

CHAPTER

26

Fire Protection

CHAPTER 26
FIRE PROTECTION

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FIRE PROTECTION - INTRODUCTION

Purpose

The fire and overheat protection systems monitor the airplane for these conditions:

- Fire
- Smoke
- Overheat
- Pneumatic duct leaks.

Fire/Overheat Detection

The airplane has these fire/overheat detection systems:

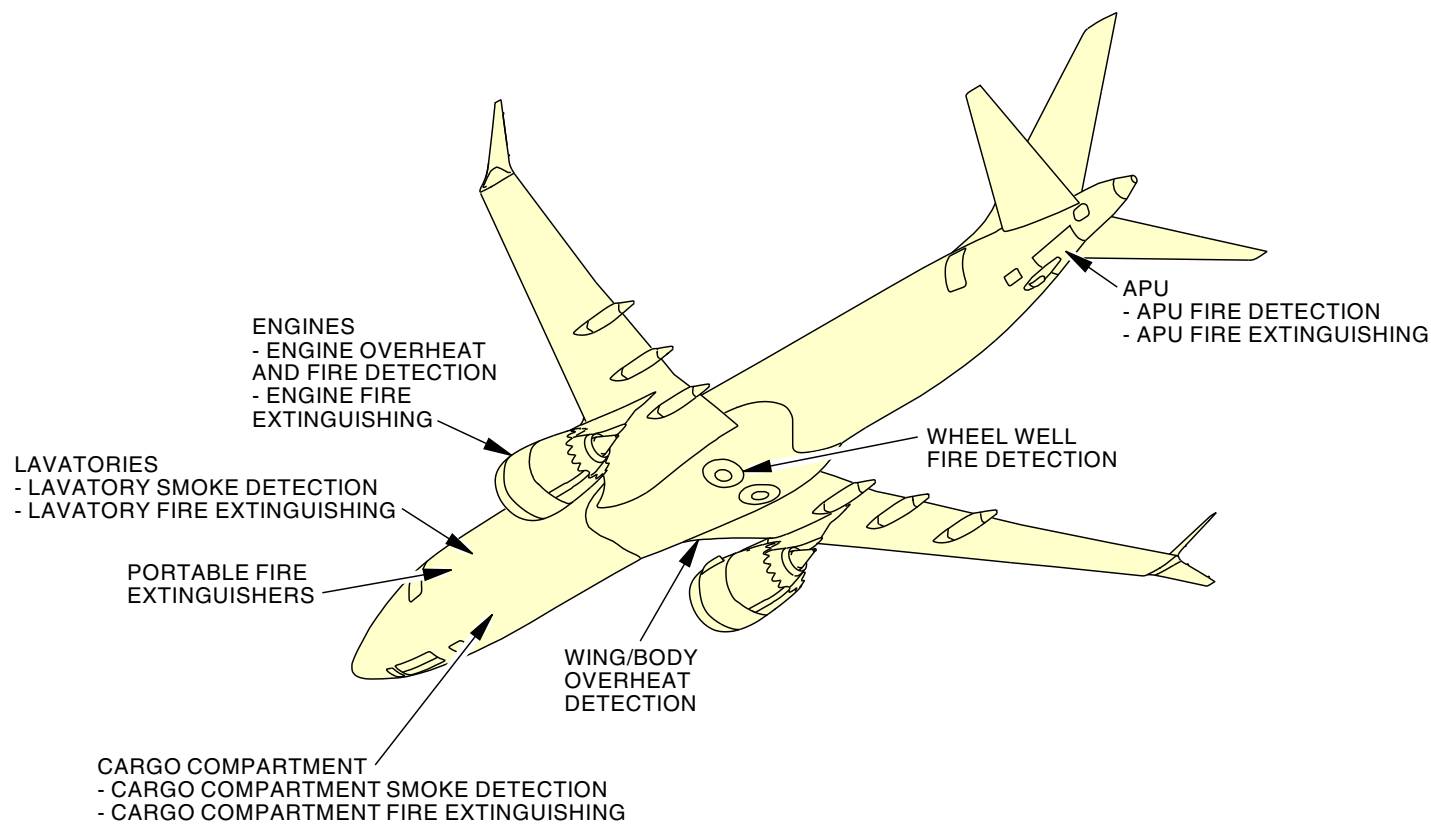
- Engine overheat detection
- Engine fire detection
- APU fire detection
- Wheel well fire detection
- Wing/Body overheat detection
- Cargo compartment smoke detection
- Lavatory smoke detection.

Extinguishing

The airplane has these fire extinguishing systems:

- Engine
- APU
- Lavatory
- Cargo compartment
- Portable fire extinguishers.

FIRE PROTECTION - INTRODUCTION



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FIRE PROTECTION - INTRODUCTION

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**FIRE PROTECTION - FIRE ALARMS - FUNCTIONAL DESCRIPTION****Purpose**

The fire alarms provide visual and aural indication of a fire in these systems:

- Engine 1
- Engine 2
- APU
- Forward cargo compartment
- Aft cargo compartment
- Main wheel well.

The two red FIRE WARN lights, bell, and horn are reset by removal of the ground. The reset is done by a momentary push on one of these:

- Left FIRE WARN light
- Right FIRE WARN light
- Bell cutout switch on P8
- Horn cutout switch on the P28 panel.

Visual and Aural Indications

When there is a fire, these are the visual and aural indications:

- Two red FIRE WARN lights on the P7 panel come on
- Bell in the aural warning unit comes on
- Red light and horn on alternately in the right main wheel well come on for an APU fire when the airplane is on the ground.

Functional Description

When there is a fire in the engine, the engine and APU fire detection module provides a ground for the two red FIRE WARN lights and the bell.

When there is a fire in the APU, the engine and APU fire detection module provides a ground for the two red FIRE WARN lights and the bell. The same module provides power for the red light and horn on the P28 panel.

When there is a fire in the main wheel well, the compartment overheat detection controller provides a ground for the two red FIRE WARN lights and the bell.

When there is smoke in the forward or aft cargo compartment, the cargo electronic unit provides a ground for the two red FIRE WARN lights and the bell.

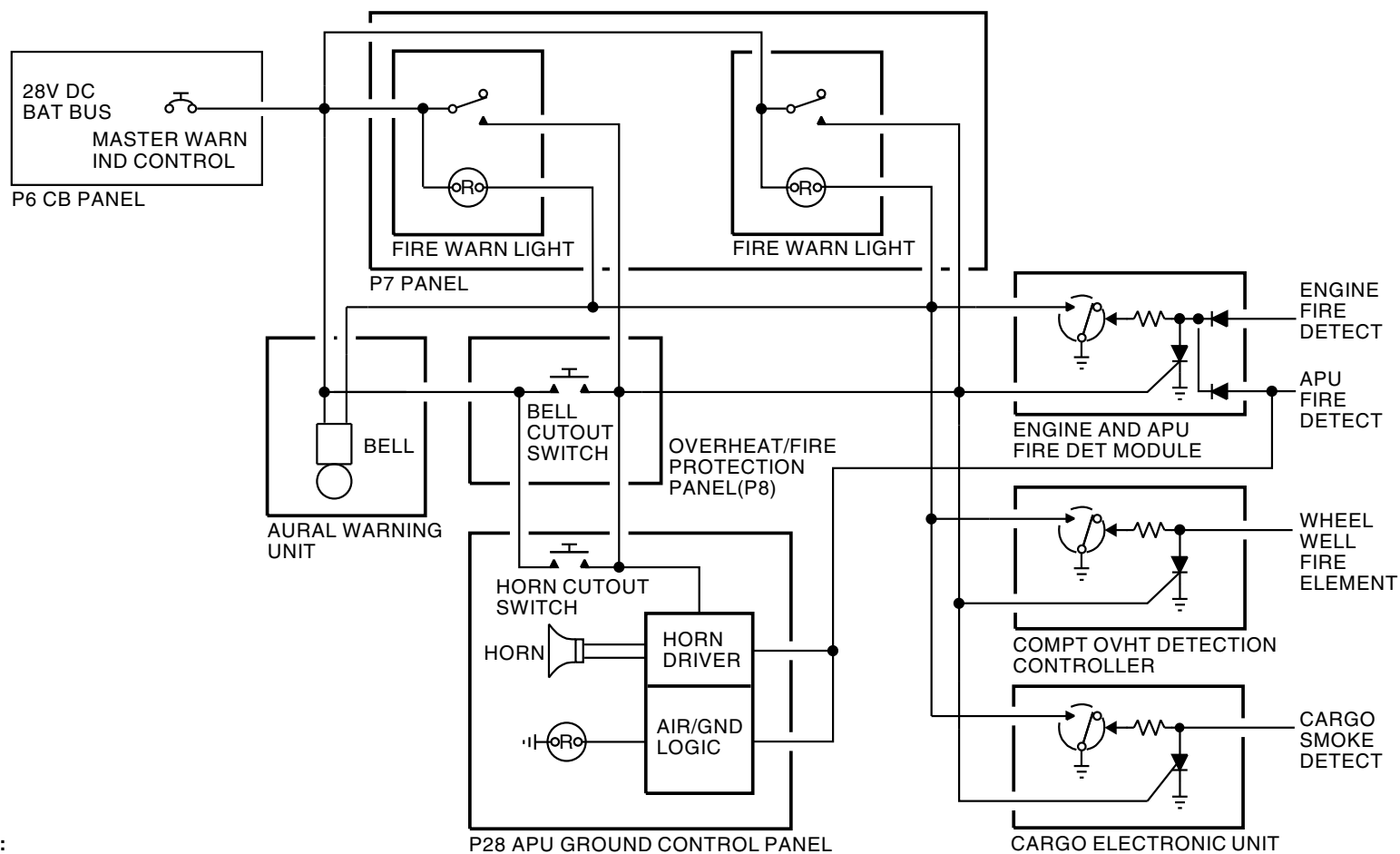
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FIRE PROTECTION - FIRE ALARMS - FUNCTIONAL DESCRIPTION



NOTE:

FIRE WARNINGS AND INDICATIONS ARE
DUPLICATED FOR BOTH CAPTAIN AND FIRST
OFFICER ON EACH OFFICER'S PANEL.

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FIRE PROTECTION - FIRE ALARMS - FUNCTIONAL DESCRIPTION

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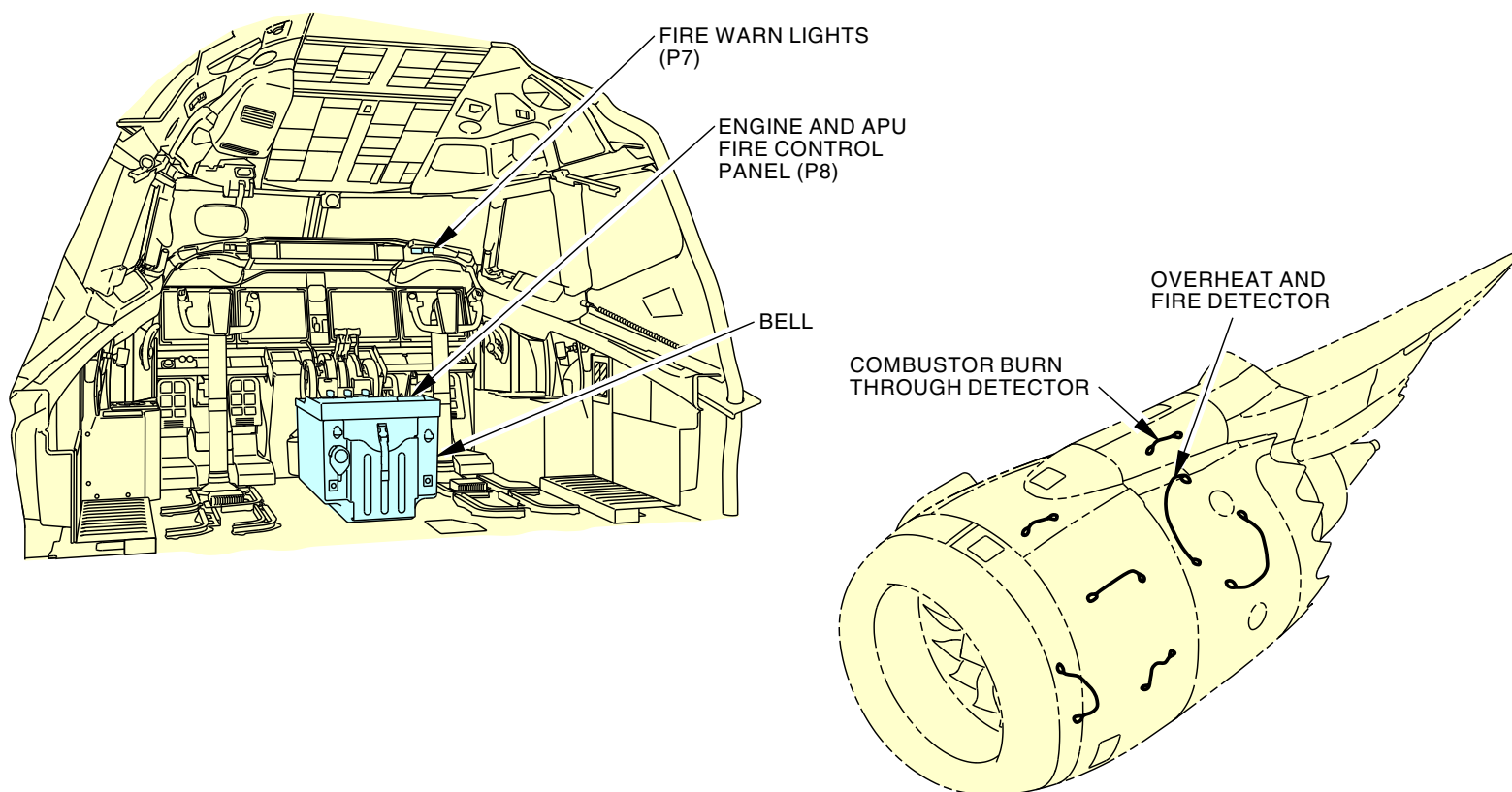
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**FIRE PROTECTION - ENGINE FIRE DETECTION - INTRODUCTION****Purpose**

The engine overheat and fire detection system uses detectors on the engine. The detectors monitor engines for overheat and fire conditions. When the system senses an overheat or a fire condition, alarm indications operate in the flight compartment. The indications are on the P7 glareshield panel and on the engine and APU fire control panel. A bell also operates in the flight compartment for an engine fire.

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FIRE PROTECTION - ENGINE FIRE DETECTION - INTRODUCTION



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FIRE PROTECTION - ENGINE FIRE DETECTION - INTRODUCTION

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**FIRE PROTECTION - ENGINE FIRE DETECTION - GENERAL DESCRIPTION****General Description**

These are the components for engine overheat and fire:

- Engine overheat/fire detector (loop A and loop B)
- Engine and APU fire detection module
- Glareshield, P7 panel
- Engine and APU fire control panel
- Aural warning unit.

Overheat/fire detectors on the engine send signals to the engine and APU fire detection module. This module will supply aural and visual indications in the flight compartment.

The engine and APU fire detection module gives visual indications for detector faults on the module and the engine and APU fire control panel.

Overheat/fire test

You use the TEST switch on the engine and APU fire control panel. In the OVHT/FIRE position, the indications in the flight compartment are the same as for the real fire condition. If the test fails, use the engine and APU fire detection module to isolate the fault.

NOTE: During the engine overheat/fire test, the APU fire and wheel well fire circuits are also tested.

Fault/inop test

You use the TEST switch on the engine and APU fire control panel. In the FAULT/INOP position, the indications in the flight compartment are the same as a real fault condition. If the test fails, use the engine and APU fire detection module to isolate the fault.

NOTE: During engine fault test, the APU fire detector fault circuit is tested.

NOTE: The fire bell will stop approximately 1.5 to 4 seconds after you release the OVHT/FIRE Test switch. This is due to the new software application on the engine and APU detection module.

Single Loop Operation

If an engine overheat/fire detector fails to operate, the engine and APU fire detection module automatically changes to single loop operation. In the single loop mode, only one loop must detect an overheat or fire condition for the engine and APU fire detection module to give the alarm condition.

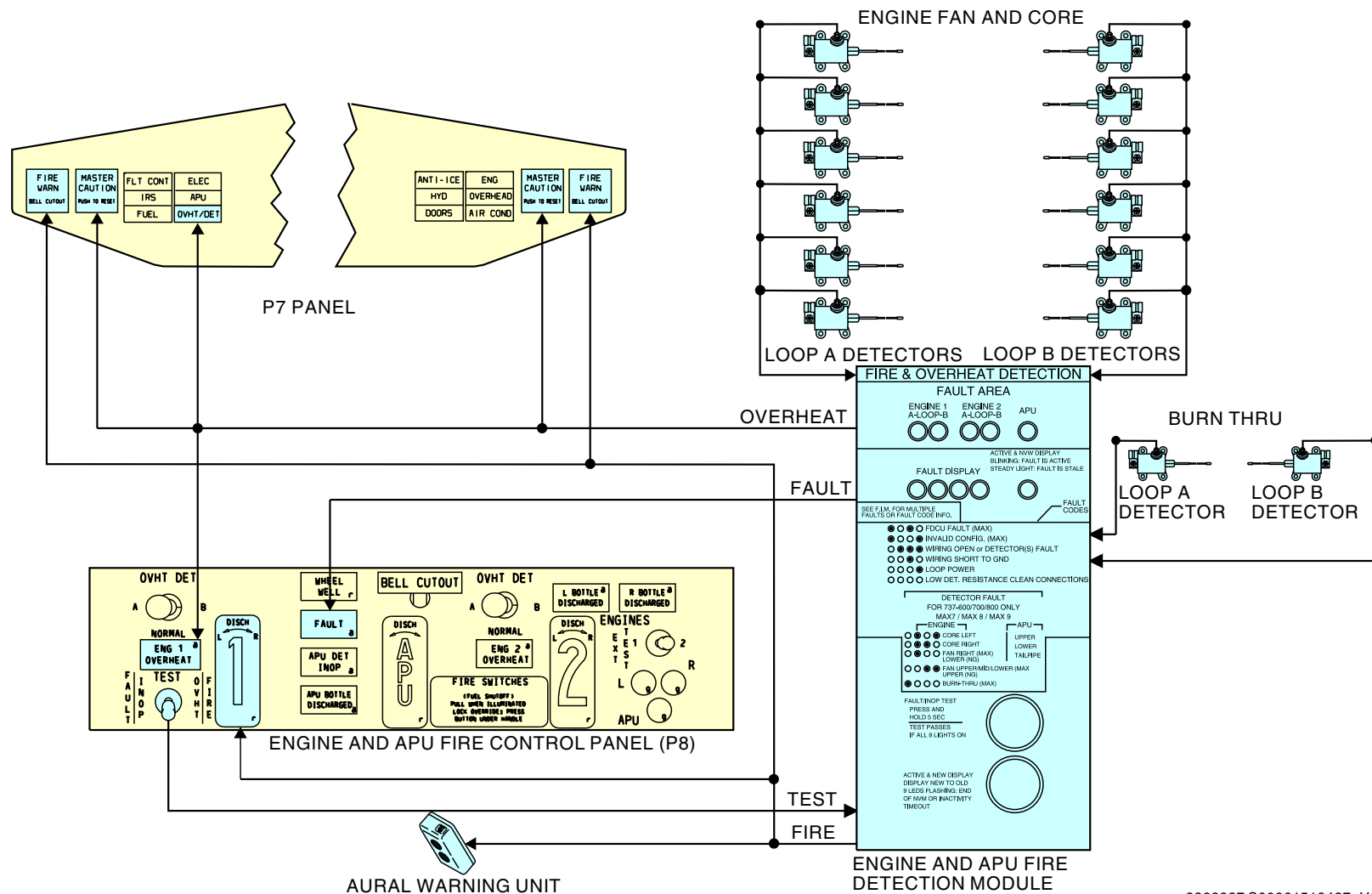
There is no indication in the flight compartment of single loop operation until you do the OVHT/FIRE test.

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FIRE PROTECTION - ENGINE FIRE DETECTION - GENERAL DESCRIPTION



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FIRE PROTECTION - ENGINE FIRE DETECTION - GENERAL DESCRIPTION

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**FIRE PROTECTION - ENGINE FIRE DETECTION - ENGINE FIRE DETECTORS****Purpose**

The engine fire detectors monitor for high temperatures in the engine area.

General Description

Each engine has fourteen detectors. The detectors monitor seven sections of the engine. In each section, two detectors attach to a support tube and make an assembly. An assembly has one detector from loop A and one from loop B.

Physical Description

The engine fire detectors have these parts:

- Overheat, fire, and fault pressure switches
- Resistors
- Terminal stud
- A stainless steel, gas charged tube.

Location

These are the locations of the engine fire detectors:

- Two on the upper fan case section
- Two on the lower fan case section
- Two on the right side fan case section
- Two on the left side mid fan case section
- Two on the left core section
- Two on the right core section
- Two on the combustor burn-thru section.

Detector Characteristics

Each engine has fourteen fire detectors. The detectors monitor seven sections of the engine. In each section, two detectors attach to a support tube and make a fire detector assembly. An assembly has one detector from loop A and one from loop B. There are seven engine fire detector assemblies and two loops.

This table shows the temperature characteristics of the detectors.

Detector Location	Overheat	Fire
Upper Fan Case	300°F (149°C)	530°F (277°C)
Lower Fan Case	300°F (149°C)	530°F (277°C)
Right Side Fan Case	300°F (149°C)	530°F (277°C)
Left Side Mid Fan Case	300°F (149°C)	530°F (277°C)
Left Core Section	650°F (343°C)	850°F (454°C)
Right Core section	650°F (343°C)	850°F (454°C)
Combustor Burn-Thru Section	650°F (343°C)	850°F (454°C)

Operation

The three pressure switches sense these conditions:

- Overheat
- Fire
- Fault (loss of gas pressure).

Gas pressure in the sense tube holds the fault pressure switch in the closed position. The other two pressure switches close when the gas pressure increases because of an overheat or fire condition.

The overheat and fire signals go to the engine and the APU fire detection module. This module supplies overheat or fire indication in the flight compartment.

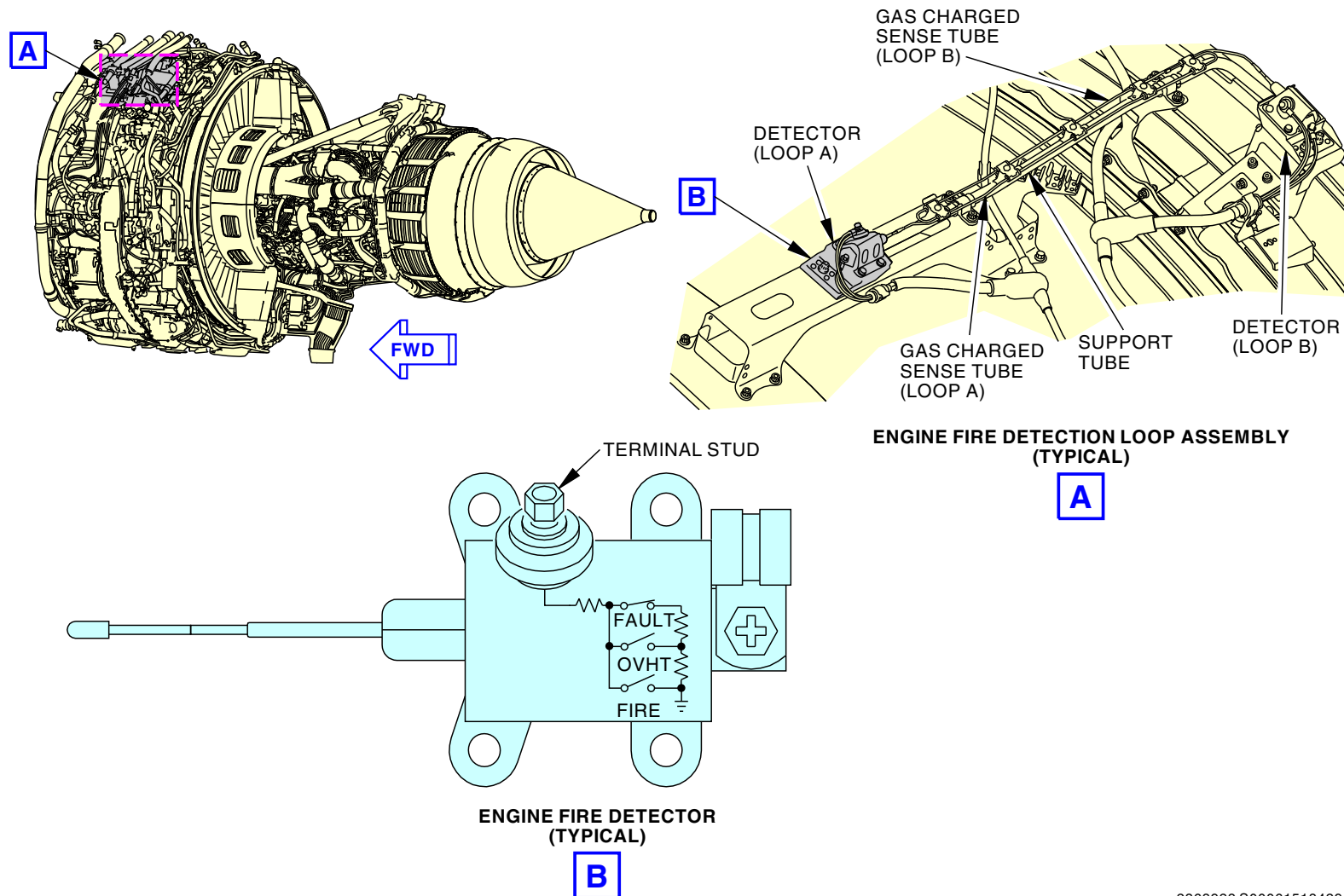
If the pressure in the sense tube decreases, the fault switch opens. This switch sends the fault signal to the engine and APU fire detection module.

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FIRE PROTECTION - ENGINE FIRE DETECTION - ENGINE FIRE DETECTORS



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FIRE PROTECTION - ENGINE FIRE DETECTION - ENGINE FIRE DETECTORS

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**FIRE PROTECTION - ENGINE FIRE DETECTION - ENGINE AND APU FIRE DETECTION MODULE****Purpose**

The engine and APU fire detection module monitors detectors for overheat and fire conditions on the engine. Also it monitors for fire conditions on the APU.

Physical Description

The control circuits for the engine overheat and fire, and the APU fire detection are in the module. The front panel has these components:

- ENGINE 1 LOOP A amber fault light
- ENGINE 1 LOOP B amber fault light
- ENGINE 2 LOOP A amber fault light
- ENGINE 2 LOOP B amber fault light
- APU amber fault light
- Four red FAULT DISPLAY lights
- FAULT/INOP test switch.

Location

The engine and APU fire detection module is on the electronic equipment compartment on the E2-2 shelf.

Operation

During normal conditions, all front panel lights are off. When a fault condition occurs, the related FAULT AREA light comes on. The FAULT DISPLAY lights show a fault code.

When you push the FAULT/INOP test switch, faults are simulated to do a check of the circuit ability to detect a fault. If the circuits operate correctly, all lights on the front panel come on. If a light does not come on, it shows a faulty circuit operation.

The FAULT DISPLAY lights show the type of fault and the detector location.

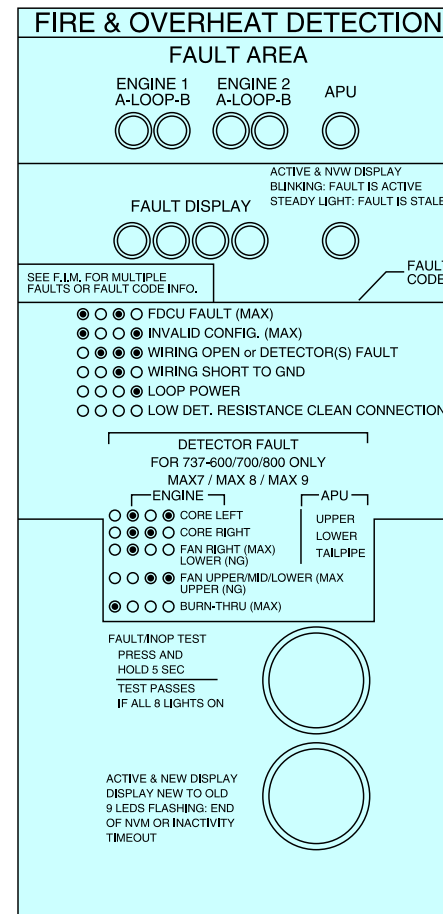
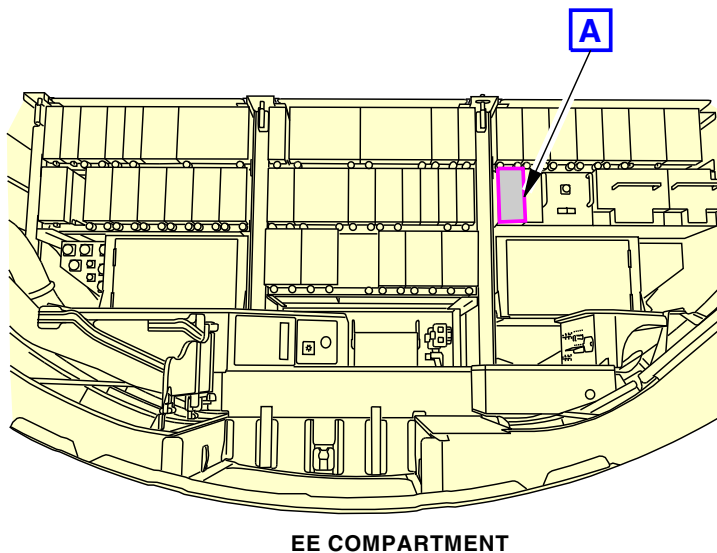
Fault Signal Priorities

When there are multiple engine loop faults (two or more amber lights on), this is the display priority:

Highest Priority	Engine 1	Loop A
	Engine 1	Loop B
	Engine 2	Loop A
	Engine 2	Loop B
Lowest Priority	APU	

If there is more than one fault, the lower priority fault does not show until you isolate the higher priority fault.

FIRE PROTECTION - ENGINE FIRE DETECTION - ENGINE AND APU FIRE DETECTION MODULE



ENGINE AND APU FIRE DETECTION MODULE (E2-2)

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FIRE PROTECTION - ENGINE FIRE DETECTION - ENGINE AND APU FIRE DETECTION MODULE

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**FIRE PROTECTION - ENGINE FIRE DETECTION - FUNCTIONAL DESCRIPTION****Functional Description**

The OVHT DET switch on the engine and APU fire control panel permits selection of the mode of operation. Each switch has these positions:

- NORMAL - makes loop A and loop B agree before the alarm condition operates
- A - makes loop A the only sense authority
- B - makes loop B the only sense authority.

At the overheat temperature set point, the gas expands in the detector and closes the OVERHEAT pressure switch. This decreases the resistance of the detector.

The engine and APU fire detection module uses this decrease in resistance to set the overheat condition. These are the results of an overheat condition:

- MASTER CAUTION and OVHT/DET annunciator lights come on
- Related engine fire handle switch unlocks
- Related ENG OVERHEAT light comes on.

At the fire temperature set point, the gas expands more to close the FIRE pressure switch in the detector. This decreases the resistance further.

The engine and APU fire detection module uses this signal to set the fire condition. These are the results of a fire condition:

- Two red FIRE WARN lights
- Aural warning unit bell
- Related engine fire warning switch lights
- Related overheat indications stay on.

The FAULT/INOP test does a check of the module fault detection circuitry and related flight compartment indications. These are the indications of a good FAULT/INOP test:

- MASTER CAUTION and OVHT/DET annunciator lights come on
- Amber FAULT light comes on
- Amber APU DET INOP light comes on

- All FAULT AREA display lights on the engine and APU fire detection module come on
- All FAULT DISPLAY lights on the engine and APU fire detection module come on after five seconds.

NOTE: YOU CAN ALSO DO THE FAULT INOP TEST AT THE ENGINE AND APU FIRE DETECTION MODULE. THE INDICATIONS IN THE FLIGHT COMPARTMENT WILL BE THE SAME.

The OVHT/FIRE test does a check of the module overheat and fire detection circuitry and flight compartment indications. These are the indications of a good OVHT/FIRE test:

- MASTER CAUTION and OVHT/DET lights come on
- Two red FIRE WARN lights come on
- ENG 1, ENG 2, and APU fire handle switch lights come on
- Amber ENG 1 and ENG 2 OVERHEAT lights come on
- Red WHEEL WELL light comes on (115v ac power is necessary)
- Aural warning unit bell sounds
- APU remote control panel horn and red light come on
- ENG 1, ENG 2, and APU fire handle switches unlock.

Fire/Overheat Detection System Logic Table - Both Loops Operative

Condition		Flight Deck Display		
Loop (A or B)	Other Loop	Normal Operation	Fire/Overheat Test	Fault/Inop Test
Normal	Normal	None	Fire & Overheat	Fault
Normal	Power Failure	None	Fault Light (note that fire handle will not illuminate)	Fault
Normal	Fault	None	Fault (note that fire handle will not illuminate)	Fault

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FIRE PROTECTION - ENGINE FIRE DETECTION - FUNCTIONAL DESCRIPTION

(Continued)

Condition		Flight Deck Display		
Normal	Overheat	None	None	Fault Light
Normal	Fire	None	None	Fault Light
Fault	Power Failure	Fault	Fault	Fault
Fault	Fault	Fault	Fault	Fault
Fault	Overheat	Overheat	Fire & Overheat	Overheat
Fault	Fire	Fire & Overheat	Fire & Overheat	Fire & Overheat
Power Failure	Power Failure	Fault	Fault	Fault
Power Failure	Overheat	Overheat	Fire & Overheat	Overheat
Power Failure	Fire	Fire & Overheat	Fire & Overheat	Fire & Overheat
Overheat	Overheat	Overheat	Fire & Overheat	Overheat
Overheat	Fire	Overheat	Fire & Overheat	Overheat
Fire	Fire	Fire & Overheat	Fire & Overheat	Fire & Overheat

Condition	Flight Deck Display		
Overheat	Overheat	Fire & Overheat	Overheat (test is inhibited due to overheat)
Fire	Fire & Overheat	Fire & Overheat	Fire & Overheat (test is inhibited due to fire)

Fire/Overheat Detection System Logic Table - Single Engine Loop Operative

Condition	Flight Deck Display		
Loop (A or B)	Normal Operation	Fire/Overheat Test	Fault/Inop Test
Normal	None	Fire & overheat	Fault
Fault	Fault	Fault	Fault
Power Failure	Fault	Fault	Fault

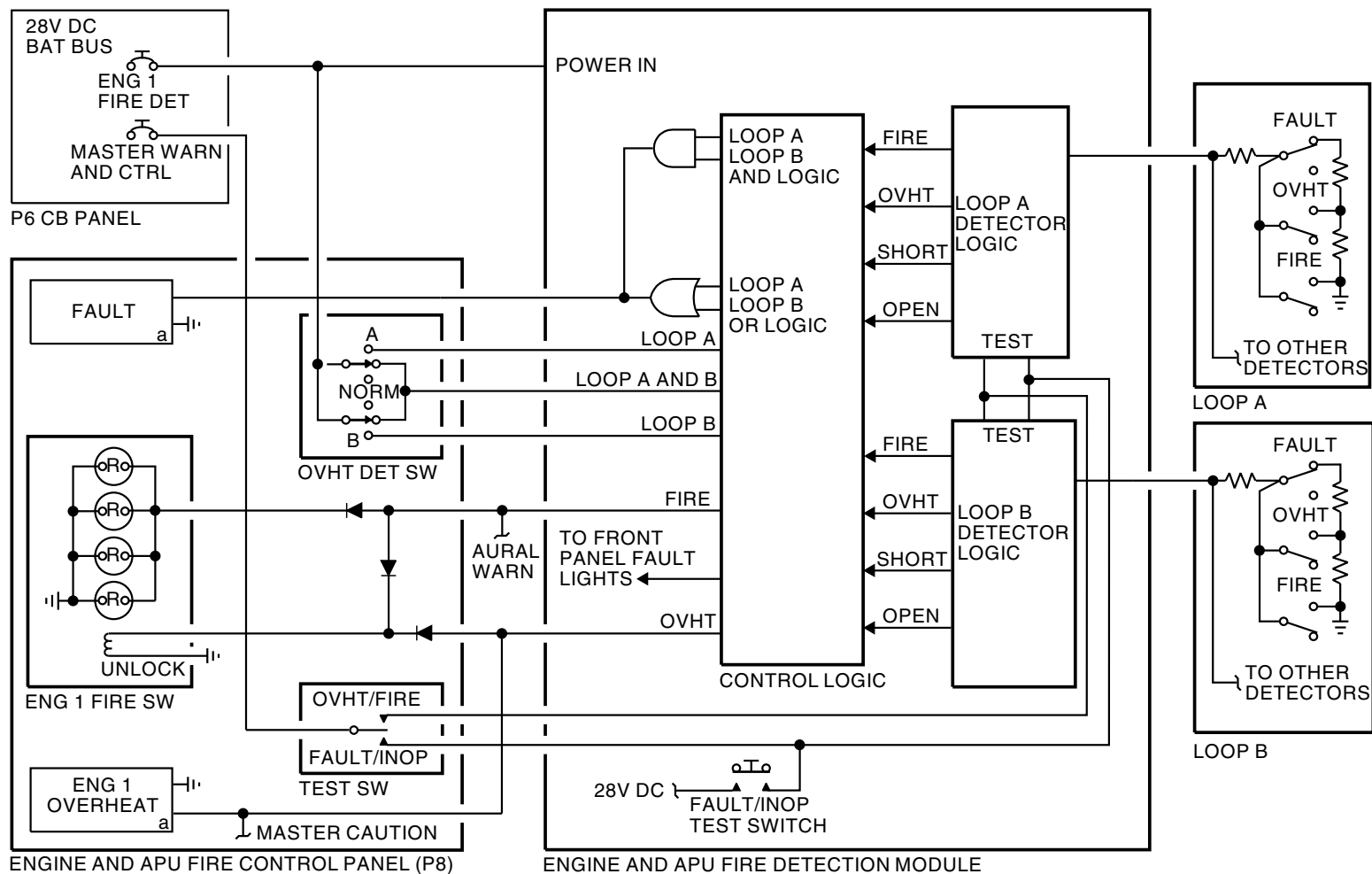
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FIRE PROTECTION - ENGINE FIRE DETECTION - FUNCTIONAL DESCRIPTION



NOTE:
ONLY ENG 1 DETAILS ARE SHOWN FOR CLARITY ON P8.

