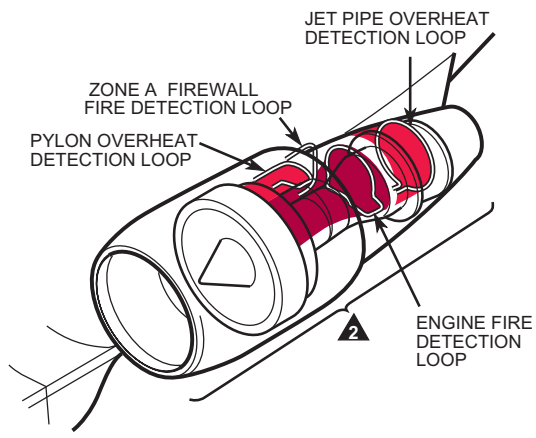
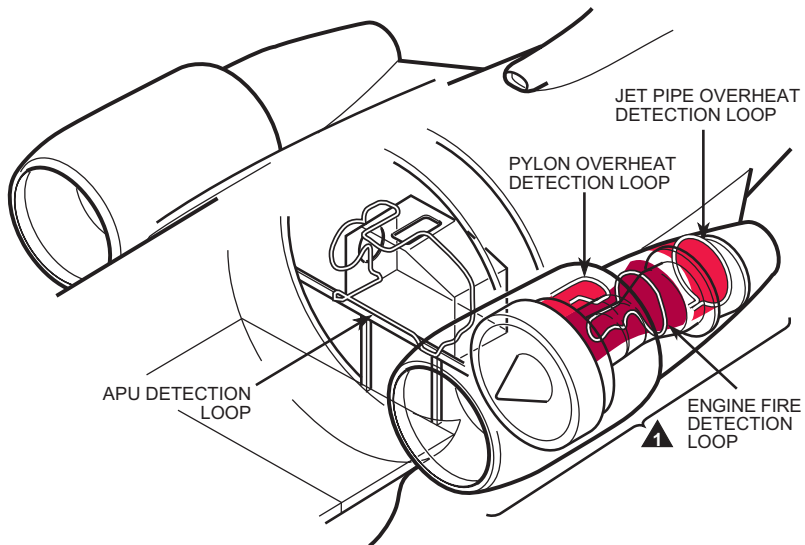




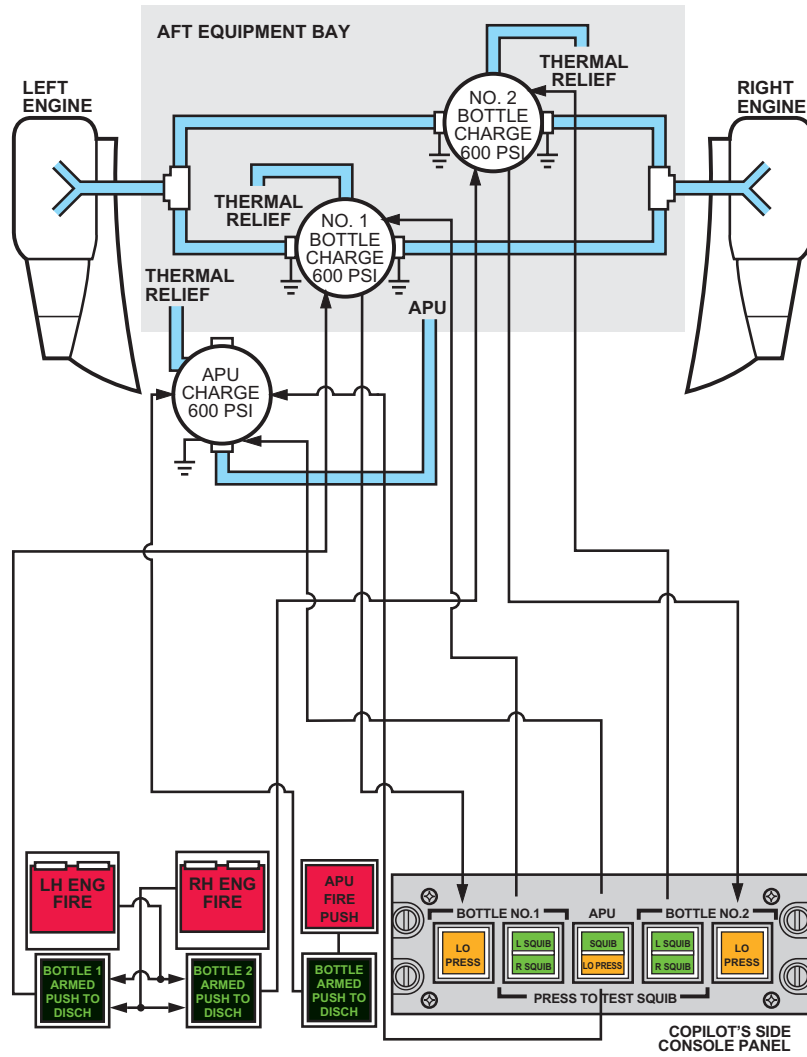


Fire Detection System



-  ZONE A
-  ZONE B
-  A/C 3001 TO 3066 AND 5001 TO 5134
-  A/C 5135 AND SUBSEQUENT

Engine and APU Fire Extinguishing



Fire Detection

Fire protection, consisting of fire detection, warning, and extinguishing, is provided by two independent systems. One for the auxiliary power unit (APU) and another for the two engines. Each system includes fire detection and extinguishing electrical circuits. Both systems are capable of detecting false fire warning signals generated by electrical shorts in the sensing cable circuits. The malfunctioning circuit is then automatically isolated and a warning light in the flight compartment illuminates to indicate a fire detection failure.

