

# Gulfstream G150

## AIRPLANE FLIGHT MANUAL

Section VII  
Systems

### AUXILIARY POWER UNIT (APU)

#### DESCRIPTION

The Honeywell RE100 APU provides electrical power to the battery bus and bleed air to the ECS ducting when necessary.

The APU is mounted in the aft fuselage. Access is provided through a access door in the left aft fuselage. The turbine air inlet is located at the fuselage top right side. The exhaust is located at the rear right fuselage and the cooling air inlet is located on the aircraft right side.

The APU is mounted on a steel mount, which rests on a Titanium tray attached to the aircraft structure by shock mounts. The APU is enclosed within a fire protecting shield made of Titanium sheet metal, which will also serve as a shield for APU debris containment during rotor disc failure.

The APU is computer controlled. Turbine speed is maintained at 100% RPM and EGT is limited to 690°C. Automatic shutdown is provided for the following conditions: overspeed, high EGT, low oil pressure, high oil temperature, APU compartment fire, APU control circuitry failure, electrical power loss, speed sensor loss, no acceleration and APU engine malfunction. The APU fuel shutoff valve closes automatically when APU MASTER switch is OFF.

# Gulfstream G150

## AIRPLANE FLIGHT MANUAL

### Section VII Systems

#### **Electronic Control Unit (ECU)**

The electronic control unit (ECU) provides full authority automatic control of the APU in all modes of operation. The engine control system operates through the ECU. The ECU is an electrically-driven, digital, computer-based controller that is programmed to control all APU electrical functions.

The ECU performs four primary functions:

- Sends signals for engine start and timed acceleration to 100% speed.
- Controls the fuel control unit (FCU) torque motor to maintain the governed speed for all required electrical and pneumatic loads.
- Continually monitors APU engine parameters to ensure that the APU operates within limits.
- Safely shuts down the APU when a normal or protective shutdown signal shutdown is received.

The ECU receives electrical inputs from the APU, pilot inputs and data from the APU sensors, condition of main engines operation and APU electrical and pneumatic load demands. The ECU analyzes the signals and sends a control signal output or ignores the input. The ECU automatically adjusts the control parameters for APU ground flight operations.

Electrical interface with the ECU is through a single ARINC 600 electrical connector mounted on the rear section of the ECU. Analog inputs / outputs, digital inputs / outputs and electrical power are transmitted.

Built-in test (BIT) capability is incorporated in the ECU. The BIT monitors APU / ECU performance and shuts down the APU if an unsafe condition occurs.

# Gulfstream G150

## AIRPLANE FLIGHT MANUAL

Section VII  
Systems

### **APU Operation**

When APU MASTER switch is placed in ON position, the ECU performs a circuitry check prior to start. The ECU BIT checks APU components to ensure safe engine start. Faults inhibit start command. If no faults are found, the ECU transmits a signal to the cockpit so that the pilot can start the APU. Upon receiving a start signal, the ECU provides power to the starter / generator.

When the engine speed reaches approximately 5%, the ECU connects the fuel shutoff valve and ignition unit. The fuel shutoff valve opens to allow fuel into the fuel nozzles. The ignition unit commands the igniter plug to fire and ignite the air-fuel mixture in the combustion chamber.

Combustion increases the energy level of the fuel-air stream. The combustion gases flow through the turbine nozzle to the turbine rotor blades. The heat and pressure energy caused by the gases turns the turbine rotor faster and causes increased mechanical power to drive the compressor gear shaft faster. The compressor gear shaft drives the gearbox gear train and accessories. When the APU reaches 60% speed, the starter / generator cuts off.

As engine speed increases and reaches 95% for 4 seconds, the ECU cuts power to the ignition unit and stops igniter spark. Continuous engine speed increases to governed speed of 100%. The fuel controller controls fuel flow and automatically controls turbine discharge temperature and RPM within set limits.

During engine operation, the ECU monitors engine speed, oil temperature, exhaust gas temperature (EGT) and oil pressure. At engine speeds above 95%, the ECU records engine operating time and number of engine starts.

An integrated lubrication pump, oil pressure regulating valve and oil filter element provide engine lubrication.

