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ELECTRICAL SYSTEM

Section *27*

FIRE PROTECTION

FILE IN VAULT

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BRANCH

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ANNEXE
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CF-105 SERVICE DATA

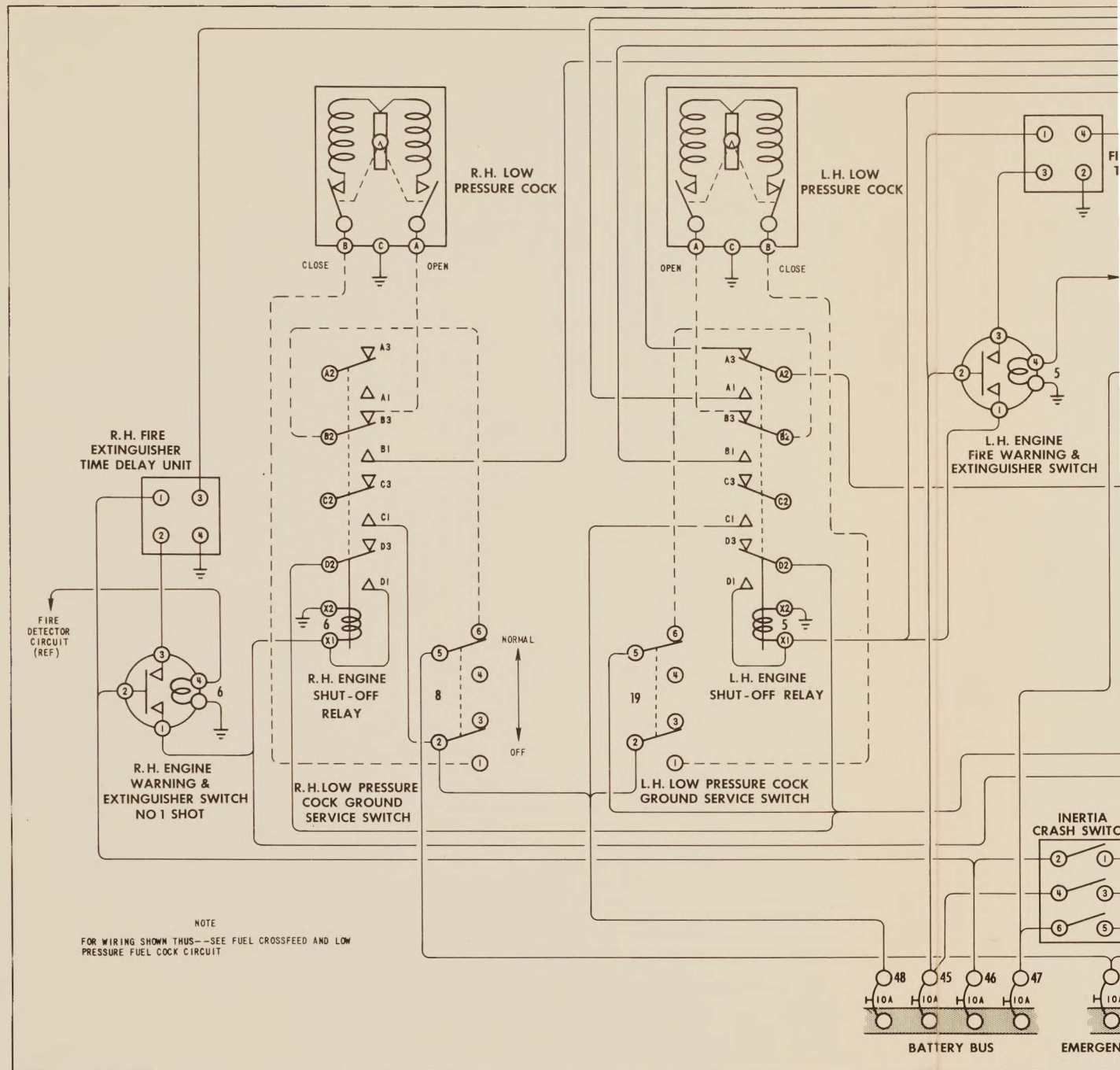
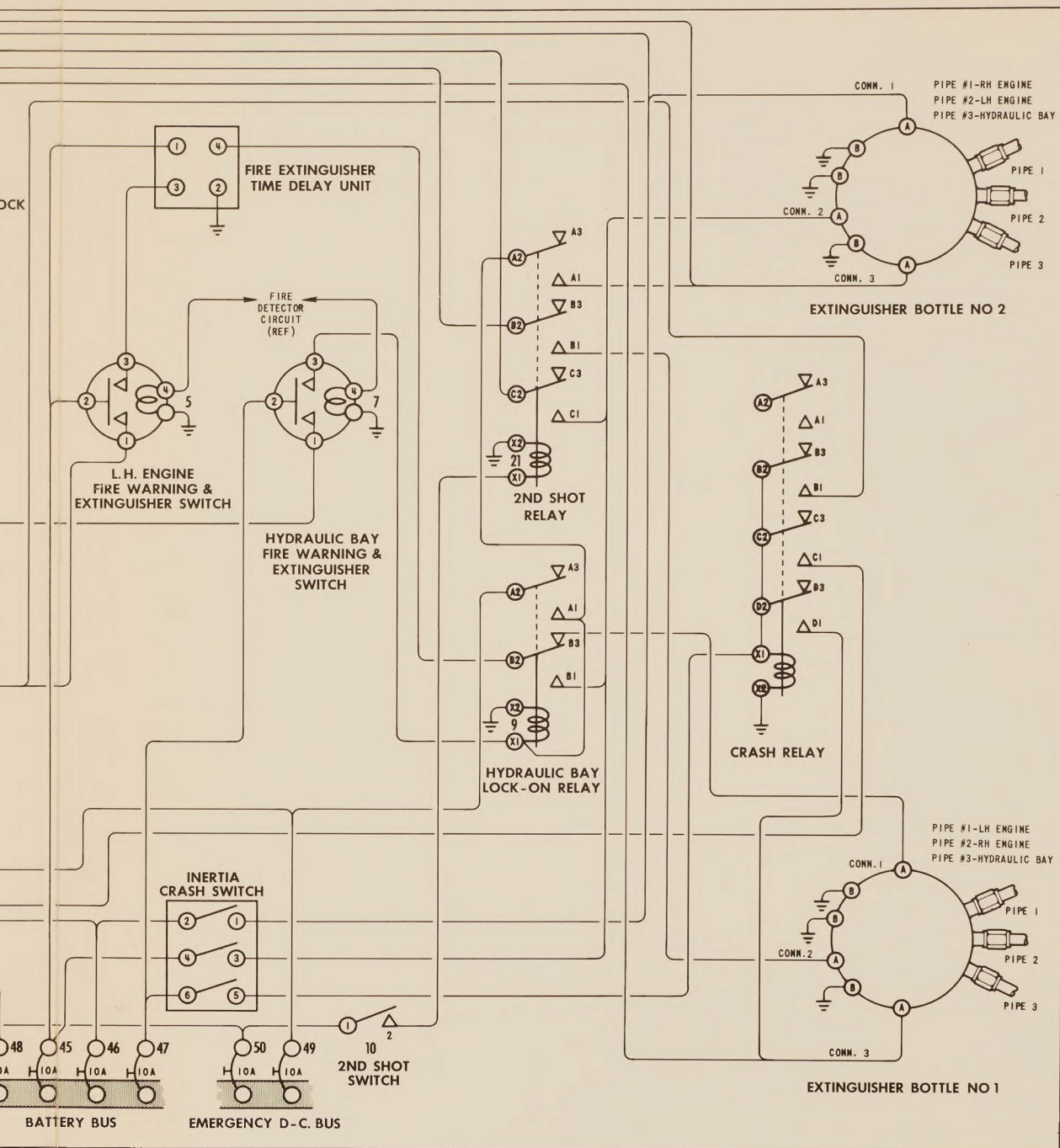


