



CHALLENGER 350

BD-100-1A10

APU

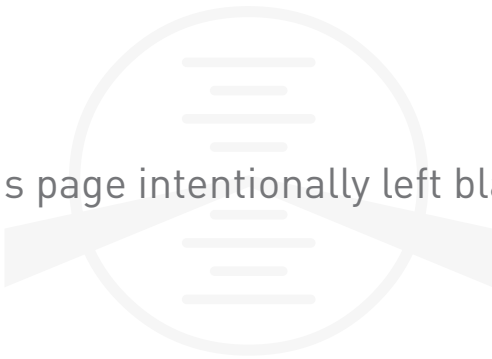
STUDY GUIDE · CARD SYSTEM

A flashcard-style reference for the CL350 Honeywell 36-150BD Auxiliary Power Unit. Each card covers one focused topic — APU architecture, ECU control, starting procedures, fuel and pneumatic systems, generator output, and protective shutdowns. Flip through, recall the numbers, and verify on the back.

ATA 49 · AUXILIARY POWER UNIT

Section APU · Revision: Original

This page intentionally left blank





APU CONTENTS

01	Five Things You Must Know	8-4
02	Apu Overview	8-5
03	Ecu Capabilities	8-6
04	Start & Ignition	8-7
05	Start Limitations	8-8
06	Pneumatic Supply	8-9
07	Generator System	8-10
08	Protective Shutdowns	8-11
09	Compartment & Indications	8-12
10	EICAS — Warning Messages	8-13
11	EICAS — Caution + Advisory	8-14
12	Quick Recall — Numbers Grid	8-15

01

FIVE THINGS YOU MUST KNOW

The five highest-value facts for the oral. Memorize numbers cold.

Honeywell
36-150BD

APU model — constant-speed gas turbine

12 kVA / 400 A

Generator output — identical to engine generators

718 °C / 973 °C

Max EGT normal / start limit

108%

Maximum APU RPM limit

37,000 ft

Maximum APU operating altitude

TIP Five baseline facts for the APU: model name, generator rating, EGT limits, RPM max, and altitude ceiling. The cards that follow break down start logic, bleed, and limits.

APU OVERVIEW - STUDY CARDS

APU MODEL	PRIMARY FUNCTION	CONTROL PHILOSOPHY
What APU is installed and where? - Honeywell 36-150BD constant-speed gas turbine - Installed in fireproof tailcone compartment - Access via single panel — fuselage underside	What is the APU's primary output? - Primary: gearbox-mounted 400-amp DC generator - Secondary: bleed air for ECS and engine starting - Electrical loads take priority over pneumatic	How is the APU controlled? - Single three-position switch: OFF / RUN / START - ECU ("Mini-FADEC") automates all APU functions - Single-switch operation with full ECU automation
ECU LOCATION & POWER	FUEL SOURCE	REMOTE CUTOFF
Where is the ECU and what powers it? - Installed in aft equipment compartment rack - ECU primary power — APU PRI CB on LEFT ESS bus (CB1-B8). Secondary — APU SEC CB on RIGHT MAIN (CB2- B8). Note: 28 VDC right battery bus powers ignition during start, not the ECU. - Computer-controlled digital controller	Where does the APU draw fuel? - Right-hand collector tank - DC-powered fuel pump; ejector pump when R eng running - ECU over-temperature protection during acceleration	Where is the ground emergency cutoff? - Right fuselage, aft of wing - Behind electrical (ground power) connection access door - Allows emergency APU shutdown from outside aircraft

ECU CAPABILITIES · STUDY CARDS

ECU MONITORING

What does the ECU automatically record?

- Operating hours and start count tracking
- Fuel acceleration schedules (DC-powered)
- EGT monitoring and control

DATA RELAY

How does ECU share data with crew?

