

SECTION 5

AUXILIARY POWER UNIT (APU)

TABLE OF CONTENTS

<u>Subject</u>	<u>Page</u>
GENERAL	1
APU CONTROL	1
START SYSTEM	3
SHUTDOWN	5
BLEED AIR SYSTEM	5
OIL SYSTEM	7

LIST OF ILLUSTRATIONS

<u>Figure Number</u>	<u>Title</u>	<u>Page</u>
1	APU Control Panels	2
2	APU Controls and Indicators	4
3	Auxiliary Battery Panel	6
4	APU Fault Indications	8

SECTION 5

AUXILIARY POWER UNIT (APU)

1. GENERAL

The auxiliary power unit (APU) is a gas turbine engine which provides bleed air for air conditioning and engine starting, and drive facilities to supply electrical power. Except for the aircraft battery and fuel supply, the APU is independent of other aircraft systems. It is mounted on a support skid assembly, within an aluminum enclosure, in the rear fuselage behind the rear pressure bulkhead. Access to the APU is by way of the rear equipment bay door.

Clean compressed air can be supplied for cabin and flight compartment air conditioning on the ground or in the air, and for ground and in-flight engine starting (for limitations on in-flight use of the APU, refer to the LIMITATIONS section of the Airplane Flight Manual). Shaft power is used to drive a generator to supply ground electrical power and in-flight standby power.

An APU control panel, located on the flight compartment overhead panel, contains a combined power and fuel supply switch/light, FUEL ON/OFF, a single START/STOP switch/light, a BLEED AIR supply switch/light, oil fault lights and rpm and exhaust gas temperature (EGT) indicators. An APU fault annunciator panel, located on the left side of the rear fuselage, contains fault indication flags, an IND RESET pushbutton and a remote APU STOP pushbutton.

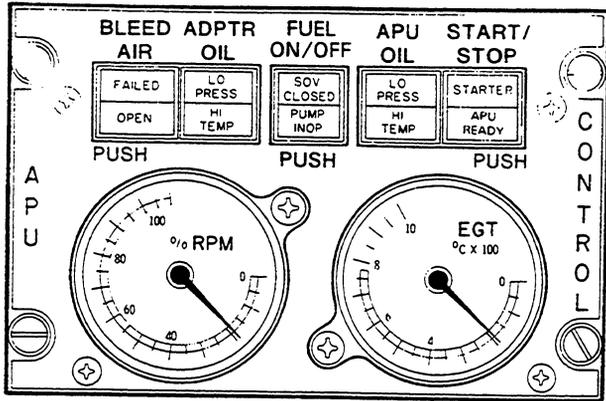
The APU has an independent fuel feed system which draws fuel from the right main fuel tank. In addition, a tapping from the left engine fuel system ensures that the supply of fuel to the APU is maintained during negative G conditions (refer to Section 12, FUEL for details of APU fuel feed system).

Fire protection is from a single Firex bottle mounted on the fuselage structure outside the APU enclosure (refer to Section 9, FIRE PROTECTION).

