EMB145

# SECTION 2-07

# FIRE PROTECTION

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# GENERAL

The fire protection system consists of fire/overheat detection and extinguishing for the engines and APU.

The detection system provides visual and aural means of detecting a localized fire or general overheating. Monitoring circuitry is provided to continuously check the fire detection/extinguishing system and to signal the EICAS in case of failure.

The baggage compartment is provided with a smoke detection system. The class "C" baggage compartment is provided with a fire extinguishing system.

In addition, the lavatory compartment is equipped with a dedicated smoke detection system and the lavatory waste container is equipped with a fire extinguishing system.

Extinguisher bottles are installed to extinguish the fire in the airplane's engines, APU, baggage compartment and lavatory waste container. Portable halon fire extinguishers installed at the front and rear of the airplane can be used to extinguish small fires in the cockpit or main cabin area. A single water extinguisher is an additional option.

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# ENGINE AND APU FIRE PROTECTION SYSTEM

## FIRE/OVERHEAT DETECTION

The engines and the APU are protected against the occurrence of fire by means of fire detection and fire extinguishing systems.

Essential DC bus 1 powers the engine 1 fire detection system and essential DC bus 2 powers the engine 2 and the APU fire detection system. Hot battery bus 1 and 2 power the engine fire extinguishing system, whereas the APU fire extinguishing system is powered by essential DC bus 2.

The fire/overheat detection system is provided with independent sensor tubes installed in the engines and APU. The sensor tube contains a fixed volume of inert gas (Helium) and a gas-impregnated (Hydrogen) core material. The inert gas provides sensing of overheating. The core element provides sensing of localized fire or high-intensity heating. Overheating causes the sensor tube's internal gas pressure to increase. This closes a switch on the fire/overheating detection system's electrical circuit and activates the warning system. Localized fire or high-intensity heating increases the central core's gas volume, raising the sensor tube's internal pressure, thus activating the alarm switch in the same manner as described above.

Manual resetting of the fire detection system is not available. Upon removal of the fire or overheat condition, a reversible process takes place, and the system automatically returns to the normal standby operation mode.

An integrity switch continuously monitors the sensor tube's integrity. The integrity switch is held closed by the sensor's internal pressure. Should this pressure be lost the integrity switch opens, generating a signal to indicate that the system is inoperative.

Upon detection of a fire/overheat signal in the engine or APU, the associated handle (for the engines) illuminates, an aural warning is generated and a warning message is presented on the EICAS. The visual warning remains activated as long as the fire signal exists. The aural warning may be canceled by pressing the master warning light.

In the case of failure of any fire detector, a caution message is presented on the EICAS.

The APU fire detection system provides a signal to shut down the APU automatically in case of fire warning during ground operation.

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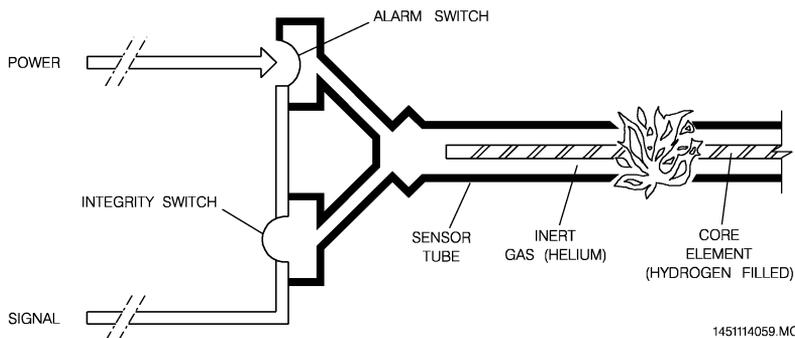
POWER

ALARM  SWITCH

INTEGRITY  SWITCH

SIGNAL

SENSOR
TUBE

INERT
GAS  (HELIUM)

CORE
ELEMENT
(HYDROGEN  FILLED)

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**FIRE OVERHEAT DETECTION SCHEMATIC**

# FIRE EXTINGUISHING

Two fire extinguishing bottles for the engines and one for the APU are installed in the airplane's tail cone.

The extinguishing agent discharge is accomplished by braking the extinguisher bottle's seal through an electrically actuated cartridge in the discharge valve.

