Pneumatic System Presentation

SYSTEM INTRODUCTION

• The Airbus single aisle family pneumatic system supplies air for:

- Air conditioning
- Wing ice protection
- Water Tank pressurization
- Hydraulic reservoir pressurization
- Engine starting
- Fuel tank inerting system

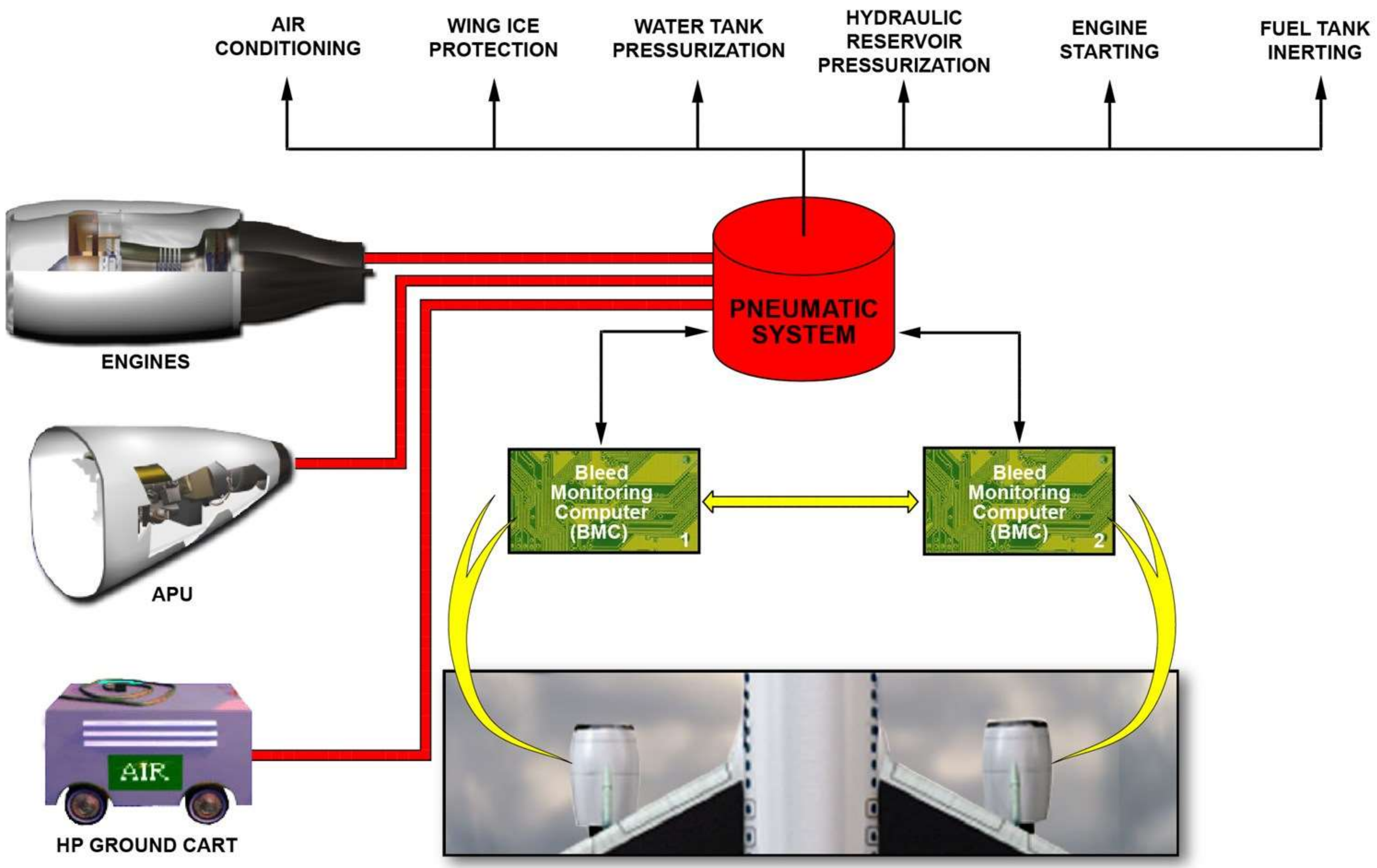
The Airbus Single Aisle family pneumatic system supplies High Pressure (HP) air for:
- Air conditioning,
- Wing ice protection,
- Water Tank pressurization,
- Hydraulic reservoir pressurization,
- Engine starting,
- Fuel tank inerting system.

• Three possible sources:

- Engine Bleed system
- APU
- HP Ground Air source

High Pressure air can be supplied from three sources:
- The Engine Bleed system,
- The APU,
- A HP Ground Air source.

• Two BMCs one for each engine bleed system
•BMCs interconnected
•Both bleeds remain operational using pneumatic regulations and safety functions in case of loss of both BMCs or electrical supplies.
The pneumatic system operates electro-pneumatically and is controlled and monitored by 2 Bleed Monitoring Computers (BMC 1 & 2).
There is one BMC for each engine bleed system.
Both BMCs exchange data.
In this NEO configuration, one BMC can control & monitor both sides when the other BMC fails.

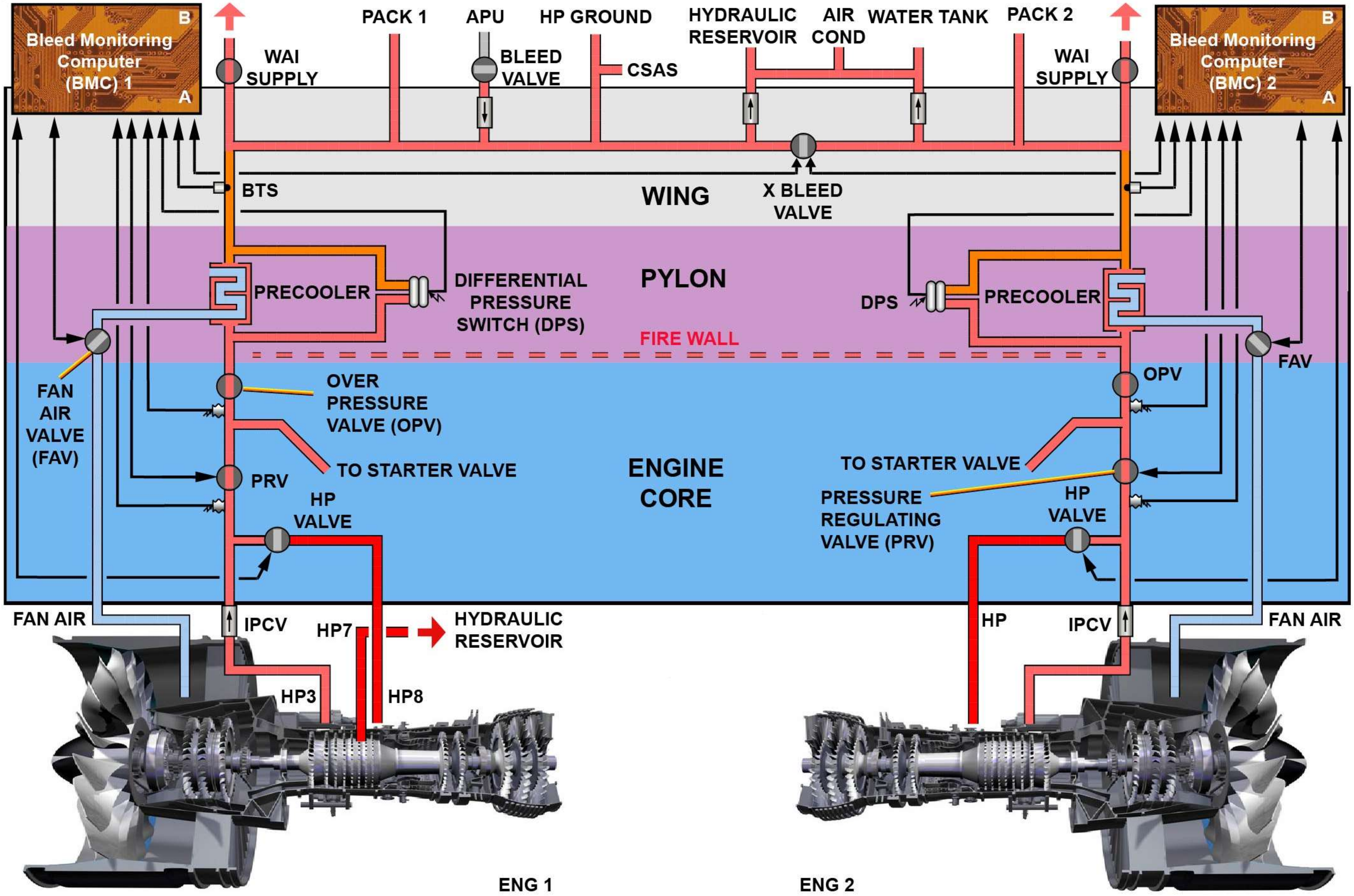

AIR CONDITIONING
WING ICE PROTECTION
WATER TANK PRESSURIZATION
HYDRAULIC RESERVOIR PRESSURIZATION
ENGINE STARTING
FUEL TANK INERTING
PNEUMATIC SYSTEM
ENGINES
APU
AIR
HP GROUND CART
Bleed Monitoring Computer (BMC) 1
Bleed Monitoring Computer (BMC) 2

ENGINE BLEED
• Air is bled from the IP (HP3) and HP8 stages
•Electro-pneumatic EBAS valves
The Engine Bleed Air is pressure and temperature regulated before it supplies the pneumatic system.
Air is bled from an Intermediate Pressure (IP) stage (HP3) or the HP8 stage with the High Pressure Valve (HPV) which is used for the pneumatic regulation.
The IP check valve gives protection to the IP stage from reverse flow when the HP valve is open.
Note: The Engine Bleed Air System (EBAS) uses electro-pneumatic valves.
• HP air is only used at low power
The HP bleed is only used when the engines are at low power and for engine efficiency the High Pressure Valve (HPV) is kept closed during cruise.

• PRV for pressure regulation and shut-off
The Pressure Regulating Valve (PRV) regulates the bleed air pressure.
The PRV is used as a protective shut off valve when the parameters are abnormal. In case of EBAS electrical failure, the PRV operates in back-up pneumatic mode.

• OPV is a protection for the system if overpressure occurs
An Overpressure Valve (OPV) is installed downstream of the bleed valve to give protection to the system if an overpressure condition occurs. On this PW Engine the OPV is installed in the engine core.
• This precooler uses cool air from the fan to regulate the temperature
The Fan Air Valve (FAV) modulates Fan discharge air through an air-to-air heat exchanger called "Precooler" to reduce the Bleed temperature.
PRV or FAV regulates when its torque-motor is energized and pressure available.
HPV is solenoid energized, pressure opened.
• BMC Ch A Digital control channel
•BMC Ch B Hardware safety back-up channel
BMCs are Dual Channel computers. Each BMC channel A is a full digital channel embedding all the control and monitoring functions.
Channel B is a hardware part and back-up channel able to detect system overtemperature.
For the monitoring, the BMCs read pressure transducers (upstream / downstream of the PRV), Precooler Differential Pressure and downstream temperature with the Bleed Temperature Sensor (BTS).
BTS is a dual sensor, each sensor connected to a different BMC channel.

APU BLEED/EXTERNAL AIR
• Crossbleed Valve used for interconnection or isolation
The left and right bleed systems are connected by a crossbleed duct. A Crossbleed Valve is used for their interconnection or isolation.
• APU bleed air supply is available on the ground or in flight
The APU is mainly used for bleed air supply on the ground for air conditioning and for engine start.
But APU BLEED air can also be used in flight, but limited in altitude.
The APU bleed supply is connected to the left side of the crossbleed duct.
• HP Ground cart can be connected
On the ground, an HP Ground cart can be connected to the left side pneumatic system. The Crossbleed valve has to be opened to supply the right side.

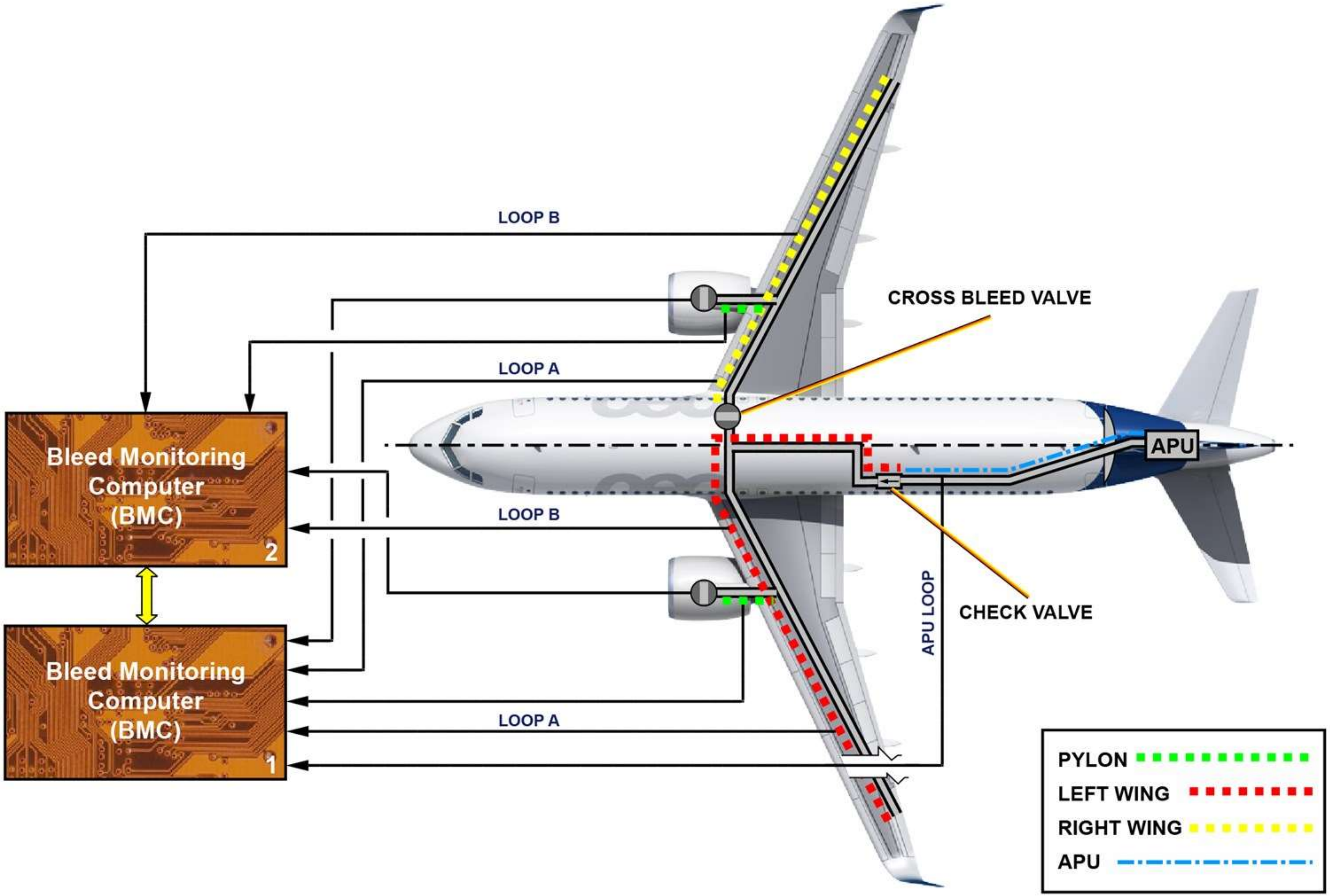

Bleed Monitoring Computer (BMC) 1
B
A
WAI SUPPLY
PACK 1
APU
BLEED VALVE
HP GROUND
CSAS
HYDRAULIC RESERVOIR
AIR COND
WATER TANK
PACK 2
WAI SUPPLY
Bleed Monitoring Computer (BMC) 2
BTS
WING
X BLEED VALVE
PYLON
PRECOOLER
DIFFERENTIAL PRESSURE SWITCH (DPS)
DPS
FIRE WALL
FAN AIR VALVE (FAV)
FAV
OVER PRESSURE VALVE (OPV)
OPV
TO STARTER VALVE
ENGINE CORE
PRV
PRESSURE REGULATING VALVE (PRV)
HP VALVE
FAN AIR
IPCV
HP7
HYDRAULIC RESERVOIR
HP3
HP8
HP
ENG 1
ENG 2

LEAK DETECTION

- Leak detection loops installed
  - Double loops pylon & wing /APU single loop
  - Connected to BMCs OHDS

Leak detection loops are installed along the hot air supply ducts of the pneumatic system. The loops are made of multiple sensing elements connected in series to the BMCs Overheat Detection System (OHDS).
If a leak is detected, a signal is sent to the BMC 1 or 2 which automatically isolates the affected area by closing the crossbleed valve and shutting off the engine bleed on the affected side.

The leak detection system is organized into three loops. Here are the loops and the protected areas:
- Pylon: dual loop from the precooler to the wing leading edge.
- Wing: dual loop from wing leading edge, including the wing air inlet supply, and belly fairing (cross bleed duct, pack supply ducts and APU forward supply duct).
- APU: single loop at APU aft supply duct (left hand side of the fuselage) from APU firewall to wheel well area


LOOP B
LOOP A
LOOP B
LOOP A
CROSS BLEED VALVE
CHECK VALVE
APU
APU LOOP
Bleed Monitoring Computer (BMC) 2
Bleed Monitoring Computer (BMC) 1
PYLON
LEFT WING
RIGHT WING
APU

CONTROL & INDICATING

•Control panels and Indications

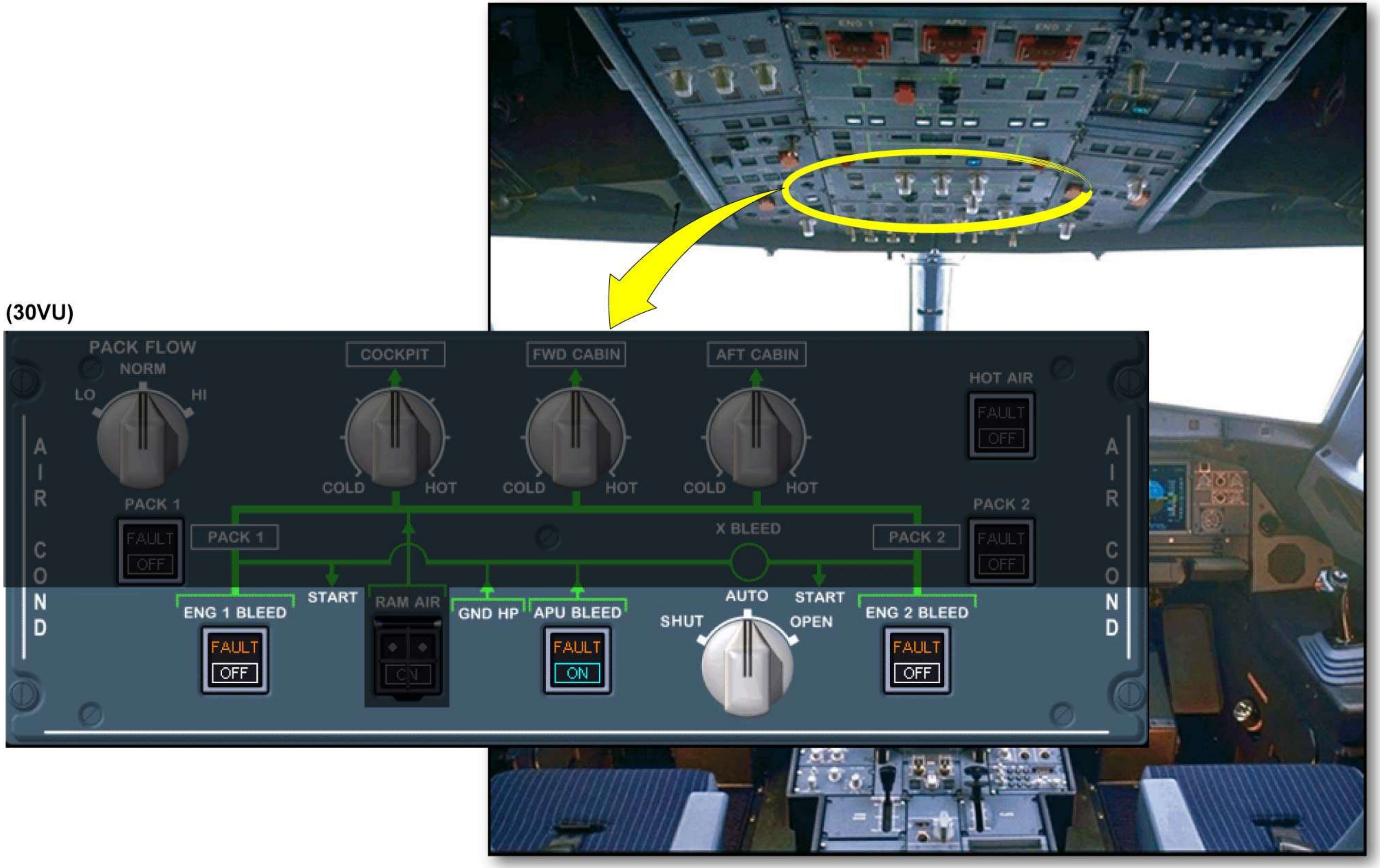
This section is related to the control panels and indications for the pneumatic system.

