CHAPTER 8 – ENVIRONMENTAL CONTROL SYSTEM

LIST OF ILLUSTRATIONS

1. INTRODUCTION

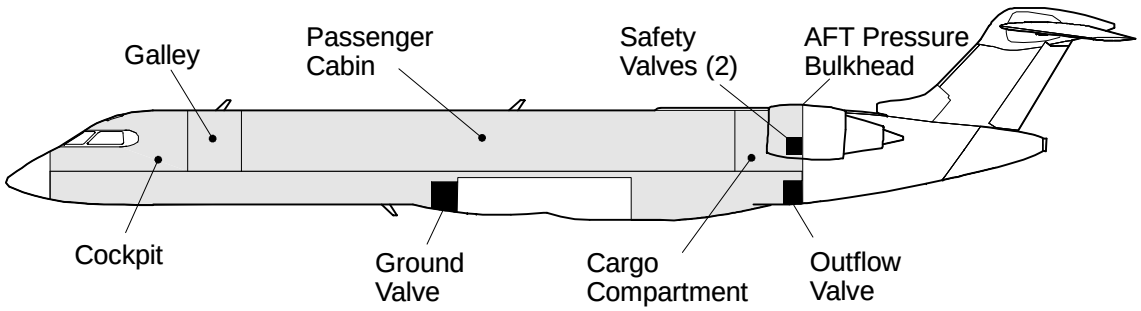
The environmental control system (ECS) provides temperature and pressure regulated air for heating, ventilating and for pressurizing the flight and passenger compartments. Exhaust air from each compartment is used to ventilate the avionics and cargo compartments, before being dumped overboard through an outflow valve and a ground valve.

For ground operations, pneumatic air for operation the ECS can be obtained from any of the following:

- A ground air supply cart connected to the aircraft
- The auxiliary power unit (APU)
- Either or both engines.

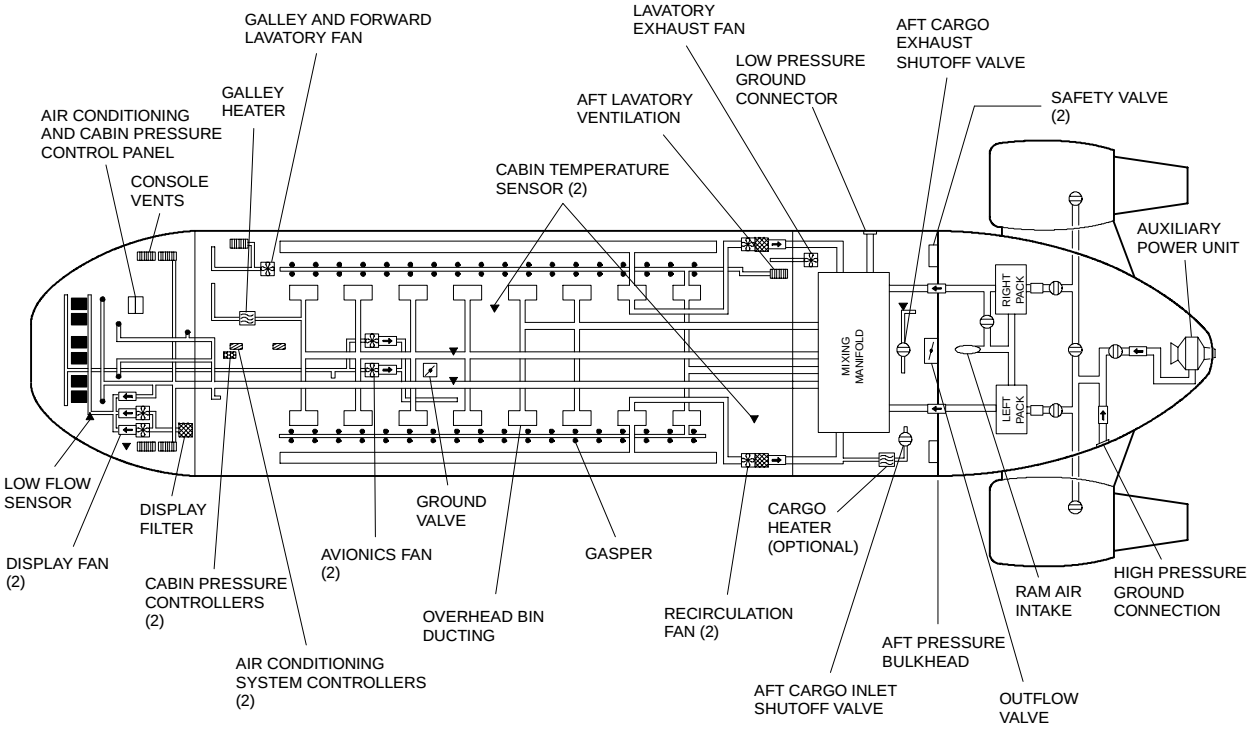
During flight, the engines normally supply bleed air for operating the air-conditioning, pressurization, and avionics cooling systems.

ECS warnings and cautions are displayed on the engine indication and crew alerting system (EICAS) primary page. ECS advisory and status messages are displayed on the EICAS status page. Views of the aircraft ECS temperature, pressure, valve positions and system status indications are displayed on the EICAS ECS synoptic page.



LEGEND

Pressurized by conditioned air



Air Conditioning System
Figure 08–10–1

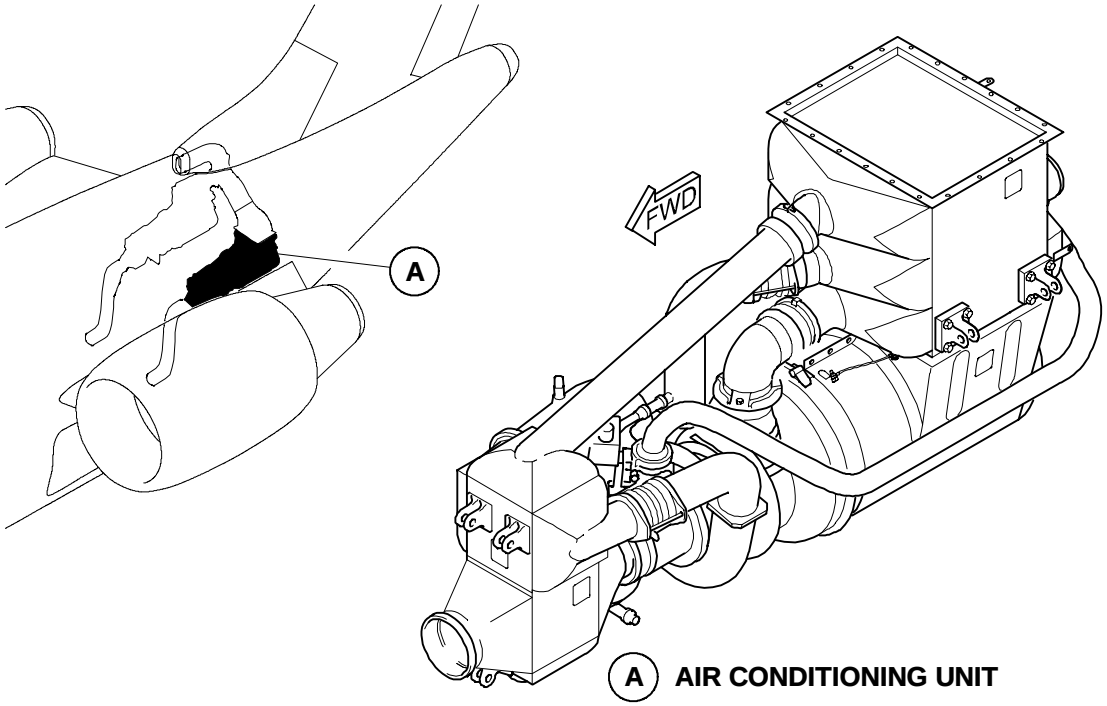
1. AIR-CONDITIONING SYSTEM

There are two air-conditioning systems packs which operate in parallel to supply conditioned air, through a common distribution system, to the flight and passenger compartments. Each system consists of an air-conditioning unit or package (PACK), an air-conditioning system controller (ACSC) and ducting. Ram air is provided for pack cooling and ventilation. The ACSC also controls the engine bleed air supply system (see Chapter 19).

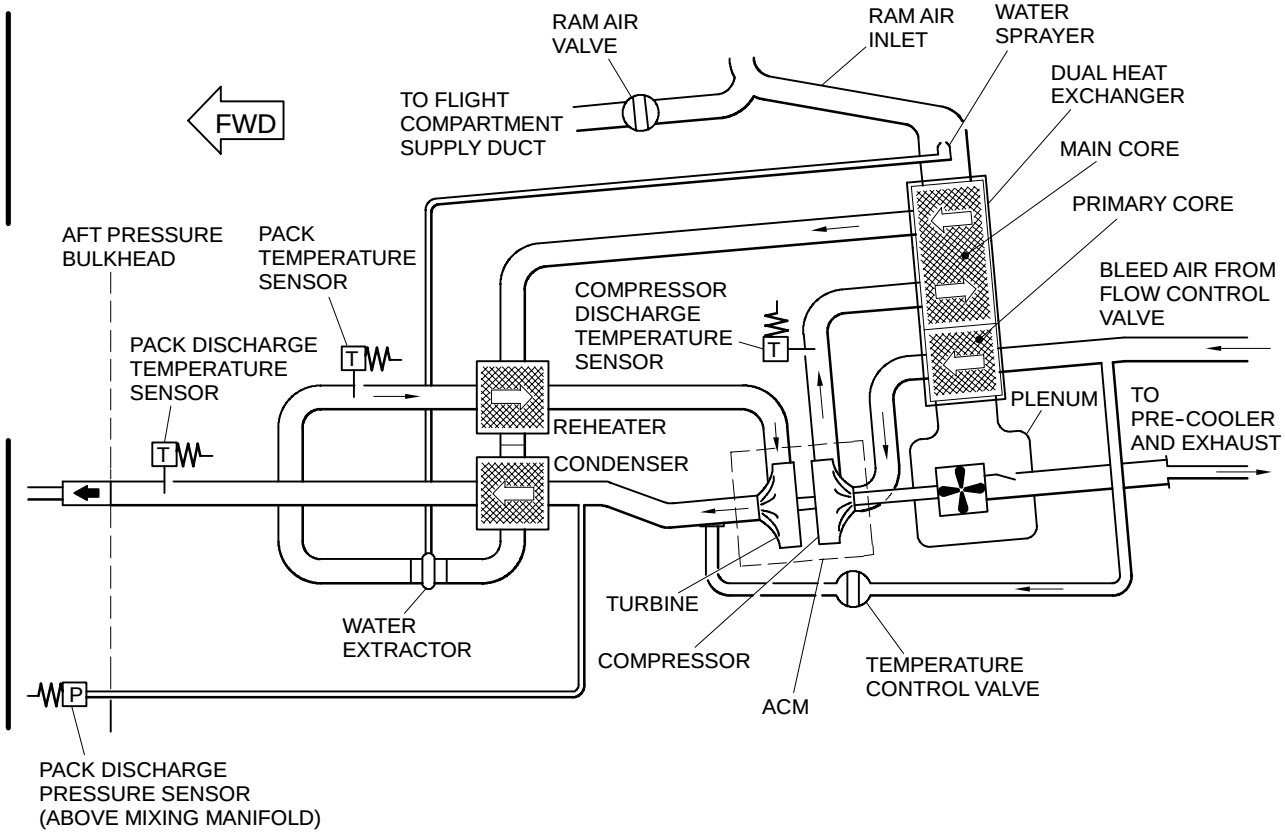
A. Packs

The packs are located in the aft equipment compartment (Refer to figure 08-20-9) and provide cooling of the engine or APU bleed air supplies for distribution to the flight and passenger compartments. Each pack consists of an air cycle machine (ACM), dual heat exchange, reheater, and condenser which are used to decrease the temperature and water content of the bleed air used in the conditioning process. The pressurized conditioned air from both packs is supplied to a mixing manifold, under the aft cargo compartment floor, where the air is then distributed to the flight and passenger compartments.