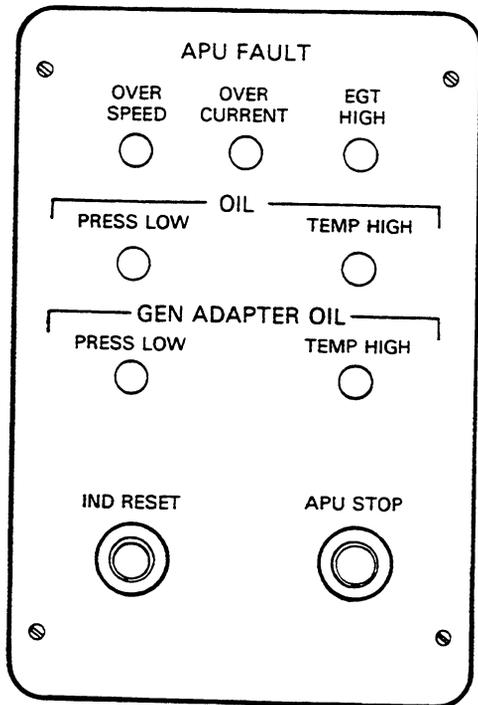
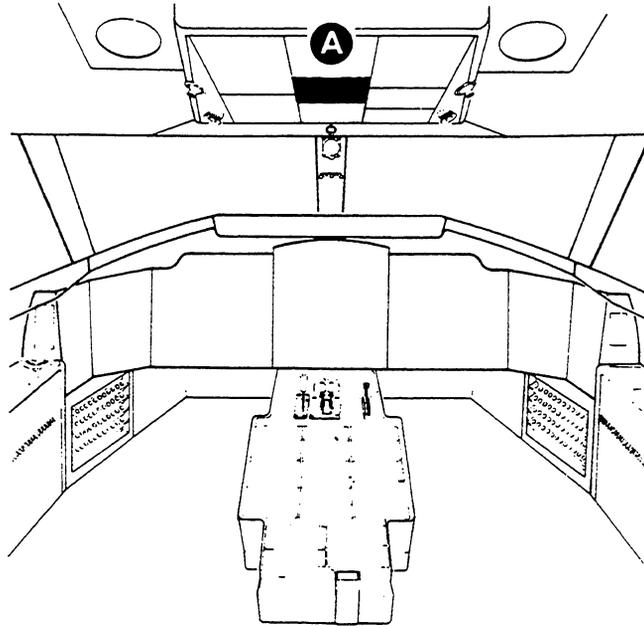
2. APU CONTROL (Figures 1 and 2)

An electronic control unit (ECU) mounted on the APU support monitors engine speed, exhaust gas temperature, oil pressure and temperature and overcurrent conditions during APU operation. Signals from sensors on the APU are relayed through the ECU to the appropriate indicators on the APU CONTROL and APU FAULT panels. The ECU also shuts down the APU under certain fault conditions (refer to paragraph 4.).

Flight crew control and monitoring is provided by the APU control panel on the flight compartment overhead panel. External shutdown control and fault finding indicators are provided on the APU FAULT panel on the left side of the rear fuselage (refer to Section 1, AIRCRAFT GENERAL, Figure 7).

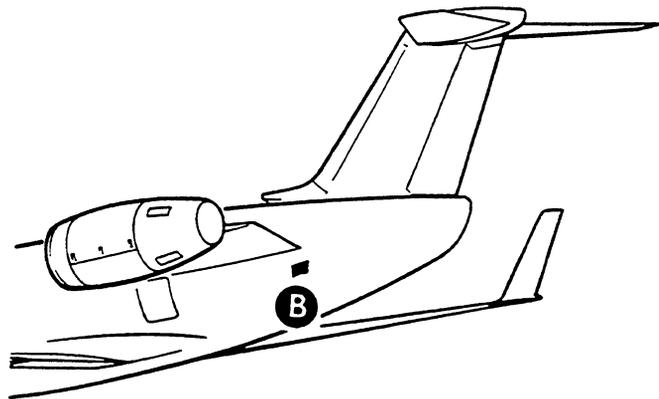


A



EXTERNAL PANEL
(LEFT SIDE OF REAR FUSELAGE)

B



APU Control Panels
Figure 1

An exhaust gas temperature indicator and an engine speed indicator are located on the APU control panel. The exhaust gas temperature indicator is calibrated in degrees Celsius and the engine speed indicator gives a readout in percentage of maximum rpm. Fault lights and switch/lights are grouped above the APU gauges.

