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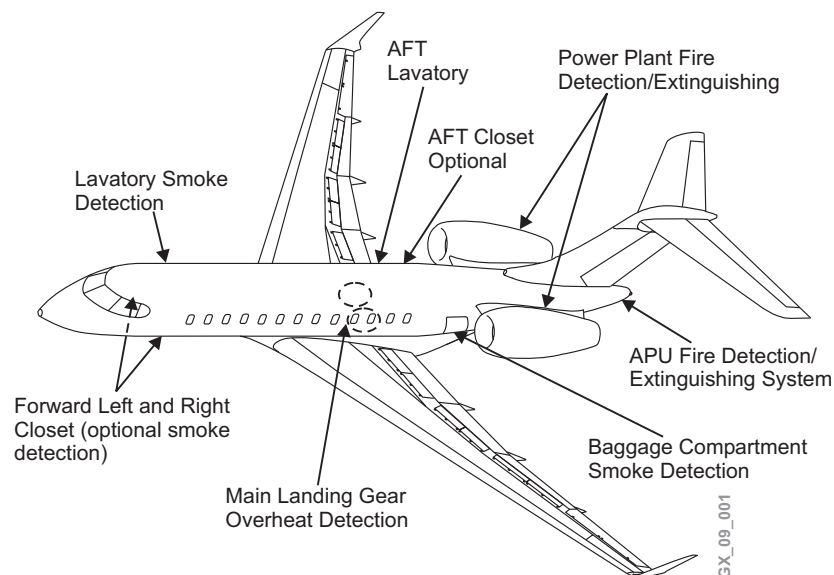
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INTRODUCTION

A Fire Detection and Extinguishing (FIDEEX) system with fault discrimination is installed with fire detectors located in each engine nacelle, and in the APU compartment.

The FIDEEX system interfaces with numerous airplane equipment and provides the following capabilities:

- Monitor zones for fire/overheat/smoke events and FIDEEX system health and status
- Automatic detection and reporting of fire events for each of the two power plants and the Auxiliary Power Unit (APU)
- Fire extinguishing for each of the power plants and APU upon receipt of pilot initiated arming and discharging commands
- Automatic detection and reporting of overheat events for the two Main Wheel Wells (MWWs)
- Automatic detection and reporting of smoke events for each of the lavatories (fwd/ aft), baggage compartment, avionics bay, and up to four cabin closets (requires installation of optional smoke detectors)



The FIDEEX system includes fire detector assemblies, sensing elements, smoke detectors (optional), fire extinguishing assemblies, and a FIDEEX control unit.

FLIGHT COMPARTMENT FIRE WARNING

The fire protection system provides the means to detect and extinguish a fire in the engine nacelles and in the auxiliary power unit (APU) compartment. Engine/APU fire warning is provided by:

- MASTER warning lights (2)
- Aural warning
- EICAS messages
- Three red warning lights (one for each engine nacelle, and one for the APU compartment), installed in the flight compartment fire handles

Both the detection systems and extinguishing systems permit testing and/or monitoring for system faults from the flight compartment. A fire warning and extinguisher preflight test of the system is provided in the flight compartment.

FIRE DETECTING SYSTEM

Fire detection elements are installed in each engine and APU compartment, permitting the flight crew to monitor any fire condition in these areas.

MAIN WHEEL WELL OVERHEAT WARNING

An overheat detection element in the wheel well area warns of an overheat condition in either of the main wheel wells. Indication and test function is provided in the flight compartment.

FIRE AGENT DISCHARGE INDICATION

The fire extinguisher bottle is fitted with a low pressure switch. The switch provides an annunciation in the flight compartment when pressure drops below a predetermined pressure setting.

SMOKE DETECTION

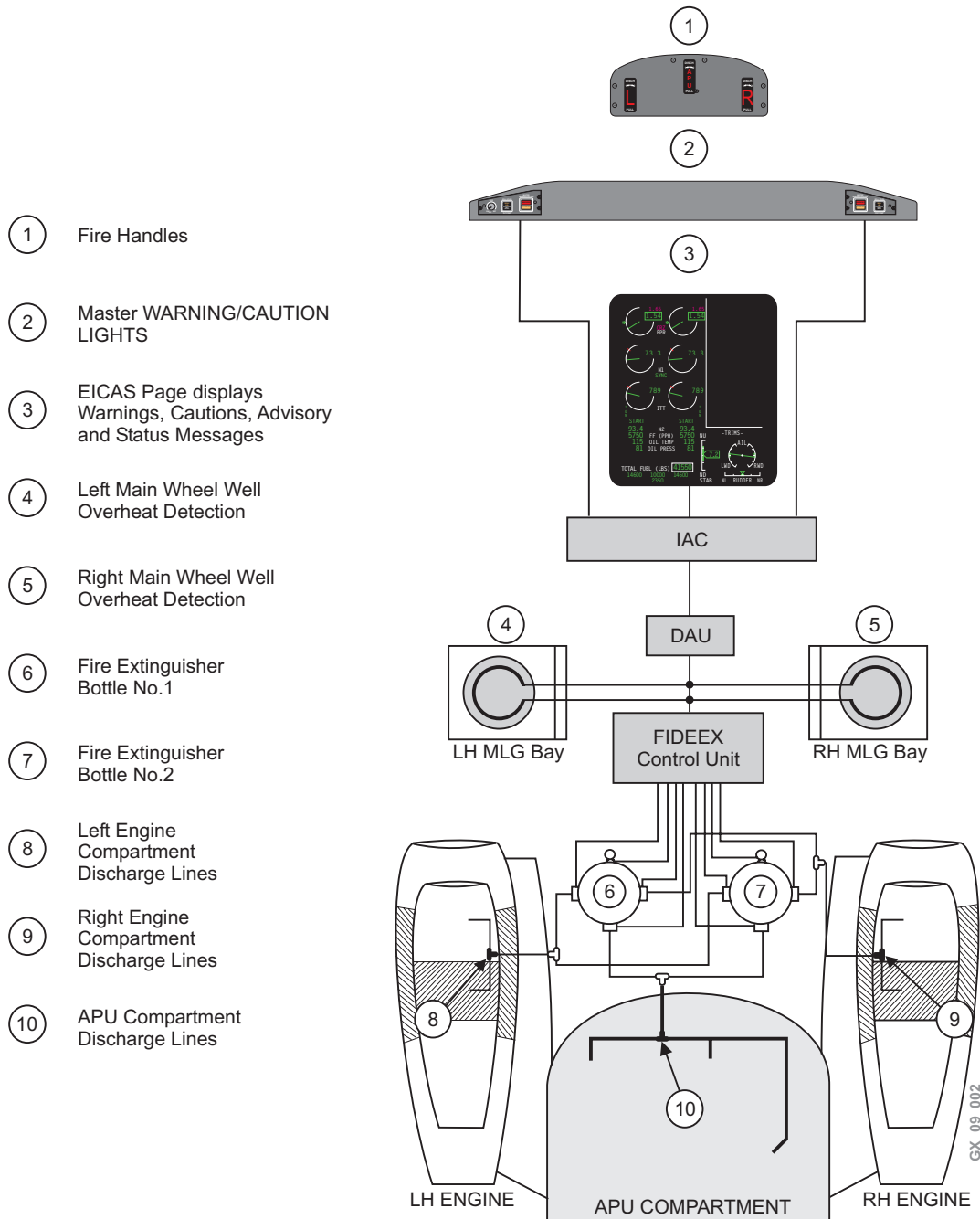
The FIDEEX system can provide smoke detection capability for the baggage compartment, forward and aft lavatories, avionics bay, and up to four cabin closets.

PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers are located throughout the airplane. One halon type fire extinguisher is installed in the flight crew compartment. Please refer to the EMERGENCY EQUIPMENT chapter for more information on the portable fire extinguishers.

DESCRIPTION

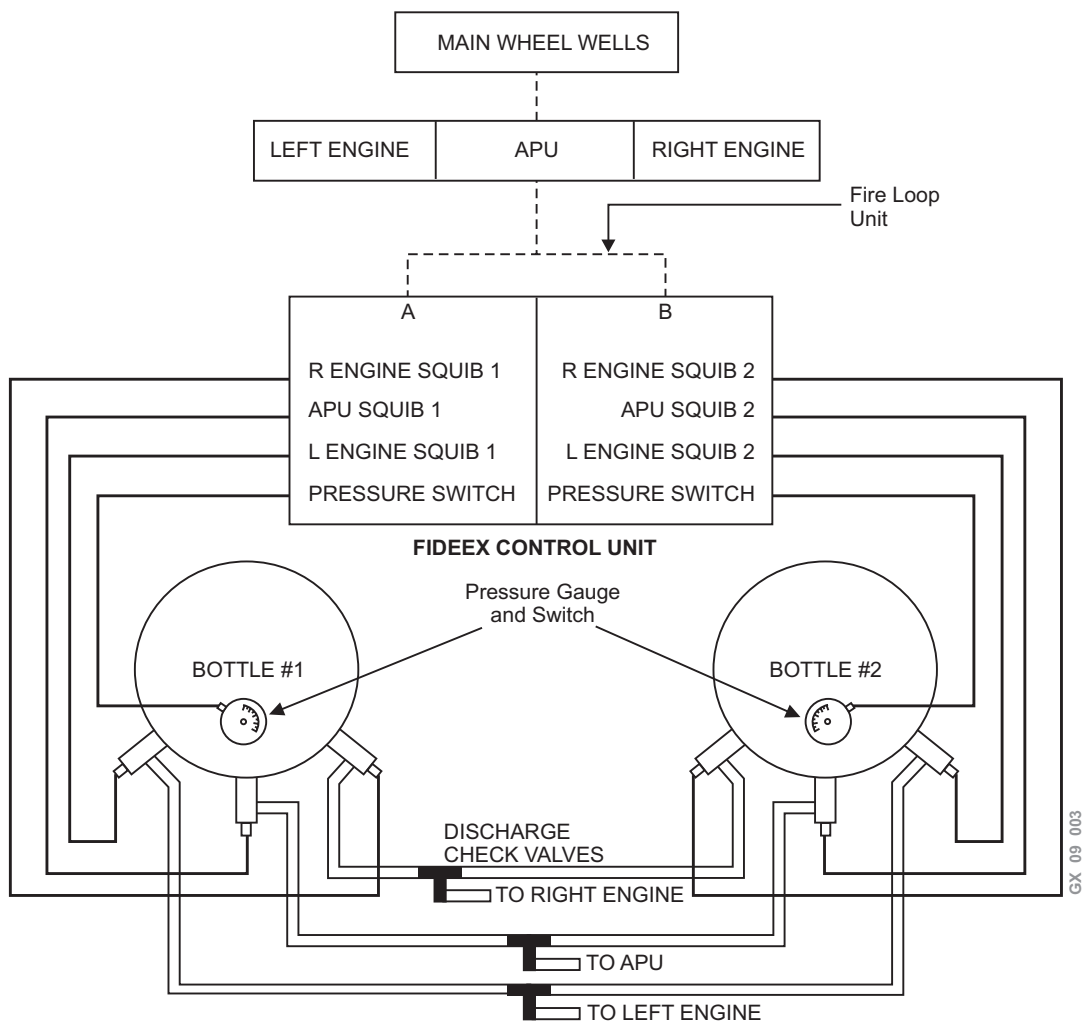
SYSTEM OVERVIEW SCHEMATIC



FIDEEX CONTROL UNIT

All interfaces from the airplane’s power and fire handles pass through the FIDEEX control unit before they reach the fire extinguishers. The FIDEEX control unit is located under the baggage compartment floor. The following functions/components are monitored continuously:

