

	PNEUMATIC DESCRIPTION		1.36.10	P 1
			SEQ 100	REV 15

GENERAL

The pneumatic system supplies high pressure air for :

- Air conditioning
- Engine starting
- Wing anti-icing
- Water pressurization
- Hydraulic reservoir pressurization
- Pack bay ventilation turbofan actuation.

High pressure air is supplied from three sources :

- Engine bleed systems
- APU load compressor
- Two HP ground connections.

Engine bleed systems are interconnected by a crossbleed duct, to which the APU and ground sources are connected.

A valve, mounted on the crossbleed duct, allows the left side (ENG 1 and ENG 2) and the right side (ENG 3 and ENG 4) to be interconnected.

Pneumatic system operation is controlled and monitored by two Bleed Monitoring Computers (BMCs with 2 channels each), the overhead control panel, and the ECAM. The APU bleed supply is controlled by the APU Electronic Control Box (ECB).

A leak detection system is provided to detect any overheat in the vicinity of the hot air ducts.

	PNEUMATIC DESCRIPTION		1.36.10	P 2
			SEQ 100	REV 15

ENGINE BLEED SYSTEM

GENERAL

Engine bleed systems are similar.

Each system is designed to :

- Select the air source compressor stage,
- Regulate bleed air pressure,
- Regulate bleed air temperature.

Each system is controlled and monitored by one Bleed Monitoring Computer (BMC).

Each BMC has bleed pressure, temperature, and valve position information, and is interconnected to :

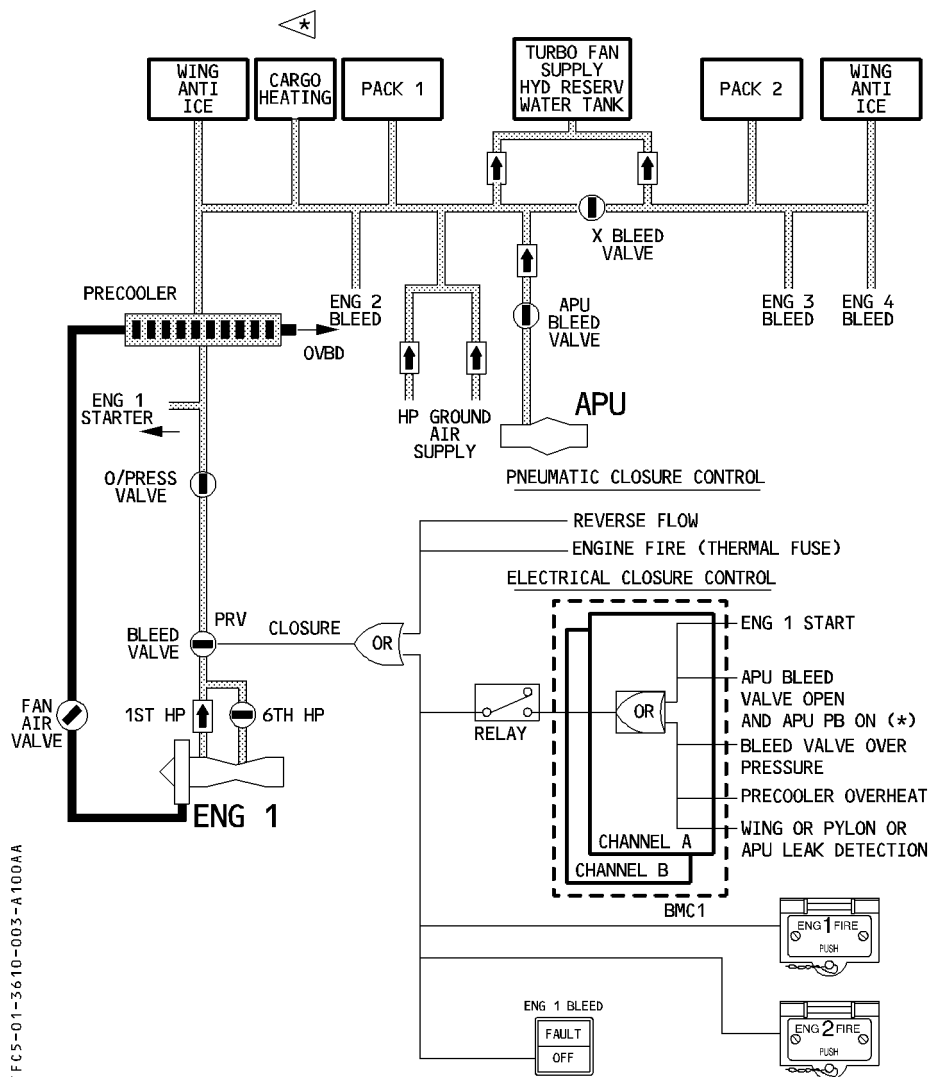
- Other systems involved with the bleed system
- The other BMC,

and provides indications and warnings to the ECAM and CMC.