For normal operation, each pack receives hot bleed air from its related engine or from the APU where it is directed to the primary core of the heat exchanger via a precooler. The primary core uses ram air to initially cool the bleed air and then the air is directed to the ACM compressor where the air temperature and pressure is increased. The air is then directed back for a double pass through the main core of the heat exchanger. From the main core, the air is then directed to the reheater and condenser where water is extracted from the air and then fed to the ram air duct to be used as a cooling medium. Air from the condenser is then directed through the reheater and then to the ACM turbine where the heat energy is extracted by expanding the air. This causes a decreases in the air temperature which is then supplied to the mixing manifold of the distribution system. A ram air regulating valve RARV, which is controlled by the ACSCs, directs ram air from the the fan in the plenum to the cores of the precooler. This is done to regulate the temperature of the air from the engines to the heat exchanger. If the RARV fails, a L (R) RARV FAULT status message is displayed on the EICAS status page.

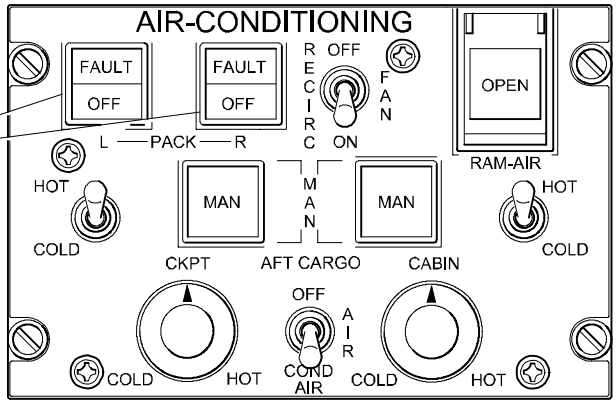


A AIR CONDITIONING UNIT

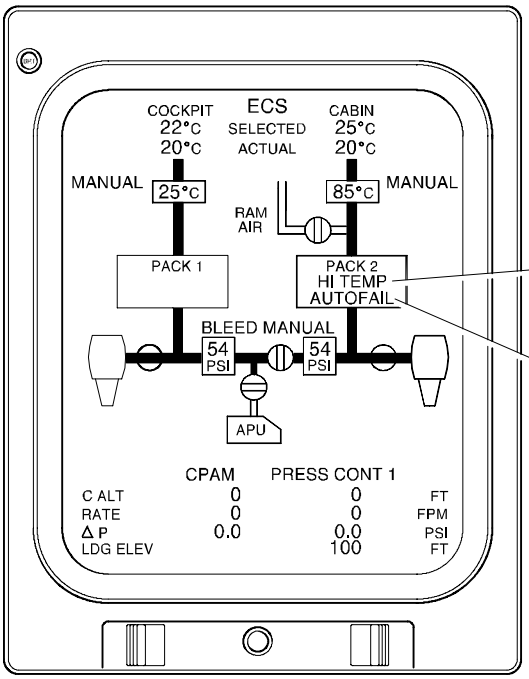


Air Conditioning Unit Schematic
Figure 08–20–1

Left (L) and Right (R) PACK
Used to control operation of air conditioning packs.
- OFF (white) light indicates pack is selected off.
- FAULT (amber) light indicates pack has failed in both automatic and manual modes.



Air-Conditioning Panel
Overhead Panel

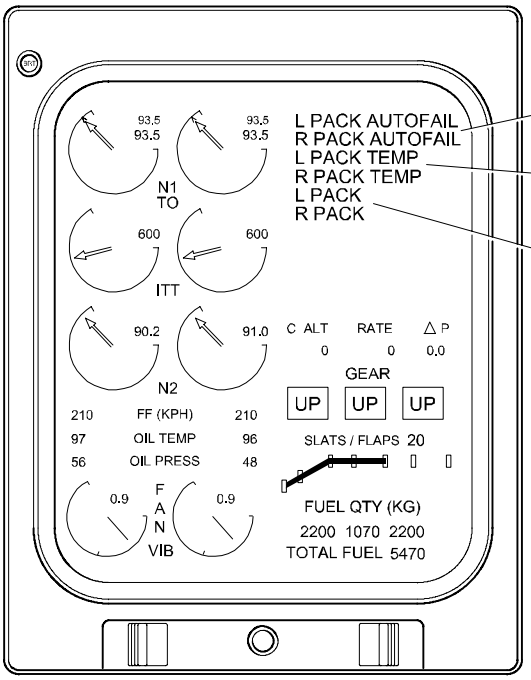


ECS Page

HI TEMP (amber)
Indicates high temperature sensed in respective pack outlet.

AUTOFAIL (amber)
Indicates failure of respective pack in automatic mode.

Packs Control <1201>
Figure 08-20-2

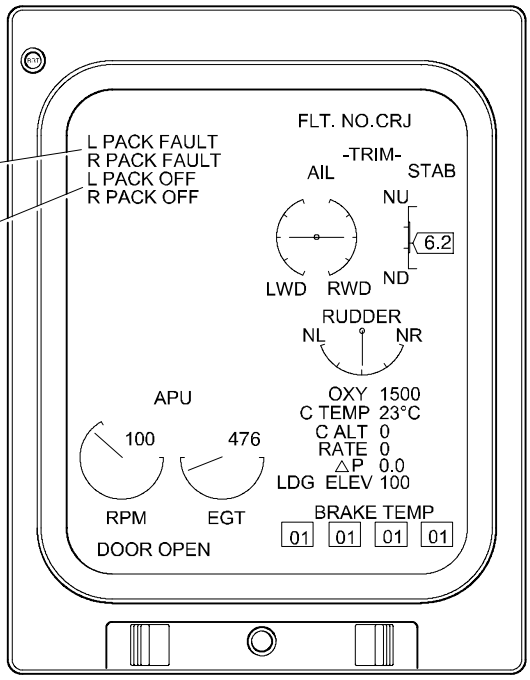


Primary Page

L or R PACK AUTOFAIL caution (amber)
Indicates failure of respective pack in automatic mode and system is not in manual mode.

L or R PACK TEMP caution (amber)
Indicates a high (> 85º C) or low (< 5º C) temperature when in manual mode.

L or R PACK caution (amber)
Indicates failure of respective pack in automatic and manual modes.



Status Page

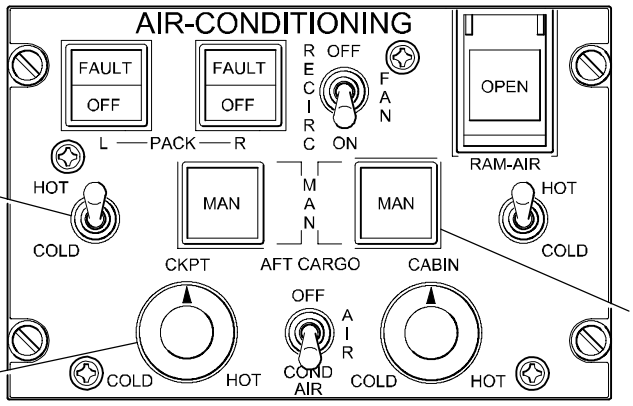
L or R PACK FAULT status (white)
Indicates a fault in respective pack.

L or R PACK OFF status (white)
Indicates that respective pack has been selected off.

Packs EICAS Indications<1001>
Figure 08–20–3

B. Temperature Control

The flight compartment and the passenger compartments have identical but independently-operated temperature control systems. Each controller subsystem is dedicated to an air-conditioning pack. Temperature control, in automatic mode, is provided by CKPT and CABIN selector knobs on the air conditioning panel. Control in manual mode is provided by left and right pack MAN switchlights and HOT/COLD switches on the same panel. The individual packs can be manually turned OFF by selecting the respective L or R PACK switchlight on the air conditioning panel.



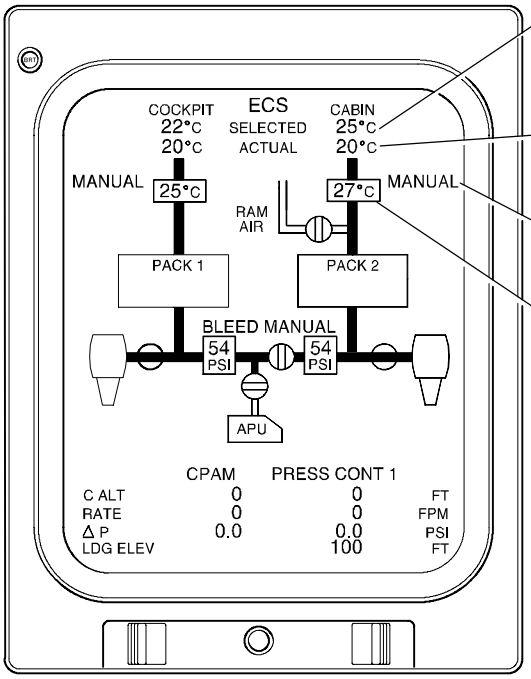
Manual Mode Temperature Control
Used to operate air conditioning temperature control valves in manual mode.

Automatic Mode Temperature Control
Used to provide automatic control of temperature in selected compartment.

MAN
Used to select manual mode temperature control.
- MAN (white) light indicates manual control is selected.