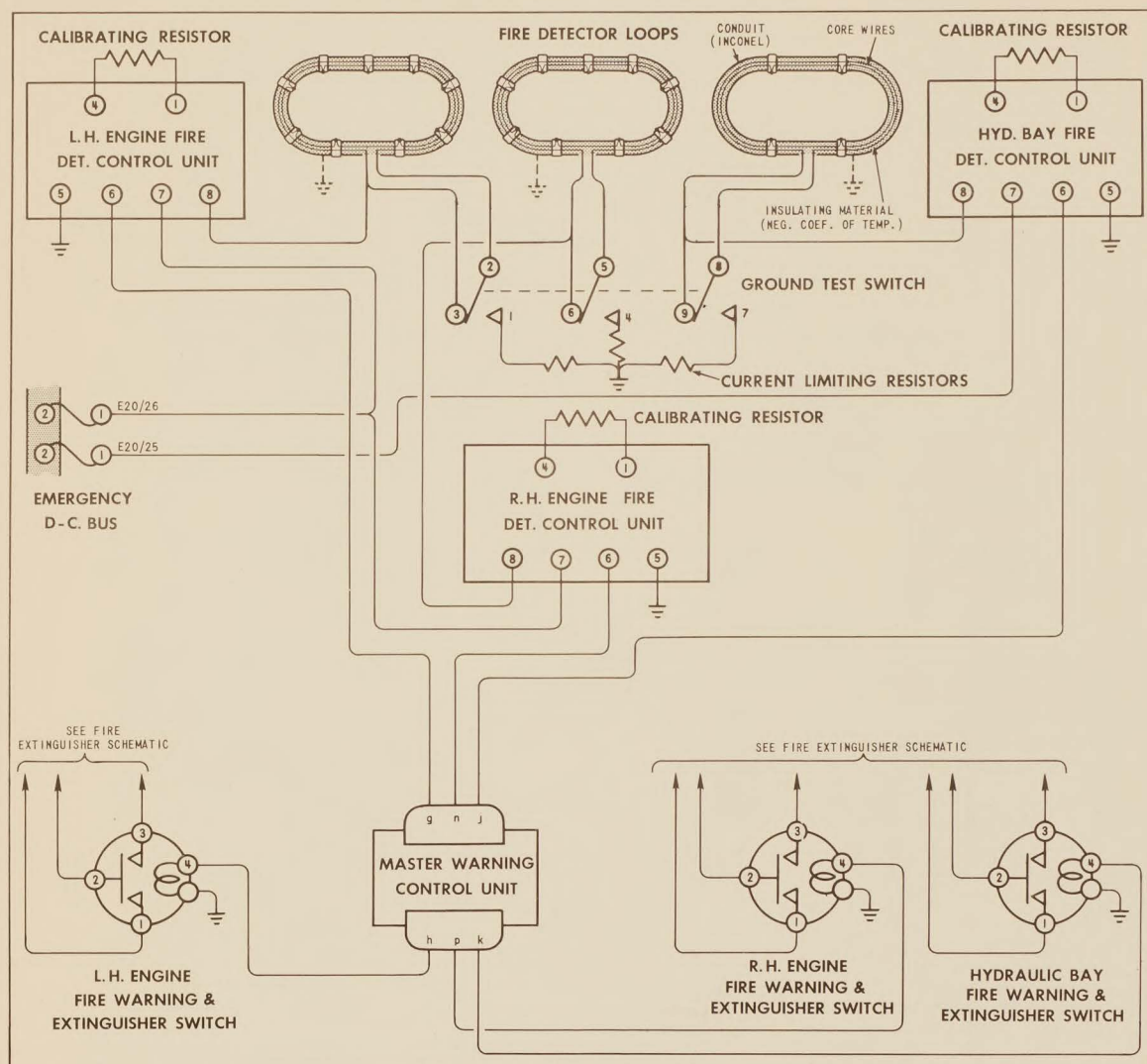
FIG. 2 FIRE EXTINGUISHER ACTUATION CIRCUITS



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FIG. 1 FIRE DETECTION CIRCUITS

