

 DC 9/80 OPERATIONS MANUAL	Air Conditioning and Pressurization Chapter 2 - 1/9	I	
		09/04/20	Rev 1

GENERAL

Air conditioning and pressurization systems control temperature and air pressure to ventilate the cockpit and passenger cabin. Outflow air from the cabin is used to heat and pressurize the lower cargo compartments and to cool off electric equipments. During ground operations when engines are off, pneumatic air to operate the air conditioning systems is obtained by the auxiliary power unit.

AIR CONDITIONING SYSTEM

The air conditioning system consists of two packs that can operate together or separately. Packs provide conditioned and pressurized air. Usually right pack operates with air coming from the right engine and supplies air for the cabin.

Left pack usually operates with air coming from the left engine and supplies the cockpit. Either pack can supply the requirements of both compartments. Part of the air supply is ducted to temperature control valves and provides the heated air portion of the system. The remaining air supply is ducted into the pack. Cooling air for the heat exchanger is provided by a fan during ground operation and by ram air during flight.

The ACM (Air Cycle Machine) inside the pack is an air-cooling device that changes the hot pneumatic air into cold air, providing the cold air portion of the system.

From the ACM the air passes through a water separator, which removes excessive entrained moisture from the air and prevents discharge of water from the cold air outlet.

Leaving the water separator, the air is then available for use through two duct systems. One duct system supplies cold air directly to individual eyeball type outlets in the passenger and cockpit compartments. The second duct system supplies cold air to be mixed with hot air coming from the temperature control valve.

The air exiting the cabin passes to the three cargo bays before being expelled through an outflow valve.

Air conditioning system has a valve that isolate the circuit in case of an engine loss during takeoff or go around to save maximum power (switch must be set on AUTO).

RADIO RACK COOLING AND FWD CARGO COMPARTMENT HEATING SYSTEM

Radio rack (situated under the cockpit, hosts many electric and electronic apparatus) is cooled, and front cargo bay is warmed by conditioned air coming from the cockpit and passenger cabin.

Air conditioned goes through the radio rack to cool off apparatus and is ducted in to the cargo bay by a fan (radio rack fan) when the radio rack fan is on FAN position.

This allow front cargo bay to be warmed up for animal transportation. When the temperature is under 16°C an automatic electric warm system (protected from overheating) activates, to keep the temperature between 16°C and 23°C.

When the 'radio rack fan' is in VENTURI position, the first cargo bay is not warmed up and conditioned air is expelled by the VENTURI. A stand-by fan is activated in case the main fan is not working. On the ground both fans work regardless of position of the radio rack fan switch.

PRESSURIZATION SYSTEM

The aircraft is pressurized by bleed air supplied to the pressurized areas and distributed by the air conditioning system. Desired pressurization level is maintained by regulating the escape of compressed air through the cabin air outflow valve.

The outflow valve is composed of two separate valves, the nozzle valve and the butterfly valve.

Position for these two valves is determined by two separated systems that maintain the correct level of pressurization from takeoff to land. Pressure can be manually controlled trough manual action on the pressure control wheel in the pedestal panel.

Valves in the cargo compartment roof permits pressure equalization between cabin and cargo compartments.

PRESSURIZZATION – AUTOMATIC MODE

For automatic operation of the cabin air outflow valve, the cabin pressure controller lever is placed in the auto (up) position.

The cabin pressure controller wheel will rotate as it automatically adjusts to maintain pressurization. An indicator, next to the wheel, will move in the direction that the outflow valve is moving.

PRESSURIZZATION – MANUAL MODE

For manual operation of the cabin air outflow valve the cabin pressure controller lever is placed in the manual (down) position.

The cabin pressure controller wheel can be manually rotated to set the desired cabin climb or descent or to maintain the scheduled cabin altitude.

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STBY ON and TRANSFER LOCKOUT Lights

When in flight mode, the cabin pressure is maintained within set parameters of a nominal value of approximately 7.77 psi differential pressure.

During climb, cruise and descent the cabin will automatically climb, cruise and descent as programmed by the altitude schedule, which is a function of airplane altitude.

