A330-200
TECHNICAL TRAINING MANUAL

MECHANICS / ELECTRICS & AVIONICS COURSE

26 FIRE PROTECTION

GE Metric

For Training Purposes Only
Issued By SPL/GK March 2006

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GENERAL SYSTEM PRESENTATION

General
Engine Fire Protection
APU Fire Protection
Avionics Smoke Detection
Cargo Fire Protection
Lavatory Fire Protection
Portable Fire Extinguishers

GENERAL

The fire protection system provides :

- Fire detection and extinguishing for the engines, the APU, the cargo compartments and the lavatories.
- Smoke detection in the avionics compartment.

In addition, automatic fire extinguishers protect the lavatory waste bins and portable fire extinguishers are installed at suitable locations in the cockpit and the cabin.

ENGINE FIRE PROTECTION

The engine fire protection is provided by two systems : the fire detection system and the fire extinguishing system.

APU FIRE PROTECTION

The APU fire protection is provided by two systems : the fire detection system and the fire extinguishing system.

AVIONICS SMOKE DETECTION

The avionics smoke detection is provided by smoke detectors in the avionics compartment.

CARGO FIRE PROTECTION

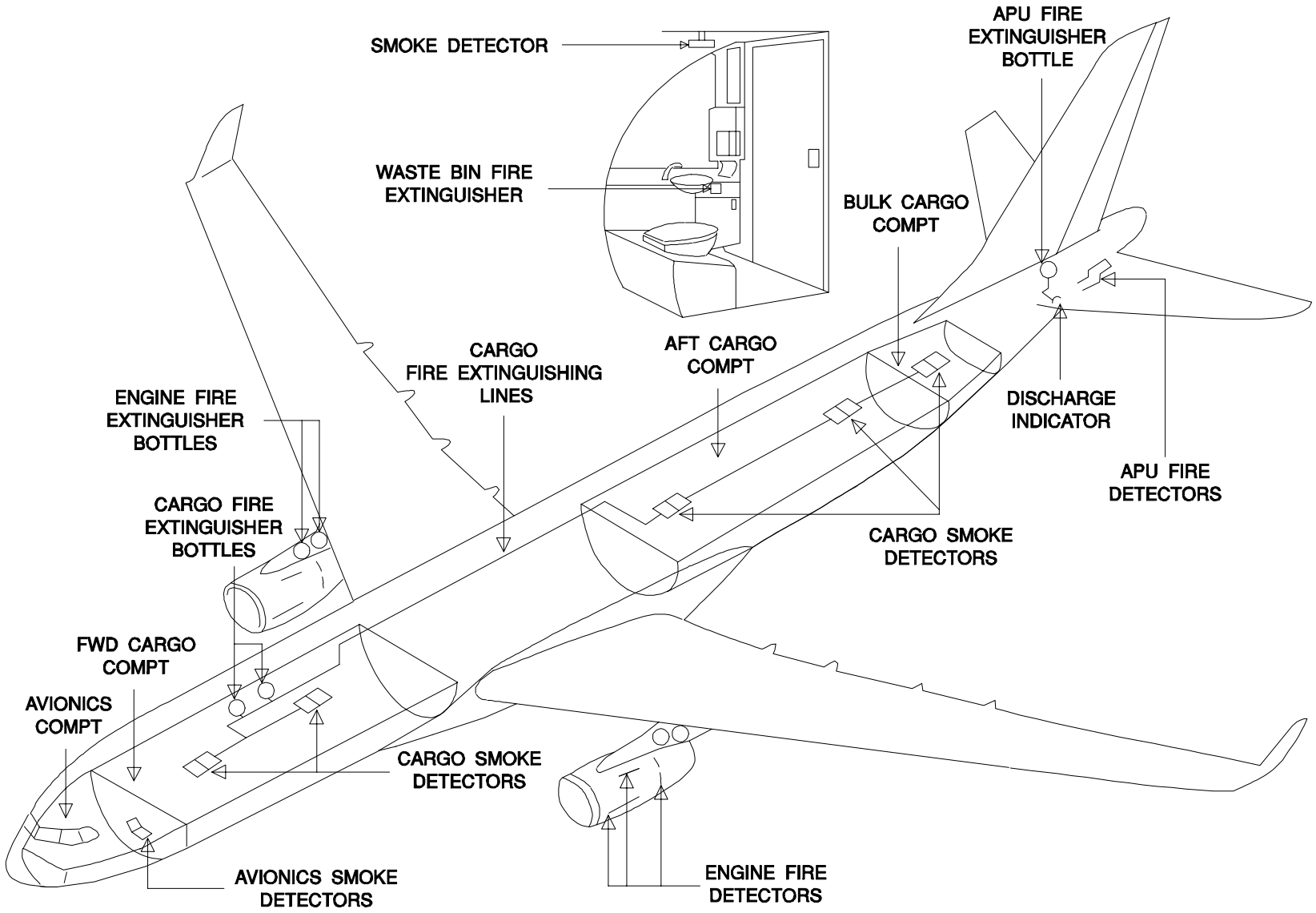
The cargo fire protection is provided by two systems : the cargo smoke detection system and the cargo fire extinguishing system.

LAVATORY FIRE PROTECTION

The lavatory fire protection is provided by two systems : the lavatory smoke detection system and the waste bin automatic fire extinguishing system.

PORTABLE FIRE EXTINGUISHERS

The portable fire extinguishers are used for fighting fire in the cockpit and cabin.



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STUDENT NOTES

SAFETY PRECAUTIONS

General
Engine/APU Fire Push
Fire Bottle
Discharge Cartridge
Smoke Detectors

GENERAL

Specific precautions must be taken during removal or installation of a fire extinguishing bottle, a discharge cartridge or a smoke detector.

ENGINE/APU FIRE PUSH

CAUTION : Cartridge percussion is possible if the fire pushbutton is released out.

FIRE BOTTLE

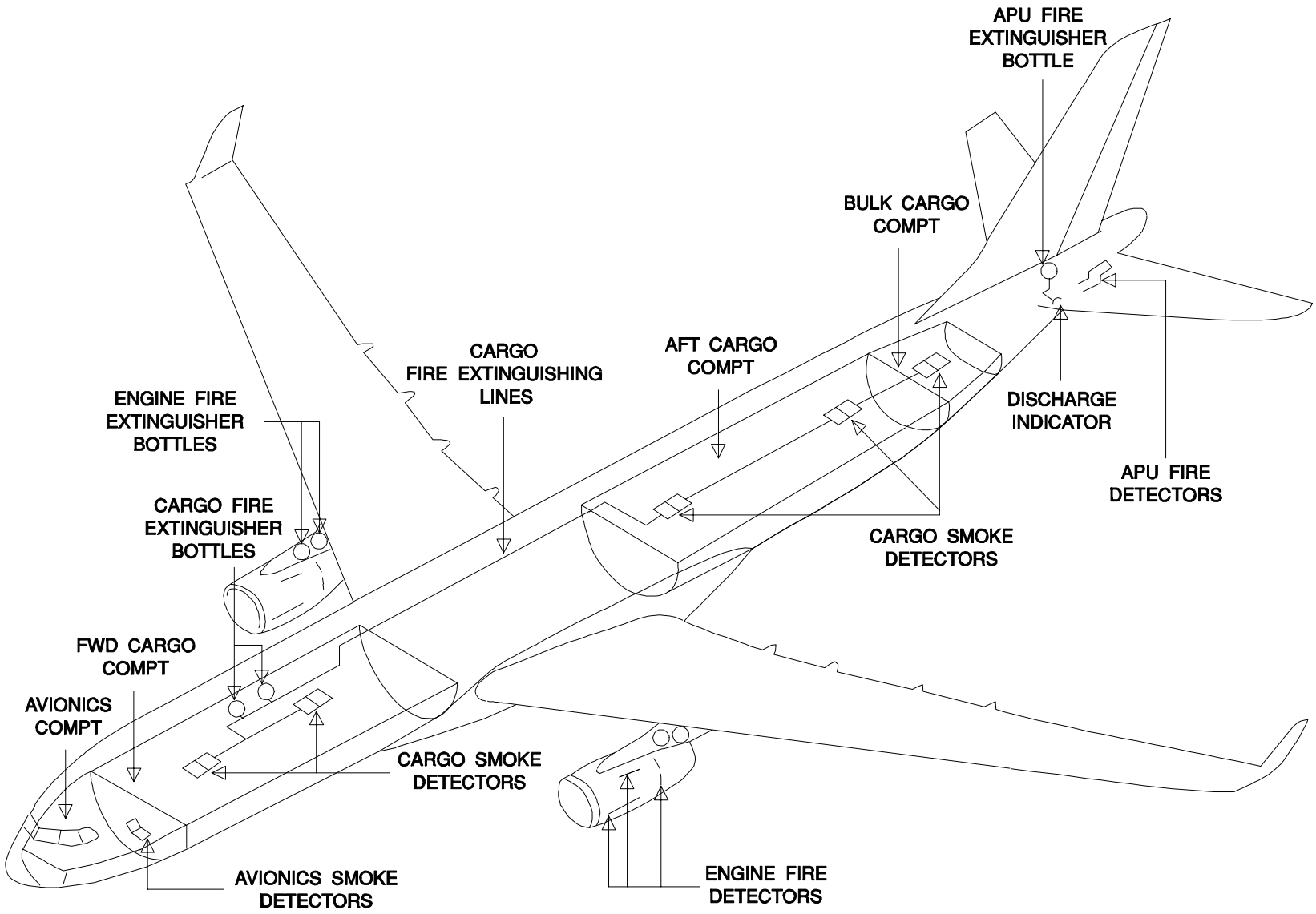
WARNING : The fire bottle cartridges are explosive.
Remove them before working on the bottle. Protective caps must be installed during bottle removal/installation to prevent damage to discharge diaphragm which could result in injury to personnel.

DISCHARGE CARTRIDGE

WARNING : Cartridges are explosive and must be handled or stored by authorized personnel or disposed of by an approved method.
- Before power is supplied to the aircraft make certain that electrical circuits, upon which work is in progress, are isolated.
When cartridge electrical connectors are disconnected, the cartridge electrical pins must be shunted with a protective shunt which is provided by the manufacturer. A shunt plug or shorting clip, will prevent bottle discharge which could cause injury to maintenance personnel.
The cartridge installed must be of the same make as the fire bottle and correspond to the specification indicated in the Maintenance Manual.

SMOKE DETECTORS

WARNING : Do not try to open or repair a smoke detector. The smoke detector contains radioactive americium 241 of approximately 0.4 microcuries. Only workshops authorized by the manufacturer can do work on the smoke detectors.



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STUDENT NOTES

ENGINE FIRE PROTECTION : SYSTEM PRESENTATION

General
Fire Detectors
Fire Detection Unit (FDU)
Warnings
Fire Bottles

GENERAL

The engine fire protection is provided by two systems : the fire detection system and the fire extinguishing system.

FIRE DETECTORS

The engine fire detection system consists of two independent loops (A and B) connected in parallel to a Fire Detection Unit (FDU).
Each loop comprises : an accessory gearbox detector, a pylon detector, a lower and an upper turbine detectors.
The detection system is of the SYSTRON-DONNER electro-pneumatic type (detectors filled with pressurized gas).

CAUTION : When handling the detector, exercise normal precautions so as not to damage or kink the sensor tube.

FIRE DETECTION UNIT (FDU)

The Fire Detection Unit processes signals received from the fire detectors.
One Fire Detection Unit (FDU), located in the avionics compartment, is provided for each engine.

WARNINGS

The Fire Detection Unit generates signals for the ECAM, Centralized Maintenance computers and cockpit local warnings.
Fire warning signals are sent to the ECAM, the engine fire panel and the engine master panel. Loop failure signals are sent to the ECAM and Centralized Maintenance Computers (CMC).
When a fire is detected, the continuous repetitive chime sounds, the Master Warning comes on, the engine fire pushbutton light on the engine fire panel comes on and the fire indication on the master panel comes on.

FIRE BOTTLES

Two extinguisher bottles are installed in each engine pylon.
Each bottle is equipped with a pressure switch, to monitor agent pressure, and an electrically operated squib for agent discharge.

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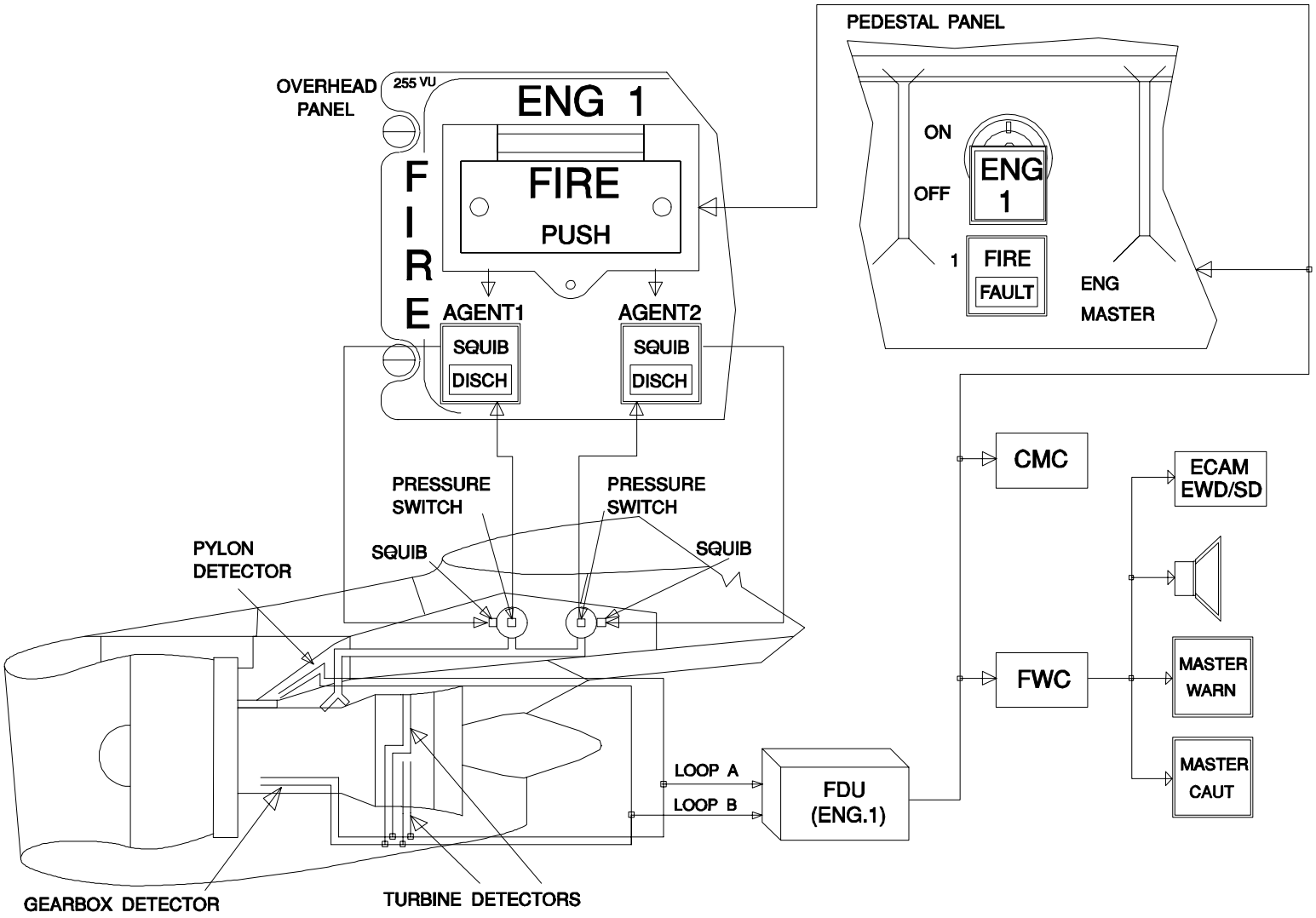

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SSTUDENT NOTES:

ENGINE FIRE PROTECTION : SYSTEM CONTROLS AND INDICATING

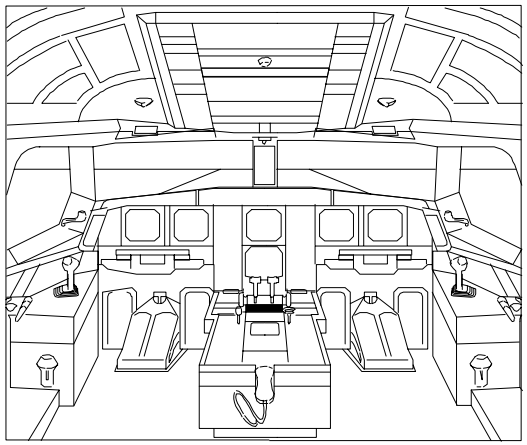
General
Pedestal
Overhead Panel

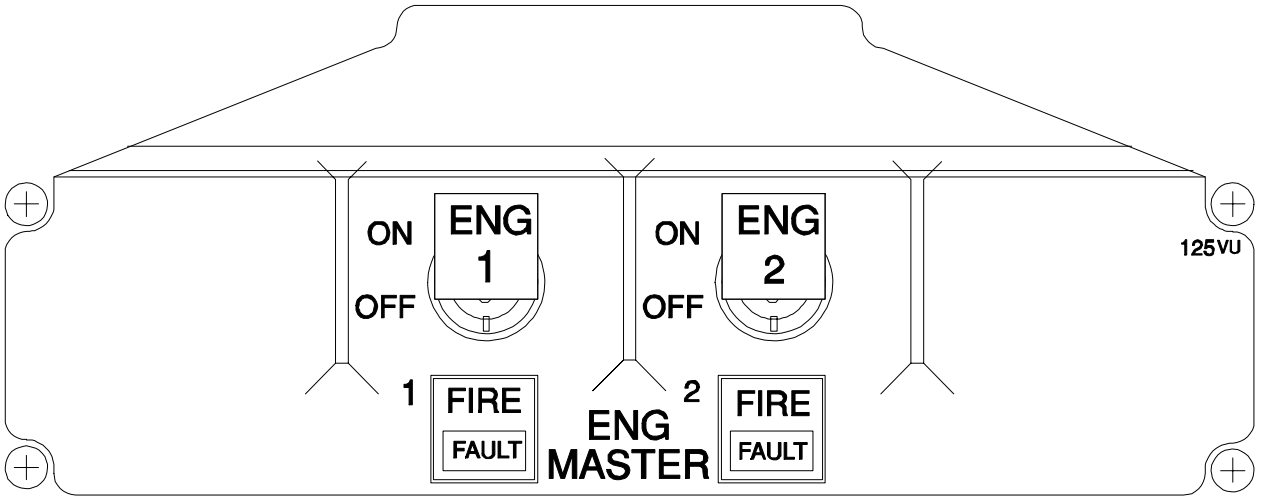
GENERAL

The controls and indicators are located on the overhead panel and the center pedestal.

PEDESTAL

The engine fire light comes on red when a fire warning is activated, to identify the engine to be shutdown.





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OVERHEAD PANEL

The engine fire control panel is located on the overhead panel.

ENG FIRE PUSHBUTTON

Incorporated lights come on along with a fire warning. When the engine fire pushbutton is released out, the squib lights come on, indicating that bottle percussion is available.
At the same time, the engine is isolated from the aircraft systems which could feed a fire.

AGENT PUSHBUTTON

Provided the white SQUIB light is on (engine fire pushbutton released out), pressing the AGENT pushbutton discharges the extinguishing agent.
A pressure switch activates the amber DISCH light when the corresponding agent has been discharged.

CAUTION: The engine bottle cartridge has one of its two squibs electrically supplied from the HOT bus, consequently the bottle can be fired even if the A/C is not powered provided the engine FIRE pushbutton is released out (no cockpit light will indicate the agent discharge until the A/C is powered).

TEST PUSHBUTTON

The test pushbutton simultaneously checks, for all engines, the condition of the :
- Fire detectors, fire detection unit, indications, warnings.
- Percussion cartridge filaments of the fire extinguisher bottles and associated wiring.

During the test :
- The ENG FIRE pushbuttons come on red.
- The SQUIB lights come on provided the continuity of both squib filaments circuit is correct.
- The DISCH lights come on associated with ECAM warnings provided the continuity of the low pressure warning circuit is correct.
- On the ENG panel (pedestal), the FIRE lights come on red.

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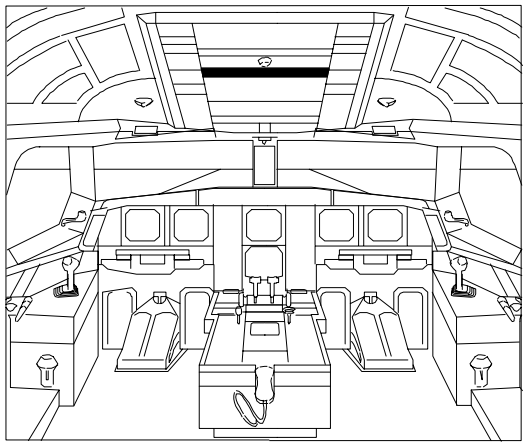

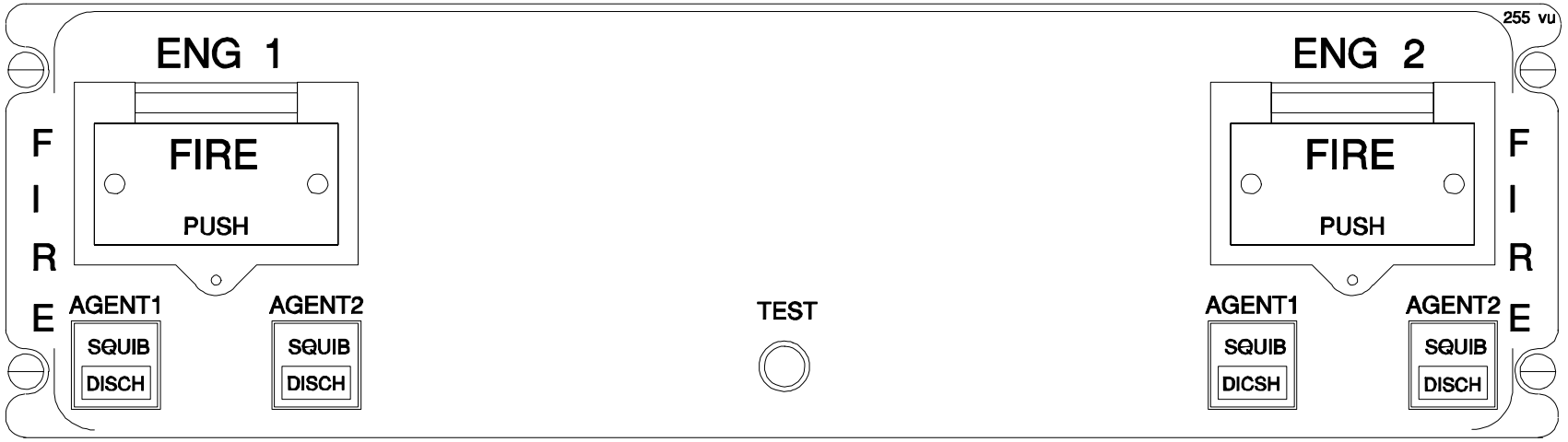

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ENGINE FIRE PROTECTION : SYSTEM OPERATION IN CASE OF ENGINE FIRE

On Ground
In Flight

ON GROUND

When a fire is detected, the continuous repetitive chime sounds, the MASTER WARNING flashes, the ENGINE FIRE PUSH button light comes on and the FIRE light on the ENGINE MASTER panel comes on.

As the rolling speed of the airplane does not exceed V1, the captain must stop the airplane.

Note that full reverse may be used to stop the airplane.

When the airplane is stopped and parking brake is set to ON.

When the ENGINE 1 MASTER lever is set to OFF, the low pressure and high pressure valves close and cause engine shutdown.

When the ENGINE FIRE PUSHbutton is released out, the continuous repetitive chime stops and the single chime sounds.

The MASTER CAUTION comes on due to deactivation of systems.

The fuel low pressure valve closure is confirmed.

The SQUIB lights on the AGENT pushbuttons come on to indicate that AGENT pushbuttons can be used.

When the AGENT 1 pushbutton is pressed, fire bottle one is discharged in the engine compartment and the DISCH light comes on.

The second bottle must be discharged.

When the fire is extinguished, the ENGINE FIRE PUSHbutton light and the MASTER WARNING go off and the FIRE indication on the ENGINE MASTER panel goes off.

To complete the exercise, the other engines must be shutdown by setting the ENG MASTER switches to OFF position. If the APU is not running the ECAM displays are lost. If the APU is running, it must be shut down.

IN FLIGHT

When a fire is detected, the continuous repetitive chime sounds, the MASTER WARNING flashes, the ENGINE FIRE PUSH button light comes on and the FIRE light on the ENGINE MASTER panel comes on.

When the ENGINE 1 MASTER lever is set to OFF, the low pressure and high pressure valves close and cause engine shutdown.

When the ENGINE FIRE PUSHbutton is released out, the continuous repetitive chime stops and the single chime sounds.

The MASTER CAUTION comes on due to deactivation of systems.

The fuel low pressure valve closure is confirmed.

The SQUIB lights on the AGENT pushbuttons come on to indicate that AGENT pushbuttons can be used.

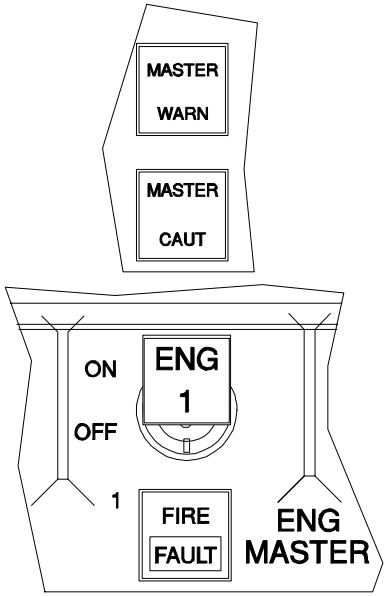
Wait for ten seconds :

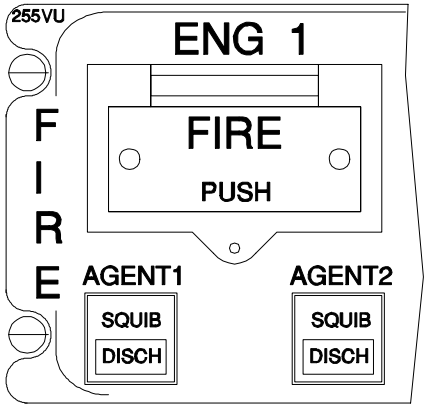
this is required to reach engine windmilling, reducing the nacelle ventilation which increases the agent effect.

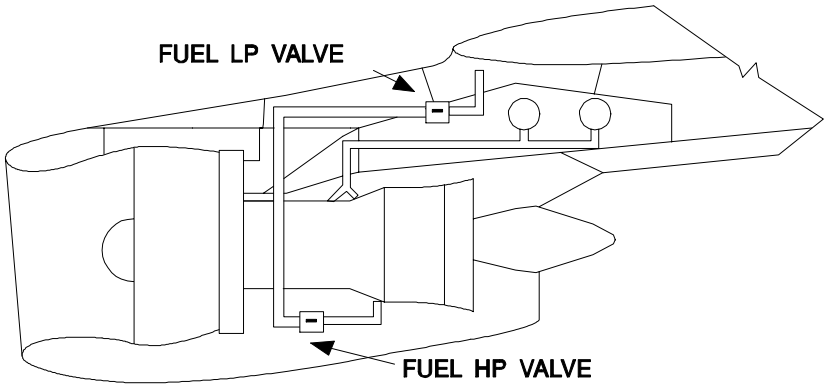
When the AGENT 1 pushbutton is pressed, fire bottle one is discharged in the engine compartment and the DISCH light comes on.

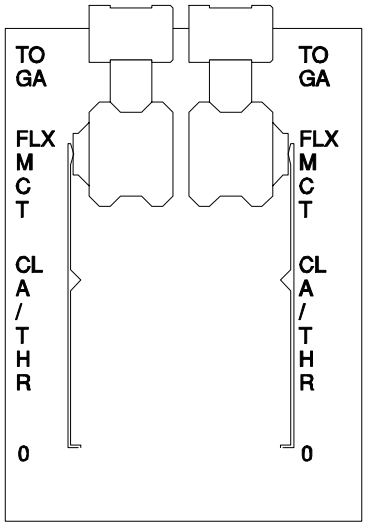
If the fire still persits after 30 seconds, the second bottle must be discharged.

When the fire is extinguished, the ENGINE FIRE PUSHbutton light and the MASTER WARNING go off and the FIRE indication on the ENGINE MASTER panel goes off.









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STUDENT NOTES

ENGINE FIRE PROTECTION : SYSTEM TEST

General
Fire Test
SQUIB Test
DISCH Test

GENERAL

The operational test enables the crew to check the fire protection system.
The operational test of the fire protection system is performed by pushing the TEST pushbutton located on the engine FIRE control panel.

