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INTRODUCTION

BLEED AIR SYSTEM

The Bleed Air System is controlled during all phases of operation by two Bleed Management Controllers (BMC). The BMCs provide indications and warnings to EICAS and maintenance information to CAIMS.

In the Bleed Air System, normal flight operations, supplies air from the engines to the ECS and Wing and Cowl Anti-Ice systems. For more information on Ice and Rain Protection, refer to Chapter 3.

On the ground air is normally supplied from the APU. A high-pressure ground air supply unit or bleed air from the engines can also be used.

The Bleed Air System control panel is located on the overhead panel.

ENVIRONMENTAL CONTROL SYSTEM (ECS)

The Environmental Control System (ECS) performs the following functions:

- Provides conditioned air
- Provides ram air in the event of a total ECS failure
- Provides air for pressurization control
- Controls cockpit and passenger compartment temperature control
- Provides sufficient airflow for emergency pressurization
- Provides air recirculation
- Exhausts the air from the cockpit and the cabin
- Exhausts the air from the toilets and the galley(s)
- Ventilates the avionics bay and cockpit displays
- Provides indications and warnings to the EICAS and maintenance information to the Central Aircraft Information Maintenance System (CAIMS)

The air conditioning system is controlled during all phases of operation by two Air Conditioning System Controllers (ACSC). The ACSCs provide indications and warnings to EICAS and maintenance information to CAIMS.

The air conditioning system is comprised of the following subsystems:

- Flow Control System
- Air Conditioning Units (2)
- Temperature Control System
- Air Distribution and Exhaust System
- Emergency Pressurization System

The Air Conditioning System control panel is located on the overhead panel.

CABIN PRESSURE CONTROL SYSTEM (CPCS)

The Cabin Pressure Control System (CPCS) is composed of two controllers, two outflow valves, and two safety valves. The CPCS provides indications and warnings to EICAS and maintenance information to CAIMS.

The system includes safety devices which affect outflow valve travel limitation, cabin altitude limitation, and differential pressure limits.

The cabin is controlled to an altitude of 7,230 feet at an airplane altitude of 51,000 feet. The CPCS controls cabin rate at 500 ft/min cabin climb and 300 ft/min cabin descent (Normal Mode) and up to a 800 ft/min descent rate (High Mode) in order to accommodate the maximum normal airplane operating performance.

The Pressurization System control panel is located on the overhead panel.

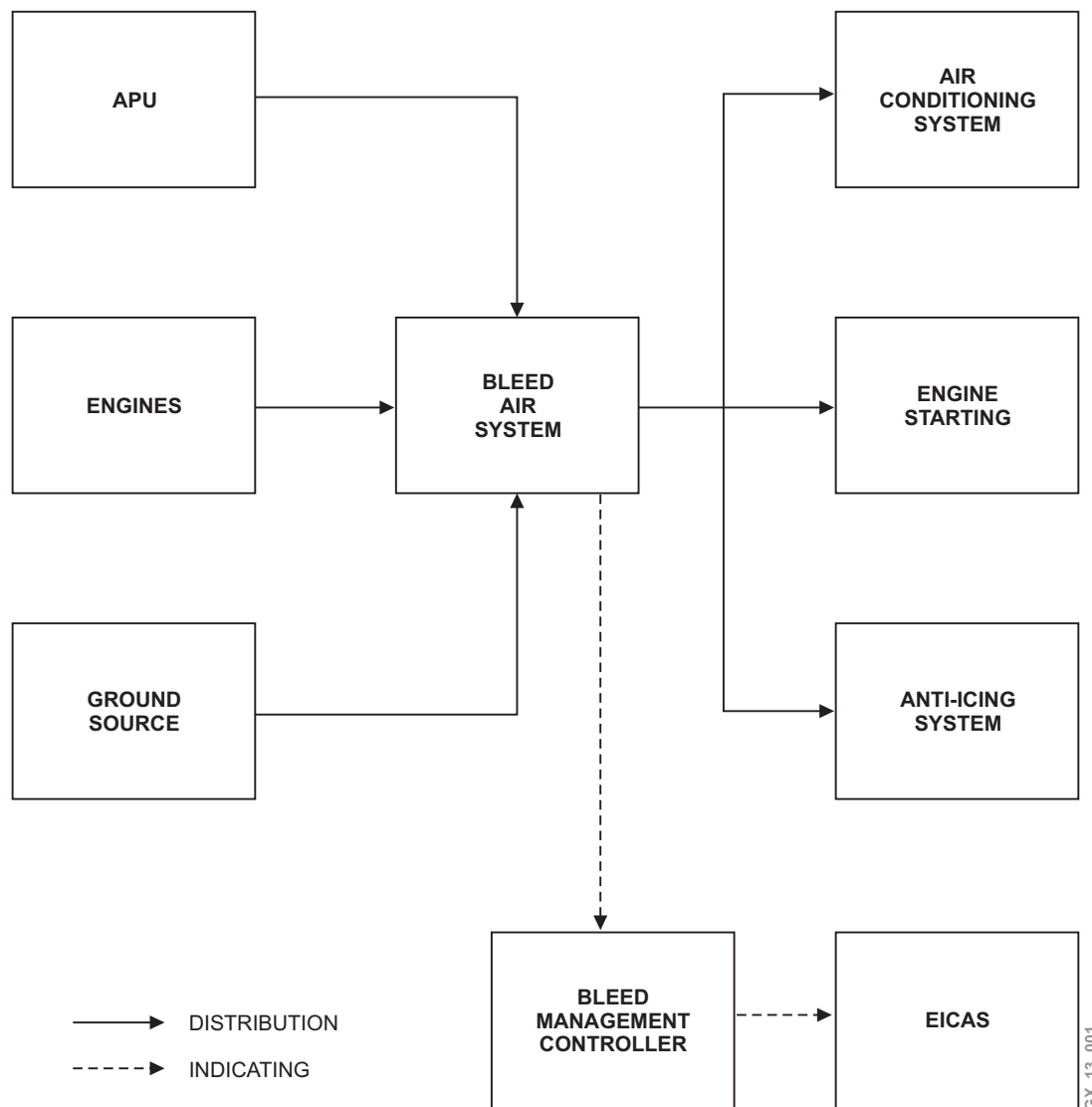
ANTI-ICE SYSTEM

The Anti-Ice System is covered in Chapter 3.

DESCRIPTION

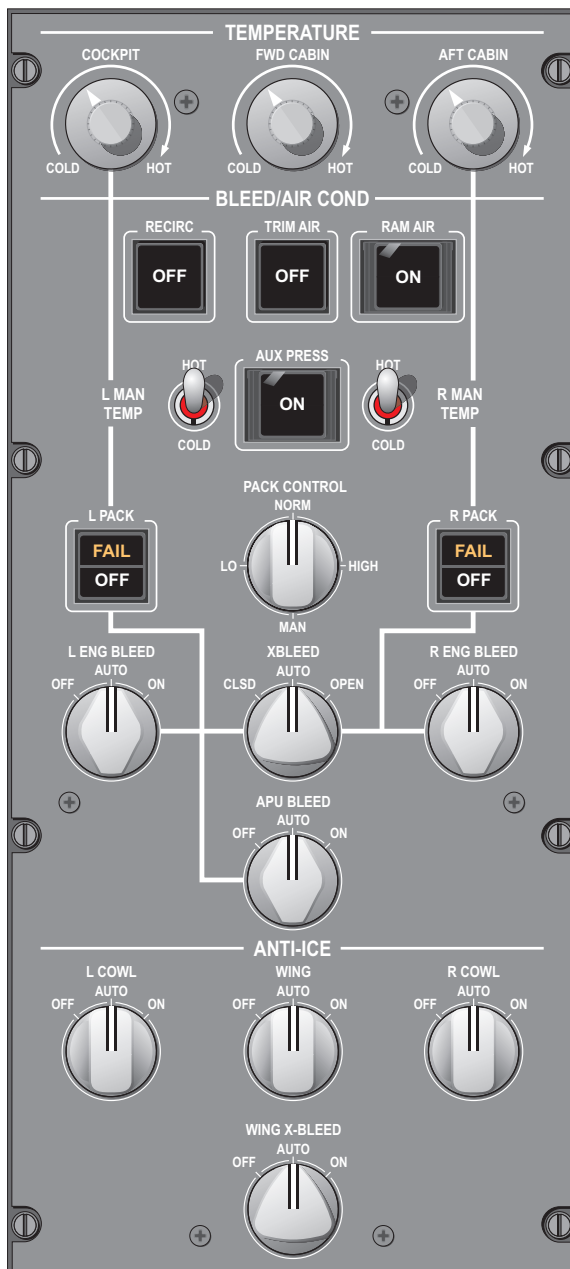
BLEED AIR SYSTEM

The pneumatic system supplies compressed air for air-conditioning and pressurization, engine starting and ice and rain protection. The pneumatic air supply normally comes from the engines in-flight, and the APU or a high-pressure ground air supply unit on the ground.

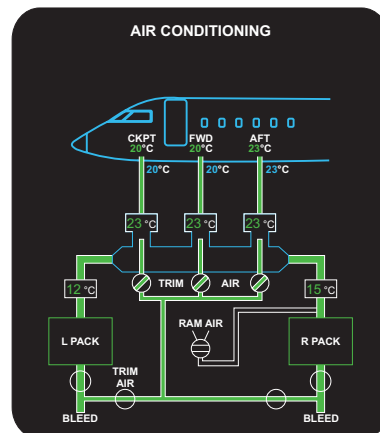


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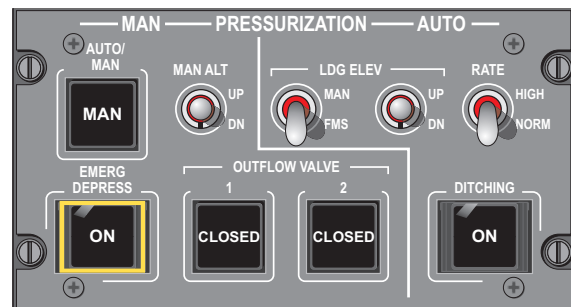
The BLEED/AIRCOND/ANTI-ICE and the PRESSURIZATION panels are located on the overhead panel. Synoptics are available on the SYSTEMS electronic display unit.



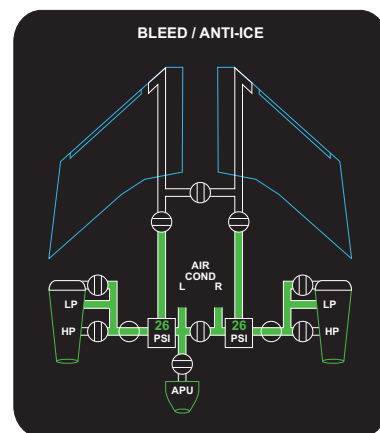
BLEED/AIR CONDITIONING/ANTI-ICE PANEL



AIR CONDITIONING SYNOPTIC



PRESSURIZATION PANEL



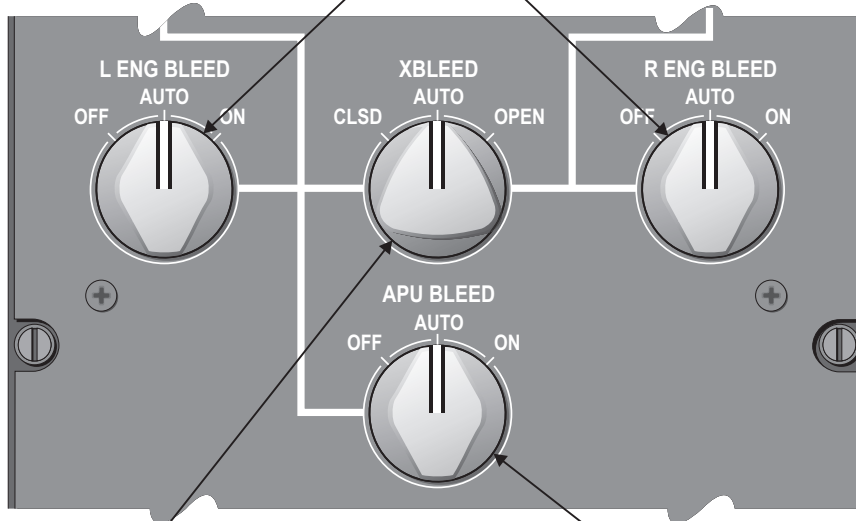
BLEED/ANTI-ICE SYNOPTIC

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Bleed selection is available on the Bleed/Air Conditioning/Anti-Ice panel. The bleed selections are as follows:

L (R) ENG BLEED Selector

- **OFF** – Selects engine bleed air pressure regulating valve (PRV) and high pressure valve (HPV) closed.
- **AUTO** – PRV and HPV operation (open/close) is controlled by the BMC.
- **ON** – Selects PRV open and HPV to open when high pressure selected by BMC. Selects PRV open and HPV closed when low pressure selected by BMC.



XBLEED Selector

- **CLSD** – Selects crossbleed valve closed.
- **AUTO** – Crossbleed valve operation (open/close) is controlled by the BMC.
- **OPEN** – Selects crossbleed valve open and the affected side PRV is commanded to close, controlled by BMC.

APU BLEED Selector

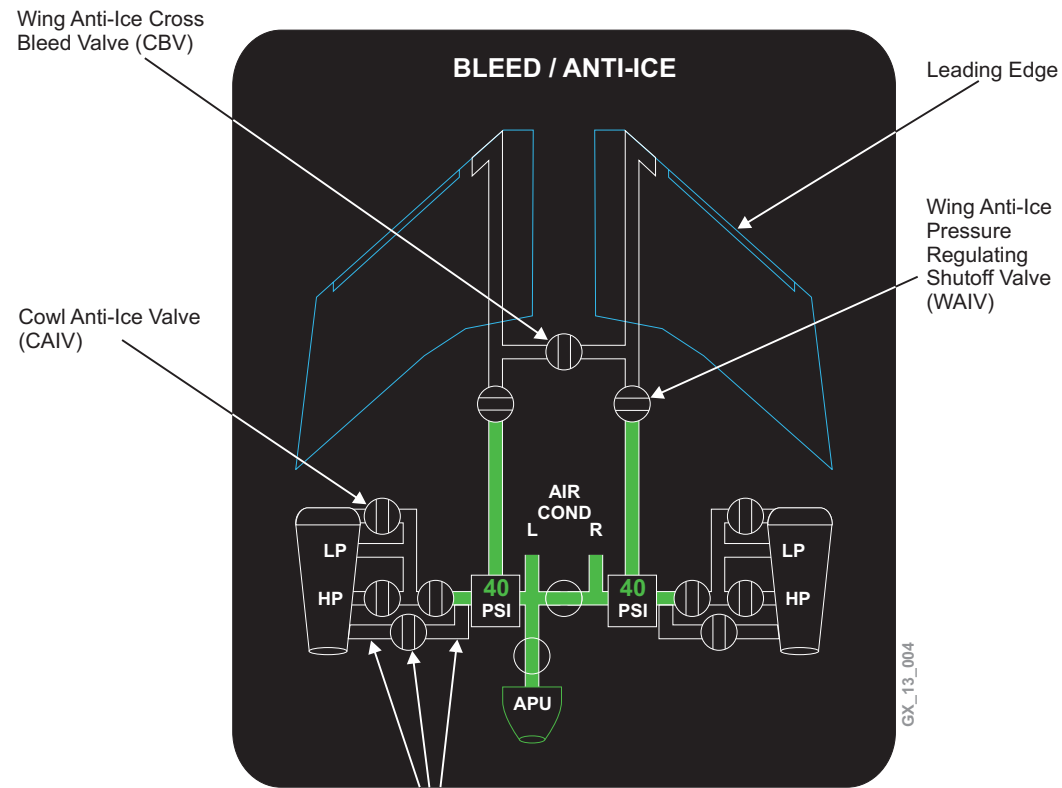
- **OFF** – Selects LCV off.
- **AUTO** – LCV operation (open/close) is controlled by the BMC through the APU FADEC (see chapter 4, AUXILIARY POWER UNIT, for more information)
- **ON** – Selects LCV to open. BMC will reposition the other valves as required to respect bleed air rules.

BLEED/ANTI-ICE SYNOPTIC

The BLEED/ANTI-ICE synoptic is selected using the EICAS Control Panel, located on the pedestal.



EICAS CONTROL PANEL



Bleed Air Starter Pop-Up Display and Starter Air Valve
(Only displayed if an engine is not operating)

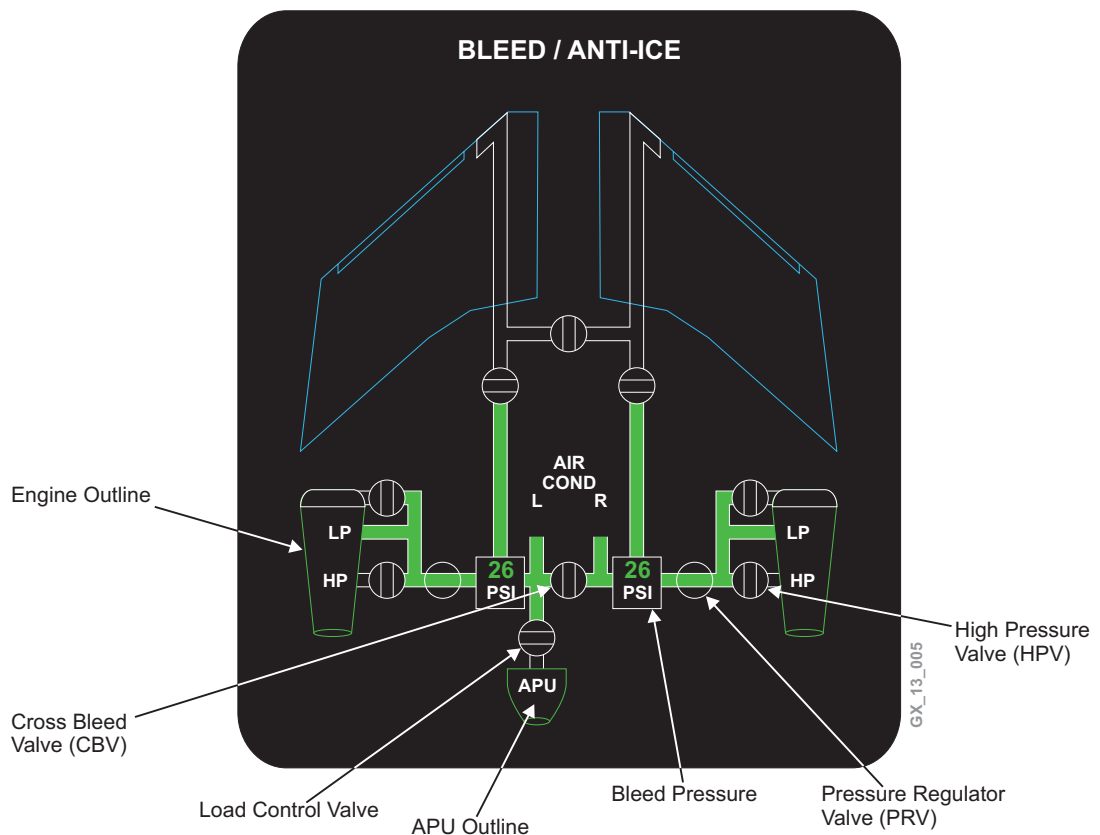
For more information on the Anti-Ice system see Chapter 3, ICE AND RAIN PROTECTION.

For more information on the Starter Pop-Up see Chapter 17, POWER PLANT.

The BLEED/ANTI-ICE synoptic is selected using the EICAS Control Panel, located on the pedestal.



EICAS CONTROL PANEL



For more information on the APU see Chapter 4, AUXILIARY POWER UNIT.

For more information on the engines see Chapter 17, POWER PLANT.

BLEED MANAGEMENT CONTROLLERS (BMC)

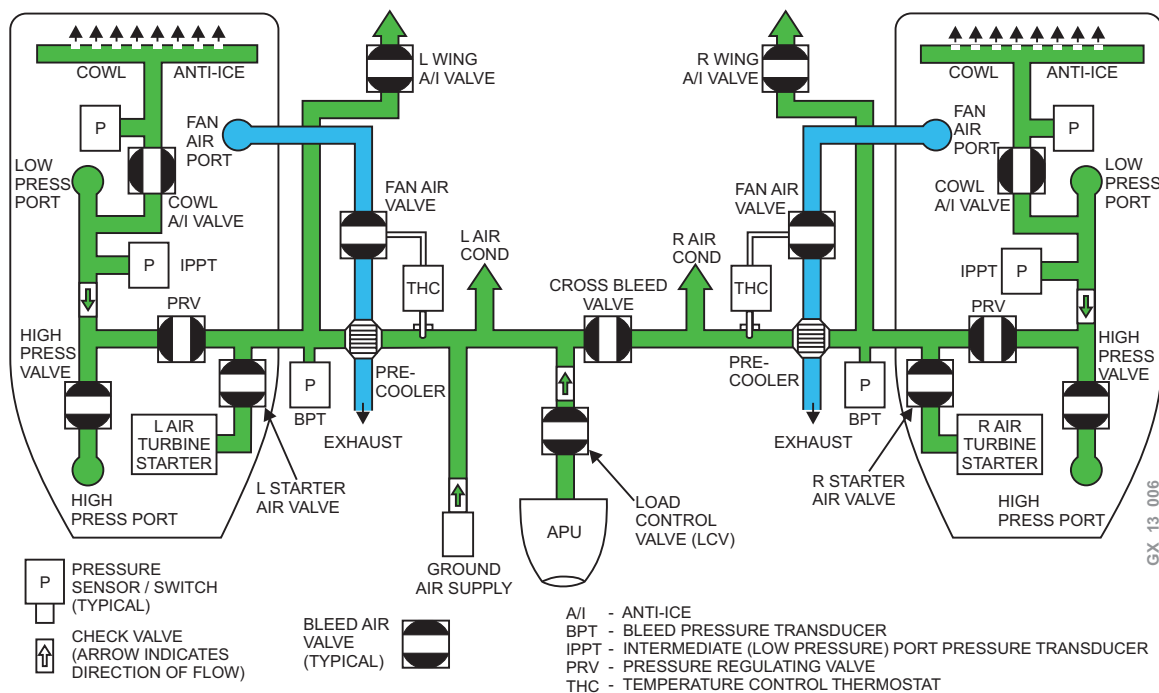
There are two BMCs, one for the left hand side and one for the right hand side of the airplane. Each BMC is comprised of two redundant channels (control and monitoring).

The control channel ensures on/off switching and the following control functions for its associated side:

- Bleed on/off
- Wing anti-ice on/off switching and monitoring
- Wing anti-ice temperature regulation and monitoring
- Crossbleed valve (CBV) and cross anti-ice functions

The monitoring channel controls monitoring functions and leak detection, and provides:

- Leak detection for the complete airplane. The redundancy on the leak detection is achieved by the two monitoring channels of the two BMCs
- Redundancy on control and monitoring of bleed switching and anti-ice switching, and wing anti-ice temperature regulation

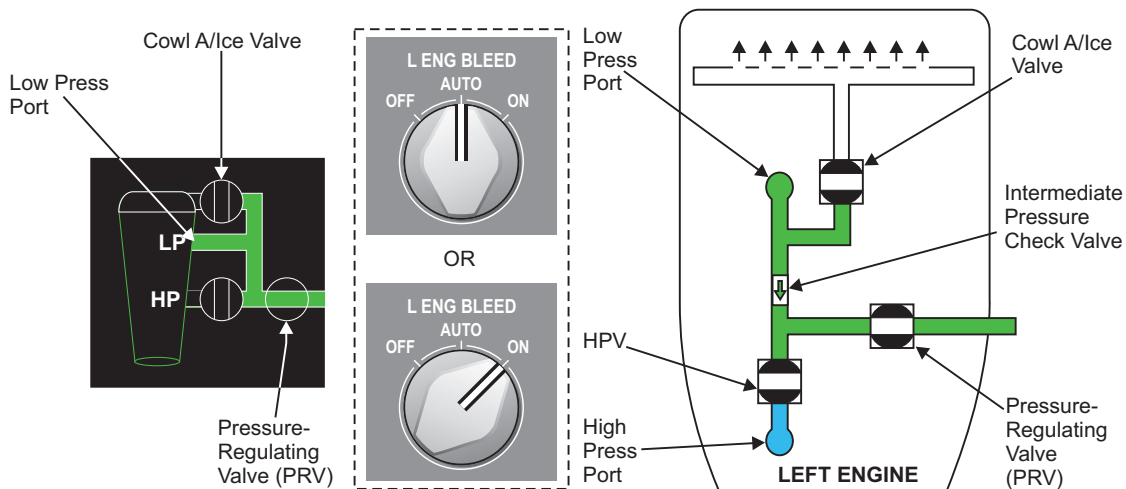


BLEED AIR TRANSFER/PRESSURE REGULATION

The BMC selects air from either the low-pressure port (5th stage) or high-pressure port (8th stage) on the engine depending on the pressure available. The Pressure Regulating Valve (PRV) limits the pressure supplied to 43 ± 3 psig.

