

FIRE PROTECTION

1. GENERAL

- ✈ Fire protection consists of overheat and fire detection sensors and fire extinguishers.
- ✈ Detection provides visual and aural indications of overheat and fire conditions in the engines, and fire conditions in the APU, main wheel well areas and 737-800 cargo compartments.
- ✈ The extinguishers provide a means of extinguishing engines, APU and B737 NG cargo fires.
- ✈ Each lavatory is equipped with a lavatory fire extinguisher system and a smoke detection system.

2. ENGINE OVERHEAT AND FIRE DETECTION

- ✈ Each engine contains two overheat/fire detection loops (gas filled). Each of these loops consists of four detector elements. As the temperature of an element increases, the pressure within increases. At a predetermined temperature, the element signals an overheat condition. At a higher temperature, the element signals a fire condition.
- ✈ The two overheat/fire detection loops are labeled A and B. An OVHT DET Switch for each engine, labeled A, B and NORMAL, permits selection of loop A, B or both A and B as the active detecting loops.

Dual Loop System

- ✈ During normal operation, with the OVHT DET Switch in NORMAL, an alert is initiated only if one of the detector elements in loop A & one of the detector elements in loop B signals an overheat or fire condition.
- ✈ Engine overheat alert indications result from dual loop indication of :
 - overheat/overheat
 - overheat/fire
 - overheat/fault.
- ✈ An engine overheat condition is indicated by illumination of :
 - the MASTER CAUTION Lights
 - the OVHT/DET System Annunciator Light
 - the associated ENG OVERHEAT Light. The light remains illuminated until the temperature drops below the onset temperature.
- ✈ Engine fire alert indications result from dual loop indication of :
 - fire/fire
 - fire/fault.

- ✈ An engine fire condition is indicated by illumination of :
 - the FIRE WARN Lights
 - the associated Engine Fire Warning Switch
 - the ENG OVERHEAT Light
 - the OVHT/DET System Annunciator Lightand the sound of the alarm bell.

The bell can be silenced and the FIRE WARN Lights extinguished by pressing either FIRE WARN Light or the Fire Warning Bell Cutout Switch on the fire panel. The Engine Fire Warning Switch remains illuminated until the temperature drops below the onset temperature.
- ✈ If both loops sense a fault, or the selected loop senses a fault, this is indicated by illumination of the FAULT light. When the test switch is positioned to OVHT/FIRE during the system test, and there is a single loop fault, the Engine Fire Warning Switch of the affected engine does not illuminate.

Single Loop System

- ✈ The system also contains a fault monitoring circuit. If a malfunction in one loop occurs with the OVHT DET Switch in NORMAL, that loop is automatically deselected and the remaining loop functions as a single loop detector.
- ✈ If the system operates as a single loop system, either due to automatic deselection of a loop or the OVHT DET Switch in A or B, the single active loop initiates the overheat or fire indication.

3. WHEEL WELL FIRE DETECTION

- ✈ A fire detection loop is installed in the main wheel well. The continuity of the loop is tested by sending an artificial electronic signal to the fire warning system. AC power must be available to test the system.

4. APU FIRE DETECTION

- ✈ A single fire detection loop (gas filled) is installed on the APU. As the temperature increases, the pressure within the loop increases. At a predetermined temperature, a fire condition is signaled. The Master FIRE WARN Lights and APU Fire Warning Switch illuminate, the fire warning bell sounds and the APU automatically shuts down. In the main wheel well, the APU fire warning horn sounds (on ground only), and the APU Fire Warning Light flashes.
- ✈ Silencing the aural warnings and activating the fire extinguisher can be done from the cockpit or the wheel well.
- ✈ If the OVHT/FIRE test switch is positioned to OVHT/FIRE, all fire indications in the cockpit and wheel well are activated.
- ✈ The APU Fire Warning Switch and Warning Light remain illuminated until the temperature has decreased below the alarm temperature.
- ✈ Illumination of the amber APU DET INOP Light, located on the fire panel, and the MASTER CAUTION and OVHT/DET System Annunciator Lights indicates a failure in the APU fire detection loop.