- Transmits operating data to EICAS displays
- Digital RPM and EGT readouts on MFD
- Generator amperage and voltage indications

ECU AUTO-PROTECTIONS

What auto-shutdowns does the ECU command?

- Overspeed: closes fuel solenoid and torque motor
- Fire / exceeded limit: fuel cutoff via ECU
- Normal shutdown: ECU commands fuel off

AUTO RELIGHT

When does the ECU initiate auto relight?

- Automatic igniter firing during flameout
- Immediate restart capability below 10% rpm rolldown
- ECU auto relight function integration

ECU — WHAT IT CONTROLS

- Fuel scheduling (acceleration + EGT limits)
- Ignition timing — energized at 5% rpm, de-energized at 95% rpm
- Bleed valve modulation (EGT management)
- Protective shutdowns (overspeed, fire, low oil, overtemp)
- Auto relight below 10% rpm on flameout
- Data relay to EICAS (RPM, EGT, gen amps/volts)



START & IGNITION · STUDY CARDS

START SEQUENCE

Steps to initiate an APU start?

- Pull switch UP → RUN for ~3 seconds (indications appear on L MFD)
- Move switch to START and hold until START icon appears
- ECU automatically sequences the rest

IGNITION WINDOW

When is ignition energized/de-energized?

- Energized at 5% APU rpm
- De-energized at 95% APU rpm
- Single igniter plug; single ignition unit

FUEL SOLENOID OPEN

At what rpm does fuel solenoid open?

- Fuel shutoff solenoid opens at 5% rpm during start
- FCU meters fuel under ECU command
- Fuel scheduling: rpm, EGT, gen and bleed demands

R BATTERY ISOLATION

What happens to the right battery during start?

- Right battery isolated from essential buses during start
- R BATT OFF light illuminates momentarily
- Left battery powers both L & R essential buses

HUNG START

When is a start considered a hung start?

- RPM fails to reach 30% after 30 seconds In-flight: no restart until after landing
- ECU terminates start sequence

BLEED AVAILABILITY

Minimum RPM for bleed air?

- APU must be above 95% maximum speed
- ECU energizes bleed-air supply at proper rpm threshold
- Bleed valve opens when flight deck switch placed to open

START LIMITATIONS · STUDY CARDS

GROUND START ATTEMPTS

How many attempts before mandatory cooling?

- Three attempts with 1-minute cooling between each
- After three attempts: 20-minute cooling required
- Two additional attempts permitted after cooling

FINAL WAIT PERIOD

What is the final wait after max attempts?

- 40 minutes minimum final wait period
- Six starts at 10-minute intervals requires 1-hour wait
- After final wait: sequence may restart

IN-FLIGHT START SPEED

Maximum airspeed for APU start in flight?

- 285 KIAS maximum in-flight start speed
- In-flight unsuccessful start: no restart until after landing
- In-flight hung start: no restart until after landing

LEFT ENGINE START LIMIT

APU restriction for left engine ground start?

- Do not use APU above 9,000 ft MSL for left engine start
- Left Engine APU Start (Ground): 9,000 ft maximum
- APU Start (Ground) general limit: 14,000 ft

ANTI-ICING FLUID — AFM PROHIBITION

What does the AFM say about APU operation during de-icing/anti-icing?

- PROHIBITED: APU operation during fluid de-icing/antiicing — AFM Limitations (binding)
- FCOM 5-minute delay (after fluid application) applies only in non-prohibited contexts
- Air intake above APU compartment on right fuselage — vulnerable to fluid ingestion

START LIMIT NUMBERS — QUICK REFERENCE

- Ground: 3 attempts → 1-min cooling between each
- After 3rd attempt: 20-minute mandatory cooling
- Then: 2 more attempts → 40-minute final wait
- In flight max start speed: 285 KIAS
- Hung start threshold: 30% RPM not reached in 30 seconds
- Left engine ground start: APU prohibited above 9,000 ft MSL



PNEUMATIC SUPPLY - STUDY CARDS

LOAD PRIORITY

Which APU output takes priority under high demand?

