
Landing Gear
Presentation
OVRD
APU
AUTO EXTING
TEST
RESET
1 FADEC GND PWR 2
HYD
BLUE
YELLOW
3000
PSI
3000
PTU
RAT
ELEC
1
ELEC
2
A/SKID &
N/W STRG
ON
OFF

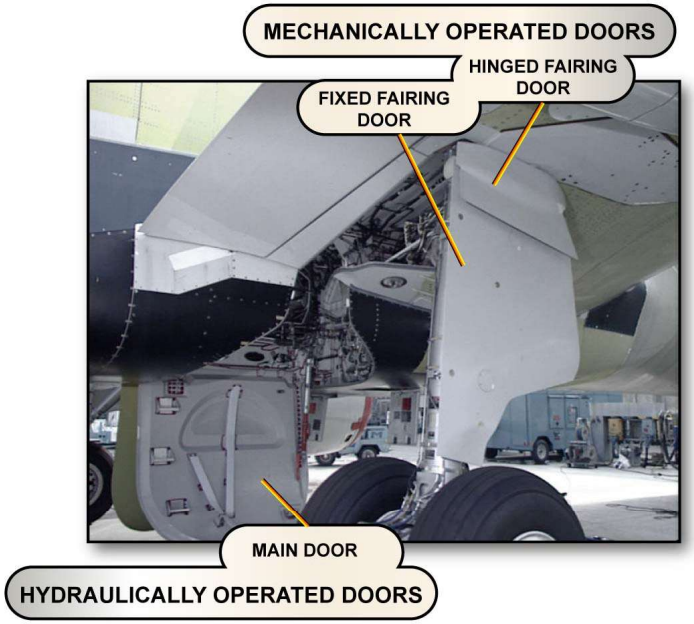
Main Landing Gear (MLG)

Nose Landing Gear (NLG)

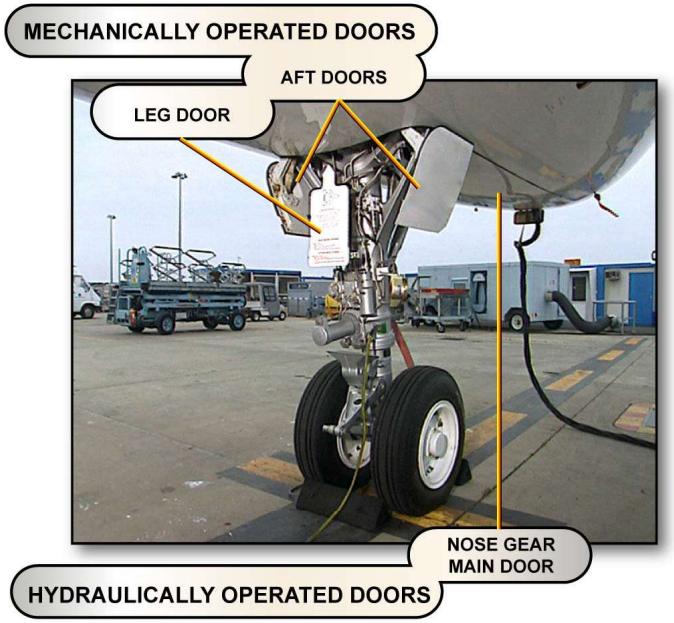
LANDING GEAR

The A320 aircraft family has a LH and RH dual wheel Main Landing Gear (MLG) and a dual wheel Nose Landing Gear (NLG).

The MLG retracts inboard into the MLG wheel well and the NLG retracts forward into the NLG wheel well. The Landing Gears (L/Gs) are hydraulically operated and electrically controlled. Each L/G has hydraulically and mechanically operated doors. Each L/G has a shock absorber.



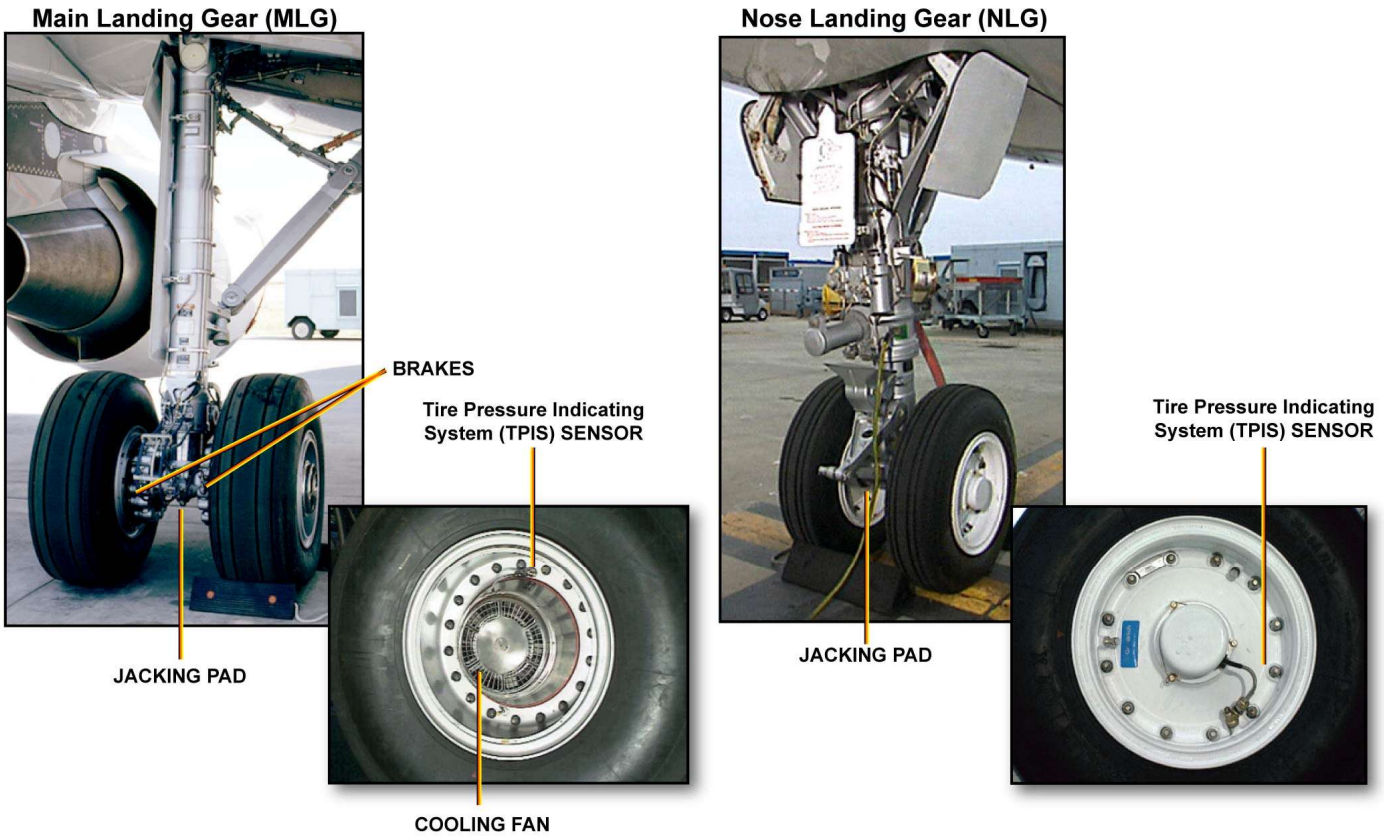
Main Landing Gear (MLG)



Nose Landing Gear (NLG)

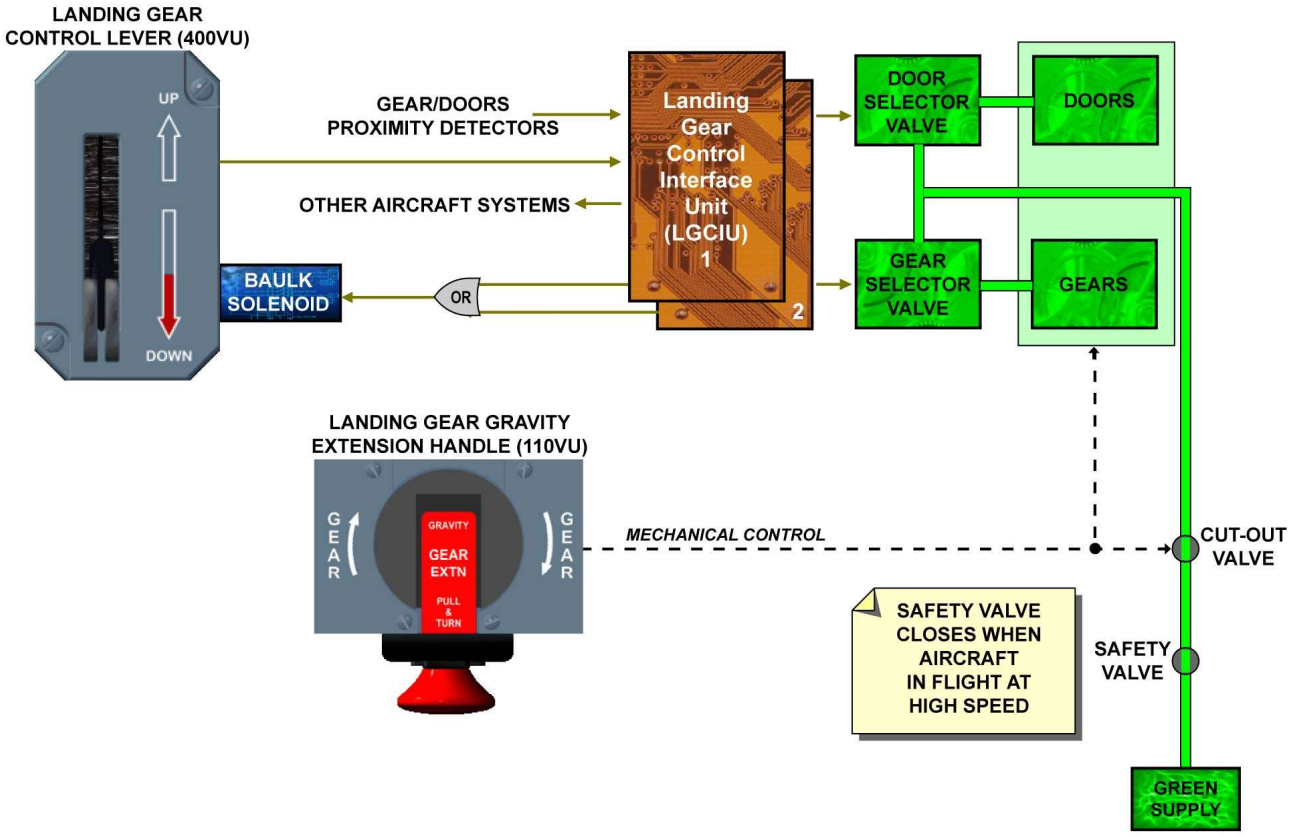
LANDING GEAR - LANDING GEAR DOORS (a)
Doors are hydraulically operated and electrically controlled.

LANDING GEAR - LANDING GEAR DOORS (b)
The mechanically operated doors are linked to the L/G struts and move with the gear.



LANDING GEAR - WHEELS AND BRAKES (a)
The MLG has:
- Wheels,
- Carbon brakes,
- Brake fans (optional),
- Tire Pressure Indicating System (TPIS) sensor (optional),
- Gear jacking pad for wheel change.

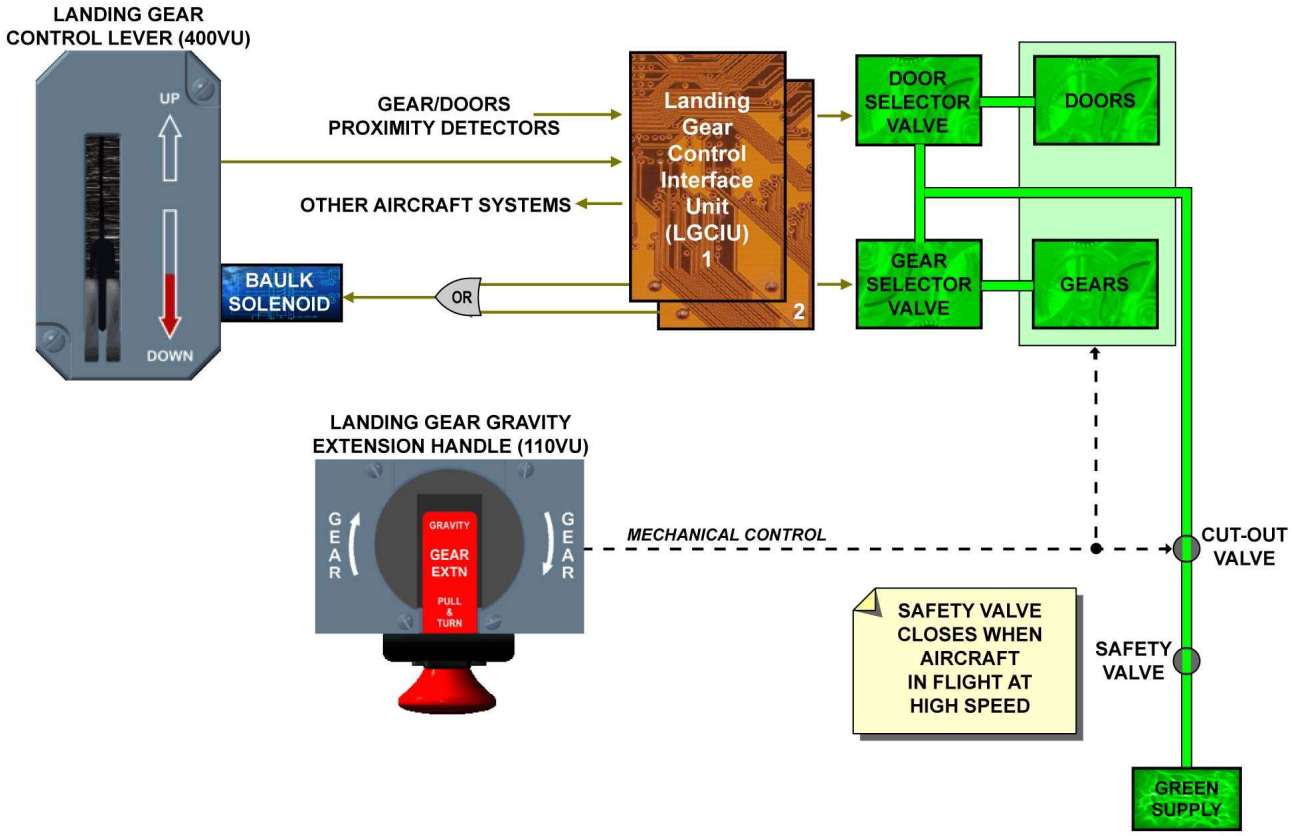
LANDING GEAR - WHEELS AND BRAKES (b)
The NLG has:
- A Nose Wheel Steering (N/WS) system,
- A jacking pad for wheel change,
- A TPIS sensor (optional).



LANDING GEAR EXTENSION AND RETRACTION (a)
The L/G extension and retraction is controlled from the L/G control lever installed in the cockpit.

LANDING GEAR EXTENSION AND RETRACTION (b)
Two computers called Landing Gear Control and Interface Unit (LGCIU) 1 and 2 control the gear up and down sequence. Only one LGCIU is in command while the other LGCIU is in standby. With any up selection the LGCIU in command will change and control a complete gear cycle.

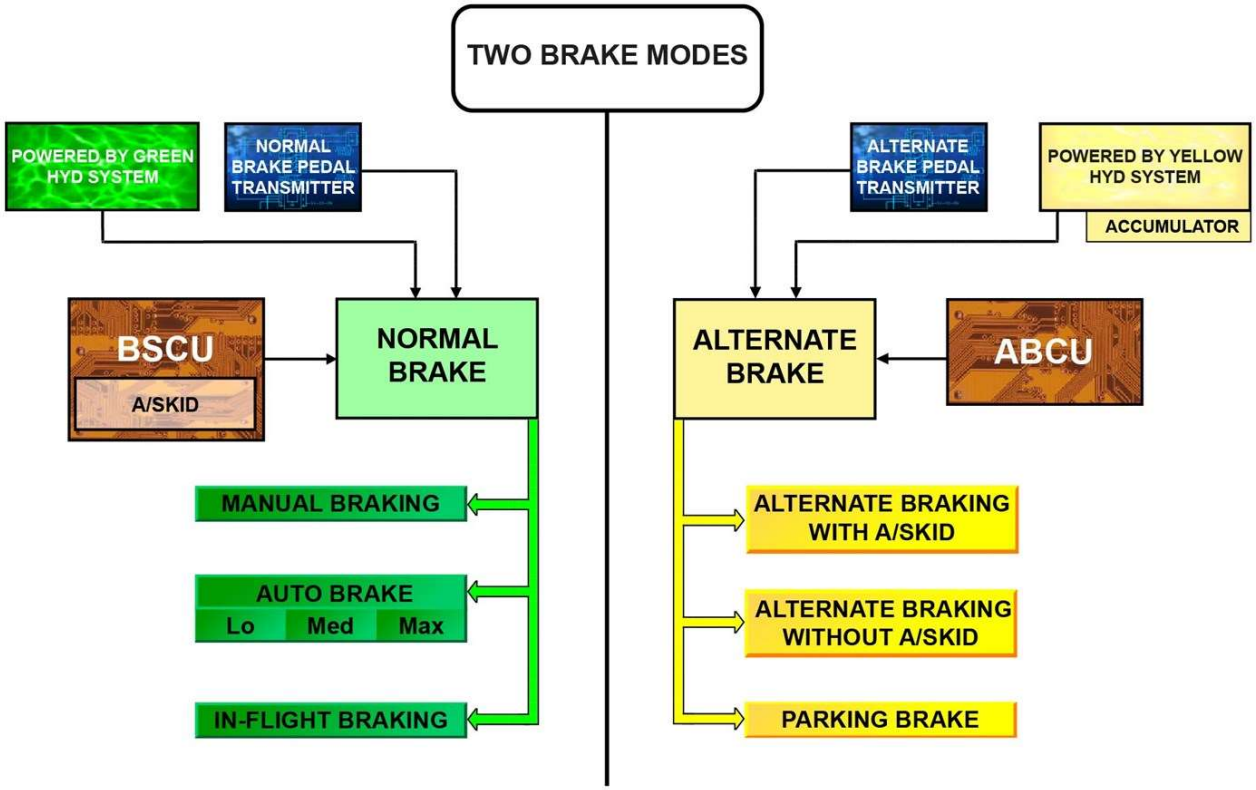
LANDING GEAR EXTENSION AND RETRACTION (c)
The gear in the up and down position, the door in the close and open position and the shock absorber compressed (ground signal) and in the fully extended (flight signal) position are monitored by proximity detectors.
In case of failure of a LGCIU or a proximity detector, the other LGCIU will be in command.



LANDING GEAR EXTENSION AND RETRACTION (d)
An interlock mechanism prevents unsafe retraction from locking the control lever in the down position when any shock absorber is compressed (ground signal).
The Nose Wheel (N/W) is automatically centered when the shock absorber is fully extended (flight signal).

LANDING GEAR EXTENSION AND RETRACTION (d)
An interlock mechanism prevents unsafe retraction from locking the control lever in the down position when any shock absorber is compressed (ground signal).
The Nose Wheel (N/W) is automatically centered when the shock absorber is fully extended (flight signal).

LANDING GEAR EXTENSION AND RETRACTION (f)
In case of failure, the gear can be extended mechanically from the cockpit by means of a free fall extension handle. During free fall extension, a cut-out valve will close to cut the L/G hydraulic supply.



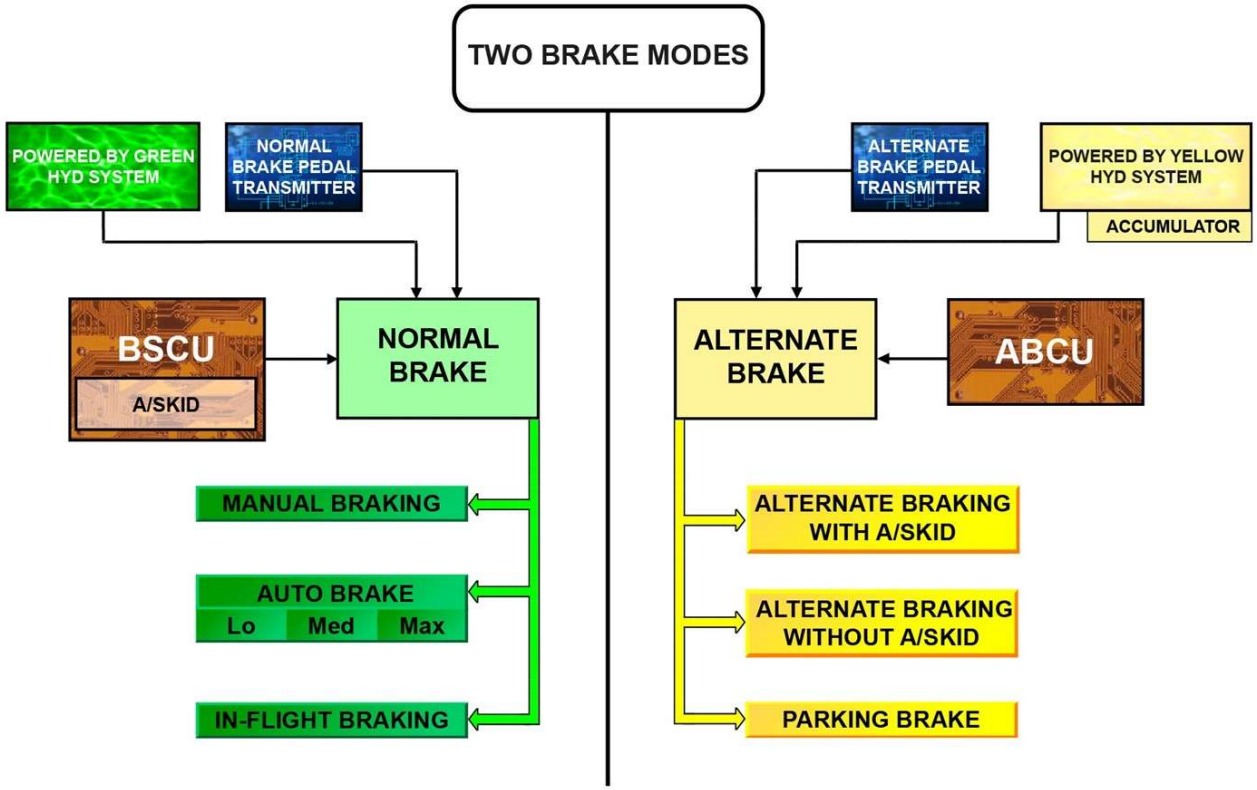
BRAKING (a)
There are two braking modes:
- Normal braking,
- Alternate braking.

BRAKING (b)
The green hydraulic system powers the normal braking system.

BRAKING (c)
The yellow hydraulic system powers the alternate brake system and a brake accumulator backs up the yellow hydraulic system.

BRAKING (d)
The Braking/Steering Control Unit (BSCU) controls and monitors normal braking functions.
These functions are:
- Braking pressure regulation and anti skid,
- Automatic braking,
- Nose wheel steering control,
- Brake temperatures indication.

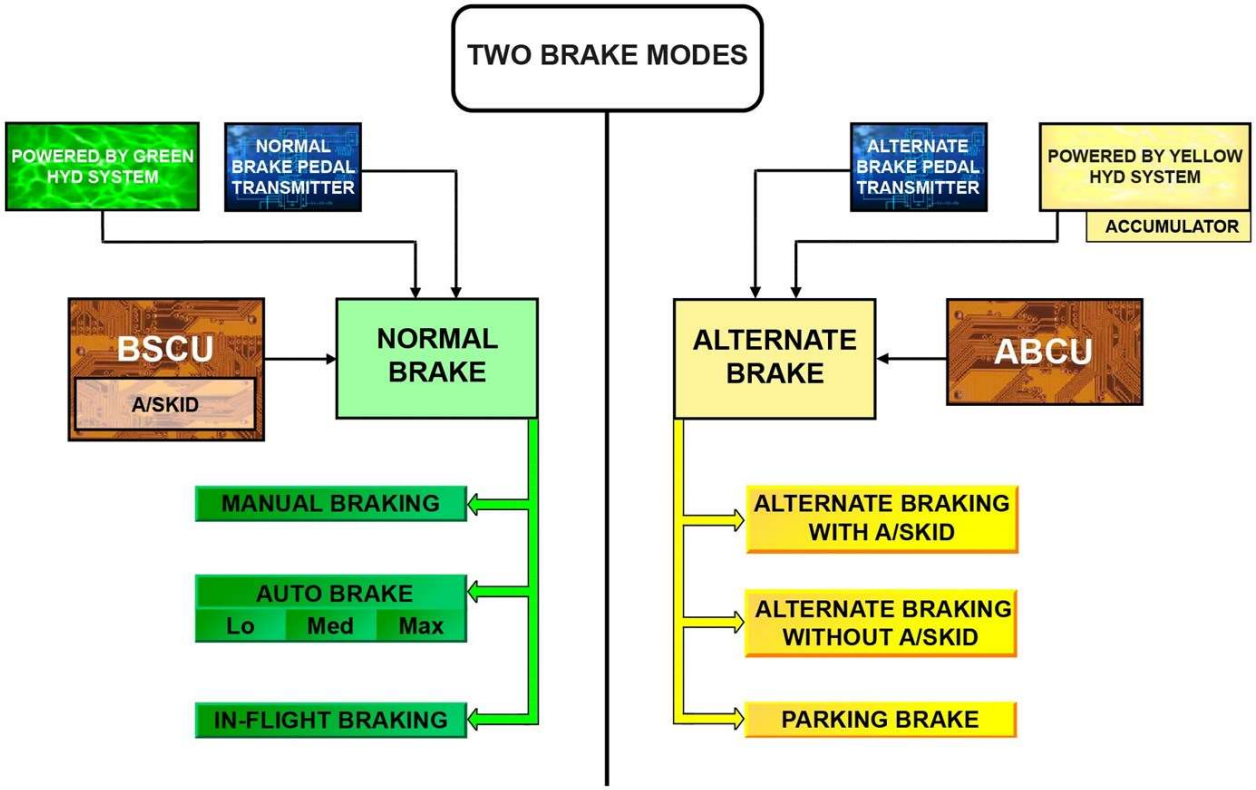
The Alternate Braking Control Unit (ABCU) controls and monitors the alternate braking system with or without the anti-skid protection.



BRAKING - NORMAL BRAKING (e)
In manual normal braking, electrical braking orders are sent by the brake pedals to the BSCU. The BSCU regulates the pressure supplied to each brake.
To obey the manual braking orders and A/SKID regulation, the BSCU regulates the pressure supplied to each brake through the normal servo valves.
Wheel rotating speed from the tachometer and braking pressure are supplied to the BSCU for braking and A/SKID computation.

BRAKING - NORMAL BRAKING (f)
Before landing, the crew can select one of the auto brake modes MEDium or LOw, to get the best deceleration rate that agrees with the length of the runway.
Before take-off, MAXimum mode must be selected in case of an aborted take-off.
Braking starts when the ground spoilers deploy.

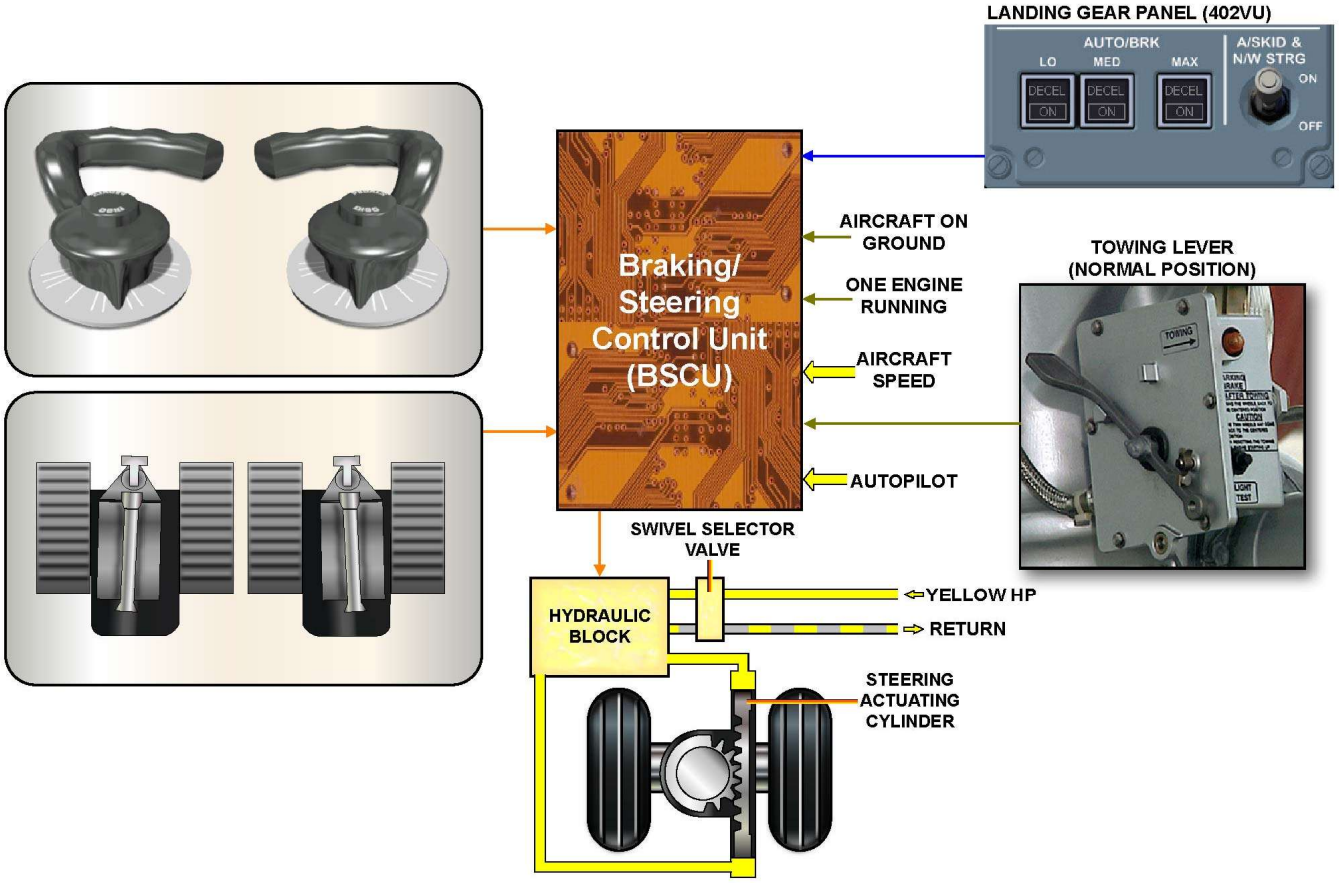
BRAKING - NORMAL BRAKING (g)
To stop the MLG wheels rotation before entry into the L/G bay, a programmed brake pressure is sent to the normal brakes during gear retraction.
Optionally, the N/Ws are mechanically braked at the end of the gear retraction with brake bands.



