CHALLENGER 350

BD-100-1A10

FLIGHT INSTRUMENTS

STUDY GUIDE · CARD SYSTEM

A flashcard-style study guide for the CL350 Electronic Flight Instrumentation System. Each card targets one focused topic — from PFD display areas and ADC/IRS data sources to reversion logic, comparator flags, SVS limitations, and EICAS messages. Drill the numbers, then verify on the back.

ATA 31 · INDICATING/RECORDING SYSTEMS

Section FI · Revision: Original

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FLIGHT INSTRUMENTS CONTENTS

01 FIVE THINGS YOU MUST KNOW

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

4 AFDs	2 PFDs + 2 MFDs — full EFIS suite
2 ADCs · 2 IRUs	Dual air data and inertial reference systems
40–400 kts	Airspeed tape range on each PFD
±4,000 fpm	Vertical speed scale range
~70 seconds	ISI (standby instrument) alignment time

TIP Five baseline numbers covering PFD architecture, sensor redundancy, and the standby instrument. The cards drill each system in detail.

02 EFIS ARCHITECTURE · STUDY CARDS

AFD COUNT & TYPES

How many displays, and what types?

- 4 Adaptive Flight Displays (AFDs) total
- 2 Primary Flight Displays (PFDs)
- 2 Multifunction Displays (MFDs)

CONTROL PANELS

What panels control the displays?

- Display Control Panel (DCP) — one per pilot
- MFD Control Panel (MCP/CCP)
- Reversion Switch Panel (RSP)

IAPS ROLE

What is IAPS?

- Integrated Avionics Processor System
- Focal point for all aircraft information flow
- Houses FGCs, FMCs, maintenance diagnostic computers

PFD DISPLAY AREAS

List the seven PFD display areas.

- AOA (left), Attitude (center), Airspeed tape (left)
- Altitude tape (right), Vertical speed (right of alt)
- FMA (top center), Navigation/HSI (lower)

MFD FORMAT PAGES

What formats can the MFD display?

- Nav map (PPOS/PLAN), EICAS engine page, synoptics
- E-charts, checklists, flight plan, datalink weather
- TCAS traffic, terrain, status/ maintenance pages

EFIS ARCHITECTURE — QUICK SUMMARY

- 4 AFDs: PFD-L, PFD-R, MFD-L, MFD-R (all identical hardware)
- IAPS is the data hub — FGCs + FMCs + MDC all inside
- Each pilot has a DCP; MCP/CCP controls MFD content
- RSP provides display reversion and ATT/HDG/AIR DATA source selection

03 PFD AIRSPEED & ALTITUDE · STUDY CARDS

AIRSPEED TAPE RANGE

What is the IAS tape range and scale?

- 40 to 400 knots full range
- Scale markings every 5 knots; labels every 20 knots
- Manual IAS/Mach select available above Mach 0.4

IAS / MACH TRANSITION

When does the display auto-switch to Mach?

- Auto IAS→Mach at 35,561 feet
- Auto Mach→IAS descending through 35,561 feet
- Trend vector: magenta line = predicted IAS in 10 sec

LOW SPEED CUE (LSC)

What does the LSC represent?

- Solid red line rising from bottom of tape
- Top of cue = 1.06 Vs = stick shaker activation speed
- Expands to red checkerboard pattern near stick shaker

ALTITUDE ALERTING

When do altitude alerts trigger?

- C-chord + cyan bug flash at 1,000 ft from selected alt
- Deviation >200 ft: both preselected altitude bugs flash amber AND a C-chord sounds
- NOTE: red 'ALT' in FMA is an air-data failure flag — NOT a deviation alert
- BARO miscompare flag for cross-side difference >0.04 IN (per common training reference; FCOM does not state threshold)

RADIO ALTITUDE

When does RA readout appear on PFD?

- Digital RA appears below 2,500 feet AGL
- Auto-decluttered above 2,500 feet AGL
- Red RA flag when radio altitude data invalid

04 PFD ATTITUDE & HEADING · STUDY CARDS

ATTITUDE DISPLAY FORMAT

Describe the ADI format and pitch range.

- Wall-to-wall ADI — full PFD width
- Normal pitch display range ±12 degrees
- IRS provides pitch, roll, and yaw data

BEARING POINTERS

Describe the two bearing pointers.

- BRG 1: cyan single-lined pointer
- BRG 2: white double-lined pointer
- Sources: VOR 1/2, ADF 1/2, FMS 1/2 — via BRG SRC on DCP

UNUSUAL ATTITUDE RECOVERY

When do red chevrons and declutter activate?