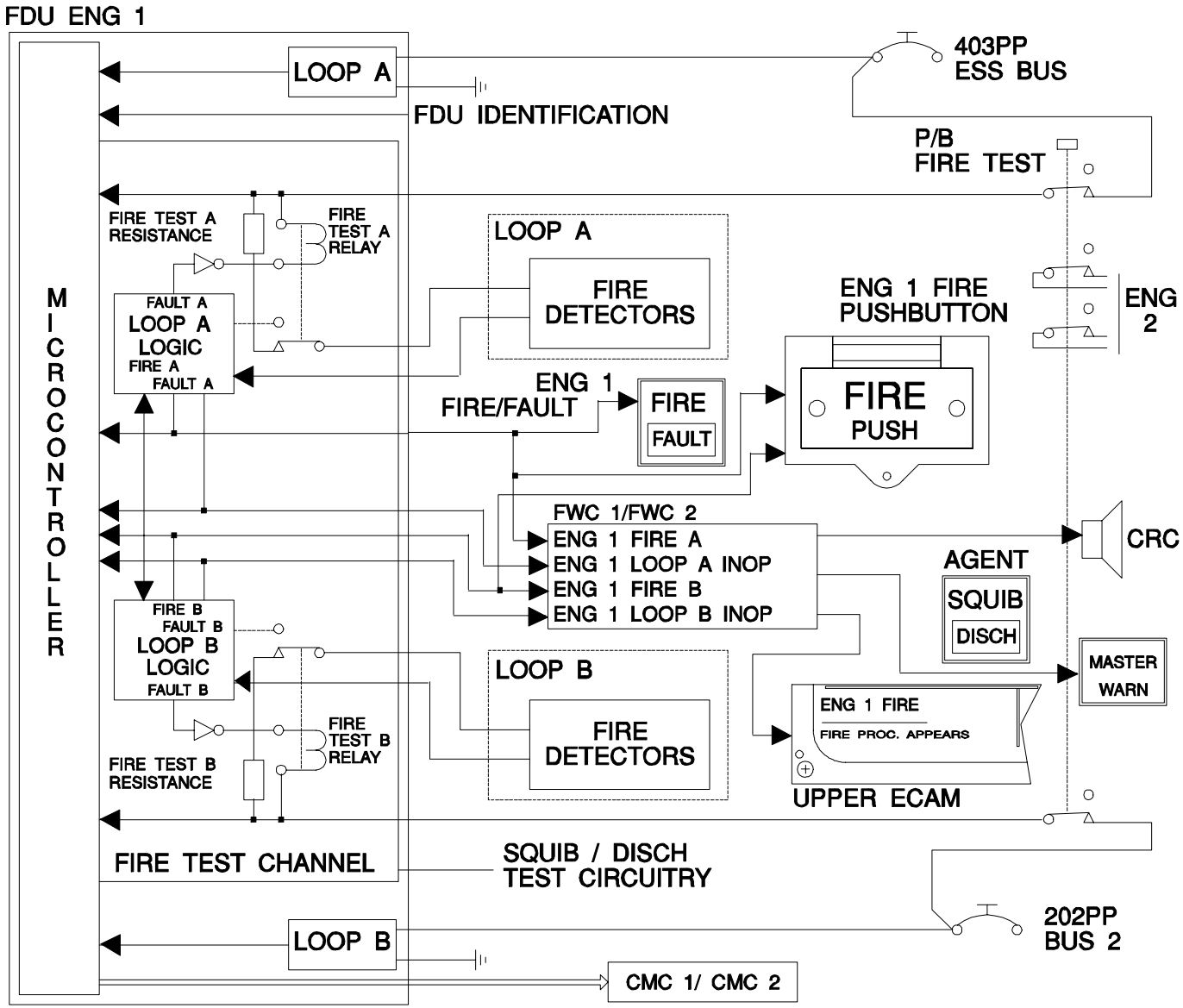
FIRE TEST

From the engine FIRE control panel the TEST pushbutton simultaneously checks, for all engines, the condition of the :

- fire detectors (loops A and B),
- Fire Detection Unit,
- indications and warnings.

As long as the test command is present :

- the CRC sounds,
- the MASTER WARNing comes on,
- ECAM ENG FIRE warnings are activated,
- the two ENG FIRE PUSHbuttons come on red on the fire panel (signal sent by channels A and B),
- the two FIRE lights come on red on the engine panel (signal sent by channel A).



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SQUIB TEST

The test channel of the FDU ensures the electrical continuity of :

- the fire extinguishing bottle squib circuit.

During the test, the FDU checks that there is :

- a ground signal through filament 1,
- a 28 VDC power supply corresponding to this filament,
- a ground signal through filament 2,
- a 28 VDC power supply corresponding to this filament.

If the result of the test is positive, the SQUIB legend comes on.
If there is a fault, the SQUIB legend remains off.
The FDU generates a maintenance message for the Central Maintenance Computer (CMC).

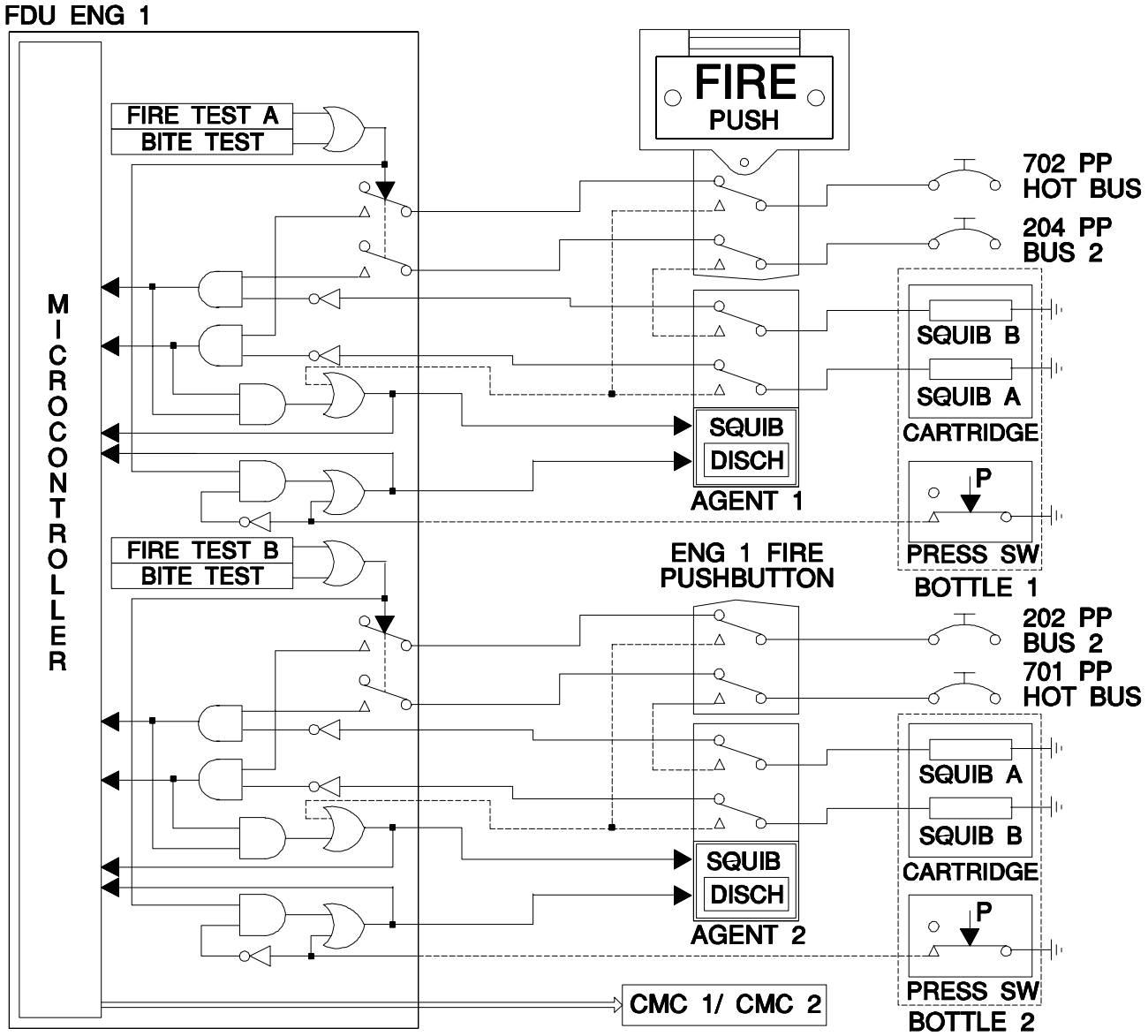
DISCH TEST

The test channel of the FDU ensures the electrical continuity of :
- the low pressure warning circuitry of the fire extinguisher bottle.

The low pressure warning circuit of the fire extinguisher bottle is also checked.
During the test, the FDU simulates a pressure drop as follows :

- it opens the circuit connected to the pressure switch and checks that it generates a warning signal.

If the result of the test is positive, the DISCH legend comes on. If there is a fault the DISCH legend remains off.



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STUDENT NOTES

ENGINE FIRE PROTECTION : SYSTEM WARNINGS

ENG 1 FIRE
ENG 1 FIRE DET FAULT
ENG 1 LOOP A FAULT

ENG 1 FIRE

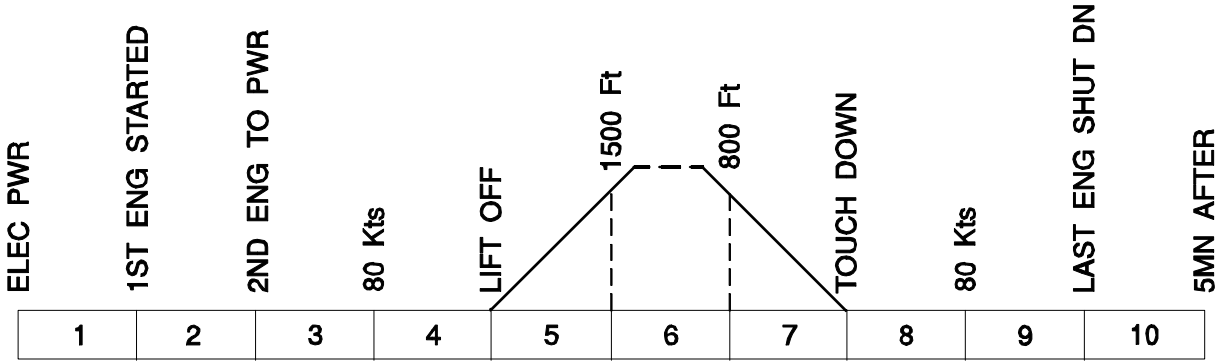
The following warnings are trigerred :
- Master Warning light
- Continuous Repetitive Chime
- FIRE light on start panel
- ENG 1 FIRE PUSHbutton light on ENG FIRE panel
- ENG system page appears on lower ECAM display
- corresponding procedure appears on upper ECAM display.

ENG 1 FIRE DET FAULT

The following warnings are trigerred :
- Master Caution light
- Single Chime
- corresponding message appears on upper ECAM display.

ENG 1 LOOP A FAULT

The following warnings are triggered :
- corresponding message appears on upper ECAM display.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
ENG 1 (2) FIRE	CRC	MASTER WARN	ENGINE	FIRE lts on ENG FIRE pb and on ENG panel	NIL
ENG 1 (2) FIRE DET FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
ENG 1 (2) LOOP A (B) FAULT	NIL	NIL	NIL	NIL	3, 4, 5, 7, 8

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STUDENT NOTES

ENGINE FIRE PROTECTION : COMPONENTS

Fire Detectors
Fire Detection Unit (FDU)
Fire Bottles
Discharge Head
Cartridge
Pressure Switch

SAFETY PRECAUTIONS

WARNING :

Specific precautions must be taken during removal or installation of a fire extinguishing bottle and a discharge cartridge.

STUDENT NOTES

FIRE DETECTORS

PYLON FIRE DETECTORS

FIN : 6WD1 - 7WD1 (ENG 1)
6WD2 - 7WD2 (ENG 2)

ZONE : 453 - 463

GEARBOX FIRE DETECTORS

FIN : 4001WD - 4002WD

ZONE : 400

UPPER TURBINE FIRE DETECTORS

FIN : 4011WD - 4012WD

ZONE : 400

LOWER TURBINE FIRE DETECTORS

FIN : 4021WD - 4022WD

ZONE : 400

COMPONENT DESCRIPTION

The detector is pneumatically operated by heating its sensing element which contains helium gas and hydrogen charged core material.

ALARM STATE

The application of an overall average temperature expands the inert gas (helium) which in turn closes the alarm switch.
The detector sends a fire signal.

The application of heat to the sensor releases active gas from the hydride core which in turn closes the alarm switch.
The detector sends a fire signal.

FAULT STATE

In the event of gas pressure loss (pipe fracture or cut off due to a torching flame), the integrity switch opens and generates a fault signal.

SAFETY PRECAUTIONS

CAUTION :

The detector responder is hermetically sealed, and as such, is not field repairable.
Any attempt to disassemble a detector responder will cause serious damage to the unit and render it inoperative.

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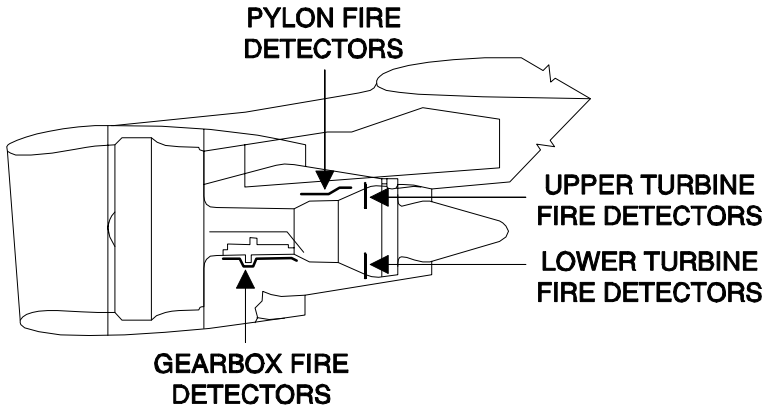

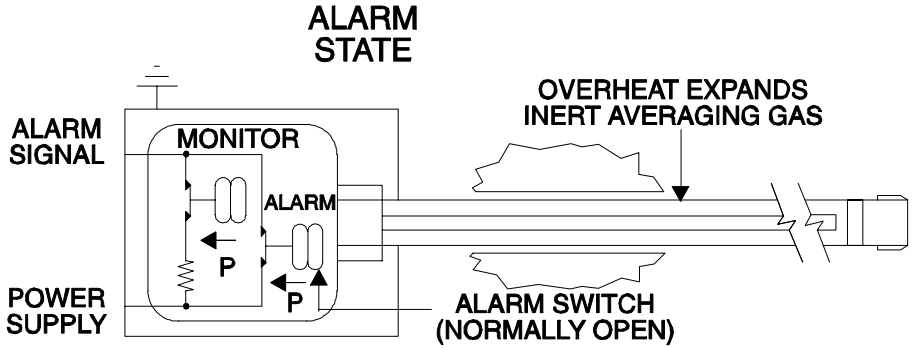

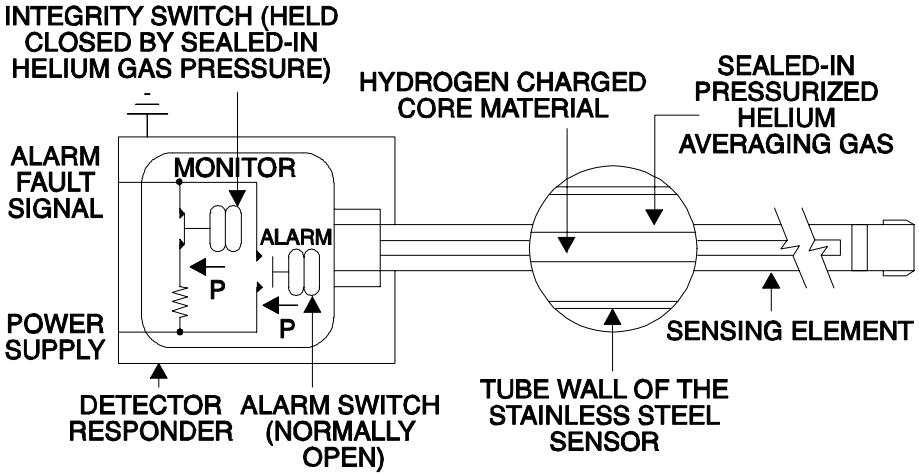

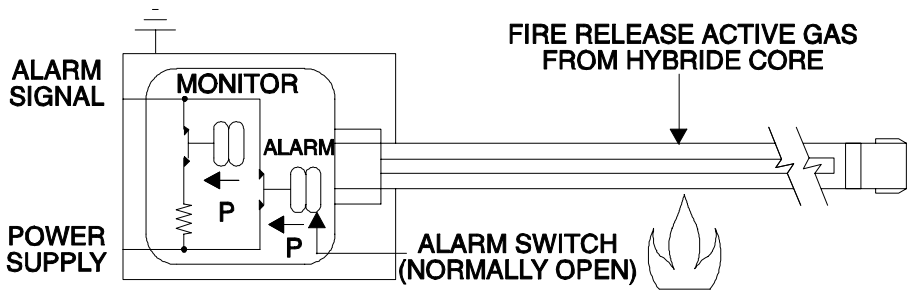

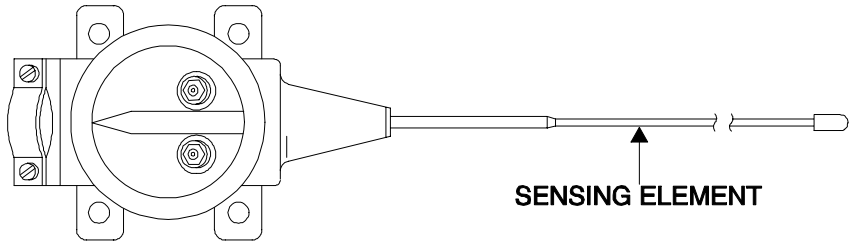

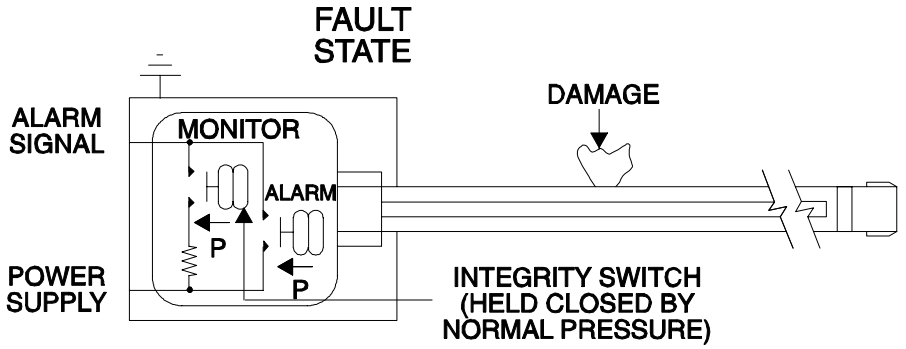

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FIRE DETECTION UNIT (FDU)

FIN : 1WD1 (ENG 1)
1WD2 (ENG 2)

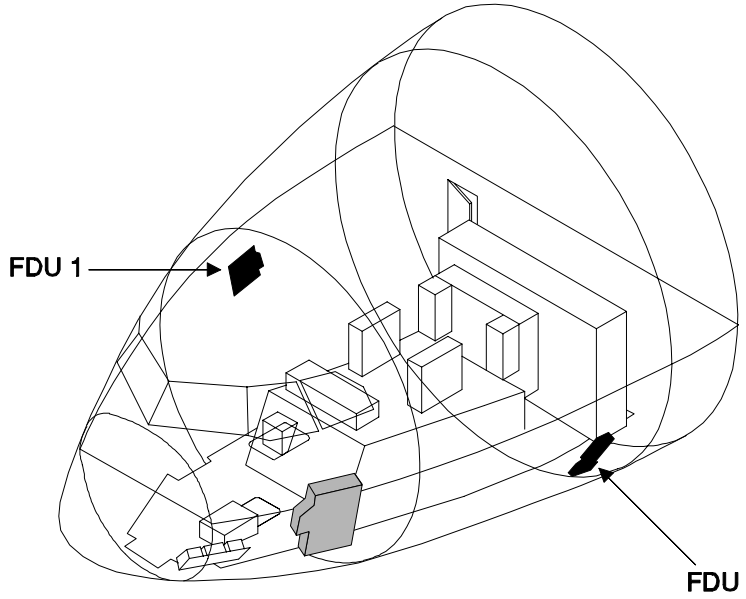
ZONE : 122 (ENG 1)
121 (ENG 2)

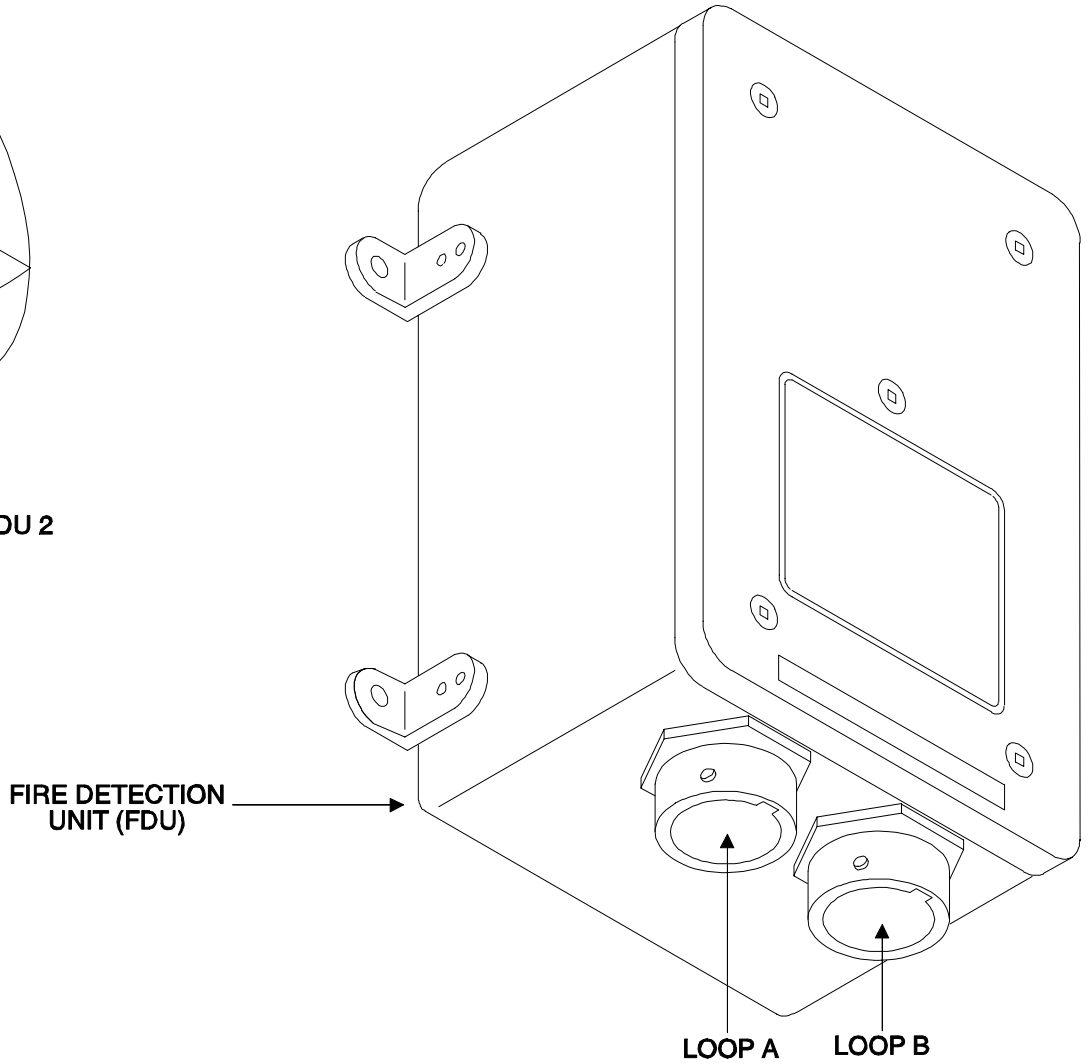
COMPONENT DESCRIPTION

There are three functional modules :

- two independent channels (1 for each detection loop)
- one monitoring circuitry (for maintenance purposes only).

All the engine FDUs are identical, interchangeable and identified by pin-programming.
They are also identical to the APU FDU.





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FIRE BOTTLES

FIN : 1WE1 - 2WE1 (ENG 1)
1WE2 - 2WE2 (ENG 2)

ZONE : 453 - 463

COMPONENT DESCRIPTION

The fire extinguisher bottle is of the high-rate discharge type and is made up of :

- a spherical container/extinguisher agent
- a discharge head
- a cartridge
- a pressure switch

There are two bottles per engine :
- type of agent : halon 1301
- nominal nitrogen pressure at 21°C: 800 psi.

SAFETY PRECAUTIONS

WARNING :

The fire bottle cartridges are explosive.
Remove them before working on the bottle.
Protective caps must be installed during bottle removal/installation to prevent damage to discharge diaphragm which could result in injury to personnel.

DISCHARGE HEAD

FIN : 5006WE1 - 5007WE1 (ENG 1)
5006WE2 - 5007WE2 (ENG 2)

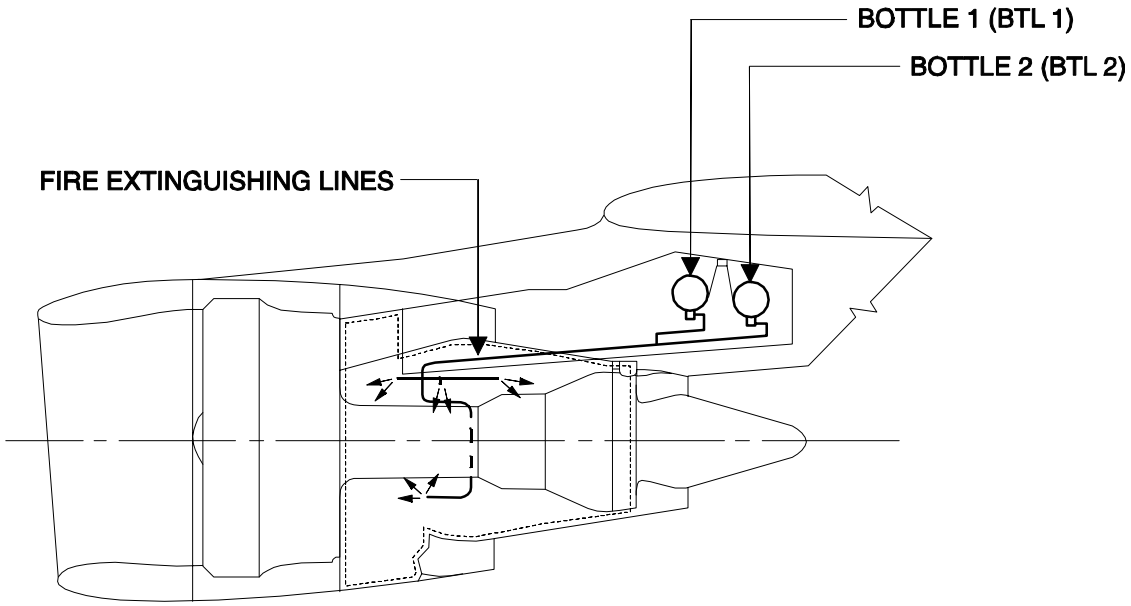
ZONE : 453 - 463

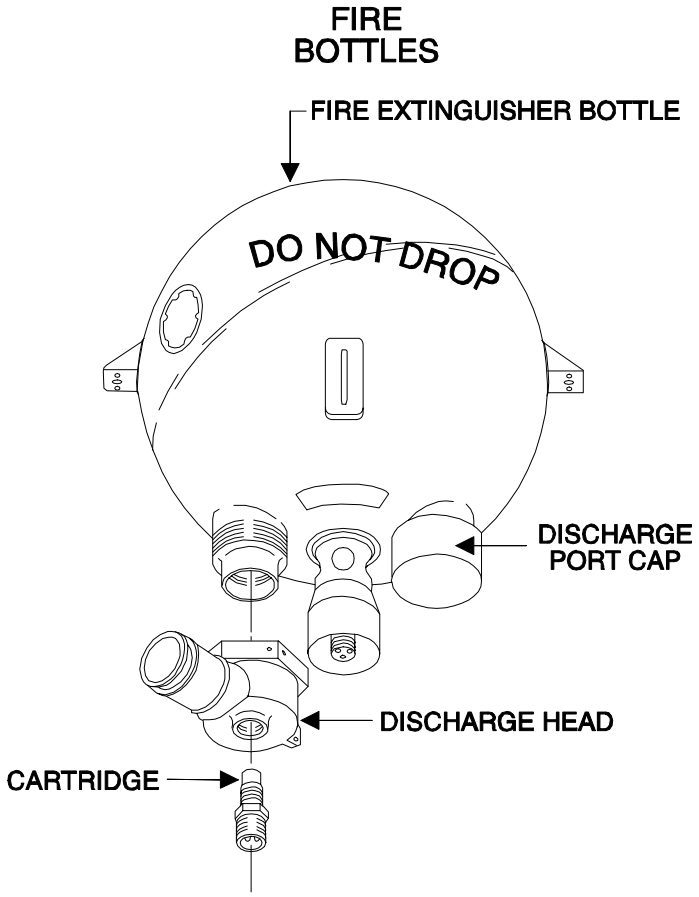
COMPONENT DESCRIPTION

The discharge head has a leakproof metallic diaphragm.

