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2.4 ALERTING SYSTEM

The EIS alerting system provides the crew with alerts for system operating information, faults, failures, configuration disagreements and automatic or pilot selected system operation. Some of these alerts provide information describing the consequences of these events on aircraft operation. The EIS alerting system consists of the Master Warning and Master Caution lights, Engine and Alert Display (EAD), System Display (SD), System Control Panel (SCP), and the Aural Attention Tone of some Level 3 alerts. Alert level messages and their display areas on the EAD and SD are described in this section. SCP operation is described in Section 2.3.3.

2.4.1 Alert Levels

There are four alert levels. They are:

▷CRG FIRE LWR FWD	Level 3 – Emergency/Warning
HYD 1 OFF	Level 2 – Abnormal, crew action required
TAIL FUEL FWD	Level 1 – Abnormal, No crew action required
IRU IN ALIGN	Level 0 – Advisories

Level 3 Alerts – Emergency/Warning: Level 3 alerts require immediate crew awareness and immediate crew action and/or impose specific limitations on the aircraft. Level 3 alerts have the highest priority and are not to be overwritten by any other alerts. They are displayed as a RED boxed alert with a leading triangle. The latest RED alert is placed at the top left of the alert area as shown in Figure 2-95.

Level 3 alerts illuminate the RED Master Warning Lights on the GCP and the appropriate associated WHITE cue light on the SCP. Pushing the master warning light resets (turns off) the illuminated master warning light. Pushing the SCP's associated switch/light resets (turns off) the master warning light and the illuminated cue light but retains the RED boxed alert on the EAD or SD. Level 3 alerts may activate an aural annunciation, such as, (say out loud), "engine one fire".

Level 2 Alerts – Abnormal, Crew Action Required: Level 2 alerts indicate abnormal systems operation (cautions) which require immediate crew awareness and subsequent

corrective action by the crew. Level 2 alerts are displayed as an AMBER boxed alert which is placed under Level 3 alerts with priority over Level 1 and 0 alerts. The latest AMBER boxed alert is added to the top of the Level 2 list. (See Figure 2-95.)

Level 2 alerts illuminate the AMBER Master Caution light on the GCP and the appropriate associated WHITE cue light on the SCP. Pushing the master caution light resets the illuminated master caution light. Pushing the illuminated cue switch/light resets the master caution and cue light and may reset the alert to a reminder message. The specific system display retains display of the reset Level 2 alert.

Level 1 Alerts – Abnormal, NO Crew Action

Required: Level 1 alerts indicate abnormal systems operation (cautions) which require crew awareness but do not generally require pilot action. Level 1 alerts are displayed as an AMBER alert which is placed under any Level 3 or 2 alerts with priority over Level 0 alerts. The latest AMBER alert is added to the top of the Level 1 list. (See Figure 2-95.)

Some Level 1 alerts may illuminate the master caution, others may not, some only cause the EAD "reminder" light to flash and still others of lesser importance only appear on the EAD, the Synoptic or on the Status page. In all cases, the system cue light illuminates. Pushing the cue light resets the master caution or stops the flashing reminder light as appropriate, and calls up the system synoptic.

Level 0 Alerts – Advisory: Level 0 alerts have the lowest priority and are displayed as CYAN messages starting above the reminder messages. They are generally operational status indications or aircraft systems status information. The latest Level 0 advisory is added to the top of the Level 0 list.

2.4.2 EAD Alert Display

The EAD contains an alert area in the lower one third of its display surface. The EAD alert area consists of two columns of six alerts (left and center), one column of four alerts (right) and reminder messages displayed at the bottom right of the engine display. At the bottom of the center column, WHITE takeoff and landing essential checklist items or a GREEN box can be displayed. Figure 2-95 shows the EAD alert area.

