASTE WATER ICE PROTECTION: COMPONENTS /1

- Drain Masts
- Heating Elements
- Temperature Sensors
- Heated Nipples
- Potable Water Tank Heaters
- Heater Cuffs

SAFETY PRECAUTIONS

Make sure that the associated power supply circuit-breaker is open.
Be careful, drain masts or heaters can be hot.

STUDENT NOTES

DRAIN MASTS

FIN : 40 DU 240 DU

ZONE : 134 153

DESCRIPTION

Each drain mast is provided with :

- an aluminum housing,
- a flange for installation,
- an electrical heating element installed on the drain tube,
- a temperature sensor which measures the ambient temperature,
- an overtemperature switch which prevents overheating of the heating element.

LOCATION

The two drain masts (FWD and aft) are installed on the lower fuselage.

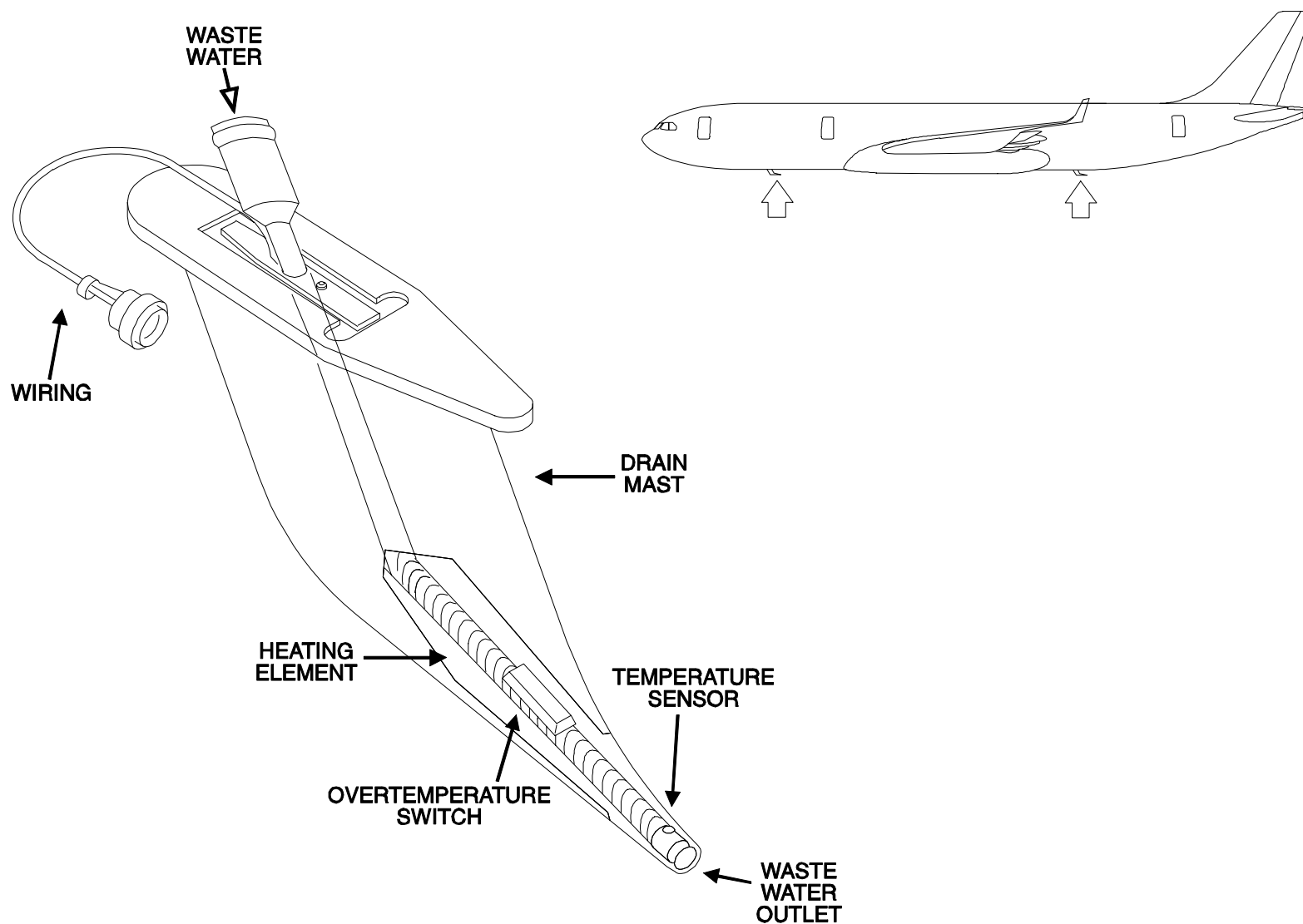
INSPECTION

Make sure that the drain mast-attachment screw-head recesses have no signs of paint, corrosion or sealant because the drain mast bonding is made through the attachment screws.

REMOVAL/INSTALLATION

Each drain mast is installed by means of four screws.

A sealing bead with sealant around the drain mast makes the installation tight.



FQW4200 GE Metric

HEATING ELEMENTS

FIN : DU....waste water ice protection
DW....potable water ice protection

ZONE : 131,133,134,138,146,151,152,153,161,162,171,172

DESCRIPTION

- Each heater is provided with :
- a self-limiting heating element,
 - two power supply connections,
 - an inner insulation,
 - a copper shield with ground bonding connection,
 - an outer protection sheath.

LOCATION

The heaters are installed on water lines in areas of possible icing conditions, on the drain valve and fill/drain valve and on the waste tank drain tubes.

REMOVAL/INSTALLATION

The heaters of the water lines are installed longitudinally with bonding tape on the lines and protected by an insulation sleeve.
The heaters of the waste tank drain tubes are installed in a ring-shape with bonding tape on the tubes and protected by an insulation blanket.

TEMPERATURE SENSORS

FIN : DU....waste water ice protection
DW....potable water ice protection

ZONE : 131,134,138,146,152,153,161,162,171

DESCRIPTION

- Each temperature sensor is provided with :
- a ceramic housing,
 - a sensing chip which contains a thermistor,
 - two connection pins.
- Each heating circuit has its own temperature sensor, except the two heating circuits of the waste tank drain tubes which have only one sensor.

LOCATION

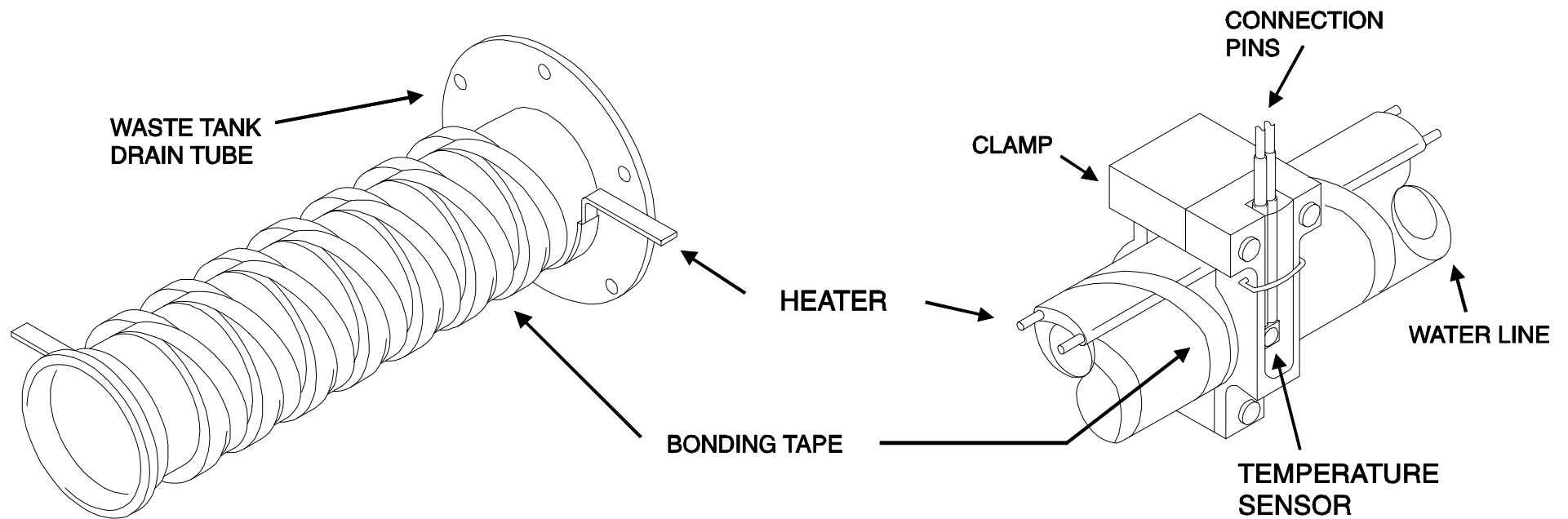
The sensors are mounted on a clamp. The clamps are installed on the lines or tubes in areas of possible icing conditions.