In case one BMC channel fails, the other channel takes over most of the monitoring functions.

The LH and RH bleed valves are electrically-controlled by BMC 1 and BMC 2 respectively, and are pneumatically-operated.

FOR INFO



FFCS-01-3610-003-A100AA

(*) The Engine 3 and 4 bleed valves close, when the APU bleed valve opens, only if the crossbleed valve is open.

	PNEUMATIC DESCRIPTION		1.36.10	P 4
			SEQ 100	REV 15

ENGINE AIR SUPPLY

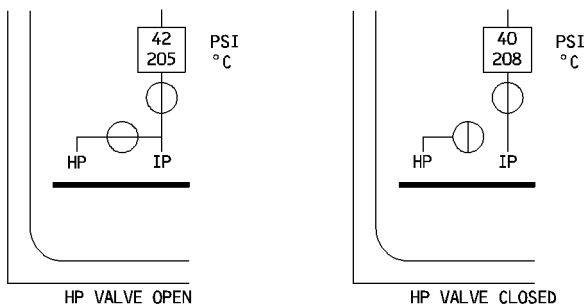
To minimize fuel penalty, air is normally bled from the 1st stage of the engine HP compressor.

When pressure from the 1st stage is not sufficient (low engine speed), air is bled through the HP valve from the 6th high pressure stage.

A pressure check valve, mounted downstream of the 1st HP stage port, closes to prevent air from the 6th HP stage from being circulated to the 1st HP stage.

ECAM INDICATION

FFCS-01-3610-004-A100AA



	PNEUMATIC DESCRIPTION	1.36.10 P 5	
		SEQ 100	REV 15

PRESSURE REGULATION AND LIMITATION

Downstream of the junction of the 6th and 1st HP ducting, air is admitted into the bleed valve which acts as a Shutoff and Pressure Regulating Valve (PRV).

Delivery pressure is regulated between 28 and 47 psi, depending on the flow, and is modulated to balance the flow bled from the two engines located on the same wing.

The pressure can be reduced in case of overtemperature at the precooler inlet.

In case of pressure regulation failure, the overpressure valve (OPV) closes when the pressure is greater than 85 psi.

The bleed valve is fully closed :

- Pneumatically, in case of :
 - Upstream pressure is less than 8 psi, or
 - Return flow
 - Engine fire (thermal fuse) ;
- Electrically through the :
 - BLEED pushbutton, when switched OFF,
 - ENG FIRE pushbutton (of related or adjacent engine) when pushed,
 - BMC in the following cases :
 - Overtemperature
 - Overpressure
 - Leak detection
 - APU bleed ON (for RH engines, provided X-bleed valve is not closed)
 - Starting sequence.

TEMPERATURE REGULATION AND LIMITATION

The temperature regulation of bleed air is achieved by a precooler, mounted downstream of the bleed valve.

The precooler is an air to air heat exchanger which uses cooling air, bled from the engine fan, to regulate the temperature to 200°C.

Fan air flow is controlled by the Fan Air Valve.

When wing anti-ice is selected off, the temperature may be regulated to 150°C, upon zone controller demand.

In the absence of pressure, the fan air valve is spring-loaded closed.

APU BLEED AIR SUPPLY

Air supplied by the APU load compressor is both available on ground and in flight.

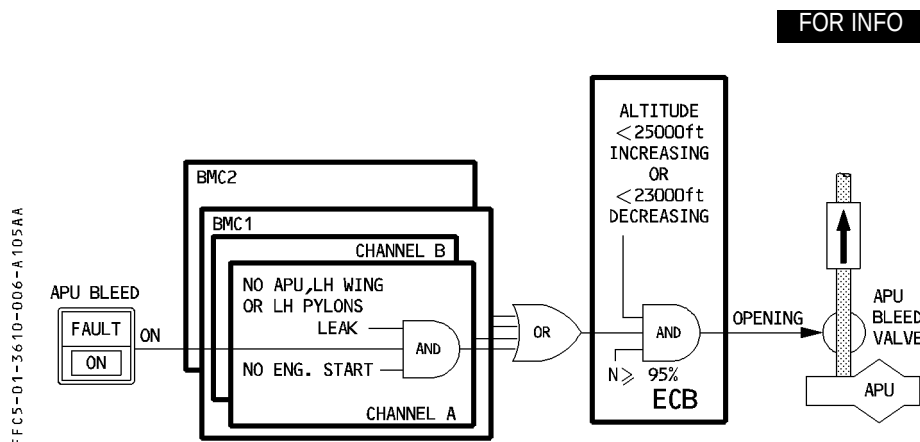
APU bleed air is controlled by the APU bleed valve, which operates as a shutoff valve. It is electrically-controlled and pneumatically-operated.