Each engine fire extinguisher bottle contains two discharge valves, a pressure gauge with a pressure switch and a fill/safety relief valve. The engine bottles are cross-connected by two double check tees to provide dual shot capability, thus one or both bottles can be discharged into one or the other engine. The double-check tee prevents the extinguishing agent of the remaining bottle from filling the emptied bottle in case of a second shot of the system. The engine extinguisher bottles are discharged by pulling and rotating the Fire Extinguishing Handle, which is located on the overhead panel.

**CAUTION:** DO NOT DISCHARGE THE SAME EXTINGUISHER BOTTLE TWICE. ACTUATING THE FIRE HANDLE INTO AN EMPTY BOTTLE MAY CAUSE STRUCTURAL DAMAGE TO THE BOTTLE.

The APU bottle contains only one discharge valve, a pressure gauge with a pressure switch, and a fill/safety relief valve. It provides single shot capability for the APU. The APU extinguisher bottle is discharged by pressing the APU Fire Extinguishing Button, located on the overhead panel.

A caution message is presented on the EICAS should any bottle be discharged or be inoperative for any reason (failed cartridge, loss of pressure, or loss of power).
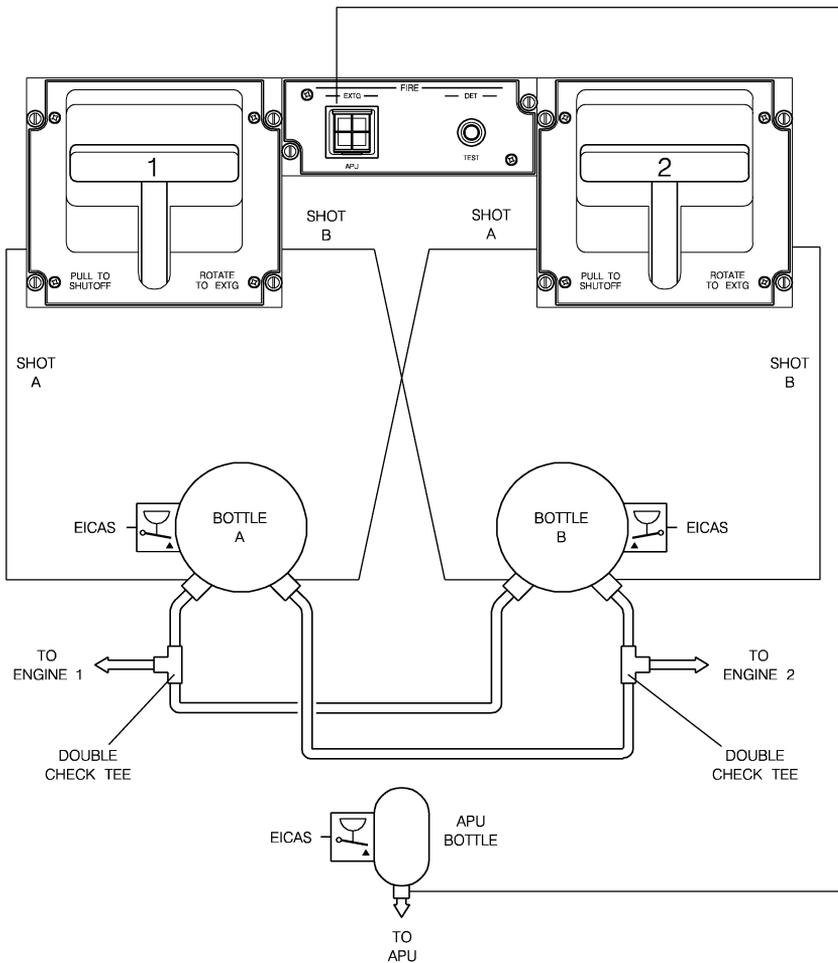
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**ENGINE AND APU FIRE EXTINGUISHING SYSTEM SCHEMATIC**

AOM-145/1114

**AIRPLANE
OPERATIONS
MANUAL**

EMB145

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## CONTROLS AND INDICATORS

### ENGINE AND APU FIRE DETECTION/EXTINGUISHING SYSTEM PANEL

### 1 - ENGINE FIRE EXTINGUISHING HANDLE

– During normal flight conditions, the handle remains flush with the panel.
– A red light illuminates inside the handle upon detection of fire or overheating.
– When pulled, it closes the fuel, hydraulic, bleed air, and lip anti-icing shutoff valves of the associated engine.
– When rotated counterclockwise or clockwise, it respectively discharges extinguisher bottles A or B into the associated engine.

