G650
Auxiliary Power Unit
Honeywell RE220

The purpose of the APU is to supply an auxiliary source of:

1. Electrical AC power
2. Pneumatic Bleed Air
3. Backup Electrical AC power
4. Pneumatic Bleed Air for Engine Air Start

- APU is powered by a dedicated single shaft, constant speed gas turbine
- APU is controlled by an Electronic Control Unit (ECU)
- APU is self-monitoring and will protect itself against faults with an automatic shutdown
- APU cannot be used for pressurization
- APU is enclosed in a fireproof titanium case
APU START/Operation (Ground)

1. Unattended ground operation is prohibited

2. Minimum Temperature = -50°C (Same as the Aircraft)

3. Minimum Batteries Volts = 22 Volts DC
   (APU starter uses L MAIN BATT only but both switches must be selected ON)

4. APU Fire Test =
   - Two (2) Overhead lights
   - Two (2) CAS Messages
   - Two (2) Master Warning lights
   - Two (2) Master Caution lights

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450_auxiliary_power_unit_(apu)_system
- Exterior Aural Warning "Fire Bell" (Ground) only

After the APU FIRE test ensure the following CAS message is not displayed:

L/R Fire Bottle Discharge

In the event of an APU FIRE the ECU will auto shutdown the APU. The QRH will direct the crew to:

1. Select APU switchlight to OFF

2. Press the APU FIRE switchlight to fire the bottle and discharge extinguishing agent into the APU.

* L Fire Bottle no longer available to Left Engine

* L Fire Bottle uses L Fire Bottle.
APU Fuel Supply:

Fuel is normally supplied from the left fuel manifold but can also be supplied from the right manifold by temporarily opening the crossflow valve.
APU MASTER SWITCH\(\text{ON}\) =

- Master switch illuminates \(\text{ON}\)
- Electronic Control Unit (ECU) \(\text{ECU}\) is powered
  - Pre-Start Build in Test (BIT)
    - APU oil temperature is sensed
    - APU fuel shutoff valve opens
    - APU air inlet door (L side) opens

If all parameters \(\text{OK}\) = APU \(\text{READY}\) light illuminates

The \(\text{ECU}\), the brains of the APU, is a microprocessor with embedded software. It is powered through the \(\text{MASTER ON}\) switch by:

- \(\text{LESS DC}\)
- \(\text{APU CONT #1}\)
- OR
- \(\text{ECU}\)
- \(\text{APU CONT #2}\)
- \(\text{R BATT BUS}\)

The \(\text{ECU}\) selects one of the two (2) power sources if both are available.
R Cowl open light

APU exhaust is exhausted overboard on the aft lower right side of the fuselage under the engine pylon

APU air inlet door

APU exhaust gases

To prevent damage to the engine cowl when opened during ground maintenance the APU starter is inhibited

R Cowl open

R engine cowl open

Starter is not inhibited inflight
APU AUTOMATIC SHUTDOWN PROTECTION:

Non-Essential (Ground Mode)

The APU will automatically shutdown in order to protect itself in the event of any of the following discrepancies:

- ECU Failure
- APU Fire
- Reverse Flow
- Loss of Speed
- OverTemp
- Low Oil Pressure

1. Cool down mode is bypassed
2. APU's fuel shutoff valve is closed
3. APU shuts down

APU STARTER LIMITS:

- Three (3) consecutive start attempts followed by a one (1) hour cooling period
- Six (6) successful and consecutive starts with a ten (10) minute interval between starts
- Use of EXT DC cart to start the APU is prohibited
10. APU Temperature Limits:
   - Start = 1050°C
   - Running = 732°C > EGT

11. APU Max RPM (Rotor Speed) = 106%

12. APU GEN = ON @ 99% RPM + Two (2) seconds

All AC and DC buses are powered.
APU LOAD CONTROL VALVE (LCV) =

The LCV allows **High pressure/temperature air** into the L/R pneumatic manifolds to power various sub-systems.

After the APU is started on the ground the LCV will not open for sixty (60) seconds to allow the APU to operate in a lightly loaded condition (low EGT).

If APU EGT is warm, the 60 second time delay is removed and APU pneumatic air will be available immediately.

APU bleed air is available immediately to restart an engine inflight.
④ APU BLEED AIR =

APU bleed air plumbing connects directly to the R manifold

Selection of APU bleed air opens the isolation valve. This allows bleed air to enter the L manifold

⑤ APU fuel consumption = 264 lbs/hour

MCDU/PERF INDEX/FUEL MGT/ 2/2
APU Engine Start:

APU bleed air can be used to start the engines on the ground or inflight up to 30,000 feet.

Stop:

APU OFF switchlight:

A. Unloads electrics and bleed air.
B. APU enters cool down mode:
   - RPM remains at 100% for 60 seconds.
C. After cool down the ECU signals an overspeed condition to shutdown the APU.
D. APU air inlet door closes.

A. Unloads electrics and bleed air.
B. APU enters cool down mode:
   - RPM decreases 1/4% for 60 seconds (70% RPM).
C. After cool down the ECU signals an overspeed condition to shutdown the APU.
D. APU air inlet door closes.
QRH STATES:

APU MASTER (RPM less than 5%) .......... OFF

A. MASTER Switch legend extinguishes

B. APU fuel shut off valve closes

C. APU immediately shuts down

D. Inlet door begins to close

If the APU is operating pressing the APU MASTER switchlight will shutdown the APU immediately (Not recommended)
APU START/OPTION (Inflight)

① Inflight operation of APU is prohibited, except:
   - Dual engine failure
   - Dual generator failure
   - Single engine failure
   - Single generator failure

Refer to AFM OIS G650ER-2016-03 APU SEALANT

② QRH ALTERNATE Normals =
   APU Inflight Operation

③ Maximum Altitude for APU Start =
   Starts are possible from 30,000' to 39,000'

   Guaranteed at or below 30,000'
4) APU Maximum Operating Altitude = 45,000'

5) APU Fire Test =
- Two (2) overhead lights
- Two (2) CAS messages
- Two (2) Master Warning lights
- Two (2) Master Caution lights

After the APU Fire Test ensure the following CAS message is not displayed:

L/R Fire Bottle Discharge
6. APU Switchlight =
   a) Select ON
   b) Wait for READY
   c) Select OFF
   d) Wait for five (5) seconds
   e) Select ON

The above procedure is to ensure the air inlet door is fully closed before start.

3. APU Surge Control Valve =

   The surge control valve opens whenever the APU is started > 16,500'. This prevents a compressor stall.

   ![Surge Valve Exhaust Pipe]
APU Automatic Shutdown Protection = Essential (Inflight) Mode

In Essential mode the APU will not automatically shutdown for certain failures. The safe condition of the aircraft takes precedence over any possible damage to the APU.

a) APU operating in flight
b) Fault detected
c) Crew notified via CAS message

APU will remain in Essential mode for fifteen (15) minutes after landing and then it will shut itself down.

APU oil check=

fifteen (15) to thirty (30) minutes after shutdown

APU oil quantity check

1/6th Ground Service Synoptic page
Fluid Quantity Indicator (Tail compartment)
Standby Multifunction Controller (SMC)
Questions, comments or errors... please send me an email: ivan.luciani@gmail.com

Thank you!