

Reference to Figure 76 Pneumatic Distribution Schematic

ATA 36 PNEUMATIC

36–10 DISTRIBUTION

SYSTEM DESCRIPTION

Bleed Monitoring Computer

Two identical BMCs are installed in the FWD avionics compartment. The BMC monitors the valve positions, the pressure and the temperature of the supplied bleed air and the leak detection system.

Both BMCs control by energizing the Control Thermostat Solenoid (CTS) the automatic closing of the PRV.

They also control and monitor the automatic X-bleed valve operation with APU bleed supply. In case one BMC fails, the other BMC takes over some of the functions.

The following list gives the functions which cannot be performed any more if one BMC fails:

- for BMC No.1
 - Pylon leak detection ENG No.1
 - L/H and R/H wing leak detection loops "A"
 - APU leak detection
 - ENG No.1 bleed FAULT light
 - ENG No.1 PRV automatically closing via CTS solenoid
 - ENG No.1 bleed leak warning
- for BMC No.2
 - Pylon leak detection ENG No.2
 - L/H and R/H wing leak detection loops "B"
 - ENG No.2 bleed FAULT light
 - ENG No.2 PRV automatically closing via CTS solenoid
 - ENG No.2 bleed leak warning

High Pressure Shut-Off Valve

- is electrically controlled and pneumatically operated
- is a pressure regulating and shut-off valve
- regulates 9th stage discharge air to ≈ 36 psi
- is normally spring loaded closed
- it has a manual override to close the valve mechanically
- has two microswitches for position feedback (open/closed position)

A pneumatic sense line connects the HPV with the bleed PRV (Pressure Regulating Valve) in order to make sure that the HPV valve will close when the bleed pressure regulator valve is controlled closed.

Intermediate Pressure Check Valve

The IPC prevents 9th stage air return flow to the 5th stage.

Pressure Regulating Valve

- is electrically controlled and pneumatically operated
- has two microswitches for position feedback (open/closed position)
- regulates bleed air to ≈ 44 psi
- is normally spring loaded closed
- has a manual override to close the valve mechanically

A sense line connects the PRV to the CTS (Control Thermostat Solenoid). The CTS controls the PRV to close by bleeding PRV muscle pressure.

Over-Pressure Valve

- protects the pneumatic system from overpressure
- is normally spring loaded open
- has one microswitch for position feedback
- starts to close at >75 psi (at 85 psi closed) and re-opens by spring force when pressure drops to approximately 35 psi

Fan Air Valve

- regulates the downstream precooler exchanger bleed temperature to $\approx 200^\circ\text{C}$
- is pneumatically controlled via the FAV CT (Control Thermostat)
- has 2 micro switches (open/closed position)
- has a manual override to close the valve mechanically
- is normally spring loaded closed

Precooler

The precooler assures cooling of the hot air bled from the engine compressors by a heat exchange process using cold air from the engine fan.

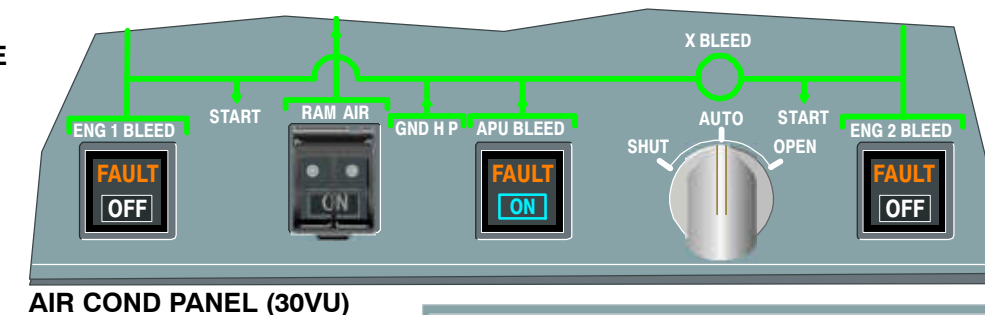
LEGEND:

LP - LOW PRESSURE STAGE
HP - HIGH PRESSURE STAGE
HPV - HIGH PRESSURE BLEED VALVE
IPC - INTERMEDIATE PRESS. CHECK VALVE
PRV - BLEED PRESS. REGULATOR VALVE
OPV - OVERPRESSURE VALVE
BMC - BLEED MONITORING COMPUTER
 LEAK DETECTION LOOPS