### 2 - APU FIRE EXTINGUISHING BUTTON (guarded)

– When pressed, it closes the APU fuel shutoff valve and discharges the APU fire extinguisher bottle. On APU Model T-62T-40C11, a signal is sent to the ESU to simulate an overspeed condition in order to execute the APU shutdown procedure. On APU Model T-62T-40C14, a stop request signal is sent to the FADEC in order to execute the APU shutdown procedure.

### 3 - FIRE DETECTION SYSTEM TEST BUTTON

– When pressed and held for at least two seconds, it permits the fire detection system to be checked.

On airplanes equipped with class "C" baggage compartment, the fire test is successfully completed if the conditions below occur simultaneously:
– The following EICAS fire detection messages are displayed:
  – Warning: APU FIRE, ENG 1 (2) FIRE, BAGG SMOKE
  – Caution: APU FIREDET FAIL, E1 (2) FIREDET FAIL
– Fire handles illuminate.
– Baggage fire extinguishing button illuminates.
– Baggage compartment fan deactivates.
– WARNING/CAUTION lights flash.
– Aural warning sounds.

**NOTE: -** On the ground, when pressed approximately for more than 10 seconds, the APU is shut down, if it is running.
- If it is necessary to repeat the test, wait at least 6 seconds to press the test button again.
- If Fire Detection Test button is held for less than 2 seconds the BAGG EXTG button may remain illuminated. In this case, repeat the test.

On airplanes equipped with class "D" baggage compartment, the fire test is successfully completed if the conditions below occur simultaneously:
− The following EICAS fire detection messages are displayed:
  − Warning: APU FIRE, ENG 1 (2) FIRE
  − Caution: APU FIREDET FAIL, E1 (2) FIREDET FAIL
− Fire handles illuminate.
− WARNING/CAUTION lights flash.
− Aural warning sounds.

**NOTE: -** On the ground, when pressed approximately for more than 10 seconds, the APU is shut down, if it is running.
- If it is necessary to repeat the test, wait at least 6 seconds to press the test button again.