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FIRE PROTECTION - ENGINE FIRE DETECTION - FUNCTIONAL DESCRIPTION

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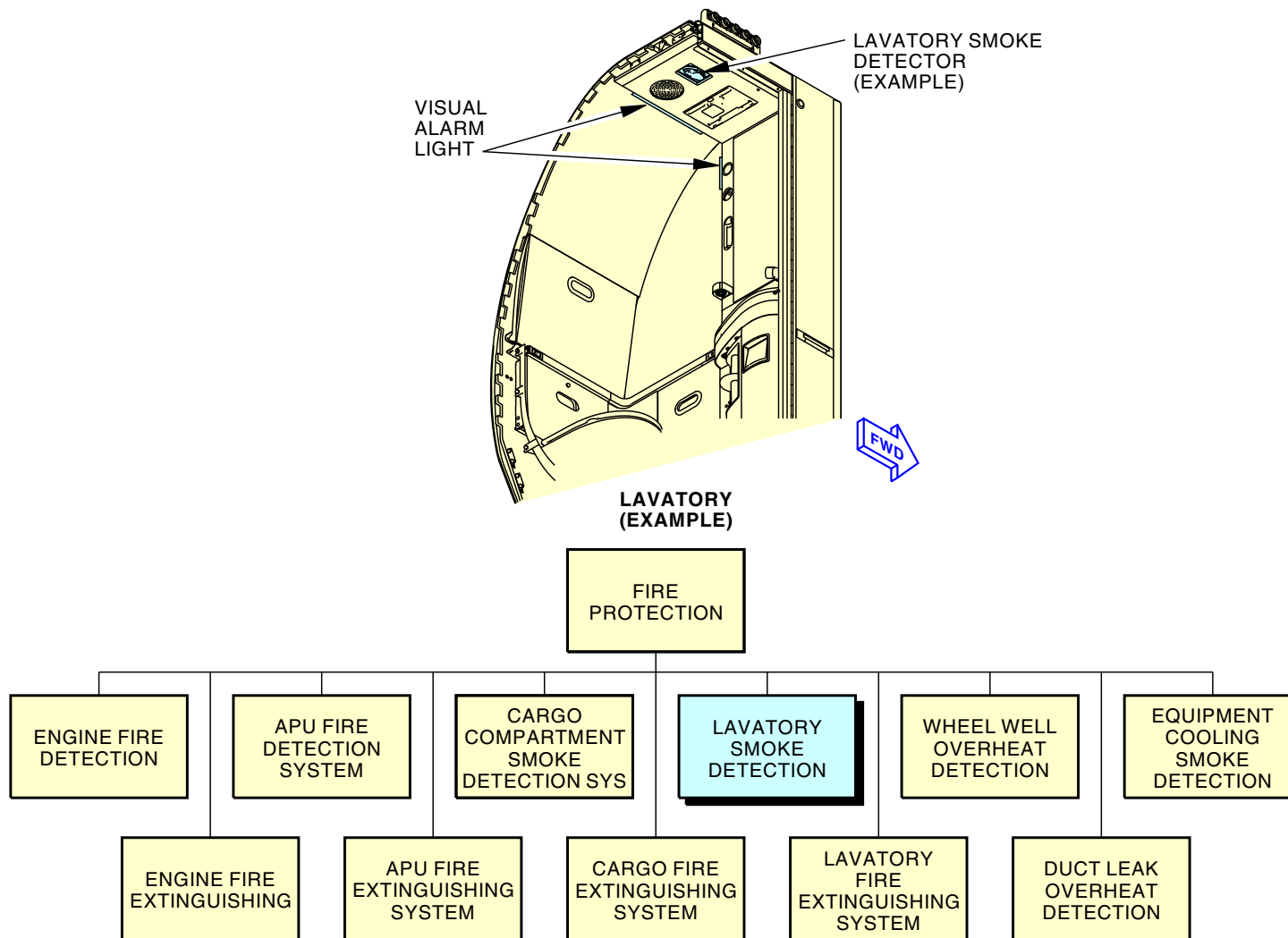
FIRE PROTECTION - LAVATORY SMOKE DETECTION - INTRODUCTION

Purpose

The lavatory smoke detection system alerts the flight compartment and cabin crews to smoke conditions in the lavatories. A smoke detector is in the ceiling of each lavatory.

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FIRE PROTECTION - LAVATORY SMOKE DETECTION - INTRODUCTION



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FIRE PROTECTION - LAVATORY SMOKE DETECTION - INTRODUCTION

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FIRE PROTECTION - LAVATORY SMOKE DETECTION - GENERAL DESCRIPTION

General

The smoke detection system gives aural and visual alarm indications when smoke is detected in a lavatory.

Interfaces

The lavatory smoke detector can have the possible interfaces:

- Electrical power.
- Lavatory call circuitry
- Flight data recorder system
- Flight compartment indications
- Attendant panel

Electrical Power

The smoke detection system uses 28v dc from bus 1.

Lavatory Call Circuitry

- The lavatory call reset switch (amber) on the outside of the lavatory above the door flashes when the lavatory smoke detector inside of that lavatory finds smoke. The smoke condition overrides the usual lavatory call indications.
 - The master lavatory call light (amber) on the forward and aft exit locator signs flash when any lavatory smoke detector finds smoke in a lavatory.
- The passenger address system turns on a chime that cycles on/off when a lavatory smoke detector finds smoke in a lavatory.

Flight Compartment Indications

The lavatory smoke detection system has an interface with the flight compartment to cause these indications:

- Master caution system for the CAUTION lights and the OVERHEAD light
- Lavatory SMOKE light on the P5 forward overhead panel

Flight Data Recorder System

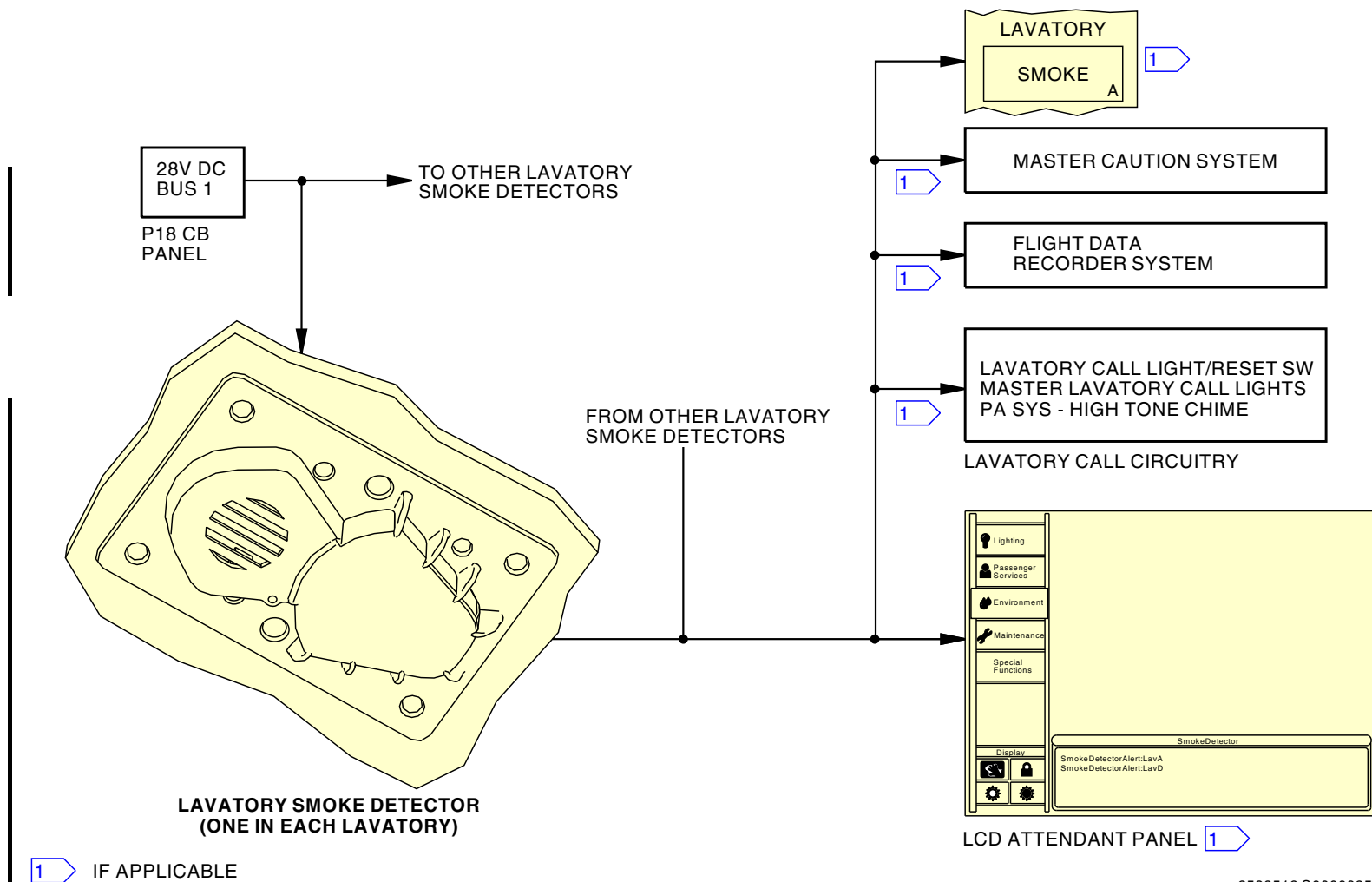
The smoke detection system gives data to the flight data recorder system when any lavatory smoke detector finds smoke.

Attendant Panel Interface

The attendant panel monitors the smoke detector status in the lavatories. When smoke is detected, the environment screen on the forward and aft attendant panel will show where smoke is detected. The Environment tab flashes amber in 1 second intervals. The location of the smoke detector alarm shows in the Smoke Detector window. The flight attendant must reset the smoke detector for the warning to disappear.

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FIRE PROTECTION - LAVATORY SMOKE DETECTION - GENERAL DESCRIPTION



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FIRE PROTECTION - LAVATORY SMOKE DETECTION - GENERAL DESCRIPTION

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**FIRE PROTECTION - LAVATORY SMOKE DETECTION - LAVATORY SMOKE DETECTOR****Purpose**

The lavatory smoke detector monitors the lavatory for smoke and gives aural and visual warnings when smoke is detected.

NOTE: Cigarette smoke may not trigger the lavatory smoke detectors.

Location

The smoke detector is in the ceiling of each lavatory.

Detector Operation

The sensor compares the wavelengths of a red and a blue light emitting diode (LED). The different color LEDs reflect different wavelengths into the photo diode. The detector measures the strength of the light while the LEDs are exposed to particulates. If the signals indicate smoke, the unit responds with an alarm. The unit can also sense an overheat condition and it will give an alarm at 100C.

The LED status indicator on the detector will be green or red. When detector power is first applied, the LED is red then green to show normal operation. Normal operation the LED stays green. When the sensor senses smoke or heat, the LED turns red and the internal horn will operate. These will stay on until the horn cancel switch is pushed or the sensor no longer senses smoke.

The HORN CANCEL switch does not have a label. The HORN CANCEL switch is recessed. A small tool or probe is necessary to operate it. When you press and release the horn cancel switch, the horn will stop sounding. The LED will stay red if smoke is still sensed. The red LED will go off when the smoke sensor no longer senses smoke.

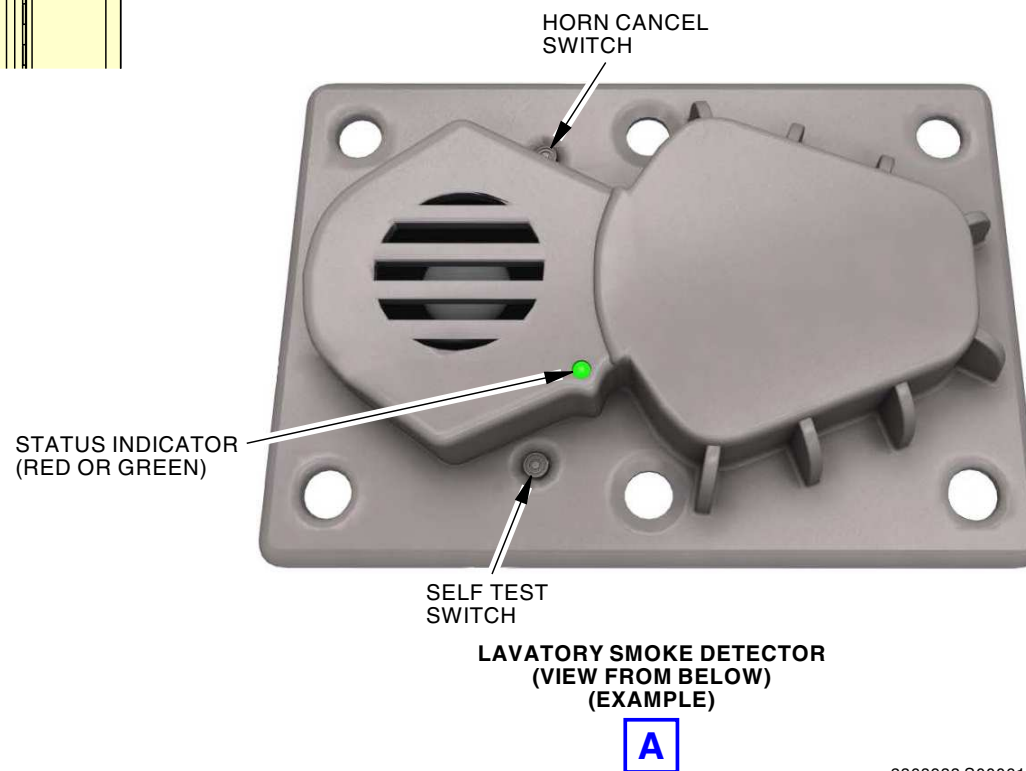
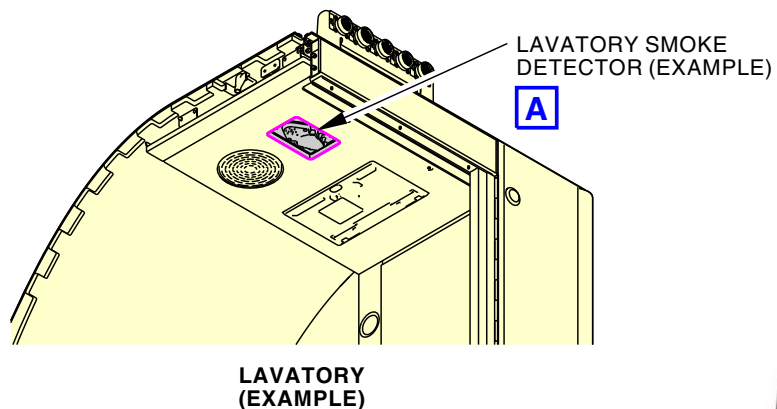
If there is a fault when power is first applied, the LED will be constant red. During operation if there is a fault, the LED will flash red at 33Hz.

If the smoke detector operates but maintenance is necessary, the LED will flash green at 33Hz.

The SELF TEST switch does not have a label. The SELF TEST switch is recessed. A small tool or probe is necessary to operate it. Use the SELF TEST switch to do a test of the smoke detector. If the detector is operating normally, the horn will operate and the red LED and external indications will be on (see Functional Description).

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FIRE PROTECTION - LAVATORY SMOKE DETECTION - LAVATORY SMOKE DETECTOR



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FIRE PROTECTION - LAVATORY SMOKE DETECTION - LAVATORY SMOKE DETECTOR

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**FIRE PROTECTION - LAVATORY SMOKE DETECTION - FUNCTIONAL DESCRIPTION****Power**

Bus 1 gives 28v dc for the lavatory smoke detection system. All photoelectric smoke detectors have a multi-color STATUS INDICATOR LED. The LED is green when a detector has power and there are no faults.

Monitoring

The smoke sensor in each detector monitors for smoke density above a preset limit. If the density stays above the limit for appropriately eight seconds, the sensor set the detector to the alarm condition.

Alarm

The alarm condition causes these indications inside of the lavatory:

- The STATUS INDICATOR LED on the smoke sensor turns steady red.
- The horn inside the smoke detector turns on.

The alarm condition can cause these possible indications outside of the lavatory:

- The lavatory call reset switch above the lavatory door flashes at 33 Hz.
- The applicable master lavatory call light on the exit locator sign flashes.
- The passenger address systems gives a high tone chime that repeats.
- A smoke detection warning message appears in the Smoke Detector Monitor window of the Attendant Panel indicating which lavatory smoke detectors have been activated.
- The lavatory SMOKE light (amber) on the P5 forward overhead panel and the master caution lights illuminate.

Pushing the lavatory call reset switch has no effect on the flashing light or smoke alarm status.

Reset

You use the HORN CANCEL switch on the detector to stop all alarm indications and to reset the smoke sensor. The alarm indications stay off after you release the HORN CANCEL switch if the smoke density is below a preset limit. If smoke density is above a preset limit, then the alarm indications turn on again.

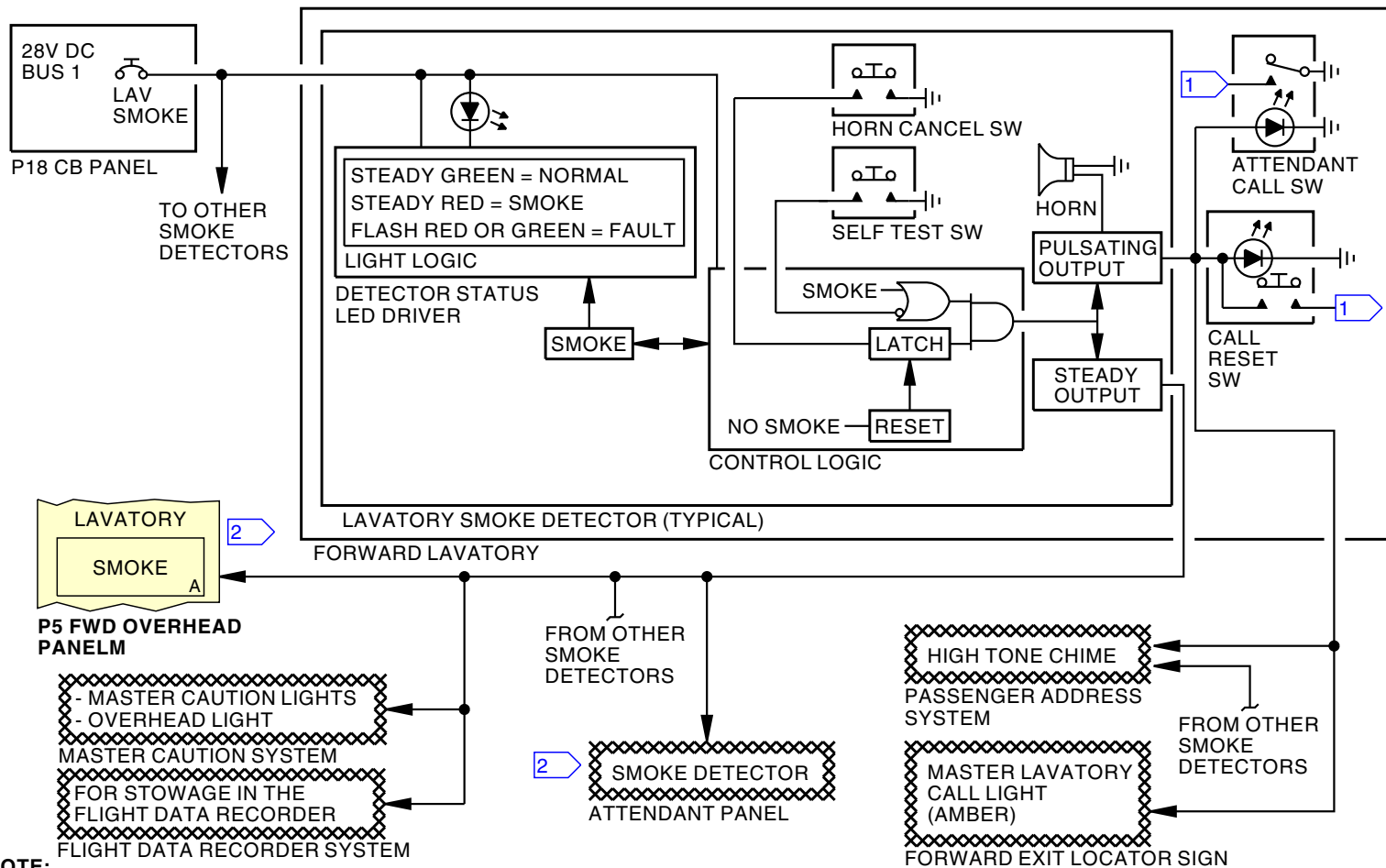
TEST

To test that a detector gives the alarm indications, you can use the SELF TEST switch or you can provide smoke to the sensor in the detectors.

The SELF TEST switch on a detector only lets you check the operation of that detector. To test the operation of all detectors, you must push and hold the SELF TEST switch at each detector and check that all alarm indications turn on.

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FIRE PROTECTION - LAVATORY SMOKE DETECTION - FUNCTIONAL DESCRIPTION



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FIRE PROTECTION - LAVATORY SMOKE DETECTION - FUNCTIONAL DESCRIPTION

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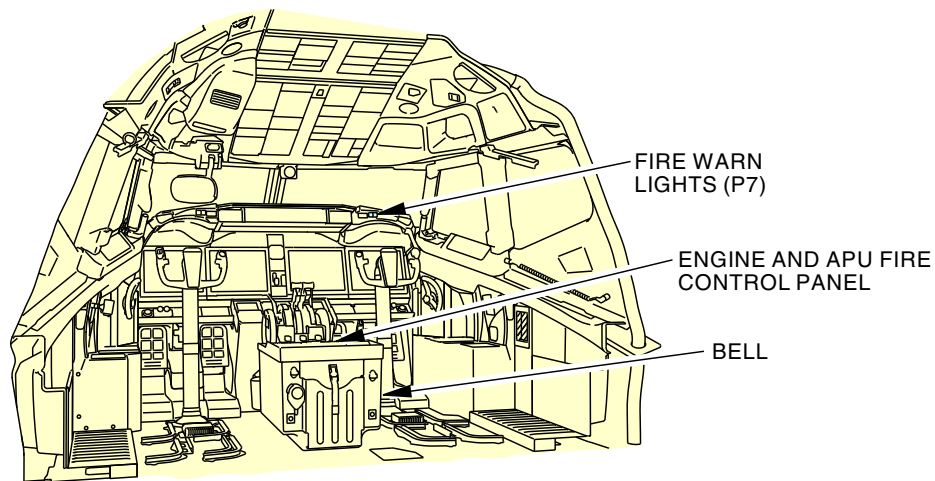
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**FIRE PROTECTION - APU FIRE DETECTION - INTRODUCTION****Purpose**

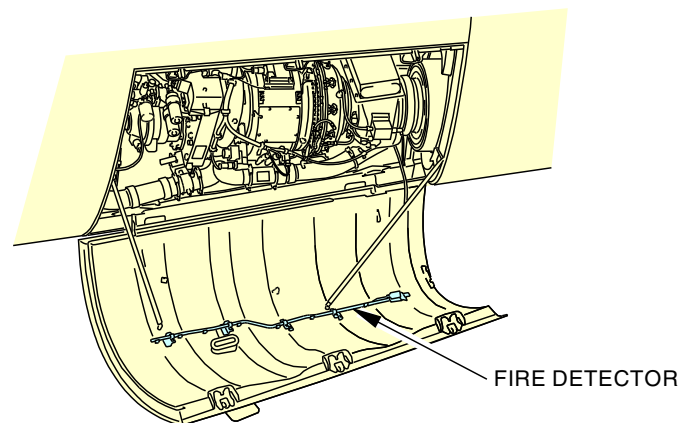
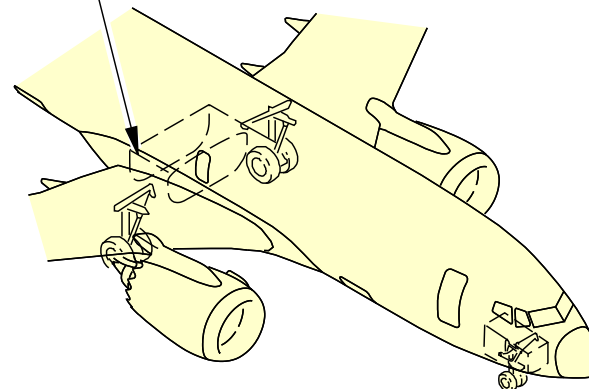
The APU fire detection system uses detectors on the APU. The detectors monitor the APU for a fire condition. When the system senses a fire condition, alarm indications operate in the flight compartment. The indications are on the glareshield P7 panel and on the engine and APU fire control panel on the P8. A bell also operates in the flight compartment. A horn and a red light operate in the right main wheel well.

FIRE PROTECTION - APU FIRE DETECTION - INTRODUCTION



FLIGHT COMPARTMENT

APU REMOTE CONTROL PANEL, P28



AUXILIARY POWER UNIT (APU)

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FIRE PROTECTION - APU FIRE DETECTION - INTRODUCTION

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**FIRE PROTECTION - APU FIRE DETECTION - GENERAL DESCRIPTION****General Description**

These are the components of the APU fire detection system:

- APU fire detectors
- Engine and APU fire detection module
- Glareshield, P7 panel
- Engine and APU fire control panel
- APU remote control panel, P28.
- Aural warning unit
- APU electronic control unit.

Fire detectors on the APU send signals to the engine and APU fire detection module. This module will supply aural and visual indications in the flight compartment. Also, the module sends signals to the APU control unit to automatically shutdown the APU.

The APU remote control panel gives the external indications of an APU fire. A horn and red light operate alternately at a one per second rate.

Overheat/Fire Test

You use the TEST switch on the engine and APU fire control panel. In the OVHT/FIRE position, the indications in the flight compartment and on the APU remote control panel are the same as for a real fire condition. If the test fails, use the engine and APU fire detection module to isolate the fault.

Fault/Inop Test

You use the TEST switch on the engine and APU fire control panel. In the FAULT/INOP position, the indications in the flight compartment are the same as a real fault condition. If the test fails, use the engine and APU fire detection module to isolate the fault.

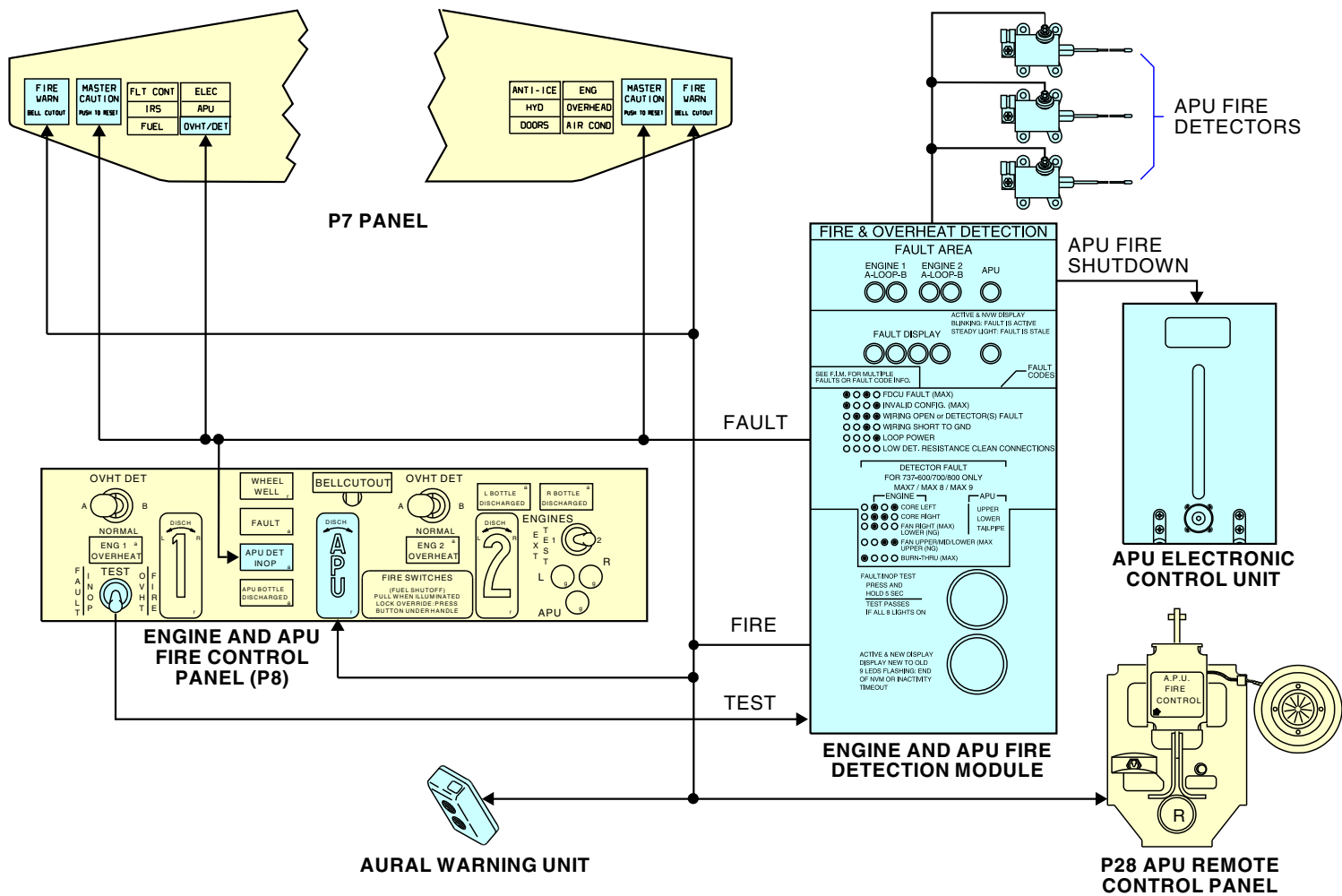
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FIRE PROTECTION - APU FIRE DETECTION - GENERAL DESCRIPTION



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FIRE PROTECTION - APU FIRE DETECTION - GENERAL DESCRIPTION

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**FIRE PROTECTION - APU FIRE DETECTION - APU FIRE DETECTOR****Purpose**

The APU fire detectors monitor for high temperatures in the APU compartment.

General Description

The APU has three detectors. The detectors monitor three sections of the APU. In each section, one detector attaches to a support tube with clamps. There is one loop for the APU fire detection.

Physical Description

Each detector has these parts:

- Fire and fault pressure switches
- Resistors
- Terminal stud
- Stainless steel, gas charged tube.

Location

These are the locations of the APU fire detectors:

- Upper APU compartment
- APU compartment door
- Tailpipe.

Detector Characteristics

Detector Location	Fire
Upper APU Compt	450°F (232°C)
Lower APU Compt	450°F (232°C)
Tailpipe	275°F (135°C)

Operation

The two pressure switches sense for these conditions:

- Fire
- Fault (loss of gas pressure).

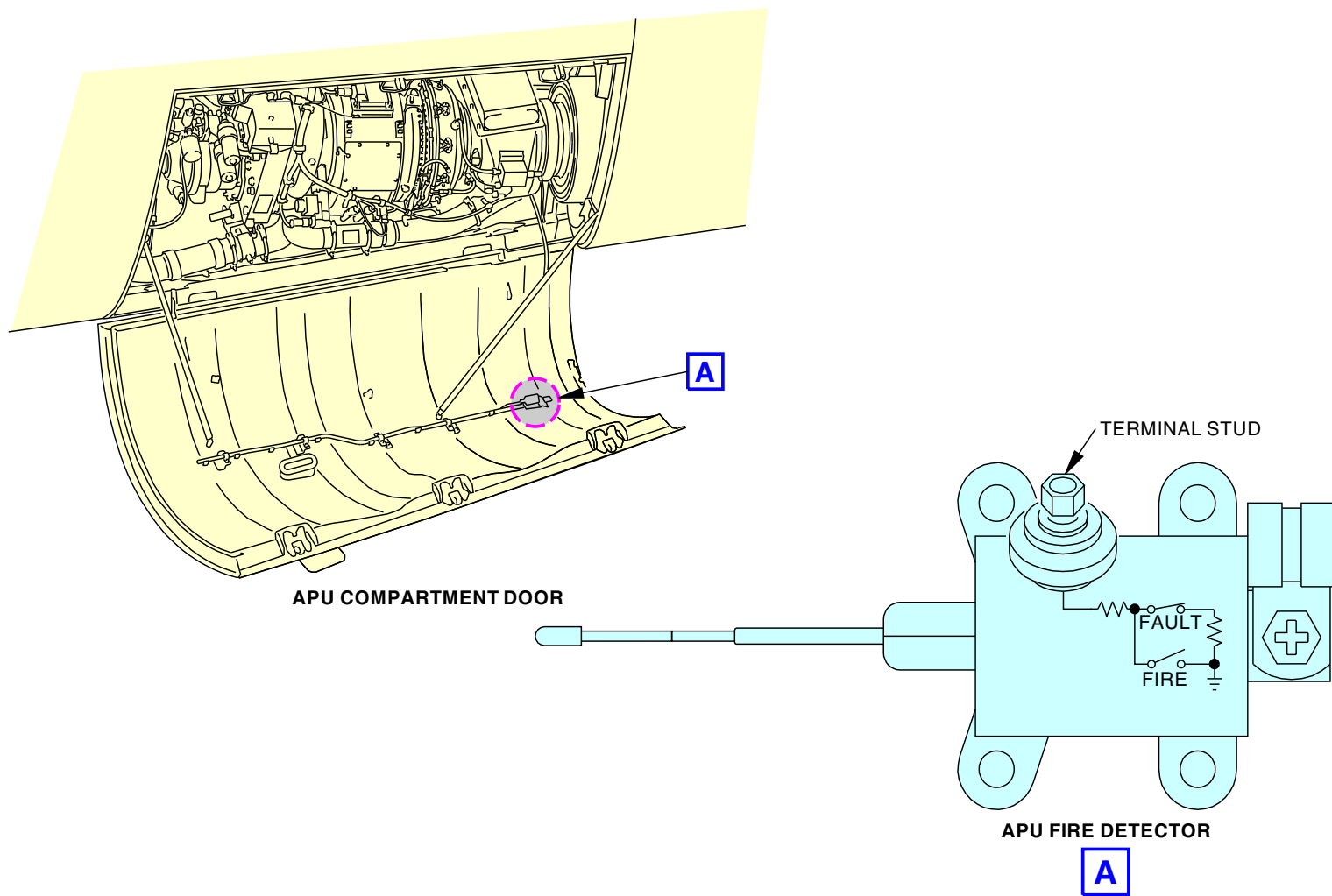
Gas pressure in the sense tube holds the fault pressure switch in the closed position. The other pressure switch closes when the gas pressure increases because of a fire condition.