Each engine has four fire sensing elements that provide fire detection for the combustion section, jetpipe, and pylon areas.

Detection circuits in the main landing gear wheel wells provide fire and overheat detection for these areas. Fire extinguishing is not available for the wheel wells.

Sensing Elements

Each coaxial sensing element consists of an inner and outer conductor separated by a semi-conductor material. The inner conductor, which forms a closed loop, connects to a fire or overheat detector unit; the outer conductor connects to electrical ground through the airframe.

At normal operating temperatures, the semi-conductor's resistance is high so that current cannot flow between the inner and outer conductors. Exposing the sensing element to increasing temperatures (e.g. fire, bleed air leak, or hot brakes) results in a proportional decrease in the semi-conductor's resistance.

When the temperature reaches the sensing element's trigger point (**see Table 4-D**), the semi-conductor's resistance decreases to the point that current flows from the inner to outer conductor. This current flow triggers the associated fire or overheat detection unit that activates the appropriate visual and/or aural warning.

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Engine and APU

Fire and overheat detection is provided for five detection zones, two for each powerplant and one for the APU. The powerplant fire zones are:

- zone A – the area within the core cowling and around the engine combustor section
- zone B – the area around the engine jet pipe and a part of the pylon assembly behind the firewall
- APU fire zone – the area within the APU's fireproof enclosure.

On S/Ns 3001 to 3066 and 5001 to 5134, each engine has two series-wired sensing elements that connect to a fire detection unit. The sensing elements wrap around the engine's combustion section to provide fire detection in engine fire zone A.

On S/N 5135 and subsequent, each engine has two sensing elements in fire zone A connected to a fire detection unit. One sensing element wraps around the engine's zone A firewall, and the other wraps around the engine's combustion section.

Fire zone B, covering the engine jetpipe and pylon, has two sensing elements connected to an overheat detection unit. One sensing element wraps around the jetpipe and the other wraps around the engine pylon.

When an overheat or fire (zone A) is detected, the ENG FIRE PUSH light illuminates and the fire bell sounds. Pressing the TONE MUTED switchlight silences the fire bell.

If an overheat condition occurs in the jet pipe or pylon area (zone B), the overheat detector unit triggers the flashing OVHT light. The light continues to flash until temperature in the jetpipe or pylon decreases below the sensing elements alarm temperature.

The APU has a single sensing element that wraps around the inside of the APU enclosure and connects to a fire detection unit.

If the sensing element detects an overheat condition, the APU fire detector unit illuminates the APU FIRE PUSH light and sounds the fire warning bell. Pressing the TONE MUTED switch silences the bell.

Fault Detection

Selecting the WARN TEST position tests the fire warning system. Normal system indication is illumination of the ENG FIRE PUSH (2), APU FIRE PUSH (1), and BOTTLE ARMED PUSH TO DISCH (3) switchlights and sounding of the fire bell. Releasing the switch returns it to the OFF position. The lights extinguish and the fire warning bell silences.

Holding the fire warning test panel switch in the FAULT TEST position tests the fire detection system fault monitoring by simulating sensing element shorts. Illumination of the three FIRE WARN FAIL lights indicates normal system operation.

Pressing the OVHT switchlights tests the integrity of jetpipe and pylon sensing elements and warning circuits. While depressing the switch, a normal indication is continuous flashing of the OVHT switchlight. Pressing the OVHT WARN FAIL switchlight tests the warning system. The OVHT WARN FAIL light illuminates along with the ENGINE light on the eight-channel annunciator panel and then the MASTER CAUTION lights flash.

Wheel Wells

Sensing elements covering the top of the main landing gear wheel wells provide warnings of excessive brake temperatures when the landing gear is retracted. The left and right main gear wheel well sensing elements connect to a common overheat detection unit.

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If the sensing element detects excessive temperatures, the overheat detection unit illuminates the main landing gear bay OVHT light.

Testing

Pressing the OVHT switchlight tests the continuity of the two sensing elements. If the system is operating normally, the OVHT switchlight illuminates. Pressing the OVHT WARN FAIL switchlight tests the warning system. Normal indications are illumination of the MLG BAY OVHT FAIL switchlight followed by the MLG BAY OVHT FAIL repeater and flashing MASTER CAUTION lights.

