

B737 NG



Air Systems

Bleed Air System Introduction

Air for the bleed air system can be supplied by the engines, APU, or an external air cart/source. The APU or external cart supplies air to the bleed air duct prior to engine start. After engine start, air for the bleed air system is normally supplied by the engines.

The following systems rely on the bleed air system for operation:

- Air conditioning/pressurization
- Wing and engine thermal anti-icing
- Engine starting
- Hydraulic reservoirs pressurization
- Water tank pressurization

[Option - Aspirated TAT]

- Aspirated TAT probe

Switches on the air conditioning panel operate the APU and engine bleed air supply system.

Engine Bleed System Supply

Engine bleed air is obtained from the 5th and 9th stages of the compressor section. When 5th stage low pressure bleed air is insufficient for the bleed air system requirements, the high stage valve modulates open to maintain adequate bleed air pressure. During takeoff, climb, and most cruise conditions, low pressure bleed air from the 5th stage is adequate and the high stage valve remains closed.

Engine Bleed Air Valves

The engine bleed air valve acts as a pressure regulator and shutoff valve. With the engine bleed air switch ON, the valve is DC activated and pressure operated. The valve maintains proper system operating pressure and reduces bleed air outflow in response to high bleed air temperature.

Bleed Trip Sensors

Bleed trip sensors illuminate the respective BLEED TRIP OFF light when engine bleed air temperature or pressure exceeds a predetermined limit. The respective engine bleed air valve closes automatically.

Duct Pressure Transmitters

Duct pressure transmitters provide bleed air pressure indications to the respective (L and R) pointers on the bleed air duct pressure indicator. The indicator is AC operated. Differences between L and R duct pressure on the bleed air duct pressure indicator are considered normal as long as there is sufficient air for cabin pressurization.

Isolation Valve

The isolation valve isolates the left and right sides of the bleed air duct during normal operations. The isolation valve is AC operated.

With the isolation valve switch in AUTO, both engine bleed air switches ON, and both air conditioning pack switches AUTO or HIGH, the isolation valve is closed. The isolation valve opens if either engine bleed air switch or air conditioning pack switch is positioned OFF. Isolation valve position is not affected by the APU bleed air switch.

External Air Connection

An external air cart/source provides an alternate air source for engine start or air conditioning.

APU Bleed Air Valve

The APU bleed air valve permits APU bleed air to flow to the bleed air duct. The valve closes automatically when the APU is shut down. The APU bleed air valve is DC controlled and pressure operated.

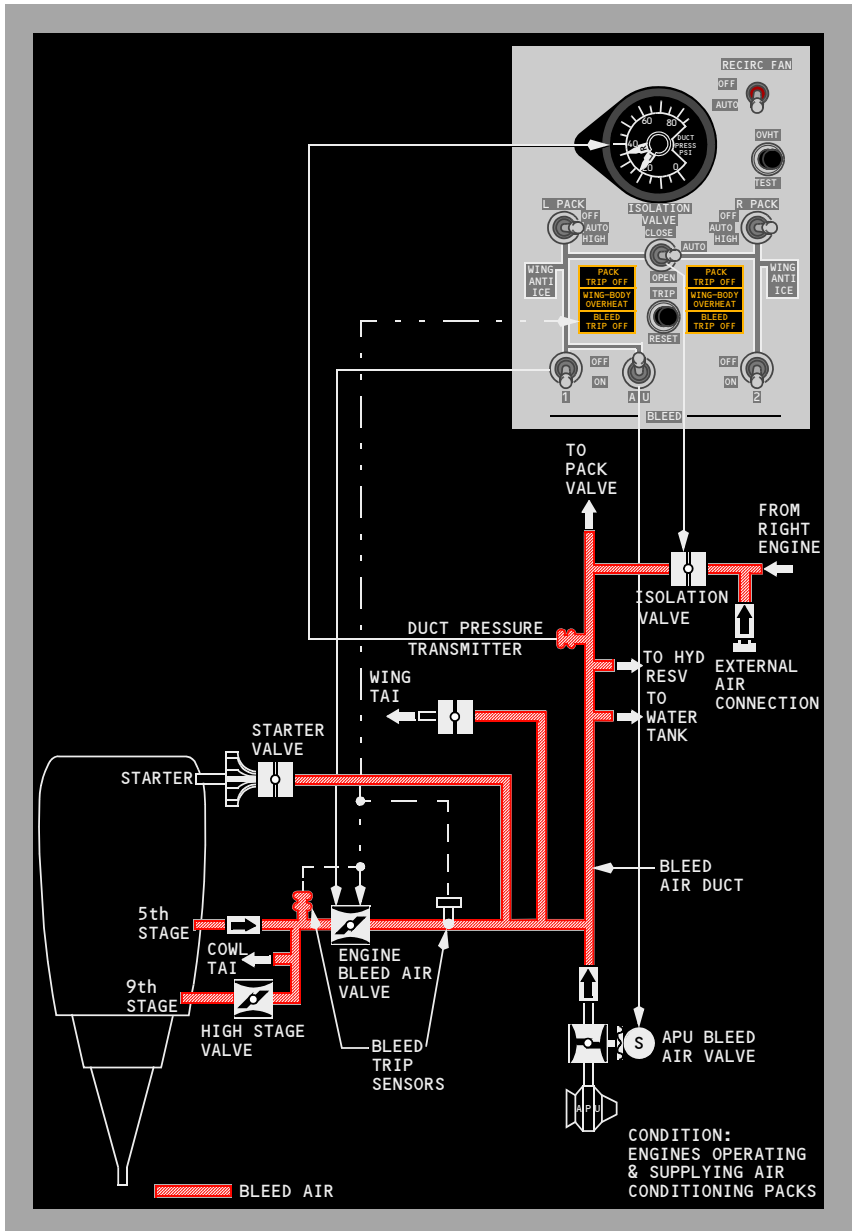
With both the APU and engine bleed air valves open, and the engines operating at idle thrust, there is a possibility of APU bleed air backpressuring the 9th stage modulating and shutoff valve. This would cause the 9th stage valve to close.

DUAL BLEED Light

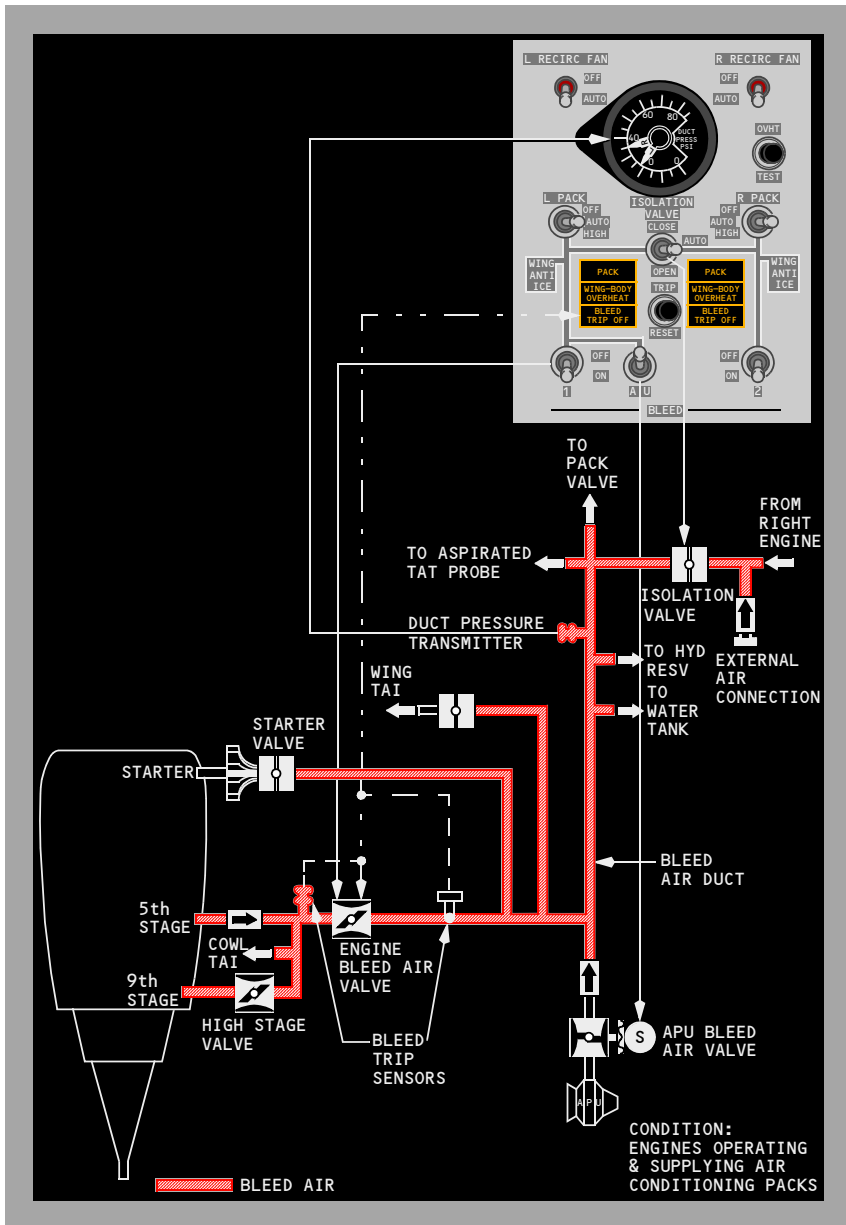
The DUAL BLEED light illuminates whenever the APU bleed air valve is open and the position of the engine bleed air switches and isolation valve would permit possible backpressure of the APU. Therefore, thrust must be limited to idle with the DUAL BLEED light illuminated.