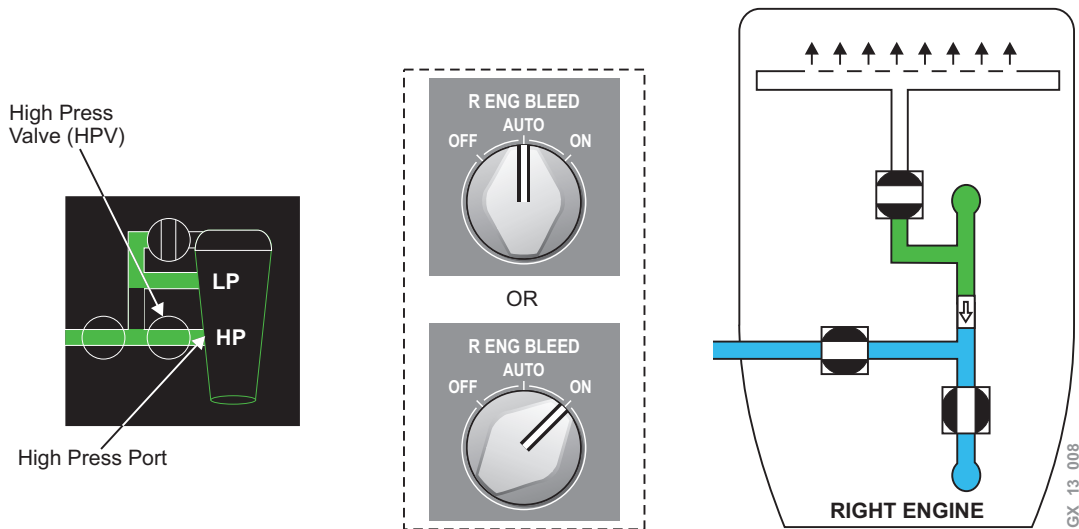
Under normal operating conditions (in-flight), the air is bled from the low-pressure port (5th stage) of the compressor. An intermediate pressure check valve, located in the engine nacelle, prevents reverse flow into the engine compressor 5th stage.

When the pressure is insufficient at the low-pressure port, the HPV is signaled to open by the BMC and air from the high-pressure port (8th stage) drives the intermediate pressure check valve closed.

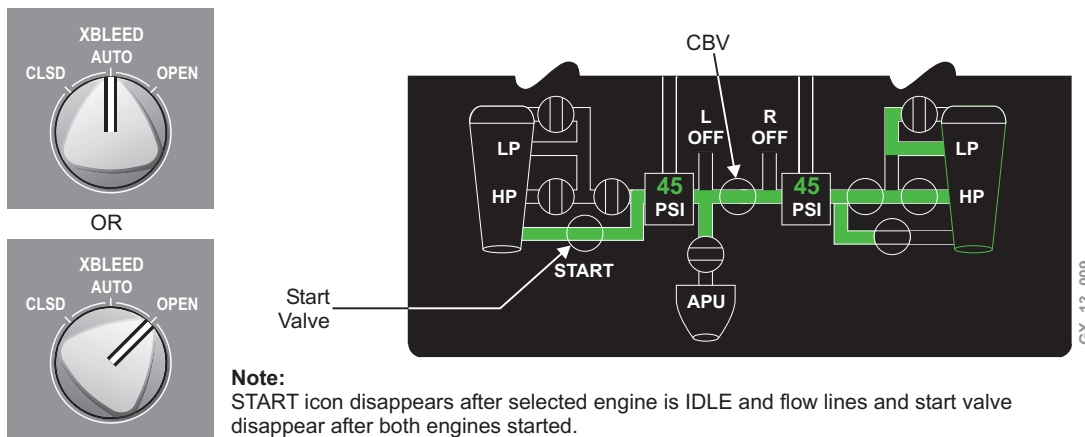


NOTE

The BMC will control the bleed pressure (high or low) when either AUTO or ON is selected.



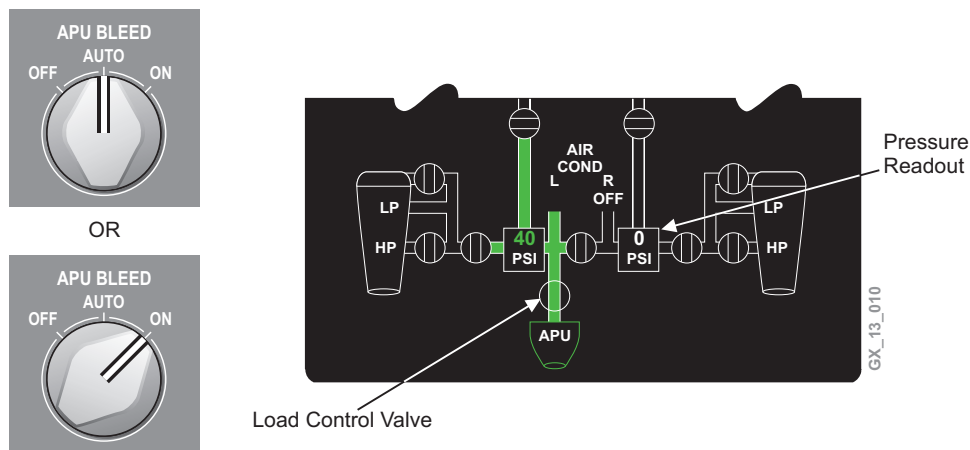
A Crossbleed Valve (CBV) is installed between the left and right pneumatic ducts which can be opened either automatically by the BMC or manually through the OPEN selection to provide bleed air from one side to the other (i.e. for engine starting). Refer to Chapter 17, POWER PLANT for more information.



Note:
START icon disappears after selected engine is IDLE and flow lines and start valve disappear after both engines started.

APU BLEED AIR

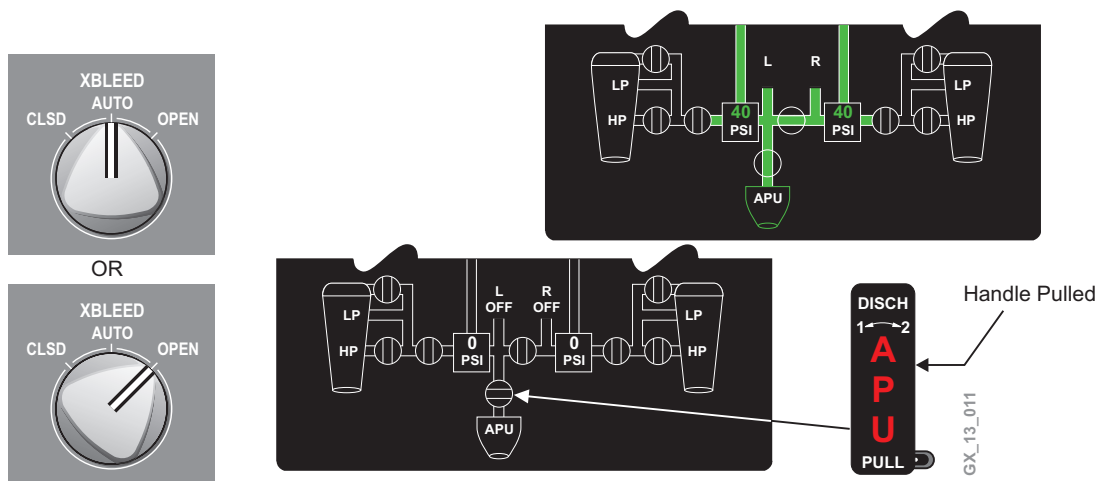
The APU can be used on the ground and in the air to supply the pneumatic system for air conditioning or engine starting. Opening the Load Control Valve (LCV), automatically by the BMC or manually through the ON selection, allows air from the APU to feed the left pneumatic duct. The air pressure delivered in the pneumatic duct is displayed on the synoptic page in psi.



NOTE

APU bleed air volume is insufficient to supply the wing anti-ice system.

Opening the crossbleed valve (CBV), automatically by the BMC or manually through the ON selection, allows air from the APU to feed the right pneumatic duct.



The APU FIRE DISCH handle, when pulled, will close the LCV. Refer to Chapter 9, FIRE PROTECTION for more information.

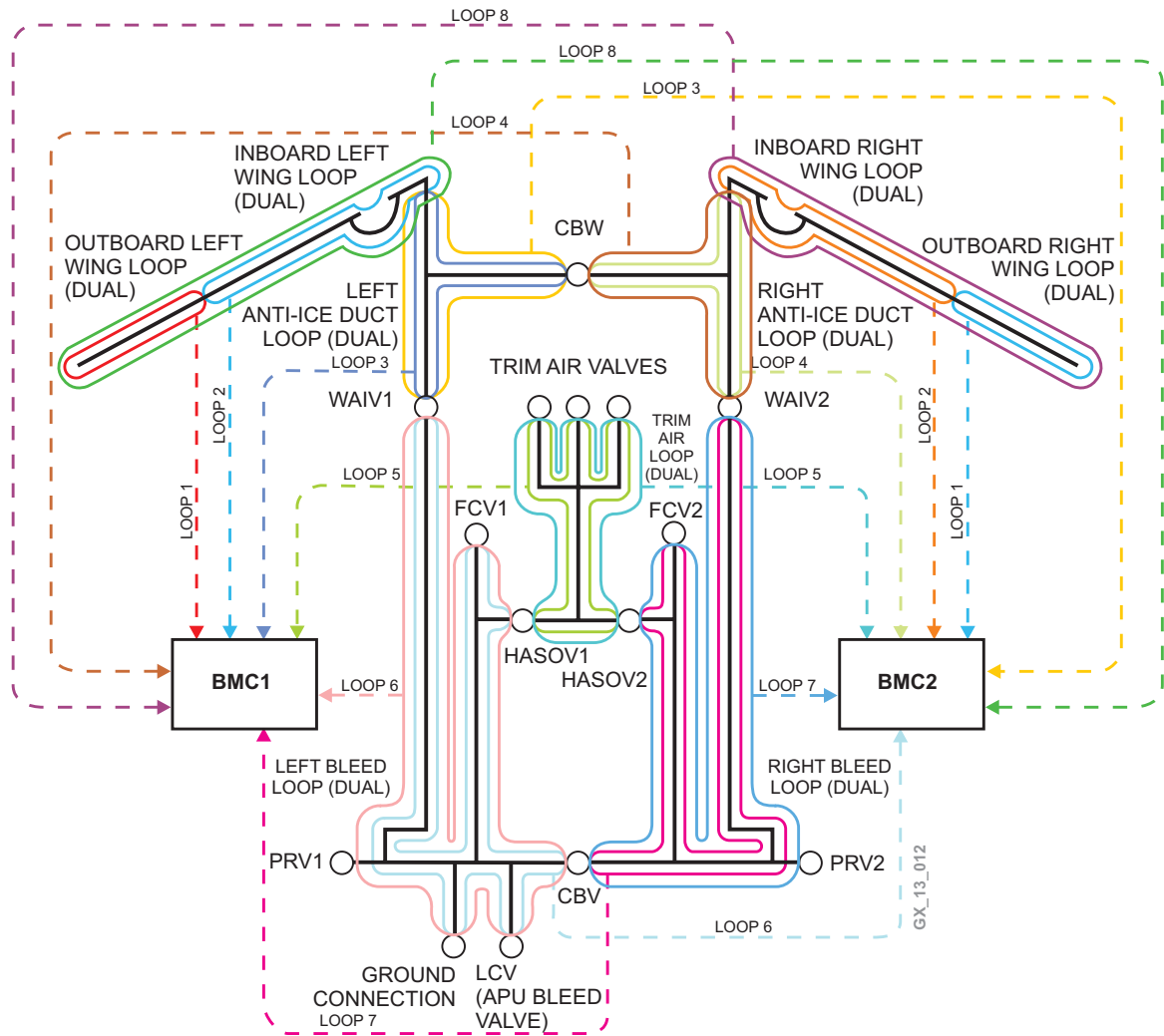
NOTE

Engine bleed has priority over APU bleed and MAN has priority over AUTO. If both PRVs are open (i.e. engines running), the BMC will automatically close the LCV and the CBV (APU BLEED and XBLEED in AUTO).



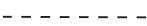

BLEED LEAK DETECTION

Hot air leaks are monitored in the airplane by dual loop continuous bleed leak detection sensing elements, routed along the airplane ducts. Each dual loop consists of loop A and loop B. Loop A is connected to the left BMC monitoring channel and loop B is connected to the right BMC monitoring channel.

Leak detection elements consist of two concentric tubes. The space between the tubes is filled with an insulated eutectic salt. During temperature increase, the salt becomes conductive and the measured resistance between the tubes drops suddenly, triggering an EICAS message.



LEGEND:

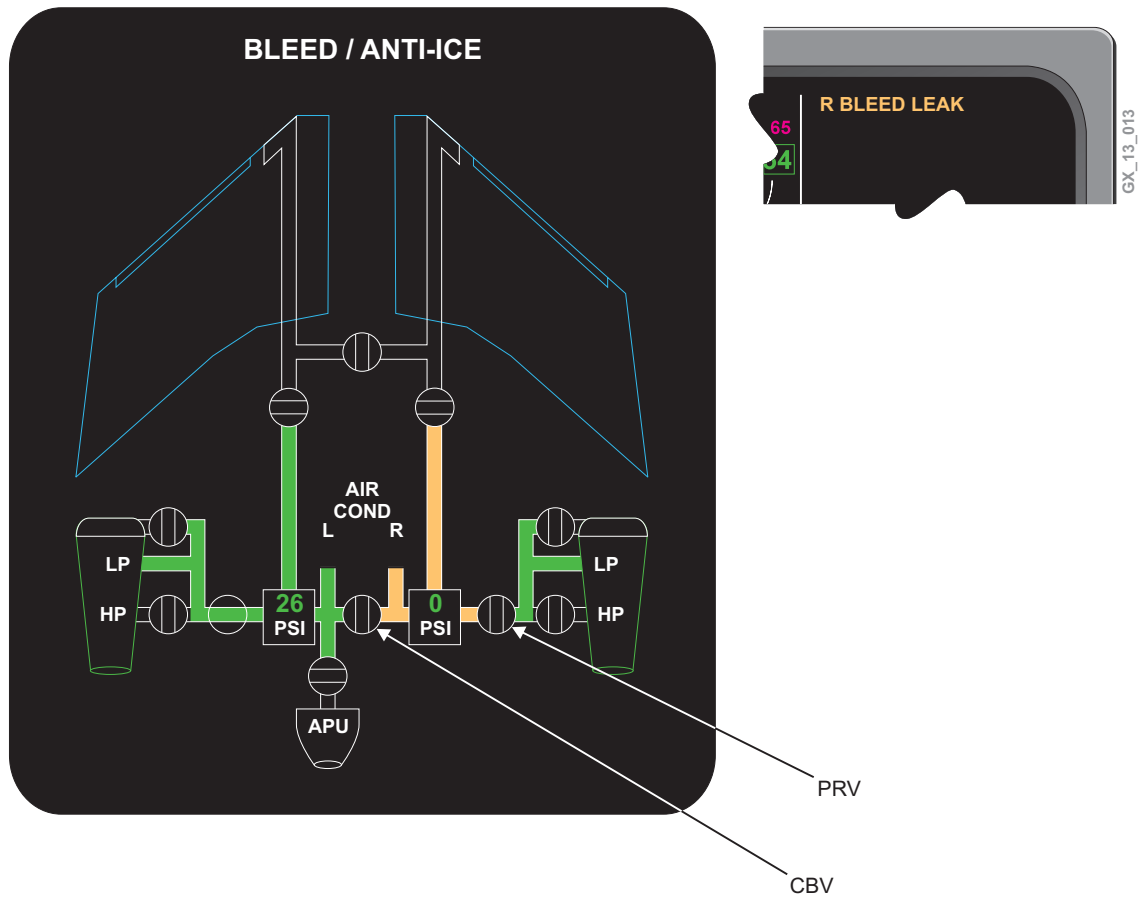
-  Valve + Duct
-  Leak Detection Loop
-  Link Loop > Controller (Loop Read by BMC)
-  BMC Bleed Management Controller

- CBV** Cross Bleed Valve
- PRV** Pressure-Regulating Valve
- FCV** Flow Control Valve
- HASOV** Hot Air Shutoff Valve
- WAIV** Wing Anti-Ice Valve
- CBW** Wing Crossfeed Valve

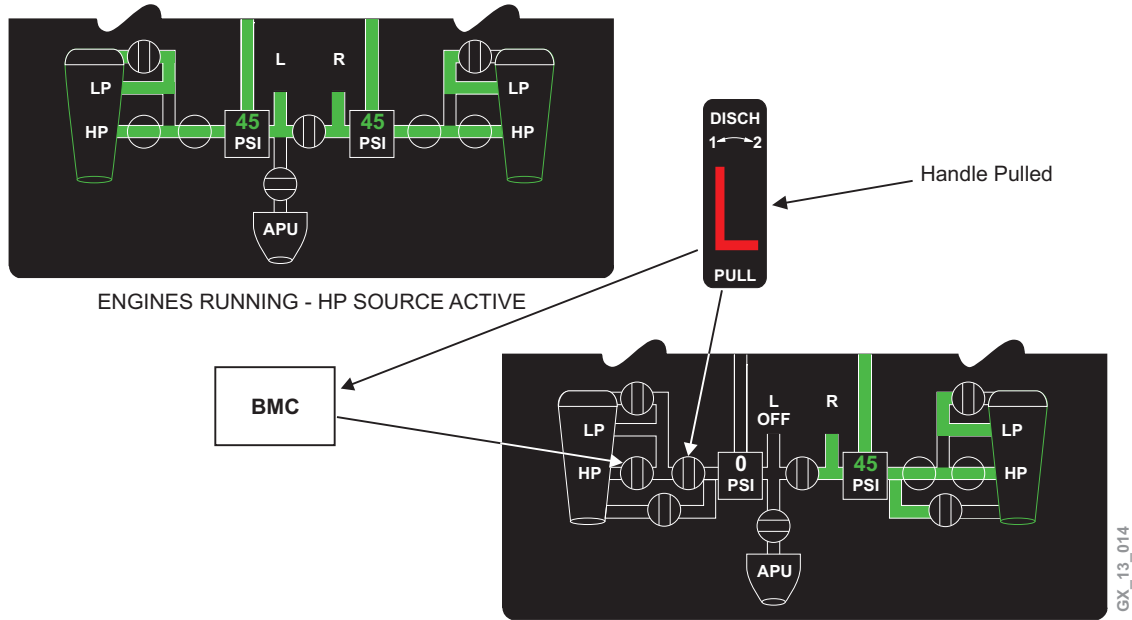
The Monitoring Channel of the Bleed Management Controller (BMC) continuously monitors, through a Continuous Built-In-Test (CBIT), the resistance of the bleed air leak detection elements. When both loops in the same circuit indicate a bleed air leak has occurred the controller will isolate the affected manifold by closing the appropriate valves.

When a leak is detected, the appropriate BLEED LEAK, WING A/I LEAK, or TRIM LEAK caution message is displayed on EICAS and the applicable valves are automatically closed by the BMC and/or the ACSC. The following action should occur when a bleed air leak is detected.

| LEAK LOCATION | DETECTED BY | INDICATION | ACTION |
|---------------------------------|----------------------------|-----------------------------|---|
| Outboard Wing | Loop 1 and Opposite Loop 8 | WING A/ICE LEAK caution msg | Automatic closure of both Wing Anti-Ice Valves (WAIV) and the Wing Cross Bleed Wing (CBW) |
| Inboard Wing | Loop 2 and Opposite Loop 8 | WING A/ICE LEAK caution msg | Automatic closure of both WAIV and the CBW |
| Left Wing Anti-Ice Supply duct | Loop 3 (both) | WING A/ICE LEAK caution msg | Automatic closure of both (WAIV) and the CBW |
| Right Wing Anti-Ice Supply duct | Loop 4 (both) | WING A/ICE LEAK caution msg | Automatic closure of both (WAIV) and the CBW |
| Trim Air Supply duct | Loop 5 (both) | TRIM AIR LEAK caution msg | Automatic closure of both Hot Air Shut-Off Valves (HASOV) |
| Left Bleed Air duct | Loop 6 (both) | L BLEED LEAK caution msg | Automatic closure of left Pressure Regulating Valve (PRV), APU Load Control Valve (LCV) and Cross Bleed Valve (CBV) |
| Right Bleed Air duct | Loop 7 (both) | R BLEED LEAK Caution msg | Automatic closure of right PRV and CBV |

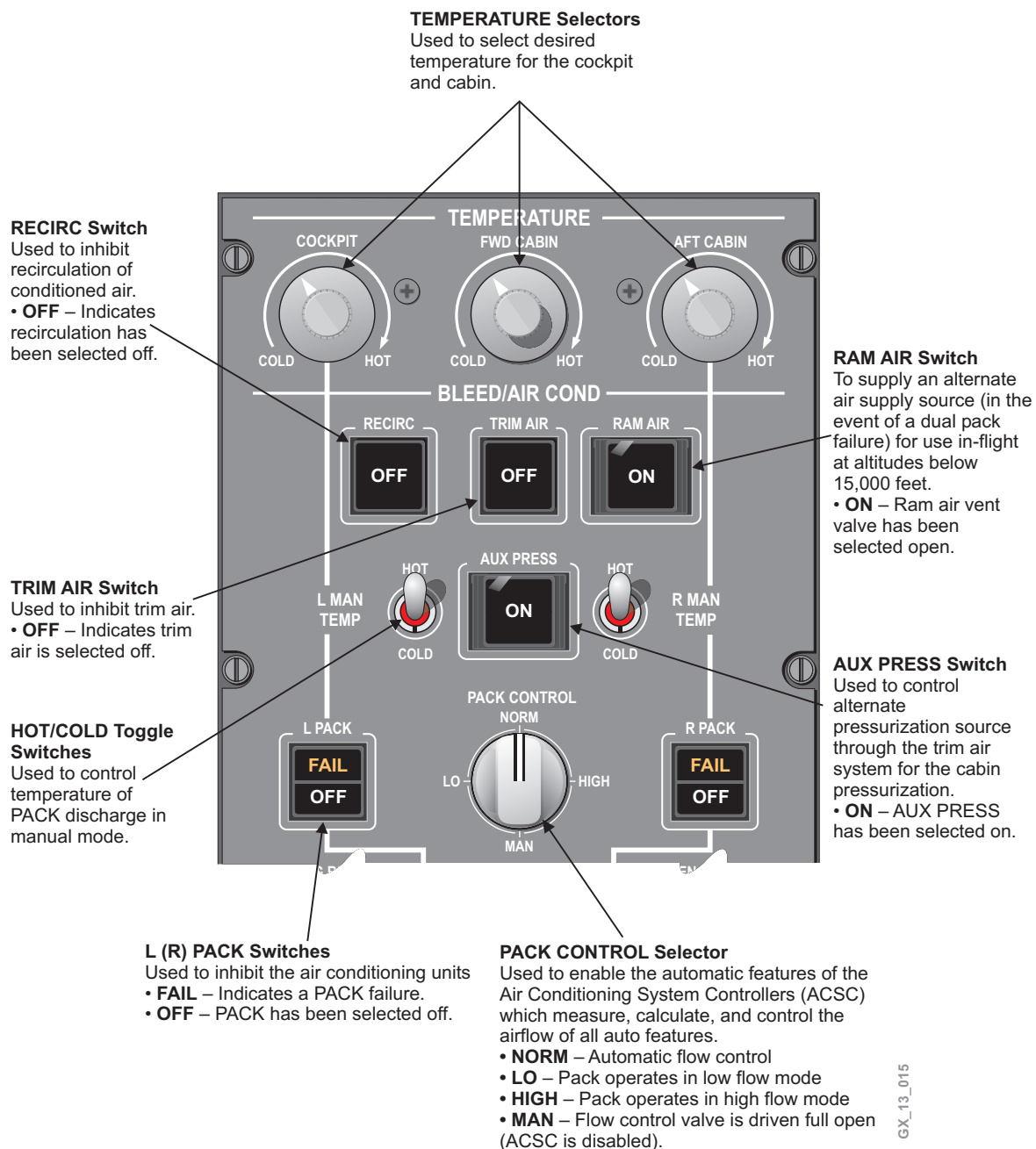


The L(R) FIRE DISCH handles, when pulled, will close the respective PRV and HPV. Refer to Chapter 9, FIRE PROTECTION for more information.



AIR CONDITIONING CONTROLS

Controls are provided on the Air Conditioning Control Panel, located on the overhead panel.



AIR CONDITIONING SYSTEM

The air conditioning system is comprised of flow control valves, air conditioning units, a ram air system, distribution system ventilation system and emergency pressurization system.

The flow control system regulates airflow from the pneumatic duct to the air conditioning units.

The ACUs decrease the temperature and moisture content of the bleed air from the pneumatic system. The ACUs are located in the aft equipment bay.

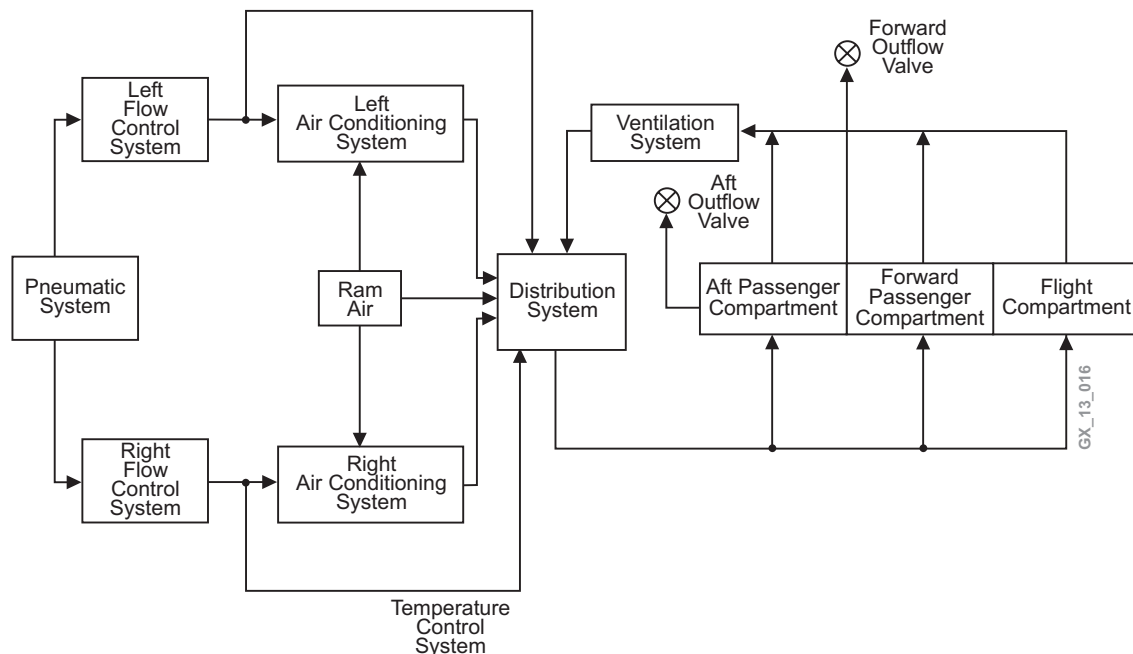
An alternate supply of fresh air is available via the ram air system.