BRAKING - ALTERNATE BRAKING (h)
The yellow hydraulic system energizes the alternate brake system and a brake accumulator is used as a back-up to this yellow hydraulic system.

BRAKING - ALTERNATE BRAKING (i)
The Alternate Braking Control Unit (ABCU) electrically controls the alternate braking with A/SKID or without A/SKID.
The ABCU becomes active when the normal brake system is defective and/or the green system has a low hydraulic pressure.
The data comes from the BSCU. The brake pedals give braking inputs, which are transmitted through the Alternate Brake Pedal Transmitter Unit to the ABCU. The ABCU will control the braking pressure.
The braking, wheel speed and aircraft speed data are sent to the BSCU to calculate the A/SKID protection.
The braking pressure is read on the triple indicator.

BRAKING - PARKING BRAKE (j)
The yellow hydraulic pressure or the brake accumulator supplies the parking brake system.
Putting ON the parking brake deactivates the other braking modes and the A/SKID system.
The pressure delivered to the LH and RH brakes as well as the brake accumulator pressure are indicated on the triple pressure indicator.

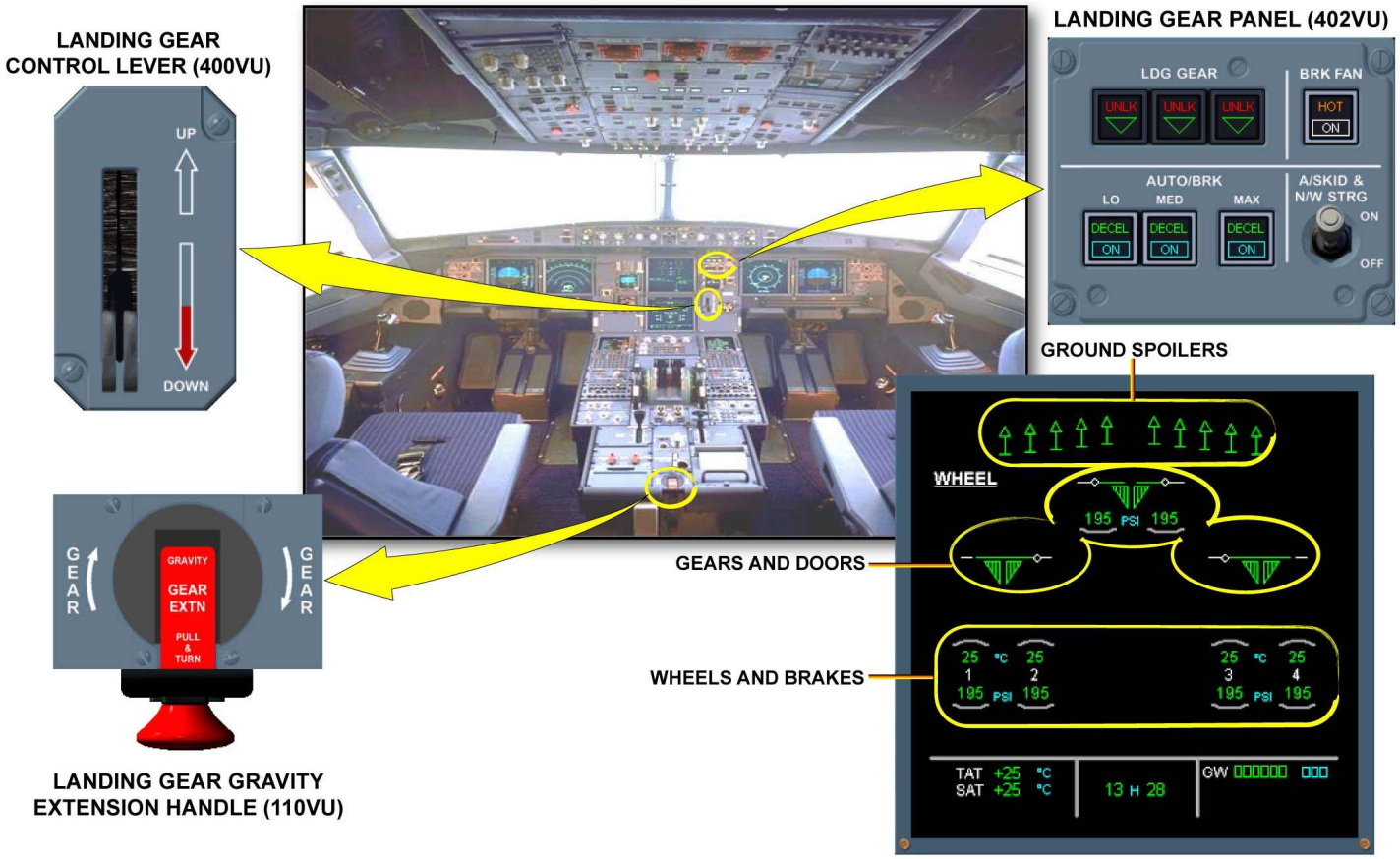


STEERING (a)
The steering system uses the yellow hydraulic system to operate a steering actuating cylinder, which changes the direction of the NLG wheels.

STEERING (b)
Orders from the steering hand wheels, the rudder pedals and the autopilot are added algebraically.

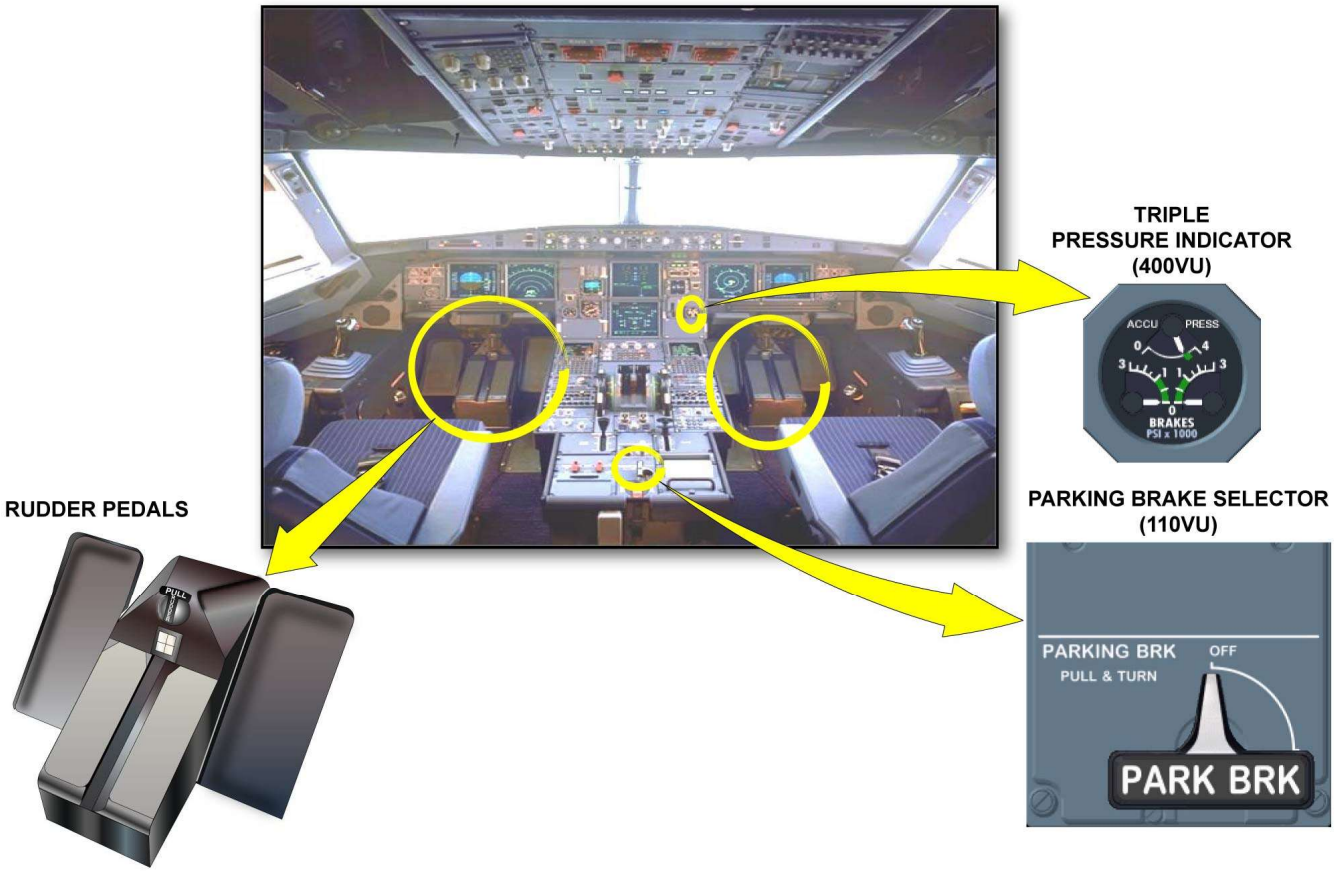
STEERING (c)
The BSCU transforms the orders into N/WS angle. That angle has the following limits:
- Rudder pedals and autopilot: max 6 degrees,
- Hand wheels: max 74 degrees.

STEERING (d)
The steering system receives hydraulic pressure in the following conditions:
- A/SKID & N/W STeeRinG switch in ON,
- Towing control lever in normal position,
- At least one ENG MASTER switch ON,
- Aircraft is on ground.



CONTROL AND INDICATING (a)
This section will highlight the control panels and indications for the landing gear system.

CONTROL AND INDICATING - LANDING GEAR / BRAKES
CONTROL AND INDICATING (b)
The cockpit equipment related to the landing gear control and indicating are :
- L/G control lever,
- L/G gravity extension lever,
- L/G panel, which includes:
- L/G position indication panel,
- Auto brake mode selection panel,
- Brake fan indication/selection panel,
- A/SKID & N/W STeeRinG selector.
- ECAM WHEEL page.



CONTROL AND INDICATING - INDICATOR, PARKING BRAKE HANDLE, RUDDER PEDALS

The Cockpit equipment related to the landing gear brakes are:

- Triple pressure indicator for brake accumulator pressure and alternate/parking brake pressure,
- Parking brake selector,
- Rudder/brake pedals.

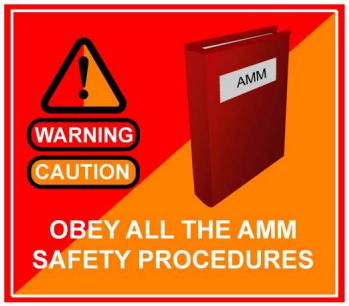
CONTROL AND INDICATING - NOSE WHEEL STEERING

N/WS controls are done with:

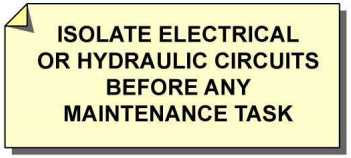
- Rudder/steering pedals,
- N/WS hand wheels.

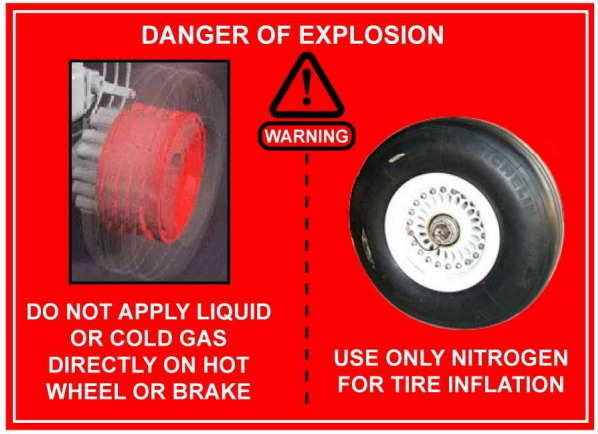
RUDDER PEDALS

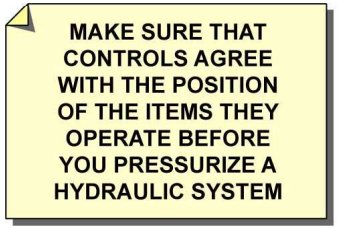
NOSE WHEEL STEERING
HAND WHEEL (18VU, 19VU)



LANDING GEAR SYSTEM







SAFETY PRECAUTIONS (a)
When you work on the L/G system, make sure that you obey all the AMM safety procedures. This will prevent injury to persons and/or damage to the aircraft. Here is an overview of main safety precautions relative to the L/G system.

SAFETY PRECAUTIONS (b)
When you do any maintenance task, make sure that all circuits are isolated. Unwanted electrical or hydraulic power can be dangerous.

SAFETY PRECAUTIONS (c)
Make sure that the L/G ground safety locks are installed.

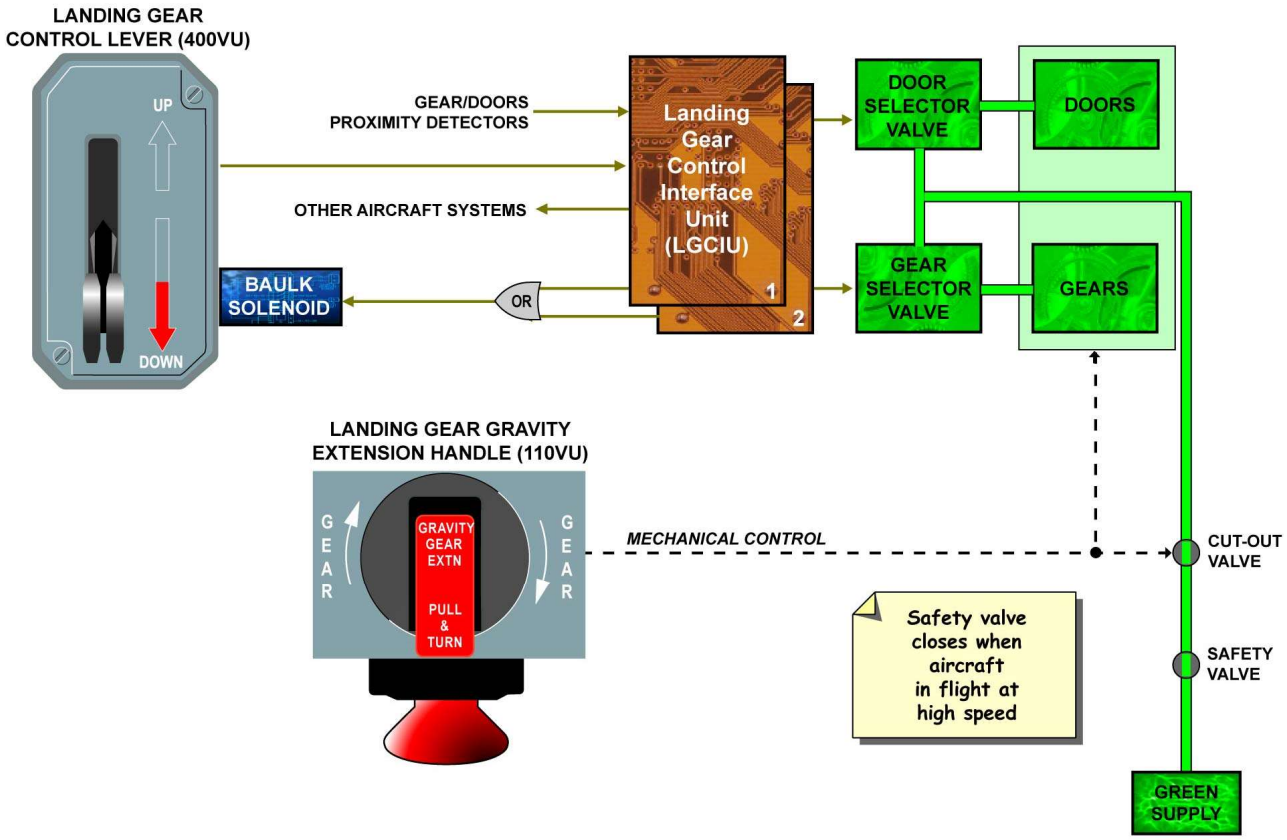
SAFETY PRECAUTIONS (d)
Let the brakes and the wheels become cool before you go near the L/G. Do not apply a liquid or gas fire extinguisher directly on a hot wheel or brake unit. This could cause an explosion.

SAFETY PRECAUTIONS (e)
Use only nitrogen for tire inflation. If the brakes overheat, other gases can cause an explosion.

SAFETY PRECAUTIONS (f)
During L/G servicing, do not let high-pressure gas get in contact with your skin. Gas bubbles in your blood can kill you.

SAFETY PRECAUTIONS (g)
Make sure that the controls agree with the position of the items they operate before you pressurize a hydraulic system.

Landing Gears System Component Location



SYSTEM OVERVIEW - EXTENSION/RETRACTION SYSTEM

Landing Gear Control and Interface Units (LGCIU) 1 and 2 electrically control the gear and door sequencing.

Each LGCIU in turn controls a complete gear cycle: one UP selection and one DOWN selection.

The LGCIU in control is the active unit and the other is the standby unit. The active unit changes after each retract/extend cycle (when the L/G control lever is moved away from the DOWN position). If a failure occurs in the active LGCIU, the standby LGCIU becomes active.

Duplicated sensors monitor the gear up and down positions, the door closed and open positions and the shock absorber compressed (ground signal) and fully extended (flight signal) positions.

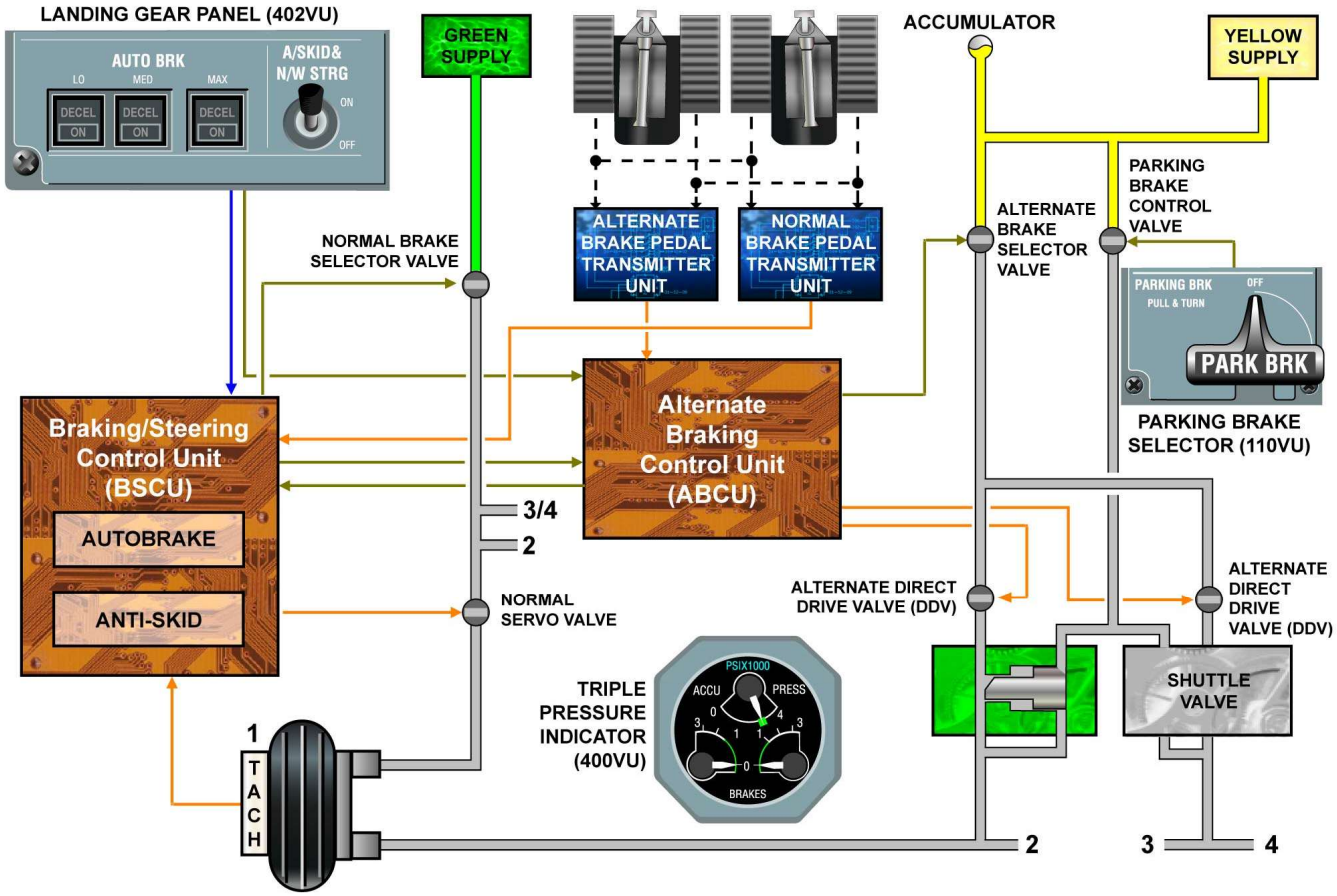
An interlock mechanism prevents unsafe retraction by locking the lever in the DOWN position when any shock absorber is compressed.

The two systems are electrically segregated with different connections on the related selector valves.

In case of failure, the gear can be mechanically extended from the cockpit by means of a gravity extension crank handle.

After free fall extension, the L/G doors stay open and the L/G is locked down by the lockstays and springs.

The normal extension and retraction control is available when the free-fall handle-assembly is put back to its initial position.



SYSTEM OVERVIEW - NORMAL BRAKING (a)

Normal braking is obtained when:

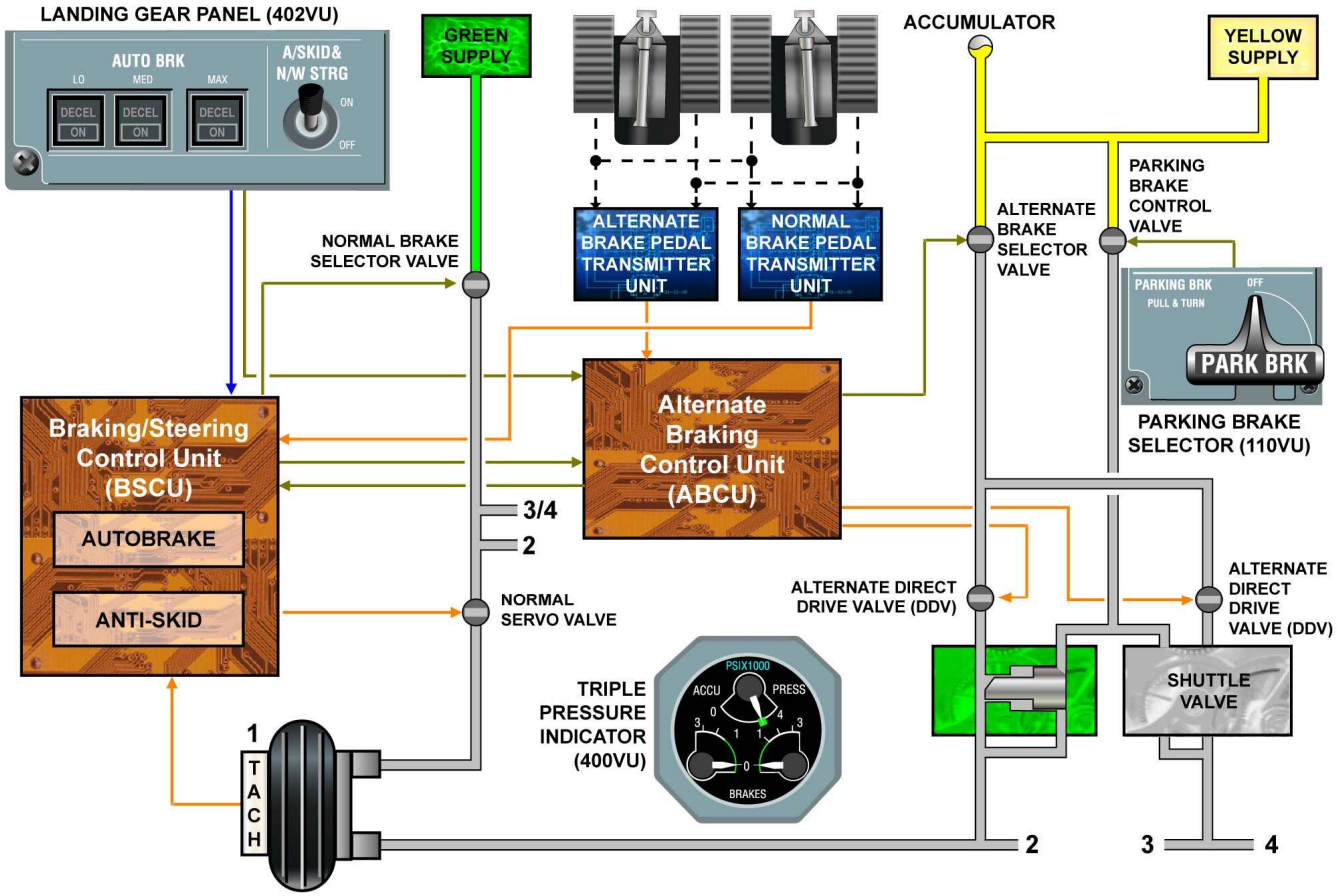
- The green hydraulic pressure is available,
- The Anti/SKID and Nose/Wheel Steering control switch is in the ON position,
- The Parking Brake control switch is in the OFF position.

Electrical control is obtained:

- Through the pedals,
- Automatically on the ground by the auto brake system,
- In flight when the gear control lever is set to UP (in flight braking).

SYSTEM OVERVIEW - ALTERNATE BRAKING (b)

The alternate brake system is energized by the yellow hydraulic system. A brake accumulator can supply hydraulic power for emergencies.



SYSTEM OVERVIEW - ALTERNATE BRAKING (c)

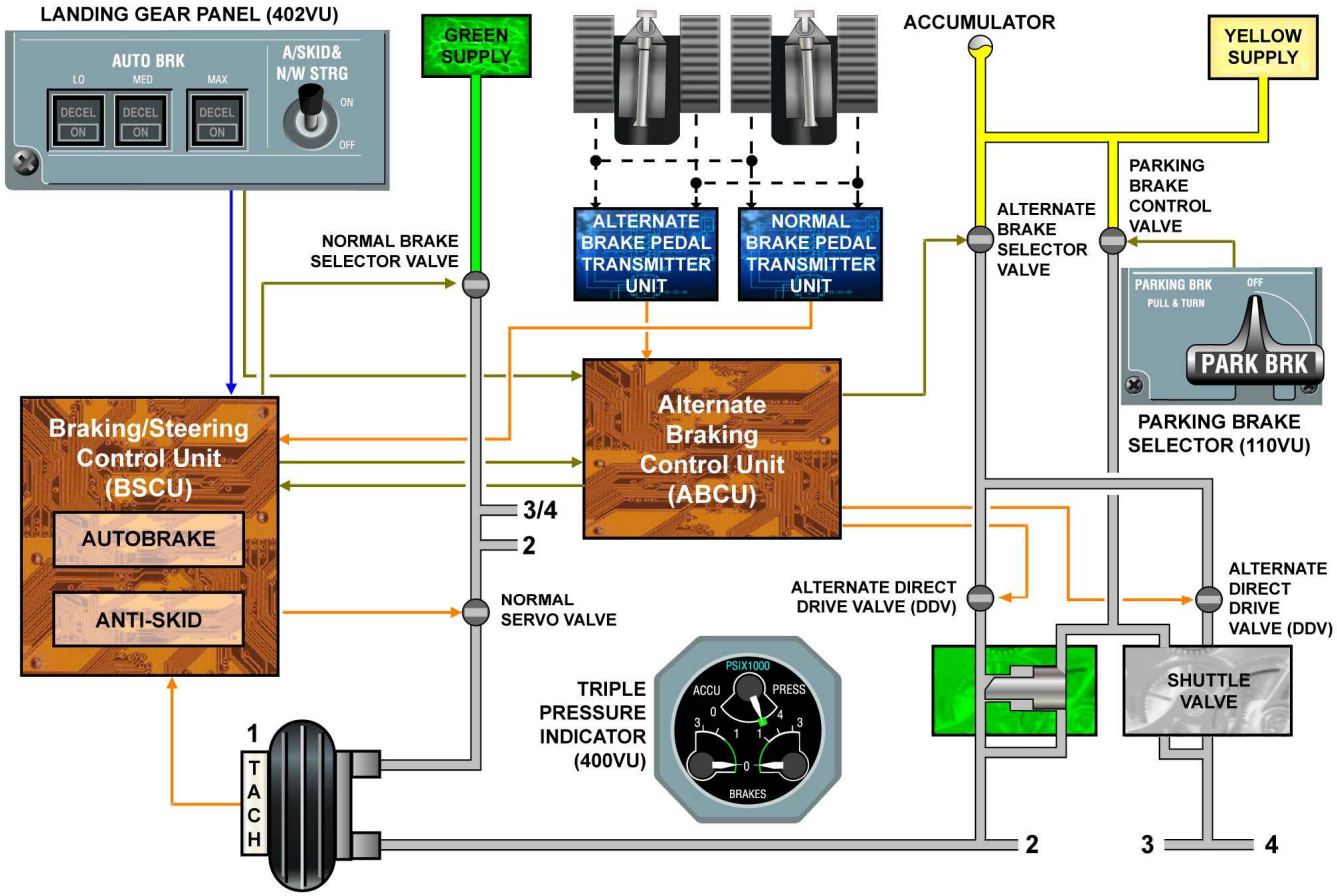
The Alternate Braking Control Unit (ABCU) electrically controls the alternate braking with A/SKID or without A/SKID.

The ABCU becomes active when the normal brake system is defective and/or the green system has a low hydraulic pressure.

The data comes from the BSCU. The brake pedals give braking inputs, which are transmitted through the Alternate Brake Pedal Transmitter Unit to the ABCU. The ABCU will control the braking pressure.

The braking, wheel speed and aircraft speed data are sent to the BSCU to calculate the A/SKID protection.

The braking pressure is read on the triple indicator.



SYSTEM OVERVIEW - ANTI SKID FUNCTION (d)

The A/SKID function is a part of the BSCU and can be set to OFF with the A/SKID & N/W STeeRinG switch.

BSCU computes the anti skid orders during normal braking.

During alternate braking, BSCU computes the anti-skid orders and sends them to the ABCU for execution.