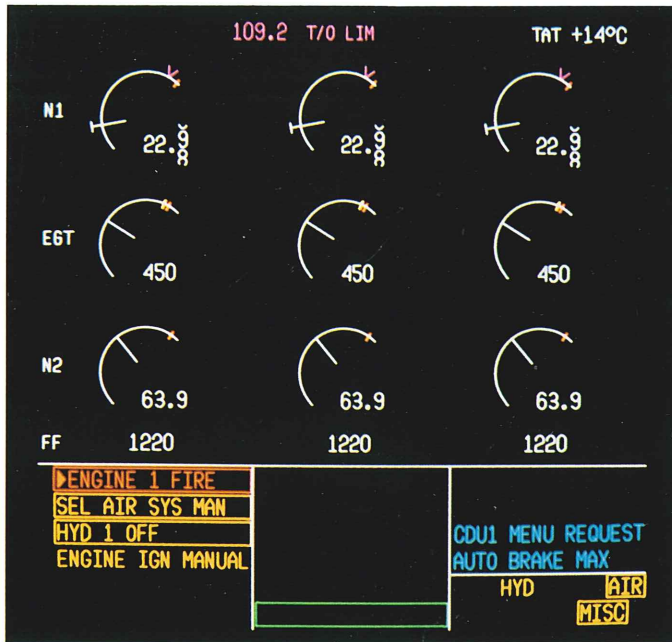


Figure 2-95
EAD Alert Display

RED Level 3 warnings and AMBER Level 2 or 1 caution messages may be displayed in any EAD area, except the reminder message area, in the lower right corner. CYAN Level 0 alerts (advisories) are displayed beginning in the right column. If there are more than 16 alerts to be displayed on the EAD, higher level alerts have priority over lower level alerts. 0 level alerts are displaced to make room for higher level alerts if needed. As alerts are reset, any displaced alerts reappear.

FUEL QTY FAULT	TNK 3 XFER PMP LO	BUS L EMER DC OFF
CARGO DOOR UPR A	TNK 1 XFER PMP LO	BUS R EMER AC OFF
BUS AC 3 OFF	GEN DRIVE 1 FAULT	BUS L EMER AC OFF
BUS AC 1 OFF	BUS DC 2 OFF	BUS AC 2 OFF
LSAS CHAN FAIL	BUS DC 1 OFF	HYD ELEC
DISARM SPOILERS	BUS R EMER DC OFF	FUEL CONFIG

Reminder Messages: Reminder messages for Level 2 or 1 alerts are SCP switch/light labels namely, ENG, HYD, ELEC, AIR, FUEL, CONFIG, or MISC displayed in the lower right message area of the EAD (see Figure 2-95). During some Level 1 alerts the reminder message flashes, though the master caution does not illuminate. Pressing the corresponding cue light causes the flashing to stop and brings up the appropriate synoptic. The original alert may be viewed on the system display anytime by pushing the switch/light corresponding to the reminder message.

Alerts Displayed: Where one failure may create multiple alerts, only the highest order alert is normally displayed on

the EAD. For example, if a generator bus fails, the generator trips off and the associated AC bus does not operate with the following three alerts detected by the alerting system:

GEN BUS 1 FAULT
GEN 1 OFF
BUS AC 1 OFF

Partially Inhibited Alert: Only the “GEN BUS 1 FAULT” is displayed on the EAD with the “ELEC” reminder message displayed for the other two. The GEN BUS 1 FAULT may be reset to a reminder message and all three alerts may be viewed on the ELEC system display by pushing the ELEC light/switch.

Partially Inhibited Alert: It is possible that an alert displayed on the EAD may have an associated alert that is not shown as a reminder but may be viewed on the associated system display. For example, when the Galley Bus is not powered because Generator 1 is faulted, the “GEN BUS 1 FAULT” is displayed on the EAD with no reminder message for the associated “GALLEY BUS OFF” alert displayed on the Electric Synoptic.

Additionally, there are alerts which can appear on the EAD without illuminating the master warning, master caution or the SCP switch/light cue. For example, when the pilot selects manual operation on the hydraulic control panel, the “HYD SYS MANUAL” alert appears on display pages without illuminating the warning, caution or cue lights.