The rupture of the metallic diaphragm is caused by :

- gas pressure released after cartridge firing
- an excessive pressure (between 2058 and 2100 psi at 95°C, 203 deg F) in the extinguisher bottle, in case of overheat condition in the engine pylon, the full quantity of the agent is released into the nacelle.





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CARTRIDGE

FIN : 3WE1 - 4WE1 (ENG 1)
3WE2 - 4WE2 (ENG 2)

ZONE : 453 - 463

COMPONENT DESCRIPTION

The cartridge contains explosive powder, fired by two filaments (squibs).

SAFETY PRECAUTIONS

WARNING :

Never check the continuity of the cartridge using a conventional ohmmeter.

WARNING :

Before power is supplied to the aircraft make certain that electrical circuits upon which work is in progress are isolated.

WARNING :

Cartridges are class "C" explosives and must be handled or stored by authorized personnel or disposed of by an approved method.

When cartridge electrical connectors are disconnected, the cartridge electrical pins must be shunted with a protective shunt which is provided by the manufacturer, to prevent cartridge operation which could cause injury to maintenance personnel.

The cartridge installed must be of the same make as the fire bottle and correspond to the specification indicated in the maintenance manual.

PRESSURE SWITCH

ZONE : 453 - 463

COMPONENT DESCRIPTION

The pressure switch is calibrated at :

- 325 psi when the pressure increases (refilling)
- 200 psi when the pressure decreases (discharge or leak).

IN SITU TEST

The pressure switch is fitted with a manual test device.
An Allen key is required to do the test.
The manual test checks the condition of the electrical contact, and causes the DISCH legend on ENGine FIRE panel to come on.

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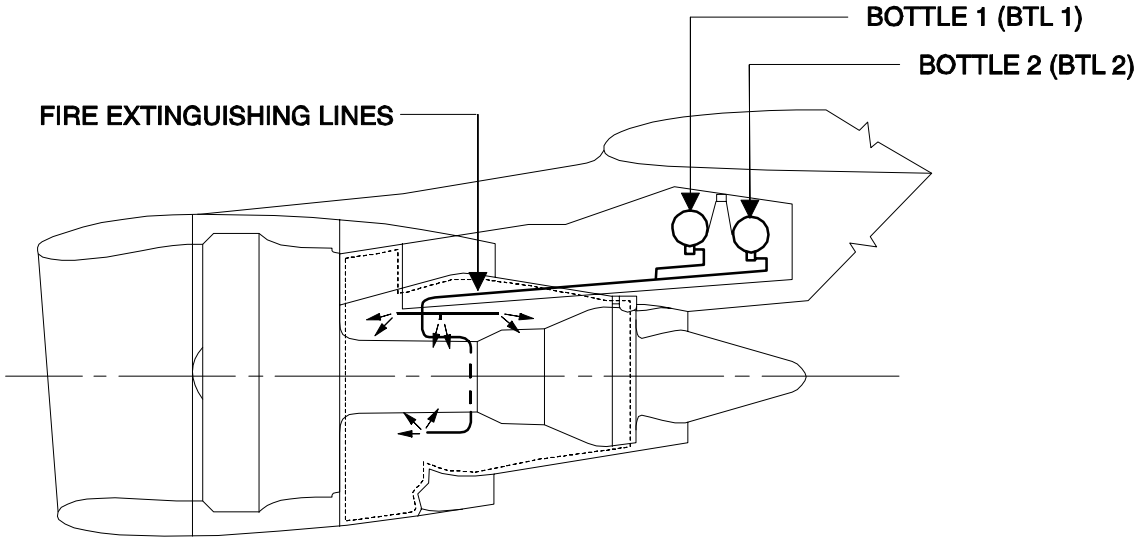
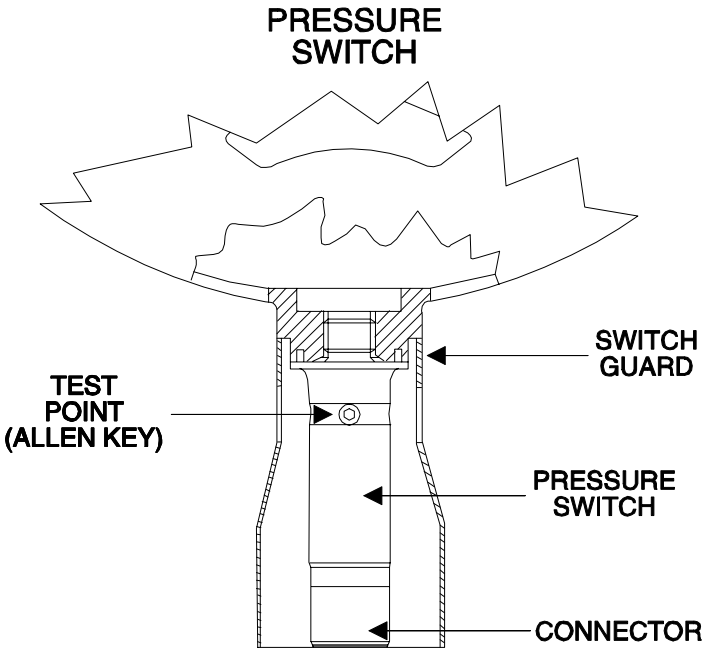
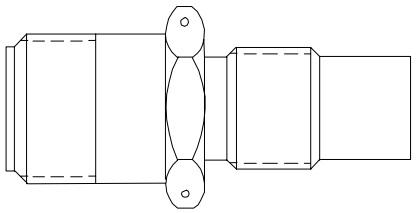
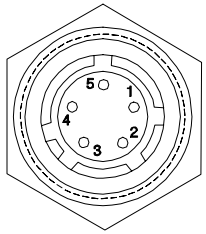


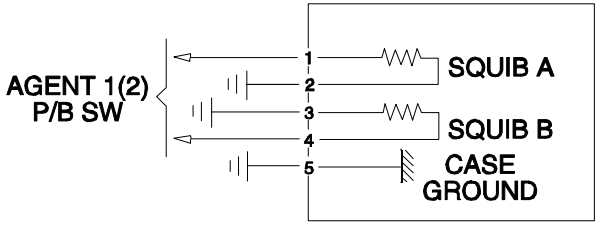


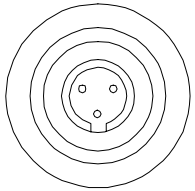
CARTRIDGE





SCHEMATIC





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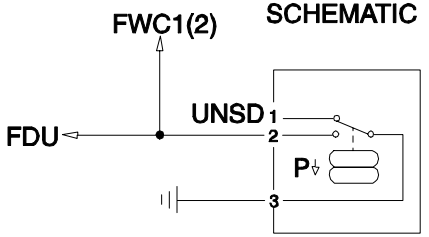

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STUDENT NOTES

ENGINE FIRE PROTECTION : SYSTEM INTERFACES

General
Discrete Inputs
Analog Inputs
Discrete Outputs
Digital Outputs

GENERAL

The Fire Detection Unit is designed as a dual channel equipment.

DISCRETE INPUTS

The FDU receives a flight/ground signal discrete input.
This input comes from LGCIU 1 and 2 and is used for a test from the Central Maintenance Computer.

The FDU receives two types of discrete inputs from fire extinguisher bottle 1 and 2.

These inputs are used for :

- monitoring the pressure of each bottle (pressure switch),
- monitoring the squib of each bottle (squib A and B).

The FDU receives a discrete signal (in each channel) from the TEST pushbutton on the engine fire panel which is used for testing the fire protection system.

The FDU receives a discrete signal from the ENGine FIRE PUSHbutton.
This signal is used when the ENGine FIRE PUSHbutton is released out for the illumination of the SQUIB light for AGENT 1 and 2.

The FDU receives a discrete signal from the pin-programming.
It is used to identify the FDU (FDU 1, FDU 2 or FDU APU).
The FDU receives a discrete signal from Central Maintenance Computer 1 (CMC 1) and 2 for the maintenance test (BITE test).

ANALOG INPUTS

The FDU receives analog inputs from the detectors of the engine (loop A and B).
Each channel receives and analyzes continuously the two signals of the detection loop.

DISCRETE OUTPUTS

The FDU sends discrete outputs to the :

- DISCH lamp of bottle 1 and 2,
- SQUIB lamp of bottle 1 and 2.

The FDU channel A discrete output (fire A) is sent to :

- engine FIRE light on the pedestal,
- ENGine FIRE PUSHbutton on the overhead panel,
- Flight Warning Computer 1 and 2.

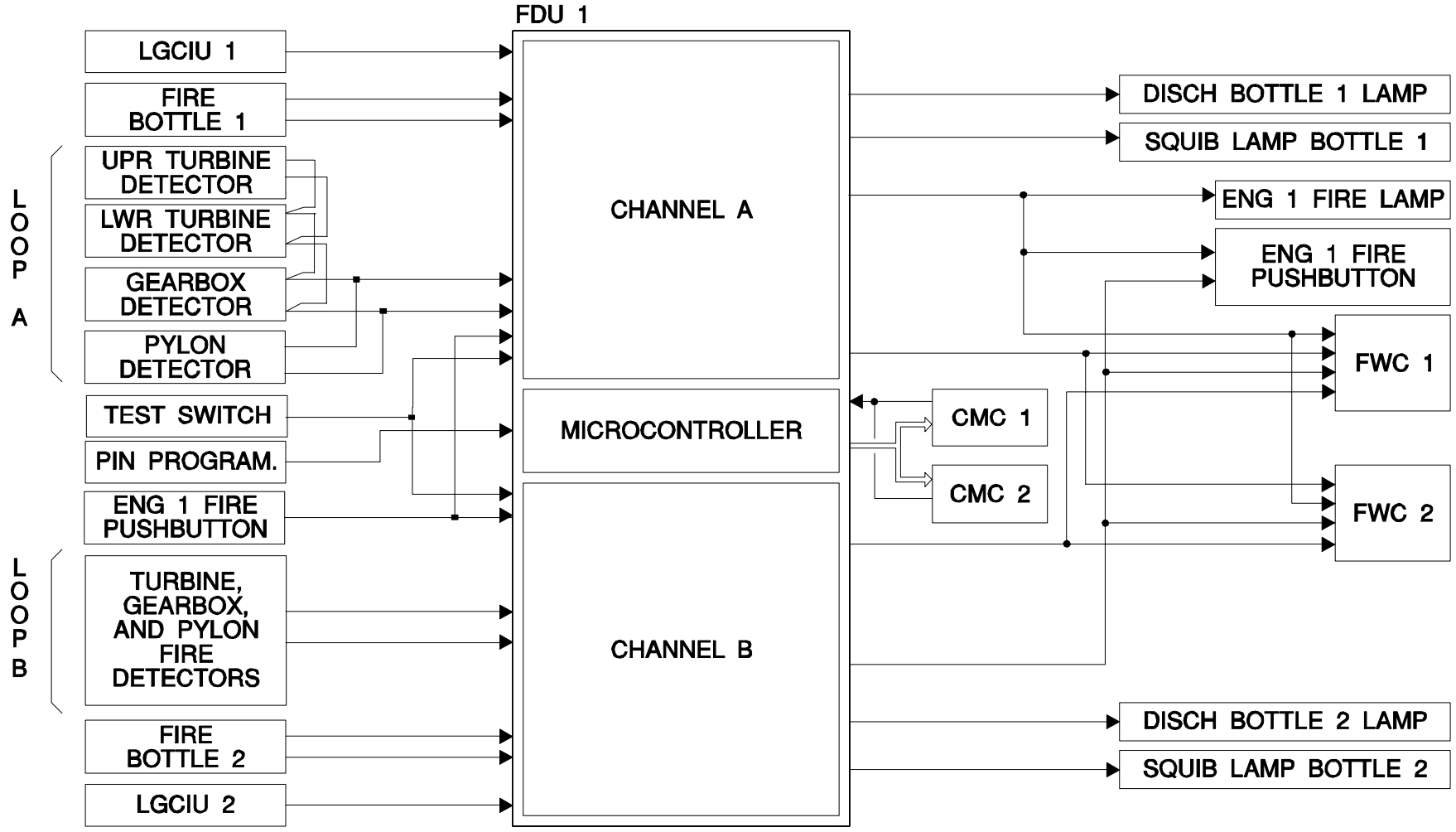
The FDU channel B discrete output (fire B) is sent to :

- ENGine Fire PUSHbutton on the overhead panel,
- Flight Warning Computer 1 (FWC 1) and 2.

The loop A fault signal is sent by channel A to the Flight Warning Computer 1 and 2.
The loop B fault signal is sent by channel B to the Flight Warning Computer 1 and 2.

DIGITAL OUTPUTS

The FDU sends digital outputs via an ARINC 429 bus to Central Maintenance Computer 1 and 2 for maintenance purposes.



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STUDENT NOTES

APU FIRE PROTECTION : SYSTEM PRESENTATION

General
Fire Detectors
Fire Detection Unit (FDU)
Warnings
Automatic Fire Extinguishing Control Unit (AFECU)
Fire Bottle
Discharge Indicator

GENERAL

The APU fire protection is provided by two systems : the fire detection system and the fire extinguishing system.

FIRE DETECTORS

The fire detection system consists of two independent loops (A and B) connected in parallel to a Fire Detection Unit. Each loop comprises one fire detector.

The detection system is of the SYSTRON-DONNER electro-pneumatic type (detectors filled with pressurized gas).

CAUTION : When handling the detector, exercise normal precautions so as not to damage or kink the sensor tube

FIRE DETECTION UNIT (FDU)

The fire detection unit processes signals received from the fire detectors.

A Fire Detection Unit (FDU), located in the avionics compartment, is provided for the APU.

WARNINGS

The Fire Detection Unit generates signals for the ECAM, Centralized Maintenance Computers and cockpit local warnings.

Fire warning signals are sent to the Automatic Fire Extinguishing Control Unit , the ECAM, the APU fire panel and the external power control panel when the aircraft is on ground. Loop failures are sent to the ECAM and Centralized Maintenance Computers.

When a fire is detected, the Continuous repetitive chime sounds, the master warning comes on and the APU fire pushbutton lights on the APU fire panel come on.

If the aircraft is on ground, the APU fire light on the external power control panel comes on and the external horn sounds.

AUTOMATIC FIRE EXTINGUISHING CONTROL UNIT (AFECU)

In case of APU fire, the Automatic Fire Extinguishing Control Unit automatically shuts down the APU via the Electronic Control Box and triggers the APU fire extinguishing system.

This is possible ONLY if the AFECU receives a ground signal from LGCIU1.

FIRE BOTTLE

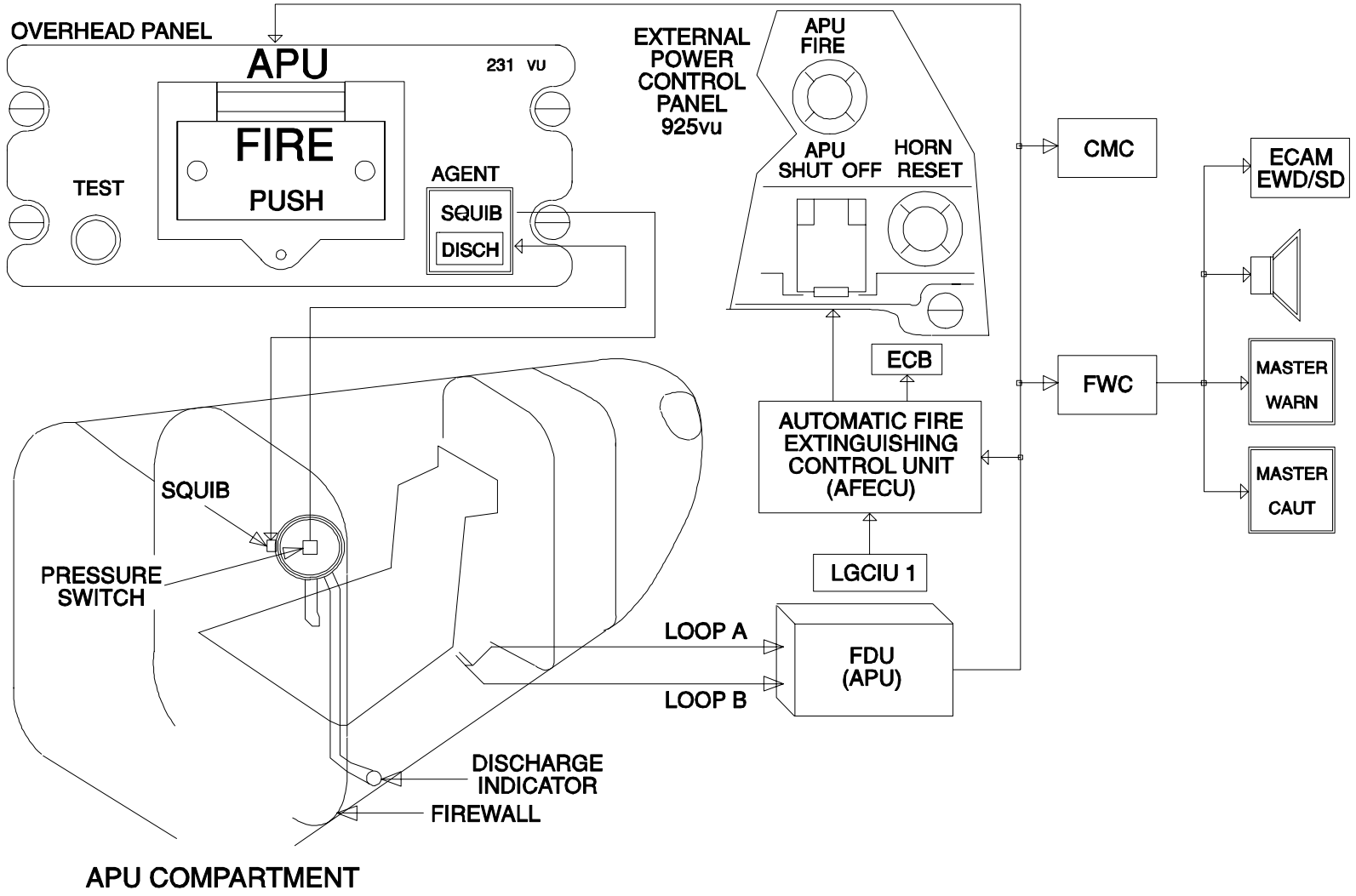
An extinguisher bottle is installed outside the APU compartment, forward of the firewall.

The bottle is equipped with a pressure switch to monitor agent pressure and an electrically operated squib for agent discharge.

DISCHARGE INDICATOR

An overpressure discharge indicator (red disc) is visible from outside.

The absence of the red disc indicates bottle overpressure discharge.



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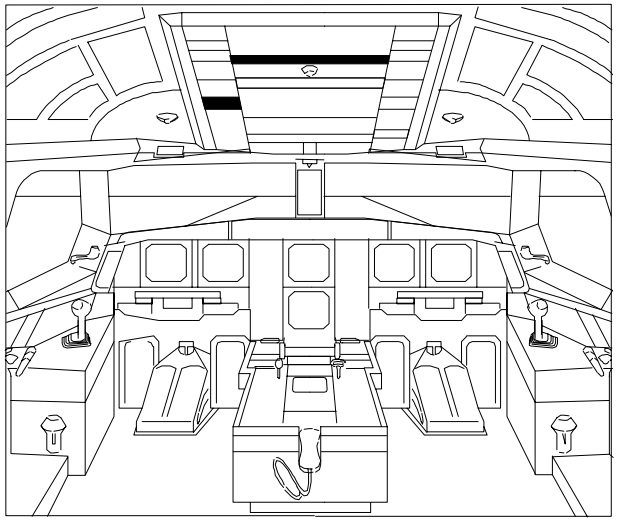
STUDENT NOTES:

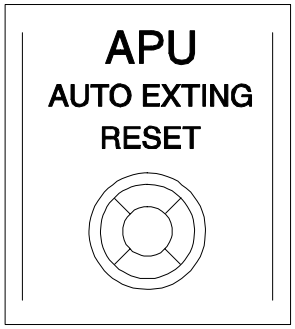
APU FIRE PROTECTION : SYSTEM CONTROLS AND INDICATING

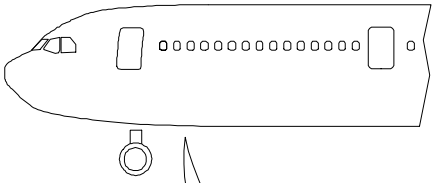
General
Overhead Panel
Maintenance Panel
External Power Control Panel

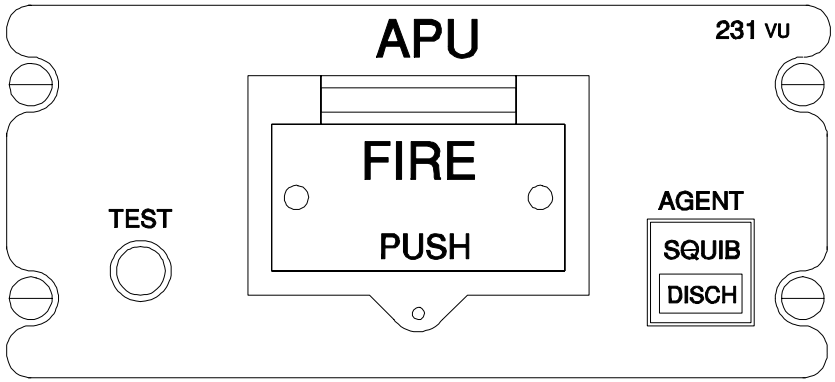
GENERAL

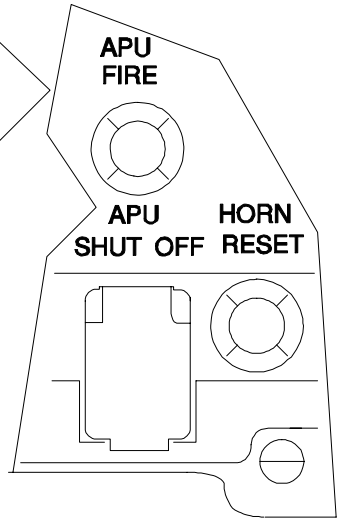
The controls and indicators are located on the overhead panel, the maintenance panel and the external power control panel.











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OVERHEAD PANEL

The APU fire control panel is located on the overhead panel.

APU FIRE PUSHBUTTON

When a fire is detected, the APU FIRE pushbutton light on the APU FIRE panel comes on, associated with ECAM warnings.
When the APU FIRE pushbutton is released out, the SQUIB light comes on to indicate that bottle percussion is available. At the same time, the APU is isolated from the aircraft systems which could feed a fire.

AGENT PUSHBUTTON

Provided the white SQUIB light is on (APU fire pushbutton released out), pressing the AGENT pushbutton discharges the extinguishing agent.
A pressure switch activates the amber DISCH light when the agent has been discharged.

CAUTION: The APU bottle cartridge has one of its two squibs electrically supplied from the HOT bus, consequently the bottle can be fired even if the A/C is not powered provided the APU FIRE pushbutton is released out (the discharge indicator red disc will disappear but no cockpit light will indicate the agent discharge until the A/C is powered).

TEST PUSHBUTTON

The test pushbutton simultaneously checks, for the APU, the condition of the :
- Fire detectors, fire detection unit, indications, warnings.
- Percussion cartridge filaments of the fire extinguisher bottle and associated wiring.

During the test :
- The APU FIRE pushbutton comes on red.
- The SQUIB light comes on provided the continuity of both squib filaments circuit is correct.
- The DISCH light comes on associated with ECAM warnings provided the continuity of the low pressure warning circuit is correct.

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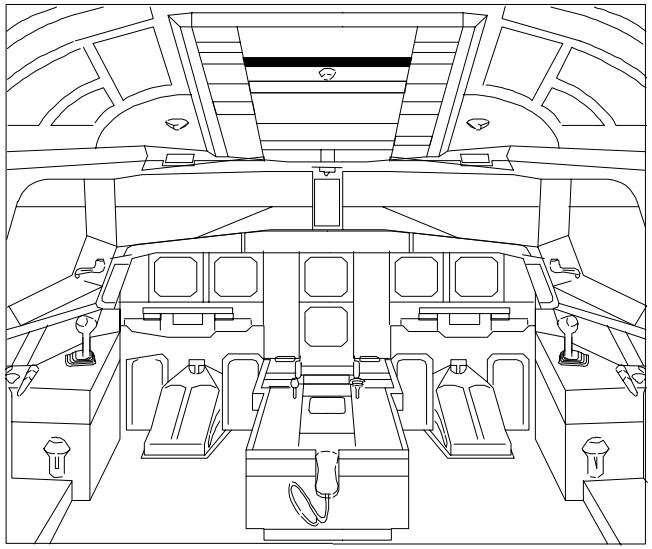

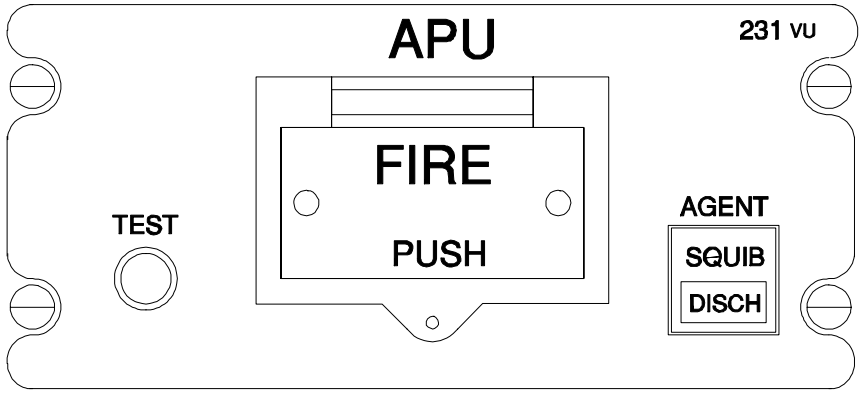

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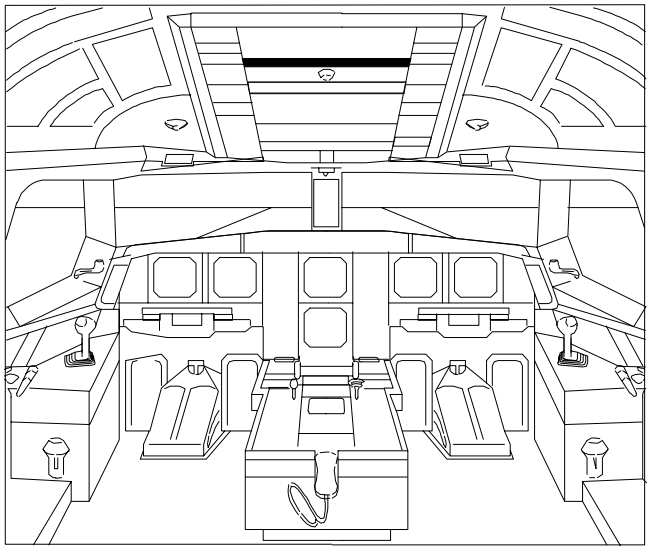
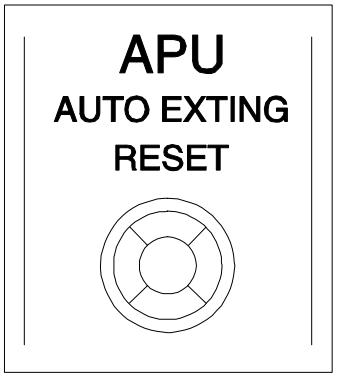
MAINTENANCE PANEL

The APU AUTO EXTING RESET pushbutton is used to reset the automatic extinguishing circuit after an APU fire.





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EXTERNAL POWER CONTROL PANEL

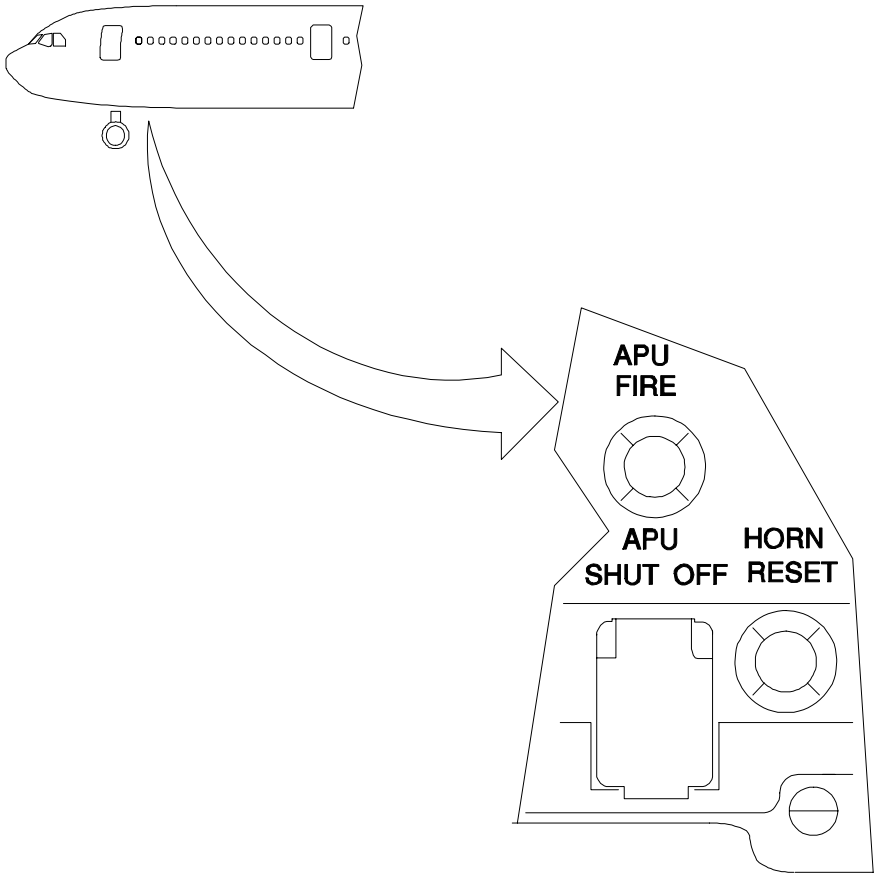
The APU fire light and the APU shut off pushbutton are located on the external power control panel.