The fire signals go to the engine and APU fire detection module. This module supplies the fire indication in the flight compartment.

See the engine fire detection section for more information on the engine and APU fire detection module. (SECTION 26-11)

If the pressure in the sense tube decreases, the fault switch opens. This switch sends the fault signal to the engine and APU fire detection module.

FIRE PROTECTION - APU FIRE DETECTION - APU FIRE DETECTOR



FIRE PROTECTION - APU FIRE DETECTION - APU FIRE DETECTOR

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**FIRE PROTECTION - APU FIRE DETECTION - FUNCTIONAL DESCRIPTION****Functional Description**

At the fire temperature set point, the gas expands in the detector and closes the FIRE pressure switch. This decreases the resistance of the detector.

The engine APU control module uses this change in resistance to set the fire condition. These are the results of a fire condition:

- APU fire handle light comes on
- APU fire handle switch unlocks
- Two red FIRE WARN lights come on
- Aural warning unit gives the bell sound
- APU automatic shutdown
- APU remote horn and light come on.

NOTE: You can also do the FAULT INOP test at the engine and APU fire detection module. The indications in the flight compartment will be the same.

The FAULT/INOP test does a check of the module fault detection circuitry and related flight compartment indications. These are the indications of a good FAULT/INOP test:

- MASTER CAUTION and OVHT/DET annunciator lights come on
- Amber FAULT light comes on
- Amber APU DET INOP light comes on
- All FAULT AREA lights on the engine and APU fire detection module come on
- FAULT DISPLAY lights the engine and APU fire detection module come on after five seconds.

The OVHT/FIRE test simulates a fire condition. These are the indications of a good OVHT/FIRE test:

- MASTER CAUTION and OVHT/DET annunciator lights come on
- Two red FIRE WARN lights come on
- ENG 1, ENG 2, and APU fire handle switch lights come on

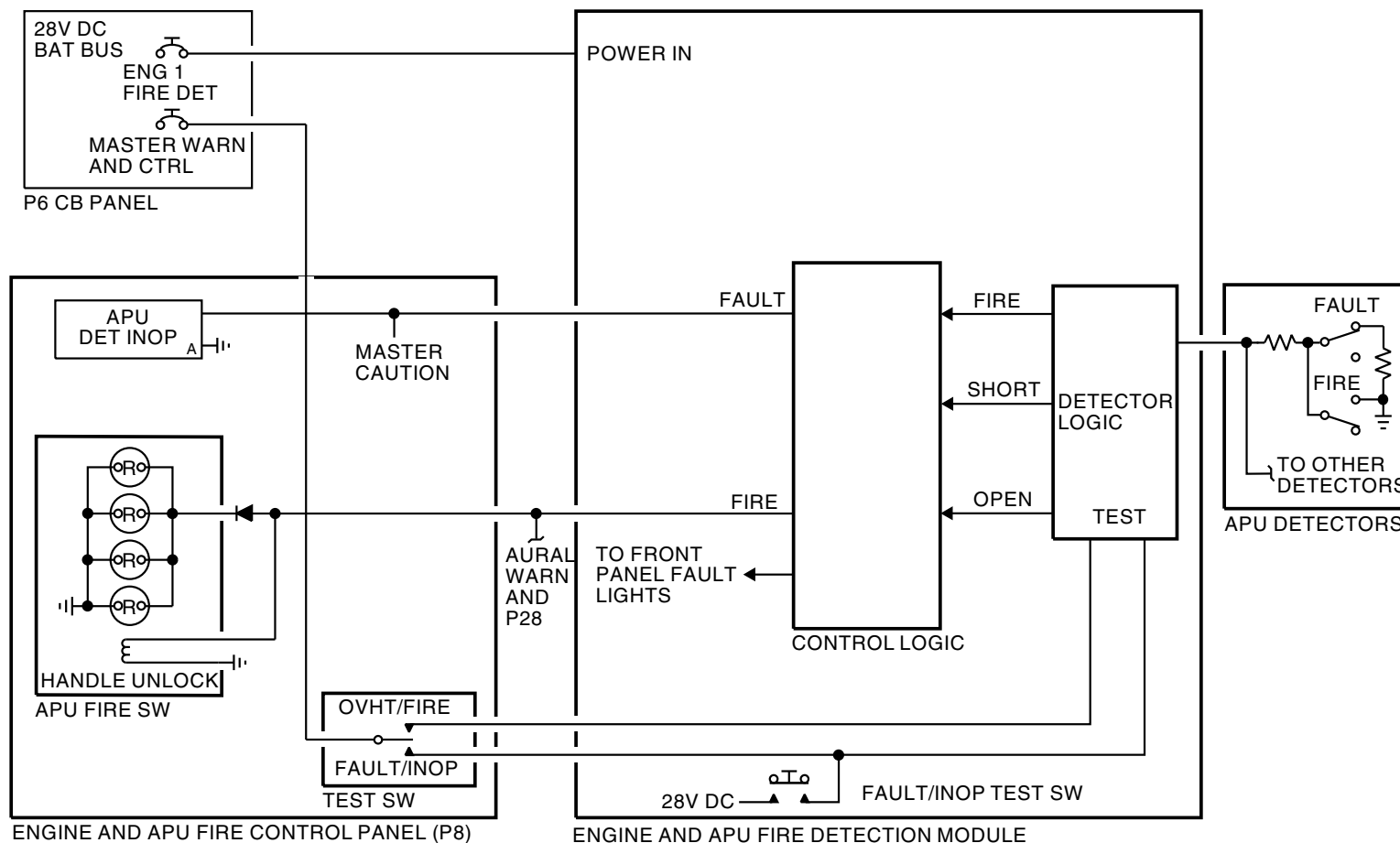
- Amber ENG 1 and ENG 2 OVERHEAT lights come on
- Red WHEEL WELL light comes on (115v ac power is necessary)
- Aural warning unit supplies the bell sound
- APU remote control panel horn and red light come on
- ENG 1, ENG 2, and APU fire handle switches unlock.

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FIRE PROTECTION - APU FIRE DETECTION - FUNCTIONAL DESCRIPTION



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FIRE PROTECTION - APU FIRE DETECTION - FUNCTIONAL DESCRIPTION

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FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - INTRODUCTION

Purpose

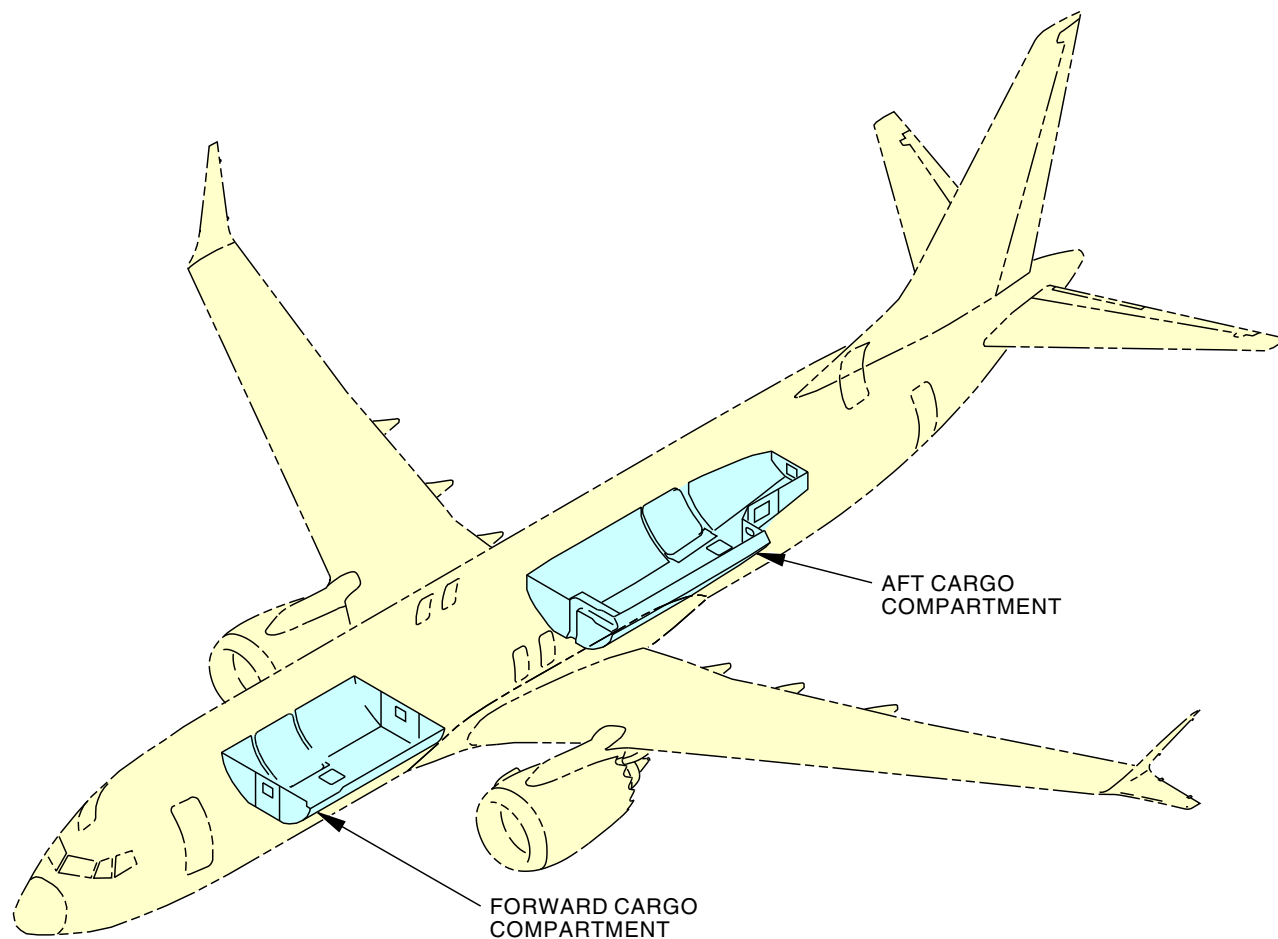
The lower cargo compartment smoke detection system gives warnings in the flight deck if there is smoke in a lower cargo compartment. There are warnings for the forward and the aft lower cargo compartments.

Abbreviations and Acronyms

- CEU - cargo electronic unit

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FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - INTRODUCTION



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FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - INTRODUCTION

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**FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - GENERAL DESCRIPTION****General Description**

These are the components of the lower cargo compartment smoke detection system:

- Smoke detectors
- Cargo electronic units
- Cargo fire control panel
- Aural warning unit
- Fire warning lights.

The smoke detectors are in a dual loop configuration.

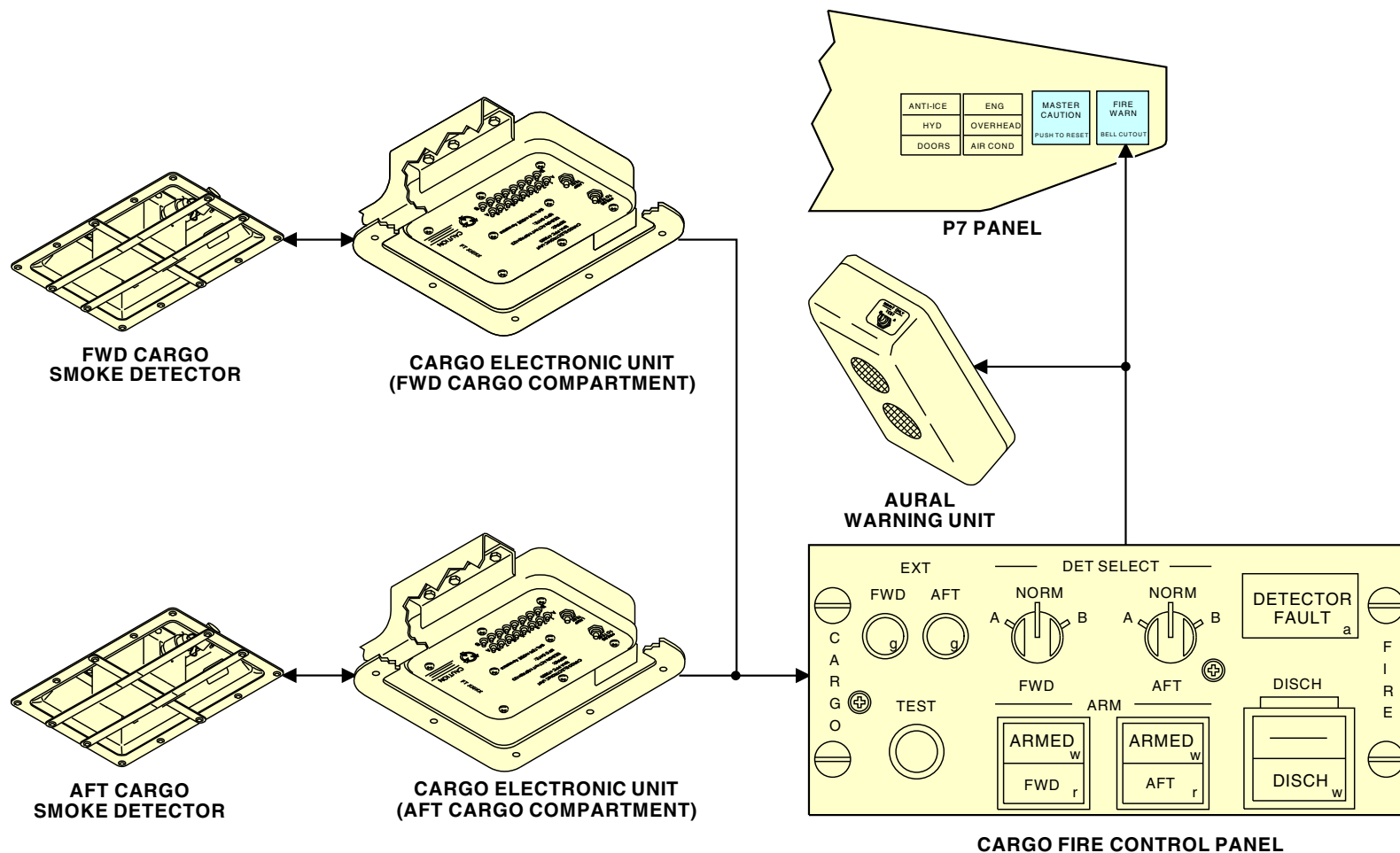
Each smoke detector monitors the cargo compartment for smoke and heat. If the detector senses smoke or heat, a signal goes to the cargo electronic unit. The cargo electronic unit sends a signal to the flight compartment for indications.

These are the indications in the flight compartment:

- FWD or AFT cargo fire light on the cargo fire control panel comes on
- P7 FIRE WARN lights come on
- Bell sound from the aural warning unit.

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FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - GENERAL DESCRIPTION



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FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - GENERAL DESCRIPTION

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**FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - COMPONENT LOCATION****Component Location**

The lower cargo compartments have many cargo smoke detectors and one cargo electronic unit in each compartment.

The forward lower cargo compartment has four smoke detectors. The aft lower cargo compartment has six smoke detectors. The detectors are in the ceiling of the compartments.

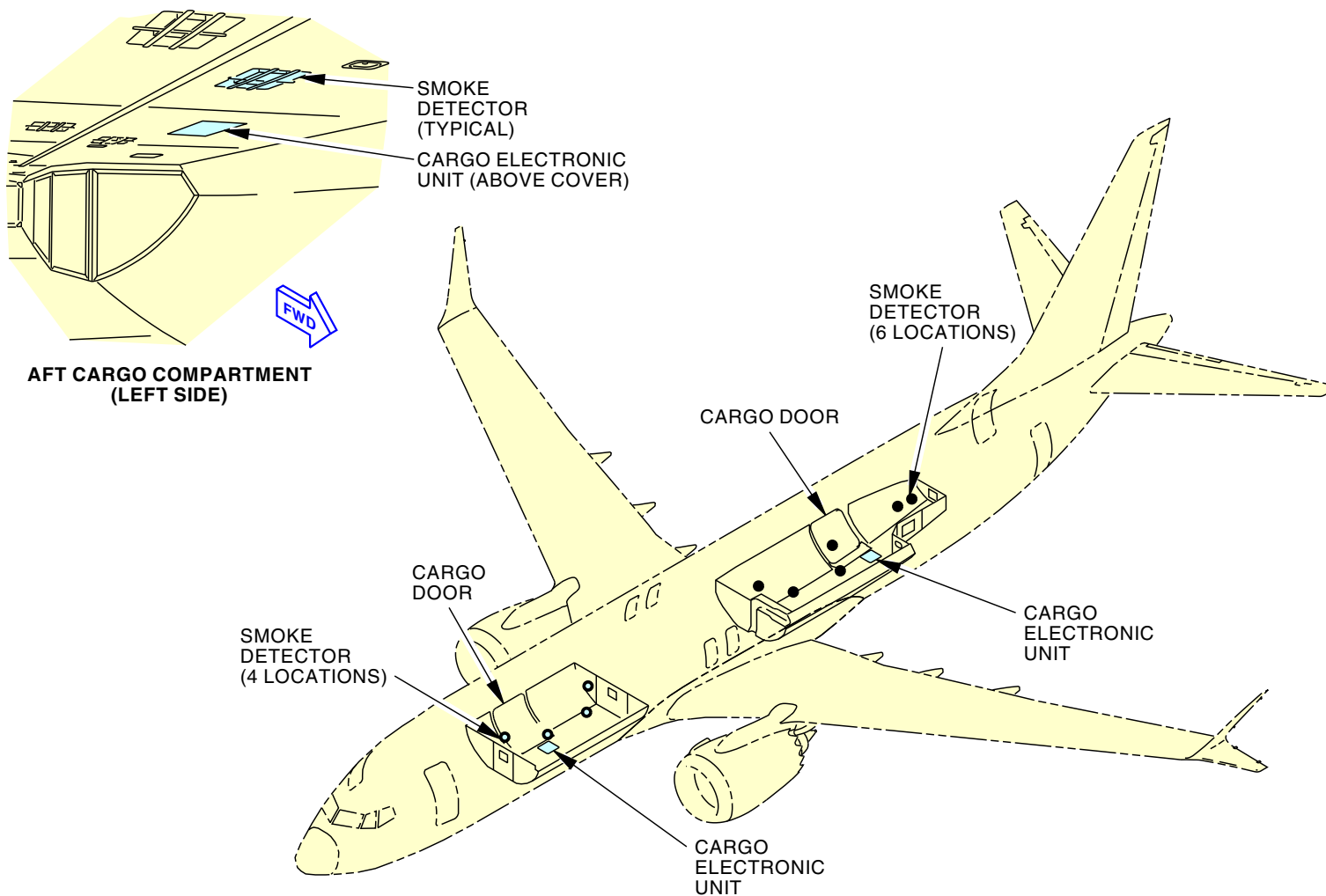
You remove a protective guard to get access to a smoke detector.

One cargo electronic unit is in the ceiling on the left side of each cargo compartment, inboard of the cargo door.

You remove a cover to get access to a cargo electronic unit.

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FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - COMPONENT LOCATION



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FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - COMPONENT LOCATION

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**FIRE PROTECTION - LWR CARGO COMPARTMENT SMOKE DETECTION - SMOKE DETECTOR****Purpose**

The smoke detectors monitor air in the forward and aft lower cargo compartments for smoke and heat.

Location

The smoke detectors are in pans in the ceiling of the forward lower cargo compartment and in the aft lower cargo compartment.

Physical Description

The forward and aft smoke detectors are the same. The smoke detectors have these components:

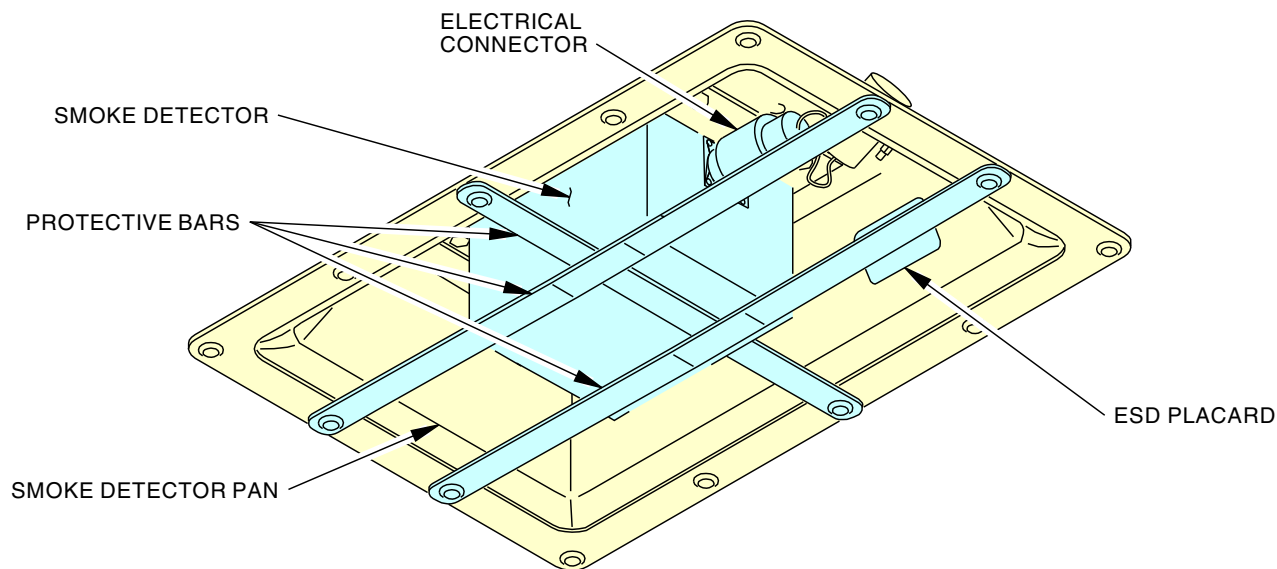
- Electrical connector
- Smoke detection chamber (internal)
- Electronic circuit (internal).

Functional Description

The smoke detectors use photoelectric cells to detect smoke. The smoke detector gives an alarm signal if it senses smoke or if it senses air temperature more than 230°F (110°C).

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FIRE PROTECTION - LWR CARGO COMPARTMENT SMOKE DETECTION - SMOKE DETECTOR



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FIRE PROTECTION - LWR CARGO COMPARTMENT SMOKE DETECTION - SMOKE DETECTOR

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FIRE PROTECTION - LWR CARGO COMPARTMENT SMOKE DETECTION - CARGO ELECTRONIC UNIT

Purpose

The cargo electronic units monitor the forward and aft lower cargo compartment smoke detectors.

Physical Description

The forward and aft cargo electronic units are identical. The cargo electronic units have these items:

- Two electrical connectors (at back of unit)
- 16 red light emitting diodes (LEDs)
- Lamp test switch
- System test switch
- Electronic circuits (internal)

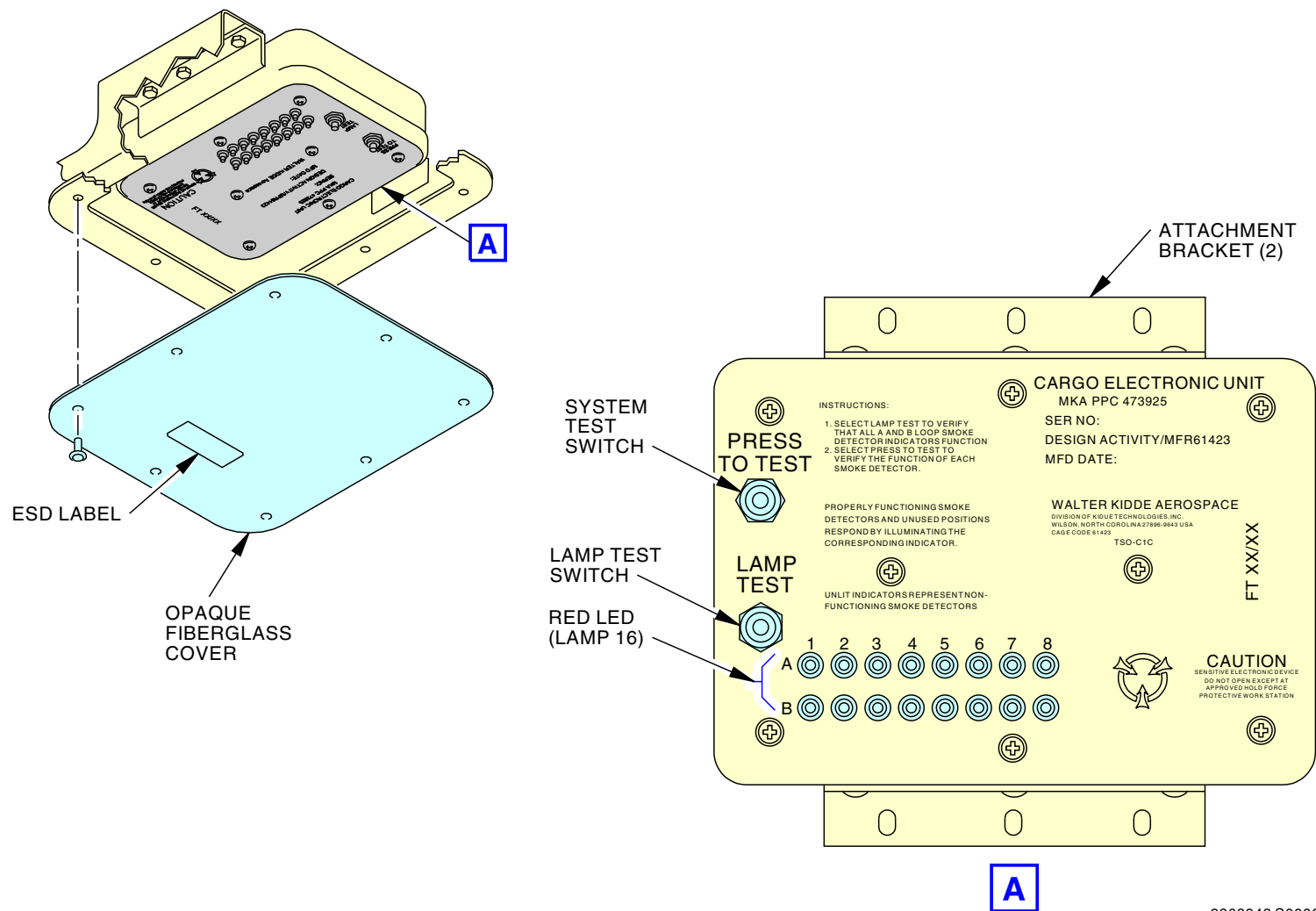
General Description

There are four smoke detectors (two in loop A and two in loop B) in the forward cargo compartment. Red LED lights on the front of the CEU labeled 1A, 1B, 2A and 2B connect to smoke detectors. The remaining LED lights are active and connect externally by a jumper cable loop.

There are six smoke detectors (three in loop A and three in loop B) in the aft cargo compartment. Red LED lights on the front of the CEU labeled 1A, 1B, 2A, 2B, 3A and 3B connect to smoke detectors. The remaining LED lights are active and connect externally by a jumper cable loop.

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FIRE PROTECTION - LWR CARGO COMPARTMENT SMOKE DETECTION - CARGO ELECTRONIC UNIT



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FIRE PROTECTION - LWR CARGO COMPARTMENT SMOKE DETECTION - CARGO ELECTRONIC UNIT

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**FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - CARGO FIRE CONTROL PANEL****Purpose**

The cargo fire control panel monitors the fire protection system for these conditions:

- Lower cargo compartment smoke
- Lower cargo compartment overheat
- Smoke detector fault conditions
- Cargo fire extinguisher bottle squib condition
- Cargo fire extinguisher bottle discharge.

The cargo fire control panel lets you do these functions:

- Set the mode of operation (single or dual loop smoke detector operation)
- Operate a cargo fire extinguisher bottle
- Do a test of the cargo fire extinguisher bottle squibs
- Do a test of the lower cargo fire protection system
- Do a test of the fault detection circuits.

Physical Description

These are the cargo fire control panel components:

- Amber DETECTOR FAULT light
- DET SELECT switches
- Green FWD and AFT EXT lights
- Amber DISCH switchlight (guarded)
- FWD and AFT cargo fire arm switches
- TEST push-button switch.

General Description

The DETECTOR FAULT amber light comes on if a cargo smoke detector has a fault.

Each DET SELECT switch has these three positions:

- NORM - both detector loops are necessary to sense a smoke or overheat condition to give a fire indication
- A - only the A loop is necessary to sense a smoke or overheat condition for a fire indication
- B - only the B loop is necessary to sense a smoke or overheat condition for a fire indication.

The green FWD and AFT EXT lights show extinguisher bottle squib continuity.

The DISCH switchlight comes on when the bottle pressure is less than 250 psi.

The TEST push button does a check of the cargo smoke detectors and the extinguishing system.

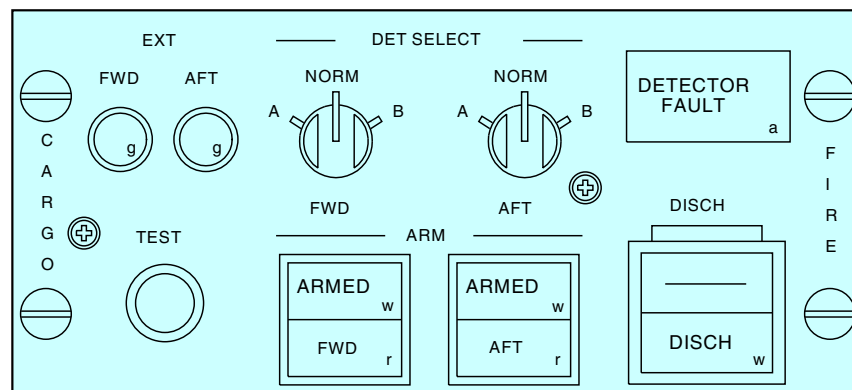
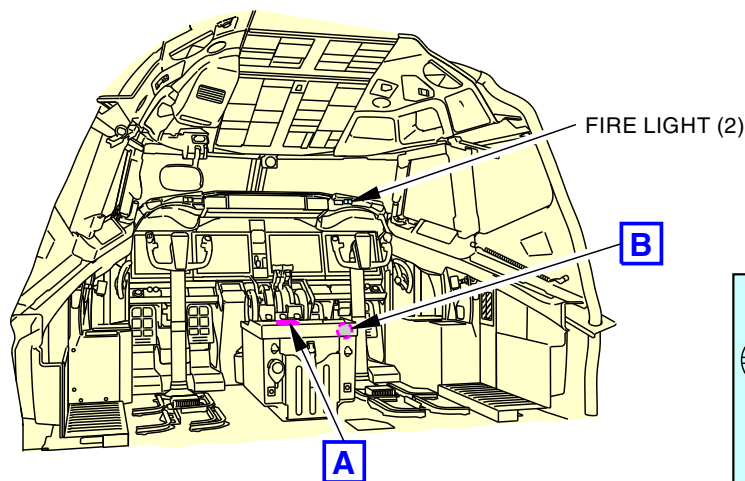
The FWD or AFT red cargo fire lights come on if a fire indication is given by the smoke detectors.

The ARMED light on the fire arm switches comes on when you push the related switch. When the fire armed switch is not pushed you can not see the word ARMED.

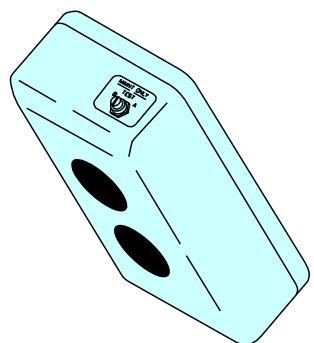
The P7 FIRE WARN lights come on and the aural warning unit operates if there is a cargo compartment smoke or overheat condition.

EFFECTIVITY	
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FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - CARGO FIRE CONTROL PANEL



CARGO FIRE CONTROL PANEL



AURAL WARNING UNIT

FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - CARGO FIRE CONTROL PANEL

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EFFECTIVITY

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**FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - FUNCTIONAL DESCRIPTION - LOWER DECK****Smoke Detection**

The smoke detectors in the lower cargo compartments are monitored by the cargo electronic units (CEUs). These units process inputs from smoke detectors and interface with the components in the flight compartment.

If smoke is detected in the lower cargo compartment, the detector sends an alarm signal to the CEU. The CEU sends the alarm signal to the cargo fire control panel.

The cargo fire control panel turns on the FWD or AFT red fire lights and sends an alarm signal to these components:

- Cabin pressure control system
- P7 FIRE WARN lights come on
- Aural warning unit gives the bell sound.

The cargo fire control panel sends the alarm signal to the cabin pressure control system. This signal causes the CPC to set the cabin pressure rate of descent to 750 slfpm. This helps prevent smoke penetration into the passenger cabin from the lower lobe. This function is inhibited on the ground.

Functional Description

There are four smoke detectors (two in loop A and two in loop B) in the forward cargo compartment. Red LED lights on the front of the CEU labeled 1A, 1B, 2A and 2B connect to smoke detectors. The remaining LED lights are active and connect externally by a jumper cable loop.

There are six smoke detectors (three in loop A and three in loop B) in the aft cargo compartment. Red LED lights on the front of the CEU labeled 1A, 1B, 2A, 2B, 3A and 3B connect to smoke detectors. The remaining LED lights are active and connect externally by a jumper cable loop.

Fault Detection

If a detector does not operate, the CEU sends the fault signal to the cargo fire control panel.

The DETECTOR FAULT amber light comes on for a fault indication.

BITE

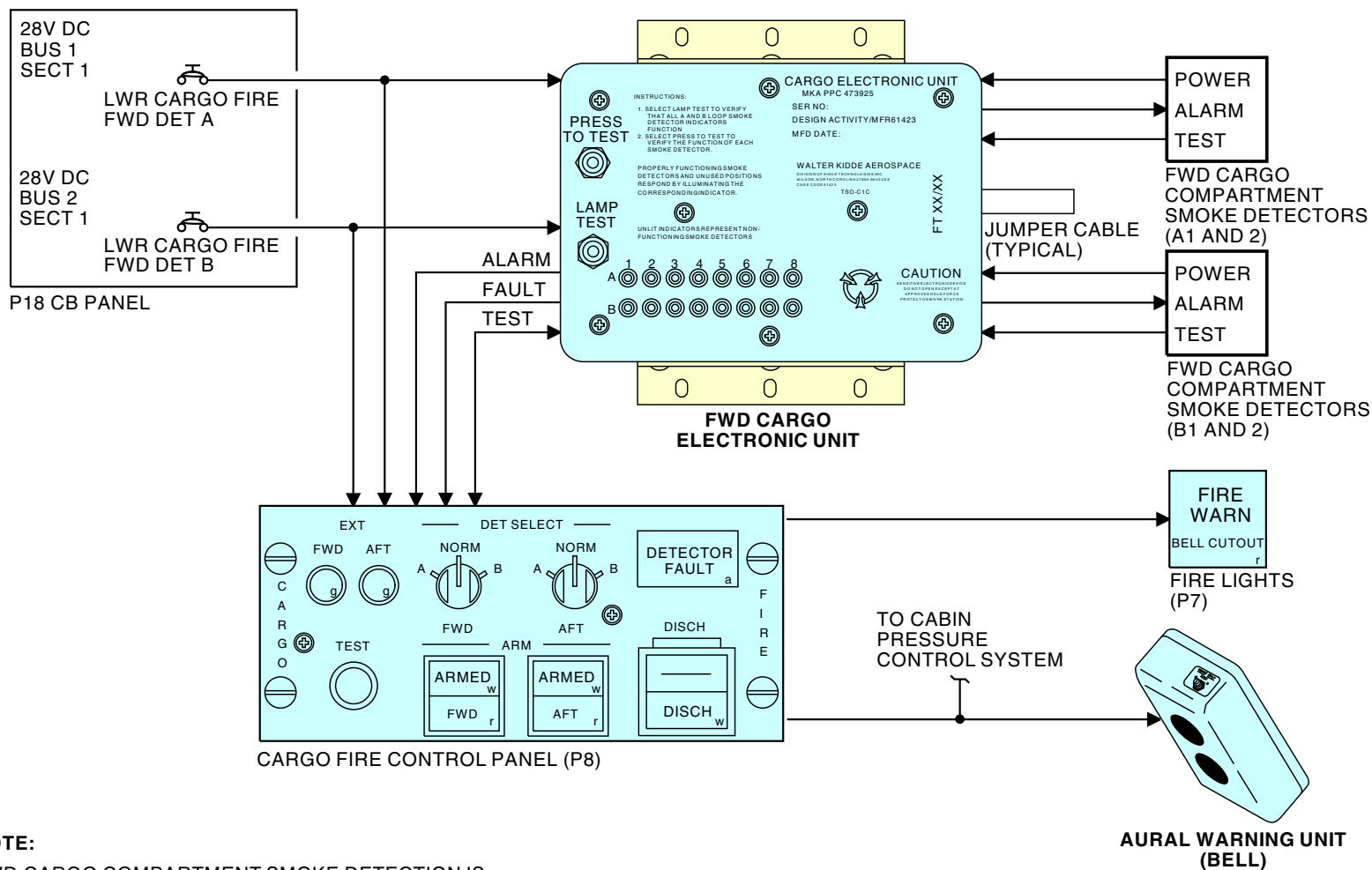
You can test the smoke detection system with the cargo fire control panel or the cargo electronic units.