Bleed Air System Schematic

[B737 - 600/700 with Non-Aspirated TAT or with Port-Capped TAT]



[B737 - 800/900 with Aspirated TAT]

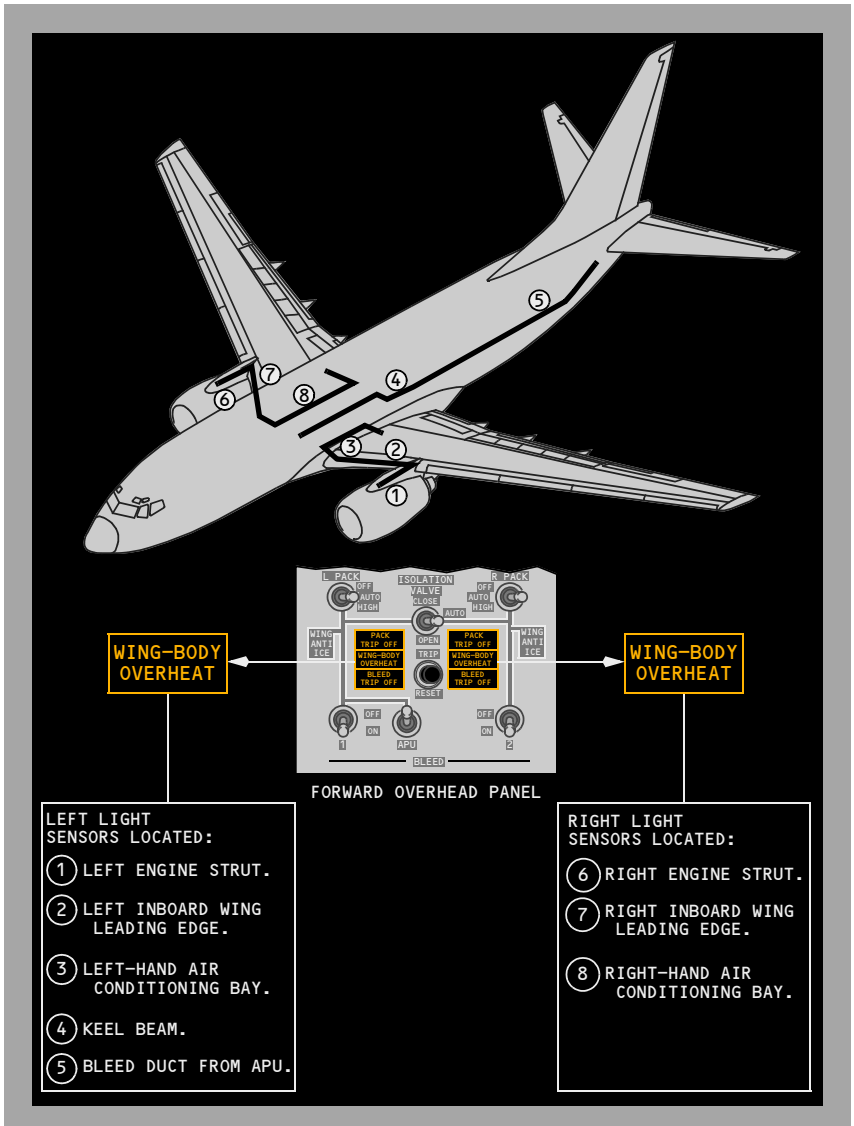


Wing-Body Overheat

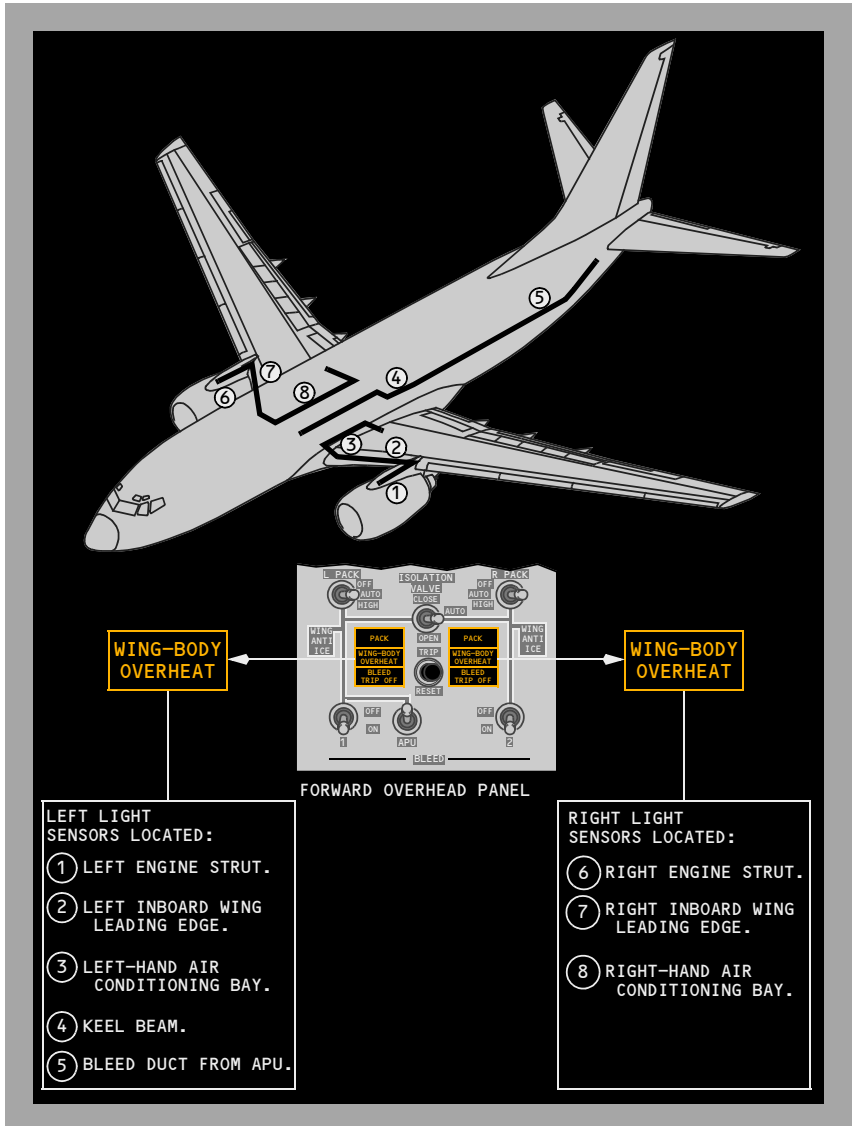
A wing-body overheat condition is caused by a bleed air duct leak. It is sensed by the overheat sensors located as shown.

Wing-Body Overheat Ducts and Lights

[B737 - 600/700]



[B737 - 800/900]



[B737-600/700]

Air Conditioning System Introduction

Conditioned air for the cabin comes from either the airplane air conditioning system or a preconditioned ground source. Air from the preconditioned ground source enters the air conditioning system through the mix manifold.

The air conditioning system provides temperature controlled air by processing bleed air from the engines, APU, or a ground air source in air conditioning packs. Conditioned air from the left pack, upstream of the mix manifold, flows directly to the flight deck. Excess air from the left pack, air from the right pack, and air from the recirculation system is combined in the mix manifold. The mixed air is then distributed through the left and right sidewall risers to the passenger cabin.

Air Conditioning Pack

The flow of bleed air from the main bleed air duct through each air conditioning pack is controlled by the respective pack valve. Normally the left pack uses bleed air from engine No. 1 and the right pack uses bleed air from engine No. 2. A single pack in high flow is capable of maintaining pressurization and acceptable temperatures throughout the airplane up to the maximum certified ceiling.

The APU is capable of supplying bleed air for two packs on the ground, or one pack in flight. Most external air carts are capable of supplying adequate bleed air for two pack operation. Do not operate more than one pack from one engine at any time.

Airflow Control

With both air conditioning pack switches in AUTO and both packs operating, the packs provide “normal air flow”. However, with one pack not operating, the other pack automatically switches to “high air flow” in order to maintain the necessary ventilation rate. This automatic switching is inhibited when the airplane is on the ground, or in flight with the flaps extended, to insure adequate engine power for single engine operation. Automatic switching to “high air flow” occurs if both engine bleed air switches are OFF and the APU bleed air switch is ON, regardless of flap position, air/ground status or number of packs operating.

With the air conditioning pack switch in HIGH, the pack provides “high air flow”. Additionally, an “APU high air flow” rate is available when the airplane is on the ground, the APU bleed air switch is ON and either or both pack switches are positioned to HIGH. This mode is designed to provide the maximum airflow when the APU is the only source of bleed air.

Ram Air System

The ram air system provides cooling air for the heat exchangers. Operation of the system is automatically controlled by the packs through operation of ram air inlet doors.

On the ground, or during slow flight with the flaps not fully retracted, the ram air inlet doors move to the full open position for maximum cooling. In normal cruise, the doors modulate between open and closed. A RAM DOOR FULL OPEN light illuminates whenever a ram door is fully open.

Deflector doors are installed forward of the ram air inlet doors to prevent slush ingestion prior to liftoff and after touchdown. Deflector doors extend when activated electrically by the air-ground safety sensor.

Cooling Cycle

The flow through the cooling cycle starts with bleed air passing through a heat exchanger for cooling. The air then flows to an air cycle machine for refrigeration and to a water separator which removes moisture. The processed cold air is then combined with hot air. The conditioned air flows into the mix manifold and distribution system.

Overheat protection is provided by temperature sensors located in the cooling cycle. An overheat condition causes the pack valve to close and the PACK TRIP OFF light to illuminate.