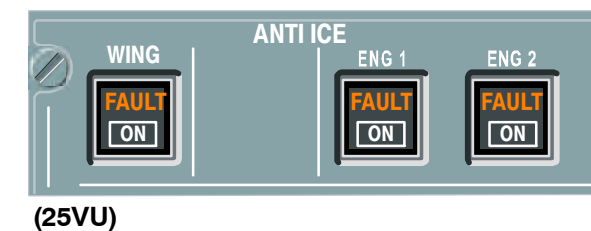
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EEC - ELECTRONIC ENGINE CONTROLLER
ECB - ELECTRONIC CONTROL BOX
FAV - FAN AIR VALVE
PR - REGULATED PRESS. TRANSDUCER
PT - TRANSFER PRESS. TRANSDUCER
CTS - PRV CONTROL THERMOSTAT SOLENOID
CT - FAV TEMP. CONTROL THERMOSTAT
T - CONTROL TEMP. SENSOR

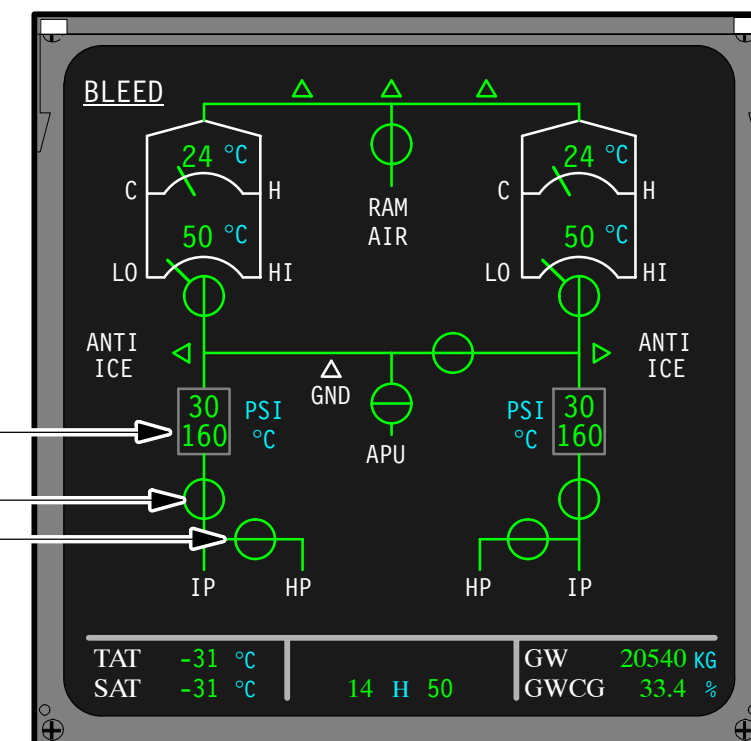
NOTE: USED ABBREVIATIONS MAY DEVIATE FROM OLDER A/C VERSIONS



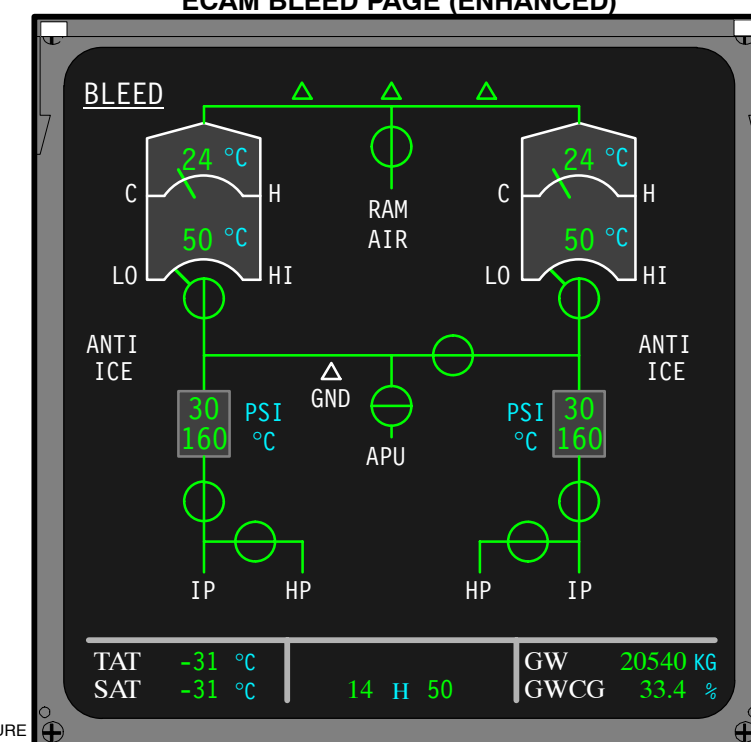
AIR COND PANEL (30VU)