26-16-00

EFFECTIVITY	
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FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - FUNCTIONAL DESCRIPTION - LOWER DECK



NOTE:

FWD CARGO COMPARTMENT SMOKE DETECTION IS SHOWN AFT CARGO COMPARTMENT IS EQUIVALENT.

2368945 S00061518469_V1

FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - FUNCTIONAL DESCRIPTION - LOWER DECK

**FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - SMOKE DETECTOR TEST****General**

The cargo smoke detection system uses these components:

- Cargo fire control panel
- Two cargo electronic units (CEUs)
- Smoke detectors.

Cargo Electronic Unit Test

These are the indications if you push the LAMP TEST or PRESS TO TEST buttons:

- LAMP TEST, all 16 red lights come on
- PRESS TO TEST, all 16 red lights come on.

At the same time, these show on the cargo fire control panel:

- The EXT FWD and EXT AFT green lights come on
- FWD and AFT red switchlights come on
- DISCH amber light comes on.

If there is a fault, one or more of the red lights do not come on.

Cargo Fire Control Panel Test

These are the indications when you push the TEST button on the cargo fire control panel:

- EXT FWD and EXT AFT green lights come on
- FWD and AFT red switchlights come on
- DISCH amber light come son
- P7 FIRE WARN lights come on
- Aural warning unit gives the bell sound.

At the same time, the 16 red lights on the CEU come on.

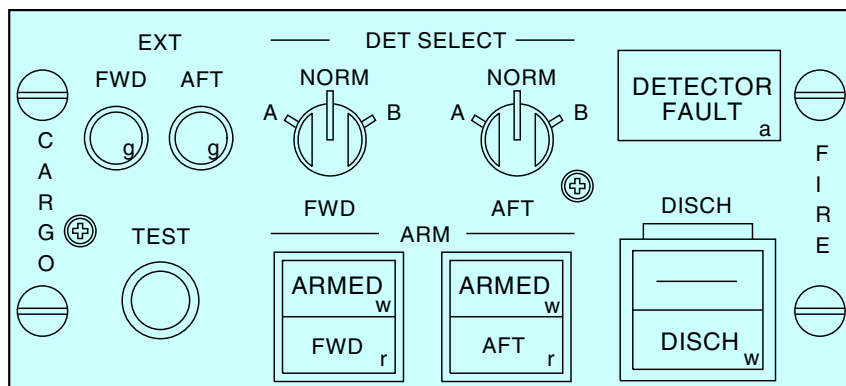
If there is a fault, the DETECTOR FAULT light comes on.

This table shows when the DETECTOR FAULT light comes on automatically.

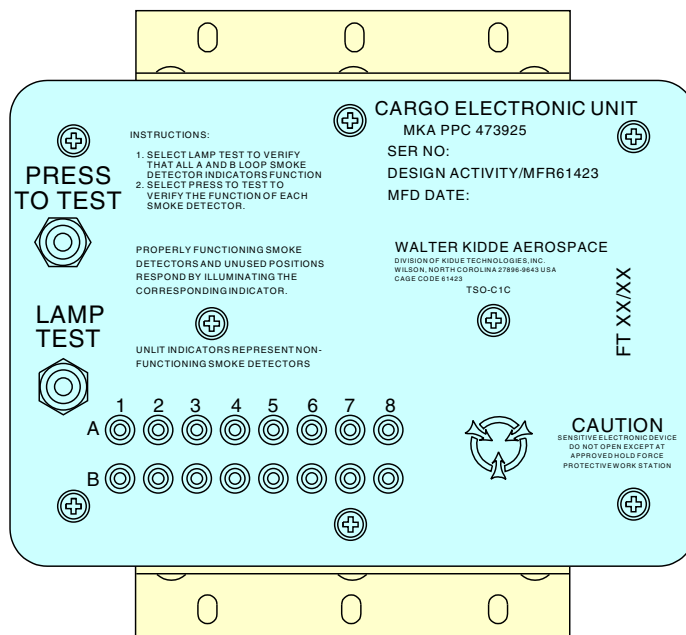
STATUS	DET SELECT SWITCH	DETECTOR FAULT LIGHT
Loop A and B fail	NORMAL	ON
Loop A fail	A	ON
Loop B fail	B	ON

SIA ALL	EFFECTIVITY

FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - SMOKE DETECTOR TEST



CARGO FIRE CONTROL PANEL



CARGO ELECTRONIC UNIT
(LOWER CARGO COMPARTMENT)

FIRE PROTECTION - CARGO COMPARTMENT SMOKE DETECTION - SMOKE DETECTOR TEST

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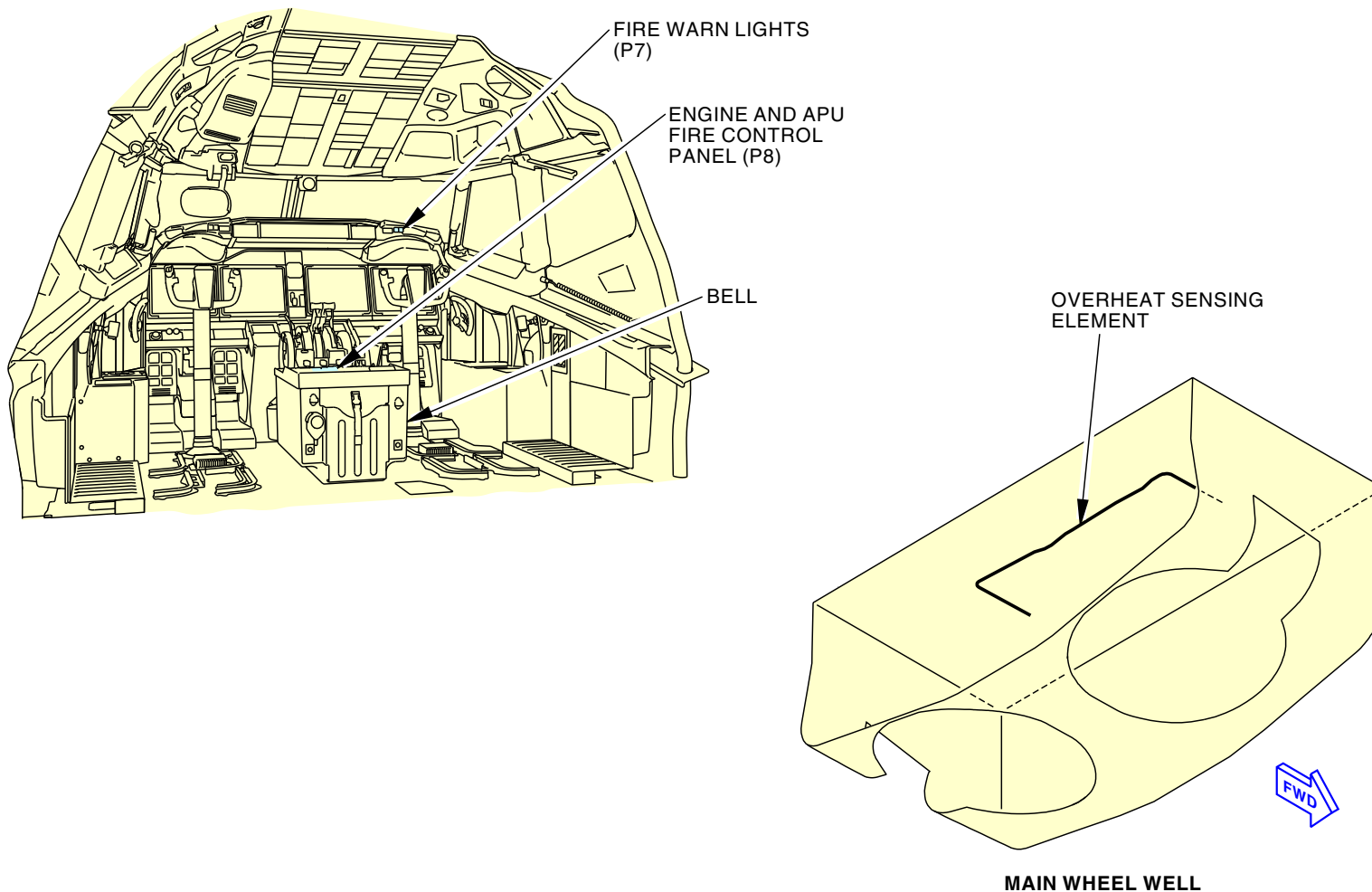
ECCN 9E991 BOEING PROPRIETARY - See title page for details

**FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - INTRODUCTION****Purpose**

The wheel well fire detection system uses overheat sensing elements in the main wheel well. It monitors the wheel well for fire condition. When the system senses a fire condition, alarm indications operate in the flight compartment. The indications are on the glareshield panel P7 and on the engine and APU fire control panel P8. A bell also operates in the flight compartment.

SIA ALL	EFFECTIVITY

FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - INTRODUCTION



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FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - INTRODUCTION

26-17-00

**FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - GENERAL DESCRIPTION****General Description**

These are the components for the wheel well fire detection:

- Main wheel well fire (overheat) sensing element (loop A and loop B)
- Compartment overheat detection controller
- P7 glareshield panel
- Engine and APU fire control panel
- Aural warning unit.

Fire (overheat) sensing elements in the main wheel well supplies the wheel well fire detection signal. The signal goes to the compartment overheat detection controller. This unit supplies the fire alarms.

These are the flight compartment indications of a wheel well fire:

- Two red FIRE WARN lights on P7 panel come on
- Bell sounds in the aural warning unit
- Red WHEEL WELL light on engine and APU fire control panel comes on.

If the wheel well fire alarms come on due to a real fire or a fault, the MAINT ADV light on the compartment overheat detection controller comes on. Use the module to do a check for real alarm or a fault condition.

You use the test switch on engine and APU fire control module panel to the OVHT/FIRE position to do a test of the wheel well sensing element. If the test passes, the indications in the flight compartment are the same as for a real fire condition. If the test fails, use the compartment overheat detection controller to isolate the fault.

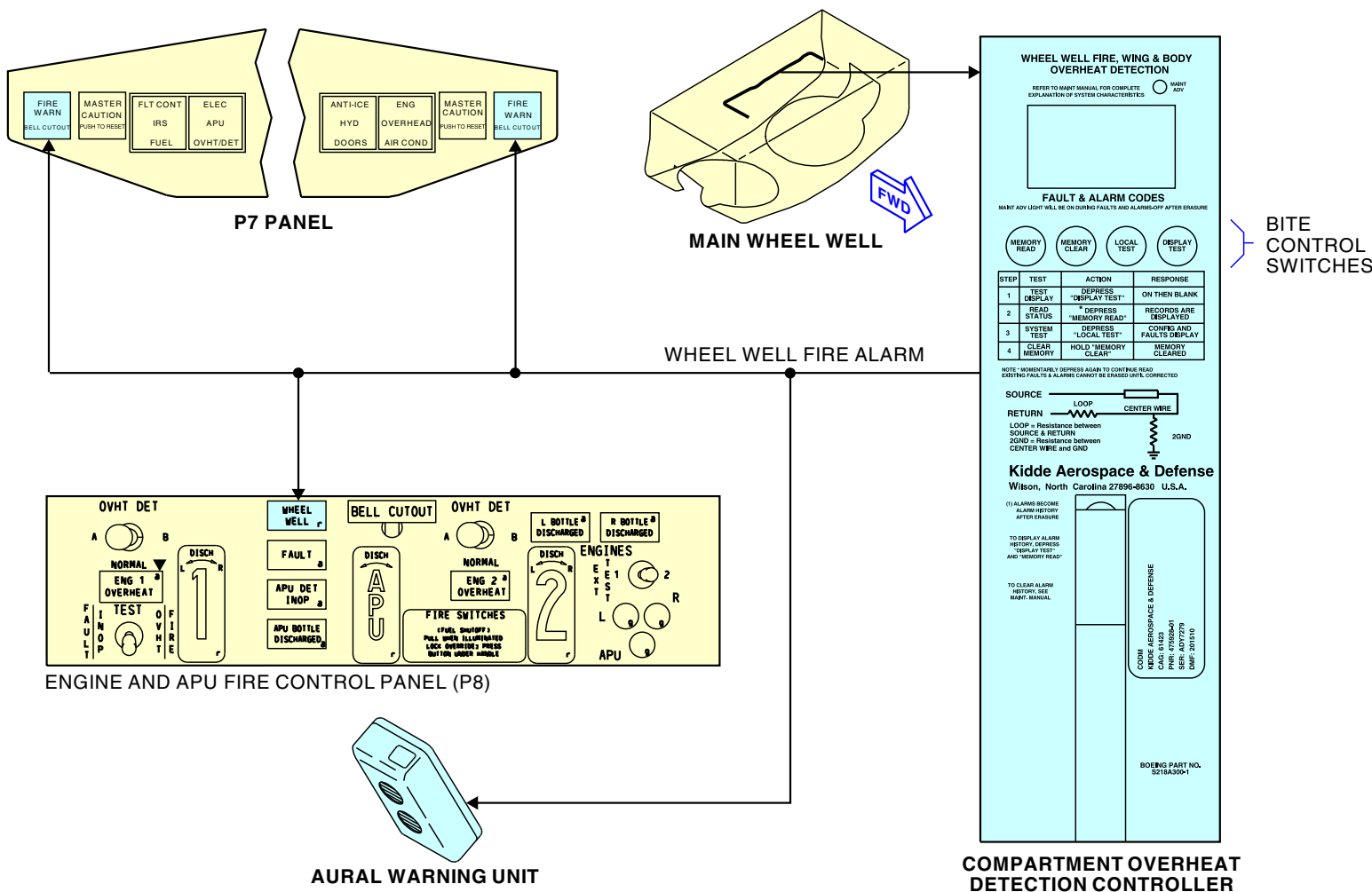
NOTE: During the wheel well fire test, the engine overheat, the engine fire, and the APU fire systems also do a test.

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FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - GENERAL DESCRIPTION



FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - GENERAL DESCRIPTION

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**FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - OVERHEAT DETECTOR ELEMENT****Purpose**

The overheat sensing elements (loop A and loop B) monitor for high temperature conditions in the main wheel well.

Physical Description

The sensing element has a single strand of nickel wire embedded in insulation. The insulation is impregnated with a salt compound and is in a tube. The sensing elements have these components:

- Nickel wire
- Insulation
- Tube
- Electrical connector.

Location

The sensing elements is in the ceiling of the left and right main wheel wells.

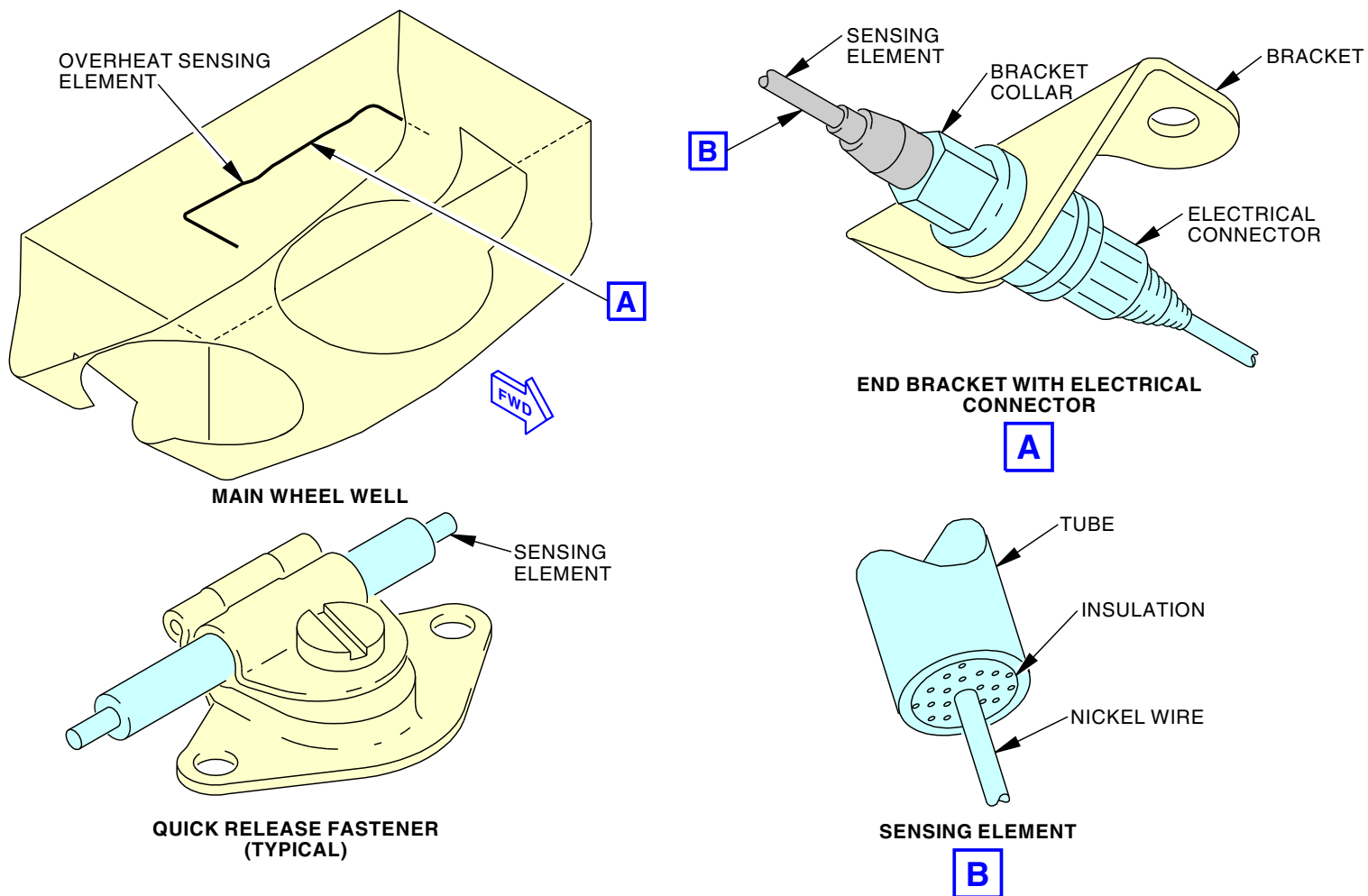
The sensing elements attaches to the ceiling of the wheel well by quick-release fasteners.

Functional Description

The sensing element is a thermistor type with resistance inversely proportional to temperature. As the element temperature increases, the resistance decreases. If any portion of the sensing element is above alarm temperature of 400°F (205°C), the element resistance decreases sharply. The single wire in the center of the core is the power lead and the outside tube is electrically grounded. The insulating resistance of the core material decreases suddenly at the alarm temperature. Current flows through the core material to ground when alarm temperature is sensed.

EFFECTIVITY	
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FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - OVERHEAT DETECTOR ELEMENT



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FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - OVERHEAT DETECTOR ELEMENT

26-17-00

**FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - COMPARTMENT OVERHEAT DETECTION CONTROLLER****Purpose**

The compartment overheat detection controller monitors sensing elements for overheat and fire conditions in the wheel well and the wing and body areas.

Physical Description

The control circuits for the wing and body overheat detection are in the controller. The front panel has these components:

- MAINT ADV (maintenance advisory) light
- LED display
- BITE instructions
- Four BITE push button switches (MEMORY READ, MEMORY CLEAR, LOCAL TEST and DISPLAY TEST).

Location

The compartment overheat detection controller is in the electronic equipment compartment on the E1-4 rack.

BITE Test Push Button Switches and Indications

The non-volatile memory provides a storage area for a minimum of ten LRU failures. Memory contents can be viewed on a 2 line by 8 character LED display.

MEMORY READ, accesses the non-volatile memory.

MEMORY CLEAR, clears the non-volatile memory. The existing faults and alarms can not be cleared until corrected.

LOCAL TEST, initiates a test sequence of the control circuits and detector elements.

DISPLAY TEST, verifies correct operation of the control circuits. This is indicated by the illumination of each LED of each character on the display.

MAINT ADV (maintenance advisory light), is on when a fault or an alarm is stored in the non-volatile memory. The light shall remain on until all faults are removed and the memory is cleared.

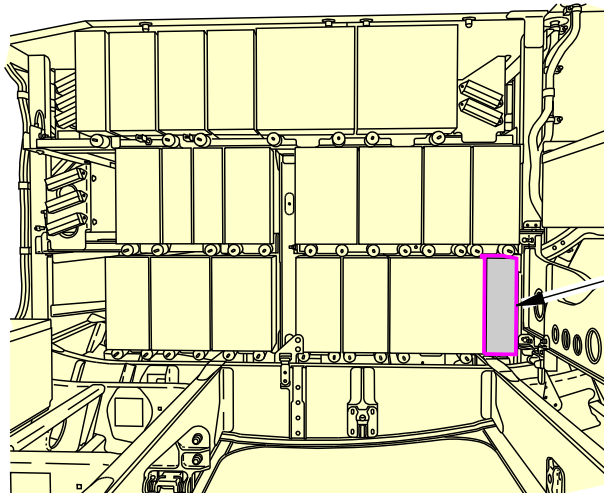
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FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - COMPARTMENT OVERHEAT DETECTION CONTROLLER



FWD



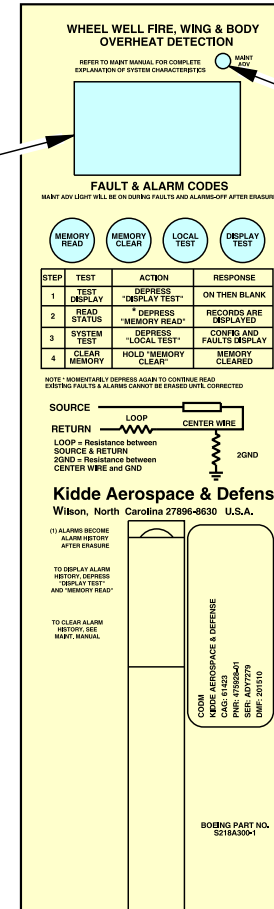
E/E COMPARTMENT

A

LED DISPLAY

MAINT ADV LIGHT

BITE CONTROL SWITCHES



A

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FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - COMPARTMENT OVERHEAT DETECTION CONTROLLER

**FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - FUNCTIONAL DESCRIPTION****Functional Description**

The compartment overheat detection controller supplies power to the sensing elements. The microprocessor monitors the wheel well sensing elements for alarm conditions.

If the microprocessor senses a wheel well fire, it keeps the alarm in memory and sets the fire condition. These are the indications of a wheel well fire:

- Two red FIRE WARN lights on P7 panel come on
- Aural warning unit gives the bell sound
- Red WHEEL WELL light on the engine and APU fire control panel comes on
- MAINT ADV light on the compartment overheat detection controller comes on.

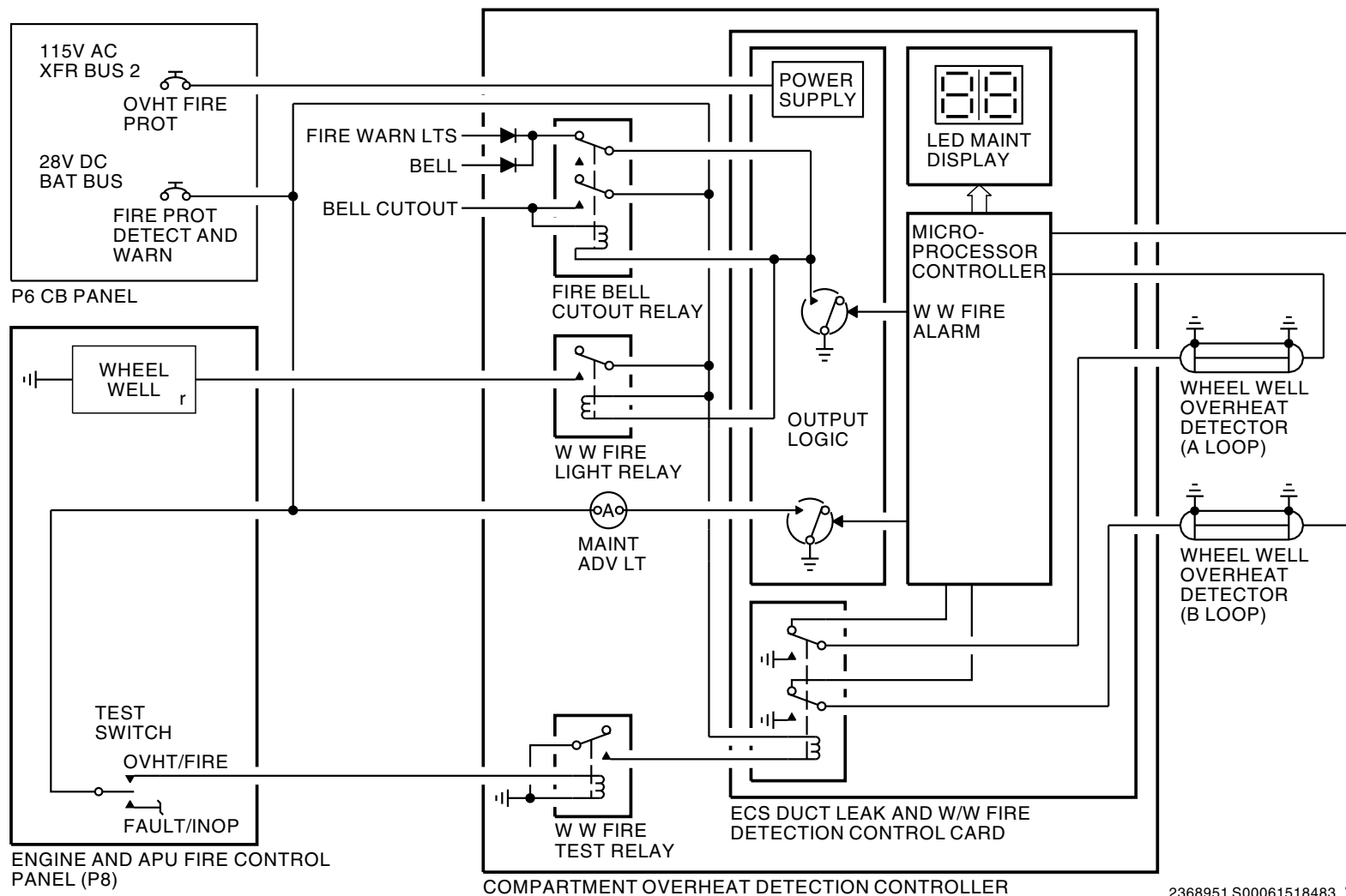
Move the test switch to the OVHT/FIRE position to start a test of the wheel well fire detection system. The test alarm inputs are not kept in memory.

The test does a check of the continuity of the sensing element. If the sensing element has continuity, the indications are the same as during a real alarm. If the sensing element does not have continuity, there are no indications in the flight compartment.

There is no difference between a real alarm and a short circuit. If there is a short circuit, the indications are the same as for a real alarm.

EFFECTIVITY	
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FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - FUNCTIONAL DESCRIPTION



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FIRE PROTECTION - WHEEL WELL OVERHEAT DETECTION - FUNCTIONAL DESCRIPTION



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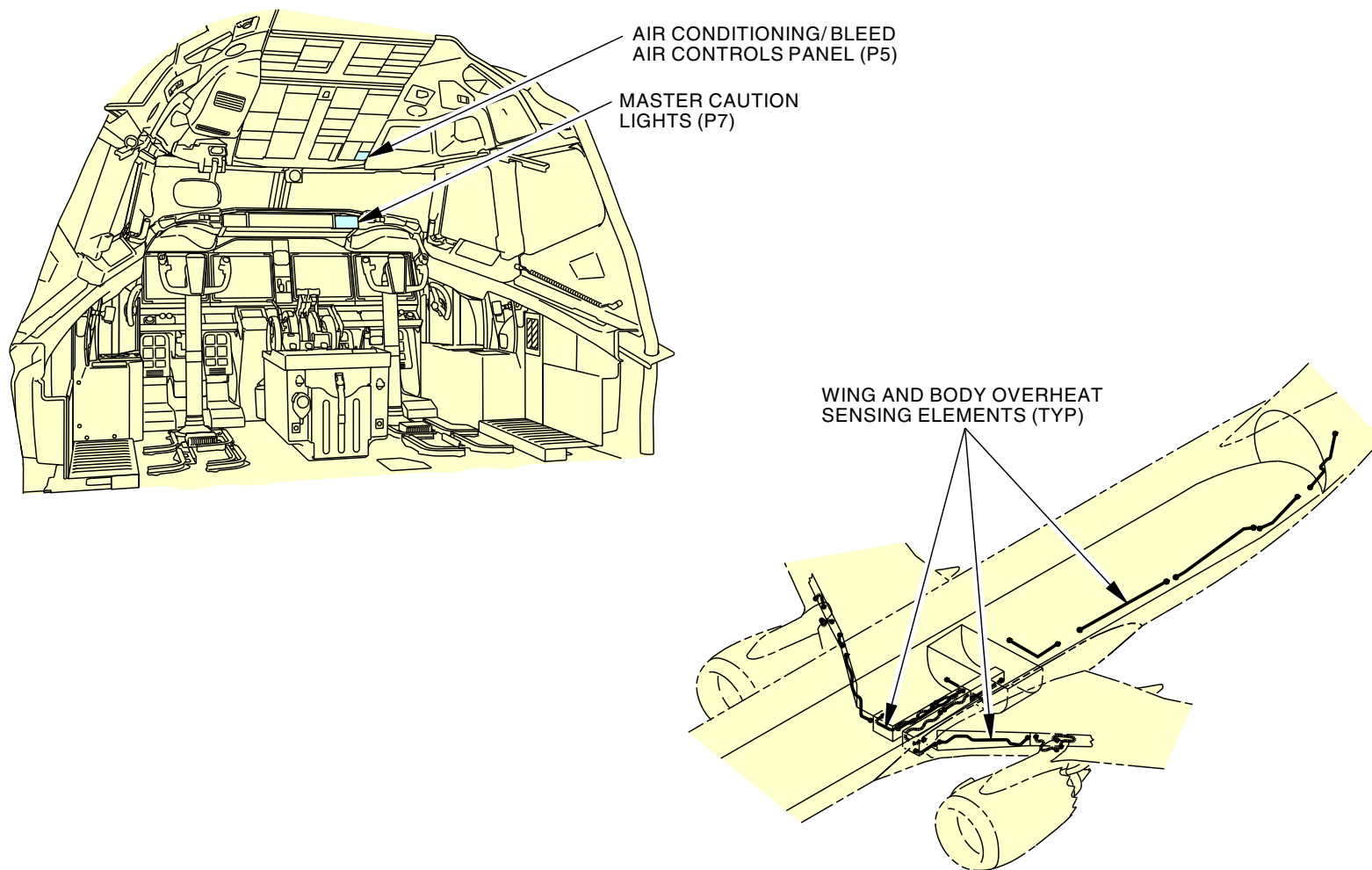
ECCN 9E991 BOEING PROPRIETARY - See title page for details

**FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - INTRODUCTION****Purpose**

The wing and body overheat detection system uses sensing elements adjacent to the pneumatic ducts. It monitors the pneumatic distribution system ducts for overheat conditions. When the system detects an overheat condition, alarm indications turn on in the flight compartment. The indications are on the P7 glareshield panel and on the P5 air conditioning/bleed air controls panel.

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FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - INTRODUCTION



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FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - INTRODUCTION

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**FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - GENERAL DESCRIPTION****General Description**

These are the major components of the wing and body overheat detection system:

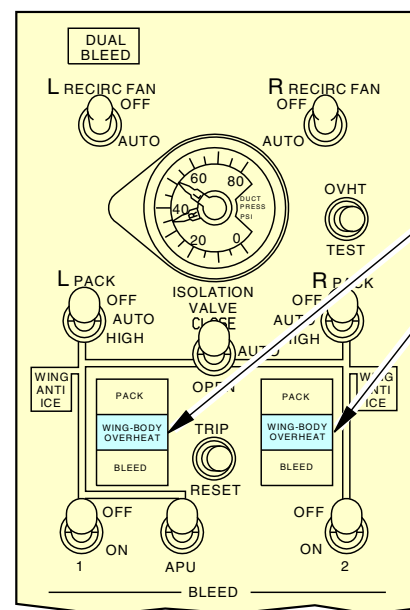
- Wing/body overheat sensing elements
- Compartment overheat detection controller
- Air conditioning panel.

The wing and body overheat detection system uses a single overheat sensing loop.

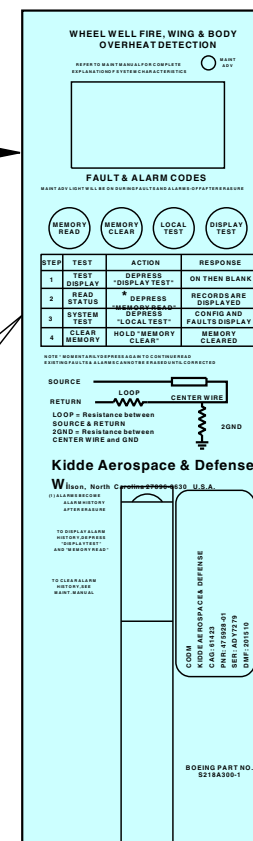
The detector loop in the left and right wing and body supplies overheat and fault signals to the compartment overheat detection controller. This controller uses the signals to give overheat or fault indications in the flight compartment on the air conditioning panel. The fault signals show on the compartment overheat detection module.

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Diagram illustrating the location of wing and body overheating sensing elements (TYP) on the aircraft structure. The diagram shows a cross-section of the wing and fuselage, with dashed lines indicating the internal structure. A blue arrow points to the sensing elements located along the upper surface of the wing and the fuselage.



AIR CONDITIONING PANEL (P5)



COMPARTMENT OVERHEAT DETECTION CONTROLLER

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FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - GENERAL DESCRIPTION

**FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - COMPARTMENT OVERHEAT DETECTION CONTROLLER****Purpose**

The compartment overheat detection controller monitors sensing elements for overheat and fire conditions in the wheel well and the wing and body areas.

Physical Description

The control circuits for the wing and body overheat detection are in the controller. The front panel has these components:

- MAINT ADV (maintenance advisory) light
- LED display
- BITE instructions
- Four BITE push button switches (MEMORY READ, MEMORY CLEAR, LOCAL TEST and DISPLAY TEST).

Location

The compartment overheat detection controller is in the electronic equipment compartment on the E1-4 rack.

BITE Test Switches and Indications

The non-volatile memory provides a storage area for ten LRU failures. Memory contents can be viewed on a 2 line by 8 character LED display.

The MEMORY READ switch gets access to the non-volatile memory.

The MEMORY CLEAR switch clears the non-volatile memory. The existing faults and alarms can not be cleared until corrected.

The LOCAL TEST switch starts a test sequence of the control circuits and detector elements.

The DISPLAY TEST switch does a check of the control circuits. This is indicated by the illumination of each LED of each character on the display.

The MAINT ADV (maintenance advisory) light is on when a fault or an alarm is stored in the non-volatile memory. The light shall remain on until all faults are removed and the memory is cleared.