REMOVAL/INSTALLATION

Remove the insulation, disconnect the electrical connections with the insertion-removal tool and loosen the clamp to remove the sensor.
Perform the operations in the opposite order to install the sensor.

IN SITU TEST

When applying cool spray for at least 10 seconds to a temperature sensor, after approximately 2 minutes you feel that the associated heaters become warm.



FQW4200 GE Metric

HEATED NIPPLES

FIN :	Potable Water Service	Waste Water Service
	Panel nipples :	Panel nipples :
	26DV/28DV	30DV/31DV(32DV : optional)

ZONE :	164	171
--------	-----	-----

DESCRIPTION

Each nipple is provided with :

- a foil heating element installed with double-sided bonding tape and covered with a shrinkable sleeve,
- an overtemperature switch which prevents overheating of the heating element,
- a temperature sensor installed on the flange.

LOCATION

The nipples are installed on the water servicing panels.

REMOVAL/INSTALLATION

Each nipple is installed by means of a screw-nut assembly.
A sealing bead with sealant around the nipple makes the installation tight.

POTABLE WATER TANK HEATERS

FIN : 320/321/322/323DW

ZONE : 172

DESCRIPTION

The aft potable water tank is provided with four foil heaters with an integrated temperature sensor.

LOCATION

The aft potable water tank is in the cargo after the bulk compartment.

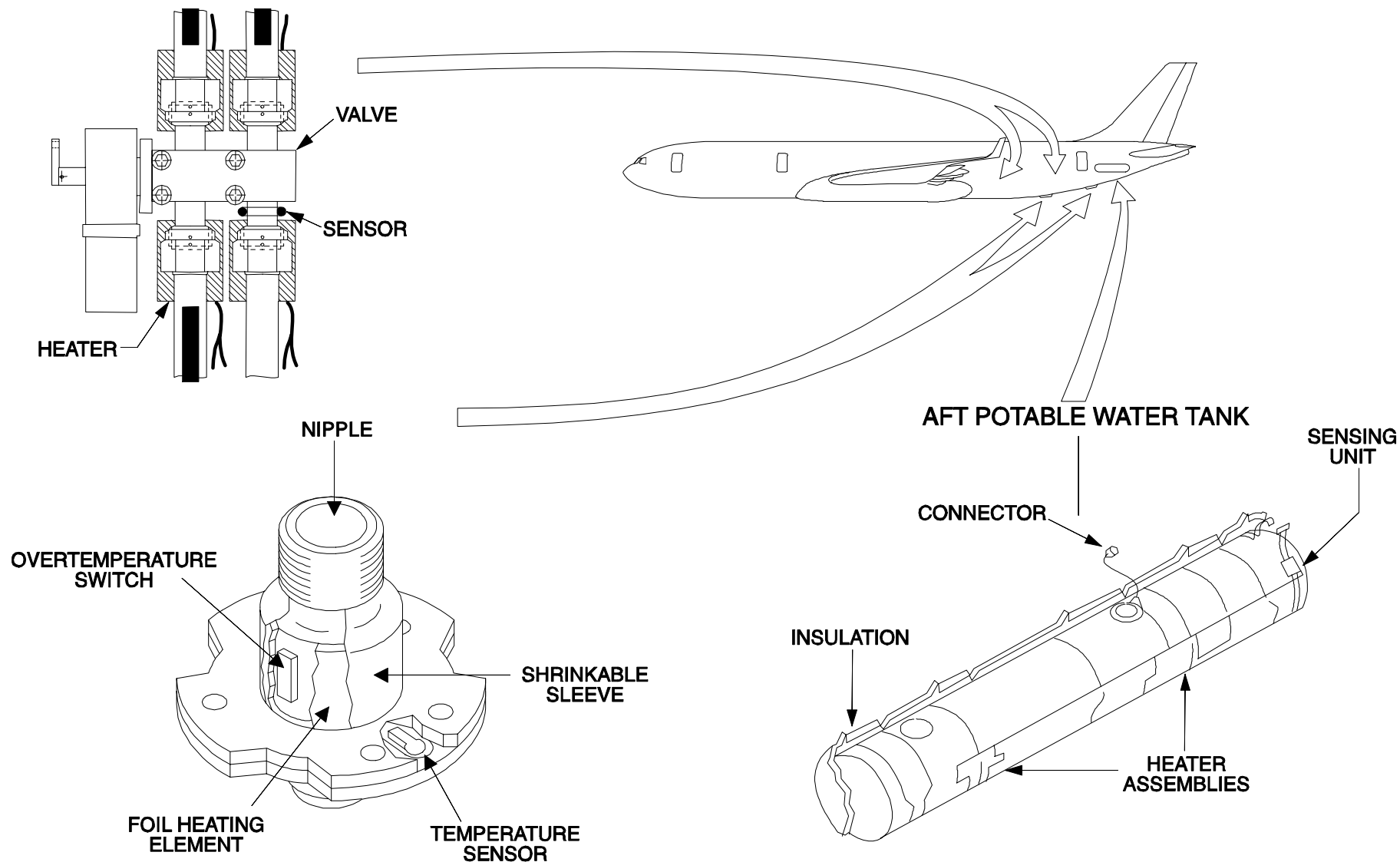
HEATER CUFFS

FIN : 1311DW 1/2/3/4 - 1321DW 1/2/3/4

ZONE : 154 172

DESCRIPTION :

The fill drain valves 22MA and 9MA are provided with four heater cuffs each to avoid ice formation on the pipe connections.
The heaters are controlled by the AFT WIPCU and temperature regulated by one sensor installed on each valve.



FQW4200 GE Metric

STUDENT NOTES

POTABLE AND WASTE WATER ICE PROTECTION: COMPONENTS /2

Water Ice Protection Control Unit

SAFETY PRECAUTIONS

Make sure that the associated power supply circuit-breaker is open.

STUDENT NOTES

WATER ICE PROTECTION CONTROL UNIT

FIN : 100DW 200DW

ZONE : 132 152

GENERAL

The WIPCU 100DW (200DW) controls and monitors the forward (aft) section of the potable/waste water ice protection system.
The water servicing panel is controlled by the aft WIPCU.

DESCRIPTION

Each WIPCU is made of and contains :

- an aluminium housing,
- one power supply Printed Circuit Board (PCB),
- one interface PCB,
- up to 8 heating control PCB,
- up to 32 internal relays,
- an ARINC 404 connector,
- an additional maintenance connector for shop maintenance.

REMOVAL/INSTALLATION

Each WIPCU is installed on a rack by means of two knurled nuts. Take care not to damage the electrical connector pins.