- Continuity of the squib circuits
- Continuity of the pressure switches
- Existence of 28 VDC on the two fire extinguishing power supply lines



The FIDEEX control unit is divided into two redundant channels (A and B). The channels power and monitor both loops of the main engines and APU, and each of the MWW loops. Both channels independently determine the presence of a fire or overheat condition. The FIDEEX control unit performs internal and operator initiated built-in tests, and reports all health and status to the flight compartment EICAS system.

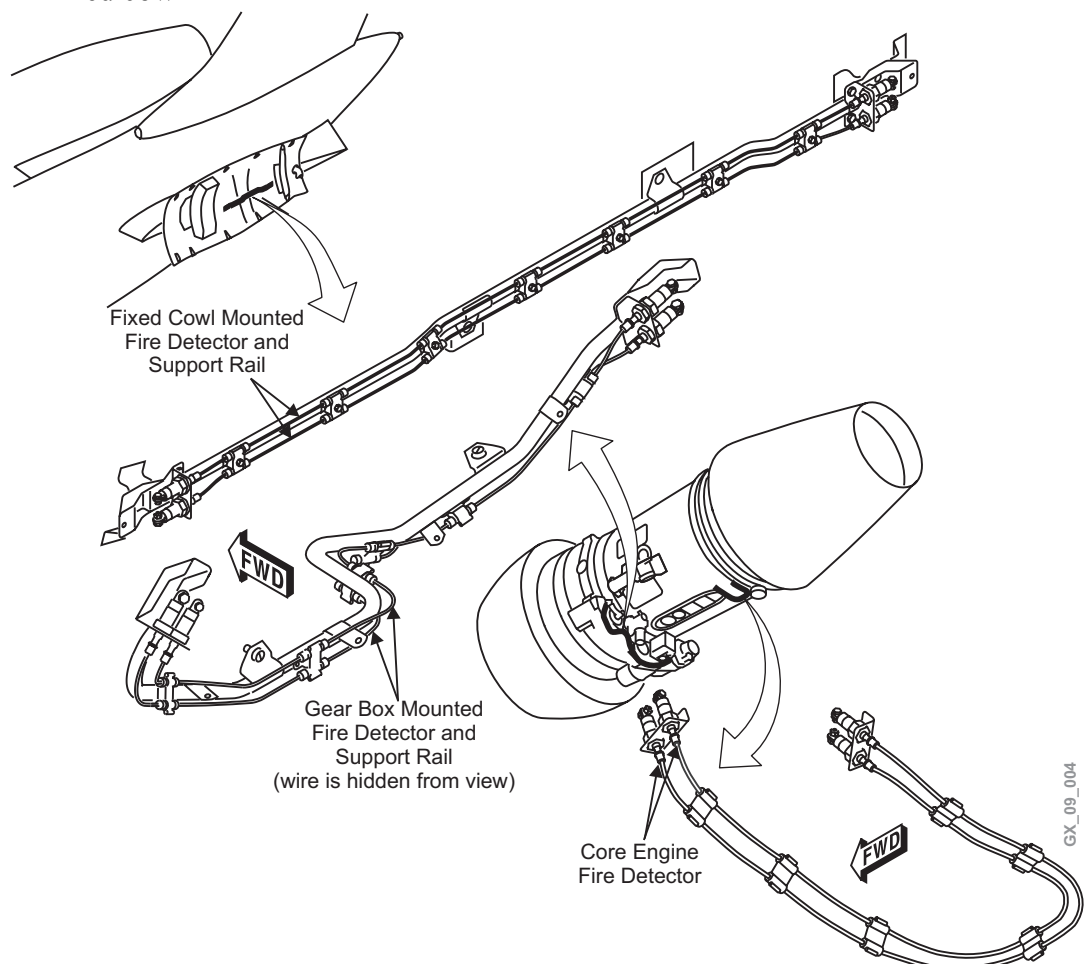
MAIN ENGINE FIRE DETECTION

Main engine fire detection is provided by a dual loop system. Each loop (loop A and loop B) consists of three sensing elements, located on the accessory gear box, under the engine core, and along the fixed cowl. In order for a fire to be detected, at least one sensing element from each loop must detect the fire. When both loops indicate a fire condition, the FIDEEX will forward that information to the DAUs and the IACs (should one loop develop a short, the FIDEEX isolates that loop and now relies on the remaining loop for the detection of a fire).

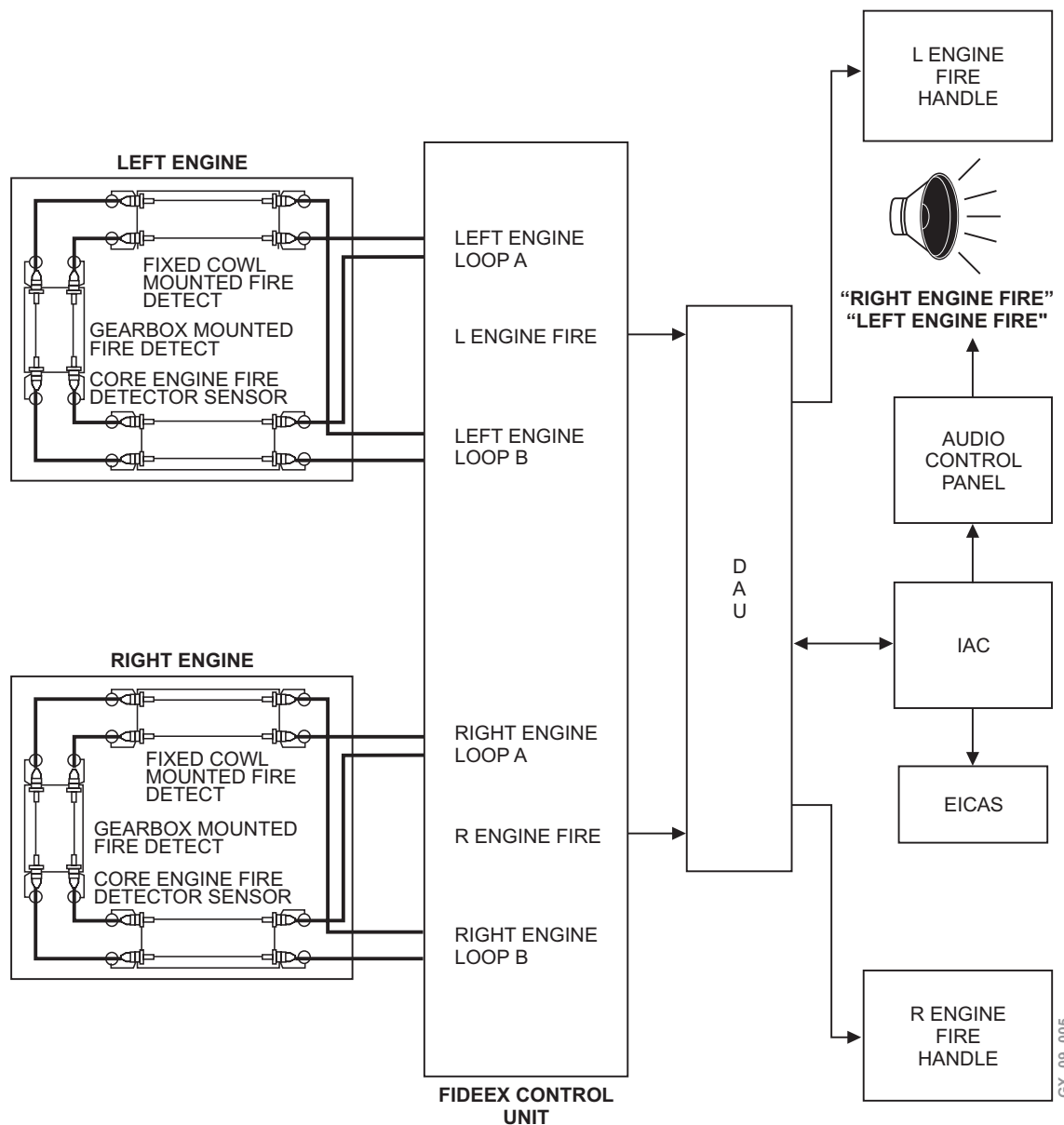
The DAUs and IACs will illuminate the applicable engine fire DISCH handle, flash the master WARNING lights, generate a warning message on EICAS and a FIRE indication on the applicable ITT gauge, and generate a LEFT or RIGHT ENGINE FIRE voice message.