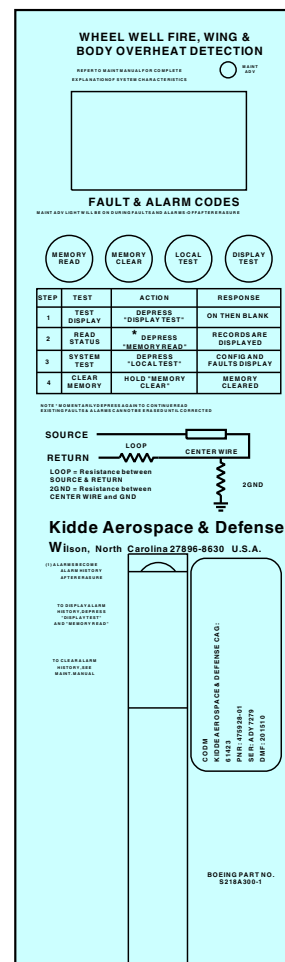
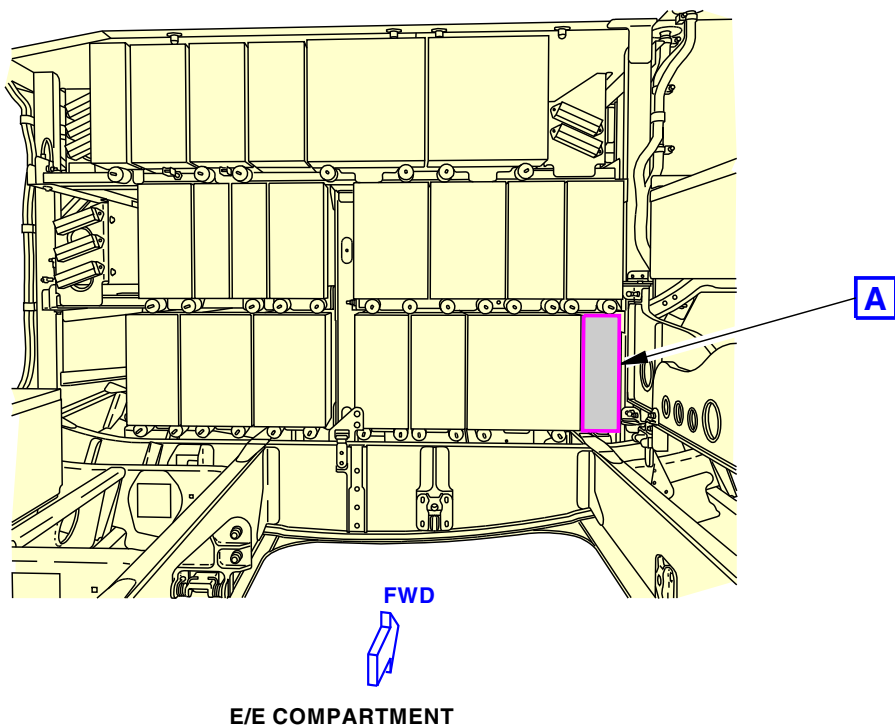
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FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - COMPARTMENT OVERHEAT DETECTION CONTROLLER



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FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - COMPARTMENT OVERHEAT DETECTION CONTROLLER

**FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - FUNCTIONAL DESCRIPTION****Functional Description**

The compartment overheat detection controller supplies power to the sensing elements. The microprocessor monitors the wing/body sensing elements for overheat conditions.

If the microprocessor detects a wing/body overheat, it keeps the alarm in memory and sets the overheat condition. These are the indications of a wing/body overheat:

- Left, right amber WING-BODY OVERHEAT light comes on the air conditioning panel
- MASTER CAUTION and AIR COND annunciator lights come on
- MAINT ADV light on the compartment overheat detection controller comes on.

Push and hold the P5 OVHT TEST switch for 5 seconds to start a test of the wing and body overheat detection system. The test alarm inputs are not kept in the memory.

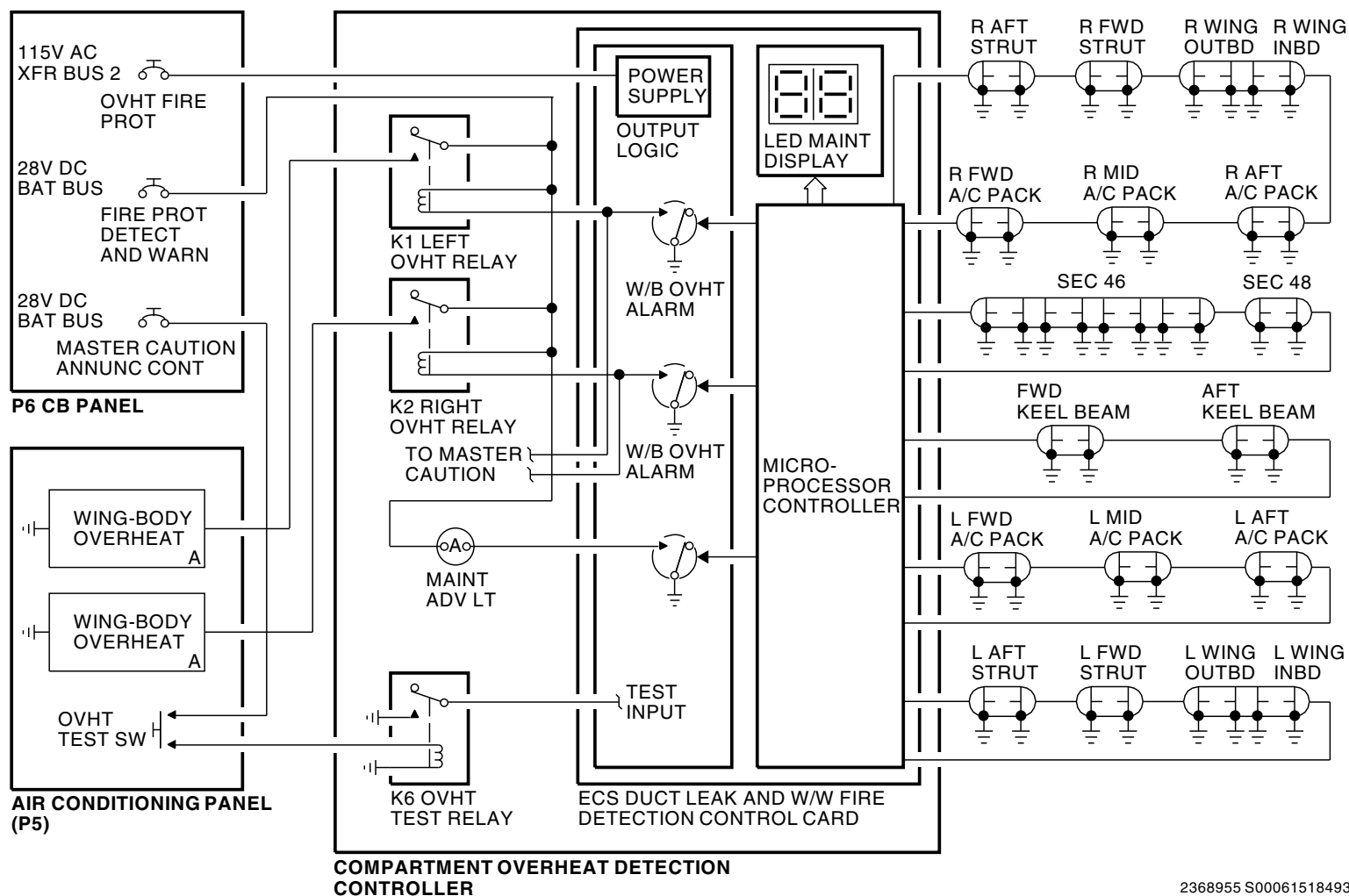
The test does a check of the continuity of the sensing elements. If the sensing element has continuity, the indications are the same as during a real alarm. If the sensing element does not have continuity, there are no indications in the flight compartment.

There is no difference between the real alarm and a short circuit. If there is a short circuit, the indications are the same as for a real alarm.

The faulty sensing element (no continuity or a short circuit) can be found by the coded indications on the compartment overheat detection controller.

EFFECTIVITY	
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FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - FUNCTIONAL DESCRIPTION



FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - FUNCTIONAL DESCRIPTION

**FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - FUNCTIONAL DESCRIPTION****Functional Description**

Overheat sensing elements in the left and right wing/body supply the overheat detection signal. The signal goes to the compartment overheat detection controller. This controller supplies the overheat alarms.

These are the flight compartment indications of a wing and body overheat:

- Left, right amber WING BODY OVERHEAT light on the air conditioning panel come on
- MASTER CAUTION and AIR COND annunciator lights come on.

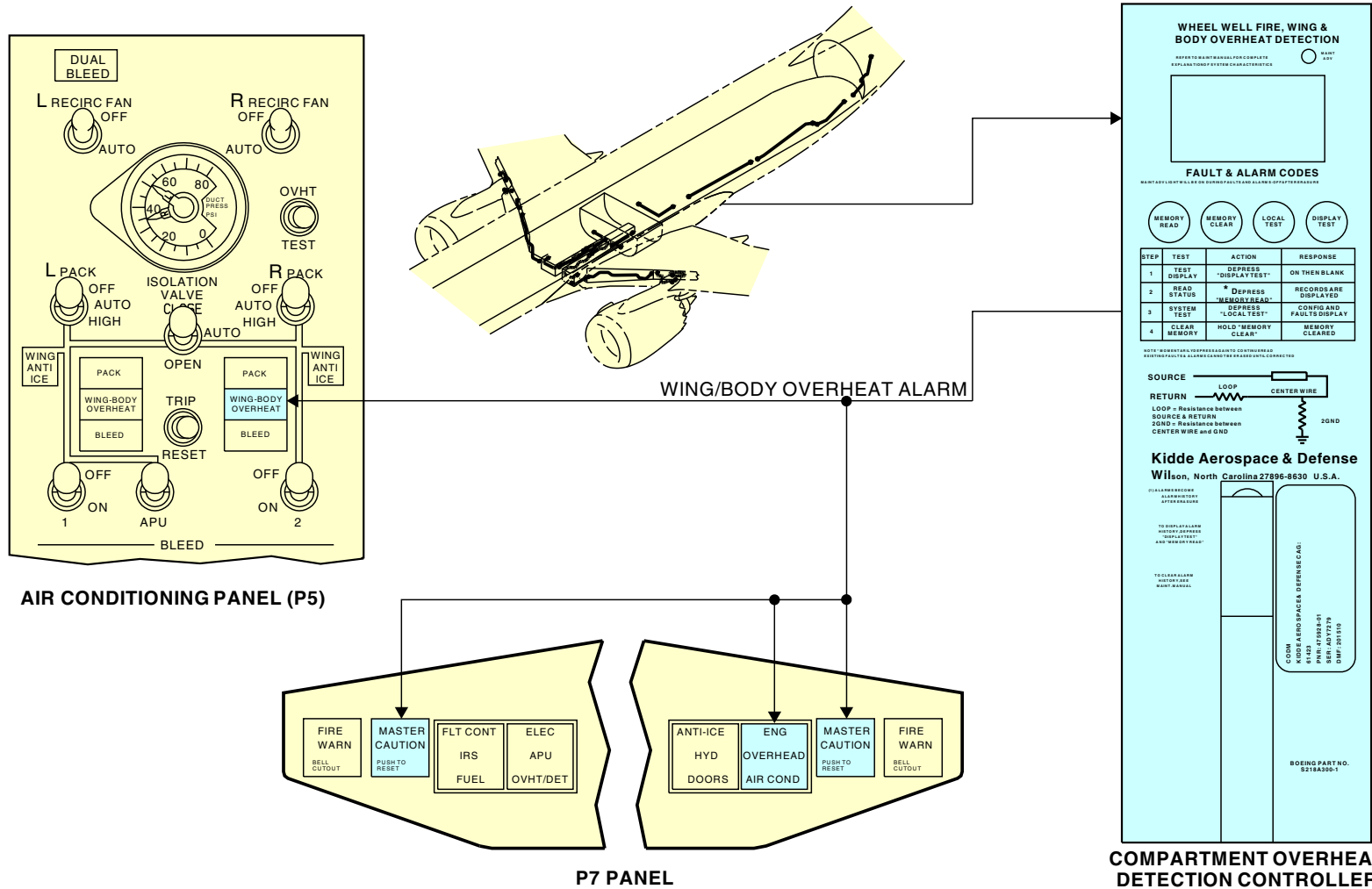
If the wing and body overheat indications come on due to a real overheat or a fault, the MAINT ADV light on the compartment overheat detection controller also comes on. Use the module to do a check for real overheat condition or a fault condition.

Wing and Body Overheat Test

The wing and body overheat detection test is with the OVHT TEST switch on the air conditioning panel. If the test passes, the indications in the flight compartment are the same as for a real overheat condition. If the test fails, use the compartment overheat detection controller to isolate the fault.

EFFECTIVITY	
SIA ALL	

FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - FUNCTIONAL DESCRIPTION



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FIRE PROTECTION - WING AND BODY OVERHEAT DETECTION - FUNCTIONAL DESCRIPTION



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EQUIPMENT COOLING SMOKE DETECTION - INTRODUCTION

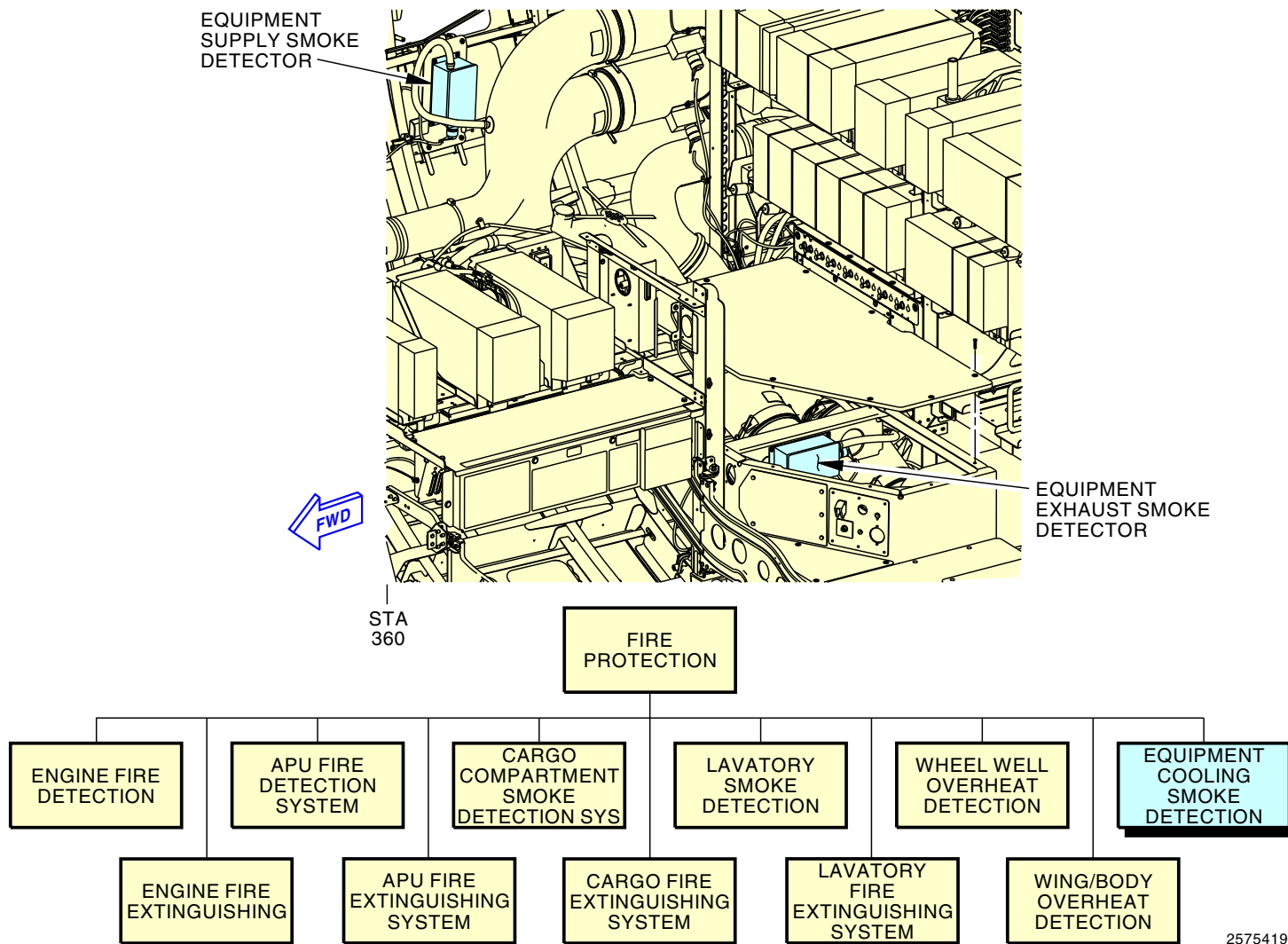
Purpose

The equipment cooling system has two subsystems, the equipment cooling supply system and the equipment cooling exhaust system. The equipment cooling smoke detection system monitors for smoke in the supply system and the exhaust system. If there is smoke, the detection system gives an indication in the flight compartment.

The detection system also starts the automatic reconfiguration of the smoke clearance mode.

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EQUIPMENT COOLING SMOKE DETECTION - INTRODUCTION



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EQUIPMENT COOLING SMOKE DETECTION - INTRODUCTION

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**EQUIPMENT COOLING SMOKE DETECTION - GENERAL DESCRIPTION****General**

The supply system and the exhaust system have a smoke detector. The detectors monitor for smoke. Relays give the logic that controls the operation of the smoke detection system.

If smoke is detected, the detector sends an alarm signal for these:

- Indication in the flight compartment
- Operation of the automatic reconfiguration for the smoke clearance mode
- Configuration of the purge mode for the supply system.

Smoke clearance mode operation has an interface with these operations in the air conditioning system:

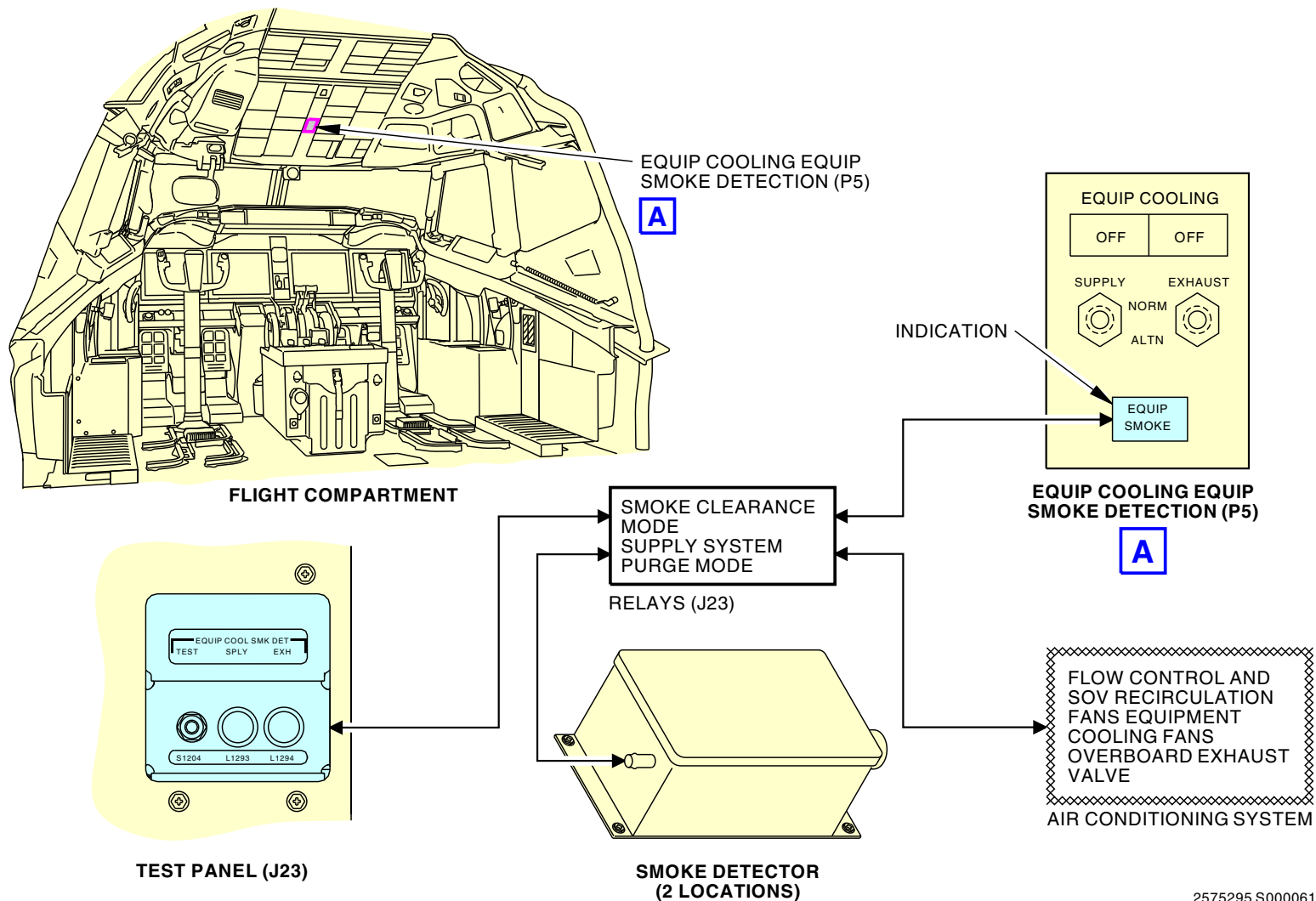
- Flow control and shutoff valve
- Recirculation fans
- Equipment cooling fans
- Overboard exhaust valve.

See the air conditioning chapter for more information about those operations (CHAPTER 21).

A test panel on the J23 junction box in the EE compartment lets you do a test of the smoke detectors and system operation.

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EQUIPMENT COOLING SMOKE DETECTION - GENERAL DESCRIPTION



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EQUIPMENT COOLING SMOKE DETECTION - GENERAL DESCRIPTION

**EQUIPMENT COOLING SMOKE DETECTION - SMOKE DETECTOR****Purpose**

The smoke detectors monitor for smoke in the equipment cooling supply and exhaust systems.

Location

The two detectors are in the Electronic Equipment (EE) compartment. The supply system detector is adjacent to the fuselage and forward of the supply fan/check valve assemblies. The exhaust system detector is below the floor board that is forward of the P92 panel and above the exhaust fan/check valve assemblies.

Physical Description

The detector is a photoelectric device. The detector has these:

- Electrical connector
- Two ports
- Mounting flange.

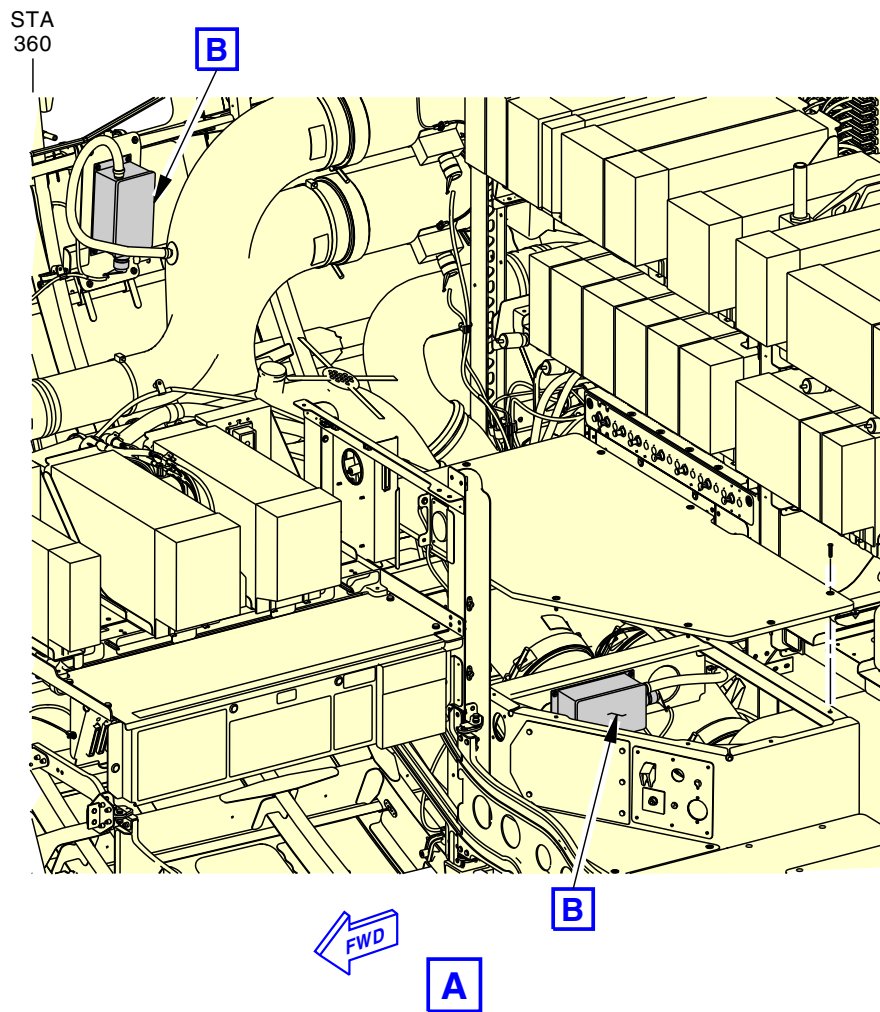
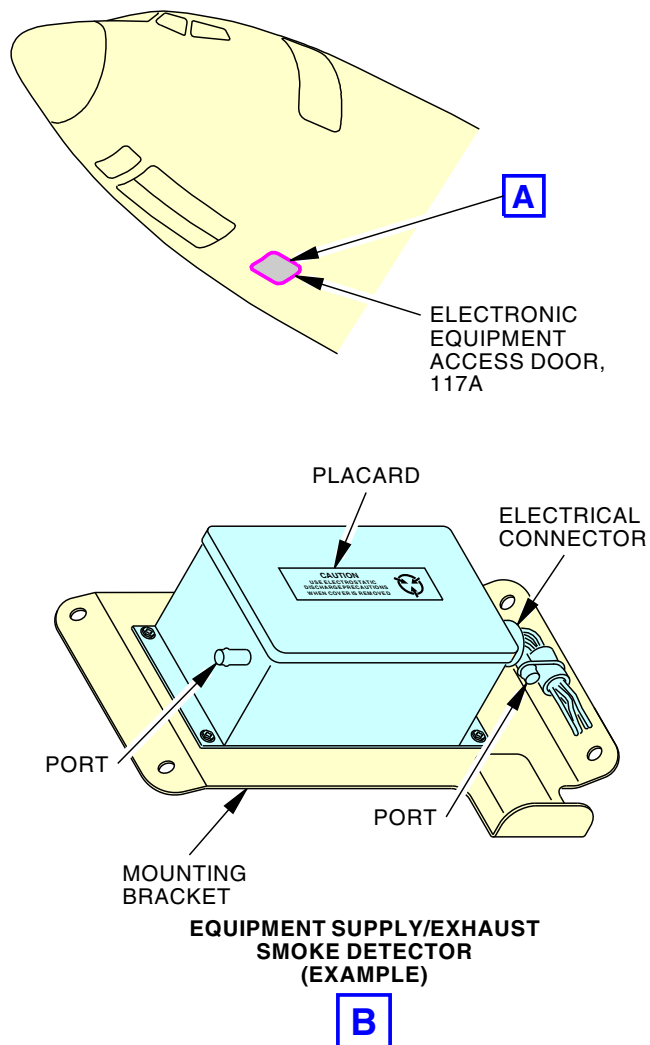
The detector has an ESDS placard.

Operation

Air goes into one port and exits the other port. In the detector, it goes through a light beam. When particles are in the air, the light beam is deflected to a circuit. The circuit energizes a relay. The relay gives a ground to the connector. The ground is the alarm signal.

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EQUIPMENT COOLING SMOKE DETECTION - SMOKE DETECTOR



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EQUIPMENT COOLING SMOKE DETECTION - SMOKE DETECTOR

26-19-00



EQUIPMENT COOLING SMOKE DETECTION - TIMELINES

General

The graphic shows the different timelines for these:

- Supply or exhaust smoke detected
- EQUIP SMOKE light operation
- Operation of the automatic reconfiguration of the smoke clearance mode
- Equipment cooling supply fan operation.

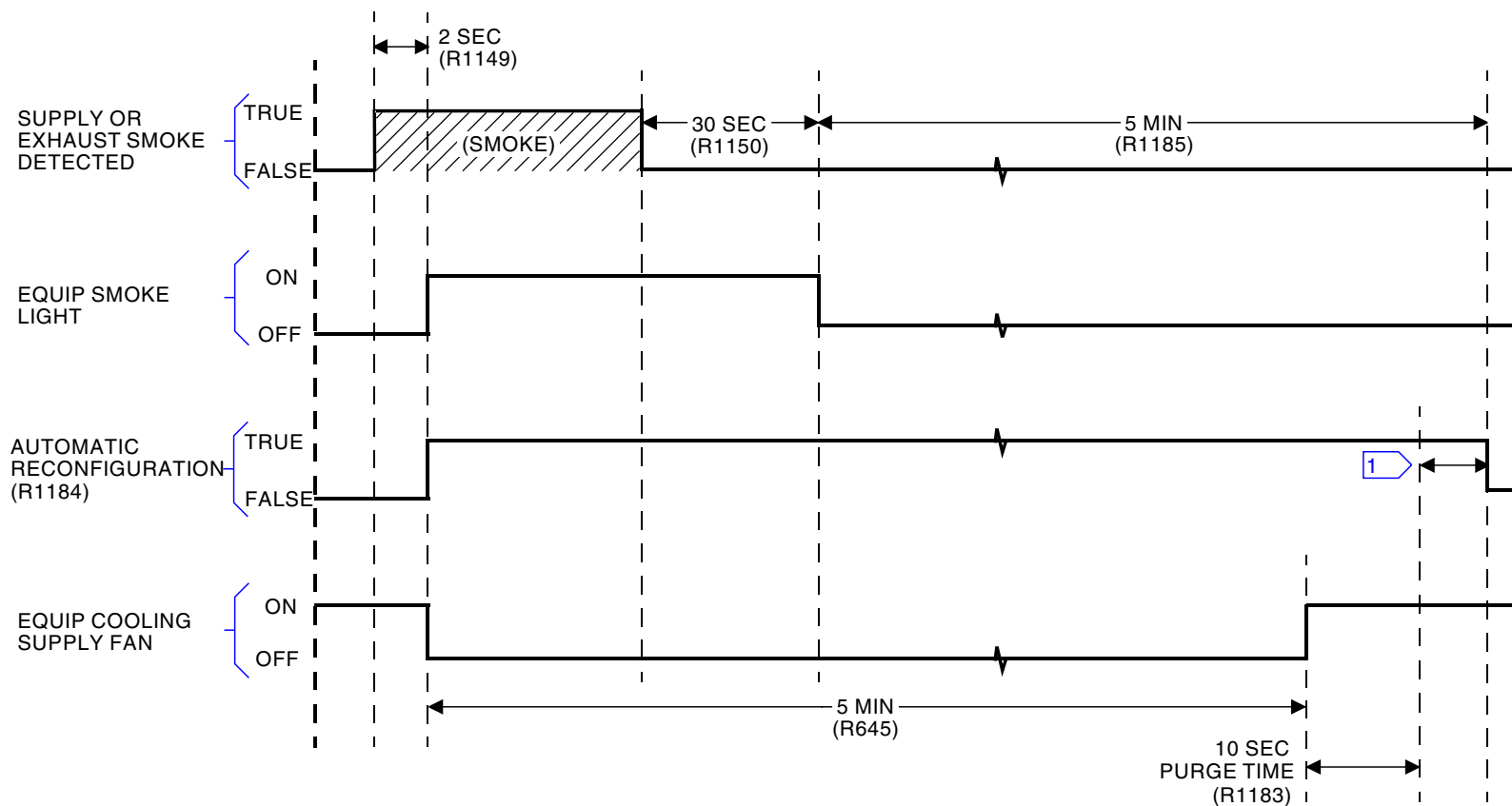
When smoke is detected, these relays give the time lengths and control of the timelines:

- R1149 - It has a two seconds time delay. It energizes two seconds after smoke is detected.
- R1184 - When it energizes, the automatic reconfiguration operates.
- R645 - The equipment cooling supply fan stops when the relay energizes.
- R1150 - It has a 30 seconds time delay. It de-energizes 30 seconds after smoke detection stops.
- R1185 - It has a five minutes time delay. It de-energizes five minutes after R1150 de-energizes.
- R1183 - It has a ten seconds internal timer. It energizes for ten seconds when R645 de-energizes.

NOTE: This page shows a general sequence of the timelines to help understand the functional description page.

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EQUIPMENT COOLING SMOKE DETECTION - TIMELINES



1 TIME = DIFFERENCE OF WHEN R645 AND R1185 DE-ENERGIZE.

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EQUIPMENT COOLING SMOKE DETECTION - TIMELINES

26-19-00

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**EQUIPMENT COOLING SMOKE DETECTION - FUNCTIONAL DESCRIPTION****General**

The equipment cooling smoke detection system monitors the supply and exhaust systems for smoke.

When a smoke alarm occurs, the detection system:

- Gives the EQUIP SMOKE alarm indication in the flight compartment
- Automatically reconfigures airplane systems to the smoke clearance mode
- Begins the purge mode setup.
- Resets the automatic reconfiguration.

The detection system also:

- Controls the purge mode
- Gives signals of the operation of the detectors and alarm indication to the Digital Flight Data Acquisition Unit (DFDAU)
- Inhibits the EQUIP SMOKE alarm indication when the smoke source is the forward cargo compartment
- Has a function to test the system for correct operation.

Smoke Detection System Components

When a smoke detector detects smoke, the relay in the detector energizes. The ground gives the smoke alarm to the system. The ground also gives the smoke alarm for the test function.

The smoke detection system has relays that give operation logic. Some relays have time delays. The TDO (time delay on operation) timers operate when they get power. The TDR (time delay on release) timers operate when power is removed. The relay with an internal timer (I/T) operates for a specified time when it gets power.

These are the components that control the indication and the reconfiguration:

- R1149 equipment cooling smoke detection persistence relay

- R1187 equipment cooling smoke detection purge enable relay. This relay gives power to energize R1183
- R1186 equipment cooling smoke detection purge setup relay. This relay gives a path to the electrical ground to energize R1183
- R1183 equipment cooling smoke detection purge mode relay. When this relay gets power from R1187, it energizes for 10 seconds
- R645 supply system control interrupt relay. Energizes when the R648 smoke control relay energizes (smoke clearance mode). See the equipment cooling section for more information about the R648 relay operation (SECTION 21-27).
- R644 recirculation fan switch bypass relay (energized during pressurized flight)
- R1185 equipment cooling smoke detection reconfiguration timeout relay. Energizes when R1150 energizes
- R1150 equipment cooling smoke detection indication timeout relay
- R1184 equipment cooling smoke detection reconfiguration relay. Energizes when R1185 energizes
- R1151 equipment cooling smoke detection indication inhibit timeout relay
- R1152 equipment cooling smoke detection indication test timer relay
- R1188 equipment cooling smoke detection test relay.

Smoke Alarm

The R1149 relay starts the reconfiguration sequence when there is a smoke alarm (either detector gives a ground).

The R1149 relay can only energize through the R1183 relay. The R1183 relay controls the purge mode (opens or closes the circuit between the detector and the R1149 relay. The open or close circuit equals purge or no purge).

When the R1149 relay energizes, it gives a ground to energize the R1150 relay. The R1150 relay gives a ground to:

- Turn on the EQUIP SMOKE light
- Energize the R1185 relay

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**EQUIPMENT COOLING SMOKE DETECTION - FUNCTIONAL DESCRIPTION**

- Give a signal to the DFDAU.

The R1150 relay gives a ground to:

- Turn on the EQUIP SMOKE light
- Energize the R1185 relay
- Give a signal to the DFDAU.

When the R1185 relay energizes, it:

- Gives a ground to energize the R1184 relay
- Connects the R1186 relay to a R1150 contact (open)
- Connects the R1186 contact to a R1150 contact (open).

Reconfiguration

When the R1184 relay energizes, it sends signals and controls to these airplane systems to operate the smoke clearance mode:

- The R648 relay energizes. This causes the R645 relay to energize and its five minutes timer to start (R645 de-energizes after five minutes). See the equipment cooling section for more information about the R648 relay and R645 relay operation (SECTION 21-27)
- APU ECU and BLEED switch (3) signals go to the Integrated Air System Controller (IASC) (packs go to high flow). See the cooling section for more information about the K18 flow mode relay (SECTION 21-50)
- The left and right K18 relays energize (packs go to high flow). See the cooling section for more information about the K18 flow mode relay (SECTION 21-50)
- If the plane is in pressurized flight (K644 relay energized), the left and right K16 relays energize (left and right recirculation fans stop). See the recirculation section for more information about the K16 E/E cooling smoke relay (SECTION 21-25).