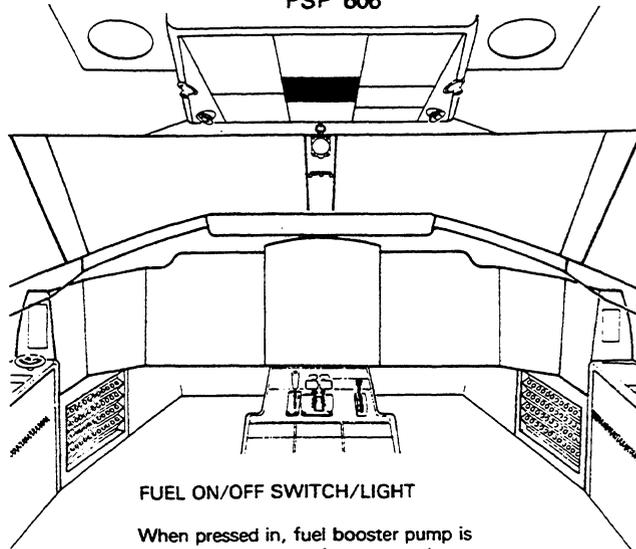
The APU FAULT panel contains a STOP pushbutton and an IND RESET pushbutton. The fault warning indicators are flags in the form of three white triangles in a circle, on a black background. Flags indicate overspeed, overcurrent, high exhaust gas temperature, low oil pressure, high oil temperature, generator adapter low oil pressure and generator adapter high oil temperature. If the fault which caused the indicator to show has been rectified, pushing the RESET button causes the white triangles to rotate out of view.

3. START SYSTEM (Figures 2 and 3)

Electrical power for APU starting is provided by the aircraft 28-volt battery or by an external dc ground power supply. The selection of power source is made at the ELEC PWR location on the overhead panel. Aircraft that incorporate Canadair Service Bulletin 600-0435 have an auxiliary 28-volt dc battery in the nose avionics compartment. Use of the auxiliary battery for cold weather starts prevents automatic start shutdown which would otherwise occur if the APU electronic control unit detected a large voltage drop on the battery bus. Auxiliary battery power is selected on the AUXILIARY BATTERY panel and is made available to the APU electronic control unit when the FUEL ON/OFF switch/light is pressed in during the start sequence (refer to Figure 3).

Before starting the APU, the external APU fault panel should be clear of all warnings and the BLEED AIR switch/light on the APU control panel pressed out.

The start cycle is initiated by pressing in the FUEL ON/OFF switch/light, followed by the START/STOP switch/light on the APU control panel. The FUEL ON/OFF switch/light energizes the APU fuel pump and completes an electrical power supply circuit to the START/STOP switch/light. On aircraft with an auxiliary battery installed, the engine-mounted fuel shutoff valve opens when the FUEL ON/OFF switch/light is pressed in. When the START/STOP switch/light is pressed in, both of the shutoff valves in the APU fuel feed system open (refer to Section 12), the APU starter motor is energized and the STARTER legend on the switch/light comes on. At 10% rpm, the engine-mounted fuel solenoid shutoff valve opens on aircraft without the auxiliary battery installation and the ignition system is energized. At 60% rpm, the STARTER light goes out, indicating that the starter has disengaged. At 95% rpm, ignition is de-energized and a green APU READY light on the START/STOP switch/light comes on. The engine then accelerates to 100% rpm. Normally, the engine accelerates to running rpm in not more than 60 seconds.



FUEL ON/OFF SWITCH/LIGHT

When pressed in, fuel booster pump is energized and power is connected to START/STOP switch/light.

Amber PUMP INOP light comes on when switch/light is pressed and fuel booster pump fails.

When pressed out, fuel booster pump is de-energized and power is removed from START/STOP switch/light.

If the APU FIRE PUSH switch/light is pressed after a fire warning, the fuel shutoff valve closes and diverts fuel back to the tank. The white SOV CLOSED light comes on.

BLEED AIR SWITCH/LIGHT

When pressed in, green OPEN light comes on, load control valve opens and APU air is available for aircraft systems.