5. B737 NG CARGO SMOKE DETECTION

- ✈ The forward and aft cargo compartment each have smoke detectors in a dual loop configuration, labeled loop A and loop B.
- ✈ For each cargo compartment (FWD and AFT), a detector select switch permits selection of loop A, B or both A and B as the active detecting loops.

Dual Loop System

- ✈ During normal operation, with the DET SELECT Switch in NORMAL, a cargo fire warning is initiated only if one detector in loop A and one detector in loop B senses smoke.
- ✈ The indications of a cargo compartment fire are :
 - The FIRE WARN lights illuminate.
 - The FWD or AFT cargo fire warning light illuminates.
 - The fire warning bell sounds.
- ✈ The bell can be silenced and the FIRE WARN Lights extinguished by pressing either FIRE WARN Light or the Fire Warning Bell Cutout Switch on the fire panel. The Cargo Fire Warning Light remains illuminated as long as smoke is sensed by at least one detector in each loop.
- ✈ If both loops sense a fault, or the selected loop senses a fault, this is indicated by illumination of the DETECTOR FAULT Light. When the TEST P/B is pushed and there is a single loop fault, the Cargo Fire Warning Light of the affected cargo compartment does not illuminate.

Single Loop System

- ✈ The system also contains a fault monitoring circuit. If a malfunction in one loop occurs with the DET SELECT Switch in NORMAL, that loop is automatically deselected and the remaining loop functions as a single loop detector.
- ✈ If the system operates as a single loop system, either due to automatic deselection of a loop or the DET SELECT Switch in A or B, the single active loop initiates the cargo fire warning.

6. ELECTRICAL POWER SOURCES

Engine Overheat & Fire Detection.....	Battery Bus
APU Fire Detection.....	Battery Bus
Wheel Well Fire Detection.....	No. 1 Transfer Bus (AC)
Lavatory Smoke Detection.....	DC Bus No. 1
Cargo Smoke Detection.....	DC Bus No. 1 and 2
Engine, APU and Cargo Fire Extinguishing.....	Hot Battery Bus

7. ENGINE FIRE EXTINGUISHER SYSTEM

- ✈ The engine fire extinguisher system consists of:
 - two freon bottles which pressure can be checked in the Left wheel well
 - Engine Fire Warning Switches
 - BOTTLE DISCHARGE Lights
 - Extinguisher Test Switch
- ✈ Each bottle is capable of discharging extinguishing agent into either engine.
- ✈ The Engine Fire Warning Switches are normally locked to prevent inadvertent shutdown of an engine. Illumination of an Engine Fire Warning Switch or ENG OVERHEAT Light causes a solenoid to activate, which unlocks the Engine Fire Warning Switch. The switch may also be unlocked manually.
- ✈ Pulling the Engine Fire Warning Switch :
 - Arms one discharge squib on each engine fire extinguisher bottle.
 - Closes the engine fuel shutoff valve and B737 NG the spar fuel shutoff valve.
 - Trips the affected generator
 - Closes the hydraulic fluid shutoff valve.
 - Deactivates the engine driven hydraulic pump LOW PRESSURE Light.
 - Closes the engine bleed air valve resulting in loss of wing anti-ice to the affected wing and of the associated pack.
 - Closes the hydraulic thrust reverser isolation valve.
 - Allows the Engine Fire Warning Switch to be rotated for discharge.
- ✈ Rotating the Engine Fire Warning Switch, electrically "fires" a squib, puncturing the seal of the extinguisher bottle to be used, discharging the extinguishing agent into the associated engine cowling. One or both bottles can be discharged into either engine. Rotating the switch the other way discharges the remaining bottle.
- ✈ The L or R BOTTLE DISCHARGE Light illuminates a few seconds after the Engine Fire Warning Switch is rotated, indicating the bottle has discharged.
- ✈ When the Extinguisher Test Switch is positioned to 1 or 2, the green Extinguisher Test Lights illuminate, verifying circuit continuity from the squib to the Engine Fire Warning Switch.
B737 Classics : The amber BOTTLE DISCHARGE Lights also illuminate.