If there is a BSCU failure or low pressure in the green and yellow hydraulic systems, the anti skid function is lost.

The pilot must then refer to the triple pressure indicator to control the brake pressure and to prevent wheel locking.

But the ABCU sets a maximum limit of 1000 PSI for the brake pressure.

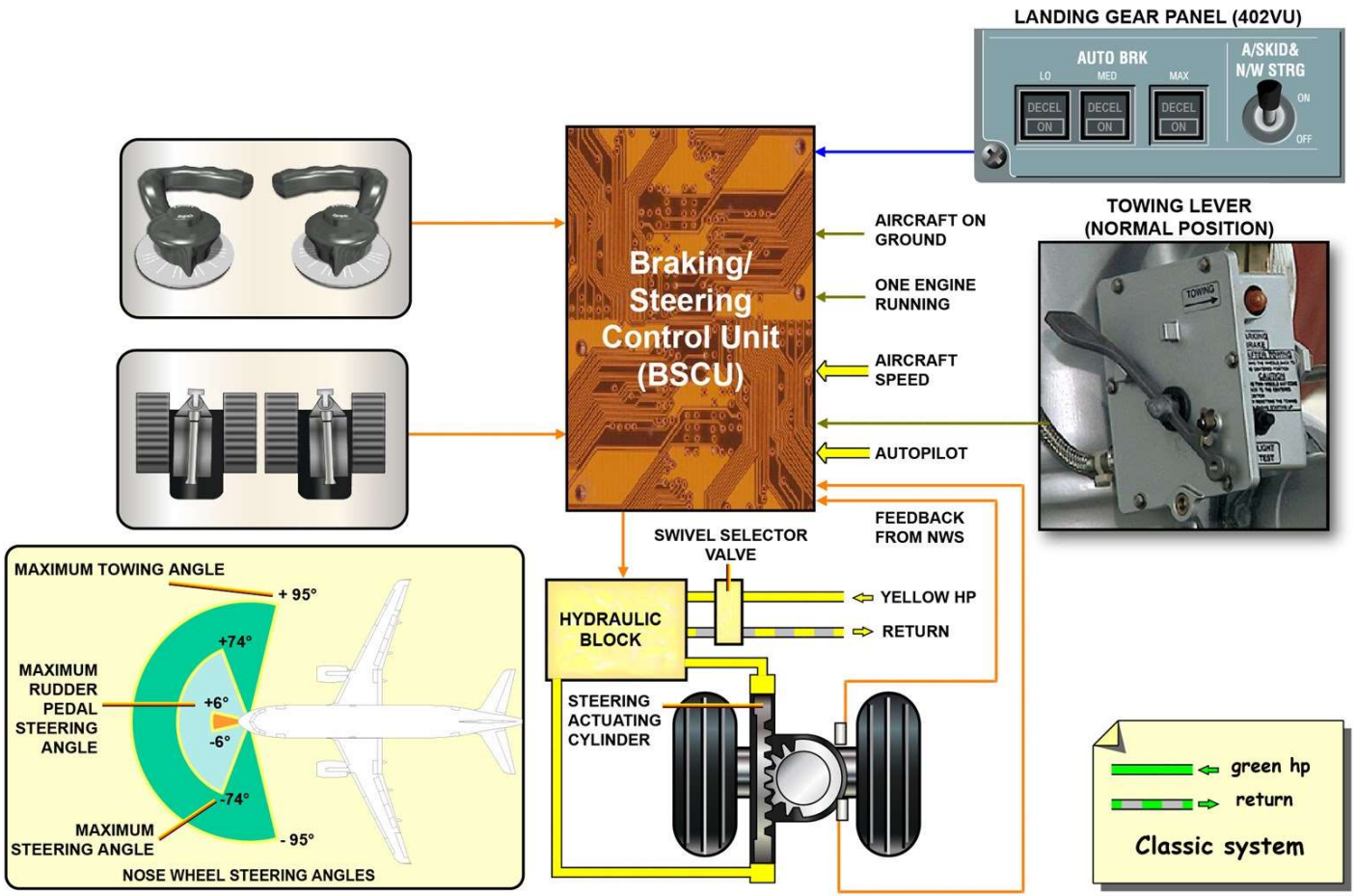
If there is a loss of the green and yellow hydraulic systems, braking is still available with the brake accumulator.

With the accumulator pressure only, a maximum of 7 full brake pedal applications can be done.

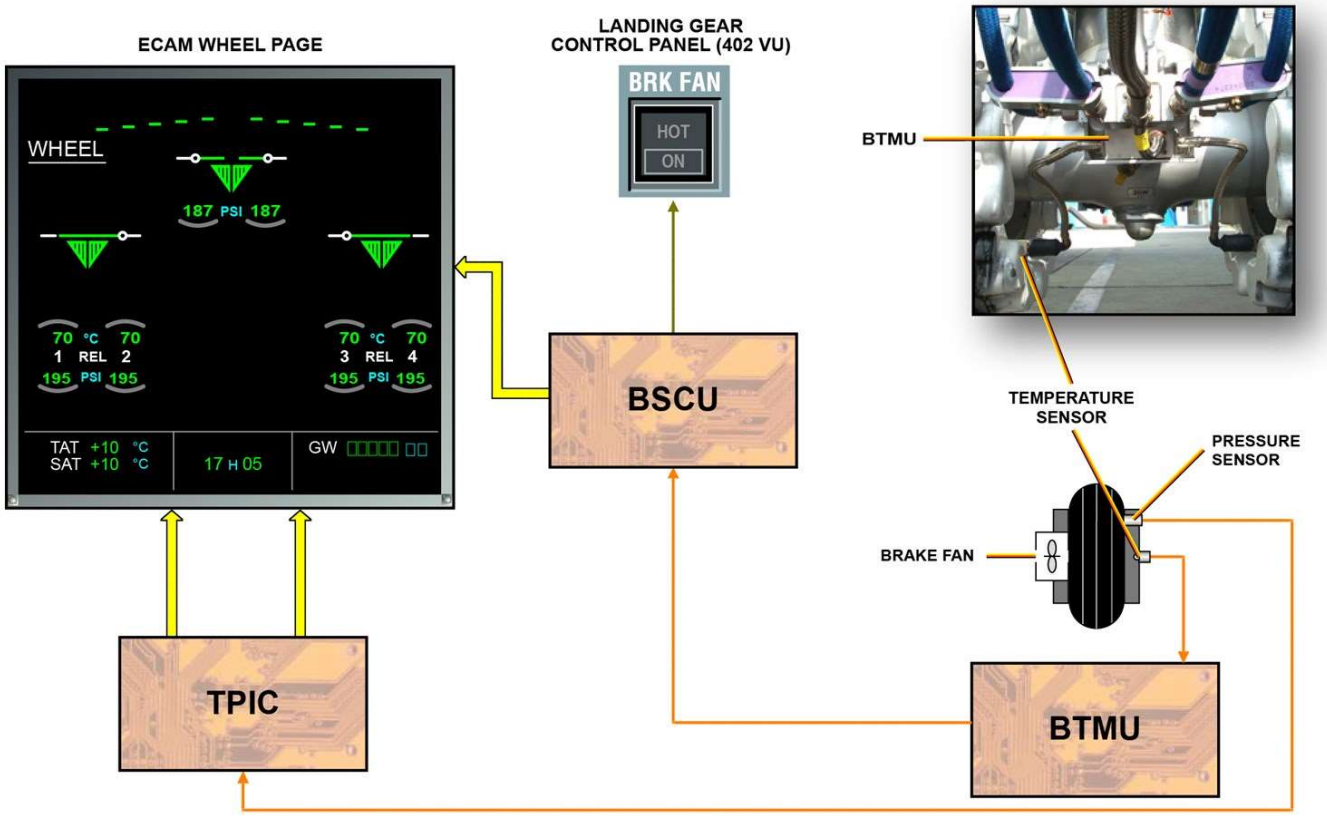
SYSTEM OVERVIEW - PARKING BRAKE (e)

The yellow hydraulic system or the brake accumulators supply brake pressure.

Putting ON the parking brake deactivates the other braking modes and the A/SKID system.



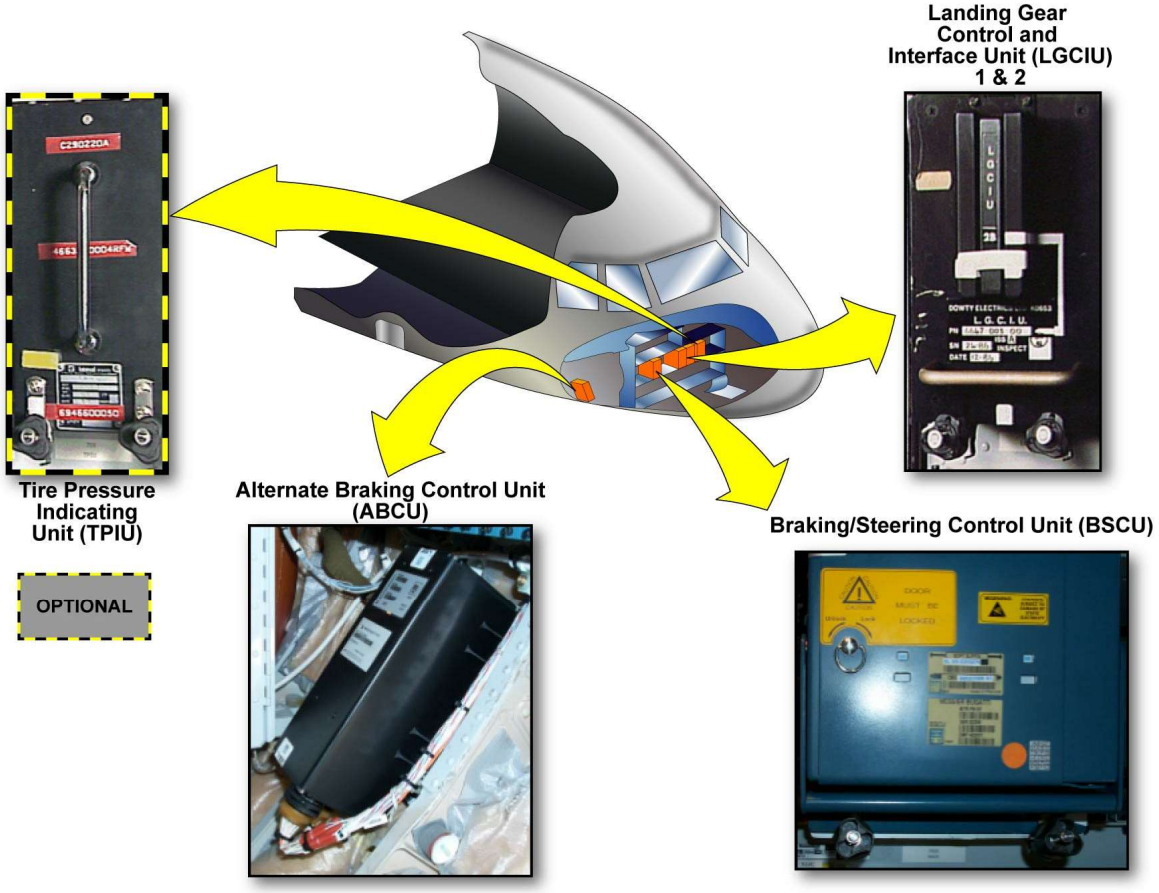
SYSTEM OVERVIEW - NOSE WHEEL STEERING (a)
The steering system uses the yellow hydraulic system to operate a steering actuating cylinder, which changes the direction of the NLG wheels.
SYSTEM OVERVIEW - NOSE WHEEL STEERING (b)
The steering system receives hydraulic pressure in the following conditions:
- A/SKID & N/W STeeRinG switch is in ON position,
- towing control lever is in normal position,
- at least one ENG MASTER switch is ON,
- aircraft is on ground.
SYSTEM OVERVIEW - NOSE WHEEL STEERING (c)
The steering system is controlled by the BSCU, which receives order from:
- the steering hand wheels (orders added algebraically),
- the rudder pedals,
- the autopilot.
SYSTEM OVERVIEW - NOSE WHEEL STEERING (d)
When the rudder pedal disconnect pushbutton is pressed in, N/WS is disconnected from the pedals.
SYSTEM OVERVIEW - NOSE WHEEL STEERING (e)
The BSCU transforms the orders into N/WS angle. That angle has the following limits:
- Ruder pedals: max 6 degrees,
- Hand wheels: max 74 degrees.
The NLG is equipped with Rotary Variable Differential Transducers (RVDTs), which are used as feedback sensors to the BSCU.



SYSTEM OVERVIEW - BTMU (a)
One Brake Temperature Monitoring Unit (BTMU) per gear transmits the brake temperature from the temperature sensors (one per brake) to the BSCU.

SYSTEM OVERVIEW - FAN (b)
The brake cooling system is a manually controlled system that decreases the temperature of the brakes when they are too hot. This optional system allows the brakes to be cooled in a short time period.
One brake fan system with one BRK FAN HOT P/BSW is installed.

SYSTEM OVERVIEW - TPIS (c)
The Tire Pressure Indicating System (TPIS) includes an electronic sensor on each wheel and a Tire Pressure Indicating Computer (TPIC). The TPIC controls and monitors the operation of the system and sends data to other interfaced systems.
As an MPD item, the tire pressure can be checked through:
- a pressure gage (tool),
- or the ECAM WHEEL page.

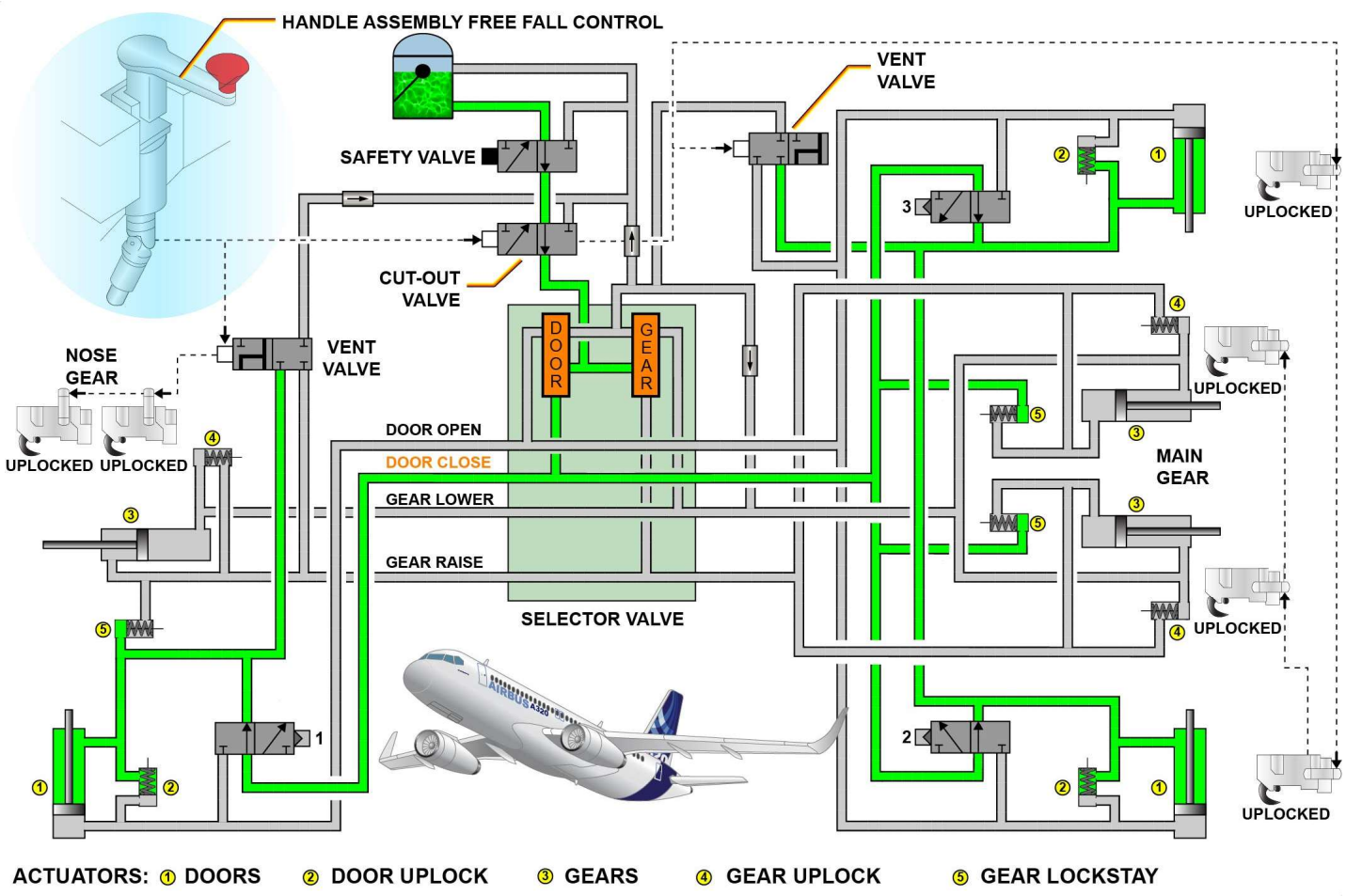


COMPONENT LOCATION

The L/G computers are installed in the forward avionics bay.

Note that the Tire Pressure Indication Unit (TPIU) is an option.


Landing Gear
Free Fall Extension
OVRD
AUTO EXTING
TEST
RESET
1 FADEC GND PWR 2
HYD
YELLOW
PSI
PTU
RAT
ELEC
1
2
A/SKID &
N/W STRG
ON
OFF



GENERAL (a)

Free fall extension is used either when:

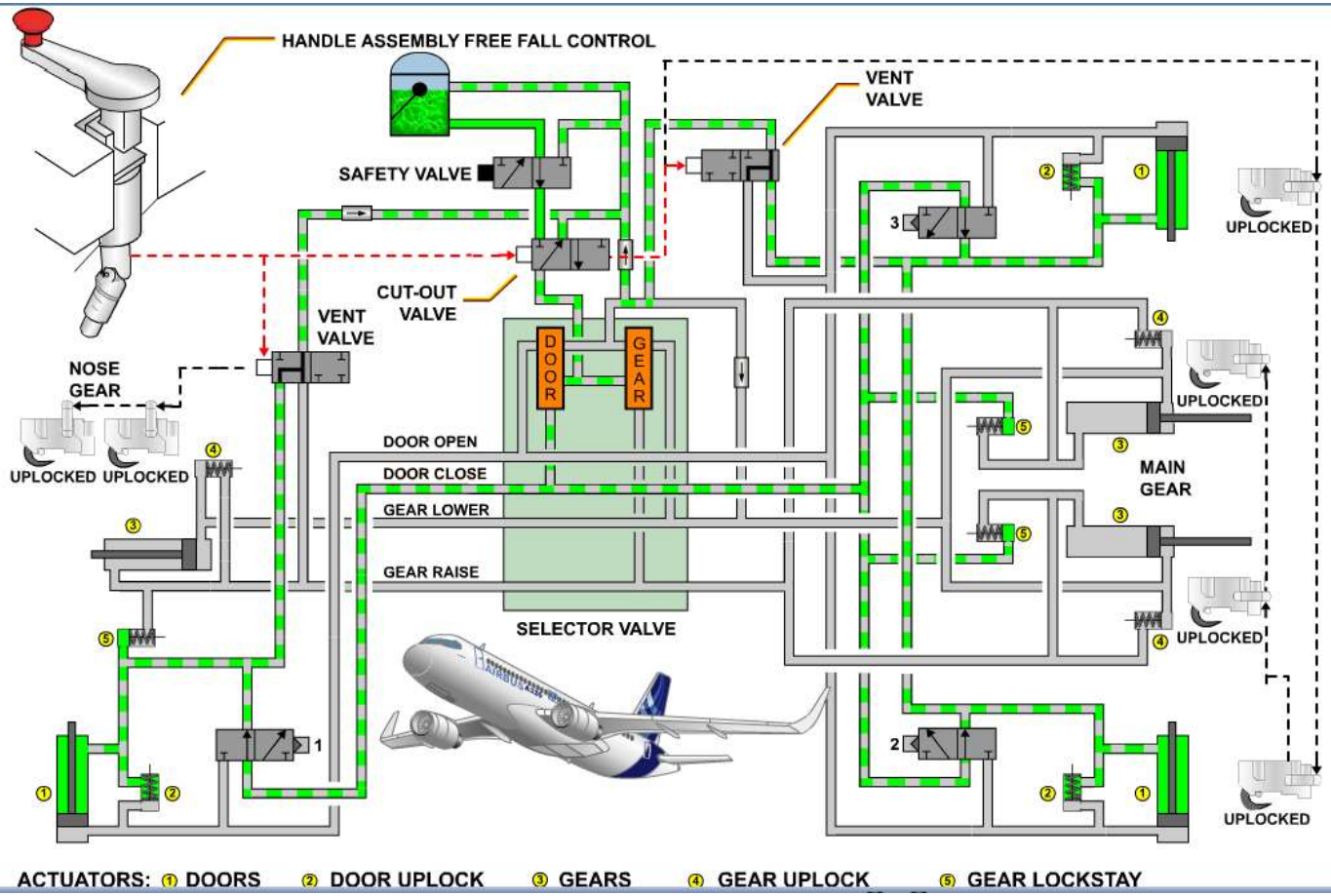
- both Landing Gear Control Interface Units (LGCIUs) have failed,
- there is green hydraulic low pressure,
- one door cannot be opened hydraulically,
- one gear leg cannot be lowered hydraulically.

If both LGCIUs fail the solenoids are not energized and the door "close" lines are not pressurized. If the green hydraulic pressure is low the door "close" lines are not pressurized.

INITIAL CONFIGURATION (b)

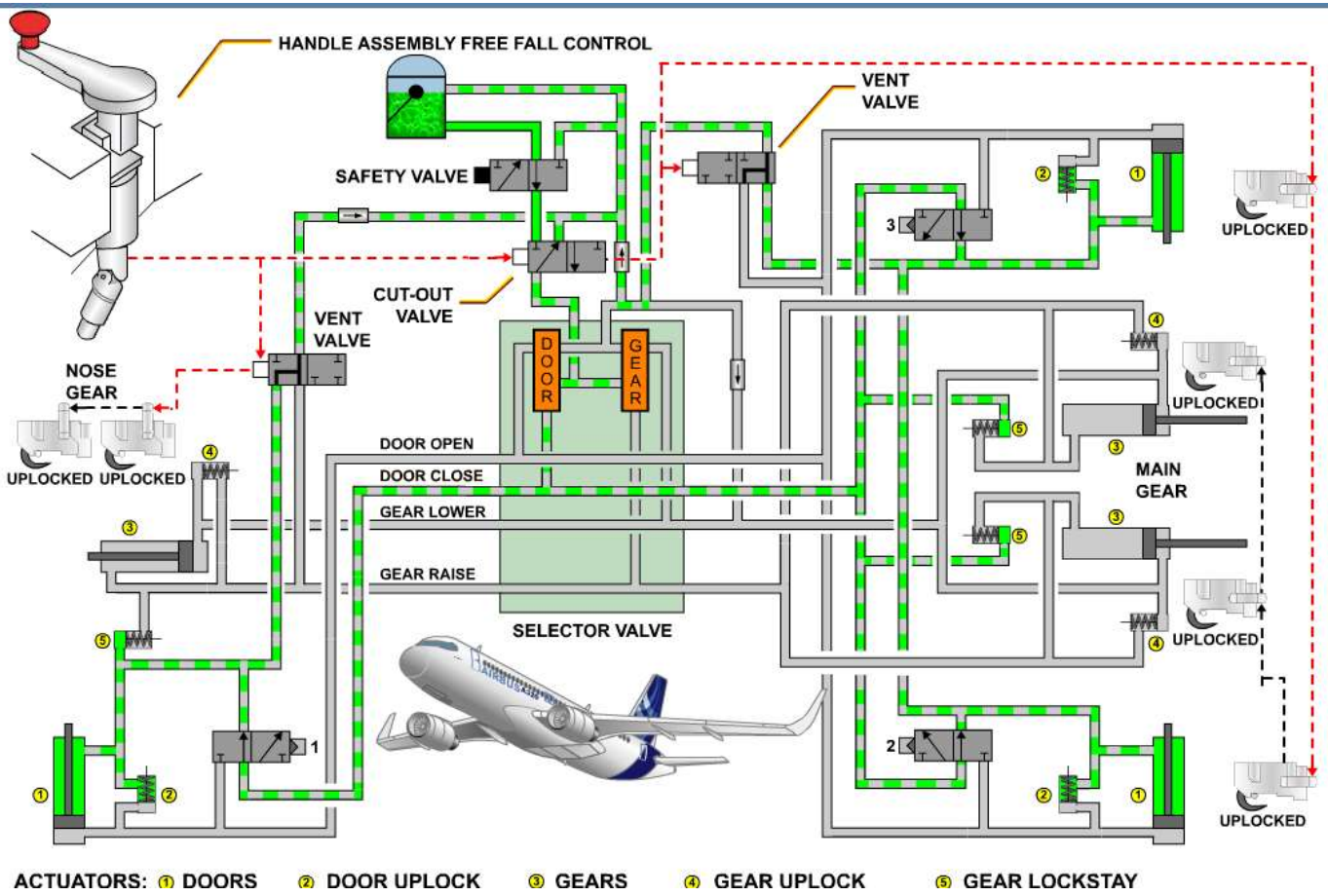
The safety valve is open and residual pressure supplies the door "close" line downstream of the selector valve. Gears and doors are uplocked.

Note: That the door bypass valves (1, 2 and 3) are only operated during ground maintenance.

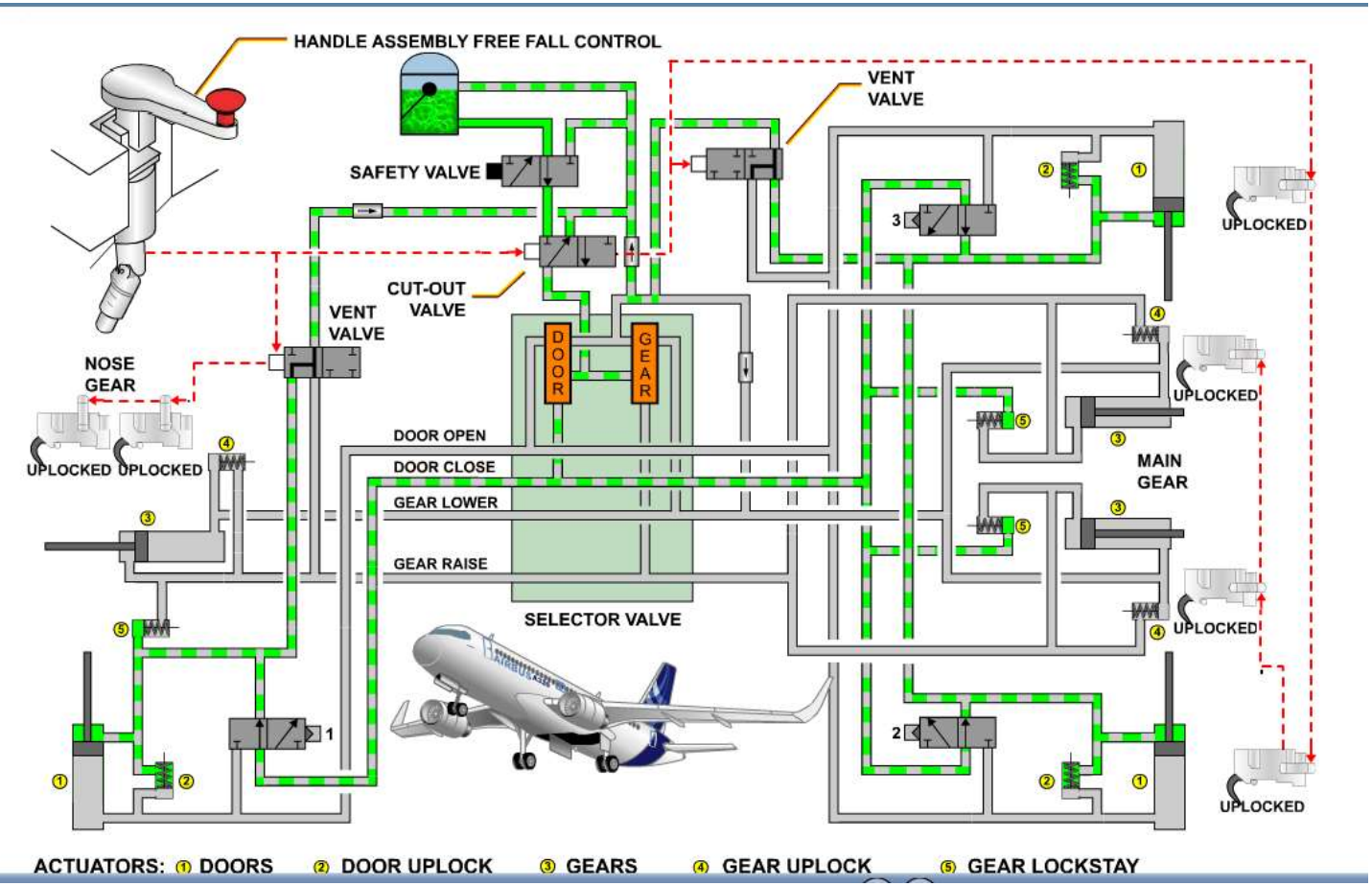


LEVER MOVEMENT UP TO 1.5 TURNS

Rotating the gravity extension crank handle initially operates the cut-out valve and both vent valves to depressurize the system by connecting the entire L/G hydraulic system to return.