APU FIRE LIGHT

On ground, an external warning is provided in the event of an APU fire.
The APU fire light comes on red, accompanied by an external horn warning when an APU fire is detected.
The light and the horn will go off once the fire is extinguished.
Note : The horn can be silenced at any time by the HORN RESET pushbutton.

APU SHUT OFF

The APU SHUT OFF pushbutton is guarded. When pressed in, in the event of an APU fire, the automatic shutdown is confirmed and the external horn warning is silenced.



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STUDENT NOTES:

APU FIRE PROTECTION :
SYSTEM OPERATION IN CASE OF APU FIRE

On Ground
In Flight

ON GROUND

The aircraft is on ground and the APU is running.
When a fire is detected, the continuous repetitive chime sounds, the MASTER WARNing flashes and the APU FIRE PUSHbutton light on the APU fire panel comes on.

The APU fire light on the external power panel comes on, the external horn sounds.

The Automatic Fire Extinguishing Control Unit starts the extinguishing sequence.

The Electronic Control Box receives a signal and activates an APU shutdown.

The fuel solenoid and the fuel LP shut off valves close and the APU shuts down.
The continuous repetitive chime stops.

The single chime sounds, the MASTER CAUTion and the FAULT light on the APU master switch pushbutton come on.

The cartridge of the extinguisher is activated.
The APU fire bottle is discharged automatically and the DISCH light on the AGENT pushbutton comes on.

When the fire is extinguished, the MASTER WARNing, the APU FIRE PUSHbutton light on the APU fire panel and the APU FIRE light on the external power control panel go off.

Note that it is not necessary to use the APU SHUT OFF switch on the external power control panel in case of APU fire auto extinguishing.

IN FLIGHT

APU running in flight.
When a fire is detected, the continuous repetitive chime sounds, the MASTER WARNing flashes and the APU FIRE PUSHbutton light on the APU fire panel comes on.

When the APU FIRE PUSHbutton is released out, the continuous repetitive chime stops, the fuel solenoid valve and the fuel LP shut off valve close and cause APU shutdown.

The single chime sounds, the MASTER CAUTion and the FAULT light on the APU master switch pushbutton come on.

The SQUIB light comes on to indicate that the AGENT pushbutton can be used.

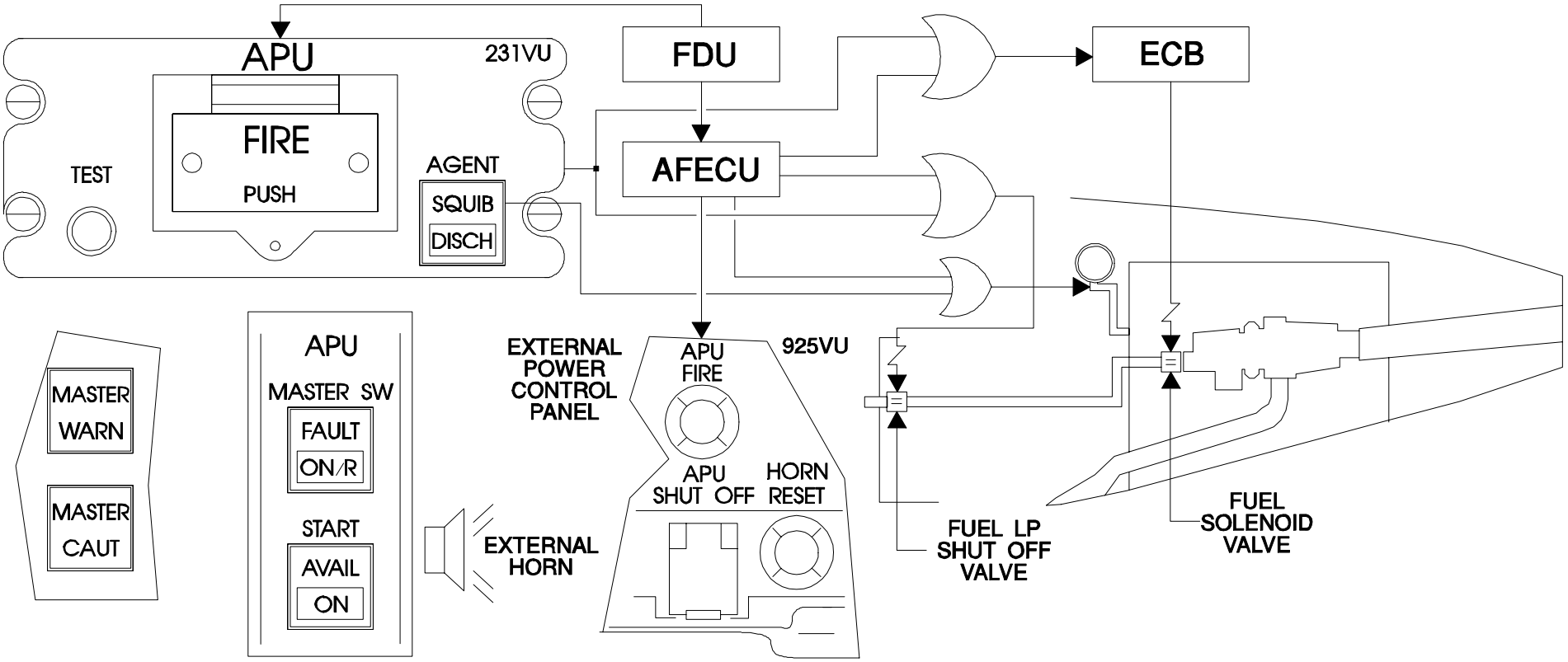
A ten second delay allows the airflow to reduce, this increases the agent effect.

When the AGENT pushbutton is pressed, the fire bottle is discharged in the APU compartment and the DISCH light comes on.

When the fire is extinguished, the MASTER WARNing and the APU FIRE PUSHbutton lights go off.

When the APU MASTER switch pushbutton is released out, the FAULT light goes off.

CAUTION : do not attempt to restart the APU.



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STUDENT NOTES

APU FIRE PROTECTION : SYSTEM TEST

General
Detection System
SQUIB Test
DISCH Test

GENERAL

The operational test enables the crew to check the fire protection system.
The operational test of the fire protection system is performed by pushing the TEST pushbutton located on the APU FIRE control panel.

DETECTION SYSTEM

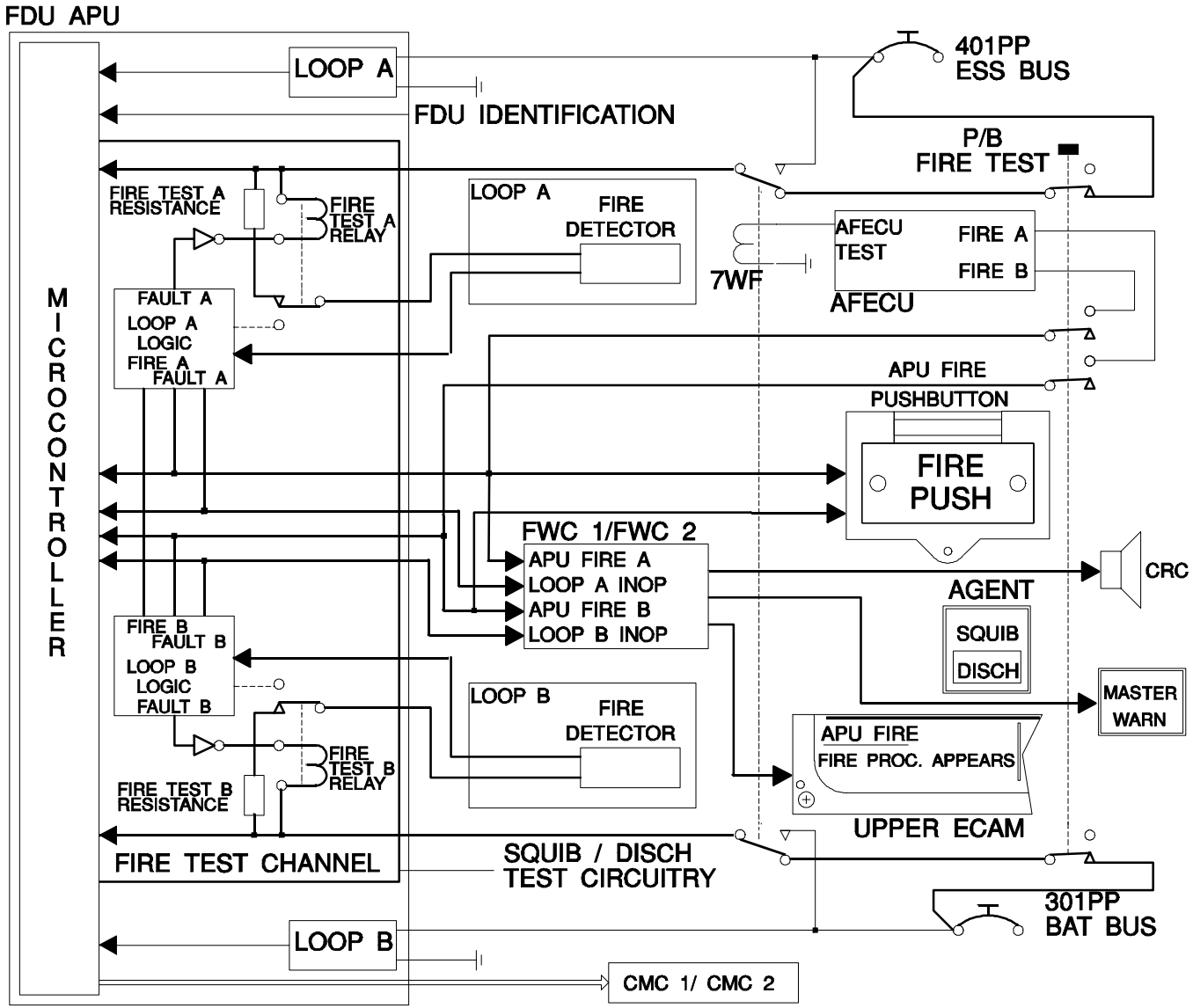
From the APU FIRE control panel the TEST pushbutton simultaneously checks the condition of the :

- fire detectors (loops A and B),
- Fire Detection Unit,
- indications and warnings.

As long as the test command is present :

- the CRC sounds,
- the MASTER WARNing comes on,
- ECAM APU FIRE warnings are activated,
- APU FIRE PUSHbutton comes on red on the fire panel (signal sent by channels A and B).

The fire signals A and B are inhibited during the test for the Automatic Fire Extinguishing Control Unit (AFECU).



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SQUIB TEST

The fire test channel of the FDU ensures the electrical continuity of :

- the fire extinguishing bottle squib circuit,

During the test, the FDU checks that there is :

- a ground signal through filament 1,
- a 28 VDC power supply corresponding to this filament,
- a ground signal through filament 2,
- a 28 VDC power supply corresponding to this filament.

If the result of the test is positive, the SQUIB legend comes on.
If there is a fault, the SQUIB legend remains off.
The FDU generates a maintenance message for the Central Maintenance Computer (CMC).

DISCH TEST

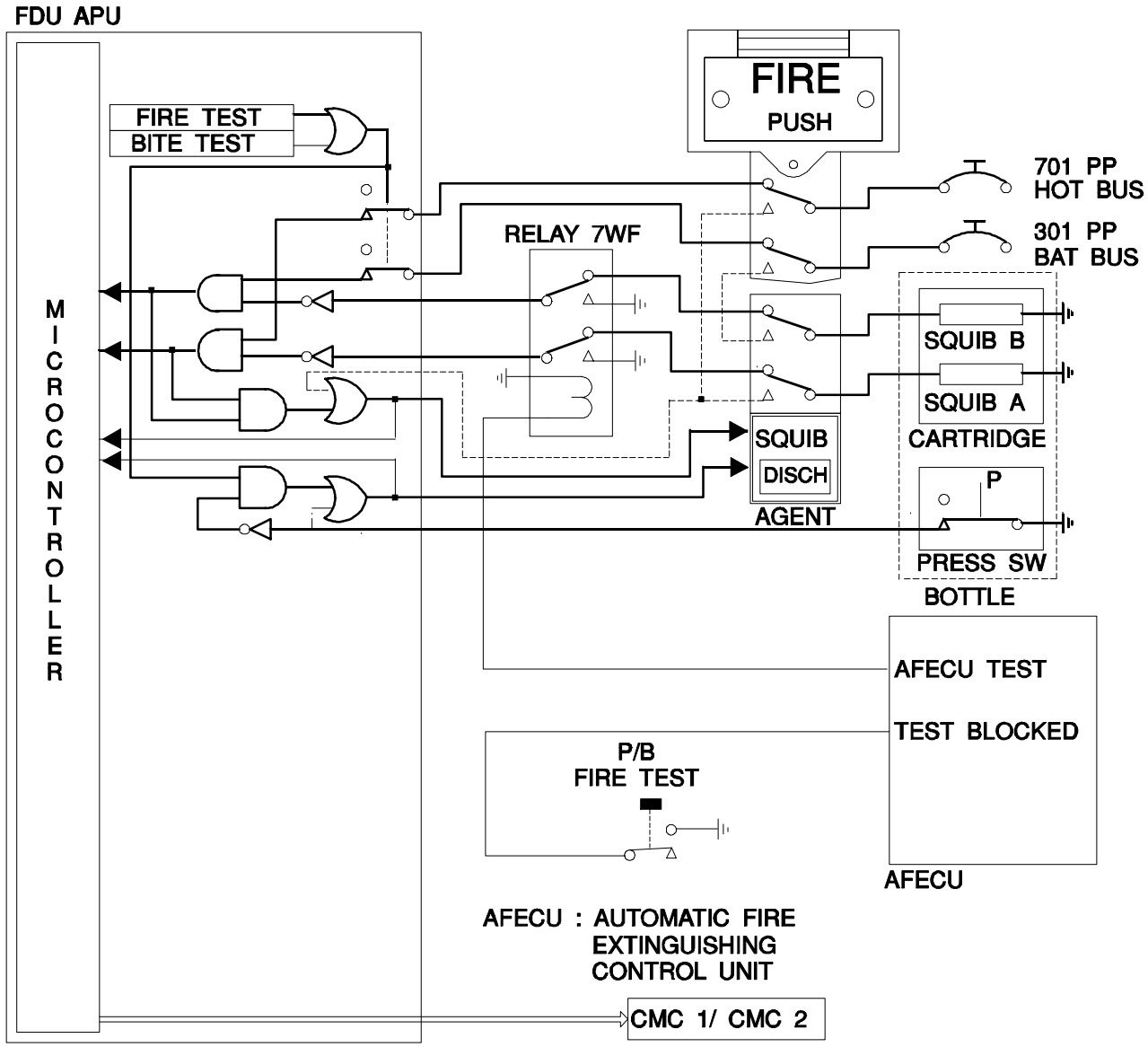
The fire test channel of the FDU ensures the electrical continuity of :

- the low pressure warning circuitry of the fire extinguisher bottle.

During the test, the FDU simulates a pressure drop as follows :

- it opens the circuit connected to the pressure switch and checks that it generates a warning signal.

If the result of the test is positive, the DISCH legend comes on. If there is a fault the DISCH legend remains off.



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STUDENT NOTES

APU FIRE PROTECTION : SYSTEM WARNINGS

APU FIRE
APU FIRE DET FAULT
APU LOOP A FAULT

APU FIRE

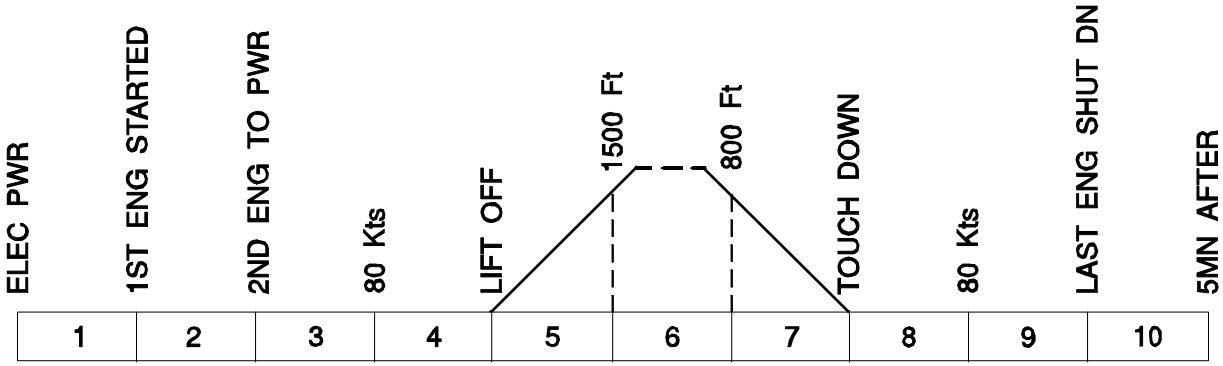
The following warnings are trigerred :
- Master Warning light
- Continuous Repetitive Chime
- APU FIRE PUSHbutton light
- APU system page appears on lower ECAM display
- corresponding procedure appears on upper ECAM display.

APU FIRE DET FAULT

The following warnings are trigerred :
- Master Caution light
- Single Chime
- corresponding message appears on upper ECAM display.

APU LOOP A FAULT

The following warnings are triggered :
- corresponding message appears on upper ECAM display.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
APU FIRE	CRC	MASTER WARN	APU	FIRE lt on APU FIRE pb	NIL
APU FIRE DET FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
APU LOOP A (B) FAULT	NIL	NIL	NIL	NIL	3, 4, 5, 7, 8

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STUDENT NOTES

APU FIRE PROTECTION : COMPONENTS

Safety Precautions
Fire Detectors
Fire Detection Unit (FDU)
Automatic Fire Extinguishing Control Unit (AFECU)
Fire Bottle
Cartridge
Pressure Switch
Discharge Indicator

SAFETY PRECAUTIONS

WARNING :

Specific precautions must be taken during removal or installation of a fire extinguishing bottle and a discharge cartridge.

STUDENT NOTES

FIRE DETECTORS

FIN : 21WG - 22WG

ZONE : 310

COMPONENT DESCRIPTION

One detector per loop.
The detector is pneumatically operated by heating its sensing element which contains helium gas and hydrogen charged core material.

ALARM STATE

The application of an overall average temperature expands inert gas (helium) which in turn closes the alarm switch.
The detector sends a fire signal.

The application of heat to the sensor releases active gas from the hydride core which in turn closes the alarm switch.
The detector sends a fire signal.

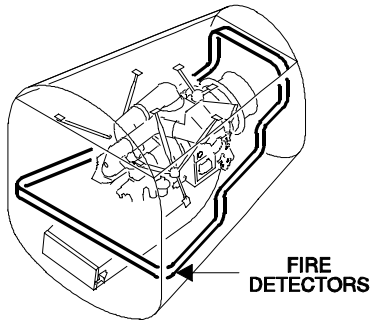
FAULT STATE

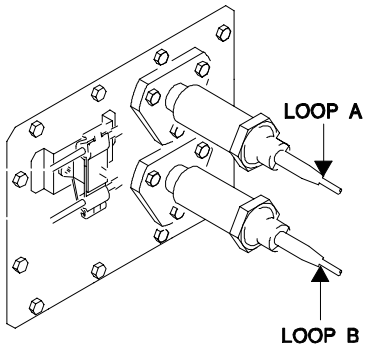
In the event of gas pressure loss (pipe fracture or cut off due to a torching flame), the integrity switch opens and generates a fault signal.

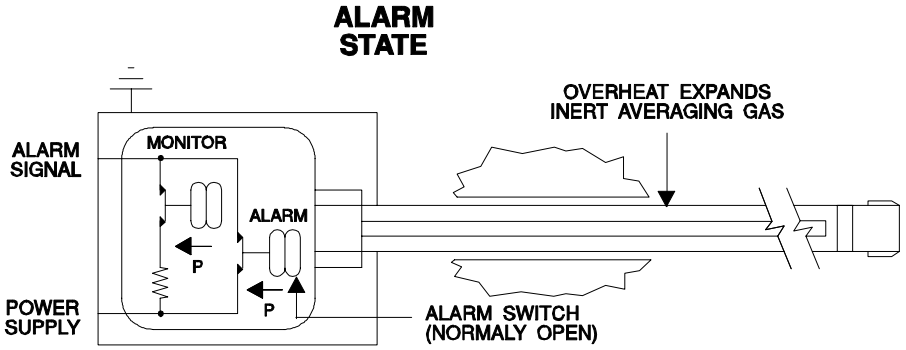
SAFETY PRECAUTIONS

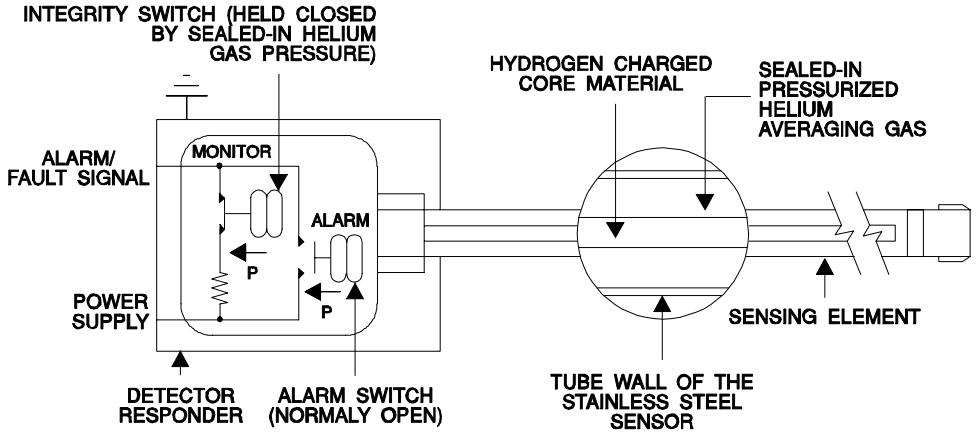
CAUTION :

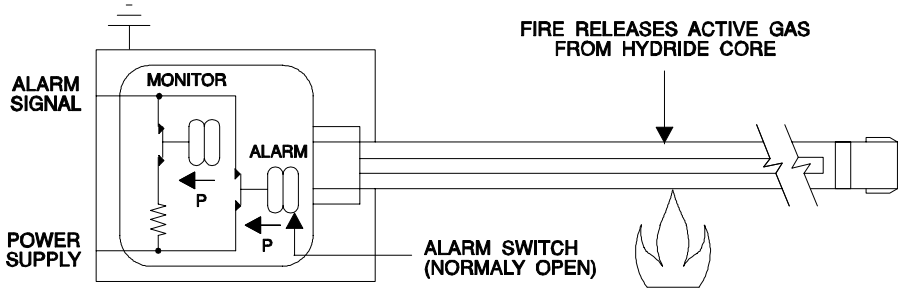
The detector responder is hermetically sealed, and as such, is not field repairable.
Any attempt to disassemble a detector responder will cause serious damage to the unit and render it inoperative.

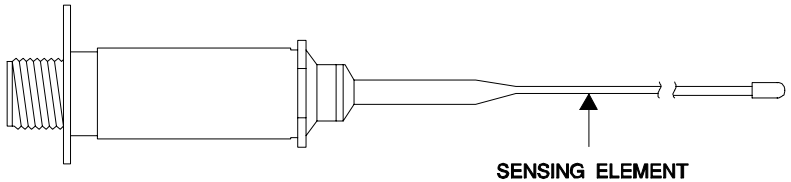


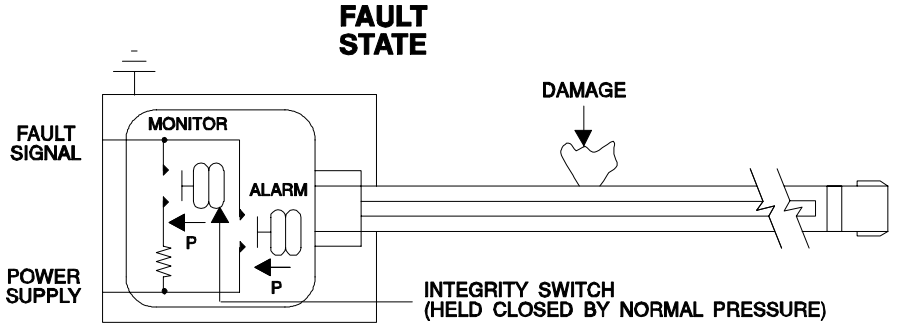












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FIRE DETECTION UNIT (FDU)

FIN : 13WG

ZONE : 120

COMPONENT DESCRIPTION

There are three functional modules :

- two independent channels (1 for each detection loop),
- one monitoring circuitry (for maintenance purposes only).

It is identical to the engine FDUs and interchangeable.

AUTOMATIC FIRE EXTINGUISHING CONTROL UNIT (AFECU)

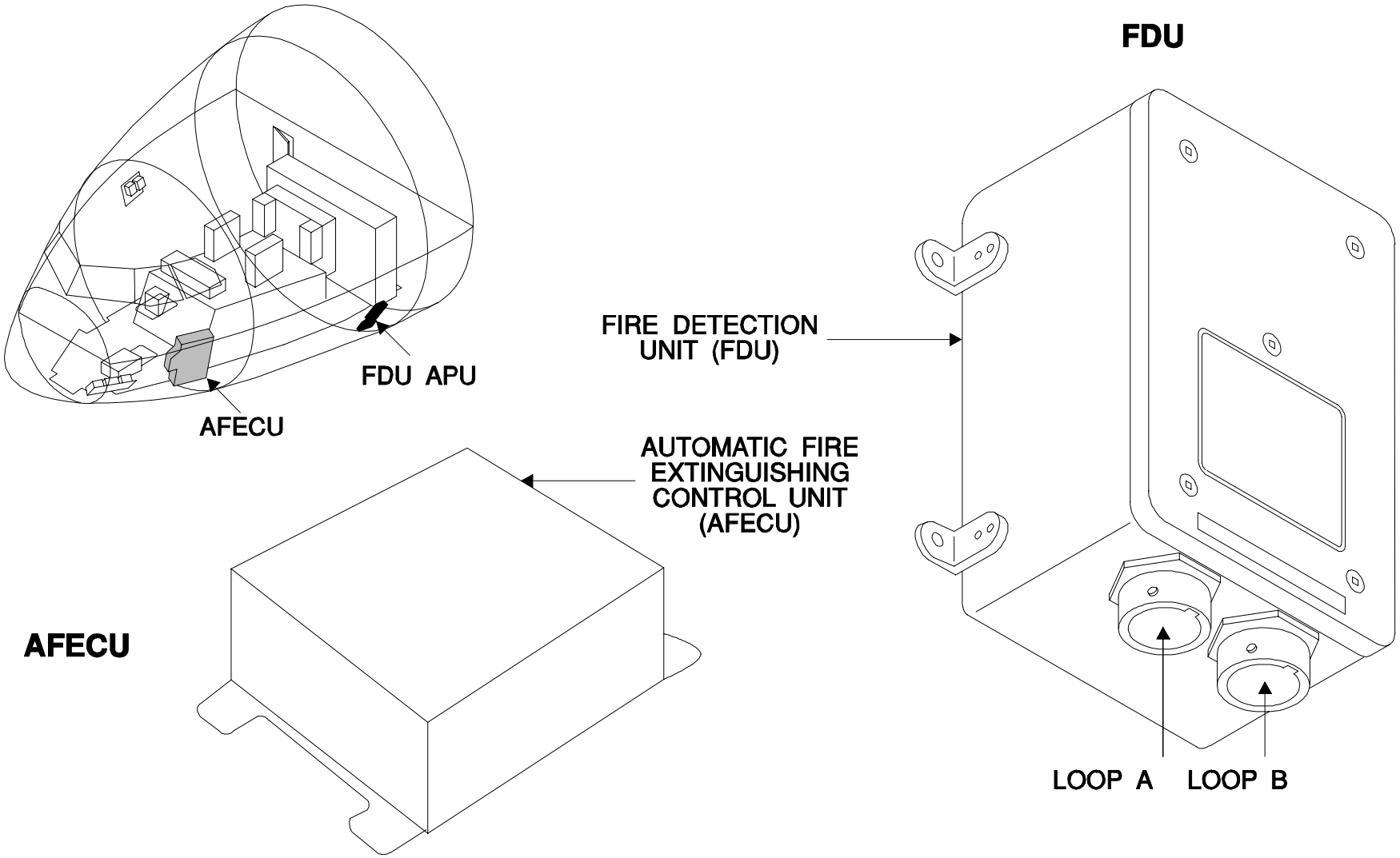
FIN : 36WF

ZONE : 121

COMPONENT DESCRIPTION

The internal structure of the AFECU consists of four main functions:

- the circuit which checks that the landing gear gear is compressed,
- the automatic fire extinguishing circuit,
- the test circuit,
- the master reset.