Conditioned air is routed from the cooling packs to the mix manifold (distribution system).

The emergency pressurization system provides an alternate pressurization source for the cabin in the event of the loss of both cooling packs.

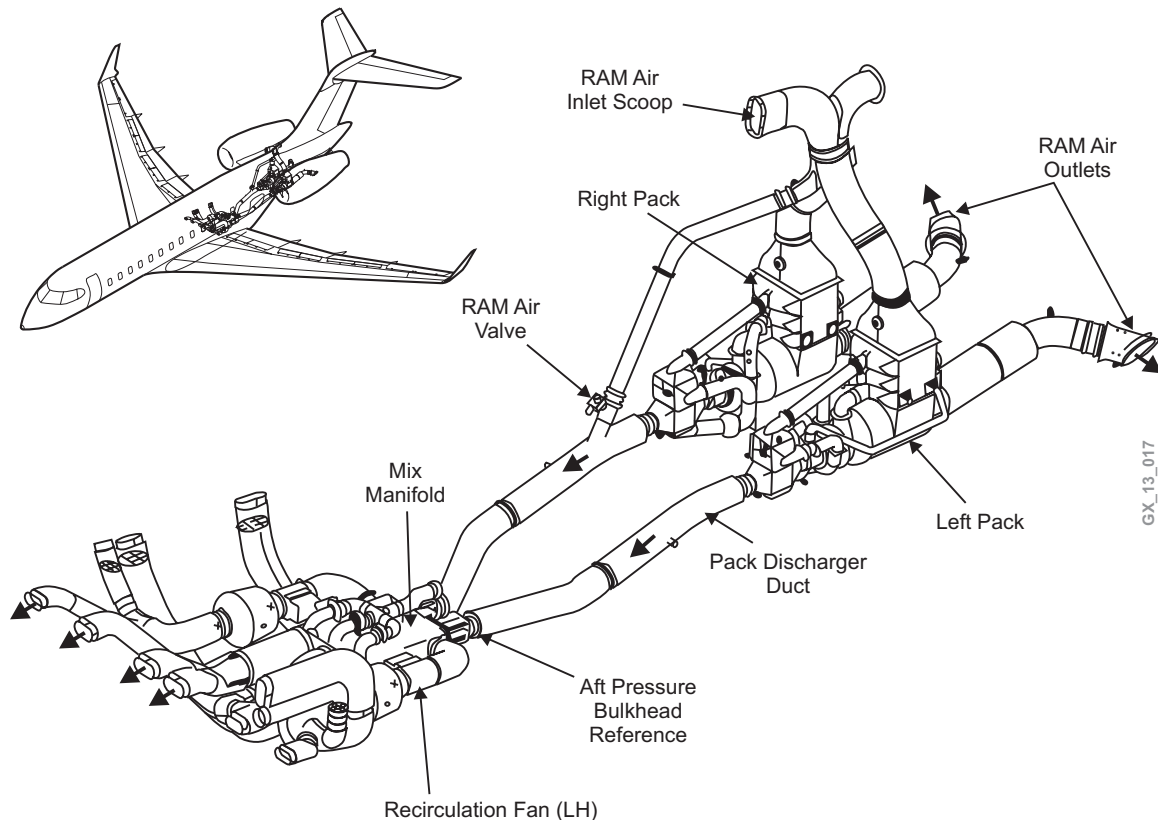
The Avionics and Cockpit Display Exhaust system ensures the ventilation of the avionic equipment and cockpit displays to prevent excessive heating.

On the Global 5000, the same functions are also carried out for the avionics rack.



AIR CONDITIONING PACKS

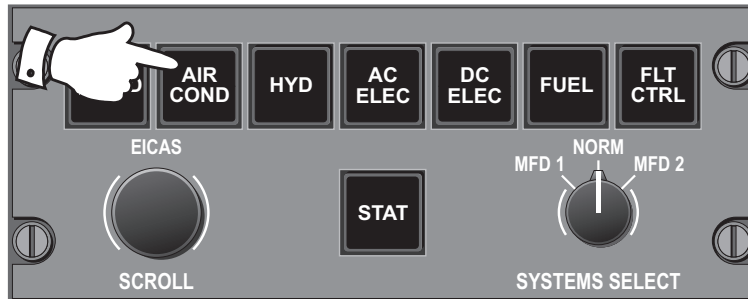
The cooling packs decrease the temperature and moisture content of the bleed air from the pneumatic system. The packs are located in the aft equipment bay.



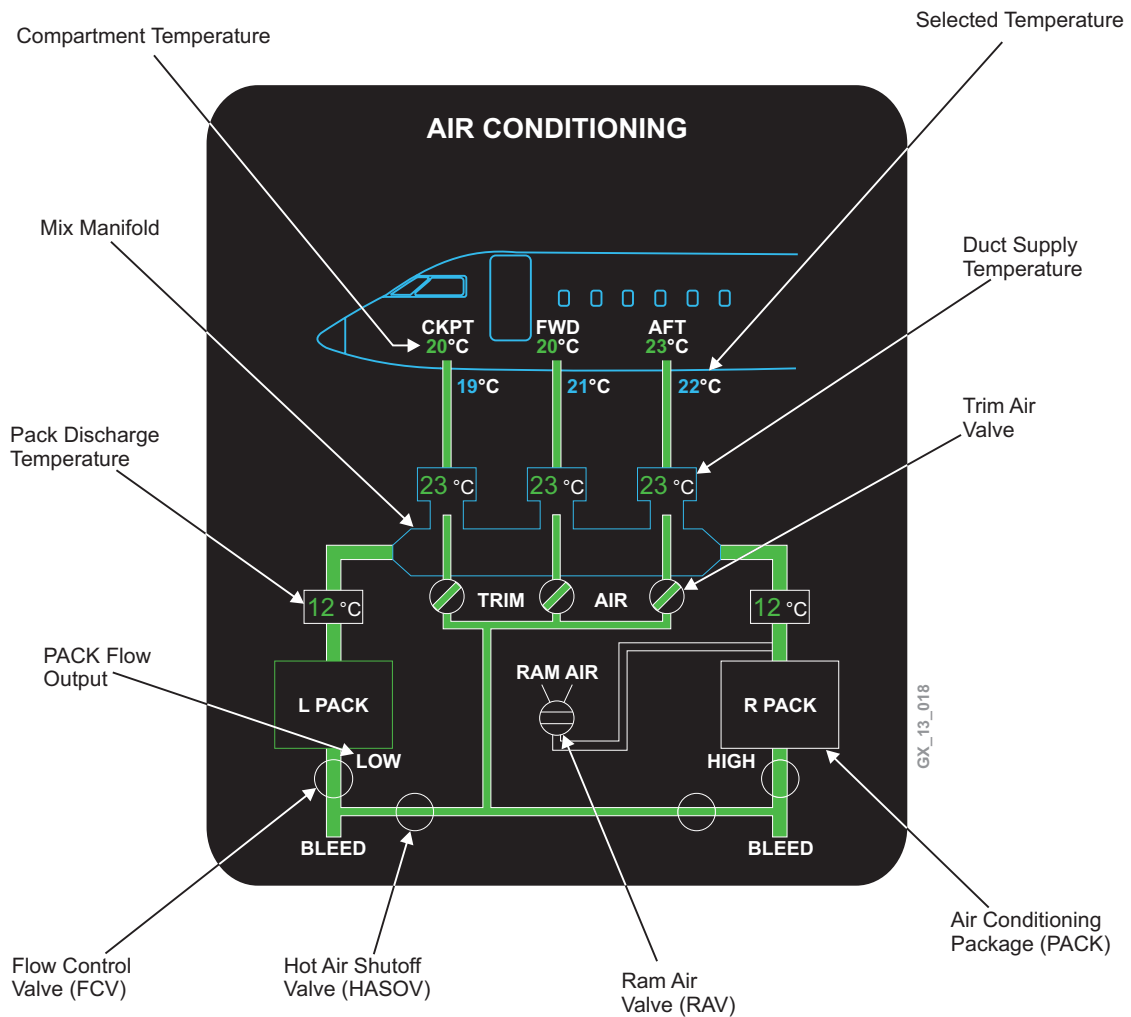
The air conditioning package is composed of:

- Two cooling packs which decrease the temperature and moisture content in the bleed air and deliver conditioned air to the mix manifold
- A RAM AIR system which has two main functions:
 - To supply air to the cooling packs' dual heat exchangers to cool the bleed air flow
 - To supply an alternate air supply source (in the event of a dual pack failure) for use in-flight at altitudes below 15,000 feet

The AIR CONDITIONING synoptic is selected using the EICAS control panel, located on the pedestal.



EICAS CONTROL PANEL



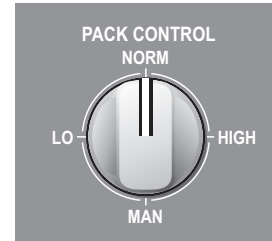
Flow selections are as follows:

NORM:

The flow demand per pack decreases linearly with airplane altitude from 30 lb/min at sea level to 18 lb/min at 51,000 feet.

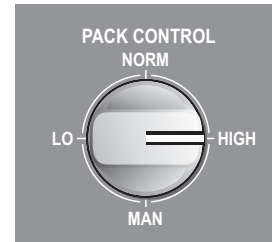
Flow is limited to a maximum value of 40lb/min per pack. The BMC will prevent two packs being supplied by one engine.

In case of single pack operation, the high flow schedule is automatically selected by the ACSC.



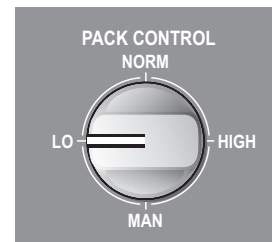
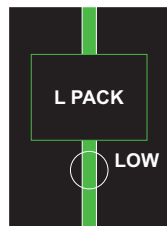
HIGH:

The flow demand per pack decreases linearly with airplane altitude from 40 lb/min at sea level to 23 lb/min at 51,000 feet (controlled by ACSC).



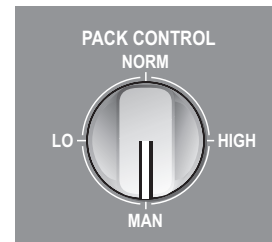
LO:

The flow demand is half, 20 lb/min, of the high flow demand but is limited to a minimum of 18 lb/min (controlled by the ACSC).



MAN:

The flow control valve is driven to the full open position (ACSC is disabled).

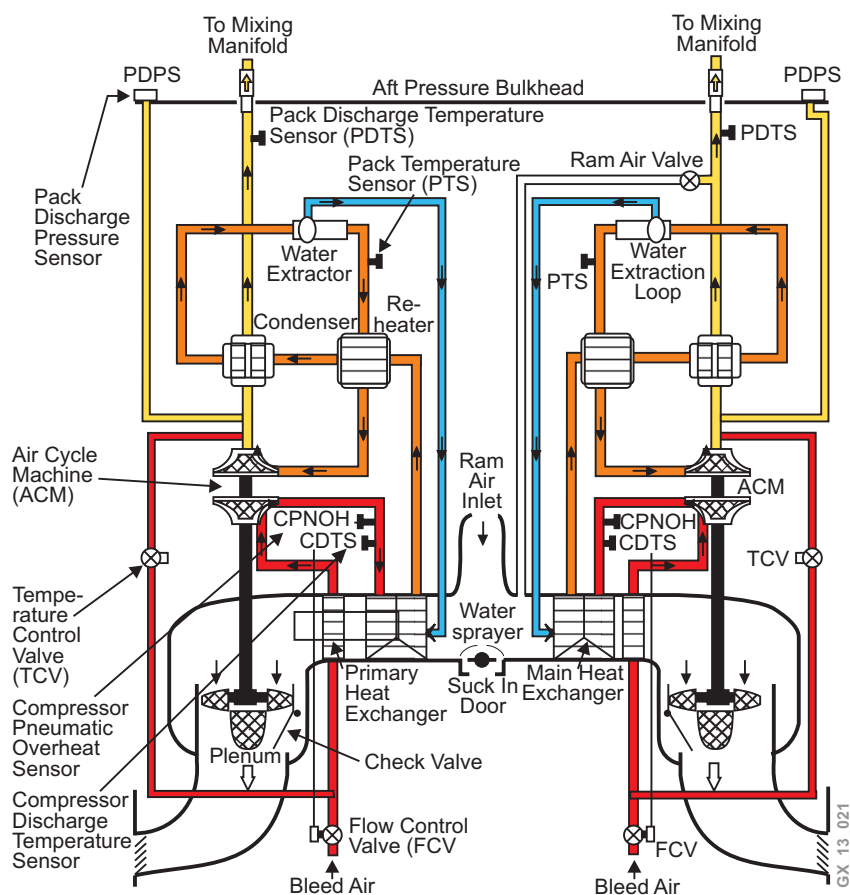


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COOLING PACKS

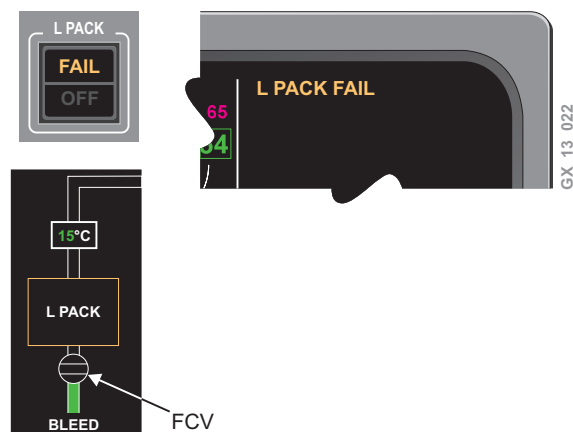
The cooling packs function as follows:

- Bleed air flows through the FCV into the primary heat exchanger, where it is cooled by ram air
- From the primary heat exchanger the air flows into the compressor of the air cycle machine where the temperature and pressure are increased
- From the compressor the air enters the main heat exchanger where the temperature is further decreased again
- From the main heat exchanger the air passes into the high-pressure water extraction loop (Reheater/Condenser, Water Extractor) where much of the water is removed and temperature is further decreased. The water is evacuated into the ram air cooling flow at the inlet of the heat exchangers to increase cooling efficiency by evaporation
- From the water extraction loop the air enters the turbine of the air cycle machine where the temperature and pressure are decreased
- From the turbine the air flows back through the condenser where the temperature is increased slightly and ducted to the mix manifold

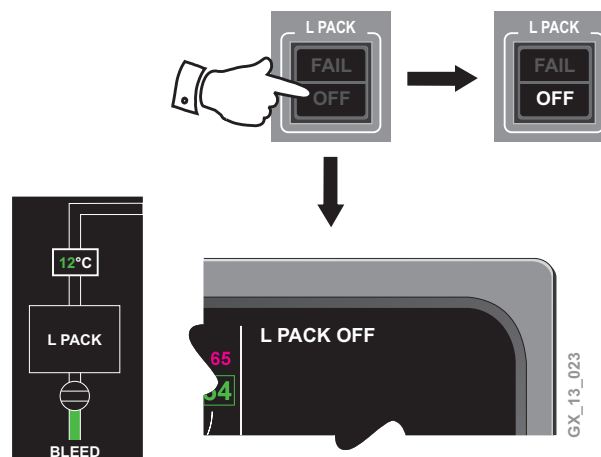


The cooling packs are shut off (FCV closed) under the following circumstances:

- In AUTO operation by the ACSC acting on the FCV torque motor due to:
 - Bleed failure or shutdown (on BMC demand)
 - Engine starting (on BMC demand)
 - During ditching operation if airplane is below 15,000 feet
 - Pack inlet overheat
 - Compressor discharge overheat
 - Pack discharge overheat
 - Pack discharge underpressure



- In AUTO or MANUAL operation by the Compressor Pneumatic Overheat Sensor (CPNOH) acting pneumatically on the FCV actuator due to:
 - Compressor discharge overheat
 - By crew selection on PACK switch acting on the FCV solenoid



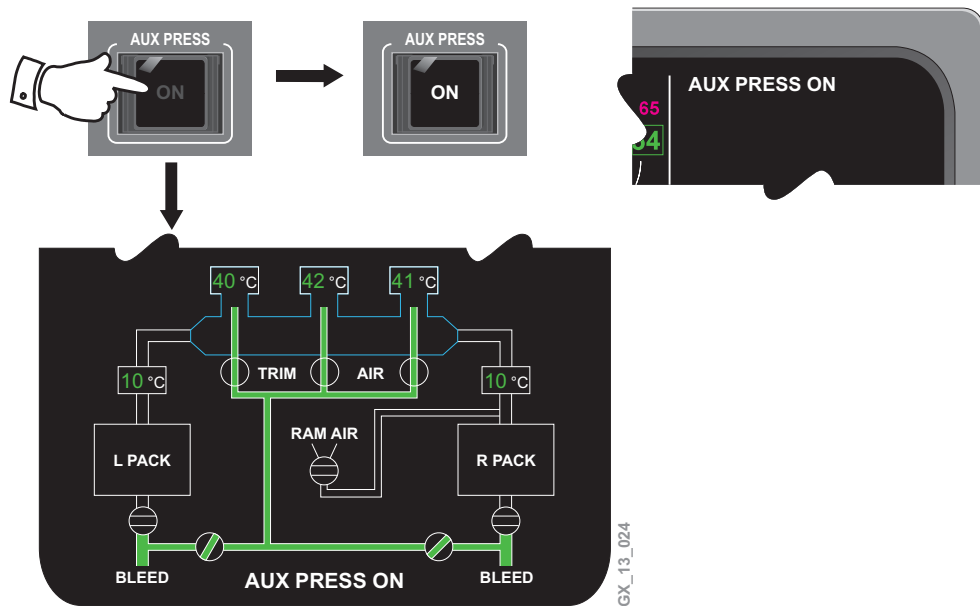
AUXILIARY PRESSURIZATION

The auxiliary pressurization system provides an alternate pressurization source for the cabin in the event of the loss of both cooling packs.

The AUX PRESS switch, when selected ON, sends a signal to each ACSC. The ACSC commands the HASOVs to mid position and the trim valves to full open to use trim air for pressurization.

The recirculation system should be selected ON to reduce the supply temperatures in the distribution ducts. Duct overheating detection is carried out by the ACSCs.

An EICAS message is displayed when AUX PRESS switch is selected ON.

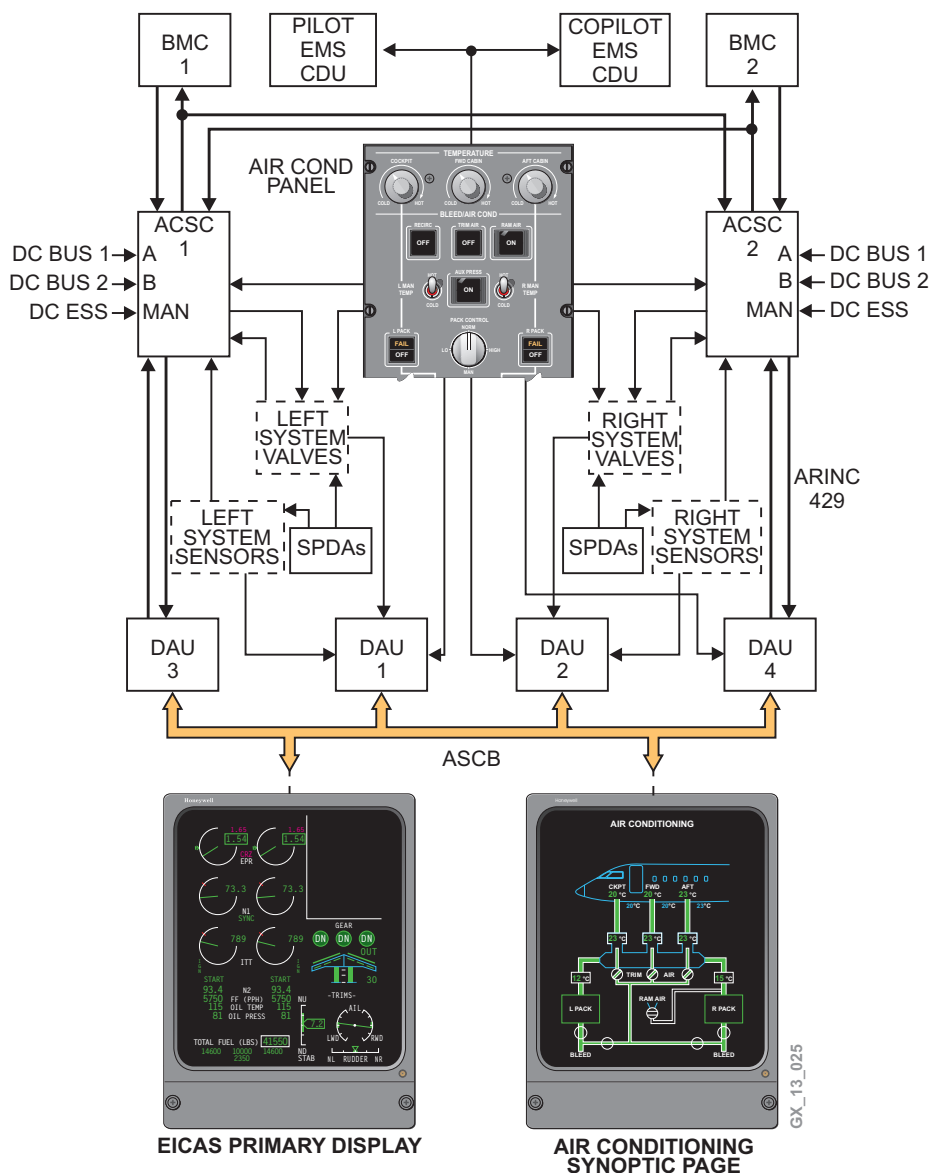


TEMPERATURE CONTROL

In normal operation, with the packs in AUTO mode and trim system ON, the pack discharge temperature is automatically controlled by the ACSC.

Each ACSC is divided into two fully redundant channels, A and B. During operation one channel is active and controlling the ECS. The inactive channel also computes the control data but does not command outputs.

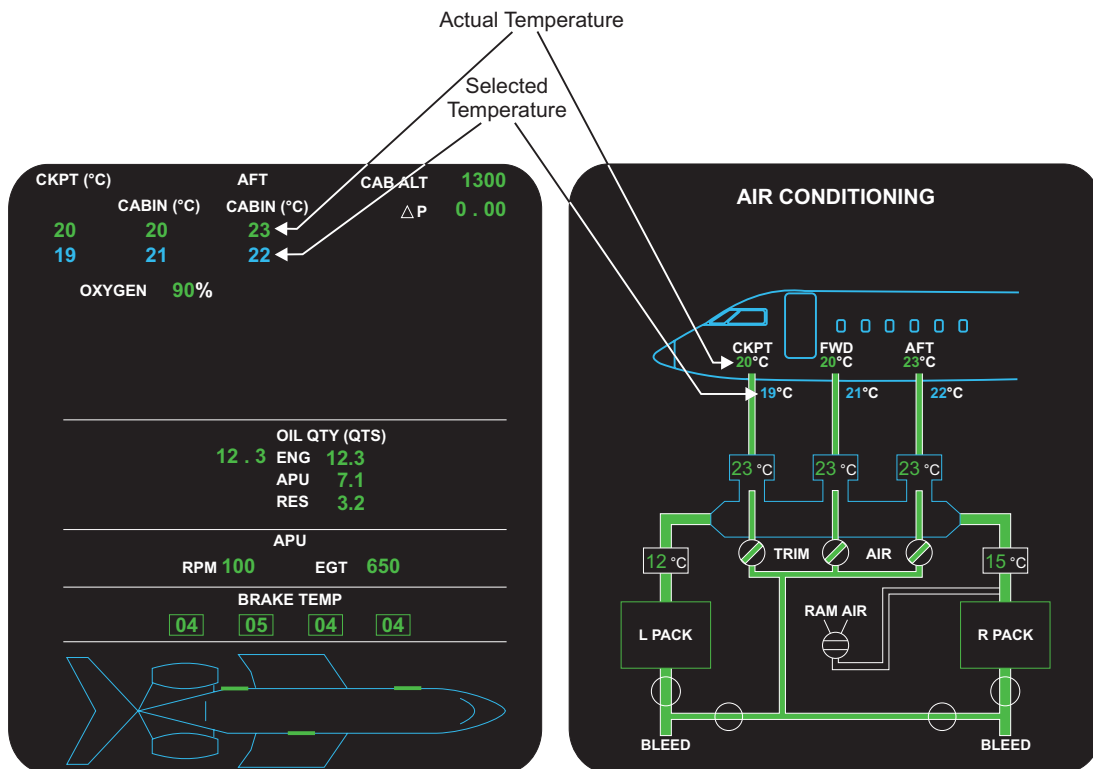
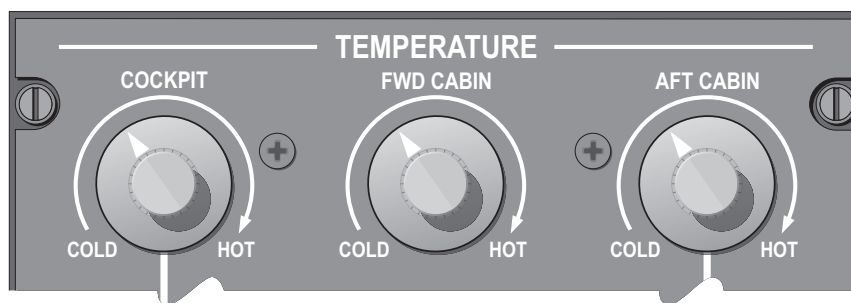
ACSC 1 (left side of the aircraft) controls the temperature in the cabin via the forward and aft trim air valves. ACSC 2 (right side) controls the cockpit temperature and cockpit trim air valve.