- Chevrons appear: nose-up approx. +23° / nose-down approx. –13° (FCOM does not specify exact angles)
- Declutter triggers: pitch >30°↑ or >20°↓, roll >65°
- Retained: Altitude; Airspeed + trend vector; Attitude + slip/skid; Vertical Speed; Compass; AOA; AP/YD engage/disengage

HEADING DISPLAY

Describe the heading bug and track pointer.

- Cyan rectangular bug on compass periphery
- Track pointer: green open circle at current track
- TRUE shown in cyan; DG shown if IRS in ATT mode (typical heading-mode behavior)

V-SPEED REFERENCES

How are V-speed bugs color-coded?

- Cyan bugs: manually set V-speed values
- Magenta bugs: FMS-calculated V-speeds
- Set via REFS button on DCP; V1, VR, V2, VT, VGA, VREF

05 AIR DATA & INERTIAL REFERENCE · STUDY CARDS

ADC ARCHITECTURE

How many ADCs and what do they compute?

- Two ADCs — ADC 1 (pilot), ADC 2 (copilot)
- Outputs: IAS, Mach, TAS, pressure alt, VS, SAT, TAT
- Also: VMO/MMO, baro correction, ISA deviation

PITOT-STATIC PROBES

Describe primary and standby pitot-static.

- Primary (L+R): 1 total pressure + 2 static ports each
- All primary probes electrically heated
- Standby: 1 pitot probe + 2 flush static ports → ISI

IRS COMPONENTS & MODES

List IRS hardware and five operating modes.

- Hardware: 2 IRUs, 2 trays, 2 APMs
- Modes: OFF, ALIGN, NAV, ATT (attitude-only), AIM (Align in Motion — in-flight alignment)
- IRS outputs: attitude, heading, position, ground speed, wind

ADC & IRS REVERSION

How are ADC and IRS sources cross-sided?

- RSP AIR DATA switch: NORM / POS 1 / POS 2
- RSP ATT/HDG switch: NORM / POS 1 / POS 2
- NORM = onside; POS 1 or 2 = all displays use that unit

ADC & IRS — REDUNDANCY SUMMARY

- Dual ADC: ADC 1 pilot-side, ADC 2 copilot-side — onside normal
- Dual IRS: IRS 1 pilot-side, IRS 2 copilot-side — onside normal
- RSP AIR DATA and ATT/HDG switches are independent — can cross-side both simultaneously
- ADC failure loses: IAS, alt, Mach, VS, SAT/TAT/TAS
- IRS ATT mode: heading/position lost; attitude and rates still available

06 STANDBY INSTRUMENTS & CLOCK · STUDY CARDS

ISI DISPLAY FEATURES

What does the ISI display?

- Attitude, airspeed tape, altitude tape
- Slip/skid indicator, baro setting
- LOC and glideslope deviation when ILS tuned

ISI — NOT DISPLAYED

What critical item is NOT on the ISI?

- No heading information provided
- Red LOC or GS flag when data invalid (scales removed)
- ISI normally powered 28 VDC aircraft bus; standby power from dedicated 24 VDC external battery located in nose landing gear bay (NOT internal)

ISI ALIGNMENT

How long does the ISI take to align?

- Self-test on power-up: 10–20 seconds
- ALIGNING flag displayed during process
- Operational after approximately 70 seconds

STANDBY COMPASS

What powers the standby compass?

- Silicon-fluid filled bowl — no electrical power for heading
- 5 VDC lighting only from integral light controller
- L/R WSHLD switches should be OFF when reading compass (prudent practice; not explicitly in FCOM)

CLOCK FUNCTIONS

What does the cockpit clock provide?

- UTC time, local time, date display
- FLT/RST: elapsed flight time (2-sec hold to reset)
- CHR button: count-up chronograph (start/stop/reset)

07 DISPLAY REVERSION (RSP) · STUDY CARDS

RSP LEFT/RIGHT DISPLAY SWITCH

What are the three positions?

- MFD REV: MFD compressed, adjacent PFD shut down
- NORM: normal MFD and PFD operation
- PFD REV: PFD compressed, adjacent MFD shut down

RSP EICAS SWITCH

What does the EICAS switch select?

- BOTH PFDS: EICAS shown compressed on both PFDs
- L MFD: left MFD shows EICAS presentation
- R MFD: right MFD shows EICAS presentation

RSP ATT/HDG & AIR DATA

Summarize both reversion switches.

- ATT/HDG: NORM=onside IRS; POS 1=all use IRS 1; POS 2=all use IRS 2
- AIR DATA: NORM=onside ADC; POS 1=all ADC 1; POS 2=all ADC 2
- Both switches independent — can cross-side simultaneously

RSP TUNE SWITCH

What are the FOUR positions of the TUNE switch?