Air-Conditioning Panel
Overhead Panel

Temperature Controls <1201>
Figure 08-20-4



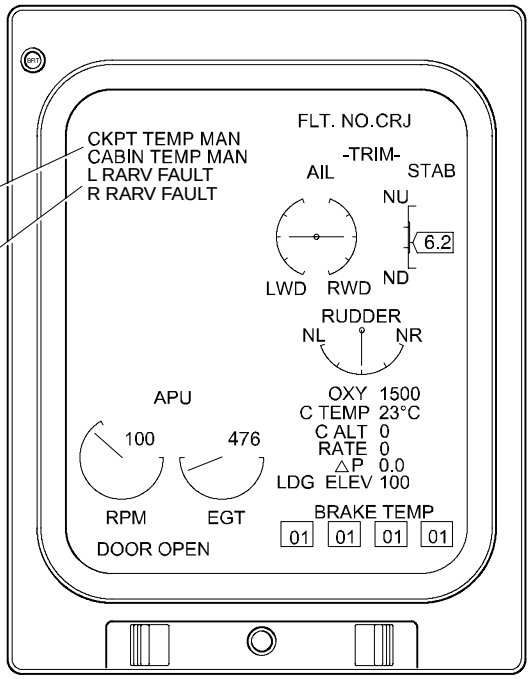
ECS Page

Selected Temperature (cyan)
Displays temperature selected by respective temperature control when in automatic mode only. Displays 24 (white) if data is not available.

Actual Temperature (white)
Displays temperature sensed at associated temperature sensing fan. Invalid data is displayed as amber dashes.

MANUAL (white)
Indicates that respective MAN switch is selected.

Supply Duct Temperature (white)
Displays temperature sensed in respective air conditioning supply duct. Invalid data is displayed as amber dashes.



Status Page

CKPT or CABIN TEMP MAN status (white)
Indicates that respective MAN switch is selected.

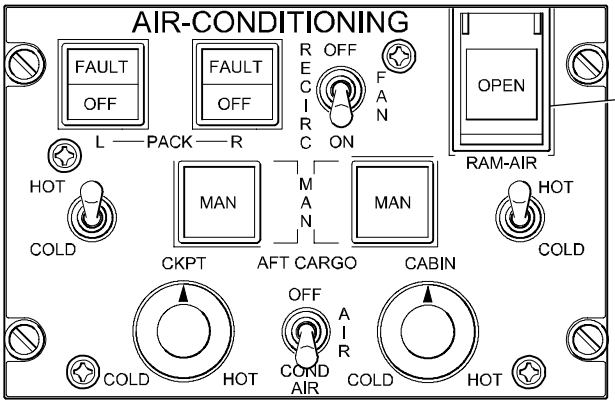
L or R RARV FAULT status (white)
Indicates that the L or R RARV has failed in the open or toward the CLSD position.

Temperature Synoptic and EICAS Indications
Figure 08–20–5

C. Ram Air Ventilation

The cooling airflow for the left and right heat exchangers is supplied from a ram air intake scoop, located on the forward lower leading edge of the vertical stabilizer. During normal operations, the ram air passes over the heat exchangers and is then vented overboard through an exhaust duct in the lower aft fuselage. The ram air supply duct also provides cooling airflow to the hydraulic system heat exchanger for cooling No. 1 and No. 2 hydraulic systems fluid (Refer to Chapter 14).

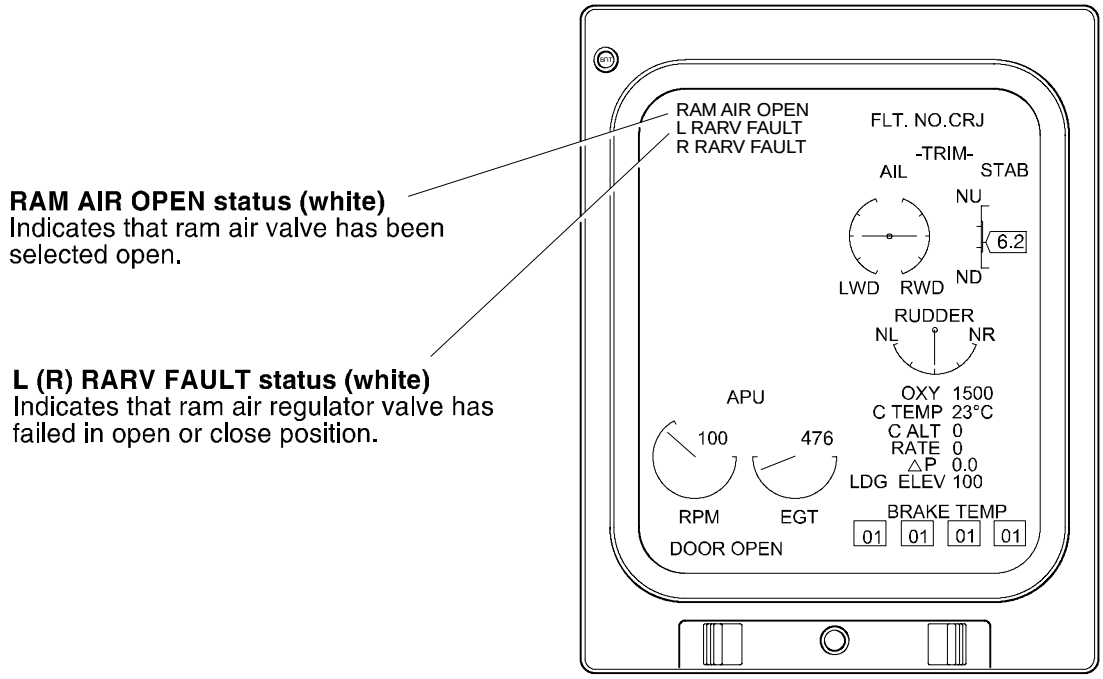
Ram air ventilation is used only when the air conditioning packs fail (unpressurized). Operating the (guarded) RAM AIR switchlight, on the air-conditioning panel, opens the normally closed ram air valve. Ram air then enters the flight compartment air supply system. Ram air is also distributed to the passenger compartment from the mixing manifold.



RAM AIR (Guarded)
Used when both packs fail. Provides ambient air to left conditioned air (cockpit) supply duct.
- OPEN (white) light indicates ram air vent valve is selected open.

Air-Conditioning Panel
Overhead Panel

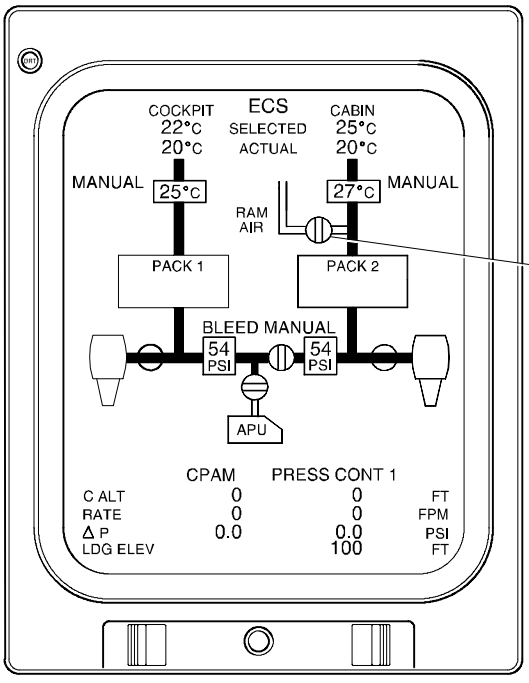
RAM Air Control <1201>
Figure 08-20-6



RAM AIR OPEN status (white)
Indicates that ram air valve has been selected open.

L (R) RARV FAULT status (white)
Indicates that ram air regulator valve has failed in open or close position.

Status Page



ECS Page

Ram Air Valve Position Indicator

- open (white)
- closed (white)
- failed (half-intensity magenta)

Temperature Synoptic and EICAS Indications
Figure 08–20–7

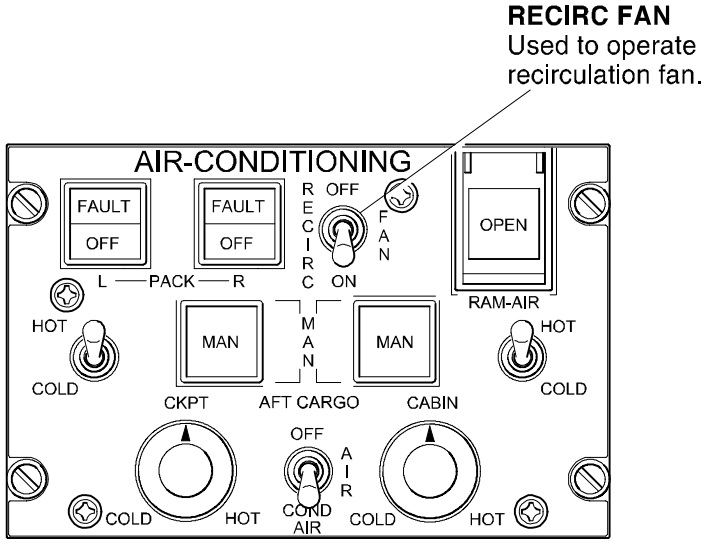
D. Conditioned Air Distribution

Conditioned air, from the left and right air-conditioning packs, is routed through separate ducting to a distribution mixing manifold. The mixing manifold mixes fresh air from the packs with recirculated air. The mixing manifold is designed so that the left pack primarily influences the flight compartment supply temperature. Like-wise,the right pack primarily influences the passenger compartment supply temperature If either pack fails, the mixing manifold will allow the remaining pack to supply the entire aircraft.

Conditioned air, to the passenger compartment, is distributed from ducts along each side of the aircraft. Passenger compartment exhaust air is routed underfloor to the outflow valves on the aft pressure bulkhead.