Reset (Auto Reconfiguration System Deactivates)

NOTE: During the reset sequence, the R645 relay timer operates and the purge mode activates.

When the smoke alarm stops, the detector ground opens and the R1149 relay de-energizes. This opens the ground to the R1150 relay. The R1150 TDR starts. Thirty seconds later, the R1150 relay de-energizes.

When the R1150 relay de-energizes:

- The ground connects, through the R1185 contact, to the R1186 relay (energizes)
- The ground connects, through the R1185 contact, to the R1186 contact
- The R1185 TDR starts
- A signal goes to the DFDAU.

After five minutes, the R1185 relay de-energizes and these occur:

- The R1186 relay de-energizes
- The R1184 relay de-energizes
- The de-energized R1184 relay causes the related airplane systems to go back to their normal control operation.

This completes the reset of the automatic reconfiguration system.

Purge Mode

After five minutes, the R645 relay de-energizes (the supply fan starts). (When the supply fan starts, the purge mode lets the fans clear smoke particles from the ducts.) This causes the R1187 relay to de-energize. The R1187 contact lets power go to the R1183 relay and:

- The R1183 relay energizes (the ground is through the R1186, R1185 and R1150 contacts)
- The internal timer starts.

**EQUIPMENT COOLING SMOKE DETECTION - FUNCTIONAL DESCRIPTION**

When the R1183 relay energizes, the circuit between the detectors and the R1149 relay opens (the smoke detection reconfiguration circuit is inhibited). This stops a false alarm caused by particles that are in the system. After ten seconds, the R1183 relay de-energizes (smoke detection reconfiguration circuit is normal).

Test

When you push the TEST switch, the R1152 relay energizes. The ground lets the R1188 relay energize. When you release the switch, the TDR starts. The R1152 relay stays energized for 20 seconds. When it de-energizes, the R1188 relay de-energizes.

When the R1188 relay energizes:

- A signal goes to the detectors to start a test
- A circuit between each detector and its related light closes.

If the detector is good, it gives a ground and its related light comes on. Also, signals go to the DFDAU.

EQUIP SMOKE Light Inhibit

The R945 relay energizes if there is a forward cargo compartment fire alarm.

The R648 relay energizes automatically or manually. If the equipment cooling smoke detection system detects smoke, it automatically energizes the R648 relay. If the crew smells smoke, they move switches. See the equipment cooling section for more information about the R648 relay operation (SECTION 21-27).

Since the smoke can be from the cargo compartment fire (the crew procedure is different from equipment cooling smoke procedures), the light is inhibited by the R1151 relay.

The R1151 relay energizes when all these occur:

- The R648 relay energized (smoke clearance mode)
- The R644 relay energized (pressurized flight)
- The R945 relay energized (forward cargo compartment fire alarm).

When the R1151 relay energizes, the EQUIP SMOKE light cannot come on. Also, a signal goes to the DFDAU.

DFDAU

The pullup resistors give reference voltages to the DFDAU for system operation data. These four pullups let accurate signals go to the DFDAU:

- R1142 equipment cooling smoke supply pullup resistor
- R1143 equipment cooling smoke exhaust pullup resistor
- R1144 equipment cooling smoke pullup resistor
- R1191 equipment cooling smoke auto pullup resistor.

The DFDAU gets signals about system operation.

The pullup resistors let the DFDAU get correct signals (grounds and opens).

The pullups stabilize (due to airplane electrical voltage variations) the electrical power to give a good reference voltage.

The DFDAU gets these signals:

- Supply detector test/no test alarm
- Exhaust detector test/no test alarm
- Test/no test
- Light inhibit/no inhibit.

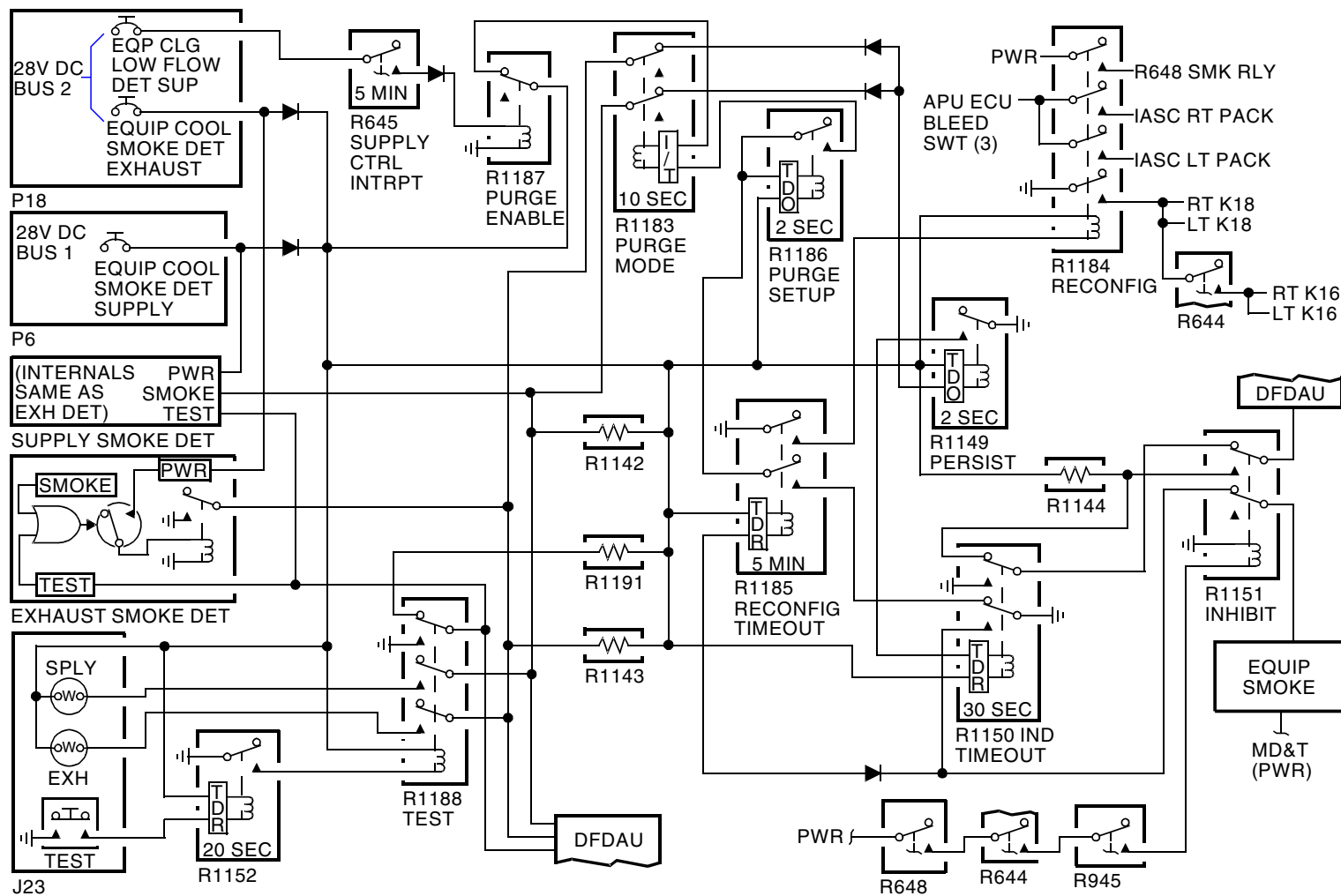
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EQUIPMENT COOLING SMOKE DETECTION - FUNCTIONAL DESCRIPTION



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EQUIPMENT COOLING SMOKE DETECTION - FUNCTIONAL DESCRIPTION

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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - INTRODUCTION

Purpose

The engine fire extinguishing system puts out fires in the engine compartment.

General Description

The engine fire extinguishing system floods the engine compartments with halon to put out the fire. Two fire extinguisher bottles supply the halon to either engine.

Physical Description

These are the components of the engine fire extinguishing system:

- Engine and APU fire control panel
- Fire extinguisher bottles (2)
- Engine fire extinguishing ports.

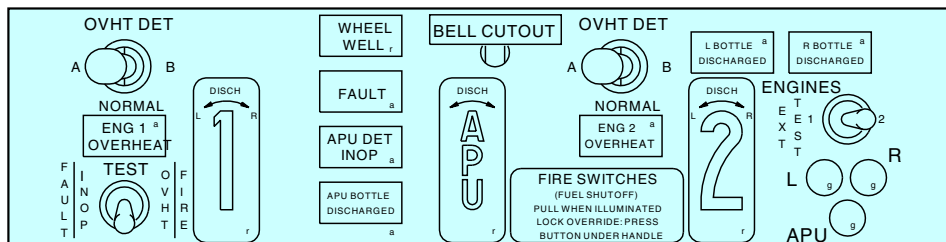
Location

The two engine fire extinguisher bottles are in the top left corner of the main wheel well.

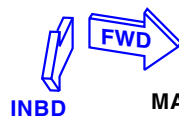
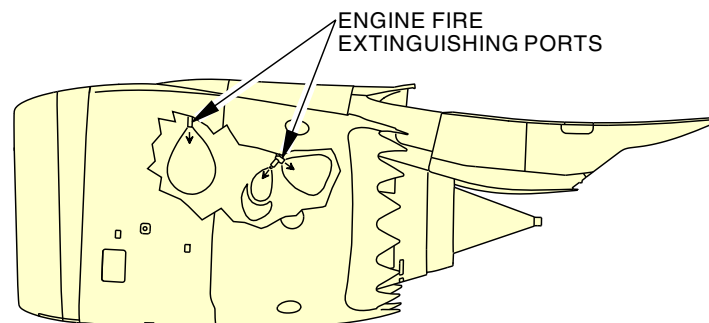
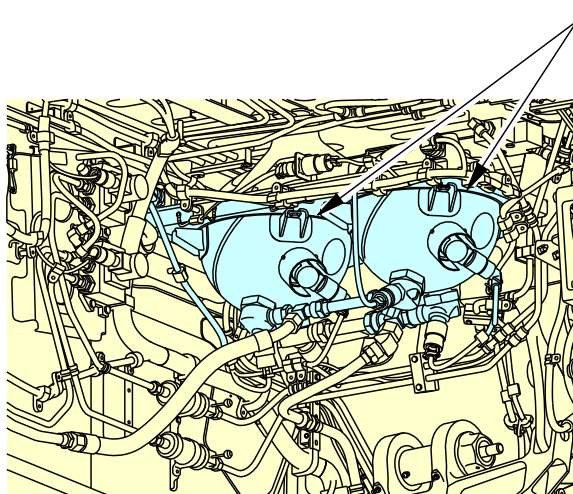
The engine and APU fire control panel is in the flight compartment on the P8 panel.

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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - INTRODUCTION



ENGINE AND APU FIRE CONTROL PANEL (P8)



MAIN WHEEL WELL

FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - INTRODUCTION

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**FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - OPERATION****Operation**

When there is an overheat or fire condition, the fire handle switch for that engine unlocks. You can also use the handle switch override under the handle to unlock the fire handle switch. When you pull the switch up, the engine systems are shutdown and isolated for safety.

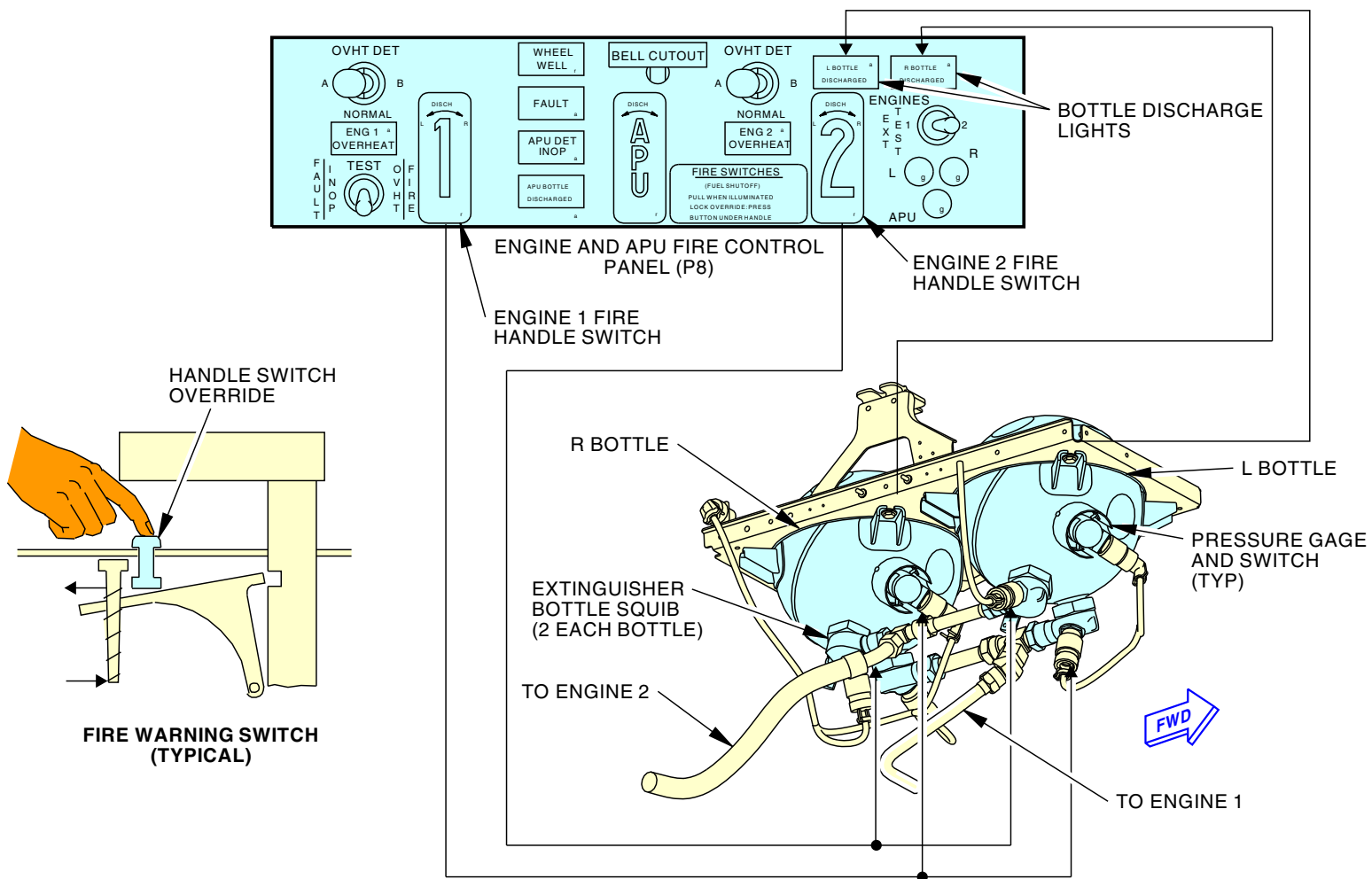
Engine 1 Fire Extinguishing

When you turn the engine 1 (left) fire handle switch clockwise, the extinguisher bottle squib 1 on the R bottle operates. This breaks a seal and sends the halon in the R bottle to engine 1. If you turn the same engine fire handle switch counter-clockwise, the extinguisher bottle squib 1 on the L bottle operates. This sends the halon in the L bottle to engine 1. When an engine fire extinguisher bottle is empty, the amber BOTTLE DISCHARGED light on the engine and APU fire control panel comes on.

Engine 2 Fire Extinguishing

The engine 2 (right) fire extinguishing system operates the same as engine 1. The engine 2 fire handle switch causes the squib 2 on the L or R bottle to operate.

FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - OPERATION



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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - OPERATION

26-21-00

**FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - EXTINGUISHER BOTTLE****Purpose**

The engine fire extinguisher bottles contain halon that extinguishes an engine fire.

Physical Description

The engine fire extinguisher bottles are spherical. Each bottle contains halon and nitrogen at a pressure of 800 psi at a temperature of 70°F (21°C). These are the components of each engine fire extinguisher bottle:

- Pressure gage and switch
- Safety relief port
- Two electrical connections
- Two discharge ports with squibs.

Each bottle has two discharge assemblies (squibs) connected to the discharge tubing. The discharge tubing with check valves sends the extinguisher agent to the left and right engine from each bottle.

Location

The two engine fire extinguisher bottles are in the main wheel well. The bottles attach to brackets in the top left corner of the main wheel well.

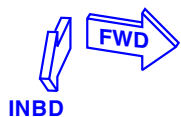
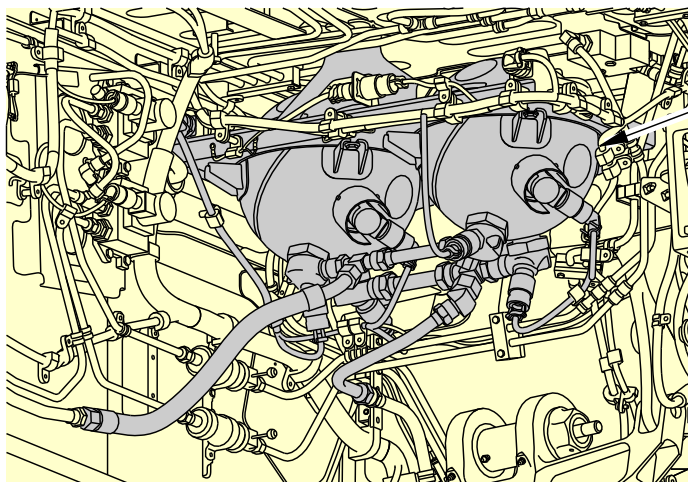
Operation

When you pull up and turn the engine fire warning switch, you operate the squib. The squib breaks a seal in the bottle. This causes the bottle to release halon. The halon gas flows from the bottle to the selected engine compartment. You can send halon from either one or both bottles to the same engine.

If the bottle temperature increases to 266°F (130°C), the safety relief port ruptures. This releases halon into the wheel well.

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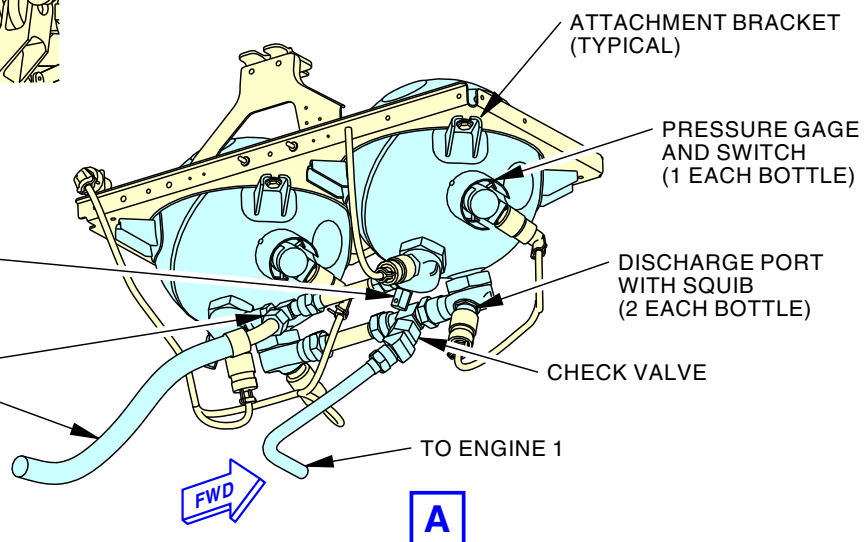
FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - EXTINGUISHER BOTTLE



MAIN WHEEL WELL

FILL FITTING AND SAFETY
RELIEF DEVICE
(1 EACH BOTTLE)

CHECK VALVE
TO ENGINE 2



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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - EXTINGUISHER BOTTLE

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**FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - EXTINGUISHER BOTTLE SQUIB****Purpose**

The purpose of the squib is to break the diaphragm seal and start the release of the halon gas from the bottle.

Physical Description

The squib is an explosive device that operates electrically. It is adjacent to a bottle diaphragm that can break. The diaphragm normally seals the pressurized bottle.

Location

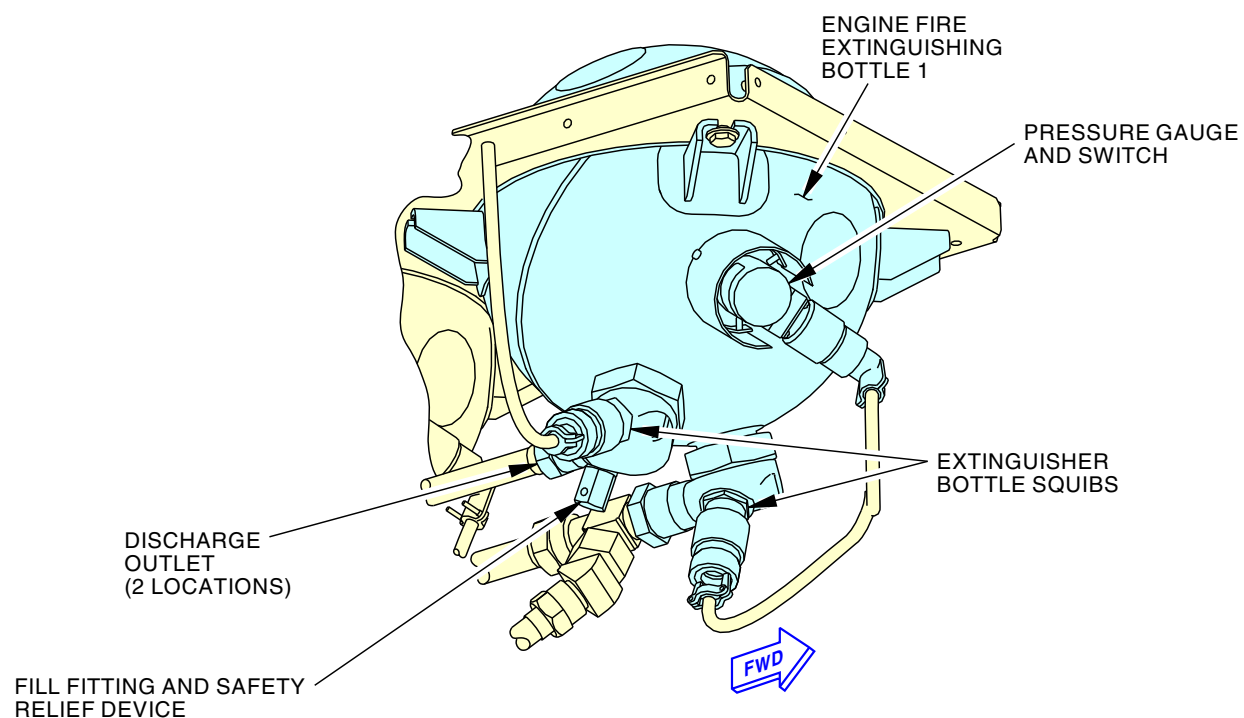
The squibs are in the discharge assembly at the bottom of the extinguisher bottles.

Functional Description

A squib operates when you turn a fire warning switch. The explosion breaks open the diaphragm. The nitrogen pressure in the bottle pushes the halon through the discharge port.

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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - EXTINGUISHER BOTTLE SQUIB



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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - EXTINGUISHER BOTTLE SQUIB

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**FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - OVERHEAT/FIRE PROTECTION PANEL****Purpose**

The engine and APU fire control panel monitors the fire protection system for these conditions:

- Engine overheat
- Engine fire
- APU fire
- Wheel well fire
- L bottle discharge
- R bottle discharge
- APU bottle discharge
- Engine fire protection fault
- APU fire protection fault.

The engine and APU fire control panel lets you do these functions:

- Set the mode of operation (single or dual loop operation)
- Operation of the fire extinguisher bottles
- Do a test of the fire extinguisher bottle squibs
- Do a test of the fire protection system
- Do a test of the fault detection circuits
- Stop the fire alarm bell.

Physical Description

These are the components of the engine and APU fire control panel:

- Engine and APU fire handle switches
- OVHT DET switches
- FAULT/INOP test switch
- OVHT/FIRE test switch
- EXT TEST switch
- Bell CUTOFF switch.

Location

The engine and APU fire control panel is on the P8 panel.

Operation Indications

These are the indications on the engine and APU fire control panel:

- WHEEL WELL fire warning light, comes on for a wheel well fire condition
- ENG OVERHEAT light comes on for an engine overheat condition
- Fire handle switch lights come on for an engine fire condition
- Bottle discharge lights come on when an extinguisher bottle is discharged
- FAULT light comes on to show a fault condition in the engine fire detection system
- APU DET INOP light comes on to show a fault condition in the APU fire detection system
- EXT TEST lights come on after you do a successful squib continuity test.

Operation Controls

These are the controls on the engine and APU fire control panel:

- Fire handle switches show fire indication and control fire extinguisher squibs
- TEST switch lets you to do two tests. One test is for the fault detection circuits. The other test is for the fire detector loops
- OVHT DET switches let you select the mode of operation, loop A or loop B. You may also select NORMAL for both loops
- EXT TEST switch lets you do a check of the extinguisher bottle squibs for continuity.

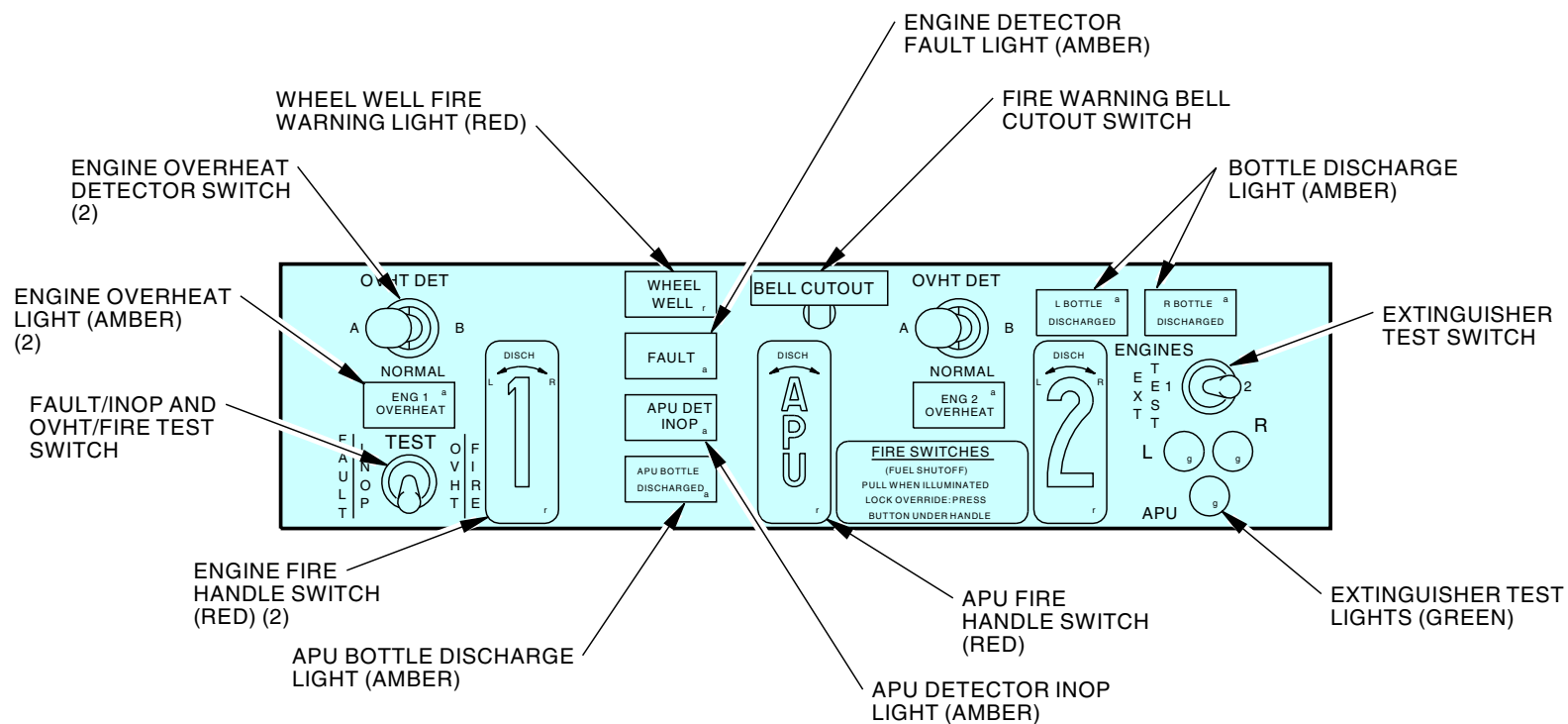
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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - OVERHEAT/FIRE PROTECTION PANEL



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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - OVERHEAT/FIRE PROTECTION PANEL

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**FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - FUNCTIONAL DESCRIPTION****Functional Description**

When there is an overheat or fire condition, the related engine fire handle switch on the engine and APU fire control panel unlocks. You can also use the manual override under the handle to unlock the fire warning switch. When you pull the switch up, these functions occur:

- High pressure fuel valve in HMU closes
- Spar fuel valve closes
- Thrust reverser control power goes off
- Engine driven hydraulic pump shutoff valve closes
- Hydraulic system low pressure indication inhibited
- Pneumatic pressure regulating and shutoff valve closes
- Generator trips off.

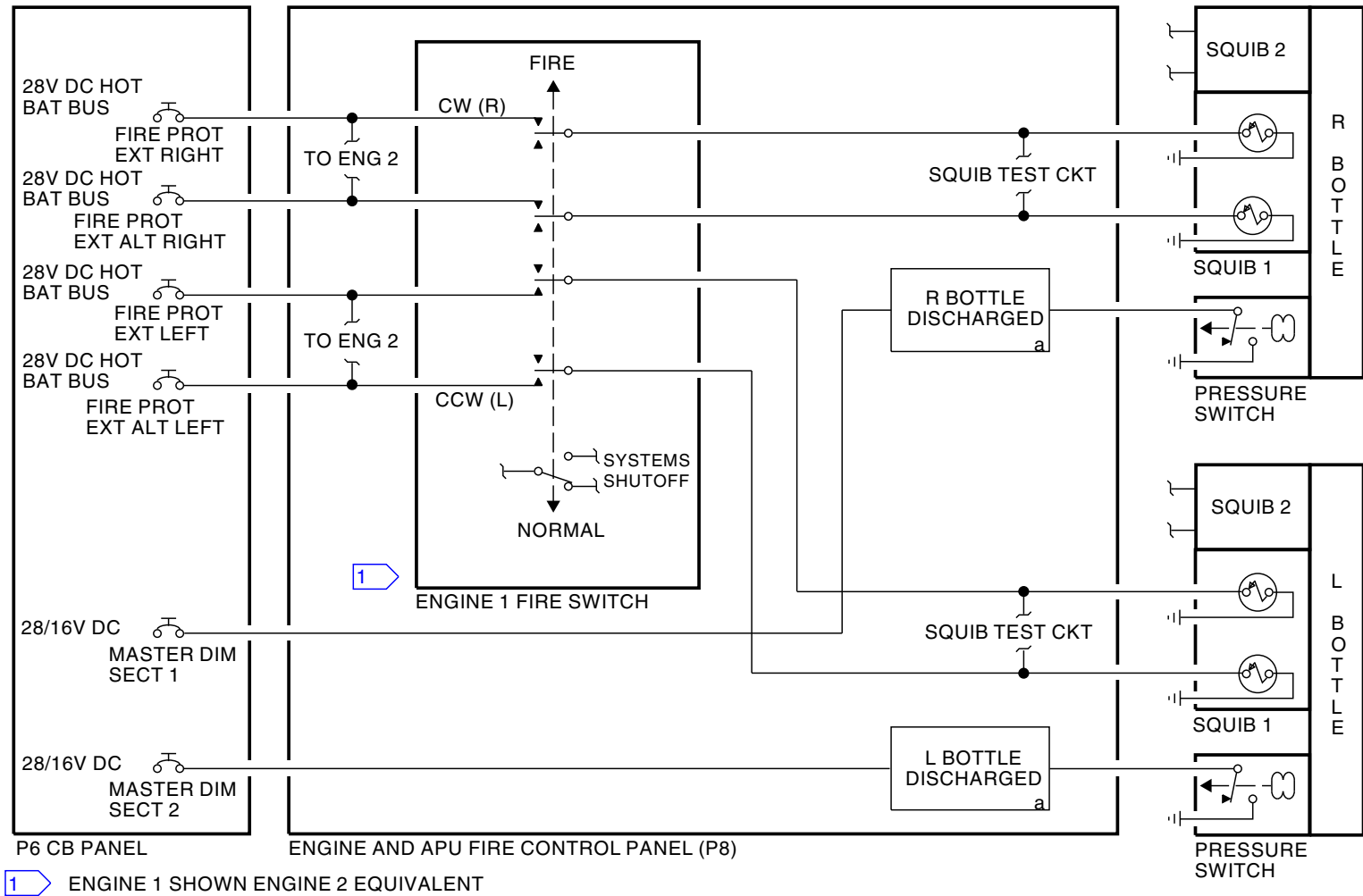
When you turn the engine 1 fire handle switch clockwise, 28v dc goes to the R bottle dual squib 1. This releases halon which goes from the bottle to engine 1. If you turn the same engine fire handle switch counter-clockwise, 28v dc goes to the L bottle dual squib 1. This releases halon which goes from the bottle to engine 1.

When an engine fire extinguisher bottle pressure is less than 250 psi, the bottle pressure switch closes. The related BOTTLE DISCHARGED amber light on the overheat/fire protection panel comes on.

The engine 2 fire extinguishing system operates the same as engine 1. The difference is that the engine 2 fire warning switch sends 28v dc to the R or L bottle squib 2.

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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - FUNCTIONAL DESCRIPTION



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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - FUNCTIONAL DESCRIPTION



FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - ENGINE AND APU FIRE EXTINGUISHER TEST

Purpose

The engine and APU fire extinguisher test does a check for fire extinguisher bottle squib continuity. This test makes sure squib servicing is not necessary.

The green test lights come on to show a successful test.

NOTE: You test the same APU bottle squib with the switch in the 1 or 2 position. The green test lights have a push-to-test function.

Physical Description

The engine and APU fire extinguisher test uses these components:

- Three-position toggle switch, spring loaded to the neutral position
- L bottle test green light comes on
- R bottle test green light comes on
- APU bottle test green light comes on.

Location

The engine and APU fire extinguisher test switch and three green lights are on the engine and APU fire control panel.

Operation

When you set the EXT TEST switch to the 1 position, a test of these squibs occurs:

- L bottle number 1 squib
- R bottle number 1 squib
- APU bottle squib.

When you set the EXT TEST switch to the 2 position, a test of these squibs occurs:

- L bottle number 2 squib
- R bottle number 2 squib
- APU bottle squib.