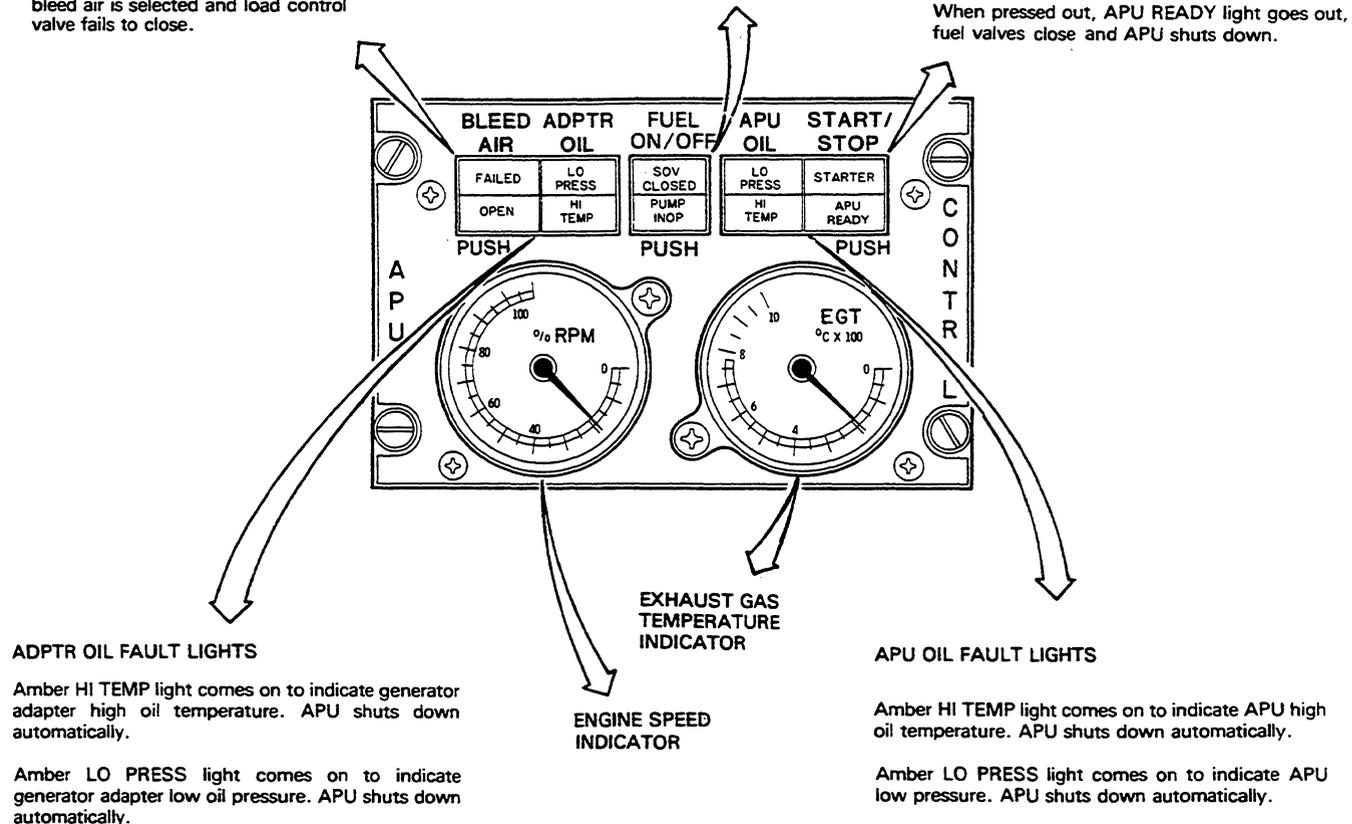
When pressed out, load control valve closes and OPEN light goes out.

Amber FAILED light comes on if load control valve fails to respond to switch light commands or if engine bleed air is selected and load control valve fails to close.

START/STOP SWITCH/LIGHT

When pressed in, both APU fuel feed system shutoff valves open, starter motor is energized and amber STARTER light comes on. At 60% rpm, amber STARTER light goes out. At 95% rpm and 4 ± 1 seconds later, green APU READY light comes on.

When pressed out, APU READY light goes out, fuel valves close and APU shuts down.



ADPTR OIL FAULT LIGHTS

Amber HI TEMP light comes on to indicate generator adapter high oil temperature. APU shuts down automatically.

