



## BRAKES SYSTEM

The brake system of the Phenom 300 is composed of two subsystems, the main brake control system and the emergency/parking brake system. These systems receive hydraulic power from the airplane hydraulic generation system.

The main brake system task is to control hydraulic pressure to the brakes as a function of brake pedal displacement and to provide antiskid protection to prevent main tires skidding during braking thus minimizing stopping distance.

Emergency/parking brake system task is to provide an alternate way to stop the airplane in case of main brake system failure, and to provide means to keep the airplane parked even when hydraulic power system is turned-off.

## MAIN BRAKE SYSTEM

The main brake consists of a brake-by-wire system controlled by either the pilot or copilot via rudder pedals. Rudder pedals actuate the pedal transducers that send the brake inputs to the Brake Control Unit (BCU), which controls both LH and RH brakes independently. Then, the BCU, which is connected to the EMERGENCY BUS, receives all brake interface signals and controls the shutoff valve (SOV) and both brake control valves (BCV's) for braking capability.

Each wheel brake is commanded by a dedicated, electro-hydraulic BCV. The BCU measures the output from the wheel speed transducer, pedal transducer and pressure transducer and provides a commensurate electrical command to the associated BCV.

Hydraulic pressure is available to the BCV through a brake SOV, electronically controlled by the BCU. This SOV provides pressure only when the pedals are pressed and the airplane is on the ground. It also provides pressure to the BCVs during the BCU built in tests. In case of failure or leakage in the main brake system, the SOV prevents this problem from affecting the other hydraulic consumers.



In case of hydraulic system failure, the emergency/parking brake is available and must be used carefully to stop the airplane.

The brake system includes the following functions:

- Locked wheel protection;
- Antiskid protection;
- Touchdown protection;
- Gear retract braking;
- Initiated Built In Test (IBIT).

### **LOCKED WHEEL PROTECTION**

The locked wheel protection prevents the main landing gear tire from bursting due to wheel locking.

The system logic compares wheel speed signals between the LH and RH brakes. If the system senses that a wheel speed is equal to or less than 30% of the reference velocity, the brake control module detects a locked wheel condition and releases the brake pressure of slower wheel to zero, thus allowing speed equalization.

The pressure dump is cancelled when the wheel speed or the "locked wheel" attains 70% of the paired wheel reference speed.

The dropout speed for this functionality is 30 kt, allowing differential braking, for steering purposes.

### **ANTISKID PROTECTION**

Antiskid protection prevents tire skidding and maximizes brake efficiency according to the runway surface.

The system controls the amount of hydraulic pressure applied to the brakes and, if necessary, reduces the wheel brake pressure in order to recover wheel speed and prevent tire skidding.

The system turns on antiskid protection when both wheel speeds are above 30 kt. For wheel speeds below 10 kt, the antiskid protection is deactivated, allowing the pilot to lock and pivot on a wheel.

Anti skid protection is not available for the emergency/parking brake system.



## TOUCHDOWN PROTECTION

Touchdown protection prevents brake application prior to airplane on ground or spin up condition occurs. System functionality commands dump pressure when it is determined that the airplane is airborne, allowing the wheels to spin up at touchdown even if the pilot is pressing pedals in order to avoid tire blow out.

Even before WOW indicate airplane "on the ground", touchdown protection is cancelled when both wheel speeds exceed 60 kt. After WOW indicates airplane "on the ground" the spin up threshold is reduced linearly from 60 to 30 kt in 3 seconds. Also, touchdown protection is cancelled 3 seconds after WOW indicate airplane "on the ground" regardless of the wheel speed.

Normal brake is not available below 10 knots when WOW indicates airplane airborne.

## GEAR RETRACT BRAKING

Gear retract braking function provides a brake pressure application during gear retraction to stop the rotating wheels before enter into the wheel well.

If both WOW indicates airborne and the gears select input changes state from down to up, the BCU algorithm applies a ramped pressure demand to stop the wheels within a 3 seconds delay. At a completion of the 3 seconds delay timer if wheel speed is present, the pressure demands is ramped up. If both wheel speeds are detected as zero or a 10 seconds time out period has elapsed the pressure demands are reset to zero.

## INITIATED BUILT IN TEST (IBIT)

An initiated built in test commence when landing gear control lever signal transitions from up to down and at least one gear indicates down and locked, providing the weight on wheels signal indicates airborne and both wheels are stationary, considering a 10 seconds delay to allow for peak hydraulic demands.



The IBIT exercises the pressure loop components throughout their full range in order to ensure correct operation of the SOV, BCV and PT. The process takes 5 seconds to be performed.

## EMERGENCY/PARKING BRAKE

Emergency/Parking brake system has two functions: first as the airplane parking brake and second as an emergency brake.

It is operated through a T-handle located at the central pedestal of the cockpit. The T-handle is linked to the emergency/parking brake valve via a steel cable.

The emergency/parking brake has a pressure accumulator isolated from the hydraulic system by a check valve and a shut-off valve, which is open during engine start, when the aircraft is on the ground and both Thrust Levers are in idle for more than 50 seconds. The emergency/parking brake is mechanically actuated and provides pressure to all brakes allowing the pilot to modulate brake pressure in emergency situations. The accumulator has sufficient pressure to provide six full-brake applications.

The emergency/parking brake handle, when pulled up, causes hydraulic pressure to activate the brakes. When pressure is equal or higher than the brake contact pressure, a pressure switch turns on a white lamp at the cockpit front panel to alert pilot.

