AIR CONDITIONING

DESCRIPTION AND OPERATION

1. GENERAL (Figure 1)

The air conditioning system includes all the sub-systems which allow to regulate the cabin air temperature and pressure and which provide ventilation to the passengers.

These sub-systems include :

- distribution,
- pressurization control,
- temperature conditioning system,
- vapor cycle cooling system,
- temperature control.

All the controls necessary for air conditioning operation are grouped on the PL23 panel (for the cockpit zone), and on the cabin control panel located on panel 248L (for the cabin area).

The air conditioning system is electrically supplied by the "MAIN BUS", "BUS 2", "BUS 4" and "BATT BUS" bars.

2. DESCRIPTION

A. Distribution - refer to 21-20-00

Air distribution system includes a distribution box, a fan and the hoses which convey the conditioned air. The emergency air supply is also included in the air distribution system.

B. Pressurization control - refer to 21-30-00

The pressurization control system controls the cabin pressure which corresponds to a cabin altitude consistent with the passengers' comfort and safety.

The cabin pressure, cabin differential pressure (ΔP) and climb rate data are displayed on the MFD unit (in display normal conditions).

C. Temperature conditioning system - refer to 21-50-00

The temperature conditioning system regulates the temperature and the pressure of the air entering the cabin.

D. Vapor cycle cooling system - refer to 21-55-00

The vapor cycle cooling system improves passenger and pilot comfort in hot and humid atmosphere.

E. Temperature control - refer to 21-60-00

The temperature control system controls temperature conditioning system and vapor cycle cooling system.

F. PL23 control panel (Figure 2) - refer to 21-00-01

The PL23 control panel is located on the central instrument panel. It includes the following controls on its front face :

- the "BLEED" - "AUTO / OFF/RST" switch which controls the opening of the pressure regulating and shut-off valve,

- the ”A/C” – ”AUTO/MANUAL/OFF” switch which controls the automatic or manual regulation of conditioned air and vapor cycle cooling system :
  - . ”OFF” : the temperature is set by default to 23°C,
  - . ”MANUAL” : the cabin fan can be controlled manually using the ”FAN SPEED” five–position selector (OFF, 1, 2, 3, 4). The vapor cycle cooling system is active only when the ”FAN SPEED” selector is at least on the minimum position,
  - . ”AUTO” : the air temperature is managed automatically by the calculator, according to the input (”TEMP/°C / CABIN TEMP/°C / CABIN/COCKPIT” selector), the values measured by the temperature sensors in the cabin and cockpit zones and the temperature of the blown air at the cabin and cockpit evaporators outlets. The speed of the cabin and cockpit fans is managed by the A300 calculator only,
- the ”CONTROL” selector which is used to configure the cockpit and cabin temperature regulation. In ”CABIN” mode, the pilot manages the cockpit zone and authorizes the passengers to manage the cabin zone using the cabin control panel. In ”COCKPIT” mode, the pilot controls both the cockpit and cabin zones – refer to 21–60–00,
- the R41 ”FAN SPEED” selector (OFF, 1, 2, 3, 4) which controls the speed of the cockpit fan (in ”CABIN” mode) or the speed of the cockpit and cabin fans (in ”COCKPIT” mode) – refer to 21–20–00,
- the R42 ”TEMP/°C” potentiometer (17°/20°/25°) which allows the pilot to select the desired temperature in the cockpit when the selector is set to ”CABIN”, or to select the desired temperature in both the cockpit and the cabin when the selector is set to ”COCKPIT” – refer to 21–60–00,
- the ”DUMP” switch (protected by a guard) which controls the depressurization solenoid valve – refer to 21–30–00,
- the ”HOT AIR FLOW” – ”DEFOG/CABIN” distributor which drives the rack control located behind the PL23 panel. The rack control modifies the position of the distribution box shutter – refer to 21–20–00.
- the “PRES MODE” – “AUTO/MAX DIFF” switch which allows to select two pressurization modes :
  - . “AUTO” : the cabin altitude rate of change is controlled to optimize comfort and avoid reaching maximum ΔP or negative ΔP,
  - . “MAX DIFF” : the cabin altitude is maintained to 0 ft when the aircraft altitude is below 13500 ft. When aircraft altitude is above 13500 ft, the cabin altitude will be maintained below 10000 ft and the cabin ΔP will be maintained below the maximum ΔP, while minimizing cabin altitude.