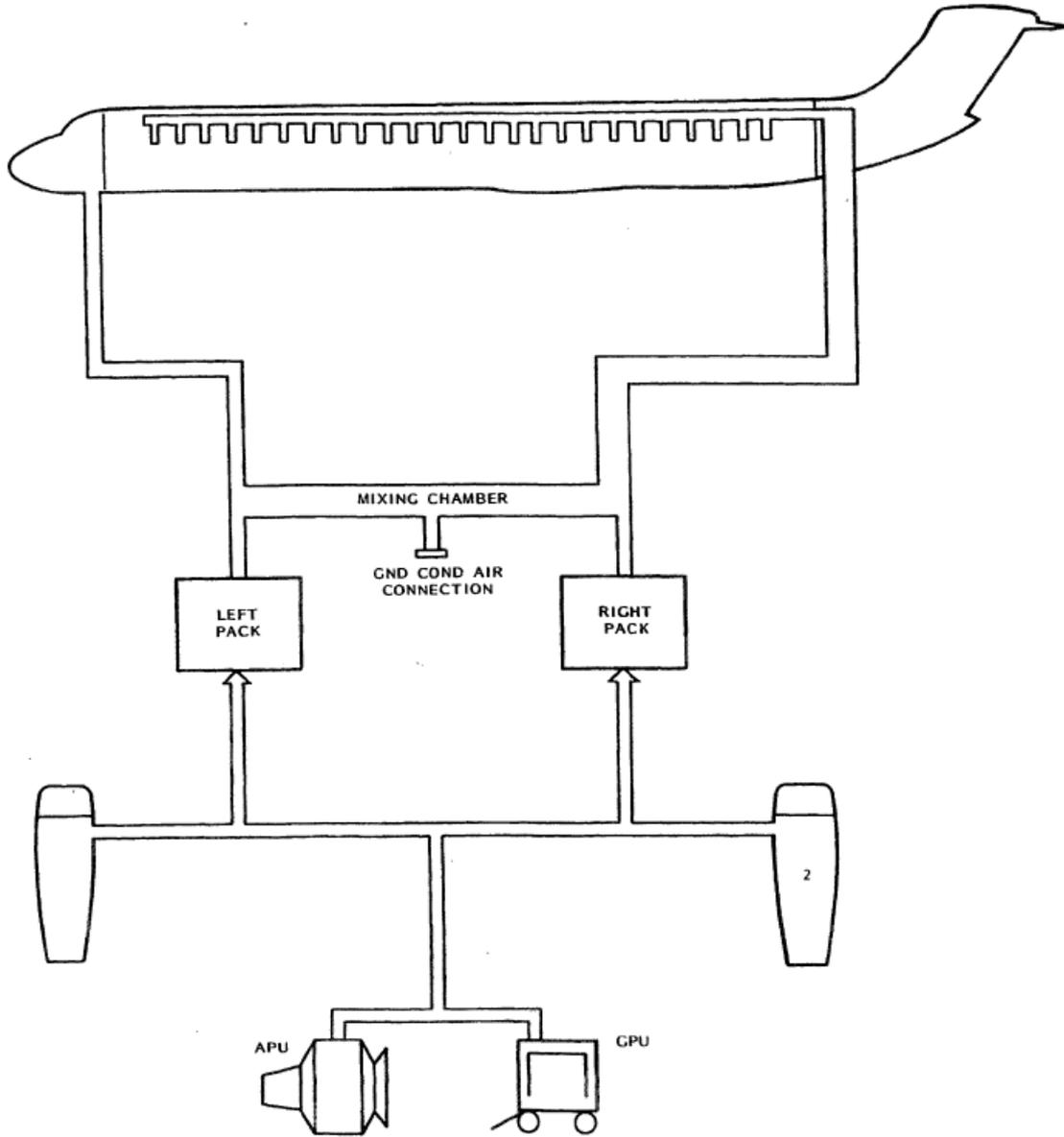
When operating on the pressure schedule, the cabin rate of climb will be proportional to the airplane rate of climb, with maximum limits as set by the rate of climb limit knob. With the knob at the index mark, the rate limit is normally 700 fpm climb and 300 fpm descent.

The pressurization system consists of two identical but independent systems. One system has primary control, while the other serves as standby.

If either an automatic or manual transfer occurs prior to landing, it will result in lockout of any subsequent automatic transfer.

The TRANSFR LOCKOUT and STDBY ON lights will be one and are not to be reset. If performance of the standby system is not satisfactory, the primary system may be reselected by placing system selector switch to STDBY and then back to PRIMARY. Manual selection between the two systems permits selection of the best performing system. Do not reset the TRANSFER LOCKOUT switch light. This inhibits any automatic transfer from the best selected performance system.