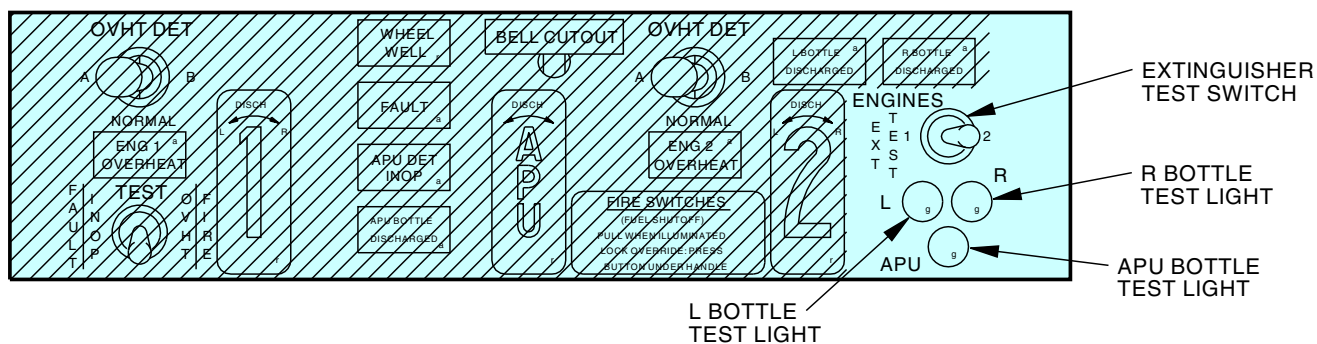
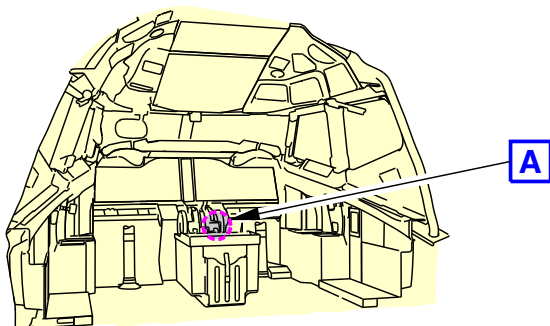
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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - ENGINE AND APU FIRE EXTINGUISHER TEST



ENGINE AND APU FIRE CONTROL PANEL (P8)

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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - ENGINE AND APU FIRE EXTINGUISHER TEST

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**FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - ENGINE EXTIN TEST - FUNCTIONAL DESCRIPTION****Functional Description**

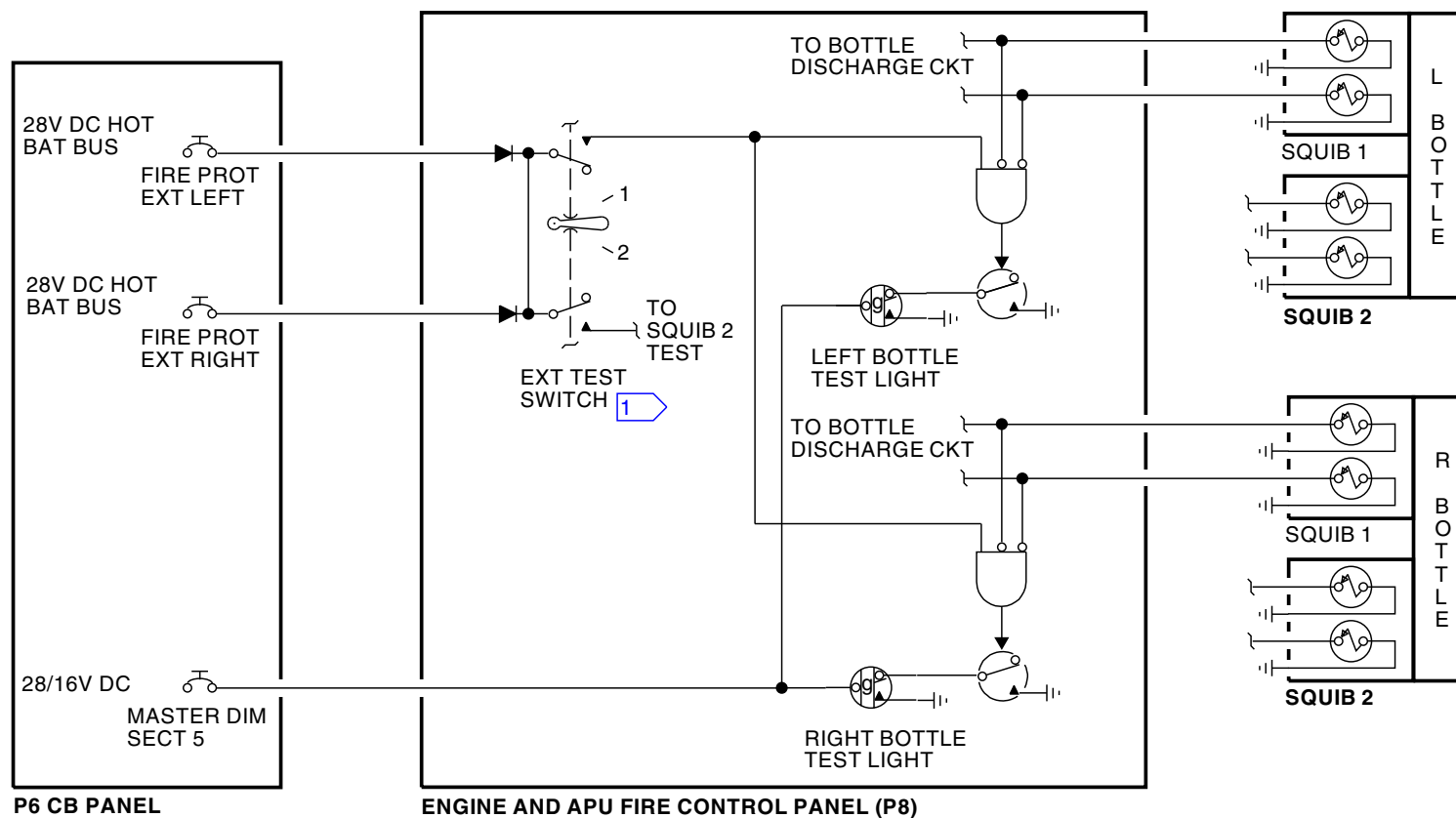
When you hold the EXT TEST switch in position 1, power goes to two logic circuits in the engine and APU fire control panel. The dual No. 1 squibs on the left and right fire extinguishing bottles are also connected to the logic circuits. When there is electrical continuity through the dual squib, a green light comes on. If the green light does not come on during test, the squib has to be replaced.

When you hold the EXT TEST switch in position 2, the dual No. 2 squibs test is done for electrical continuity on the left and right engine fire extinguisher bottles.

NOTE: You do a test of the APU fire extinguisher bottle squib from position 1 and 2 of the EXT TEST switch.

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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - ENGINE EXTIN TEST - FUNCTIONAL DESCRIPTION



1 EXT TEST SWITCH POSITION 1 SHOWN, POSITION 2 THE SAME

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FIRE PROTECTION - ENGINE FIRE EXTINGUISHING - ENGINE EXTIN TEST - FUNCTIONAL DESCRIPTION



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FIRE PROTECTION - APU FIRE EXTINGUISHING - INTRODUCTION

Purpose

The APU fire extinguishing system extinguishes fires in the APU compartment.

General Description

The APU fire extinguishing system floods the APU compartment with halon to extinguish the fire. One fire extinguisher bottle supplies the extinguishing agent to the APU compartment.

Physical Description

These are the components of the APU fire extinguishing system:

- Engine and APU fire control panel
- APU fire extinguishing bottle
- APU remote control panel.

Location

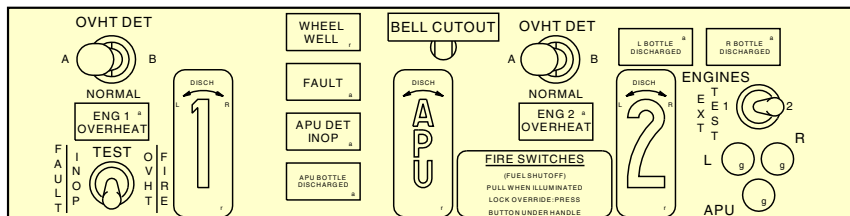
The APU fire extinguishing bottle is in the horizontal stabilizer accessory compartment.

The engine and APU fire control panel is in the flight compartment on the P8 panel.

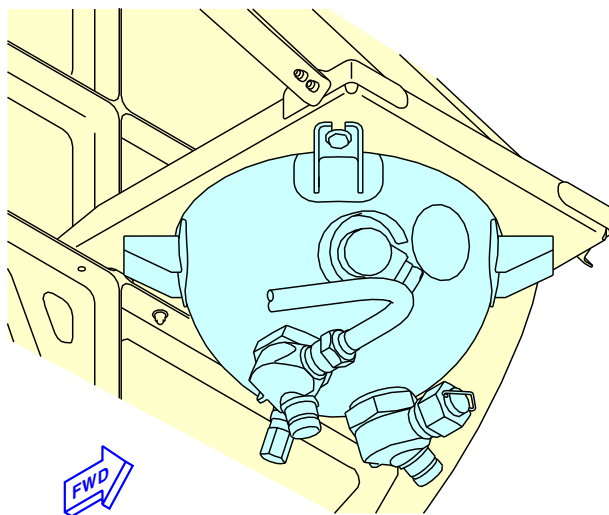
The APU remote control panel P28 is in the right main wheel well, on the aft bulkhead.

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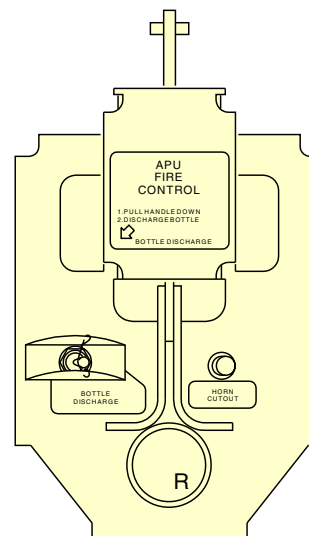
FIRE PROTECTION - APU FIRE EXTINGUISHING - INTRODUCTION



ENGINE AND APU FIRE CONTROL PANEL (P8)



APU FIRE EXTINGUISHING BOTTLE
(HORIZONTAL STABILIZER ACCESSORY COMPARTMENT)



APU REMOTE CONTROL PANEL, P28
(RIGHT MAIN WHEEL WELL)

2368965 S00061518517_V1

FIRE PROTECTION - APU FIRE EXTINGUISHING - INTRODUCTION

26-22-00-001

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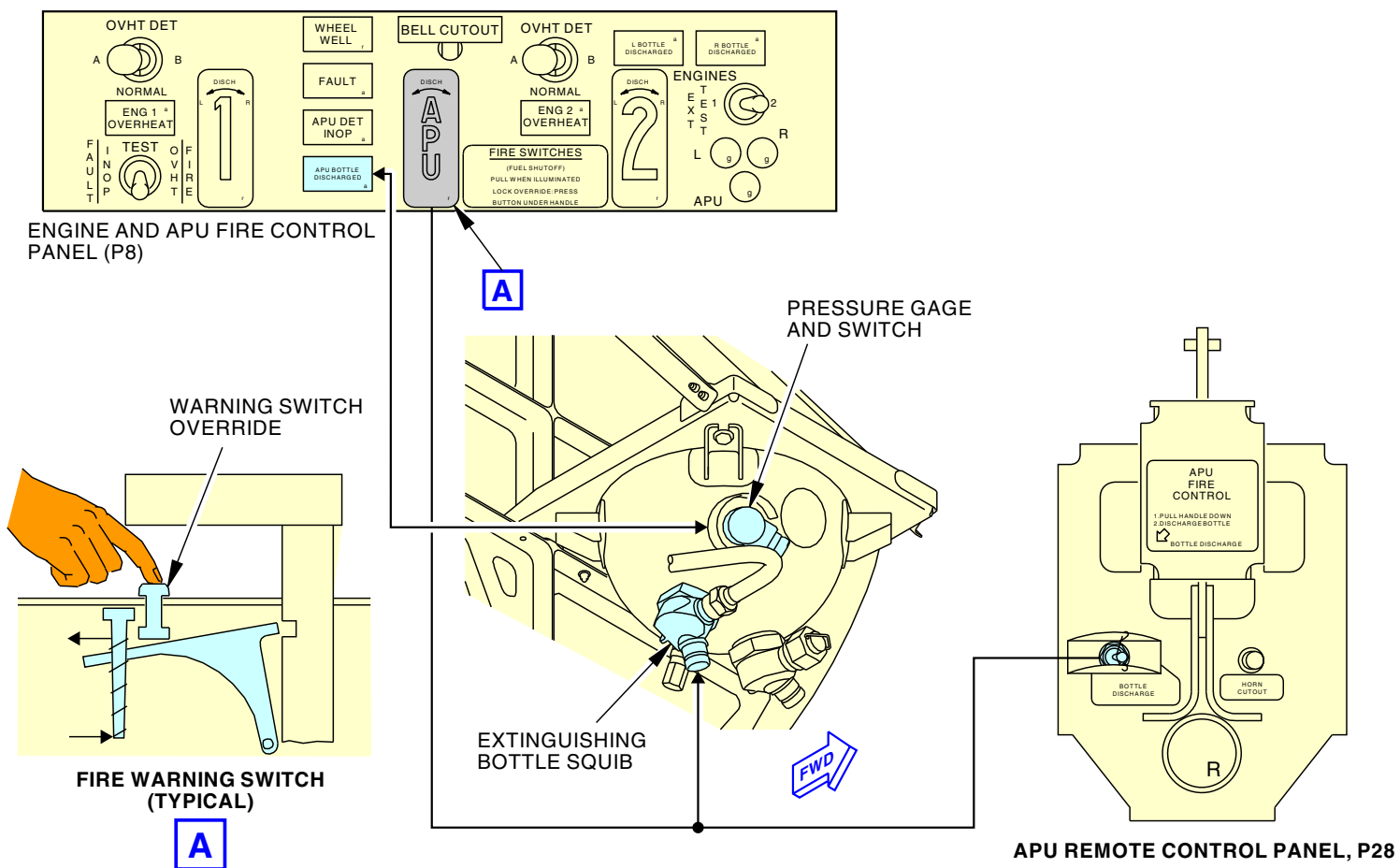
**FIRE PROTECTION - APU FIRE EXTINGUISHING - OPERATION****Operation**

When there is a fire condition, the APU fire warning switch unlocks. You can also use the warning switch override under the handle to unlock the switch. When you pull the APU fire warning switch up, the APU systems are shutdown and isolated.

When you turn the APU fire handle switch clockwise or counter-clockwise, the extinguisher bottle squib operates. This breaks the seal and lets the extinguishing agent in the bottle to go to the APU compartment. You can also use the engine and APU fire control panel to operate the APU fire extinguisher bottle. When the APU fire extinguisher bottle is empty, the amber APU BOTTLE DISCHARGED light on the engine and APU remote control panel comes on.

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FIRE PROTECTION - APU FIRE EXTINGUISHING - OPERATION



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FIRE PROTECTION - APU FIRE EXTINGUISHING - OPERATION

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**FIRE PROTECTION - APU FIRE EXTINGUISHING - APU FIRE EXTINGUISHING BOTTLE****Purpose**

The APU fire extinguishing bottle contains extinguishing agent that extinguishes an APU fire.

Physical Description

The APU fire extinguishing bottle is spherical. The bottle contains extinguishing agent under a nitrogen pressure of 800 psi at a temperature of 70°F (21°C). These are the components of the APU fire extinguishing bottle:

- Pressure gage and switch
- Fill fitting and safety relief device
- Two electrical connectors
- Two discharge ports with squibs.

Only one electrical connector and discharge port is used. The second electrical connector is capped and the discharge port is also capped.

Location

The APU fire extinguishing bottle is in the horizontal stabilizer accessory compartment.

Operation

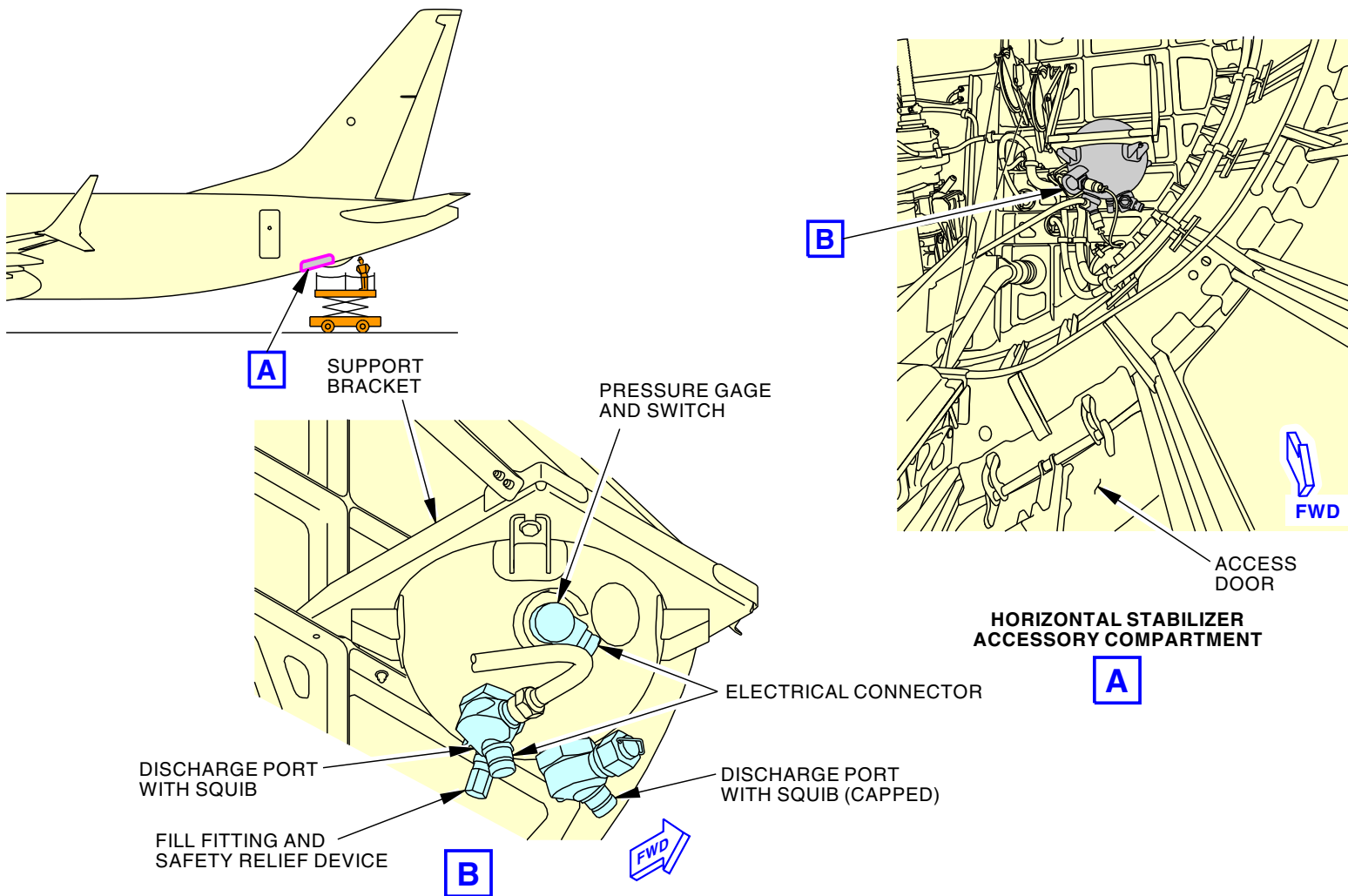
When you pull up and turn the APU fire warning switch in any direction or move the toggle switch on the panel in the wheel well, you operate the squib. The squib breaks a seal in the bottle. This causes the bottle to release extinguishing agent to the APU compartment.

If the bottle temperature increases to 266°F (130°C) or bottle pressure to approximately 1800 psi, the safety relief port breaks open.

This blows out the disc and discharges the extinguishing agent into the accessory compartment.

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FIRE PROTECTION - APU FIRE EXTINGUISHING - APU FIRE EXTINGUISHING BOTTLE



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FIRE PROTECTION - APU FIRE EXTINGUISHING - APU FIRE EXTINGUISHING BOTTLE



FIRE PROTECTION - APU FIRE EXTINGUISHING - APU FIRE EXTINGUISHER BOTTLE SQUIB

Purpose

The purpose of the squib is to break the diaphragm in the bottle and start the release of the extinguishing agent.

Physical Description

The squib is an explosive device that operates electrically. It is adjacent to a bottle diaphragm that can break. The diaphragm normally seals the pressurized bottle.

Location

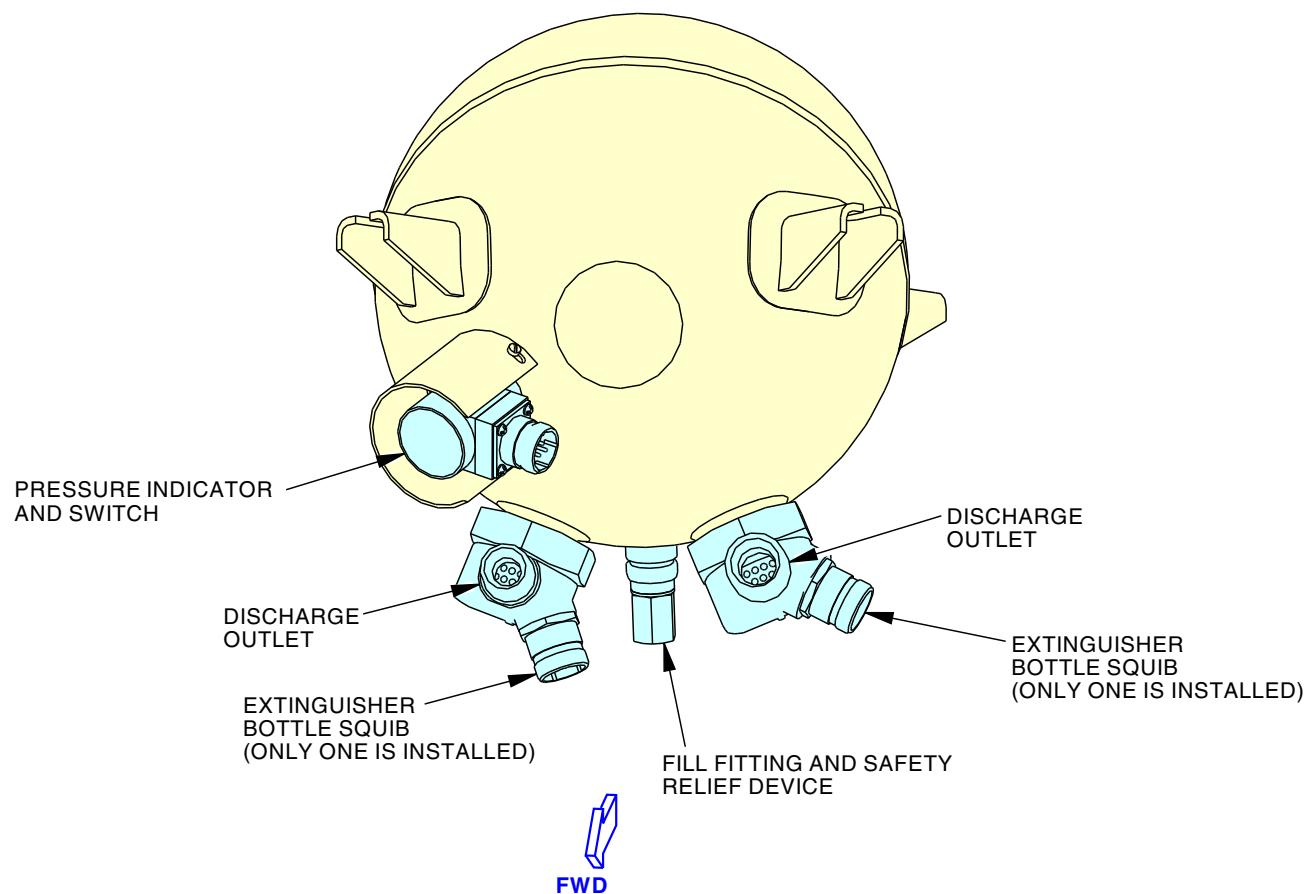
The squib is in the discharge assembly at the bottom of the fire bottle.

Functional Description

Electrical power goes to the squib during the fire extinguisher operation. An explosion of the squib opens the diaphragm. Nitrogen pressure in the bottle pushes the extinguishing agent through the discharge port.

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FIRE PROTECTION - APU FIRE EXTINGUISHING - APU FIRE EXTINGUISHER BOTTLE SQUIB



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FIRE PROTECTION - APU FIRE EXTINGUISHING - APU FIRE EXTINGUISHER BOTTLE SQUIB

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**FIRE PROTECTION - APU FIRE EXTINGUISHING - APU GROUND CONTROL PANEL****Purpose**

On the ground, the APU remote control panel gives you visual and aural indications of an APU fire. The control panel also lets you extinguish an APU fire.

Physical Description

The APU remote control panel has these components:

- Red fire warning light
- Fire horn
- Horn cutout switch
- APU fire control handle
- Bottle discharge switch.

Operation

When there is a fire in the APU, the horn and light operate alternately and the APU stops. The horn does not operate in flight.

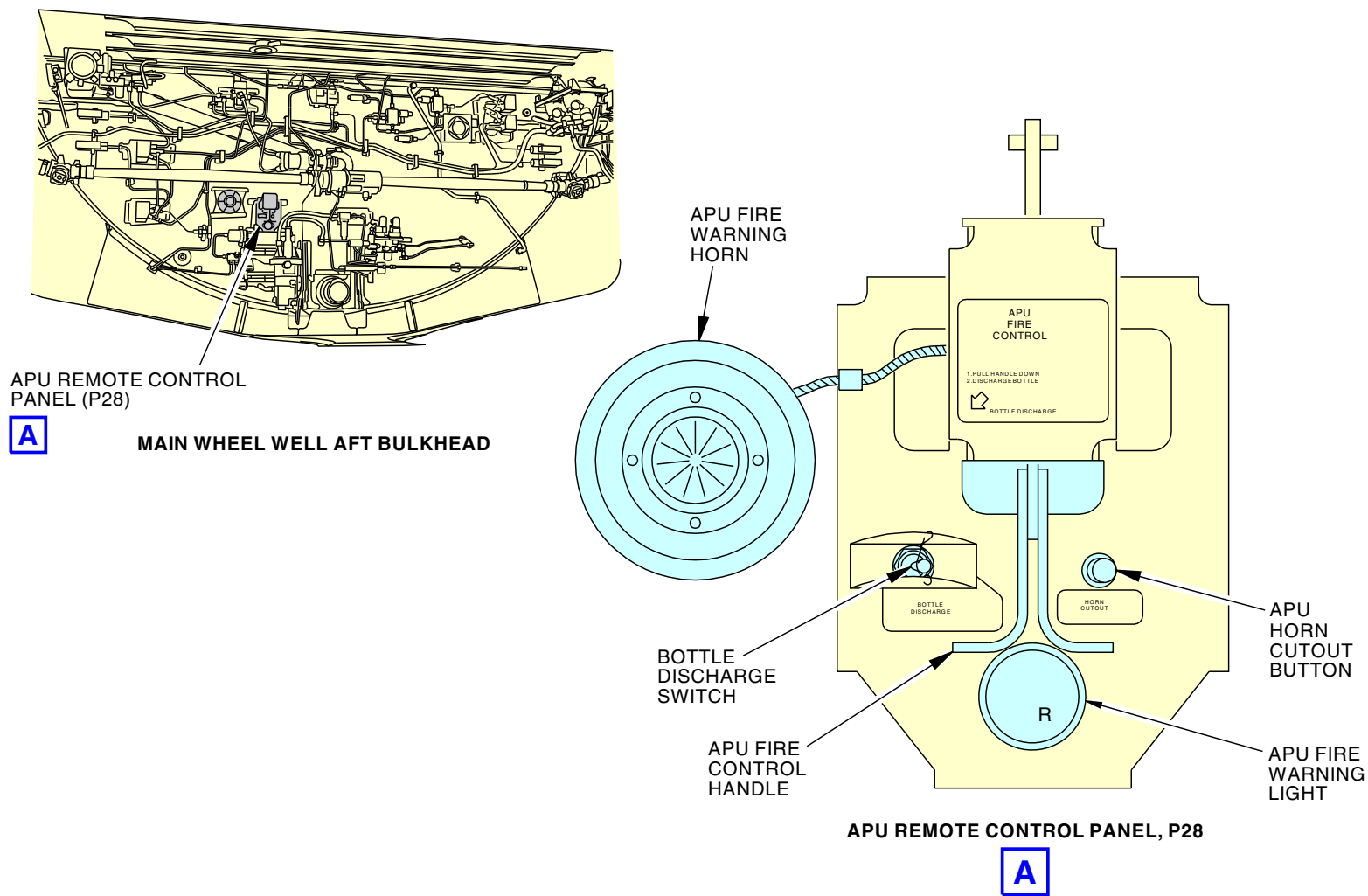
When you push the horn cutout button, the horn sound stops and the red light stays on continuously as long as APU is on fire.

When you pull the APU fire control handle, the APU system stops and isolates from other systems.

When you pull down the APU fire control handle, you arm the fire extinguisher toggle switch. You use the toggle switch to discharge the APU fire extinguisher bottle to the APU compartment.

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FIRE PROTECTION - APU FIRE EXTINGUISHING - APU GROUND CONTROL PANEL



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FIRE PROTECTION - APU FIRE EXTINGUISHING - APU REMOTE CONTROL PANEL

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FIRE PROTECTION - APU FIRE EXTINGUISHING - FUNCTIONAL DESCRIPTION

Functional Description

When there is a fire condition, the APU fire handle switch on the engine and APU fire control panel unlocks. When you pull the APU fire warning handle switch up, a signal goes to these components:

- APU generator control unit - opens the APU generator breaker
- APU control unit - shuts down the APU.

When you turn the fire warning handle switch right or left, 28v dc goes to the APU extinguisher bottle. This causes the APU fire extinguisher bottle squib to release the extinguishing agent.

You get the same results when you use the APU remote control panel P28. When you pull the fire handle switch on the P28 panel, a signal goes to these components:

- APU generator control unit - opens the APU generator breaker
- APU electronic control unit - shuts down the APU.

The bottle discharge switch also arms.

The bottle discharge switch sends 28v dc to the APU extinguisher bottle. This causes the APU extinguisher bottle squib to release the extinguishing agent.

The APU fire extinguisher bottle is discharged automatically when these conditions are present:

- APU is on fire
- Airplane is on the ground
- Both engines are not running.

When these conditions are present, relay R732 energizes after 10-second time delay. This lets the APU shut down before the bottle discharges. The relay sends 28v dc to the APU extinguisher bottle. This causes the APU bottle squib to release the extinguishing agent.

When the APU fire extinguisher bottle pressure is less than 250 psi, the pressure switch makes the amber APU BOTTLE DISCHARGED light on the engine and APU fire control panel come on.

Extinguisher Bottle Squib Test

You do a test of the APU fire extinguisher bottle squib with the EXT TEST switch on the engine and APU fire control panel. The switch in position 1 or 2 sends low voltage to the APU squib. If there is continuity through the squib, the green light comes on. When you release the test switch, the light goes out.

NOTE: You do a test of the engine fire extinguisher bottle squibs from positions 1 and 2.

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FIRE PROTECTION - APU FIRE EXTINGUISHING - FUNCTIONAL DESCRIPTION

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**FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - INTRODUCTION****Purpose**

The cargo compartment fire extinguishing system sends halon to the forward and aft cargo compartments.

General Description

The lower cargo compartment fire extinguishing system has these components:

- Cargo fire control panel
- High Rate Discharge (HRD) fire extinguisher bottle
- Low Rate Discharge (LRD) fire extinguisher bottle
- Filter/Dryer (2x)
- Discharge nozzle (5x).

The cargo fire control panel is in the flight compartment on the P8 panel. The panel has these controls and indications for fire extinguishing:

- ARM FWD and AFT switchlights
- EXT FWD and AFT squib test lights
- Extinguisher bottle DISCH switchlight.

The fire extinguisher bottles contain halon 1301 fire extinguishing agent pressurized with nitrogen. The HRD bottle is 630 in³ (10.3 l) and filled with 25 lb (11.3 kg) of halon. The HRD bottle is used for fire extinguishing and the LRD bottle is used for fire suppression. The LRD bottle is 800 in³ (13.1 l) and filled with 33 lb (15.0 kg) of halon. The larger LRD bottle provides fire suppression for 195 minutes. Tubes connects the bottles to discharge nozzles in the forward and aft cargo compartments.

The filter/dryers remove moisture, filters contamination, and meters the flow of halon. This is done during the release from the Low Rate Discharge (LRD) fire extinguisher bottle.

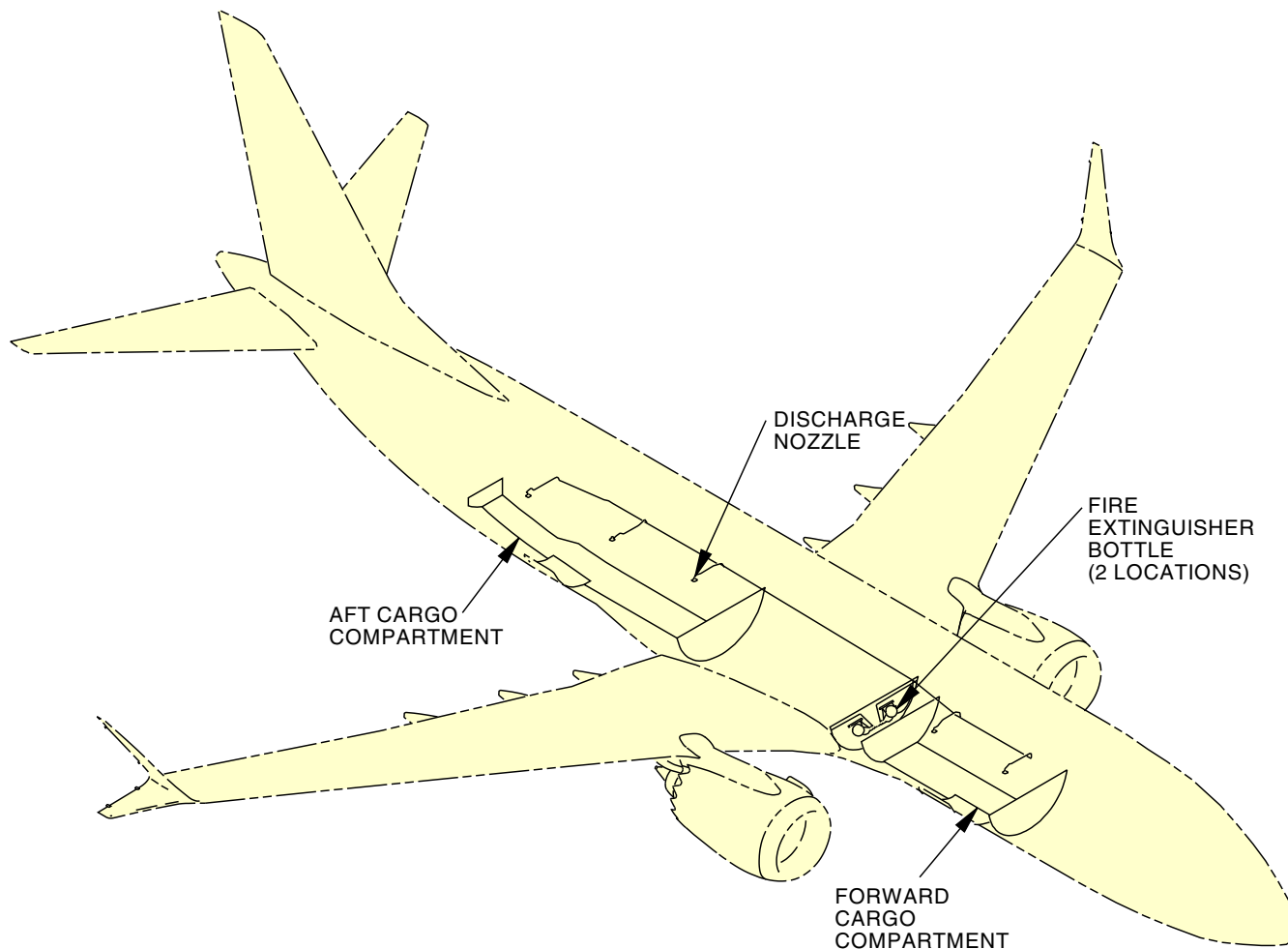
The discharge nozzles spray halon into the forward or aft cargo compartments. There are 2 discharge nozzles in the ceiling of the forward cargo compartment and 3 in the ceiling of the aft cargo compartment.

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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - INTRODUCTION



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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - INTRODUCTION

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**FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - CARGO FIRE CONTROL PANEL****Physical Description**

These are the cargo fire control panel fire extinguishing components:

- EXT FWD and AFT lights
- DISCH switchlight (guarded)
- ARM FWD and AFT switches
- TEST push-button.

General Description

The EXT FWD and AFT lights show the continuity on the extinguisher bottle squib.

The DISCH switchlight comes on when extinguisher bottle pressure decreases below 250 psi (1724 kPa).

The FWD and AFT cargo fire ARM switches arm the related forward or aft extinguisher system when pushed. When the ARM FWD or AFT switch is pushed, the ARMED light comes on.

The TEST push-button does a check of the cargo compartment fire extinguishing system. The TEST push-button also does a check of the cargo compartment smoke detection system.

When you push the TEST push-button, these are the indications on the cargo fire control panel:

- EXT FWD and AFT lights come on
- DISCH light comes on
- FWD and AFT lights on the fire ARM switch come on.

Also, when you push the TEST push-button, these other indications in the flight compartment occur:

- FIRE WARN lights on the P7 panel come on
- Bell sounds from the aural warning module.