Amber LO PRESS light comes on to indicate generator adapter low oil pressure. APU shuts down automatically.

ENGINE SPEED INDICATOR

EXHAUST GAS TEMPERATURE INDICATOR

APU OIL FAULT LIGHTS

Amber HI TEMP light comes on to indicate APU high oil temperature. APU shuts down automatically.

Amber LO PRESS light comes on to indicate APU low pressure. APU shuts down automatically.

APU Controls and Indicators
Figure 2

4. SHUTDOWN (Figures 2 and 4)

Normal shutdown of the APU is accomplished by removing all loads from the unit, then pressing out the START/STOP switch/light on the APU CONTROL panel. When the APU has completely stopped, pressing out the FUEL ON/OFF switch/light de-energizes the APU fuel pump and disconnects the electrical power supply circuit to the START/STOP switch/light.

Remote APU shutdown is accomplished by pressing the APU STOP pushbutton on the external APU FAULT panel. After a remote shutdown, the START/STOP switch/light must be pressed out to reset the APU starting system.

The APU electronic control unit shuts down the APU automatically for any of the following reasons:

- APU overspeed
- Overcurrent
- High exhaust gas temperature
- Low oil pressure
- High oil temperature
- Generator adapter low oil pressure
- Generator adapter high oil temperature

White triangle flag indicators on the APU fault panel show the fault responsible for the automatic shutdown.

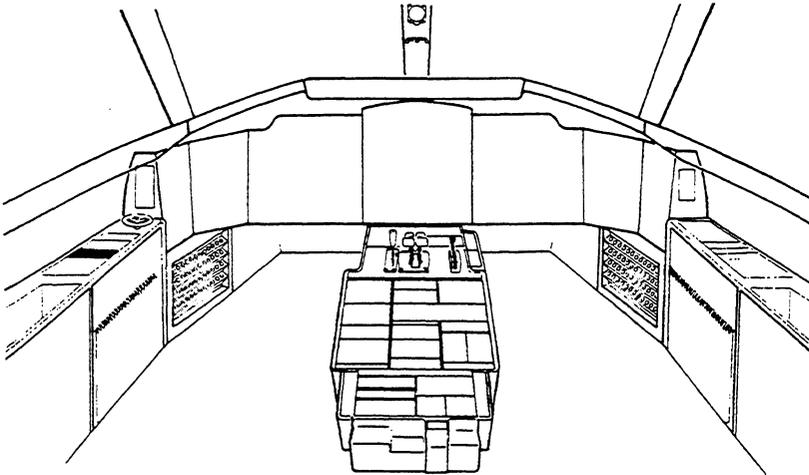
5. BLEED AIR SYSTEM

The APU supplies compressed air to power the aircraft pneumatic systems and shaft horse power to drive the generator, which supplies the aircraft electrical systems.

The BLEED AIR switch/light controls two valves: a surge valve, which prevents compressor surge by bleeding off air if there is excessive pressure; and a load control valve, which opens to deliver the bleed air to the pneumatic system.

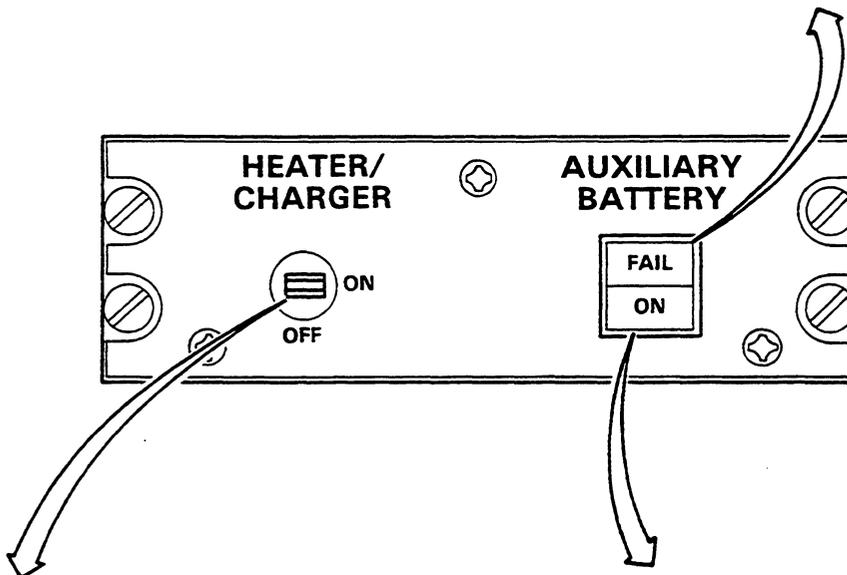
After the EGT and rpm have stabilized and the green APU READY light comes on, bleed air may be selected by pressing in the BLEED AIR switch/light. The surge valve then closes and the load control valve opens.