FQW4200 GE Metric

FIRE BOTTLE

FIN : 11WF

ZONE : 313

COMPONENT DESCRIPTION

The fire extinguisher bottle is of the high-rate discharge type and is made up of :

- a spherical container/extinguisher agent,
- a discharge head,
- a cartridge,
- a pressure switch,
- type of agent : halon 1301,
- nominal nitrogen pressure at 21°C, 600psi.

SAFETY PRECAUTIONS

WARNING :

The fire bottle cartridges are explosive.
Remove them before working on the bottle.
Protective caps must be installed during bottle removal/installation to prevent damage to discharge diaphragm which could result in injury to personnel.

CARTRIDGE

FIN : 12WF

ZONE : 313

COMPONENT DESCRIPTION

The cartridge contains explosive powder, fired by two filaments (squibs) supplied with 28VDC.

SAFETY PRECAUTIONS

WARNING :

Never check the continuity of the cartridge using a conventional ohmmeter.

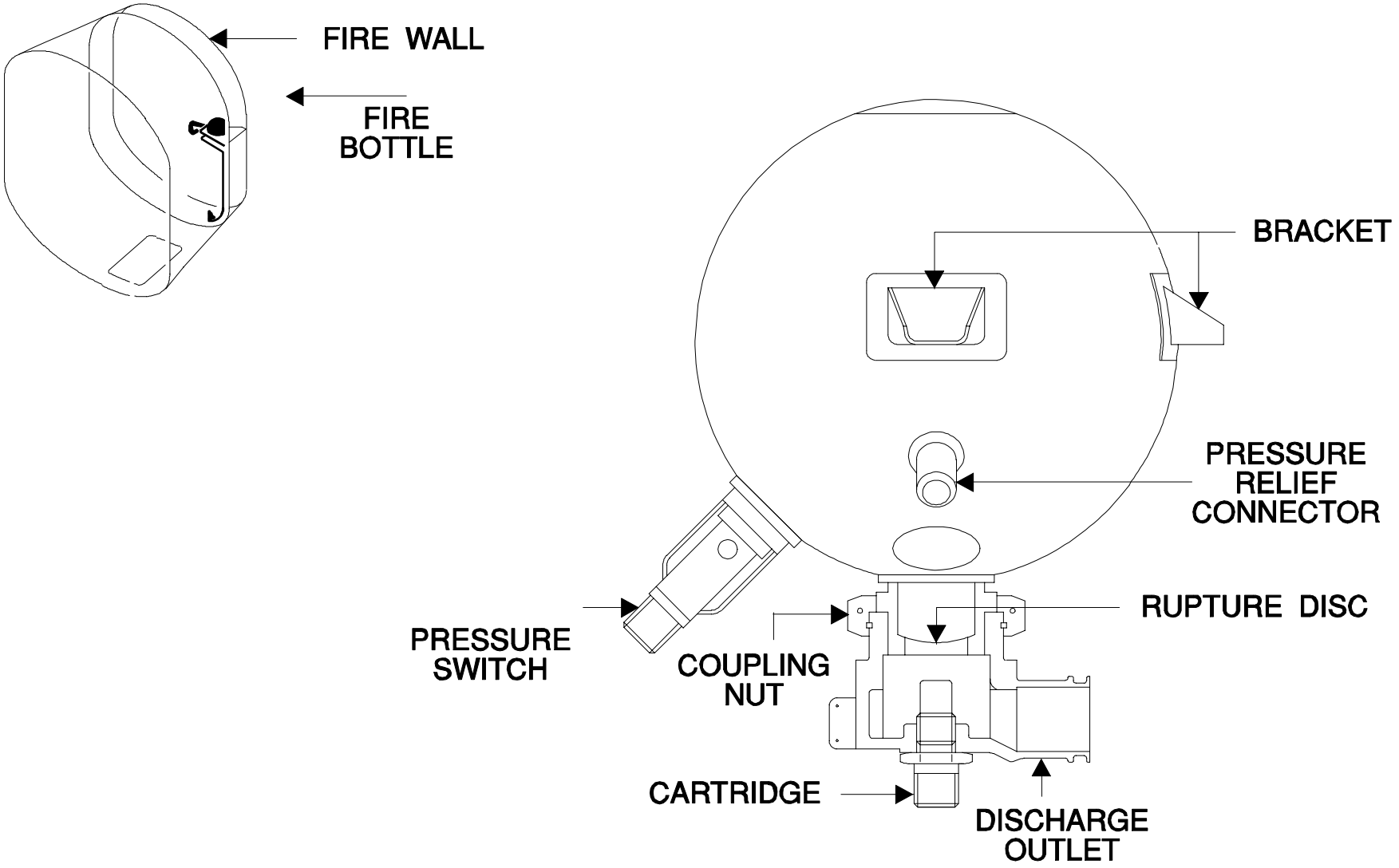
WARNING :

Before power is supplied to the aircraft make certain that electrical circuits upon which work is in progress are isolated.

WARNING :

Cartridges are class "C" explosives and must be handled or stored by authorized personnel or disposed of by an approved method.

When cartridge electrical connectors are disconnected, the cartridge electrical pins must be shunted with a protective shunt which is provided by the manufacturer.
A shunt plug or shorting clip, will prevent bottle discharge which could cause injury to maintenance personnel.
The cartridge installed must be of the same make as the fire bottle and correspond to the specification indicated in the maintenance manual.



FQW4200 GE Metric

PRESSURE SWITCH

ZONE : 313

COMPONENT DESCRIPTION

The pressure switch is calibrated at :

- 400 psi when the pressure increases (refilling),
- 225/275 psi when the pressure decreases (discharge or leak).

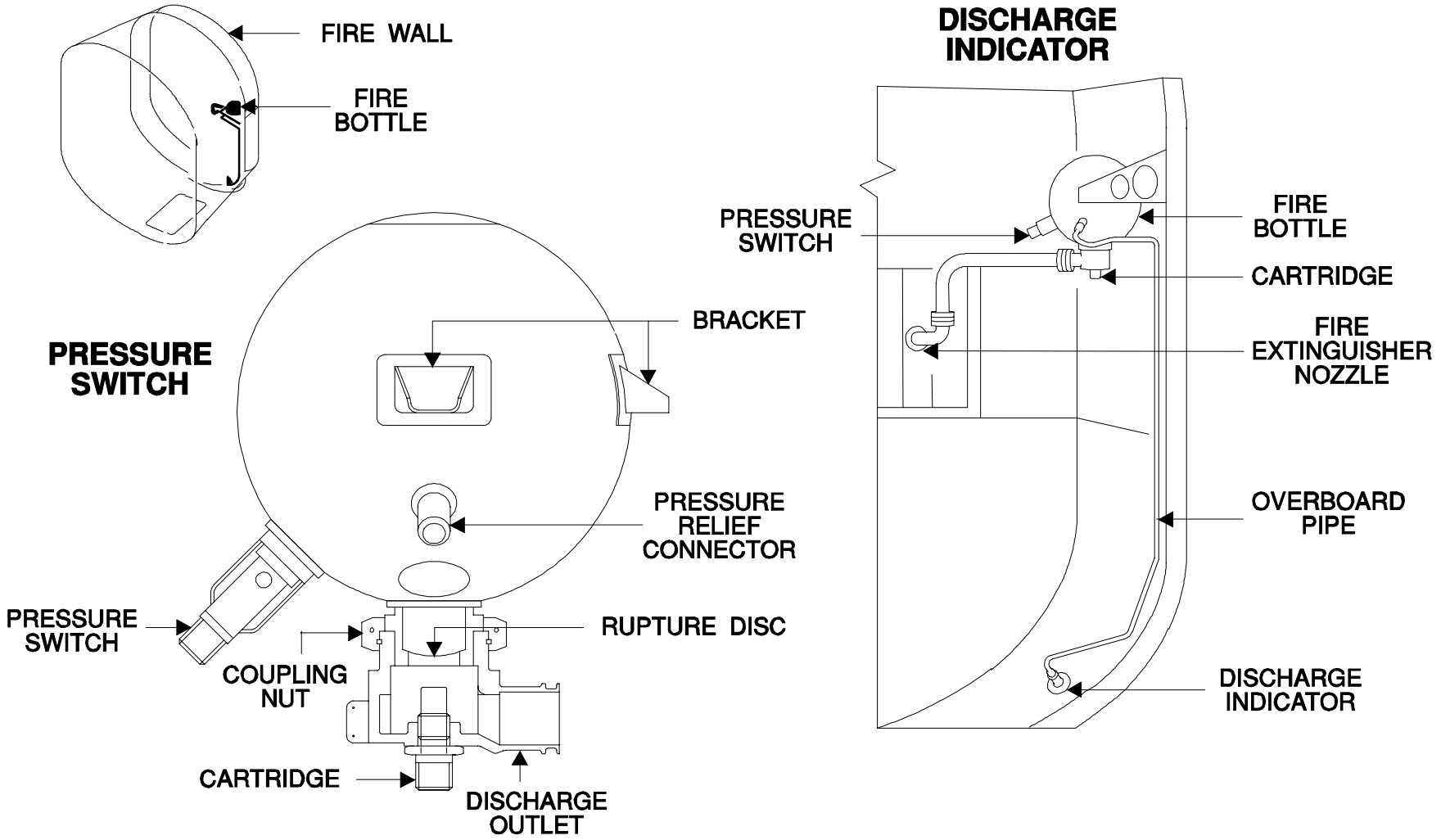
DISCHARGE INDICATOR

FIN : 5222WE

ZONE : 311

COMPONENT DESCRIPTION

The discharge indicator (red disc) blows out in case of thermal discharge (overpressure).



FQW4200 GE Metric

STUDENT NOTES

APU FIRE PROTECTION : SYSTEM INTERFACES

General
FDU Discrete Inputs
AFECU Discrete Inputs
Analog Inputs
FDU Discrete Outputs
AFECU Discrete Outputs
Digital Outputs

GENERAL

The Fire Detection Unit is designed as a dual channel equipment.

FDU DISCRETE INPUTS

The FDU receives a flight/ground signal discrete input.
This input comes from LGCIU 1 and 2 and is used for :

- test from the Central Maintenance Computer.

The FDU receives two types of discrete inputs from the fire extinguisher bottle.
These inputs are used for :

- monitoring the pressure of the fire bottle (pressure switch),
- monitoring the squib of the fire bottle (squib A and B).

the FDU receives a discrete signal (in each channel) from the TEST pushbutton on the APU fire panel which is used to test the fire protection system.

The FDU receives a discrete signal from the APU FIRE PUSHbutton.
This signal is used when the APU FIRE PUSHbutton is released out for :

- illumination of the SQUIB light for the AGENT.

The FDU receives a discrete signal from the pin-programming.
It is used to identify the FDU (engines or APU).
The FDU receives a discrete signal from Central Maintenance Computers (CMC 1 and 2) for the maintenance test (bite test).

AFECU DISCRETE INPUTS

The AFECU receives two types of discrete inputs from the fire extinguisher bottle.
These inputs are used for :

- monitoring the pressure of the fire bottle (pressure switch),
- monitoring the squib of the fire bottle (squib A and B).

The AFECU receives the signal FIRE A and FIRE B from the FDU.
These signals are used to activate the automatic fire extinguishing sequence on ground.

The AFECU receives a discrete signal from the TEST pushbutton on the APU FIRE panel to inhibit a AFECU test (bite test).

The AFECU receives a flight/ground signal discrete input.
This input comes from LGCIU 1 and is used for :

- activation of the extinguishing sequence.

The AFECU receives a signal from the reset pushbutton and is used to reset the AFECU after an APU fire.

The AFECU receives a discrete signal from the APU FIRE PUSHbutton or the APU SHUT OFF pushbutton or the APU EMERG SHUT DOWN pushbutton used to cancel the external horn. The AFECU receives a discrete signal from Central Maintenance Computers (CMC 1 and 2) for the maintenance test (bite test).

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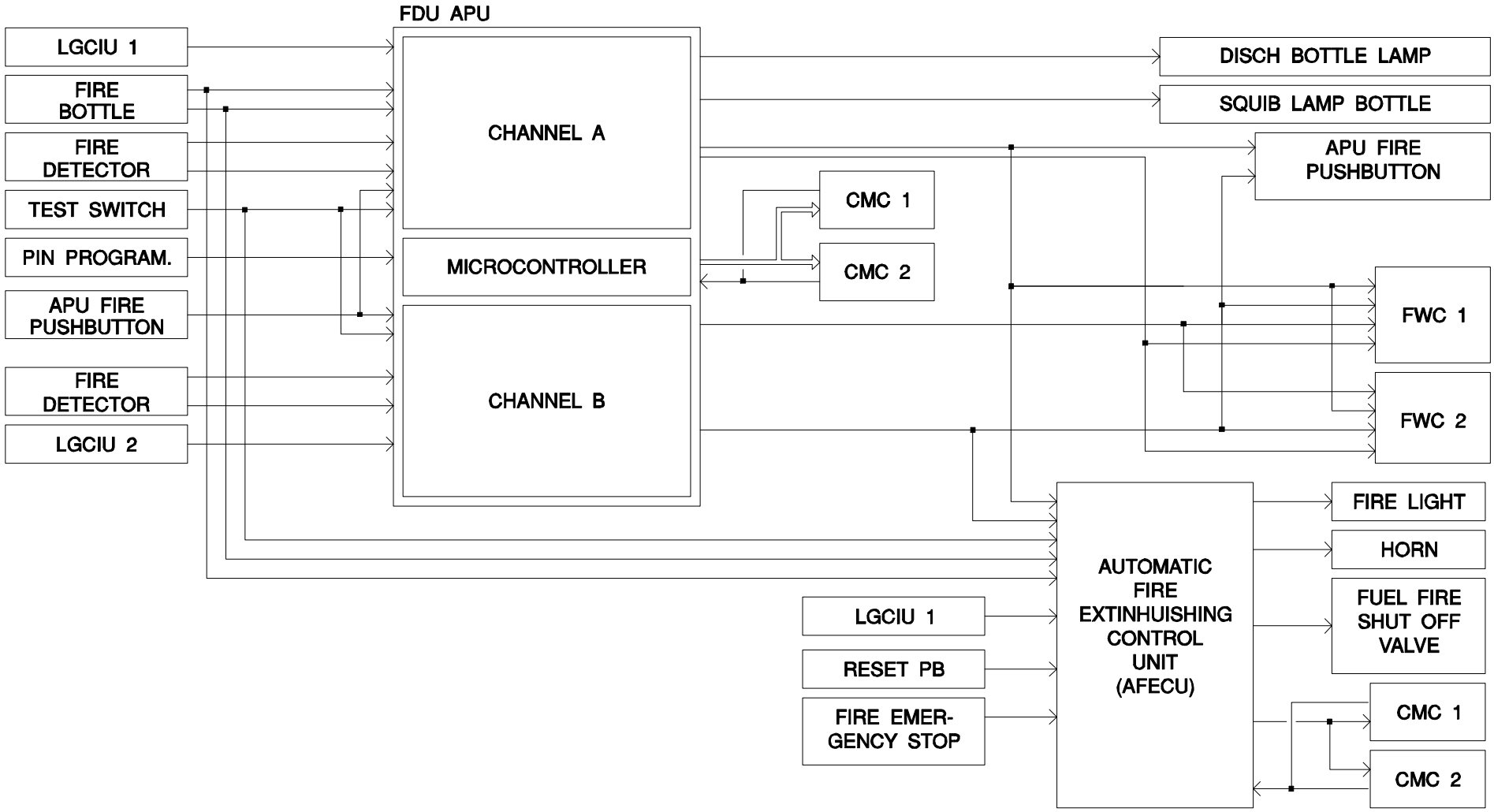


FQW4200 GE Metric

ANALOG INPUTS

The FDU receives analog inputs from the detectors of the APU (loop A and B).
Each channel receives and analyzes continuously the two signals from the detection loop (fire or fault).

FDU DISCRETE OUTPUTS

The FDU sends discrete outputs to the :
- DISCH lamp of the AGENT pushbutton,
- SQUIB lamp of the AGENT pushbutton.

The FDU channel A and B discrete outputs (fire A and fire B) are sent to :
- APU FIRE PUSHbutton on the overhead panel,
- Flight Warning Computer 1 and 2.

The loop A fault signal is sent by channel A to the Flight Warning Computer 1 and 2.
The loop B fault signal is sent by channel B to the Flight Warning Computer 1 and 2.

AFECU DISCRETE OUTPUTS

The AFECU sends discrete outputs to the :
- APU fire light on the external power control panel,
- external horn,
- fuel fire shut off valve,
- Central Maintenance Computer 1 and 2.

DIGITAL OUTPUTS

The FDU sends digital outputs via arinc 429 bus to Central Maintenance Computer 1 and 2 for maintenance purposes.

AVIONICS SMOKE DETECTION : SYSTEM PRESENTATION

General
Smoke Detectors
Smoke Detection Control Unit (SDCU)
Warnings

GENERAL

The avionics smoke detection is performed by sampling the air extracted from the panels and equipment racks.

SMOKE DETECTORS

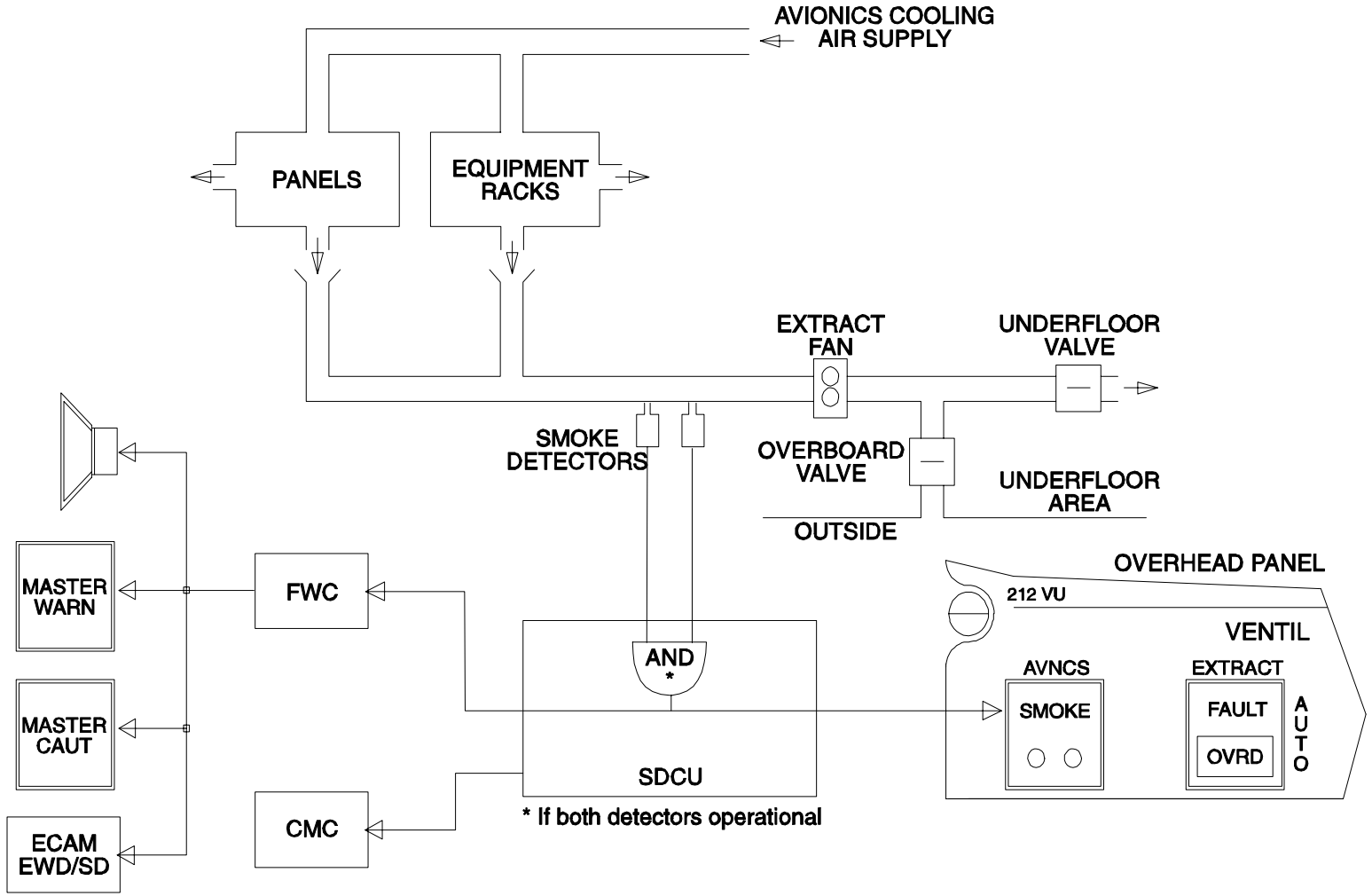
The avionics compartment smoke detection is provided by two smoke detectors installed on the air extraction duct of the ventilation system.
The smoke detectors are of the ionisation type, and are connected to the Smoke Detection Control Unit (SDCU).

SMOKE DETECTION CONTROL UNIT (SDCU)

The Smoke Detection Control Unit processes signals received from the smoke detectors.
The SDCU normally activates the smoke warning with an AND logic. It also monitors the smoke detectors for failures.

WARNINGS

Smoke warning signals are sent to the ECAM and the ventilation panel. Smoke detector failures are sent to the ECAM and Centralized Maintenance Computers.
When smoke is detected, the Continuous Repetitive Chime sounds, the MASTER WARNING light comes on and the SMOKE light on the ventilation panel comes on.



FQW4200 GE Metric

STUDENT NOTES

AVIONICS SMOKE DETECTION : SYSTEM OPERATION IN CASE OF AVIONICS SMOKE

Avionics Smoke

AVIONICS SMOKE

When smoke is detected, the MASTER WARNING comes on, the continuous repetitive chime sounds, the SMOKE and FAULT lights on the ventilation panel come on.

The actions to be performed appear on the upper ECAM display.

If smoke is confirmed, use the OXYGEN MASK and establish crew communication.

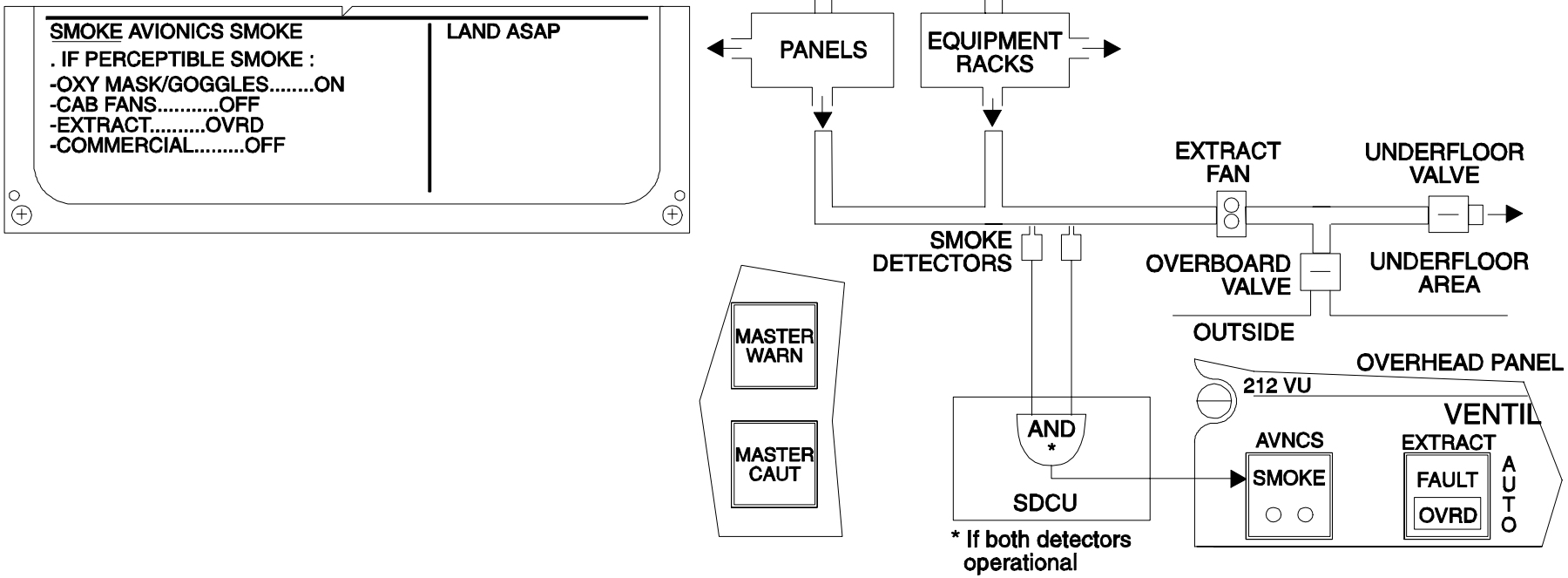
Stop the cabin fans to prevent smoke entering into the cockpit and cabin.

The extract fan of the avionics ventilation system must be set to override position, to evacuate the smoke overboard.

When the EXTRACT pushbutton is set to override, the air is extracted through the overboard valve which is partially open.

The COMMERCIAL pushbutton is set to OFF to isolate commercial loads including galleys.

Land as soon as possible, and if required apply the smoke procedure.



FQW4200 GE Metric

STUDENT NOTES

AVIONICS SMOKE DETECTION : SYSTEM WARNINGS

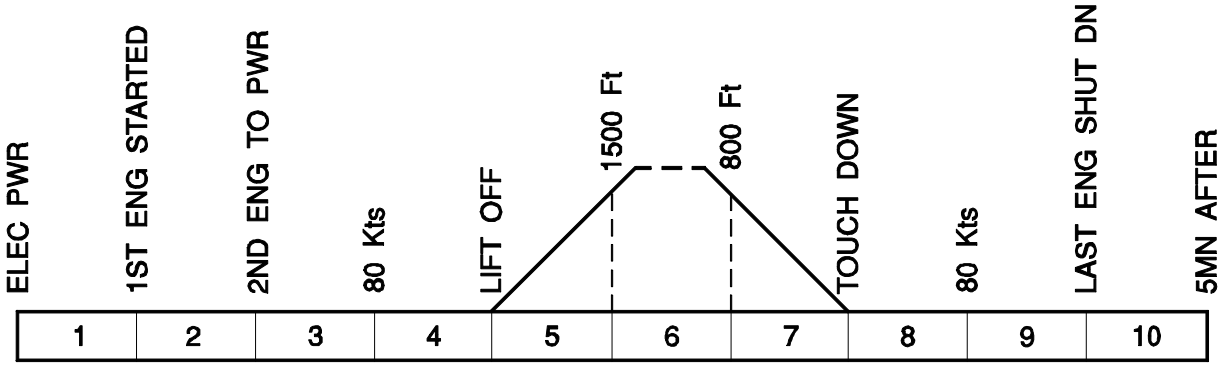
AVIONICS SMOKE
AVIONICS DET FAULT

AVIONICS SMOKE

The following warnings are triggered :
- Master Warning light
- Continuous Repetitive Chime
- SMOKE light on VENTILATION panel
- corresponding procedure appears on upper ECAM display.

AVIONICS DET FAULT

The following warnings are triggered :
- corresponding message appears on upper ECAM display.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
AVNCS VENT SMOKE	CRC	MASTER WARN	NIL	SMOKE lt on VENTILATION panel	4, 5, 7, 8
AVIONICS DET FAULT	NIL	NIL	NIL	NIL	3, 4, 5, 7, 8

FQW4200 GE Metric

STUDENT NOTES

AVIONICS SMOKE DETECTION : COMPONENTS

Smoke Detectors

SAFETY PRECAUTIONS

WARNING :

Do not try to open or repair a smoke detector.
Only workshops authorized by the manufacturer can do work on the smoke detector.