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SYSTEM DATA SHEET

SYSTEM	SUB-SYSTEM	AIRCRAFT EFF'TY	REF. NO.
ELECTRICAL	FIRE PROTECTION	25201	11-12
<p style="text-align: center;">DESCRIPTION</p> <p>General</p> <ol style="list-style-type: none"> The fire protection system is comprised of fire detection and fire extinguisher actuation circuits. The fire detection circuits detect and indicate overheating conditions in the LH engine compartment, the RH engine compartment and the hydraulic bay which is the section of the fuselage between the engine compartments. In addition to the hydraulic equipment, fuel system and electrical system components are located in this section. In the extinguisher actuation circuits, two fire extinguishers are fitted which can be discharged individually into any two of the three fire detection areas. Alternatively, both extinguishers can be discharged into any one of the three areas, or both extinguishers can be discharged simultaneously by an inertia switch. In this case, the content of one extinguisher is discharged into both the LH and RH engine compartments, and the content of the remaining extinguisher is discharged into the hydraulic bay. <p>Fire Detection Circuits</p> <ol style="list-style-type: none"> The three fire detection circuits are electrically identical. Each circuit is comprised of a number of lengths of a specially constructed heat detector conduit, a detector unit and a fire warning indicator light which, when depressed, actuates the corresponding actuation circuit of the extinguishers. The detector conduit consists of two uninsulated wires embedded in an insulating material which has a negative co-efficient of temperature, i.e. a rise in temperature results in a drop in the insulation resistance value. The wires and the insulating material are contained in a conductive sheathing of Inconel which is grounded at intervals to the aircraft structure. One of the core wires is connected to the sheathing, and the other is connected to one end of the coil of a relay located in the detector unit. The other end of the relay coil receives a d-c supply from the emergency d-c bus. If an overheat condition occurs, the leakage current across the core wires at a pre-determined temperature will be sufficient to energize the relay. The relay, when energized, completes a supply circuit from the emergency d-c bus to the fire warning indicator located in the cockpit. The lengths of detector conduit can be constructed to have different operating limits by increasing or decreasing the leakage current flow for any given temperature. This permits a complete circuit to indicate overheating conditions at different temperatures along its length. The detector circuits of the engine compartments are assembled in this manner. The conduit lengths fitted forward of the engine firewall are constructed to permit sufficient leakage current to flow and energize the detector relay if the ambient 			
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temperature exceeds 260°C (500°F), or if at least six inches of the conduit is subjected to 315°C (600°F). The conduit lengths fitted aft of the firewall are constructed to permit sufficient leakage current to flow and energize the relay if the ambient temperature exceeds 307°C (585°F), or if at least six inches of the conduit is subjected to 380°C (715°F). The detector conduits in the hydraulic bay are constructed to permit sufficient leakage current to flow and energize the relay if the ambient temperature exceeds 232°C (450°F), or if at least six inches of the conduit is subjected to 288°C (550°F).

9. A resistor fitted externally on each detector control unit facilitates calibration of the relevant system to the required temperature operating limits. These calibrating resistors are, in effect, in parallel with the detector conduit core wires and provide a small, standing current through the relay coil of the detector unit. By altering the ohmic value of the calibrating resistors, the leakage current flow between the core wires required to energize the corresponding detector unit relay will be increased or decreased. Increasing the ohmic value of the calibrating resistors, with respect to the core wire resistance, will increase the operating temperature limit. Conversely, decreasing the ohmic value will decrease the operating temperature limit.

10. As the detector circuits are formed in loops, they will continue to operate normally despite a break occurring in the live core wire. To facilitate checking this core wire for continuity, a switch is provided to interrupt the loop and ground the core wire. This simulates a leakage current to ground and continuity of the wire will be indicated if the relevant fire warning lights illuminate. The switch is a three-pole type and grounds all three detection circuits simultaneously. To restrict the current flow when the detector circuits are grounded, a current limiting resistor for each circuit is inserted between the test contacts of the switch and ground.