- Electrical loads take priority over pneumatic loads
- ECU modulates bleed valve closed if EGT limit reached
- Ensures electrical power requirements are met first

BLEED VALVE

What does the bleed valve do?

- Controls airflow to aircraft bleed system
- Electrically controlled with pneumatic operation
- Butterfly valve mechanism with ECU position adjustment

SURGE CONTROL VALVE

When does the surge valve open?

- Opens when APU supplies electrical loads above 15,000 ft
- Reduces APU surge potential during unloaded operation
- Automatically controlled by ECU

EGT MANAGEMENT

How does bleed air extraction affect EGT?

- Bleed loads cause rpm drop and EGT increase
- ECU increases fuel flow to recover governed speed
- ECU modulates bleed valve toward closed to prevent overtemp

CHECK VALVE

What prevents reverse airflow in the pneumatic system?

- One-way check valve prevents reverse airflow
- APU compressor bleed pressurizes right bleed air manifold
- Provides bleed for engine starting and air conditioning

GENERATOR SYSTEM · STUDY CARDS

GENERATOR OUTPUT

Rating and voltage of APU generator?

- 12 kVA (400 amp) — identical to engine generators
- 29.5 volts nominal output
- Gearbox-mounted on APU

ALTITUDE CAPABILITY

Maximum altitude for APU generator?

- 30,000 ft maximum for backup generator use
- Load sharing with engine generators at medium/low altitude
- 37,000 ft maximum for APU operation overall

GENERATOR CONTROL

How is APU generator selected?

- DC electrical power controlled from ELECTRICAL panel
- Manual selection via APU GEN switch
- Connects through APU Power Center

BACKUP ROLE

When is APU generator used in flight?

- Emergency replacement for failed engine generator(s)
- Automatic load distribution with engine generators
- Bus tie operations with generator priority

START ISOLATION

Why is R battery isolated during APU start?

- Prevents voltage drop to essential buses
- R battery powers starter via APU start contactor
- L battery maintains essential bus power throughout



PROTECTIVE SHUTDOWNS - STUDY CARDS

ESSENTIAL vs NON-ESSENTIAL MODE

What determines Essential vs Non-Essential mode?

- S/N 20501–20696 without SB 350-49-001: essential mode in flight
- S/N 20697+, or SB 350-49-001 incorporated: nonessential mode
- Essential mode: some shutdowns inhibited in flight

GROUND-ONLY SHUTDOWNS (ESS)

Essential mode: which shutdowns are ground only?

- Fire indication, Reverse flow, Loss of EGT signal
- Low oil pressure, High oil temp, Overtemperature
- No flame / No acceleration during start

ALWAYS-ACTIVE SHUTDOWNS

Which shutdowns are active ground AND inflight?

- 28 VDC power loss, Overspeed, Emergency fire
- Internal ECU failure, Loss of overspeed protection circuit
- Non-essential mode adds all conditions to both modes

OVERSPEED SHUTDOWN

What RPM limit triggers APU overspeed?

- Maximum APU RPM: 108%
- ECU closes fuel solenoid and torque motor
- APU OVERSPEED caution posted on EICAS

EGT LIMITS

EGT limits for normal ops vs start?

- Normal operations: 718 °C maximum EGT
- Start limit: 973 °C maximum EGT
- APU OVERTEMP warning if limit exceeded

FIRE SHUTDOWN

How does fire protection differ ground vs flight?

- Ground: auto shutdown AND auto fire extinguisher
- In flight: no auto shutdown, no auto extinguisher
- APU FIRE warning on EICAS with continuous aural alert

SHUTDOWN MODES — GROUND vs IN-FLIGHT

- Ground-only (Essential mode): Fire, Reverse flow, EGT loss, Low oil press, High oil temp, Overtemp, No flame, No accel
- Ground + In-flight (always): 28 VDC loss, Overspeed, Emergency fire, Internal ECU failure, Loss of overspeed circuit
- Non-essential mode (SB 350-49-001): ALL conditions active in both ground and flight
- Fire in flight: crew must manually shut down — no auto action

COMPARTMENT & INDICATIONS - STUDY CARDS

APU COMPARTMENT

Where is the APU installed?