For more information on the cargo compartment smoke detection system, see 26-16-00.

Operation

To operate the cargo compartment fire extinguishing system, do these things:

- Push the applicable ARM switch
- Lift the guard to the DISCH switchlight
- Push the DISCH switchlight for a minimum of 1 second.

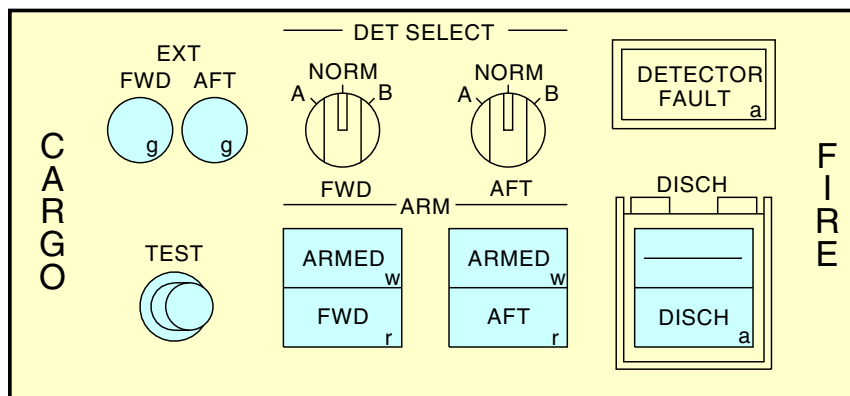
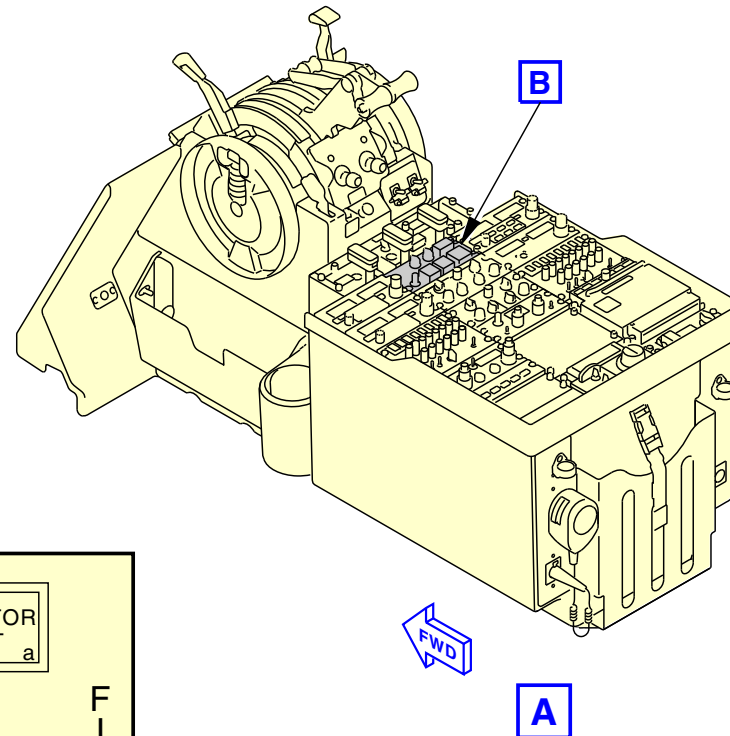
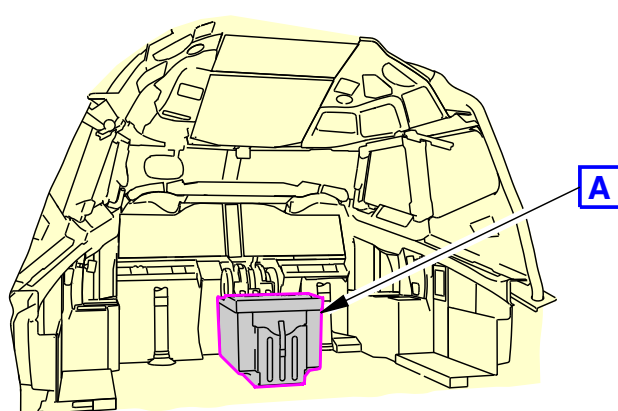
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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - CARGO FIRE CONTROL PANEL



CARGO FIRE CONTROL PANEL (P8)

B

FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - CARGO FIRE CONTROL PANEL

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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - COMPONENT LOCATION

Component locations

The cargo fire control panel is located in the flight compartment on the P8 panel.

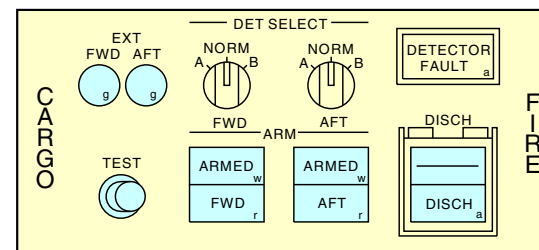
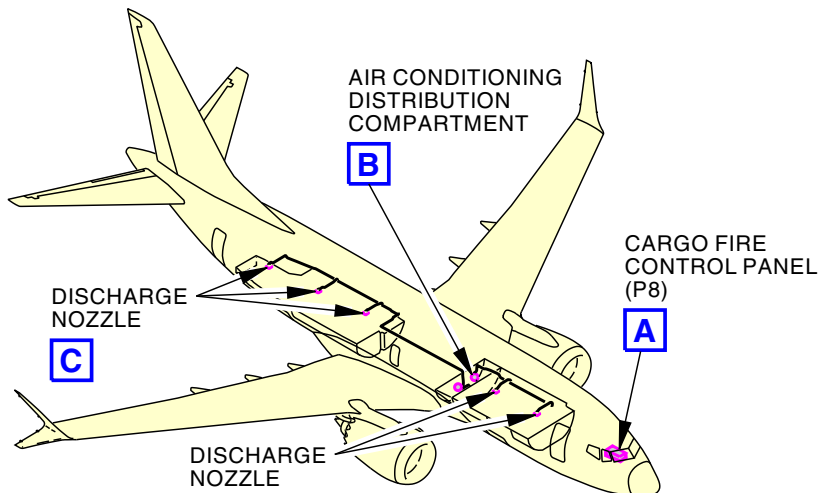
The fire extinguisher bottles are in the air conditioning distribution bay. The HRD bottle is on the left side and the LRD bottle is on the right side of the air conditioning distribution bay. The bottles attach to the bottle mounting brackets on the aft bulkhead.

The filter/dryers are in the discharge lines of the LRD fire extinguisher bottle.

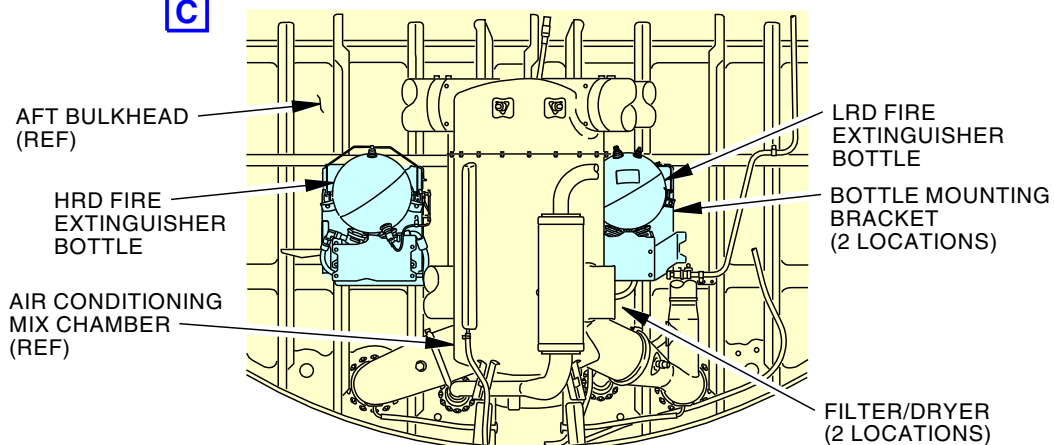
The discharge nozzles are found in the ceiling of the forward and aft cargo compartments. There are 2 nozzles in the forward cargo compartment and 3 in the aft cargo compartment.

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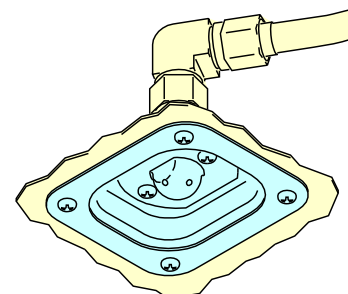
FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - COMPONENT LOCATION



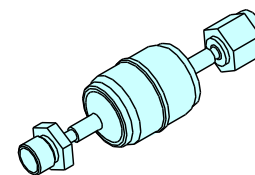
CARGO FIRE CONTROL PANEL (P8)



AIR CONDITIONING DISTRIBUTION COMPARTMENT



DISCHARGE NOZZLE



FILTER/DRYER

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FIRE PROTECTION - CARGO COMPARTMENT FIRE EXTINGUISHING - COMPONENT LOCATION

**FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FIRE EXTINGUISHER BOTTLE****Purpose**

The fire extinguisher bottle holds halon fire extinguishing agent pressurized with nitrogen to extinguish fires in the forward and aft cargo compartments.

Physical Description

The fire extinguisher bottles contain halon fire extinguishing agent pressurized with nitrogen.

The fire extinguisher bottles have these components:

- Safety relief and fill port
- Two handles
- Pressure switch
- Stowage for the electrical protective caps for the squibs.

Location

The fire extinguisher bottles are in the air conditioning distribution bay. There are two fire extinguisher bottles for cargo compartment fire protection; a Low Rate Discharge (LRD) and a High Rate Discharge (HRD).

Functional Description

The discharge assembly has an explosive squib that releases the halon through the discharge port. The squib is activated when the DISCH switchlight on the cargo fire control panel (P8) is pressed.

The pressure switch monitors the pressure in each fire extinguisher bottle. When the fire extinguisher bottle pressure is less than 250 psi (1724 kPa), the pressure switch sends a signal to the flight compartment and the DISCH light, on the cargo fire control panel (P8), comes on.

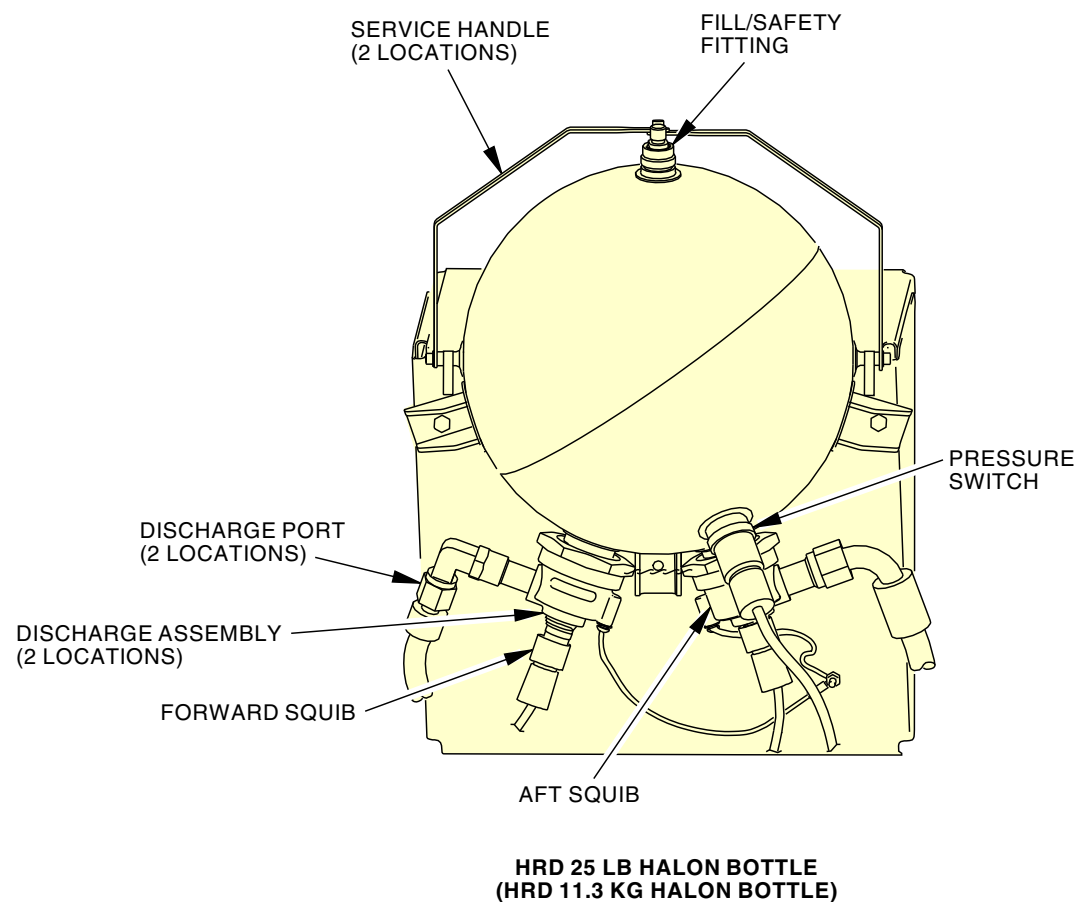
The safety relief and fill port is a fitting on each fire extinguisher bottle. The safety relief opens if the internal pressure is too high. The fill port is for servicing the fire extinguisher bottle after it is removed from the airplane.

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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FIRE EXTINGUISHER BOTTLE



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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FIRE EXTINGUISHER BOTTLE

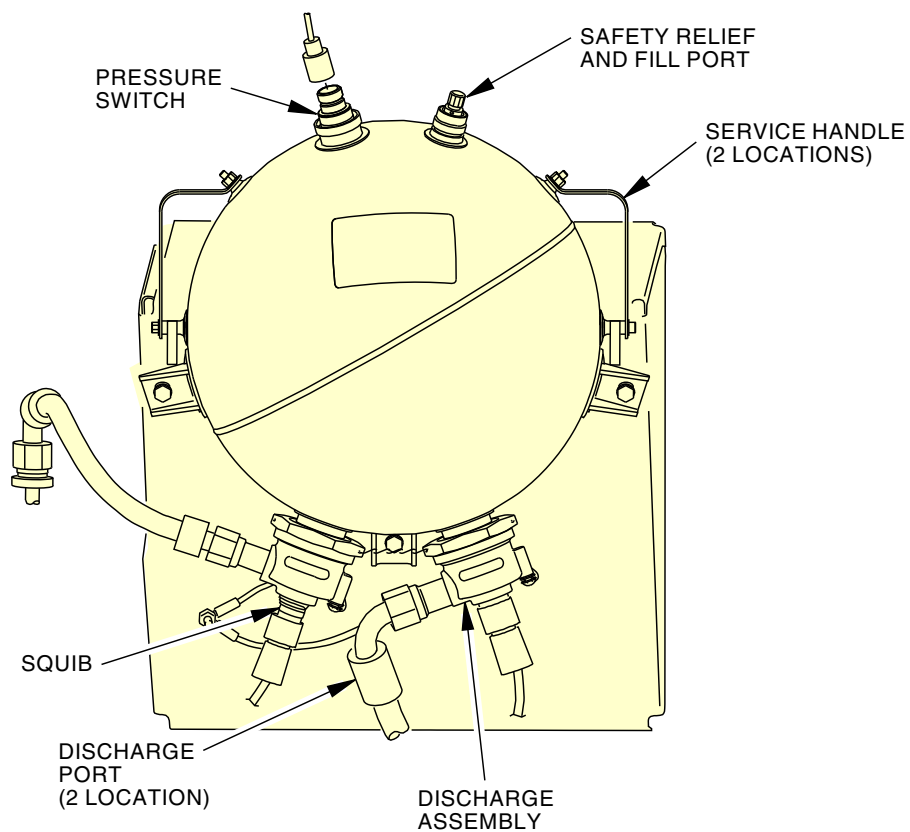
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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FIRE EXTINGUISHER BOTTLE



**LRD 33 LB HALON BOTTLE
(LRD 15.0 KG HALON BOTTLE)**

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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FIRE EXTINGUISHER BOTTLE

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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FILTER/DRYER

Purpose

The filter/dryer removes moisture, filter debris, and meter the flow of halon during release from cargo LRD fire extinguishing bottle.

Physical Description

The filter/dryers are metal. They contain these components:

- Metering orifice
- Desiccant granules
- Filter.

Location

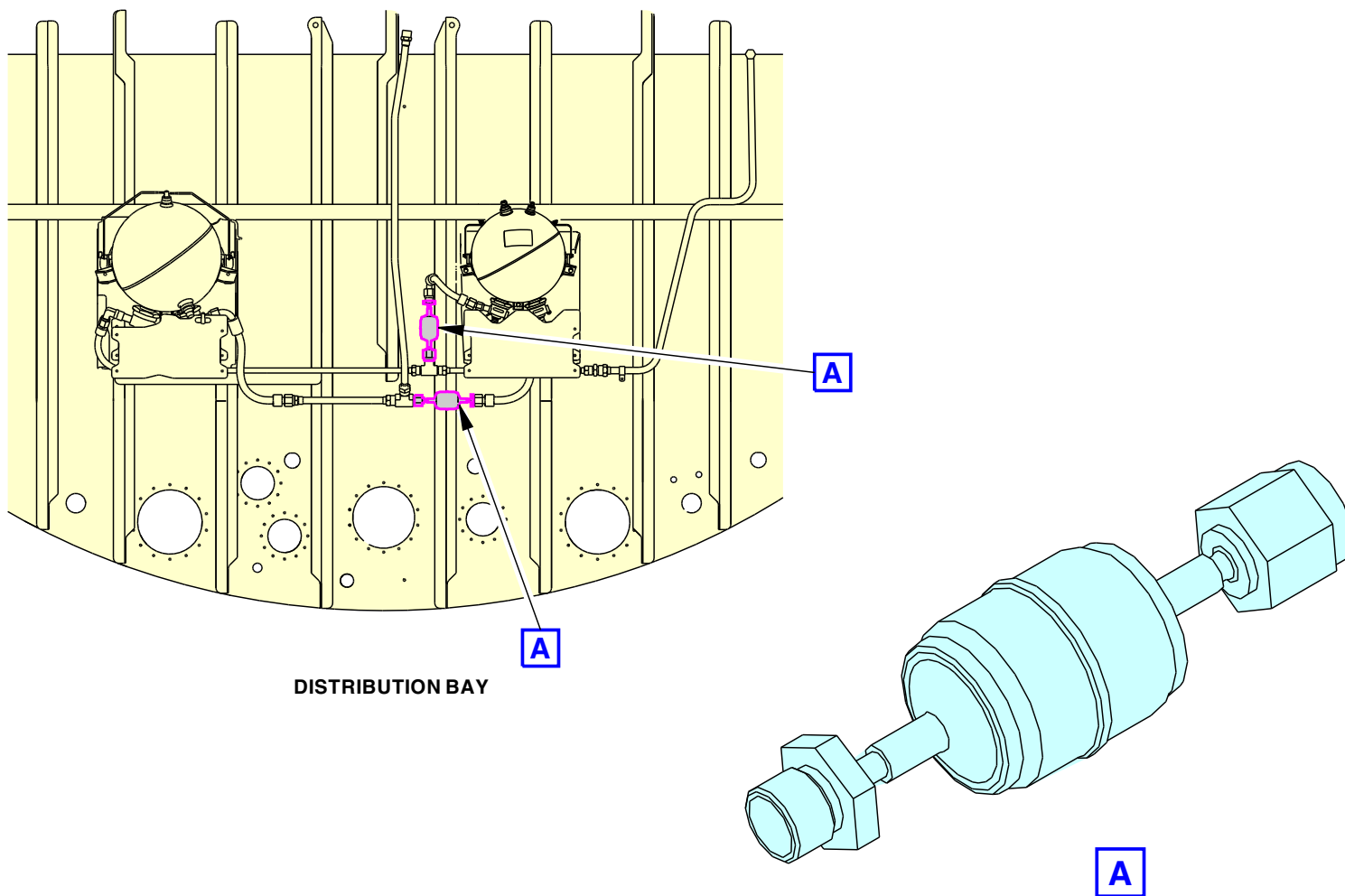
The two filter/dryers are in the air conditioning distribution bay. Each LRD fire extinguisher bottle discharge line contains one filter/dryer.

Functional Description

The filter/dryer meters the halon gas so that the halon level in the compartment stays above 3% for 195 minutes. The filter/dryer give a halon metering rate of 0.13 lb/min (0.06 kg/min). The filter/dryer uses desiccant granules to remove moisture. And, it has a filter to remove squib debris or other contaminants to prevent line blockage.

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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FILTER/DRYER



DISTRIBUTION BAY

FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FILTER/DRYER

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**FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FUNCTIONAL DESCRIPTION****Functional Description**

When you push a cargo fire arm switch, you set the related squib. If you push the discharge switch for 1 second, 28v dc goes to the HRD bottle squib. Then the bottle releases extinguishing agent to the related cargo compartment at a fast rate to put the fire out.

The discharge switch also starts the 15 minute timer. If the airplane is in-flight, after 15 minutes the LRD bottle releases its contents to the same cargo compartment. This increases the total cargo compartment fire suppression time to 195 minutes. The discharge system inhibits if the airplane makes a landing before the 15-minute timer operates.

When the pressure in a bottle decreases, the bottle pressure switch closes and makes a ground. The DISCH light comes on.

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The diagram illustrates the electrical control system for cargo fire suppression. It features several interconnected components:

- Master Control:** Includes the MASTER DIM SECT 7 and DISCH a, which manage the overall discharge sequence.
- Fire Detection and Control:** The CARGO FIRE DISCHARGE SWITCH and CARGO FIRE ARM SW are central to initiating the discharge. These are linked to the DISCH and ARMED indicators.
- Extinguishing Systems:** The system controls two types of extinguishers:
 - HRD BOTTLE (High Rate Discharge):** Includes a PRESSURE SW, FWD SQUIB, and AFT SQUIB.
 - LRD BOTTLE (Low Rate Discharge):** Also includes a PRESSURE SW, FWD SQUIB, and AFT SQUIB.
- Timing and Safety:** A 15-MINUTE TIMER is used to manage the duration of the discharge. Safety features include the SYS 1 AIR/GND RELAY (J22) and the DISCH TEST CKT.
- Power Sources:** The system is powered by 28V DC HOT BAT. BUS lines, which are connected to the P6 and P18 CB PANELS.

The diagram uses standard electrical symbols for switches, relays, timers, and indicators to show the complex wiring and logic of the fire control system.

FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - FUNCTIONAL DESCRIPTION

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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - CARGO FIRE CONTROL PANEL - SQUIB TEST

Functional Description

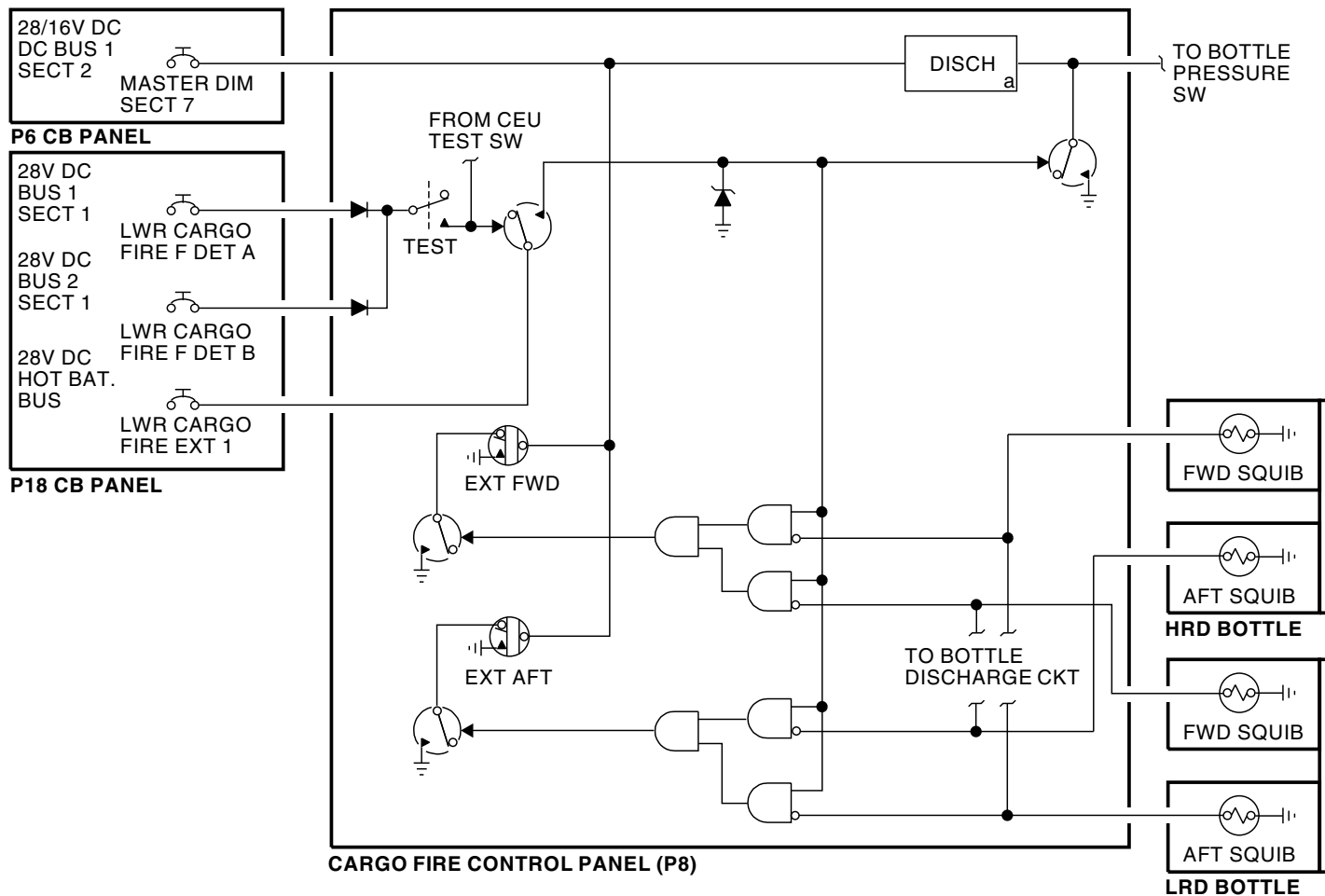
The squibs on each fire bottle connects to the EXT lights on the cargo fire control panel, P8.

The TEST push-button on the cargo fire control panel lets you do a test of all fire bottle squibs. It lets you find a squib fault.

If a squib has a fault, the extinguisher light will not come on.

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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - CARGO FIRE CONTROL PANEL - SQUIB TEST



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FIRE PROTECTION - CARGO COMPT FIRE EXTINGUISHING - CARGO FIRE CONTROL PANEL - SQUIB TEST

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FIRE PROTECTION - LAVATORY FIRE EXTINGUISHING - LAV FIRE EXTING BOTTLE AND TEMP INDICATOR

Purpose

The lavatory fire extinguishing system extinguishes fires under the wash basin and trash bin area.

Physical Description

The lavatory extinguishing system has these components:

- Fire extinguisher bottle
- Temperature indicators.

Location

The lavatory fire extinguishing systems are in the lavatories under the wash basin.

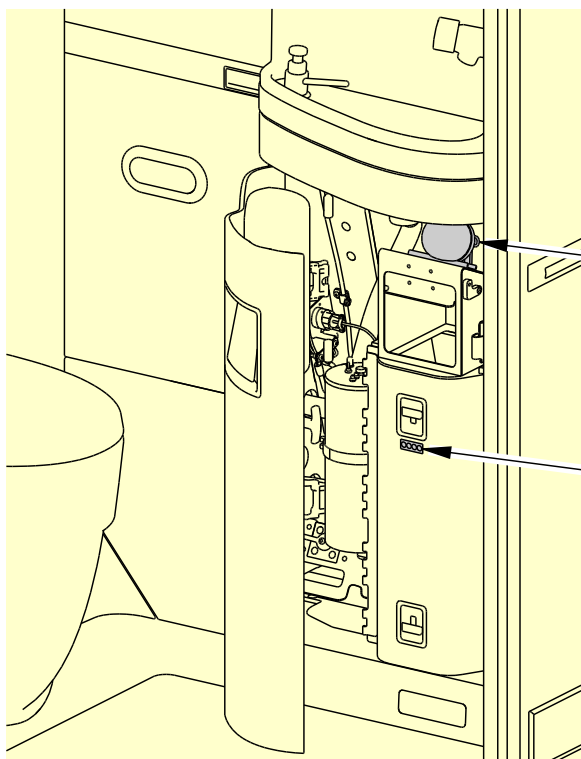
Operation

The extinguisher bottle has two discharge ports. The ports have eutectic plugs. These plugs melt at high temperatures. When there is an overheat or fire condition, this occurs:

- Temperature indicators change color (white to black)
- Eutectic plug melts
- Extinguisher releases halon to stop the fire.

EFFECTIVITY	
SIA ALL	

FIRE PROTECTION - LAVATORY FIRE EXTINGUISHING - LAV FIRE EXTING BOTTLE AND TEMP INDICATOR



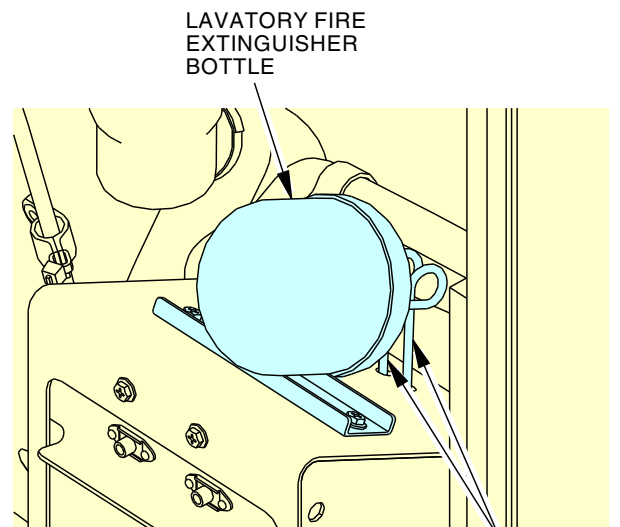
LAVATORY
(TYPICAL)

WASTE
COMPARTMENT

A

TEMPERATURE
INDICATOR STRIP

B

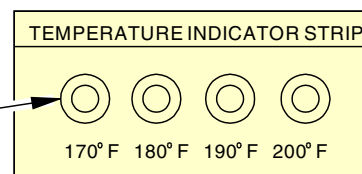


LAVATORY FIRE
EXTINGUISHER
BOTTLE

WASTE COMPARTMENT

A

DISCHARGE
NOZZLES



TEMPERATURE INDICATOR
(BLACK WHEN EXPOSED
TO TEMPERATURE
GREATER THAN 170°F)

TEMPERATURE INDICATOR STRIP

B

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FIRE PROTECTION - LAVATORY FIRE EXTINGUISHING - LAV FIRE EXTING BOTTLE AND TEMP INDICATOR



FIRE PROTECTION - LAVATORY FIRE EXTINGUISHING - LAV FIRE EXTING BOTTLE AND TEMP INDICATOR

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**FIRE PROTECTION - PORTABLE FIRE EXTINGUISHING****Purpose**

There are portable fire extinguishers to extinguish fires inside the airplane. There are three types of extinguishers, water-type, halon and clean agent (2-BTP). The water-type extinguishers are for solid combustible fires. The Halon extinguishers are for electrical and flammable liquid fires. The Clean Agent (2-BTP) extinguishers are for electrical and flammable liquid fires.

Location

There are extinguishers in these areas:

- Flight compartment
- Galley
- Passenger compartment.

Placards identify all of the extinguisher locations.

Physical Description

The water-type extinguishers contain a water and anti-freeze mixture. Each water extinguisher has these parts:

- Trigger (discharge valve)
- Water cylinder
- Handle with internal gas cartridge
- Discharge nozzle
- Quick-release mounting strap.

Each Halon extinguisher has these parts:

- Pressure indicator
- Halon cylinder
- Trigger
- Discharge nozzle
- Handle lock pin
- Handle.

Each Clean Agent (2-BTP) extinguisher has these parts:

- Pressure indicator
- 2-BTP cylinder
- Trigger
- Discharge nozzle
- Pull-Out pin
- Handle.

Operation

To operate the water-type extinguisher, turn the handle and push the trigger.

To operate the Halon extinguisher, remove the handle lock pin and push the handle.

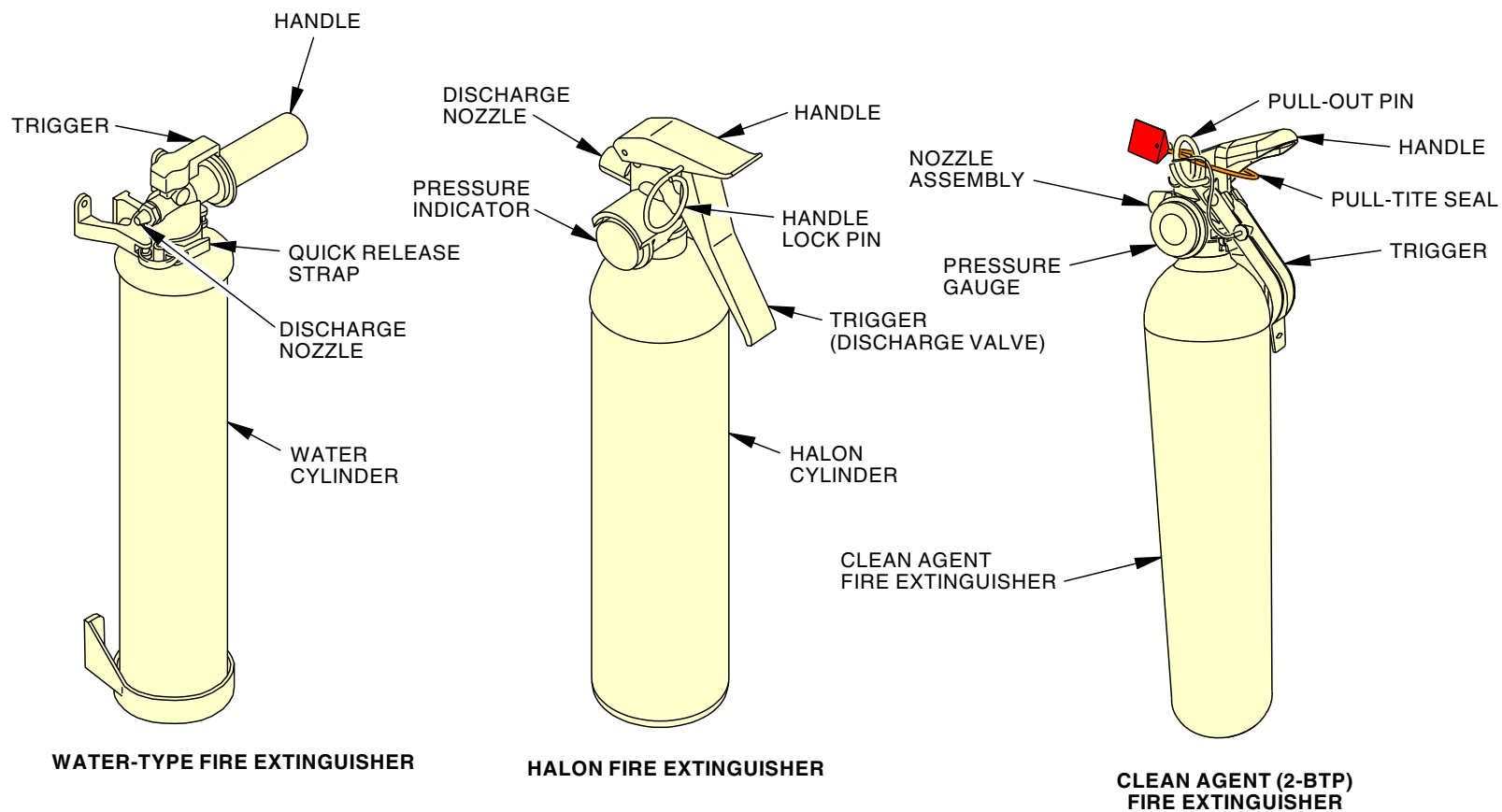
To operate the Clean Agent (2-BTP) extinguisher, remove the pull-out pin and push the handle.

26-26-00**SIA ALL EFFECTIVITY**

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FIRE PROTECTION - PORTABLE FIRE EXTINGUISHING



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FIRE PROTECTION - PORTABLE FIRE EXTINGUISHING

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