CONTROL PANEL

• Controls for the pneumatic system are part of the AIR COND panel on the overhead panel

Controls for the pneumatic system are part of the AIR COND panel and are operated from the overhead panel.

(30VU)

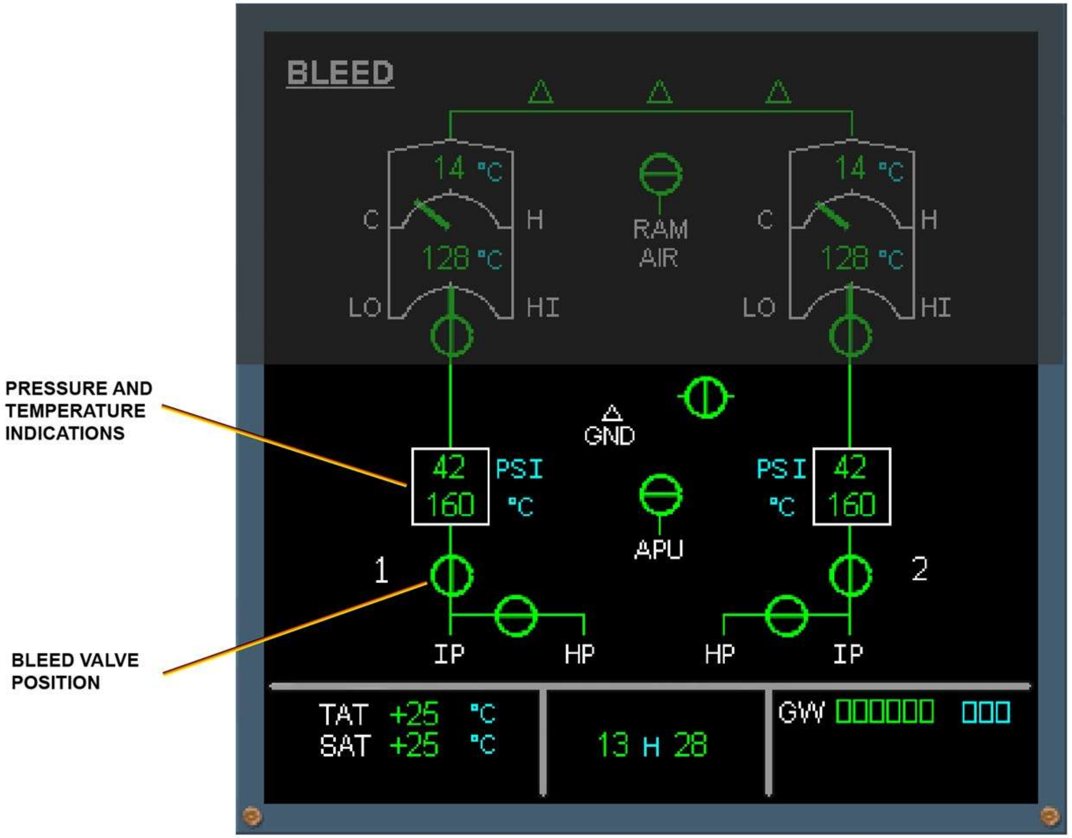

PACK FLOW
NORM
LO
HI
COCKPIT
FWD CABIN
AFT CABIN
COLD
HOT
HOT AIR
FAULT
OFF
AIR COND
PACK 1
PACK 2
X BLEED
START
RAM AIR
GND HP
APU BLEED
AUTO
SHUT
OPEN
ENG 1 BLEED
ENG 2 BLEED
ON

ECAM INDICATION

• Lower part of the ECAM BLEED page

The pneumatic system indications are displayed on the lower part of the ECAM BLEED page:

- HPV, PRV positions with delivered bleed pressure and temperature,
- APU bleed and crossbleed status.



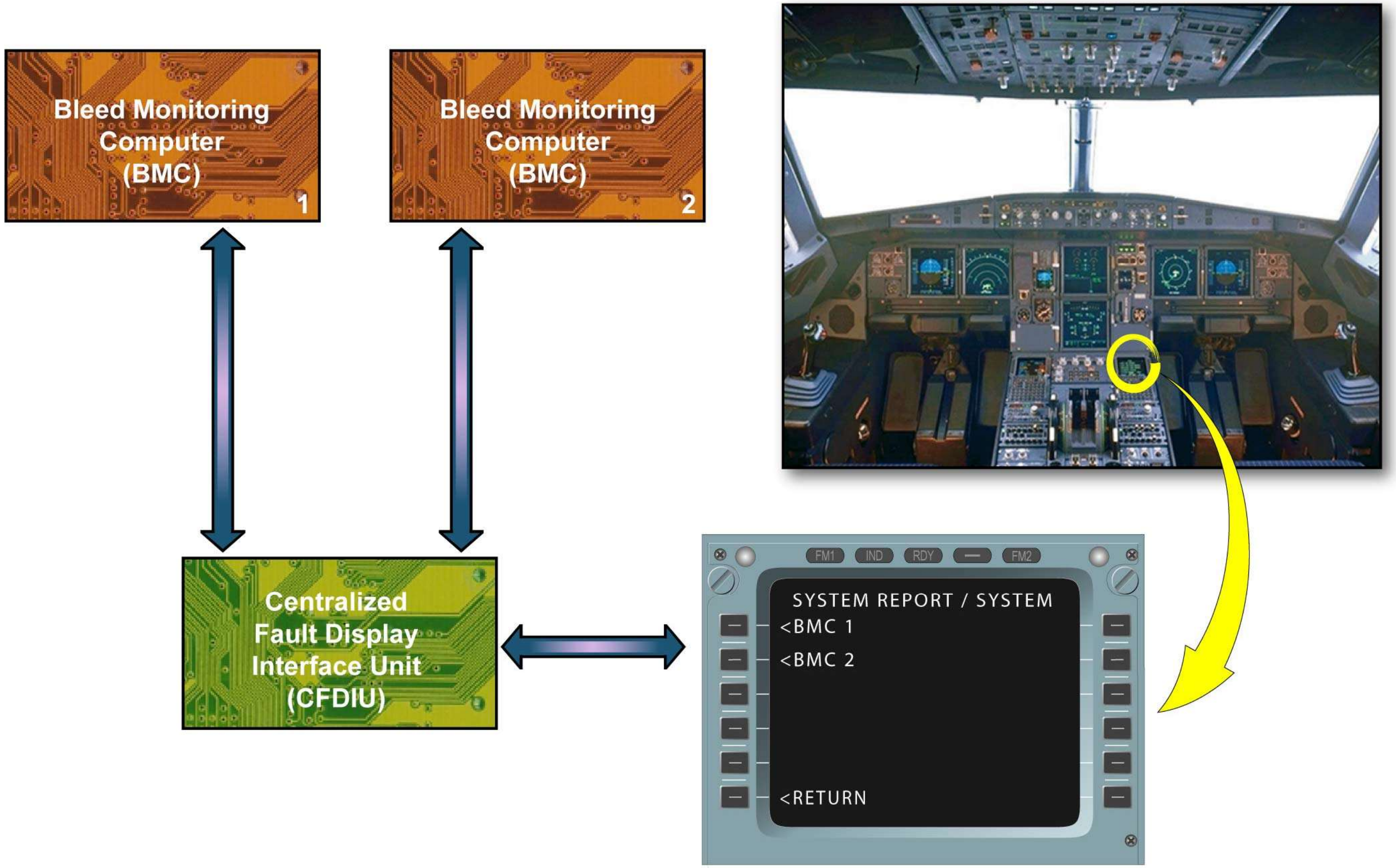
SD

MAINTENANCE/TEST FACILITIES

•CFDS fault messages of the PNEUMATIC system accessible through the MCDU

•BITE test available

Using the Multipurpose Control and Display Unit (MCDU), you can have access to the Centralized Fault Display System (CFDS) fault messages of the PNEUMATIC system. BMC1 and BMC2 Built-In Test Equipment (BITE) is standard type 1.



SAFETY PRECAUTIONS

• AMM safety procedures for injury prevention

When you do work on the aircraft, make sure that you obey all the Aircraft Maintenance Manual (AMM) safety procedures. This will prevent injury to people and / or damage to the aircraft. Here is an overview of the main safety precautions related to the pneumatic system.

• Pneumatic system must be depressurized

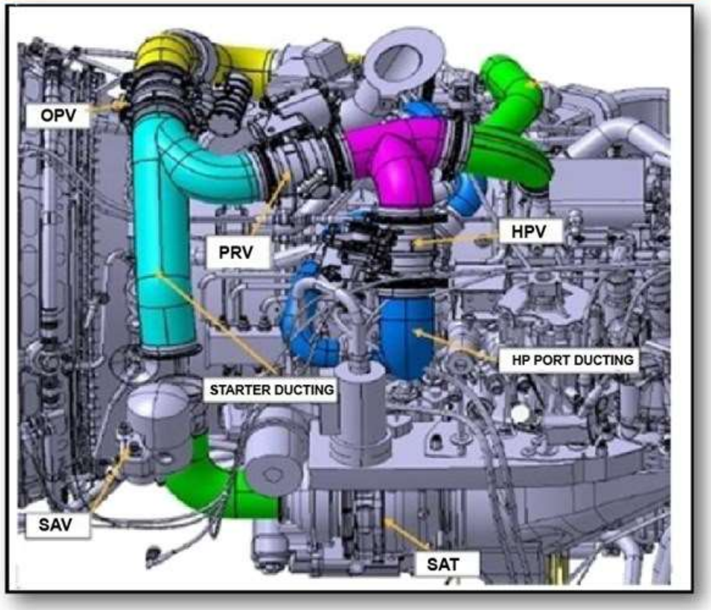
Make sure that the pneumatic system is depressurized before you start the work. HP air can cause unwanted pressurization of the aircraft, and injury to personnel.

• Parts can be hot for one hour after engine shutdown

Be careful when you do work on the engine components immediately after the engine shutdown. The engine components can stay hot for one hour.

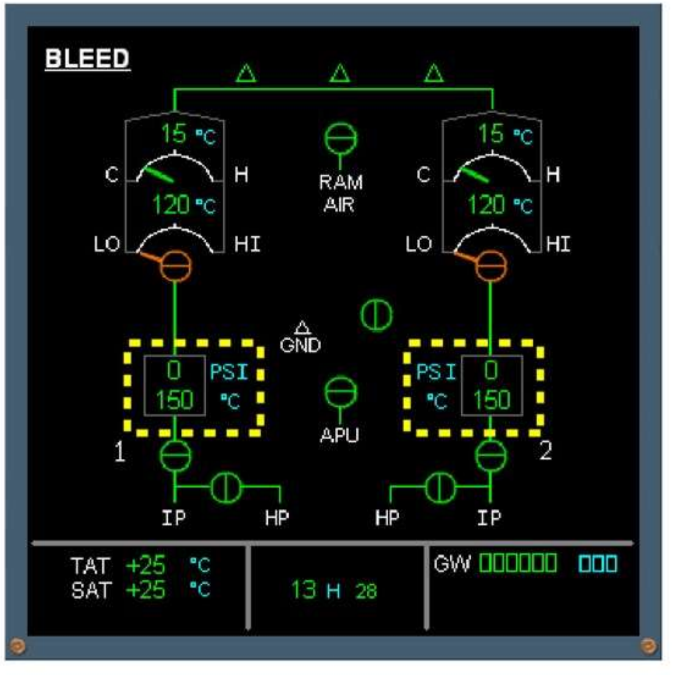
CAUTION

PARTS CAN BE HOT FOR ONE HOUR AFTER ENGINE SHUTDOWN



WARNING

PNEUMATIC SYSTEM MUST BE DEPRESSURIZED



Pneumatic System Component Location

SYSTEM OVERVIEW

• HP air used for A/C, pressurization, engine start, anti-ice

•Pneumatic sources:

- Engine 1 & 2 bleed systems
- APU bleed
- External HP air

The Pneumatic system is used to supply High Pressure (HP) air for air conditioning, pressurization, Fuel Tank Inerting System (FTIS), engine start and anti-icing. HP air can be supplied from the two engines, the APU or an external ground source.

ENGINE BLEED

• Air is bled from the HP stages

The engine bleed air is pressure regulated and temperature controlled before it supplies the aircraft pneumatic system.

Air is bled from the engine High Pressure Compressor (HPC) stages: HP3 via an Intermediate Pressure Check Valve (IPCV) and HP8 via the HP Valve (HPV).

• HP air is only used at low power

•Electro-pneumatic valves

The High Pressure Bleed Valve (HPV) supplies air to the system when the engine is at low power. When the Intermediate Pressure (IP) bleed is sufficient, the HPV closes.

The bleed valves are electro-pneumatically controlled.

• PRV for pressure regulation and shut-off

•OPV mechanical overpressure protection

The Pressure Regulating Valve (PRV) installed downstream the IPCV and HPV regulates the bleed pressure.

Each Bleed Monitoring Computer (BMC) controls and monitors its engine bleed system and the opposite.

An Overpressure Valve (OPV) is installed downstream from the bleed valve as a protection of the system if the pressure is too high.

• This precooler uses cool air from the fan to regulate the temperature

The engine bleed air is temperature regulated. The hot bleed air goes through an air-to-air heat exchanger called Precooler. Fan discharge air, modulated by the Fan Air Valve (FAV), is blown across the precooler to keep the temperature within limits.

APU BLEED/EXTERNAL AIR

• Crossbleed valve enables interconnection or isolation

The left and right bleed systems are connected by a crossbleed duct. A Crossbleed valve is used for their interconnection or isolation.

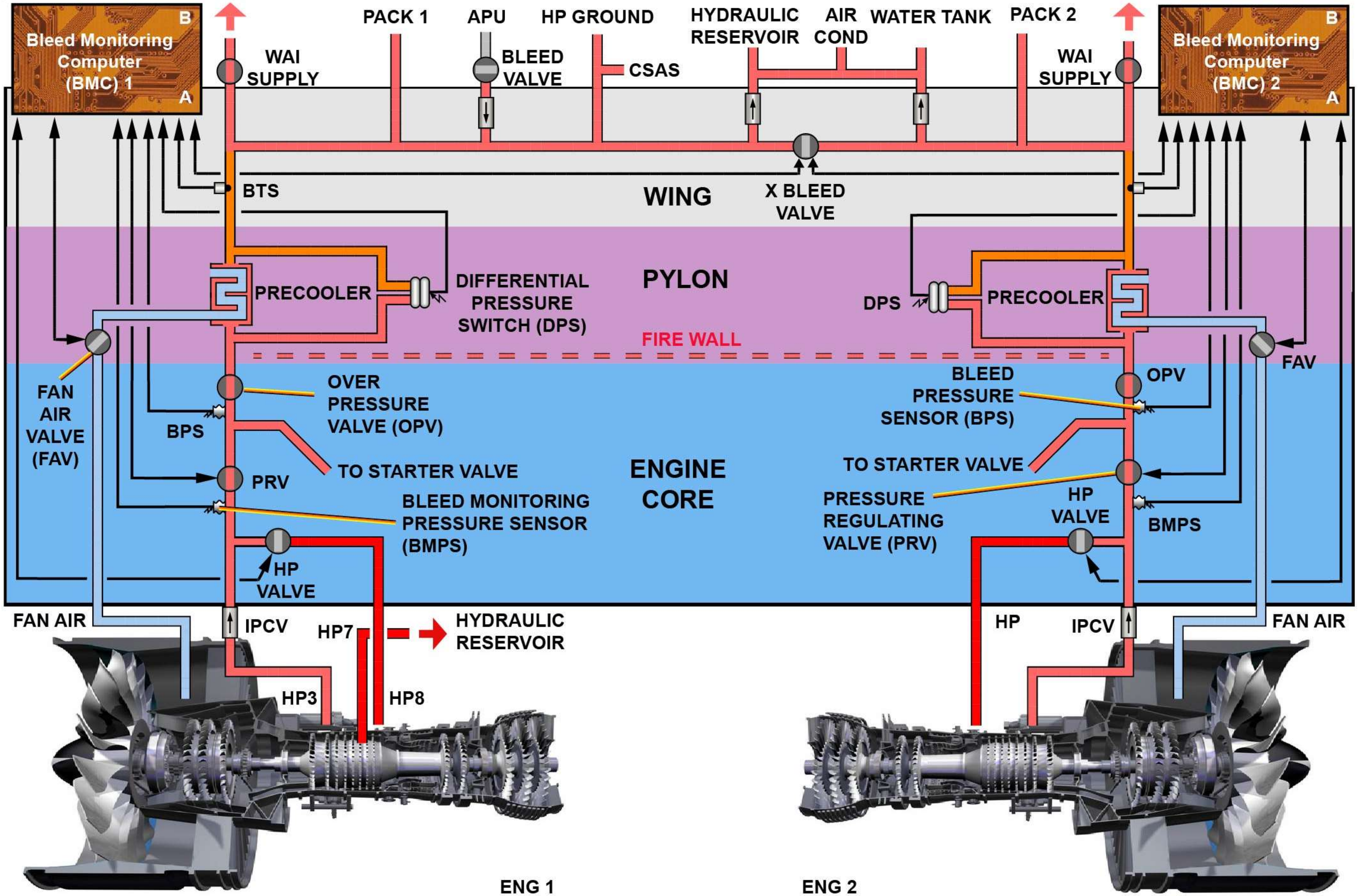
• APU bleed air supply is available on the ground or in flight

The APU can also be used for bleed air supply. This is usually done on the ground for air conditioning and for engine start.

But APU BLEED air can also be used in flight, in relation to the altitude. The altitude can be different for each aircraft. These altitude limits are given by the manufacturer. The APU bleed supply is connected to the left side of the crossbleed duct.

• HP ground power unit can be connected

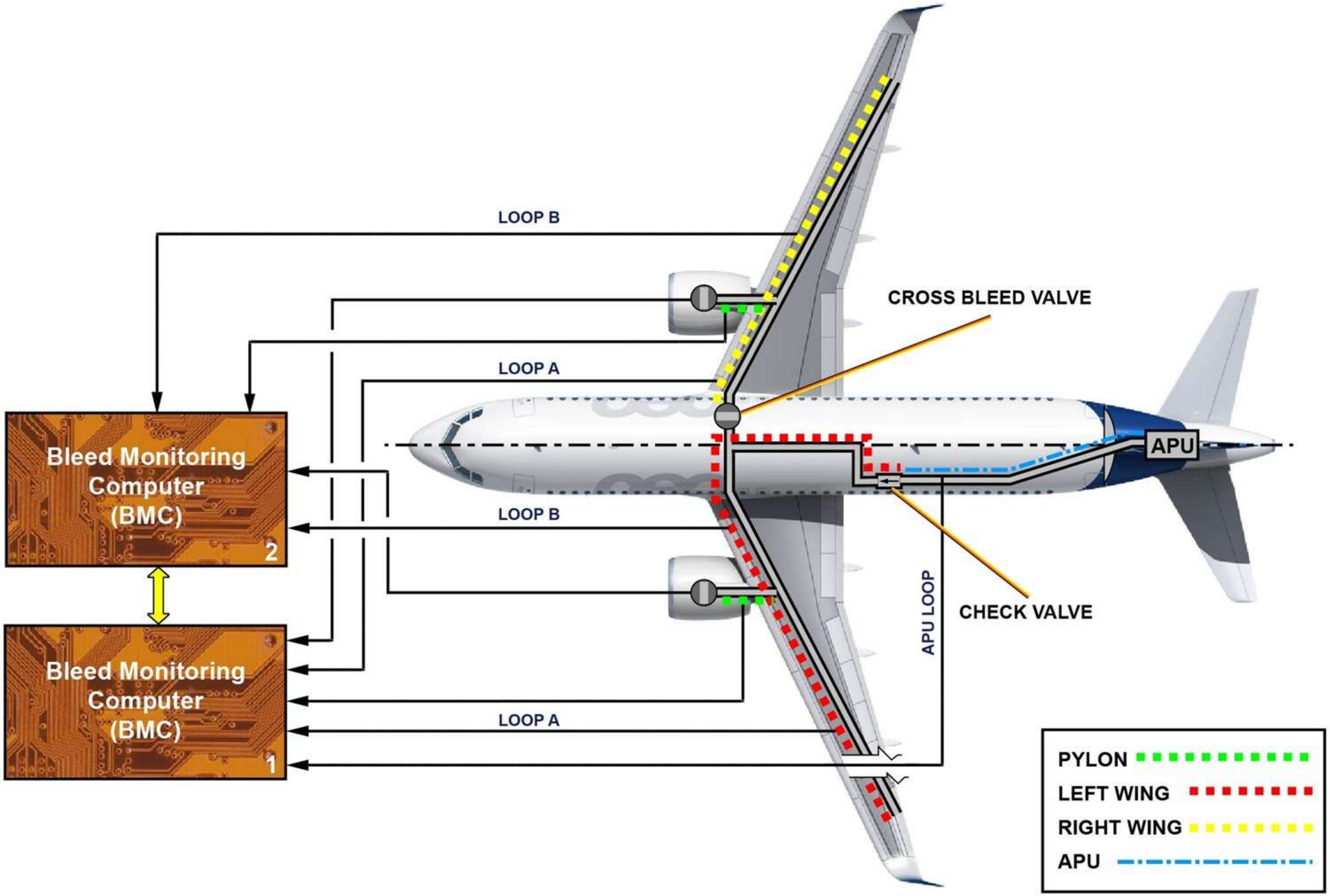
On the ground, a HP ground power unit can be connected to the left side pneumatic system. The right side can be supplied by opening the crossbleed valve.