The cabin–altitude alarm switch S88 – refer to 21–30–00 is attached behind the front face of the PL23 control panel.

G. Cabin control panel (Figure 3)

The cabin control panel is located on the armrest of the L.H. passenger seat, in the cabin zone. The cabin control panel includes :

- the ”FAN SPEED” selector (OFF, 1, 2, 3, 4), which allows the passenger to control the speed of the cabin fan when the ”CONTROL” selector of the PL23 control panel is set to ”CABIN” position – refer to 21–20–00,
- the ”CABIN TEMP/°C” potentiometer (17°/20°/25°) which allows the passenger to select the desired temperature when the ”CONTROL” selector of the PL23 control panel is set to ”CABIN” position – refer to 21–60–00.

PRESSURIZATION CONTROL

DESCRIPTION AND OPERATION

1. GENERAL

The pressurization control system allows to maintain a pressure corresponding to a cabin altitude consistent with the passengers' safety and comfort.

It is managed by the A300 calculator - refer to 21-60-00.

The system consists of :

- the L11 outflow valve,
- the safety valve,
- the S88 cabin-altitude alarm switch,
- the S89 differential pressure switch,
- the MT42 cabin pressure sensor.

This system uses :

- the temperature conditioning system - refer to 21-50-00, for pressurization control, and the vacuum system for monitoring and safety.
- the PL23 control panel - refer to 21-00-00,
- the A300 calculator from the temperature control system - refer to 21-60-00,
- the G1000 system alarm messages, from the visual alarms - refer to 31-60-00,
- the S171 L.H. wing ground safety microswitch - refer to 32-30-00,
- the G1000 system, to select Landing Field Elevation and to display the cabin pressure information.

The pressurization control system is electrically supplied by "BUS 2" bar.

2. LOCATION (Figures 1 and 2)

COMPONENT	QTY	AREA	ACCESS DOOR	REFERENCE
L11 outflow valve	1	260	266	21-30-02
Safety valve	1	260	266	21-30-03
S88 cabin-altitude alarm switch	1	270	PL23	21-30-05
S89 differential pressure alarm switch	1	210	211	21-30-06
MT42 cabin pressure sensor	1	270	/	21-30-08
Circuit breaker : - CB60 "CAB. BLEED"	1	PL1	/	WM

3. DESCRIPTION

A. Cabin pressurization management

The cabin pressure control and cabin pressure rate of change control are automatically computed by the A300 calculator to optimize comfort and to ensure that maximum differential pressure will never been exceeded. Two automatic modes are proposed :

- AUTO Mode,
- MAX DIFF PRESS Mode.

The cabin altitude and the cabin rate of change are calculated for each mode according to programmed laws depending on the following inputs received from aircraft avionics system :

- aircraft altitude,
- aircraft vertical speed,
- landing field elevation,
- barometric correction.

In AUTO mode, the cabin altitude will be maintained below 10000 ft and the cabin ΔP will be maintained below the maximum ΔP, while maximizing comfort.

In MAX DIFF PRESS mode, the cabin altitude will be maintained to 0 ft when aircraft altitude is below 13500 ft. When aircraft altitude is above 13500 ft, the cabin altitude will be maintained below 10000 ft and the cabin ΔP will be maintained below the maximum ΔP, while minimizing cabin altitude.

The cabin pressure is managed by the A300 calculator which, by means of the torque motor of the outflow valve, will apply the reference pressure to the control chamber of the outflow valve.

B. L11 outflow valve

The L11 outflow valve regulates the cabin pressure via the line of its torque motor which modulates the discharge flow.

It controls the flow at cabin outlet by opening its valve ; this opening is a function of the torque motor current supplied by the A300 calculator.

The L11 outflow valve provides overpressure discharge safety, negative pressure discharge safety and cabin altitude limitation.

The L11 outflow valve includes :

- the top portion, which forms the control chamber and receives four control components,
- the bottom portion, used as a mounting support and including the discharge valve which isolates the cabin from the atmospheric pressure,
- a spring and a baffle.

The four control components secured to the top cover are :

- the 3-boss box,
- the torque motor unit,
- the cabin altitude limitation box,
- the DUMP box.

The A300 calculator which computes the cabin pressure, controls the torque motor unit of the outflow valve.