Area	Temperature		Warning
	°C	°F	
Engine Combustion Section S/Ns 3001 – 3006 S/Ns 5001 – 5134 S/N 5135 and subsequent	333 473	632 884	ENG FIRE PUSH Fire Bell
Engine Jet Pipe S/Ns 3001 – 3066 S/Ns 5001 – 5134 S/N 5135 and subsequent	521 522	969 973	OVHT
Engine Pylon	191	376	OVHT
Auxiliary Power Unit	232	450	APU FIRE PUSH Fire Bell
Main Landing Gear Wheel Well	160	320	MLG BAY OVHT

Table 4-D; Fire Protection System

Fire Extinguishing

The engines have two fire extinguisher bottles so that each bottle can supply fire extinguishing agent to either engine. The APU has a single fire extinguisher bottle.

All three bottles contain Halon 1301 pressurized with a gaseous nitrogen charge to approximately 600 to 625 PSI. If a bottle pressure drops below 225 to 275 PSI, a pressure switch opens and the associated LOW PRESS light illuminates.

Continuity of the fire extinguishing systems can be tested by pressing the L. SQUIB/R. SQUIB and SQUIB switchlights. If the electrical circuitry for at least one ignition element of each bottle squib is functional, the associated L. SQUIB/R. SQUIB and SQUIB lights illuminate.

Engine

Pressing an illuminated ENG FIRE PUSH switchlight arms the fire extinguishing system, illuminates the BOTTLE ARMED PUSH TO DISCH switchlights, and energizes the engine and cockpit heater shutoff relays (left engine only).

When the shutoff relay energizes, it supplies power to:

- close the fuel shutoff valve
- close the hydraulic shutoff valve
- close 10th and 14th stage bleed air shutoff valves
- perform a shutdown of the engine's generator.

When the cockpit heater shutoff relay energizes, it removes power to the left foot warmer shutoff valve so it can close.

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Pressing an illuminated BOTTLE ARMED PUSH TO DISCH switchlight supplies 28V DC from the Battery bus to the associated engine's fire extinguisher bottle cartridge. The cartridge fires so that Halon 1301 flows through the discharge tube to the engine's fire zone A. After bottle discharge, the bottle's pressure switch opens to extinguish the respective BOTTLE ARMED PUSH TO DISCH switchlight.

If the fire warning persists, pressing the remaining BOTTLE ARMED PUSH TO DISCH switchlight discharges the second bottle into the same engine. After discharge, the switchlight extinguishes.

APU

Pressing the illuminated APU FIRE PUSH switchlight arms the APU fire extinguishing system, illuminates the APU BOTTLE ARMED PUSH TO DISCH switchlight, and initiates an APU shutdown by energizing the APU shutoff relay. The BOTTLE ARMED PUSH TO DISCH switchlight does not illuminate if bottle pressure is below 225 to 275 PSI.

Pressing the BOTTLE ARMED PUSH TO DISCH supplies 28V DC from the Battery bus to the APU fire extinguisher bottle squib. The squib then fires to release pressurized Halon 1301 from the bottle to the APU enclosure through the discharge tube. After bottle discharge, the BOTTLE ARMED PUSH TO DISCH light extinguishes.

Cockpit and Cabin

A Halon 1211 (bromochlorodifluoromethane) portable fire extinguisher is behind the copilot's seat on the lower left side of the bulkhead. Halon 1211 is a relatively non-toxic and non corrosive fire extinguishing agent that chemically interferes with the combustion process.

Typically, **S/Ns 3001 to 3066 and 5001 to 5042** have a fire extinguisher that contains approximately two pounds of extinguishing agent while **S/N 5043 and subsequent** have a 3.5 pound fire extinguisher.

A typical passenger cabin installation has one or two Halon 1211 and/or water portable fire extinguishers. Normally, these portable fire extinguishers are in a readily accessible location available for use by the flight crew or passengers.

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Fire Detection

Power Source	Battery bus
Distribution	Engine Combustion area (zone A) Jetpipe (zone B) Pylon (zone B) APU Main landing gear wheel wells
Control	WARN TEST/FAULT TEST switch Aural warning selector FIRE position TONE MUTED switchlight
Monitor	LH/RH ENG FIRE PUSH switchlights APU FIRE PUSH switchlight Fire bell FIRE WARN FAIL switchlights

Engine Fire Extinguishing

Power Source	Two Halon 1301 filled bottles Battery bus
Distribution	Each bottle can discharge to either engine
Control	ENG FIRE PUSH switchlights (bottle arming) BOTTLE ARMED PUSH TO DISCH switches
Monitor	Bottle LO PRESS lights L./R. SQUIB switchlights Bottle pressure gages Bottle discharge discs Bottle low pressure switches (LO PRESS)
Protection	Bottle overpressure relief valve

APU Fire Extinguishing

Power	One Halon 1301 filled bottle Battery bus
Distribution	APU enclosure
Control	APU FIRE PUSH switchlight (arming) BOTTLE ARMED PUSH TO DISCH switch
Monitor	Bottle pressure gage LO PRESS/SQUIB switchlight
Protection	Bottle overpressure relief valve

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