Bleed Monitoring Computer (BMC) 1
B
A
WAI SUPPLY
PACK 1
APU
BLEED VALVE
HP GROUND
CSAS
HYDRAULIC RESERVOIR
AIR COND
WATER TANK
PACK 2
WAI SUPPLY
Bleed Monitoring Computer (BMC) 2
BTS
WING
X BLEED VALVE
PRECOOLER
DIFFERENTIAL PRESSURE SWITCH (DPS)
PYLON
FIRE WALL
DPS
PRECOOLER
FAN AIR VALVE (FAV)
FAV
OVER PRESSURE VALVE (OPV)
OPV
BPS
BLEED PRESSURE SENSOR (BPS)
TO STARTER VALVE
TO STARTER VALVE
PRV
ENGINE CORE
PRESSURE REGULATING VALVE (PRV)
BLEED MONITORING PRESSURE SENSOR (BMPS)
HP VALVE
BMPS
HP VALVE
FAN AIR
IPCV
HP7
HYDRAULIC RESERVOIR
HP
IPCV
FAN AIR
HP3
HP8
ENG 1
ENG 2

LEAK DETECTION

- Leak detection loops installed
    - Connected to BMCs
- Protected areas
    - Pylon
    - APU supply duct
    - Wings and belly fairing

Leak detection loops are installed along the hot air supply ducts of the pneumatic system and are connected to the BMCs. The leak detection system is organized into three loops. Here are the loops and the protected areas:
- PYLON: the precooler outlet area,
- WING: wing leading edge and belly fairing,
- APU: APU aft supply duct (left hand side of the fuselage) from APU firewall to wheel well area.


LOOP B
CROSS BLEED VALVE
LOOP A
Bleed Monitoring Computer (BMC)
2
LOOP B
APU
APU LOOP
CHECK VALVE
Bleed Monitoring Computer (BMC)
1
LOOP A
PYLON
LEFT WING
RIGHT WING
APU

COMPONENT LOCATION

- Component location:
  - Pressure regulation components
  - Temperature regulation components

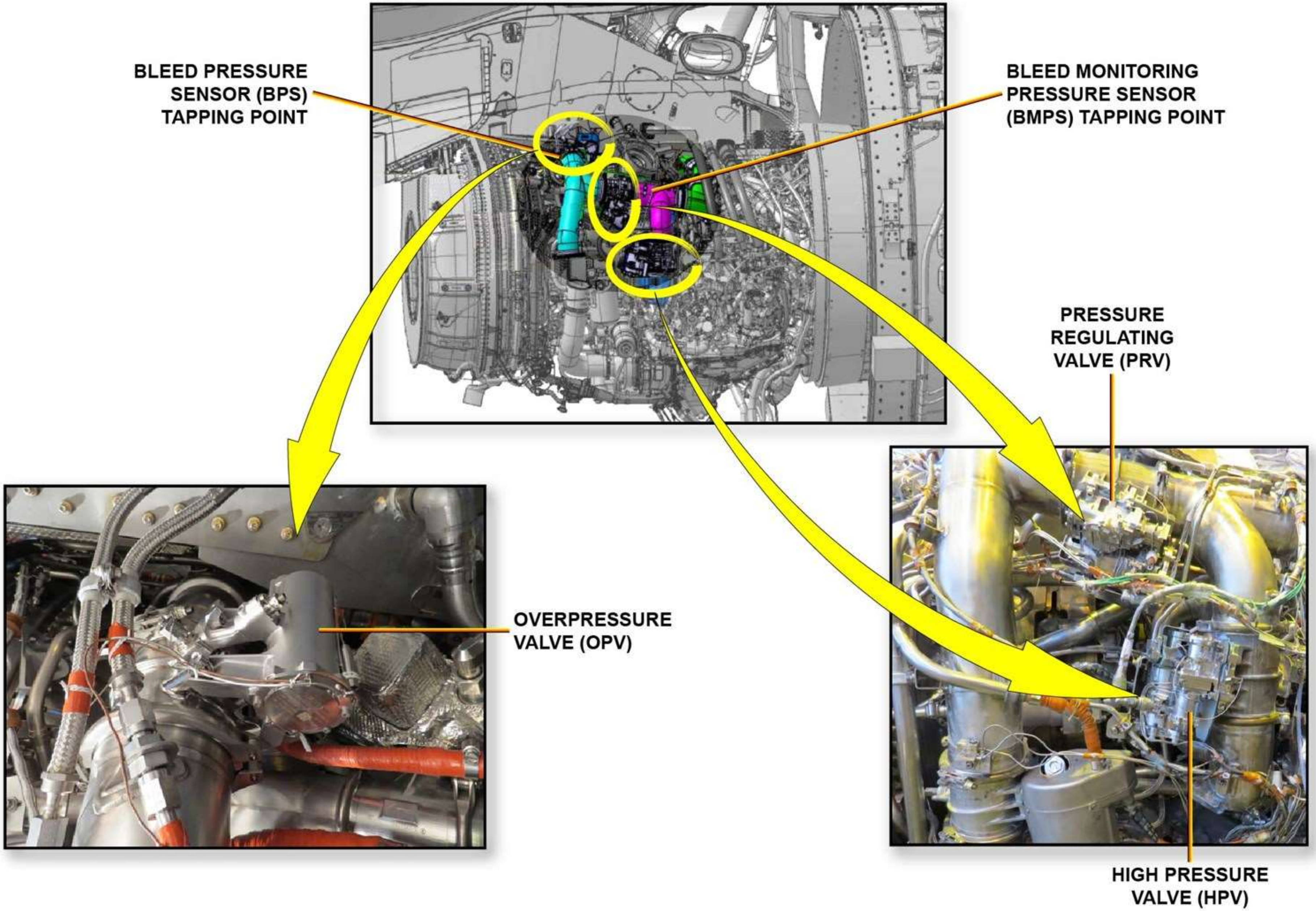
The primary components of the pneumatic system are installed on the engines and in the pylons.

PRESSURE REGULATION COMPONENTS

- The pressure regulation components are on the engines

The pressure regulation components on the engines are the:
- Engine HPV,
- Engine BLEED PRV,
- OPV,
- Bleed Monitoring Pressure Sensor (BMPS),
- Bleed Pressure Sensor (BPS),
- Differential Pressure Sensor (DPS).

To get access, open the right fan cowl and thrust reverser cowl

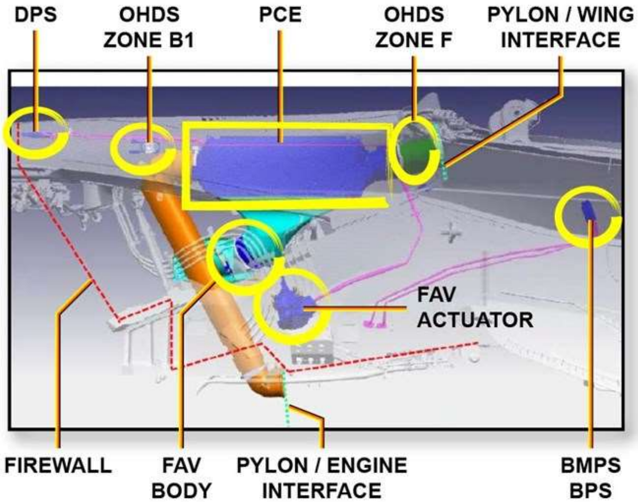

BLEED PRESSURE SENSOR (BPS) TAPPING POINT
BLEED MONITORING PRESSURE SENSOR (BMPS) TAPPING POINT
PRESSURE REGULATING VALVE (PRV)
OVERPRESSURE VALVE (OPV)
HIGH PRESSURE VALVE (HPV)

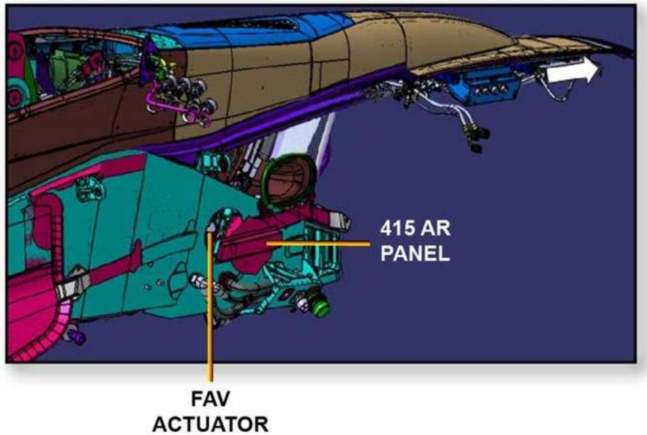
TEMPERATURE REGULATION COMPONENTS

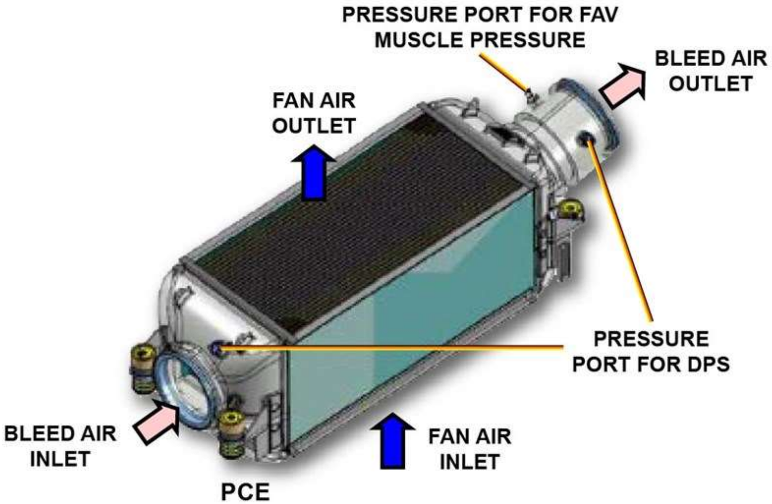
• The temperature regulation components are in the pylons

The temperature regulation components are in the pylons:

- the FAV,
- the Precooler,
- the Bleed Temperature Sensor (BTS).







BMPS: Bleed Monitoring Pressure Sensor
BPS: Bleed Pressure Sensor
DPS: Differential Pressure Sensor
FAV: Fan Air Valve
OHDS: OverHeat Detection System
PCE: Precooler Exchanger

OTHER COMPONENTS

Crossbleed valve in belly fairing

The Crossbleed valve is in the forward section of the lower fuselage belly fairing area.

• HP Ground Connector in belly fairing

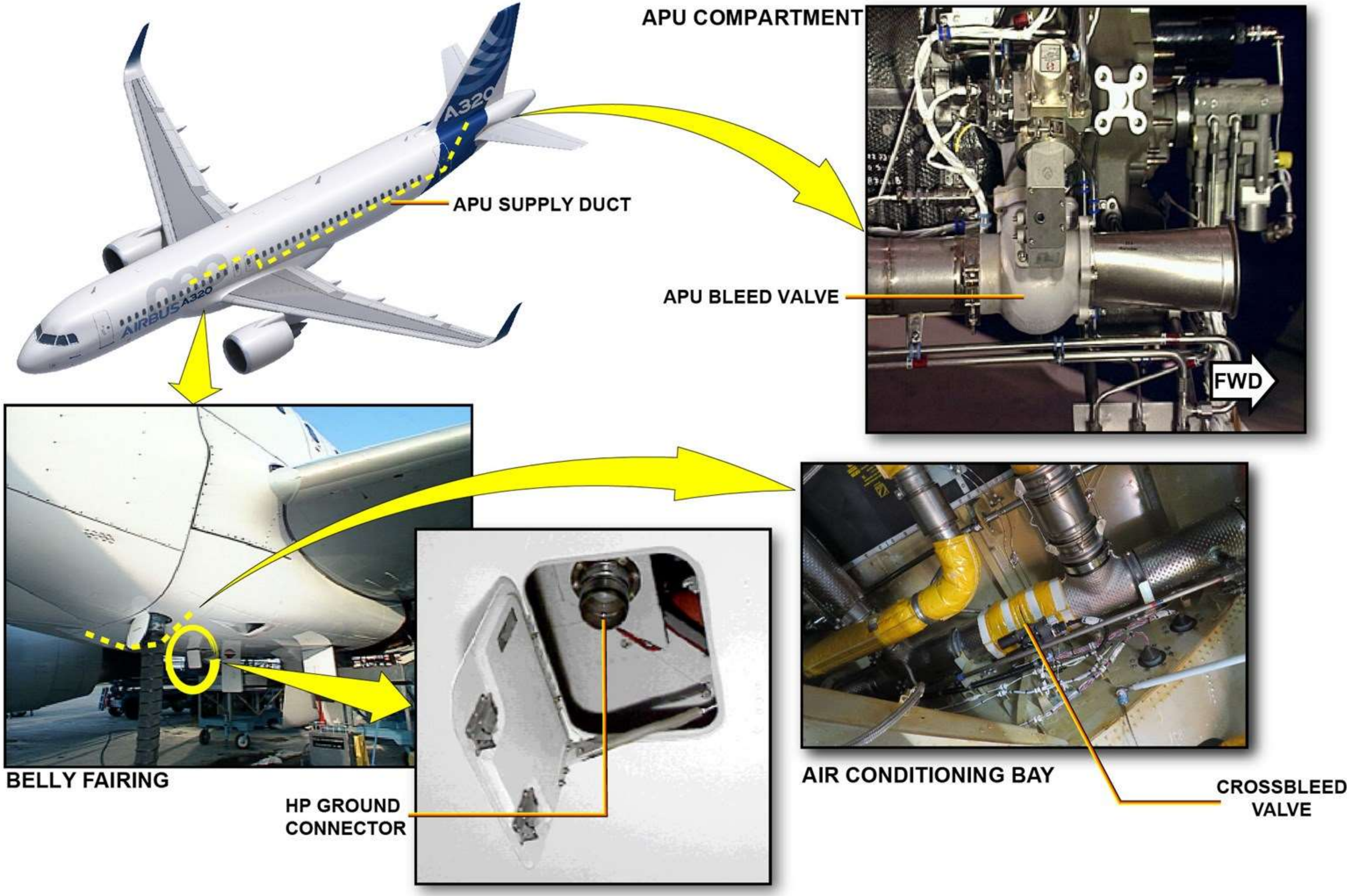
The access to the HP ground connector is through a small access door on the lower fuselage belly fairing.

• APU bleed valve in the APU compartment

The APU bleed valve is on the APU.

• Pneumatic supply line along the left hand side of the fuselage to the wheel well area

The APU supply duct is installed along the left hand side of the fuselage to the wheel well area and is connected to the crossbleed duct in the forward belly fairing area.


APU COMPARTMENT
APU SUPPLY DUCT
APU BLEED VALVE
FWD
BELLY FAIRING
HP GROUND
CONNECTOR
AIR CONDITIONING BAY
CROSSBLEED
VALVE

Engine Bleed System Description

GENERAL
IPCKV
HPV
PRV
OPV
Comp loc Pylon LH
FAV
BMPS
BPS
DPS
BTS
Comp loc FWD Avio Bay BMC 1 / 2

• EBAS supplies pressure and temperature regulated airflow
•In normal operation: Bleed systems isolated by XBLEED valve
- Except during 2nd engine start
- Except during under APU bleed

•Pressure regulation controlled and monitored by 2 BMCs
•NEO characteristics:
- Higher bleed air temperatures during
- HP operation
- Lower air pressure during IP operation
- Lower fan pressures for cooling air flow supply
- Limited space for installation (new pylon config)
- New design of the electro-pneumatic bleed air systemNEO.

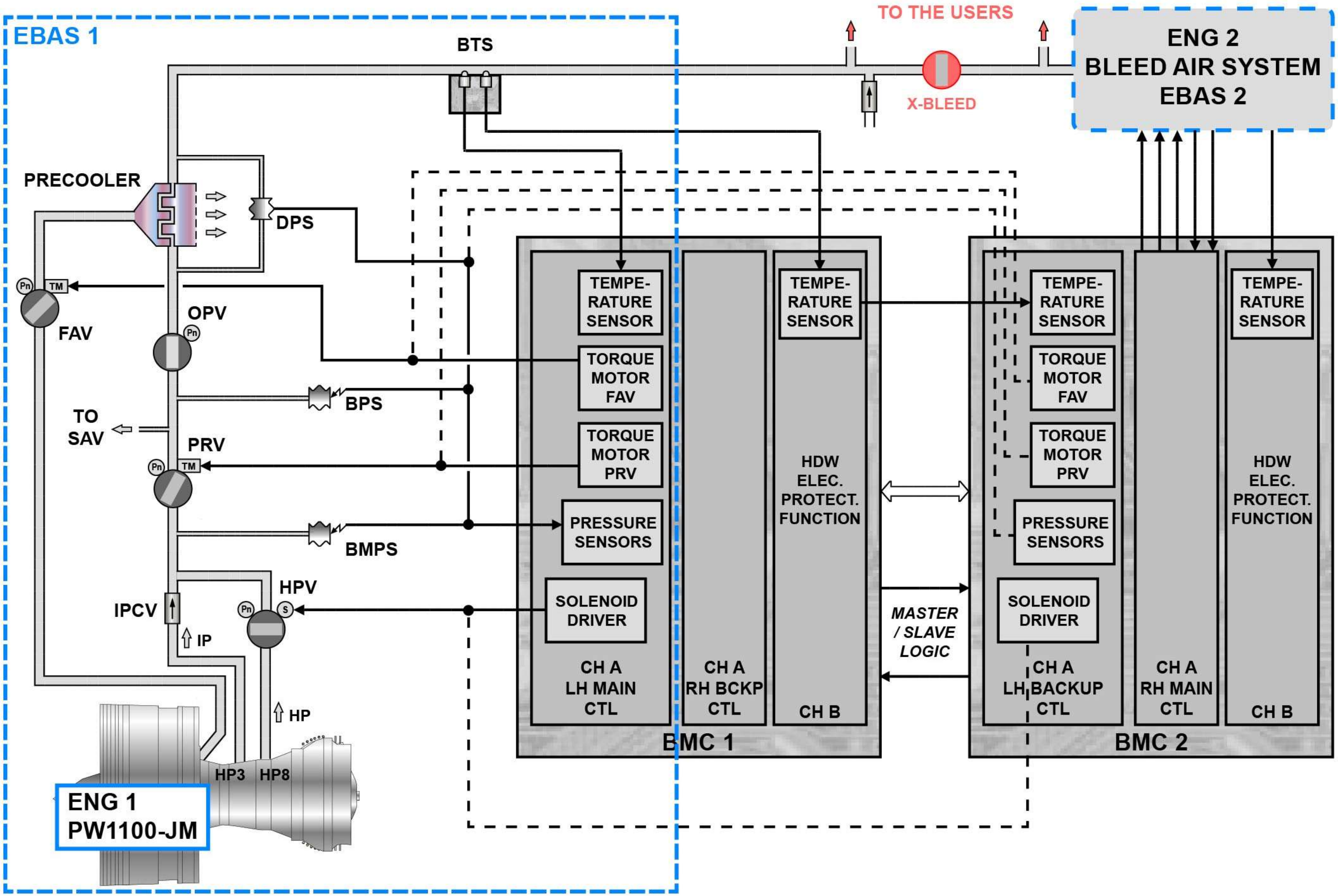
•Engine bleed air:
- Pneumatically regulated by the HP VLV or the PRV
- Monitoring by the BMCs

The Engine Bleed Air System (EBAS) supplies pressure and temperature regulated airflow from each engine to the air system users.

During normal operation, each engine bleed system is isolated from adjacent system by the Crossbleed valve; except during 2nd engine starting using air bled from 1st started engine, Crossbleed valve opened or under APU Bleed.

The pressure regulation system is controlled and monitored by two Bleed Monitoring Computers (BMCs).
As compared to A320 CEO,
the NEO engine has higher bleed air temperatures during High Pressure (HP) operation, lower air pressure during Intermediate Pressure (IP)

operation, lower fan pressures for cooling air flow supply and limited space for installation due to new pylon configuration. Toachieve better performance requirements a new electro-pneumatic bleed air system is designed for A320 NEO.