Extinguisher Actuation Circuits

11. Two fire extinguisher actuation circuits, namely a first shot circuit and a second shot circuit, are provided for each one of the three fire detection areas. The first shot circuits are actuated by depressing the relevant fire warning indicator. The second shot circuits which are inoperative until the corresponding first shot circuits have been selected, are actuated by operating a second shot switch.

12. Due to the fact that the first shot circuit of the LH engine compartment and the hydraulic bay discharge the same extinguisher, the operation of these circuits is interrelated. When the fire warning indicator of the LH engine is depressed, a supply circuit is completed to an engine shut-off relay and a time delay unit. The shut-off relay, when energized, does the following:

- (a) Completes a self-holding circuit which holds the relay in the energized position until the supply circuit is interrupted, i.e. selecting the Master Power switch to OFF.
- (b) Completes a preparatory supply circuit to the relay-open contact of a second shot relay.
- (c) Transfers the low pressure fuel cock supply circuit from the open side to the close side.
- (d) Transfers the hydraulic bay first shot circuit to the remaining extinguisher.

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SYSTEM		SUB-SYSTEM		AIRCRAFT EFF'TY		REF. NO.	
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<p>13. The time delay unit completes the supply circuit to the relevant extinguisher after a delay of two and one-half seconds. This delay ensures that the low pressure fuel cock will be fully closed before the extinguisher discharges. The supply to the extinguisher is maintained by the delay unit for a period of four seconds irrespective of the time during which the fire warning light is kept depressed. The circuit from the time delay unit to the extinguisher is completed via the relay open contacts of a lock-on relay in the hydraulic bay extinguisher actuation circuit. If the hydraulic bay circuit has been actuated prior to the LH engine circuit, the lock-on relay will be energized which transfers the supply through the relay closed contacts to the remaining extinguisher.</p> <p>14. The hydraulic bay extinguisher circuit, when actuated by depressing the hydraulic bay fire warning indicator, completes a supply circuit to a lock-on relay and, via the relay-open contacts of the LH engine shut-off relay, to the relevant extinguisher. If the LH engine extinguisher circuit has been actuated prior to the hydraulic bay, this shut-off relay will be energized which transfers the supply through the relay closed contacts to the remaining extinguisher. The hydraulic bay lock-on relay, when energized, completes a self-holding circuit and a second shot preparatory circuit and transfers the LH engine first shot circuit to the remaining extinguisher.</p> <p>15. An engine shut-off relay and a time delay unit are incorporated in the RH engine extinguisher circuit. When the RH engine fire warning light is depressed, a supply circuit is completed to the shut-off relay and the time delay unit. The shut-off relay, when energized, completes a self-holding circuit and a second shot preparatory circuit and transfers the RH low pressure fuel cock supply to the close side.</p> <p>16. The time delay unit, after a delay of two and one-half seconds, completes a supply directly to the extinguisher for a period of four seconds irrespective of the time during which the fire warning light is kept depressed.</p> <p>17. The second shot circuits are identical in operation. Operating the 2nd SHOT switch will complete a supply circuit to the second shot relay. This relay, when energized, completes all three second shot circuits, but only one will be live due to the operation of the first shot circuit.</p> <p>18. The inertia switch is paralleled into the second shot circuit of the LH engine and the first shot circuit of the RH engine and the hydraulic bay. Therefore, when the inertia switch is tripped by a deceleration force in excess of 6G, it completes a supply circuit from the battery bus which discharges both extinguishers. The second shot circuit of the LH engine and the first shot circuit of the RH engine discharge the same extinguisher into the LH and RH engine compartments. The first shot circuit of the hydraulic bay discharges the remaining extinguisher into the hydraulic bay. In addition to actuating the extinguisher circuits, the inertia switch energizes a relay which completes a supply circuit to the LH and RH engine shut-off relays. This action closes the low pressure fuel cocks.</p>							
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COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Fire Warning Light and Extinguisher Push Switches - 3		REF. NO. 11-12-1	
AVRO PART NO. CS-S-155		MANUFACTURER		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To serve as a combined fire warning indicator and fire extinguisher actuation switch. One assembly for each of the three detection areas, viz. LH engine compartment, RH engine compartment and the Hydraulic Bay.							
LOCATION Front cockpit LH console, panel E14.							
ACCESS Unobstructed when panel E14 is removed from the LH console - four quick-fasteners.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure assembly to panel E14 using lock-washer and nut provided. Solder circuit wires to lugs. Refit panel in console - four quick-fasteners.						MEN X MINUTES	

