

CHAPTER 2 – AURAL/VISUAL INDICATING AND RECORDING

	Page
TABLE OF CONTENTS	02-00
Table of Contents	02-00-1
INTRODUCTION	02-10
Introduction	02-10-1
ENGINE INDICATING AND CREW ALERTING SYSTEM	02-20
Engine Indicating and Crew Alerting System	02-20-1
Display Reversion	02-20-6
Aural Warning	02-20-7
Master Warning / Master Caution Lights	02-20-9
Crew Alerting System Messages	02-20-9
Synoptic Pages	02-20-11
EICAS Warning Messages (Red) and Aural	02-20-13
EICAS Caution Messages (Amber)	02-20-14
EICAS Advisory Messages (Green)	02-20-16
EICAS Status Messages (White)	02-20-17
Inhibits	02-20-18
Warning Inhibits	02-20-20
Caution Inhibits	02-20-21
Take-Off Configuration Warnings	02-20-21
Landing Configuration Warnings	02-20-25
Menu Page	02-20-26
System Circuit Breakers	02-20-28
RECORDING	02-30
Recording	02-30-1
System Circuit Breakers	02-30-4
MAINTENANCE DIAGNOSTIC SYSTEM	02-40
Maintenance Diagnostic System	02-40-1
Maintenance Main Menu Overview	02-40-3
Data Loader Unit	02-40-6
System Circuit Breakers	02-40-6

LIST OF ILLUSTRATIONS

INTRODUCTION		
Figure 02-10-1	Aural/Visual Indicating and Recording Schematic	02-10-2



**AURAL/VISUAL INDICATING AND
RECORDING
Table of Contents**

Vol. 1

02-00-2

REV 3, May 03/05

| ENGINE INDICATING AND CREW ALERTING SYSTEM

Figure 02-20-1	Engine Indicating and Crew Alerting System - General	02-20-3
Figure 02-20-2	EICAS Control Panel	02-20-4
Figure 02-20-3	EICAS Miscomparison Indication	02-20-5
Figure 02-20-4	Display Reversion	02-20-6
Figure 02-20-5	Display Selector	02-20-6
Figure 02-20-6	DCU Controls and Indications	02-20-8
Figure 02-20-7	Master Warning / Master Caution Lights	02-20-9
Figure 02-20-8	EICAS Display Message Fields	02-20-12
Figure 02-20-9	Take-Off Configuration Advisory	02-20-22
Figure 02-20-10	Take-Off Configuration Warning	02-20-24
Figure 02-20-11	Menu Page	02-20-27

RECORDING

Figure 02-30-1	Recording	02-30-2
Figure 02-30-2	Recording - EICAS Indications	02-30-3

MAINTENANCE DATA COMPUTER

Figure 02-40-1	Maintenance Data Computer - Controls	02-40-2
Figure 02-40-2	Maintenance Main Menu EICAS Page	02-40-4
Figure 02-40-3	MDC Fault Indication	02-40-5
Figure 02-40-4	Data Loader Unit	02-40-6

	AURAL/VISUAL INDICATING AND RECORDING Introduction	Vol. 1	02-10-1
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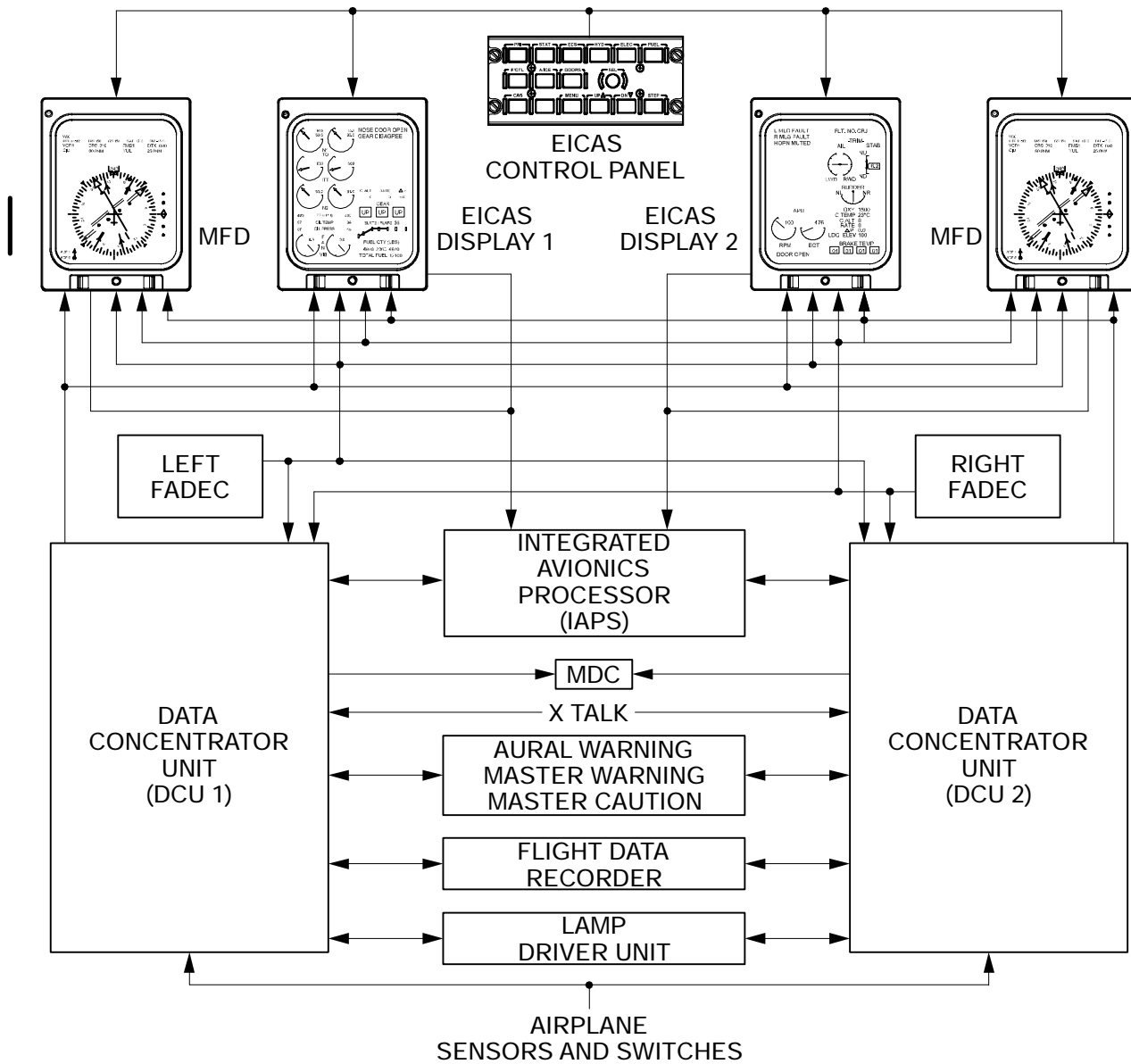
1. INTRODUCTION

The indicating and recording systems consist of components that provide visual indications of system operation and to record aircraft information.

Data from the aircraft systems and the full authority digital engine control (FADEC) on each engine is received and processed by two data concentrator units (DCU) located in the avionics compartment. The DCUs provide information to the engine indication and crew alerting system (EICAS). Master warning and caution lights on the glareshield enhance the indication system. Audio signals are generated within the DCUs and are heard through the flight deck speakers.

The DCUs also provide interface with the flight data recorder system (FDR), the lamp driver unit (LDU) and the maintenance data computer (MDC) via the integrated avionic processor (IAPS).

	Flight Crew Operating Manual CSP C-013-067	
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Aural/Visual Indicating and Recording Schematic
Figure 02-10-1



1. ENGINE INDICATING AND CREW ALERTING SYSTEM

The engine indicating and crew alerting system (EICAS) provides the crew with two electronic displays to monitor engines, control surfaces and all major aircraft systems. The EICAS system also provides the crew with alerting system messages that are posted on the EICAS displays in the form of warning, caution, advisory and status messages. All warning and caution messages will also illuminate the MASTER WARNING or MASTER CAUTION lights on the glareshield. Some crew alerts are also accompanied by aural tones and voice advisories. The EICAS system can also illuminate switchlights on specific system control panels to provide component/system status or to prompt corrective crew action.

The EICAS system consists of the following:

- Two EICAS displays on the center instrument panel - Used to display system information and status.

NOTE

The EICAS displays are referred to as EICAS Display 1 (ED1) and EICAS Display 2 (ED2). ED1 is on the left and ED2 is on the right. The information that is shown on each display is referred to as a page. In normal configuration, the Primary page is shown on ED1 and the Status page is shown on ED2.

- EICAS control panel on the center pedestal - Used to select which EICAS page, (primary page, status page, synoptic pages or menu page) is to be shown on ED2. The panel is also used to display additional caution and status messages on ED1 and ED2.
- Engine/Miscellaneous test panel on the center pedestal - Used to perform tests of the annunciator lights, set annunciator light levels, record specific flight data events and synchronize the engines N1 or N2.
- Display reversion control panels on the pilot's and copilot's side panel - PFD position - puts the primary flight display (PFD) information on the pilot's or copilot's multifunctional display (MFD). EICAS position - makes all EICAS information available on the pilot's or copilot's MFD.
- EICAS selector on the center pedestal SOURCE SELECTOR PANEL - Used to select where the EICAS information will be displayed. The information can be displayed on ED1 and ED2, or all the EICAS information can be displayed on either ED1 or ED2.
- MASTER WARNING and MASTER CAUTION switchlights on the glareshield. - Illuminate when a warning or caution is detected by the data concentrator units (DCUs).
- Lamp driver unit, located in the avionics compartment - Used to control and test flight compartment annunciator lights.
- Data concentrator units located in the avionics compartment - Used to process data and transmit the applicable data to the EICAS displays, flight data recorder and lamp driver units. The DCUs are also used to control the aural warning system.