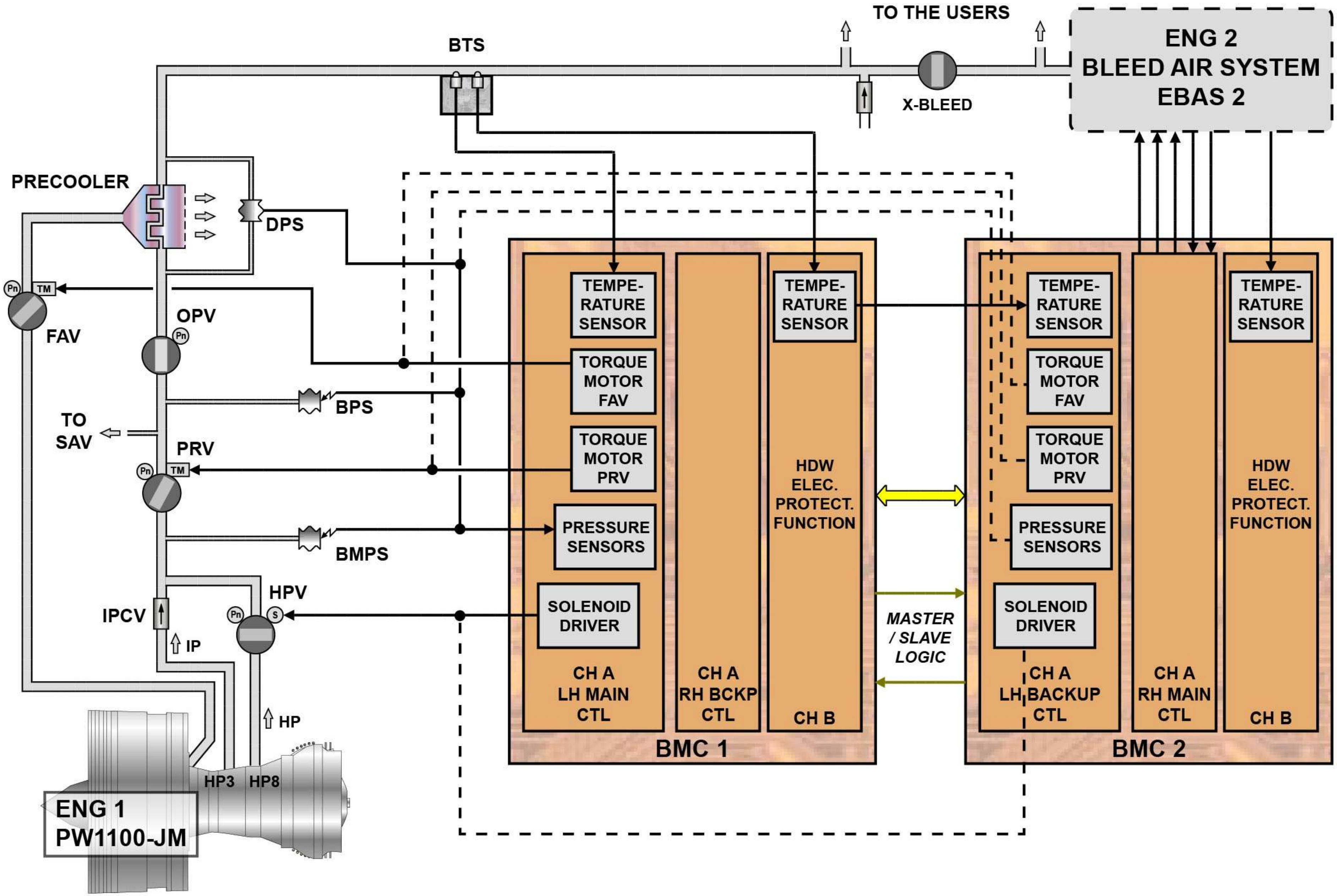

EBAS 1
BTS
TO THE USERS
X-BLEED
ENG 2
BLEED AIR SYSTEM
EBAS 2
PRECOOLER
DPS
FAV
OPV
BPS
TO
SAV
PRV
BMPS
HPV
IPCV
IP
HP
HP3
HP8
ENG 1
PW1100-JM
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH MAIN
CTL
CH A
RH BCKP
CTL
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
BMC 2

BMC

•2 BMCs interconnected control & monitor
•Each BMC has a full digital channel A with:

- Its side Main control software
- Opposite side back-up control software
- And a fully hardware part channel B as Electrical Protection function

Normally BMC 1 Channel A does all the control and monitoring of the LH EBAS and BMC 2 Channel A the RH EBAS.
Each BMC channel A controls torque-motor and solenoid for the electro-pneumatic valves, monitors sensors. As both BMC interface, each one is capable to control both sides.
The channel B is a fully hardware part able to detect the system overtemperature: Electrical Protection Function (EPS). This detection is fully independent from software part.
Each BMC reports the failures independently of each other.


TO THE USERS
BTS
X-BLEED
ENG 2
BLEED AIR SYSTEM
EBAS 2
PRECOOLER
DPS
FAV
OPV
BPS
TO
SAV
PRV
BMPS
IPCV
IP
HPV
HP
HP3
HP8
ENG 1
PW1100-JM
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH MAIN
CTL
CH A
RH BCKP
CTL
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
BMC 2

HPC

HP VALVE (HPV)

• Characteristics:
- 4 inch diameter
- Inconel
- Pneumatically actuated
- Electrically commanded
- Shut-off butterfly valve

•HPV:
- Regulates pressure between 15 and 65 psi
- Forced to close if PRV is closed
- Manual override and test port

The engine air bleed pressure is pneumatically regulated by the HP Valve (HPV) when air is supplied by the High Pressure Compressor (HPC) stage or directly by the Pressure Regulating Valve (PRV) when the air is supplied by the Intermediate Pressure (IP) HPC stage.

− Intermediate-pressure service port: IP is defined by HP3.

− High-pressure service port: HP is defined by HP8.

The HPV lets air to be bled from the engine HP stage at lower power settings. It is a pressure regulating and shut-off valve with a butterfly closure element. It regulates the pressure of the bleed air between 15 and 65 psig. With the Solenoid energized, the minimum upstream muscle pressure needed to operate the valve is 15 psig. When the solenoid is not energized, the HPV is commanded to the full closed position.

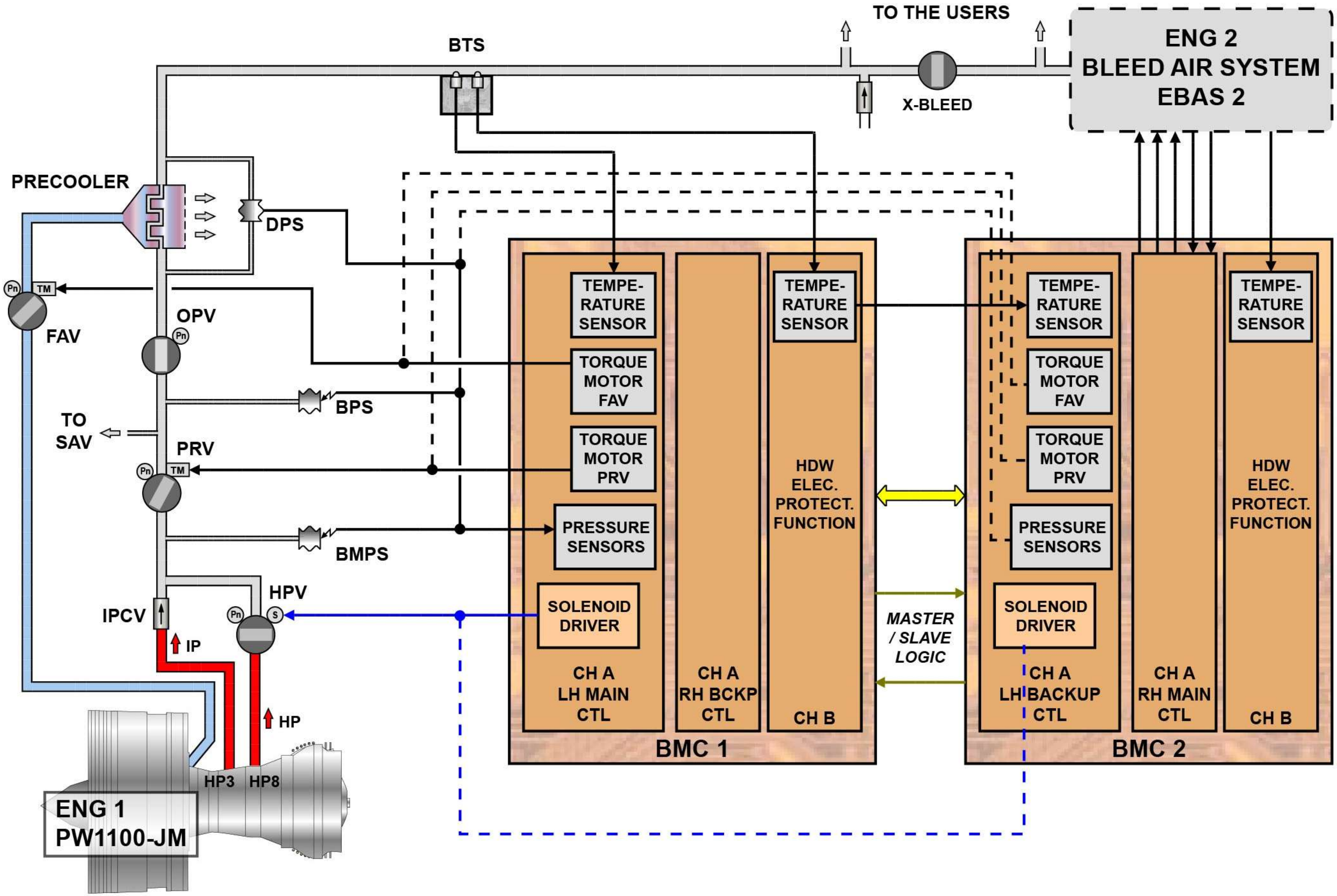
When the solenoid is energized but without pressure in the valve body, the HPV stays closed.

The HPV is forced to close when the PRV is closed. The valve has a manual override and test port for pneumatic test in-situ.

IP CHECK VALVE (IPCV)

• IPCV protects the IP stage from reverse flow

An Intermediate Pressure Check Valve (IPCV) lets air to be bled from the engine IP stage. It is closed when air is bled from HP stage. The purpose of this IPCV is to allow the flow from IP stage and avoid the reverse flow from either the HP port or the pneumatic manifold.


TO THE USERS
BTS
X-BLEED
ENG 2
BLEED AIR SYSTEM
EBAS 2
PRECOOLER
DPS
FAV
OPV
BPS
TO
SAV
PRV
BMPS
HPV
IPCV
IP
HP
HP3
HP8
ENG 1
PW1100-JM
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH MAIN
CTL
CH A
RH BCKP
CTL
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
BMC 2

PRESSURE REGULATING VALVE (PRV)

• Characteristics:

- 4 inch diameter
- Inconel
- Pneumatically actuated
- Electrically commanded pressure regulating
- Shut-off butterfly valve

•PRV:

- Regulates bleed pressure around 42 psig in dual bleeds (50 psig in single bleed) - closed at 60 psi
- Operates as a shut off valve i.e. failsafe closed

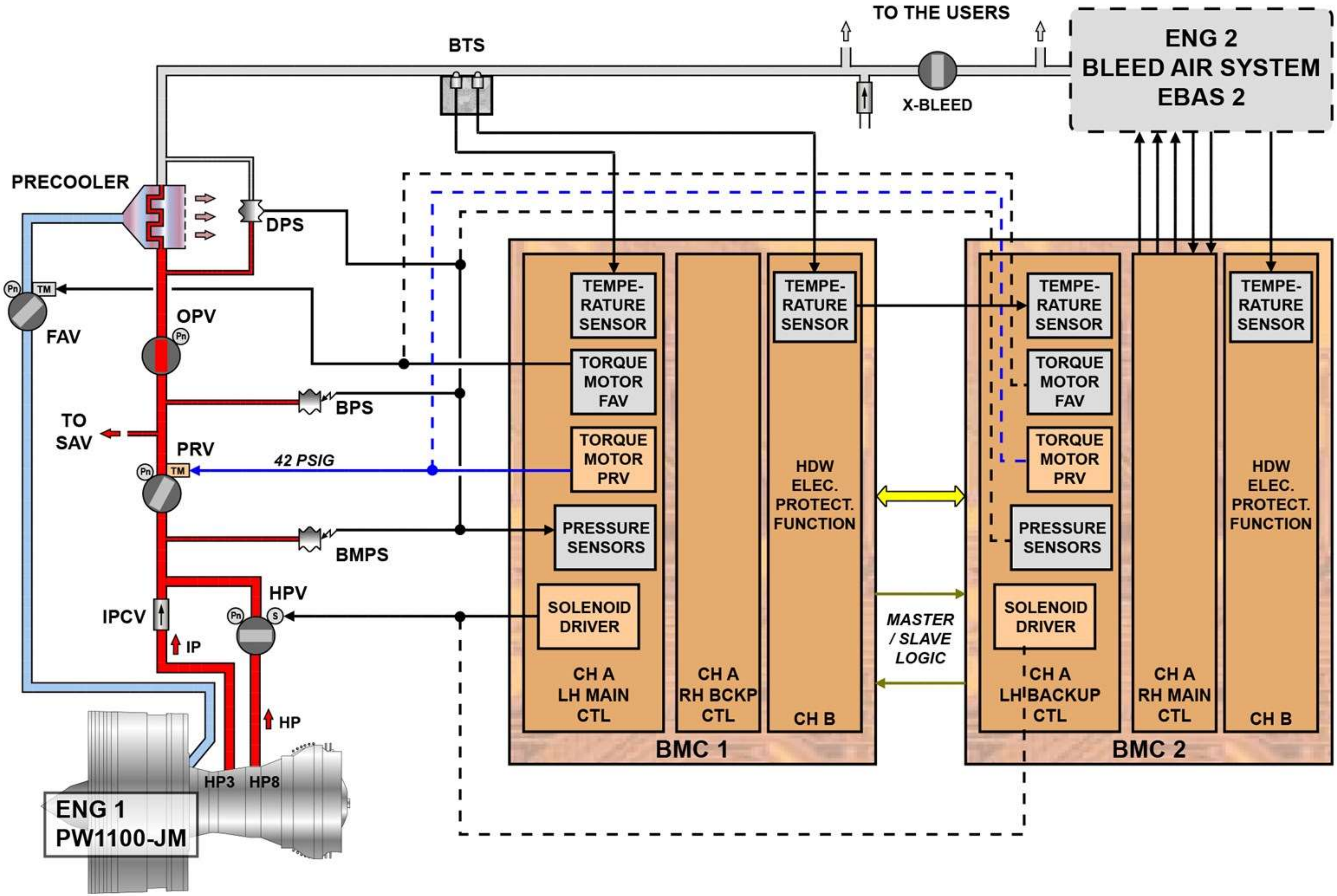
The Pressure Regulating Valve (PRV) is a 4 inch diameter butterfly valve, installed downstream of the IPCV and HPV.
It regulates the pressure of the bleed air at 42 +- 2 psig in normal dual bleed operation (50 +- 2 psig in single bleed operation).
Its setting is modulated by the electric command on the torque-motor.
When the torque-motor is de-energized, the PRV is commanded to the full closed position.
When the torque-motor is energized but without pressure, the PRV stays closed.
With the torque-motor energized, the minimum upstream muscle pressure needed to operate the valve is 15 psig.
The PRV operates as a shut off valve when abnormal conditions occur.
The valve has a manual override and test port for pneumatic test in-situ.

OVERPRESSURE VALVE (OPV)

• Characteristics:

- 4 inch diameter
- Stainless Steel
- Butterfly valve
- Normally open
- Starts to close at 75 psig and is fully closed at 90 psig
- Re-opens again between 43 and 59 psig

The Overpressure Valve (OPV) downstream of the PRV in the engine core, protects the system against damage if overpressure occurs.
It operates pneumatically. The OPV, normally in spring-loaded open position will be fully closed if bleed pressure reaches 90 psig.
The valve has a manual override and test port for pneumatic test in-situ.


TO THE USERS
BTS
ENG 2
BLEED AIR SYSTEM
EBAS 2
X-BLEED
PRECOOLER
DPS
FAV
OPV
TO SAV
PRV
42 PSIG
BPS
BMPS
IPCV
IP
HPV
HP
HP3
HP8
ENG 1
PW1100-JM
TEMPE-RATURE SENSOR
TORQUE MOTOR FAV
TORQUE MOTOR PRV
PRESSURE SENSORS
SOLENOID DRIVER
CH A LH MAIN CTL
CH A RH BCKP CTL
HDW ELEC. PROTECT. FUNCTION
CH B
BMC 1
MASTER / SLAVE LOGIC
TEMPE-RATURE SENSOR
TORQUE MOTOR FAV
TORQUE MOTOR PRV
PRESSURE SENSORS
SOLENOID DRIVER
CH A LH BACKUP CTL
CH A RH MAIN CTL
TEMPE-RATURE SENSOR
HDW ELEC. PROTECT. FUNCTION
CH B
BMC 2

PRESSURE SENSORS

BLEED MONITORING PRESSURE SENSOR (BMPS)

• Characteristics:
- Silicon type sensor
- Sense line tapping located upstream of the PRV
- Transmits the pressure to BMC

•HP/IP bleed port switching function
•HPV butterfly position, HPV and PRV monitoring

The Bleed Monitoring Pressure Sensor (BMPS) is used to perform bleed port switching function. It is also used to estimate the position of the HPV butterfly and to monitor the HPV and the PRV.

BLEED PRESSURE SENSOR (BPS)

• Characteristics:
- Silicon type sensor
- Sense line tapping located between PRV and OPV
- Transmits the pressure to BMC

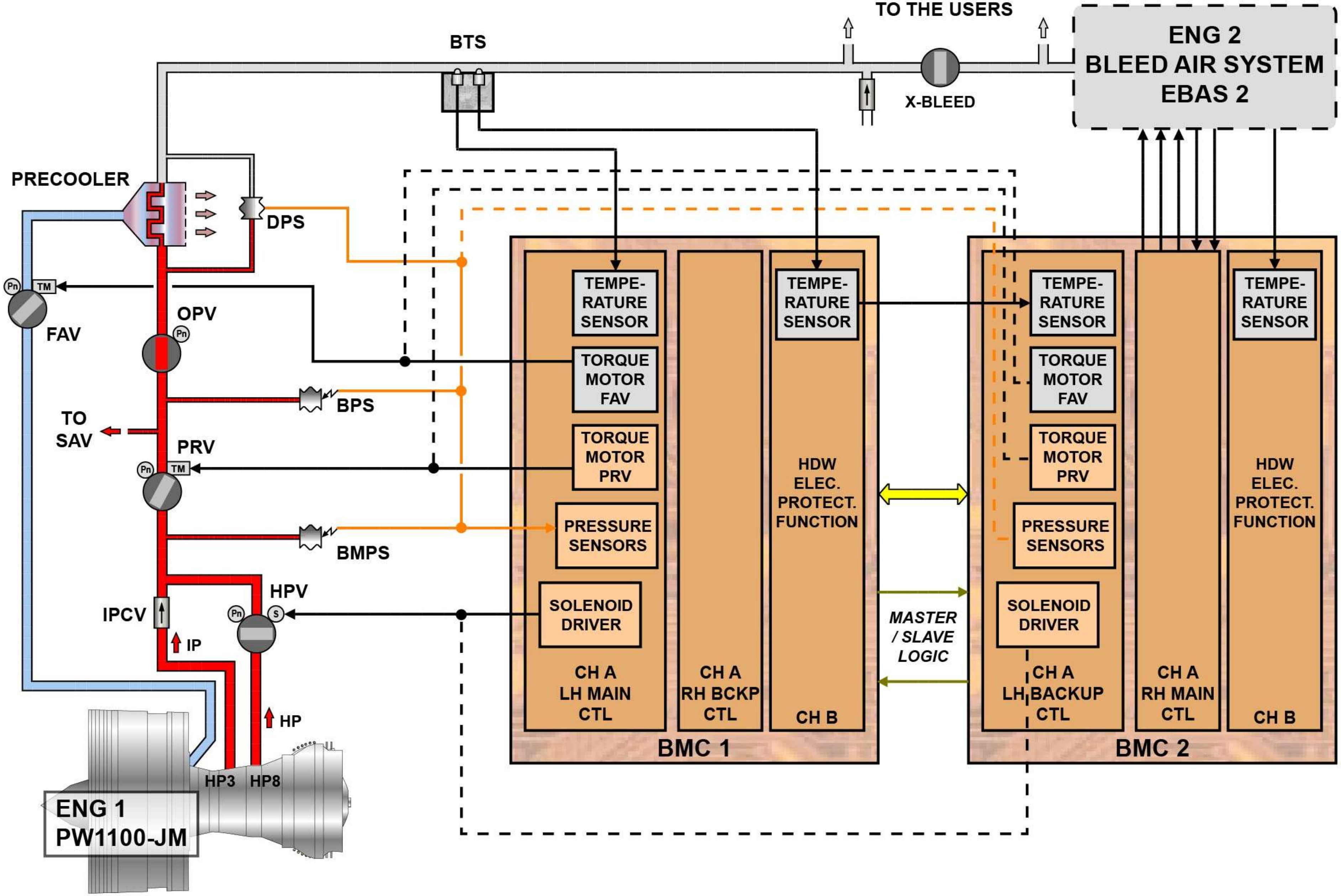
•Actual bleed air pressure control by BMC
•Overpressure and low pressure alarms

The Bleed Pressure Sensor (BPS) is installed downstream the PRV. It provides to BMC the actual bleed air pressure delivered through the PRV. This sensor is also used by the BMC for system monitoring (overpressure and low pressure alarms) and to monitor the position of the OPV butterfly.