Sensing elements are located on the following areas:

- Accessory gear box
- Engine core
- Fixed cowl



ENGINE FIDEEX CONTROL SCHEMATIC

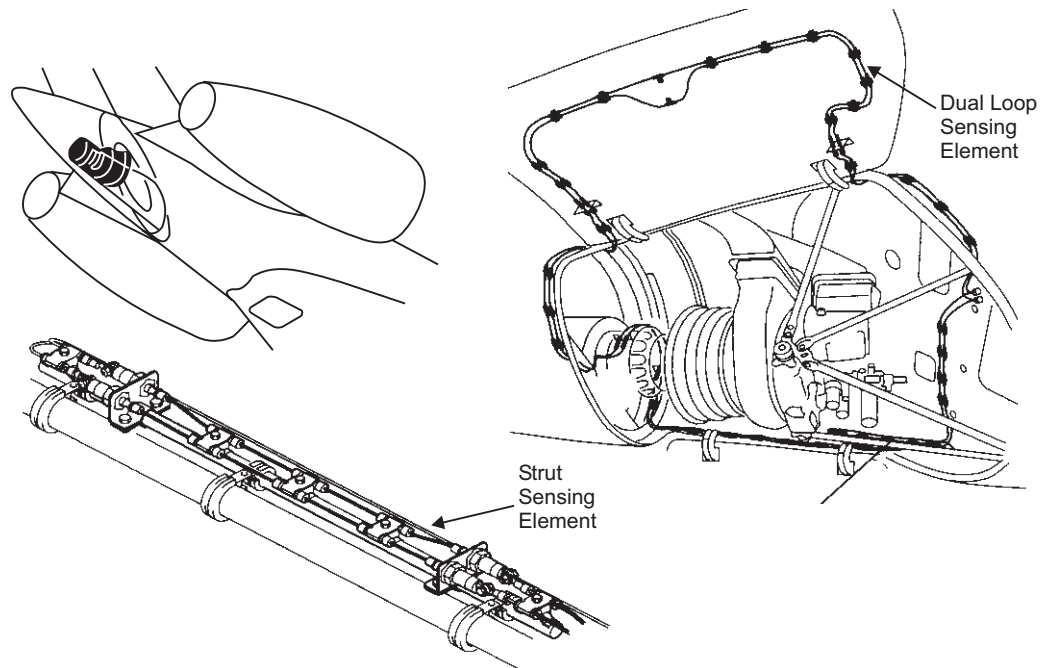


The engine fire loop elements send their information to the FIDEEX control unit. The FIDEEX control unit in turn sends information to the DAU. In the event of a fire, the DAU will signal the applicable engine fire DISCH handle to illuminate. The DAU reports the status of the detection system to the IAC which provides warning conditions to the EICAS, and audio control panel.

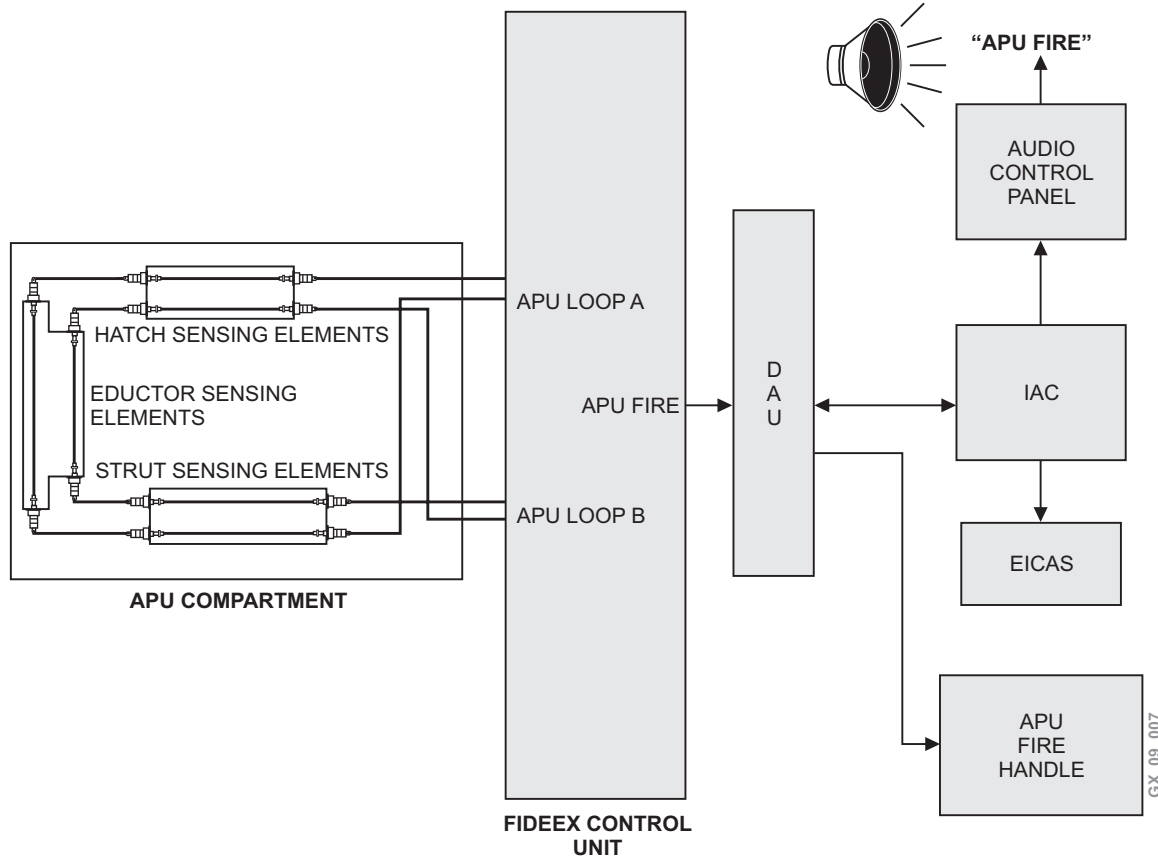
APU COMPARTMENT FIRE DETECTION

APU fire detection is also provided by a dual loop system. Each loop (loop A and loop B) consists of three sensing elements, located on the APU Eductor, on the right APU Compartment hatch, and along a strut supporting the APU. In order for a fire to be detected, at least one sensing element from each loop must detect the fire. When both loops indicate a fire condition, the FIDEEX will forward that information to the DAUs and the IACs (should one loop develop a short, the FIDEEX isolates that loop and now relies on the remaining loop for the detection of a fire).

The DAUs and IACs will illuminate the APU fire DISCH handle, flash the master WARNING lights, generate an APU FIRE warning message on EICAS, and generate an APU FIRE voice message.



APU FIDEEX CONTROL SCHEMATIC



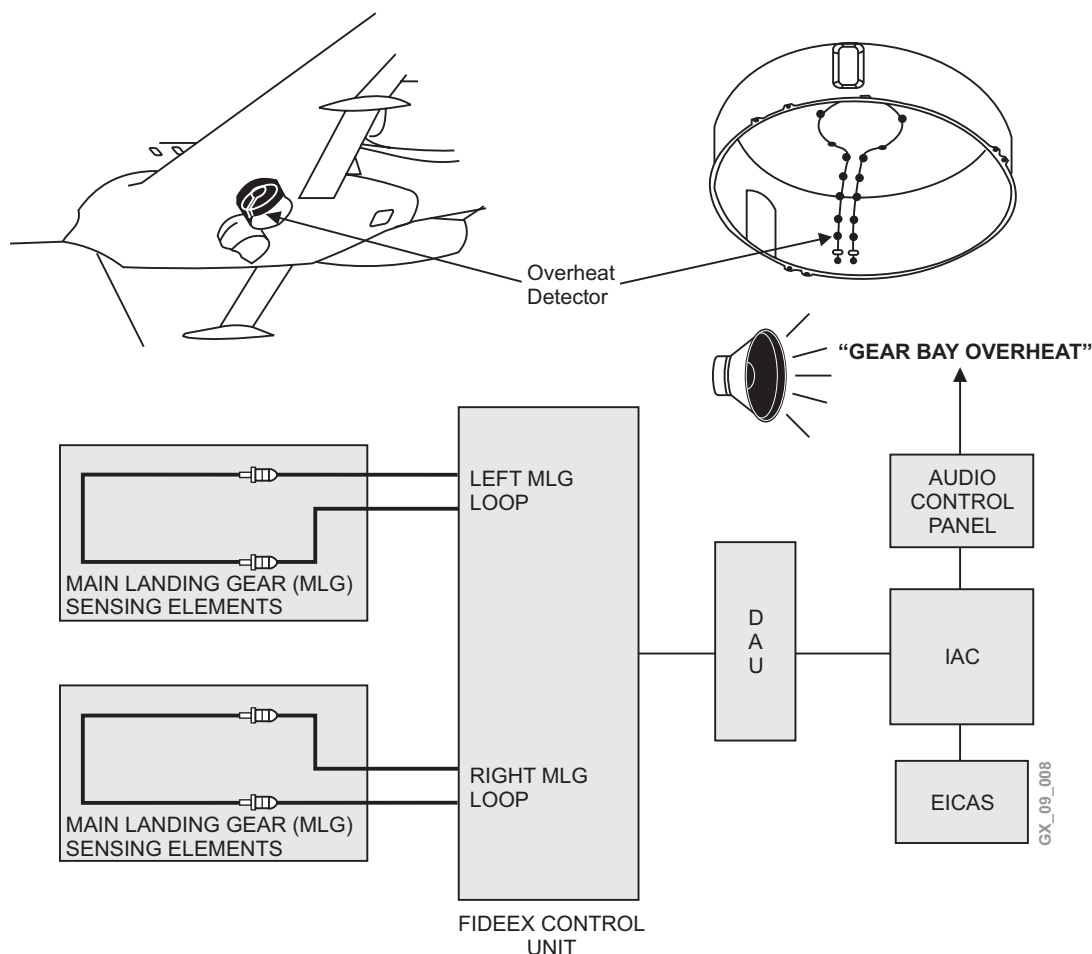
The APU fire loop elements send their information to the FIDEEX control unit. The FIDEEX control unit in turn sends information to the DAU. The DAU reports the status of the detection system to the IAC which signal the EICAS, and audio control panel of the warning condition.

When a fire is detected, the APU fire warning handle will illuminate, master WARNING lights will illuminate, a warning message will appear on EICAS, and a voice message APU FIRE will sound.

MAIN WHEEL WELL (MWW) OVERHEAT DETECTION

The main landing gear bays can be subjected to overheating conditions due to brake/tire overheating, or fire. The MWW overheating detection is provided by a single loop system for each main wheel well (left and right); each loop consists of one sensing element. The sensing elements are mounted in the vicinity of the brakes on the top surface of each MWW bin.