- Fireproof tailcone compartment
- Access via single panel aft of aft equipment bay door
- Panel removal from fuselage underside

AIR INTAKE

Where is the APU air intake?

- Above APU compartment on right fuselage side
- Positioned below vertical stabilizer
- Provides combustion air for APU operation

VENTILATION

How is the APU compartment cooled?

- NACA inlet for compartment ventilation
- Exhaust via APU exhaust eductor in tailcone
- Separate NACA inlet for generator cooling

SYNOPTIC MONITORING

Which EICAS synoptic pages show APU data?

- ELECTRICAL synoptic: APU generator status
- ECS synoptic: pneumatic bleed operations
- FUEL synoptic: APU pump and fuel SOV status

EICAS PARAMETERS

What APU parameters are displayed?

- Digital RPM display (percentage)
- EGT digital readout (°C)
- Generator amperage, voltage, and bleed air status



WARNING MESSAGES

Immediate crew action required

Message	Meaning	Inhibits
APU FIRE	APU fire detection loop activated — auto shutdown/extinguisher on ground; in flight: does NOT auto shutdown or activate extinguisher	—
APU OVERTEMP	APU EGT overtemperature detected — APU will auto shutdown on ground; inhibited during TO/LAND	TO/LAND

EICAS · CAUTION & ADVISORY

CAUTION MESSAGES

Timely crew awareness/action needed

Message	Meaning	Inhibits
APU BLEED ALT LIMIT	APU bleed air commanded above 20,000 ft, or bleed modulated due to excessive EGT	TO/LAND
APU FIRE DET FAIL	The APU fire detection system has failed	TO/LAND
APU FUEL SOV FAIL	The APU fuel feed shutoff valve has failed	TO/LAND
APU GEN FAIL	The APU generator has failed	TO/LAND
APU GEN OVERLOAD	APU generator overloaded	TO/LAND
APU OVERSPEED	The APU has shutdown due to an overspeed	TO/LAND
APU OIL PRESS LOW	The APU oil pressure is low while in flight	TO/LAND
APU OIL TEMP HIGH	The APU oil temperature is high while in flight	TO/LAND
APU STARTER FAIL ON	Power still being supplied to APU starter when ECU is not commanding a start	TO/LAND
FIREX APU SQUIB FAULT	APU fire extinguisher squib on bottle No. 2 is inoperative	TO/LAND

ADVISORY MESSAGES

Crew awareness - no immediate action required

Message	Meaning	Inhibits
APU FAULT	Fault in APU system — bleed valve failed, fuel solenoid failed, start prevented, avionics not communicating with ECU, or reverse flow detected	TO/LAND
APU SHUTDOWN	ECU has shut down the APU for protective reasons	TO/LAND



12

QUICK RECALL · NUMBERS GRID

Cover the labels and recite the number; reverse and recite the label.
Repeat until automatic.

36-150BD APU model (Honeywell)	12 kVA / 400 A Generator output	29.5 V Generator voltage (nom)	30,000 ft Max altitude — APU gen
37,000 ft Max altitude — APU ops	20,000 ft Max altitude — bleed air	14,000 ft Max APU start (ground)	9,000 ft Max — L eng start via APU
718 °C Max EGT — normal ops	973 °C Max EGT — start	108% Max APU RPM	5% Ignition on / fuel SOV open
95% Ignition off / bleed avail	285 KIAS Max in-flight start speed	3 → 20 min Ground attempts → cooling	30% / 30 sec Hung start threshold

This page intentionally left blank