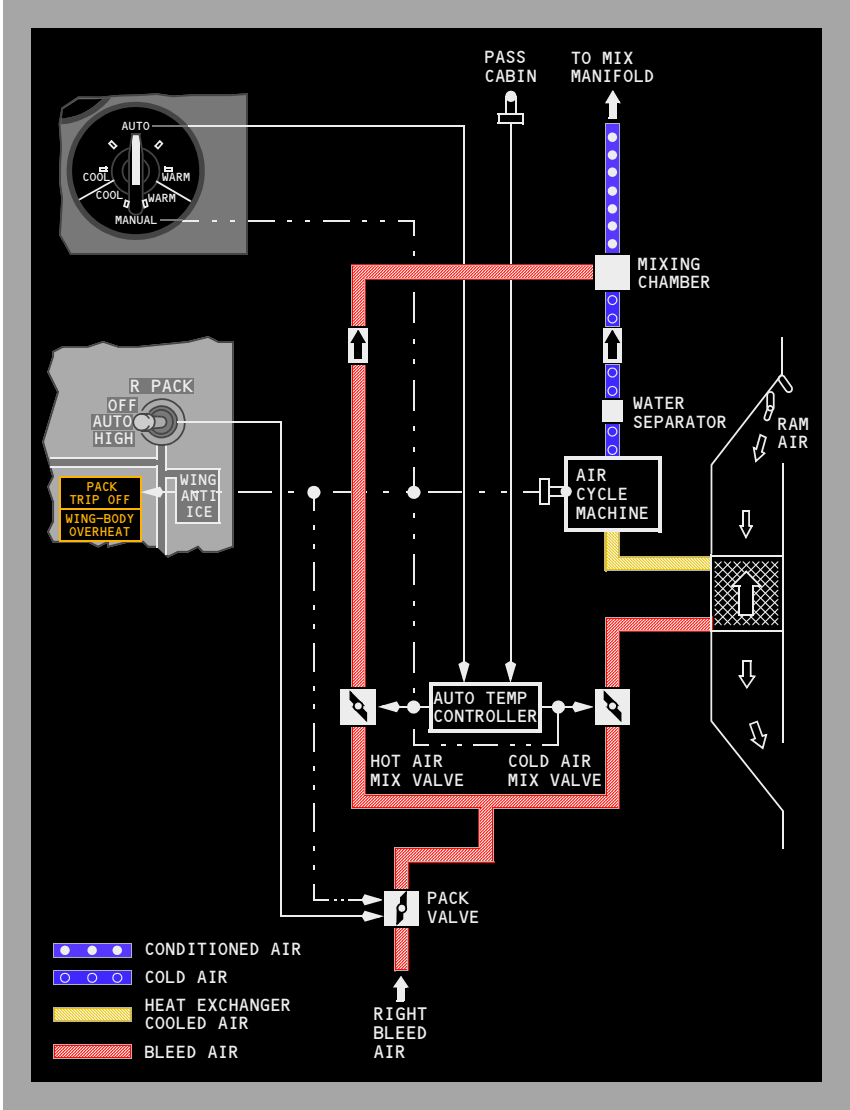
Air Mix Valves

The two air mix valves for each pack control hot and cold air according to the setting of the CONT CABIN or PASS CABIN temperature selector. Air that flows through the cold air mix valve is processed through a cooling cycle and then combined with hot air flowing from the hot air mix valve.

In the automatic temperature mode, the air mix valves are operated by the automatic temperature controller. The automatic temperature controller uses inputs from the respective temperature selector and cabin temperature sensor. The automatic temperature controller is bypassed when the temperature selector is positioned to MANUAL.

Anytime the pack valve closes, the air mix valves are driven to the full cold position automatically. This aids startup of the cooling cycle and prevents nuisance hot air trips when the pack is turned on.

Air Conditioning Pack Schematic



Air Conditioning Distribution

Conditioned air is collected in the mix manifold. The temperature of the air is directly related to the setting of the CONT CABIN and PASS CABIN temperature selectors.

Overheat detection is provided by temperature sensors located downstream of the packs. An overheat condition causes the appropriate mix valves to drive full cold and the DUCT OVERHEAT light to illuminate. A temperature higher than the duct overheat causes the appropriate pack valve to close and the PACK TRIP OFF light to illuminate.

Flight Deck

Since the flight deck requires only a fraction of the air supply provided by the left pack, most of the left pack air output is mixed with the right pack supply and routed to the passenger cabin.

Conditioned air for the flight deck branches into several risers which end at the floor, ceiling, and foot level outlets. Air diffusers on the floor under each seat deliver continuous air flow as long as the manifold is pressurized.

Overhead diffusers are located on the flight deck ceiling, above and aft of the No. 3 windows. Each of these outlets can be opened or closed as desired by turning a slotted adjusting screw.

There is also a dual purpose valve behind the rudder pedals of each pilot. These valves provide air for warming the pilots' feet and for defogging the inside of the No. 1 windshields. Each valve is controlled by knobs located on the Captain's and First Officer's panel, respectively.

Passenger Cabin

The passenger cabin air supply distribution system consists of the mix manifold, sidewall risers, and an overhead distribution duct.

Sidewall risers go up the right and left wall of the passenger cabin to supply air to the overhead distribution duct. The overhead distribution duct routes conditioned air to the passenger cabin. It extends from the forward to the aft end of the ceiling along the airplane centerline and also supplies the sidewall diffusers.

Recirculation Fan

The recirculation fan system reduces the air conditioning system pack load and the engine bleed air demand. Air from the passenger cabin and electrical equipment bay is drawn to the forward cargo bay where it is filtered and recirculated to the mix manifold. The fan is driven by an AC motor. The fan operates with the recirc fan switch in AUTO except with both packs on and one or both in HIGH.

Equipment Cooling

The equipment cooling system cools electronic equipment in the flight deck and the E & E bay.

The equipment cooling system consists of a supply duct and an exhaust duct. Each duct has a normal fan and an alternate fan. The supply duct supplies cool air to the flight deck displays and electronic equipment in the E & E bay. The exhaust duct collects and discards warm air from the flight deck displays, the overhead and aft electronic panels, circuit breaker panels in the flight deck, and electronic equipment in the E & E bay.

Loss of airflow due to failure of an equipment cooling fan results in illumination of the related equipment cooling OFF light. Selecting the alternate fan should restore airflow and extinguish the OFF light within approximately 5 seconds.

If an overtemperature occurs on the ground, alerting is provided through the crew call horn in the nose wheel well.

Forward Cargo Compartment

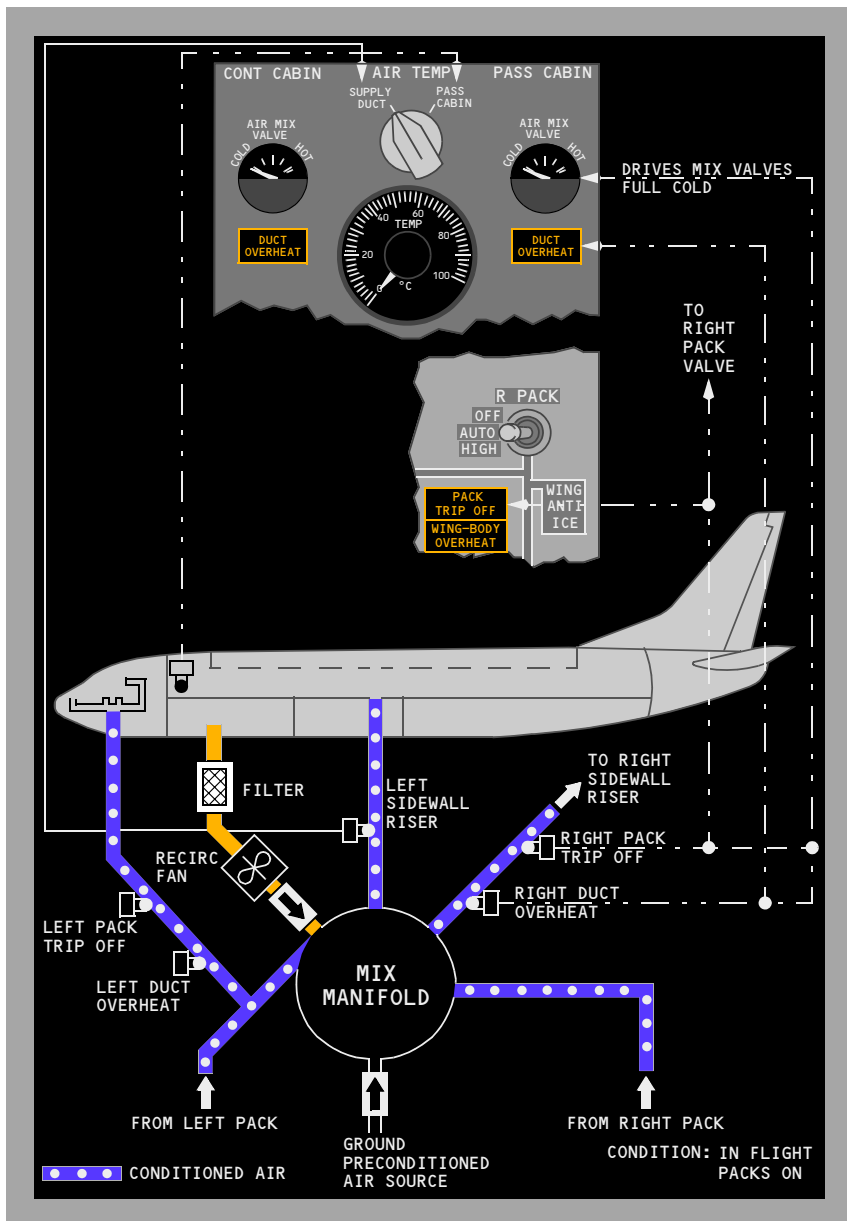
The recirculation fan system circulates air from the passenger cabin around the lining of the forward cargo compartment. When the overboard exhaust valve is closed, exhaust air from the equipment cooling system is also diffused to the lining of the forward cargo compartment for additional inflight heating.

Conditioned Air Source Connection

A ground air conditioning source may be connected to the mix manifold to distribute preconditioned air throughout the airplane.

Air Conditioning Distribution Schematic

[Option - Air Temperature Indicator in degrees C]



[B737-800/900]

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Airflow Control

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With the air conditioning pack switch in HIGH, the pack provides “high air flow”. Additionally, an “APU high air flow” rate is available when the airplane is on the ground, the APU bleed air switch is ON and either or both pack switches are positioned to HIGH. This mode is designed to provide the maximum airflow when the APU is the only source of bleed air.

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On the ground, or during slow flight with the flaps not fully retracted, the ram air inlet doors move to the full open position for maximum cooling. In normal cruise, the doors modulate between open and closed. A RAM DOOR FULL OPEN light illuminates whenever a ram door is fully open.

Deflector doors are installed forward of the ram air inlet doors to prevent slush ingestion prior to liftoff and after touchdown. Deflector doors extend when activated electrically by the air-ground safety sensor.

Cooling Cycle

Flow through the cooling cycle starts with bleed air passing through a heat exchanger for cooling. The air then flows to an air cycle machine for refrigeration. The processed cold air is then combined with hot air which has bypassed the air cycle machine, then through a high pressure water separator which removes moisture. This conditioned air then flows into the mix manifold and distribution system.

Overheat protection is provided by temperature sensors located in the cooling cycle. An overheat condition causes the pack valve to close and the PACK light to illuminate.