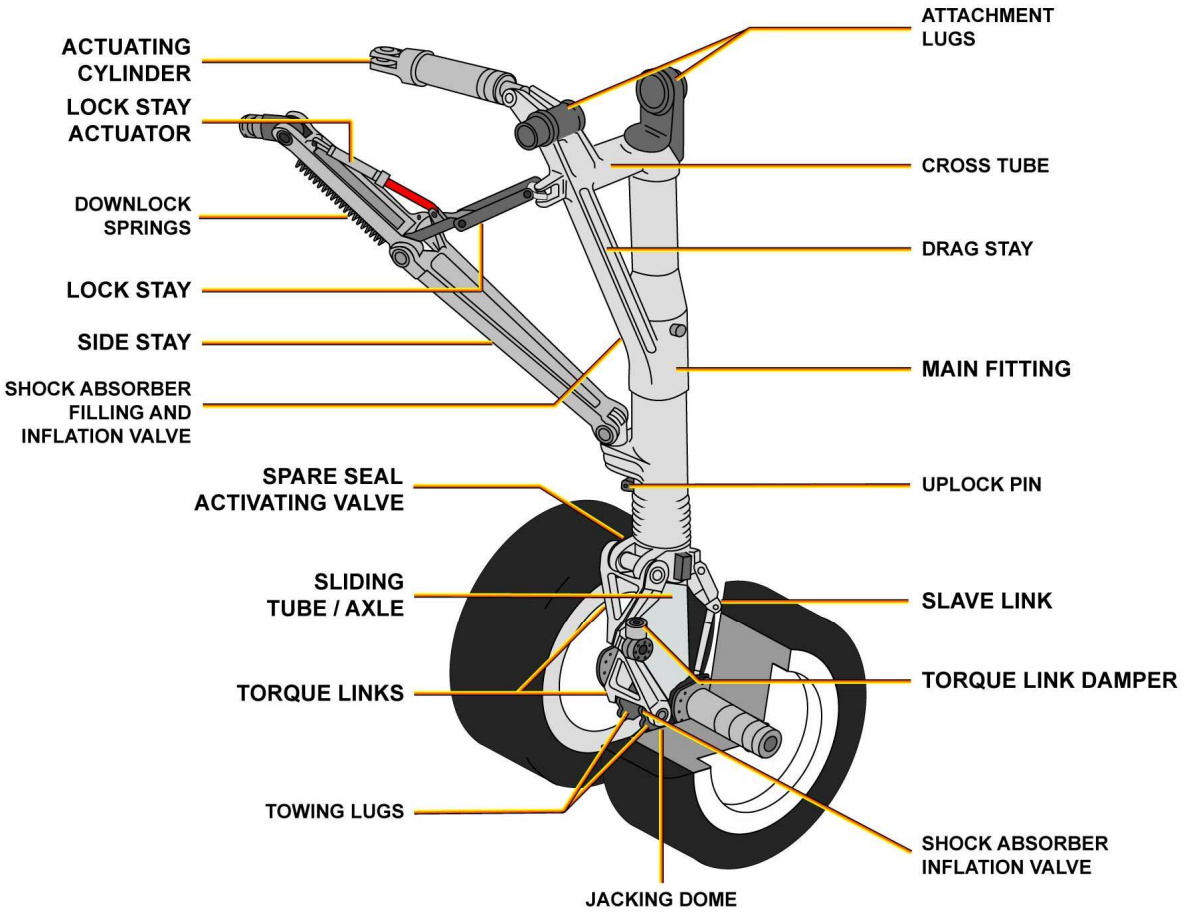


LEVER MOVEMENT BETWEEN 1.6 AND 1.8 TURNS
Then the doors uplocks are released.



LEVER MOVEMENT BETWEEN 1.9 AND 3 TURNS
Finally the gear uplocks are released and the landing gear extends by gravity.
NOTE: Normal L/G operation is restored by rotating the crank handle 3 turns counter-clockwise.

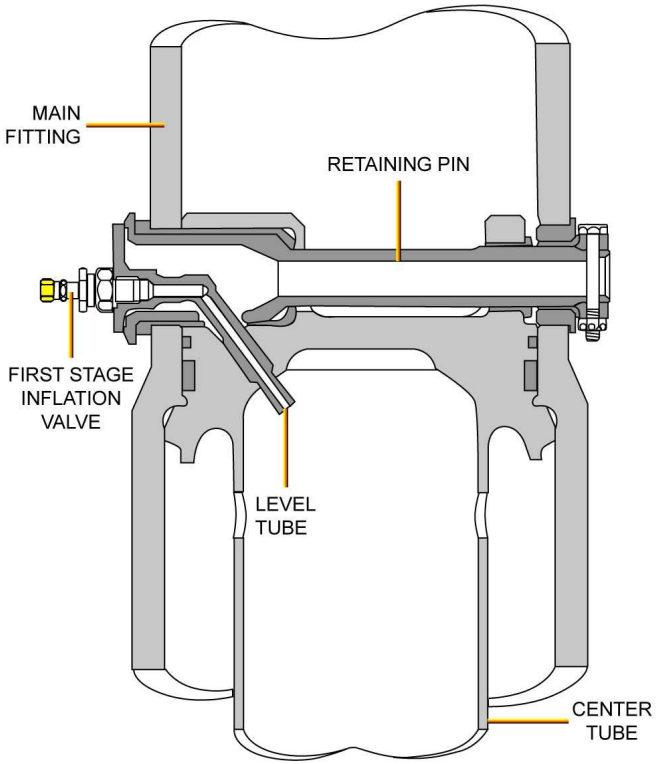
Main Landing Gear Description



GENERAL

Each Main Landing Gear (MLG) includes these parts:

- a main fitting,
- a sliding tube,
- a shock absorber,
- a retraction actuating cylinder,
- a side stay assembly,
- a lock stay assembly and actuator,
- torque and slave links.

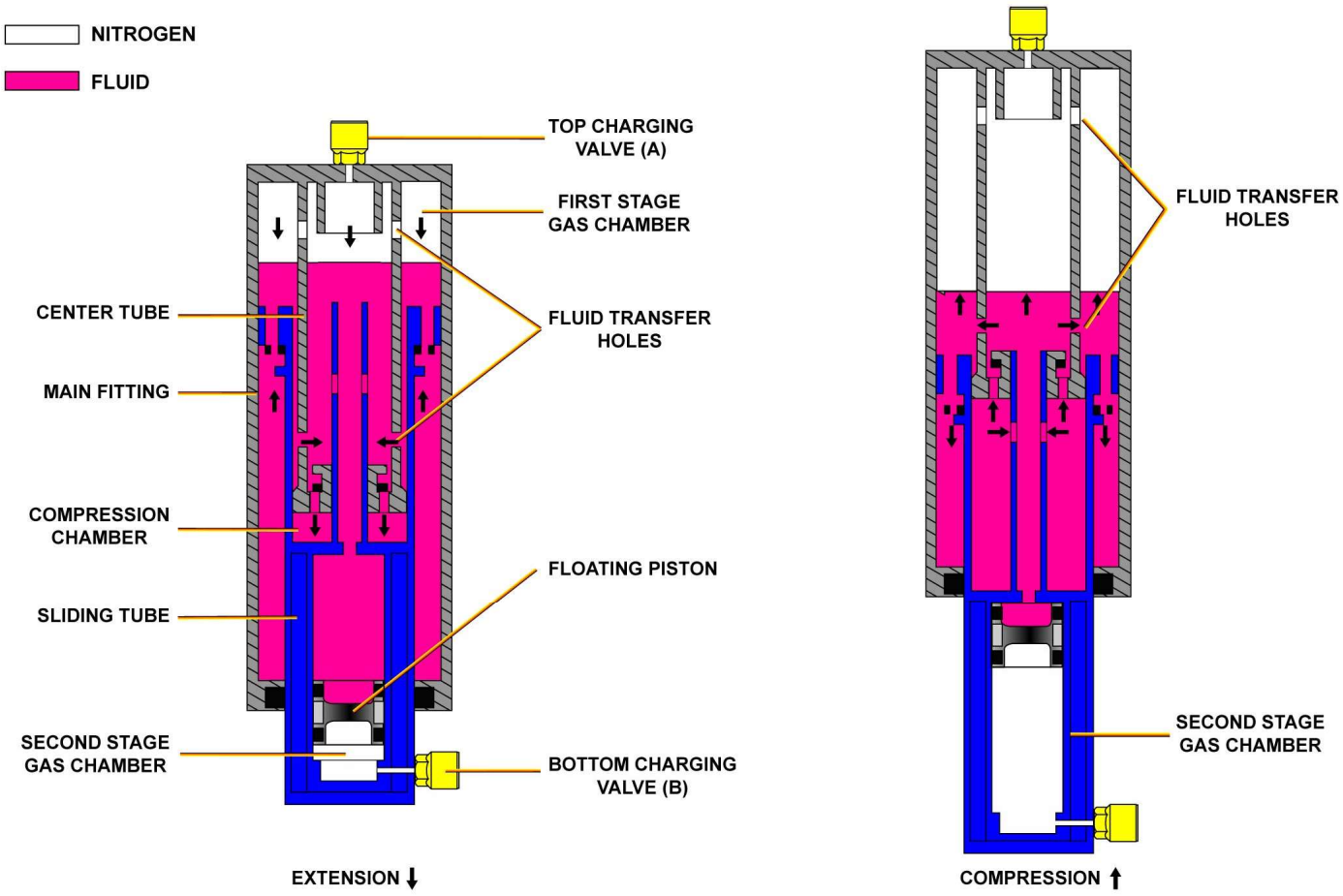


MAIN FITTING

The main fitting includes:

- the main barrel,
- the drag stay,
- the cross tube,
- the aircraft attachment lugs.

It contains a diaphragm and tube assembly that forms the top of the shock absorber. A pin connects the diaphragm and the tube assembly. This pin is located in the two lateral holes in the main fitting, and contains the shock absorber upper charging valve.



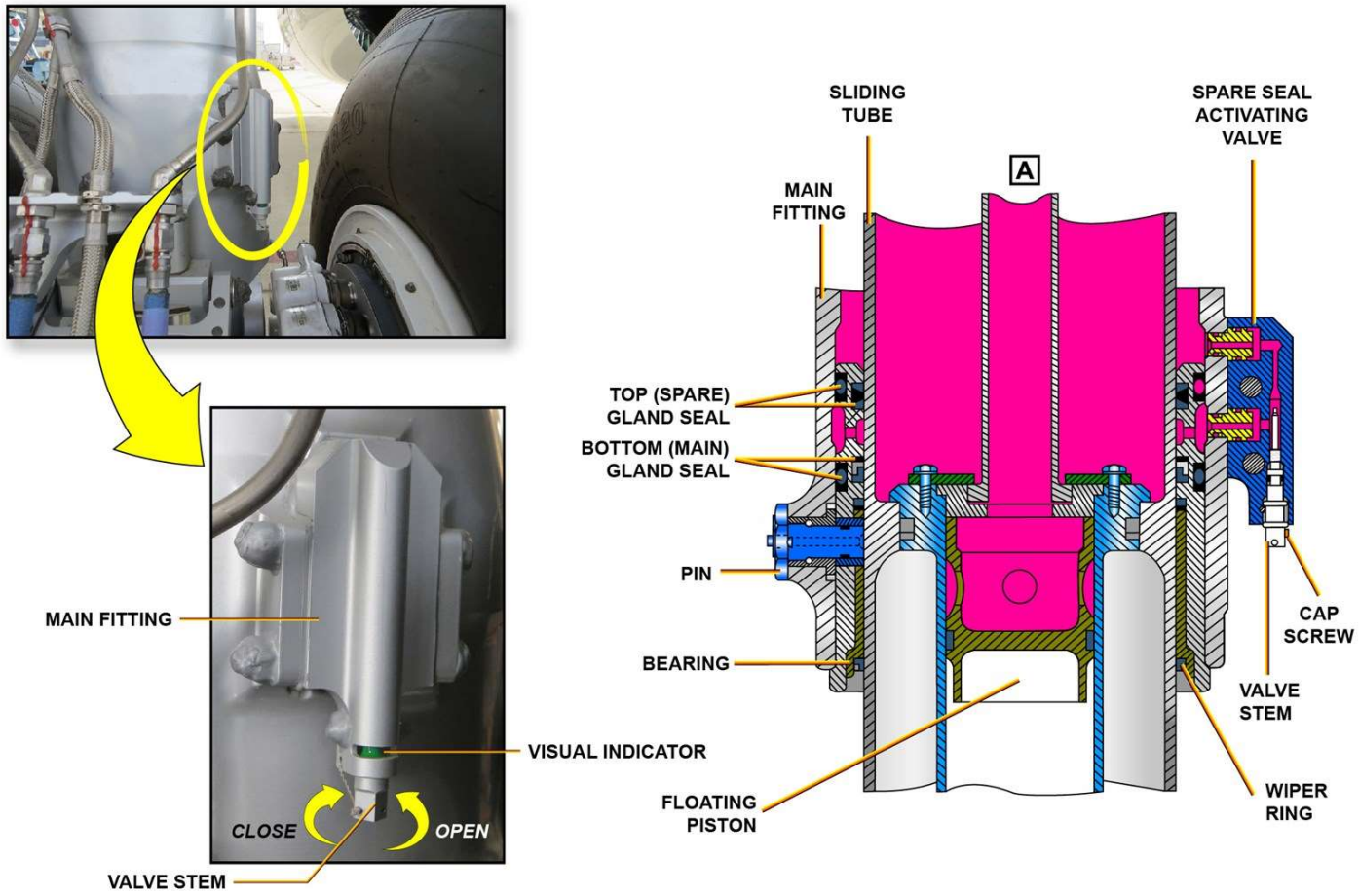
MAIN FITTING - SHOCK ABSORBER

The shock absorber is a telescopic oleo-pneumatic unit which includes the sliding tube. It is installed in the main fitting to transmit the landing, take off and taxiing loads to the wing. When the shock absorber is compressed, the load is transmitted to the hydraulic fluid and nitrogen gas. The shock absorber is a 2 stage unit and contains four chambers:

- a first stage gas chamber contains gas at a low pressure and hydraulic fluid,
- a recoil chamber that contains hydraulic fluid,
- a compression chamber that contains hydraulic fluid,
- a 2nd stage gas chamber that contains gas at a high pressure.

Primary control of the shock absorber recoil is:

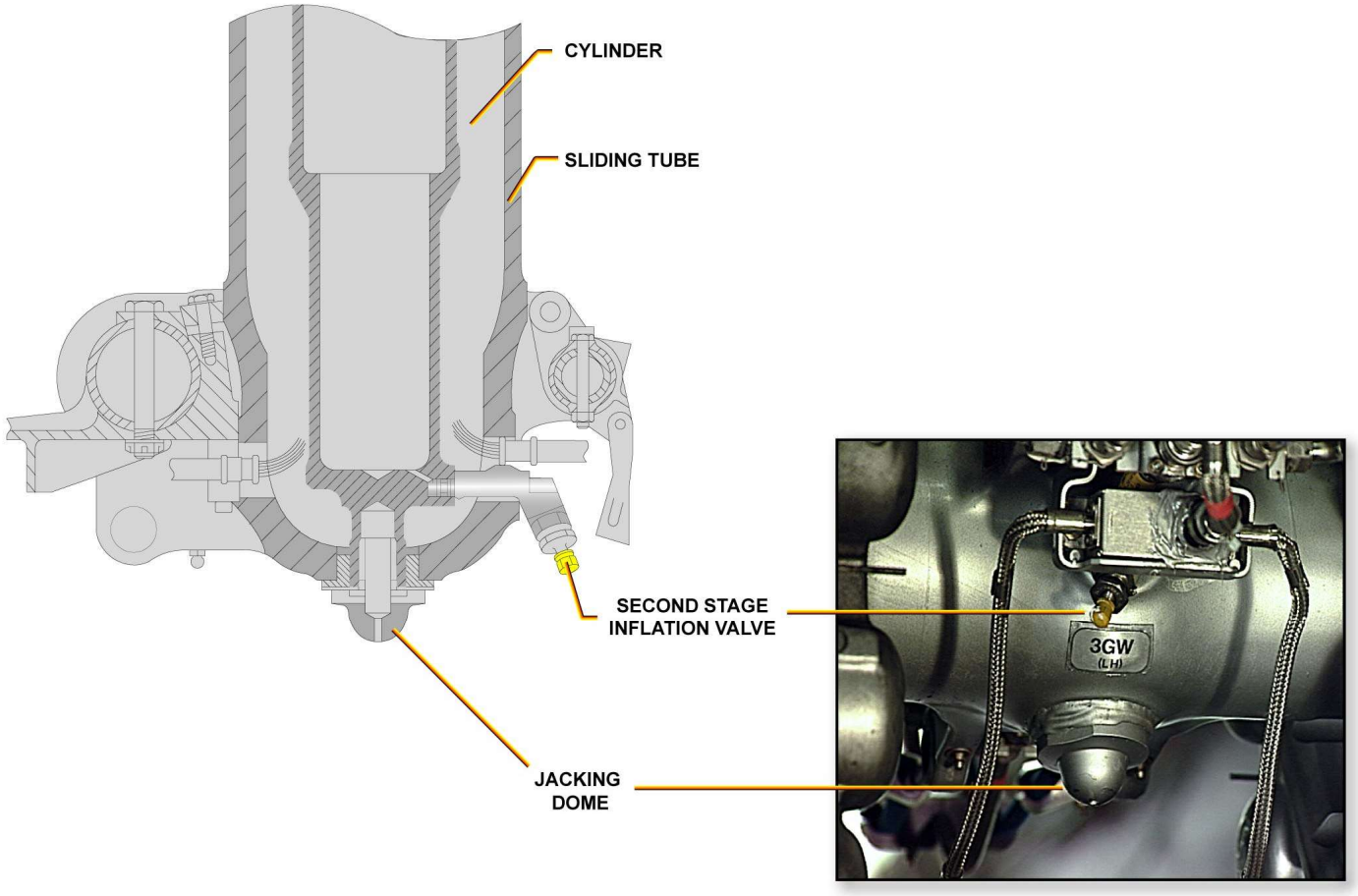
- the fluid flow from the recoil chamber into the gas chamber,
- the fluid flow from the gas chamber into the compression chamber.



MAIN FITTING - SPARE-SEAL ACTIVATING-VALVE

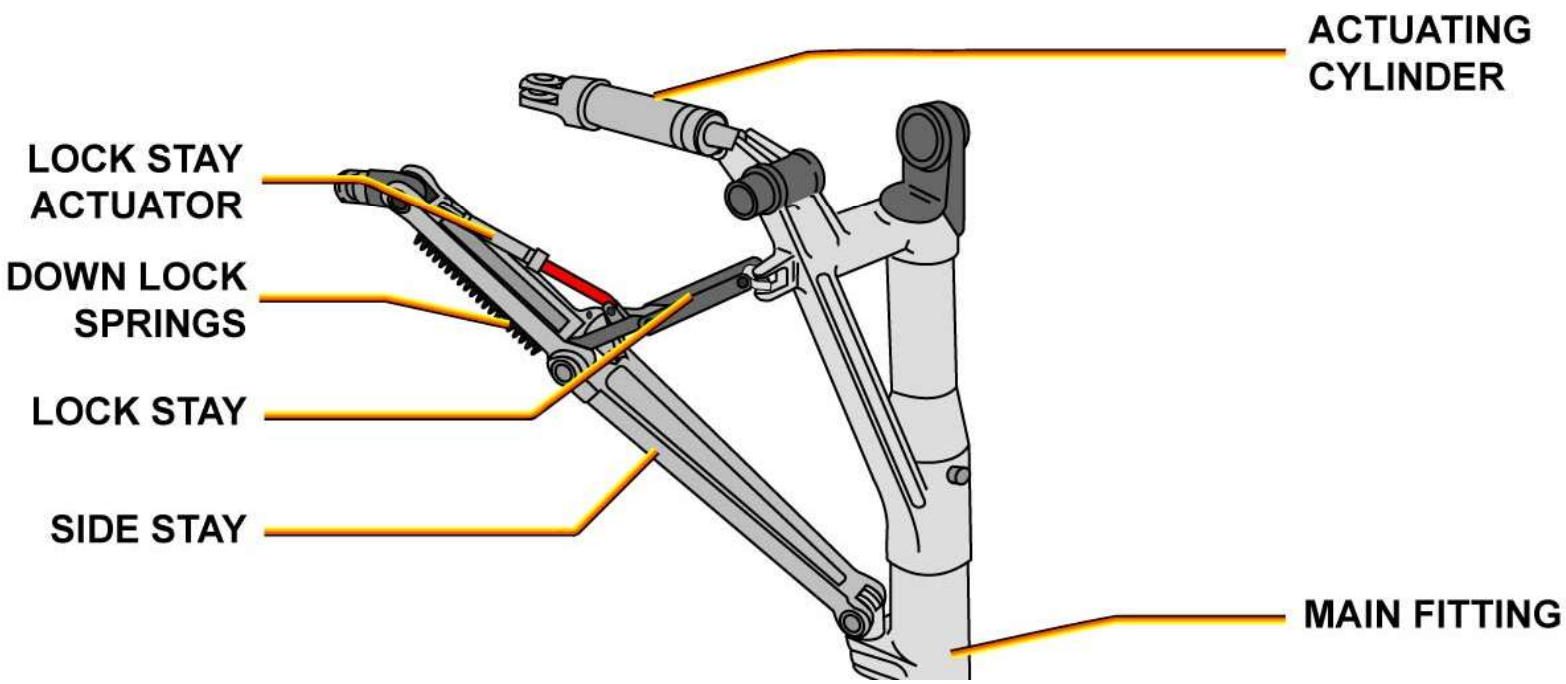
A gland housing assembly, at the bottom end of the main fitting, seals the joint between the main fitting and the sliding tube. A spare-seal activating-valve can isolate the bottom gland seals if a leak occurs. The spare-seal activating-valve is equipped with a color indicator to show if the secondary seal has been activated:

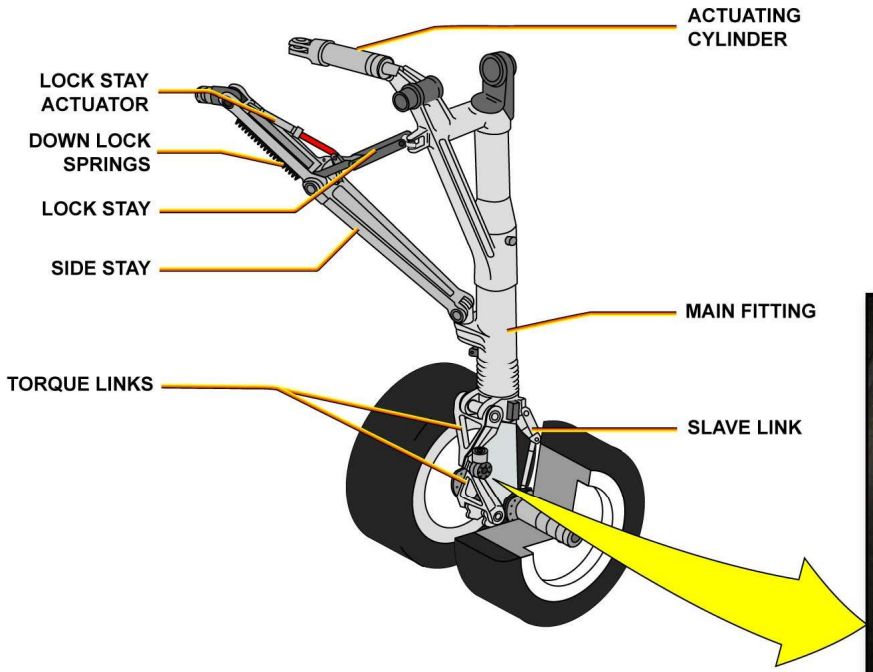
- Green = Primary Seal activated,
- Red = Secondary Seal activated.

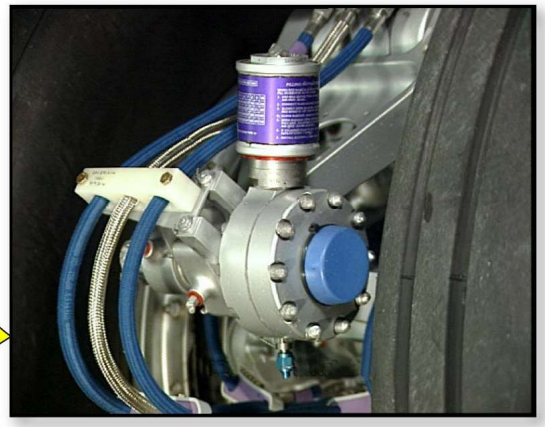


SLIDING TUBE/AXLE

The sliding tube moves in the main fitting and is a primary component of the shock absorber. The axle and the sliding tube are part of same assembly. The second stage inflation valve of the shock absorber is on the sliding tube.


ACTUATING CYLINDER
LOCK STAY ACTUATOR
DOWN LOCK SPRINGS
LOCK STAY
SIDE STAY
MAIN FITTING





TORQUE LINK DAMPER

LOCK STAY ACTUATOR (d)

During MLG extension the two lock stay actuator ports are open to return; a restrictor controls the rate of MLG extension. It is pressurized to extend during MLG door closure until hydraulic pressure on the door close line is released. During MLG retraction, the hydraulic fluid retracts the piston which opens the over centered lock, to fold the side stay and the lock stay against the lock springs.

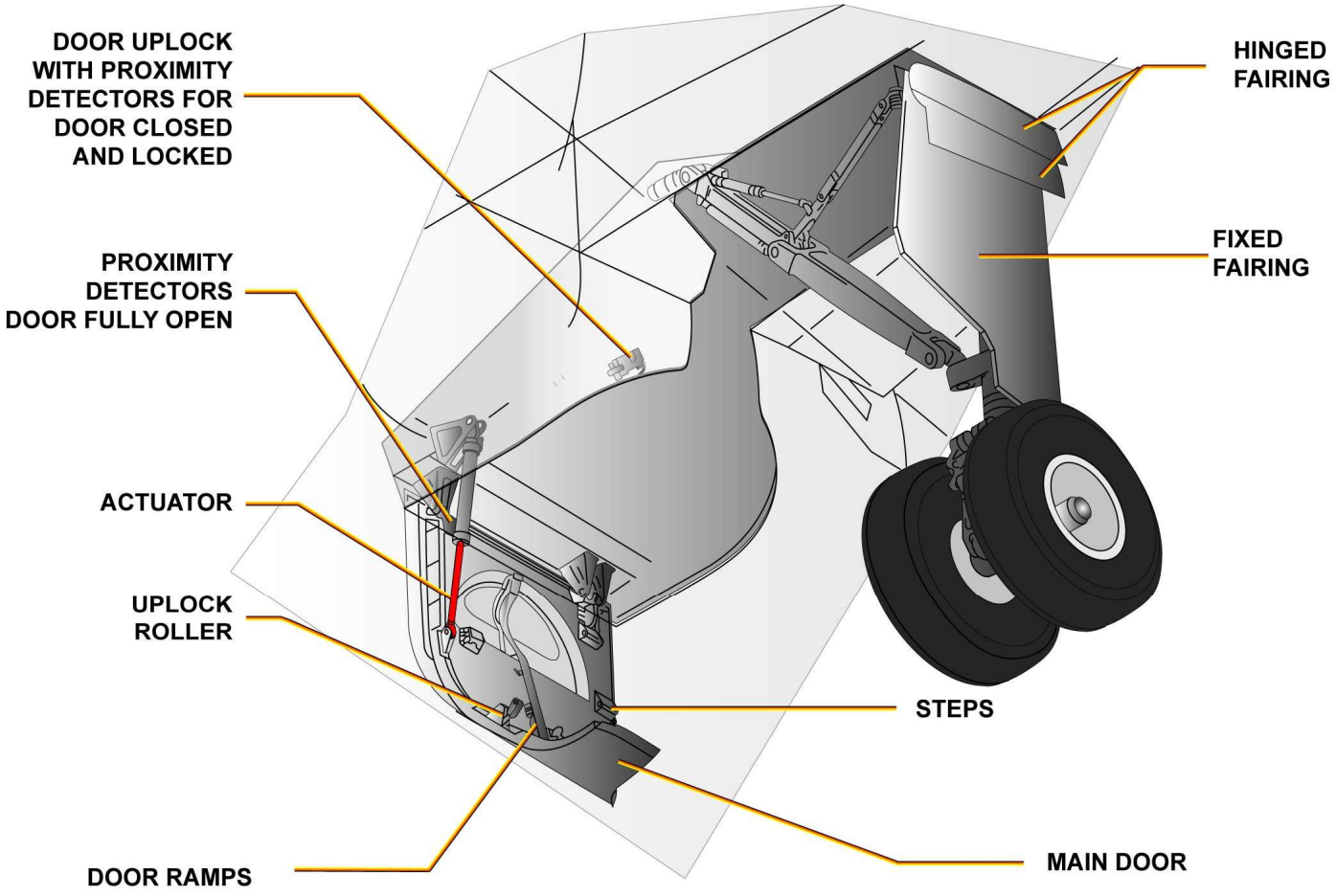
TORQUE LINKS/SLAVE LINK (e)

The torque links align the main fitting and the sliding tube, but let vertical movement between the parts occur. The slave link is mounted at the rear.

TORQUE LINK DAMPER (f)

The torque link damper is a spring-centered, two-way hydraulic unit, which has its own hydraulic reservoir. Its function is to decrease the landing vibrations through the torque links. The hydraulic fluid contents of the damper are shown by the extension of the reservoir when it is pressurized. When the contents are correct, the "FULL" and "REFILL" level indications are in view.


Main Landing Gear
Doors Description
OVRD
APU
AUTO EXTING
TEST
RESET
1 FADEC GND PWR 2
HYD
YELLOW
3000
PSI
PTU
RAT
ELEC
1
2
A/SKID &
N/W STRG
ON
OFF



GENERAL (a)

Each Main Landing Gear (MLG) is enclosed by one door and two fairings:

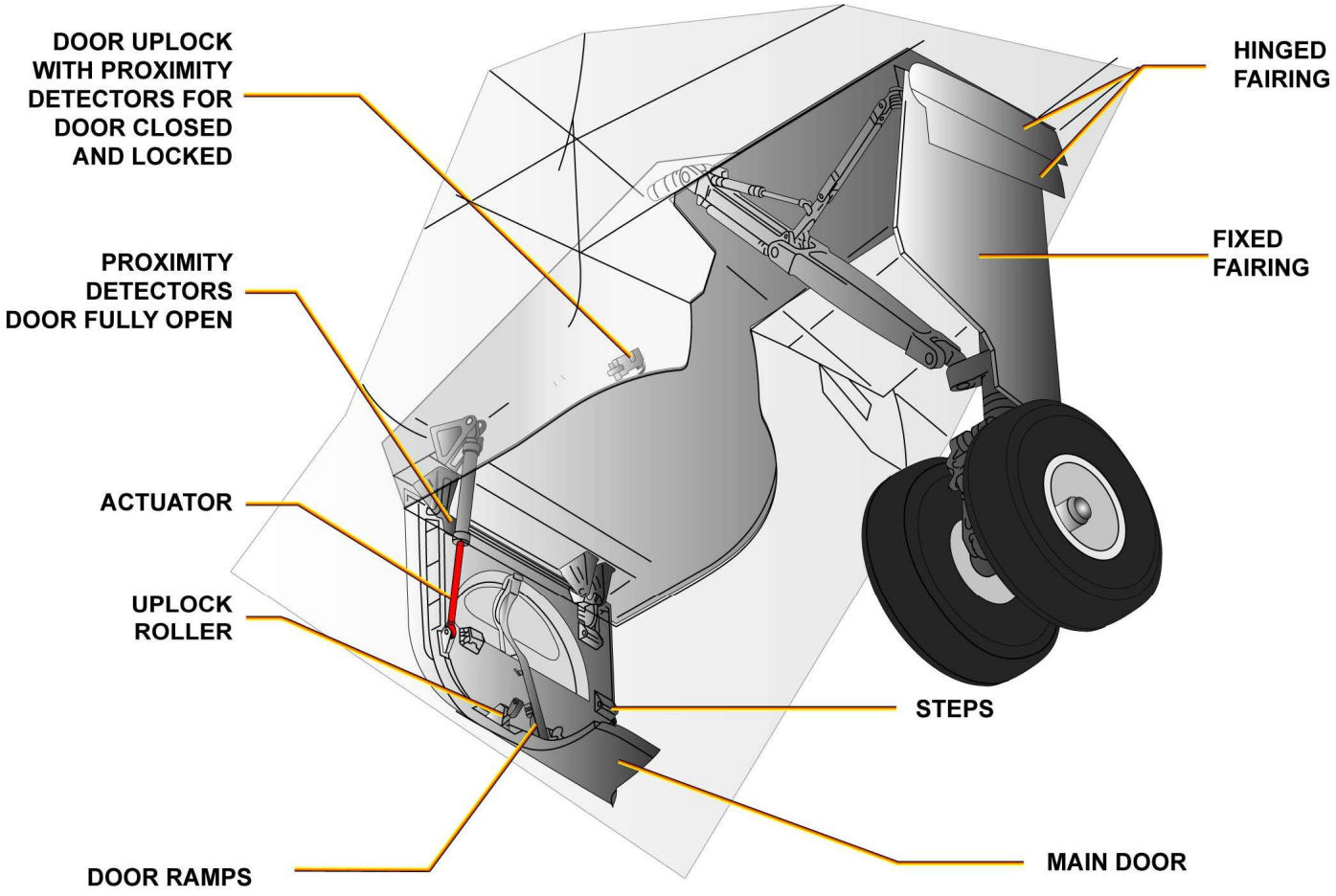
- one main door,
- one hinged fairing,
- one fixed fairing.