TEMPERATURE CONTROL – AUTO

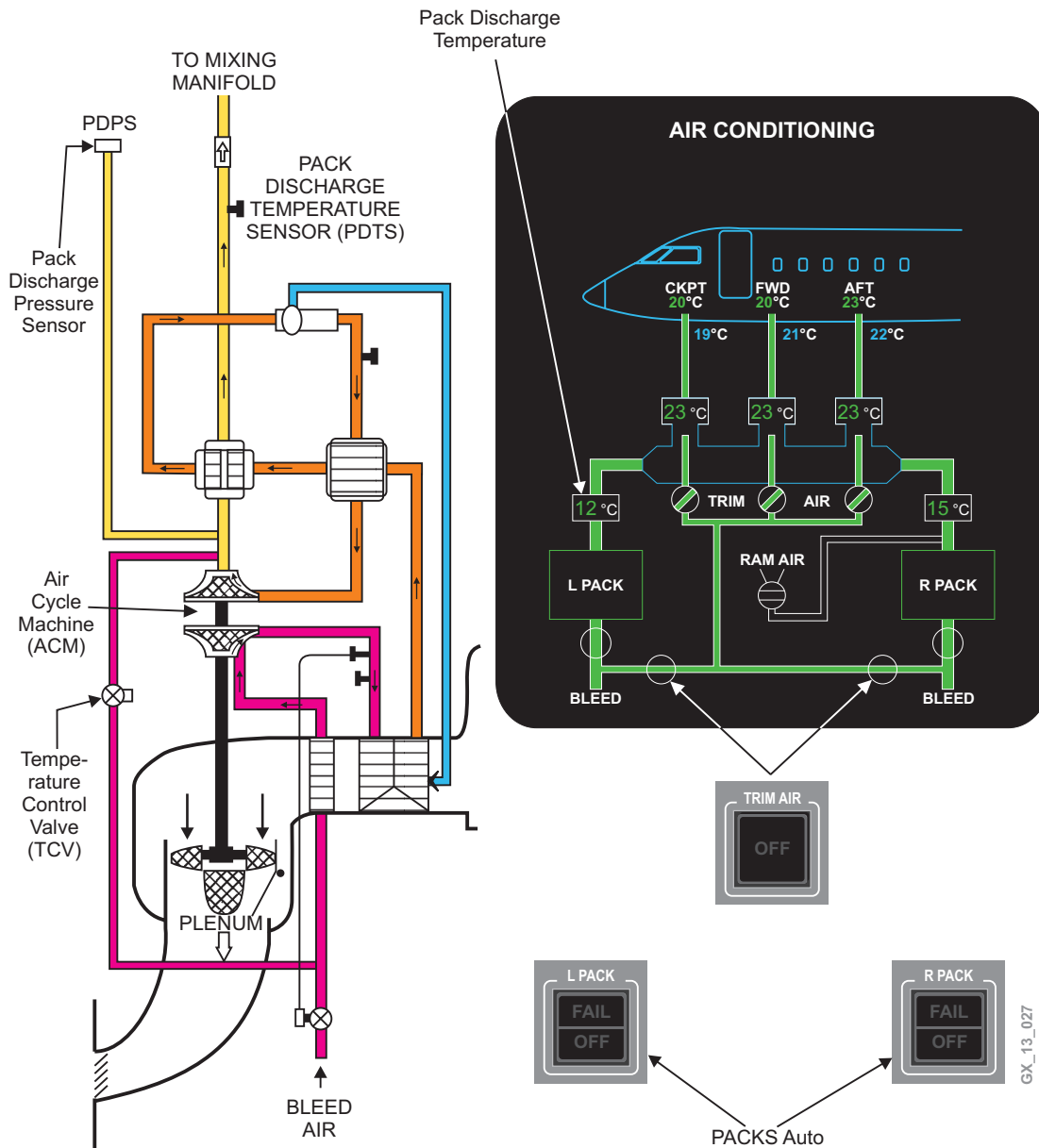
The temperature selectors, when selected COLD will cause the ACSC to modulate the TRIM AIR valves towards closed and when selected HOT will cause the ACSC to modulate the TRIM AIR valves towards open. The affected compartment trim valve will modulate to attain and maintain the selected temperature.

The selected temperature and actual temperature will be displayed on the STATUS page and AIR CONDITIONING synoptic page.

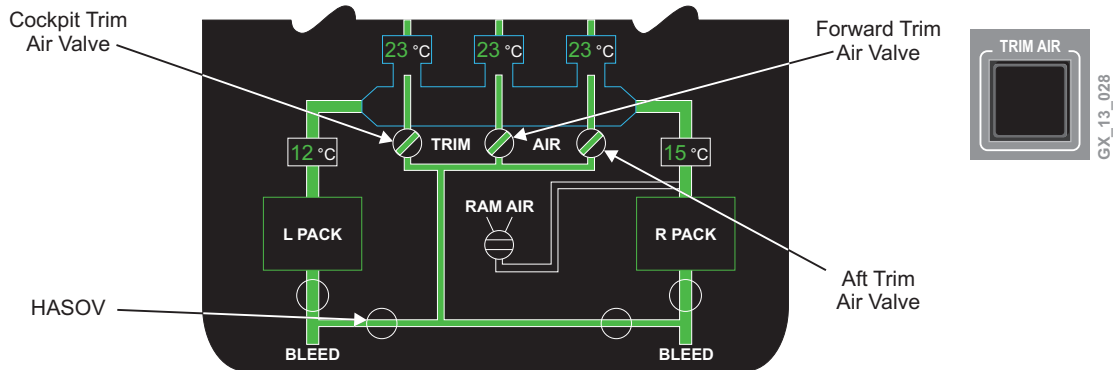


With the TRIM AIR ON and the air conditioning PACKS in AUTO, the ACSC modulates the Temperature Control Valve (TCV). To control pack discharge temperature, the TCV bypasses hot air around the pack to mix with the cool air at the Air Cycle Machine (ACM) turbine outlet.

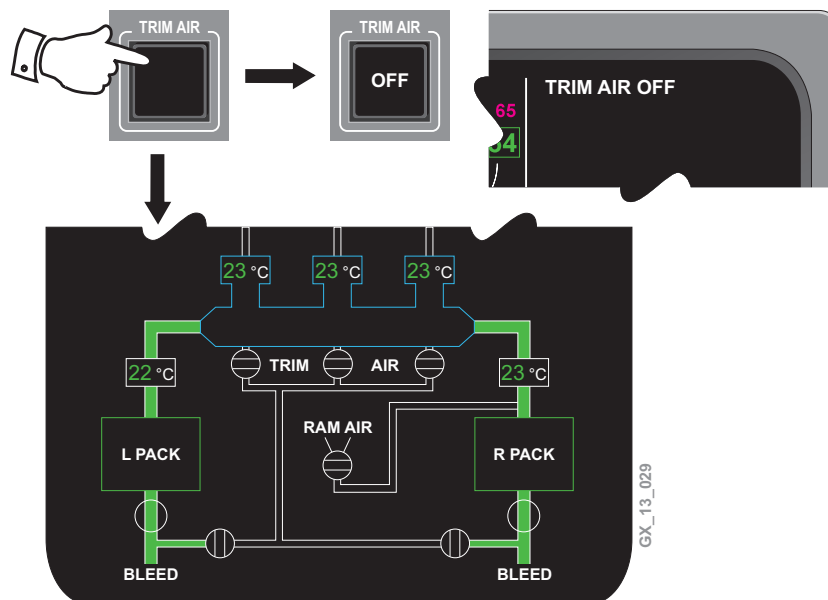
In AUTO mode, the temperature is controlled between a minimum of 3°C to a maximum of 70°C.



The TRIM AIR switch in the ON position opens the Hot Air Shutoff Valves (HASOV) and the ACSC modulates the cockpit, forward and aft trim air valves.

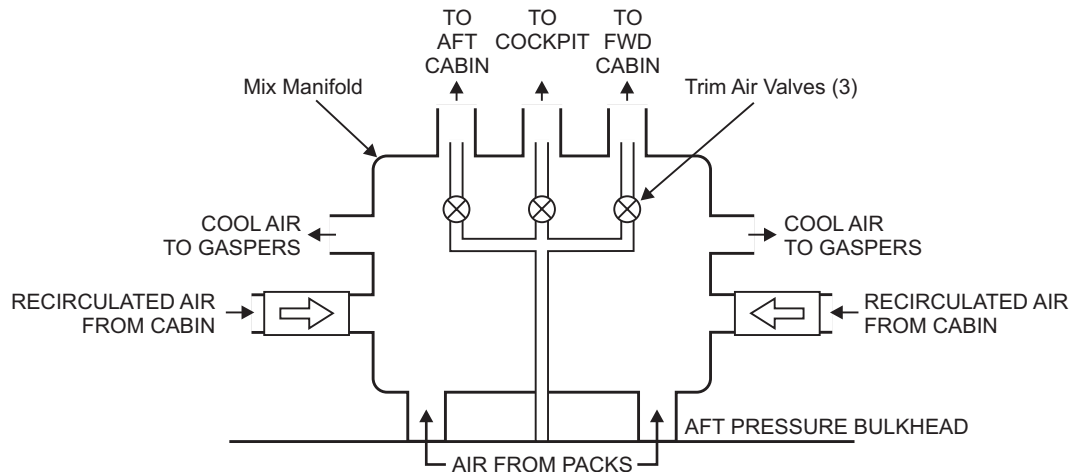


The TRIM AIR switch, when selected in the OFF position, closes the Hot Air Shutoff Valves (HASOV) and the ACSC closes the cockpit, forward and aft trim valves.



AIR DISTRIBUTION AND EXHAUST

Conditioned air is routed from the cooling packs to the mix manifold. The mix manifold also receives recirculated air from the passenger cabin.



GX_13_030

FLOW CONTROL

The mix manifold, mounted underfloor, receives fresh air from the packs and passenger cabin via the recirculation system. The quantities of air distributed to the various occupied compartments and the thermal requirements of each compartment are preset values. The split of flows to the three compartments is through suitably sized orifices at the exit ports of the mix manifold.

The distribution of airflow under steady conditions is as follows:

- Cockpit - 22% of total flow
- FWD Cabin - 39% of total flow
- AFT Cabin - 39% of total flow

The flow split required between cockpit and cabin during cool down is different, since proportionally more flow is required to cool down the cabin. During this cool down condition, the flow split is as follows:

- Cockpit - 17.5% of total flow
- FWD Cabin - 34% of total flow
- AFT Cabin - 48.5% of total flow

To achieve this redistribution of flow, a flood valve (FLV) has been installed. When open, the FLV dumps air directly into the cabin.

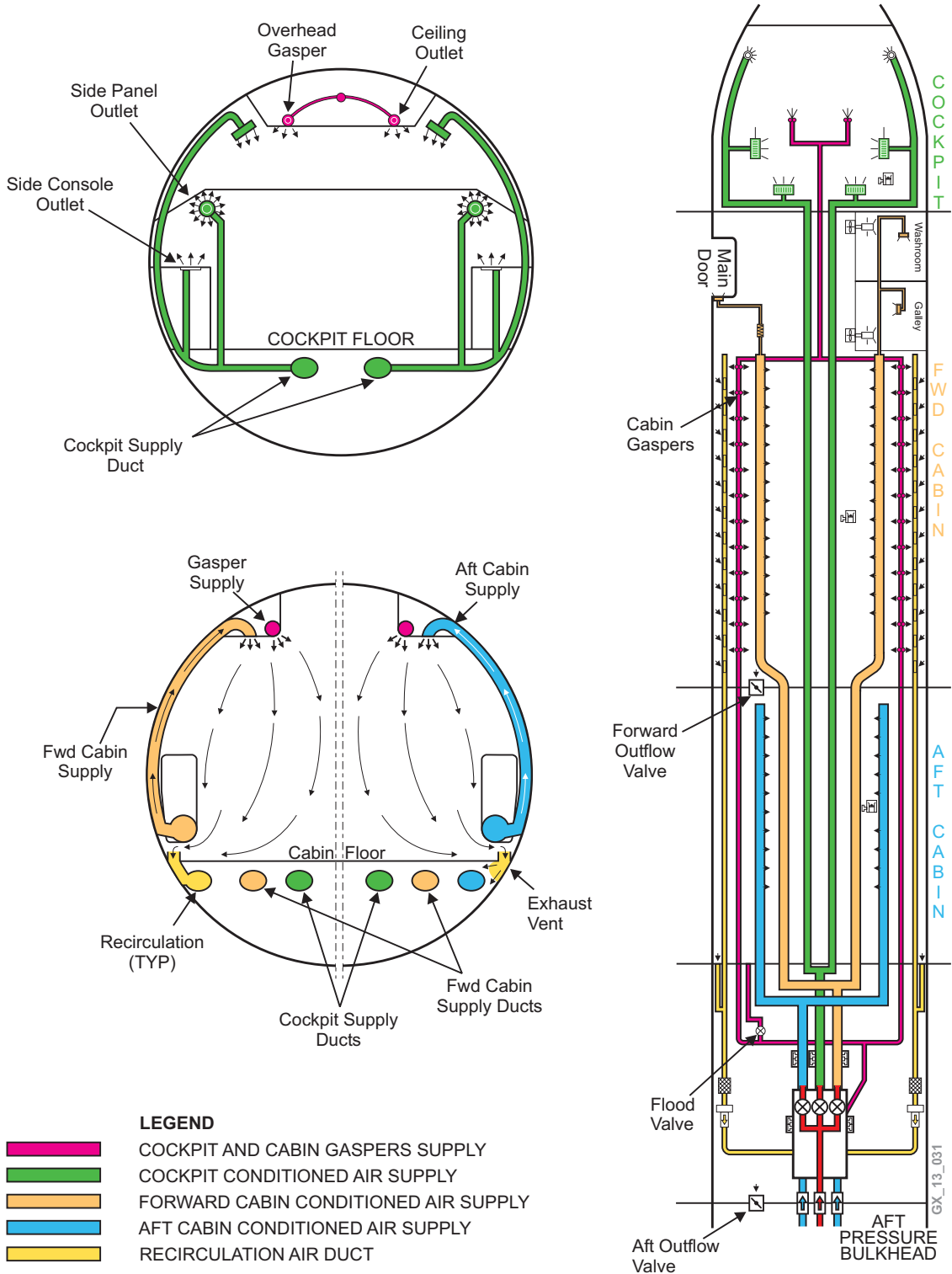
The FLV is controlled by ACSC 1 and is opened on the ground when:

- Both pack flow control selectors are HIGH; or
- Cool down mode is detected by the ACSC.

The ACSC closes the FLV when:

- Cool down mode is ended; or
- Pack control selectors are not in HIGH.

AIR DISTRIBUTION AND FLOW PATHS



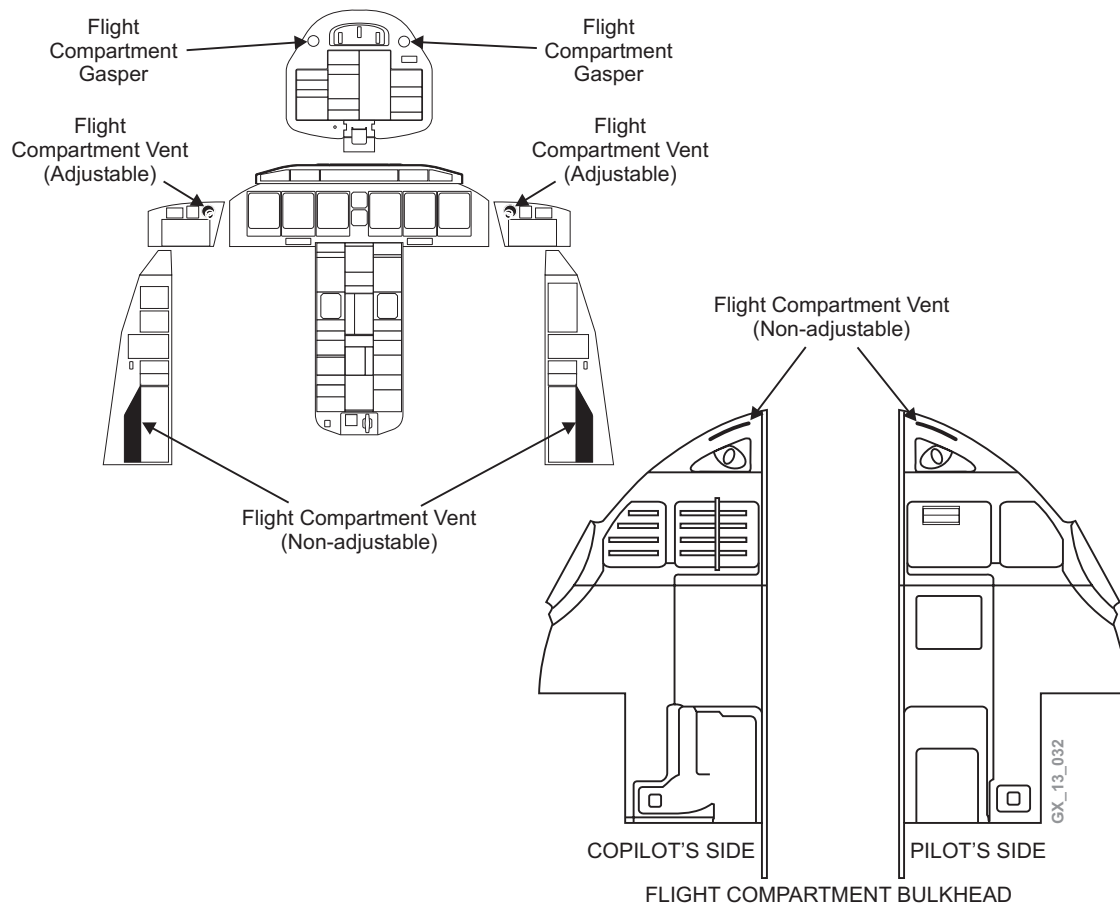
GASPER SUPPLY

Conditioned air is also distributed via the gasper line. This picks up air in the cooler area of the mix manifold and passes it through a duct. The duct runs the length of the cabin and into the cockpit incorporating individual gasper outlets in the cabin and flight deck.

COCKPIT VENTILATION

In the cockpit the following air outlets are provided:

- A non-adjustable upward facing outlet in each side console
- A non-adjustable forward facing outlet on each side at roof level above the crew
- One gasper type vent on each side of the instrument panel, adjustable for flow and direction
- One gasper outlet each side of the overhead panel, adjustable for flow and direction



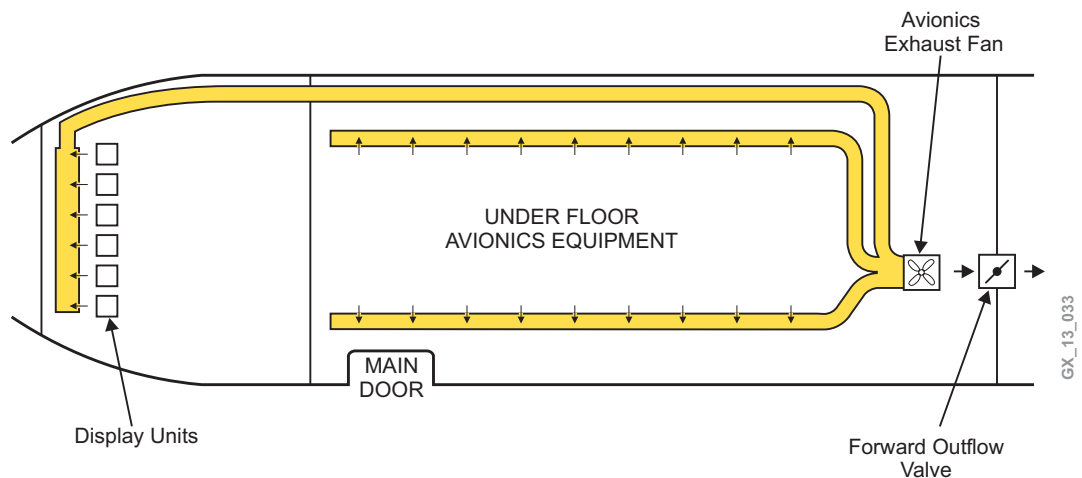
AVIONICS AND COCKPIT DISPLAY VENTILATION

(Global 5000 – See Appendix 1)

GLOBAL

The system is comprised of two suction ducts connected to an exhaust fan which exhausts airflow overboard via the forward outflow valve of the cabin pressurization system. The first duct sucks the air from a manifold which collects the hot air at the back side of each display in the cockpit. The second is subdivided into two ducts which run along the top of the avionics bay to collect the hot air coming from the electronic boxes. These ducts direct the air towards the exhaust fan at the rear of the avionics bay.

The avionics fan ON/OFF switching logic is based on aircraft altitude. The fan is ON at an altitude of less than 30,000 feet with a default to always ON in the event of loss of altitude data from the DAUs.



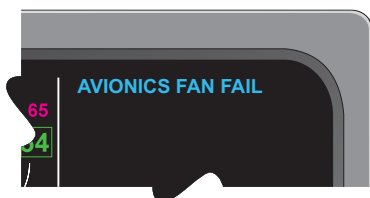
The avionics fan, which is controlled by ACSC 2, can run at a high or low speed. The fan is driven at high speed when:

- ACSC 2 is OFF; or
- Both packs are OFF; or
- Main door is not closed and locked

The fan is driven at low speed when:

- ACSC 2 is ON; and
- At least 1 pack is on, and
- Main door is closed and locked

In the case of a failure, the avionics fan is automatically powered OFF by its converter. The converter tries up to three times to restart the fan by automatic reset. If failure is still detected, the converter will shut off the fan and post a message on the EICAS.



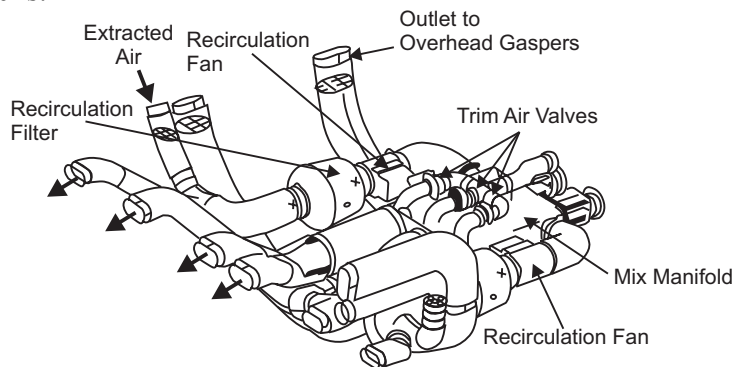
Note:
Check limits on ground operations with failed Avionics fan and ECS OFF. Maximum operating time of 30 minutes.

GX_13_034

In the case of a fan underspeed failure detected by the converter, a fault signal is provided but the fan remains running.

RECIRCULATION

Two recirculation fans pull air from the cabin back to the mix manifold. The air is extracted from each side of forward and aft cabins through holes in the cabin side sills and is ducted under the floor to the recirculation filters. From the filters the air enters the recirculation fans and is blown into the mix manifold to be mixed with incoming air from the packs.



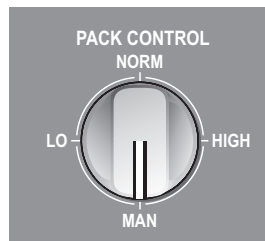
NORM:

In normal operation, recirculation fan speed is at minimum but can be increased when the mix manifold temperature is too low or too high.



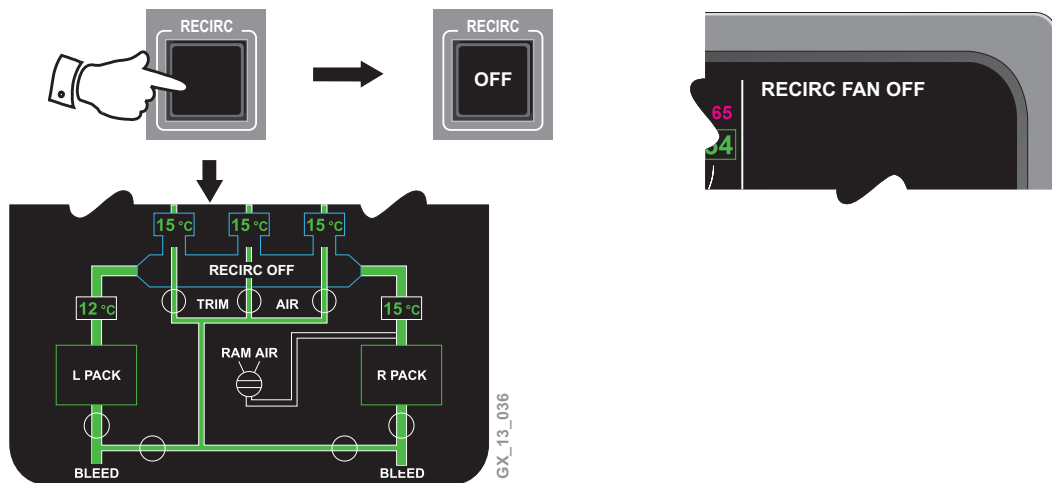
MAN:

In manual mode, (i.e. no speed control by the AFCS) the recirculation fan will run at minimum speed.