8. APU FIRE EXTINGUISHER SYSTEM

- ✈ The APU fire extinguisher system consists of one freon bottle, an APU Fire Warning Switch, APU BOTTLE DISCHARGE Light and an Extinguisher Test Switch.
- ✈ The APU Fire Warning Switch is normally locked to prevent inadvertent shutdown of the APU. Illumination of the APU Fire Warning Switch causes a solenoid to be activated, which unlocks the switch.

- ✈ Pulling the APU Fire Warning Switch:
 - Provides backup for automatic shutdown feature.
 - Deactivates the fuel solenoid and closes the APU fuel shutoff valve.
 - Closes the AP U bleed air valve.
 - Closes the APU air inlet door.
 - Trips the APU generator.
 - Arms the APU fire extinguisher bottle squib.
 - Allows the APU Fire Warning Switch to be rotated for discharge.
- ✈ Rotating the APU Fire Warning Switch in either direction, electrically "fires" the squib, puncturing the seal of the extinguisher bottle and discharging the extinguishing agent into the APU. The APU BOTTLE DISCHARGE Light illuminates in a few seconds, indicating the bottle has discharged.
- ✈ When the Extinguisher Test Switch is positioned to 1 or 2, the green APU Extinguisher Test Light illuminates, verifying circuit continuity from the squib to the APU Fire Warning Switch.
B737 Classics : The APU BOTTLE DISCHARGE Light also illuminates.

9. B737 NG CARGO FIRE EXTINGUISHER SYSTEM

- ✈ A single fire extinguisher bottle is installed in the air conditioning mix bay on the forward wing spar.
- ✈ Detection of smoke will cause the FWD or AFT cargo fire warning light to illuminate. The extinguisher is armed by pushing the appropriate cargo fire ARMED switch. Subsequently, pushing the cargo fire DISCH switch results in the total discharge of the bottle contents into the selected compartment. This provides extinguishing and additional protection for at least 1 hour. The cargo fire DISCH light illuminates once the bottle is discharged. It may take up to 30 seconds for the light to illuminate.

10. LAVATORY FIRE EXTINGUISHER SYSTEM

- ✈ An automatic fire extinguisher system is located beneath the sink area in each lavatory. The extinguisher discharges through one, or both, of two heat-activated nozzles. One nozzle discharges toward the towel disposal container, the other in the area of the lavatory flush motor. The color of the nozzle tips will change to an aluminum color when the extinguisher has discharged.
- ✈ A temperature-indicator placard is located on the inside of the access door below each sink. White dots on the placard will turn black when exposed to high temperatures. If an indicator has turned black, or a nozzle tip has changed color, the extinguisher has discharged. The associated light illuminates on the Fwd Attendant lavatory Smoke Detection panel.

11. LAVATORY SMOKE DETECTION

- ✈ The smoke detection system monitors air for the presence of smoke and provides a visual and aural warning if smoke is detected. The smoke alarm sounds, the appropriate Alarm Indicator Light on the Forward Attendant's Panel illuminates red and the Lavatory SMOKE Light on the Forward Overhead Panel, the OVERHEAD System Annunciator Light, and MASTER CAUTION Lights illuminate.

- ✈ Pressing the Horn Off Switch silences the aural warning. The Red Alarm Indicator Light remains illuminated as long as smoke is present in the lavatory.
- ✈ Pressing the Reset Switch silences the aural warning and resets the system. If smoke is still present when the switch is released, the alarm will sound again.
- ✈ Pressing the Test Switch causes the lavatory aural warning to sound, the Alarm Indicator Lights to flash and the Lavatory SMOKE Light, OVERHEAD System Annunciator Light and MASTER CAUTION Lights to illuminate.