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INSPECTION		MEN X MINUTES	
<p>Check that the indicator is securely mounted on the panel. Check that the circuit wires are securely and properly soldered. Depress the indicator light and check that the spring return action is positive.</p>			
FUNCTIONAL CHECKS		MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT			
SPECIAL TOOLS TO REMOVE OR SERVICE			
REMARKS			
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COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Fire Detection Control Units - 3		REF. NO. 11-12-2	
AVRO PART NO. 7-1154-18		MANUFACTURER Walter Kidde		MAN'FR'S PART NO. P/N 871510		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		350 hours	
FUNCTION To complete a supply circuit to the fire warning light when overheat conditions are detected. Three units are fitted which operate in conjunction with their corresponding LH engine compartment, RH engine compartment and Hydraulic Bay fire detection circuits.							
LOCATION Main Accessory Panel E5, located on bulkhead at station 485 in the Missile Bay.							
ACCESS Lower the missile pack and release E5 panel from its forward mounts by removing two pip pins.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure unit to panel with four screws. Connect and secure circuit wiring to terminals. Raise and position panel, secure with the two pip pins.						MEN X MINUTES	

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<p>INSPECTION</p> <p>Check that the unit is securely mounted. Check that the circuit wiring is securely and properly connected.</p>							MEN X MINUTES		
<p>FUNCTIONAL CHECKS</p>							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
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COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Fire Protection Loop (Portion forward of LH and RH engine firewall)		REF. NO. 11-12-3	
AVRO PART NO. 7-1195-29 (3 off) 7-1195-27 (1 off)		MANUFACTURER Walter Kidde		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN-				ESTIMATED- 1500 hours			
FUNCTION To detect ambient temperatures in excess of 260°C (500°F) or localized heating in excess of 315°C (600°F).							
LOCATION Engine compartment forward of firewall (LH and RH) Detector length 32 feet, assembled from four lengths.							
ACCESS When engine is removed, unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect and secure the electrical connectors at both ends of the length of conduit to the connectors of the adjacent lengths. Fit and secure the length of conduit to the aircraft structure with the fixed securing clips.						MEN X MINUTES	

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INSPECTION Check that the electrical connectors are securely and properly fitted throughout the length of the loop. Check that the loop is fitted securely, throughout its length, to the aircraft structure.							MEN X MINUTES	
FUNCTIONAL CHECKS							MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT								
SPECIAL TOOLS TO REMOVE OR SERVICE								
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SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Fire Protection Loop (Portion aft of LH and RH engine firewall)		REF. NO. 11-12-4	
AVRO PART NO. 7-1158-77 (1 off) 7-1158-71 (1 off)		MANUFACTURER Walter Kidde		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION To detect ambient temperatures in excess of 307°C (585°F) or localized heating in excess of 380°C (715°F).							
LOCATION Engine compartment aft of firewall (LH and RH) Detector length 28 feet, assembled from 2 lengths.							
ACCESS When engine is removed, unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect and secure the electrical connectors at both ends of the length of conduit to the connectors of the adjacent lengths. Fit and secure the length of conduit to the aircraft structure with the fixed securing clips.						MEN X MINUTES	