GX_13_035

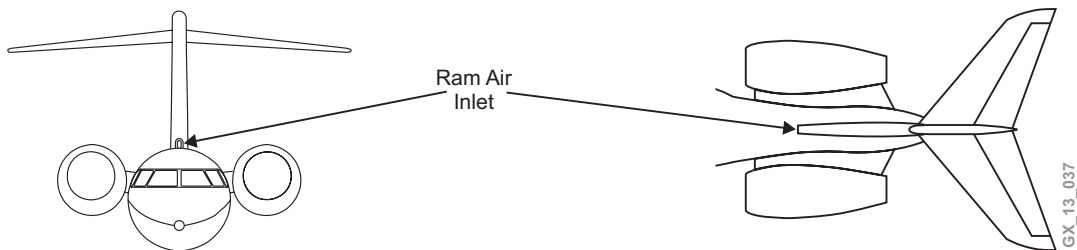
Each fan converter unit can detect internal failures (overheat, overcurrent). If a failure is detected, the converter unit will shut off fan power and reset the fan. The converter will attempt three times to restart the fan. If a failure is still detected, the converter will shut off the fan and a message is posted on the EICAS. The crew can turn off the RECIRC FAN via the PBA located on the BLEED/AIR CONDITIONING control panel.



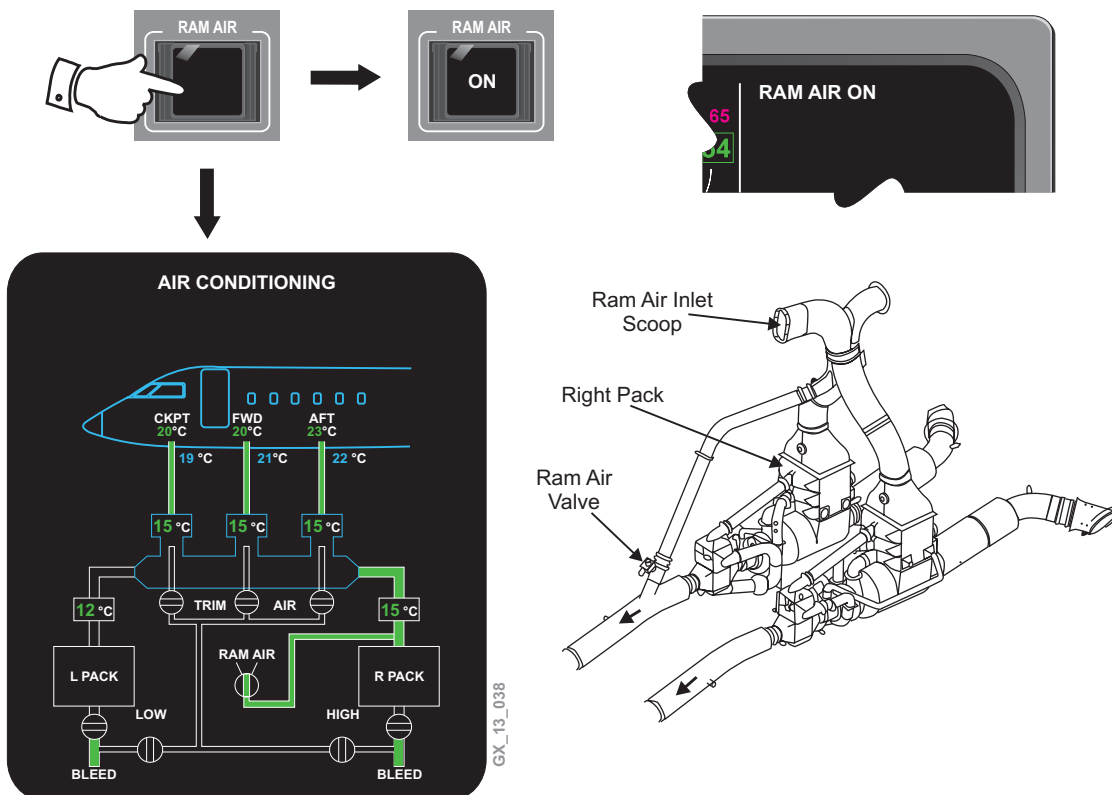
RAM AIR VENTILATION

The ram air system is picked up at the ram air inlet at the base of the vertical fin and is used primarily (normal ops) to provide cooling for the heat exchangers of the cooling packs.

A secondary role is to supply an alternate source of fresh air via the ram air system. It has been designed for use in-flight at an altitude of 15,000 feet or less. The Ram Air Valve may be selected open at any altitude, however ram air will not enter the airplane if packs are operating or if the airplane is above 15,000 feet.



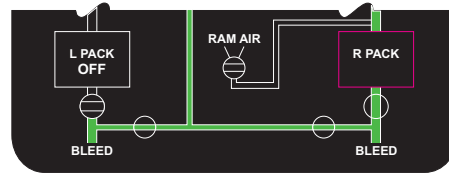
The ram air valve is closed in normal operations. It can be switched ON manually, by means of a guarded switch on the air conditioning control panel. The ram air valve is opened for unpressurized flight operations below 15,000 feet.



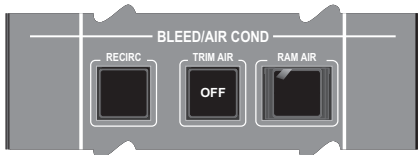
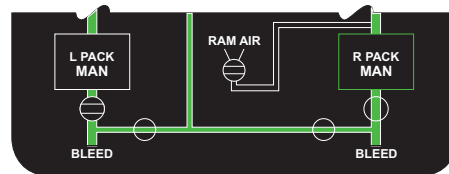
TEMPERATURE CONTROL - MAN



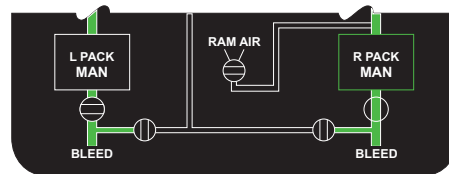
Select one pack OFF



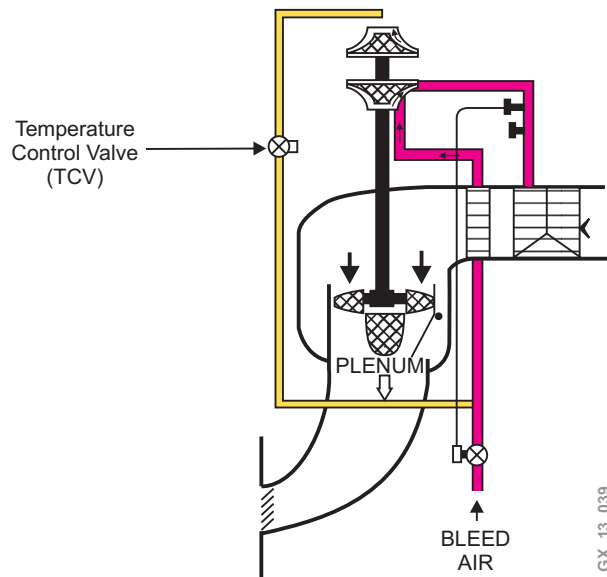
Pack control manual



Trim Air OFF



Manual Temperature Control activates the TCV. The objective is to maintain the pack discharge temperature between 5°C and 60°C



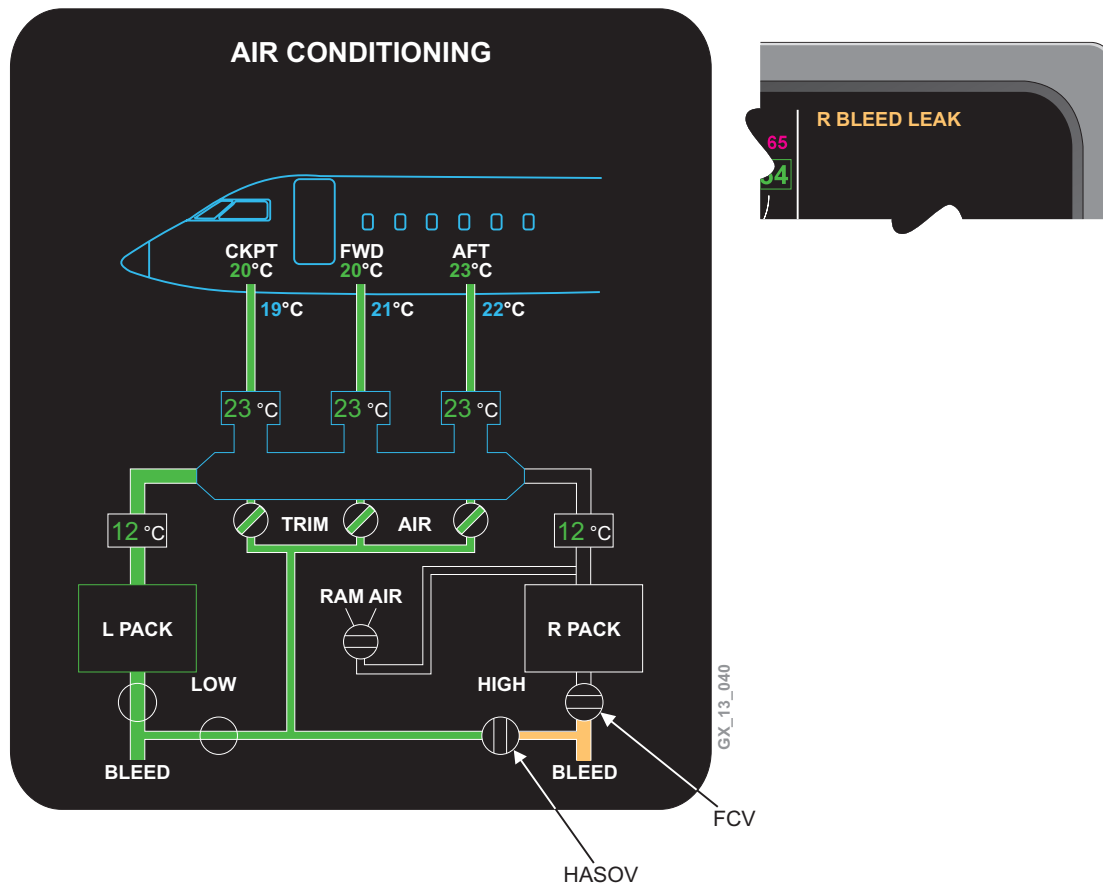
GX_13_039

NOTE

To avoid overshooting desired temperature, do not toggle for more than two seconds duration.

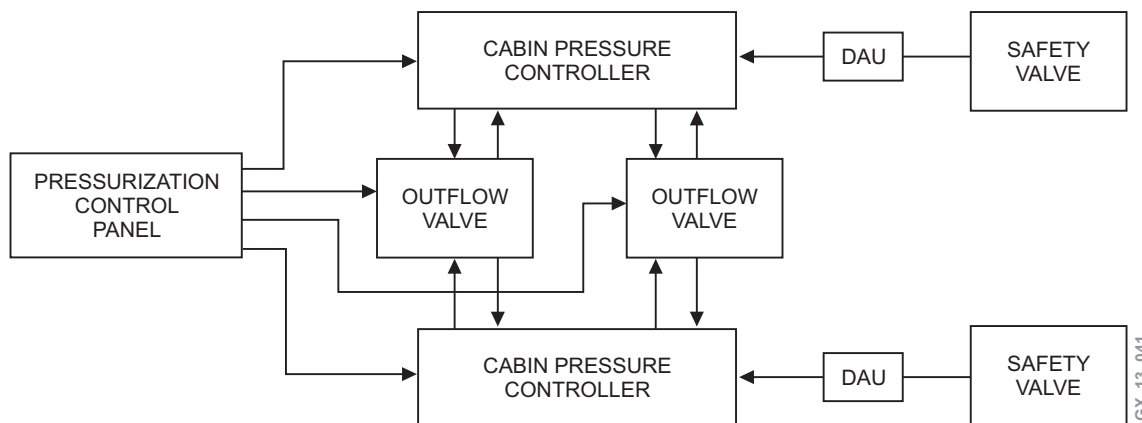
AIR CONDITIONING BLEED LEAK DETECTION

When a leak is detected, a message is displayed on EICAS and the BMC will automatically close the affected valves to isolate and stop the leak.



PRESSURIZATION

The Cabin Pressure Control System (CPCS) is an electrical system except for pressure relief function. The CPCS is composed of two controllers, two electrical Outflow Valves (OFV), two Safety Valves (SFV), and an electrical control panel.



The CPCS includes three independent control channels:

- Two identical, independent and AUTO channels are available from the two digital Cabin Pressure Controllers (CPC). Either CPC drives both electrical OFVs in turn
- One MANUAL control channel performs the control of both OFVs. The control is done by moving a toggle switch, located on the Cabin Pressurization Control Panel, to raise or lower the cabin altitude

The cabin is controlled to an altitude of no more than 7,230 feet at 51,000 feet aircraft altitude and no more than 6,000 feet when flying at 45,000 feet.

The CPCS allows for two cabin rate selections in automatic control:

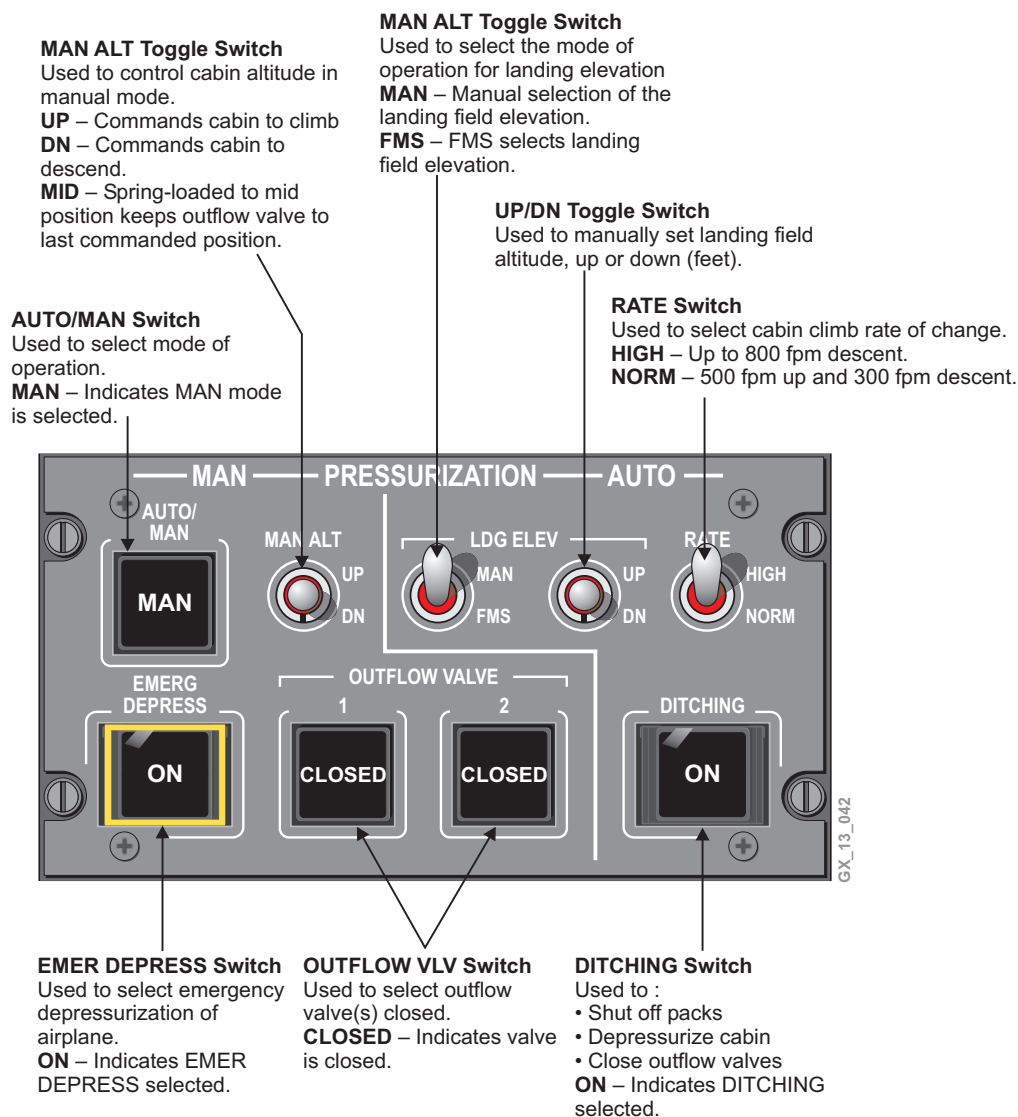
- **NORMAL** Provides 500 feet per minute (ft/min) cabin climb and 300 ft/min descent rate
- **HIGH** Provides 0 to 800 ft/min descent rate

The system includes safety devices which override AUTO and MANUAL mode for OFV travel limitation, cabin limitation, and differential pressure limits.

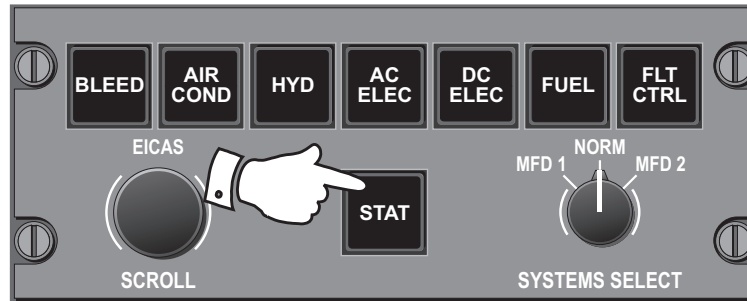
In both AUTO and MANUAL modes the CPCS provides indication of cabin pressure parameters on the STATUS page and any failures are displayed on the EICAS.

The CPCS can rapidly depressurize the cabin through an EMER DEPRESS switch on the Pressurization Control Panel. Additionally, a DITCHING switch performs the shutdown of both packs and depressurizes the cabin prior to closing both OFVs.

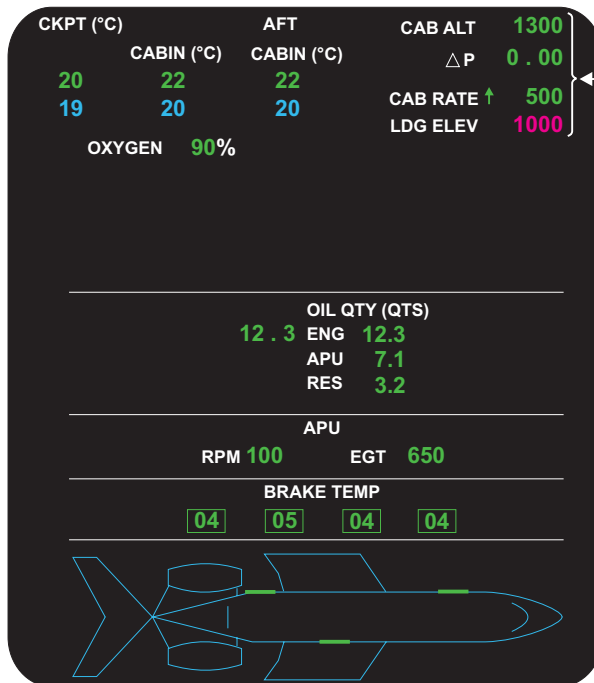
Controls are provided on the Pressurization Control panel located on the overhead panel.



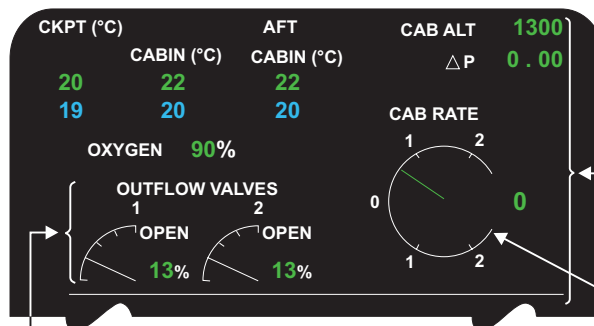
To view pressurization data, select STAT on the EICAS Control Panel which is located on the pedestal.



EICAS CONTROL PANEL



AUTO Mode Data Display
 CAB ALT – Displayed in feet.
 Δ P – Displayed in psi.
 CAB RATE – Displayed in feet/min.
 LDG ELEV – Displayed in feet.



MAN Mode Data Display
 CAB ALT – Displayed in feet.
 Δ P – Displayed in psi.
 CAB RATE – Sweep range displayed in feet/min.
 LDG ELEV – Not displayed.

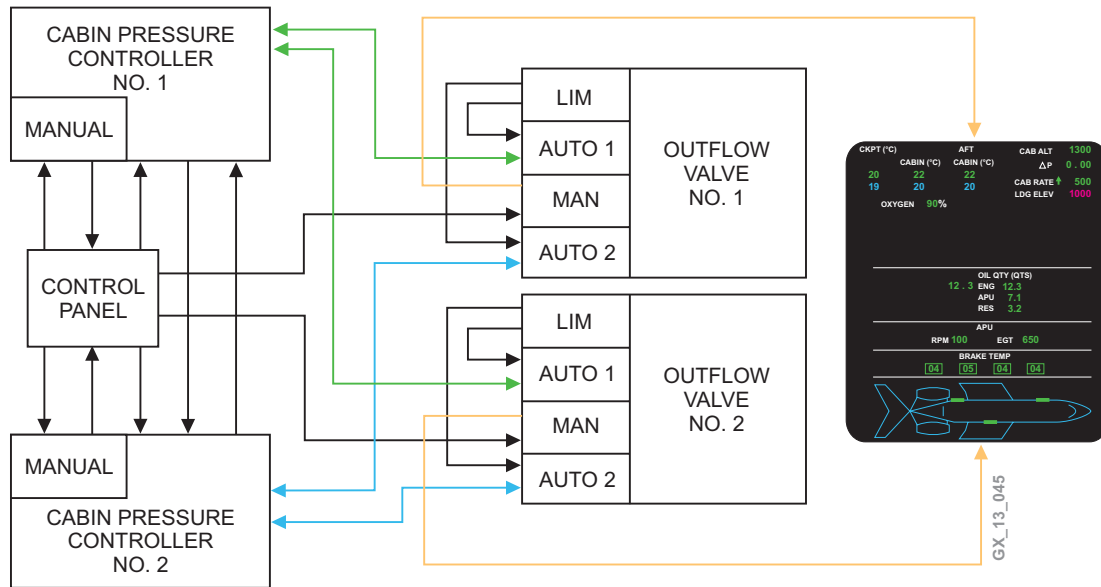
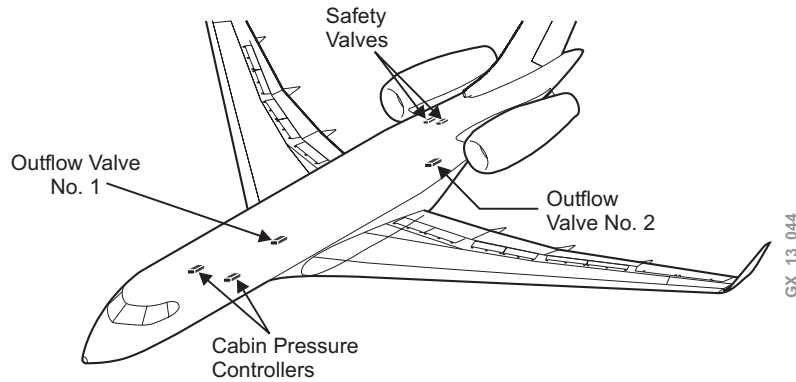
CAB RATE Indicator
 Displayed when MAN selected.

OUTFLOW VALVES Position Indicators
 Displayed when MAN selected and measured in percent.
 Also displayed when EMER DEPRESS selected, or
 OUTFLOW VLV closed, or DITCHING selected.

GX_13_043

OUTFLOW VALVES (OFV)

The two electrical OFVs modulate the discharge airflow to control cabin pressure in both AUTO modes and in the Manual mode.



In both AUTO modes the OFV provides its position to the CPC. In Manual mode it provides its position to the STATUS page.

The two outflow valves operate in a ‘slave and master’ mode. During normal operations OFV 2 is master on day 1 and 2 in a four day cycle and OFV 1 is master on day 3 and 4 in the same four day cycle.

MODES OF OPERATION

The Pressurization system has two independent automatic modes and one manual mode.