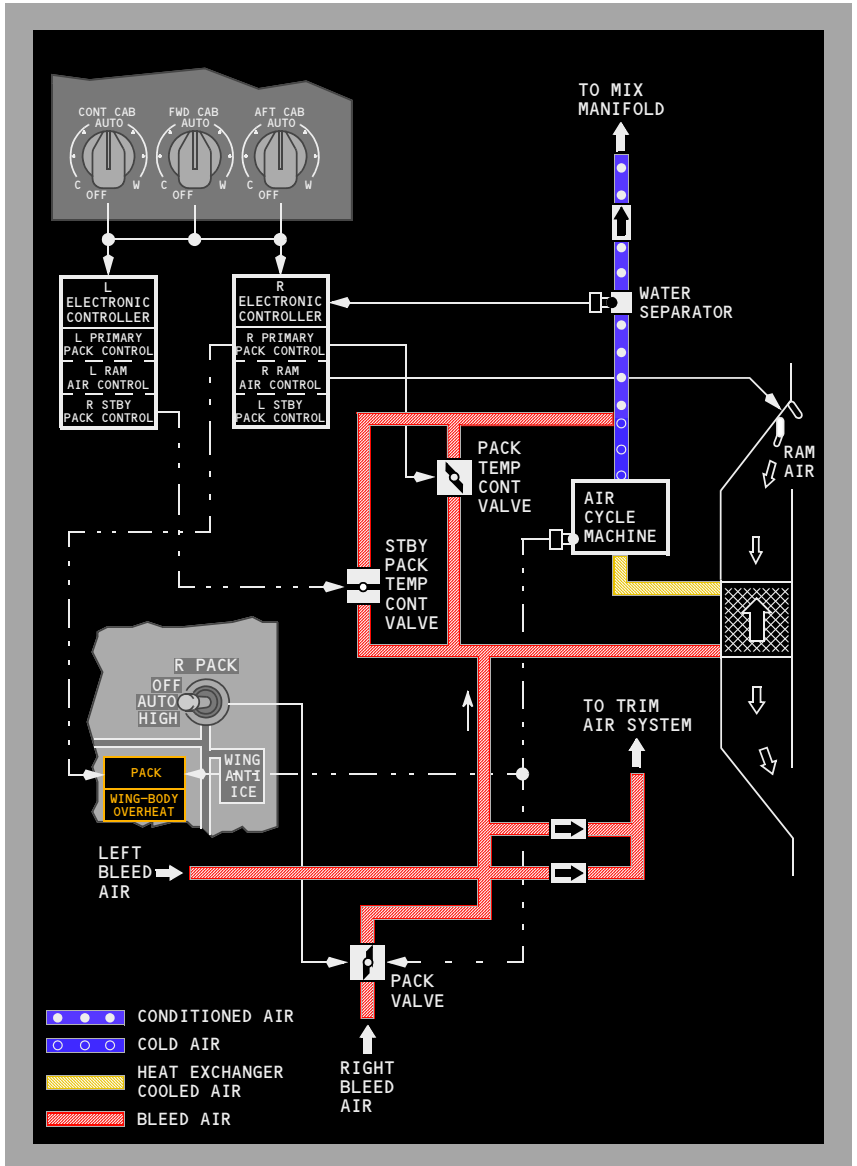
Pack Temperature Control

Electronic controllers command the pack temperature control valve toward open or closed to satisfy pack discharge requirements.

If a primary pack control fails, the affected pack is controlled by the standby pack control in the opposite controller. A primary or standby pack control failure causes the PACK, MASTER CAUTION and AIR COND System Annunciator lights to illuminate during recall.

If both the primary and the standby pack controls fail for the same pack, the PACK, MASTER CAUTION, and AIR COND System Annunciator lights illuminate. The pack will continue to operate without control unless excessive temperatures cause the pack to trip off.

Air Conditioning Pack Schematic



Zone Temperature Control

There are three zones: flight deck, forward cabin and aft cabin. Desired zone temperature is set by adjusting the individual Temperature Selectors. The selector range is approximately 65°F (18°C) to 85°F (30°C).

The packs produce an air temperature that satisfies the zone which requires the most cooling. Zone temperature is controlled by introducing the proper amount of trim air to the zone supply ducts. The quantity of trim air is regulated by individual trim air modulating valves.

During single pack operation with the TRIM AIR selected ON, zone temperature is controlled the same as during two pack operation. During single pack operation with the TRIM AIR selected OFF, the pack attempts to produce an air temperature to satisfy the average temperature demands of all three zones.

If air in a zone supply duct overheats, the associated amber ZONE TEMP light illuminates, and the associated trim air modulating valve closes. The trim air modulating valve may be reopened after the duct has cooled by pushing the TRIP RESET Switch.

Zone Temperature Control Modes

The left electronic controller controls the aft cabin zone and provides backup control for the flight deck. The right controller controls the forward cabin zone and provides primary control for the flight deck.

Failure of the primary flight deck temperature control will cause an automatic switch to the back up control and will illuminate the CONT CAB amber ZONE TEMP light upon Master Caution Recall. Failure of both the primary and standby controls will illuminate the lights automatically.

Failure of the forward or aft cabin temperature control will cause the associated trim air modulating valve to close. The Temperature Selectors operate normally, but the Temperature Selector settings of the two passenger cabin zones will be averaged. The amber ZONE TEMP light will illuminate upon Master Caution Recall to indicate failure of the associated zone control.

Unbalanced Pack Temperature Control Mode

Any failure affecting the supply of trim air will cause the temperature control system to control both packs independently. If flight deck trim air is lost, the left pack will provide conditioned air to the flight deck at the selected temperature and the right pack will satisfy the demand of the passenger zone which requires the most cooling. If a passenger cabin zone trim air, or all trim air is lost, the forward and aft zone temperature demands will be averaged for control of the right pack.

If any individual zone is switched OFF, the Temperature Selector setting will be ignored by the temperature control system.

Standby Pack Average Temperature

If all zone controls and primary pack controls fail, the standby pack controls command the packs to produce air temperatures which will satisfy the average temperature demand of the two cabin zones. The trim air modulating valves will close. The flight deck zone Temperature Selector will have no effect on the standby pack controls.

Fixed Cabin Temperature

If all Temperature Selectors are positioned OFF, the pack controls will cause the left pack to maintain a fixed temperature of 75°F (24°C) and the right pack to maintain 65°F (18°C) as measured at the pack temperature sensor.

Air Conditioning Distribution

Conditioned air is collected in the mix manifold. The temperature of the air is directly related to the setting of the Temperature Selectors.

Overheat detection is provided by temperature sensors located downstream of the packs and the mix manifold. An overheat condition causes the appropriate trim air modulating valve to close and the ZONE TEMP light to illuminate.

Flight Deck

Since the flight deck requires only a fraction of the air supply provided by the left pack, most of the left pack output is routed to the mix manifold.

Conditioned air for the flight deck branches into several risers which end at the floor, ceiling and foot level outlets. Air diffusers on the floor under each seat deliver continuous air flow as long as the manifold is pressurized.

Overhead diffusers are located on the flight deck ceiling, above and aft of the No. 3 windows. Each of these outlets can be opened or closed as desired by turning a slotted adjusting screw.

There is also a dual purpose valve behind the rudder pedal of each pilot. These valves provide air for warming the pilots' feet and for defogging the inside of the No. 1 windshields. Each valve is controlled by knobs located on the Captain's and First Officer's panels.

Passenger Cabin

The passenger cabin air supply distribution system consists of the mix manifold, sidewall risers, and an overhead distribution duct.

Sidewall risers go up the right and left walls of the passenger cabin to supply air to the overhead distribution duct. The overhead distribution duct routes conditioned air to the passenger cabin. It extends from the forward to the aft end of the ceiling along the airplane centerline and also supplies the sidewall diffusers.

Recirculation Fan

The recirculation fan system reduces the air conditioning system pack load and the engine bleed air demand. Air from the passenger cabin and electrical equipment bay is drawn to the forward cargo bay where it is filtered and recirculated to the mix manifold. The fans are driven by AC motors. Each recirculation fan operates only if the respective RECIRC FAN Switch is selected to AUTO. In flight, the left recirculation fan operates if both packs are operating unless either PACK switch is in HIGH. The right recirculation fan operates in flight if both packs are operating unless both PACK switches are in HIGH. On the ground, the left recirculation fan operates unless both PACK switches are in HIGH and the right recirculation fan operates even if both PACK switches are in HIGH.

Equipment Cooling

The equipment cooling system cools electronic equipment in the flight deck and the E & E bay.

The equipment cooling system consists of a supply duct and an exhaust duct. Each duct has a normal fan and an alternate fan. The supply duct supplies cool air to the flight deck displays and electronic equipment in the E & E bay. The exhaust duct collects and discards warm air from the flight deck displays, the overhead and aft electronic panels, circuit breaker panels in the flight deck, and electronic equipment in the E & E bay.

Loss of airflow due to failure of an equipment cooling fan results in illumination of the related equipment cooling OFF light. Selecting the alternate fan should restore airflow and extinguish the OFF light within approximately 5 seconds.

If an overtemperature occurs on the ground, alerting is provided through the crew call horn in the nose wheel well.