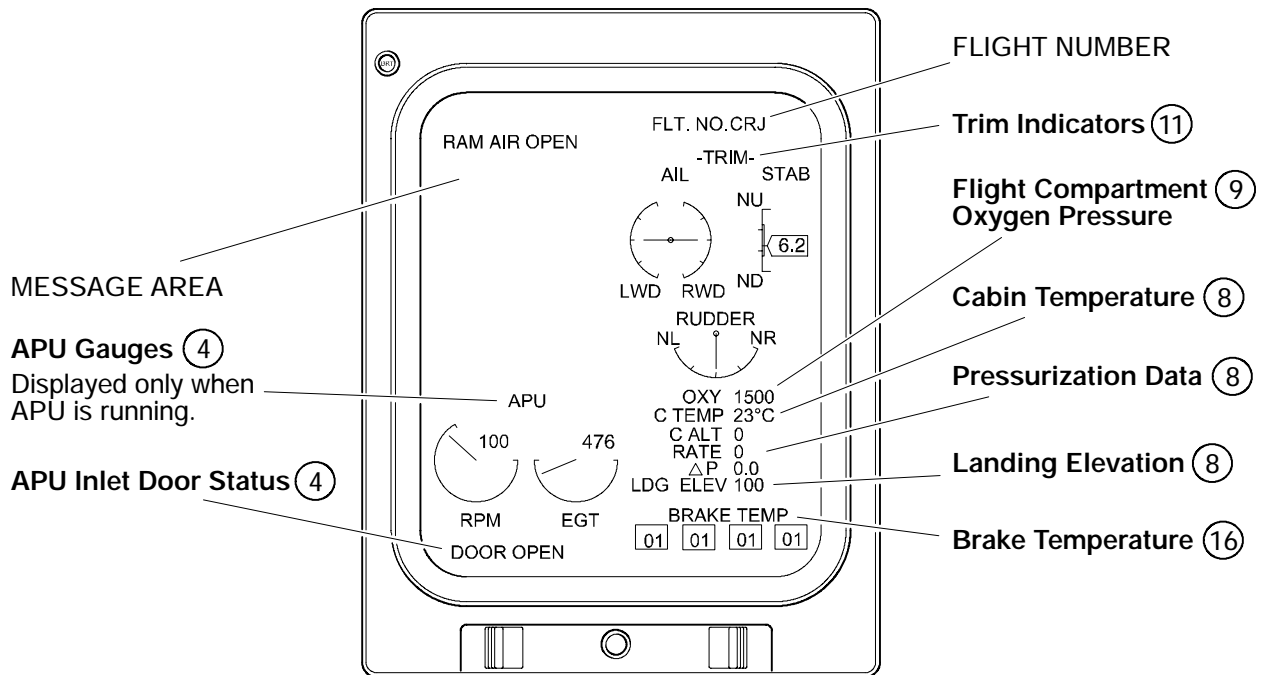
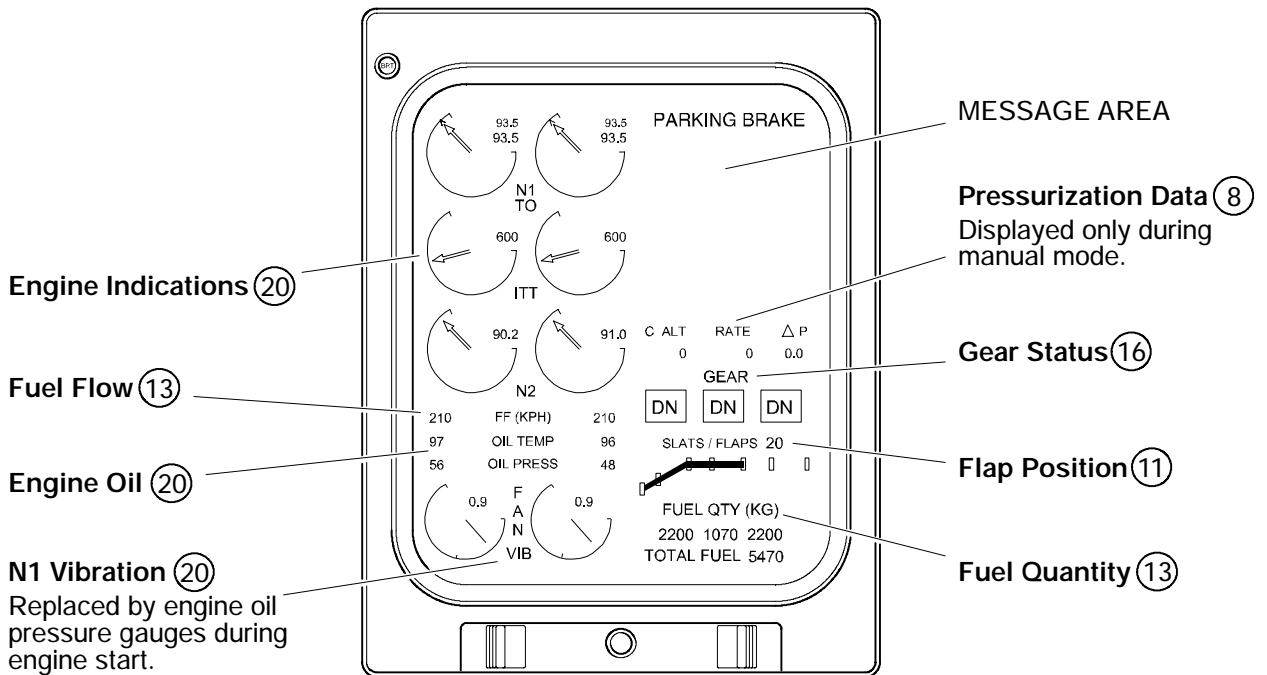


The EICAS primary page displays the following information:

- Engine compressor and turbine speeds (N₁ and N₂ rpm)
- Engine temperature (ITT)
- Fuel flow (FF)
- Oil pressure and temperature
- Engine vibration data
- Pressurization data
- Landing gear position
- Slat/flap position
- Fuel tank quantities and total fuel
- Crew alerting system (CAS) messages in the form of red warning and amber caution messages

The EICAS status page displays the following information:

- Flight control trim indications
- Auxiliary power unit (APU) indications such as APU RPM, exhaust gas temperature (EGT) and APU inlet door status
- Pressurization data such as cabin altitude, cabin rate of change, cabin pressure differential, and landing field elevation
- Oxygen system pressure
- Brake system temperature readouts
- Aircraft systems synoptic pages (via the EICAS control panel)
- MENU page (via the EICAS control panel) allows reset of the fuel used indicator and displays the engine oil quantity
- Crew alerting system (CAS) messages in the form of green advisory and white status messages



○ Indicates Chapter in which information on item may be found.

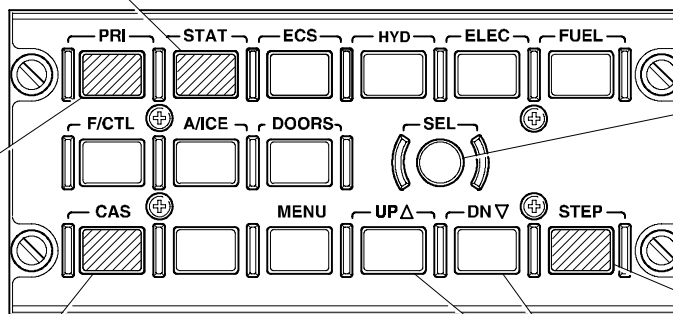
Engine Indicating and Crew Alerting System – General <1001>
 Figure 02-20-1

Status Page (STAT)

Used to display the status page on the secondary display. A second push will remove status messages from view or will display additional status messages if more messages exist.

Synoptic Pages (ECS, HYD, ELEC, FUEL, F/CTL, A/ICE, DOORS, MENU)

Used to display system synoptic pages. A second push of the ELEC button will replace the AC electrical synoptic page with the DC electrical synoptic page.



Primary Page (PRI)

Used to displays the primary page on the secondary display.

Select (SEL)

Used to activate a selected item. Cursor symbol, letter or number will change color to acknowledge selection.

Crew Alerting System (CAS)

Used when primary page is displayed to remove caution messages from view or display additional caution messages if more messages exist.


STEP

Used to step through pages on secondary display.

UP and DN

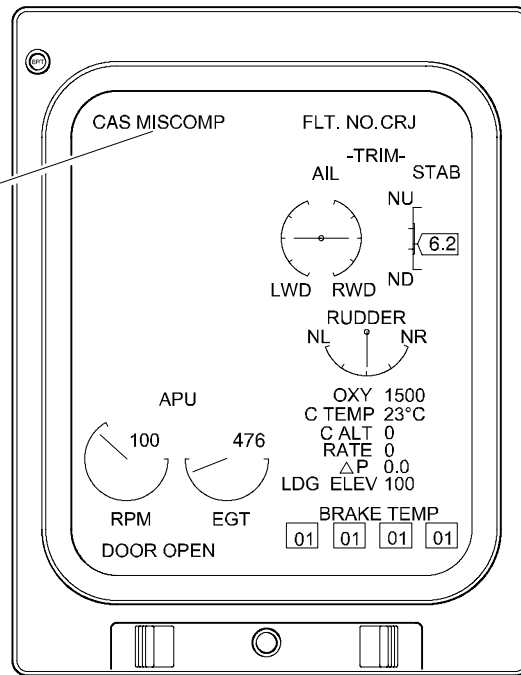
Used to control operation of cursor on menu page. These buttons slew the value of selected items.

EICAS Control Panel Center Pedestal

 Indicates controls operable during a panel failure.

EICAS Control Panel
Figure 02-20-2

CAS MISCOMP status (white)
Indicates that a miscomparison of detected warning, caution or aural alerts exists between DCUs.

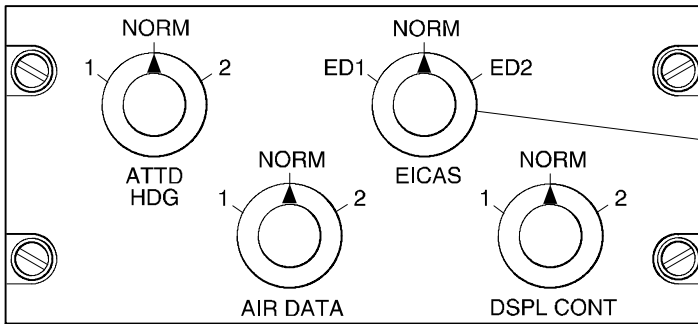


Status Page

EICAS Miscomparison Indication
Figure 02-20-3

A. Display Reversion

If EICAS display 1 (ED1) fails, the primary page will be automatically displayed on ED2. If ED2 fails, there is no automatic transfer to ED1. With either display failure, the EICAS control panel is rendered inoperative. To regain control, the EICAS selector on the SOURCE SELECTOR PANEL must be set to the operable display (ED1 or ED2) to re-establish the EICAS control panel functions. The selector also makes available all EICAS information on the selected display.