(25VU)

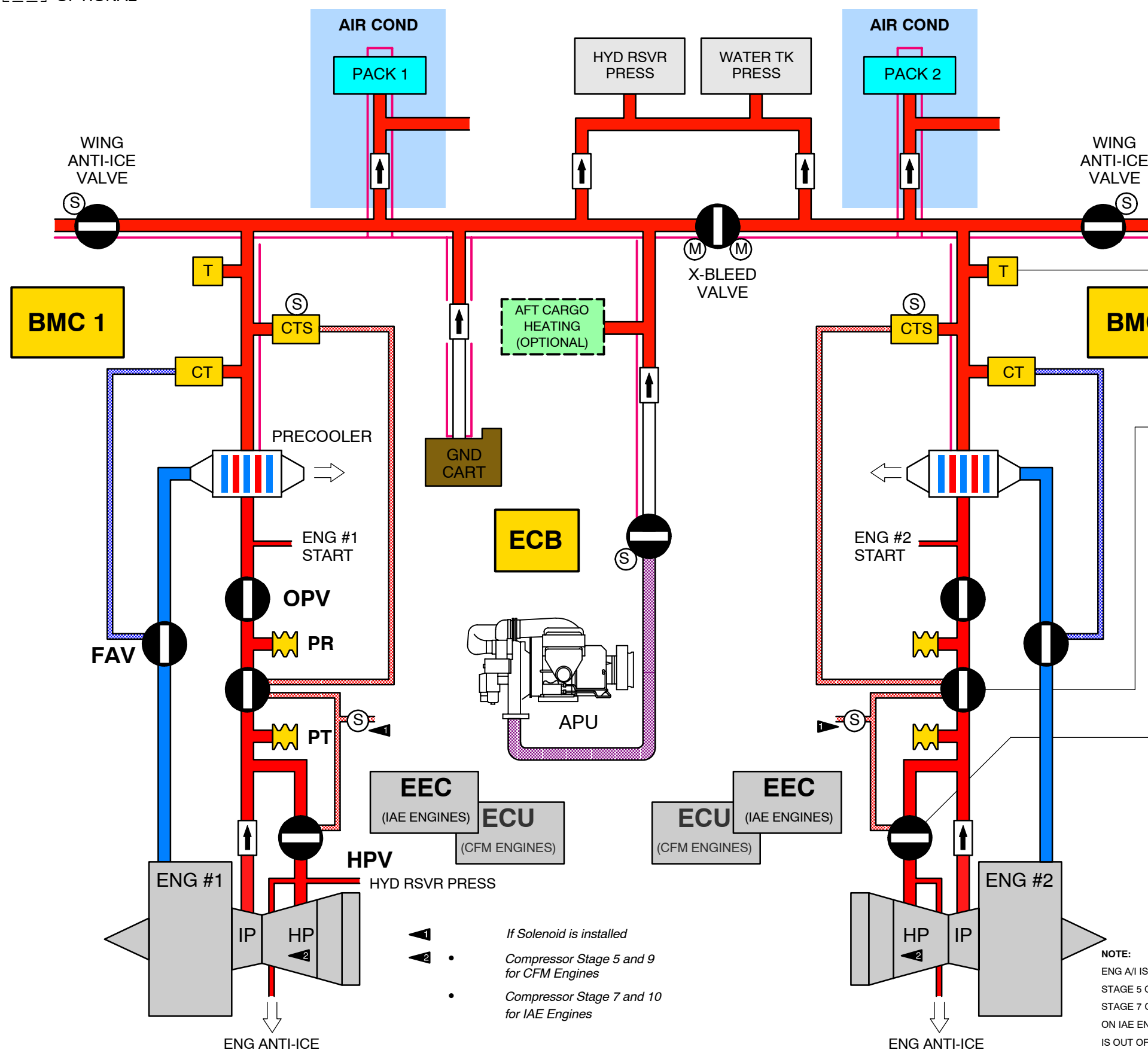


ECAM BLEED PAGE (ENHANCED)



ECAM BLEED PAGE

NOTE:
 ENG A/I IS TAKEN FROM
 STAGE 5 ON CFM AND FROM
 STAGE 7 ON IAE ENGINES.
 ON IAE ENG MUSCLE PRESSURE
 IS OUT OF STAGE 10.