MAIN DOOR (b)

The main door is attached to the fuselage structure by two hinges and is operated by a hydraulic actuator. Attached to the forward end of the main door are the hydraulic actuator and an uplock roller that is used to keep the main door in the closed position. Installed on the rear end of the main door are steps, used for access to the gear well compartment. Two ramps are installed on the inside of the main door. These ramps make sure that the gear does not catch on the main door during a free-fall extension. Two proximity sensors and targets send the door open position signal of the main door to the Landing Gear Control and Interface Units (LGCIUs).

MLG DOOR UPLOCK (c)

The MLG door uplock is closed mechanically, locking the door in the closed position and hydraulically opened, releasing the door during normal extension and retraction sequences. The uplock can also be opened mechanically in free-fall extension and ground door opening.



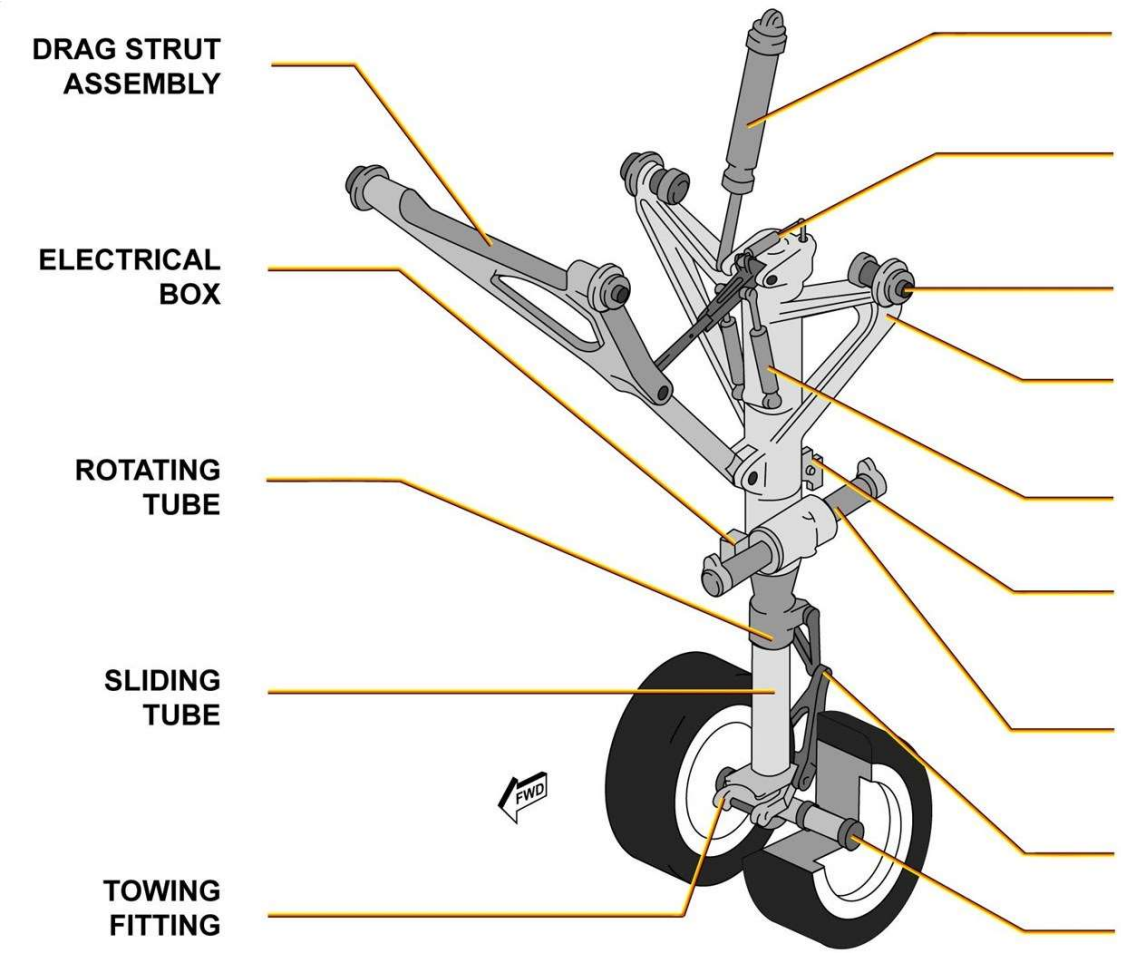
HINGED FAIRING (d)

The hinged fairing is attached to the wing skin by a single hinge and to the L/G by an adjustable tie-rod. The adjustable tie-rod causes the hinged fairing to follow the L/G during the L/G extension and retraction.

FIXED FAIRING (e)

The fix fairing is attached to the gear on 5 points and is fully adjustable in vertical and horizontal directions.

Nose Landing Gear Description



GENERAL (a)

The nose gear retracts forward into the fuselage, and is thus favorably assisted by aerodynamic moments during gear extension.

The nose gear includes:

- a shock strut assembly,
- a drag strut assembly,
- a lock stay assembly,
- a gear actuating cylinder,
- nose wheel steering system components.

SHOCK STRUT ASSEMBLY (b)

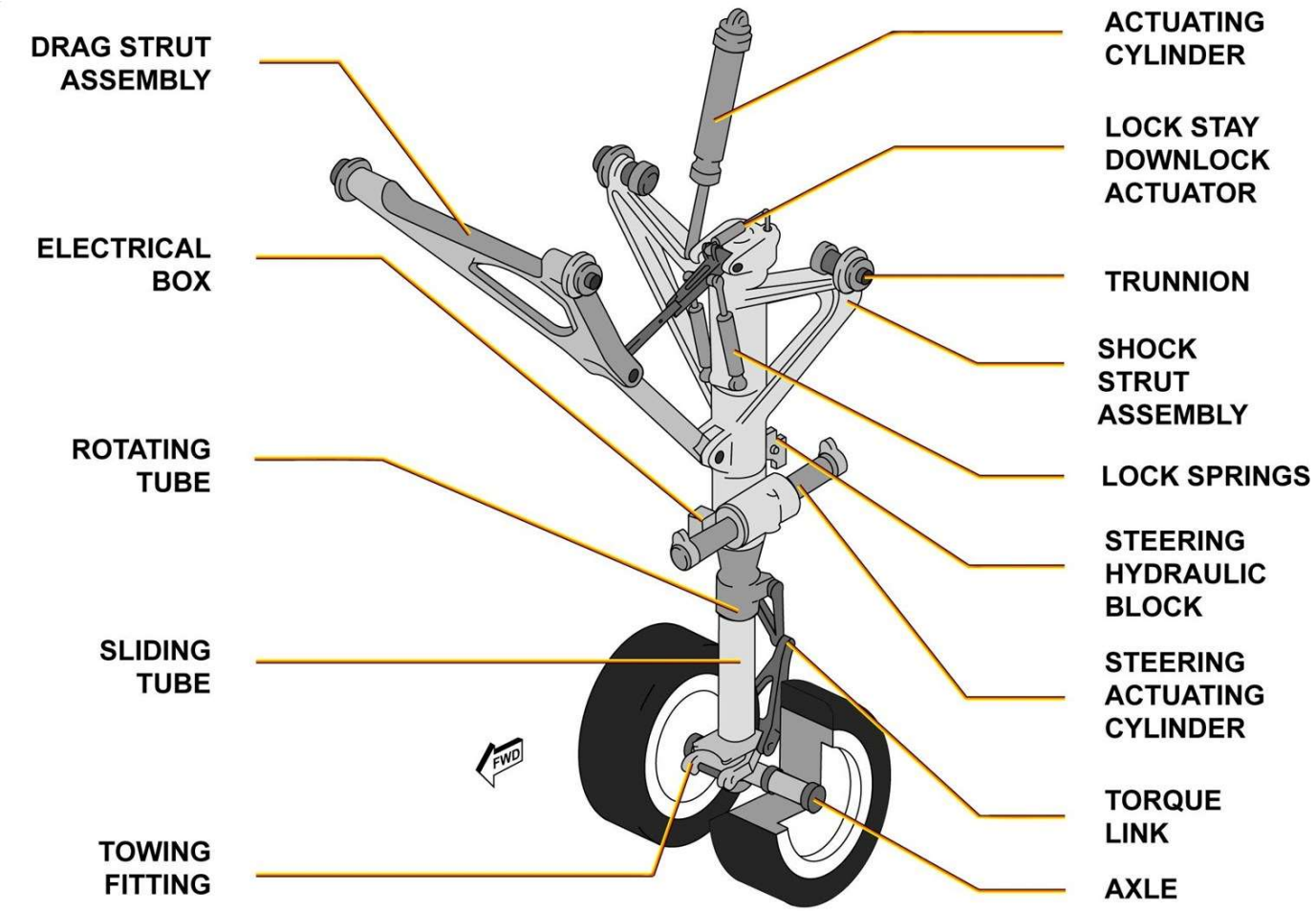
The shock strut assembly is attached to the structure by two trunnions. It includes the shock absorber.

ACTUATING CYLINDER (c)

The actuating cylinder operates the nose gear during retraction and extension sequences.

DRAG STRUT ASSEMBLY (d)

The drag strut assembly consists of a forestay at the top and a tubular arm at the bottom that are interconnected by a universal joint. The uplock roller is installed on the upper hinge pin of the universal joint.

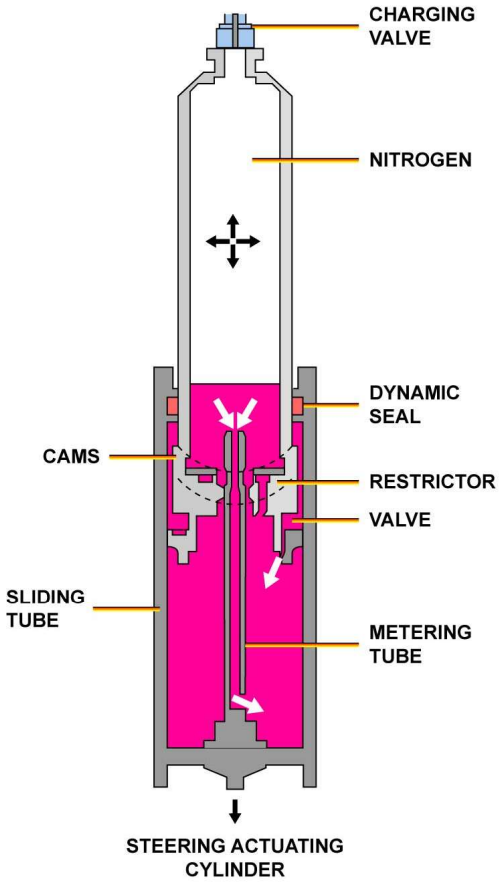


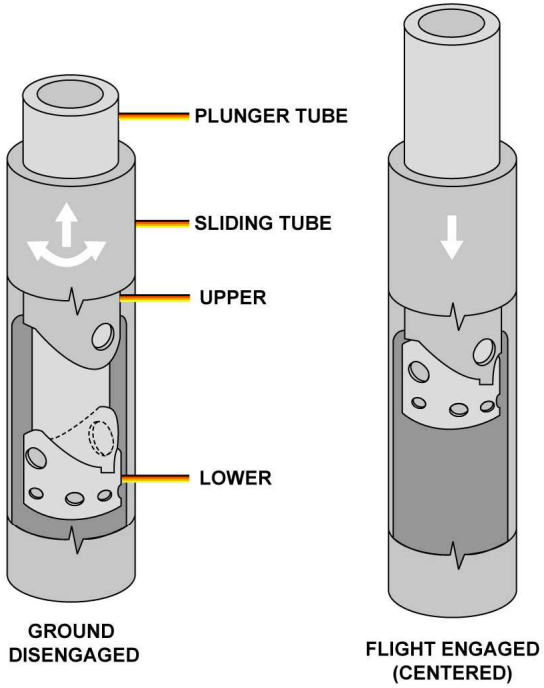
LOCKSTAY DOWNLOCK ACTUATOR (e)
The downlock actuator locks and unlocks both brace assemblies of the lock stay. It is assisted by two springs.

SLIDING TUBE (f)
The sliding tube includes the wheel axle. It is inclined 9 degrees forward; this design allows the wheels to return freely to the centered position and decrease the shimmy effect. The towing lug is designed to shear if the towing load is more than the limit. The two system proximity detectors provide signals for both gear extended and wheel centered positions.

ROTATING TUBE (g)
The rotating tube is inside the shock strut. It is equipped with a pinion that transmits steering orders from the steering actuating cylinder via the rotating tube and the torque link to the wheel axle.

TORQUE LINK (h)
The torque link is installed on the rear. It connects the sliding tube to the rotating tube.



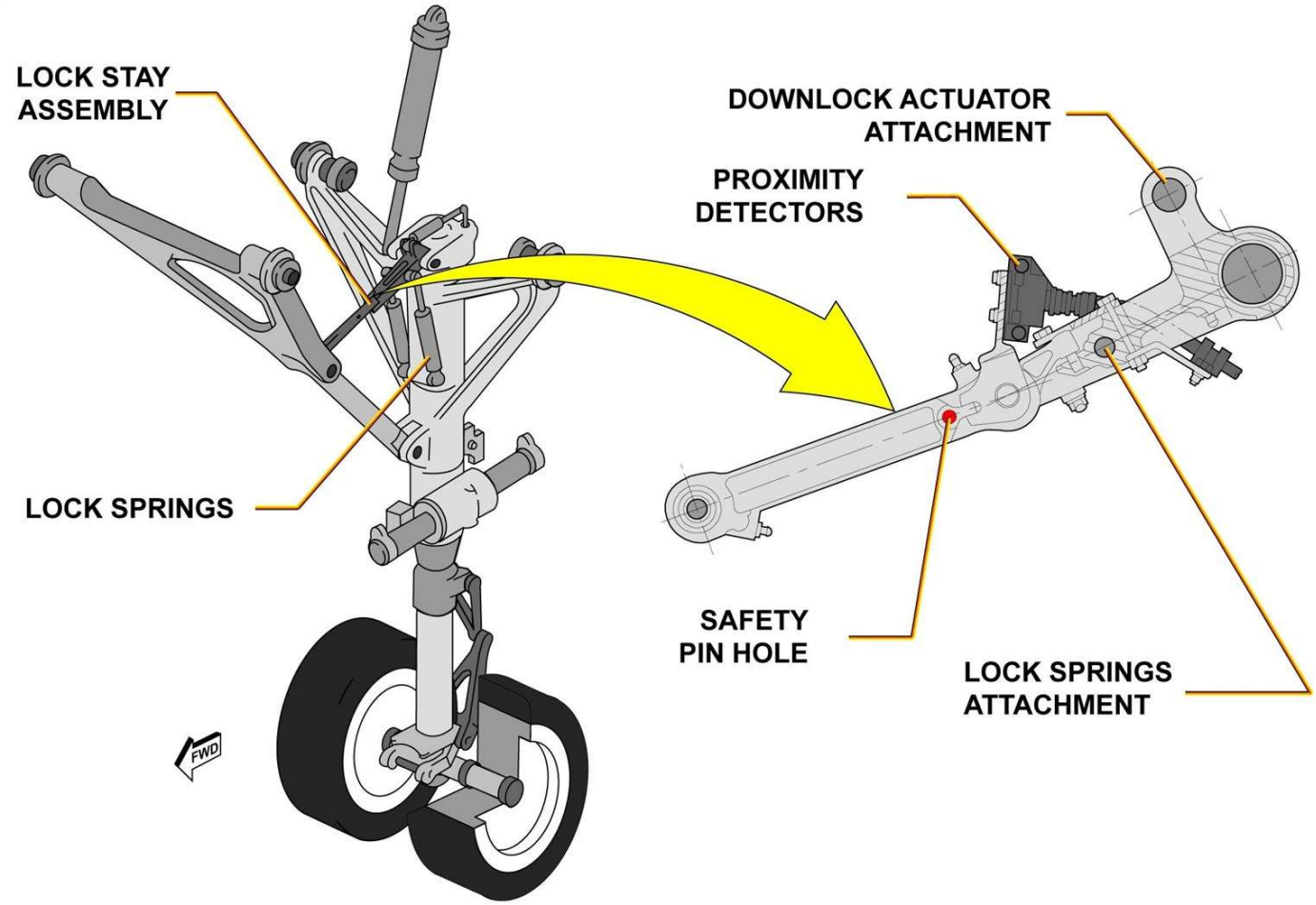


SHOCK ABSORBER (a)

The shock absorber is of the single chamber type without a separation piston and is double acting. The shock absorber is filled with hydraulic fluid and nitrogen through a single standard servicing valve in the upper part of the leg. Calibration of the metering devices in the shock absorber is the same for the different versions of the aircraft. Holes are included in the leg to show possible leaks from the dynamic seal of the shock absorber. It is possible to remove the shock absorber without drainage of the hydraulic fluid. A placard bonded to the leg shows the filling curves.

SHOCK ABSORBER (b)

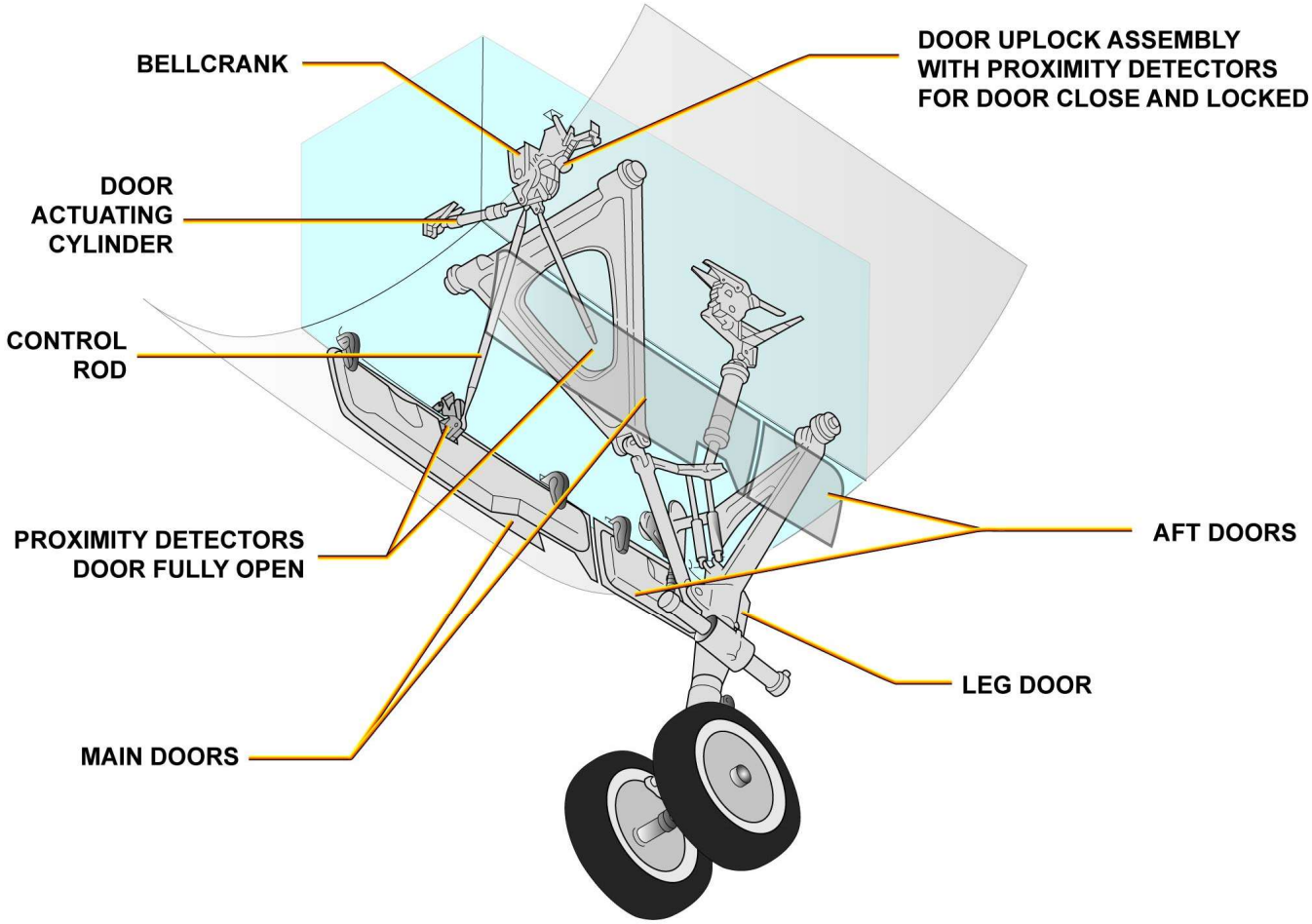
The shock absorber includes 2 centering cams, the lower cam is part of the plunger tube and the upper cam is part of the sliding tube. When the shock absorber is fully extended the pressure of the nitrogen causes the cams to engage. The wheels then return automatically to the center position.



LOCKSTAY ASSEMBLY

The lock stay assembly provides an over centered stop and a geometric lock of the nose gear. It includes both systems downlock proximity detectors. On the ground, a safety pin locks the two arms of the lock stay.

Nose Landing Gear Doors Description



LOCKSTAY ASSEMBLY

The lock stay assembly provides an over centered stop and a geometric lock of the nose gear. It includes both systems downlock proximity detectors. On the ground, a safety pin locks the two arms of the lock stay.

MAIN DOORS (b)

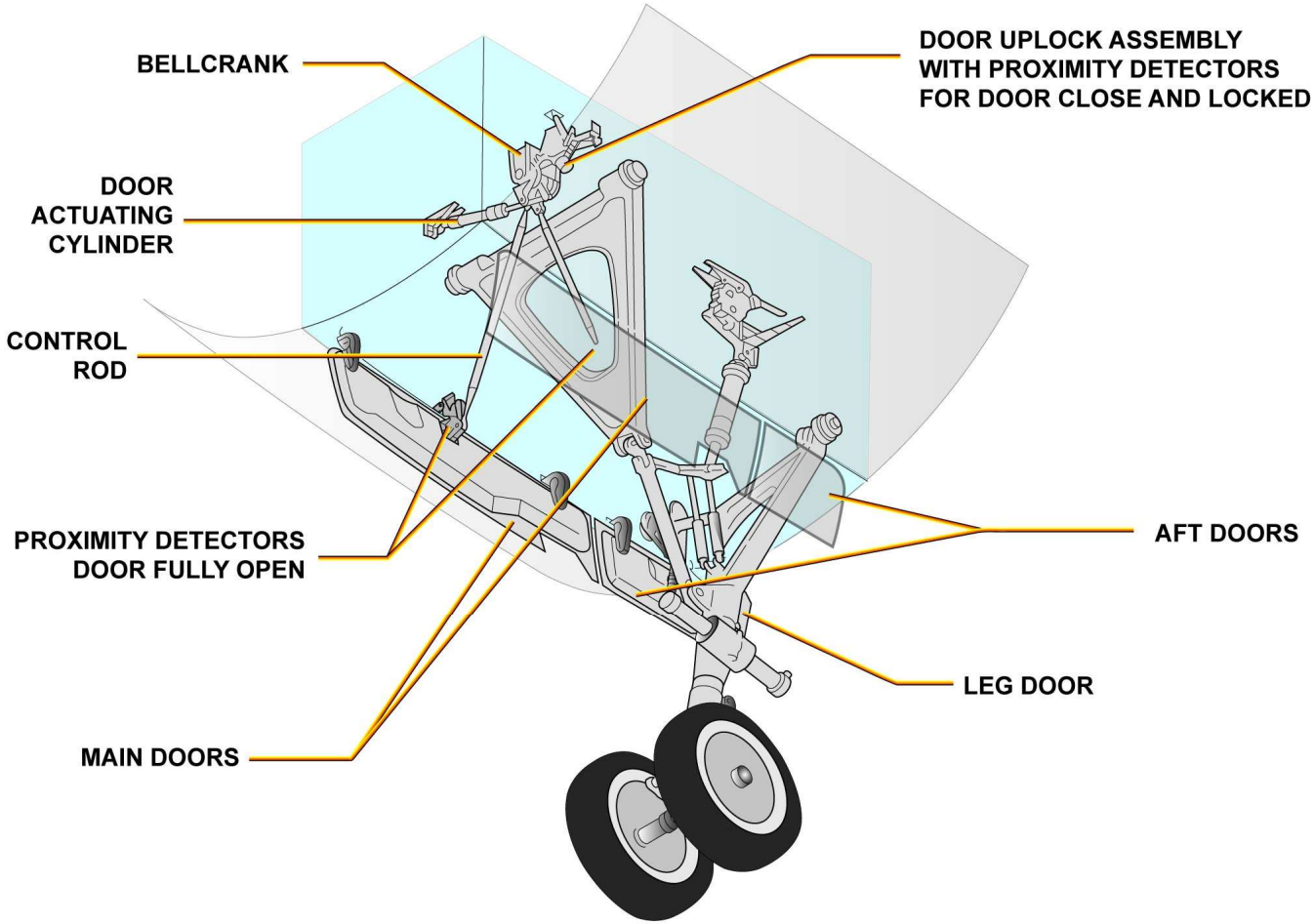
The two main doors are hydraulically operated. These two doors are connected mechanically to the A/C by a linkage that has two control rods connected to the same bellcrank. This bellcrank is installed at the roof of the L/G well and is operated by one double-acting actuator. An uplock assembly latches the doors in the closed position.

PROXIMITY DETECTORS (c)

Two proximity switch detectors per door provide a signal in the open position. The doors must be in this position to permit the gear to operate. The signals are sent to the two systems, one signal per doors by system .

AFT DOORS (d)

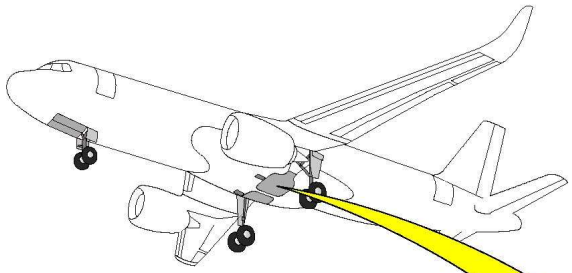
The two aft doors are symmetrical, hinged to the fuselage and connected by an adjustable rod to the gear leg. These doors close the aft part of the nose gear well when the gear is retracted.

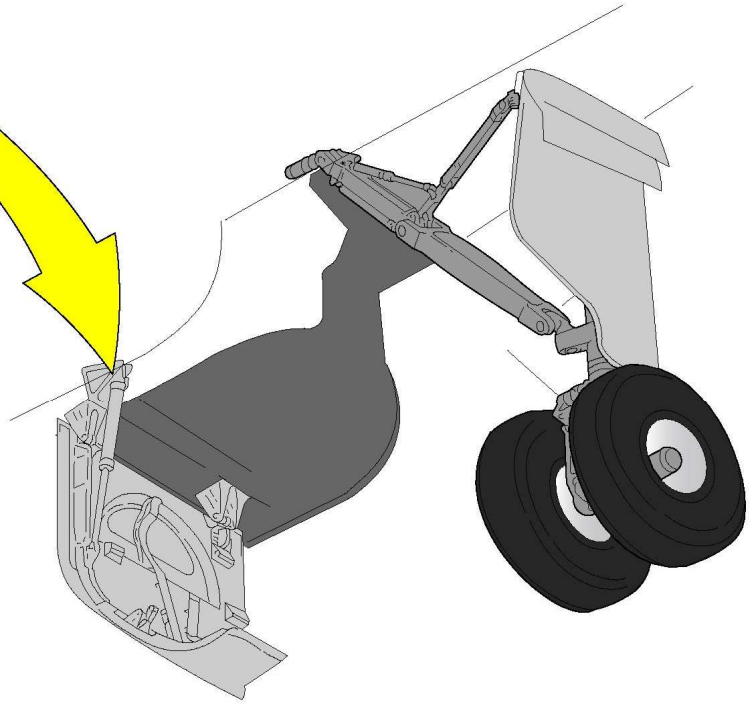


LEG DOOR (e)

The leg door is attached to the rear part of the gear leg. When the gear is retracted, this door closes off the area through which the drag strut passes when the gear is extended.


Landing Gear Doors
Ground Operation
OVRD
APU
AUTO EXTING
TEST
RESET
FADEC GND PWR
HYD
GREEN
BLUE
YELLOW
3000
PSI
PTU
RAT
ELEC
A/SKID &
N/W STRG
ON
OFF





MLG DOOR GROUND OPERATION (a)
The MLG doors can be opened on the ground, for servicing or inspection purposes.

MLG DOOR GROUND OPERATION - DOOR OPENING PREPARATION (b)
Before you start the task, make sure that the Ground Safety Locks are installed on the landing gear.
In the flight-deck check that the Landing Gear Control-lever is in the "down" position and the Gravity Gear Extension Handle is in "neutral and stowed" position. Check on the ECAM Hydraulic page that the hydraulic systems are depressurized.
Note: Place warning notices to tell personal not to pressurize the hydraulic systems, not to operate the Landing Gear Control lever, or the Gravity Gear Extension Handle.