11. FIRE & OVERHEAT SYSTEM TEST WITH AN INOPERATIVE LOOP

To determine the specific inoperative loop :

- OVHT DET switchesA
- Test switchOVHT/FIRE

If the FAULT light remains extinguished and both ENG OVERHEAT lights and engine fire warning switches illuminate, loop A is good.

If the FAULT light illuminates and one of the ENG OVERHEAT lights and corresponding engine fire warning switch remain extinguished, there is a fault in loop A of the detection system of that engine.

- OVHT DET switchesB
- Test switch OVHT/FIRE

If the FAULT light remains extinguished and both ENG OVERHEAT lights and engine fire warning switches illuminate, loop B is good.

If the FAULT light illuminates and one of the ENG OVERHEAT lights and corresponding engine fire warning switch remain extinguished, there is a fault in loop B of the detection system of that engine.

OVHT DET switches As required

Select the good loop for each engine (NORMAL if both loops tested good).

- Test switchOVHT/FIRE

If the test is successful leave the fire panel in this configuration for flight.

12. CONTROLS & INDICATORS

ENGINE & APU Overheat / Fire Protection

- ✈ OVERHEAT DETECTOR SWITCH
 - NORMAL :
Both loop A and B must sense an overheat or fire condition before warning is activated.
 - A or B :
Only the selected loop initiates an overheat or fire warning.

✈ FIRE WARNING BELL CUTOUT SWITCH

PRESS:

- Silences the fire warning bell and extinguishes the Master FIRE WARN Lights.
- Silences the APU fire warning horn in the main wheel well.

✈ EXTINGUISHER TEST SWITCH

1 and 2 :

- Test the associated bottle discharge circuits for all three extinguisher bottles.
- Illuminates three green Extinguisher Test Lights & 737-300/-400 the three amber BOTTLE DISCHARGE Lights.

✈ APU FIRE WARNING SWITCH (red)

ILLUMINATED :

- The APU fire detector circuit senses a fire input.
- The Master FIRE WARN Lights illuminate and the fire warning bell sounds.
- Pressing either Master FIRE WARN Light silences the fire warning bell and extinguishes the Master FIRE WARN Lights.

The switch is locked until the APU fire detector circuit senses a fire input; the switch is then unlocked.

PULL UP :

- Arms the associated extinguisher circuit.
- Closes the fuel shutoff valve, bleed air valve and APU inlet door.
- Trips the generator control relay and generator breaker.

ROTATE (left or right):

Discharges the APU fire bottle.

✈ ENGINE FIRE WARNING SWITCH (red)

ILLUMINATED :

- The respective fire detector circuits sense a fire input,
- The Master FIRE WARN Lights illuminate and the fire warning bell sounds.
- Pressing either Master FIRE WARN Light silences the fire warning bell and extinguishes the Master FIRE WARN Lights.

The switch is locked until the engine overheat/fire warning circuit detects an overheat/fire condition; the switch is then unlocked.

PULL UP :

- Arms one discharge squib on each engine fire extinguisher.
- Closes the fuel (spar) valve, bleed air, thrust reverser and hydraulic shutoff valves.
- Trips the generator.
- Deactivates the engine driven hydraulic pump LOW PRESSURE Light.

ROTATE (left or right) :

Discharges the respective fire bottle.

✈ FAULT/INOP AND OVHT/FIRE TEST SWITCH

FAULT/INOP :

- Tests the fault detection circuits for both engines and the APU.
- MASTER CAUTION, OVHT/DET System Annunciator, FAULT and APU DET INOP Lights illuminate.

OVERHEAT/FIRE :

- Tests the overheat and fire detection loops on both engines and the APU, and the fire detector in the wheel well.
- The fire warning bell sounds; the APU horn sounds in the wheel well; and the APU Fire Warning Light in the wheel well illuminates flashing.
- The Master FIRE WARN, MASTER CAUTION, OVHT/DET System Annunciator, Engine No.1, APU and Engine No.2 Fire Warning Switches, ENG 1 and ENG 2 OVERHEAT and WHEEL WELL Fire Warning Lights illuminate.