▲ If Solenoid is installed
 • Compressor Stage 5 and 9 for CFM Engines
 • Compressor Stage 7 and 10 for IAE Engines

Figure 76 Pneumatic Distribution Schematic

Reference to Figure 77 Pneumatic Distribution Schematic

COMPONENT DESCRIPTION

1 PRV Control Thermostat Solenoid

The CTS has a solenoid valve which is energized to bleed the open pressure of the PRV and HPV and both valves close.

The solenoid is energized directly when:

- Engine Bleed P/BSW is in OFF position
- ENG Fire P/BSW is activated

The solenoid is energized via the BMC when:

- APU Bleed P/BSW ON
- Engine Starter Valve not closed signal
- Wing or Pylon Leak
- Bleed temperature $>257^{\circ}\text{C}$ >55 sec/
 $>270^{\circ}\text{C}$ >15 sec/ $>290^{\circ}\text{C}$ >5 sec
- Bleed Pressure >57 psi >15 sec

The CTS has a pneumatic function to bleed the open pressure of the PRV and HPV in case of:

- Reverse Flow (delta p diaphragm)
- Temperature limiting $>235^{\circ}\text{C}$ (thermostat)

The temperature limiting function is achieved by an integrated invar rod which bleeds the open pressure between $\approx 235^{\circ}\text{C}$ and $\approx 245^{\circ}\text{C}$. PRV outlet pressure is then reduced in relation to temperature but $\text{min} \approx 17$ psi.

NOTE: The invar rod and its limiting function has been deleted on enhanced A/Cs.

2 FAV Temperature Control Thermostat

The FAV CT regulates pneumatically the downstream precooler exchanger bleed temperature through the fan air valve to $\approx 200^{\circ}\text{C}$. It is installed downstream of the precooler exchanger.

The temperature regulation is achieved by Invar Rods which influence the FAV control pressure.

3 Transfer Pressure Transducer (PT)

The Transfer Pressure Transducer measures the pressure downstream of the HPV to monitor its function and sends the pressure signal to the BMC.

4 Regulated Pressure Transducer (PR)

The Regulated Pressure Transducer measures the pressure downstream of the PRV to monitor its function and sends the pressure signal to both BMCs and to the ECAM for indication.

5 Control Temperature Sensor (T)

The Control Temperature Sensor measures the temperature downstream the precooler and sends the temperature signal to both BMCs and the ECAM for temperature indication.

6 Cross Bleed Valve

The Cross Bleed Valve has two electro motors (one for MANUAL and one for the AUTO Mode). It splits the system into the L/H and R/H pneumatic system. It is controlled by the BMCs when the Mode Selector is in AUTO Position:
OPEN during APU Bleed Supply
SHUT during ENG Bleed supply and APU Bleed OFF, or manual via X-Bleed Selector on the Overhead Panel in OPEN or SHUT.

7 HP Bleed Override Solenoid Valve

Depending on engine and aircraft type the BMCs command this solenoid valve to bleed HPV muscle pressure above specified aircraft altitudes and engine power configurations.

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DEVIATE FROM OLDER A/C VERSIONS