HEATING CONTROL PCB

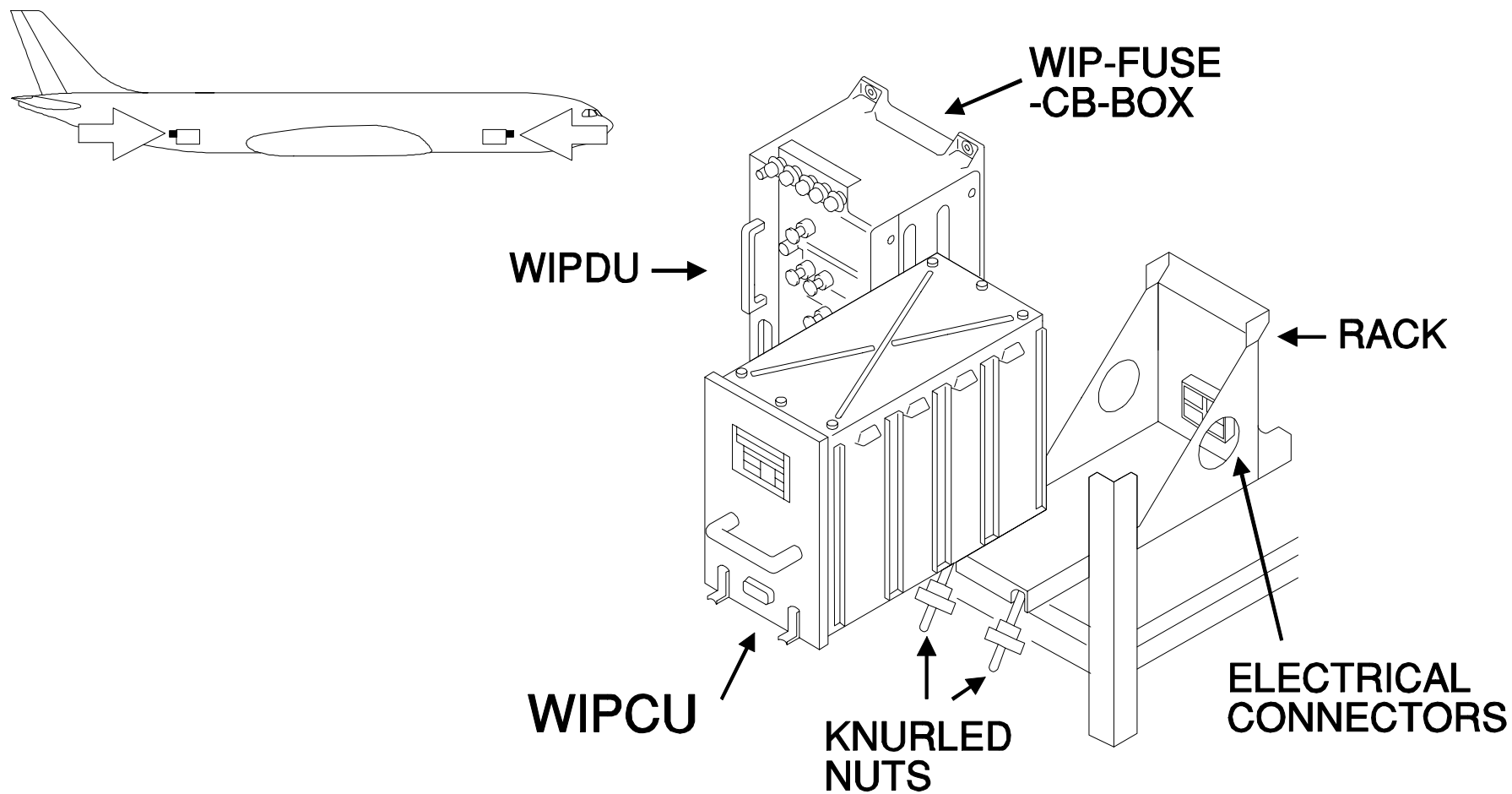
A microcontroller installed on each heating control PCB monitors and controls 4 heating circuits according to their temperature sensor.
Each heating control PCB is fully independent.

INTERFACE PCB

The interface PCB manages the data exchange between the RS 232 interface (CIDS through DEU-B), the shop-maintenance RS 232 interface and the heating control PCB.
The interface PCB is provided with a Central Processing Unit and the BITE memory.

POWER SUPPLY PCB

The WIPCU is supplied with 28 VDC. The power supply PCB gives the power supply for the interface PCB (5 VDC), the heating control PCBs (28 VDC) and also the WIPDU (12 VDC short-circuit protected).



STUDENT NOTES

ESCAPE SLIDE LOCKING MECHANISM ICE PROTECTION: SYSTEM PRESENTATION

Function
Locking
Control
Test

FUNCTION

The escape slide locking plates are electrically heated to make sure that the escape slide locking mechanism can be disarmed at door opening.

Each passenger/crew door and emergency exit sill is equipped with two locking plates.

LOCKING

Each locking plate has two heating elements, a temperature sensor and an overtemperature switch.