MLG DOOR GROUND OPERATION - DOOR OPENING (c)

Open the access panel 195BB for the left MLG, or 196BB for the right MLG Door.

Remove the safety pin from the ground door opening handle.

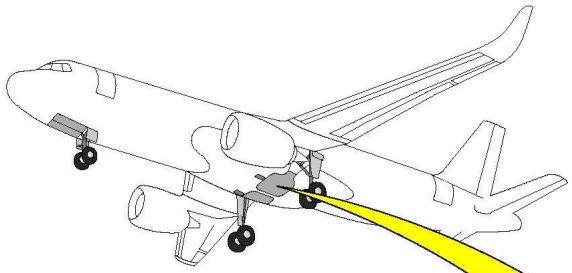
Stand clear of the door travel range and observe the travel area.

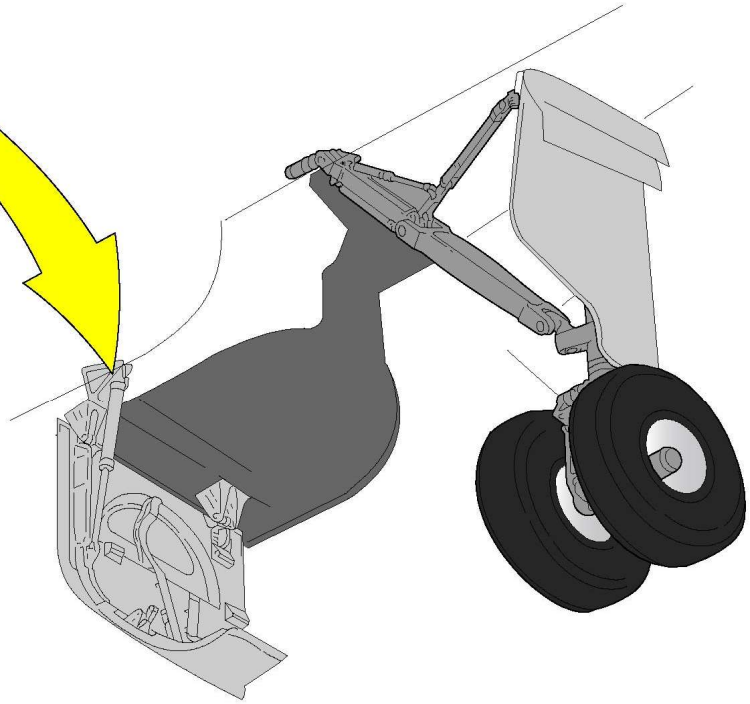
Push and hold the button to move the handle fully down. Re-install the safety pin on the pushbutton.

Install the safety-sleeve on the MLG-Door actuator and secure it with the ball-lock pins.

You might need to push the door to the fully open position to ease the safety sleeve installation.

The landing gear door will be shown on the ECAM WHEEL page in the fully open position.





MLG DOOR GROUND OPERATION - DOOR CLOSING PREPARATION (d)

Before you start the task, make sure that the Ground Safety Locks are installed on the landing gear. The travel ranges of the flight controls are clear.

On the gear make sure that the Ground Door Opening Handle is in the open position and the safety sleeve is still installed on the MLG Door actuator.

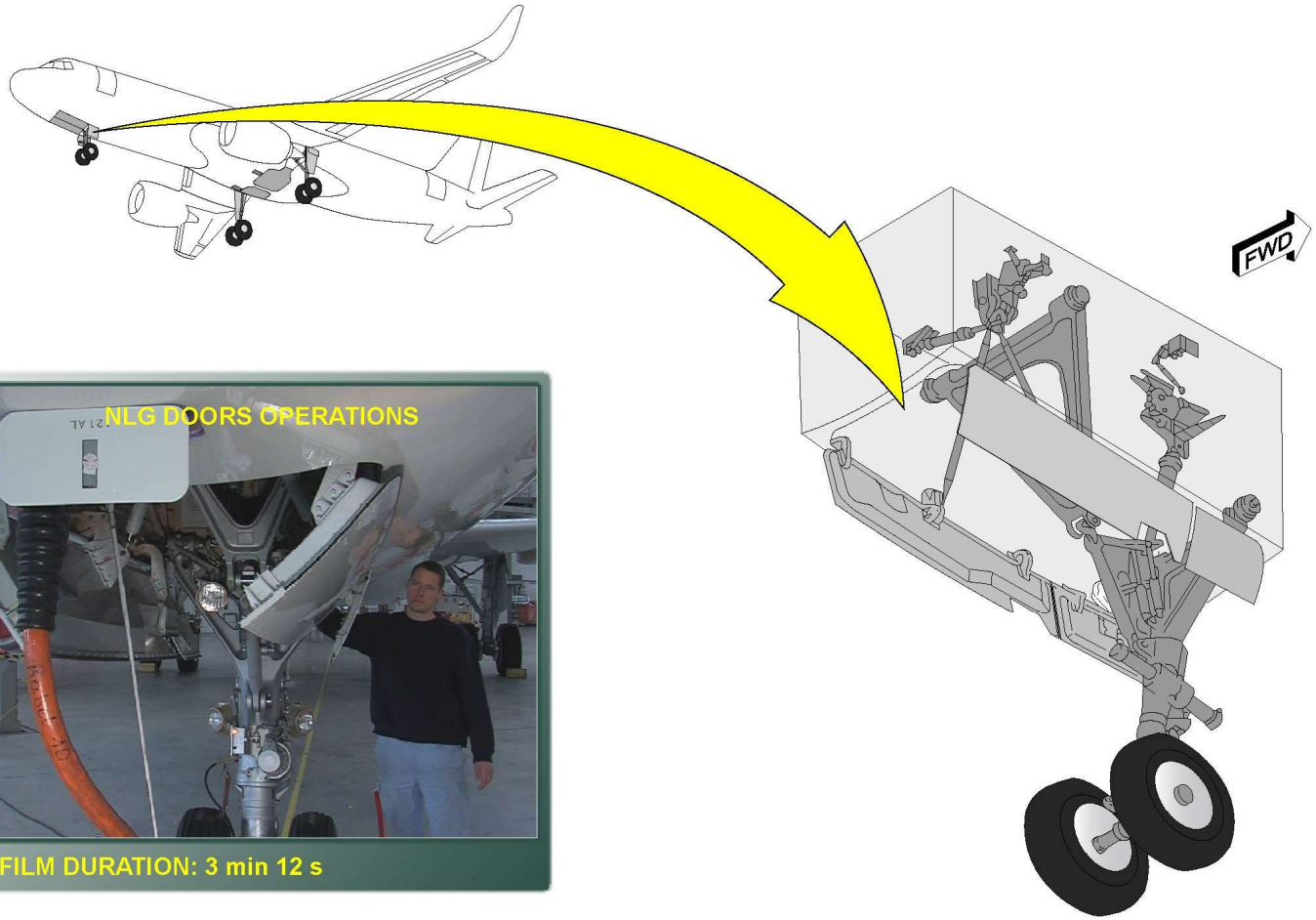
In the flight-deck, check that the landing gear control-lever is in the "down" position and the Gravity Gear Extension Handle is in "neutral and stowed" position.

Check on the ECAM Hydraulic Page that no warning messages are displayed.

Pressurize the green hydraulic system via the PTU by using the Yellow Electric Pump.

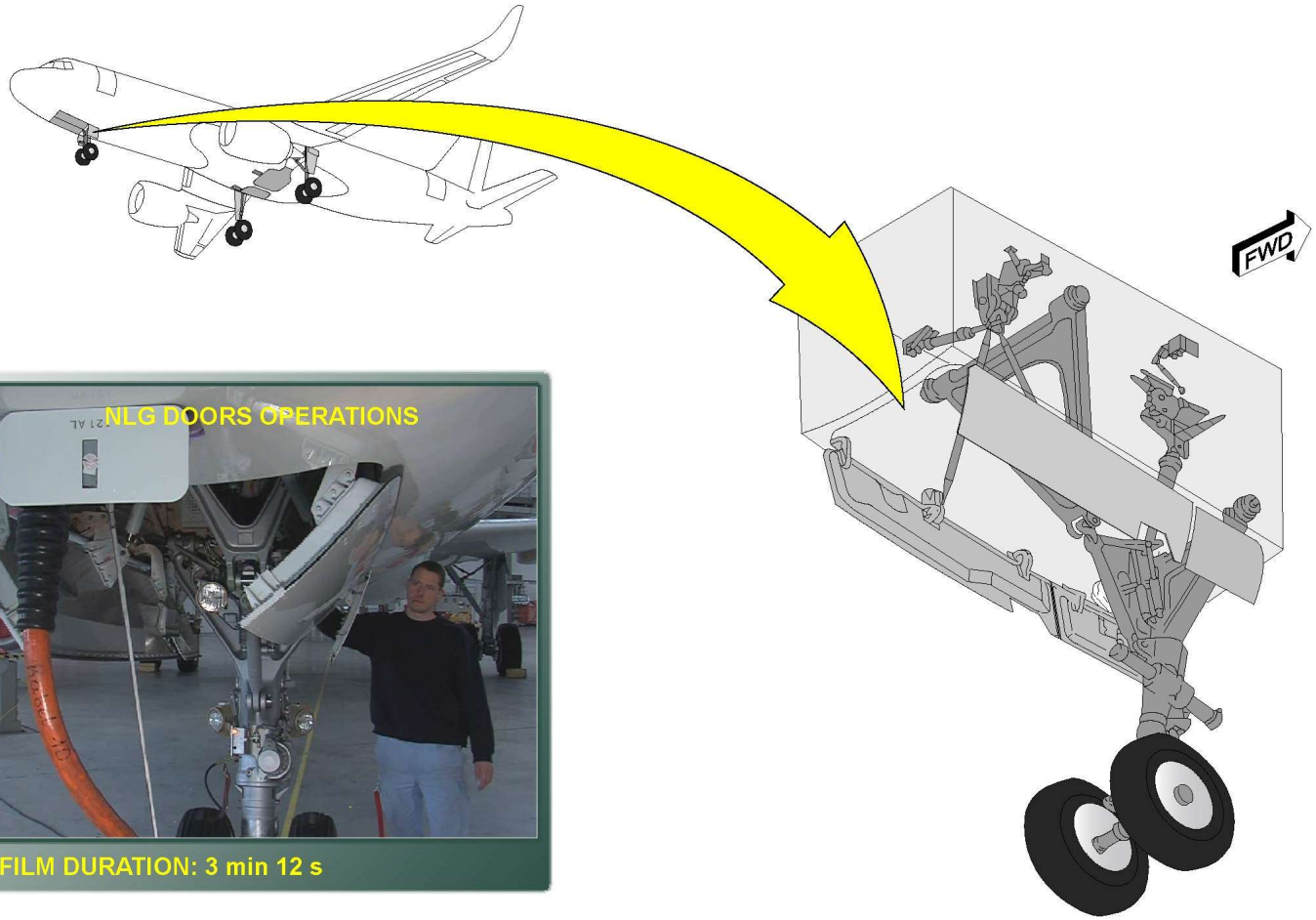
Note: Only pressurize the systems required for this task.

MLG DOOR GROUND OPERATION - DOOR CLOSING (e)
Confirm that the Ground Door Opening Handle is still in the open position and remove the safety sleeve from the MLG Door actuator.
Remove the safety pin from the ground door opening handle.
Stand clear of the door travel range and observe the travel area.
Push and hold the button to move the handle fully up. Re-install the safety pin on the pushbutton.
Close the access panel.
In the flight-deck check on the ECAM WHEEL Page that the landing gear door is shown in the fully closed position.
Depressurize the hydraulic systems and remove the warning notices.

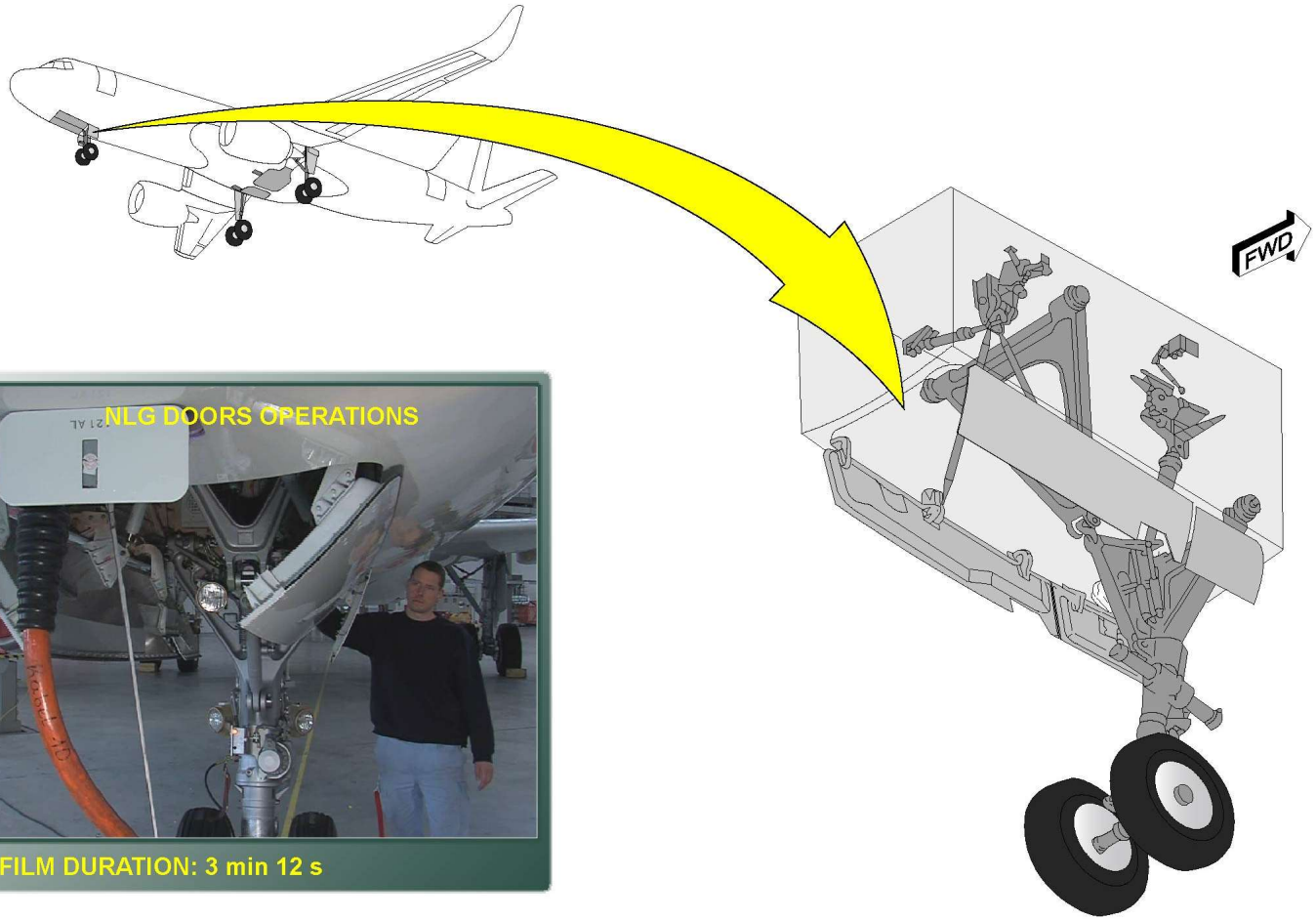


NLG DOORS GROUND OPERATION (a)
The NLG doors can be opened on the ground, for servicing or inspection purposes.

NLG DOORS GROUND OPERATION - DOORS OPENING PREPARATION (b)
Before you start the task, make sure that the Ground Safety Locks are installed on the landing gear.
In the flight-deck, check that the Landing Gear Control-lever is in the "down" position and the Gravity Gear Extension Handle is in "neutral and stowed" position.
Check on the ECAM Hydraulic Page that the hydraulic systems are depressurized.
Note: Place warning notices to tell personal not to pressurize the hydraulic systems, not to operate the Landing Gear Control lever, or the Gravity Gear Extension Handle.



NLG DOORS GROUND OPERATION - DOORS OPENING (c)
Stand aft and left of the Nose Landing Gear to gain access to the Ground Door Opening Handle. Remove the safety pin from the handle. Stand clear of the travel range of the doors and observe the travel area.
Push and hold the button to move the handle fully down.
Re-install the safety pin on the pushbutton.
Install the safety-pin on each of the NLG-Doors.
You might need to manually adjust the door position to ease the safety pin installation.
The landing gear doors will be shown on the ECAM WHEEL Page in the fully open position.



NLG DOORS GROUND OPERATION - DOORS CLOSING PREPARATION (d)

Before you start the task, make sure that the Ground Safety Locks are installed on the landing gear. The travel ranges of the flight controls are clear.

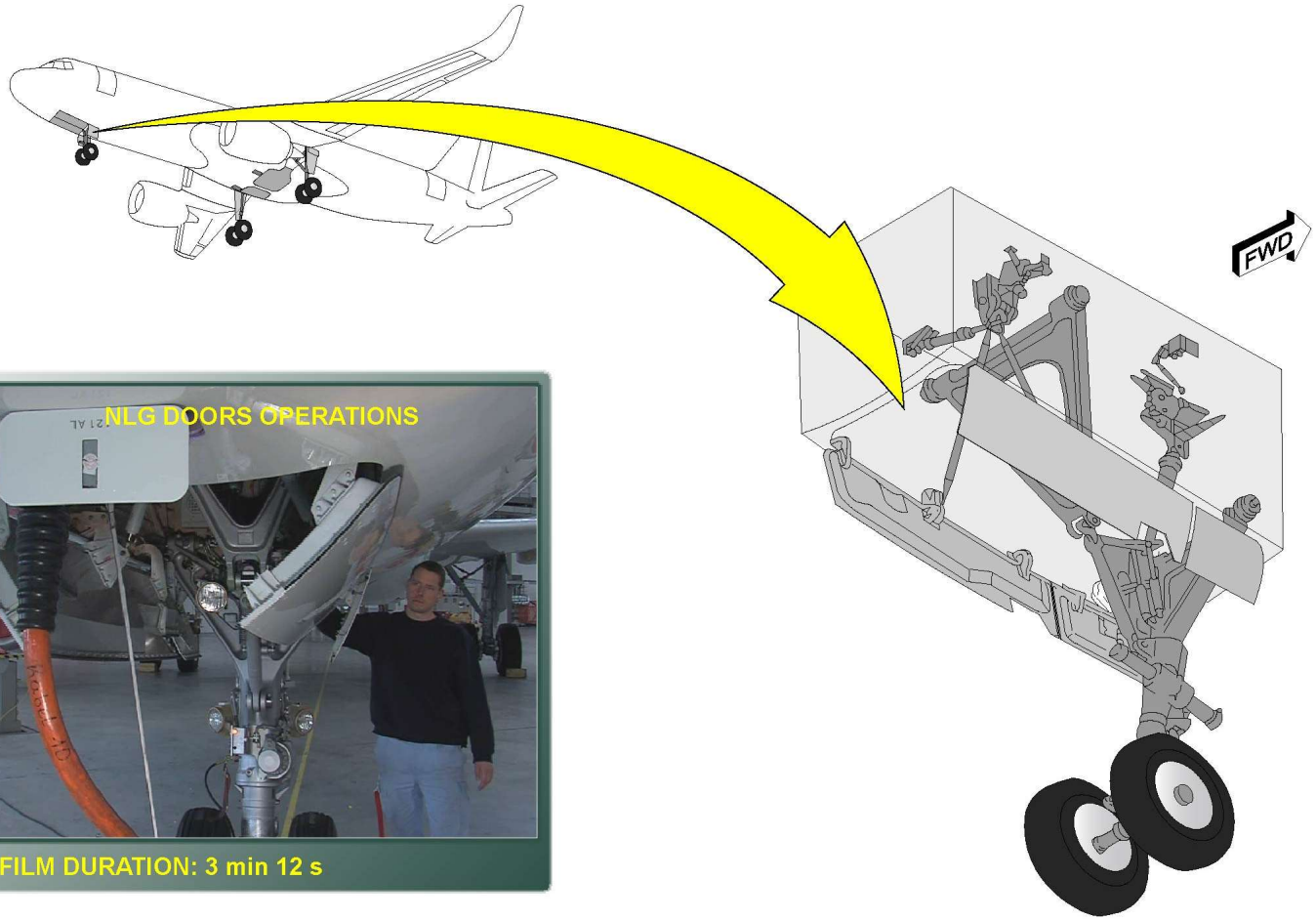
On the gear, make sure that the Ground Door Opening Handle is in the open position and the safety pins are still installed on the NLG Doors.

In the flight-deck check that the landing gear control-lever is in the "down" position and the Gravity Gear Extension Handle is in "neutral and stowed" position.

Check on the ECAM Hydraulic Page that no warning messages are displayed.

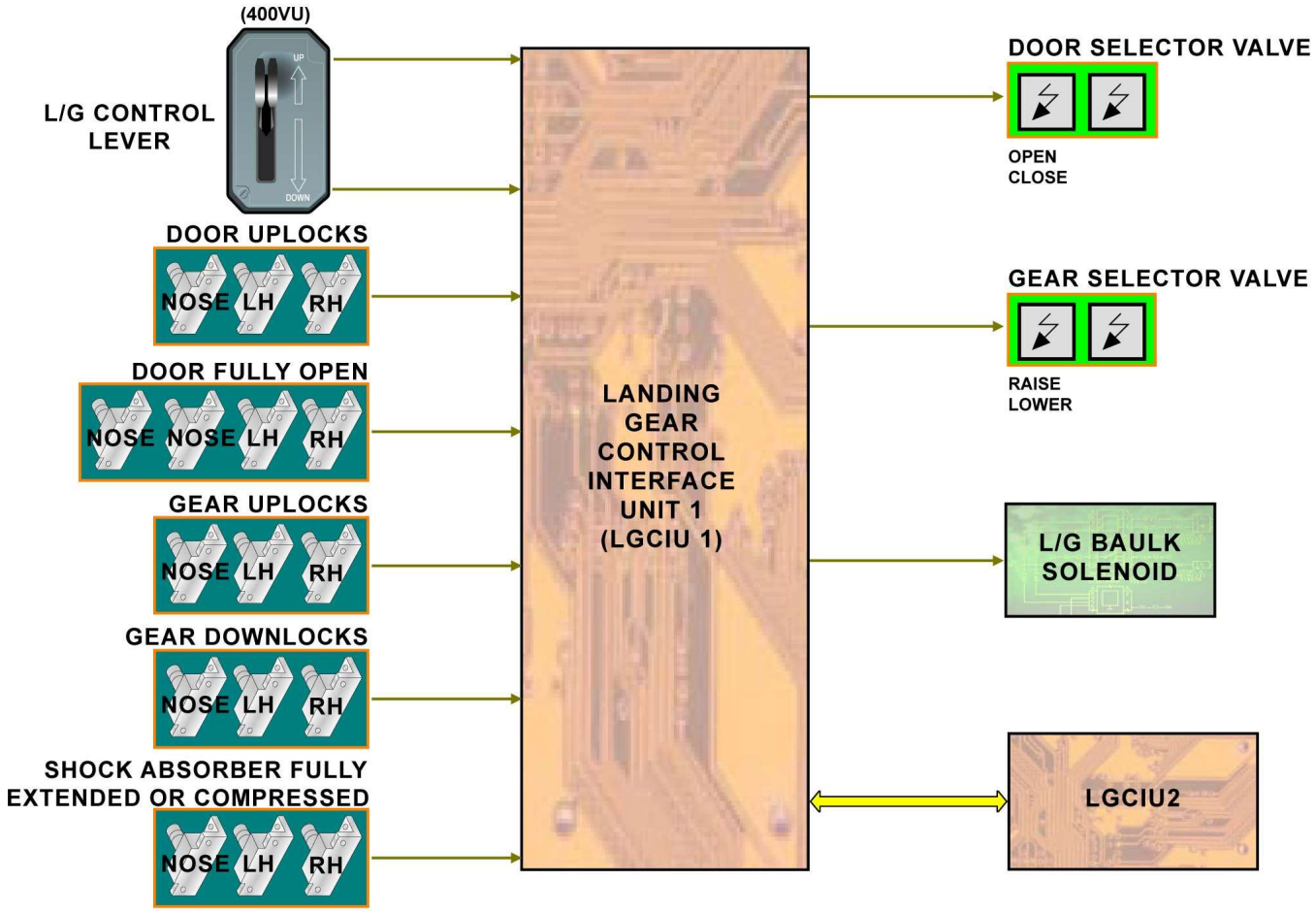
Pressurize the green hydraulic system via the PTU by using the Yellow Electric Pump.

Note: Only pressurize the systems required for this task



NLG DOORS GROUND OPERATION - DOORS CLOSING (e)
Confirm that the Ground Door Opening Handle is still in the open position and remove the safety pins from the NLG Doors.
Remove the safety pin from the ground door opening handle.
Stand clear of the door travel range and observe the travel area.
Push and hold the button to move the handle fully up. Re-install the safety pin on the pushbutton.
In the flight-deck check on the ECAM WHEEL Page that the landing gear door is shown in the fully closed position.
Depressurize the hydraulic systems and remove the warning notices.


LGCIU Control
Signals
OVRD
APU
AUTO EXTING
TEST
RESET
1 FADEC GND PWR 2
HYD
YELLOW
3000
PSI
3000
PSI
3000
PTU
RAT
ELEC
1
ELEC
2
A/SKID &
N/W STRG
ON
OFF



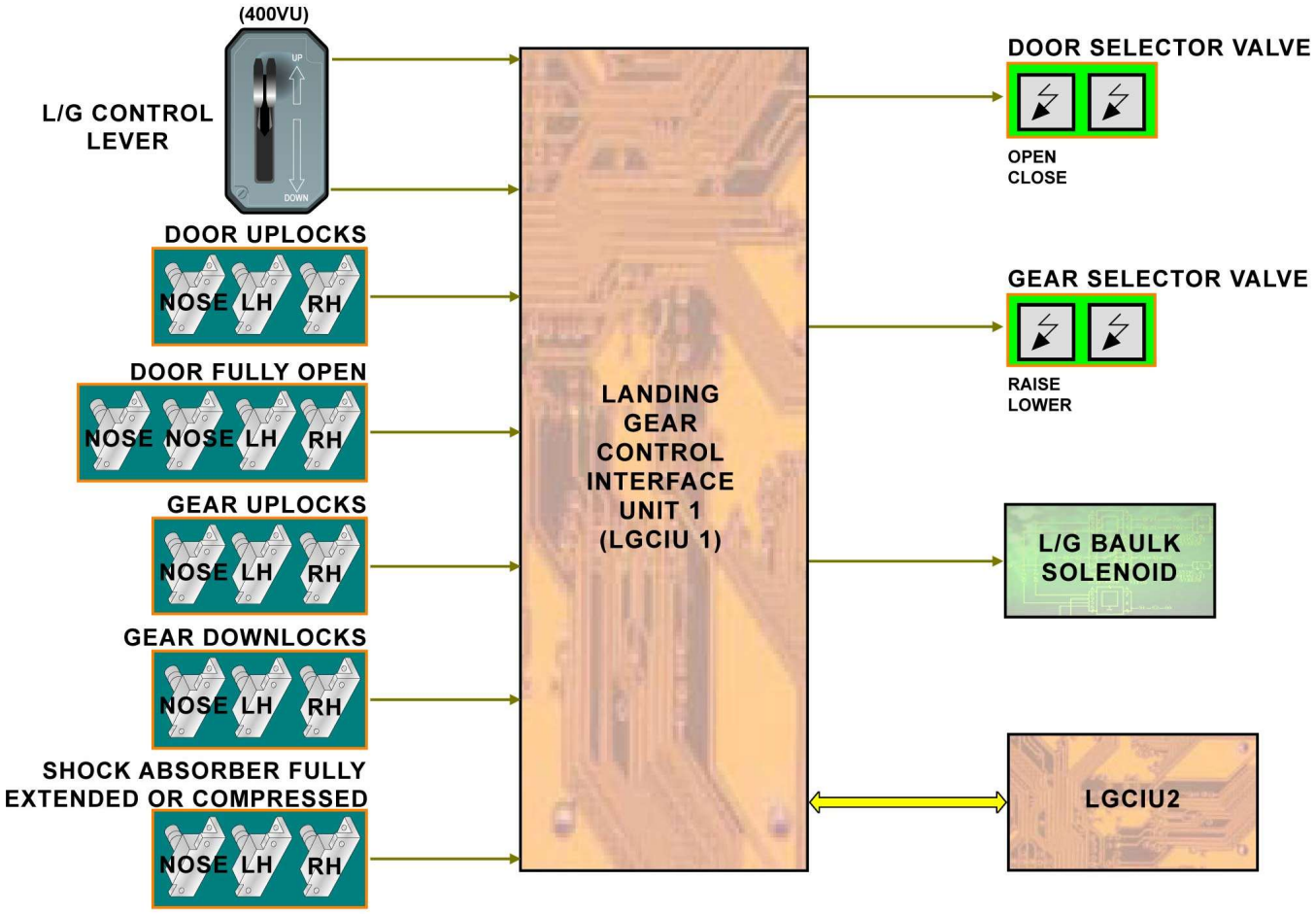
UP SELECTION (a)
Two UP selection signals that come from the lever, are sent to the Landing Gear Control Interface Unit (LGCIU) to initiate the gear retraction sequence.

DOWN SELECTION (b)
Two DOWN selection signals coming from the lever, are sent to the LGCIU to initiate the gear extension sequence.

DOOR UPLOCKS (c)
Three door uplock signals that come from door uplock proximity detectors, are sent to the LGCIU to indicate whether doors are uplocked, or not.

DOOR FULLY OPEN (d)
There are four door fully open signals, two of which for nose doors. These signals come from the corresponding proximity detectors and are sent to the LGCIU's to indicate whether doors are fully open, or not.

GEAR UPLOCKS (e)
Three gear uplock signals that come from gear uplock proximity detectors, are sent to the LGCIU to indicate whether gears are uplocked, or not.