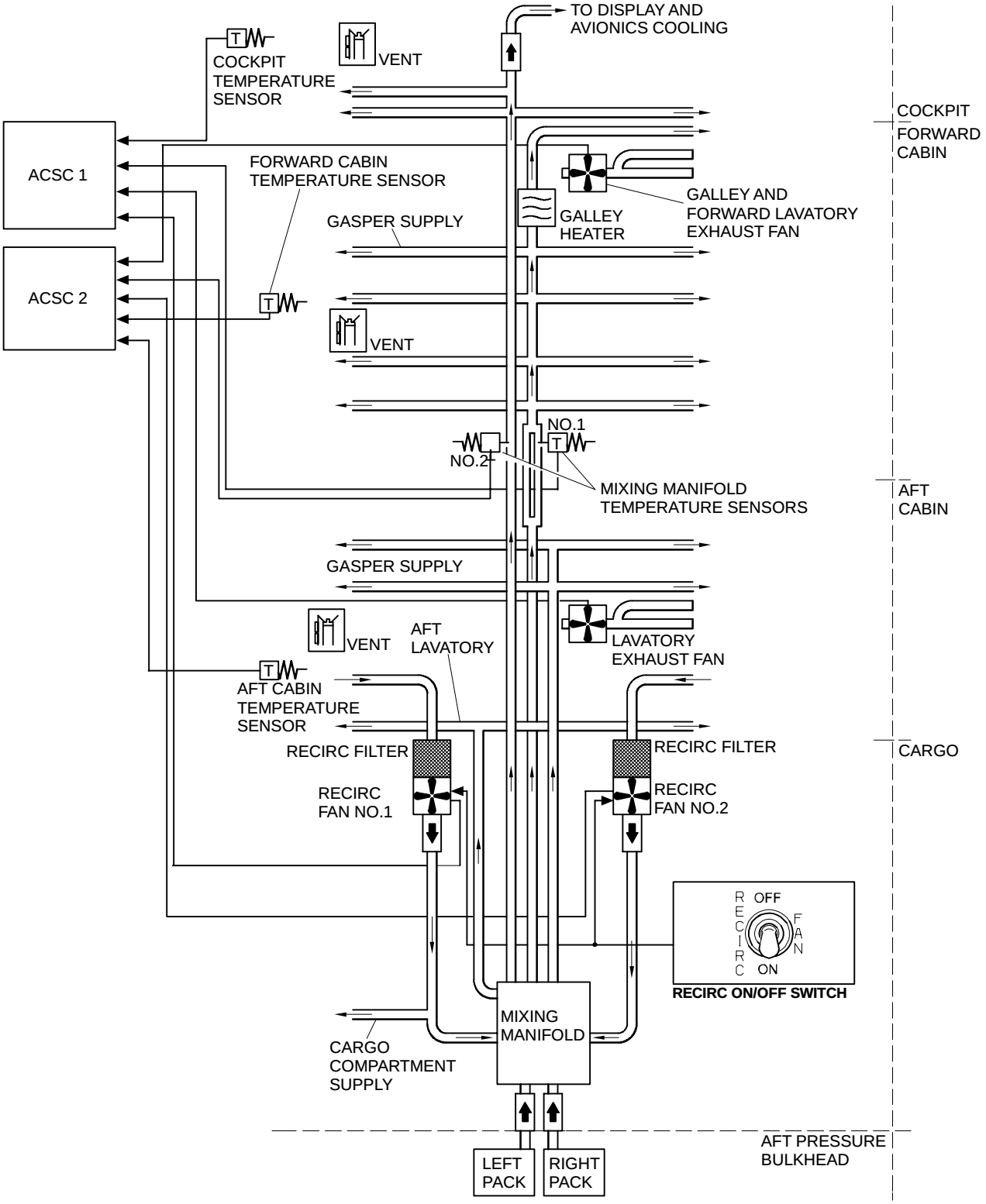
Conditioned air, to the flight compartment, is distributed to the side console panels, gaspers and vents, and avionics units within the instrument panel. Dedicated fans and ducts direct conditioned air over the flight compartment display units. Flight compartment exhaust air is routed underfloor through the avionics compartment to the outflow valve at the aft pressure bulkhead.

Recirculation of the air is provided by two recirculation fans connected to the distribution manifold. The fans are controlled by a single RECIRC switch on the air-conditioning panel.



Air-Conditioning Panel
Overhead Panel

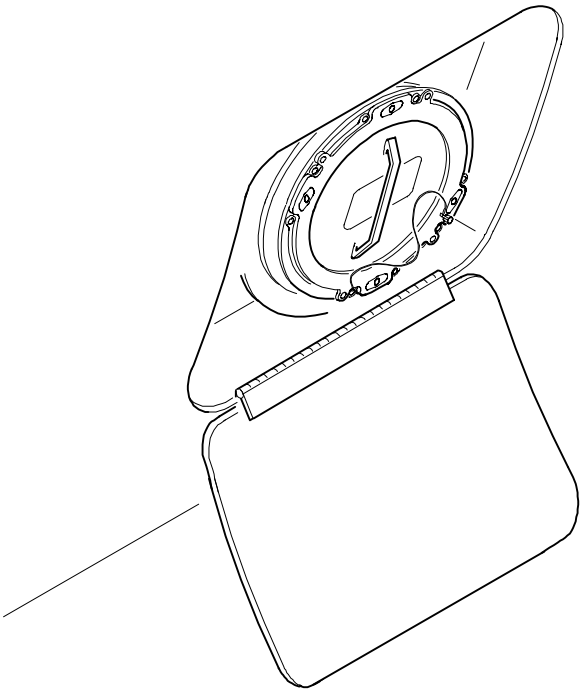
Recirculation Air Control <1201>
Figure 08-20-8



Air Distribution Schematic
Figure 08–20–9

E. Low Pressure Ground Air Connection <1007>

An external ground air connector, located on the right aft fuselage, is provided for ground air-conditioning. Low pressure compressed air from a ground air conditioning cart can be supplied directly into flight and passenger compartment distribution systems.



LOW PRESSURE GROUND AIR CONNECTION PANEL

Low Pressure Ground Air Connection <1007>
Figure 08–20–10

F. System Circuit Breakers

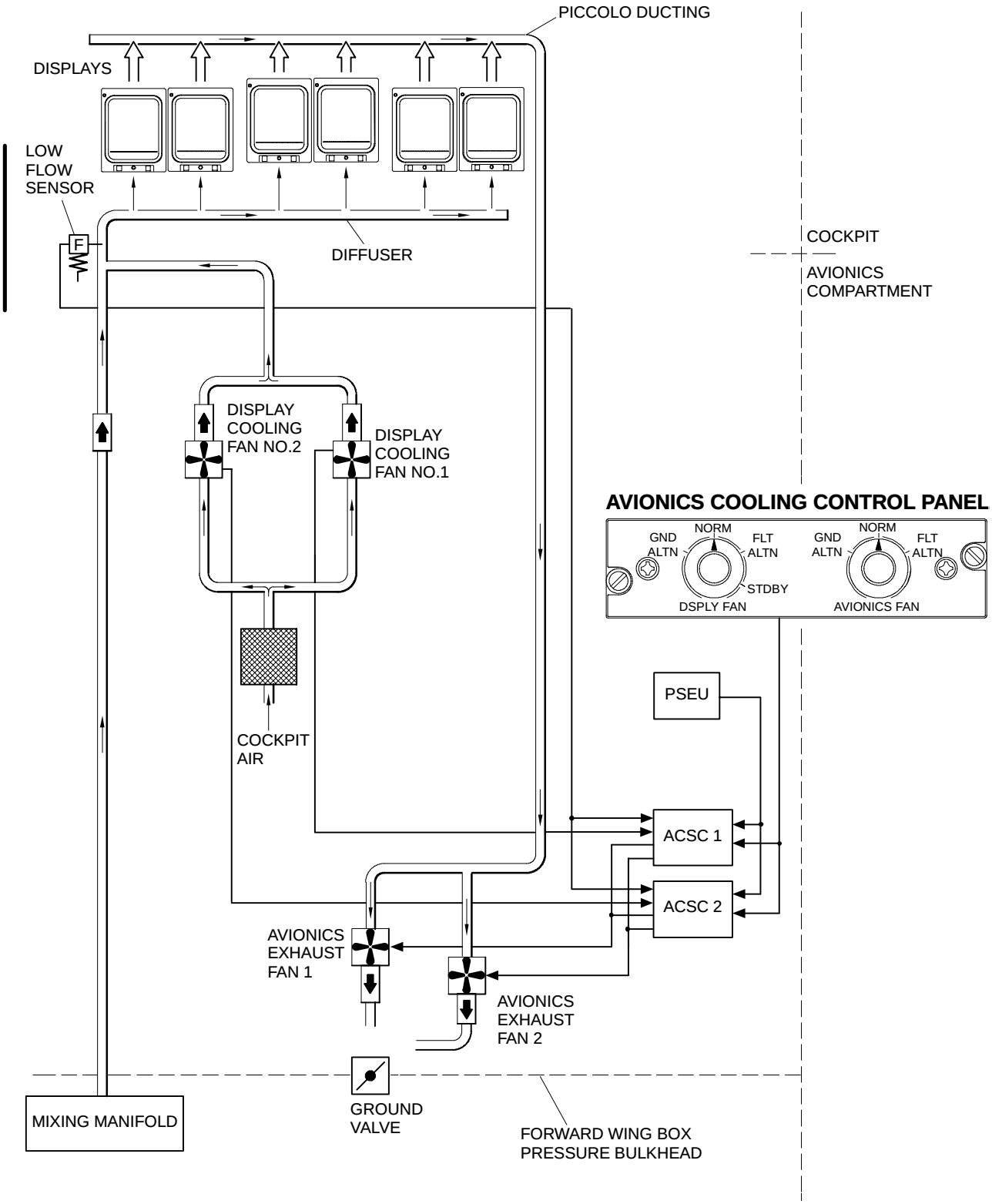
SYSTEM	SUB-SYSTEM	CB NAME	BUS BAR	CB PANEL	CB LOCATION	NOTES
Air Conditioning	Control	ACS CONT 1 CH A	BATTERY BUS	1	L1	
		ACS CONT 1 CH B	DC BUS 2	2	J4	
		ACS CONT 2 CH A	DC BUS 1	1	K6	
		ACS CONT 2 CH B	DC ESSENTIAL	2	T7	
		ACS R MAN	DC BUS 2	2	K6	
		ACS L MAN	DC ESSENTIAL	2	T8	
	Pressure Sensors	ACS R PRESS SENS	DC ESSENTIAL	2	T11	
		ACS L PRESS SENS	DC BUS 2	2	F6	
	Temperature Sensors	CKPT TEMP SENS	DC BUS 1	1	K7	
		AFT CABIN TEMP SENS	DC BUS 1	1	J1	
		FWD CABIN TEMP SENS	DC BUS 2	2	J1	
	Ram Air	RAM AIR SOV	BATTERY BUS	2	P4	
	Recirculation Fan	RECIRC FAN 1	AC BUS 1	1	A5	
		RECIRC FAN 2	AC BUS 2	2	A5	
		FAN MONIT	DC BUS 1	1	F6	