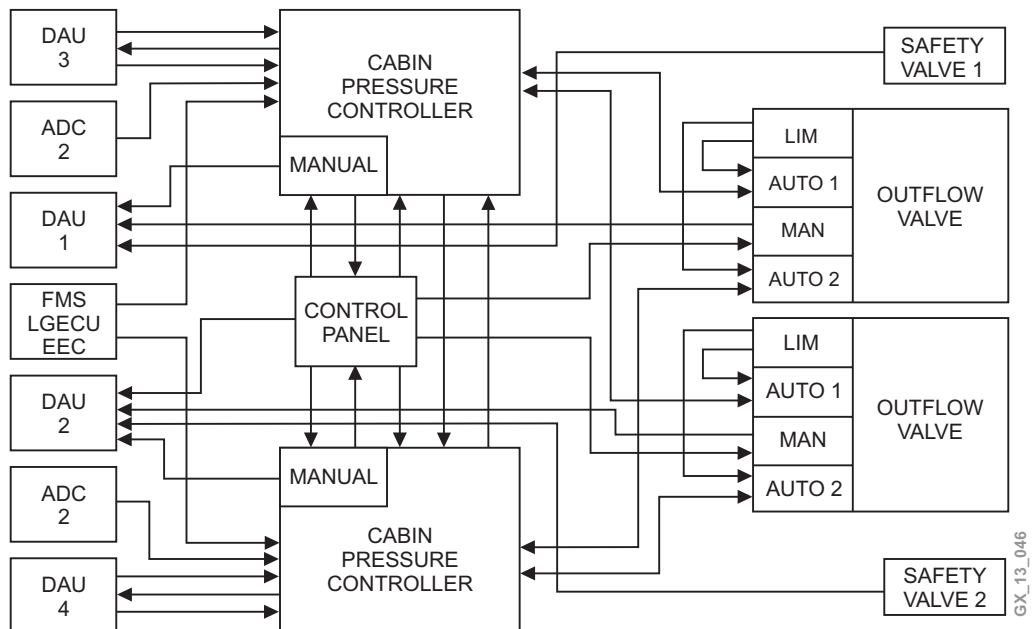
AUTOMATIC MODE

Two identical and independent AUTO control channels (one in each CPC) are available from two CPCs. The automatic controller performs the following functions:

- Automatic control of cabin altitude, regulation, and rate limitation
- Ditching sequence
- Door open protection
- Generating outputs for the EICAS display and messages
- CAIMS function and interface

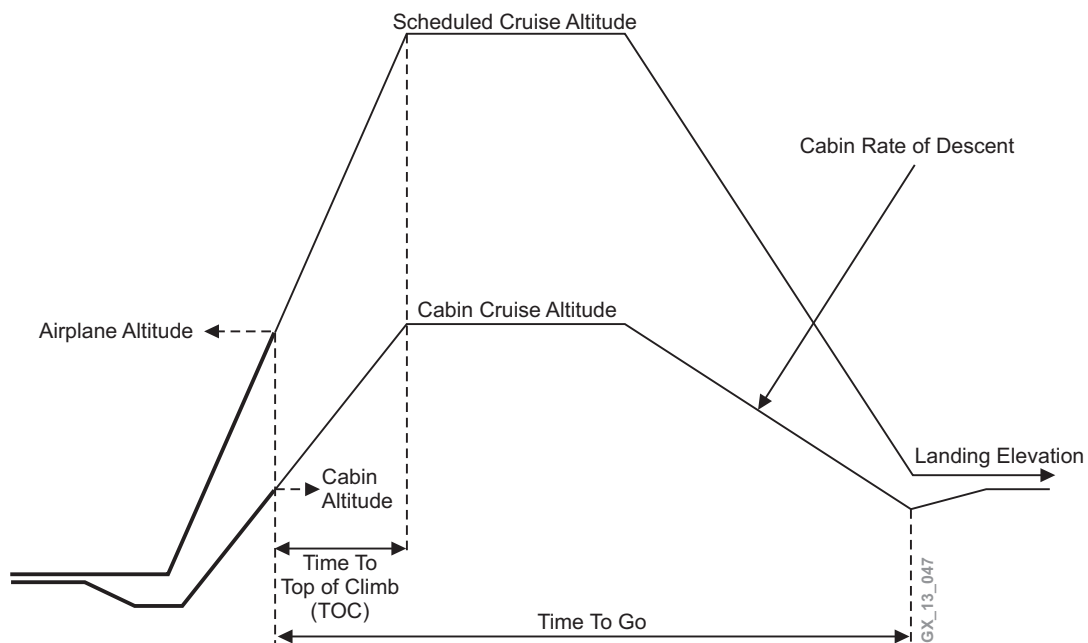
AUTO mode is dependent upon the following information:

- Airplane altitude, vertical speed, and barometric correction received from ADCs and DAUs, or scheduled flight information from FMS when available
- Landing elevation from FMS, or directly selected from the switch on the cabin pressure control panel
- Rate limit selection from the cabin pressure control panel
- Weight on wheels and door open position from the Landing Gear Electronic Control Unit (LGECU)
- Engine throttle position from the Electronic Engine Controllers (EEC)



There are two modes of operation while the CPCS is controlled in AUTO, the PRIMARY and the SECONDARY mode.

The PRIMARY mode uses information from the FMS to minimize cabin altitude pressure rate and maximize cabin comfort. In primary mode the CPC uses time to go, time to top of climb, cruise flight level, and landing information from the FMS to compute the cabin pressurization schedule for the flight. The CPCS operates in PRIMARY mode when FMS information has been programmed, landing elevation source is selected to FMS, VNAV is the active vertical mode and the autopilot is on. In all other cases the system defaults to SECONDARY mode.



In SECONDARY mode the CPC uses the airplane pressure altitude and vertical speed to compute the pressurization schedule for the flight.

In either AUTO mode the CPC controls the cabin pressure through the opening of both electrical outflow valves.

Only one CPC is in operation while the other is in active standby. Transfer from one CPC to the other automatically occurs each day (CPC 1 on odd days, CPC 2 on even days), and in the case of a failure of the active system.

AUTOMATIC PRE-PRESSURIZATION SEQUENCE ON GROUND

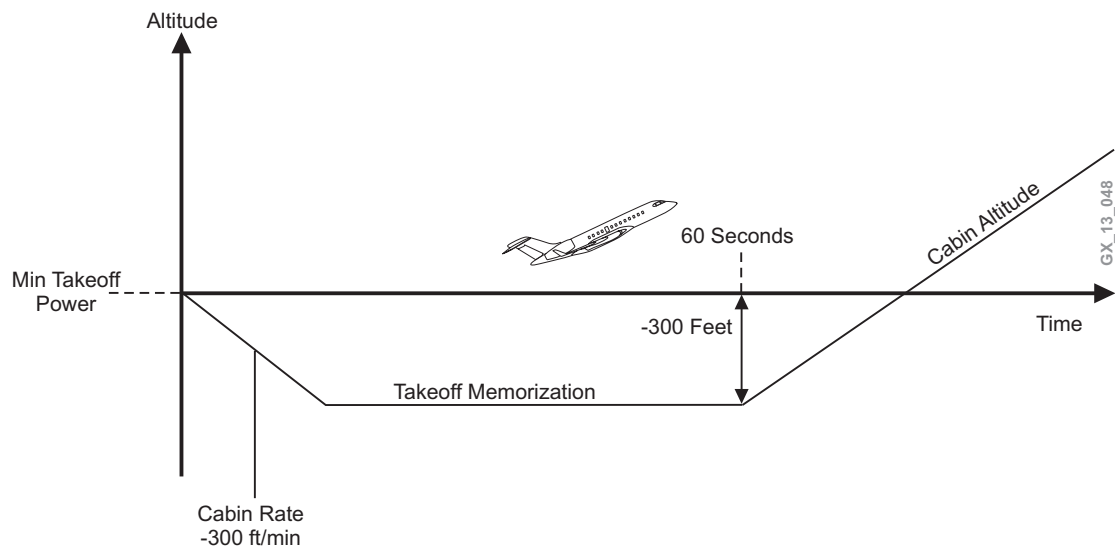
The purpose of automatic pre-pressurization is to avoid cabin bump at takeoff.

When the LGECU indicates an airplane weight on wheels condition and both thrust lever angles are higher than 20° the pre-pressurization sequence is initiated.

During this sequence:

- The scheduled cabin pressure is equal to the last measured cabin value (takeoff memorization) before the engine FADEC gives the “takeoff power” position
- The reference cabin pressure moves by computation towards the scheduled cabin pressure with a pressure rate limit change equal to -300 ft/min

In the case of takeoff with air conditioning packs operating cabin pressurization is controlled with a pressure rate equal to -300 ft/min limited to a differential pressure of 300 feet at sea level.



In the case of takeoff without packs this sequence will close both outflow valves.

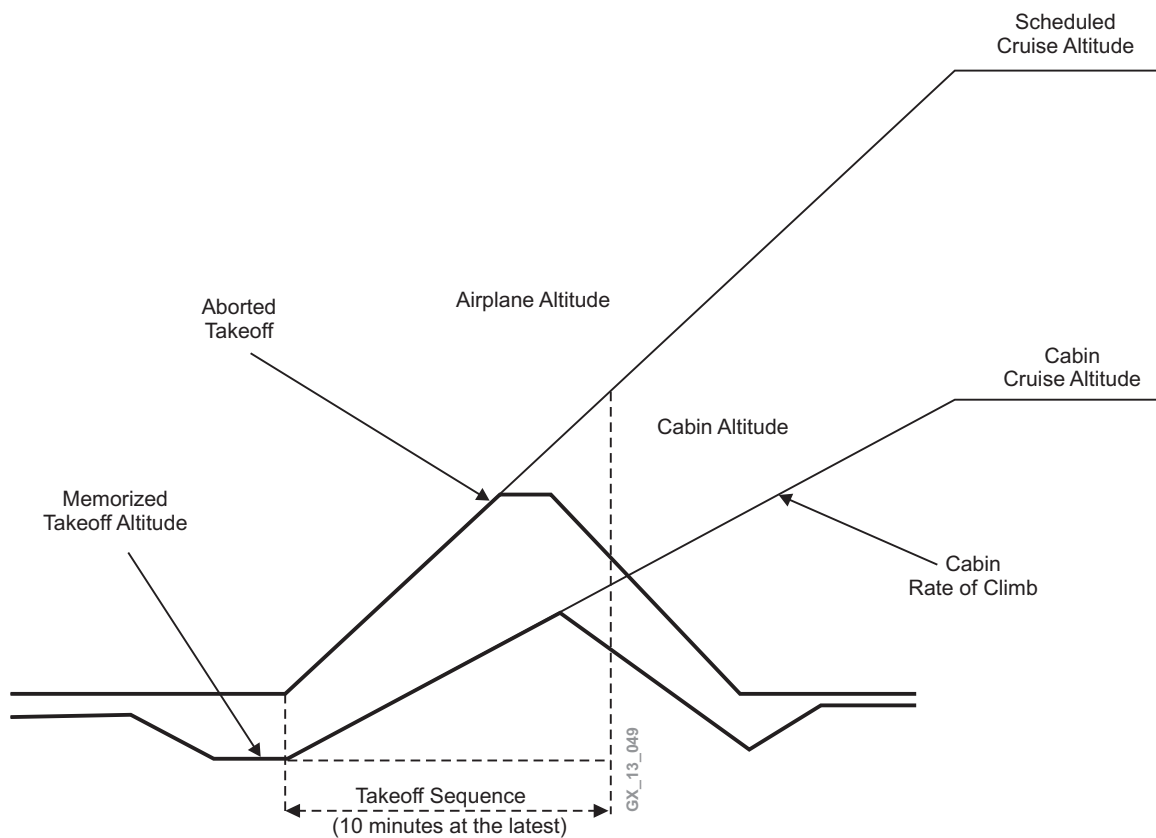
TAKEOFF SEQUENCE (ABORT CAPABILITY PRIMARY MODE)

The purpose of this sequence is to avoid the requirement to manually reselect the landing altitude in case of an aborted flight and emergency return to the departure airport.

When the LGECU indicates the airplane is no longer weight on wheels, the automatic takeoff sequence is initiated.

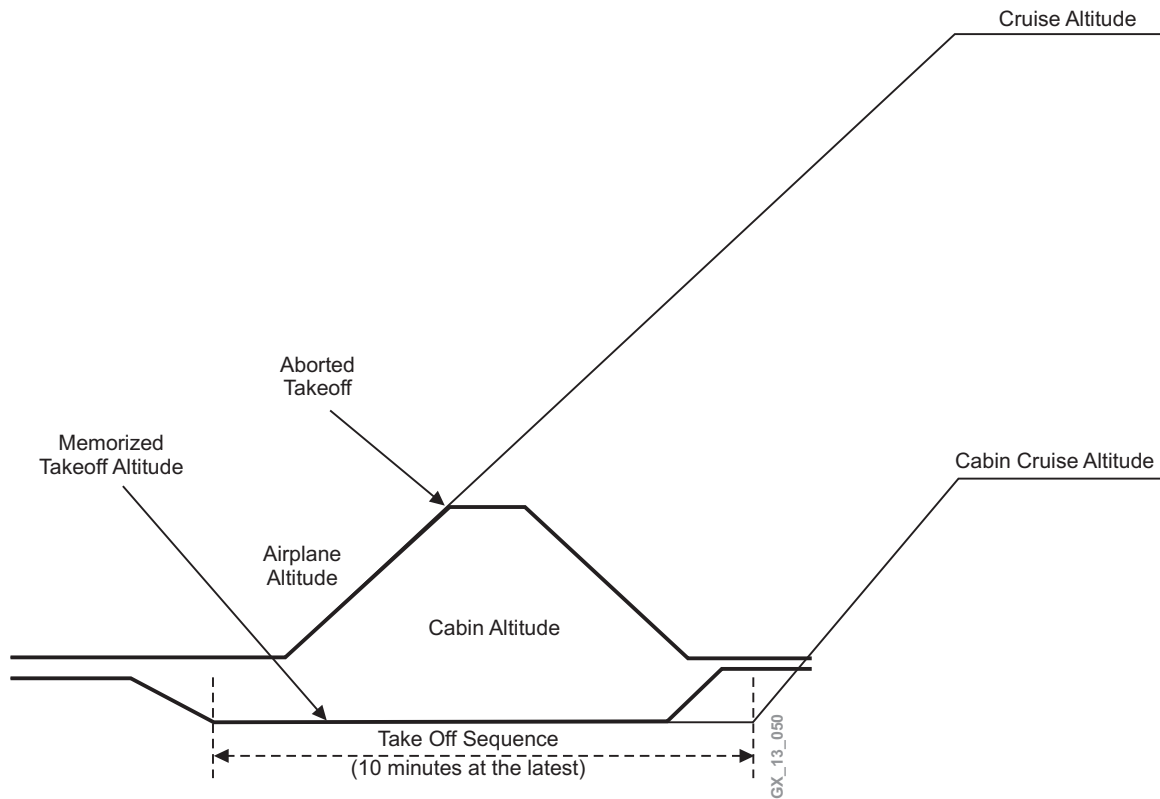
During this sequence, in PRIMARY mode:

- When a descent rate > 500 ft/min is detected for more than 10 consecutive seconds within the first 10 minutes after T/O, the sequence switches to SECONDARY MODE. In this mode cabin pressure is scheduled at a nominal rate back to the cabin pressure of the pre-pressurization sequence



During this sequence in SECONDARY mode:

- The scheduled cabin pressure remains constant, equal to the scheduled cabin pressure of the pre-pressurization sequence for 10 minutes or as long as scheduled cabin pressure is lower than the theoretical cabin pressure



FLIGHT SEQUENCES WITH FMS (PRIMARY MODE)

When the LGECU indicates that the airplane is in flight, the flight sequence with FMS (primary mode) is initiated (except during the takeoff sequence).

PRIMARY mode is in use when the following conditions are met:

- AUTOPILOT and vertical navigation are engaged
- FMS information is valid
- LDG ELEV switch is set to “FMS”

During this sequence in primary mode:

- Climb – The scheduled cabin pressure takes the lowest value between theoretical cabin pressure and destination landing pressure -300 feet. Theoretical cabin pressure is computed from the airplane altitude cruise flight level received from the FMS

Theoretical Cabin Altitude Schedule Table

Note: Primary mode of operation.

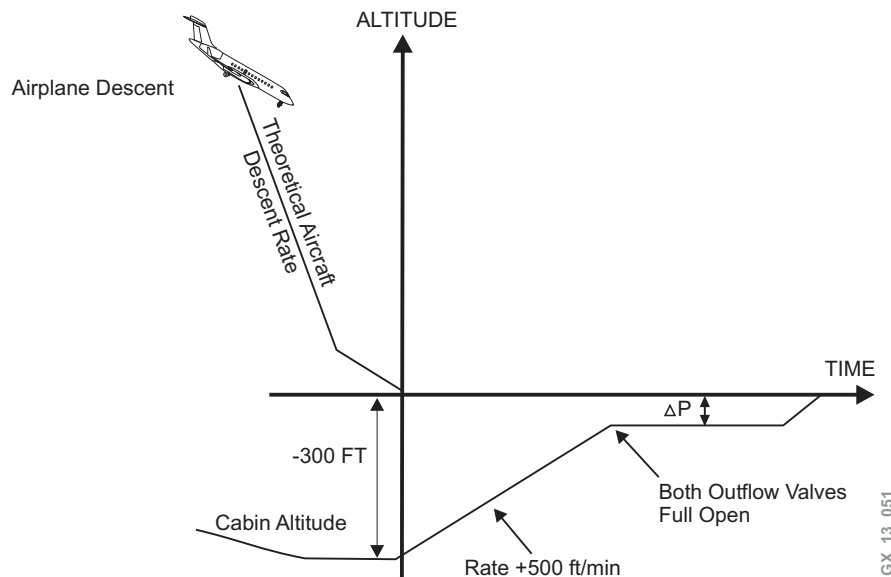
| AIRCRAFT ALTITUDE | ZCTH | DELTA P |
|-------------------|-------|---------|
| -1000 | -1300 | 0.17 |
| 0 | -600 | 0.32 |
| 1000 | -526 | 0.81 |
| 2000 | -452 | 1.27 |
| 3000 | -378 | 1.73 |
| 4000 | -304 | 2.17 |
| 5000 | -224 | 2.59 |
| 6000 | -144 | 3.00 |
| 7000 | -64 | 3.39 |
| 8000 | 22 | 3.77 |
| 9000 | 103 | 4.14 |
| 10,000 | 189 | 4.49 |
| 11,000 | 411 | 4.76 |
| 12,000 | 503 | 5.09 |
| 13,000 | 601 | 5.40 |
| 14,000 | 705 | 5.69 |
| 15,000 | 809 | 5.98 |
| 16,000 | 919 | 6.25 |
| 17,000 | 1029 | 6.51 |
| 18,000 | 1146 | 6.76 |
| 19,000 | 1262 | 7.00 |
| 20,000 | 1385 | 7.22 |
| 21,000 | 1514 | 7.44 |
| 22,000 | 1643 | 7.64 |
| 23,000 | 1784 | 7.83 |
| 24,000 | 1925 | 8.01 |
| 25,000 | 2073 | 8.18 |

| AIRCRAFT ALTITUDE | ZCTH | DELTA P |
|-------------------|------|---------|
| 26,000 | 2233 | 8.33 |
| 27,000 | 2394 | 8.48 |
| 28,000 | 2573 | 8.61 |
| 29,000 | 2758 | 8.72 |
| 30,000 | 2951 | 8.83 |
| 31,000 | 3139 | 8.94 |
| 32,000 | 3286 | 9.05 |
| 33,000 | 3440 | 9.16 |
| 34,000 | 3595 | 9.26 |
| 35,000 | 3756 | 9.35 |
| 36,000 | 3918 | 9.44 |
| 37,000 | 4106 | 9.50 |
| 38,000 | 4306 | 9.56 |
| 39,000 | 4514 | 9.60 |
| 40,000 | 4748 | 9.62 |
| 41,000 | 4996 | 9.64 |
| 42,000 | 5261 | 9.64 |
| 43,000 | 5518 | 9.64 |
| 44,000 | 5764 | 9.64 |
| 45,000 | 6000 | 9.64 |
| 46,000 | 6227 | 9.64 |
| 47,000 | 6444 | 9.64 |
| 48,000 | 6653 | 9.64 |
| 49,000 | 6853 | 9.64 |
| 50,000 | 7045 | 9.64 |
| 51,000 | 7229 | 9.64 |



The rate of climb is automatically limited to:

- 500 ft/min if airplane vertical speed is < 2300 ft/min
- 540 ft/min if airplane vertical speed is > 6000 ft/min
- Between the above values the cabin rate of change is proportional to airplane vertical speed
- Descent – This sequence is initiated when the descent rate is > 500 ft/min for a duration of more than 10 seconds. The scheduled cabin pressure takes the lowest value between the theoretical cabin pressure and destination landing pressure -300 feet, plus barometric correction



The rate of descent is automatically limited to:

- 300 ft/min if airplane vertical speed is < 2300 ft/min
- 800 ft/min if airplane vertical speed is > 6000 ft/min
- Between the above values the cabin rate of change is proportional to airplane vertical speed

FLIGHT SEQUENCES WITHOUT FMS (SECONDARY MODE)

When the LGECU indicates the airplane is in flight, the normal flight sequence is initiated (except during the takeoff sequence).

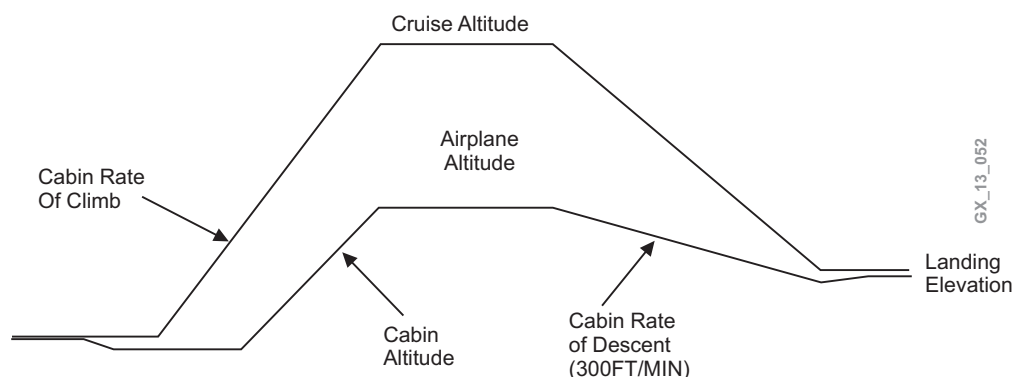
During this sequence:

- Cabin pressurization is controlled with calculated rates of change according to selected landing elevation and theoretical cabin altitude schedule
- The theoretical cabin altitude schedule provides a relation between airplane altitude and theoretical cabin altitude/pressure by taking into account:
 - The maximum climb performance of the airplane at the minimum airplane weight and
 - the normal differential pressure (9.64 psi) providing a cabin altitude of 7,230 feet at 51,000 feet. The theoretical schedule is designed in order to reach the maximum differential pressure at the lowest airplane altitude, with a minimum rate of climb

The rate of change is automatic during:

- Climb - The rate of climb is directly taken from the theoretical cabin altitude schedule and the cabin rate of change is proportional to airplane vertical speed. The rate of climb will be maximized and limited to climb of 540 ft./min. when the airplane climbs at maximum performance at minimum weight. The cabin rate of climb is automatically limited to:
 - 500 ft/min if airplane vertical speed is < 2300 ft/min
 - 540 ft/min if airplane vertical speed is > 6000 ft/min
 - Between the above values the cabin rate of change is proportional to aircraft vertical speed.

An automatic rate of climb increase is active if vertical speed is less than 500 ft/min for more than 10 seconds.

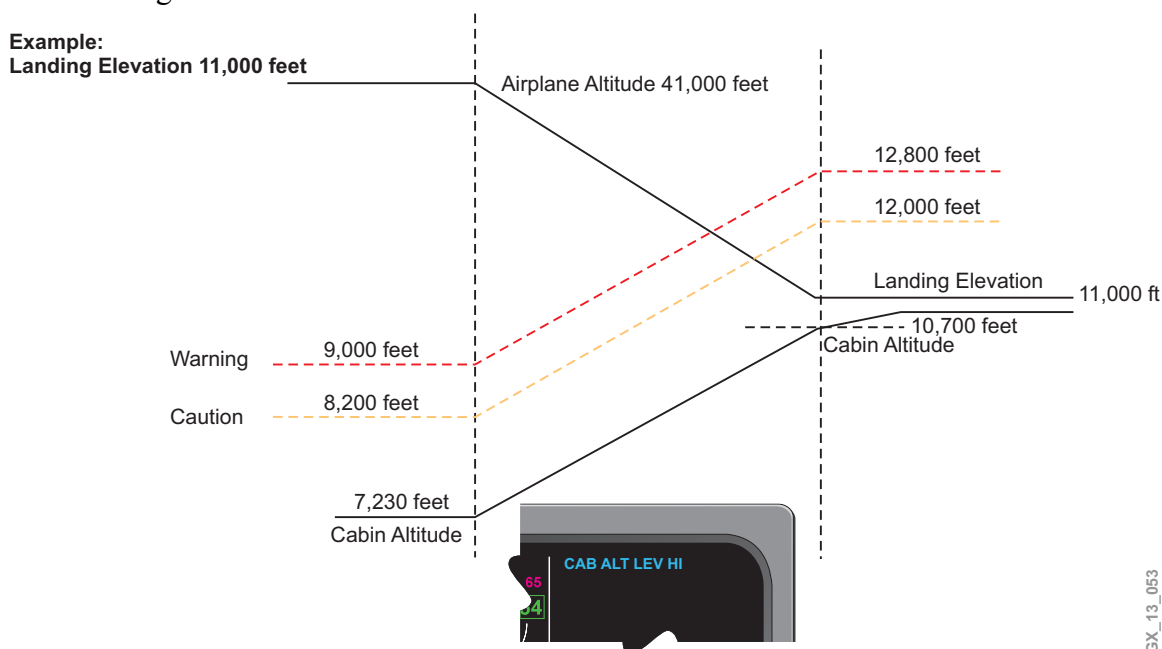


- Descent - The nominal rate of descent is limited to -500 ft/min and the rate is proportional to the airplane rate of descent. In case of high speed descent, the rate of descent is increased according to the calculation of the remaining flight time. The remaining flight time is calculated from the airplane speed received from the ADC. This increased cabin rate of change demand is automatically limited according to the airplane vertical speed:
 - 300 ft/min if airplane vertical speed is ≤ 2300 ft/min
 - 800 ft/min if airplane vertical speed is > 6000 ft/min if high rate selected
 - Between the above values the cabin rate of change is proportional to airplane vertical speed

LANDING SEQUENCE AT FIELD ELEVATION GREATER THAN 7,230 FEET

This sequence does not require additional crew action if the actual landing field elevation was selected prior to takeoff. The scheduled cabin pressure is normally limited to 7,230 feet during flight and then automatically reset to the landing field elevation.