The APU bleed valve is controlled by the APU BLEED pushbutton, located on the AIR panel.

When, the pushbutton is set to ON, APU bleed air supplies the pneumatic system, provided APU N is greater than 95%. This causes the X-BLEED valve to open and the engine bleed valves to close.

A non-return valve, located near the crossbleed duct, protects the APU when air is bled from another supply source.

APU BLEED VALVE OPENING LOGIC



HP GROUND AIR SUPPLY

Air is supplied to the aircraft's pneumatic system via two HP ground connectors. The crossbleed valve has to be manually opened to provide air for both sides.

CROSSBLEED

A crossbleed valve, installed on the crossbleed duct, permits the isolation or interconnection of the LH (ENG 1 and 2) and RH (ENG 3 and 4) air supply system.

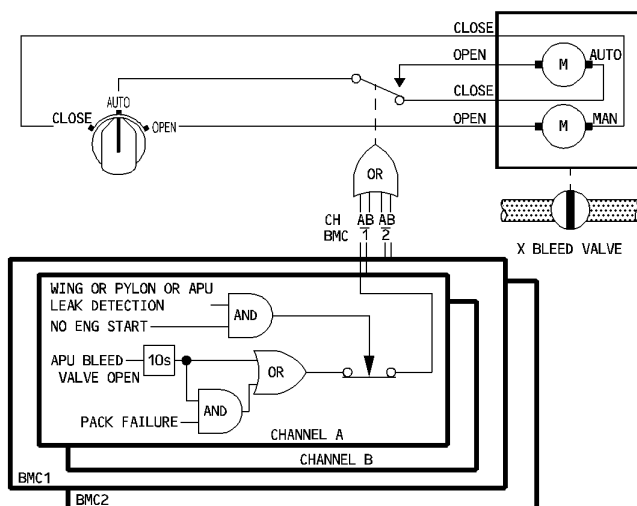
The crossbleed valve is electrically-controlled from a rotary selector, located on the AIR panel.

The valve is controlled by two electric motors : One for automatic mode, the other for manual mode.

In automatic mode, the crossbleed valve is normally closed. It opens, either when APU bleed air is used or in the event of a pack fault. In such cases, it closes when a wing, pylon or APU leak is detected (except during engine start).

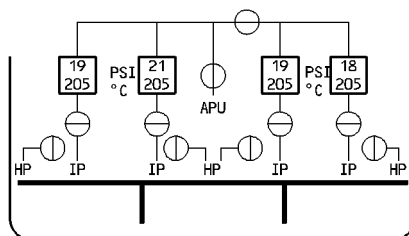
X-BLEED VALVE CONTROL LOGIC

FOR INFO



FFC5-01-3610-007-A100AA

ECAM INDICATION



FFC5-01-3610-007-B100AA

	PNEUMATIC DESCRIPTION		1.36.10	P 8
			SEQ 100	REV 15

LEAK DETECTION

The air leakage detection loops detect any ambient overheat in the vicinity of the hot air ducts in the fuselage, pylons and wings.

The sensing elements are tied to form a single loop for the pylon or, a double loop for the wing, APU, packs and crossfeed ducts.

A wing, APU, pack or crossfeed duct leak signal is activated when the two loops of a given section detect a leak, or when one loop detects the leak and the other is inoperative.

The system has identical control logic included in each BMC.

– In case of wing leak signal :

- Both the bleed and HP valves on the related side are automatically closed.
- Both associated FAULT lights, on the AIR panel, come on.
- The X-bleed valve automatically closes (except during an engine start or manually selected open).
- If the APU bleed valve is open, and if the leak concerns the left wing, it automatically closes (except during engine start).

A crossfeed duct leak signal is considered as a wing leak signal by the system.