1. AVIONICS COOLING SYSTEM

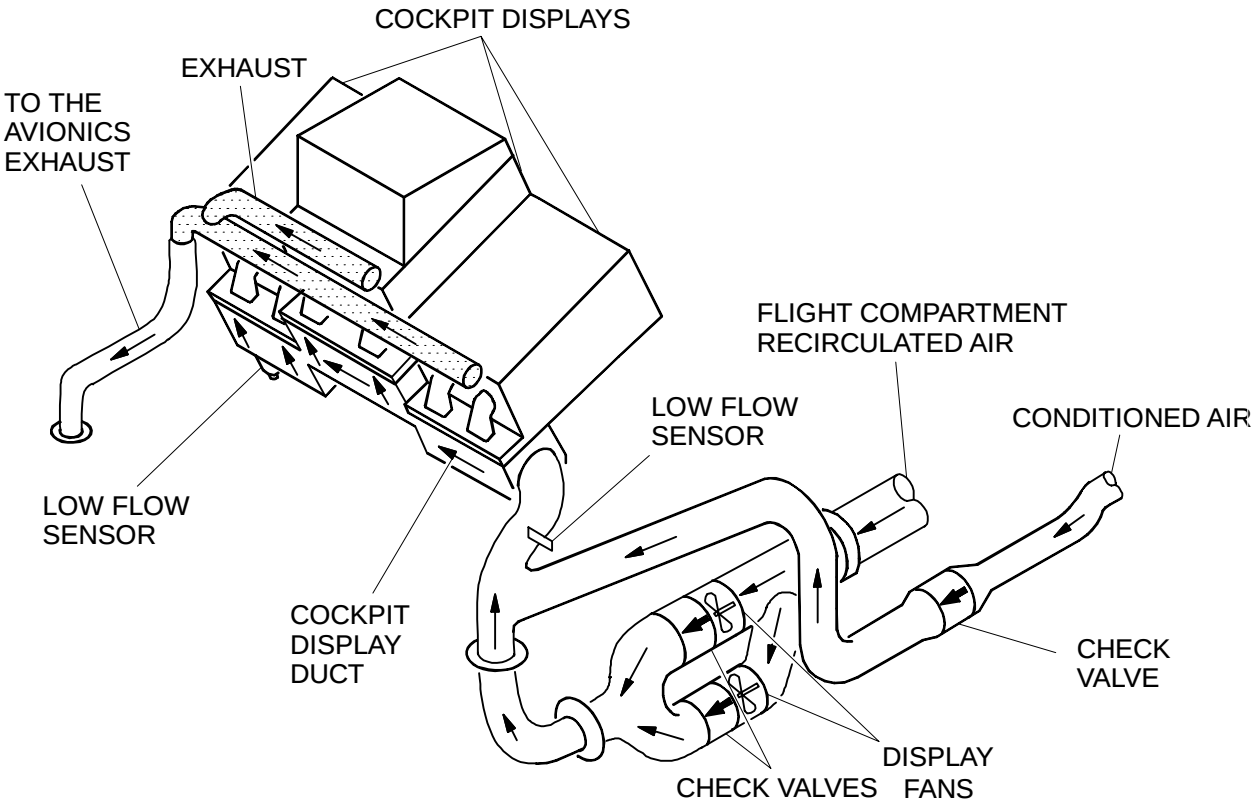
The electronic flight instruments in the flight compartment instrument panel, control panels and display units in the center pedestal, and electronic units in the left and right portions of the underfloor avionics bay are cooled during on-ground and flight operations.

The flight compartment displays are cooled with air from two display fans located under the flight compartment floor. Fan control is provided by a DSPLY FAN selector knob on the avionics cooling panel. Normally, only one fan operates at a time (operation is controlled by the PSEU). In flight, only fan 1 is powered and on the ground, only fan 2 is powered. When powered, the respective fan draws in air from the flight compartment and mixes it with conditioned air then supplies the air to the backs of each display. In the event of a fan failure, the alternate fan can be selected using the selector on the avionics cooling panel. If both fans fail, the selector is set to STDBY to permit conditioned air to ventilate the displays. A low flow sensor monitors air flow to ensure appropriate cooling. Check valves prevent loss of cooling air or reverse flow.

Two avionics exhaust fans are installed under the flight compartment floor. The fans are used to extract the heated air from behind the flight compartment displays and from the avionics equipment. Fan control is provided by a AVIONICS FAN selector knob on the avionics cooling panel. Normally, only one fan operates at a time (operation is controlled by the PSEU). In flight, only fan 1 is powered and on the ground, only fan 2 is powered. In the event of a fan failure, the alternate fan can be selected using the selector on the avionics cooling panel. On the ground, the heated air is dumped overboard through the ground outflow valve. In flight, the heated air is ducted to the pressurization outflow valve and dumped overboard.



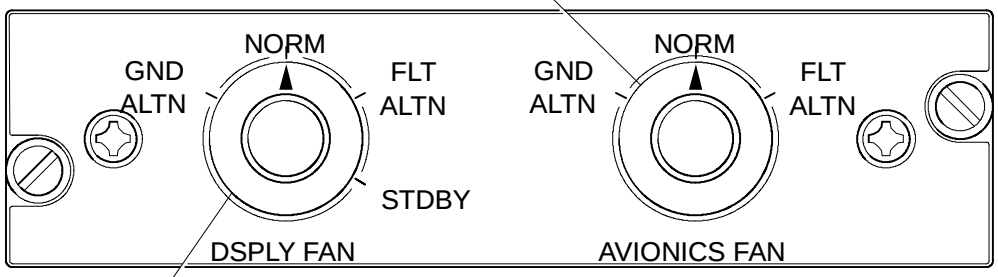
Cockpit Displays and Avionics Cooling System Schematic
Figure 08–30–1



Avionics Cooling System–General
Figure 08–30–2

AVIONICS FAN

- NORM – Fans in exhaust duct operate in automatic mode to exhaust hot air from the flight compartment displays and avionics compartment:
  Fan 1 during flight, and
  Fan 2 during ground operations.
- FLT ALTN – Selects fan 2 as the alternate fan in flight.
- GND ALTN – Selects fan 1 as the alternate fan on ground.

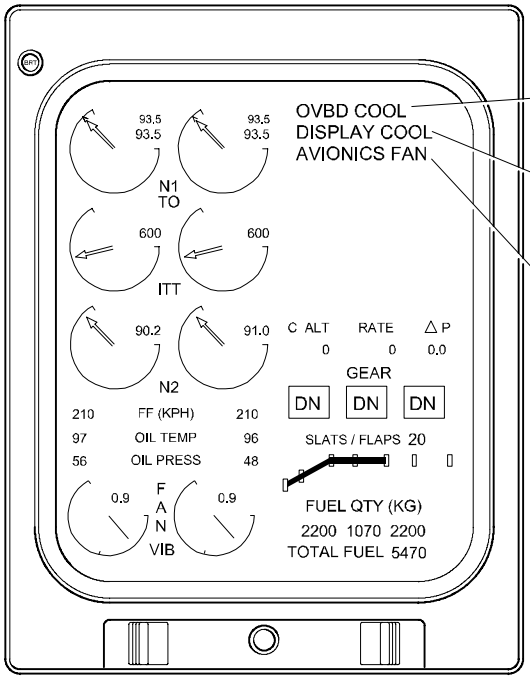


Avionics Cooling Fan Selector Panel
Center Pedestal

DSPLY FAN

- NORM – Fans in display duct operate in automatic mode providing airflow through flight compartment displays:
  Fan 1 during flight, and
  Fan 2 during ground operations.
- FLT ALTN – Selects fan 2 as the alternate fan in flight.
- GND ALTN – Selects fan 1 as the alternate fan on ground.
- STDBY – Selects conditioned air shut-off valve open.

Display Fan Controls
Figure 08–30–3



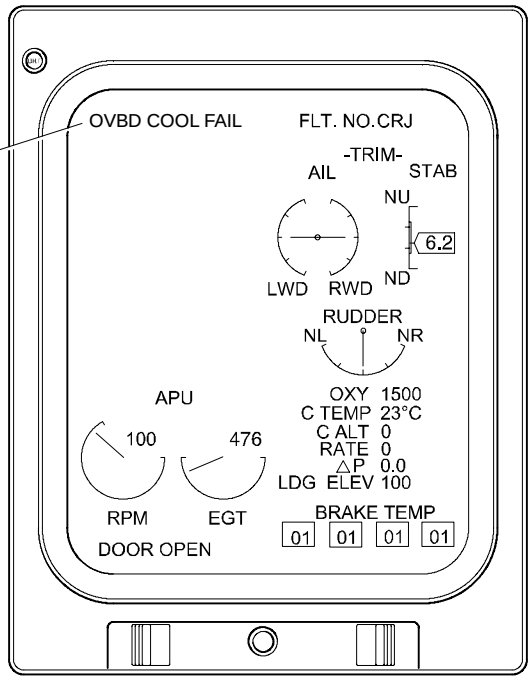
Primary Page

OVBD COOL caution (amber)
Indicates overboard exhaust shutoff valve not closed with passenger door and service door closed. The airplane will not pressurize to normal levels if valve has failed open.

DISPLAY COOL caution (amber)
Indicates low airflow in cockpit display cooling duct due to duct blockage or disconnection, or a fan has failed.

AVIONICS FAN caution (amber)
Indicates that avionics fan has failed or a low airflow exists in the exhaust duct.

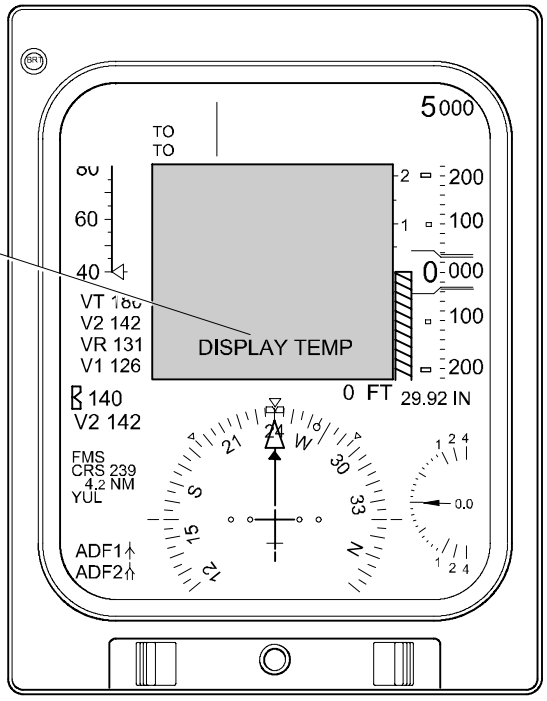
OVBD COOL FAIL status (white)
Indicates overboard exhaust shutoff valve has failed closed with the aircraft on the ground and the passenger door unlatched.



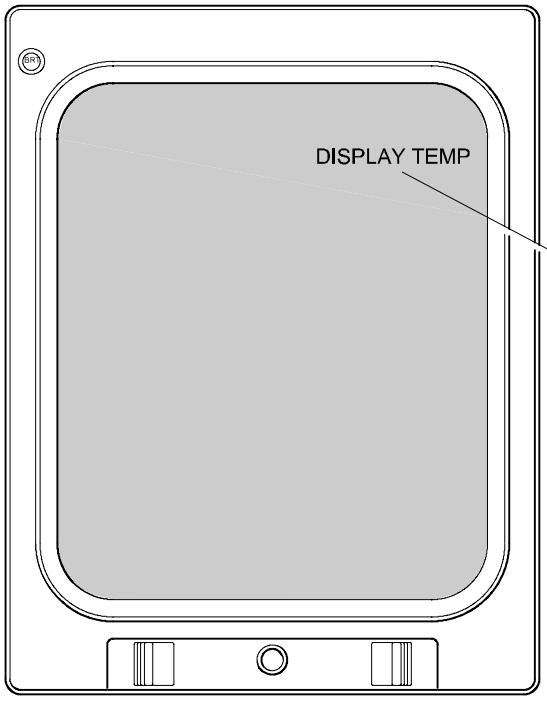
Status Page

Avionics Cooling EICAS Indications <1001>
Figure 08–30–4

Display Overtemperature warning (red)
Indicates an approaching thermal shutdown of PFD.
- Sky and ground raster is removed (to delay thermal shutdown).