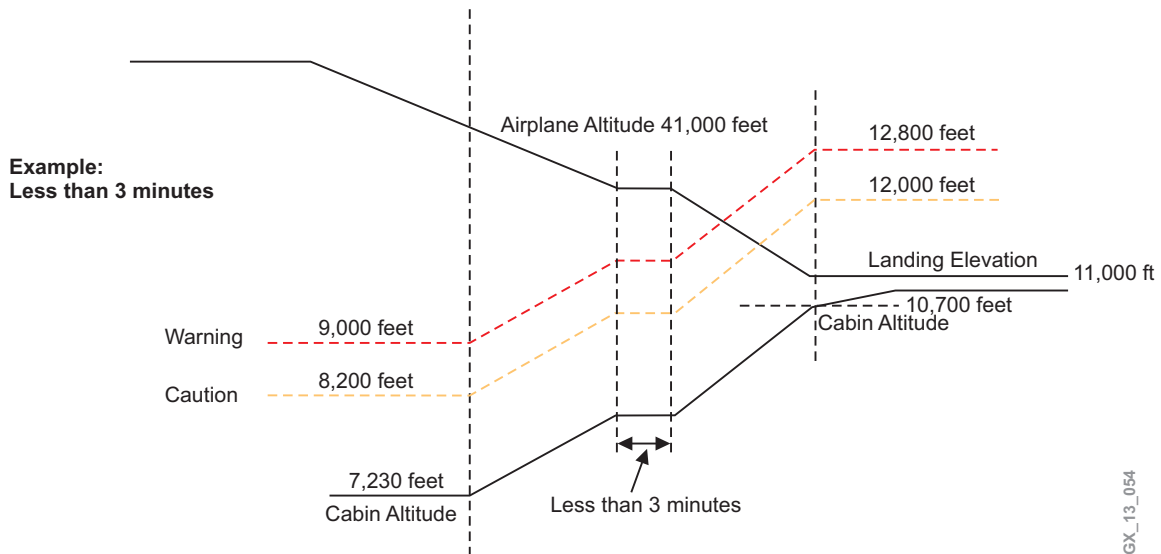
The CABIN ALT caution (cabin altitude exceeds limits) is normally set for 8,200 feet and the CABIN ALT warning is set for 9,000 feet. When the airplane altitude decreases below 41,000 feet, the CABIN ALT caution and warning start to increase proportionally to the airplane altitude. The CABIN ALT caution and CABIN ALT warning altitudes will increase 1,000 feet and 1,800 feet respectively, above the landing field elevation. Both CABIN ALT caution and warning are limited to 14,500 feet. An advisory message is displayed on EICAS informing the crew that the warning and caution limits have been reset.



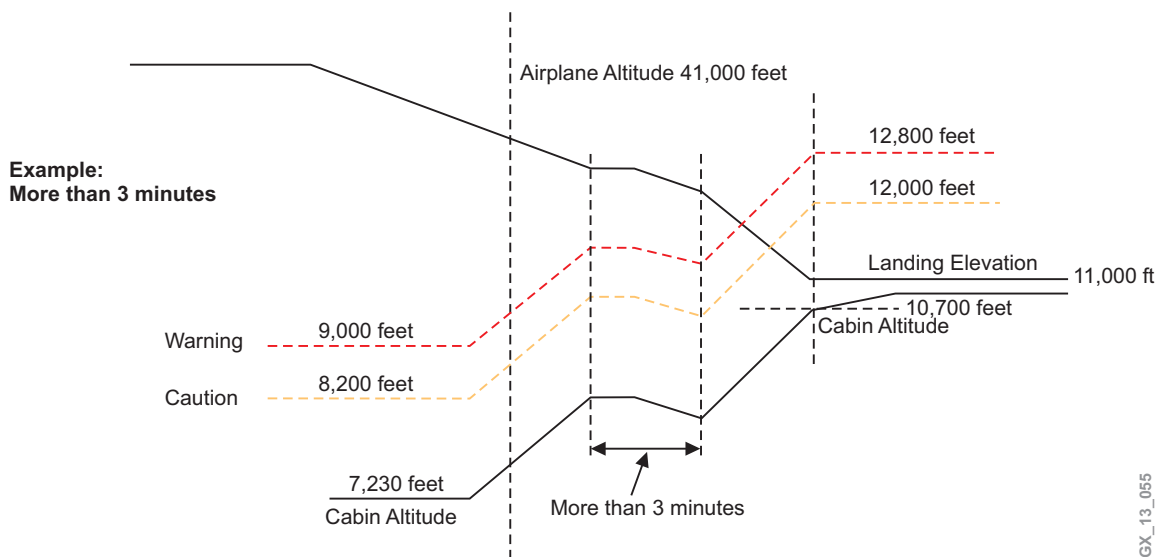
GX_13_053

LEVELING OFF DURING DESCENT

If a leveling off occurs above 41,000 feet during descent, the cabin remains at 7,230 feet. If leveling off occurs at or below 25,000 feet during descent, the cabin remains at current altitude. If leveling off occurs between 41,000 and 25,000 feet, the cabin altitude will remain at the current altitude for 3 minutes.

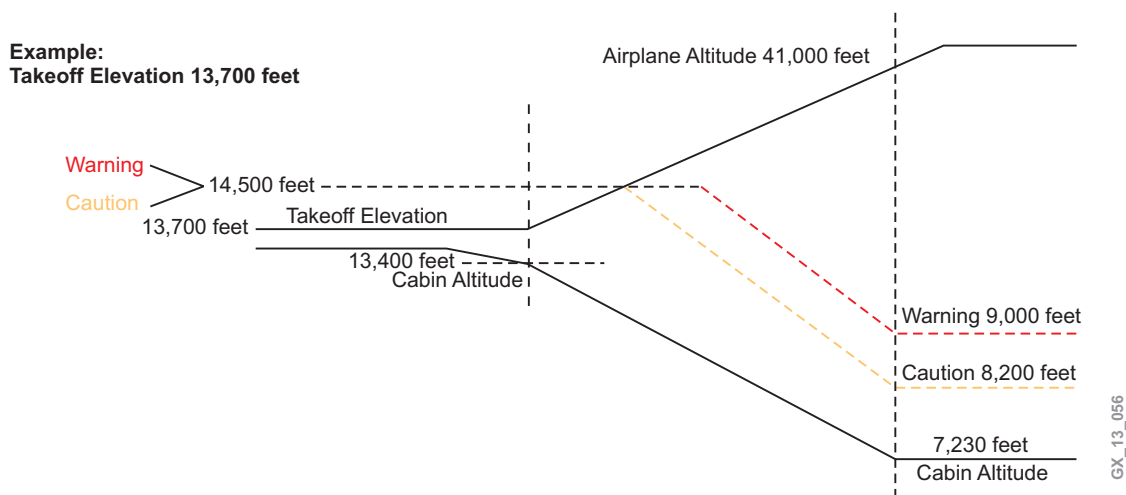


If the leveling off lasts for more than 3 minutes, the cabin altitude will descend at a rate of 300 ft/min until descent is initiated.



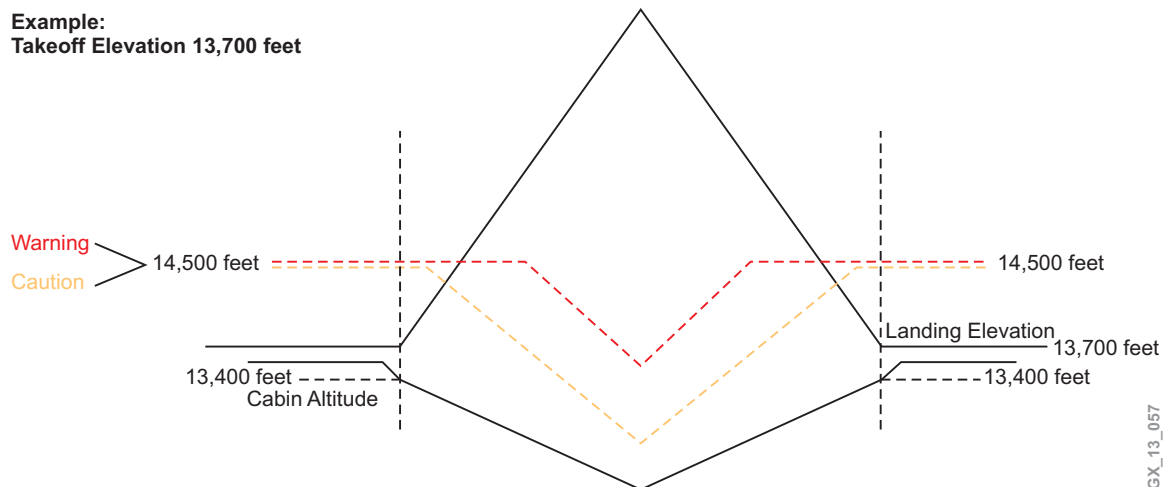
TAKEOFF AT FIELD ELEVATION GREATER THAN 7,230 FEET

When the airplane is in the climb, the CABIN ALT warning and caution decrease proportionally to the airplane altitude. As soon as cabin altitude reaches 7,230 feet or airplane reaches 41,000 feet or above, the CABIN ALT caution is reset to 8,200 feet and the CABIN ALT warning is reset to 9,000 feet.



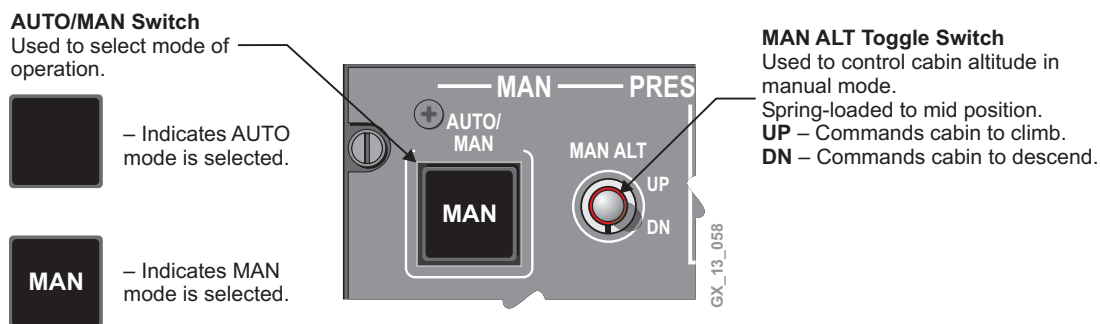
ABORTED TAKEOFF ABOVE 7,230 FEET

The take off is identical to normal takeoff above 7,230 feet. When the airplane starts to descend, an aborted takeoff sequence is initiated. The landing is similar to landing above 7,230 feet.

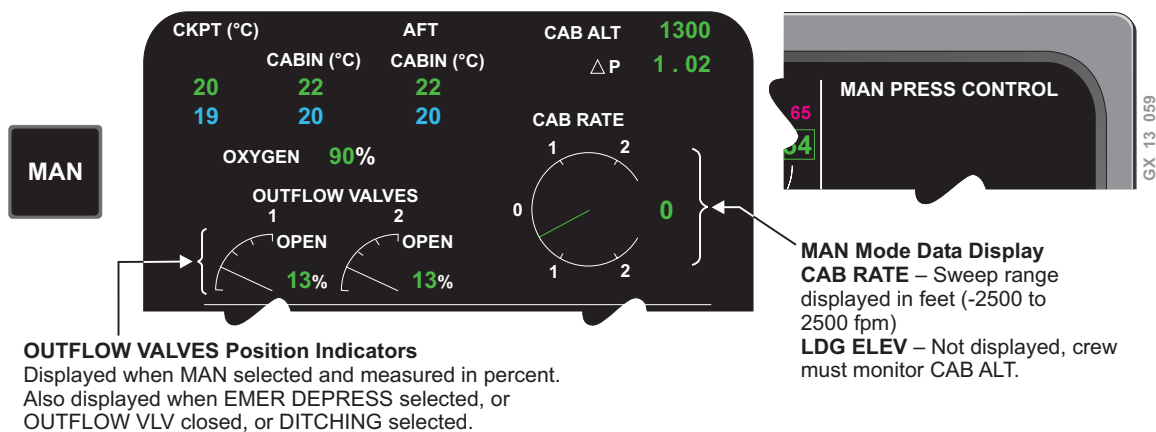


MANUAL MODE

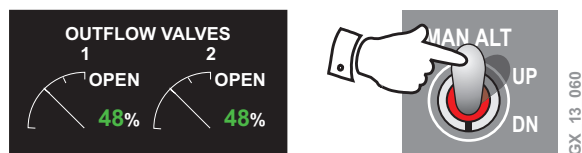
In the manual mode, cabin pressure is manually controlled by selecting the applicable switches on the Pressurization Control Panel.



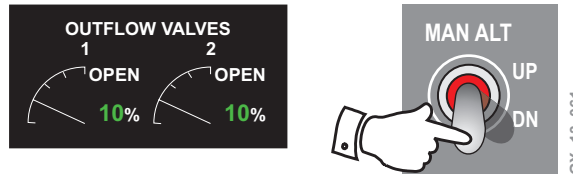
Selecting MAN will display both outflow valve position indicators, and an analog rate of change gauge. It also eliminates the LDG ELEV message from the status page and displays a status message on the EICAS.



When the MAN ALT (spring loaded) toggle switch is selected to UP both outflow valves open slowly and the cabin altitude increases proportionally to the outflow change.



When the MAN ALT toggle switch is selected to DN, both outflow valves close slowly and the cabin altitude decreases proportionally to the outflow change.



The desired control (climb, level, descent) is maintained by adjusting the outflow valve positions according to flow or differential pressure changes.

MANUAL MODE OPERATION

In order to control pressurization, MAN/ALT toggle switches are required:

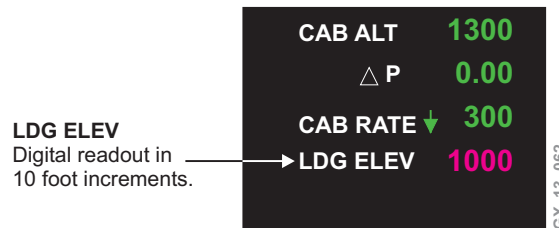
- To increase cabin altitude select:
 - MAN/ALT toggle switch to UP momentarily and monitor climb rate and cabin altitude
- To decrease cabin altitude select:
 - MAN/ALT toggle switch to DN momentarily and monitor descent rate and cabin altitude
- To maintain cabin altitude select:
 - MAN/ALT toggle switch to mid position when reaching target cabin altitude (see the chart below)

| | | | | | | | | | |
|-----------------------|------|------|------|------|------|------|------|------|------|
| Cruise Flight Level | 180 | 200 | 220 | 240 | 260 | 280 | 290 | 310 | 330 |
| Target Cabin Altitude | 1146 | 1385 | 1643 | 1925 | 2233 | 2573 | 2758 | 3139 | 3440 |
| Target ΔP | 6.76 | 7.22 | 7.64 | 8.01 | 8.33 | 8.61 | 8.72 | 8.94 | 9.16 |
| | | | | | | | | | |
| Cruise Flight Level | 350 | 370 | 390 | 410 | 430 | 450 | 470 | 490 | 510 |
| Target Cabin Altitude | 3756 | 4106 | 4514 | 4996 | 5518 | 6000 | 6444 | 6853 | 7229 |
| Target ΔP | 9.35 | 9.50 | 9.60 | 9.64 | 9.64 | 9.64 | 9.64 | 9.64 | 9.64 |

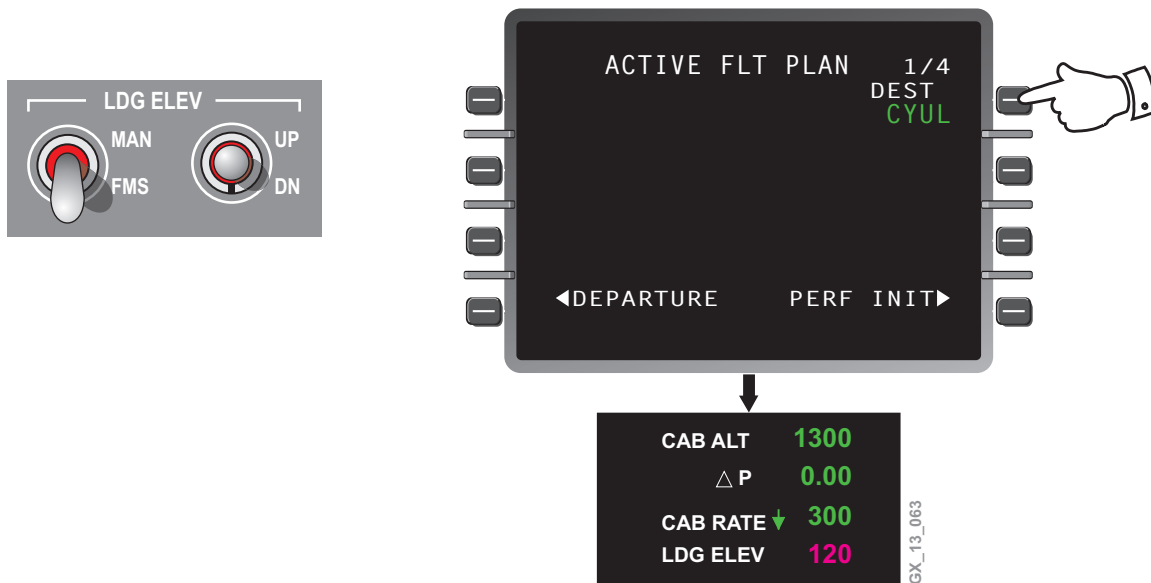
- During descent select:
 - MAN/ALT toggle switch adjust UP or DN to attain landing elevation
 - MAN/ALT toggle switch to mid position to maintain landing elevation

LANDING ELEVATION

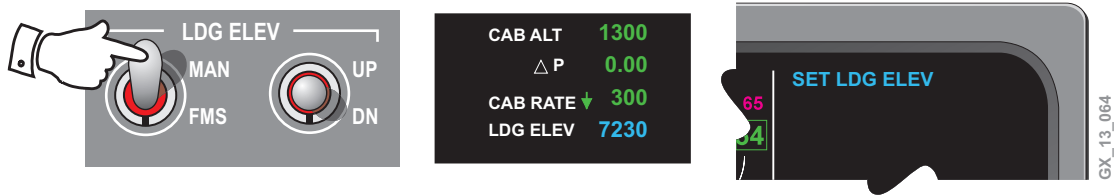
Landing elevation information is transmitted by the FMS or from the manual selection on the Pressurization Control Panel. The value used for pressurization control by the CPCs is displayed on the STAT page.



When the LDG ELEV FMS/MAN selector is set to FMS, and the landing destination information has been programmed in the FMS, and the flight plan activated, the LDG ELEV is displayed on the STAT page.



When the LDG ELEV FMS/MAN selector is set to MAN, the LDG ELEV selection is made from the Pressurization Control Panel. The LDG ELEV is defaulted to 0 feet on the ground and 7,230 feet in flight. A message is displayed on the EICAS and will remain posted until a selection of UP or DN.

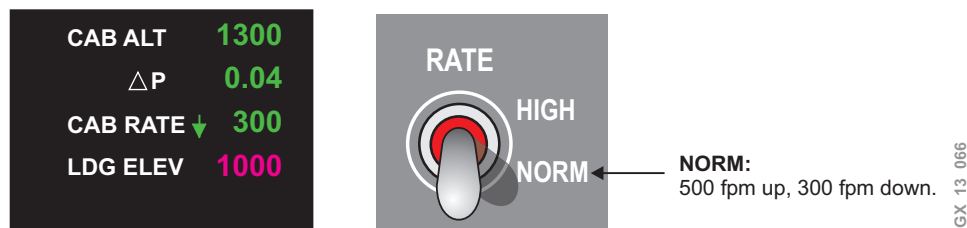


To enter a new LDG ELEV, hold the UP/DN switch until desired field elevation is reached.

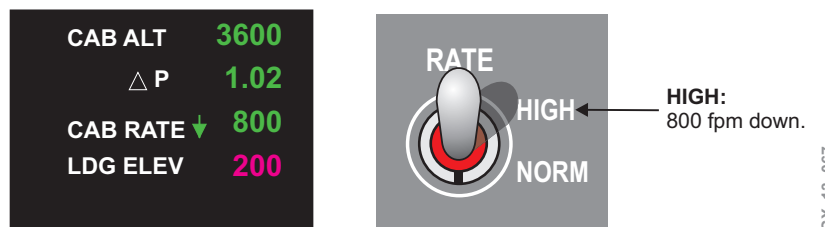


RATE LIMIT SELECTION

Cabin rate of change control is automatically controlled during ground and flight sequences. The airplane is normally flown with the rate limit selector set to NORM position. The automatic rate of change control is based upon + 500 ft/min and - 300 ft/min. The airplane cabin altitude rate will vary within these normal limits, to follow the pressurization schedule. The cabin rate is displayed on the STAT page. If the cabin is in a climb, the arrow will indicate up. If the cabin is in descent, the arrow will indicate down.



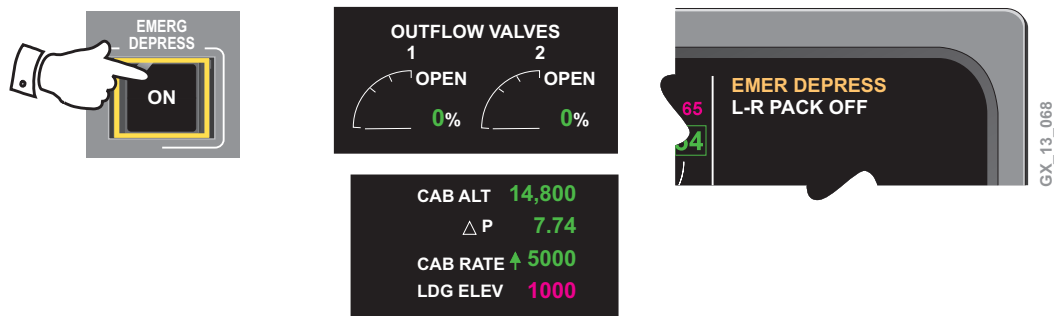
It is possible to manually override the automatic rate of change control limits through the rate limit selection on the Pressurization Control Panel. In the HIGH position, the rate limits are set to 0 to 800 ft/min descent. The cabin rate will vary between these two limits as required to maintain the pressurization schedule.



EMERGENCY DEPRESSURIZATION

When the EMER DEPRESS switch is selected ON, a fast depressurization is performed in AUTO or MAN mode by opening both OFVs through the manual drive of the OFVs.

Cabin altitude limitation functions override this function and will not allow the cabin altitude above $14,500 \pm 500$ feet. The cabin rate of climb limitation is inoperative.



CABIN ALTITUDE LIMITATION

The cabin altitude limiters override the operation of both the AUTO and MAN mode. Two cabin altitude limiters are provided, one for each OFV. When the cabin altitude reaches $14,500 \pm 500$ feet, the cabin altitude limiter signal is active.

This signal isolates the automatic and manual control of the OFVs, and closes the OFVs through the manual channel of the OFV until the cabin altitude drops below $14,500 \pm 500$ feet.

The cabin altitude limitation function includes a cabin rate limitation of 3,000 ft/min to close the OFV when the cabin altitude rate exceeds the setting value. The altitude rate limitation is not active in the case of Emergency Depressurization and Ditching.



OUTFLOW VALVE TRAVEL LIMITER

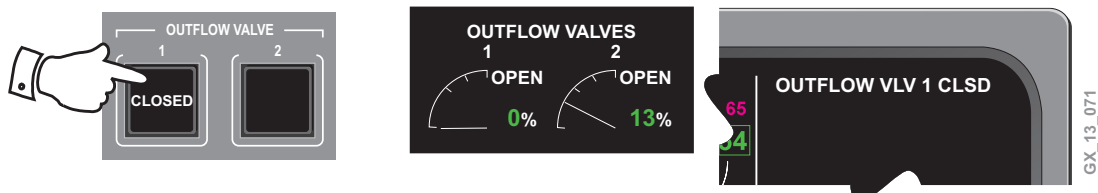
An OFV travel limiter device is included on each OFV to limit the OFV opening (for differential pressure higher than 7 ± 0.5 psid) to a safe value (maximum 50%) at high altitudes.

When the pressure differential is above 7 ± 0.5 psid, the travel limiter device prevents the OFV opening beyond 50%. The travel limiter will not prevent movement from open to close.



CLOSE OUTFLOW VALVE

The OFVs can be manually closed, both in AUTO and MAN, by selecting the OUTFLOW VLV switch(es) on the Cabin Pressure Control Panel. The OFV is driven to the closed position through the manual drive of its actuator. The outflow valves' position will be displayed on the STATUS page and a message is displayed on the EICAS.



AUTOMATIC DITCHING SEQUENCE

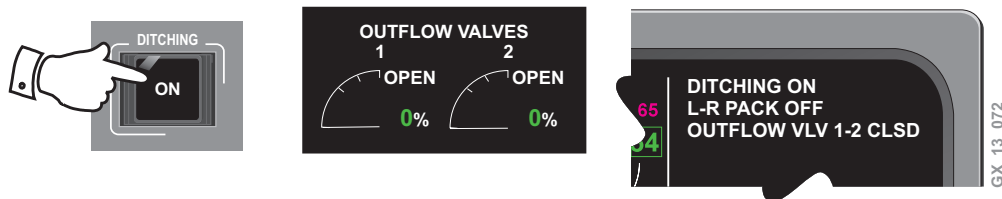
Safety in case of ditching is achieved in both AUTO and MAN modes, ensuring that the cabin is fully depressurized and that the outflow valves are fully closed.

The AUTO sequence is generated from the DITCHING switch selection and the following occurs:

- PACKS flow shutoff
- Cabin is depressurized
- OFVs are driven to the closed position

The AUTO ditching sequence is inhibited above 15,000 feet. The altitude rate limitation is inoperative whenever DITCHING is selected ON.