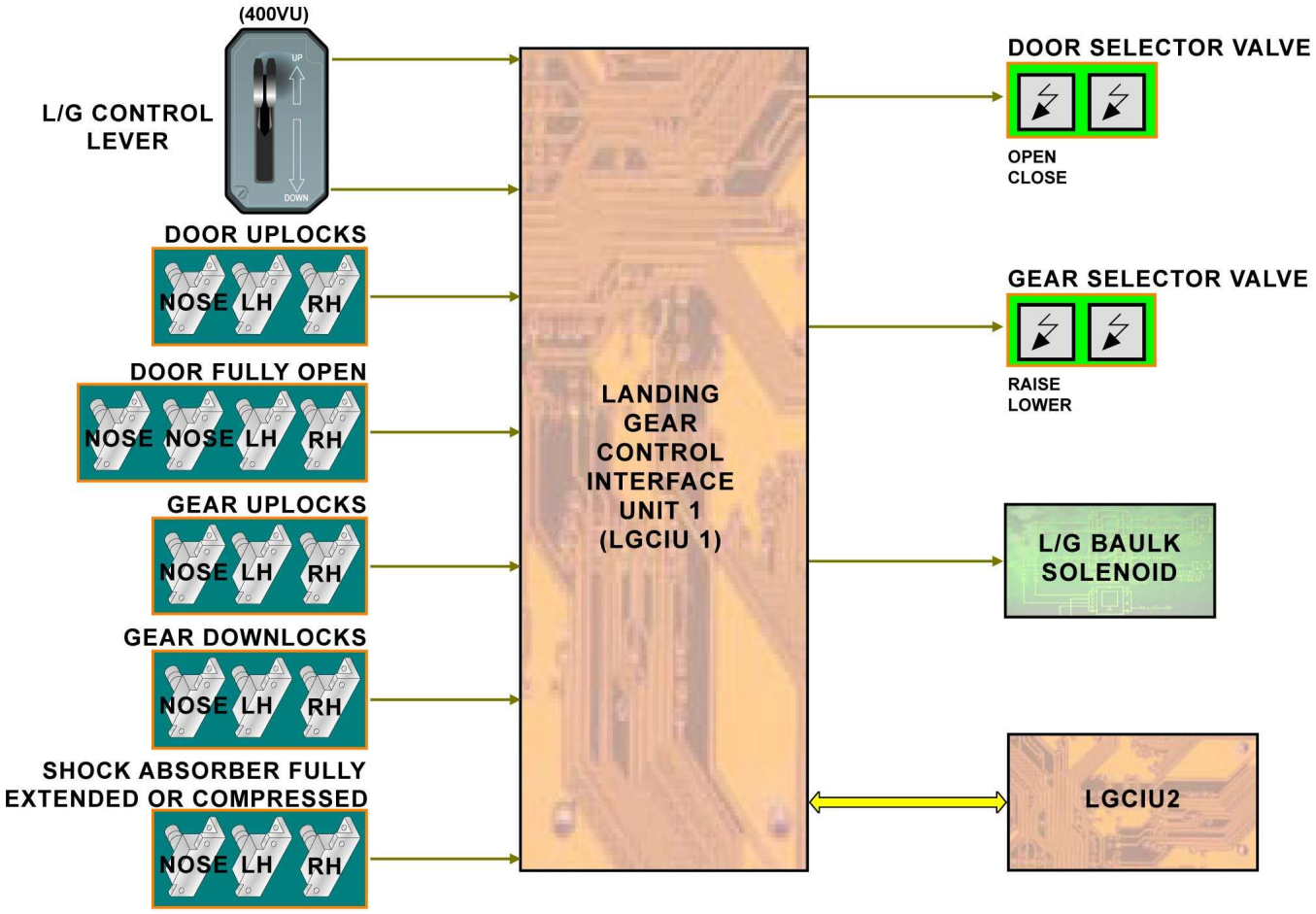
GEAR DOWNLOCKS (f)
Three gear down lock signals that come from gear down lock proximity detectors, are sent to the LGCIU to indicate whether gears are down and locked, or not.

FULLY EXTENDED OR COMPRESSED (g)
Three shock absorber signals, which come from the proximity detectors, are sent to the LGCIU to indicate whether shock absorbers are fully extended or compressed. Note that nose landing gear "ground" or "flight" information is given according to the shock absorber and wheel position.

DOOR SELECTOR VALVE (h)
After analyzing all the input signals, the LGCIU sends a signal to the corresponding solenoid of the door selector valve according to the position of the gears.

GEAR SELECTOR VALVE (i)
After analyzing all the input signals, the LGCIU sends a signal to the corresponding solenoid of the gear selector valve according to the position of the doors.

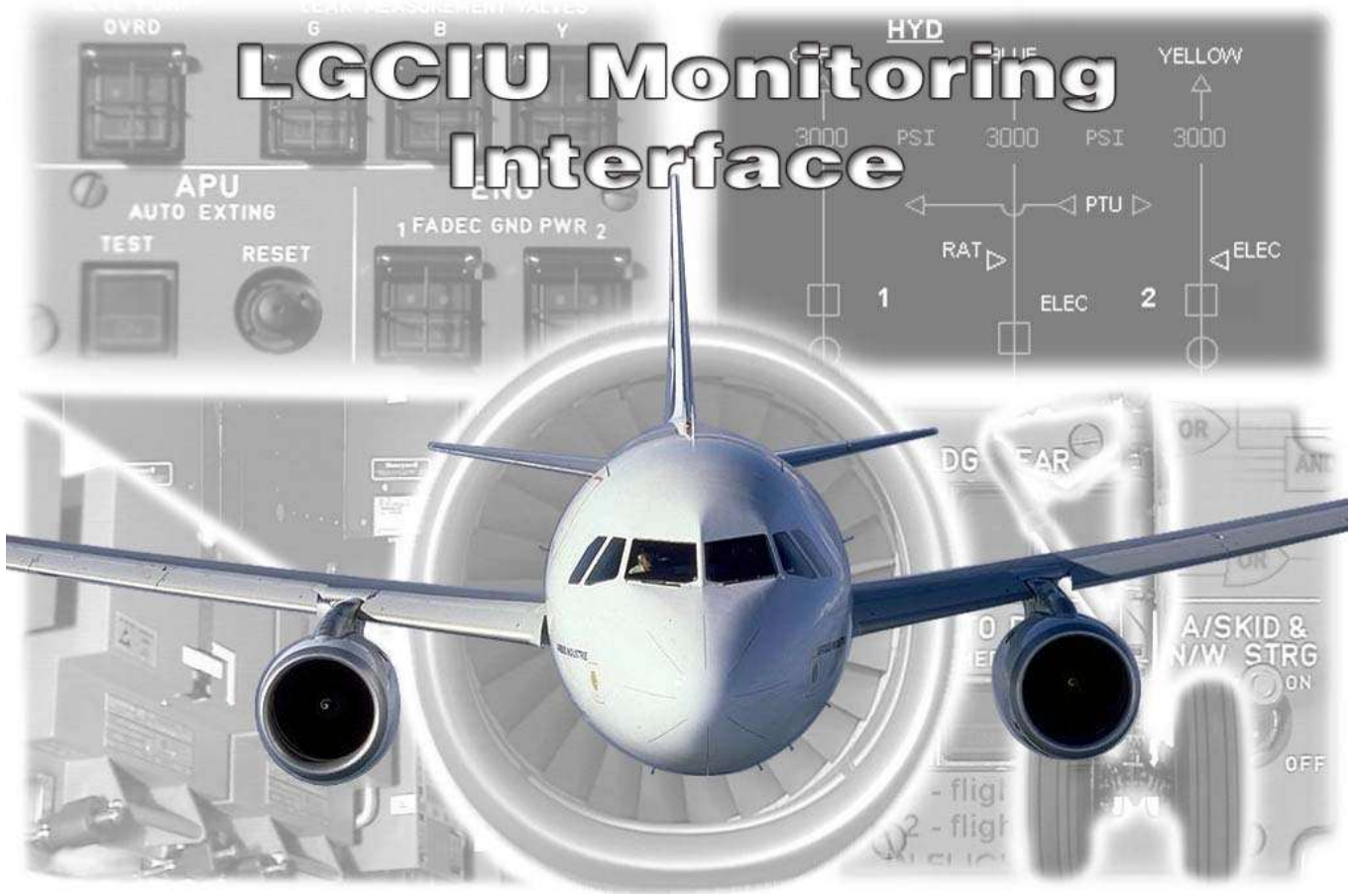
L/G BAULK SOLENOID (j)
After analyzing all shock absorber signals, the LGCIU sends a signal to the L/G baulk solenoid to prevent gear retraction if any shock absorber is compressed or nose wheels are not centered.

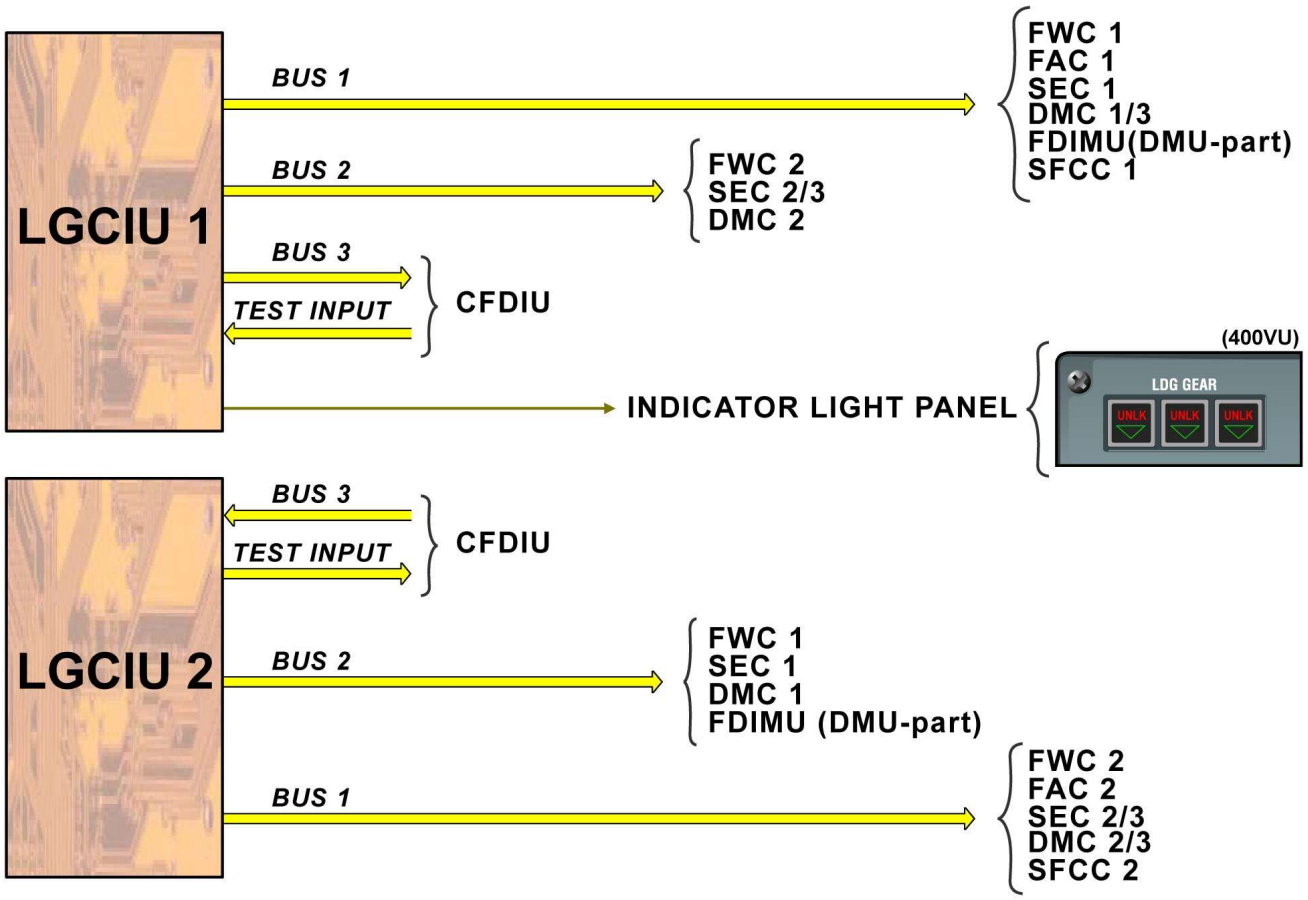


LGCIU 2 (k)

The control signals for LGCIU 2 are the same. Four signals are used by the LGCIU for system selection:

- two for system 1 status,
- two for system 2 status.


LGCIU Monitoring Interface
OVRD
APU
AUTO EXTING
TEST
RESET
FADEC GND PWR
HYD
YELLOW
3000
PSI
PTU
RAT
ELEC
A/SKID &
N/W STRG
ON
OFF



ARINC AND INDICATOR PANEL

After analyzing gear uplock and down lock signals, the Landing Gear Control and Interface Unit (LGCIU) sends up to six signals to the corresponding lights on the L/G indicator panel.

DISCRETE

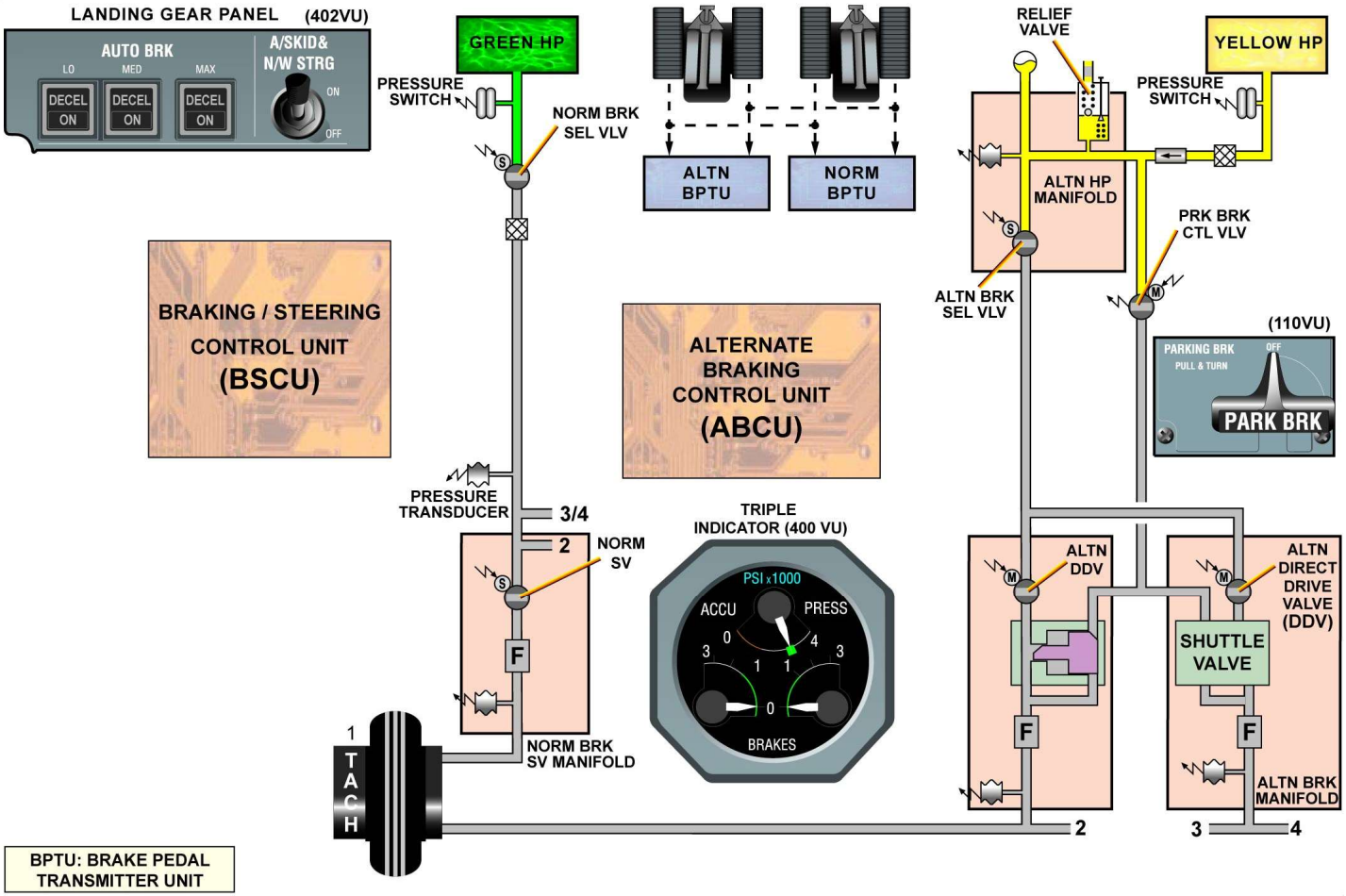
The discrete connections are classified into four categories corresponding to the status of the L/G:

- L/G shock absorber compressed,
- L/G shock absorber fully extended,
- L/G downlocked,
- L/G uplocked/unlocked.

Discrete logic signals are given to the applicable systems when:

- the NLG shock absorber is compressed,
- the NLG shock absorber is fully extended,
- the NLG or the L/H MLG or the R/H MLG are downlocked,
- the L/H or the R/H MLGs are in a ground condition, they are applicable when the gear(s) is(are) locked down,
- the L/H or the R/H MLGs are in a flight condition.

Brake System Description



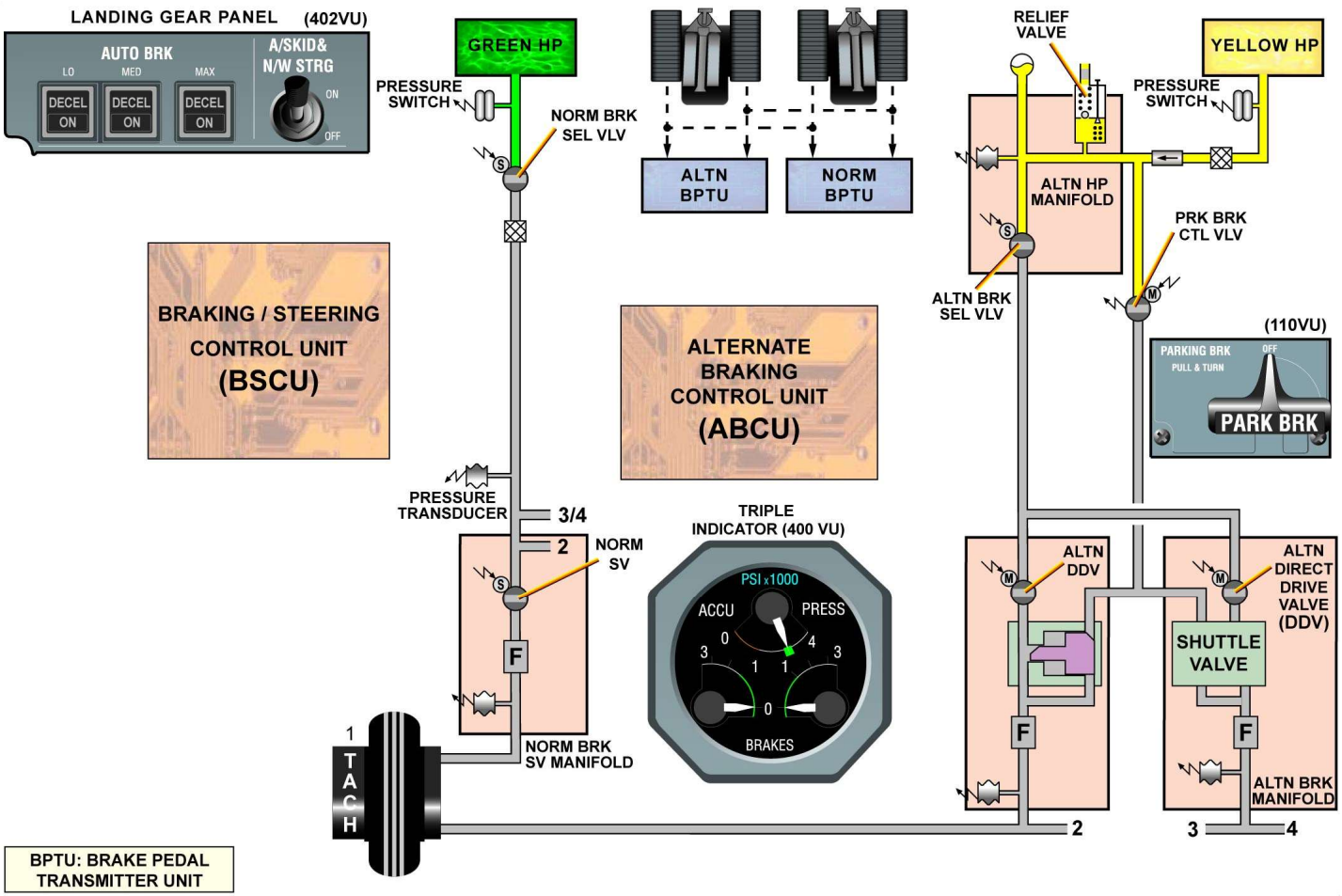
B2 SCOPE (a)
MODULE TAGGED B2 SCOPE.
BE AWARE THAT ONLY AVIONICS/ELECTRICAL TOPICS SHOULD BE LEARNED FOR A T2 COURSE.

PEDALS (b)
The pedals give mechanical inputs to the normal brake pedal Transmitter (XMTR) unit, and to the alternate pedal XMTR unit for manual normal braking and alternate braking.

BRAKE PEDALS XMTR UNITS (c)
The brake pedal XMTR units transform the mechanical input from the right and left pedals into electrical signals which are sent to the Braking and Steering Control Unit (BSCU) in normal braking and to the Alternate Braking Control Unit (ABCU) in alternate braking.

BSCU (d)
The BSCU controls normal braking, auto braking as well as anti-skid operation during normal and alternate braking.

SELECTOR VALVE (e)
The selector valve is an on/off valve. When normal braking is applied, the BSCU first energizes the selector valve, this lets full green pressure supply the normal servovalves.



NORMAL SERVOVALVES (f)

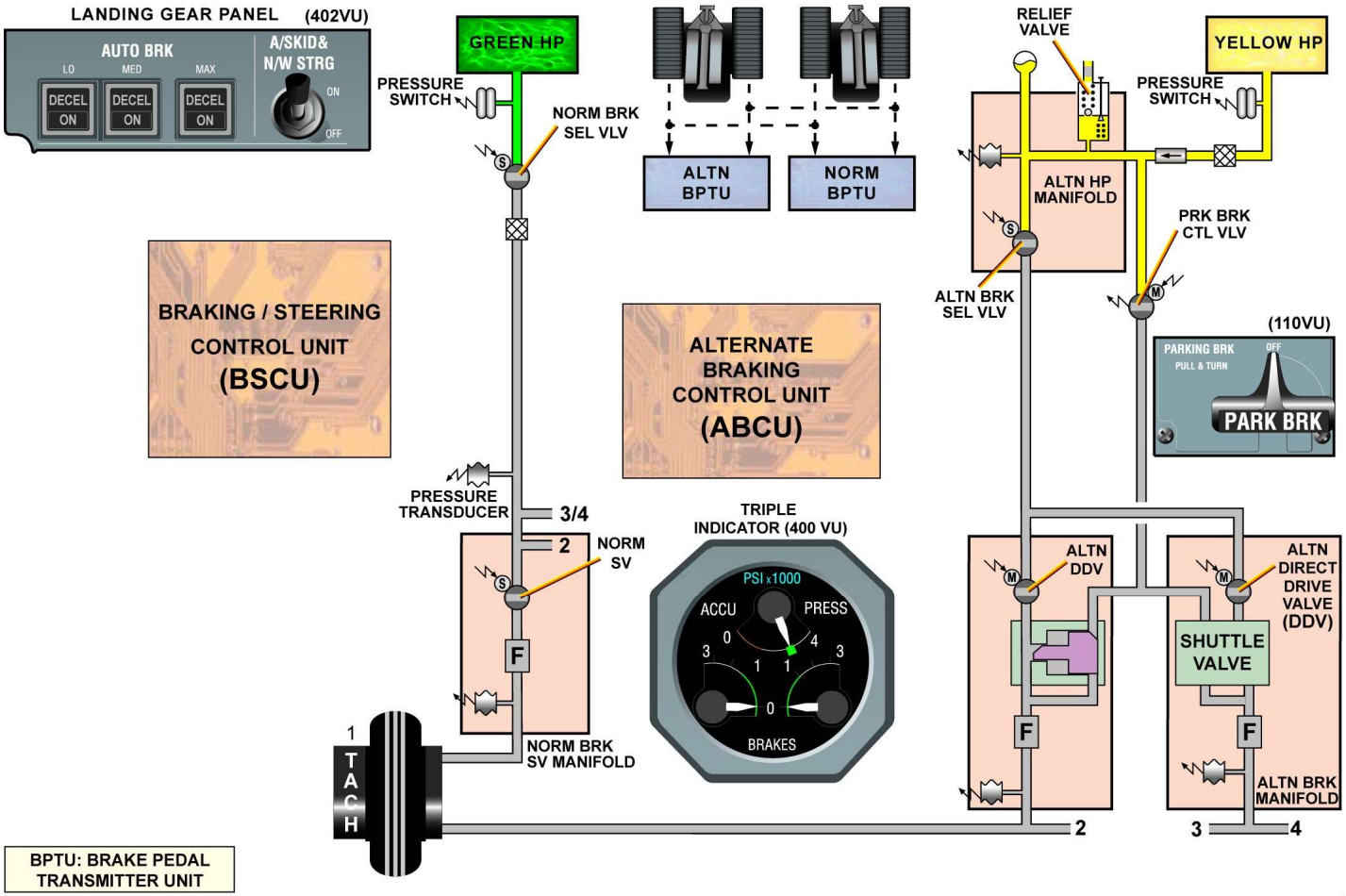
The normal servovalve has a dual function: it regulates braking pressure, which depends on BSCU braking orders, and anti-skid control pressure delivered to the brakes. This servovalve with direct control laws is fully closed when there is no braking order. They are located on the MLG strut.

ABCU (g)

The ABCU controls and monitors the alternate braking system with and without anti-skid protection.

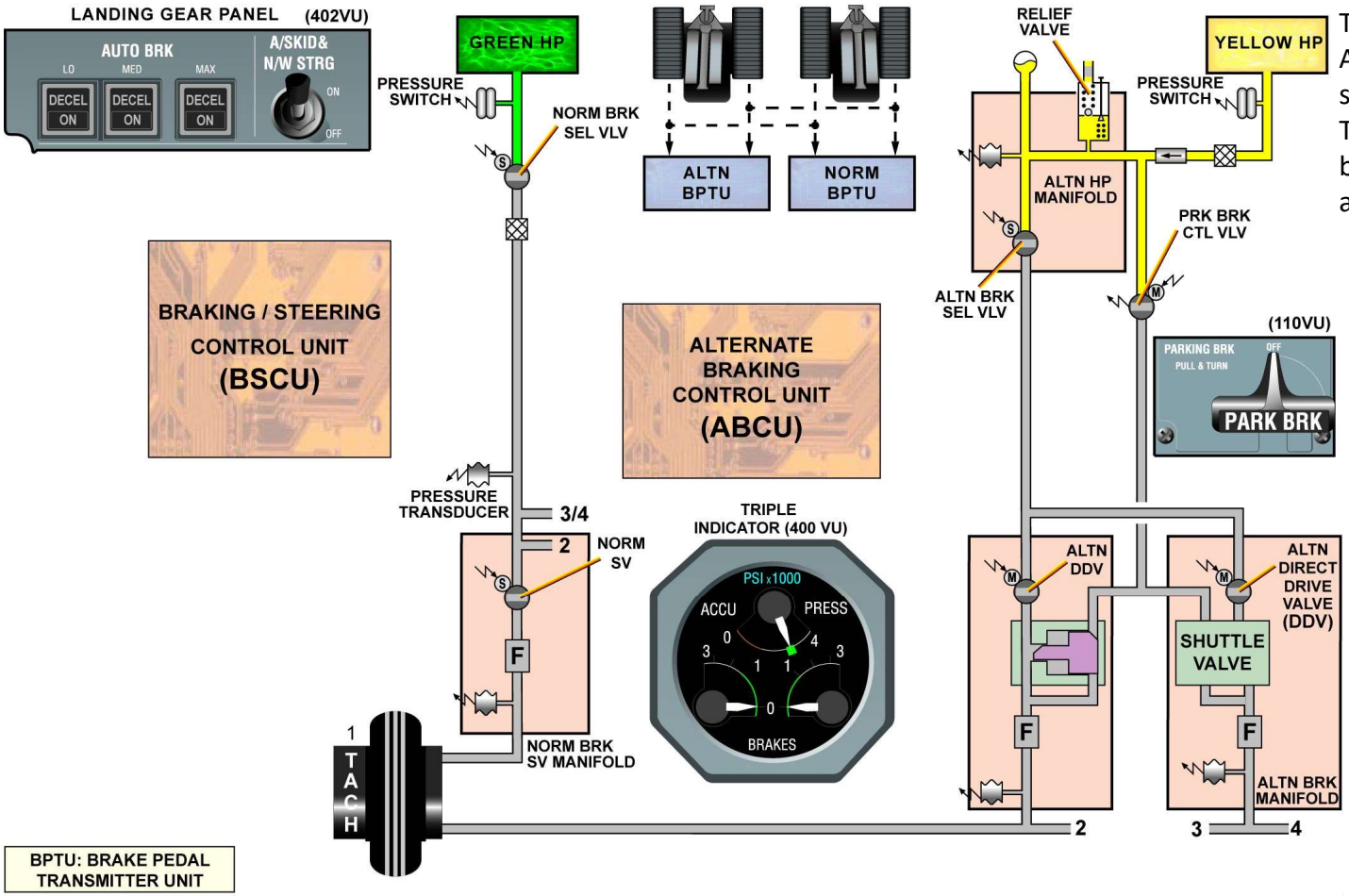
The ABCU is automatically activated if:

- the anti-skid is faulty,
- the A/SKID switch is selected to OFF (BSCU OFF)
- the BSCU is not serviceable (both system 1 & 2 have failed),
- the normal braking has failed,
- the pressure downstream the selector valve drops below a given threshold,
- only the batteries supply the A/C.