The FIDEEX control unit continuously monitors the heat sensing elements in the main landing gear area. Any overheating condition or system fault detected by the monitoring system is annunciated on EICAS in the form of a main landing gear bay overheating warning message, overheating fail caution message, or main landing gear bay overheating fault. The gear bay overheating warning message will be accompanied by an aural warning.



The FIDEEX control unit receives signals from the MWW sensing elements, and in turn sends information to the DAU. The DAU reports the status of the detection system to the IAC which signals the EICAS and audio control panel for warning conditions.

SMOKE DETECTION

The following smoke detectors are installed on the “green” configuration of the (Global Express) aircraft:

- Forward avionics bay
- Aft avionics bay
- Baggage compartment (but not functionally connected)

The following smoke detectors are installed on the “green” configuration of the (Global 5000) aircraft:

- Forward avionics bay
- Aft avionics bay
- Avionics rack
- Baggage compartment (but not functionally connected)

The smoke detectors installed in the lavatories, cabin and closets are installed by the completion center(s). Also, the completion center(s) is/are responsible for functionally connecting the baggage compartment smoke detectors once the interior has been installed.

The FIDEEX control unit and the avionics system have built-in provisions for the smoke detectors for the baggage compartment, lavatories, avionics bay, and cabin closets. The smoke detectors are checked during power-up and during pilot initiated test. The flight deck activates the following warning devices:

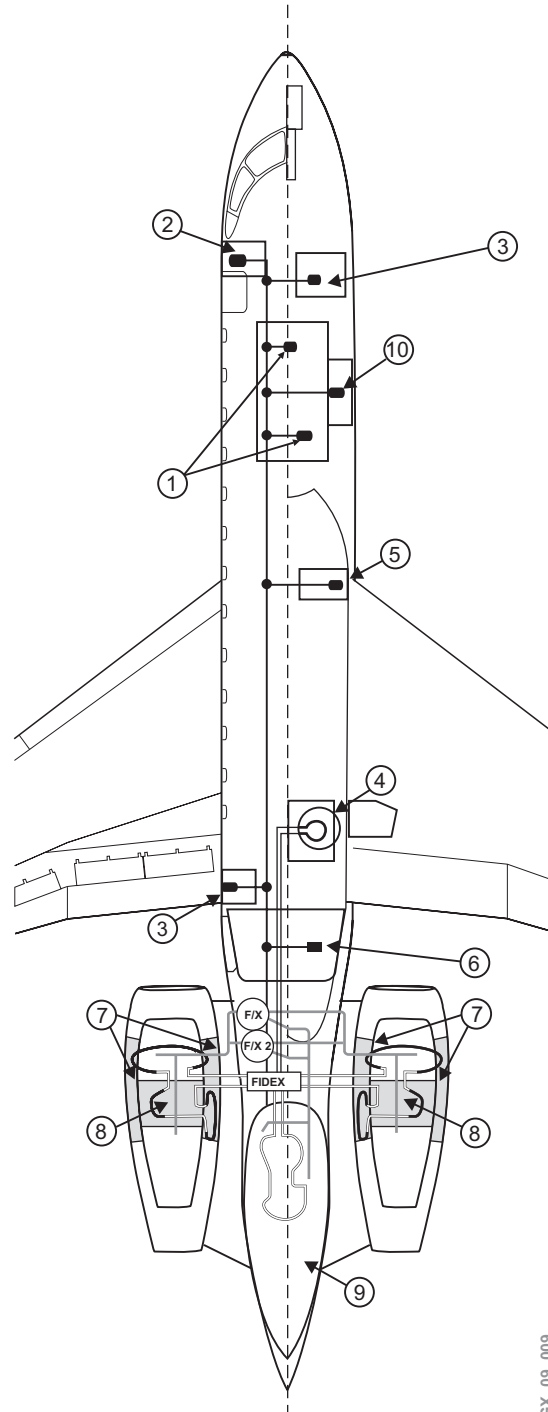
- Flashing master WARNING lights (glareshield)
- Appropriate smoke warning message on EICAS
- Sounds the appropriate smoke warning voice message in the flight compartment

Fire suppression for the baggage compartment, lavatories and cabin closets is provided via hand-held portable fire extinguishers. Provisioning and certification of the smoke detectors and hand-held extinguishers are the responsibility of the completion center and are not further described in this chapter.

- ① **AVIONICS BAY**
 - Smoke detection
- ② **CLOSET** – 2A...FWD; 2B...AFT
 - Smoke detection
- ③ **LAVATORY** – 3A...FWD; 3B...AFT
 - Smoke detection
- ④ **MAIN LANDING GEAR BAY**
 - (x2, R & L, left not shown)
 - Overheat detection
 - Suppression by lowering gear
- ⑤ **CABIN** – Position varies per interior
 - Smoke detection (GX only)
- ⑥ **BAGGAGE COMPARTMENT**
 - Smoke Detection
- ⑦ **MAIN POWERPLANT ZONE 1**
 - Dual loop fire detection, loops common with zone 2
 - Two shot halon fire extinguishing system
- ⑧ **MAIN POWERPLANT ZONE 2 – Core**
 - Dual loop fire detection, loops common with zone 1
 - Two shot halon fire extinguishing system
- ⑨ **APU COMPARTMENT**
 - Dual loop fire detection
 - Two shot halon fire extinguishing system
- ⑩ **AVIONICS RACK**
 - Smoke detection (G5000 only). Considered integral part of avionics bay for “Smoke Warning” message

NOTE

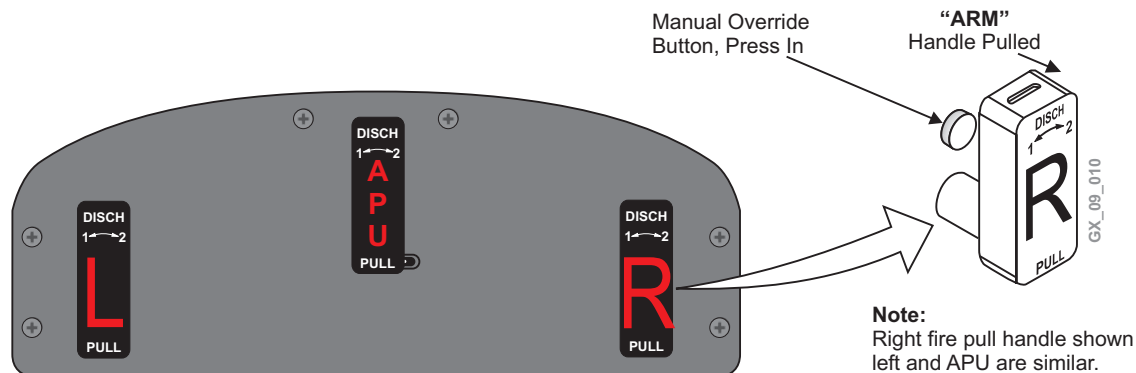
The Cabin, Closet, Lavatory, and Baggage compartment fire protection zones are shown here for reference only. These are not part of the green A/C, except the Baggage Compartment smoke detector which is installed, but not functional.



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FIRE HANDLES

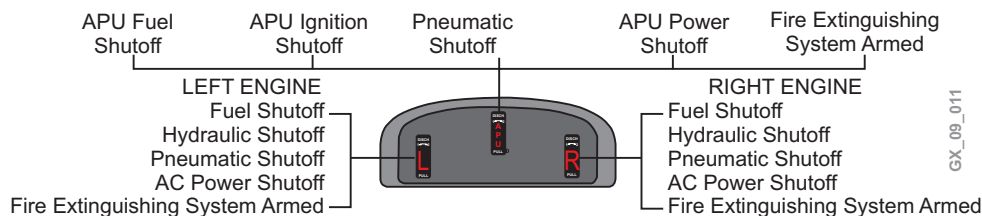
The three fire handles are provided for the engine and APU fire protection system. They are installed on the center overhead panel in the flight compartment.



To prevent accidental engine shutdown and fire extinguisher discharges, each fire control handle is maintained in the stowed position by four center springs and a solenoid operated switch.

When a fire warning is received, the Data Acquisition Unit unlocks the solenoid to allow ease of pulling the handle. At any other time when an arm/discharge command sequence is desired, the solenoid must be manually unlocked by depressing the manual override button, (overhead panel behind each switch) while pulling the handle. Each fire handle also has four lamps (bulbs) to illuminate each individual handle for fire detection.

When a handle is pulled to the armed position, the following events occur:



- Applicable (engine/APU) fuel Shutoff Valve (SOV) closes
- Each engine - applicable hydraulic SOV closes
- Each engine and APU - applicable bleed SOV closes
- A signal is sent to trip the applicable Variable Frequency Generators (VFGs)
- A signal is sent to the APU electronic control unit to cancel ignition
- Redundant commands are sent to ARM the FIDEEX control unit's discharge circuits

If the warning persists following the pulling of the handle, the fire can be extinguished by discharging a fire extinguisher bottle.

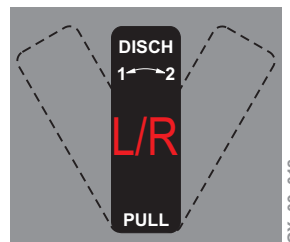
ENGINE FIRE

When an engine DISCH fire handle is pulled, the ENGINE FUEL SOV is commanded closed, preventing fuel flow to the engine.

NOTE

Pulling the fire DISCH handle does not command an immediate engine shutdown. In the event of a fire, the engine should be shut down, using the ENGINE RUN switches which will close the high pressure fuel shutoff valve (HPSOV).

"BOTTLE 1"
HANDLE PULLED, ROTATED
TO THE LEFT

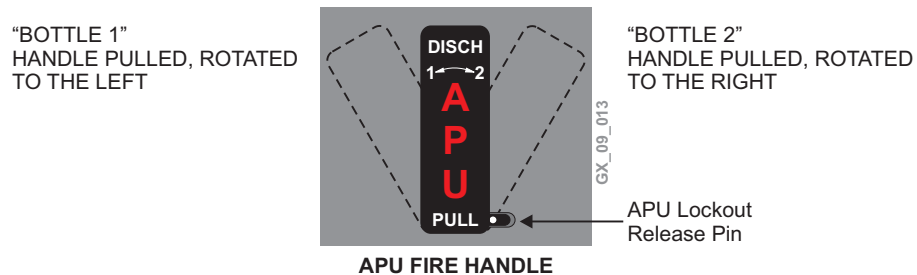


"BOTTLE 2"
HANDLE PULLED, ROTATED
TO THE RIGHT

ENGINE FIRE HANDLE

To discharge an engine bottle, the handle must be turned fully and held (at least one second) to overcome the spring force of the handle; counterclockwise (bottle 1) or clockwise (bottle 2). This action will send redundant commands to discharge the selected fire extinguisher bottle into the armed zone. When a handle is turned fully in the opposite direction, the remaining bottle will be discharged.