DIFFERENTIAL PRESSURE SENSOR (DPS)

• Reverse flow protection

The Differential Pressure Sensor (DPS) ensures the reverse flow protection by sensing the differential pressure between Precooler hot side inlet and outlet. It also provides to the BMC an indication of the PRV and OPV position.


TO THE USERS
BTS
X-BLEED
ENG 2
BLEED AIR SYSTEM
EBAS 2
PRECOOLER
DPS
FAV
OPV
BPS
TO SAV
PRV
BMPS
IPCV
IP
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TEMPE-RATURE SENSOR
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BMC 1
MASTER / SLAVE LOGIC
TEMPE-RATURE SENSOR
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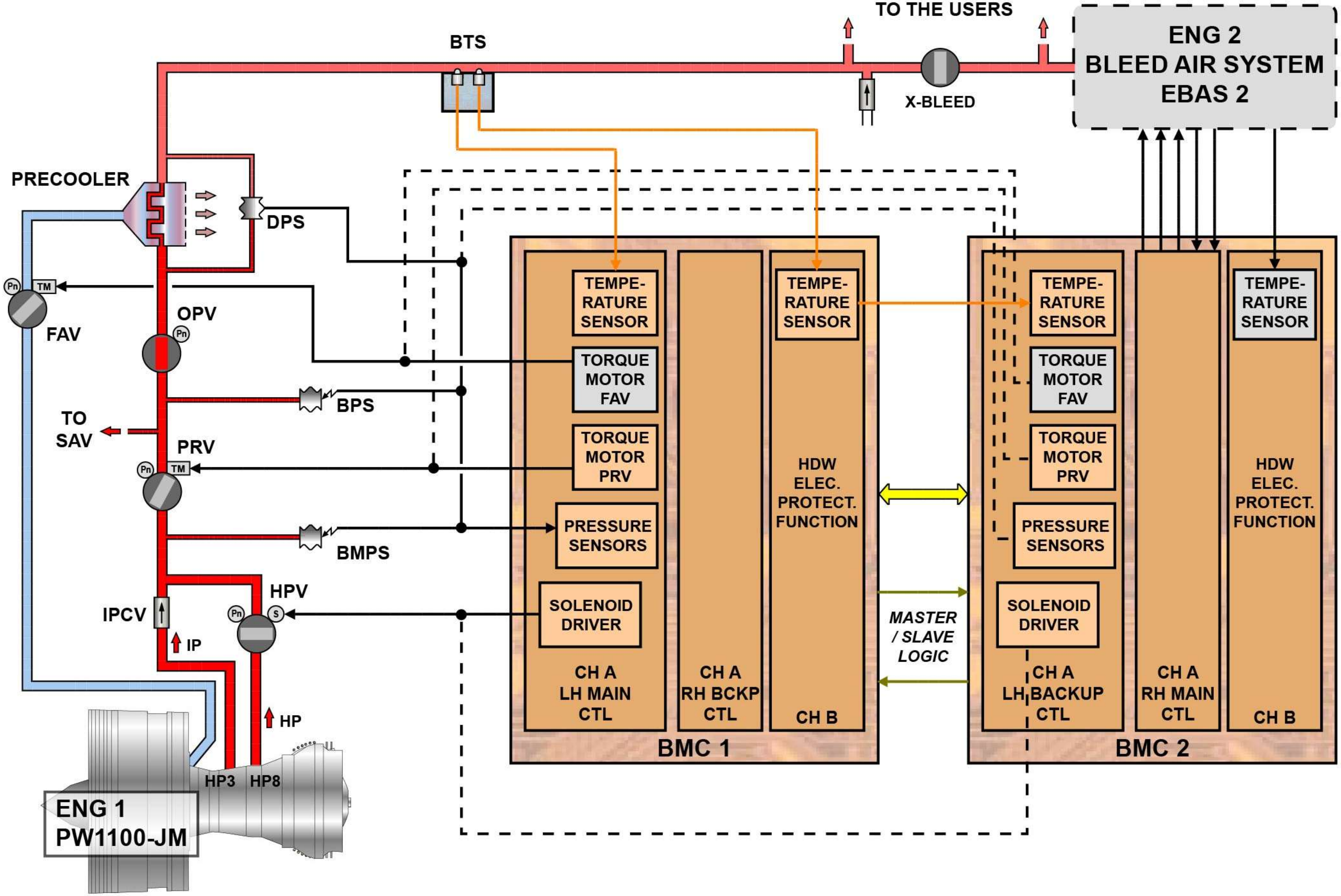
TORQUE MOTOR PRV
PRESSURE SENSORS
SOLENOID DRIVER
CH A LH BACKUP CTL
CH A RH MAIN CTL
TEMPE-RATURE SENSOR
HDW ELEC. PROTECT. FUNCTION
CH B
BMC 2

BLEED TEMPERATURE SENSOR (BTS)

• PT500 Type dual sensor
•Temperature signals to CH.A & B plus to Ch. A of the other BMC
•Overtemperature and low temperature alarms

The dual Bleed Temperature Sensor (BTS) installed downstream the Precooler provides to the BMC the actual EBAS temperature.
The BMC uses EBAS temperature to position the Fan Air Valve (FAV).
The wiring connected to channel A of the BTS is fully segregated from the wiring connected to channel B.
Both BMCs interchange temperature measurements and can carry out both sides temperature regulation.
This dual sensor is also used by the BMCs for system monitoring (overtemperature and low temperature alarms).

NOTE: Channel B of one BMC is connected to Channel A of the other BMC, so that in case of loss of temperature monitoring and control in Channel A of one side, the opposite controller can take over control of the whole EBAS.


TO THE USERS
BTS
ENG 2
BLEED AIR SYSTEM
EBAS 2
X-BLEED
PRECOOLER
DPS
Pn
TM
FAV
OPV
Pn
BPS
TO
SAV
PRV
Pn
TM
BMPS
HPV
IPCV
Pn
S
IP
HP
HP3
HP8
ENG 1
PW1100-JM
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH MAIN
CTL
CH A
RH BCKP
CTL
TEMPE-
RATURE
SENSOR
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
TEMPE-
RATURE
SENSOR
TORQUE
MOTOR
FAV
TORQUE
MOTOR
PRV
PRESSURE
SENSORS
SOLENOID
DRIVER
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
TEMPE-
RATURE
SENSOR
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 2

TEMPERATURE REGULATION

FAN AIR VALVE (FAV)

• Characteristics:

- 6 inch Aluminium alloy
- Actuated butterfly valve
- Regulates the fan airflow

•Fan airflow through Precooler for temperature regulation:

- At 200ºC (392�F) norm config
- or 160ºC (320�F) in Climb and Hold with 2 bleeds and WAI off

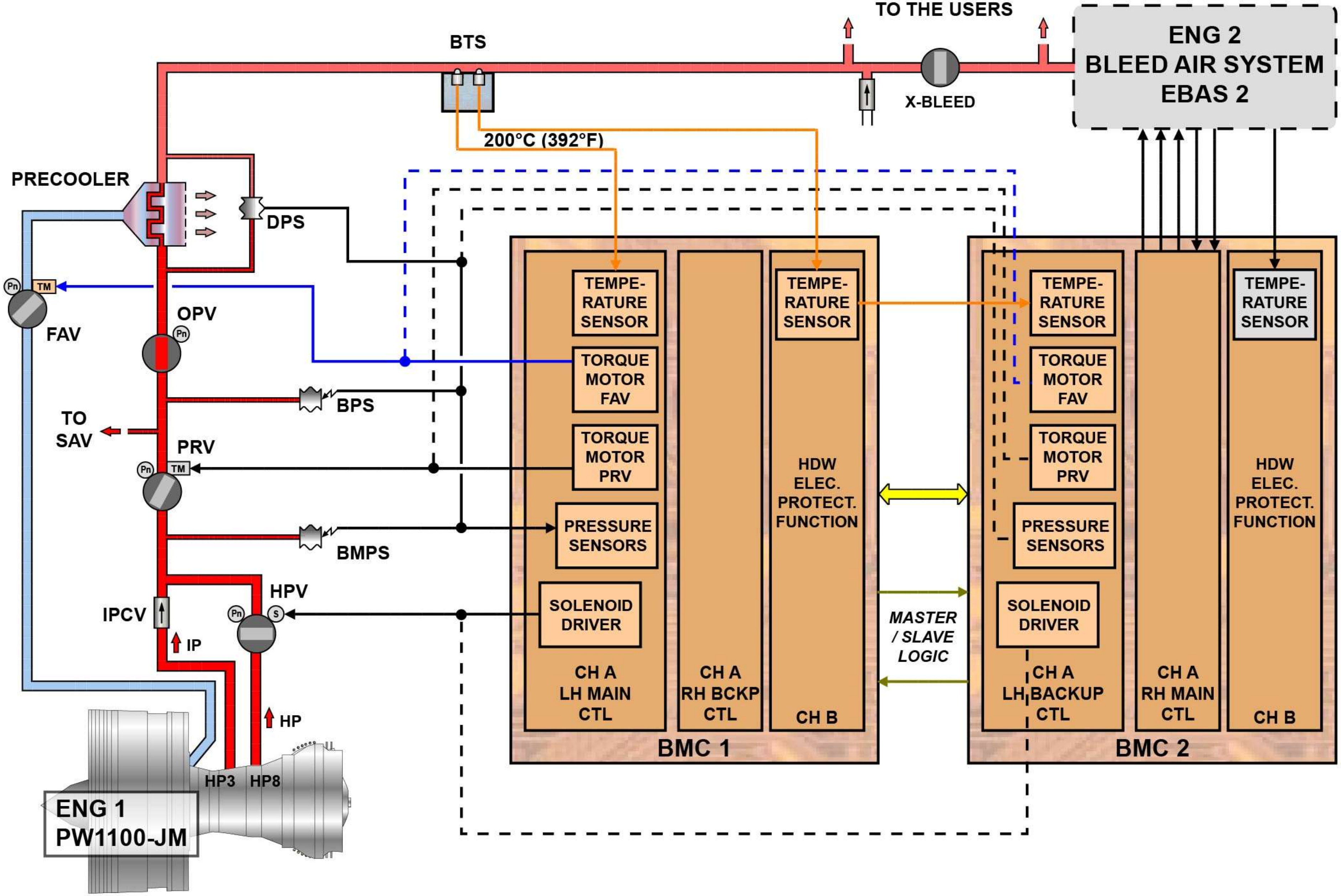
•With no electrical power and enough muscle pressure the FAV is full open

The FAV pneumatically regulates the fan airflow to the Precooler for bleed air temperature regulation.
The FAV butterfly valve actuator rod is adjusted by the BMC via a torque motor servo-control depending on BTS input.
The BMC set point is 200ºC (392�F) in normal operations and 160ºC (320�F) in Climb and Hold with 2 bleeds and Wing Anti-Ice (WAI) off.
With no electrical power and enough muscle pressure, the FAV valve is fully open.
The valve has a test port for pneumatic test in-situ.

PRECOOLER EXCHANGER

• Plate and fin, cross flow type air-to-air heat exchanger
•Made of stainless steel and nickel alloy
•Cools down hot from HPC using cooling flow from engine fan

The Precooler is a stainless steel and nickel alloy air-to-air heat exchanger.
It cools down the hot air supplied from the engine HP compressor stage by a heat exchange process with cooling flow taken from the engine fan.


TO THE USERS
BTS
X-BLEED
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BLEED AIR SYSTEM
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200°C (392°F)
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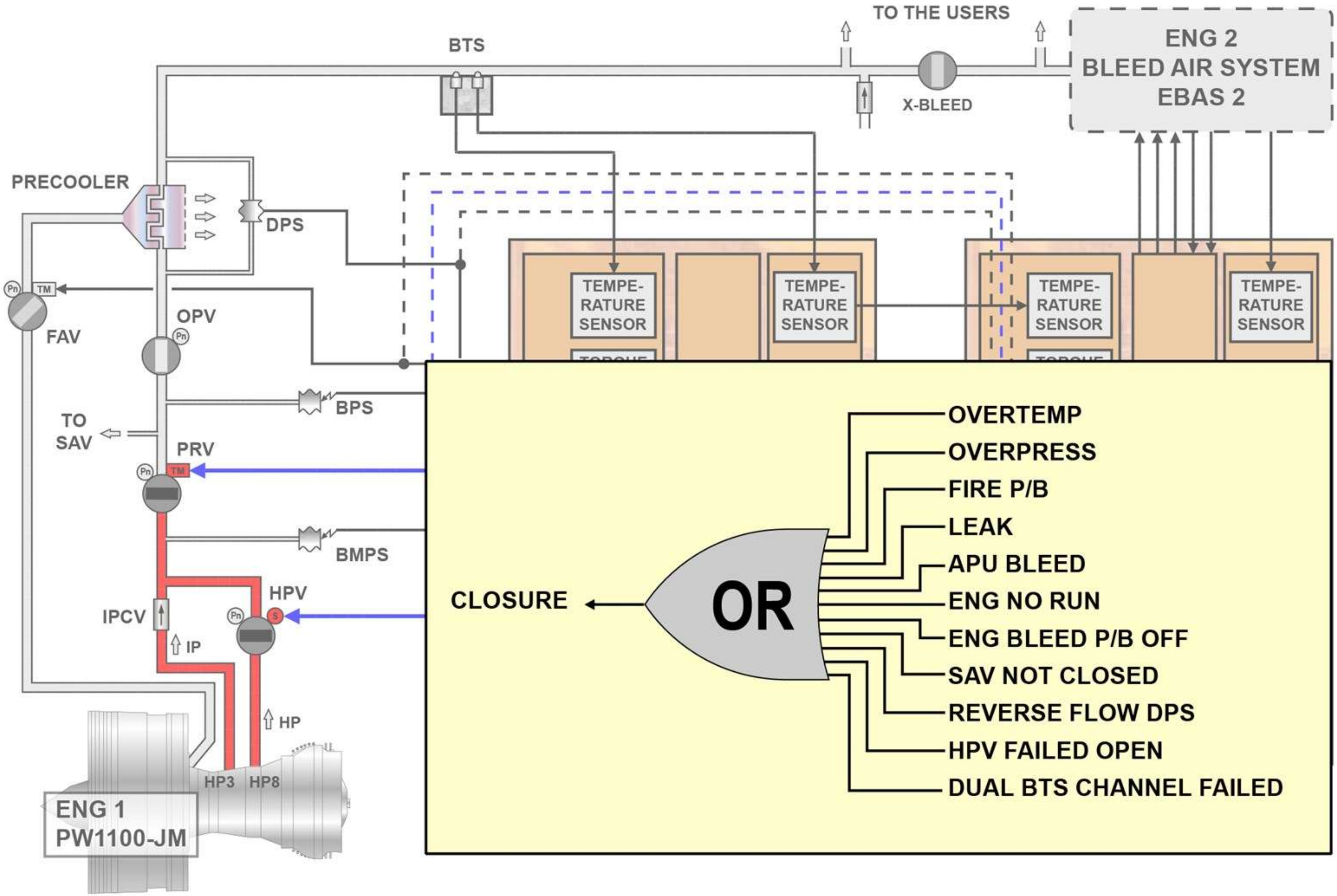
HDW
ELEC.
PROTECT.
FUNCTION
CH B
BMC 1
MASTER
/ SLAVE
LOGIC
CH A
LH BACKUP
CTL
CH A
RH MAIN
CTL
BMC 2

PROTECTION - ISOLATION

• PRV closure conditions (HPV also commanded)

The PRV operates as a shut-off valve. It is commanded to close in the following conditions:
- Over-temperature downstream of the Precooler (BTS):
257ºC (495�F) < T ≤ 270ºC (518�F) during 55s,
270ºC (518�F) < T ≤ 290ºC (554�F) for 15s,
T > 290ºC (554�F) for 5s.
- Overpressure downstream of the PRV > 60 º3 psig at BPS,
- Engine fire (consequence of crew action on the ENG FIRE P/B),
- Leak detection in pylon/wing/fuselage ducts surrounding areas,
- APU bleed valve not closed & APU BLEED P/B selected:
Depending on the Crossfeed Bleed Valve (CBV) position, only one PRV (left engine PRV if CBV is closed) or both (if XBleed is open).
- Reverse flow detected by DPS,
- ENG BLEED P/B selected OFF or ENG not running,
- Associated Starter Air Valve (SAV) not closed,
- HPV failed open,
- Dual BTS channels failed.


TO THE USERS
BTS
ENG 2
BLEED AIR SYSTEM
EBAS 2
X-BLEED
PRECOOLER
DPS
TEMPE-
RATURE
SENSOR
TEMPE-
RATURE
SENSOR
TEMPE-
RATURE
SENSOR
TEMPE-
RATURE
SENSOR
Pn
TM
FAV
OPV
BPS
TO
SAV
PRV
BMPS
HPV
IPCV
IP
HP
HP3
HP8
ENG 1
PW1100-JM
CLOSURE
OR
OVERTEMP
OVERPRESS
FIRE P/B
LEAK
APU BLEED
ENG NO RUN
ENG BLEED P/B OFF
SAV NOT CLOSED
REVERSE FLOW DPS
HPV FAILED OPEN
DUAL BTS CHANNEL FAILED

BMC Interfaces

BMC

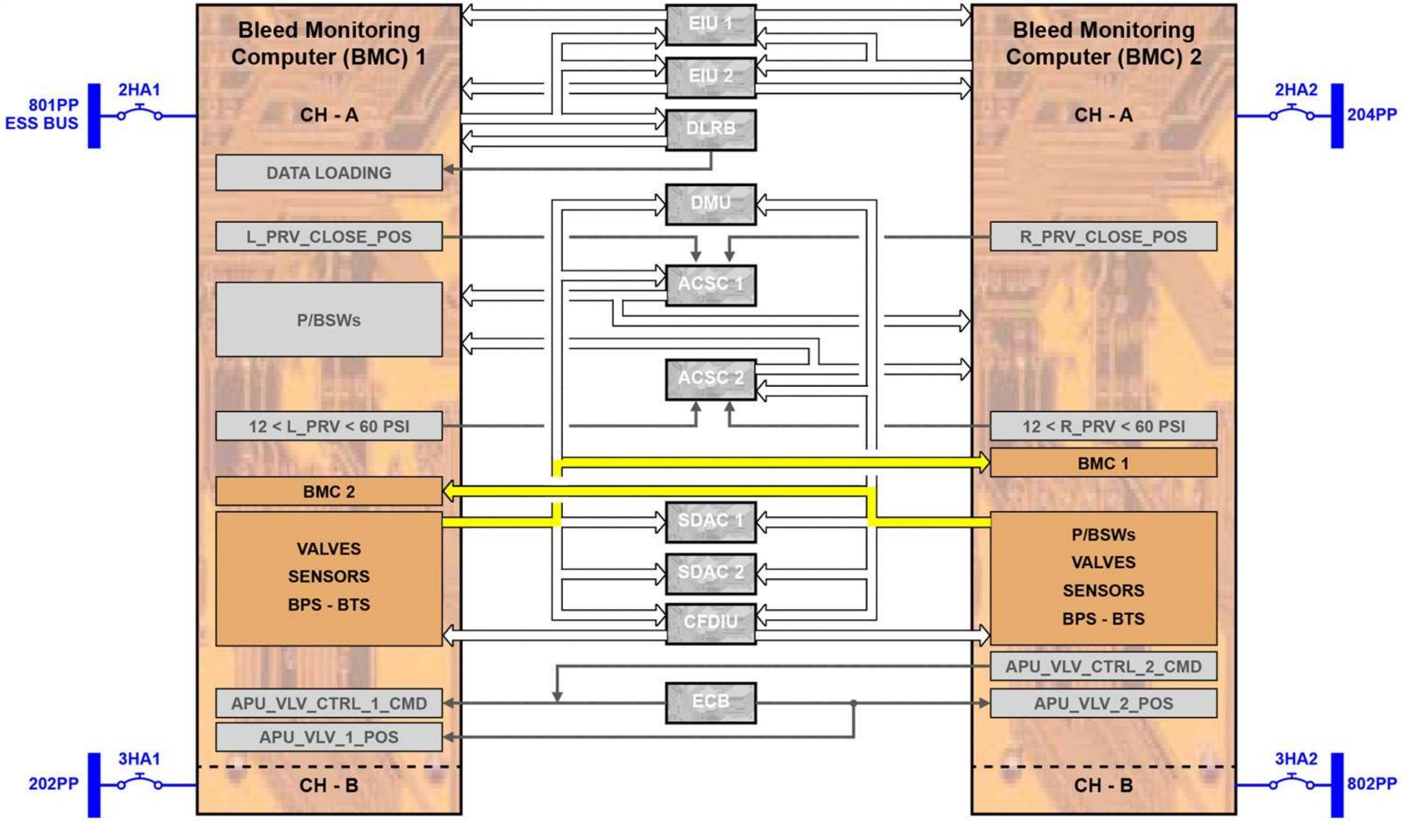
• 2 identical BMCs Master/Slave crosstalk

•28V DC supply: ESS BUS and NORMal bus

The pneumatic system uses 2 identical controllers with a microprocessor and command channel A and a back-up channel B. Each channel is supplied by a different 28V DC bus bar.