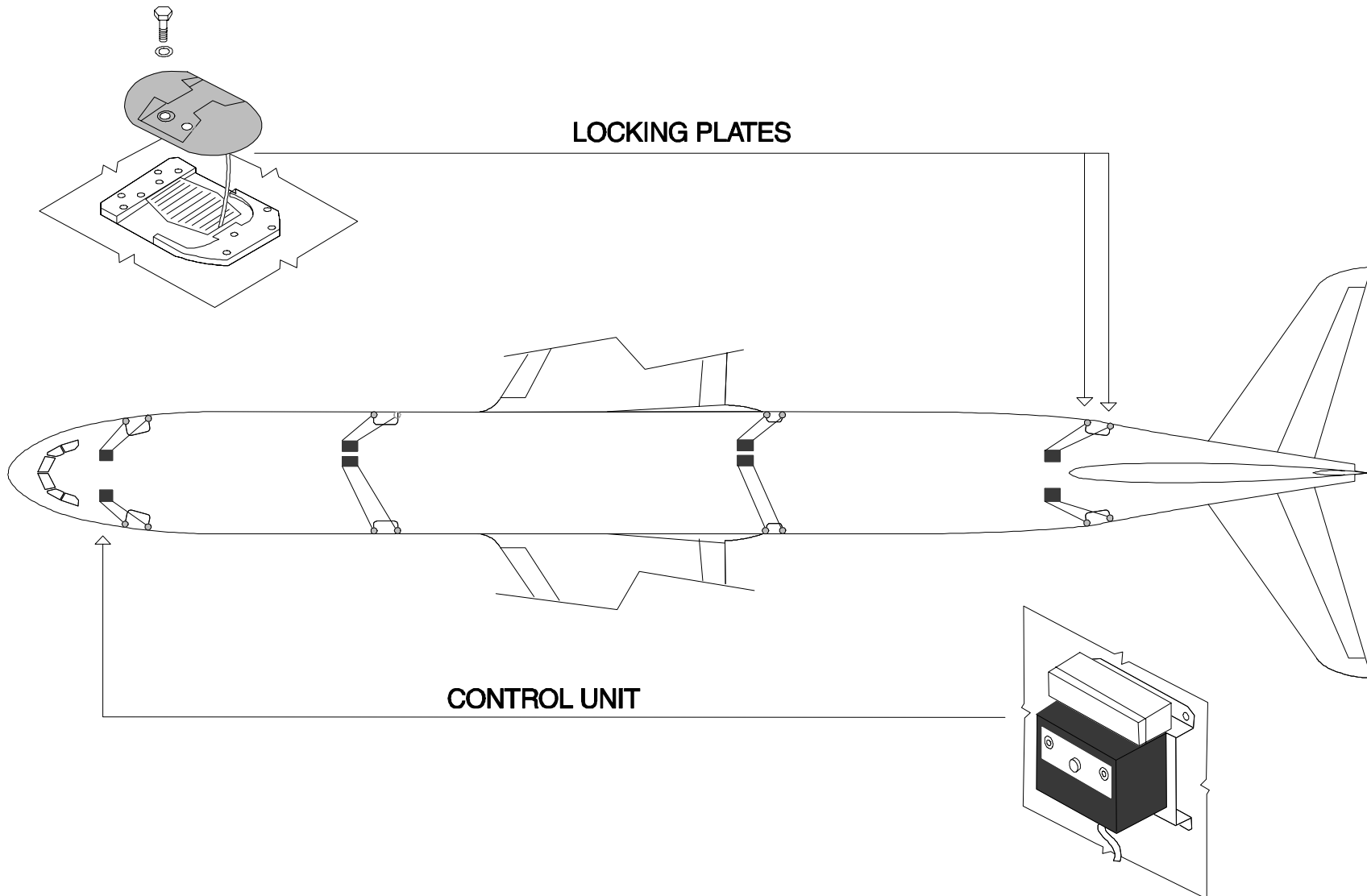
CONTROL

The control units, one per door, control, monitor and regulate the temperature of the heating elements.

The heating elements heat the related locking plate automatically when icing conditions are detected, provided the escape slide is armed.

TEST

The two indicator lights come on by pressing the pushbutton on the control unit when the system is operational.



FQW4200 GE Metric

STUDENT NOTES:

ESCAPE SLIDE LOCKING MECHANISM ICE PROTECTION: SYSTEM D/O

Description
Activation
Operation
Protection
BITE

DESCRIPTION

Each control unit controls and monitors the heating elements automatically. The control unit is supplied with 115V AC and interfaces with the temperature sensor of each locking plate and with the Proximity Switch Control unit (PSCU) of the related door.

ACTIVATION

To prevent unnecessary heating of the locking plates, the Proximity Switch Control Unit supplies a "disable/ enable" signal to the control unit, according to the emergency escape slide control lever position.

CONTROL LEVER POSITION	PSCU SIGNAL	CONTROL UNIT STATE
DISARMED	DISABLE (28Vdc)	STANDBY
ARMED	ENABLE (0Vdc)	ACTIVE

OPERATION

The control unit compares the temperature values detected by the temperature sensors with internal temperature thresholds.

Provided the enable signal is present, the control unit will turn ON the heating elements via internal relays.

TEMPERATURE THRESHOLDS

heater ON at TEMP < 12°C (53.6°F)
heater OFF at TEMP > 17°C (62.6°F)

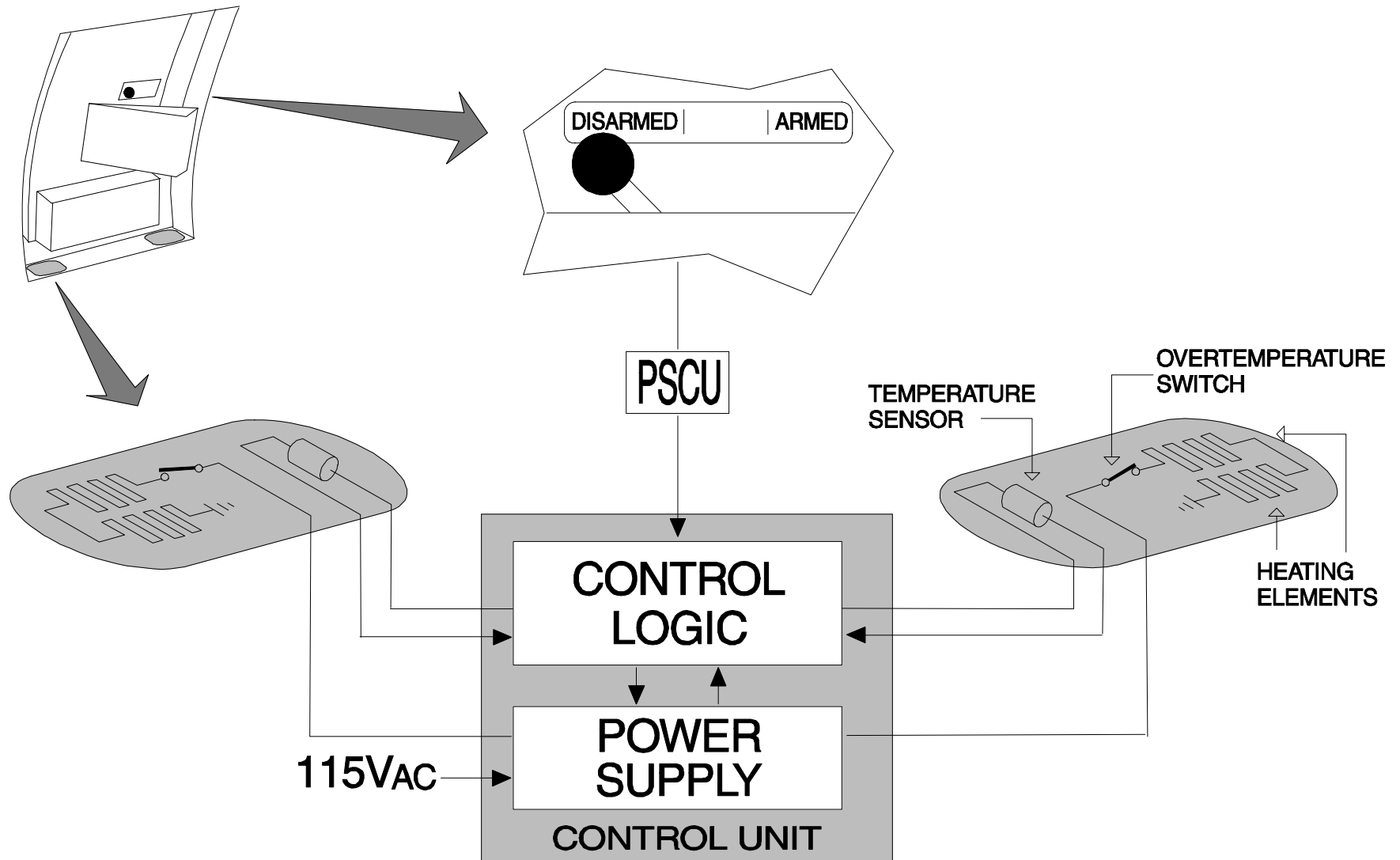
PROTECTION

An overtemperature switch prevents damage of the heaters by cutting the supply when the temperature exceeds the limit [80°C (176°F)].

BITE

The BITE operates independently of the locking plates temperature and the Proximity Switch Control Unit signal.

Each control unit has its own BITE function, which monitors :the control and monitor circuits, the relays, the heaters, the temperature sensors, the power supply, the interface connector.



FQW4200 GE Metric

STUDENT NOTES:

ESCAPE SLIDE LOCKING MECHANISM ICE PROTECTION: COMPONENTS

Safety Precautions
Control Unit
Locking Plates

SAFETY PRECAUTIONS

Make sure that the associated circuit breaker is open.

STUDENT NOTES

CONTROL UNIT

FIN : 3, 4, 9, 10, 15, 16, 21, 22 DH

ZONE : 121, 122, 132, 152, 171, 172

DESCRIPTION

Each control unit is made of :

- an aluminium plate and a plastic case,
- a Programmable Array Logic (PAL),
- two relays,
- two operational amplifiers,
- an internal 5 volts DC power supply,
- a connector.