✈ EXTINGUISHER TEST LIGHTS (green)

ILLUMINATED :

- The Extinguisher Test Switch is positioned to 1 or 2 and the discharge circuits are normal.

B737 NG Cargo Fire Panel

✈ DETECTOR SELECT SWITCHES

NORM :

- Detection loop A and B are active.

A :

- Only detection loop A is active.

B :

- Only detection loop B is active.

✈ CARGO FIRE DISCHARGE SWITCH

PUSH :

- If system is armed, discharges the extinguisher bottle.

✈ CARGO FIRE ARMED SWITCHES

PUSH FWD ARMED :

- Extinguisher armed for the forward cargo compartment.

PUSH AFT ARMED :

- Extinguisher armed for the aft cargo compartment.

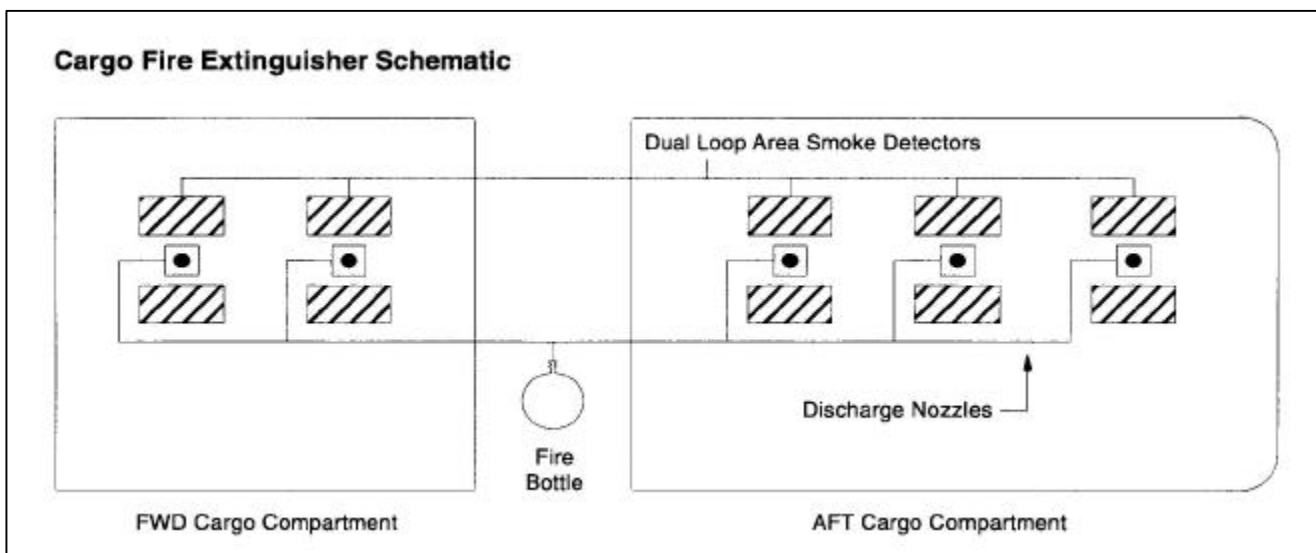
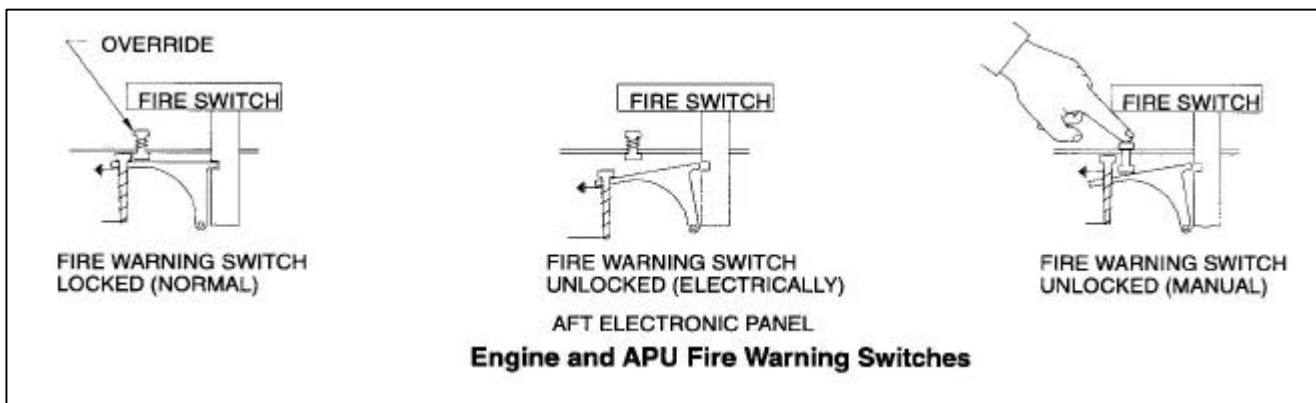
✈ CARGO FIRE TEST SWITCH