Primary Flight Display
Pilot's and Copilot's Instrument Panels



Display Overtemperature warning (red)
Indicates an approaching thermal shutdown of MFD.

Multifunction Display
Pilot's and Copilot's Instrument Panels

Display Overtemperature Indications
Figure 08–30–5

A. System Circuit Breakers

SYSTEM	SUB-SYSTEM	CB NAME	BUS BAR	CB PANEL	CB LOCATION	NOTES
Avionics Cooling	Display Fans	AVIONICS DISPLAY COOLING FAN 1	AC ESSENTIAL	1	U2	
		AVIONICS DISPLAY COOLING FAN 2	AC BUS 1	1	B2	
		AVIONICS FAN 1	AC ESSENTIAL	1	V2	
Avionics Cooling	Display Fans	AVIONICS FAN 2	AC BUS 1	1	A2	Post SB670BA-21-004
Avionics Cooling	Display Fans	DISPLAY FAN CONT	DC ESSENTIAL	2	T10	

THIS PAGE INTENTIONALLY LEFT BLANK

1. AFT CARGO COMPARTMENT VENTILATION SYSTEM

The aft cargo compartment ventilation system allows the flight crew to control the air ventilation and temperature within the aft cargo compartment. <1201>

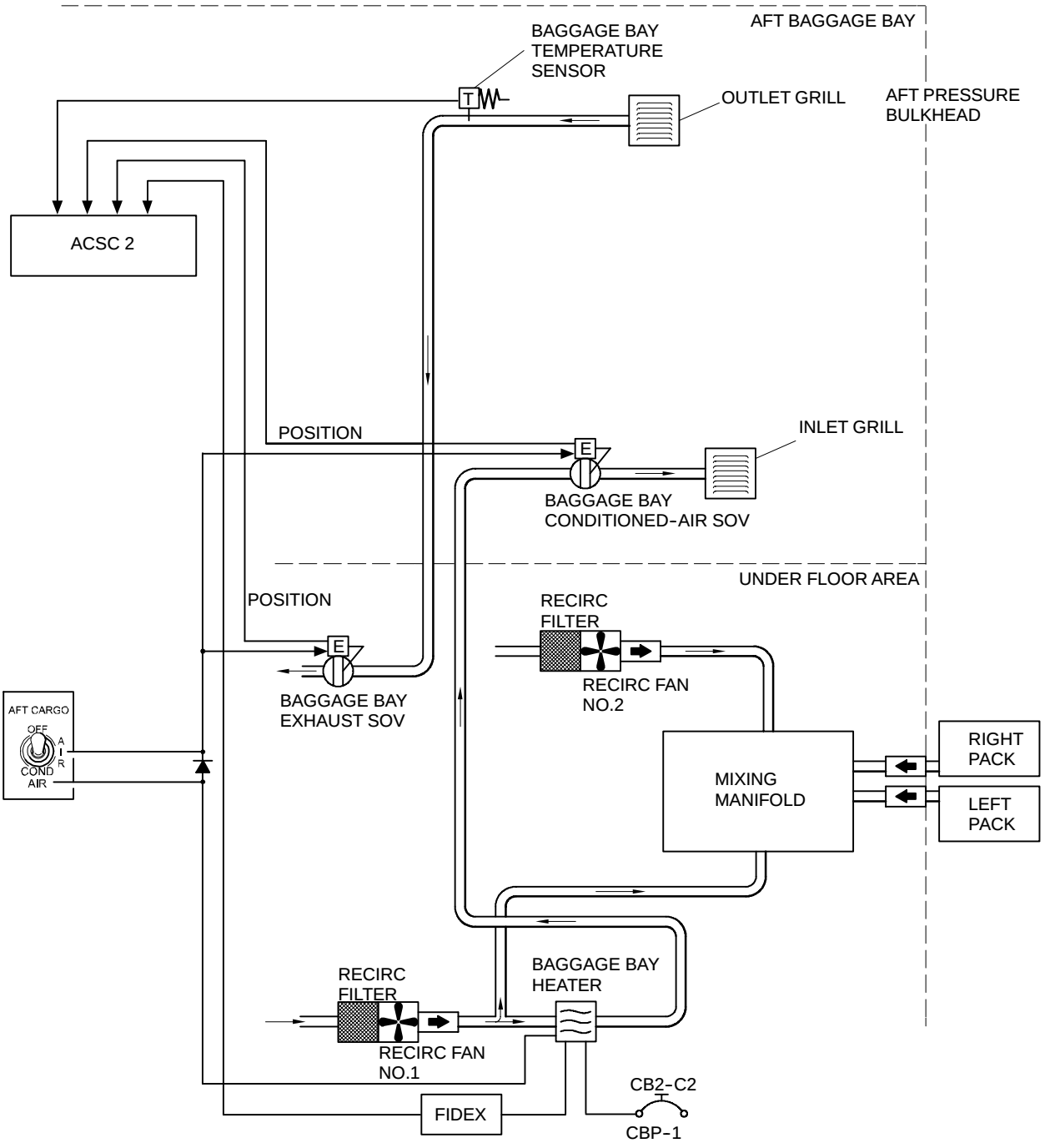
The system consists of an inlet shut-off valve, outlet shut-off valve, heater and an overtemperature switch. The system is supplied with recirculated air from recirc fan1 and/or air from the mixing manifold. <1201>

The system is controlled by an AFT CARGO, 3-position, OFF/AIR/AIR COND switch on the air-conditioning panel. In the OFF position, both shut-off valves are closed and the system is disabled. In the AIR position, both shut-off valves open to allow recirculated air into the aft cargo compartment to maintain the compartment temperature above freezing. In the COND AIR position, both shut-off valves are open and the heater is enabled. The heater will cycle ON and OFF as necessary to maintain the cargo compartment temperature between 16 and 27°C (60 and 80°F). <1201>

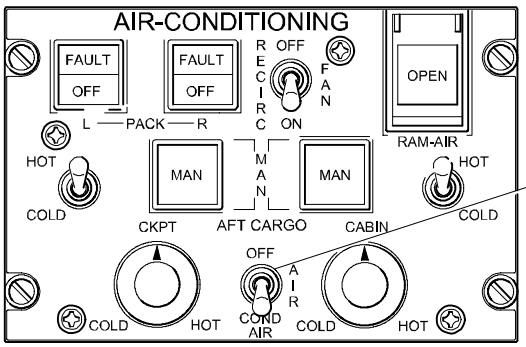
Cargo bay air is exhausted via a ceiling vent, through the outlet valve and ducted beneath the cargo floor to the outflow valves.

The aft cargo compartment temperature is monitored by a temperature sensor. The sensor supplies temperature information to air conditioning system controller 2 (ACSC 2) which controls the operation of the heater. If the temperature in the compartment exceeds 40°C (104°F), the ACSC removes power from the heater and transmits a signal to the DCUs to display an AFT CARGO OVHT caution message on the EICAS primary page. The crew should then select the AFT CARGO switch to the AIR position which will disable the heater power circuit. <1201>

The system interacts with the cargo bay smoke detectors and fire extinguishing system (See Chapter 10, Fire Protection). When smoke is detected, the shut-off valves automatically close to isolate the aft cargo compartment. <1201>



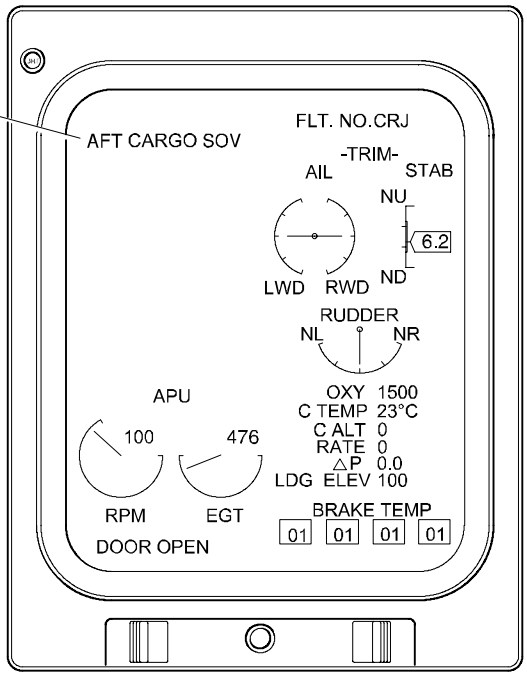
Cargo Compartment Air System Schematic <1201>
Figure 08–40–1



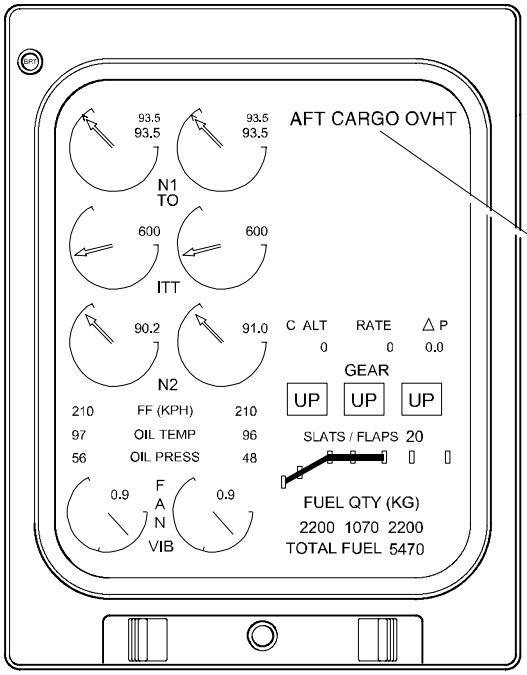
Air-Conditioning Panel
Overhead Panel

AFT Cargo Ventilation Switch
Used to provide recirculated air or a mixture of recirculated air and conditioned air to the cargo bay.
The cargo switch should only be set to COND AIR after take-off.

AFT CARGO SOV status (white)
Indicates that air inlet shut-off valve has failed open or closed.



Status Page



Primary Page

AFT CARGO OVHT caution (amber)
Indicates cargo bay temperature greater than 40° C.

AFT Cargo Bay EICAS Indication <1001,1201>
Figure 08–40–2

A. System Circuit Breakers

SYSTEM	SUB-SYSTEM	CB NAME	BUS BAR	CB PANEL	CB LOCATION	NOTES
Aft Cargo Bay Ventilation System	Controller	BAGG COMPT CONT	DC BUS 1	1	D8	
	Heater	BAGG COMPT HEATER	AC BUS 1	1	C2	

1. LAVATORY AND GALLEY VENTILATION SYSTEM

Lavatory and galley ventilation is provided by exhaust fans. The fans run whenever aircraft AC power is available. Each fan has an overheat thermal switch which shuts down the fan when the fan motor overheats.