FUNCTION

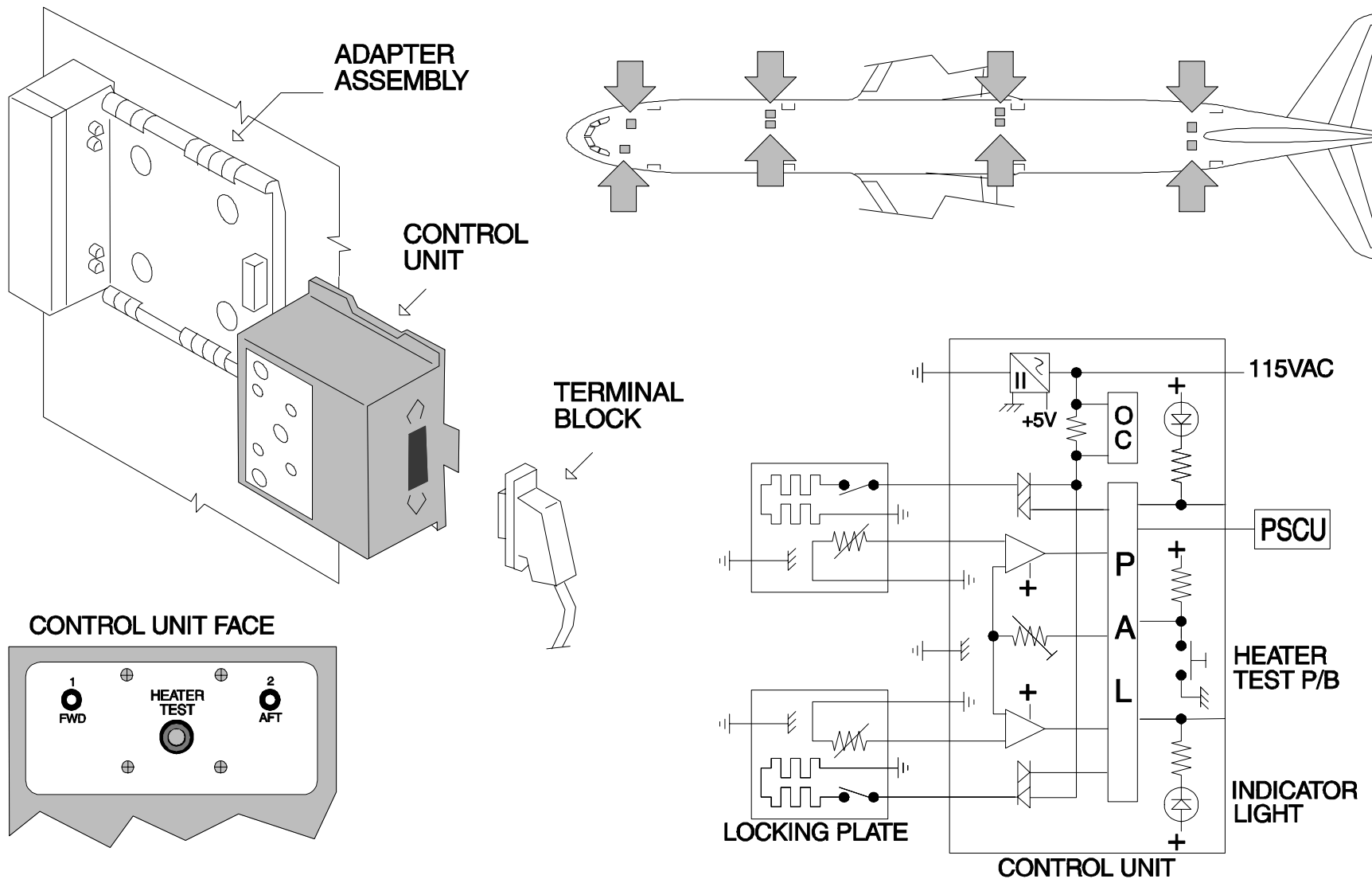
The Programmable Array Logic is the primary part of the control unit and is divided into a regulation part and a test part (BITE).

REMOVAL INSTAL

Each unit is installed on the adapter assembly by means of a locking catch.

IN SITU TEST

To perform the BITE test, you must first energize the aircraft electrical circuits, then push and hold the HEATER TEST pushbutton. The FWD and AFT TEST OK indicator lights come on when the system is operational. The lights go off when you release the HEATER TEST pushbutton.



FQW4200 GE Metric

LOCKING PLATES

FIN : 5, 7, 6, 8, 11, 13, 12, 14, 17, 19, 18, 20, 23, 25, 24, 26 DH

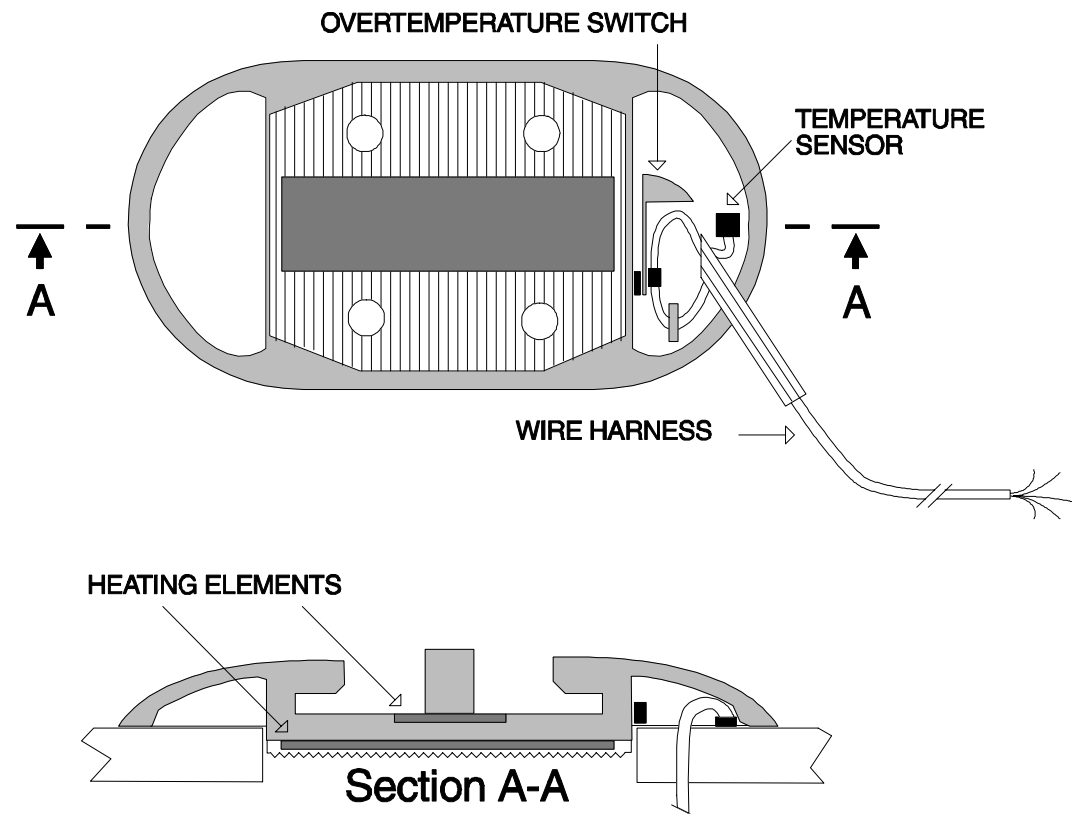
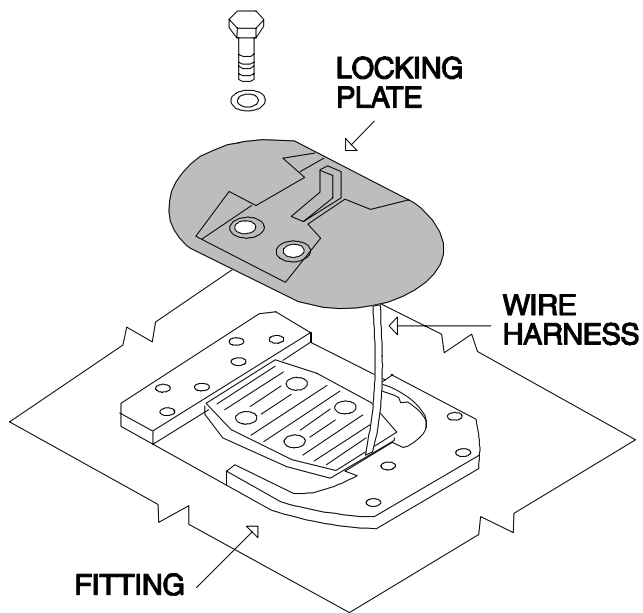
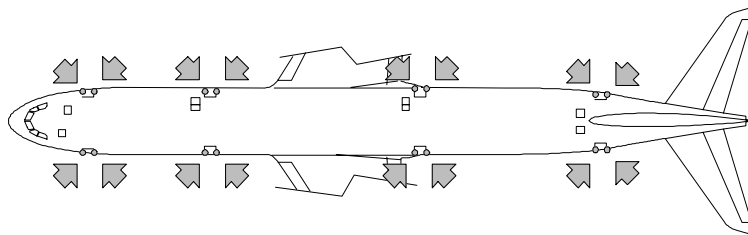
ZONE : 211, 222, 241, 242, 261, 262, 271, 272