PUSH :

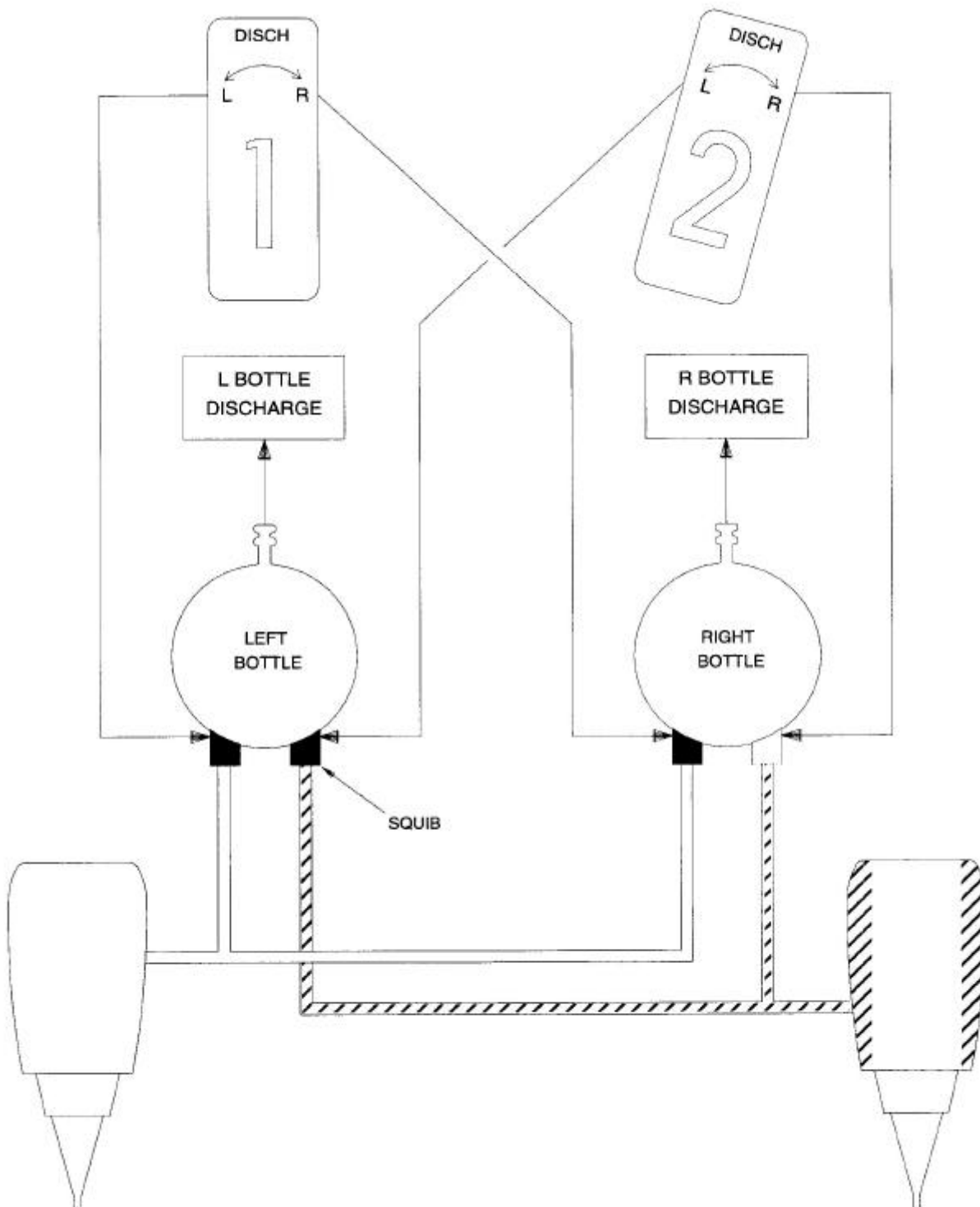
- Tests circuits for both forward and aft cargo detector loops and extinguishing system.
- The fire warning bell sounds.
- The Master FIRE WARN Lights, FWD and AFT Cargo Fire Warning Lights, Cargo Fire Bottle DISCH Light and the green Extinguisher Test Lights illuminates.