The galley air supply line is fitted with a 1000 watt heater to provide supplementary heat to the galley and service door area. The heater is controlled by a HEATER switchlight on the galley control panel. The heater incorporates an internal, self-resetting, exhaust air temperature switch that removes power to the heater when the heater outlet temperature becomes excessive. The heater also incorporates an internal, overheat protection switch which disables the heater when the internal temperature exceeds a preset limit.

Effectivity:

- *Airplanes **incorporating** Service Bulliten SB 670BA-21-013:*

The galley air supply line heater is reduced to 500 watts power.

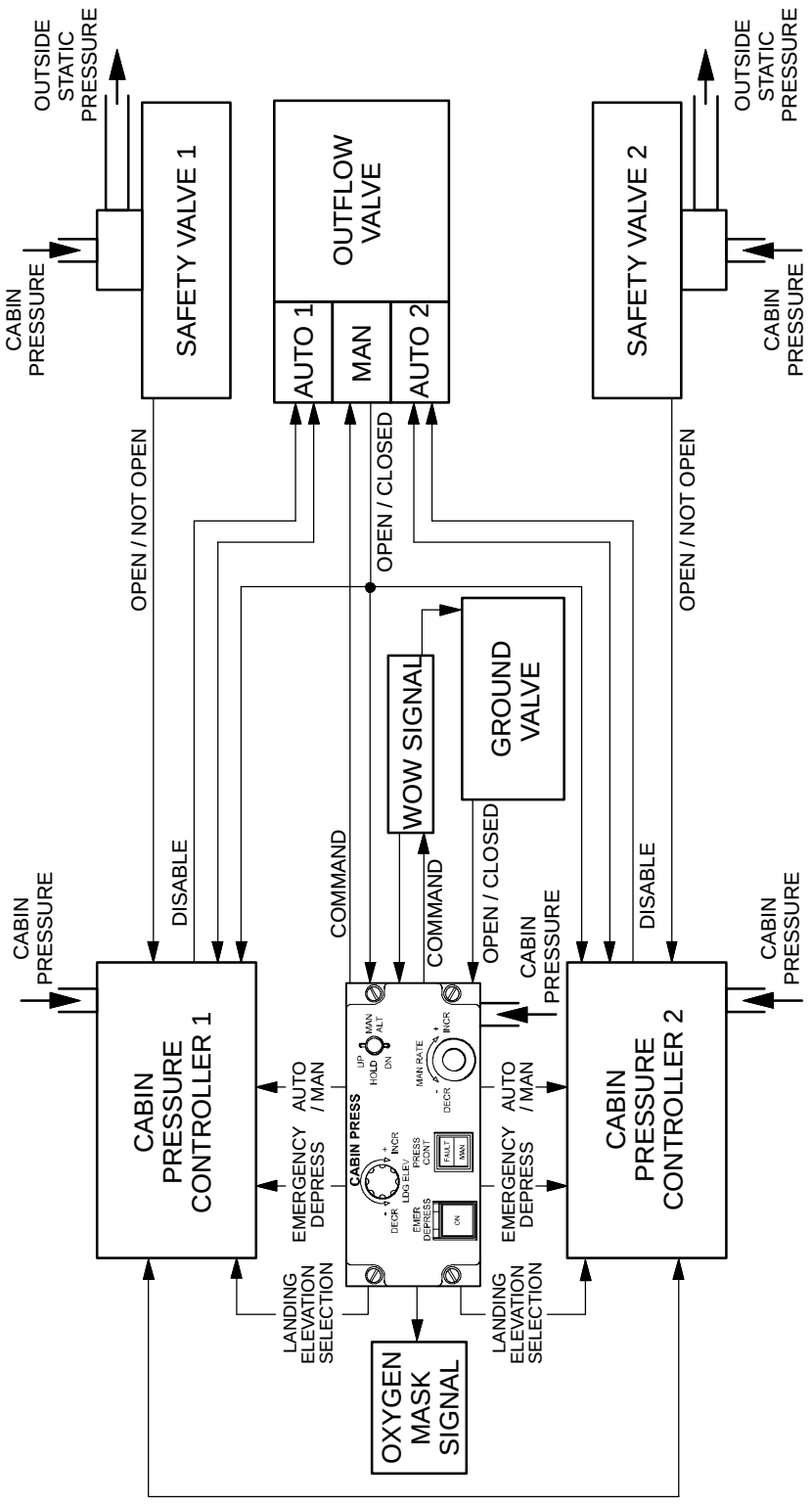
A. System Circuit Breakers

SYSTEM	SUB-SYSTEM	CB NAME	BUS BAR	CB PANEL	CB LOCATION	NOTES
Galley Ventilation	Heater	GALLEY HEATER CONT	DC BUS 2	2	F11	
		GALLEY HEATER	AC BUS 2		B11	
	Fan	GALLEY EXHAUST FAN			B8	
Lavatory Ventilation		LAV EXHAUST FAN	AC BUS 1	1	B8	

THIS PAGE INTENTIONALLY LEFT BLANK

1. PRESSURIZATION SYSTEM

The aircraft is pressurized by bleed air supplied by the air-conditioning system. Pressurization is controlled by opening and closing a single electrically controlled outflow valve to regulate the internal cabin pressure. The outflow valve is controlled by either, of two independent cabin pressure controllers, in automatic mode or by controls on the cabin pressurization control panel in manual mode. When the aircraft is on the ground, differential pressure is limited by a ground valve. Two safety valves provide overpressure and negative pressure relief. If cabin altitude exceeds 14,000 feet, a signal is sent to the passenger oxygen system to deploy the oxygen masks.

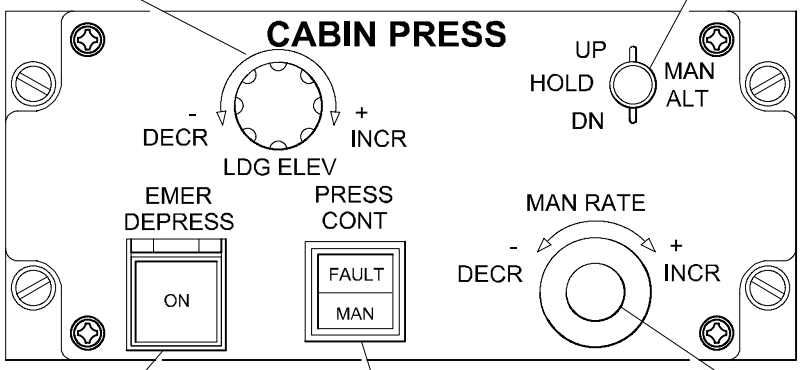


Pressurization System – General
Figure 08–60–1

LDG ELEV
Used to set destination airport altitude. Setting indicated at LDG ELEV readout on EICAS display.

MAN ALT
Used to control pressurization system in manual (pneumatic) mode.
- UP - Causes outflow valves to open and increases cabin altitude.
- DN - Causes outflow valves to close and decreases cabin altitude.
- HOLD - Disables all previous manual selections.

Cabin Pressurization Control Panel
Overhead Panel

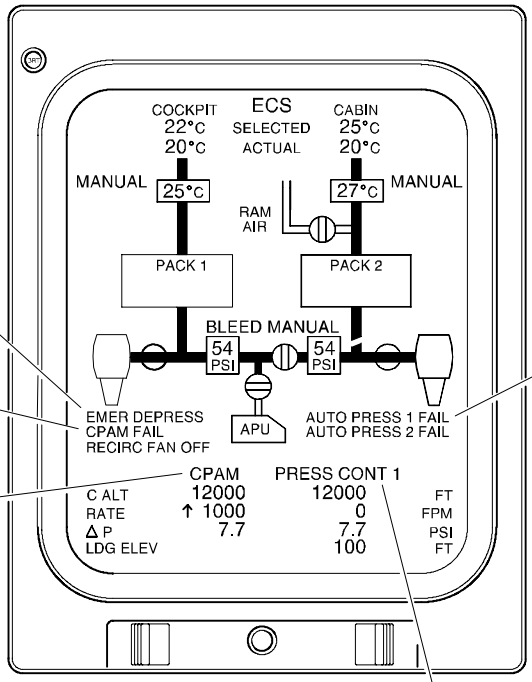


EMER DEPRESS (Guarded)
Used to depressurize airplane during an emergency.
- ON (amber) light indicates emergency depressurization is selected. Outflow valve opens fully to dump cabin pressure. At cruise, valves dump to cabin pressure of 14500 ±500 feet.

PRESS CONTROL
Selects either manual or automatic control of pressurization system.
- MAN (white) light indicates manual mode is selected.
- FAULT (amber) light indicates failure of both cabin pressure controllers. Manual mode data is displayed on EICAS primary display. Automatic mode data is displayed on EICAS secondary display.
  When pressed twice, the redundant controller gains control.

MAN RATE
Pneumatically adjusts outflow valve rate during manual mode.
MAN ALT selected UP - Range is 150 (± 150) fpm to 4000 (± 500) fpm.
MAN ALT selected DN - Range is -100 (± 100) fpm to -2500 (± 500) fpm.

Pressurization Controls
Figure 08–60–2



EMER DEPRESS (amber)
Indicates that emergency depressurization has been selected

CPAM FAIL (white)
Indicates failure of cabin pressure control panel indication system.

Monitoring Data Source (white)
Indicates monitoring source:
- CPAM,
- PRESS CONT 1 or
- PRESS CONT 2

If all sources failed, comes on as dashes (amber)

AUTO PRESS 1 or 2 FAIL (white)
Indicates failure of respective controller.

Environmental Control System Page

Active Controller Data Source
Indicates active pressurization controller:
- PRESS CONT 1 (half-intensity cyan),
- PRESS CONT 2 (half-intensity cyan) or
- PRESS MAN (white)

If all sources failed, comes on as dashes (amber)

NOTE
The standby controller becomes the monitoring source.

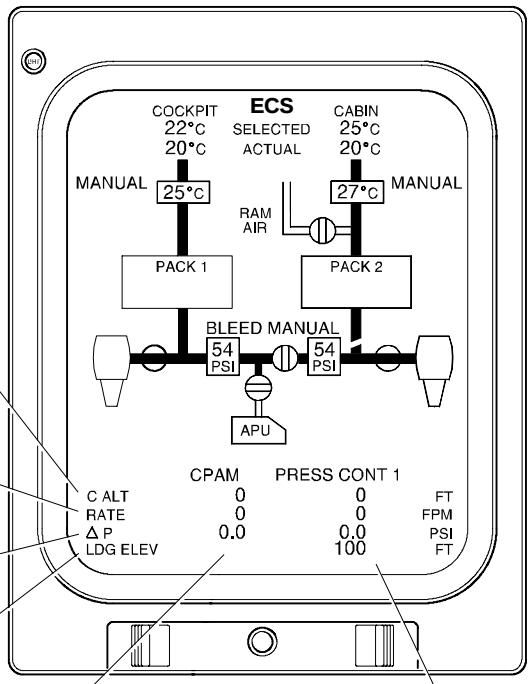
Pressurization EICAS Synoptic Page Message
Figure 08–60–3

C ALT
Displays current cabin altitude (100 foot increments).
Monitored data is displayed green and active data is displayed white. Monitored data will turn amber if altitude is above 8,500 feet and red if altitude is above 10,000 feet. Invalid data is displayed as amber dashes.