EICAS

Used to establish EICAS control panel functions on a selected display.

- NORM - EICAS operates normally with both primary and secondary displays.
- ED1 - Enables EICAS control panel functions on primary display and disable secondary display.
- ED2 - Enables EICAS control panel functions on secondary display and disables primary display.

**Source Selector Panel
Center Pedestal**

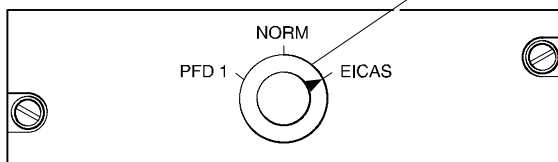
**Display Reversion
Figure 02-20-4**

To ensure timely access to essential EICAS data, all EICAS pages can be made available on either MFD by selecting the EICAS position on the respective Display Reversionary Panel.

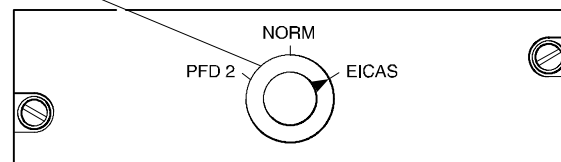
Display Selector

Used to convert the pilots or copilots MFD display.

- EICAS - MFD reverts to an EICAS display.
The status page is initially shown. Access to the remaining EICAS pages is through the EICAS control panel.



**Pilot's Display Reversionary Panel
Pilot's Side Panel**



**Copilot's Display Reversionary Panel
Copilot's Side Panel**

**Display Selector
Figure 02-20-5**

B. Aural Warning

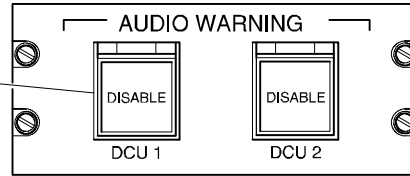
Various tones call attention to warnings. There are ten types of aural alerts:

Sound	Indication	Chapter Reference
Warbler	Stall	Chapter 11, Flight Controls
Siren	Windshear	Chapter 18, Navigation
Whoop - Whoop	GPWS mode 1 or 2 (excessive descent rate or excessive closure rate)	Chapter 18, Navigation
Fire Bell	Fire warnings	Chapter 10, Fire Protection
Clacker	<ol style="list-style-type: none"> 1. Excessive stabilizer trim movement 2. V_{MO}/M_{MO} exceedance 3. Airspeed too high for current flap setting 	Chapter 11, Flight Controls Chapter 12, Flight Instruments
Cavalry Charge	Autopilot disconnect	Chapter 3, Automatic Flight Control System
Horn	Gear not down	Chapter 16, Landing Gear
Triple chime	Warning tone that precedes an aircraft system voice advisory	Chapters 2 through 20
C-chord	Altitude alert	Chapter 12, Flight Instruments
Single chime	Caution tone that precedes an aircraft system voice advisory	Chapters 2 through 20

DCU 1 and DCU 2 (Guarded)

Used to disable and silence the aural warnings of a faulty DCU.

- **DISABLE** (white) light indicates respective DCU aural output is disabled.



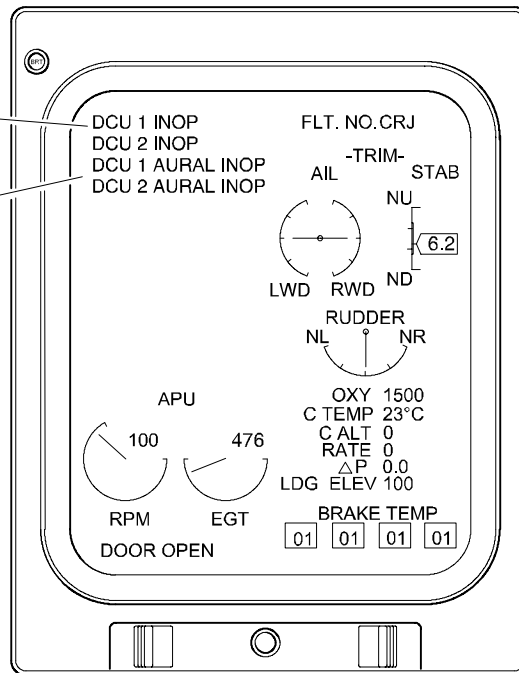
Audio Warning Panel
Copilot's Side Console

DCU 1 or 2 INOP status (white)

Indicates internal fault or crosstalk fault in respective data concentrator unit.

DCU 1 or 2 AURAL INOP status (white)

Indicates internal aural fault in respective data concentrator unit or indicates respective DCU aural output has been disabled.



Status Page

DCU Controls and Indications
Figure 02-20-6

C. Master Warning / Master Caution Lights

Two MASTER WARNING lights come on flashing when any warning occurs. The lights remain on as long as the warning exists. Pushing either MASTER WARNING extinguishes both MASTER WARNING lights for the duration of that warning and resets the lights for future warnings.

Pushing the MASTER WARNING also silences the aural warnings except for the following cases:

- Stall warbler
- Stabilizer trim clacker
- GPWS/TCAS (voices and aural)
- AP Disconnect cavalry charge
- Overspeed clacker
- Configuration warnings
- Flap clacker
- Gear Horn

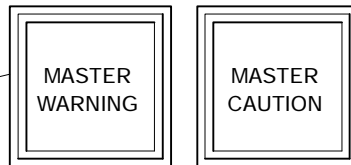
Two MASTER CAUTION lights come on flashing when any caution occurs. Pushing either MASTER CAUTION extinguishes both MASTER CAUTION lights for the duration of that caution and resets the lights for future cautions.

Pushing the MASTER CAUTION will not silence the following:

- GPWS and TCAS voice alerts
- Altitude alert (C-chord) aural

MASTER WARNING

Both lights come on (red) in conjunction with warning lights and EICAS messages. Pushing either switch will turn both lights out and reset warning system for subsequent indications. Lights cannot be dimmed.



Left and Right Glareshield

MASTER CAUTION

Both lights come on (amber) in conjunction with caution lights and EICAS messages. Pushing either switch will turn both lights out and reset caution system for subsequent indications. Lights cannot be dimmed.

Master Warning / Master Caution Lights
Figure 02-20-7

D. Crew Alerting System Messages

Crew alerting system messages appear in the message area on both EICAS displays (ED1 and ED2). The messages are arranged by their urgency and order of occurrence. All crew alerting system messages are divided into one of four categories: warnings, cautions, advisories, or status.



- Warnings messages, are the most urgent type of crew alerts and indicate operational or aircraft system conditions that require immediate corrective action. All warning messages are preceded by a triple chime and appear in red at the top of the message area on ED1. For all warnings, the red MASTER WARNING lights will flash. Some warnings also have an aural alert consisting of a unique tone and a voice advisory. Warning messages cannot be removed from view, unless the applicable failure has been rectified.
- Cautions messages, are less urgent than warnings and indicate operational or aircraft system conditions that require prompt corrective action. All caution messages are preceded by a single chime and appear in amber immediately below the warnings in the message area on ED1. For all cautions, the amber MASTER CAUTION lights will flash. Caution messages can be removed from view by using the CAS button on the EICAS control panel.
- Advisories messages are used to show that a safe condition exists. They appear in green at the top of the message area on ED2. Advisory messages cannot be removed from view, unless the applicable system or switch has been deactivated or deselected.
- Status messages indicate that an abnormal condition exists or that a low-priority failure has occurred. They appear in white in the message area below the advisories. Status messages can be removed from view by using the STAT button on the EICAS control panel.

The most recent message appears at the top of its respective group of messages. A message is automatically removed from EICAS when the associated condition no longer exists. In this case, messages which appeared below the deleted message, each move up one line. When a new fault occurs, the new message will move older messages down one line.

If the number of warnings exceeds the message area (number of lines), then only the most recent warning messages are displayed and a red PAGE 1/2 appears at the bottom of the message area.

When more caution messages exist than can fit in the message area, a second page of cautions will be created and a page 1 of 2 will be indicated in the top RH corner of primary page. The CAS button on the EICAS control panel is then used to the next page of caution messages.

- Caution messages can be removed from view by pressing the CAS button, providing that both main generators are operating and on-line. A **MSG** icon will appear, advising the crew that the caution messages are out of view.

NOTE

If a new abnormal situation occurs, the corresponding caution message will appear. To view all of the caution messages, re-select the CAS button.

Advisory messages cannot be removed from view, unless the appropriate system/switch, has been deactivated. If the number of advisories exceeds the message area, a green PAGE 1/2 appears at the bottom of the message area.

When more status messages exist than can fit in the message area, a second page of status messages will be created and a page 1 of 2 will be indicated in the top LH corner of the status page. The STAT button on the EICAS control panel is then used to select the next page of status messages.

- Status messages can be removed from view, anytime the EICAS system is powered, by pressing the STAT button on the EICAS control panel. A MSG5 icon will appear, advising the crew that status messages are out of view.

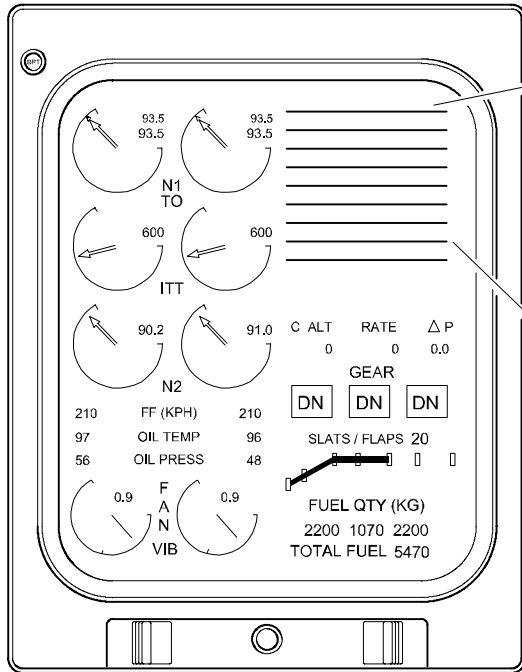
E. Synoptic Pages

Aircraft system information is presented in the form of synoptic pages. Synoptic pages are simplified top-level schematic diagrams used for pilot and maintenance information. The synoptic pages are dynamic displays of the aircraft systems status and operation which includes all major components and parameter values. When a malfunction occurs, the affected component and/or parameter value will change color. System flow lines are green to indicate flow and white to indicate no flow. Status and malfunction messages are also included on the synoptic pages.