DESCRIPTION

Each locking plate is electrically heated by two heating elements.
The heating elements (embedded in ceramic plates) the temperature sensor and the overtemperature switch are installed on the bottom of the locking plate.

REMOVAL INSTAL

Each locking plate is installed on a fitting by means of four screws.
An insertion-removal tool is needed to disconnect the contact pins from the terminal block on the control unit.



FQW4200 GE Metric

STUDENT NOTES

DUAL ADVISORY ICE DETECTION: SYSTEM PRESENTATION

Function
Detection
Messages
Monitoring

FUNCTION

The purpose of the dual advisory ice detection system is to provide :

- better detection of icing conditions,
- fuel saving by cutting off the anti-ice systems when the latter are no longer necessary.

The dual advisory ice detection system is made of two ice detectors installed on the skin of the aircraft and directly connected to the Flight Warning Computer (FWC) to send warning messages to the crew on the Engine/Warning Display (EWD).

DETECTION

Two levels of detection are provided :

- ICE DETECTED corresponding to an elementary detection,
- SEVERE ICE DETECTED corresponding to 7 elementary detections.

The ice detection system is operating at electrical power up and sends warning messages in flight, above 1500 feet and when TAT is below 8°C, even with one ice detector faulty.

The system is inhibited on ground or below 1500 feet.

MESSAGES

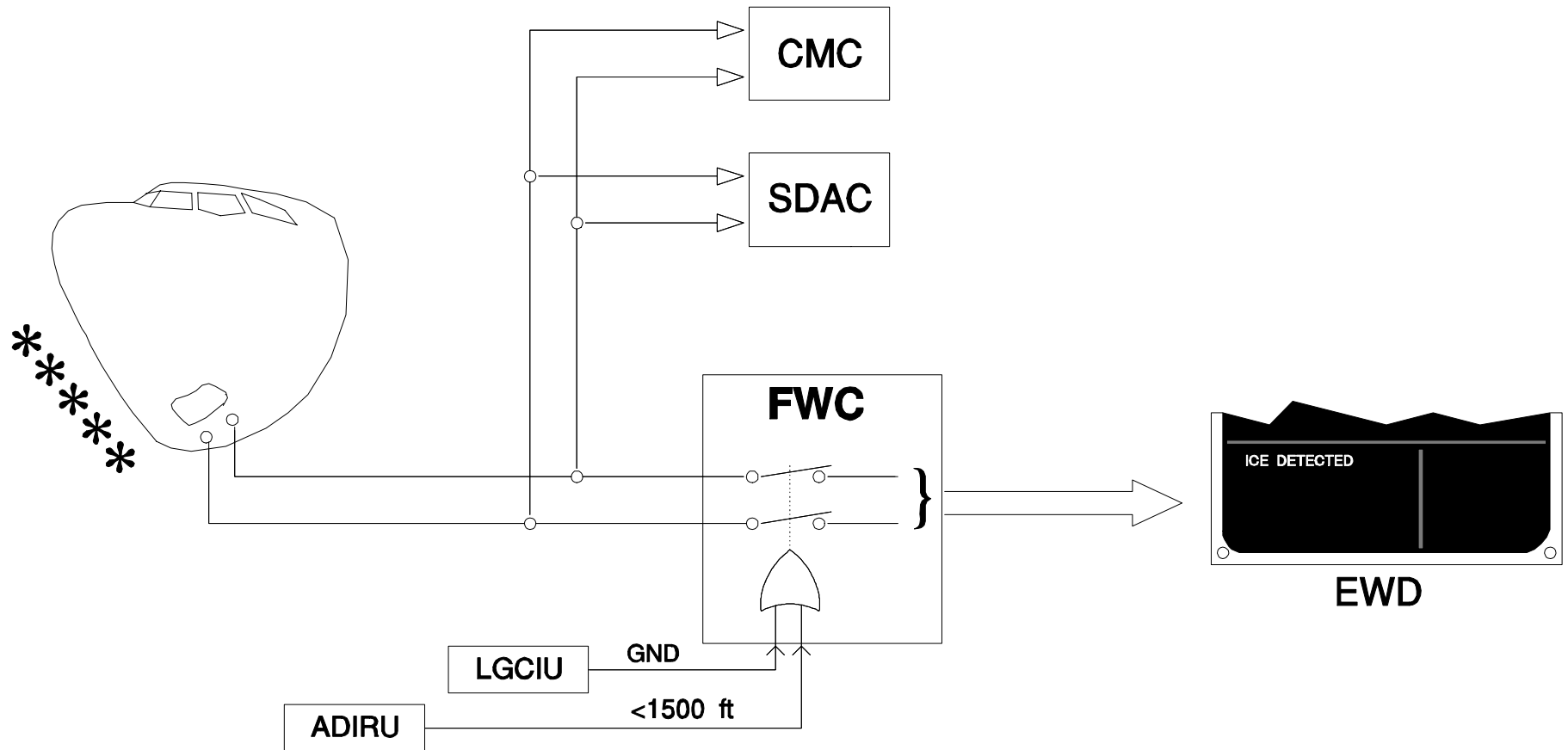
The ice detectors generate three different discrete signals :

- ICE DETECTED signal used for the engine anti-ice,
- SEVERE ICE DETECTED signal used for the wing anti-ice,
- FAULT signal when the two ice detectors are faulty.

MONITORING

Each ice detector is provided with a BITE function for continuous monitoring.

The FAULT signals are sent to the System Data Acquisition Concentrator (SDAC) and to the Centralized Maintenance Computer (CMC).



FQW4200 GE Metric

STUDENT NOTES:

DUAL ADVISORY ICE DETECTION: INTERFACES

FWCs
SDACs
CMCs
Wing Anti-Ice Relays
Power Supply

FWCs

Each ice detector sends "ICE" and "SEVERITY" signals to Flight Warning Computers 1 and 2 respectively in case of an elementary ice detection or 7 elementary ice detections.

This in order to display class 1 warning messages on the ECAM warning display. These messages can be respectively inhibited by engine or wing anti-ice selection.

SDACs

Each ice detector sends a "FAULT" signal to System Data Acquisition Concentrators 1 and 2 in case of failure during either power up, MCDU or in operation tests.

A class 1 failure message is displayed on the ECAM warning display in case of dual ice detector failure.

CMCs

Each ice detector sends a "FAULT" signal to the Centralized Maintenance Computers 1 and 2 in case of failure during either power up, MCDU or in operation tests.