# Gulfstream G150

## AIRPLANE FLIGHT MANUAL

### Section VII Systems

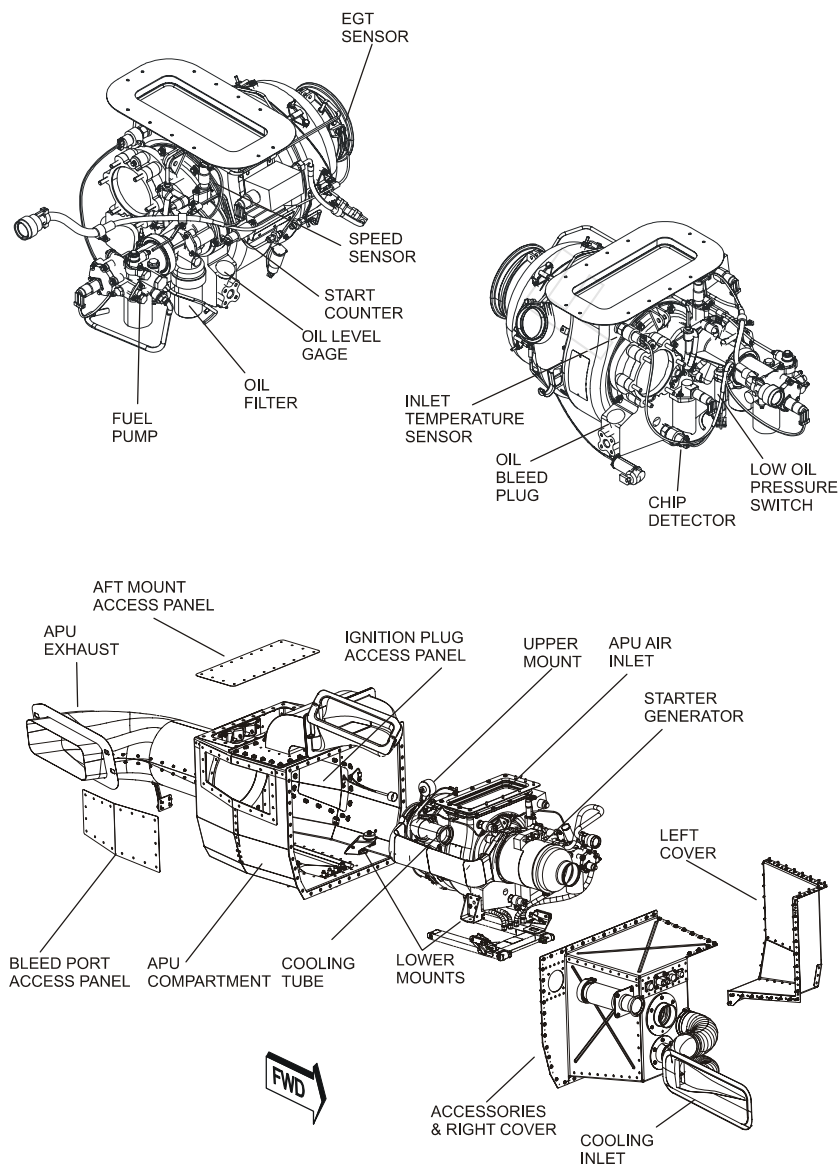


Figure 7-49-1. APU Components

# Gulfstream G150

## AIRPLANE FLIGHT MANUAL

Section VII  
Systems

### APU CONTROLS AND INDICATORS

STARTER switch - Has three positions:

START - Momentary position to engage starter.

OFF - Switch rest position.

STOP - Stops starter operation and APU operation.

MASTER switch - Has two positions:

ON - Engages the APU electrical power and opens APU fuel shutoff valve. IN TRANS then OPEN lights come on

OFF - Stops APU operation.

GEN switch - Has three positions:

ON - Connects APU generator.

OFF - APU generator is off.

RESET - Resets APU generator.

APU FIRE pushbutton - When pressed, the pushbutton arms the APU fire extinguisher for operation, shuts down the APU and closes the APU fuel shutoff valve.

ARM-EMPTY pushbutton-indicator - The ARM Indicator (green light) is The upper half of the ARM/EMPTY (discharge) pushbutton. ARM light comes on to indicate that the APU discharge cartridge in the right container is armed. The ARM light goes out and the EMPTY light comes on when the ARM pushbutton is pressed and the right container is discharged.

PRESS TO TEST pushbutton - Pressed to test APU fire protection system.

ECS selector - The normal aircraft selector (on the pedestal) has APU position which is used to select APU bleed air for air conditioning and pressurization.