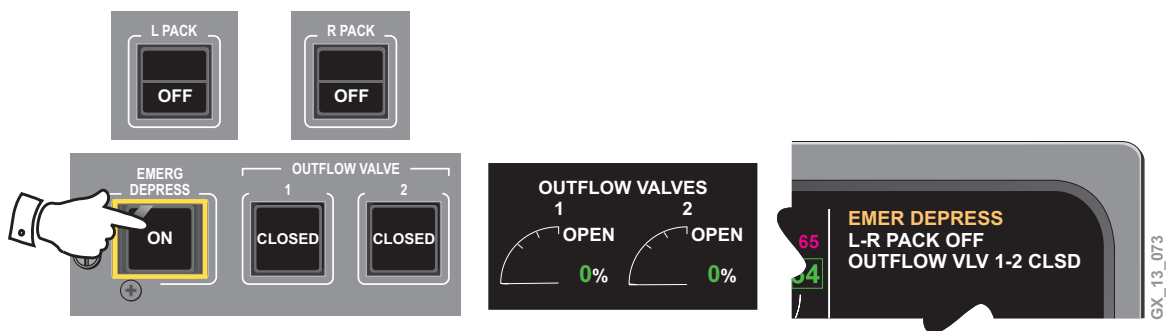
When the DITCHING switch is selected ON, the OFVs are displayed on the STAT page and status messages are displayed on the EICAS.



MANUAL DITCHING SEQUENCE

The MAN sequence is generated manually by the following selections:

- Select PACKS OFF
- Select EMER DEPRESS ON
- Select both OFVs CLOSED



SAFETY VALVES

The two safety valves (SFV 1 and SFV 2) are located in the aft bulkhead.

Each SFV ensures overpressure and negative pressure relief, and provides an OPEN position signal to the EICAS.



SYSTEM SAFETIES

The system safety features incorporated in the CPCS are:

- Dual redundant positive and negative pressure relief valves
- Dual (segregated) cabin altitude limiters, each dedicated to one outflow valve (OFV)
- An OFV travel limiter on each OFV
- Automatic Ditching provision
- Emergency Depressurization provision
- Dual OFV closure override circuitry
- Door Open Protection

OVERPRESSURE RELIEF

Overpressure relief is ensured pneumatically by each identical SFV and overrides the operation of both the AUTO and MAN mode. When maximum differential pressure is reached, an overpressure valve located on the safety valve, opens to outside pressure. The differential pressure shall not exceed 0.1 psi during taxi and 1.0 psi upon initial landing. The maximum positive differential pressure is controlled at 10.02 ± 0.1 psi. At $9.92 + 0.1$ psi, the safety valve opens. At 10.02 psi **CABIN DELTA P** will be displayed on the EICAS and the digital readout on the STAT page will appear red.



NEGATIVE PRESSURE RELIEF

Negative pressure relief is ensured pneumatically by each identical SFV and overrides the operation of both the AUTO and MAN mode. During an emergency descent without cabin airflow, when the outside pressure becomes slightly greater than cabin pressure, the SFV opens to control negative pressure at a value lower than or equal to -0.5 psid. A warning message will be displayed on the EICAS and the digital readout on the STAT page will appear red.

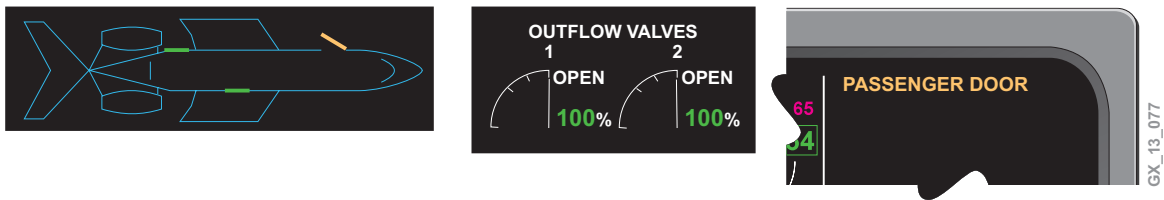


DOOR OPEN PROTECTION

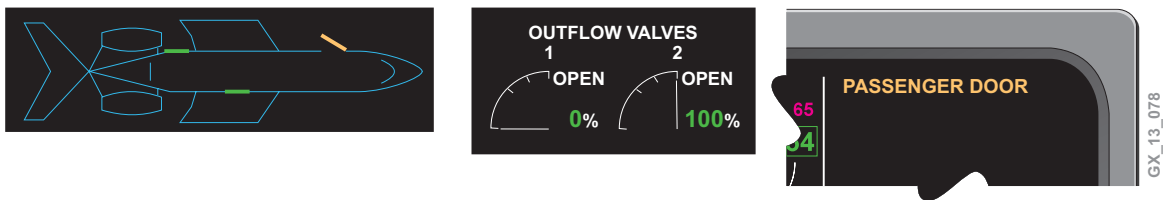
Door open protection prevents cabin pressurization if the main entrance door is not closed and fully locked.

If the main entrance door is open:

- If one or both packs are ON, both outflow valves are driven to the open position

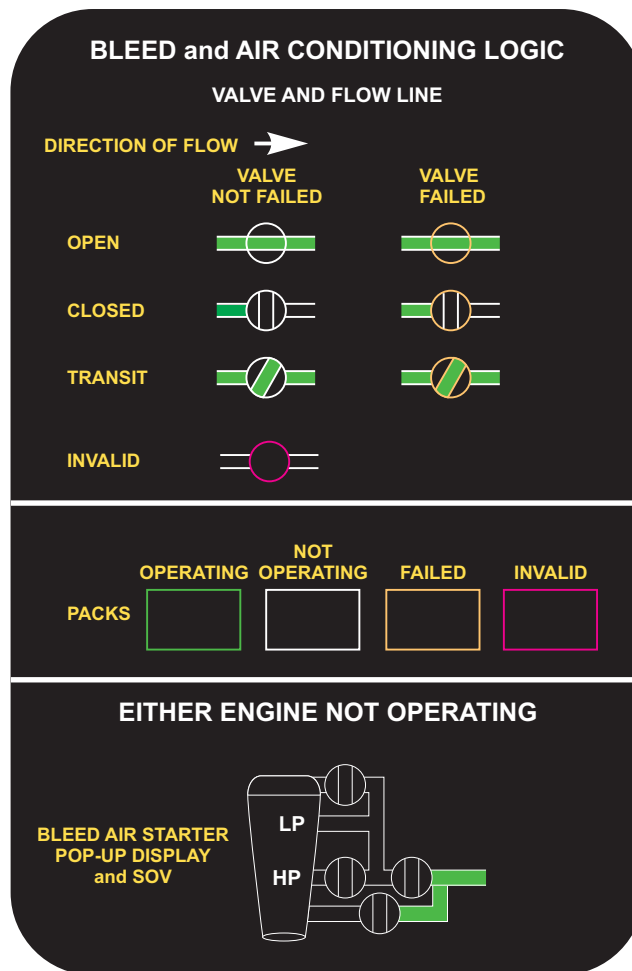


- If both packs are OFF, the aft OFV is driven open and the forward OFV is driven closed

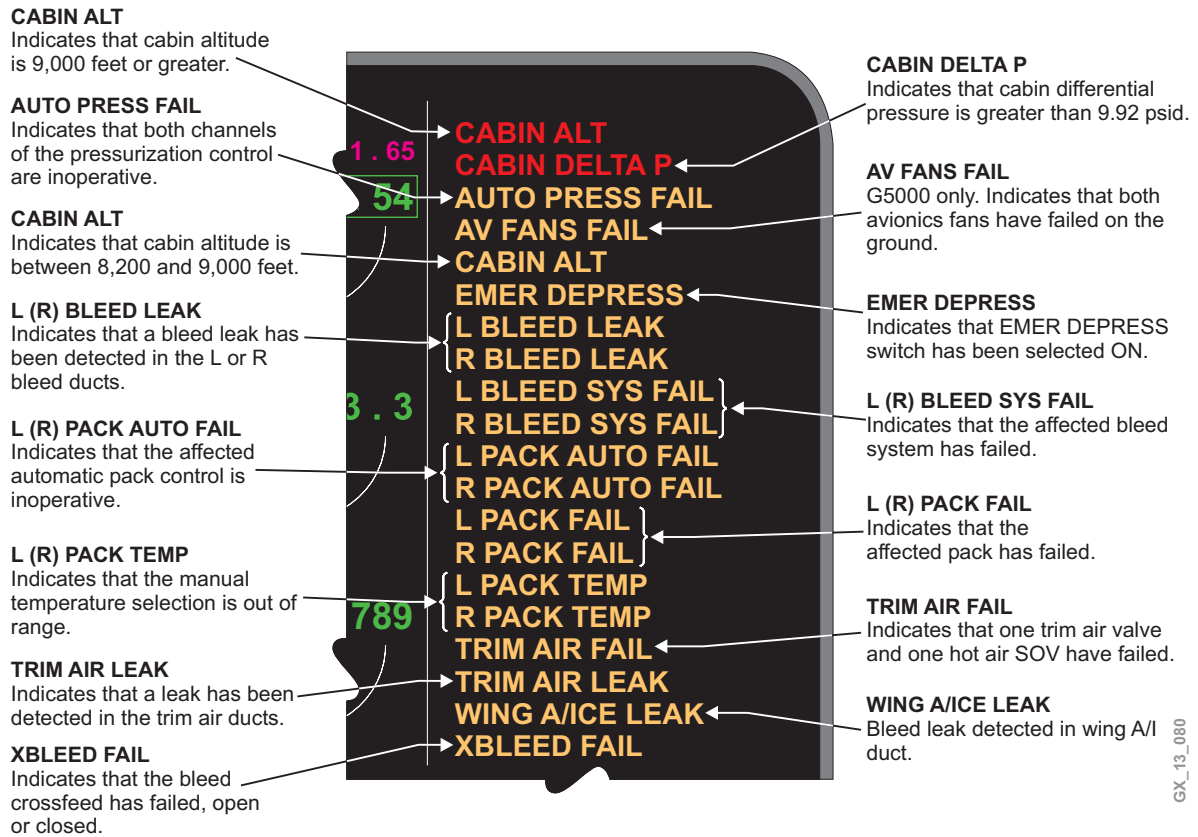


EICAS PHILOSOPHY

The following represents the EICAS symbols and logic for the BLEED and AIR CONDITIONING synoptic page. The symbols are shown in serviceable and failure conditions.

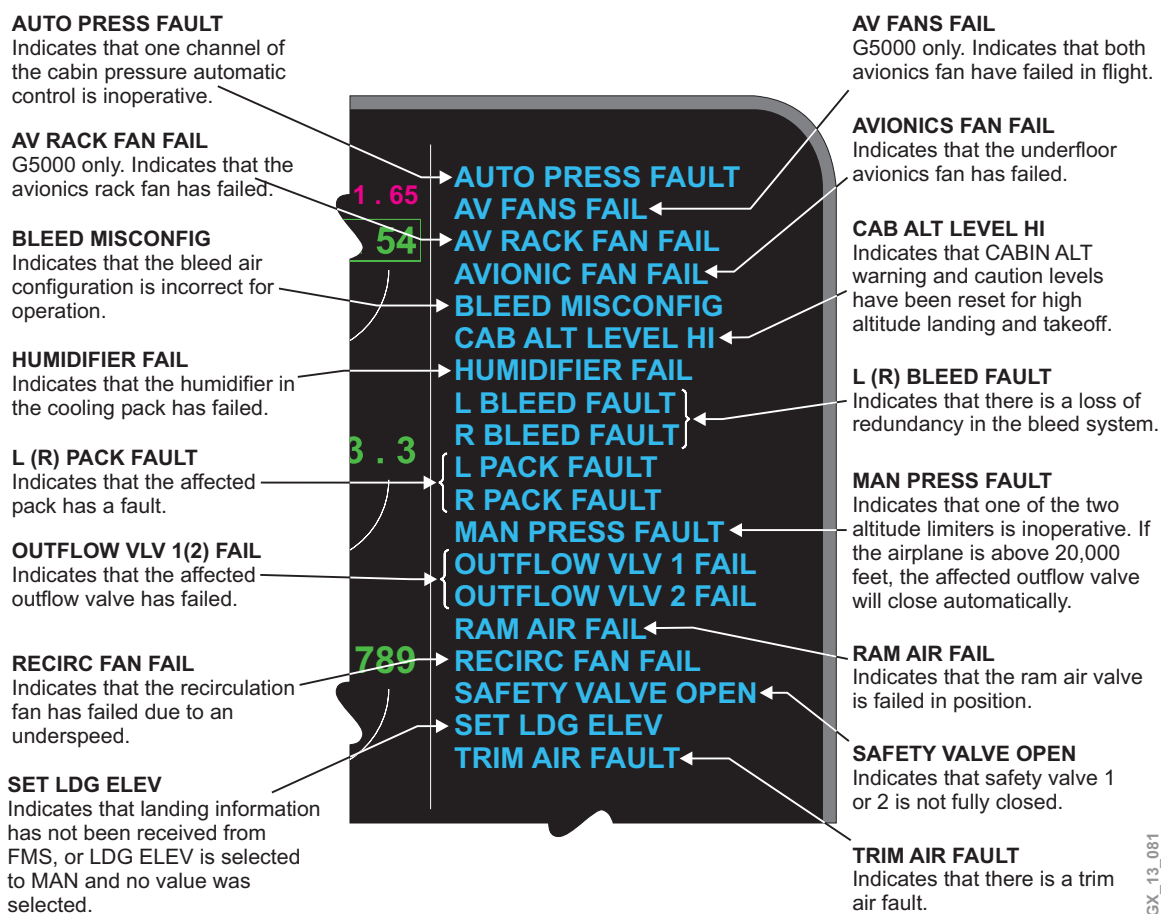


BLEED/AIR CONDITIONING/PRESSURIZATION EICAS MESSAGES



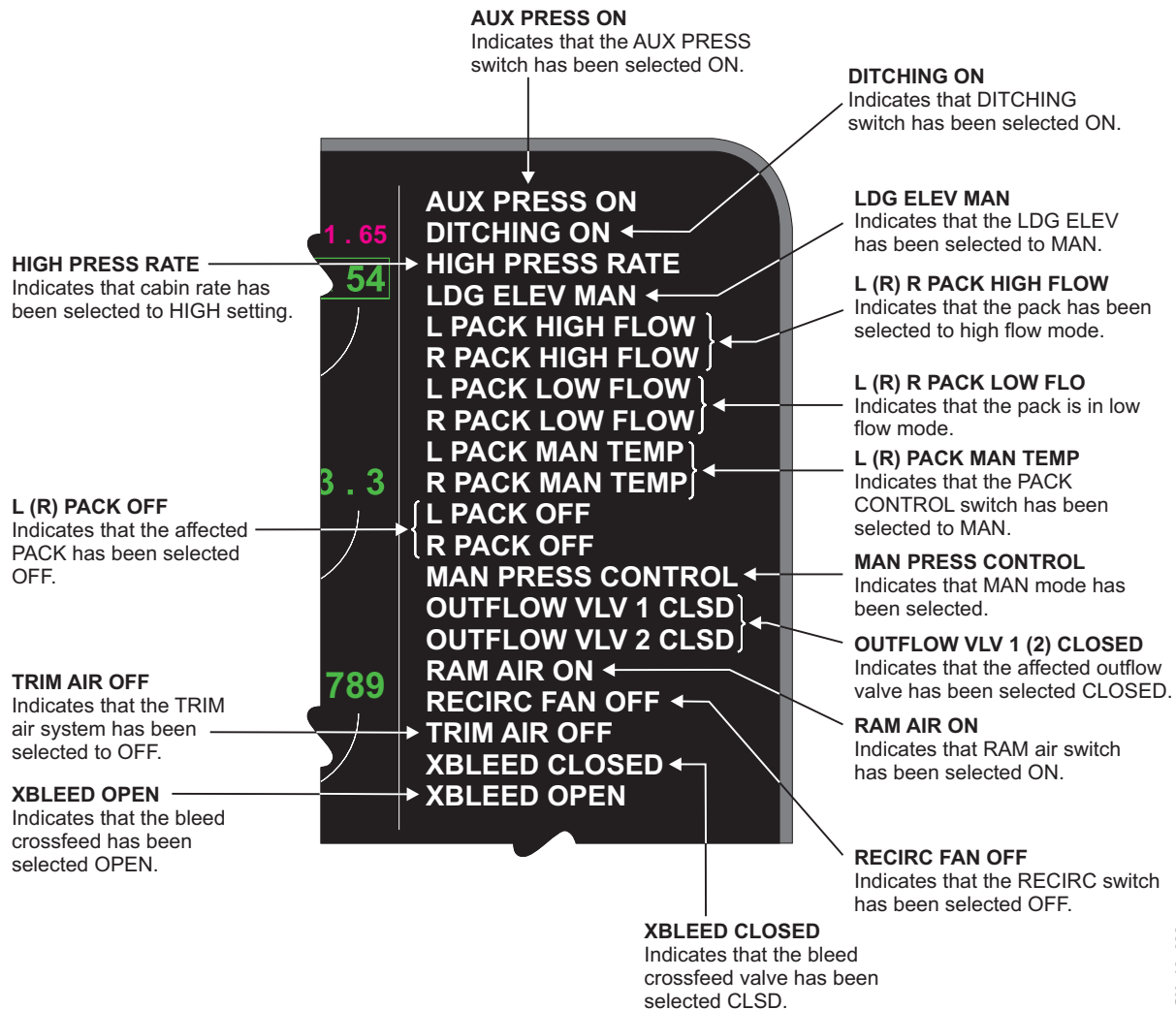
GX_13_080

BLEED/AIR CONDITIONING/PRESSURIZATION EICAS MESSAGES (Cont)



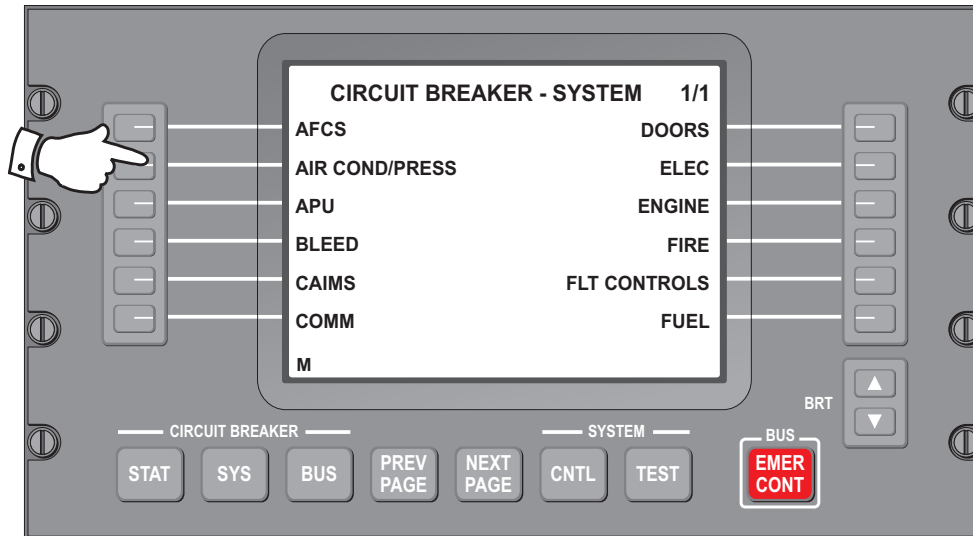
GX_13_081

BLEED/AIR CONDITIONING/PRESSURIZATION EICAS MESSAGES (Cont)



GX_13_062

EMS CIRCUIT PROTECTION



| | | | | | | | | | | | |
|--|--|--|--|--|--|--|--|--|--|--|--|
| CB - AIR COND / PRESS SYSTEM 1/6 AUTO PRESS 1 DC ESS IN AUTO PRESS 2 DC ESS IN AVIONICS FAN AC 4 IN CAB TEMP SENSOR DC 1 IN CKPT TEMP SENSOR DC 2 IN DOOR HEAT 1 AC 1 CCBP IN | | | CB - AIR COND / PRESS SYSTEM 4/6 MAN PRESS 1 BATT IN MAN PRESS 2 BATT IN R ECS HASOV DC ESS IN R ECS PRESS XDCR DC 2 IN R FOOTWARMER DC 2 IN R PACK CTL VLV DC ESS IN | | | CB - AIR COND / PRESS SYSTEM 1/6 AUTO PRESS 1 DC ESS IN AUTO PRESS 2 DC ESS IN AVIONICS FAN AC 4 IN AV RACK FAN DC 1 IN CAB TEMP SENSOR DC 1 IN CKPT TEMP SENSOR DC 2 IN | | | CB - AIR COND / PRESS SYSTEM 4/6 MAN OUTFLOW VLV BATT IN MAN PRESS 1 BATT IN MAN PRESS 2 BATT IN R ECS HASOV DC ESS IN R ECS PRESS XDCR DC 2 IN R FOOTWARMER DC 2 IN | | |
| CB - AIR COND / PRESS SYSTEM 2/6 DOOR HEAT 2 AC 1 CCBP IN DOOR HEAT CTL DC 2 IN GALLEY FAN DC 2 IN L ECS HASOV DC ESS IN L ECS PRESS XDCR DC 1 IN L FOOT WARMER DC 1 IN | | | CB - AIR COND / PRESS SYSTEM 5/6 R PACK CTLR CH B DC 1 IN R PACK CTLR CH A DC 2 IN R PACK DUCT HEAT DC 1 IN R RECIRC FAN AC 4 IN RAM AIR VLV DC ESS IN TOILET FAN DC 1 IN | | | CB - AIR COND / PRESS SYSTEM 2/6 DOOR HEAT 1 AC 1 CCBP IN DOOR HEAT 2 AC 1 CCBP IN DOOR HEAT CTL DC 2 IN GALLEY FAN DC 2 IN L ECS HASOV DC ESS IN L ECS PRESS XDCR DC 1 IN | | | CB - AIR COND / PRESS SYSTEM 5/6 R PACK CTL VLV DC ESS IN R PACK CTLR CH B DC 1 IN R PACK CTLR CH A DC 2 IN R PACK DUCT HEAT DC 1 IN R RECIRC FAN AC 4 IN RAM AIR VLV DC ESS IN | | |
| CB - AIR COND / PRESS SYSTEM 3/6 L PACK CTL VLV DC ESS IN L PACK CTLR CH A DC 1 IN L PACK CTLR CH B DC 2 IN L PACK DUCT HEAT DC 2 IN L RECIRC FAN AC 1 IN MAN OUTFLOW VLV BATT IN | | | CB - AIR COND / PRESS SYSTEM 6/6 TRU BAY FAN AC 1 CCBP IN TRU BAY FAN CTL DC 2 IN | | | CB - AIR COND / PRESS SYSTEM 3/6 L FOOT WARMER DC 1 IN L PACK CTL VLV DC ESS IN L PACK CTLR CH A DC 1 IN L PACK CTLR CH B DC 2 IN L PACK DUCT HEAT DC 2 IN L RECIRC FAN AC 1 IN | | | CB - AIR COND / PRESS SYSTEM 6/6 TOILET FAN DC 1 CCBP IN TRU BAY FAN AC 1 IN TRU BAY FAN CTL DC 2 IN | | |

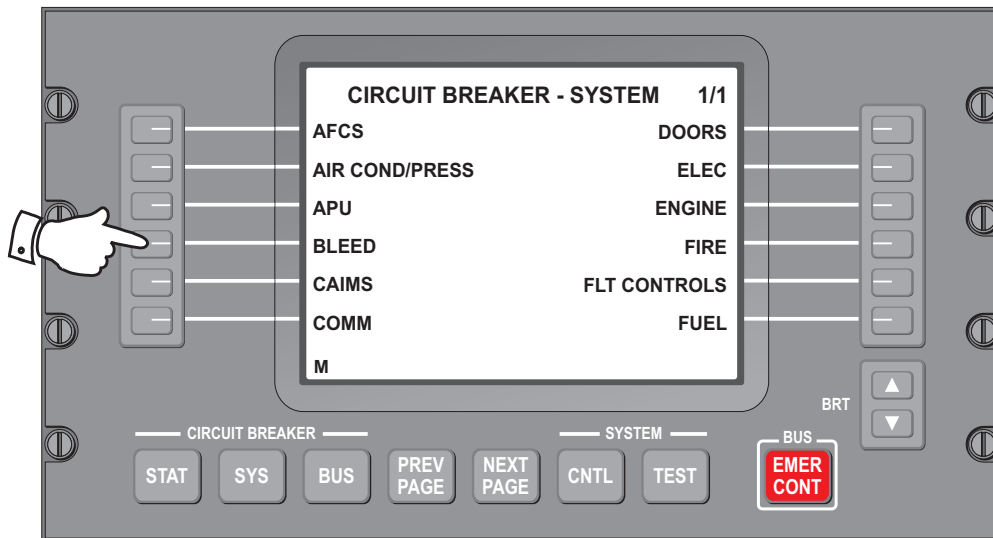
GLOBAL EXPRESS

GLOBAL 5000

Note:
 The EMS CDU indicates R PACK CTLR CH A is on DC BUS 1 and R PACK CTLR CH B is on DC BUS 2, of SPDA #3. The EMS CDU should indicate R PACK CTLR CH A on DC BUS 2 and R PACK CTLR CH B on DC BUS 1.

GX_13_083

EMS CIRCUIT PROTECTION (Cont)



| CB - BLEED SYSTEM | | | 1/2 |
|-------------------|--------|----|-----|
| L BMC CH A | DC 1 | IN | |
| L BMC CH B | DC 2 | IN | |
| L BMC SENSORS | DC ESS | IN | |
| L ENG BLEED VLV | DC ESS | IN | |
| L ENG HP VLV | DC ESS | IN | |
| R BMC CH A | DC 2 | IN | |
| CB - BLEED SYSTEM | | | 2/2 |
| R BMC CH B | DC 1 | IN | |
| R BMC SENSORS | DC ESS | IN | |
| R ENG BLEED VLV | DC ESS | IN | |
| R ENG HP VLV | DC ESS | IN | |
| XBLEED CTL | BATT | IN | |
| XBLEED VLV | BATT | IN | |
| M | | | |

GX_13_084