All alerts are displayed on the STATUS page.

Essential Checklist: Essential check list items are normally displayed at the bottom of the center column when V2 is entered and confirmed (or T/O CLAMP for 10 minutes) and two engines are started. Alerts are displaced to display the essential takeoff or landing checklist items or GREEN box indicating checklist compliance. The takeoff essential items checklist consists of the following ordered list of messages and conditions:

MESSAGE	CONDITION
STAB TRIM	Stab not in green band
SLAT	Slats not in takeoff position
FLAP	Flaps not in takeoff position
BRAKES	Parking brake on
SPOILERS	Spoilers not armed
	Checklist complied with

If the essential takeoff checklist items are not accomplished and takeoff is attempted, the box and displayed message (except spoilers which remain WHITE) turns RED. The essential items checklist is removed when the aircraft has an airspeed greater than 80 knots.

Below landing runway elevation + 1500 ft BARO and with landing flaps selected or the gear down, the EIS initiates a

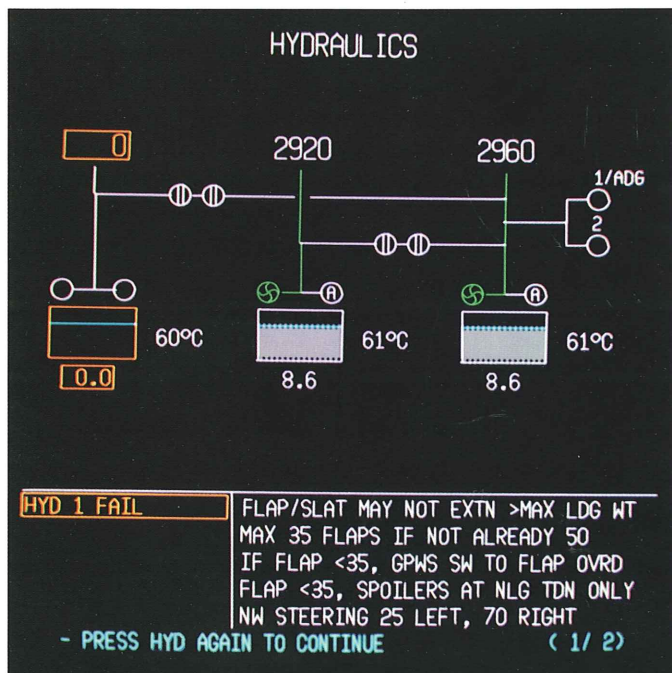
check of essential landing items. This checklist is displayed in the same manner as the takeoff checklist and includes:

MESSAGE	CONDITION
LANDING GEAR	Landing gear not down
FLAP	Flaps not in land position
SPOILERS	Spoilers not armed
	Checklist complied with

When all essential landing items have been complied with, an empty GREEN box is displayed until it is removed when the aircraft is on the ground.

2.4.3 System Display Alerts

Each System Display page shown by pushing the associated SCP cue light/switch (refer to Section 2.3.3) displays a system schematic (except MISC, STATUS and CONSEQUENCES pages) with about one third of the bottom display surface dedicated to Level 1, 2, or 3 alert messages and their consequences displayed in WHITE. Alerts are grouped by level and appear in the same order as they appear on the EAD. Consequences are aligned with the generating alerts on the system display as well as on the CONSEQ page. Figure 2-96 shows HYD alert display.