When bleed air is no longer required, the system is shut down by pressing out the BLEED AIR switch/light.



FAIL LIGHT

Amber light comes on if auxiliary battery is not providing 28 volt dc output or if internal monitoring detects a failure.



HEATER/CHARGER SWITCH

Two position toggle switch

ON - If power is available on battery bus, auxiliary battery is brought up to minimum operating temperature and rated charge by built-in charger/monitor. Auxiliary battery output is paralleled to that of main battery and is available to APU electronic control unit when FUEL ON/OFF switch/light on APU CONTROL panel is pressed in.

OFF - Built-in charger/monitor is off and auxiliary battery is isolated from APU start system.

ON LIGHT

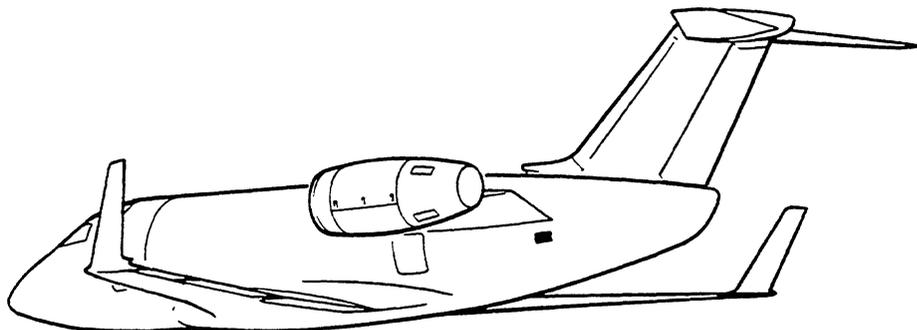
If HEATER/CHARGER switch is ON, white ON light comes on when FUEL ON/OFF switch/light is pressed in to indicate that auxiliary battery is providing full 28 volt dc output to APU start system.

EFFECTIVITY: A/C incorporating Canadair SB 600-0435

6. OIL SYSTEM

The APU engine oil system provides pressure oil and splash lubrication for all drive gears and shaft bearings in the APU engine. If low oil pressure occurs during APU operation, a low oil pressure switch, located in the engine gearcase, transmits a signal and illuminates the LO PRESS light on the APU control panel. Similarly, a high temperature switch, located near the oil pressure switch, transmits a signal to illuminate the HI TEMP light.

The APU generator adapter has a self-contained oil system for lubrication and cooling. Adapter oil LO PRESS and HI TEMP warning lights are also provided.