STUDENT NOTES

SMOKE DETECTORS

FIN : 1WA - 2WA

ZONE : 130

COMPONENT DESCRIPTION

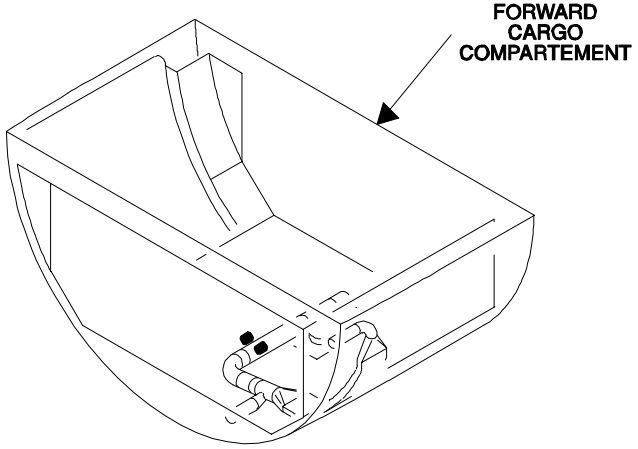
The smoke detector has two chambers :

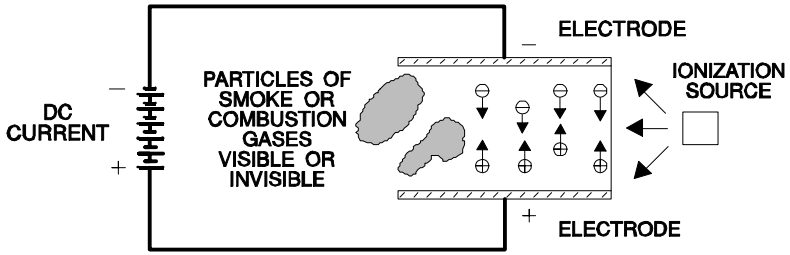
- the reference chamber,
- the measurement chamber.

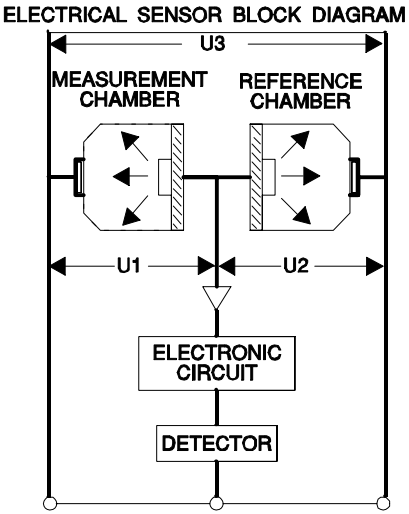
The reference chamber makes allowances for the differential pressure and temperature differences.
This makes sure that the detector operates on the ground and in flight with the same level of sensitivity.

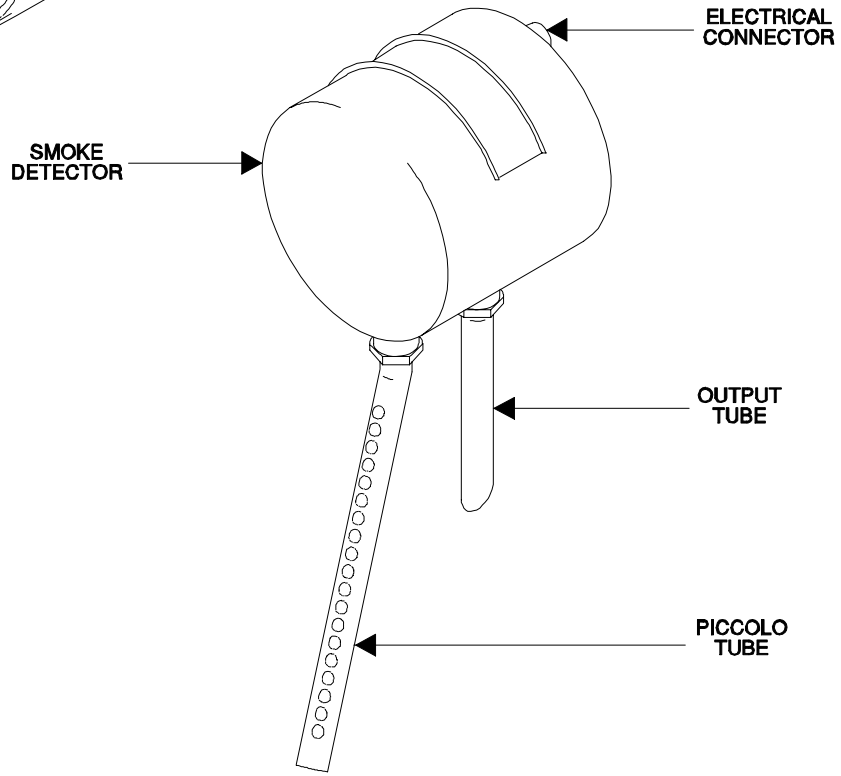
IONIZATION PRINCIPLE

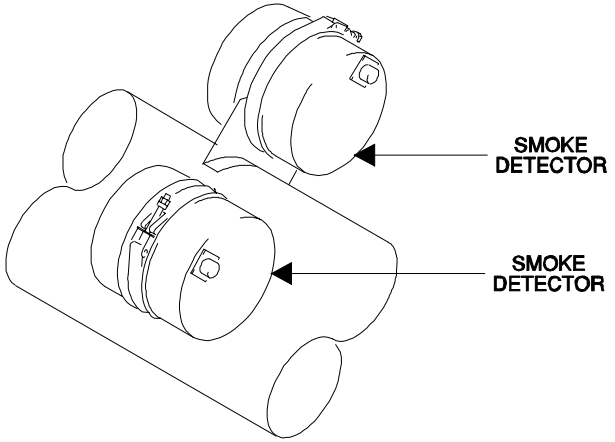
The smoke detector ionizes the air particles that pass between the electrodes.
As smoke causes the electrical resistance of the circuit to increase, the voltage in the measurement chamber increases to a higher level than the reference chamber and, at a set difference level, the detector sends a signal to the Smoke Detection Control Unit (SDCU).











FQW4200 GE Metric

STUDENT NOTES

CARGO FIRE PROTECTION : SYSTEM PRESENTATION

General
Smoke Detectors
Smoke Detection Control Unit (SDCU)
Warnings
Fire Bottle

GENERAL

The cargo fire protection is provided by two systems : the cargo smoke detection system and the cargo fire extinguishing system.

SMOKE DETECTORS

The smoke detectors are installed in the cargo compartment ceiling. They are of the ionisation type and are connected to the Smoke Detection Control Unit.
There are :
- 2 sets of two smoke detectors in the FWD cargo compartment.
- 2 sets of two smoke detectors in the AFT cargo compartment.
- 1 set of two smoke detectors in the BULK cargo compartment.

SMOKE DETECTION CONTROL UNIT (SDCU)

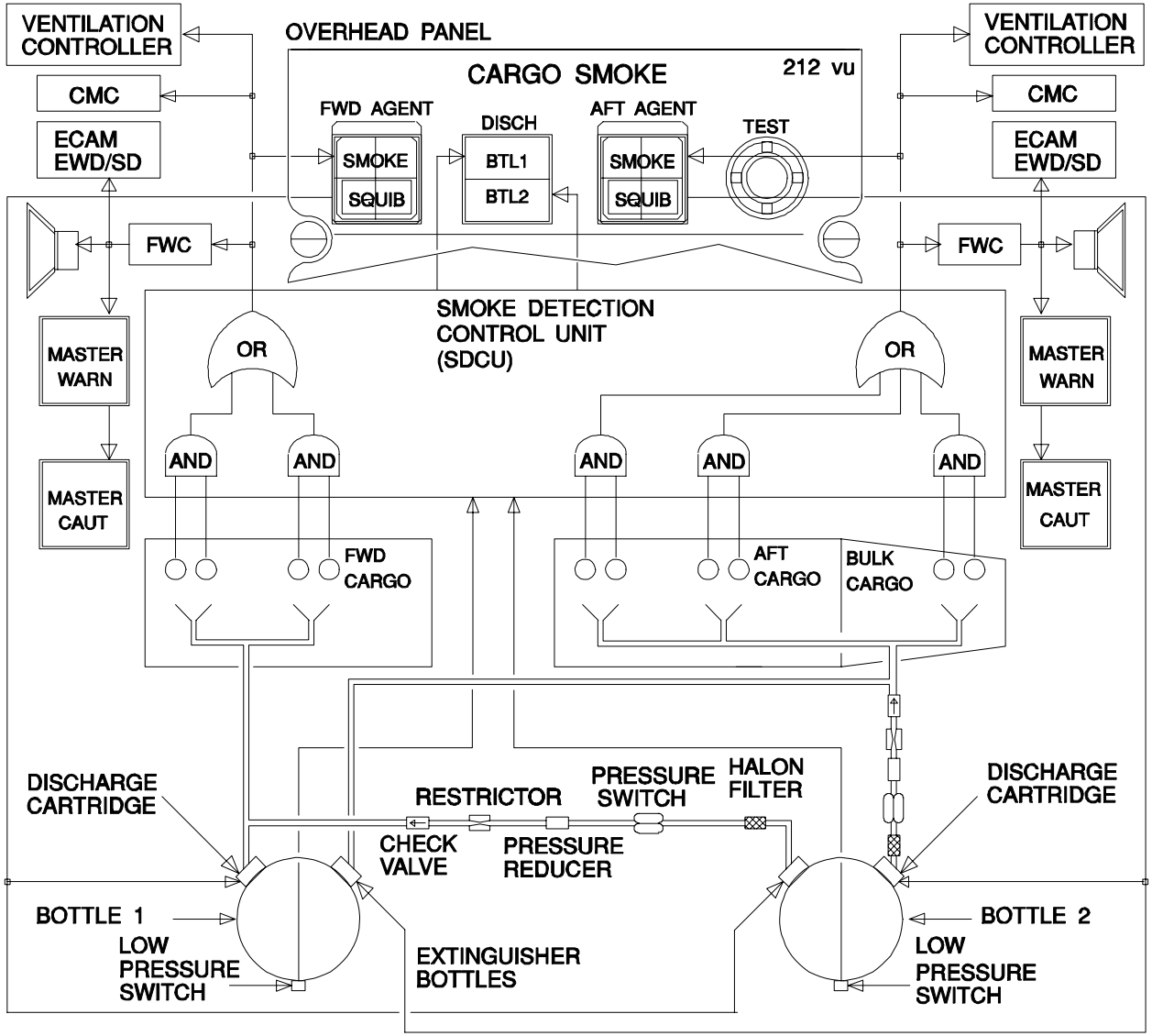
The Smoke Detection Control Unit processes signals received from the smoke detectors.
The SDCU normally activates the warning with an AND logic. It also monitors the smoke detectors for failures.

WARNINGS

Smoke warning signals are sent to the ECAM, the ventilation controller and the cargo smoke panel. Smoke detector failures are sent to the ECAM and Centralized Maintenance Computers (CMC).
The SDCU generates signals for the ECAM, Centralized Maintenance Computers, cockpit local warnings and for the ventilation controller to shutdown the ventilation system.

FIRE BOTTLE

Two extinguisher bottles are installed in the forward cargo compartment and provide fire extinguishing for the forward and AFT/BULK cargo compartments.
Bottle number one is of the quick discharge type. Bottle number two discharge is flow metered in order to keep a satisfactory proportion of fire extinguishing agent in the cargo hold.
The bottles are equipped with a low pressure switch to monitor agent pressure and two electrically operated squibs for agent discharge.
Note that the SMOKE light remains on due to the presence of extinguisher agent



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STUDENT NOTES

CARGO FIRE PROTECTION : SYSTEM CONTROLS AND INDICATING

SMOKE Light
SQUIB Light
AFT / FWD AGENT Pushbutton
BTL 1 / BTL 2 Light
TEST Pushbutton

SMOKE LIGHT

The SMOKE light comes on red and is accompanied by an ECAM warning when smoke is detected in the related compartment.

SQUIB LIGHT

The SQUIB light comes on, when the FWD (or AFT) AGENT pushbutton is pressed in, to indicate that the squib bottle has been triggered. It also comes on during the test.

AFT / FWD AGENT PUSHBUTTON

When the AFT or FWD guarded AGENT pushbutton is pressed, bottles one and two are discharged in the corresponding compartment.

CAUTION: Each cargo bottle cartridge has one of its two squibs electrically supplied from the HOT bus, consequently both bottles can be fired even if the A/C is not powered (no cockpit light will indicate the agent discharge until the A/C is powered).

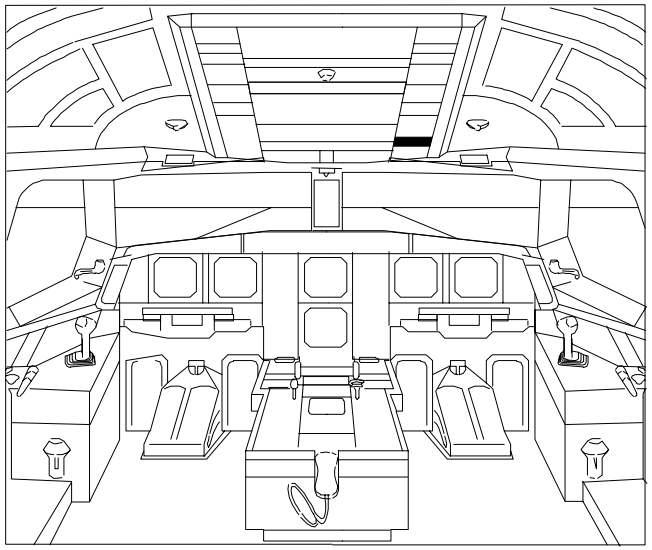
BTL 1 /BTL 2 LIGHT

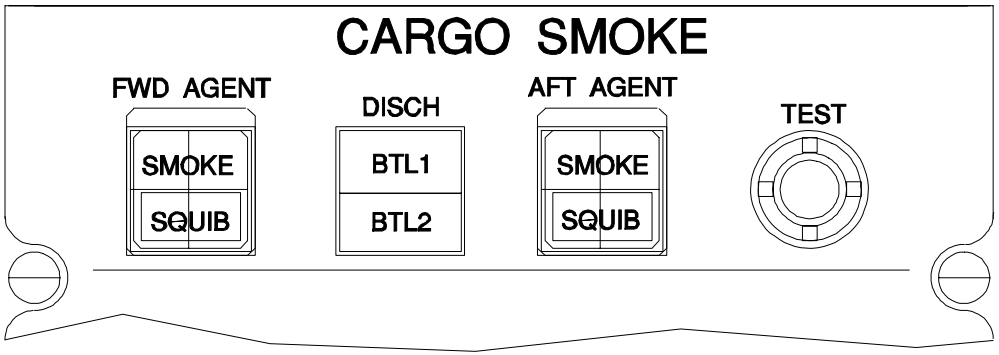
The BTL 1 or BTL 2 light comes on white when the corresponding bottle has been discharged.

TEST PUSHBUTTON

When the TEST pushbutton is pressed :

- The smoke detectors are tested by the SDCU in sequence
- The two red SMOKE lights come on associated with the ECAM warnings.
- the SQUIB lights and the BTL 1 and BTL 2 lights come on.





FQW4200 GE Metric

STUDENT NOTES

CARGO FIRE PROTECTION : SYSTEM OPERATION IN CASE OF CARGO SMOKE

FWD Cargo Smoke

FWD CARGO SMOKE

When cargo smoke is detected, the continuous repetitive chime sounds, the MASTER WARNING flashes and the corresponding SMOKE light on the CARGO SMOKE panel comes on.

The optional FWD cargo compartment isolation valves are automatically closed and the corresponding ISOL VALVE FAULT light on the CARGO AIR COND panel comes on.

When the optional FWD ISOlation VALVES pushbutton is set to OFF, the isolation valves closure is confirmed.

When the FWD AGENT pushbutton is pressed, the extinguisher agent from both bottles is released.

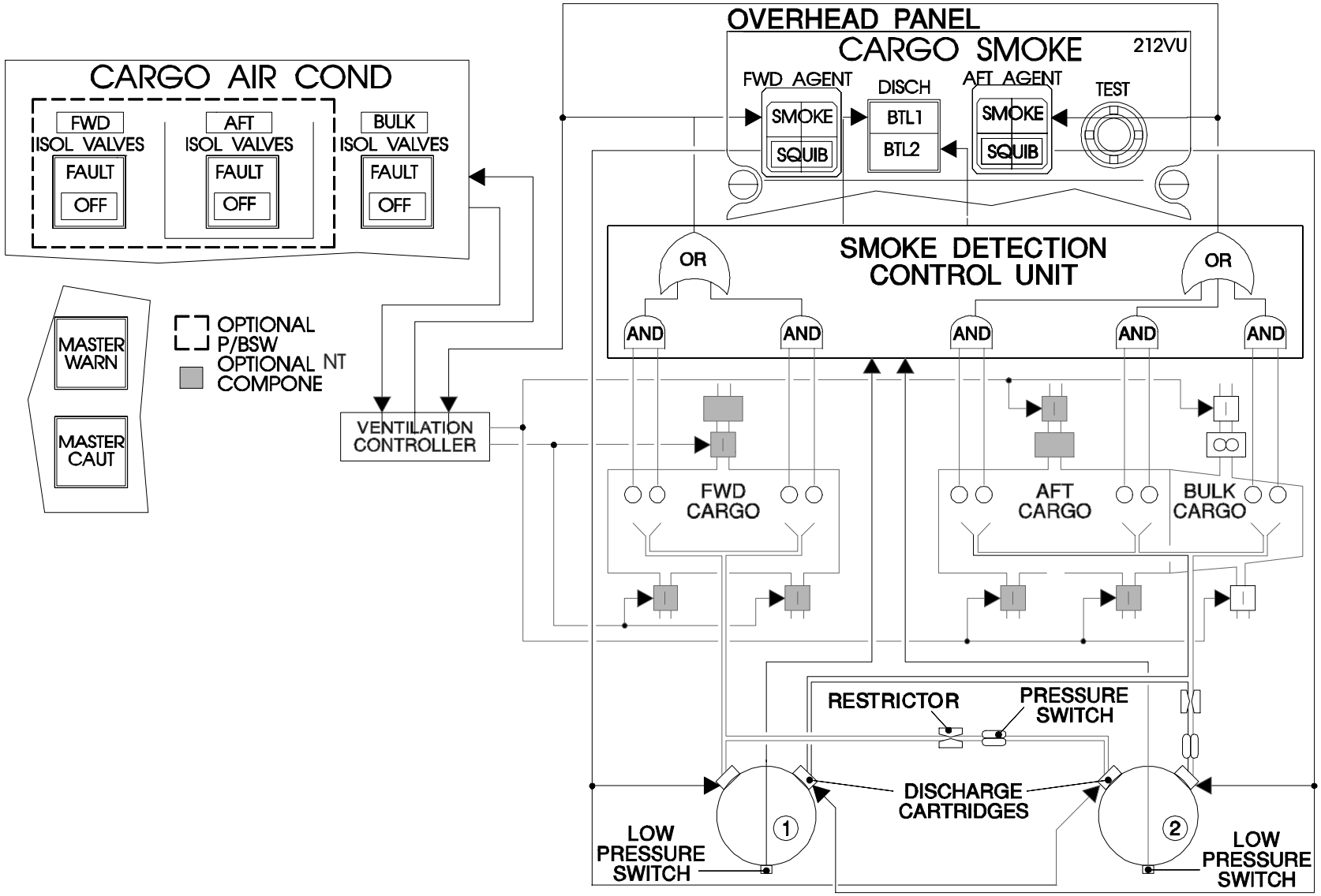
The agent from bottle 1 flows directly to the FWD cargo compartment. The agent from bottle 2 flows through a restrictor which controls its release, in order to maintain a slow agent discharge until the aircraft has landed.

A low pressure switch sends a signal to the Smoke Detection Control Unit (SDCU) when the pressure in its dedicated bottle reduces sufficiently.

The BTL1 light on the DISH indicator comes on first, as pressure in bottle 1 quickly decreases (after approximately 1 minute).

The BTL 2 light comes on a long time after as pressure in bottle 2 slowly decreases.

If the agent from bottle 2 is not released correctly, the pressure switch does not send a discharge signal to the SDCU. Consequently, a bottle 2 fault signal is triggered by the FWC 2 minutes later



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STUDENT NOTES

CARGO FIRE PROTECTION : SYSTEM WARNINGS

FWD CARGO SMOKE
DET FAULT
FWD CRG BTL 1 FAULT
FWD CRG DET FAULT

FWD CARGO SMOKE

The following warnings are triggered :
- Master Warning light
- Continuous Repetitive Chime
- SMOKE light on the CARGO SMOKE panel
- corresponding procedure appears on upper ECAM display.

DET FAULT

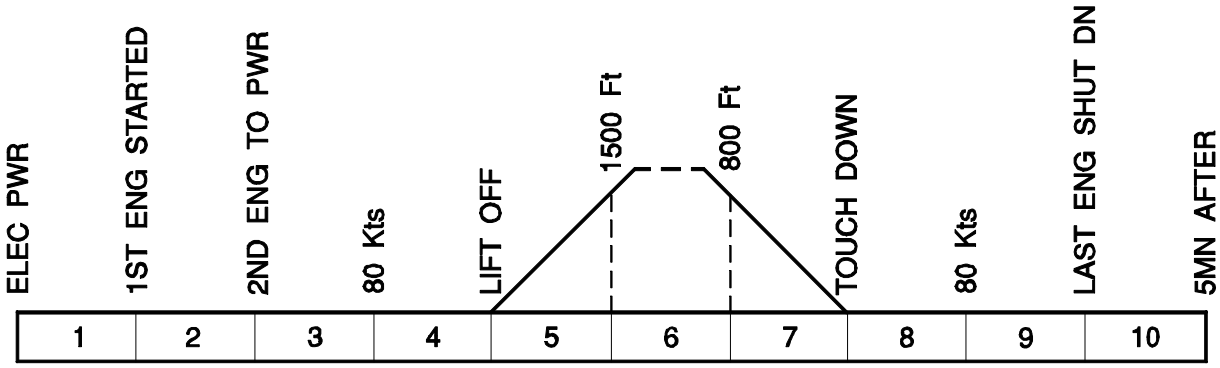
The following warnings are triggered :
- Master Caution light
- Single Chime
- corresponding message appears on upper ECAM display.

FWD CRG BTL 1 FAULT

The following warnings are triggered :
- Master Caution light
- Single Chime
- corresponding message appears on upper ECAM display.

FWD CRG DET FAULT

The following warnings are triggered :
- corresponding message appears on upper ECAM display.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
FWD (AFT/BULK) CARGO SMOKE	CRC	MASTER WARN	NIL	SMOKE lt on CARGO SMOKE panel	4, 5, 7, 8
DET FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3, 4, 5, 7, 8
FWD (AFT) CRG BTL 1 (2) FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	4, 5, 7, 8
FWD (AFT/BULK) CRG DET FAULT	NIL	NIL	NIL	NIL	3, 4, 5, 7, 8

FQW4200 GE Metric

STUDENT NOTES

CARGO FIRE PROTECTION : COMPONENTS

Smoke Detectors
Spray Nozzles
Smoke Detection Control Unit
Fire Bottles
Halon Filter
Pressure Switch
Pressure Reducer
Check Valve

SAFETY PRECAUTIONS

WARNING :

Specific precautions must be taken during removal or installation of a fire extinguishing bottle and a discharge cartridge.

STUDENT NOTES

SMOKE DETECTORS

FIN : 1WH - 2WH - 3WH - 4WH
5WH - 6WH - 7WH - 8WH
9WH - 10WH

ZONE : 130 - 150 - 160

COMPONENT DESCRIPTION

The smoke detector has two chambers :

- the reference chamber
- the measurement chamber.

The reference chamber makes allowances for the differential pressure and temperature differences.
This makes sure that the detector operates on the ground and in flight with the same level of sensitivity.

IONIZATION PRINCIPLE

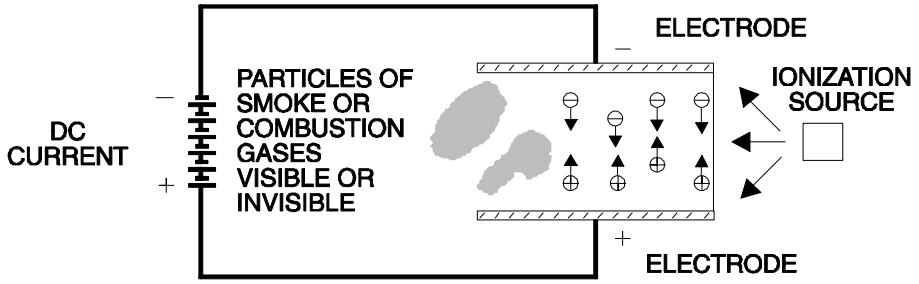
The smoke detector ionizes the air particles that pass between the electrodes.
As smoke causes the electrical resistance of the circuit to increase, the voltage in the measurement chamber increases to a higher level than the reference chamber and at a set difference level, the detector sends a signal to the Smoke Detection Control Unit (SDCU).

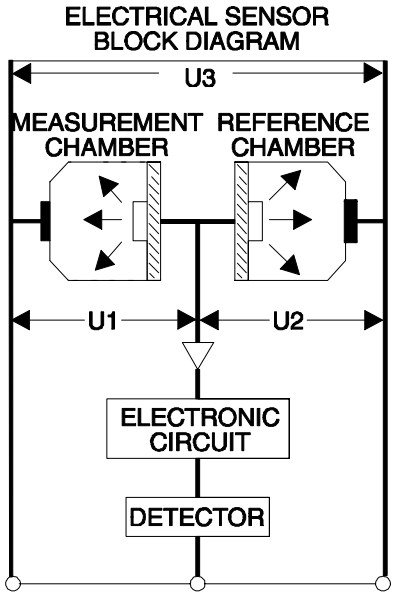
SPRAY NOZZLES

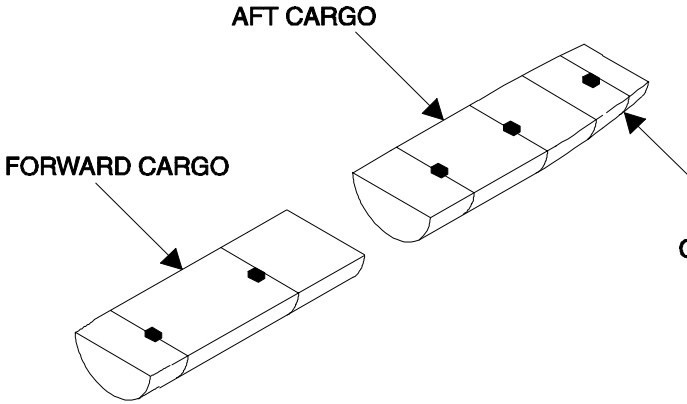
ZONE : 130 - 150 - 160

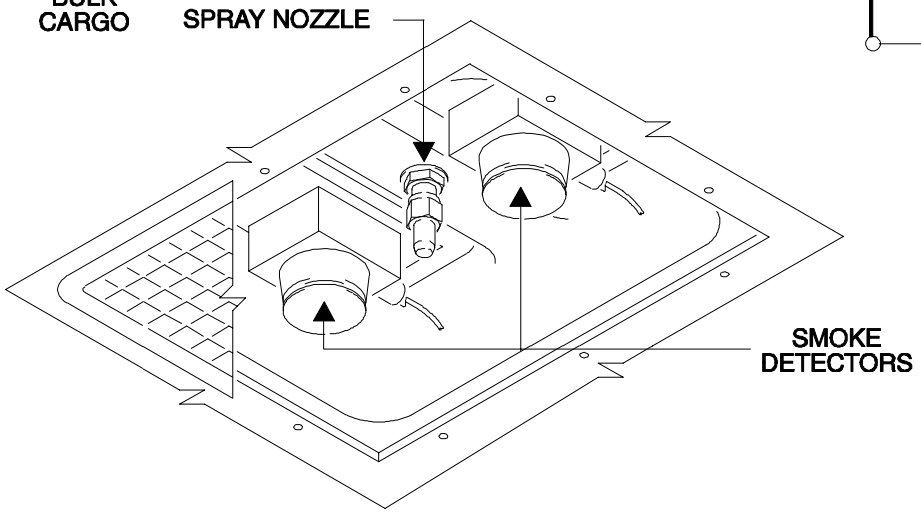
COMPONENT DESCRIPTION

One spray nozzle is installed in each smoke detector cavity.