APU FIRE

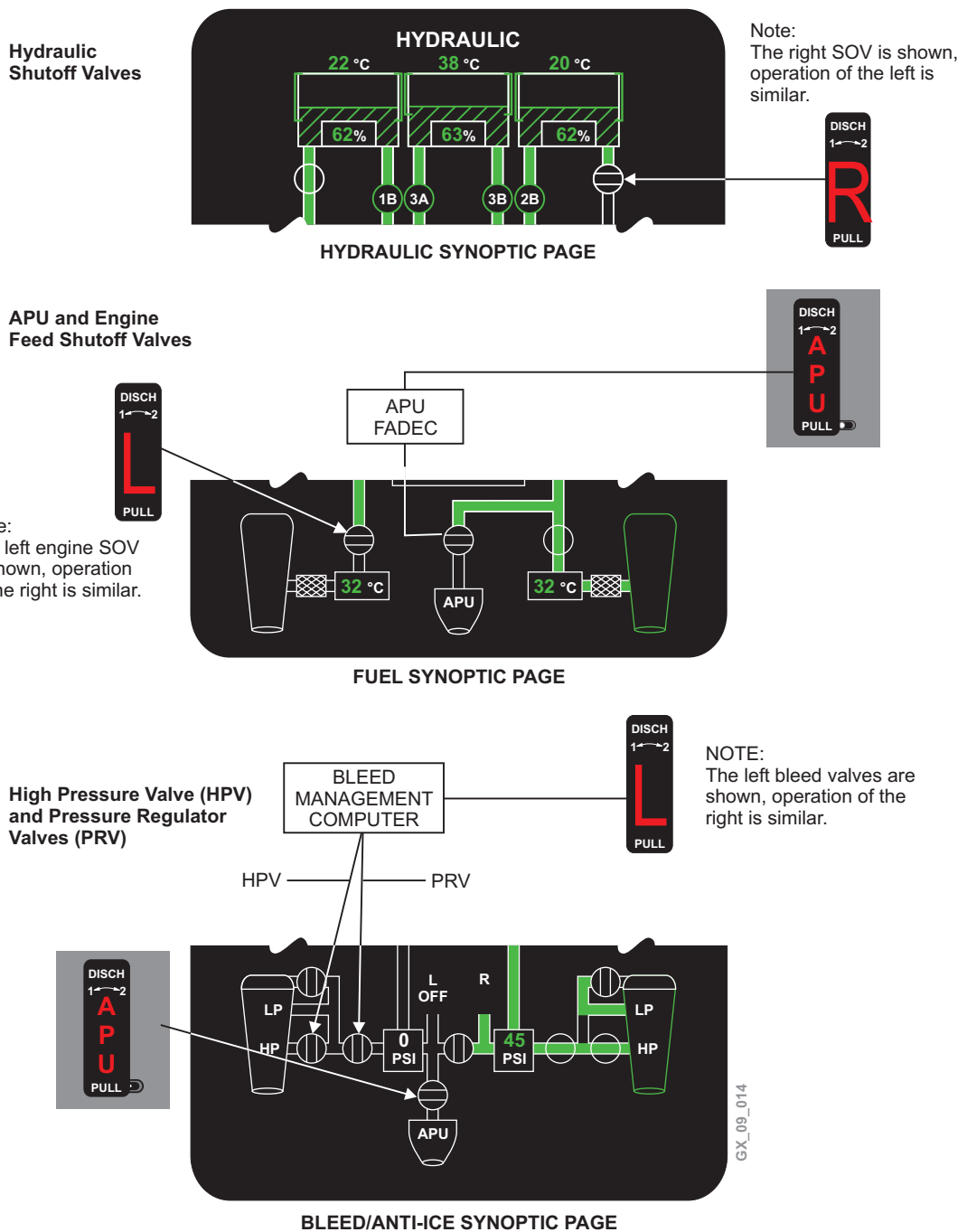


To discharge the APU bottle, the handle must be turned fully and held (at least one second) to overcome the spring force of the handle; counterclockwise (bottle 1) or clockwise (bottle 2). This action will send redundant commands to discharge the selected fire extinguisher bottle into the armed zone.

To discharge the second extinguisher bottle, the lockout release pin must be slid to the right, to allow the handle to be rotated back to the center position. This is most often a two handed operation. The additional step for the APU is deemed necessary to preserve one bottle for possible engine fire. When a handle is turned fully in the opposite direction, the remaining bottle will be discharged.

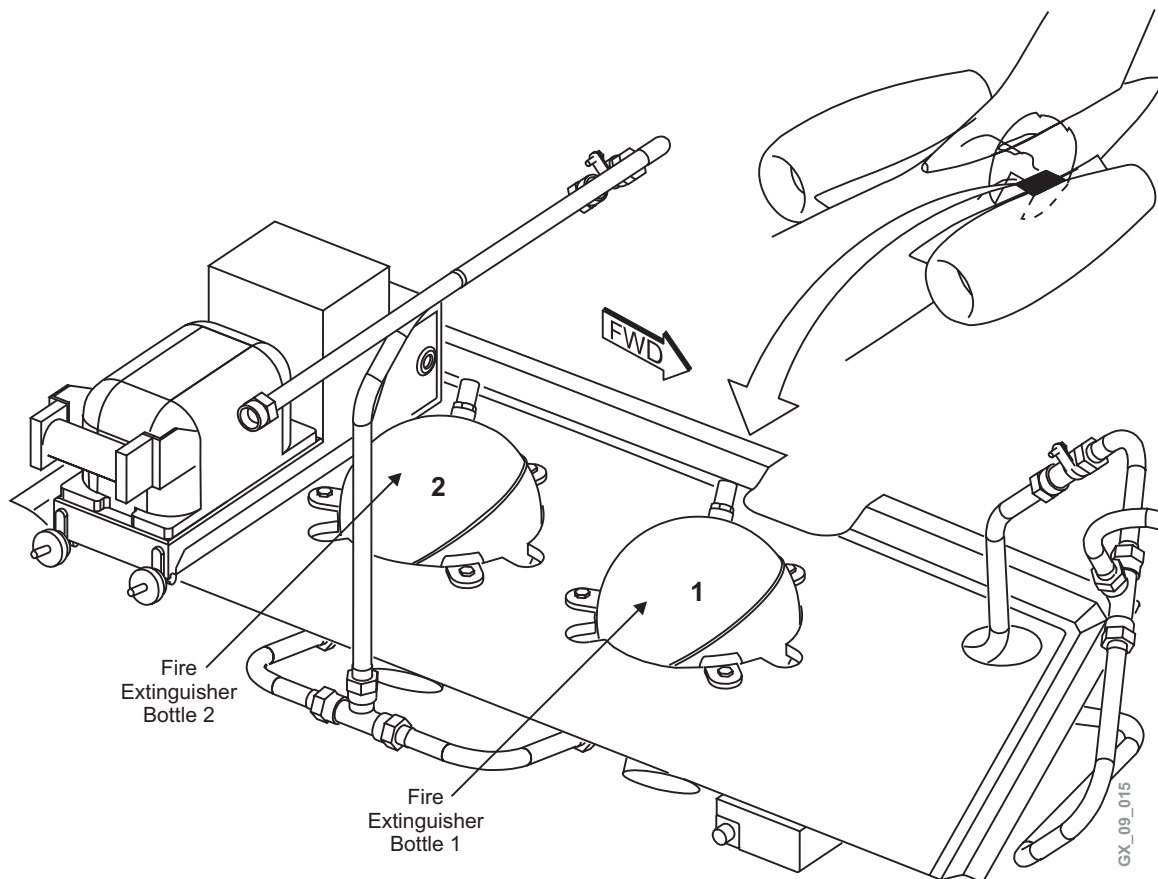
SHUTOFF VALVES (SOV)

The following valves are commanded closed as a function of pulling the applicable fire DISCH handle.



FIRE EXTINGUISHER ASSEMBLY

The designated fire zones are left engine, right engine and APU. There are two fire extinguisher bottles on each airplane attached to the left rear fuselage structure. Each fire extinguisher bottle incorporates a hermetically-sealed pressure vessel filled with Halon 1301. The forward fire extinguisher bottle is designated as bottle 1, and the aft fire extinguisher is designated as bottle 2.

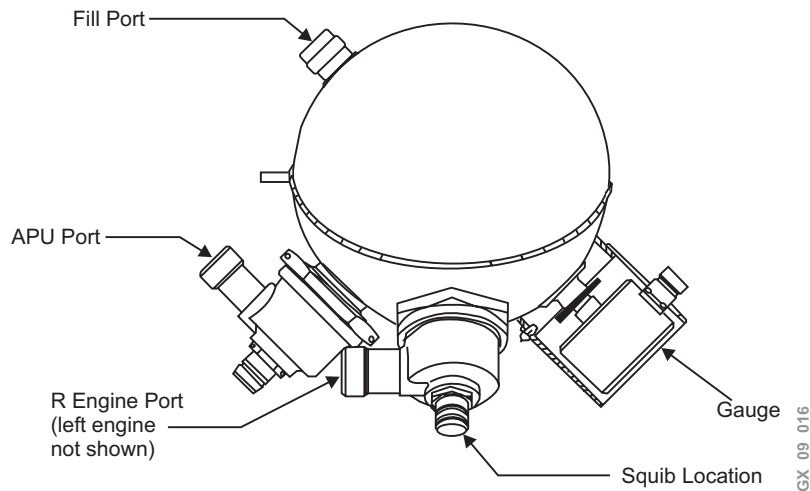


FIRE EXTINGUISHER DISCHARGE BOTTLES

Each bottle in the Fire Extinguisher Assembly has three discharge ports. Each of these ports are designated toward one of the fire zones (left engine, right engine or APU enclosure). Therefore the contents of a bottle can be directed into any one of these three zones, if required.