**ENGINE AND APU FIRE DETECTION/EXTINGUISHING PANEL**

**AIRPLANE
OPERATIONS
MANUAL**

EMB145
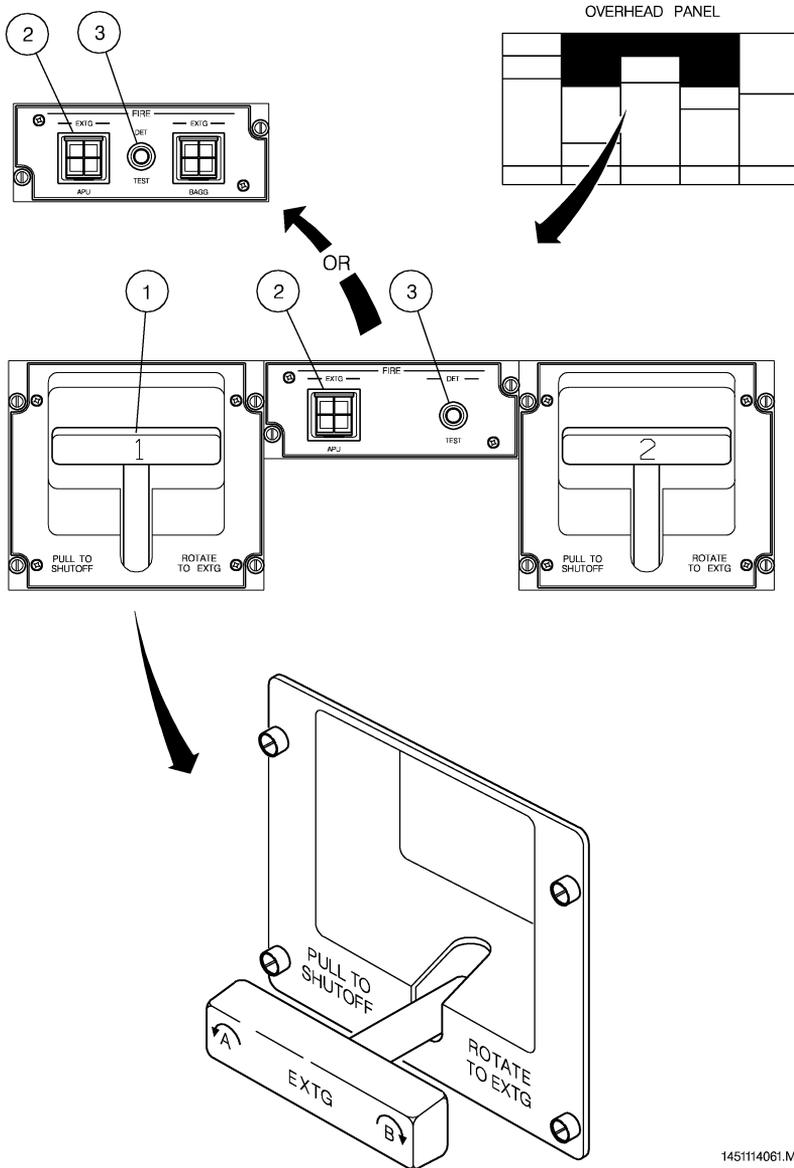
## EICAS MESSAGES

| TYPE | MESSAGE | MEANING |
|---|---|---|
| WARNING | APU FIRE | Fire in the APU. |
| | ENG1 (2) FIRE | Fire in associated engine. |
| CAUTION | E1 (2) FIREDET FAIL | Associated engine fire detection system failed. |
| | APU FIREDET FAIL | APU fire detection system failed. |
| | E1 (2) EXTBTLA INOP | Associated bottle has been discharged or is inoperative. |
| | E1 (2) EXTBTLB INOP | |
| | APU EXTBTL INOP | |

# LAVATORY FIRE PROTECTION SYSTEM

## LAVATORY SMOKE DETECTION

The lavatory smoke detection system consists of a smoke sensor installed in the lavatory ceiling and a Smoke Detector Panel located near the forward galley.

Upon detection of smoke inside the lavatory, the smoke detector signals the panel to activate a red alarm light and a horn. In addition, a warning message is presented on the EICAS. The smoke sensor is less sensitive to smoke from cigarettes.

The EMB-135 has an additional horn, installed in the aft cabin section on the ceiling panel, right in front of the lavatory door.

## LAVATORY FIRE EXTINGUISHING

A single fire extinguisher bottle is installed for fire protection of the lavatory waste container.

The bottle discharging tube outlets are fitted to the waste container, and are provided with temperature sensitive heads. Discharge of the extinguishing agent is accomplished by sensitive heads melting under high temperatures, which opens an outlet passage.

No warning is provided in the cockpit when the waste container extinguisher bottle is discharged.
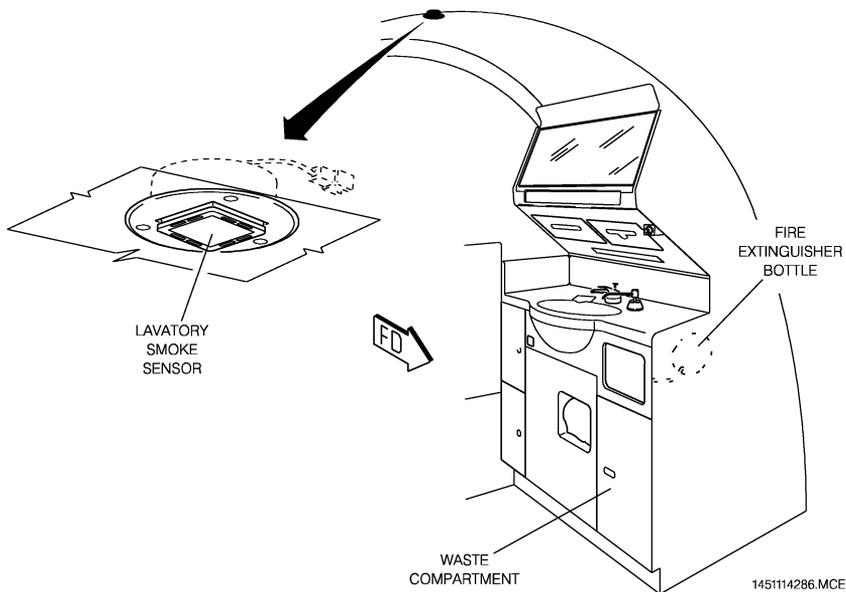
## EICAS MESSAGE