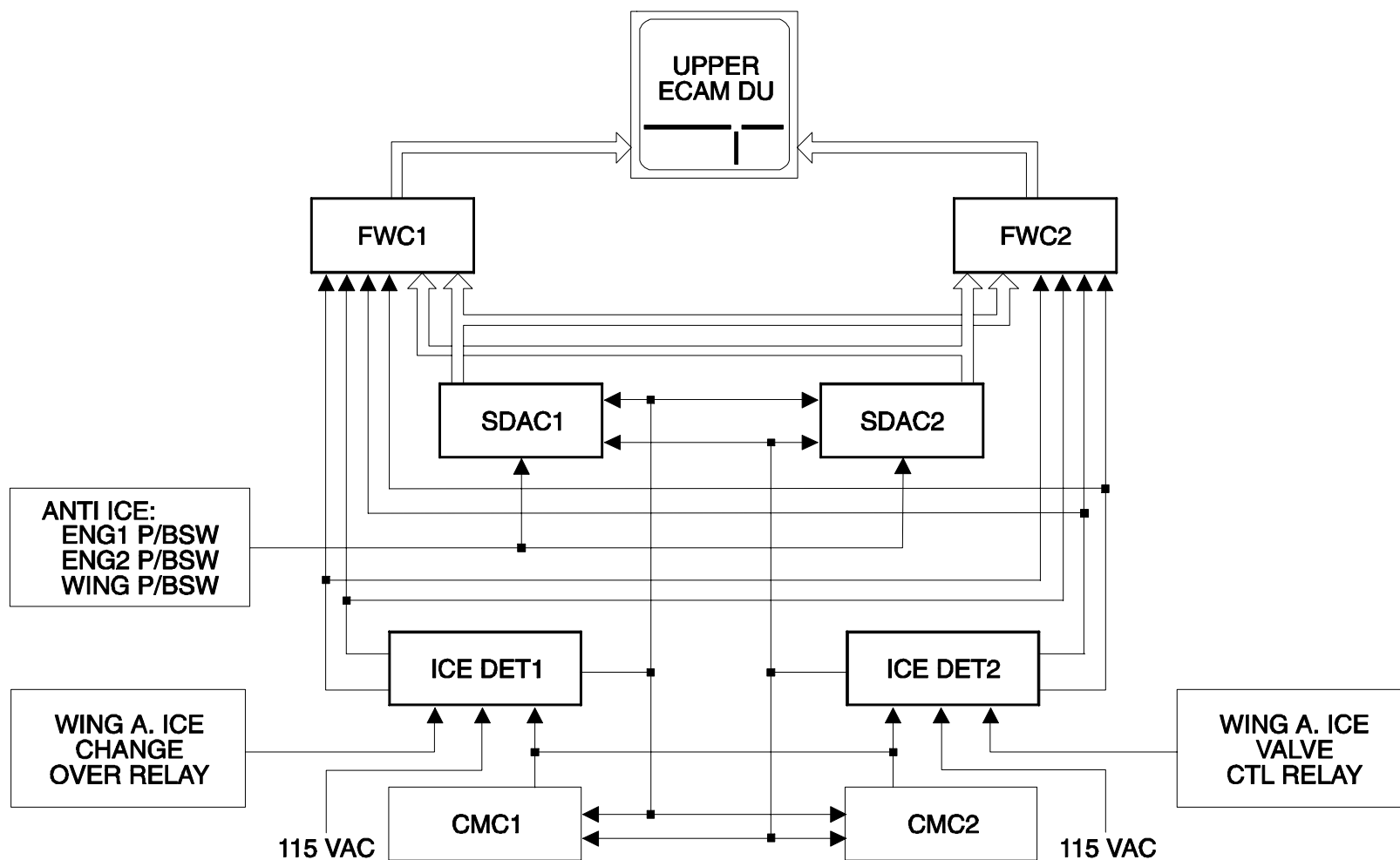
A class 2 fault message is displayed on the MCDU ANTI-ICE ICE DETECTOR 1 or 2 system page in case of ice detector failure.

WING ANTI-ICE RELAYS

When wing anti-ice valves are controlled to open, two ground signals are sent to the ice detectors in order to reset the ice detection counter and cut off the "SEVERITY" signal.

POWER SUPPLY

Each ice detector is supplied with 115 VAC.



FQW4200 GE Metric

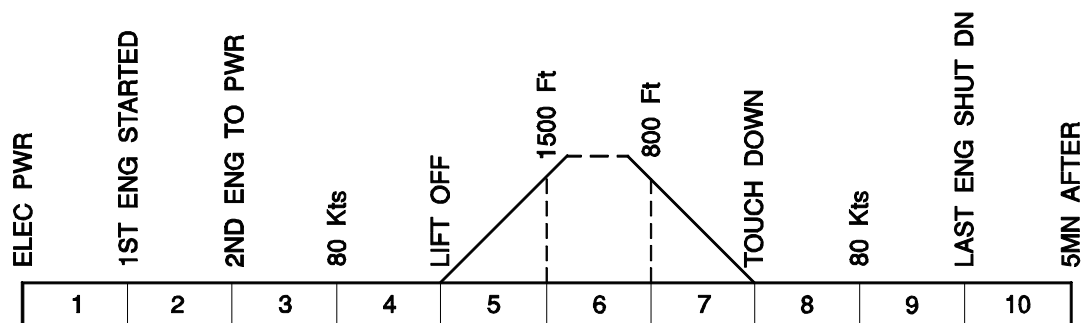
STUDENT NOTES

DUAL ADVISORY ICE DETECTION: WARNINGS

ICE DETECT FAULT

ICE DETECT FAULT

Ice detectors 1 and 2 internal monitoring detects a failure in both ice detectors.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
ICE DETECT FAULT DETECTORS 1 AND 2 FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8

STUDENT NOTES

DUAL ADVISORY ICE DETECTION: COMPONENTS

Safety Precautions
Ice Detectors

SAFETY PRECAUTIONS

Make sure that the associated circuit breaker is open.