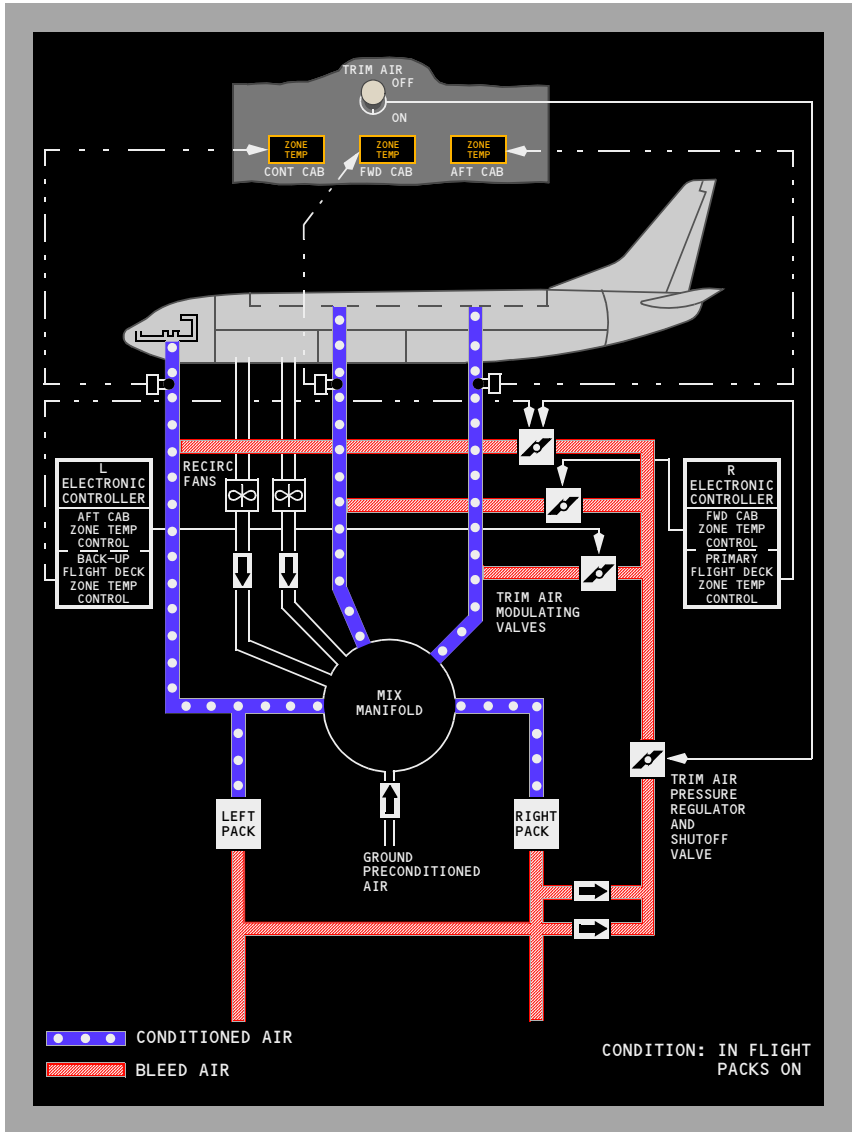
Forward Cargo Compartment

The recirculation fan system circulates air from the passenger cabin around the lining of the forward cargo compartment. When the overboard exhaust valve is closed, exhaust air from the equipment cooling system is also diffused to the lining of the forward cargo compartment for additional inflight heating.

Conditioned Air Source Connection

A ground air conditioning source may be connected to the mix manifold to distribute preconditioned air throughout the airplane.

Air Conditioning Distribution Schematic



Pressurization System Introduction

Cabin pressurization is controlled during all phases of airplane operation by the cabin pressure control system. The cabin pressure control system includes two identical automatic controllers available by selecting AUTO or ALTN and a manual (MAN) pilot-controlled mode.

The system uses bleed air supplied to and distributed by the air conditioning system. Pressurization and ventilation are controlled by modulating the outflow valve and the overboard exhaust valve.

Pressure Relief Valves

Two pressure relief valves provide safety pressure relief by limiting the differential pressure to a maximum of 9.1 psi. A negative relief valve prevents external atmospheric pressure from exceeding internal cabin pressure.

Cabin Pressure Controller

Cabin altitude is normally rate-controlled by the cabin pressure controller up to a cabin altitude of 8,000 feet at the airplane maximum certified ceiling of 41,000 feet.

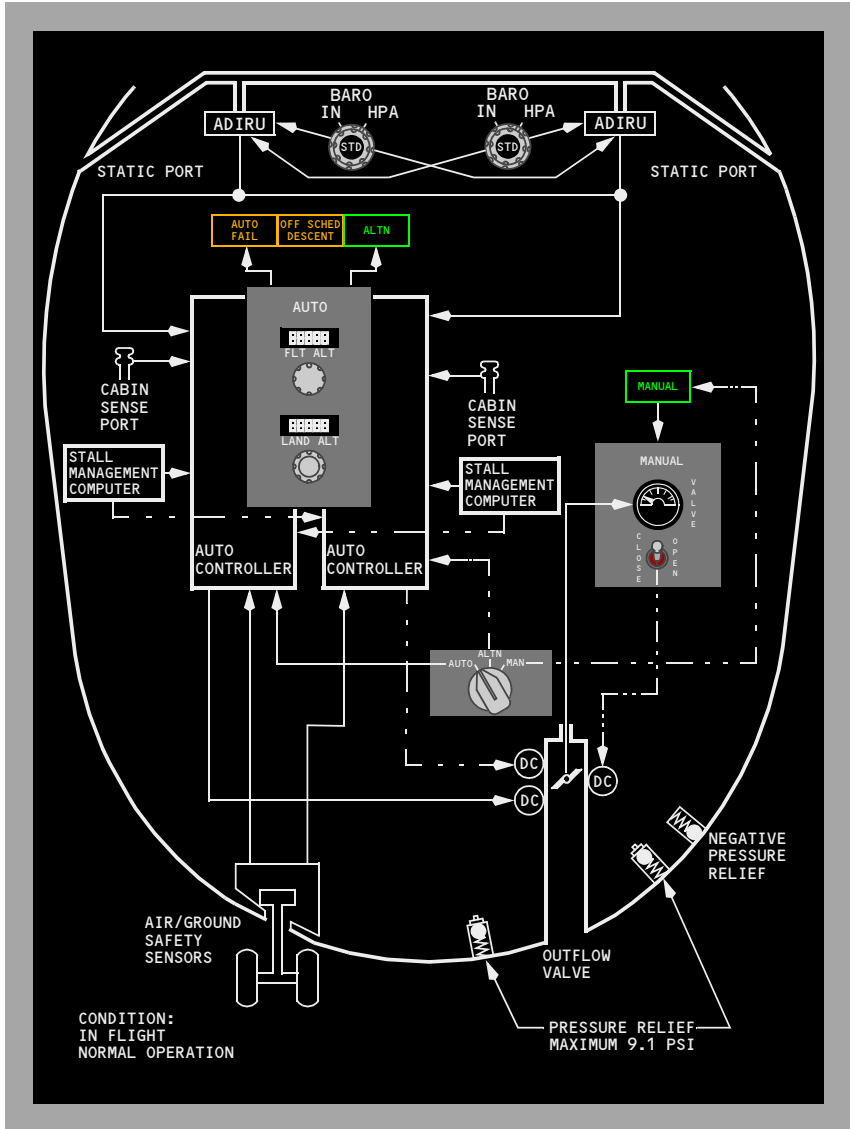
The cabin pressure controller controls cabin pressure in the following modes:

- AUTO – Automatic pressurization control; the normal mode of operation. Uses DC motor.
- ALTN – Automatic pressurization control; the alternate mode of operation. Uses DC motor.
- MAN – Manual control of the system using DC motor.

The air data inertial reference units (ADIRUs) provides ambient static pressure, baro corrected altitude, non corrected altitude and calibrated airspeed to both automatic controllers. The ADIRUs receive barometric corrections from the Captain's and First Officer's BARO reference selectors.

The automatic controllers also receive throttle position from both stall management computers and signals from the air/ground sensors.

Cabin Pressure Control System Schematic



Pressurization Outflow

Cabin air outflow is controlled by the outflow valve and the overboard exhaust valve. A small amount is also exhausted through toilet and galley vents, miscellaneous fixed vents, and by seal leakage.

Outflow Valve

The outflow valve is the overboard exhaust exit for the majority of the air circulated through the passenger cabin. Passenger cabin air is drawn through foot level grills, down around the aft cargo compartment, where it provides heating, and is discharged overboard through the outflow valve.

Overboard Exhaust Valve

On the ground and in flight with low differential pressure, the overboard exhaust valve is open and warm air from the E & E bay is discharged overboard. In flight, at higher cabin differential pressures, the overboard exhaust valve is normally closed and exhaust air is diffused to the lining of the forward cargo compartment.

[B737-600 or 737-700]

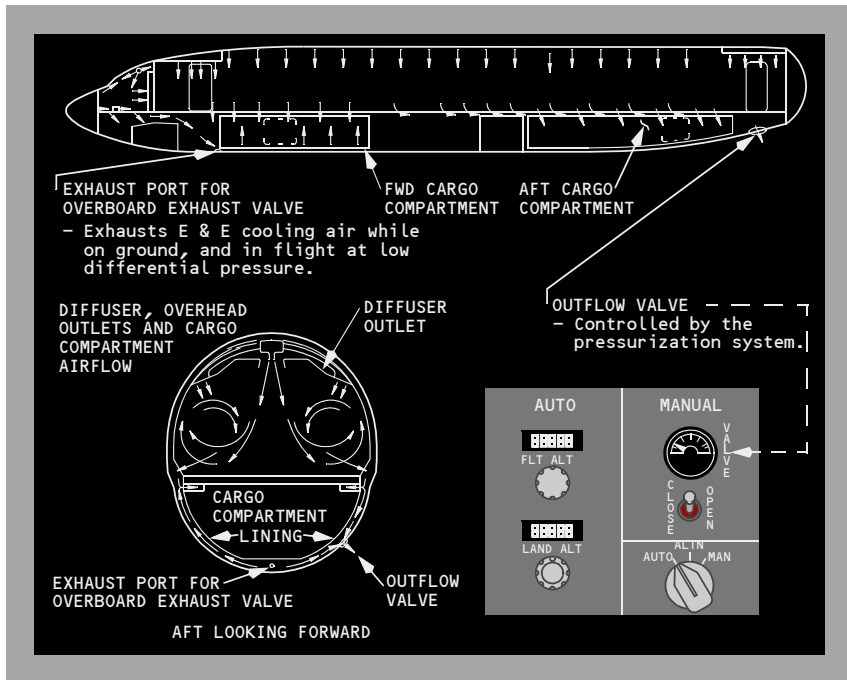
However, the overboard exhaust valve is driven open if either pack switch is in high and the recirculation fan is off. This allows for increased ventilation in the smoke removal configuration.

[B737-800 or 737-900]

However, the overboard exhaust valve is driven open if either pack switch is in high and the right recirculation fan is off. This allows for increased ventilation in the smoke removal configuration.



Pressurization Outflow Schematic



Auto Mode Operation

The AUTO system consists of two identical controllers, with one controller alternately sequenced as the primary operational controller for each new flight. The other automatic controller is immediately available as a backup.

In the AUTO or ALTN mode, the pressurization control panel is used to preset two altitudes into the auto controllers:

- FLT ALT (flight or cruise altitude).
- LAND ALT (landing or destination airport altitude).

Takeoff airport altitude (actually cabin altitude) is fed into the auto controllers at all times when on the ground.

The air/ground safety sensor signals whether the airplane is on the ground or in the air. On the ground and at lower power settings, the cabin is depressurized by driving the outflow valve to the full open position.