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# Gulfstream G150

## AIRPLANE FLIGHT MANUAL

### Section VII Systems

APU AIRFLOW pushbutton - Pressed to increase APU conditioned air flow. HI FLOW light comes on.

#### **Warning Messages**

APU FIRE - APU fire. APU enters automatic shut-down sequence

APU OVERSPEED - APU RPM too high. APU did not enter automatic shut-down sequence

APU OVERTEMP - APU excessive temperature. APU did not enter automatic shut-down sequence

L ENG/APU BLEED LEAK - Leak or rupture in bleed air ducting from left engine or APU. APU automatically shuts down

#### **Caution Messages**

APU FAULT - APU malfunction. APU automatically shuts down

APU EXHAUST OVERTEMP - Excessive temperature around APU exhaust duct. APU automatically shuts down

APU GEN OVERHEAT - APU generator temperature high

APU GEN OVERLOAD - APU generator load above limits

APU OIL PRESS LOW - APU oil pressure too low APU automatically shuts down

#### **Advisory Messages**

APU READY - APU is on and running and ready to load up

#### **Status Messages**

APU GEN OFF - APU is operating and APU generator is disconnected

APU OIL LEVEL LOW - APU oil quantity low

APU OVERSPEED - APU overspeed. APU automatically shuts down

APU OVERTEMP - APU overtemperature. APU automatically shuts down

# Gulfstream G150

## AIRPLANE FLIGHT MANUAL

### Section VII Systems

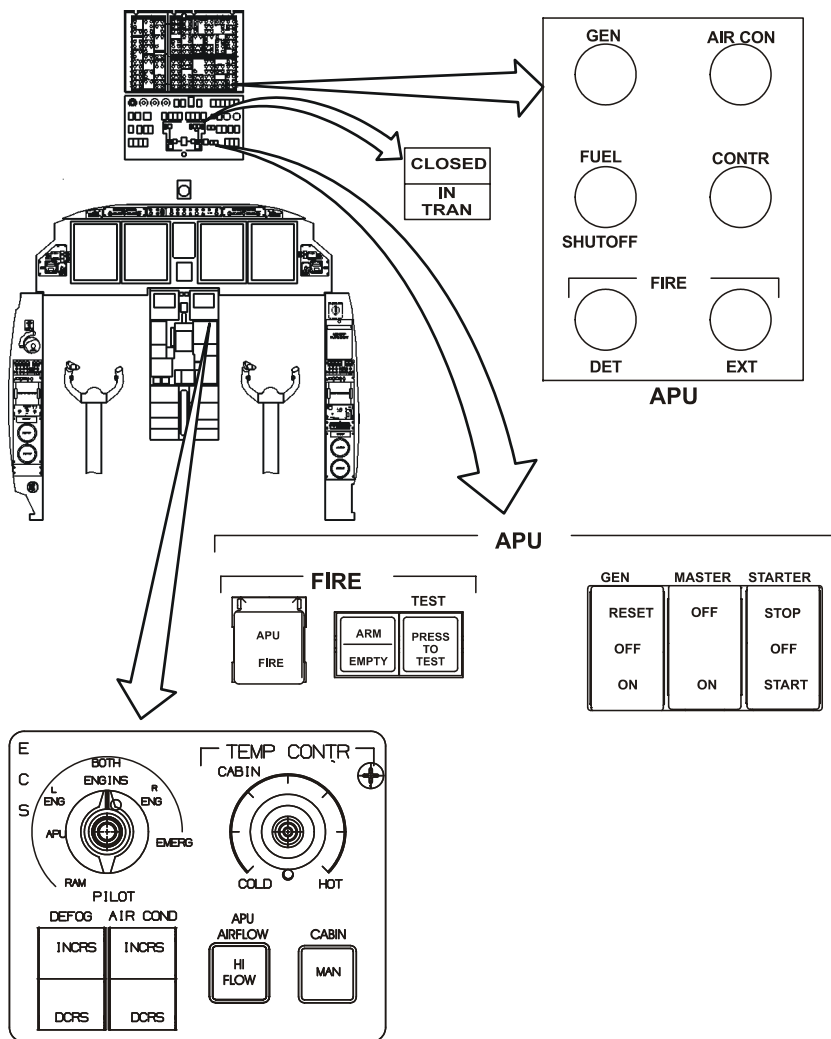


Figure 7-49-2. APU Controls