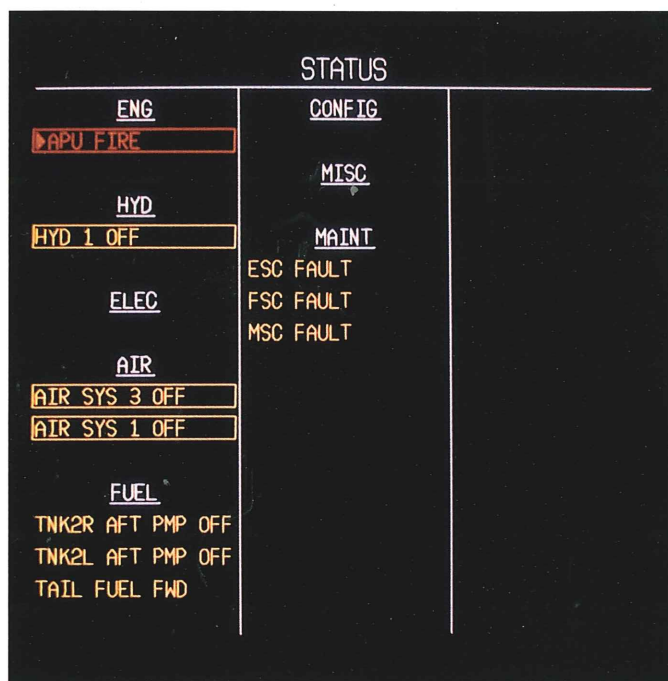


**Figure 2-96
SD Alert Display**

If more than 5 alerts or their consequences cannot be displayed on the first page, the "PRESS XXXXX AGAIN TO CONTINUE" is displayed at the bottom of the page. XXXXX is the page name such as HYD, ELEC, etc. and flashes until all pages pertaining to the current alert have been reviewed. To the right of this message near the corner, the page number/total pages are displayed in brackets such as "(2/3)". Pressing the cue switch/light advances the display to the next page. See Figures 2-96, 2-126, and 2-127 for examples.

2.4.4 Status Page

The Status page displays a list of all alerts included on the systems pages and is selected by pressing the STATUS cue switch/light on the SCP. The alerts are displayed in three columns grouped in the same order as the cue switch/lights on the SCP and reminder messages area. Alerts in each group are prioritized the same as the EAD. Maintenance faults are displayed after the MISC faults under the "MAINT" title. Maintenance alerts are all Level 1 and must be displayed on the first status page. Figure 2-97 shows the STATUS display page.



**Figure 2-97
STATUS Display Page**

The status page and all subsequent pages can display up to 51 alerts. Additional pages required to display all alerts are announced by the message, "PRESS STATUS AGAIN TO CONTINUE" with the same page identification scheme and page changing as the system displays (i.e., 1/3, 2/3, and 3/3).

2.4.5 Consequences Page

If a Level 3 or 2 alert has a consequence, it can be viewed on the Consequences page after pushing the SCP-CONSEQ cue. The alerts are grouped by level and appear in the same order as they appear on the EAD. Consequences are displayed adjacent to that alert. See Figure 2-98.

CONSEQUENCES	
PITOT HEAT AUX	STBY AIRSPEED/ALTIMETER UNRELIABLE
PITOT HEAT FO	SELECT ALTERNATE CADC
PITOT HEAT CAPT	SELECT ALTERNATE CADC
ENG IGN NOT ARMED	WHEN IGNITION DESIRED, USE OVRD

Figure 2-98
Consequences Display Page

Up to 17 alerts and 17 consequences can be displayed on a page with overflow displayed on subsequent pages. The "PRESS CONSEQ AGAIN TO CONTINUE" message at the bottom of the page indicates additional pages are available. Page identification (i.e., 2/3) and selection (pushing the cue switch) are the same as the EAD.

2.4.6 Miscellaneous Page

The Miscellaneous system page displays alerts and consequences for various uncategorized systems in text form only. The page is selected by pushing the MISC cue switch on the SCP. Alerts levels 3, 2 and 1 are displayed. Only consequences for levels 3 and 2 are displayed. (See Figure 2-99.)

Alerts Inhibits

NOTE: During takeoff and landing it is desirable to inhibit nonessential alerts in order to minimize distractions which could cause unneeded aborts or go-arounds.

The TAKEOFF inhibit begins at throttle advance where most alerts are prevented. Additional alerts are inhibited at 80Kts, V1 minus 20Kts, and at V1 speed.