The cabin begins to pressurize on the ground at higher power settings. The controller modulates the outflow valve toward close, slightly pressurizing the cabin. This ground pressurization of the cabin makes the transition to pressurized flight more gradual for the passengers and crew, and also gives the system better response to ground effect pressure changes during takeoff.

In the air, the auto controller maintains a proportional pressure differential between airplane and cabin altitude. By increasing the altitude at a rate proportional to the airplane climb rate, cabin altitude change is held to the minimum rate required.

An amber OFF SCHED DESCENT light illuminates if the airplane begins to descend without having reached the preset cruise altitude; for example, a flight aborted in climb and returning to the takeoff airport. The controller programs the cabin to land at the takeoff field elevation without further pilot inputs. If the FLT ALT indicator is changed, the automatic abort capability to the original takeoff field elevation is lost.

The cruise mode is activated when the airplane climbs to within 0.25 psi of the selected FLT ALT. During cruise the controller maintains the cabin altitude slightly below the selected LAND ALT, if the differential pressure between the selected LAND ALT and FLT ALT is less than or equal to 8.35 psid above 37,000 feet, 7.80 psid with the FLT ALT between 28,000 and 37,000 feet, and 7.45 psid with FLT ALT less than 28,000 feet. If the differential pressure between the selected LAND ALT and FLT ALT is greater than these values, the controller maintains a pressure differential of 8.35 psid above 37,000 feet, 7.80 psid with the FLT ALT between 28,000 and 37,000 feet, and 7.45 psid with FLT ALT less than 28,000 feet. Deviations from flight altitude can cause the pressure differential to vary as the controller modulates the outflow valve to maintain a constant cabin altitude.

The descent mode is activated when the airplane descends 0.25 psi below the selected FLT ALT. The cabin begins a proportional descent to slightly below the selected LAND ALT. The controller programs the cabin to land slightly pressurized so that rapid changes in altitude during approach result in minimum cabin pressure changes.

While taxiing in, the controller drives the outflow valve slowly to the full open position depressurizing the cabin.

An amber AUTO FAIL light illuminates if any of the following conditions occurs:

- Loss of DC power
- Controller fault
- Outflow valve control fault
- Excessive differential pressure (> 8.75 psi)*
- Excessive rate of cabin pressure change (± 2000 sea level feet/minute)*
- High cabin altitude (above 15,800 feet).*

*If controller is not responding properly

With illumination of the AUTO FAIL light, the pressure control automatically transfers to the other auto controller (ALTN mode).

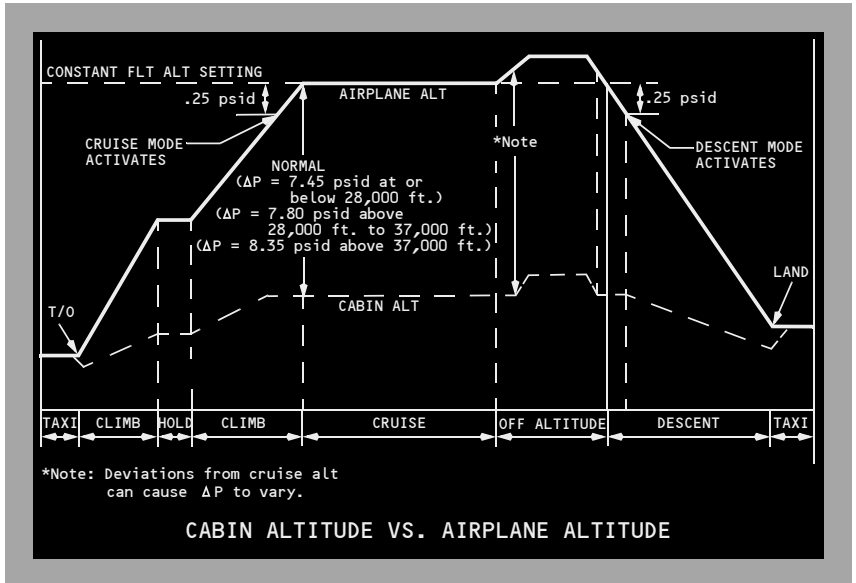
Moving the pressurization mode selector to the ALTN position extinguishes the AUTO FAIL light, however the ALTN light remains illuminated to indicate single channel operation.

High Altitude Landing

[Option - High Altitude Landing System]

When the high altitude landing system is engaged and the actual landing altitude is set, the controller brings the cabin altitude to the landing airport elevation when the descent mode is activated. Upon departure from a high altitude airport, the system returns to normal operation as the cabin descends through 8,000 feet.

Flight Path Events – Auto Mode



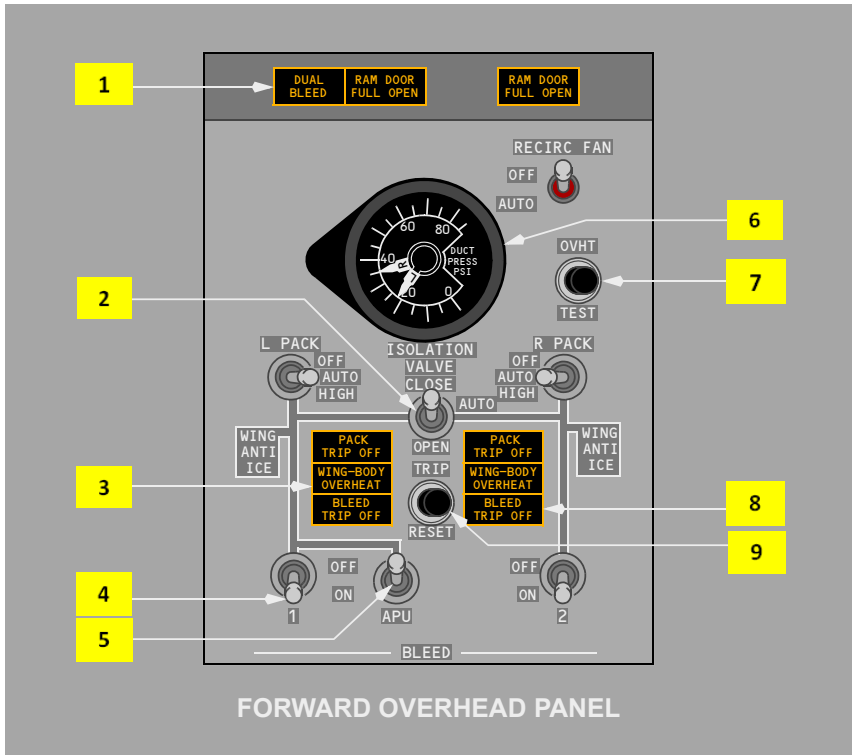
Manual Mode Operation

A green MANUAL Light illuminates with the pressurization mode selector in the MAN position.

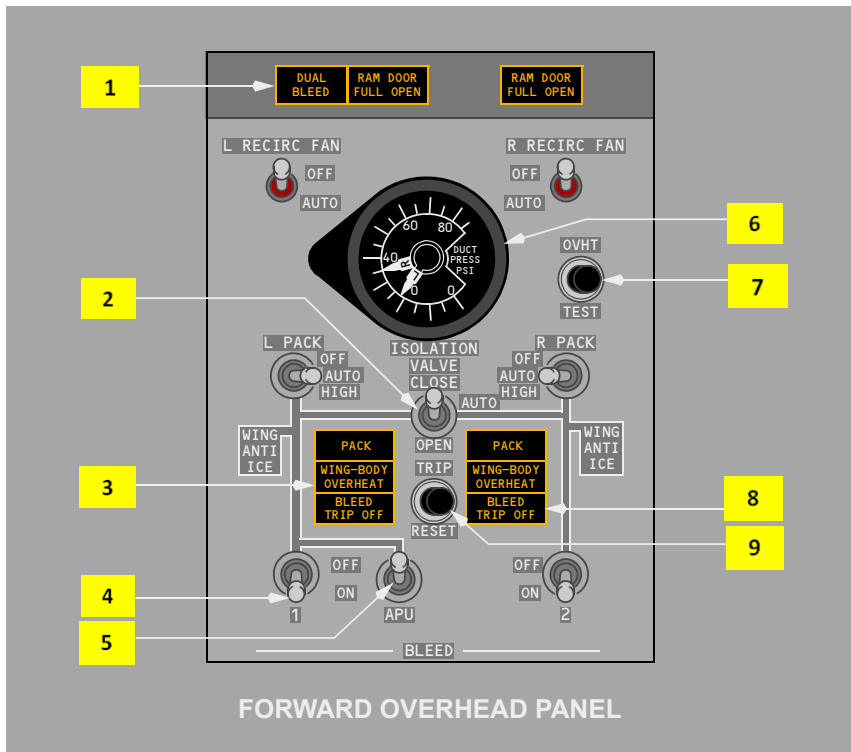
Manual control of the cabin altitude is used if both the AUTO and ALTN modes are inoperative. In the MAN mode, the outflow valve position switch is used to modulate the outflow valve by monitoring the cabin altitude panel and valve position on the outflow valve position indicator. A separate DC motor, powered by the DC standby system, drives the outflow valve at a slower rate than the automatic modes. Outflow valve full range of motion takes up to 20 seconds.

Bleed Air Controls and Indicators

[B737 - 600/700]



[B737 - 800/900]



1 DUAL BLEED Light

Illuminated (amber) – APU bleed air valve open and engine No. 1 BLEED air switch ON, or engine No. 2 BLEED air switch ON, APU bleed air valve and isolation valve open.

2 ISOLATION VALVE Switch

CLOSE – closes isolation valve.

AUTO –

- closes isolation valve if both engine BLEED air switches are ON and both air conditioning PACK switches are AUTO or HIGH
- opens isolation valve automatically if either engine BLEED air or air conditioning PACK switch positioned OFF.

OPEN – opens isolation valve.

3 WING–BODY OVERHEAT Light

Illuminated (amber) –

- left light indicates overheat from bleed air duct leak in left engine strut, left inboard wing leading edge, left air conditioning bay, keel beam or APU bleed air duct
- right light indicates overheat from bleed air duct leak in right engine strut, right inboard wing leading edge or right air conditioning bay.

4 Engine BLEED Air Switches

OFF – closes engine bleed air valve.

ON – opens engine bleed air valve when engines are operating.

5 APU BLEED Air Switch

OFF – closes APU bleed air valve.

ON – opens APU bleed air valve when APU is operating.