APU OVERCURRENT FAULT FLAG

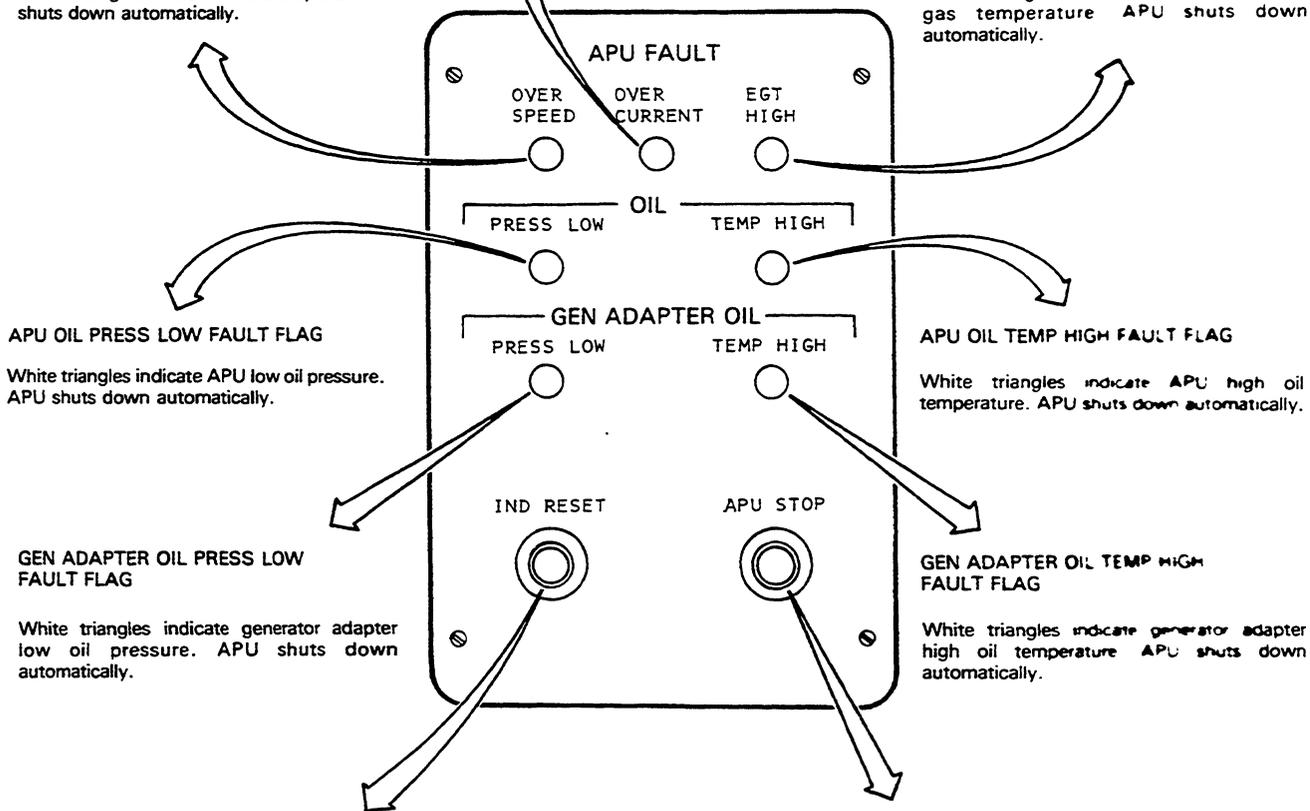
White triangles indicate overcurrent fault. APU shuts down automatically.

APU OVERSPEED FAULT FLAG

White triangles indicate APU overspeed. APU shuts down automatically.

APU EGT HIGH FAULT FLAG

White triangles indicate APU high exhaust gas temperature. APU shuts down automatically.



APU OIL PRESS LOW FAULT FLAG

White triangles indicate APU low oil pressure. APU shuts down automatically.

APU OIL TEMP HIGH FAULT FLAG

White triangles indicate APU high oil temperature. APU shuts down automatically.

GEN ADAPTER OIL PRESS LOW FAULT FLAG

White triangles indicate generator adapter low oil pressure. APU shuts down automatically.

GEN ADAPTER OIL TEMP HIGH FAULT FLAG

White triangles indicate generator adapter high oil temperature. APU shuts down automatically.

IND RESET PUSHBUTTON

When pressed, fault flags are reset by rotating them out of view. If condition has not been corrected, flags stay in view.

APU STOP PUSHBUTTON

When pressed, stops APU at any time.

APU Fault Indications
Figure 4