| TYPE | MESSAGE | MEANING |
|------|---------|---------|
| WARNING | LAV SMOKE | Smoke has been detected inside the lavatory. |

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LAVATORY
SMOKE
SENSOR

FD

FIRE
EXTINGUISHER
BOTTLE

WASTE
COMPARTMENT

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**LAVATORY FIRE PROTECTION SYSTEM**

EMB145

# CONTROLS AND INDICATORS

## LAVATORY SMOKE DETECTOR PANEL

### 1 - LAVATORY SMOKE DETECTOR OPERATION LIGHT (green)
− Illuminates during normal system operation.

### 2 - LAVATORY SMOKE DETECTOR ALARM LIGHT (red)
− Flashes in case of smoke detection inside the lavatory. In this case, a horn is also activated.

### 3 - LAVATORY SMOKE DETECTOR TEST BUTTON (guarded)
− When pressed (momentarily), simulates a smoke detection condition and activates all associated alarms (horn, red alarm light and EICAS message).
− During test, the green operation light extinguishes.

### 4 - LAVATORY SMOKE DETECTOR RESET BUTTON
− Cancels the horn and resets the system for operation.
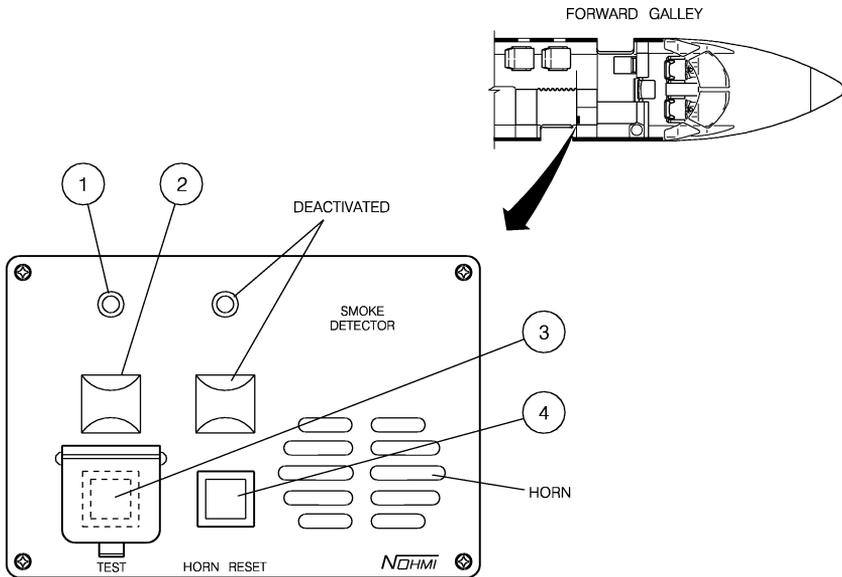


**LAVATORY SMOKE DETECTOR PANEL**

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# BAGGAGE COMPARTMENT FIRE PROTECTION SYSTEM

## BAGGAGE COMPARTMENT SMOKE DETECTION SYSTEM

A smoke detection system is provided in the baggage compartment. The system consists of two smoke detection modules installed on the compartment ceiling.

A warning message is presented on the EICAS to indicate smoke detection inside the baggage compartment.

The smoke sensor resumes normal operation when the fire is extinguished, the smoke has been cleared and the smoke sensor is reset through the power-reset button, located on each smoke detection module.