FQW4200 GE Metric

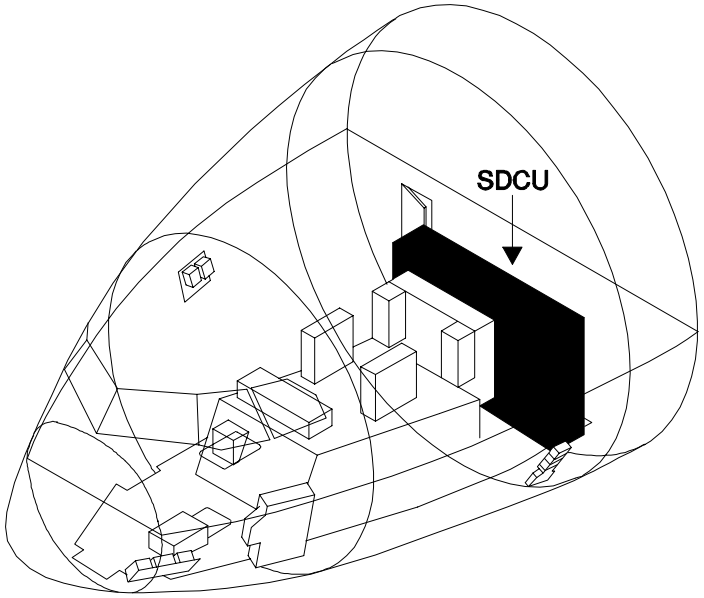
SMOKE DETECTION CONTROL UNIT

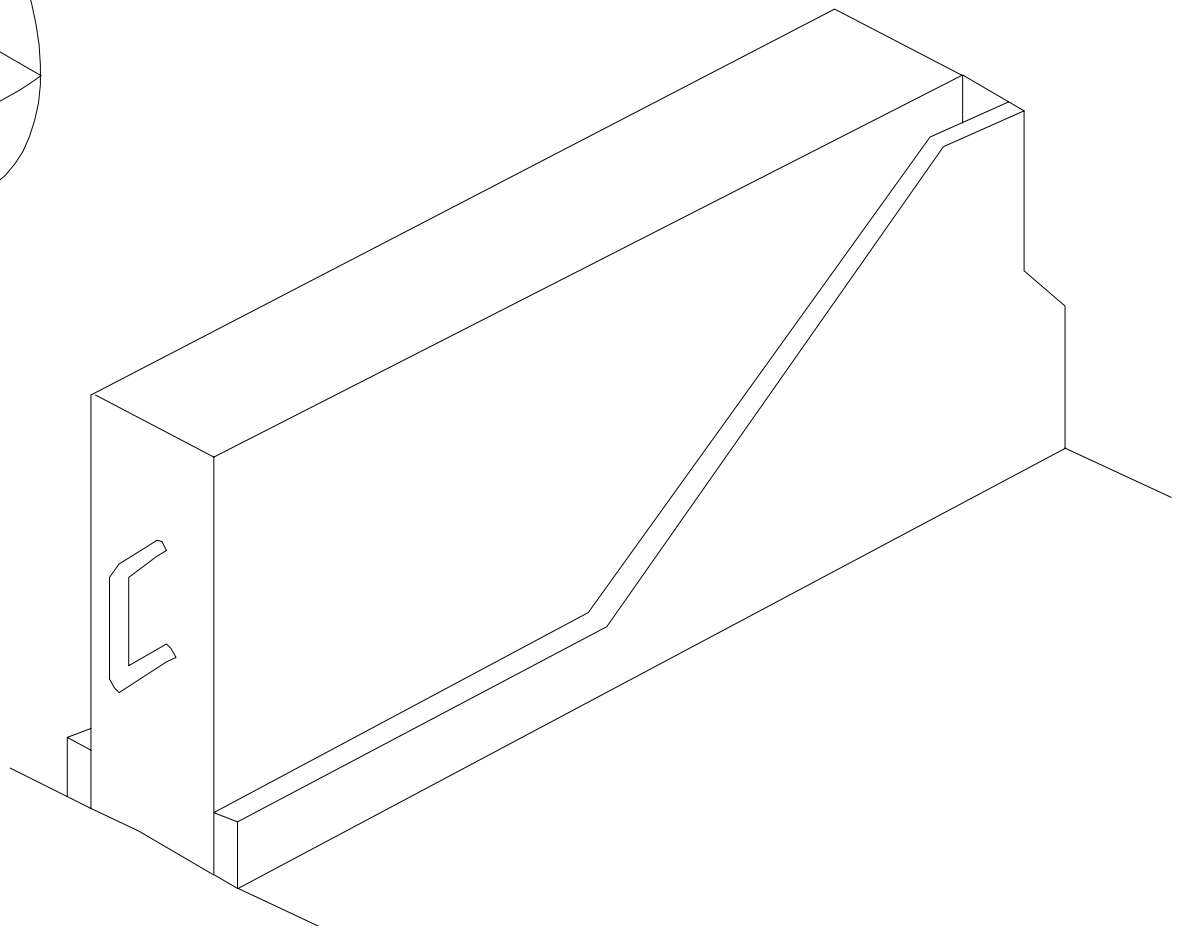
FIN : 20WH

ZONE : 122

COMPONENT DESCRIPTION

The smoke Detection Control Unit has two independent channels for redundency.





FQW4200 GE Metric

FIRE BOTTLES

FIN : 4005WX - 4010WX

ZONE : 130

COMPONENT DESCRIPTION

The cargo compartment fire protection is equipped with two fire bottles located in the forward cargo compartment.

Each bottle comprises a pressure switch, two electrically operated cartridges, a fill/safety valve (connected to a hose that goes to the FWD compartment) and two discharge heads :

- type of agent : halon 1301
- nominal nitrogen pressure at 21°C, 360psi.

The fire bottle 2 has a volume of 800 in.3 or an optional volume of 1600 in.3.

LOW PRESSURE SWITCH

The low pressure switch is connected to the SDCU for bottle pressure condition monitoring.

CARTRIGE

Each electrically operated cartridge has two squibs (A and B) with a separate supply of power for each squib.

WARNING :

Never check the continuity of the cartridge using a conventional ohmmeter.

SAFETY VALVE

The fill safety valve has two functions :

- it allows the bottle to be filled
- a thin preformed disc ruptures if the bottle pressure increases to a dangerous level and lets the agent flow to the FWD cargo compartment.

SAFETY PRECAUTIONS

WARNING :

The fire bottle cartridges are explosive.
Remove them before working on the bottle.
Protective caps must be installed during bottle removal/installation to prevent damage to discharge diaphragm which could result in injury to personnel.

WARNING :

Cartridges are class "C" explosives and must be handled or stored by authorized personnel or disposed of by an approved method.
When cartridge electrical connectors are disconnected, the cartridge electrical pins must be shunted with a protective shunt which is provided by the manufacturer.
A shunt plug or shorting clip, will prevent bottle discharge which could cause injury to maintenance personnel.
The cartridge installed must be of the same make as the fire bottle and correspond to the specification indicated in the maintenance manual.

HALON FILTER

FIN : 5010WE - 5011WE

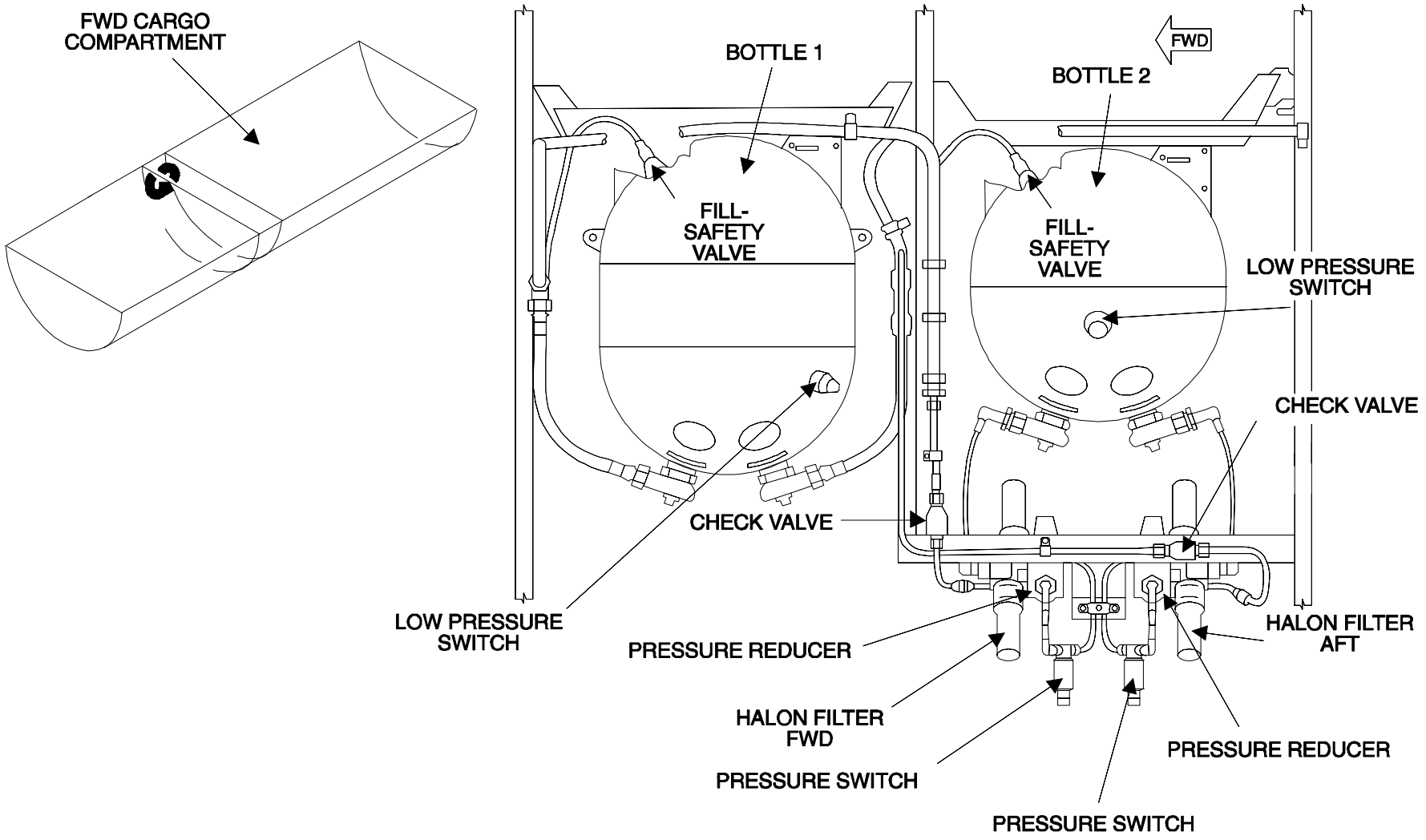
ZONE : 130

COMPONENT DESCRIPTION

The halon filter has two functions :

- to remove water from the extinguishing agent.
  This is to prevent ice blockage in the pressure reducer and the restrictor.
- to remove the remaining solid particles of the cartridge and burst diaphragm from the extinguishing agent.

FQW4200 GE Metric



FQW4200 GE Metric

PRESSURE SWITCH

FIN : 4016WX - 4018WX

ZONE : 130

COMPONENT DESCRIPTION
The discharge pressure switch sends a signal to the SDCU when the bottle 2 is fired. It gives an indication when there is pressure in the flow metering system.

PRESSURE REDUCER

FIN : 5014WE - 5015WE

ZONE : 130

COMPONENT DESCRIPTION
The pressure reducer controls and decreases the pressure of the agent when it is released.

CHECK VALVE

FIN : 5016WE - 5017WE

ZONE : 130

COMPONENT DESCRIPTION
The check valve stops the flow of unwanted particles from the cartridge and burst diaphragm from bottle 1 to the flow metering equipment downstream of bottle 2.
It also prevents damage to the pressure reducer from backpressure (from bottle 1) and humidity (from the cargo compartments).

LAVATORY FIRE PROTECTION : SYSTEM PRESENTATION

General
Smoke Detectors
Smoke Detection Control Unit (SDCU)
Warnings
Waste Bin Fire Extinguisher

GENERAL

The lavatory fire protection is provided by two systems : the lavatory smoke detection system and the waste bin fire extinguishing system.

SMOKE DETECTORS

One ambient smoke detector is installed in each lavatory ceiling in the air outlet cavity.
The smoke detectors are of the ionisation type and are connected to the Smoke Detection Control Unit (SDCU).

SMOKE DETECTION CONTROL UNIT (SDCU)

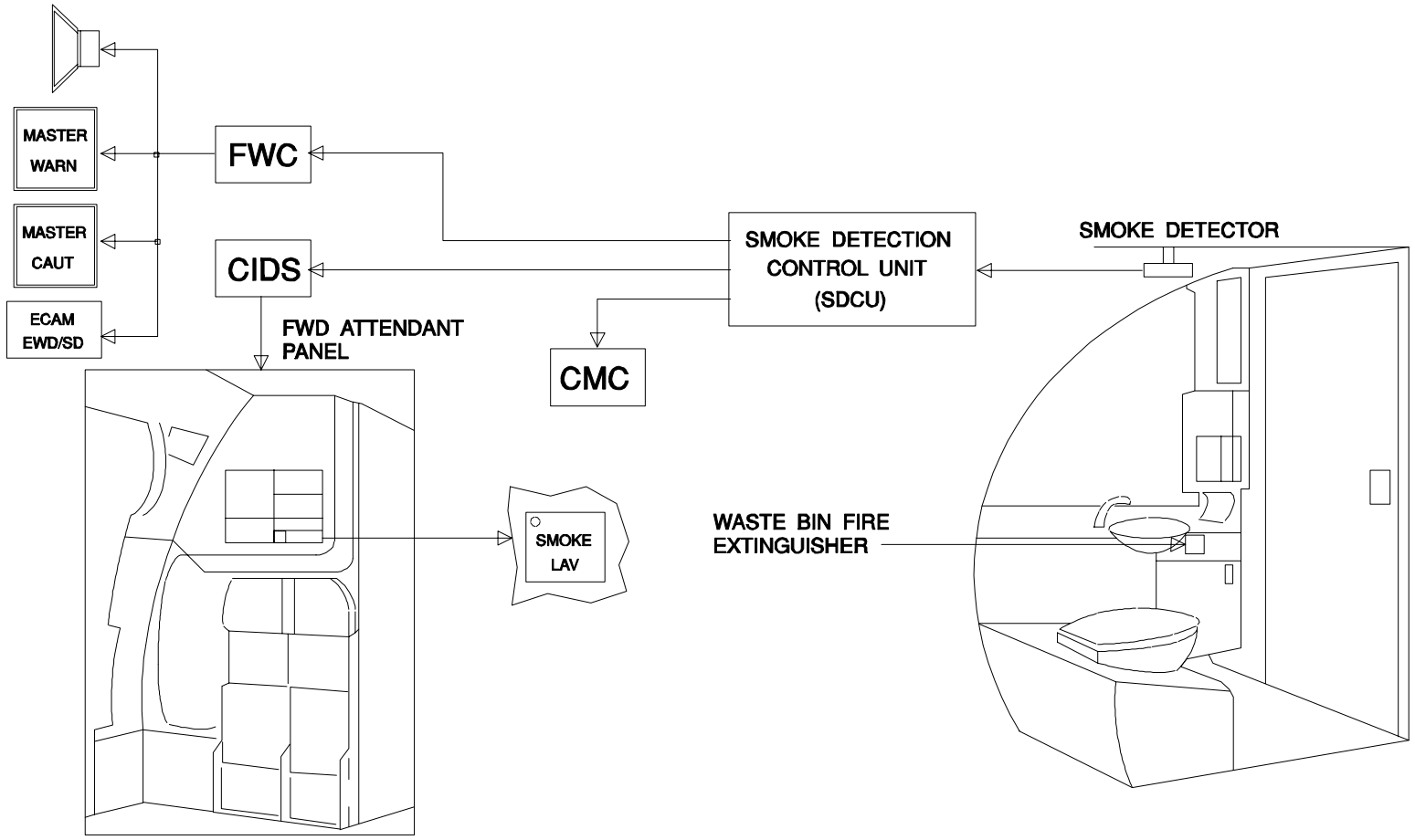
If smoke is detected in the lavatory, the Smoke Detection Control Unit activates the smoke warnings in the cockpit and in the passenger cabin.
The Smoke Detection Control Unit (SDCU) monitors all the lavatory smoke detectors.

WARNINGS

The Smoke Detection Control Unit sends the lavatory smoke warning signals to the ECAM and the Cabin Intercommunication Data System which transmits them to the forward attendant panel.
The Smoke Detection Control Unit also provides the fault messages to the Centralized Maintenance Computer (CMC).
Also, an amber light comes on above the affected lavatory door.
Note that for lavatory fire extinguishing, a cabin portable fire extinguisher must be used.

WASTE BIN FIRE EXTINGUISHER

A small fire extinguisher is built in the waste bin of each lavatory to provide automatic extinguishing in case of fire.
The waste bin fire extinguisher automatically discharges its agent when overheating melts a fusible material in the tip of the discharge tube.



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STUDENT NOTES:

LAVATORY FIRE PROTECTION : SYSTEM WARNINGS

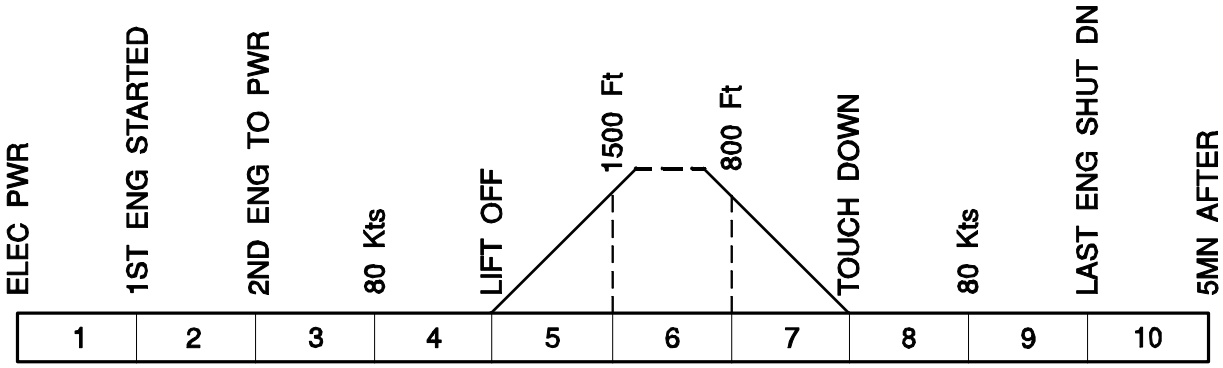
LAVATORY SMOKE
LAVATORY DET FAULT

LAVATORY SMOKE

The following warnings are trigerred :
- Master Warning light
- Continuous Repetitive chime
- corresponding message appears on upper ECAM display
- Triplicate chime in the cabin
- SMOKE LAV on the forward attendant panel
- Red light and text appears on the AIP
- Amber light on the ACP
- Amber light on the affected lavatory.

LAVATORY DET FAULT

The following warnings are triggered :
- corresponding message appears on upper ECAM display
- amber CIDS CAUT light on the Programming and Indication Module.



E/WD : FAILURE TITLE	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
LAVATORY SMOKE	CRC	MASTER WARN	NIL	NIL	4, 5, 7, 8
LAVATORY DET FAULT	NIL	NIL	NIL	NIL	3, 4, 5, 7, 8

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STUDENT NOTES

LAVATORY FIRE PROTECTION : COMPONENTS

Smoke Detectors
Waste Bin Fire Extinguisher

SAFETY PRECAUTIONS

WARNING :

Do not try to open or repair a smoke detector.
Only workshops authorized by the manufacturer can do work on the smoke detector.

STUDENT NOTES

SMOKE DETECTORS

FIN/ZONE

FIN : 1WQ - 8WQ
10WQ - 11WQ
15WQ - 16WQ
26WQ...

ZONE : depends on the cabin layout.

COMPONENT DESCRIPTION

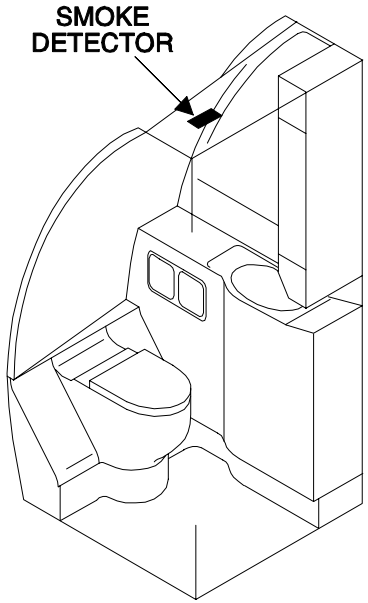
The smoke detector has two chambers :

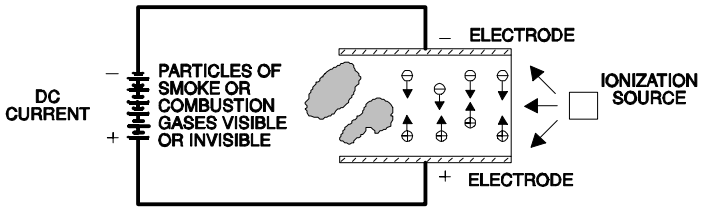
- the reference chamber,
- the measurement chamber.

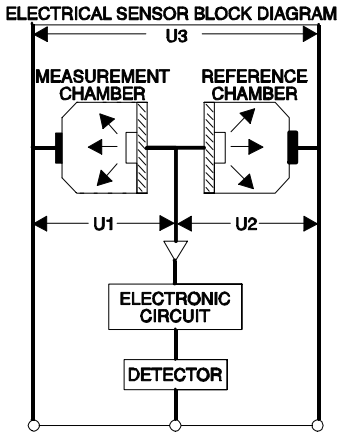
The reference chamber makes allowances for the differential pressure and temperature differences.
This makes sure that the detector operates on ground and in flight with the same level of sensitivity.

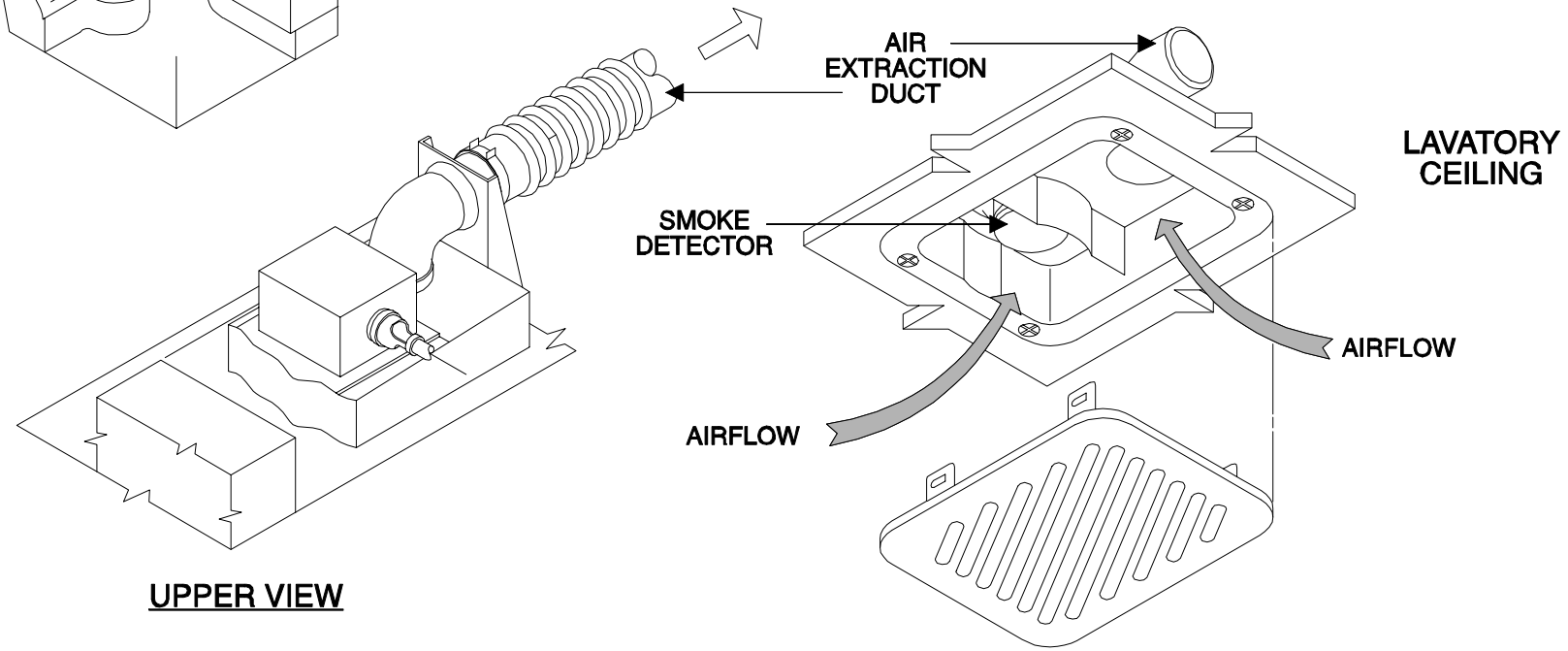
IONIZATION PRINCIPLE

The smoke detector ionizes the air particles that pass between the electrodes.
As smoke causes the electrical resistance of the circuit to increase, the voltage in the measurement chamber increases to a higher level than the reference chamber and, at a set difference level, the detector sends a signal to the Smoke Detection Control Unit (SDCU).









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WASTE BIN FIRE EXTINGUISHER

FIN/ZONE

FIN : 79**WE**
(* : depends on the lavatory location)

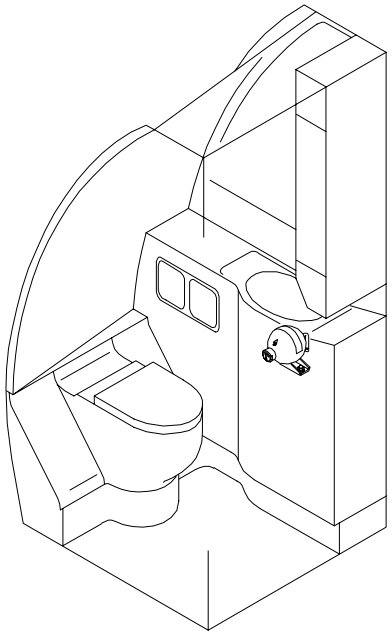
ZONE : depends on the cabin layout.

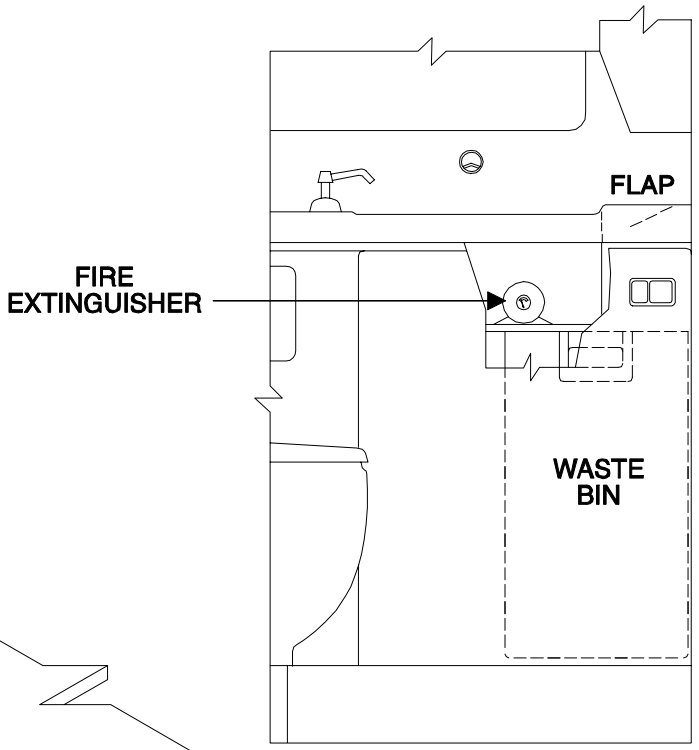
COMPONENT DESCRIPTION

Each extinguisher is a self-operating device which operates independently of other systems when the temperature in the waste bin reaches approximately 77°C (170°F).
It consists of :

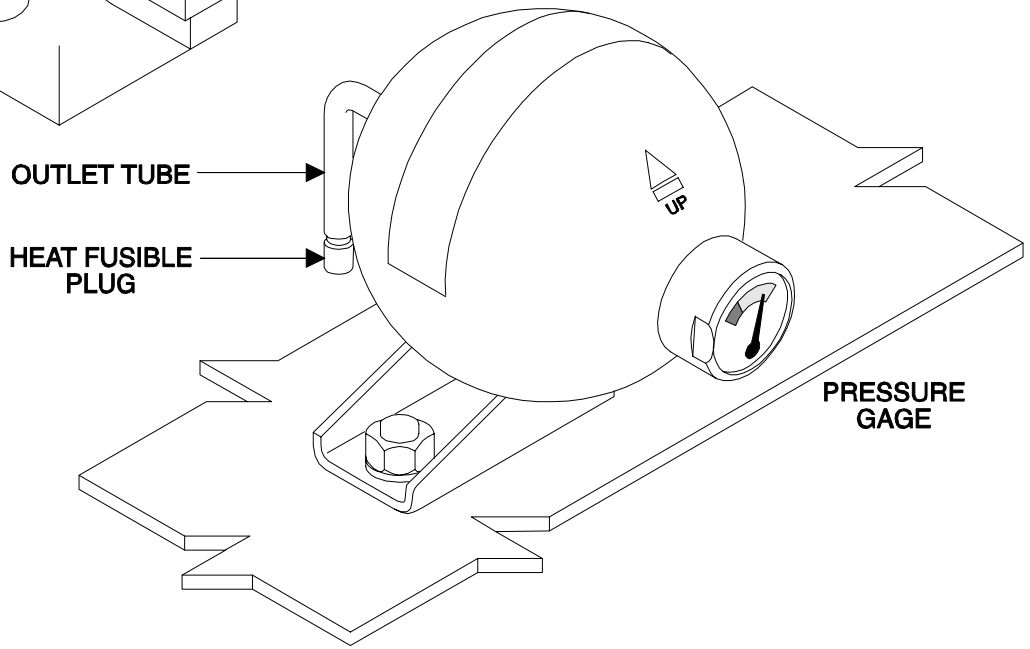
- a spherical container,
- a fill port with a fill valve,
- a mounting bracket,
- a discharge tube with a fusible plug,
- a pressure gage,
- an identification label.

The label indicates the part and serial numbers, the date of manufacture, the agent type and the total weight (used for the bottle weight check).