Both Bleed Monitoring Computers (BMCs) will work as MASTER/SLAVE so long as the ARINC429 cross communication is working properly.

If one ARINC429 bus is lost from one BMC to the other, the BMC receiving no data will take over control and would inform to the opposite BMC.



ACSC: Air Conditioning System Controller
APU: Auxiliary Power Unit
BPS: Bleed Pressure Sensor
BTS: Bleed Temperature Sensor
CFDIU: Centralized Fault Display Interface Unit
CMD: Command
CTRL: Control
DLRB: Data Loading Routing Box
DMU: Data Management Unit
ECB: Electronic Control Box
EIU: Engine Interface Unit
PRV: Pressure Regulating Valve
SDAC: System Data Acquisition Concentrator
VLV: Valve

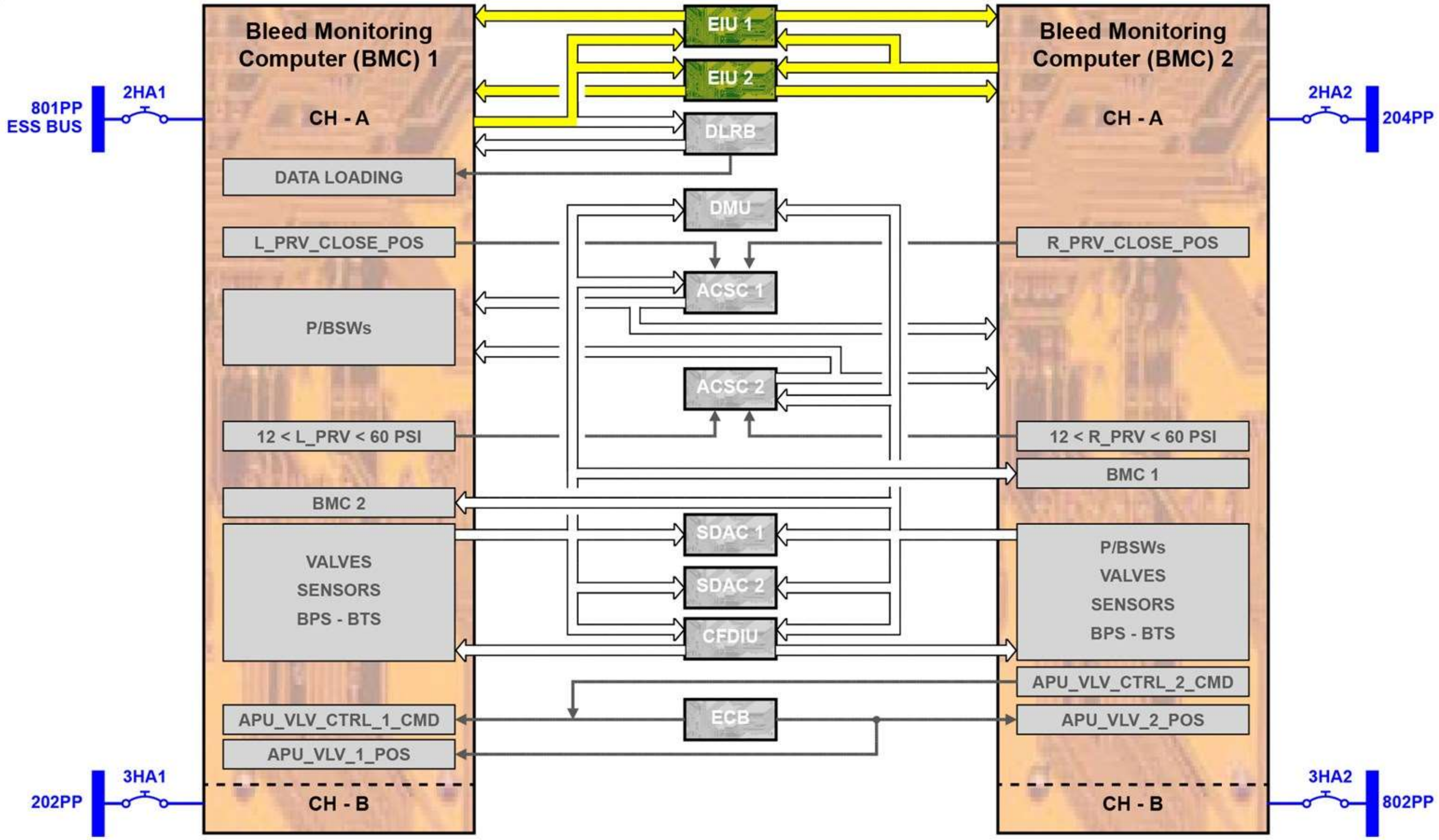
EIU

• Both BMCs interface with both EIUs

The Propulsion Control System (PCS) informs both BMCs via both Engine Interface Units (EIUs) when engines start/run.

The Electronic Engine Control (EEC) will need information relative to the Aircraft Environmental Control System (ECS) from the EIU ARINC data bus as system bleed pressure, bleed and anti-ice configuration.

The EIUs receive positions of ENG BLEED P/Bs ON, APU BLEED P/B OFF, Crossbleed valve status.



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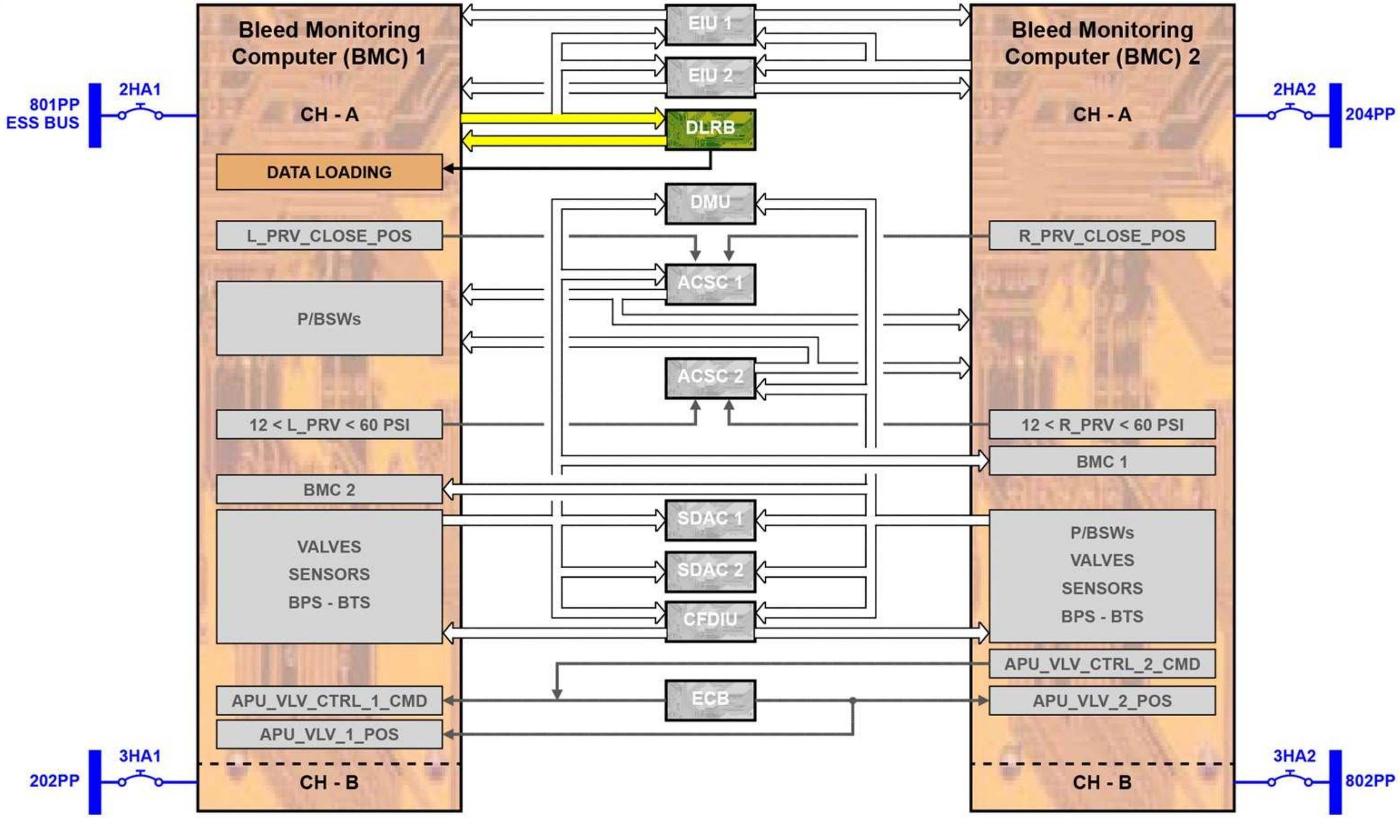
DATA LOADING

• DLRB for Data up & down loading on ground
•BMC 1 loaded first then crosstalk to BMC 2

The up and down data loading system is an interface between the onboard computers as BMCs and the ground-base data processing stations.

For data loading purposes, the BMC 1 Channel A is connected to Data Loading Routing Box (DLRB). The BMC 2 Channel A will be loaded through BMC 1 Channel A. The BMC 2 will be uploaded through the crosstalk bus from the BMC 1 once the BMC 1 has been fully uploaded from the data loader.



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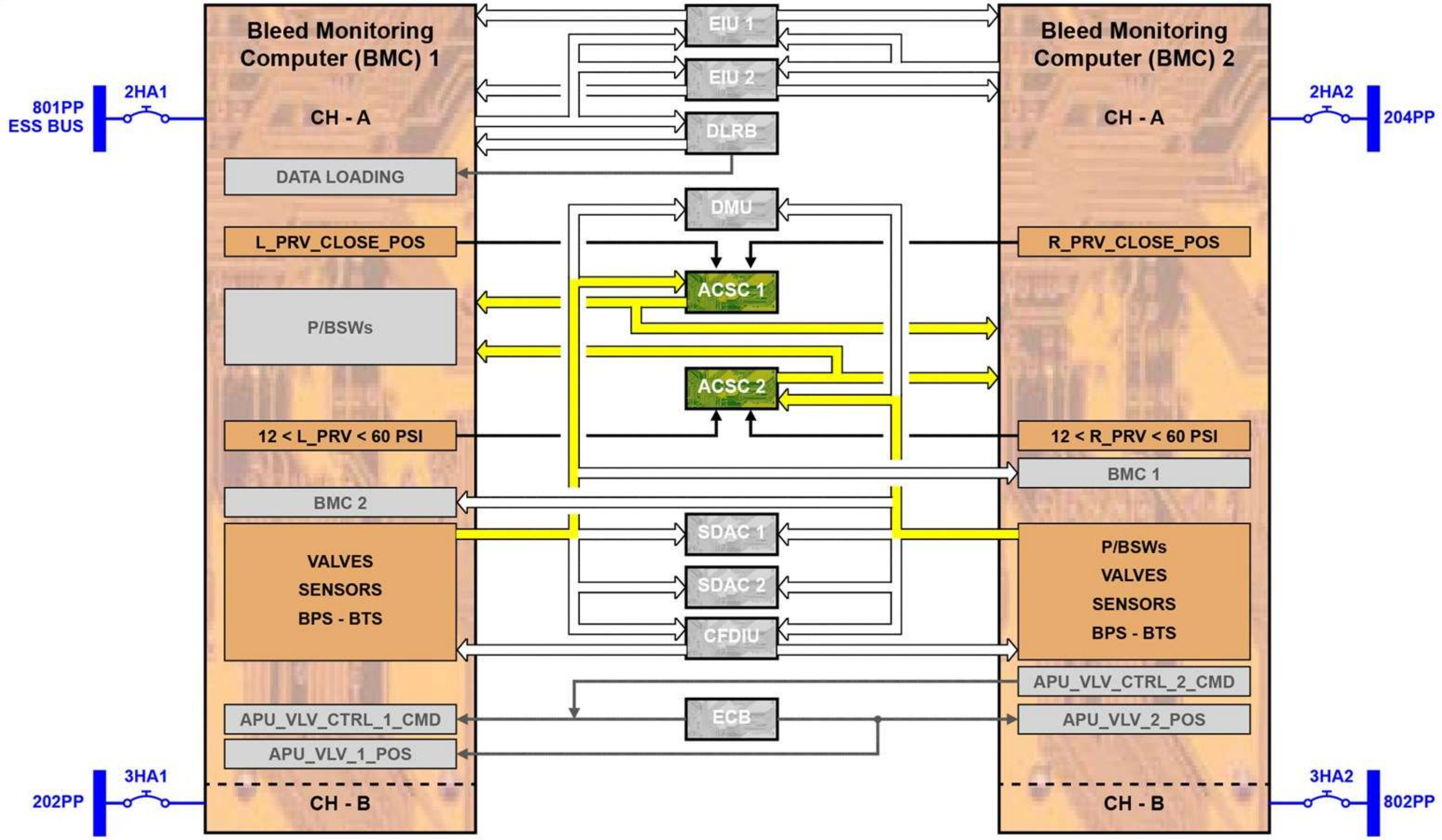
ACSC

•Both BMCs interface with both ACSCs

The BMC inform the Air Conditioning System Controller (ACSC) on the precooler outlet temperature for pack flow calculation. The bleed pressure Sensor (BPS) and the wired Crossbleed valve position are used for Pack Inlet Pressure Sensor (PIPS) monitoring.
The BMC send a discrete input of its Pressure Regulating Valve (PRV) position.
Another discrete signal informs about the precooler delivered bleed pressure.
The ACSCs input the BMCs for Pack 1/2 P/B SW position, Pack Inlet Pressure and wing anti-ice valves position.



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SDAC: System Data Acquisition Concentrator
VLV: Valve

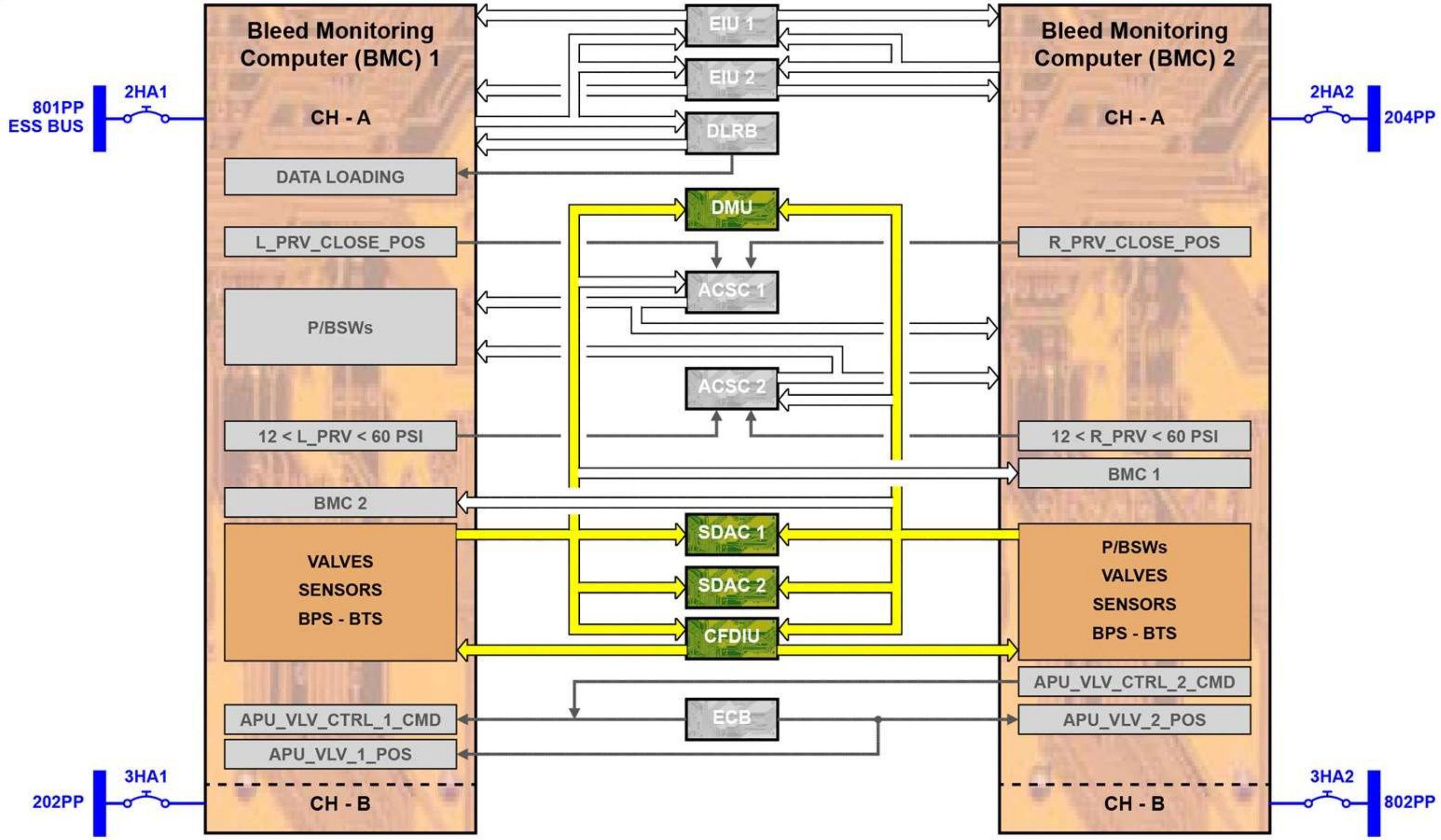
DISPLAY

•Bleed system display SDAC

•Bleed system Bite CFDS

The BMCs 1 and 2 transmit ARINC signals to the System Data Acquisition Concentrator (SDAC) for monitoring, fault indication, warning and data recording purposes by the Flight Warning Computer (FWC), Electronic Instrument System (EIS) and Digital Flight Data Recording System (DFDRS).

The Centralized Fault Display Interface Unit (CFDIU) is connected to the BITE of the BMCs to centralize the pneumatic system data for maintenance via the Multipurpose Control and Display Units (MCDUs), printer and Aircraft Communication Addressing and Reporting



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SDAC: System Data Acquisition Concentrator
VLV: Valve

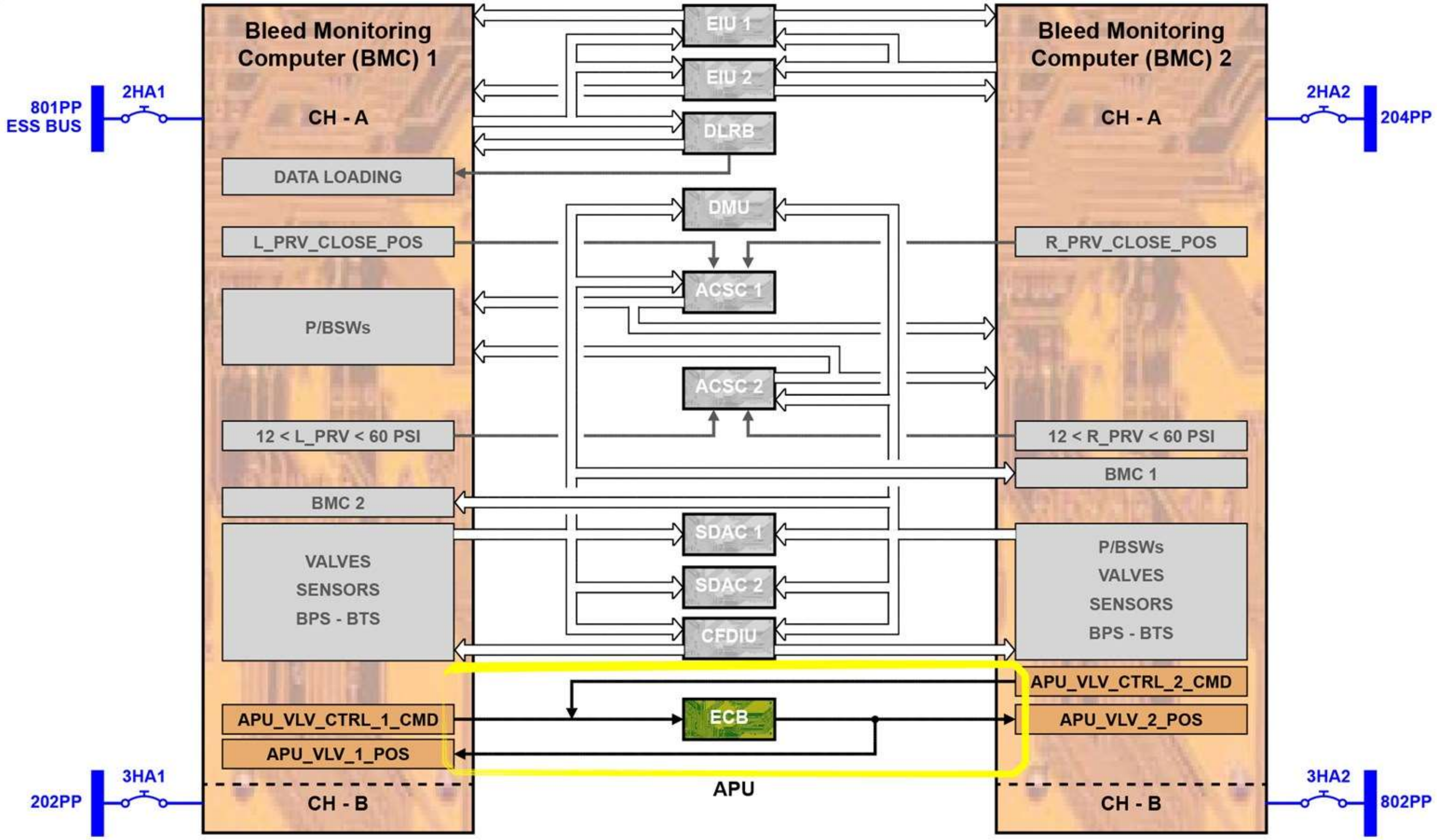
APU

• ECB to BMC: APU Bleed Valve CTL position & command

The APU/Electronic Control Box (ECB) system sends to the Engine Bleed Air System EBAS/BMC the information about APU bleed valve position in order to command the PRV to close when APU BLEED P/B is ON.