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INSPECTION		MEN X MINUTES	
<p>Check that the electrical connectors are securely and properly fitted throughout the length of the loop. Check that the loop is fitted securely, throughout its length, to the aircraft structure.</p>			
FUNCTIONAL CHECKS		MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT			
SPECIAL TOOLS TO REMOVE OR SERVICE			
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SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Fire Protection Loop (Hydraulic Bay)		REF. NO. 11-12-5	
AVRO PART NO. 7-1150-5027 (8 off) 7-1150-5029 (1 off)		MANUFACTURER Walter Kidde		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To detect ambient temperatures in excess of 232°C (450°F) or localized heating in excess of 288°C (550°F).							
LOCATION Hydraulic Bay. Detector length 85 feet, assembled from nine lengths.							
ACCESS Hydraulic Bay access doors.						MEN X MINUTES	
REPLACEMENT PROCEDURE Connect and secure the electrical connectors at both ends of the length of conduit to the connector of the adjacent lengths. Fit and secure the length of conduit to the aircraft structure with the fixed securing clips.						MEN X MINUTES	

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INSPECTION		MEN X MINUTES							
		Check that the electrical connectors are securely and properly fitted throughout the length of the conduit. Check that the loop is fitted securely, throughout its length, to the aircraft structure.							
FUNCTIONAL CHECKS					MEN X MINUTES				
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
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COMPONENT DATA SHEET

SYSTEM ELECTRICAL	SUB-SYSTEM FIRE PROTECTION	COMPONENT Fire Detector Test Switch	REF. NO. 11-12-6
AVRO PART NO. 9CS-G-160	MANUFACTURER	MAN'FR'S PART NO.	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE : KNOWN- ESTIMATED- 1500 hours			
FUNCTION To facilitate testing the core wire of the fire detector conduits for continuity.			
LOCATION Refuel and Ground Test panel E21, located forward of LH speed brake in electrical duct bay.			
ACCESS			MEN X MINUTES
Open hinged access panel, forward of LH speed brake. Remove panel E21 by releasing 11 camloc fasteners.			
REPLACEMENT PROCEDURE			MEN X MINUTES
Fit and secure switch to panel using lock-washer and nut supplied. Connect and secure circuit wires to switch terminals. Refit panel - 11 camloc fasteners.			

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INSPECTION		MEN X MINUTES	
<p>Check that the switch is securely mounted. Operate the switch and check that the lever action is smooth and that the make and break is not sluggish.</p>			
FUNCTIONAL CHECKS		MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT			
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SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Fire Extinguisher Time Delay Relays - 2		REF. NO. 11-12-7	
AVRO PART NO. CS-R-126		MANUFACTURER Rogers Majestic		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE: KNOWN- ESTIMATED- 1500 hours							
FUNCTION		To delay the extinguisher actuation pulse for two and one-half seconds which permits the low pressure fuel cock to close before the extinguisher is discharged. Also, completes the actuation pulse for four seconds irrespective of the length of time the fire warning light is depressed. One unit is fitted in the extinguisher actuation circuit for the LH engine and one in the extinguisher actuation circuit for the RH engine.					
LOCATION		Main Accessory Panel E5, located on bulkhead at station 485 in the Missile Bay.					
ACCESS Lower the missile pack and release E5 panel from its forward mounts by removing two pip pins.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure unit to panel with four screws. Connect and secure circuit wiring to terminals. Raise and position the panel, secure with the two pip pins.						MEN X MINUTES	

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INSPECTION Check that the unit is securely mounted. Check that the circuit wiring is securely and properly connected.		MEN X MINUTES							
FUNCTIONAL CHECKS		MEN X MINUTES							
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
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COMPONENT DATA SHEET

SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Fire Protection Relays - Engine Shut-off, LH and RH		REF. NO. 11-12-8	
AVRO PART NO. MS25024-1		MANUFACTURER		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED- 1500 hours			
FUNCTION		When energized, by depressing the corresponding LH engine or RH engine fire warning light, the relays complete a supply circuit to close the relevant LH or RH low pressure fuel cock and complete circuits in preparation for a second shot.					
LOCATION		Panel E3, located on the RH wall of the nose wheel well.					
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure relay in panel E3 using four mounting screws. Connect and secure circuit wire to relay terminals.						MEN X MINUTES	