RATE
Displays rate of climb or descent in feet per minute (100 fpm increments) and direction via arrow symbol.
Monitored data is displayed green and active data is displayed white. Invalid data is displayed as amber dashes.

DELTA P
Displays cabin to ambient differential pressure (0.1 psi increments).
Monitored data is displayed green and active data is displayed white. Monitored data will turn red if differential exceeds 8.6 psi. Invalid data is displayed as amber dashes.

LDG ELEV
Displays elevation in feet as set at LDG ELEV selector (20 foot increments).
Displayed in cyan. Invalid data, elevations above 15,000 feet and elevations below -2000 feet are displayed as amber dashes.



Environmental Control System Page

MONITORED DATA

ACTIVE DATA

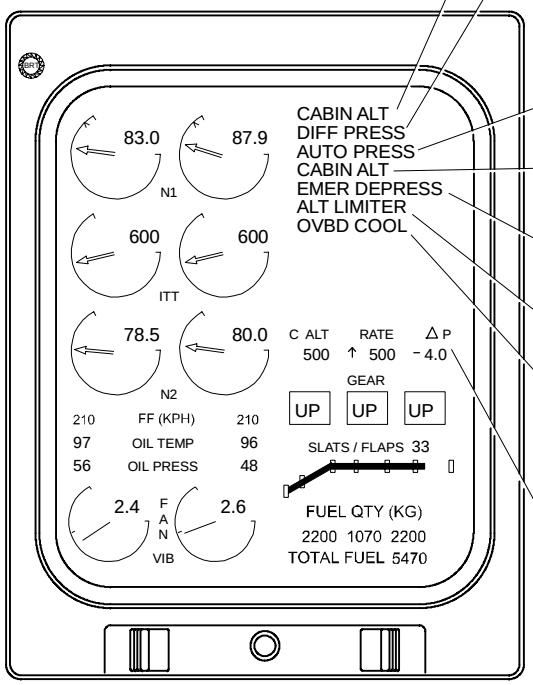
Pressurization EICAS Synoptic Page Elements
Figure 08-60-4

CABIN ALT warning (red)
Indicates that cabin altitude is greater than 10,000 feet.
Accompanied by aural warning:

CABIN PRESSURE

DIFF PRESS warning (red)
Indicates that differential pressure is greater than 8.6 psi.
Accompanied by aural warning:

CABIN PRESSURE



Primary Page

AUTO PRESS caution (amber)
Indicates that automatic presurization control is inoperative.

CABIN ALT caution (amber)
Indicates that cabin altitude is greater than 8,500 feet but not greater than 10,000 feet.

EMER DEPRESS caution (amber)
Indicates that EMER DEPRESS switch has been selected on.

ALT LIMITER caution (amber)
Indicates that altitude limitation function is inoperative.

OVBD COOL caution (amber)
Ground valve failed OPEN, in flight.

Pressurization Readouts (manual mode)
Comes on when pressurization system is operated in manual mode:

- C ALT – Displays current cabin altitude.
- RATE – Displays rate of climb or descent in feet per minute and direction via arrow symbol.
- DP – Displays cabin to ambient differential pressure.

Landing Elevation readout is not displayed.

NOTE

Readouts removed from primary page when automatic mode selected.

Pressurization EICAS Indications – Primary Page <1001>
Figure 08–60–5

AUTO PRESS 1 or 2 FAIL status (white)
Indicates that respective cabin pressure controller is inoperative

AUTO PRS 1/2 FAIL status (white)
Indicates loss of active channel in manual mode.

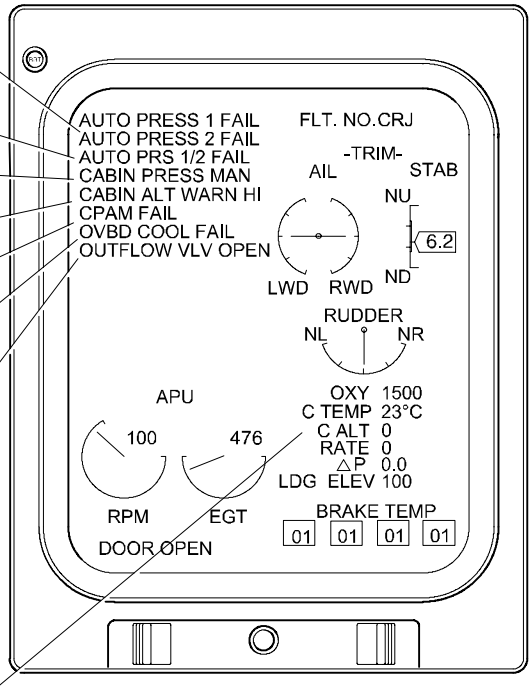
CABIN PRESS MAN status (white)
Indicates that PRESS CONTROL switch is selected to MAN.

CABIN ALT WARN HI status (white)
Indicates that landing elevation is set above 8000 feet.

CPAM FAIL status (white)
Indicates failure of cabin pressure control panel indication system.

OVBD COOL FAIL status (white)
Indicates that the ground valve has failed CLOSED on the ground.

OUTFLOW VLV OPEN status (white)
Indicates outflow valve in full open position.



Status Page

Pressurization Readouts (automatic mode)
Comes on when pressurization system is operated in automatic mode:
- C ALT – Displays current cabin altitude.
- Rate – Displays rate of climb or descent in feet per minute and direction via arrow symbol.
- DP – Displays cabin to ambient differential pressure.
- LDG ELEV – Displays elevation in feet as set at LDG ELEV selector.

Pressurization EICAS Indications – Status Page
Figure 08–60–6

2. CABIN PRESSURE CONTROLLERS

The aircraft is equipped with dual, redundant controllers, which operate only in automatic mode. All controller outputs are sent to the outflow valve. While one controller is in use, the other updates automatically. The active cabin pressure controller commands the outflow valve to a nominal differential pressure of 8.33 psid. Normally, inputs to the pressure controllers are supplied from air data computer 1 (ADC 1). ADC 2 is the backup to ADC 1. If a controller fails, the system will automatically switch over to the other controller. If automatic switch-over fails, select the PRESS CONTROL switch twice. This will enable the redundant controller. If both pressure controllers fail, both outflow valves will go to an isobaric hold mode. When the airplane is on the ground for 3 minutes, automatic pressure controller switch-over will occur.

The pressurization system automatically maintains cabin pressure through all phases of flight. Typical values used in the cabin/flight altitude schedule during manual mode are as follows:

AIRPLANE FLIGHT ALTITUDE (feet)	CABIN PRESSURE ALTITUDE (feet)
10 000	-200
15 000	600
20 000	1500
25 000	2700
30 000	4200
35 000	6000
41 000	8000

A. Automatic Pressurization Modes

- Ground mode: Both the outflow valve and ground valve are driven full open.
- Pre-Pressure mode: When thrust levers are advanced to take-off, the cabin pressure moves towards the scheduled cabin pressure with a pressure rate of change equal to 300 ft/min, limited at a differential pressure of 150 ft/min. During take-off without air-conditioning, the outflow valve and ground valve are driven closed.
- Take-Off abort mode: When the thrust levers are retarded to idle, the cabin ascends at approximately 500 ft/min for 20 seconds, then the outflow valves are driven full open.
- Climb mode: Cabin climb is in accordance with a fixed schedule, cabin altitude vs airplane altitude. The climb rate varies between approximately 500 and 800 ft/min, dependant on the airplane climb speed. The controller compares selected landing elevation to the climb schedule, then selects the highest pressure schedule.
- Flight abort mode: When the airplane has maintained an altitude of up to 6,000 feet above the take-off field altitude for 10 minutes, and then has initiated a descent of 1,000 ft/min, the system will then assume the elevation for the departing airport, regardless of the pre-selected landing elevation.

- Descent mode: The cabin full descent schedule occurs when the airplane is in descent. Cabin altitude decreases at approximately 300 to 750 ft/min, to either landing elevation, or maximum differential, whichever is highest. When the landing elevation exceeds 8,000 feet, cabin altitude will be maintained at maximum differential, until the airplane descends, then the cabin altitude will rate up to the pre-selected landing elevation.

- Landing mode: The cabin altitude is driven below field elevation or the airplane is unpressurized. When the cabin is below field elevation, then the cabin is rated up at approximately 600 ft/min for 30 seconds, then the outflow valve is driven full open.

- Touch and Go mode: On airplane touchdown, the system will assume landing mode; as the thrust levers are advanced, the system will schedule pre-pressure mode.

B. Manual Pressurization Modes

- UP selection: Cabin ascends at selected rate of 150 (±150) to 3,000 (±500) fpm. When the desired cabin altitude is reached, select MAN ALT to HOLD position.

- DN selection: Cabin descends at selected rate -100 (±100) to -2,500 (±500) fpm.. When the desired cabin altitude is reached, select MAN ALT to HOLD position.

- HOLD position: Disables all previous MAN ALT selections.

C. Safety Valves

Two safety valves are installed at the top of the rear pressure bulkhead. The purpose the valves is to make sure that the cabin pressure differential does not exceed its maximum positive and negative pressure limits. Maximum positive differential pressure is limited to 8.6 ±0.1 psid and negative differential pressure is limited to −0.5 psid.

D. Ground Valve

The ground valve is normally open when the aircraft is on the ground and the passenger or service doors are open. The valve is used to limit differential pressure drop by discharging air from the avionics compartment overboard. The valve is driven to the closed position by the CPCP as soon as the passenger and service doors are closed and locked or when the automatic pre-pressurization sequence is initiated Failure of the ground valve to open on the ground will be indicated by an OVBD COOL FAIL status message on the EICAS status page

E. Cabin Altitude Limitation

Altitude limitation closes the outflow valve to prevent an increase in cabin altitude above 14,500 ±500 feet.

F. Emergency Depressurization

Electrical signals from the EMER DEPRESS switch commands the outflow valve to open. If the airplane is at a cruise altitude (above 15,000 feet), the altitude limiters operate to prevent cabin altitude from exceeding 15,000 feet.

G. Cabin Pressure Monitoring

Cabin pressure is monitored using data from the two cabin pressure controllers and the cabin pressurization control panel to display the following on the EICAS displays:

- Cabin altitude
- Cabin altitude rate of change
- Cabin to ambient differential pressure
- Landing elevation

H. System Circuit Breakers

SYSTEM	SUB-SYSTEM	CB NAME	BUS BAR	CB PANEL	CB LOCATION	NOTES
Cabin Pressurization Control	Controller	CABIN PRESS MAN CONT	BATTERY BUS	2	P5	
		CABIN PRESS CONT 1	DC BUS 1	1	F10	
		CABIN PRESS CONT 2	DC BUS 2	2	F10	