MISCELLANEOUS	
PITOT HEAT AUX	STBY AIRSPEED/ALTIMETER UNRELIABLE
PITOT HEAT FO	SELECT ALTERNATE CADC
PITOT HEAT CAPT	SELECT ALTERNATE CADC
ENG IGN NOT ARMED	WHEN IGNITION DESIRED, USE OVRD
AOA HEAT R FAIL	
AOA HEAT L FAIL	
IRU OFF	

Figure 2-99
Miscellaneous Display Page

The inhibit period on takeoff continues until above 1000 feet AGL or beyond a 2-minute time limit starting at throttle advance.

The landing inhibit starts at 1000 feet AGL and continues until after landing below 80Kts or when a time limit has been exceeded which begins at 100 feet AGL.

Only RED Level 3 alerts will appear during the inhibit period.

The first miscellaneous page may have a maximum of 17 alerts and 17 consequences. Additional pages may be viewed if the "PRESS MISC AGAIN TO CONTINUE" message is displayed at the bottom of the display. Page identification (i.e., 2/3) and selection (pushing the cue switch) are the same as the EAD.

Miscellaneous Alerts: Level 3 miscellaneous alerts are displayed at the top of the display with Level 2 displayed next and Level 1 last. Alerts that may be observed on this page include the following:

LEVEL 3			
ALERT	CUE	CAUSE	PAGE
▶NO MASKS	MISC	Oxygen masks have not deployed automatically as required	2-115

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LEVEL 2			
ALERT	CUE	CAUSE	PAGE
AVNCS COMPT DOOR	MISC	Avionics compartment wheel well door or ext access door is open.	NONE
CARGO DOOR AFT A	MISC	Aft cargo door clsd/lckd is open.	2-156
CARGO DOOR AFT B	MISC	Aft cargo door not locked.	2-156
CARGO DOOR CTR A	MISC	Center cargo door clsd/lckd is open.	2-156
CARGO DOOR CTR B	MISC	Center cargo door not locked.	2-156
CARGO DOOR FWD A	MISC	Forward cargo door clsd/lckd is open.	2-156
CARGO DOOR FWD B	MISC	Forward cargo door not locked.	2-156
CARGO DOOR UPR A	MISC	Upper forward or aft, cargo door clsd/lckd is open.	2-156
CARGO DOOR UPR B	MISC	Upper forward or aft cargo door not locked.	2-156
IRU 1 FAIL	MISC	IRU 1 failed.	NONE
IRU 2 FAIL	MISC	IRU2 failed.	NONE
IRU AUX FAIL	MISC	Auxiliary IRU failed.	NONE
MISC ALERTS	MISC	Both miscellaneous system controller data buses are invalid. MISC ALERTS may not be issued	NONE
MSC AUTO FAIL	MISC	One MSC CPU is inop.	2-155
TAIL CONE UNLOCK	MISC	Tail cone is unlocked.	NONE