– In case of a pylon leak signal :

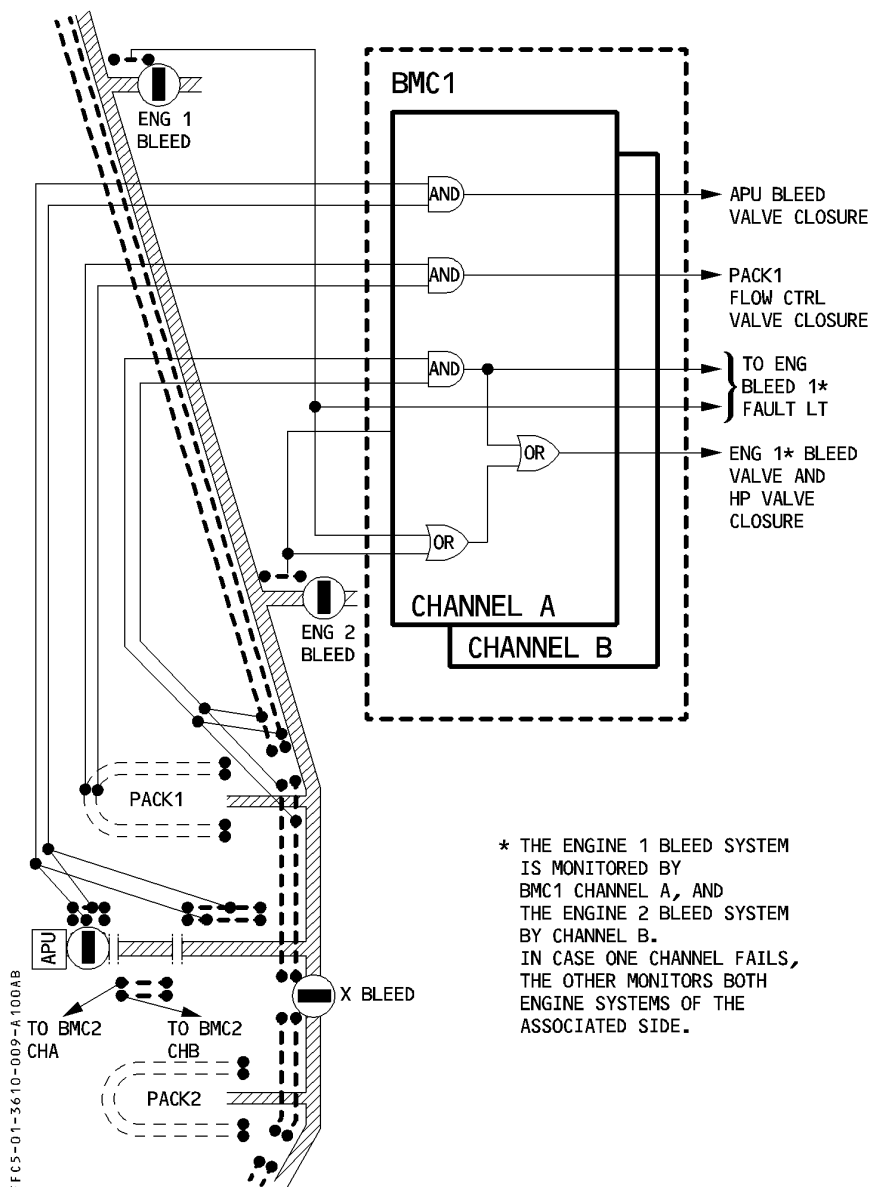
- Both the bleed and HP valves on the related side are automatically closed.
- Only the FAULT light associated with the related engine comes on, on the AIR panel.
- The X-bleed valve automatically closes (except during an engine start or manually selected open).

– In case of an APU leak signal :

- The APU bleed valve automatically closes.
- The FAULT light, on the APU bleed pushbutton of the AIR panel, comes on.
- The X-bleed valve automatically closes (except during an engine start or manually selected open).

APU bleed leak detection is divided into three sections, each having double loops. Leak detection in the first and third sections is performed by BMC 1 ; in the middle section, it is performed by BMC 2. In case of a pack leak signal, the pack flow control valve automatically closes.

FOR INFO



* THE ENGINE 1 BLEED SYSTEM IS MONITORED BY BMC1 CHANNEL A, AND THE ENGINE 2 BLEED SYSTEM BY CHANNEL B. IN CASE ONE CHANNEL FAILS, THE OTHER MONITORS BOTH ENGINE SYSTEMS OF THE ASSOCIATED SIDE.

	PNEUMATIC DESCRIPTION	1.36.10	P 10
		SEQ 100	REV 15

OPERATION FOLLOWING FAILURES

BMC FAILURE

If one BMC is failed, control, monitoring, and leak detection, of the wing, engine, and pack bleed systems, of the associated side of the aircraft, are lost. Half of the APU leak detection is also lost. The crossbleed and APU bleed valves are still controlled by the other BMC, as are the associated wing, engines and pack bleed systems.