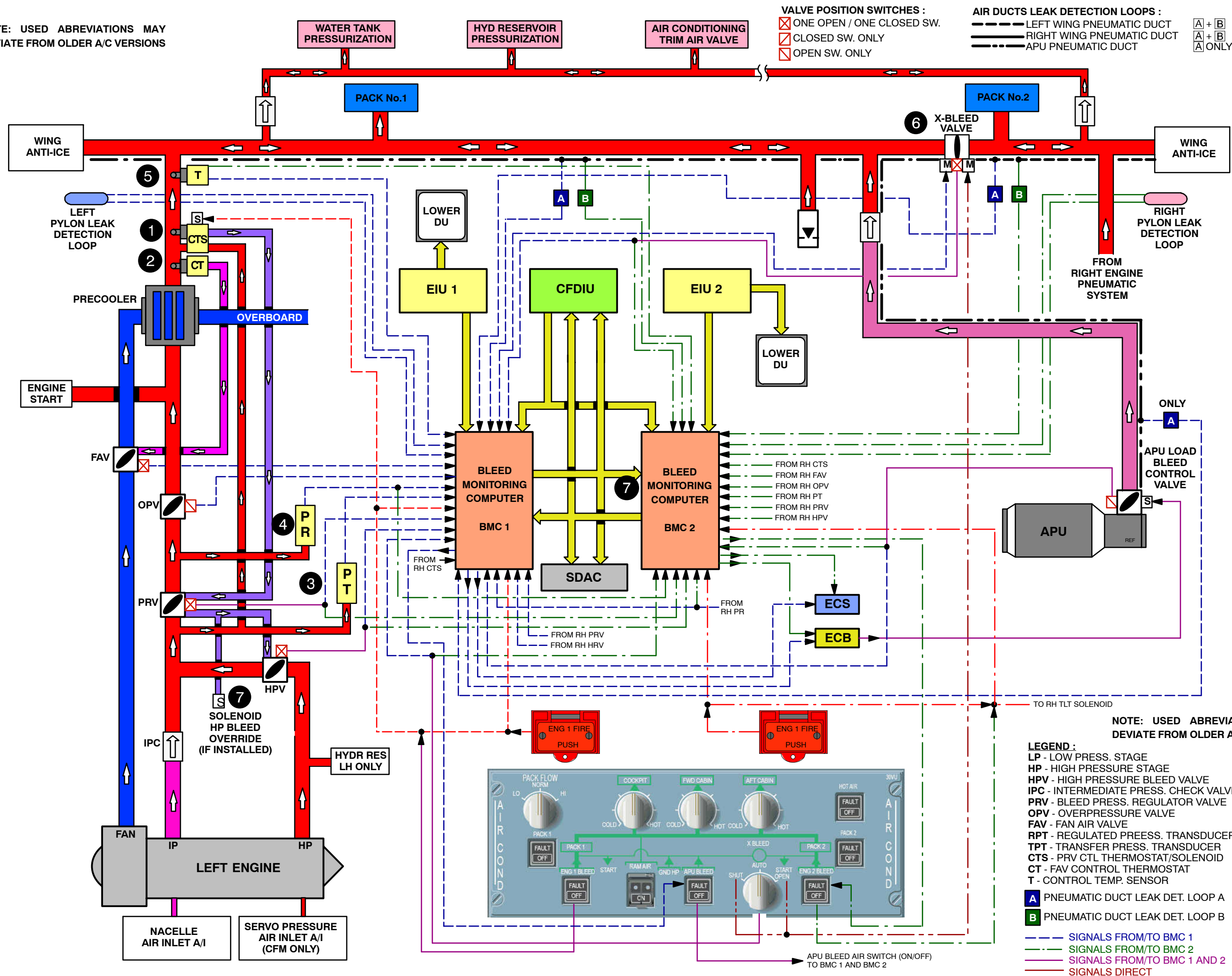


Figure 77 Pneumatic Distribution Schematic

Reference to Figure 78 Engine Bleed Air Supply System

36–11 ENGINE BLEED AIR SUPPLY SYSTEM

COMPONENT DESCRIPTION

1 HPV Check Valve

An internal check valve bleeds open pressure if HPV upstream pressure >100psi.

2 Thermal Fuse

Thermal fuses close the PRV and HPV by venting the open pressure when the valve temperature reaches >450°C.

3 PRV Control Thermostat Invar Rod

When the temperature downstream of bleed air precooler exchanger increases and reaches 235°C, the INVAR Rod in the sensing tube starts to open the rod valve by differential dilatation. This causes a modification of the butterfly position of the bleed pressure regulator valve which tends to close to reduce the downstream pressure.

If the temperature increases up to 245°C, the rod valve will be fully open and the system bleed pressure is limited to 17.5 psig.

NOTE: The INVAR Rod and its function has been deleted on enhanced aircrafts. To replace the function the BMC generates a class 2 message if the bleed temperature reaches 240°C.

4 FAV Control Thermostat INVAR Rod and Anticipation Sensing Element

When the temperature is above the required value differential dilatation between the INVAR rod and the stainless steel sensing tube opens the rod valve causing the venting of the CT and thus pressurizing of the FAV control sense line. This results in FAV opening.