The synoptic pages are selected by dedicated keys on the EICAS control panel (ECP) or by using the STEP key to sequence through the pages (refer to figure 2). In normal operation, the selected synoptic page will be displayed on EICAS display 2 (ED2). Pressing the STAT key will return the status page to ED2.

NOTE

A description of each synoptic page is included in its related chapter.



Primary Page

Warning Messages (red)

Conditions that require immediate corrective action.

Warning messages cannot be paged.

If the number of warning messages exceeds the available message area, only the most recent will be displayed.

Warning messages cannot be removed from view, without rectifying the failure.

Caution Messages (amber)

Conditions that require prompt corrective action.

Caution messages can be paged.

Caution messages can be removed from view, providing both main generators are operating and on-line.

Advisory Messages (green)

System response or acknowledgement messages (new condition).

Advisory messages cannot be paged.

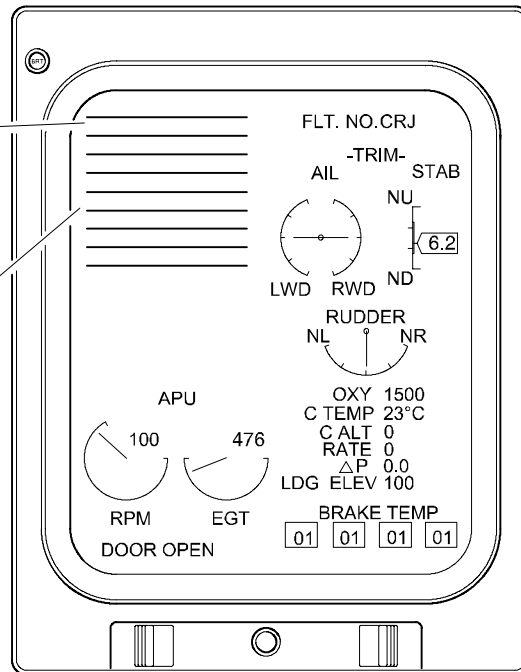
Advisory messages cannot be removed from view, without de-selecting the appropriate system.

Status Messages (white)

Conditions that require time available corrective action.

Status messages can be paged.

Status messages can be removed from view anytime.



Status Page

EICAS Display Message Fields <1001>
Figure 02-20-8



F. EICAS Warning Messages (Red) and Aural

Message	Aural	Chapter
AFCS MSG FAIL		3
ANTI-ICE DUCT	Anti-Ice Duct	19
APU FIRE	☆	10
APU OVERSPEED	APU	4
APU OVERTEMP	APU	4
BRAKE OVHT	Brakes	16
CABIN ALT	Cabin Pressure	8
CONFIG AILERON	Config Trim	2
CONFIG AP	Config Autopilot	2
CONFIG FLAPS	Config Flaps	2
CONFIG RUDDER	Config Trim	2
CONFIG SPLRS	Config Spoilers	2
CONFIG STAB	Config Trim	2
DIFF PRESS	Cabin Pressure	8
EMER PWR ONLY		7
ENGINE OVERSPD		20
GEAR DISAGREE	Gear Disagree	16
L BLEED DUCT	Bleed Air Duct	19
L COWL A/I DUCT	Anti-Ice Duct	19
L ENG FIRE	☆	10
L ENG OIL PRESS	Engine Oil	20
L REV DEPLOYED		20
MLG BAY OVHT	Gear Bay Overheat	10
NOSE DOOR OPEN	Nose Door	16
PARKING BRAKE	Config Brakes	16
PASSENGER DOOR	Door	6
R BLEED DUCT	Bleed Air Duct	19
R COWL A/I DUCT	Anti-Ice Duct	19
R ENG FIRE	☆	10
R ENG OIL PRESS	Engine Oil	20
R REV DEPLOYED		20
SMOKE AFT CARGO	Smoke	10
SMOKE AFT LAV		10
SMOKE FWD CARGO	Smoke	10
SMOKE FWD LAV		10
WING OVHT	Wing Overheat	15

NOTE

☆ Firebell aural tone.



**AURAL/VISUAL INDICATING AND
RECORDING
Engine Indicating and Crew Alerting System**

Vol. 1

02-20-14

REV 3, May 03/05

G. EICAS Caution Messages (Amber)

Message	Ch.	Message	Ch.	Message	Ch.	Message	Ch.
AC 1 AUTOXFER	7	ELT ON	9	L ENG SOV FAIL	13	R ENG DEGRADED	20
AC 2 AUTOXFER	7	EMER DEPRESS	8	L ENG SOV OPEN	13	R ENG FLAMEOUT	20
AC BUS 1	7	EMER LTS OFF	17	L ENG SQB	10	R ENG SOV CLSD	13
AC BUS 2	7	ENG BTL 1 LO	10	L ENG SRG CLSD	20	R ENG SOV FAIL	13
AC ESS BUS	7	ENG BTL 2 LO	10	L ENG SRG OPEN	20	R ENG SOV OPEN	13
AC SERV BUS	7	FIRE SYS FAULT	10	L ENG TAT HEAT	15	R ENG SQB	10
AFT CARGO DET	10	FLAPS FAIL	11	L FADEC	20	R ENG SRG CLSD	20
AFT CARGO DOOR	6	FLT SPLR DEPLOY	11	L FADEC OVHT	20	R ENG SRG OPEN	20
AFT CARGO OVERHEAT	8	FUEL CH 1/2 FAIL	13	L FIRE FAIL	10	R ENG TAT HEAT	15
AFT CARGO SQB 1	10	FUEL IMBALANCE	13	L FUEL FILTER	13	R FADEC	20
AFT CARGO SQB 2	10	FWD CARGO DET	10	L FUEL LO PRESS	13	R FADEC OVHT	20
AFT SERVICE DOOR	6	FWD CARGO DOOR	6	L FUEL LO TEMP	13	R FIRE FAIL	10
ALT LIMITER	8	FWD CARGO SQB 1	10	L FUEL PUMP	13	R FUEL FILTER	13
ANTI-ICE DUCT	19	FWD CARGO SQB 2	10	L MAIN EJECTOR	13	R FUEL LO PRESS	13
ANTI-ICE LOOP	19	FWD SERVICE DOOR	6	L PACK	8	R FUEL LO TEMP	13
AP PITCH TRIM	3	GEN 1 OFF	7	L PACK AUTOFAIL	8	R FUEL PUMP	13
APR CMD SET	20	GEN 2 OFF	7	L PACK TEMP	8	R FWD EMER DOOR	6
AP TRIM IS LWD	3	GEN 1 OVLD	7	L PITOT HEAT	15	R MAIN EJECTOR	13
AP TRIM IS ND	3	GEN 2 OVLD	7	L REV INOP	20	R PACK	8
AP TRIM IS NU	3	GLD NOT ARMED	11	L REV UNLOCKED	20	R PACK AUTOFAIL	8
AP TRIM IS RWD	3	GLD UNSAFE	11	L REV UNSAFE	20	R PACK TEMP	8
APU BATT OFF	7	GND SPLR DEPLOY	11	L SCAV EJECTOR	13	R PITOT HEAT	15
APU BLEED ON	19	HYD EDP 1A	14	L START ABORT	20	R REV INOP	20
APU BTL LO	10	HYD EDP 2A	14	L START VALVE	20	R REV UNLOCKED	20
APU DOOR OPEN	4	HYD 1 HI TEMP	14	L STATIC HEAT	15	R REV UNSAFE	20
APU ECU FAIL	4	HYD 2 HI TEMP	14	L THROTTLE	20	R SCAV EJECTOR	13
APU FAULT	4	HYD 3 HI TEMP	14	L WINDOW HEAT	15	R START ABORT	20
APU FIRE FAIL	10	HYD 1 LO PRESS	14	L WING A/I	15	R START VALVE	20
APU GEN OFF	7	HYD 2 LO PRESS	14	L WSHLD HEAT	15	R STATIC HEAT	15
APU GEN OVLD	7	HYD 3 LO PRESS	14	L XFER SOV	13	R THROTTLE	20
APU LCV CLSD	19	HYD PUMP 1B	14	LOW FUEL	13	RUD LIMITER	11
APU LCV OPEN	19	HYD PUMP 2B	14	MACH TRIM	11	R WINDOW HEAT	15
APU PUMP	13	HYD PUMP 3A	14	MAIN BATT OFF	7	R WING A/I	15
APU SOV FAIL	13	HYD PUMP 3B	14	MLG OVHT FAIL	16	R WSHLD HEAT	15
APU SOV OPEN	13	HYD SOV 1 OPEN	14	NO STRTR CUTOUT	20	R XFER SOV	13
APU SQB	10	HYD SOV 2 OPEN	14	OB BRAKE PRESS	16	SLATS FAIL	11
A/SKID INBD	16	IB BRAKE PRESS	16	OB FLT SPLRS	11	SPOILERONS ROLL	11
A/SKID OUTBD	16	IB FLT SPLRS	11	OB GND SPLRS	11	STAB TRIM	11
AUTO PRESS	8	IB GND SPLRS	11	OB SPOILERONS	11	STAB TRIM LIMIT	11
AV BAY DOOR	6	IB SPOILERONS	11	OVBD COOL	8	STALL FAIL	11
AVIONICS FAN	8	ICE	15	OXY LO PRESS	9	STBY PITOT HEAT	15
BATTERY BUS	7	ICE DET FAIL	15	PARK BRAKE SOV	16	STEERING INOP	16