A fire extinguisher discharge squib (electro-explosive device) is installed in each discharge port. Each squib has two circuits (bridgewires), each of which is capable of firing the squib. One of the circuits is wired to channel A, and the other to channel B of the FIDEEX control unit. Firing a squib shoots a “dagger” at a burst disk contained within each port. The rupture of this burst disk allows the bottle contents to discharge

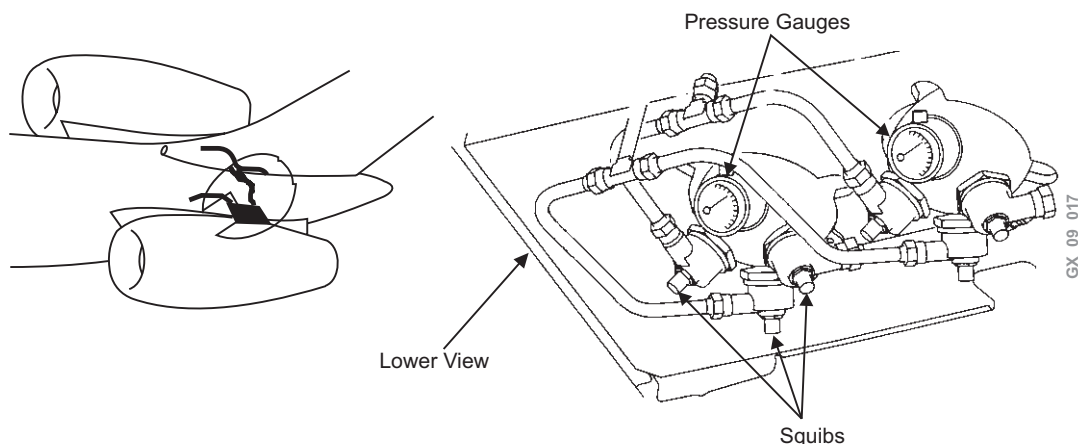
into its designated zone. This burst disk also acts as a pressure relief valve within a bottle. Should the bottle become overpressurized, one of these burst disks will rupture, discharging the contents of the bottle.



If one of the circuits detects a fault, it will report to Central Aircraft Information Maintenance System (CAIMS), but no EICAS message will be posted since there is no loss of bottle discharge capability. If both circuits to a squib are detected to be nonfunctional, a squib advisory message will be posted for the affected system.

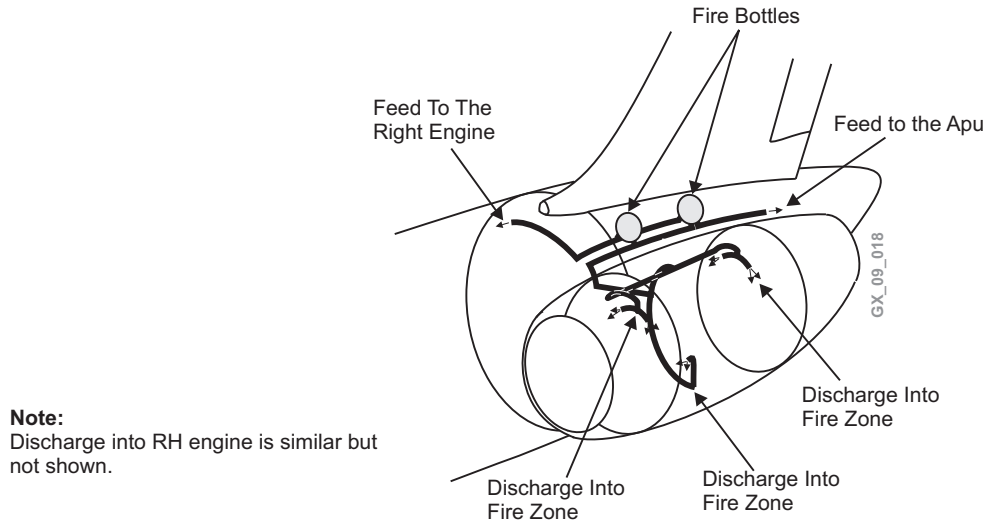
FIRE EXTINGUISHER GAUGES

Each bottle in the Fire Extinguisher Assembly has a pressure gauge to display bottle pressure and a pressure switch to act as an “alarm gauge”. This alarm gauge automatically signals the FIDEEX control unit if the fire extinguisher pressure drops below the minimum operating pressure (250 psi). This will generate the following EICAS message “FIRE BTL 1 (2) LO PRESS” to alert the flight crew.

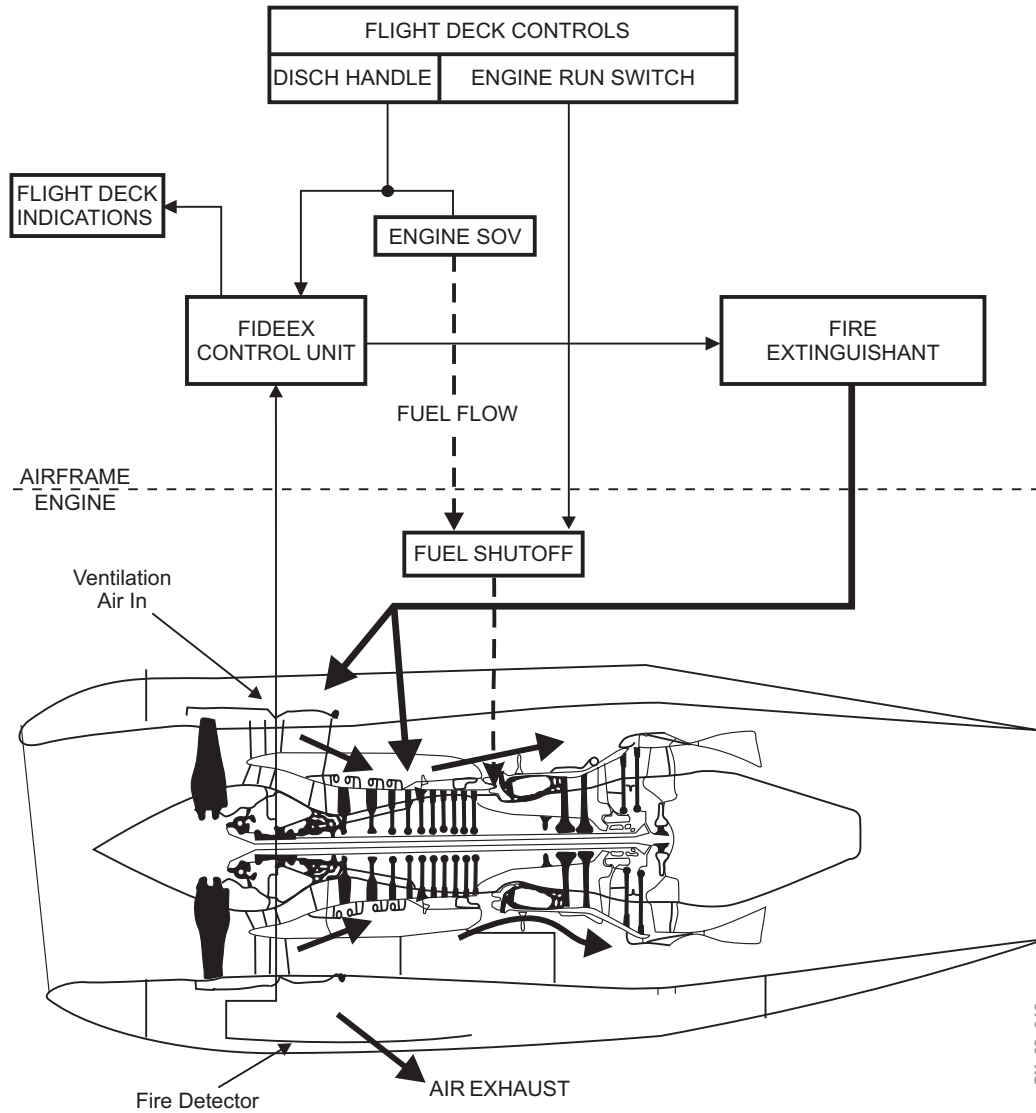


MAIN ENGINE FIRE EXTINGUISHING

The FIDEEX control unit monitors the engine fire detecting elements. It sends information to the flight compartment and if initiated by the flight crew, commands the fire bottle to discharge the extinguishing agent.



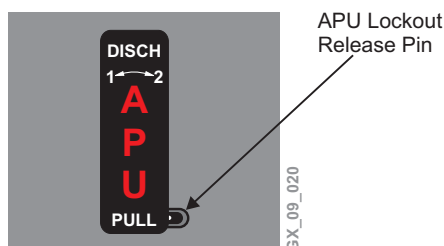
The extinguishing piping from the bottles extend through the pylon to the engine. The piping is then directed within the engine to a “T” junction which divides the flow into two zones, accessory and core. A nozzle assembly directs halon to different sections of each zone.



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APU COMPARTMENT FIRE EXTINGUISHING

The APU compartment is protected by a two shot fire extinguishing system. Each discharge is independently directed by the pilot, with provision to guard against accidental discharge of both extinguishers into the APU.



APU FIDEEX/FADEC INTERFACE

On the ground, the FADEC will automatically shut down the APU if a fire signal is received for at least 5 seconds, and the APU fire handle is not pulled. Although the APU will automatically shut down if a fire is detected, there is no automatic discharging of the fire extinguishing agent. Therefore, the APU must not be left unattended for ground operations.

If in an airborne state, the EICAS will give aural and visual warnings but the APU must be shut down via the fire handle.

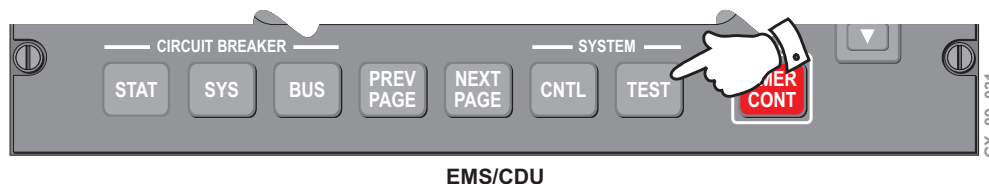
NOTE

If an APU fire is detected on the ground, and the fire handle signal (pulled) is not detected within 5 seconds, the FADEC will command an auto shutdown of the APU.