- COM 1 121.50: L-VHF COM tuned to 121.50 MHz emergency frequency
- MFD ONLY: CDU tuning disabled; MFD tuning enabled
- NORM: normal tuning from both CDU and MFD
- CDU: MFD tuning disabled; tuning through CDU only

RSP REVERSION — ONE-MINUTE RECAP

- RSP switch groups: L DISPLAYS · EICAS · R DISPLAYS · ATT/HDG · AIR DATA · TUNE
- MFD REV compresses that MFD and shuts down the adjacent PFD
- PFD REV compresses that PFD and shuts down the adjacent MFD
- EICAS switch ensures EICAS always visible — on PFDs or chosen MFD
- TUNE (4 positions): COM 1 121.50 → MFD ONLY → NORM → CDU; NORM is normal dual-source tuning

08 SVS & COMPARATOR FLAGS & CLOCK · STUDY CARDS

SVS PURPOSE & LIMITATIONS

What is the SVS and its restriction?

- Situational awareness enhancement only
- Replaces ADI background with 3D terrain view
- NOT approved for operational credit or approach continuation

SVS DATABASES

Describe the two SVS databases.

- Terrain database: worldwide coverage, no expiration date
- Airport/runway database: updated every 28 days
- Airport symbols 10–15 NM; runway within 10 NM; centerline 7.5 NM

SVS REMOVAL CONDITIONS

When is SVS automatically removed?

- Unusual attitude or compressed PFD format
- Heading/pitch/roll or airspeed/ altitude miscompare
- SVS failure, GPS accuracy inadequate, VIU failure

COMPARATOR FLAGS — AMBER

Name three amber comparator thresholds.

- IAS: difference >10 knots between pilot and copilot
- HDG: difference >6° when roll ⩽20°
- MACH: difference >0.03; RA: mismatch below approx.
- 2,450 ft AGL (per truth sources)

SYSTEM FLAGS — RED

Name four critical red warning flags.

- ATT — attitude data from AHRS/IRS invalid
- IAS — airspeed data from ADC missing/invalid
- ALT — baro altitude data from ADC missing/invalid
- AP (flashing red) — autopilot disengaged

09 EICAS · CAUTION + ADVISORY

CAUTION MESSAGES

Timely crew awareness/action needed - Each accompanied by a single chime

Message	Meaning	Inhibits
AIR SATA 1 (2) FAULT	The angle of attack input to the ADC has failed. Affected altitude may indicate up to 150 ft low	TO/LAND
EFIS COMPARATOR INOP	EFIS comparator monitor is inoperative	TO/LAND
EFIS MISCOMPARE	Pilot/copilot EFIS data sources disagree (no inhibit)	-
L (R) IAPS FAIL	Integrated Avionics Processing System failure	TO/LAND
PFD X-TALK FAIL	PFD cross-talk failure	TO/LAND

ADVISORY MESSAGES

Crew awareness required - May have associated tone

Message	Meaning	Inhibits
DCU FAN FAULT	The data concentrator unit fan is inoperative	TO/LAND
DCU FAULT	Data Concentrator Unit fault	TO/LAND
IAPS FAN FAULT	IAPS cooling fan fault	TO/LAND
MFD X-TALK FAIL	MFD cross-talk failure	TO/LAND
RDC FAN FAIL	Radio Distribution Cabinet fan failed	TO/LAND
RDC FAULT	Radio Distribution Cabinet fault	TO/LAND

10 EICAS · STATUS

STATUS MESSAGES	
Information only - no crew action required	
Message	**Meaning**
STBY INST OFF	Standby instrument selected OFF
IRS 1(2) IN ATT	IRU 1 (or 2) in Attitude mode

11 QUICK RECALL · NUMBERS GRID

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

4 AFDs 2 PFD + 2 MFD	**2 ADCs** Dual air data computers	**2 IRUs** Dual inertial reference units	**40–400 kts** Airspeed tape range
35,561 ft IAS/Mach auto-transition alt	**±12°** PFD normal pitch display range	**±4,000 fpm** VS scale range	**1,000 ft** Altitude alert capture range
>200 ft Alt deviation: bugs flash amber + C-chord	**2,500 ft AGL** Radio alt display threshold	**>10 kts** IAS comparator flag limit	**>6°** HDG comparator (roll ⩽20°)
>0.03 Mach comparator flag limit	**>0.04 IN** BARO miscompare limit	**~70 sec** ISI alignment time	**28 days** SVS runway DB update cycle

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