FIRE EXTINGUISHER
(DISPOSABLE)



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STUDENT NOTES

SDCU INTERFACES

General
Common Inputs
Inputs Channel 1 and Channel 2
Common Outputs
Outputs Channel 1 and Channel 2

GENERAL

The SDCU is designed as a dual channel equipment.
The common discrete inputs/outputs are transmitted to channel 1 and channel 2.
Each channel contains a cross channel monitoring and command.

COMMON INPUTS

The SDCU receives a flight/ground discrete input.
This input comes from LGCIU 1 and 2 and is used for :

- storage of prefault condition for a smoke detector,
- test from the Central Maintenance Computer.

The SDCU receives two types of discrete input from fire extinguisher bottle 1 and 2. These inputs are used for :

- monitoring the low pressure in each bottle (low pressure switch),
- monitoring the squib of each discharge head (forward and aft).

In addition, the SDCU receives a third type of discrete input from the bottle 2 flow metering system. It is used for :

- monitoring the bottle 2 discharge (two pressure switches).

The SDCU receives a discrete signal from the TEST pushbutton on the cargo smoke panel.
It is used to test the smoke detectors and indications.
The SDCU receives discrete signals from the pin-programming.
They are used for the aircraft configuration.

INPUTS CHANNEL 1 AND CHANNEL 2

The SDCU receives reset channel 1 and reset channel 2 discrete inputs.
These inputs are used for resetting channel 1 and resetting channel 2.

The SDCU supplies the detectors with a controlled voltage through a two-wire safety bus system.

The SDCU receives digital inputs via an ARINC 429 bus to Central Maintenance Computer (CMC) 1.
These inputs are used to dialog with the SDCU.

COMMON OUTPUTS

The SDCU sends discrete outputs to the ventilation controller.
One when forward cargo smoke is detected and one when aft/Bulk cargo smoke is detected.

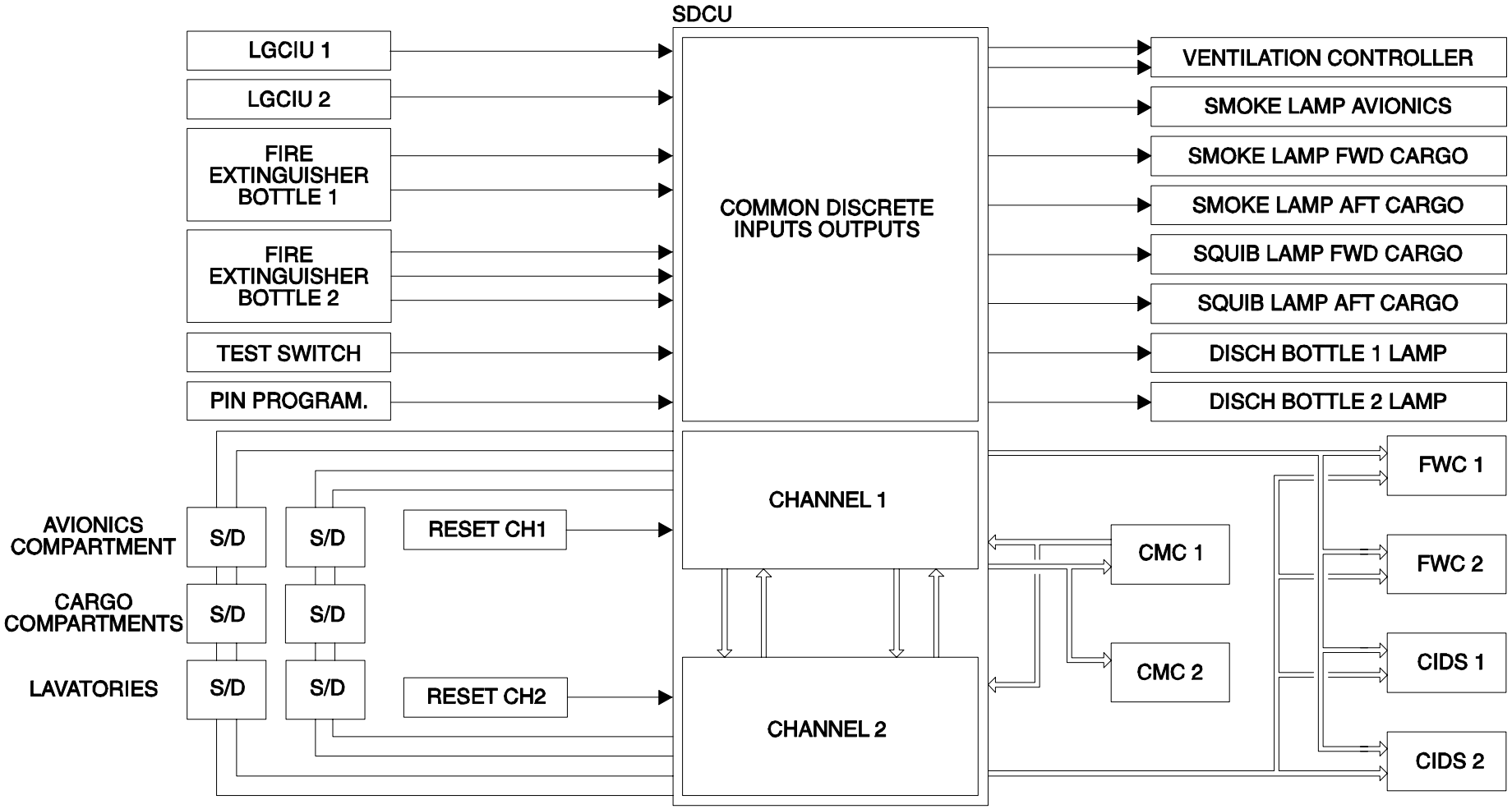
The SDCU sends discrete outputs to the smoke lamps of the avionics, forward and aft/Bulk compartments when smoke is detected.

The SDCU sends discrete outputs to the SQUIB lamps of the forward and aft/Bulk cargo compartments.
The SDCU sends discrete outputs to the DISCH bottle 1 and bottle 2 lamps.

OUTPUTS CHANNEL 1 AND CHANNEL 2

The SDCU sends digital outputs via an ARINC 429 bus to CMC 1 and CMC 2 (Central Maintenance Computer) for maintenance purposes.

Each channel of the SDCU sends digital outputs via an ARINC 429 bus to Flight Warning Computer (FWC) 1, Flight Warning Computer 2, Cabin Intercommunication Data System (CIDS) 1 and 2.



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STUDENT NOTES

PORTABLE EQUIPMENT :
PORTABLE FIRE EXTINGUISHERS

Location
Description
Utilization

LOCATION

In the typical cabin layout seven portable fire extinguishers are in the cabin and one in the cockpit.
The portable fire extinguishers are stored in stowage compartments, in doghouses or under the aft attendant seats. They are used for fighting fire in the cabin or in the lavatories

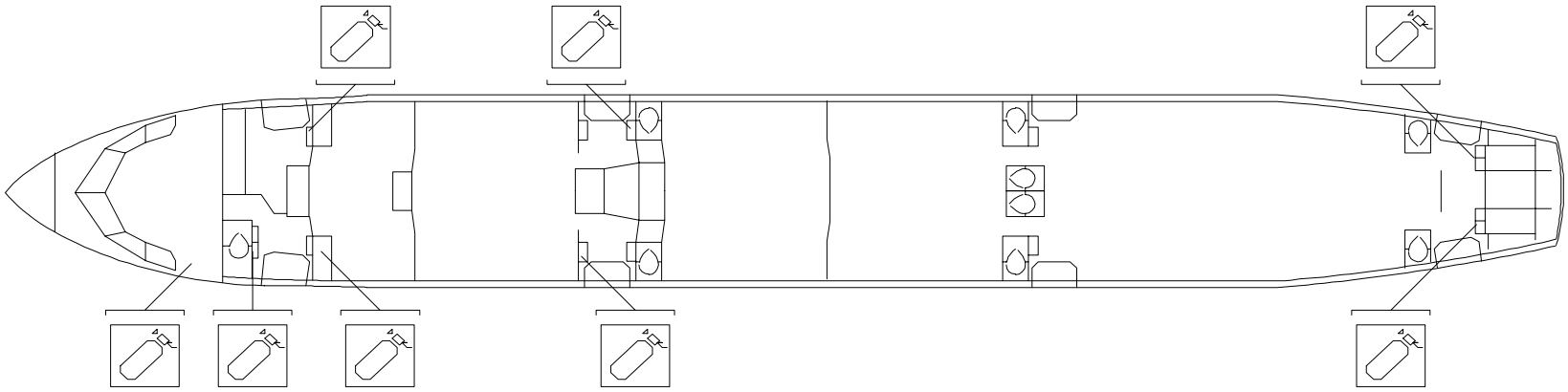
DESCRIPTION

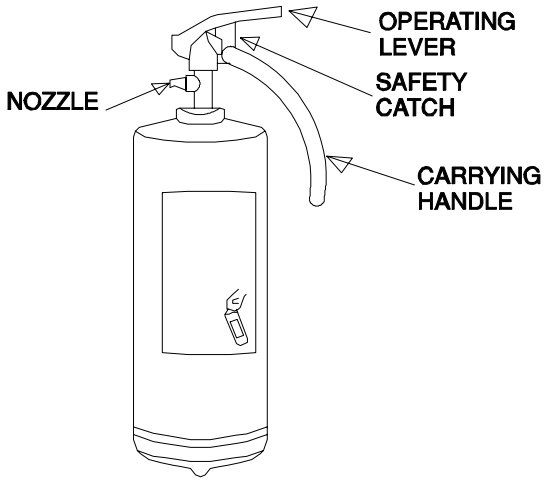
The portable fire extinguisher consists of three main components.
The WALTER KIDDE, type Halon 1211 fire extinguisher consists of three main components :

- The bottle
- The operating head
- The agent.

UTILIZATION

For the correct operation and information concerning the portable fire extinguisher, refer to the label.
The label on the extinguisher contains the instructions for use, approval number, details of weight and date of last check.





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STUDENT NOTES

PIM UTILIZATION

General
System Check
Smoke Detector failure

GENERAL

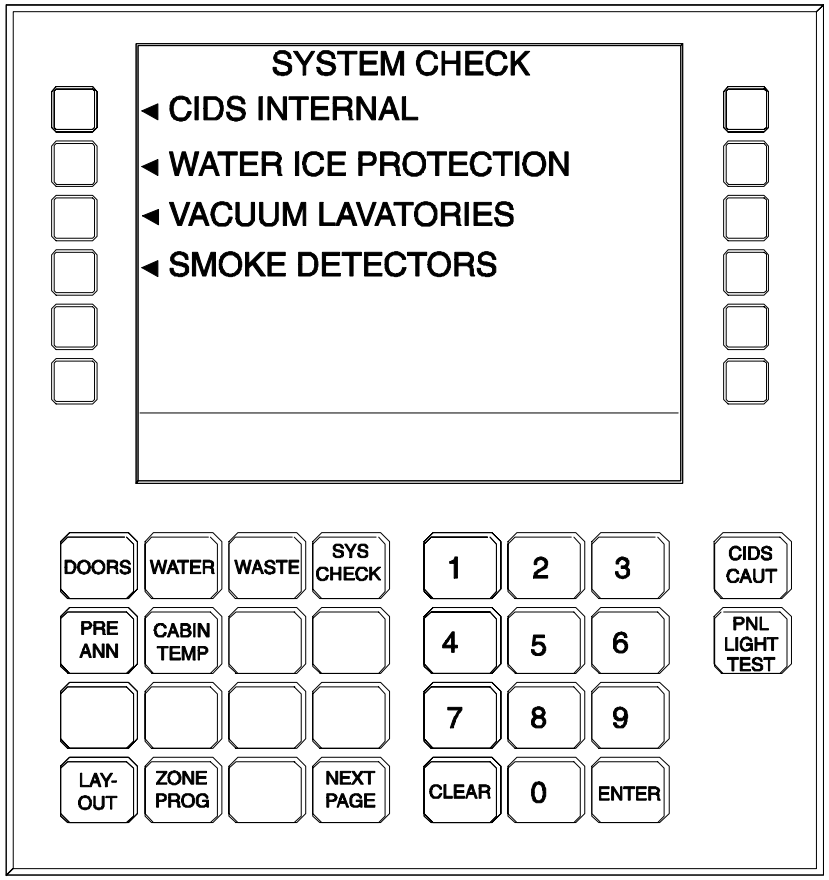
The Programming and Indication Module is a part of the Forward Attendant Panel installed at the forward attendant station
The Programming and Indication Module (PIM) is used by the cabin crew for cabin system status indications.

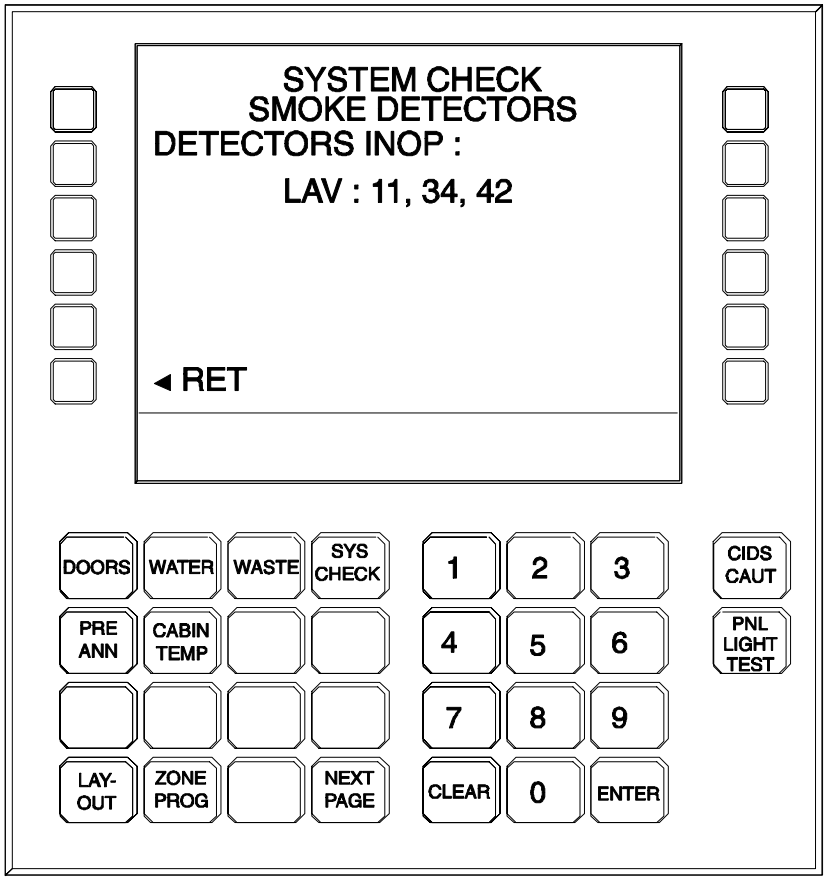
SYSTEM CHECK

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: smoke detector 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.

SMOKE DETECTOR FAILURE

A smoke detector failure has been detected.
The "◁" symbol flashes indicating that a smoke detector failure has been detected.
The SMOKE DETECTORS page displays the failed smoke detectors location. Cabin crew action may be required !
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.





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STUDENT NOTES

CMS SPECIFIC PAGE PRESENTATION

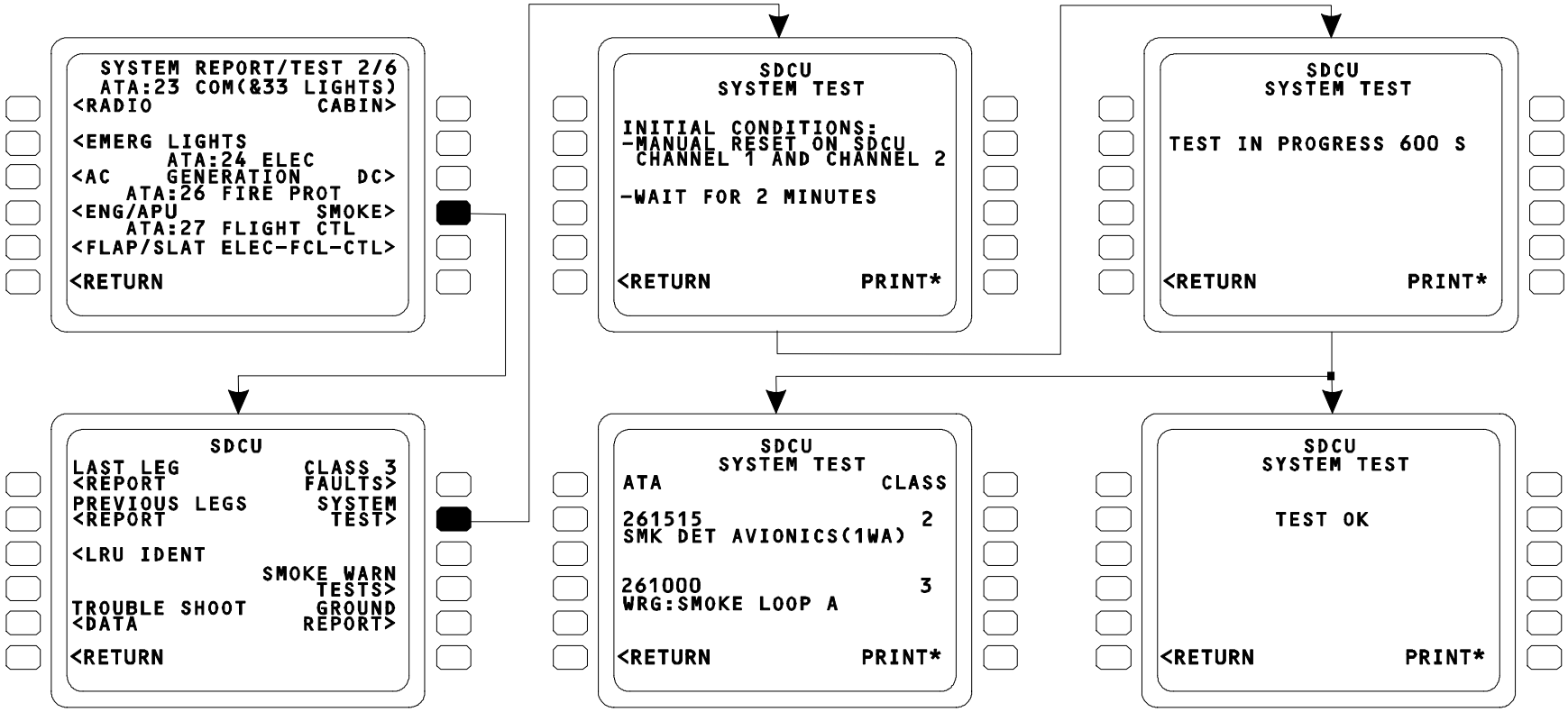
General
SystemTest
Smoke Warning Tests

GENERAL

This is the SDCU maintenance main menu. Only two functions are specific to the SDCU the other functions are standard and are described in the ATA 45 course.

SYSTEM TEST

During the SDCU system test, the avionics smoke detector loops, the FWD, AFT and BULK cargo compartment smoke detector loops and the lavatory smoke detectors will be tested.
After approximately 2 minutes the "TEST IN PROGRESS 600 S" message is shown. The test shall be aborted if the "RETURN" key is selected. Fault information is displayed identical to "LAST LEG REPORT" screen format, refer to ATA 45 chapter. If the test is positive (no faulty LRUs), then the "TEST OK" message is displayed.



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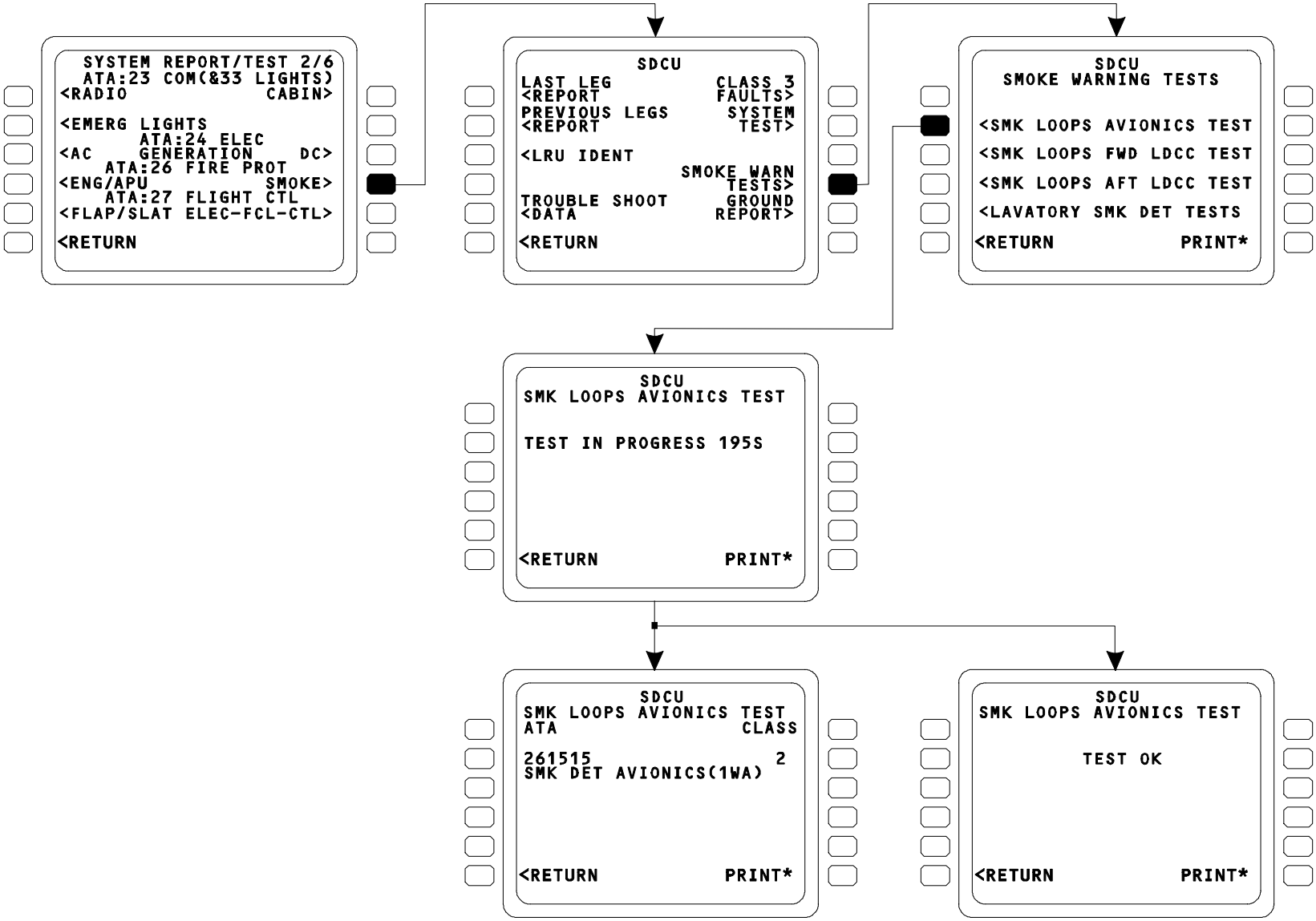
SMOKE WARNING TESTS

Only one item is described, the other items are identical.

During the SMoKe LOOPS AVIONICS TEST, the smoke avionics loops warning and components are tested.

The "TEST IN PROGRESS 195 S" message is shown. The test shall be aborted if the "RETURN" key is selected. Fault information is displayed identical to "LAST LEG REPORT" screen format, refer to ATA 45 chapter. If the test is positive (no faulty LRUs), then the "TEST OK" message is displayed.



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STUDENT NOTES

APU FIRE PROTECTION :
APU AUTO EXTINGUISHING GROUND TEST

General
Unit Test
Extinguishing Test
Test Results
Reset

GENERAL

The auto extinguishing ground test checks the automatic fire extinguishing system. You can use SYSTEM REPORT/TEST of the Central Maintenance System to do this test only when the aircraft is on the ground

UNIT TEST

The unit test checks the functions of the Automatic Fire Extinguishing Control Unit (AFECU).
The unit makes sure that between 3 and 5 seconds :
- The K1 TEST relay is on,
- The 28VDC manual test FDU (7WF relay is on) output signal is on,
- The loop A (FIRE A)and loop B (FIRE B) input signals are on,
- The K2 AUTO DISCH relay and K3 AUTO PUSH relay are on,
- The self test is on,
- The discrete inputs and outputs are correct.

Then between 6.8 and 7 seconds it makes sure that :
- The 28VDC manual test FDU (7WF relay is off) output signal is off,
- The loop A (FIRE A) and loop B (FIRE B) input signals are off,
- The K2 AUTO DISCH relay and K3 AUTO PUSH relay are off,
- The K1 TEST relay is off.

EXTINGUIHING TEST

The extinguishing test checks the squib A and B and the pressure switch.
The extinguishing test between 3 and 5 seconds :
- Measures the resistance of the squibs A and B and compares the value with the theorical resistance in the non volatile memory,
- Checks that there is no short circuit between :
squib A and B, squib A and DC ground, squib B and DC ground,
- Makes sure that the pressure switch is in the correct condition.

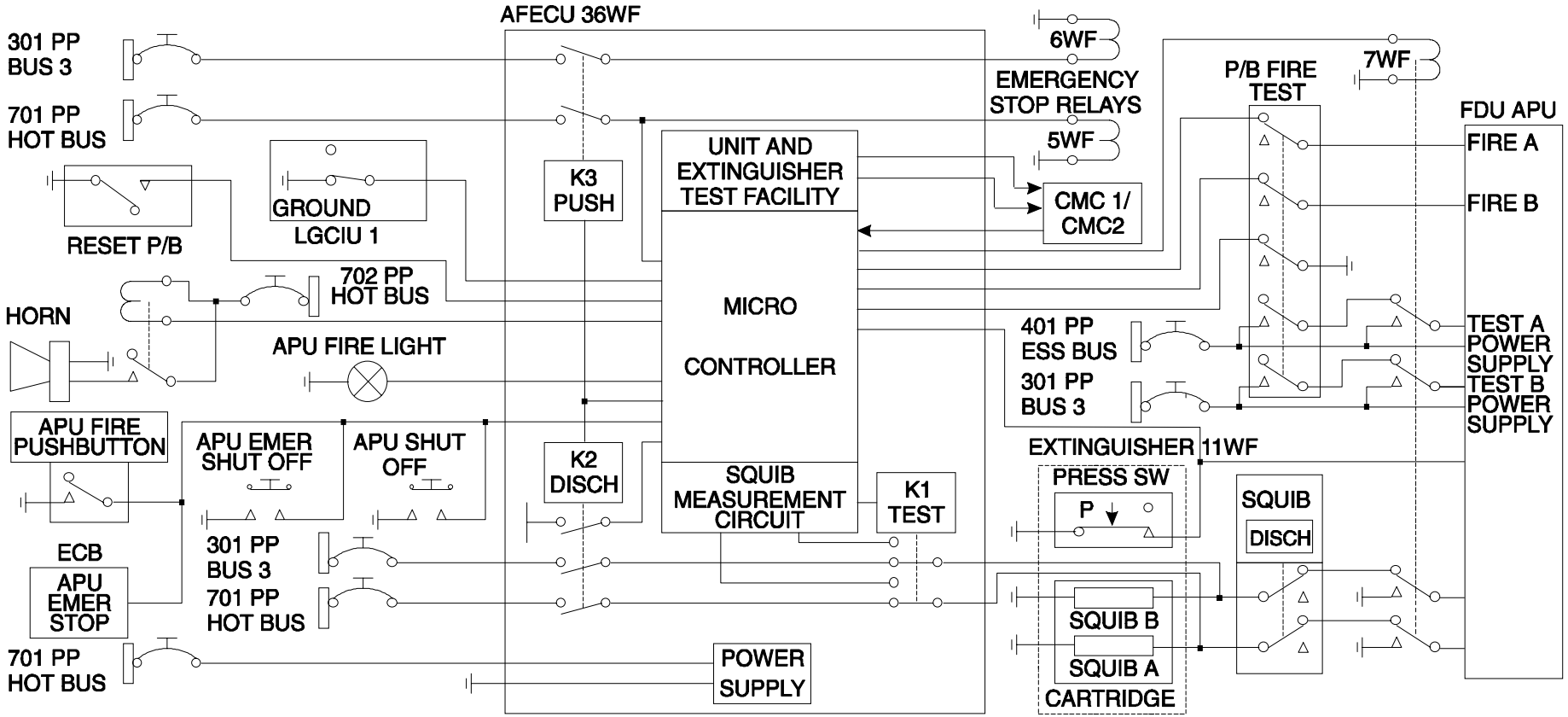
TEST RESULTS

If the extinguishing test and unit test are correct, the AFECU transmits a signal to the CMC between 7 and 8 seconds after the beginning of the test. The MCDU shows the subsequent message : "TEST OK". If the extinguisher test is not correct the MCDU shows the subsequent failure message : 262241 EXTINGUISHER (11WF). If the unit test is not correct the MCDU shows the subsequent failure message: 262234 UNIT (36WF).
NOTE :

If the extinguishing test and the unit test are not correct the MCDU shows the two messages at the same time.

RESET

After 8 seconds the AFECU automatically starts a master reset and all the functions return to the start position.



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STUDENT NOTES