• BMC to ECB: APU Bleed Valve opening CTL

The EBAS transmits to the ECB information related to the APU Bleed Valve open Command in order to provide APU Bleed valve control in when APU flow is required.



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Pneumatic Leak Detection System Description and Operation

ROUTING
Comp loc EXT RH Wing WING Leak sensing
Comp loc AFT CARGO Compartment APU Leak sensing
Comp loc EXT FWD LH PYLON leak sensing

• Leak detection system used to detect leaks in the vicinity of the packs, wings, pylons and APU hot air ducts
•Protected areas with double loop for:

- Engine 1 & 2 pylons
- RH wing and pack 2
- LH wing, pack 1 and mid fuselage APU duct

•Protected areas with single loop for:

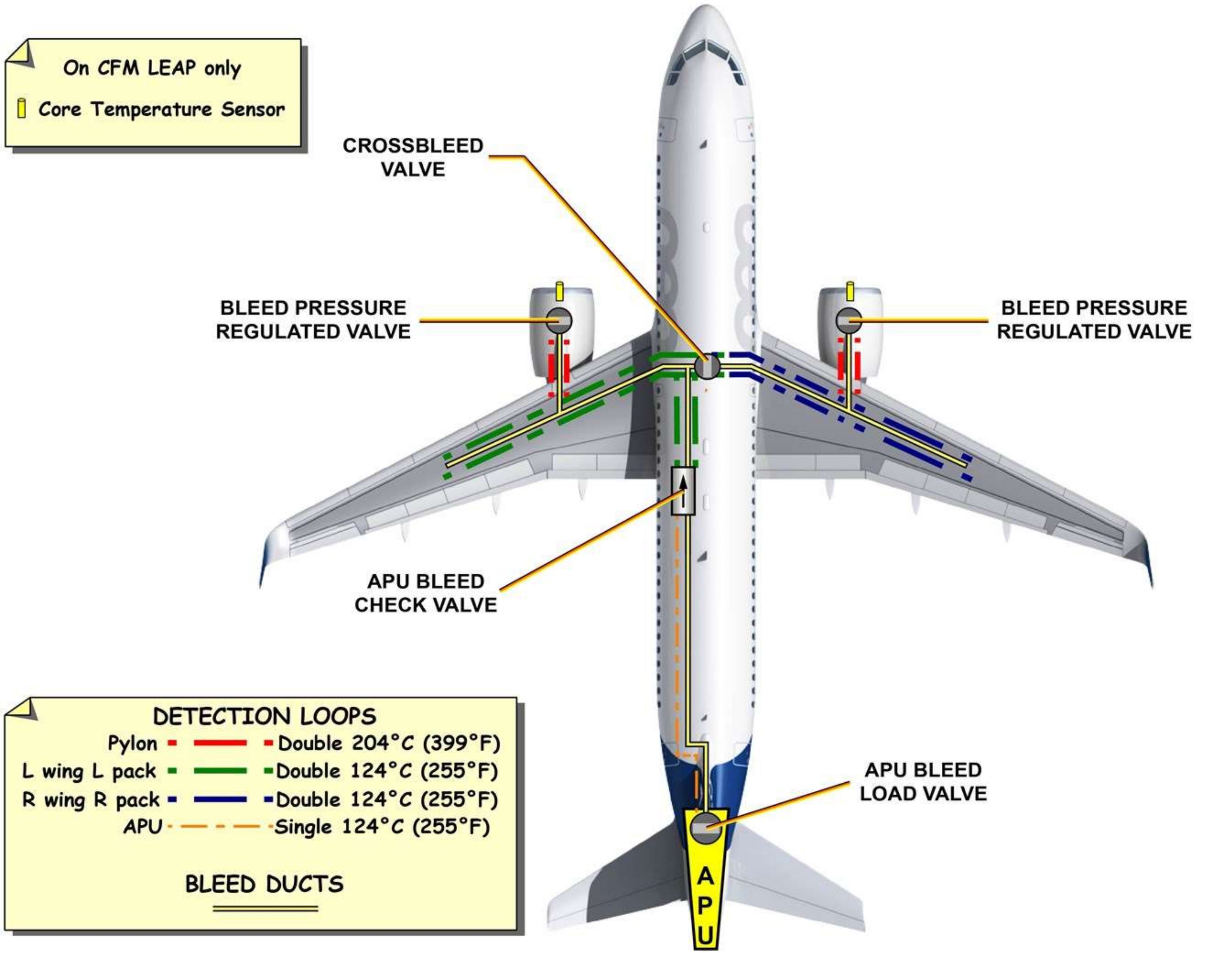
- APU duct

The leak detection system is used to detect leaks in the vicinity of the packs, wings, pylons and APU hot air ducts.
There are two independent loops as redundancy in both pylons and both wing sides.
The APU hot air duct is monitored by a single loop.
Protected areas with double loop for:
- Engine 1 and Engine 2 pylons,
- RH wing and pack 2,
- LH wing, pack 1 and mid fuselage APU duct.
Protected areas with single loop for:
- APU duct.
NOTE: Each loop consists of sensing elements connected in series.
Both extremities of the overheat detection loop are connected to the BMC.
The sensing element is an inconel tubing with porous insulator and center wire.

• On CFM LEAP only:

- Engine Nacelle Core Temperature sensor measures core cowling temperature
- Signal used to indicate undercowl leak

For CFM LEAP only, the Engine Nacelle Core Temperature sensor measures the temperature within the core cowling near the ECS ducting. This signal is used to indicate an undercowl leak (overheat and/or burst duct events).
Sensor wired to EEC A�. Nacelle Temp on Engine SD page, advisory if > 280ºC.


On CFM LEAP only
Core Temperature Sensor
CROSSBLEED VALVE
BLEED PRESSURE REGULATED VALVE
BLEED PRESSURE REGULATED VALVE
APU BLEED CHECK VALVE
APU BLEED LOAD VALVE
APU
DETECTION LOOPS
Pylon - Double 204°C (399°F)
L wing L pack - Double 124°C (255°F)
R wing R pack - Double 124°C (255°F)
APU - Single 124°C (255°F)
BLEED DUCTS

DETECTION LOGIC

•BMCs:

- BMC Channel A leak detection loop inputs
- Exchange data via ARINC bus for the wing and pylon double loop detection

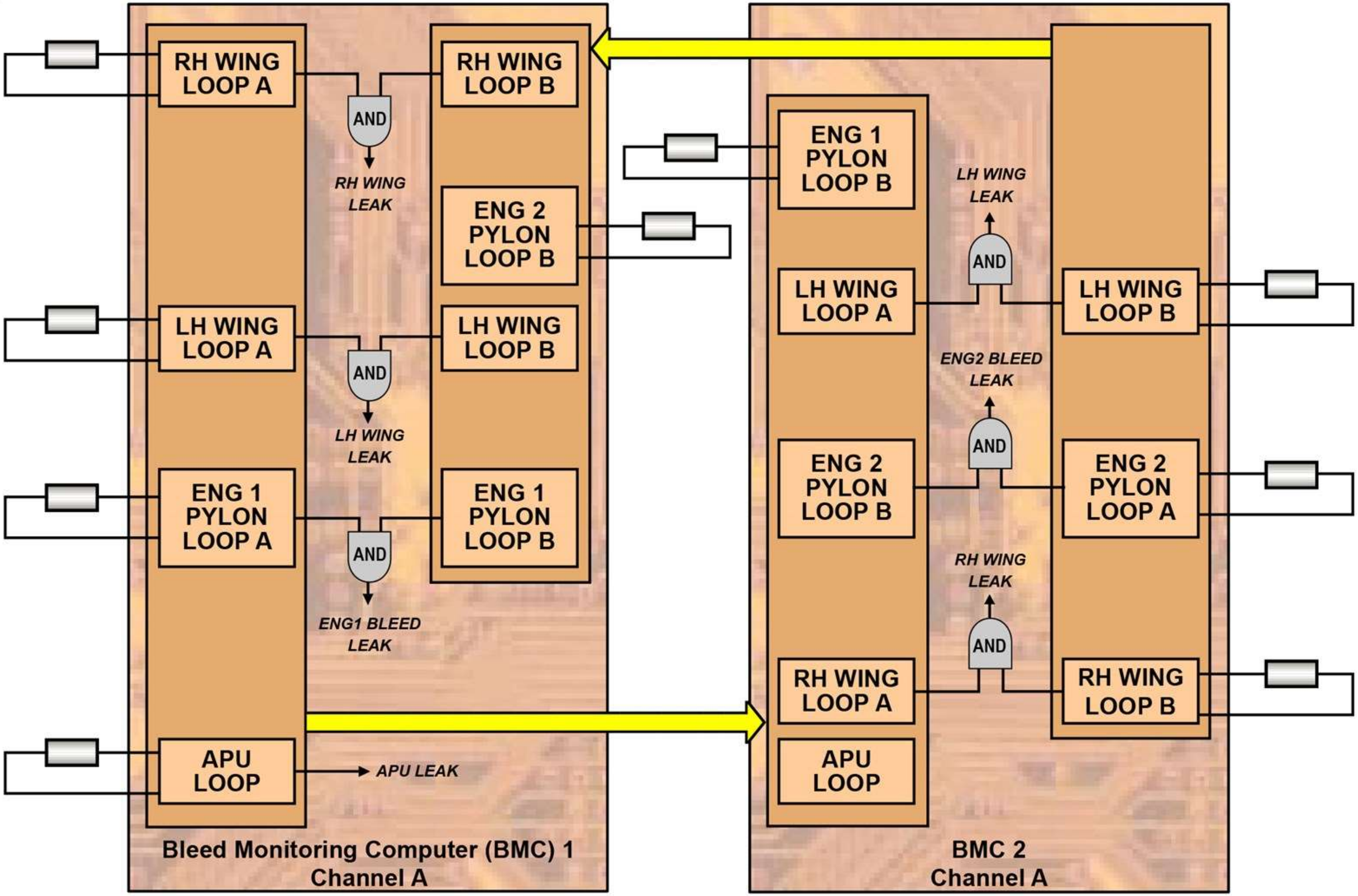
Both Bleed Monitoring Computers (BMCs) permanently receive signals from the leak detection loops primarily tested at power-up.

They exchange data via an ARINC bus for the double loop detection.

Each BMC channel A normally controls its side engine bleed air system, so monitors the OverHeat Detection System (OHDS).

NOTE: The wing and pylon loops A are connected to one BMC and wing and pylon loops B to the other BMC.

The crosstalk bus allows wing leak warnings to be activated through an AND logic. The APU loop is connected to BMC 1 only.


RH WING LOOP A
RH WING LOOP B
AND
RH WING LEAK
ENG 2 PYLON LOOP B
LH WING LOOP A
LH WING LOOP B
AND
LH WING LEAK
ENG 1 PYLON LOOP A
ENG 1 PYLON LOOP B
AND
ENG1 BLEED LEAK
APU LOOP
APU LEAK
Bleed Monitoring Computer (BMC) 1
Channel A
ENG 1 PYLON LOOP B
LH WING LEAK
AND
LH WING LOOP A
LH WING LOOP B
ENG2 BLEED LEAK
AND
ENG 2 PYLON LOOP B
ENG 2 PYLON LOOP A
RH WING LEAK
AND
RH WING LOOP A
RH WING LOOP B
APU LOOP
BMC 2
Channel A

WARNING CONSEQUENCES

• ENG BLEED FAULT light comes on when a leak is detected by the wing or pylon loops A & B

•APU BLEED FAULT light comes on when an APU duct leak is detected

The ENG BLEED FAULT light comes on when a leak is detected by the wing loops A and B or by the pylon loops A and B.
For CFM LEAP Engine only, it illuminates if Fan Duct Burst is detected.
The APU BLEED FAULT light comes on when an APU duct leak is detected.

• Leak/Overheat condition detected by both loops, alerts generated for:
  - Pylons
  - Wings
  - APU

•New alert for A320 NEO to isolate a bleed leak in opposite pylon to the operative bleed

•Failure of a single loop for pylon or wing:
  - Maintenance message displayed on STATUS page

•Dual engine loop failure:
  - Message displayed on STATUS page
  - NO GO

When an overheat condition is detected by both loops, the following alerts are generated for the affected zone:
- AIR ENG 1(2) LEAK for a leak/overheat detected in the Pylons,
- AIR L(R) WING LEAK for a leak/overheat detected in the Wings,
- AIR APU LEAK for a leak/overheat detected in the APU line,
- AIR APU LEAK [APU LEAK FED BY ENG] for a leak/overheat detected in the APU line and the leak is automatically isolated.

A new warning alert has been introduced on the A320neo, the AIR BLEED LEAK to isolate a bleed leak in the opposite pylon to the operative bleed with manually open Crossbleed Valve.

The failure of a single loop for Pylon or Wing is identified by a MAINTENANCE message displayed on the STATUS SD page.
Dual engine loop failure is identified by the AIR ENG 1(2) LEAK DET FAULT and is NO GO.

• APU BLEED LEAK warning is lost if BMC 1 is failed

If one BMC is failed, the other BMC takes over monitoring of the bleed system and triggers the ECAM warnings.
The aircraft dispatch is for 10 days with the BMC 1 inoperative for non-ETOPS operations provided that the Engine 1 Bleed Air System (EBAS 1) is considered inoperative and the APU leak detection loop is considered inoperative.

LEAK CONSEQUENCE

• A detected leak will close associated valves

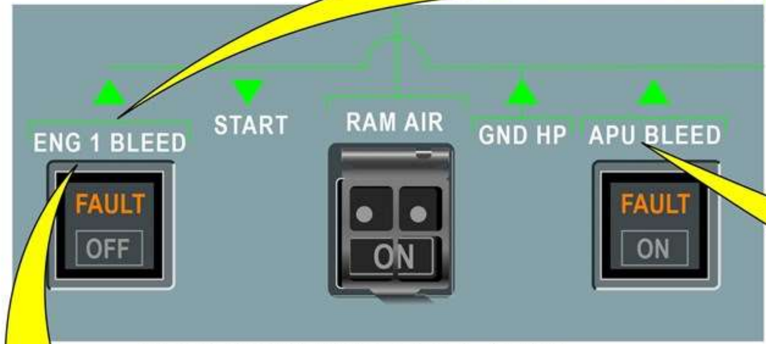
•These valves are automatically controlled to close if they were open

A detected leak will close associated valves, as shown on the table.
These valves are automatically controlled to close if they were open.
NOTE: APU and cross bleed (X-BLEED) valves do not close during Main Engine Start (MES).

WARNING MESSAGES:

Related to leak:
- AIR: ENG 1(2) LEAK
- AIR: L(R) WING LEAK
- AIR: BLEED LEAK

Related to other failures (e.g. Overheat, overpressure...):
- AIR: ENG 1(2) BLEED FAULT



AIR CONDITIONING PANEL (30VU)

WARNING MESSAGES:

Related to leak:
- AIR: APU LEAK
- AIR: APU LEAK [APU LEAK FED BY ENG]

WARNING MESSAGE (CFM LEAP only (*)):

Related to Fan Duct Burst:
- ENG X: HOT AIR LEAK

36-22-01	Pylon Leak Detection System

36-22-01E

Repair interval	Nbr installed	Nbr required	Placard
–	2	2	No

Must be operative.

Note: Failure of one loop in one or both pylon is indicated by a MAINTENANCE message displayed on the STATUS SD page.
Refer to Item 36-00-01 AIR BLEED MAINTENANCE Message

MINIMUM EQUIPMENT LIST (MEL)

TYPE OF FAILURE	ENG 1 FAULT (PYLON LEAK OR LH WING LEAK)	ENG 2 FAULT (PYLON LEAK OR RH WING LEAK)	APU LEAK (EXCEPT DURING ENGINE START)	ENG X HOT AIR LEAK *
AUTOMATIC RESPONSE/ VALVE CLOSURE	- PRV 1 - ANTI-ICE VALVE 1 - X BLEED VALVE (IN AUTO) - APU BLEED VALVE	- PRV 2 - ANTI-ICE VALVE 2 - X BLEED VALVE (IN AUTO)	- APU BLEED VALVE - X BLEED VALVE (IN AUTO)	- PRV X - APU BLEED VALVE (avoid opening XBleed Valve)

Pneumatic System Line Maintenance

MEL ITEMS

EBAS MEL

• 1 ENG Bleed Supply System INOP NEO same dispatch as CEO = MEL 36-11-01

•But only 1 PACK can be supplied

The aircraft dispatch is for 10 days with the Engine Bleed Supply System inoperative on one side provided that:
- The associated bleed is isolated by setting the ENG BLEED P/BSW to OFF,
- The X-BLEED valve is manually open to supply both sides,
- The speed brakes are operative.

For an Extended Range Twin Engined Aircraft Operations (ETOPS) flight, Auxiliary Power Unit (APU) Bleed should be available.

One Engine Bleed Air System (EBAS) remaining available, it supplies both sides for Wing Anti-Ice (WAI) and air conditioning. However, there is limitation on A320 NEO compared to A320 CEO due to lower capacity of the heat exchanger in case of single bleed operations.

NOTE: Only one PACK can be supplied. Therefore, the associated operational procedure will ask to switch one PACK off.

HPV FAILURE

• HPV failed closed leads to:
    • Low Bleed Pressure
    • Or Low Temp warning

•HPV failed open leads to overpressure or overtemperature warning identified by AIR ENG 1(2) BLEED FAULT

•Deactivated CLOSED for dispatch per MEL

Failed closed High Pressure Valve (HPV) can lead to low bleed pressure or low bleed temperature when engine is at low power settings (in idle or in holding conditions).

HPV failed in open position, leads to Bleed overpressure or Bleed overtemperature identified by AIR ENG 1(2) BLEED FAULT.

In case of failure of one HPV, the aircraft can be dispatched for 10 days with the valve secured closed.

The consequence of having the HPV secured closed is that the bleed air from the Intermediate Pressure (IP) port will be insufficient at low engine power settings (taxi, descent, holding). That is the reason why the crew procedure requests to switch off the associated EBAS at low power setting and to open the Crossbleed valve in order to supply both sides from the opposite EBAS which is operative.

HPV FAILED CLOSED: AIR ENG 1(2) HP VALVE FAULT

HPV FAILED OPEN: AIR ENG 1(2) BLEED FAULT

36-11-07	Engine Bleed HP Valve

36-11-07A Associated bleed considered inoperative

Repair interval	Nbr installed	Nbr required	Placard
C	2	1	No

One may be inoperative in the closed position provided that the associated engine bleed air supply system is considered inoperative.
Refer to Item 36-11-01 Engine Bleed Air Supply System

36-11-07B HP valve secured in the closed position

Repair interval	Nbr installed	Nbr required	Placard
C	2	1	No

(o) (m) One may be inoperative provided that:.
1) The affected engine bleed HP valve is secured in the closed position, and
2) The opposite engine bleed supply system is operative.

Reference(s)

(o) *Refer to OpsProc 36-11-07B Engine Bleed HP Valve*
(m) *Refer to AMM 36-11-00-040-XXX*

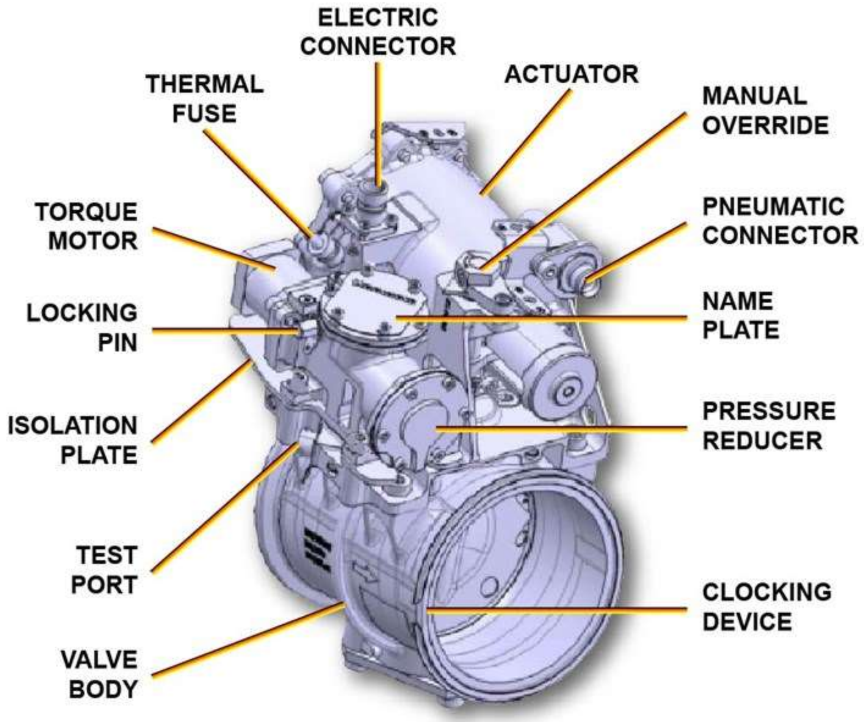
At low engine power settings, affected side ENG BLEED P/B is set to OFF and X BLEED selector is set to OPEN.