BLOCK DIAGRAM



AIR CONDITIONING Controls and Indicators

SUPPLY PRESSURE Indicator:

Indicates pressure in psi of air available for the air conditioning system.



AIR COND SUPPLY L, R Switches:

AUTO: Opens the pressure regulator and the flow control valves, provided pneumatic air pressure is available. Arms the augmentation valve for automatic operation and, on ground, starts the heat exchanger cooling fan.

HP BLD OFF: Maintain augmentation valves at closed position.

OFF: Closes the pressure regulator and flow control valves, the augmentation valves and shutoff the heat exchanger cooling fan.



AIR COND SHUTOFF Switch:

AUTO: Both air conditioning packs shutoff automatically in event of single engine failure during takeoff or landing.

OVRD: Override automatic shutoff of air conditioning packs during single engine failures.

RAM AIR Switch:

ON: Opens the ram air valve

OFF: Closes the ram air valve.



Temperature Control Valve position L, R Indicator:

Indicates the actual position of the air conditioning system temperature control valve.

CKPT/CABIN TEMP Selectors:

Each control provides automatic control of selected temperature.

AUTO: Provides automatic control of selected temperature in the range 18° to 27°C

MANUAL: When the control selector is moved to the MANUAL range, it becomes spring loaded to the STOP position. Movement from the STOP toward the COLD or HOT position will move the air conditioning temperature control valve. Releasing the selector will stop movement of the valve.

TEMP SEL Selector:

CABIN SPLY: Selects cabin supply duct for display on CABIN TEMP indicator.

CABIN: Selects cabin temperature for display on CABIN TEMP indicator.



RADIO RACK Switch:

FAN: In flight, turns on primary radio rack fan and closes VENTURI valve for radio rack cooling, and forward cargo compartment heating.

VENTURI: In flight, opens VENTURI valve and turns off radio rack fan.

NOTE: On the ground both primary and standby radio rack fans are on and VENTURI valve is closed regardless of switch position.

CABIN TEMP Indicator:

Shows temperature at the location selected by TEMP SEL.

PRESSURIZATION SYSTEM

CABIN ALT/DIFF PRESS Indicator:

Outer CAB ALT dial indicates existing cabin altitude in hundreds and thousands of feet.
Inner DIFF PRESS dial shows difference in pressure between cabin and ambient in psi.



CABIN CLIMB Indicator:

Indicates rate of change, in feet per minute, of cabin pressurization.

TRANSFER LOCKOUT Switch-Light:

ON: In flight whenever transfer to standby system occurs or power is lost. If control was transferred to standby and then returned to primary, pressing TRANSFER LOCKOUT switch-light will reset system and turn off light.

FLOW Lt: (Push to test)

ON: whenever cabin climb rate is detected in conjunction with a closed outflow valve. Indicates insufficient air conditioning inflow or excessive fuselage leakage.

RATE LIMIT Knob:

At index mark cabin rate limit is 700 fpm climb and 300 fpm descent.

System Selector Switch:

STBY: Transfers system control from primary to standby. STBY ON and TRANSFER LOCKOUT light will come on.

PRIMARY: Transfers system control from standby to primary. STBY light will go off and TRANSFER LOCKOUT light will remain on until reset.



LDG ALT Selector Knob:

Used to set destination airport altitude in landing altitude window. Scale is numbered in 100 ft increments..

LDG BAR Selector Knob:

Used to set correct destination barometric pressure reading in mb (millibar) window.



CABIN ALT Light:

ON whenever cabin altitude exceeds 10000 feet. When light comes on, a warning horn will sound, followed by a cabin altitude vocal annunciation. The MASTER WARNING light also comes on.



CABIN PRESS Control Wheel:

The control wheel follows the outflow valve motion, providing an indication of direction and rate of movement.

Outflow valve position indicator:

Indicates the relative position of the outflow valve.

CABIN PRESS Manual/Auto Control Lever:

Selects either manual or automatic control of the pressurization system.

UP (Auto): Permits electrical outflow valve operations by AUTOMATIC CABIN PRESS CONTROLLER.

DOWN (Manual): Removes electrical supply from the outflow valve and permits manual operation.