6 Bleed Air DUCT PRESSURE Indicator

Indicates pressure in L and R (left and right) bleed air ducts.

7 Wing–Body Overheat (OVHT) TEST Switch

Push –

- tests wing–body overheat detector circuits
- illuminates both WING–BODY OVERHEAT lights.

8 BLEED TRIP OFF Light

Illuminated (amber) – excessive engine bleed air temperature or pressure

- related engine bleed air valve closes automatically
- requires reset.

9 TRIP RESET Switch

[B737 - 600/700]

Push (if fault condition is corrected) –

- resets BLEED TRIP OFF, PACK TRIP OFF and DUCT OVERHEAT lights
- related engine bleed valve opens, or related pack valve opens, or related air mix valve opens
- lights remain illuminated until reset.

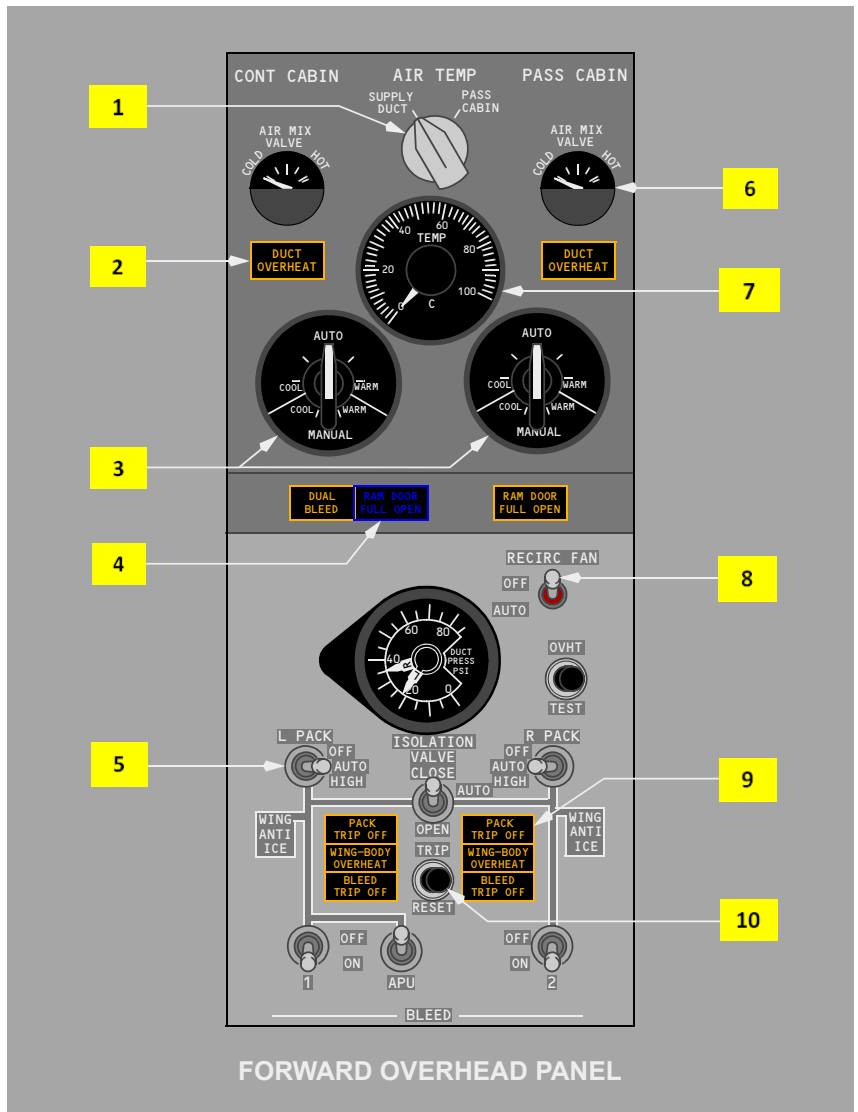
9 TRIP RESET Switch**[B737 - 800/900]**

Push (if fault condition is corrected) –

- resets BLEED TRIP OFF, PACK and ZONE TEMP lights
- related engine bleed valve opens, or related pack valve opens, or related air mix valve opens
- lights remain illuminated until reset.

Air Conditioning Controls and Indicators

[B737 - 600/700 and Air Temperature Indicator in degrees C]



1 AIR Temperature (TEMP) Source Selector

SUPPLY DUCT – selects main distribution supply duct sensor for TEMP indicator.

PASS CABIN – selects passenger cabin sensor for TEMP indicator.

2 DUCT OVERHEAT Light

Illuminated (amber) –

- bleed air temperature in related duct exceeds limit
- air mix valves drive full cold
- requires reset.

3 Control (CONT) CABIN and Passenger (PASS) CABIN Temperature Selector

AUTO – automatic temperature controller controls passenger cabin or flight deck temperature as selected.

MANUAL – air mix valves controlled manually. Automatic temperature controller bypassed.

4 RAM DOOR FULL OPEN Light

Illuminated (blue) – indicates ram door in full open position.

5 Air Conditioning PACK Switch

OFF – pack signalled OFF.

AUTO –

- with both packs operating, each pack regulates to low flow
- with one pack operating, operating pack regulates to high flow in flight with flaps up
- when operating one pack from APU (both engine BLEED air switches OFF), regulates to high flow.

HIGH –

- pack regulates to high flow
- provides maximum flow rate on ground with APU BLEED air switch ON.

6 AIR MIX VALVE Indicator

Indicates position of air mix valves:

- controlled automatically with related temperature selector in AUTO
- controlled manually with related temperature selector in MANUAL.

7 Air Temperature (TEMP) Indicator

Indicates temperature at location selected with AIR TEMP source selector.

8 Recirculation (RECIRC) FAN Switch

OFF - fan signalled off.

AUTO – fan signalled on except when both packs operating with either PACK switch in HIGH.

9 PACK TRIP OFF Light

Illuminated (amber) –

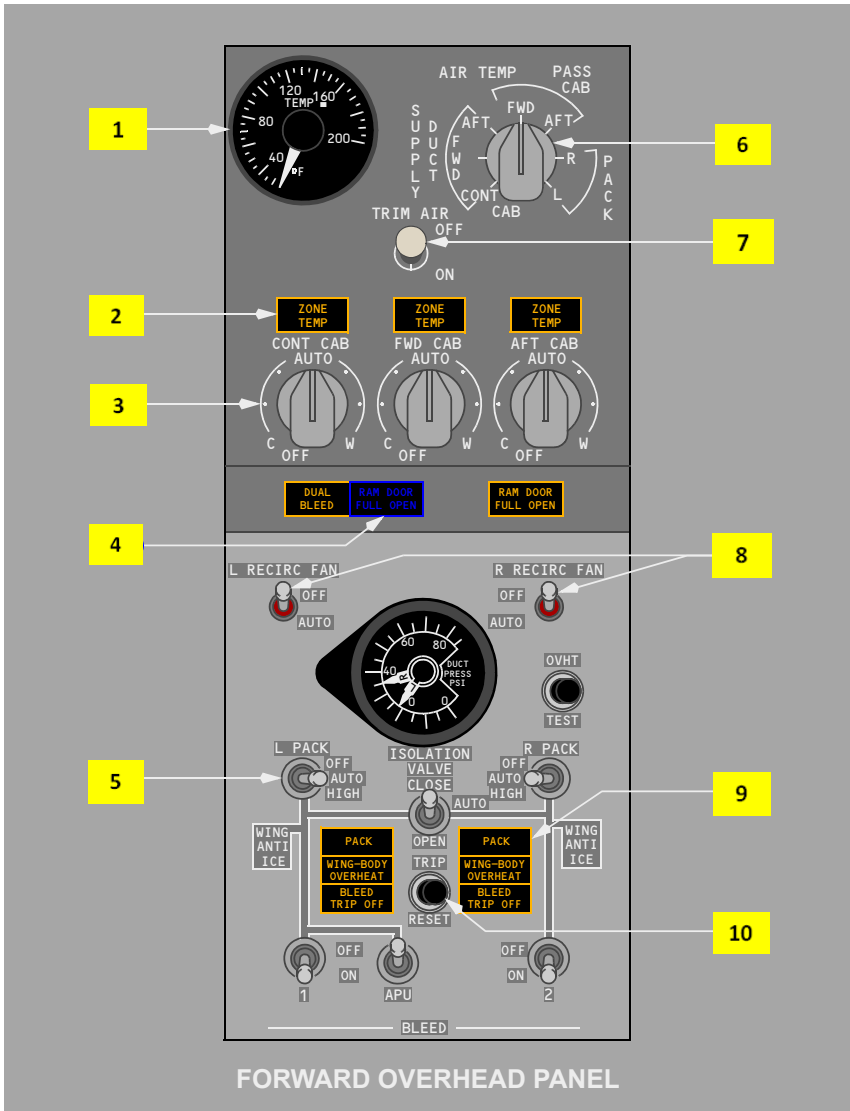
- indicates pack temperature has exceeded limits
- related pack valve automatically closes and mix valves drive full cold
- requires reset.

10 TRIP RESET Switch

Push (if fault condition is corrected) –

- resets BLEED TRIP OFF, PACK TRIP OFF and DUCT OVERHEAT lights
- related engine bleed air valves open, or related pack valves open, or related air mix valves open
- lights remain illuminated until reset.

[B737 - 800/900 and Air Temperature Indicator in degrees F]



1 Air Temperature (TEMP) Indicator

Indicates temperature at location selected with AIR TEMP source selector.

2 ZONE TEMP Lights

Illuminated (amber) –

- CONT CAB indicates a duct temperature overheat or failure of the flight deck primary and standby temperature control
- FWD CAB or AFT CAB indicates duct temperature overheat.

During Master Caution light recall:

- CONT CAB indicates failure of the flight deck primary or standby temperature control
- either FWD CAB or AFT CAB indicates failure of the associated zone temperature control
- lights will extinguish when Master Caution is reset.

3 Temperature Selector

AUTO – provides automatic temperature control for the associated zones. Rotating the control toward C (cool) or W (warm) manually sets the desired temperature.

OFF – closes the associated trim air modulating valve.

4 RAM DOOR FULL OPEN Light

Illuminated (blue) – indicates ram door in full open position.

5 Air Conditioning PACK Switch

OFF – pack signalled OFF.

AUTO –

- with both packs operating, each pack regulates to low flow
- with one pack operating, operating pack regulates to high flow in flight with flaps up
- when operating one pack from APU (both engine BLEED air switches OFF), regulates to high flow.