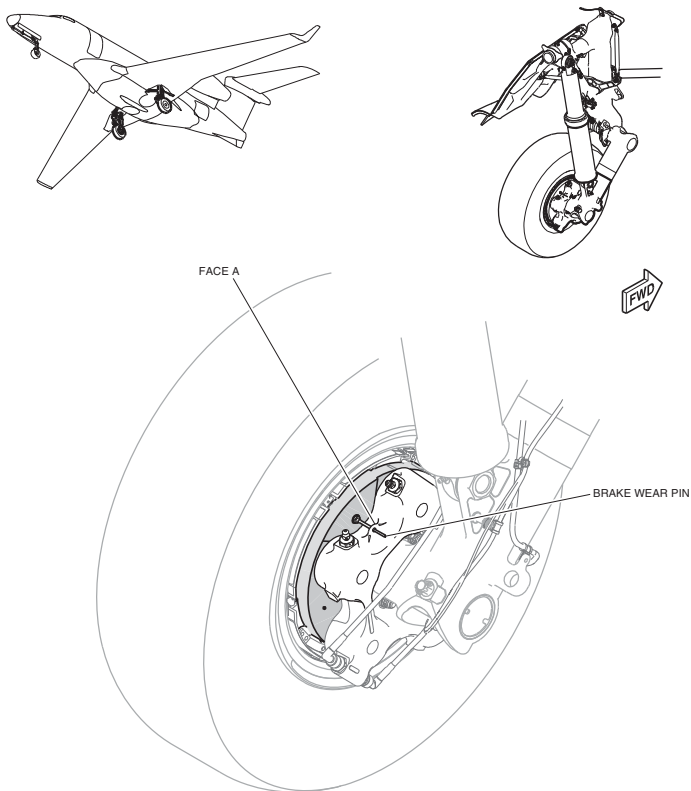
## FUSIBLE PLUGS

The fusible plugs are metal plugs installed to the wheels, whose core melts to relieve the tire pressure in case of a tire overheat.

## BRAKE WEAR PINS

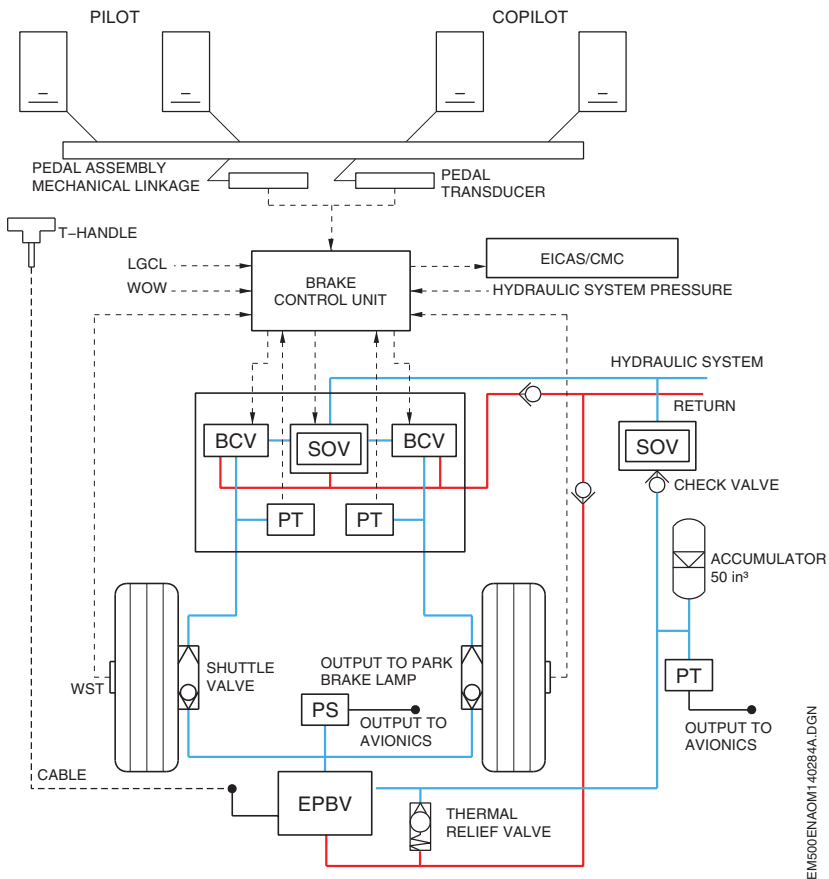
During brake operations, brake pads and disks are consumed and, when the wear pins are flush with the face A, the brakes need replacement.

**NOTE:** The Parking Brakes must be set for an accurate wear pin reading.



EM500ENAOM140327E.DGN

**BRAKE WEAR PINS**



EM500ENAQM140264A.DGN

**BRAKE SYSTEM SCHEMATIC**



## CAS MESSAGES

TYPE	MESSAGE	MEANING
WARNING	LG LEVER DISAG	A discrepancy between the position of the LDG GEAR lever and at least one landing gear is detected.
CAUTION	ANTI-SKID FAIL	Loss of the antiskid protection mode.
	BRK FAIL	Loss of the wheel brake on either the left or right landing gear.
	EMER BRK LO PRES	Emergency/parking brake accumulator pressure is low.
	LG WOW SYS FAIL	Indicates a failure condition in the WOW indication system.
	PARK BRK NOT REL	Indicates the emergency/parking brake actuated condition.