Between both values the FAV butterfly has an intermediate position. When the temperature downstream of the precooler increases suddenly, the anticipation sensing element reacts before the thermostat tube causing the opening of the FAV to prevent any overtemperature.

NOTE: USED ABBREVIATIONS MAY DEVIATE
FROM OLDER A/C VERSIONS

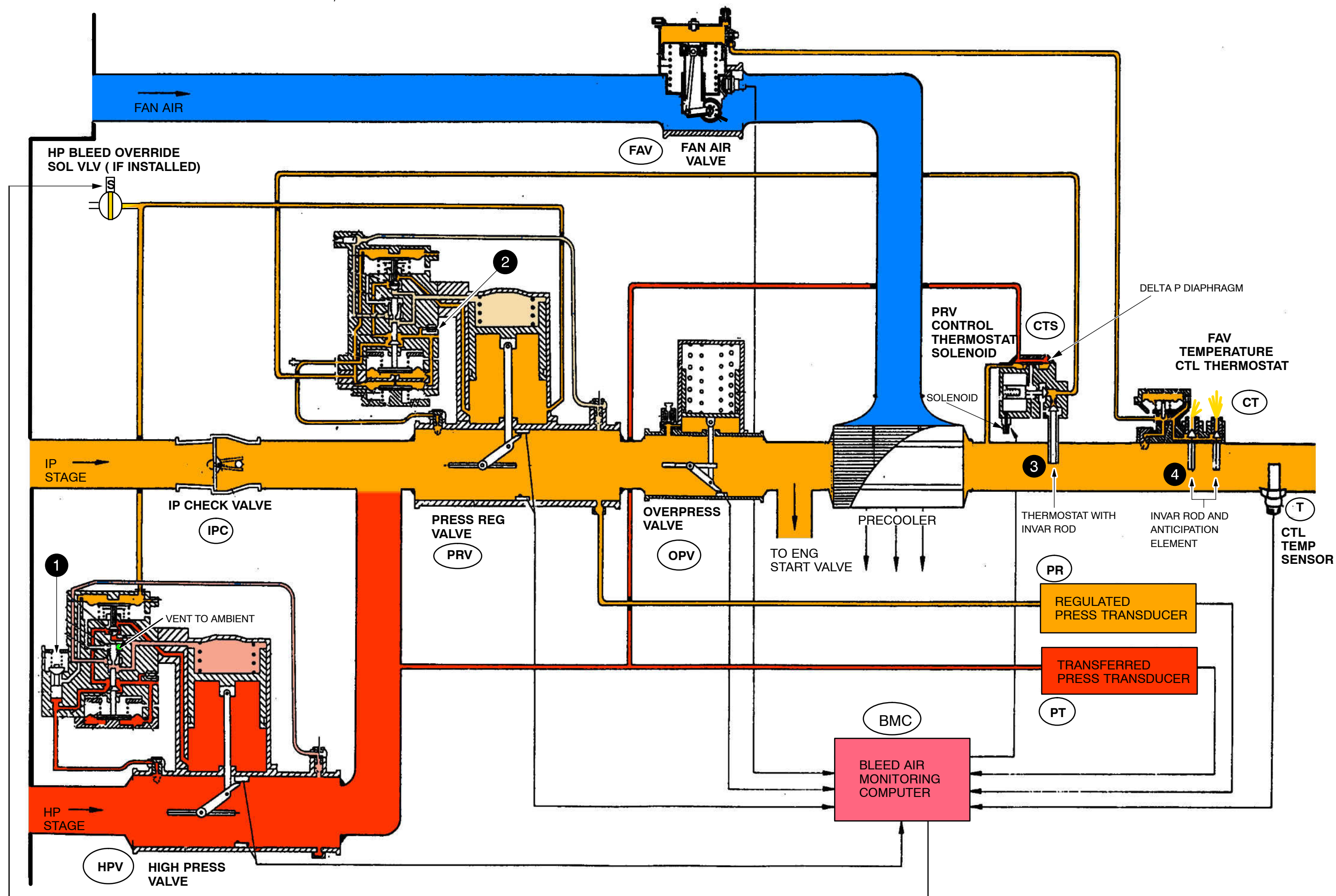


Figure 78 Engine Bleed Air Supply System