Flight crew inspection of the baggage compartment is possible for airplanes equipped with an optional sight glass in the rear lavatory partition. For some airplanes a switch is available to turn on the lights in baggage compartment (Refer to 2-06-15 − Lighting).

## BAGGAGE COMPARTMENT FIRE EXTINGUISHING SYSTEM (OPTIONAL)

Two fire extinguishing bottles are installed in the rear electronic compartment for baggage compartment fire protection.

The High Discharge Bottle is designed to instantaneously fill the baggage compartment while the Metering Discharge Bottle provides the required level of fire extinguishing agent concentration for at least 50 minutes.

Upon smoke detection inside the baggage compartment, one of the smoke detectors sends a signal to deactivate the baggage compartment fan and illuminates the baggage fire extinguisher button on the Fire Detection/Extinguishing Panel.

## EICAS MESSAGES

| TYPE | MESSAGE | MEANING |
|---|---|---|
| WARNING | BAGG SMOKE | Smoke has been detected inside the baggage compartment. |
| CAUTION | BAGG EXTBTL INOP | Any of the bottles have been discharged or are inoperative, in class C baggage compartment. |

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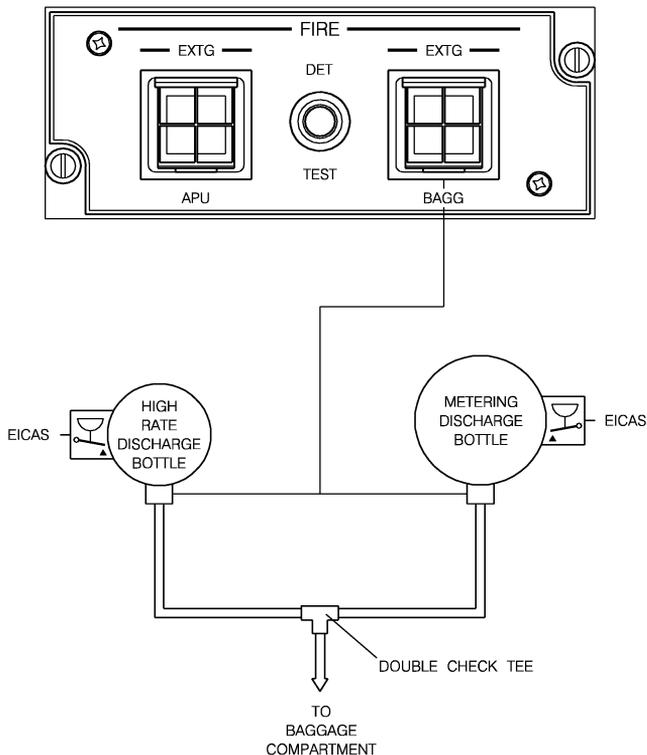


**BAGGAGE FIRE EXTINGUISHING SCHEMATIC**

# CONTROLS AND INDICATORS

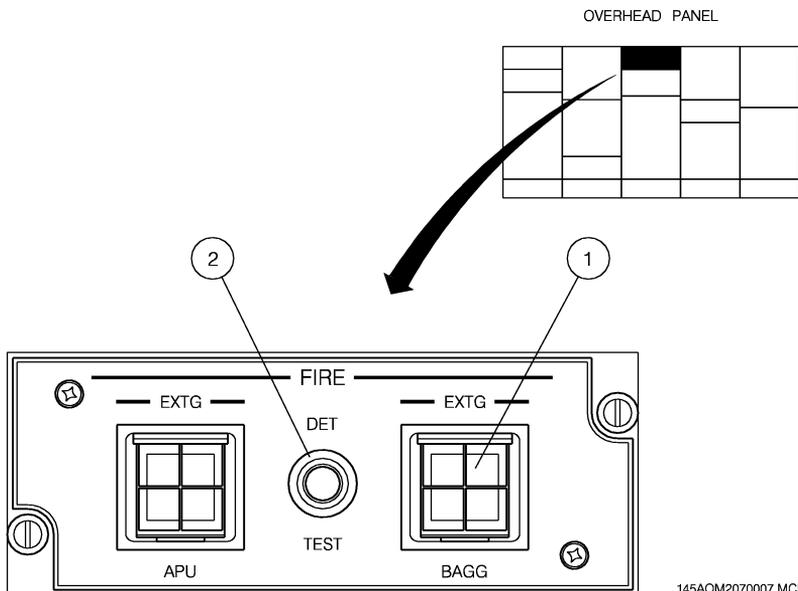## BAGGAGE DETECTION/EXTINGUISHING PANEL (OPTIONAL)