**AURAL/VISUAL INDICATING AND
RECORDING**
Engine Indicating and Crew Alerting System

Vol. 1

02-20-15

REV 1, Jan 13/03

Message	Ch.	Message	Ch.	Message	Ch.	Message	Ch.
BLEED MISCONFIG	19	IDG 1	7	PASS OXY ON	9	TAT PROBE HEAT	15
BULK FUEL TEMP	13	IDG 2	7	PAX DR LATCH	6	WING A/I SNSR	15
CABIN ALT	8	ISOL FAIL	19	PAX DR OUT HNDL	6	WING XBLEED	15
CARGO BTL LO	10	L AFT EMER DOOR	6	PITCH FEEL	11	WOW INPUT	16
CTR CARGO DOOR	6	L AOA HEAT	15	PROX SYS CHAN	16	WOW OUTPUT	16
DC BUS 1	7	L BLEED DUCT	19	PROX SYSTEM	16	XFLOW PUMP	13
DC BUS 2	7	L BLEED LOOP	19	R AFT EMER DOOR	6	YAW DAMPER	11
DC EMER BUS	7	L COWL A/I	15	R AOA HEAT	15		
DC ESS BUS	7	L COWL A/I OPEN	15	R BLEED DUCT	19		
DC SERV BUS	7	L COWL LOOP	19	R BLEED LOOP	19		
DISPLAY COOL	8	L ENG BLEED	19	R COWL A/I	15		
EFIS COMP INOP	12	L ENG DEGRADED	20	R COWL A/I OPEN	15		
EFIS COMP MON	12	L ENG FLAMEOUT	20	R COWL LOOP	19		
ELEVATOR SPLIT	11	L ENG SOV CLSD	13	R ENG BLEED	19		



H. EICAS Advisory Messages (Green)

Message	Chapter
ADS HEAT TEST OK	15
APU SOV CLSD	13
COWL A/I ON	15
CPLT ROLL CMD	11
ENGS HI PWR SCHED	20
FDR EVENT	2
FIRE SYS OK	10
FLAPS EMER	11
FLT SPLR DEPLOY	11
GLD MAN ARM	11
GND SPLR DEPLOY	11
GRAV XFLOW OPEN	13
HYD SOV 1 CLOSED	14
HYD SOV 2 CLOSED	14
ICE	15
L AUTO IGNITION	20
L COWL A/I ON	15
L ENG SOV CLSD	13
L FUEL PUMP ON	13
L REV ARMED	20
PARKING BRAKE ON	16
PLT ROLL CMD	11
R AUTO IGNITION	20
R COWL A/I ON	15
R ENG SOV CLSD	13
R FUEL PUMP ON	13
R REV ARMED	20
SPLR/STAB IN TEST	11
T/O CONFIG OK	2
WING A/I ON	15
WING/COWL A/I ON	15



I. EICAS Status Messages (White)

Message	Ch.	Message	Ch.	Message	Ch.
AC 1 AUTOXFER OFF	7	GLD MAN DISARM	11	PITCH FEEL FAULT	11
AC 2 AUTOXFER OFF	7	GPWS FAIL	18	PROX SYS FAULT 1	16
AC ESS ALTN	7	GRAV XFLOW FAIL	13	PROX SYS FAULT 2	16
ACARS CALL	<1214 >5	GS CANCEL	18	RAM AIR OPEN	8
ACARS MESSAGE	<1214 >5	HGS FAIL	18	R AUTO XFLOW ON	13
ACARS NOCOMM	<1214>5	HORN MUTED	16	R COWL A/I DUCT	15
ADG AUTO FAIL	7	IAPS DEGRADED	3	RECIRC FAN FAULT	8
ADG FAIL	7	IAPS OVERTEMP	3	RECIRC FAN OFF	8
AFT CARGO SOV	8	IB FLT SPLR FAULT	11	R ENG BLEED CLSD	19
APU ALT LIMIT	4	IB GND SPLR FAULT	11	R ENG BLEED SNSR	19
APU BATT CHGR	7	IB SPLRONS FAULT	11	R ENGINE START	20
APU FAULT	4	ICE DET 1 FAIL	15	R ENG SHUTDOWN	20
APU IN BITE	4	ICE DET 2 FAIL	15	R ENG SOB	10
APU LCV OPEN	19	IDG 1 DISC	7	R FADEC FAULT 1	20
APU SOV OPEN	13	IDG 2 DISC	7	R FADEC FAULT 2	20
APU START	4	IRS 1 IN ATT	12 <1025>	R IGN A FAULT	20
A/SKID FAULT	16	IRS 2 IN ATT	12 <1025>	R IGN B FAULT	20
AUTO PRESS 1 FAIL	8	IRS 1 OVERTEMP	12 <1025>	R ITT EXCEEDED B	20
AUTO PRESS 2 FAIL	8			R ITT EXCEEDED B1	20
AUTO PRS 1/2 FAIL	8	ISOL CLOSED	19	R ITT EXCEEDED C	20
AUTO XFLOW INHIB	13	ISOL OPEN	19	R MLG FAULT	16
BLEED CLOSED	19	L AUTO XFLOW ON	13	R OIL LEVEL LO	20
BLEED MANUAL	19	L COWL A/I DUCT	15	R PACK FAULT	8
CABIN ALT WARN HI	8	L ENG BLEED CLSD	19	R PACK OFF	8
CABIN PRESS MAN	8	L ENG BLEED SNSR	19	R RARV FAULT	8
CABIN TEMP MAN	8	L ENGINE START	20	R REV FAULT	20
CAS MISCOMP	2	L ENG SHUTDOWN	20	R THROTTLE FAULT	20
CKPT TEMP MAN	8	L ENG SOB	10	RUD LIMIT FAULT	11
CONT IGNITION	20	L FADEC FAULT 1	20	R VIB FAULT	20
CPAM FAIL	8	L FADEC FAULT 2	20	R XFLOW ON	13
DC CROSS TIE CLSD	7	L IGN A FAULT	20	SEAT BELTS	17
DC ESS TIE CLSD	7	L IGN B FAULT	20		
DC MAIN TIE CLSD	7	L ITT EXCEED B	20	SLAT FAULT	11
DCU 1 AURAL INOP	2	L ITT EXCEED B1	20	SLATS HALFSPEED	11



**AURAL/VISUAL INDICATING AND
RECORDING
Engine Indicating and Crew Alerting System**

Vol. 1

02-20-18

REV 3, May 03/05

Message	Ch.	Message	Ch.	Message	Ch.
DCU 2 AURAL INOP	2	L ITT EXCEED C	20	SPEED REFS INDEP	3
DCU 1 INOP	2	L MLG FAULT	16	SPLR/STAB FAULT	11
DCU 2 INOP	2	L OIL LEVEL LO	20	SSCU 1 FAULT	11
DUCT MON FAULT	19	L PACK FAULT	8	SSCU 2 FAULT	11
EMER LTS ON	17	L PACK OFF	8	STAB CH 1 INOP	11
ENG SYNC OFF	20	L RARV FAULT	8	STAB CH 2 INOP	11
ESS TRU 1 FAIL	7	L REV FAULT	20	STAB FAULT	11
ESS TRU 2 FAIL	7	L THROTTLE FAULT	20	STEERING DEGRADED	16
ESS TRU 2 XFER	7	L VIB FAULT	20	TERRAIN FAIL	18
FD 1 FAIL	3	L XFLOW ON	13	TERRAIN NOT AVAIL	18
FD 2 FAIL	3	MAIN BATT CHGR	7	TERRAIN OFF	18
FDR ACCEL FAIL	2	MAN XFLOW	13	TRU 1 FAIL	7
FDR FAIL	2	MDC FAULT	2	TRU 2 FAIL	7
FIRE SYS FAULT	10	MLG FAULT	16	TRU FAN FAIL	7
FLAP FAULT	11	NO SMOKING	17	VHF 3 VOICE	5
FLAPS HALFSPEED	11	OB FLT SPLR FAULT	11	WINDSHEAR FAIL	18
FLUTTER DAMPER	11	OB GND SPLR FAULT	11	WING A/I FAULT	15
FUEL CH 1 FAIL	13	OB SPLRONS FAULT	11	WING XBLEED OPEN	15
FUEL CH 2 FAIL	13	OUTFLOW VLV OPEN	8	YD 1 INOP	11
FUEL QTY DEGRADED	13	OVBD COOL FAIL	8	YD 2 INOP	11

J. Inhibits

During the initial take-off, final take-off and landing phases, the DCUs will process inhibit logic to minimize intermittent or distracting warning or caution messages.

(1) Initial Take-off Phase

The initial take-off inhibits are enabled when:

- Left and right engine N₁ is greater than 79%,
- weight-on-wheels, and airspeed is less than 100 knots.

The initial take-off inhibit is removed when:

- Left and right engine N₁ is less than 67.6%, or
- Airplane is in the final take-off phase.

	AURAL/VISUAL INDICATING AND RECORDING Engine Indicating and Crew Alerting System	Vol. 1	02-20-19
		REV 1, Jan 13/03	

(2) Final Take-off Phase

The final take-off inhibits are enabled when:

- Left and right engine N_1 is greater than 79%, and
- airspeed transitions to greater than 100 knots.

The final take-off inhibit is removed when:

- Left and right engine N_1 is less than 67.6%, or
- Radio altitude is greater than 400 ft AGL, or
- 30 seconds after ground to air transition.

(3) Landing Phase

Landing phase inhibits are enabled when:

- Radio altitude transitions to less than 400 ft AGL, and
- landing gear down and locked.

The landing phase inhibit is removed when:

- 30 seconds after air to ground transition or
- Radio altitude transitions from less than 400 ft to greater than 400 ft.