During normal APU operation, the APU FADEC signals the fuel management system to open the APU SOV. If an APU fire were detected and the APU fire DISCH handle pulled, the FIDEEX control unit will close the APU SOV.

PILOT-INITIATED TEST

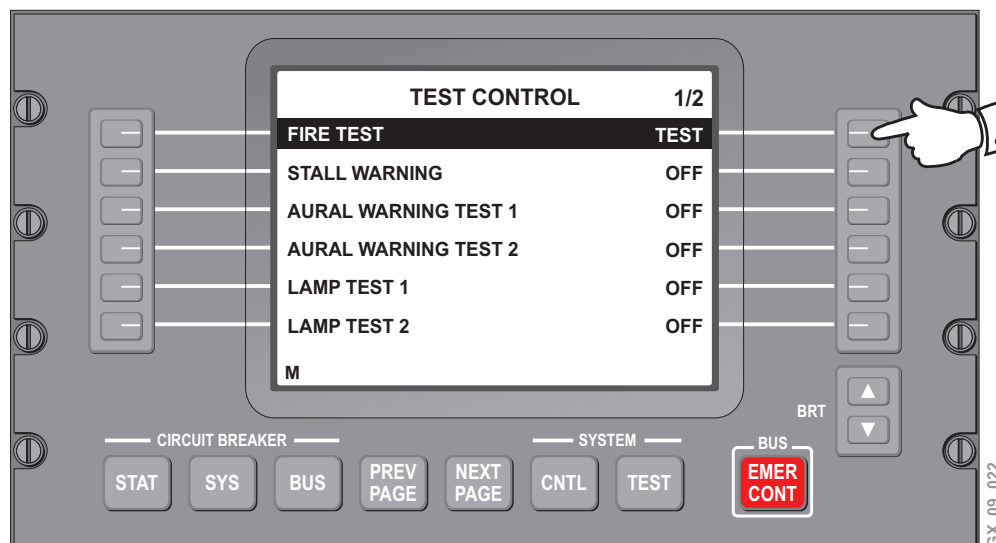
A Pilot-Initiated Test (PIT) of the fire extinguishing system shall be commanded as part of the airplane preflight, and can be carried out at any time during normal operation of the system.



To initiate the fire system test, press the TEST activation button on the EMS/CDU. The command test signal is sent to the FIDEEX control unit. The crew initiated fire test consists of:

- A periodic test of all fire/overheat loops with all flight deck reporting active
- A smoke detector test of all installed smoke detectors

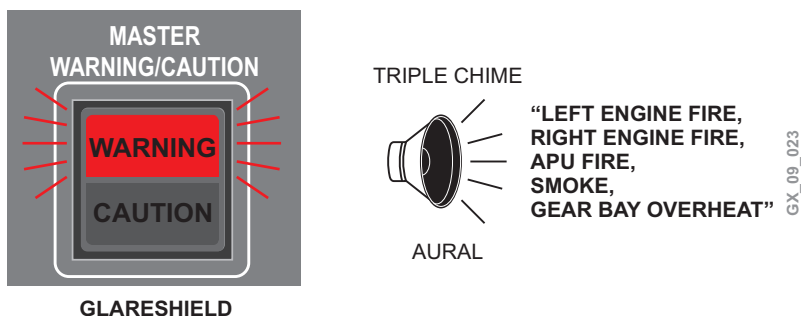
When the TEST button on the EMS/CDU is selected, the FIRE TEST is automatically highlighted on the SYSTEM TEST page.



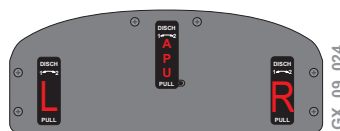
To initiate the test, the right side button must be selected. Test will automatically terminate after approximately 15 seconds, or can be aborted by a reselect of the FIRE TEST key.

A PIT is successful if each of the following events occur:

1. Both master WARNING lights flash and an aural warning sounds.

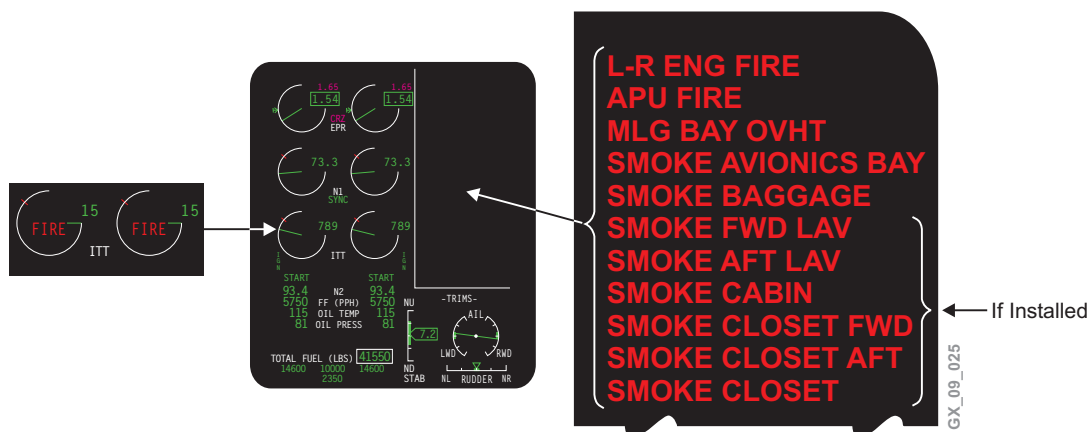


2. Left engine, right engine, and APU fire handles illuminate.



The following EICAS warning messages appear:

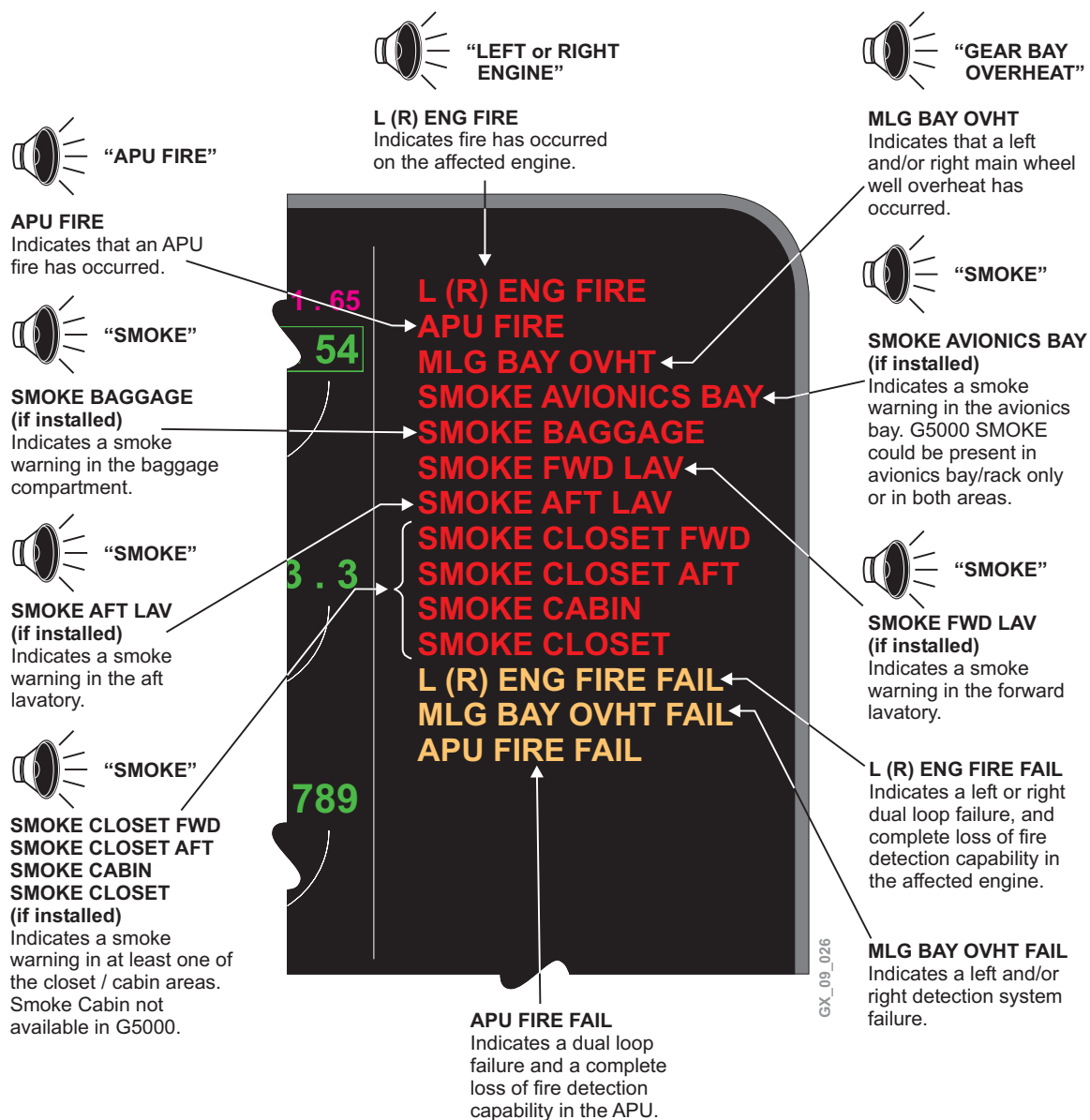
- L/R ENG FIRE
- APU FIRE
- MLG BAY OVHT
- SMOKE BAGGAGE, SMOKE FWD LAV, SMOKE AFT LAV, and SMOKE CABIN, SMOKE CLOSET FWD, SMOKE CLOSET AFT, (if smoke detectors are installed)