STUDENT NOTES

ICE DETECTORS

FIN: 1DD1, 1DD2

ZONE: 121, 122

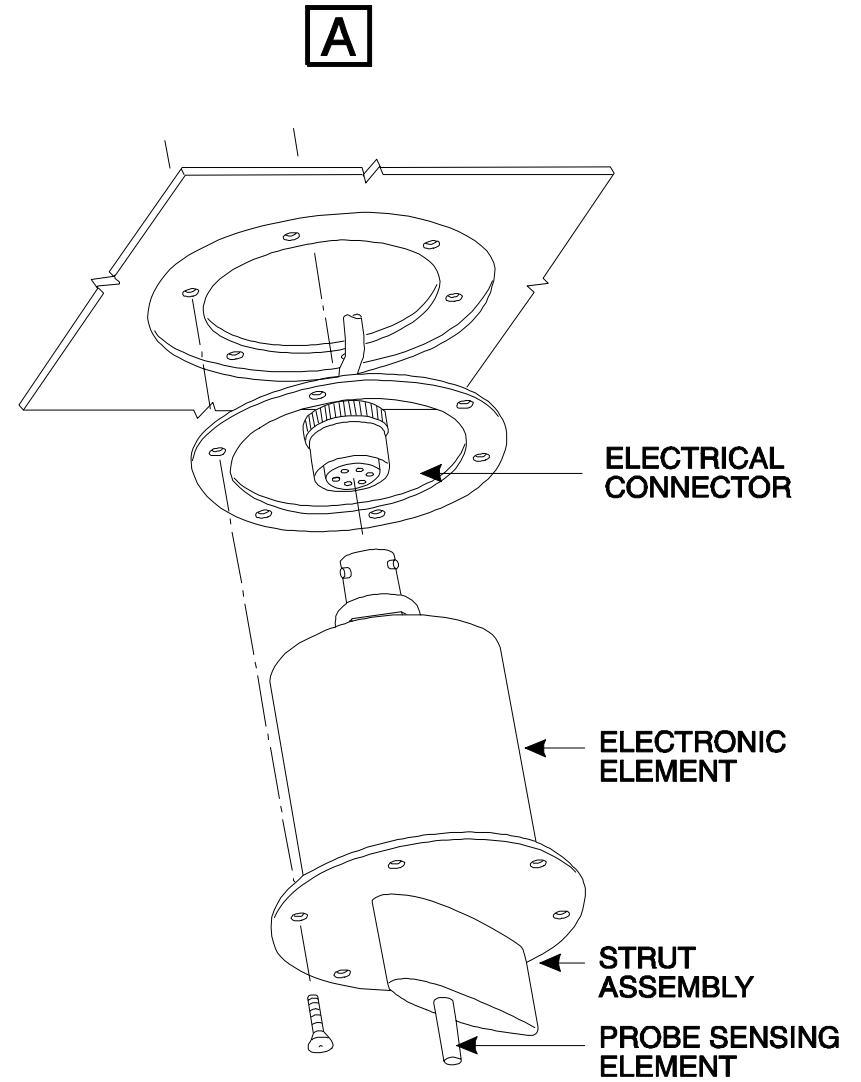
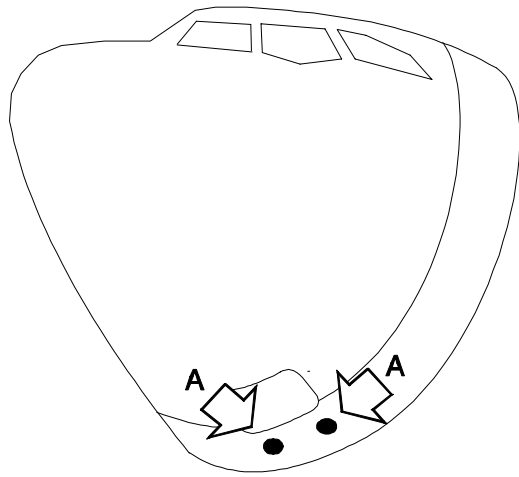
DESCRIPTION

Each ice detector comprises in the same unit:

- the sensing function : probe and strut assembly
- the electronic function : micro computer, probe oscillator and heater.

REMOVAL/INSTALLATION

Each ice detector is installed on the aircraft by means of six screws.



STUDENT NOTES

MAINTENANCE PRACTICES: PIM UTILIZATION

General
System Check
Water Ice Protection System failure

GENERAL

The Programming and Indication Module is a part of the Forward Attendant Panel installed at the forward attendant station.

The Programming and Indication Module (PIM) is used by the cabin crew for cabin system status indications.

SYSTEM CHECK

The SYSTEM CHECK menu provides the menu of several cabin systems for status indication. The SYSTEM CHECK menu page may be called up when the SYSTEM CHECK key is pressed for preflight checks.

Additionally this menu appears during all flight phases in the automatic mode, if dedicated messages for the cabin crew are to be displayed (ex: water ice protection system failure). On receiving the respective system failure information, the system check or the message "select system check" will be automatically displayed whatever the flight phase. The CIDS CAUTION light flashes amber in order to draw the cabin crew attention. The system affected by failures will be displayed in amber with the "<" sign flashing. With no failure the system message is displayed in white and the "<" is steady.

WATER ICE PROTECTION SYSTEM FAILURE

A water ice protection system failure has been detected.

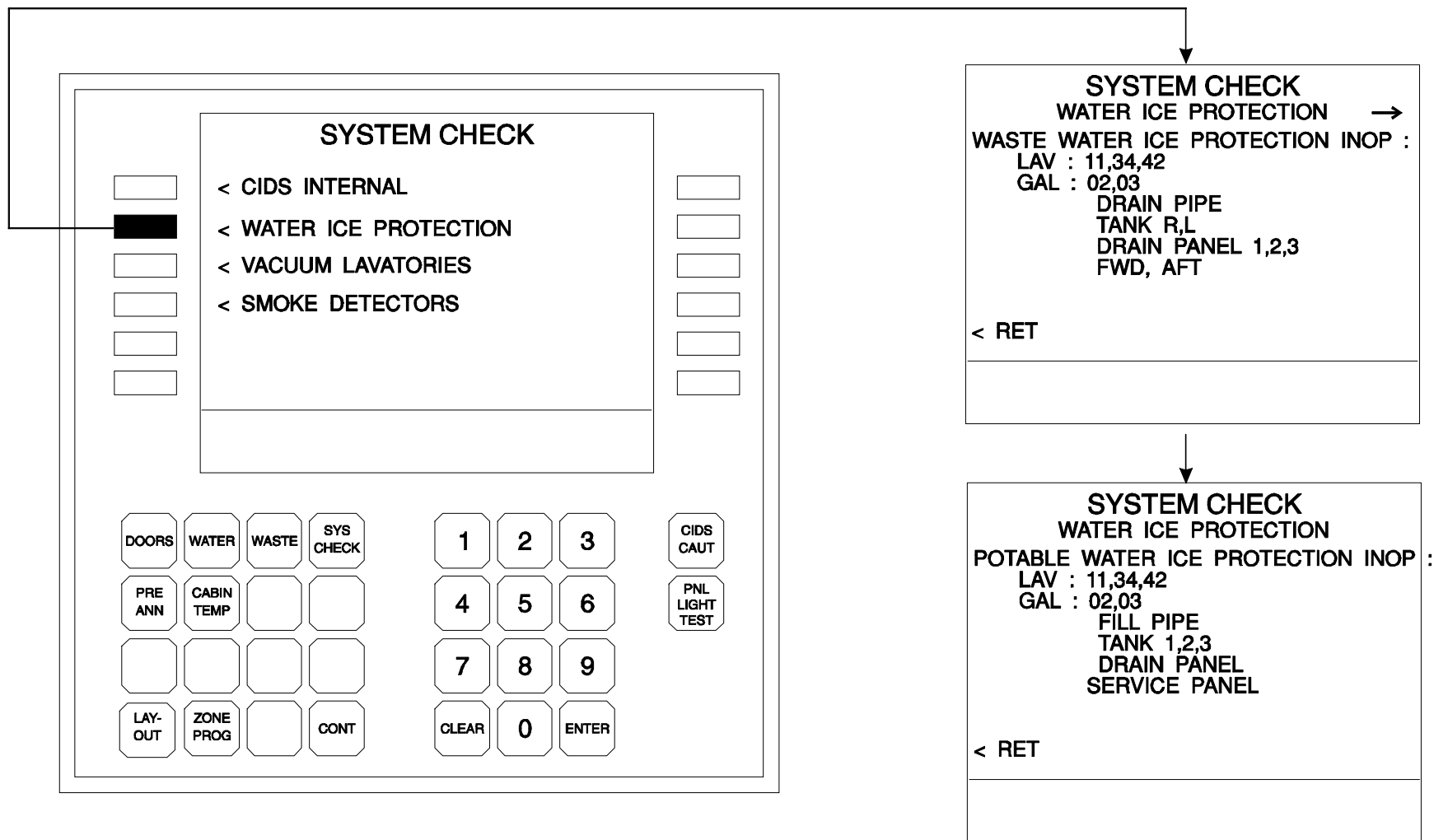
The "<" symbol flashes indicating that a water ice protection system failure has been detected.

The first water ice protection page displays the failed waste water ice protection system location.

The second water ice protection page displays the failed potable water ice protection system location and may be accessed by pushing the NEXT PAGE key.

These data are limited to the cabin attendant requirements, the cabin attendant can do the failure related action.

When you go back to the system check menu page, the flashing "<" becomes steady : it means that the failure has been seen by the cabin crew. The system text is still amber.



STUDENT NOTES