LEVEL 1			
ALERT	CUE	CAUSE	PAGE
CRG DOOR TST FAIL	MISC	Cargo door not locked when the power-up test is performed.	2-156
DFDR OFF	MISC	Digital flight data recorder is off.	NONE
DOOR OPEN	MISC	Any door open or not locked.	2-156
EMER LTS DISARM	MISC	Emergency lighting system is disarmed.	NONE
ENG IGN NOT ARMED	MISC	Engine ignition is not armed.	NONE
FD G/A ONLY	MISC	Autopilot go-around not available.	2-36
GPWS FAIL	MISC	GPWS has failed. Refer to the Warning and Alerting chapter for a description of GPWS.	NONE
IRU 1 NAV FAIL	MISC	IRU 1 navigation function failed.	NONE
IRU 1 NO ALIGN	MISC	IRU 1 did not align and crew must complete the alignment.	NONE
IRU 1 ON BAT	MISC	IRU 1 on battery power.	NONE
IRU 2 NAV FAIL	MISC	IRU 2 navigation function failed.	NONE
IRU 2 NO ALIGN	MISC	IRU 2 did not align and crew must complete the alignment.	NONE
IRU 2 ON BAT	MISC	IRU 2 on battery power.	NONE
IRU AUX NAV FAIL	MISC	Auxiliary IRU navigation function failed.	NONE
IRU AUX NO ALIGN	MISC	Auxiliary IRU did not align and crew must complete the alignment.	NONE
IRU AUX ON BAT	MISC	Auxiliary IRU on battery power.	NONE
IRU BAT LO	MISC	Any IRU battery voltage is low.	NONE
IRU OFF	MISC	One or more IRUs are switched off.	NONE
MANUAL G/A ONLY	MISC	No autopilot or flight director go-around mode available.	2-36
NO AUTOLAND	MISC	No autoland (single or dual) available.	2-36
PITOT HEAT AUX	MISC	Auxiliary pitot heater is off.	2-156
PITOT HEAT CAPT	MISC	Captain's pitot heat is off.	2-156
PITOT HEAT FO	MISC	First Officer's pitot heat is off.	2-156
PITOT HEAT OFF	MISC	Pitot heat override switch is not on.	NONE
ROLL CWS FAIL	MISC	Roll CWS inoperative.	2-28
SINGLE LAND	MISC	Dual autoland not available.	2-36
STALL WARN FAIL	MISC	Stall warning is inoperative	2-28
TAT PROBE HEAT	MISC	TAT probe heater is off.	2-156
WSHEAR DET FAIL	MISC	Windshear detector (not certified) inoperative. One channel in each FCC failed.	2-36
WSHLD DEFOG OFF	MISC	WINDSHIELD DEFOG switch is in OFF.	2-154
WSHLD HEAT L FAIL	MISC	Left windshield heat inoperative.	2-154
WSHLD HEAT R FAIL	MISC	Right windshield heat inoperative.	2-154

LEVEL 1			
ALERT	CUE	CAUSE	PAGE
AIR COND DOOR	MISC	Air conditioning door is open.	NONE
AOA HEAT L FAIL	MISC	Left angle of attack heat failed.	2-156
AOA HEAT R FAIL	MISC	Right angle of attack heat failed.	2-156
ATC XPDR 1 FAIL	MISC	Transponder 1 failed.	NONE
ATC XPDR 2 FAIL	MISC	Transponder 2 failed.	NONE
AUTOPILOT SINGLE	MISC	One autopilot channel available only.	2-9
CAB DOOR OVWING L	MISC	Left overwing cabin door is open.	NONE
CAB DOOR OVWING R	MISC	Right overwing cabin door is open.	NONE
CABIN DOOR AFT L	MISC	Left aft cabin door is open.	NONE
CABIN DOOR AFT R	MISC	Right aft cabin door is open.	NONE
CABIN DOOR FWD L	MISC	Left forward cabin door is open.	NONE
CABIN DOOR FWD R	MISC	Right forward cabin door is open.	NONE
CABIN DOOR MID L	MISC	Left mid cabin door is open.	NONE
CABIN DOOR MID R	MISC	Right mid cabin door is open.	NONE
CAC DOOR	MISC	Center accessory compartment door is open.	NONE
CAWS FAULT	MISC	Central aural warning system fault.	NONE

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Level 0 Miscellaneous alerts are displayed on the EAD only. They include:

LEVEL 0			
ALERT	CUE	CAUSE	PAGE
CDU1 MENU REQUEST CDU2 MENU REQUEST	MISC	CDU1 is displaying the MENU page, prompting the pilot to select and FMC (or ACARS if installed) that was previously failed.	2-58
EMER LTS TST PASS	MISC	Emergency lighting system passed the test performed with the EMER LT TEST button.	2-157
IRU IN ALIGN	MISC	Any IRU in normal align mode.	NONE
NO SMOKING	MISC	NO SMOKING sign illuminated.	NONE
SEAT BELTS	MISC	SEAT BELT sign illuminated.	NONE
WSHLD HEAT HI	MISC	Windshield heat selected to high.	2-154
WSHLD HEAT ON	MISC	Windshield heat selected to on.	2-154