K. Warning Inhibits

The following warning messages, their corresponding lights and aural are inhibited during initial take-off:

Airplane System	Warning Message (Inhibited during take-off)	Aural (Inhibited during take-off)
Environmental Control System	CABIN ALT	Cabin Pressure
Flight Controls		Overspeed Clacker
Landing Gear	GEAR DISAGREE NOSE DOOR OPEN	Gear Disagree Nose Door

The following warning messages, their corresponding lights and aural are inhibited during approach:

Airplane System	Warning Message (Inhibited during approach)	Aural (Inhibited during approach)
Auxiliary Power Unit	APU OVERTEMP	APU
Doors	PASSENGER DOOR	Door
Environmental Control System	CABIN ALT DIFF PRESS	Cabin Pressure Cabin Pressure
Ice and Rain Protection	ANTI-ICE DUCT L COWL A/I DUCT R COWL A/I DUCT WING OVHT	Anti-Ice Duct Anti-Ice Duct Anti-Ice Duct Wing Overheat
Landing Gear	NOSE DOOR OPEN	Nose Door
Power Plant	L ENG OIL PRESS R ENG OIL PRESS	Engine Oil Engine Oil



L. Caution Inhibits

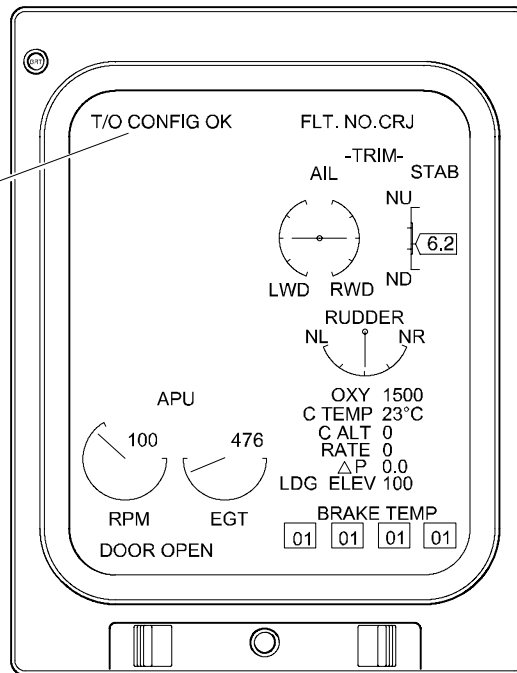
All caution messages and their corresponding lights (if applicable) are inhibited during take-off and/or landing except the following:

Airplane System	Caution Message (Not Inhibited)	
Automatic Flight Control System	YAW DAMPER	
Auxiliary Power Unit	APU LCV CLSD	
Fire Protection	FIRE SYS FAULT	
Flight Controls	GLD NOT ARMED GLD UNSAFE GND SPLR DEPLOY IB (OB) FLT SPLRS IB (OB) GND SPLRS IB (OB) SPOILERONS	PITCH FEEL RUD LIMITER SLATS FAIL SPOILERONS ROLL STAB TRIM STAB TRIM LIMIT STALL FAIL
Flight Instruments	EFIS COMP MON	
Hydraulic Power	HYD 1 (2) (3) LO PRESS	
Ice and Rain Protection	ICE ICE DET FAIL	L (R) COWL A/I OPEN L (R) WING A/I
Landing Gear	A/SKID INBD (OUTBD) IB (OB) BRAKE PRESS	PROX SYSTEM WOW INPUT (OUTPUT)
Pneumatic	ANTI-ICE DUCT L (R) BLEED DUCT	L (R) COWL LOOP
Power Plant	L (R) ENG FLAMEOUT L (R) ENG SRG CLSD L (R) FADEC L (R) FADEC OVHT	L (R) REV INOP L (R) REV UNLOCKED L (R) REV UNSAFE

M. Take-Off Configuration Warning

Take-off configuration warnings are armed when the airplane is on the ground and both engines are accelerated towards take-off thrust (N_1 greater than 70%).

T/O CONFIG OK advisory (green)
Indicates that the airplane is in a proper take-off configuration. Message goes out upon airplane rotation.



Status Page

Take-Off Configuration Advisory
Figure 02-20-9



**AURAL/VISUAL INDICATING AND
RECORDING**
Engine Indicating and Crew Alerting System

Vol. 1

02-20-23

REV 1, Jan 13/03

The following systems / conditions are checked:

Condition	Voice Message	EICAS Message
Autopilot engaged	Config Autopilot	CONFIG AP
Flaps not in take-off position	Config Flaps	CONFIG FLAPS
All spoilers not in take-off position (down)	Config Spoilers	CONFIG SPLRS
Horizontal stabilizer outside of take-off range ("green band")	Config Trim	CONFIG STAB
Parking brake set (brake valve closed)	Config Brakes	PARKING BRAKE
Rudder trim outside of take-off range (trim > ±1 degree)	Config Trim	CONFIG RUDDER
Aileron trim outside of take-off range (trim > ±1 degree)	Config Trim	CONFIG AILERON

If the airplane is in an unsafe take-off configuration, configuration aural and warning messages, and both MASTER WARNING lights come on.

All configuration warning indications are cancelled when the configuration error is corrected.

CONFIG AP warning (red)

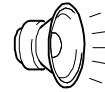
Indicates that the autopilot is engaged with the airplane configured for take-off.



CONFIG AUTOPILOT

CONFIG AILERON warning (red)

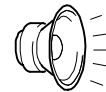
Indicates that aileron trim is outside of the take-off range.



CONFIG TRIM

CONFIG FLAPS warning (red)

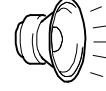
Indicates that flaps are not in a take-off position with the airplane configured for take-off.



CONFIG FLAPS

CONFIG RUDDER warning (red)

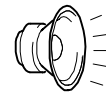
Indicates that rudder trim is outside of the take-off range.



CONFIG TRIM

CONFIG SPLRS warning (red)

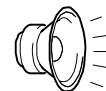
Indicates that flight spoilers are not retracted with the airplane configured for take-off.



CONFIG SPOILERS

CONFIG STAB warning (red)

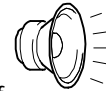
Indicates that the horizontal stab trim is outside of the take-off range.



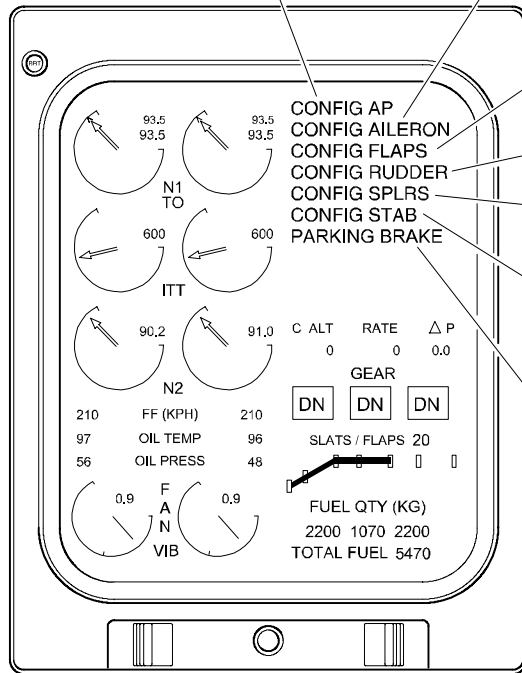
CONFIG TRIM

PARKING BRAKE warning (red)

Indicates that the parking brake is set with the airplane configured for take-off.



CONFIG BRAKES



Primary Page

Take-Off Configuration Warning <1001>
Figure 02-20-10

	AURAL/VISUAL INDICATING AND RECORDING Engine Indicating and Crew Alerting System	Vol. 1	02-20-25
		REV 3, May 03/05	

N. Landing Configuration Warning

The landing gear horn will sound 2 minutes after ground to air transition with any landing gear not down and locked, if one of the follow conditions exists:

- Radio altitude is less than 500 ft AGL with both throttles at less than maximum landing setting or with flaps greater than 30 degrees

or

- Both throttles are at less than maximum landing setting or any one throttle is at IDLE with the landing gear warning horn muted

and

- Airspeed is less than 170 knots with flaps greater than 30 degrees or airspeed is less than 190 knots with flaps and slats at 0

and

- Radio altimeter or throttle is not valid

or

- Radio altitude is less than 1000 ft AGL with a vertical speed less than -400 ft/min

and

- No windshear warning or a windshear warning with a windshear monitor failure

or

- Radio altitude is less than 1000 ft AGL with vertical speed or GPWS not valid

NOTE

The landing gear horn may be muted with one thrust lever at IDLE and the landing gear not in the down and locked position. Refer to Chapter 16, Landing Gear.

The "Too low gear" aural warning is heard if any landing gear is not down and locked with the radio altitude less than 500 ft AGL and the indicated airspeed at less than 190 knots.

	Flight Crew Operating Manual CSP C-013-067	
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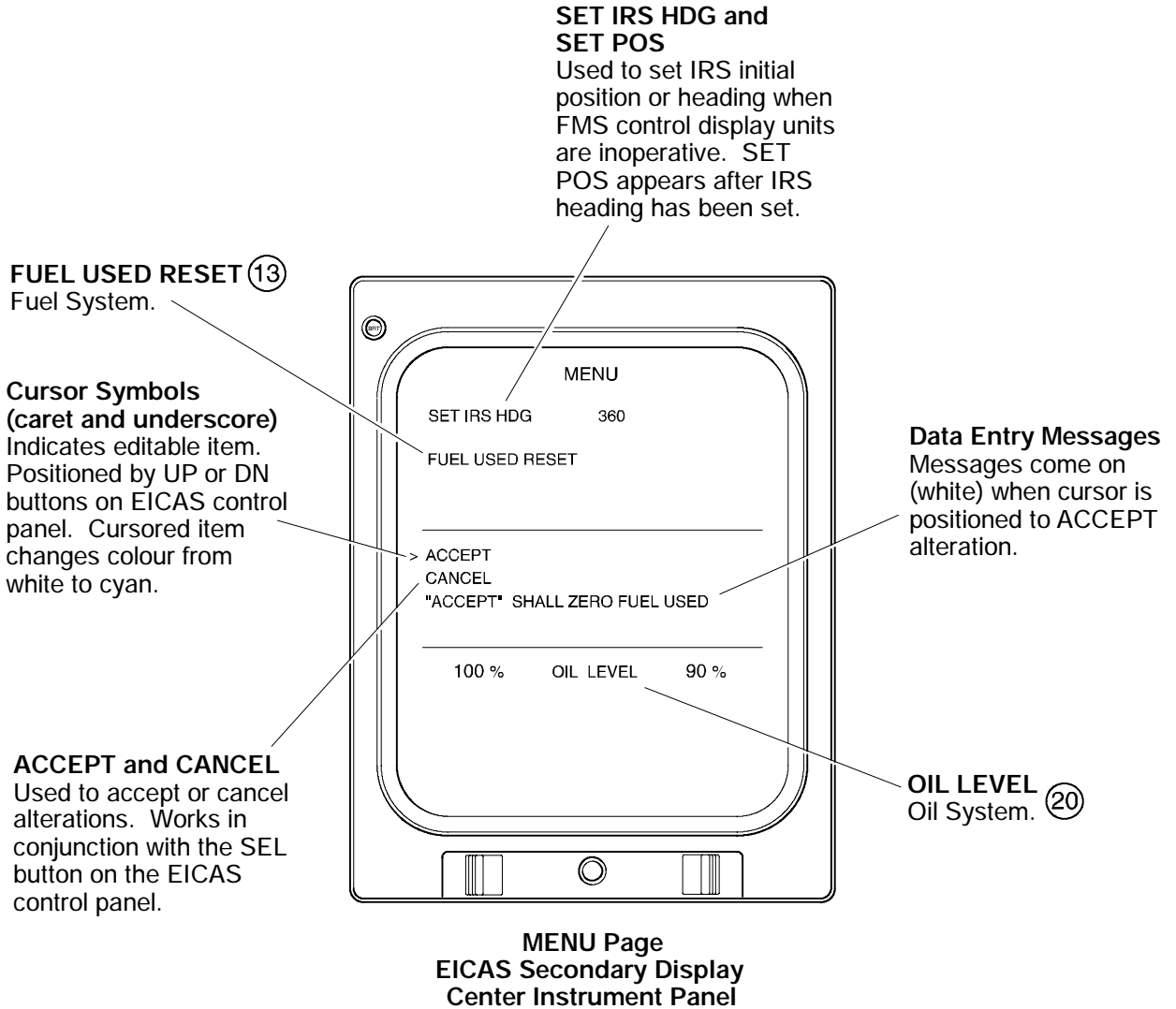