5. FAULTS & INDICATIONS

LIGHT	INDICATION	VALID FOR					
		300	400	500	600	700	800 900
APU BOTTLE DISCHARGE	ENGINE OVERHEAT LIGHT (amber) - Indicates an overheat on the associated engine. <i>The MASTER CAUTION and OVHT/DET System Annunciator Lights illuminate.</i>	X	X	X	X	X	X
APU DET INOP	APU DETECTOR INOP LIGHT (amber) - Indicates a malfunction in the APU fire detection circuit. <i>The MASTER CAUTION and OVHT/DET System Annunciator Lights illuminate.</i>	X	X	X	X	X	X
DETECTOR FAULT	DETECTOR FAULT LIGHT (amber) - One or more detectors in the selected loop(s) has failed. <i>Individual detector fault can only be detected by a Manually initiated test. The MASTER CAUTION Light does not illuminate</i>				X	X	X
DISCH	CARGO FIRE DISCHARGE LIGHT (amber) - Indicates the extinguisher bottle has discharged				X	X	X
ENG 1 OVERHEAT	ENGINE OVERHEAT (L/R) (amber) - Indicates an overheat on the associated engine <i>The MASTER CAUTION and OVHT/DET System Annunciator Lights illuminate.</i>	X	X	X	X	X	X
FAULT	FAULT LIGHT (amber) - The Fault Test Switch is pressed & the detector circuits are normal - Both loops in any circuit have failed. <i>The MASTER CAUTION and OVHT/DET System Annunciator Lights do not illuminate</i>	X	X	X	X	X	X
L BOTTLE DISCHARGE	BOTTLE DISCHARGE (L/R) (amber) - Indicates the associates bottle has discharged - B737 Classics : The extinguisher Test Switch is positioned to 1 or 2 & the circuits are normal	X	X	X	X	X	X
WHEEL WELL	WHEEL WELL FIRE WARNING LIGHT (red) - Indicates a fire in the main gear wheel well - <i>The fire warning bell sounds & the Master FIRE WARN Lights illuminate.</i>	X	X	X	X	X	X
ARMED FWD	CARGO FIRE WARNING LIGHT (FWD / AFT) (red) - Indicates one detector in each loop detects smoke - With failure of one loop, at least one detector on. The remaining loop detects smoke - <i>The fire warning bell sounds & the Master FIRE WARN Lights illuminate.</i>				X	X	X



ENGINE FIRE EXTINGUISHER - SCHEMATIC



Condition: ENG FIRE WARN Switch 2 pulled and rotated right