### 1 - BAGGAGE FIRE EXTINGUISHING BUTTON (guarded)

- When lit, button indicates that smoke was detected inside the baggage compartment or that the fan has been deactivated.
- Button remains lit as long as there is smoke inside baggage compartment.
- When pressed:
  - Discharges the baggage fire extinguishing bottles.
  - Deactivates the baggage compartment fan

**NOTE:** Fire extinguishing agent may activate the smoke detector.

### 2 - FIRE DETECTION SYSTEM TEST BUTTON

- Refer to ENGINE AND APU FIRE DETECTION/EXTINGUISHING PANEL.

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OVERHEAD PANEL

2

1

FIRE
EXTG — DET — EXTG
TEST
APU BAGG

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**BAGGAGE DETECTION/EXTINGUISHING PANEL**

## BAGGAGE COMPARTMENT SMOKE DETECTOR

AIRPLANES PRE-MOD S.B. 145-26-0004

### 1 - BAGGAGE SMOKE DETECTOR OPERATION LIGHT (green)
– Illuminates during normal system operation.

### 2 - BAGGAGE SMOKE DETECTOR RESET SWITCH
– Cancels the EICAS message and resets the system for operation.

### 3 - BAGGAGE SMOKE DETECTOR TEST SWITCH
– When pressed (momentarily), simulates a smoke detection condition and activates all associated alarms (red alarm light and EICAS message).
– During test, the green operation light extinguishes.

### 4 - BAGGAGE SMOKE DETECTOR ALARM LIGHT (red)
– Illuminates in case of smoke detection inside the baggage compartment.

## BAGGAGE COMPARTMENT SMOKE DETECTOR

AIRPLANES POST-MOD S.B. 145-26-0004 OR S/N 145.119, 145.134 AND ON

– Detectors are tested during Fire Detection System test.
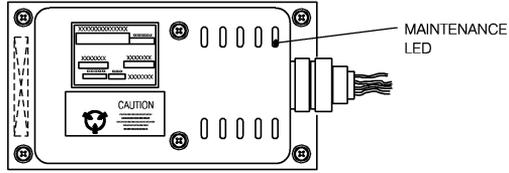
WALTER KIDDE AEROSPACE SMOKE DETECTOR

MAINTENANCE LED

1  2  3  4

JAMCO SMOKE DETECTOR

BAGGAGE DOOR (REF.)

FWD
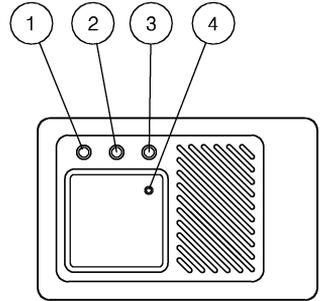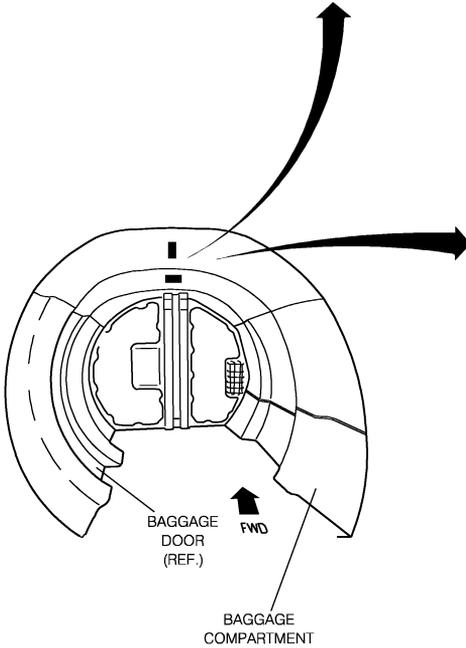
BAGGAGE COMPARTMENT

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**BAGGAGE COMPARTMENT SMOKE DETECTOR**

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