At higher power settings, affected side ENG BLEED P/B is set back ON and X BLEED selector is set to AUTO.

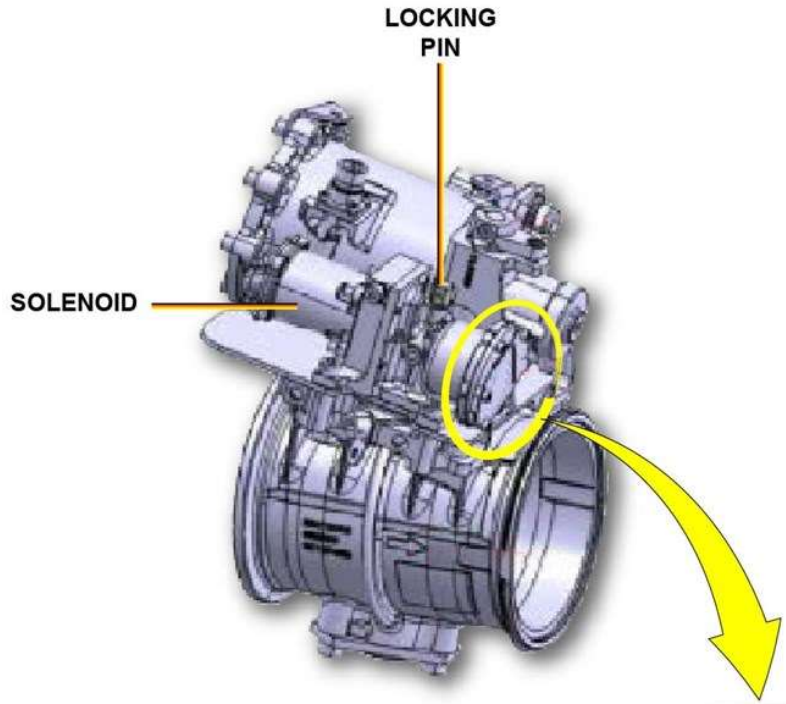
BLEED VALVE DEACTIVATION

- In case of failure the PRV / HPV are deactivated CLOSED for dispatch per MEL
- On the Valve, move the manual override to the CLOSED position
    - Secure in CLOSED position with locking pin

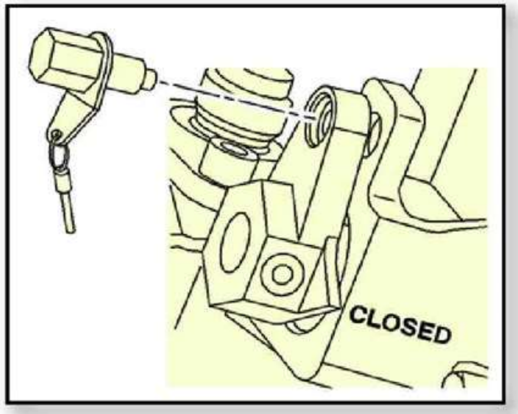
In case of failure, Pressure Relief Valve (PRV) and HPV have to be deactivated CLOSED for dispatch under Minimum Equipment List (MEL).
The deactivation procedure is the same for both valves:
- make sure pneumatic system in not pressurized, BLEED switches OFF,
- deactivate the thrust reverser,
- open the RH fan and reverser cowls,
- move the manual override to the CLOSED position,
- secure in CLOSED position with locking pin,
- close cowlings,
- reactivate the thrust reverser.



PRESSURE REGULATING VALVE (PRV)



HIGH PRESSURE VALVE (HPV)



LOCKING PIN

IDENTIFICATION PLATE

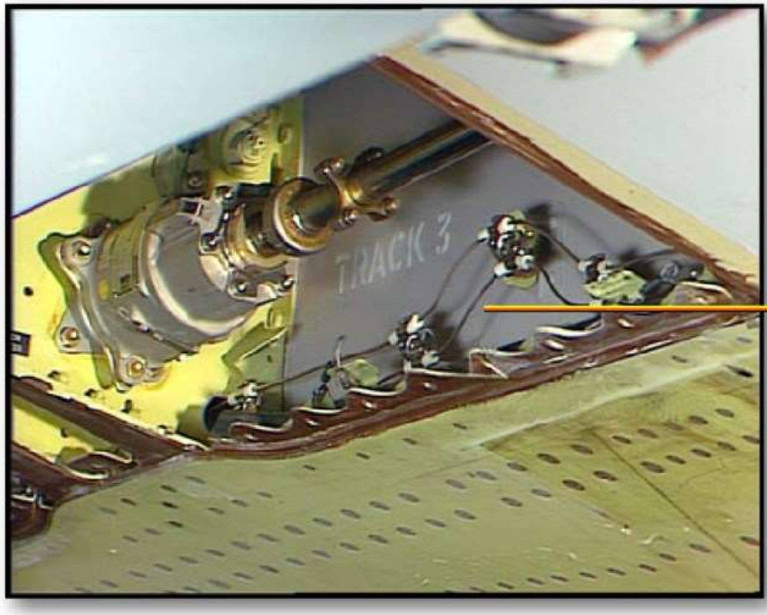
WING LEAK DETECTION

• Dual-loop WING leak detection
    • WING leak detection NO GO for dispatch

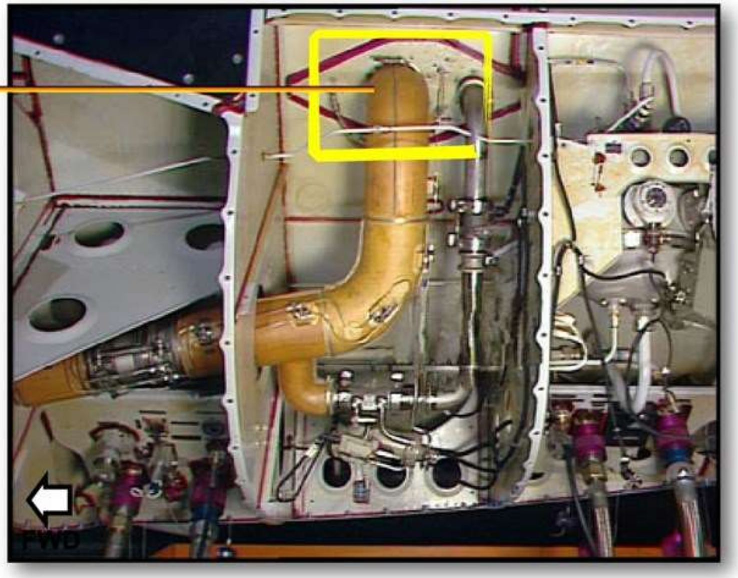
The WING leak detection is a dual-loop system. To generate a WING LEAK warning, both A and B loops have to detect the overheat. For dispatch, WING leak detection must be operational (at least one loop) on each wing. If a single loop fails, the MAINTENANCE message AIR BLEED will be displayed on the STATUS page associated with a Centralized Fault Display System (CFDS) message L(R) WING LOOP (INOP). The aircraft may be dispatched per MEL with the MAINTENANCE message displayed.

• WING detection is more than wings alone

For troubleshooting it is important to understand that the WING detection elements monitor much more than just the wings alone.
The protected areas are:
- wing leading edge (wing anti-ice supply duct),
- air conditioning compartment - belly fairing - (pack supply, crossbleed manifold, APU supply, ground air supply),
- APU forward supply duct (from the APU check valve through the wheel well).

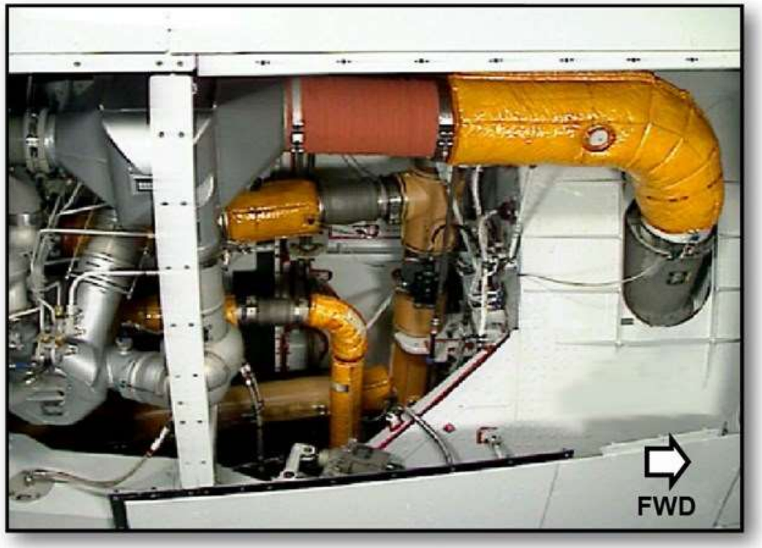


WING LEADING EDGE



FUSELAGE LEFT SIDE (AFT BELLY FAIRING)

The WING leak detection elements monitor more than the wings alone.
The protected areas are :
- Wing leading edge (wing anti-ice supply),
- Air conditioning compartment (pack supply, crossbleed manifold, APU supply, ground air supply)
- APU supply duct (from the APU check valve through the wheel well).



AIR CONDITIONING COMPARTMENT

MAINTENANCE TIPS
CFDS

• BMC BITE reports failure messages related to all equipment of the pneumatic system
•Each BMC reports the failures independently of each other
•BMC Bite is standard A Type 1

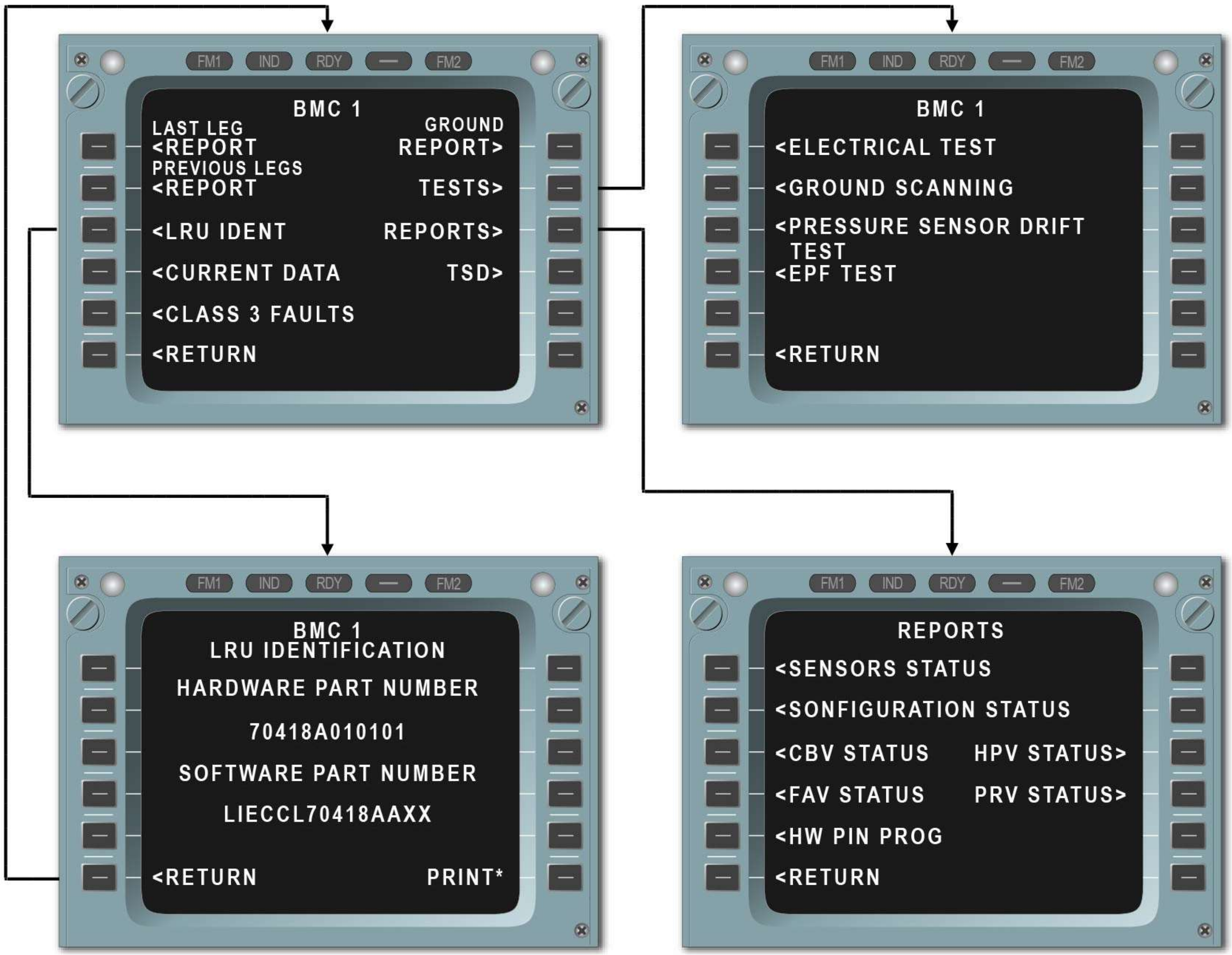
CFDS BMC menus for NEO are different from CEO except for Last Leg, Previous Leg, Current Data display, class 3 faults, and ground Report.
CFDS menus for all failure reports and interactive mode displays are generated by the Bleed Monitoring Computer (BMC) itself.
In normal mode, the BITE transmits maintenance messages (Standard A type 1) for detection results on level of:
- OverHeat Detection System (OHDS),
- Valves,
- Precooler,
- Sensors,
- External communication,
- Internal communication,
- BMC (Hardware and Software).

• New BMC TESTS menu: fully electrical
•New Reports menu give all system status

The electrical test verifies the EBAS following functions:
- Central Processing Unit (CPU) (microprocessor, RAM, ROM),
- discrete outputs,
- leak detection loops and interfaces,
- discrete and analog inputs,
- digital Inputs/Outputs,
- torque motors, solenoid,
- pressure sensors failures,
- temperature sensors failures,
- valves.

•EPF is the Ch B independent hardware monitoring overtemp
•REPORTS all valves and controls positions

The pressure sensor drift test shall detect any pressure drift in Differential Pressure Sensor (DPS) and/or Bleed Pressure Sensor (BPS).
Electrical Protection System (EPS) corresponds to the channel B Electrical Protection Function (EPF) test.
The reports menu displays the status in real time for all the system.



Electrical Test possible if:
- A/C on ground AND
- Engines OFF AND
- APU not bleeding AND
- HPGC not bleeding.

The Pressure Drift Test shall detect any pressure drift in DPS and/or BPS.

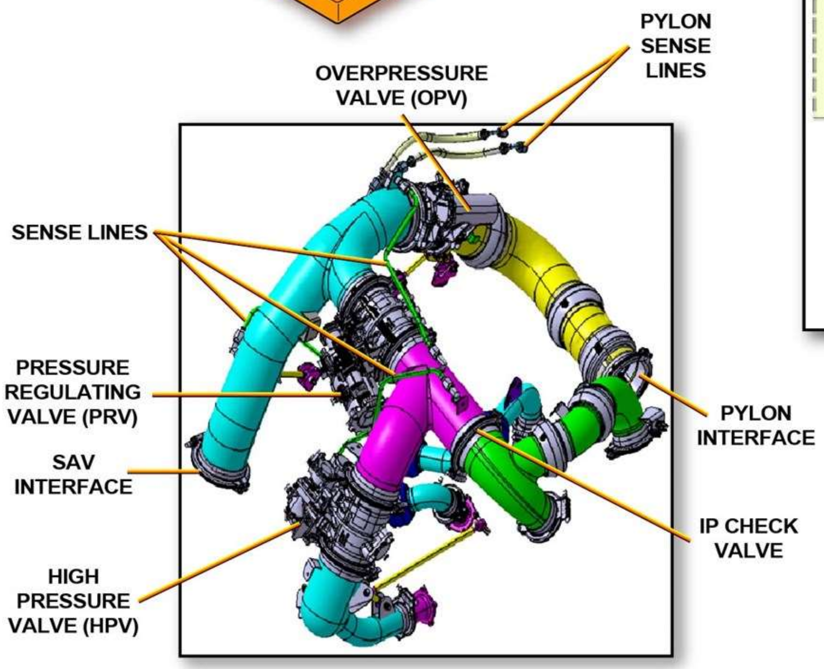
BPS: Bleed Pressure Sensor
CBV: Cross Bleed Valve
DPS: Differential Pressure Sensor
EPF: Electrical Protection Function
FAV: Fan Air Valve
HPGC: High Pressure Ground Connector
HW: Hardware
LRU: Line Replaceable Unit
PRV: Pressure Relief Valve

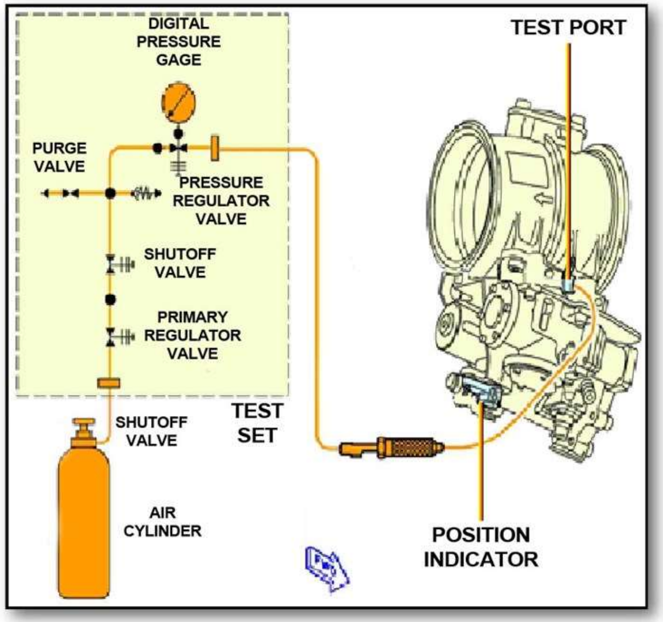
TEST SET

•10 Test set available

•Check all pneumatic connections during troubleshooting

The Test Set P/N 98L36103002000 is available to assist in troubleshooting the pneumatic system. The test set enables calibrated pressure to be applied to individual valves, components and isolated parts of the system to check for normal operation and sense line integrity (i.e.: PRV, HPV, Overpressure Valve (OPV), Fan Air Valve (FAV), Bleed Pressure Regulated Transducer...).





FUNCTIONNAL TEST OF THE PRESSURE REGULATING VALVE (PRV) WITH THE TEST SET P/N 98L36103002000

IP: Intermediate Pressure
SAV: Strater Air Valve

ENGINE START WITH GROUND AIR

- Engine start with ground air
    - HP ground connection located on belly fairing

To perform an engine start with ground air, the connection is located on the lower fuselage. The access door is on the belly fairing.

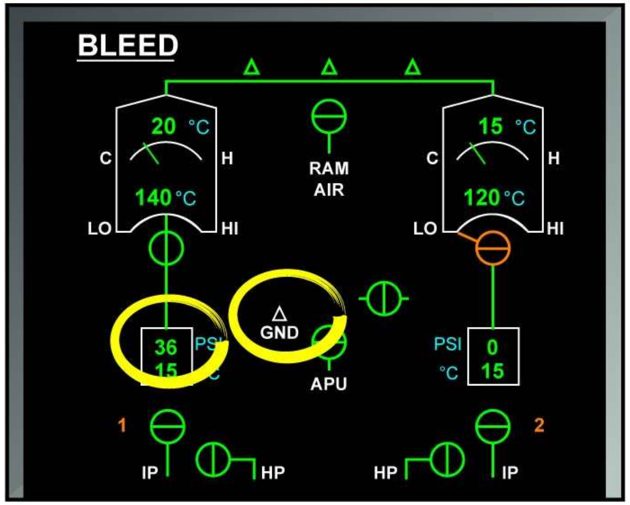
- Crossfeed valve manual ops

During a ground air start, the crossbleed valve must be operated manually. For safety, it is recommended to use the ground air supply to start the first engine. Then disconnect the ground air supply and perform a crossbleed start for the second engine.

- ECAM "GND" indication

On the ECAM BLEED page, the GND indication DOES NOT indicate ground air supply connected or available. This indication appears when the aircraft is on the ground to show that the ground air is directly supplied to the LEFT side of the system only. The left bleed system pressure indicator will indicate pressure when the ground air is supplied.

HP GROUND AIR CONNECTOR



END