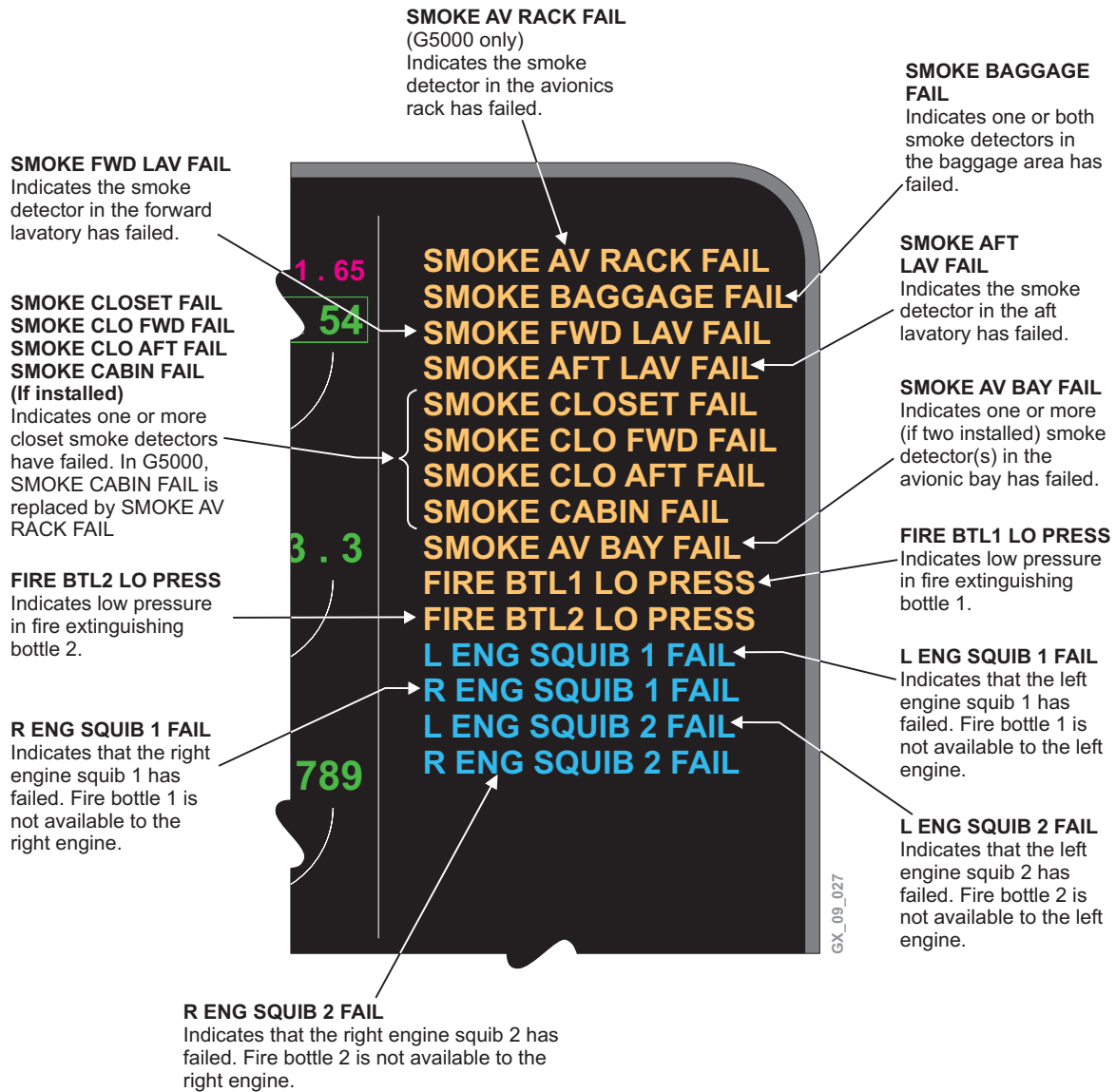
The fire test duration is approximately 10 seconds. When the fire test is completed, all warning messages will go out, fire aural warning will deactivate, master WARNING lights will go out, and the fire DISC handle lights will go out.

If loss of detection for either engine, APU, MWW or smoke sensing is detected by the FIDEEX, the appropriate zone fire fail caution message will be displayed on the EICAS until the fail condition no longer exists.

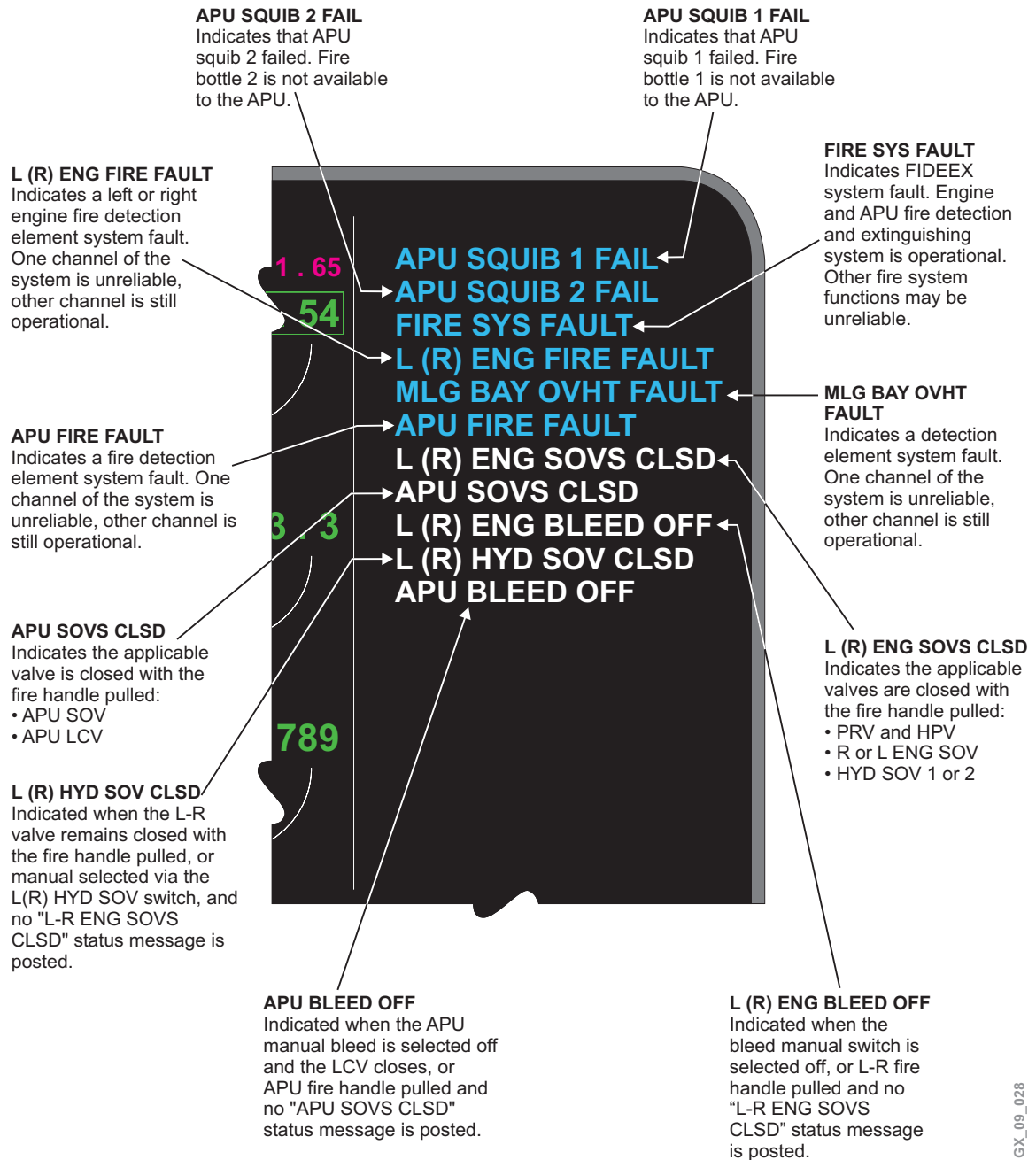
EICAS MESSAGES



EICAS MESSAGES (Cont)

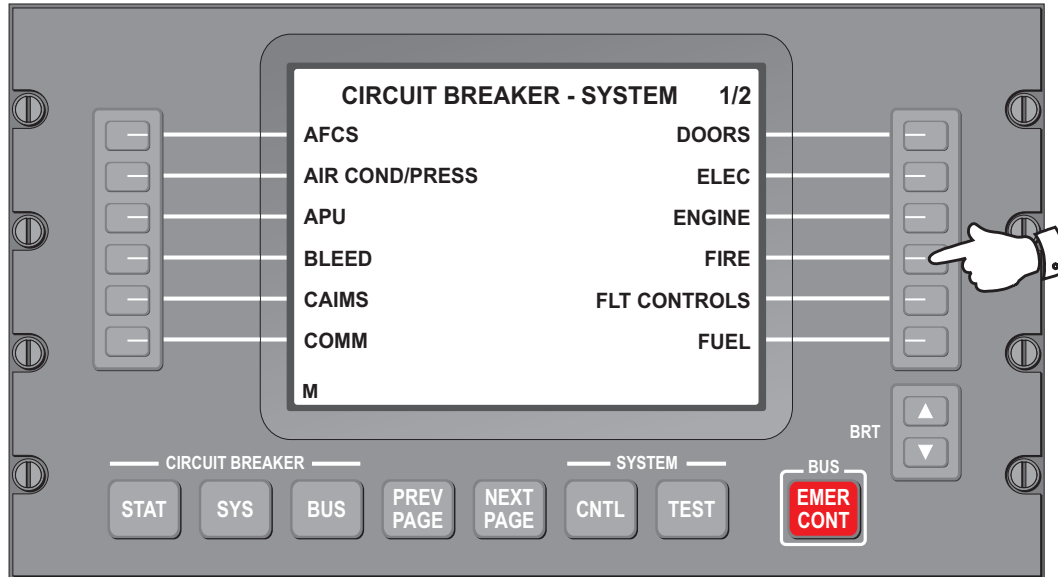


EICAS MESSAGES (Cont)



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EMS CIRCUIT PROTECTION



CB - FIRE SYSTEM				1/2
APU FIRE HANDLE	BATT			IN
FIRE DETECT CH A	BATT			IN
FIRE DETECT CH B	BATT			IN
FIREX CH A	DC EMER	DCPC		IN
FIREX CH B	DC EMER	DCPC		IN
L FIRE HANDLE	BATT			IN
CB - SYSTEM				2/2
R FIRE HANDLE	BATT			IN

M

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