O. MENU Page

The MENU page is divided into three sections: menu section, confirmation section and parameter readout. A cursor on the left side of the screen is controlled by the UP/DN buttons on the EICAS control panel (ECP). The SELECT button on the ECP is used to select an line item.

The menu list contains a single FUEL USED RESET line. When the line is selected, the ACCEPT/CANCEL selections in the confirmation section are used to accept or cancel the request to reset to zero the "Fuel Used" indication, on the FUEL synoptic page.

The parameter readouts section contains the engine OIL LEVEL indications.



○ Indicates Chapter in which information on item may be found.

Menu Page <1025>
Figure 02-20-11



P. System Circuit Breakers

SYSTEM	SUB-SYSTEM	CB NAME	BUS BAR	CB PANEL	CB LOCATION	NOTES
EICAS	Primary Display	EICAS PRIM DISPL	DC BUS 1	1	H3	
			BATTERY BUS	2	Q5	
	Secondary Display	EICAS SEC DISPL	DC BUS 1	1	H4	
			BATTERY BUS	2	Q6	
	Control Panel	EICAS CONT PNL	BATTERY BUS	2	Q7	
	Lamp Driver Unit	EICAS LDU L	DC BUS 1	1	H5	
		EICAS LDU R	BATTERY BUS	2	Q8	
	Bright / Dim Power Supply	EICAS BRT / DIM PWR SUP 1	DC BUS 1	1	H6	
			BATTERY BUS	2	Q10	
		EICAS BRT / DIM PWR SUP 2	DC BUS 1	1	H7	
			BATTERY BUS	2	Q11	
	DCU 1	EICAS DCU 1	DC ESSENTIAL	2	U8	
			BATTERY BUS		Q1	
	DCU 2	EICAS DCU 2	BATTERY BUS		Q2	

	AURAL/VISUAL INDICATING AND RECORDING Recording	Vol. 1	02-30-1
		REV 1, Jan 13/03	

1. RECORDING

A flight data recorder (FDR) records aircraft systems data (including altitude, airspeed, position, heading, acceleration and radio communications events). The FDR provides a digital record of aircraft data for the last 25 hours of aircraft operation. The FDR normally receives data from data concentrator unit No.1 (DCU 1), records the information and sends it back to the DCU1 for comparison. If DCU 1 fails, DCU 2 will supply the data to the FDR.

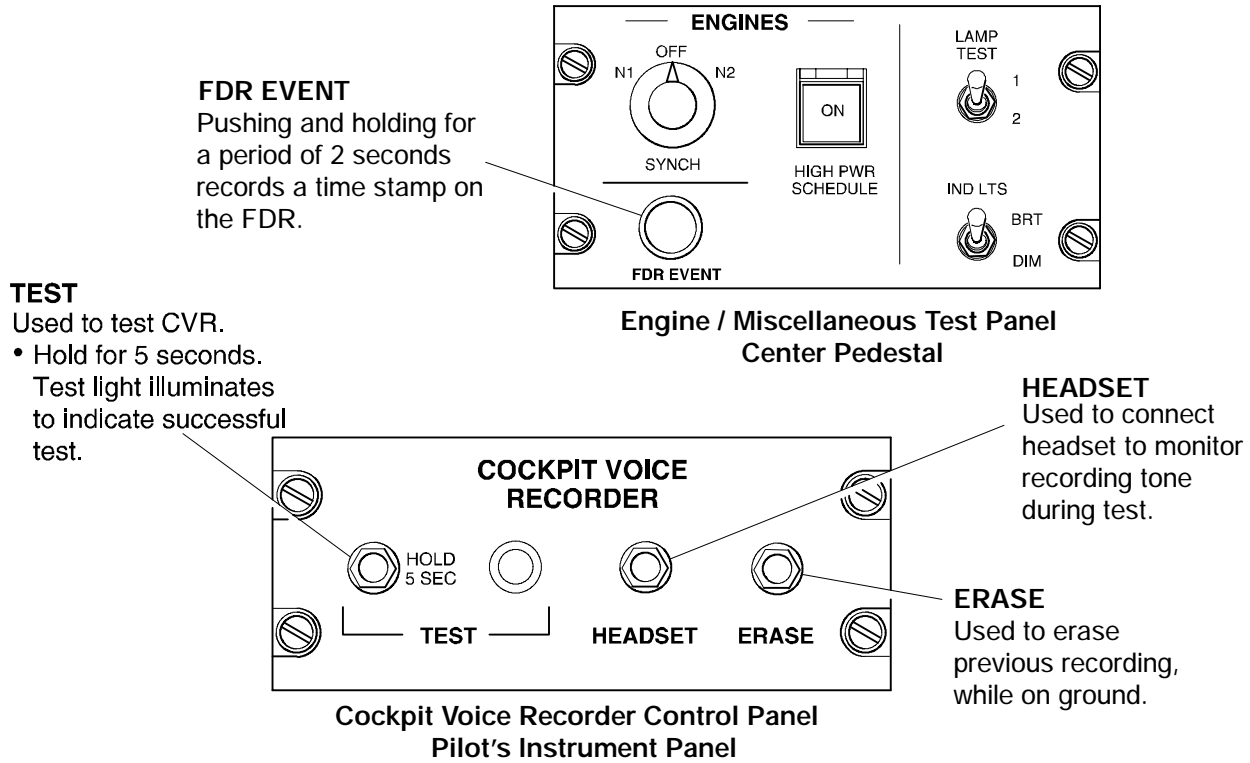
The FDR will operate when the STROBE lights switch or BEACON lights switch is selected on, or if the aircraft is in a weight off wheels condition. The FDR has an internal clock which is used as the time reference from which events are recorded. An event can be marked by the pilot by operation of a FDR EVENT button on the Engine/Miscellaneous test panel.

A cockpit voice recorder (CVR) starts recording as soon as power is applied to the aircraft. It has a solid state non-volatile memory with the capacity to record the last 120 minutes of cockpit and mixed PA audio. The deceleration of impact removes the power to prevent erasure of the data. <1065>

The FDR and CVR each includes an underwater locator device (ULD). The ULD is a battery operated, underwater, pulsed acoustic beacon which has an internal switch that is activated by water. When activated, the unit sends out a 36.5 to 38.5 kilohertz signal.

A quick access recorder (QAR), located in the underfloor avionics bay, operates under the same conditions as the FDR. The QAR receives flight data from the data concentrator unit (DCU) that is not supplying data to the FDR. The data is stored in files on a removable disk. <1204>

	Flight Crew Operating Manual CSP C-013-067	
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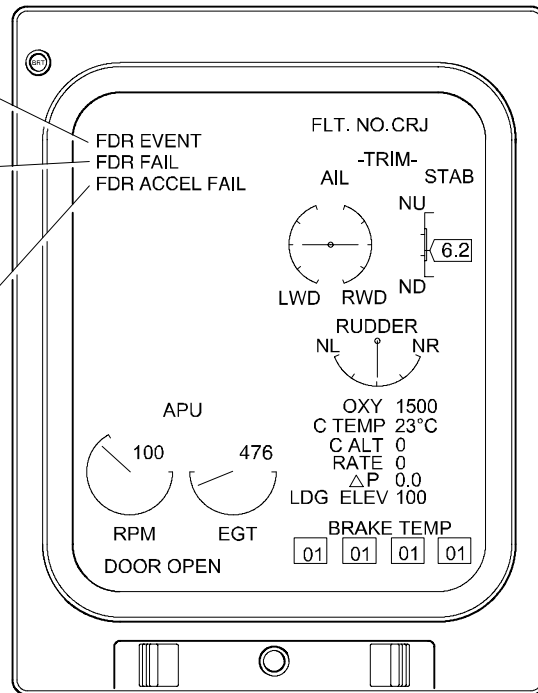


Recording
Figure 02-30-1

FDR EVENT advisory (green)
Indicates that a FDR EVENT was selected.

FDR FAIL status (white)
Indicates a difference between the recorded data and the data supplied by the DCU.

FDR ACCEL FAIL status (white)
Indicates a FDR accelerometer failure.



Status Page

Recording – EICAS Indications
Figure 02-30-2



**AURAL/VISUAL INDICATING AND
RECORDING
Recording**

Vol. 1

02-30-4

REV 1, Jan 13/03

A. System Circuit Breakers

SYSTEM	SUB-SYSTEM	CB NAME	BUS BAR	CB PANEL	CB LOCATION	NOTES
Recording	Flight Data Recorder	FLIGHT REC PWR	AC BUS 1	1	C9	
		FLIGHT REC CONT	DC BUS 1		E14	
	Cockpit Voice Recorder	CKPT VOICE REC	DC ESSENTIAL	2	V7	
	Quick Access Recorder <1204>	QAR	AC BUS 2		C13	

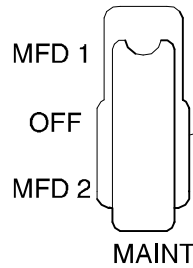
	AURAL/VISUAL INDICATING AND RECORDING Maintenance Data Computer	Vol. 1	02-40-1
		REV 1, Jan 13/03	

1. MAINTENANCE DIAGNOSTIC SYSTEM

The maintenance diagnostic system is used by maintenance personnel to view current and historical information relating to specific aircraft systems health and operation.