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INSPECTION Check that the relay is securely mounted. Check that the circuit wiring is securely and properly connected to the relay terminals.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
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SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Hydraulic Bay Lock-On Relay		REF. NO. 11-12-9	
AVRO PART NO. MS25024-1		MANUFACTURER		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE :		KNOWN-		ESTIMATED-		500 hours	
FUNCTION		When energized, by depressing the hydraulic bay fire warning light, the relay transfers the LH engine extinguisher actuation to the remaining extinguisher and completes a circuit in preparation for a second shot.					
LOCATION		Panel E6, located on the roof of nose wheel well.					
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure relay to panel using four mounting screws. Connect and secure circuit wires to relay terminals.						MEN X MINUTES	

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INSPECTION		MEN X MINUTES	
<p>Check that the relay is securely mounted. Check that the circuit wiring is securely and properly connected to the relay terminals.</p>			
FUNCTIONAL CHECKS		MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT			
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COMPONENT DATA SHEET

SYSTEM ELECTRICAL	SUB-SYSTEM FIRE PROTECTION	COMPONENT Second Shot Switch	REF. NO. 11-12-10
AVRO PART NO.	MANUFACTURER Cutler - Hammer	MAN'FR'S PART NO. 8811K15	AIRCRAFT EFFECTIVITY 25201
OVERHAUL LIFE : KNOWN- ESTIMATED- 1500 hours			
FUNCTION To complete the supply for the extinguisher actuation second shot circuits.			
LOCATION Front cockpit LH console, panel E14.			
ACCESS Unobstructed when panel E14 is removed from the console - seven quick-fasteners.			MEN X MINUTES
REPLACEMENT PROCEDURE Fit and secure switch and guard to panel using lock-washer and nut supplied. Connect and secure circuit wires to switch. Fit and secure panel E14 in the console with seven quick-fasteners.			MEN X MINUTES

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INSPECTION Check that the switch and its guard are securely and properly fitted. Operate the switch and check that the lever action is smooth and that the make and break is not sluggish or rough.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
SPECIAL TOOLS TO REMOVE OR SERVICE									
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SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Second Shot Relay		REF. NO. 11-12-11	
AVRO PART NO. MS25024-1		MANUFACTURER		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE :		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION When energized, by operating the second shot switch, completes the preparatory second shot actuation circuit set-up by the selected first shot actuation circuit.							
LOCATION Panel E6, located on the roof of nose wheel well.							
ACCESS Unobstructed.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure relay on panel E6 using four mounting screws. Connect and secure circuit wires to relay terminals.						MEN X MINUTES	

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INSPECTION		MEN X MINUTES	
<p>Check that the relay is securely mounted. Check that the circuit wiring is securely and properly fitted to the relay terminals.</p>			
FUNCTIONAL CHECKS		MEN X MINUTES	
GROUND HANDLING AND GROUND TEST EQUIPMENT			
SPECIAL TOOLS TO REMOVE OR SERVICE			
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SYSTEM ELECTRICAL		SUB-SYSTEM FIRE PROTECTION		COMPONENT Inertia Switch		REF. NO. 11-12-12	
AVRO PART NO. CS-S-150		MANUFACTURER Minneapolis-Honeywell		MAN'FR'S PART NO.		AIRCRAFT EFFECTIVITY 25201	
OVERHAUL LIFE:		KNOWN-		ESTIMATED-		1500 hours	
FUNCTION To trip under a deceleration force in excess of 6G and actuate, simultaneously, the three extinguisher actuation circuits.							
LOCATION Aft face, LH side, of bulkhead at station 485.							
ACCESS Remove electrical power bay access door - 44 camlocs.						MEN X MINUTES	
REPLACEMENT PROCEDURE Fit and secure unit to bulkhead using two mounting bolts. Connect and secure circuit wires to terminals. Fit terminal cover - two screws.						MEN X MINUTES	

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INSPECTION Check that the unit is securely mounted. Check that the circuit wires are securely and properly connected. Trip and then reset the switch.							MEN X MINUTES		
FUNCTIONAL CHECKS							MEN X MINUTES		
GROUND HANDLING AND GROUND TEST EQUIPMENT									
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