HIGH –

- pack regulates to high flow
- provides maximum flow rate on ground with APU BLEED air switch ON.

6 AIR Temperature (TEMP) Source Selector

SUPPLY DUCT – selects appropriate zone supply duct temperature

PASS CAB – selects forward or aft passenger cabin temperature

PACK - selects left or right pack temperatures.

7 TRIM AIR Switch

ON - trim air pressure regulating and shutoff valve signaled open.

OFF - trim air pressure regulating and shutoff valve signaled closed.

8 Recirculation (RECIRC) FAN Switches

OFF - fan signalled off.

AUTO –

- in-flight –
 - the left recirculation fan operates if both packs are operating unless either PACK switch is in HIGH
 - the right recirculation fan operates if both packs are operating unless both PACK switches are in HIGH.
- on the ground –
 - the left recirculation fan operates unless both PACK switches are in HIGH
 - the right recirculation fan operates even if both PACK switches are in HIGH.

9 PACK Light

Illuminated (amber) –

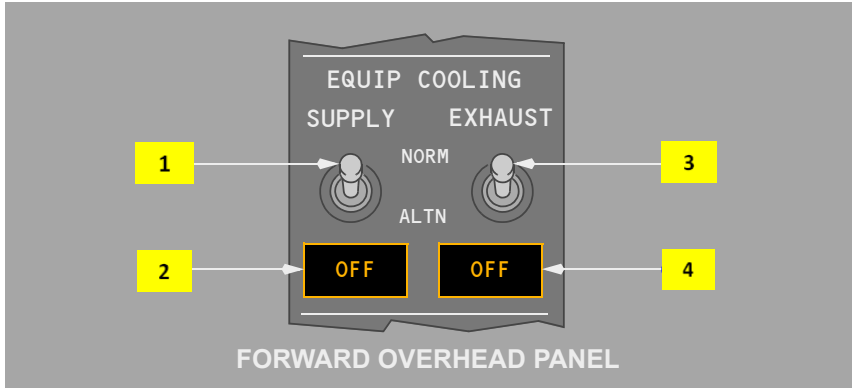
- indicates pack trip off or failure of both primary and standby pack controls
- during Master Caution recall, indicates failure of either primary or standby pack control. Extinguishes when Master Caution is reset

10 TRIP RESET Switch

Push (if fault condition is corrected) –

- resets BLEED TRIP OFF, PACK and ZONE TEMP lights
- related engine bleed air valves open, or related pack valves open, or related air mix valves open
- lights remain illuminated until reset.

Equipment Cooling Panel



1 Equipment (EQUIP) COOLING SUPPLY Switch

NORM – normal cooling supply fan activated.

ALTN – alternate cooling supply fan activated.

2 Equipment Cooling Supply OFF Light

Illuminated (amber) – no airflow from selected cooling supply fan.

3 Equipment (EQUIP) COOLING EXHAUST Switch

NORM – normal cooling exhaust fan activated.

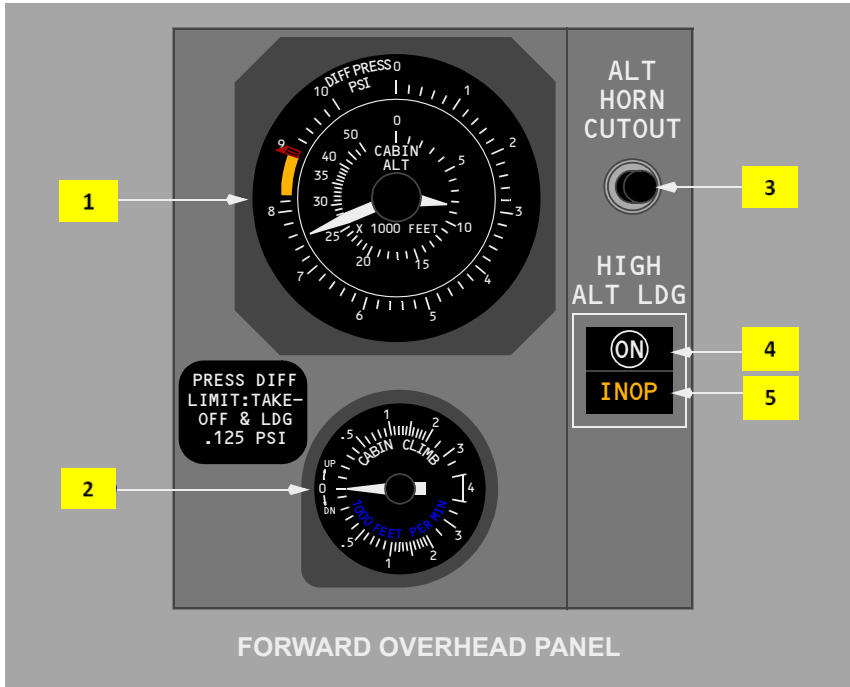
ALTN – alternate cooling exhaust fan activated.

4 Equipment Cooling Exhaust OFF Light

Illuminated (amber) – no airflow from selected cooling exhaust fan.

Cabin Altitude Panel

[Option - High Altitude Landing switch]



1 CABIN Altimeter (ALT)/Differential Pressure (DIFF PRESS) Indicator

Inner Scale – indicates cabin altitude in feet.

Outer Scale – indicates differential pressure between cabin and ambient in psi.

2 CABIN Rate of CLIMB Indicator

Indicates cabin rate of climb or descent in feet per minute.

3 Altitude (ALT) HORN CUTOUT Switch

Push –

- cuts out intermittent cabin altitude warning horn
- altitude warning horn sounds when cabin reaches 10,000 feet altitude.

4 High Altitude Landing Switch

[Option - High Altitude Landing switch]

ON (white) – reprograms initiation of cabin altitude warning horn from 10,000 to 12,500 feet.

Off – (ON not visible)

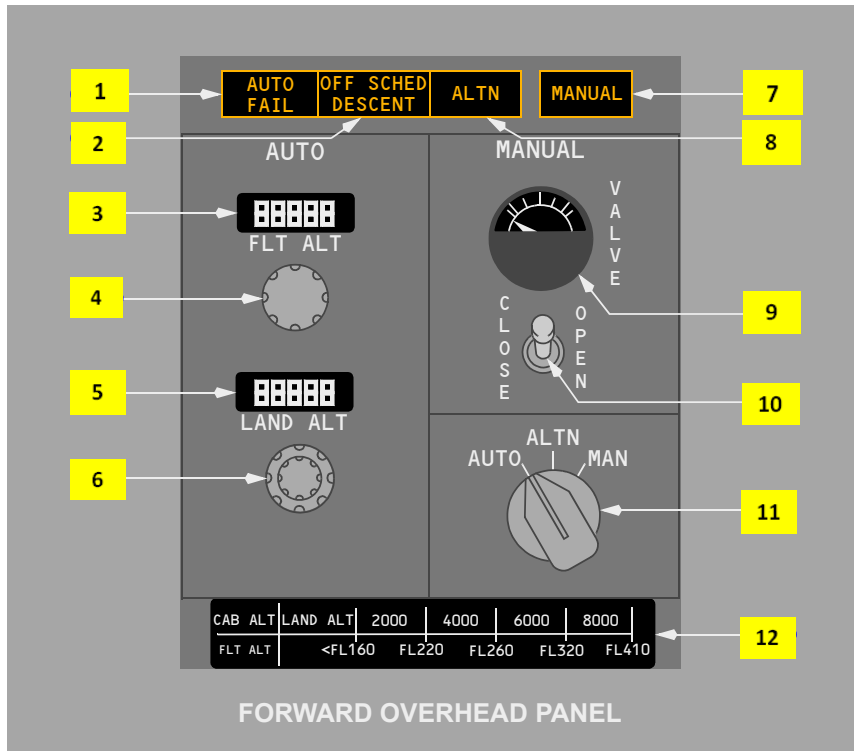
- reprograms cabin pressurization from high altitude to normal operation
- extinguishes INOP light

5 High Altitude Landing INOP Light

[Option - High Altitude Landing switch]

Illuminated (amber) – indicates high altitude landing system fault.

Cabin Pressurization Panel



1 AUTO FAIL Light

Illuminated (amber) – automatic pressurization system failure detected:

- indicates a single controller failure when ALTN light is also illuminated
- indicates a dual controller failure when illuminated alone.

2 OFF Schedule (SCHED) DESCENT Light

Illuminated (amber) – airplane descended before reaching the planned cruise altitude set in the FLT ALT indicator.

3 Flight Altitude (FLT ALT) Indicator

- indicates selected cruise altitude
- set before takeoff.

4 Flight Altitude Selector

Rotate – set planned cruise altitude. (-1,000 ft. to 42,000 ft. in 500 ft. increments).

5 Landing Altitude (LAND ALT) Indicator

- indicates altitude of intended landing field
- set before takeoff.

6 Landing Altitude Selector

Rotate – select planned landing field altitude. (-1,000 ft. to 14,000 ft. in 50 ft. increments).

7 MANUAL Light

Illuminated (green) – pressurization system operating in the manual mode.

8 Alternate (ALTN) Light

Illuminated (green) – pressurization system operating in the alternate automatic mode:

- Illumination of both ALTN and AUTO FAIL lights indicates a single controller failure and automatic transfer to ALTN mode
- pressurization mode selector in ALTN position.

9 Outflow VALVE Position Indicator

- indicates position of outflow valve
- operates in all modes.

10 Outflow Valve Switch (spring-loaded to center)

CLOSE – closes outflow valve electrically with pressurization mode selector in MAN position.

OPEN – opens outflow valve electrically with pressurization mode selector in MAN position.

11 Pressurization Mode Selector

AUTO – pressurization system controlled automatically.

ALTN – pressurization system controlled automatically using ALTN controller.

MAN –

- pressurization system controlled manually by outflow valve switch
- both auto controllers bypassed.

12 Cabin /Flight Altitude (CAB ALT)(FLT ALT) Placard

Used to determine setting for cabin altitude when operating in manual mode

Limitations (Pressurization)

[Option - Normal Cabin Altitude]

The maximum cabin differential pressure (relief valves) is 9.1 psi.

The following is not an AFM limitation, but is provided for flight crew information:

With engine bleed air switches ON, do not operate the air conditioning packs in HIGH for takeoff, approach or landing.