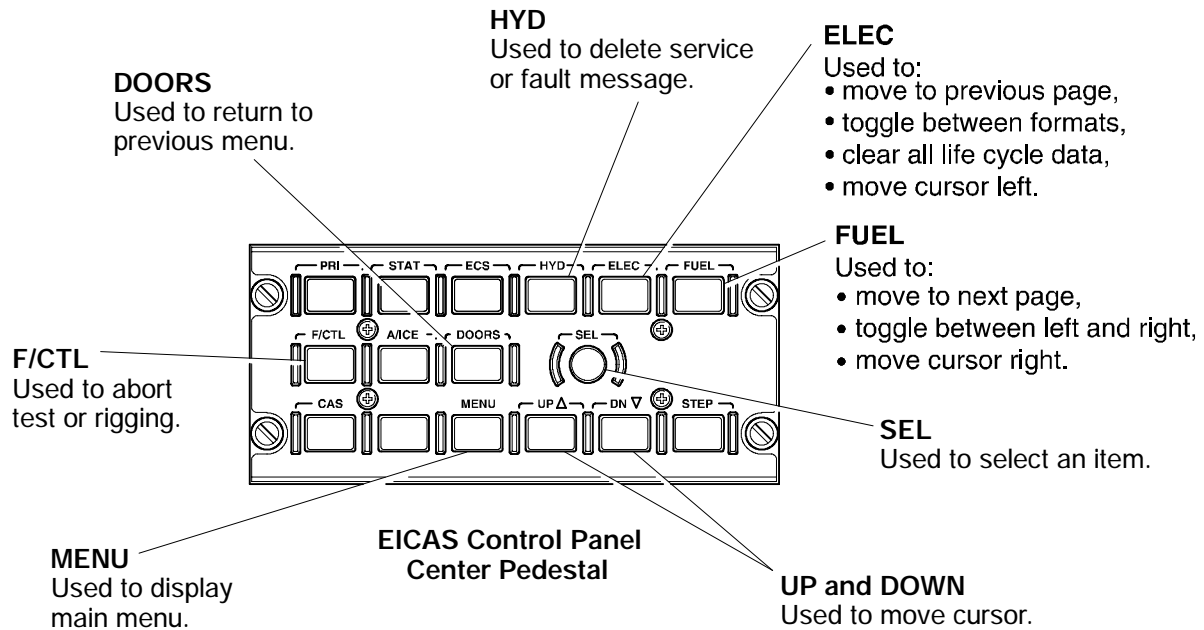
The system uses a maintenance diagnostic computer (MDC) to process and record avionics and aircraft systems data for future retrieval. A maintenance switch, located behind the pilot's seat, is used to enter the maintenance diagnostics mode. The multifunctional displays (MFD) are used to display the maintenance data and the EICAS control panel is used to control and select information on the MFD display. A data loader unit is used to upload or download data to or from a floppy disk.

When the maintenance switch is set to MFD1 or MFD2, the applicable MFD is configured to display maintenance related display pages and the EICAS control panel is configured as a maintenance page control panel.



MAINT (Guarded)
Used to select the appropriate MFD for maintenance diagnostics.

**Maintenance Switch
Behind Pilot's Seat**



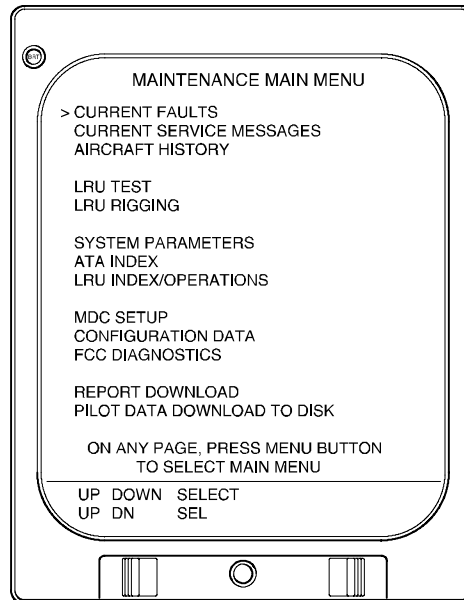
Maintenance Data Computer – Controls
Figure 02-40-1

	AURAL/VISUAL INDICATING AND RECORDING Maintenance Data Computer	Vol. 1	02-40-3
		REV 1, Jan 13/03	

A. Maintenance Main Menu Overview

- Current Faults - Displays fault(s) currently detected by the MDC and failure messages reported by the DCU.
- Current Service Messages - Displays maintenance messages received from the DCU.
- Aircraft History - Provides access to history displays for faults, service messages, engine excellence and engine trends. Also used to access life cycle data and flight leg summary.
- LRU Testing - Used to initiate an line replaceable unit (LRU) test and display test results.
- LRU Rigging - Used to initiate the LRU programming procedure.
- System Parameters - Displays airplane system parameters.
- ATA Index - Displays list of ATA chapter numbers for all aircraft and avionics systems.
- LRU Index/Operations - Displays a list of LRUs and is used to select any associated test or rigging procedure.
- MDC Setup - Used to set aircraft identification and clock. Also used to load files.
- Configuration Data - Used to access the configuration of the integrated avionics processor system (IAPS) computers and to check the MDC version information.
- FCC Diagnostic - Displays instructions to put flight control system into diagnostic mode.

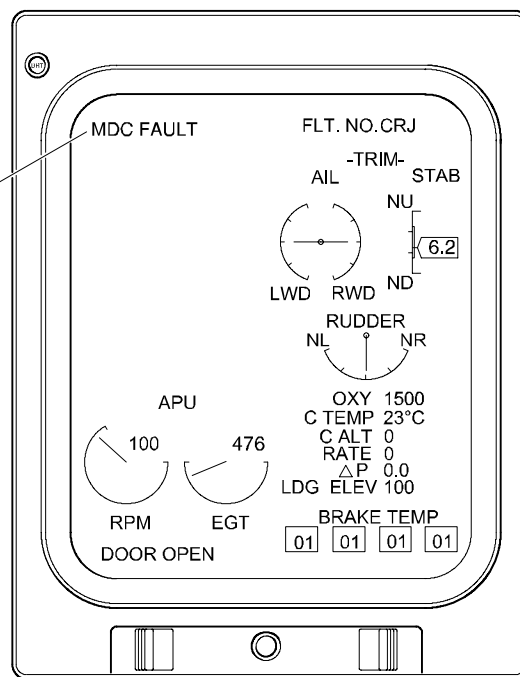
	Flight Crew Operating Manual CSP C-013-067	
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**Maintenance Main Menu Page
Multifunction Display**

**Maintenance Main Menu EICAS Page
Figure 02-40-2**

MDC FAULT status (white)
Indicates that a fault has been detected in the MDC.

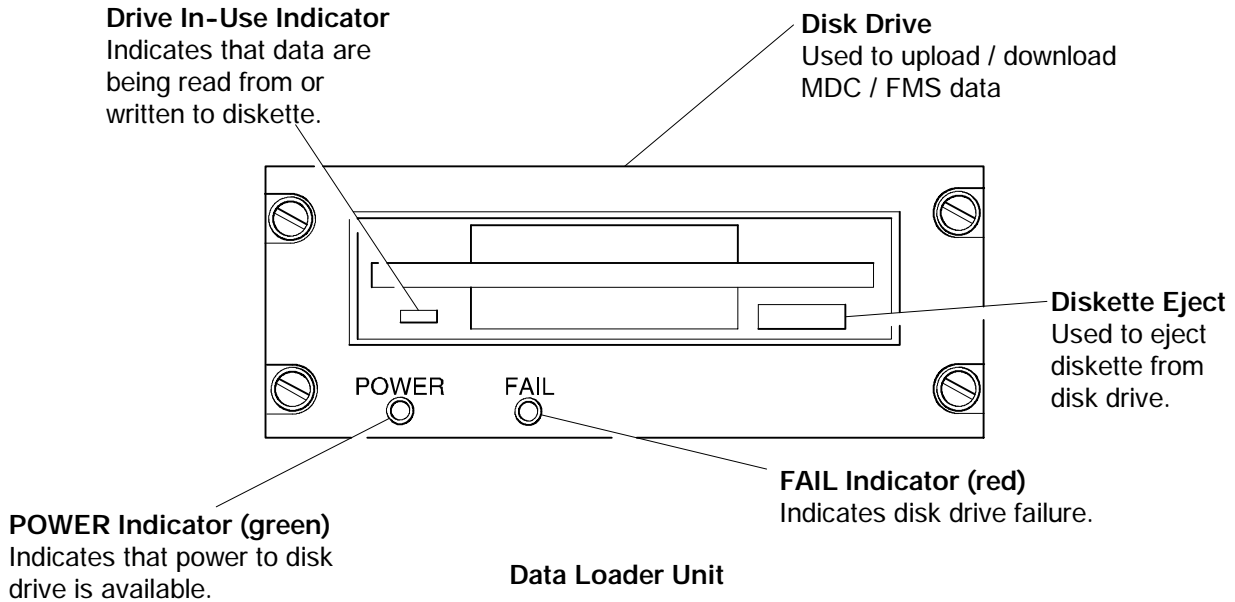


Status Page

**MDC Fault Indication
Figure 02-40-3**

B. Data Loader Unit

The data loader unit is located in the top of the forward entrance compartment. Through the download function from the MENU page, the unit enables the transfer of data files, between DOS-compatible diskettes and applicable aircraft systems. The data loader unit provides the capability to format disks, read directories and read/write files. <1018>



NOTE

Indicators are not dimmable.

Data Loader Unit <1018>
Figure 02-40-4

C. System Circuit Breakers

SYSTEM	SUB-SYSTEM	CB NAME	BUS BAR	CB PANEL	CB LOCATION	NOTES
Maintenance Data Computer	Data Loader	DATA LOAD	DC BUS 1	1	H10	
	MDC	IAPS L AFCS / MDC	BATTERY BUS	2	P6	