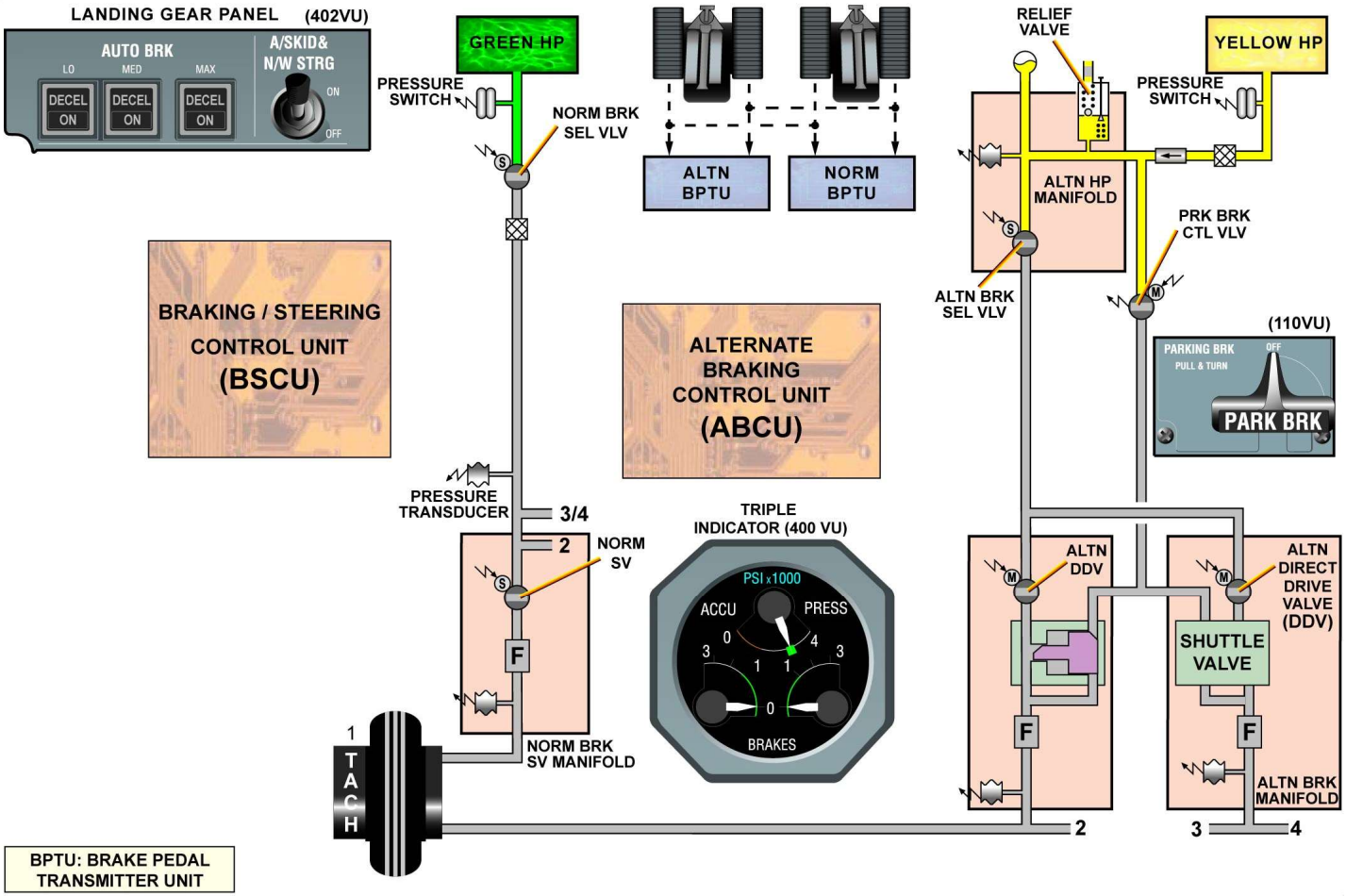
LANDING GEAR PANEL (h)

A landing gear panel is composed of a toggle switch for anti-skid and nose wheel steering function inhibition. There are also three P/BSWs for AUTO-BRAKE selection. The BSCU and ABCU receive inputs from the landing gear panel.



TRIPLE INDICATOR (i)

A triple indicator gives pressure indication. The top needle supplies the alternate breaking accumulator supply pressure. The bottom needles supply pressure sent to the left and right brakes units (indication available only if ALTERNATE BRAKING is active or PARKING BRAKE is set to on).



WHEELS (j)

Each main wheel has multidisc carbon brakes. Each main wheel rotation speed given by a tachometer is sent to the BSCU for anti-skid computation.

SHUTTLE VALVES (k)

The shuttle valves give the hydraulic priority for brake supply to the parking brake.

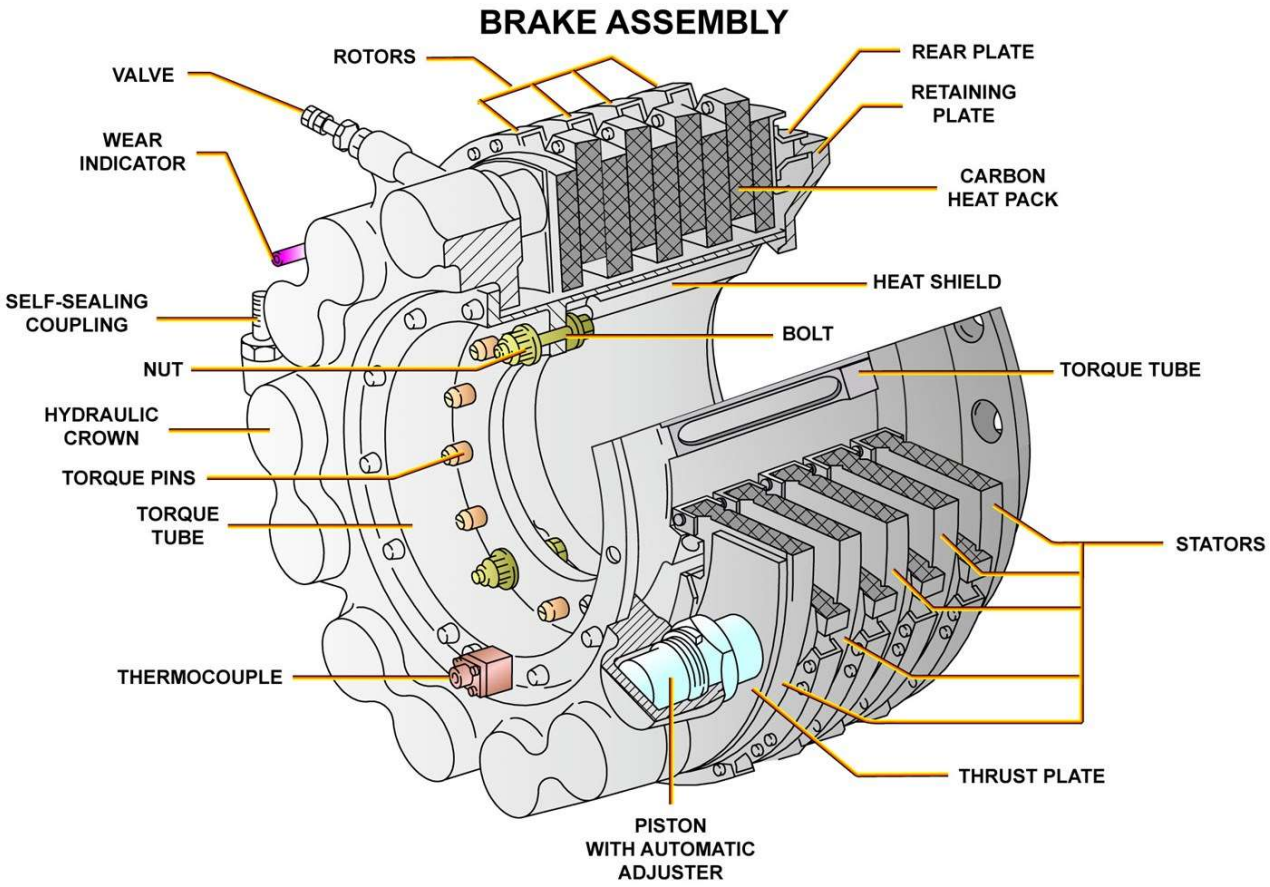
PARKING BRAKE CONTROL VALVE (l)

The parking brake electrical control valve is operated by the parking brake handle. When it is open, a signal is sent to the BSCU and the ABCU in order to override all other braking modes.

If the normal braking system is available and, if the pedals are depressed when the PARK BRK is ON and the pressure commanded by the pedal deflection exceeds the pressure delivered by the park brake system, the normal system will send a complement of pressure to the normal set of pistons to reach the commanded value.

ACCUMULATOR (m)

The brake accumulator is supplied from the yellow hydraulic system and can provide pressure to the alternate brake system.



BRAKE ASSEMBLY

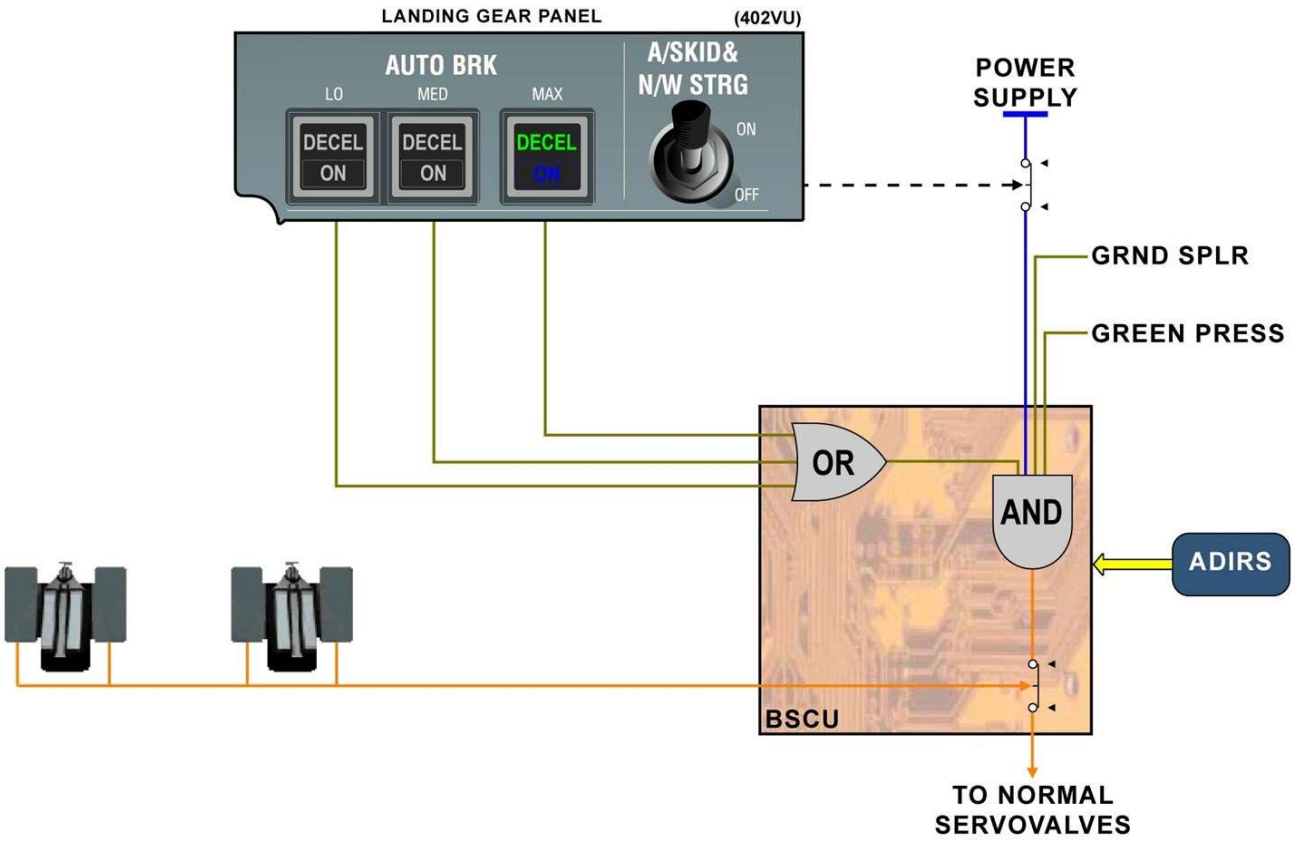
There are different available brake assemblies. A typical brake assembly includes a piston housing and a carbon heat pack.

The piston housing has:

- 2 hydraulically independent sets of pistons (normal and alternate),
- a piston set that has 5 or 7 pistons (in relation to the brake unit version),
- a bleeder for each of the two systems,
- a self-sealing coupling for each system,
- a torque tube,
- two wear indicators for the heat pack,
- a brake temperature sensor.

Three bolts and nine pins attach the brake to the axle flange of the landing gear.

Autobrake System Description and Operation



AUTOBRAKE MODES (a)

The AUTO BRaKe panel is used to select the desired deceleration rate of the system. MAXimum mode is normally selected for take-off: in the event of an aborted take-off, maximum braking pressure is sent to the normal brake pistons as soon as ground spoilers deployment order is present. MEDium or LOw modes are selected for landing: progressive pressure is sent to the brakes, for respectively 2 or 4 seconds after the ground spoilers deployment order.

ADIRS (b)

The Air Data Inertial Reference System (ADIRS) signals the aircraft deceleration rate to the Braking and Steering Control Unit (BSCU) to be compared with the selected deceleration mode for braking computation.

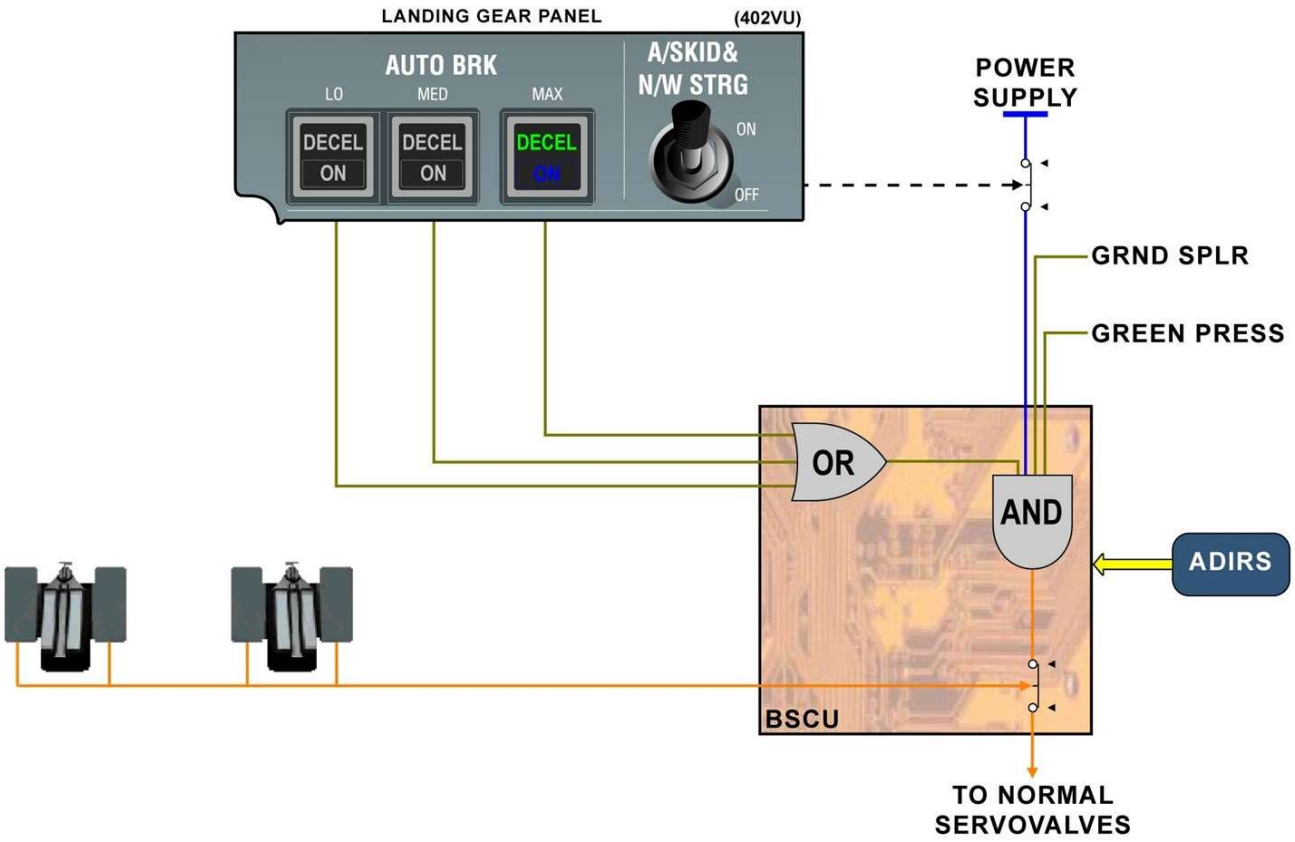
A/SKID & N/W STRG SWITCH (c)

The A/SKID & N/W STRG switch activates the anti-skid system and enables autobrake arming.

ON: anti-skid (A/SKID) and nose wheel steering (N/W STRG) are available and autobrake can be armed provided the green pressure is valid. If green pressure drops:

- yellow pressure takes over automatically, anti-skid is available, nose wheel steering is still available,
- and autobrake cannot be armed.

OFF: anti-skid, nose wheel steering, normal brake and autobrake are lost.

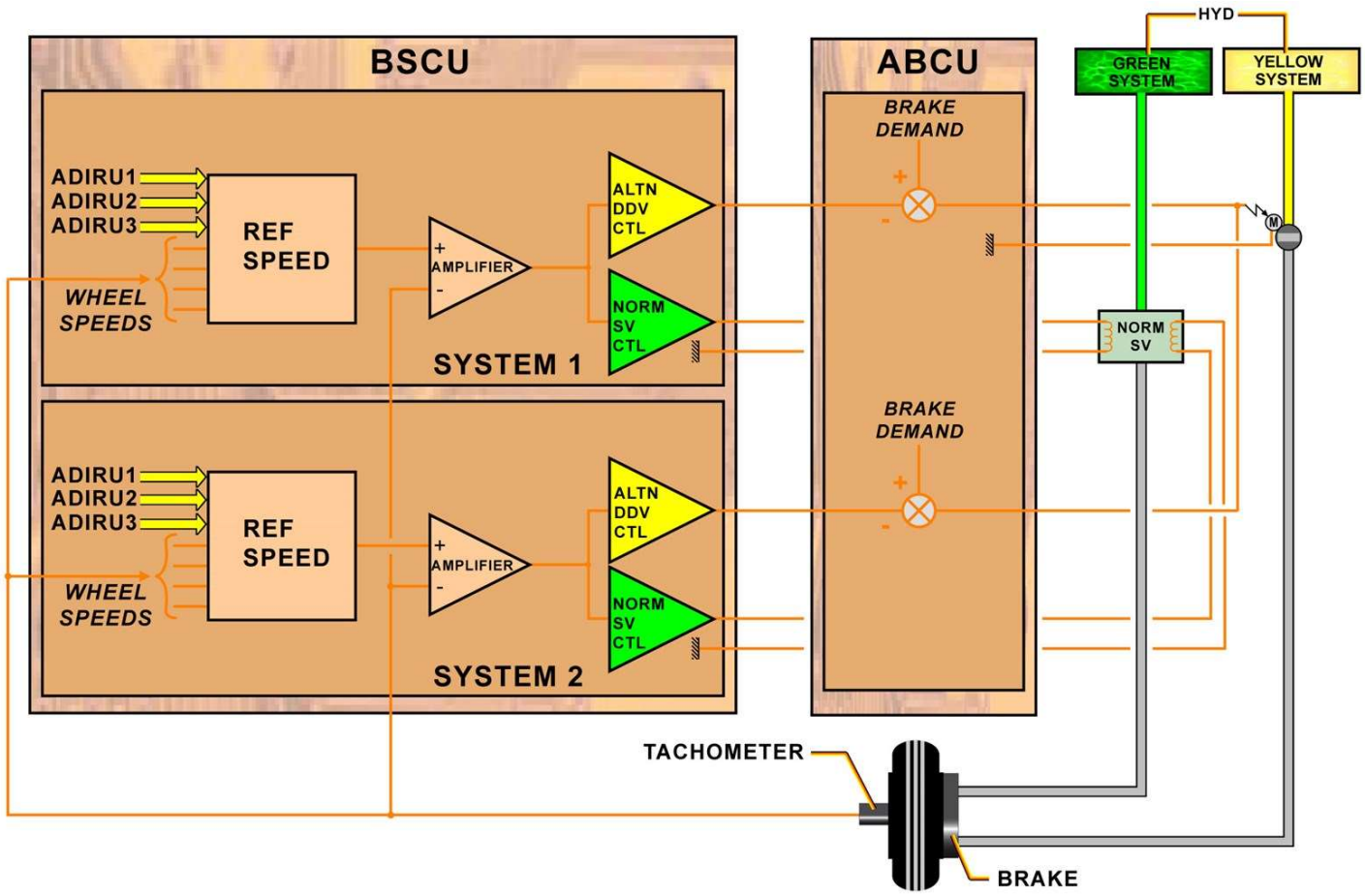


ARMING (d)
The autobrake system is armed if one of the three modes P/B (LO, MED or MAX) is pressed in and the following conditions are met:
- green pressure available,
- BSCU electrically powered,
- no failure in the normal braking system.
The ON light comes on blue when the corresponding rate is armed.

ACTIVATION (e)
The automatic braking system is activated by at least 2 of the 3 ground spoiler extension signals coming from the Spoiler Elevator Computers (SECs). The DECEL light comes on green when actual aircraft deceleration is 80 % of the selected rate (LO and MED modes) or 0.27 g (MAX mode).

DISARMING (f)
The autobrake is disarmed by:
- releasing the selected P/B out,
- loss of one or more arming conditions,
- applying sufficient force to the pedals when autobrake is operating,
- ground spoilers retraction. If ground spoilers are extended again, autobrake will be activated as well.


Anti-Skid Function
OVRD
G
B
Y
APU
AUTO EXTING
TEST
RESET
ENG
1 FADEC GND PWR 2
HYD
YELLOW
3000
PSI
3000
PSI
3000
PTU
RAT
ELEC
1
ELEC
2
A/SKID &
N/W STRG
ON
OFF



PURPOSE (a)

The Anti-Skid (A/SKID) system gives the maximum braking efficiency as it keeps each individual wheel at the maximum deceleration rate avoiding a skidding configuration.

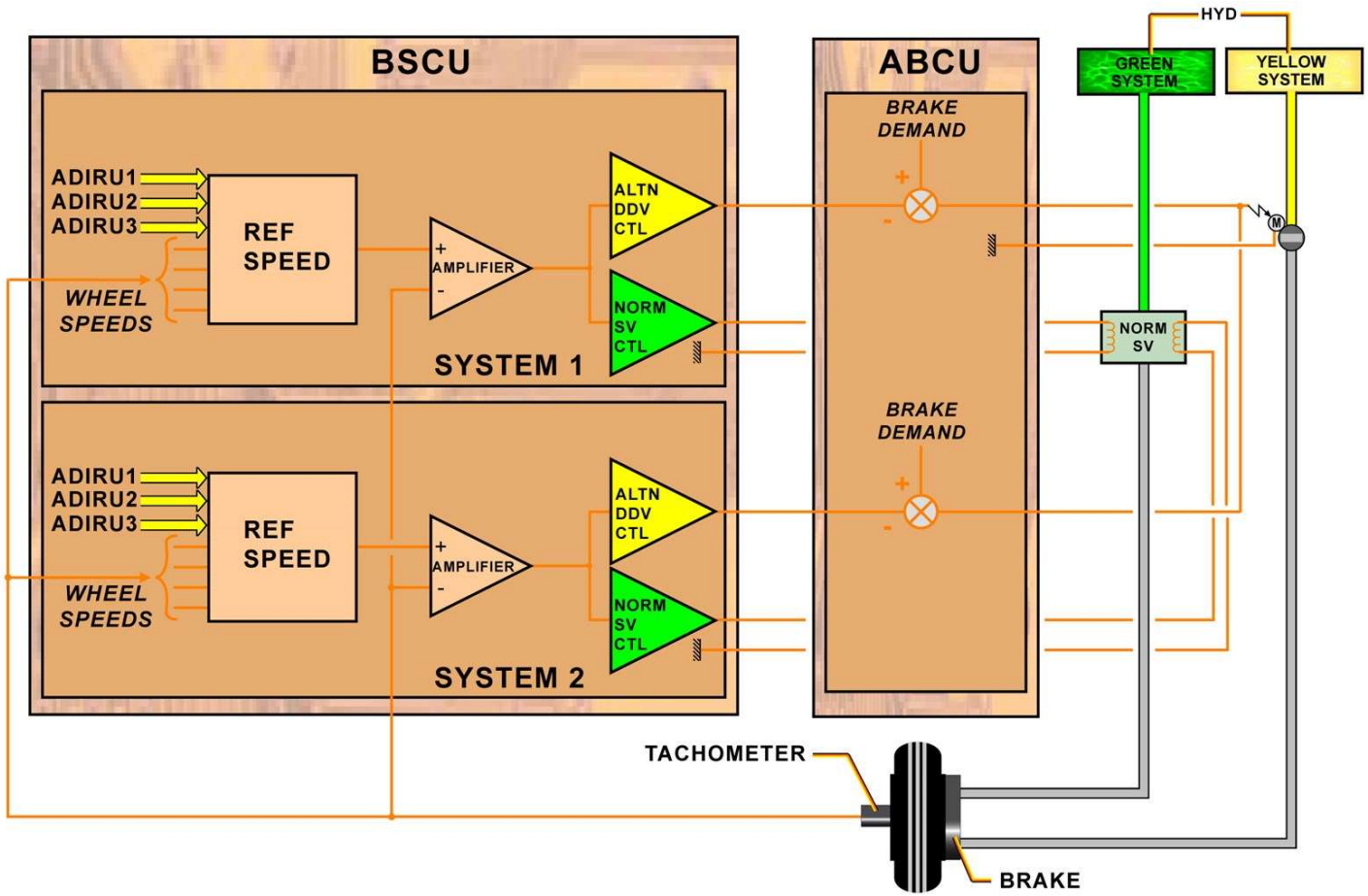
BSCU (b)

The Braking and Steering Control Unit (BSCU) gives the A/SKID control during normal and alternate braking by either system 1 or 2 of the BSCU. Systems 1 and 2 have independent power supplies, and at each power up, the first system supplied takes control. If the two systems are supplied simultaneously. System 1 has priority and system 2 is in standby.

System on standby will take control when L/G control lever is placed in the DOWN position.

PRINCIPLE (c)

The speed of each main gear wheel, given by a tachometer, is compared with the A/C speed supplied by the Air Data Inertial Reference Units (ADIRUs). A reference speed is determined by the BSCU from the longitudinal deceleration given by ADIRUs 1, 2 or 3. When the speed of a wheel decreases below 0.87 times the reference speed, brake release orders are given to that wheel to maintain the wheel deceleration rate at that value.



REGULATION (d)

The operational amplifier compares the calculated reference speed with the speed of the decelerating wheel. The operational amplifier supplies numerical values which are converted into current to supply the coil of the normal Servovalve (SV) and sends it to the Alternate Braking Control Unit (ABCU).

ABCU (e)

The Alternate Braking Control Unit (ABCU) controls the alternate braking components during alternate braking with or without A/SKID.

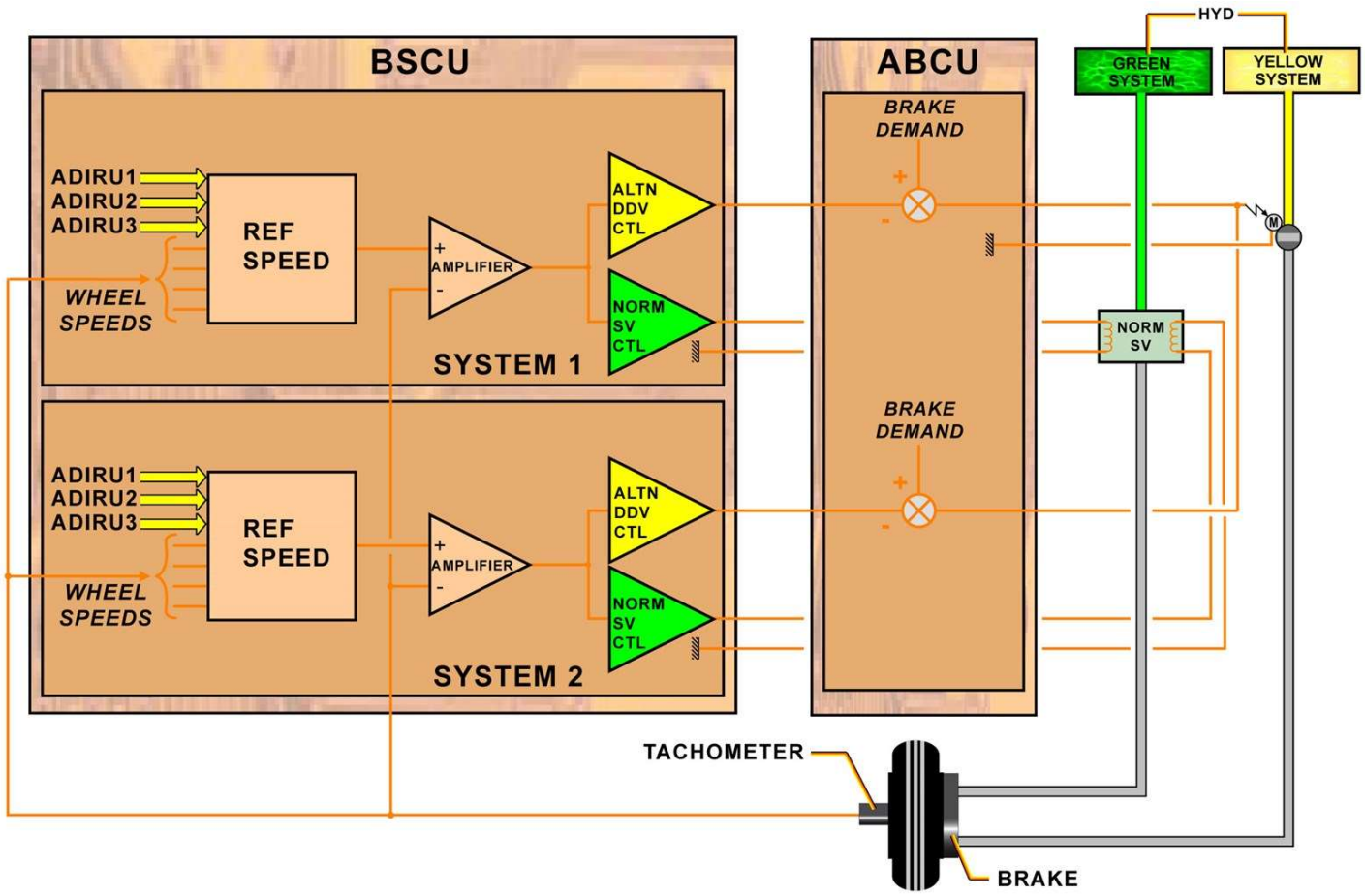
The ABCU determines the braking orders according to the brake pedal deflections measured by the Brake Pedal Transmitter Unit (BPTU).

The ABCU combines these braking orders with the antiskid orders sent by BSCU. The ABCU send the braking orders, combined or not with antiskid control orders, to the alternate brake DDVs.

SV AND DDV (f)

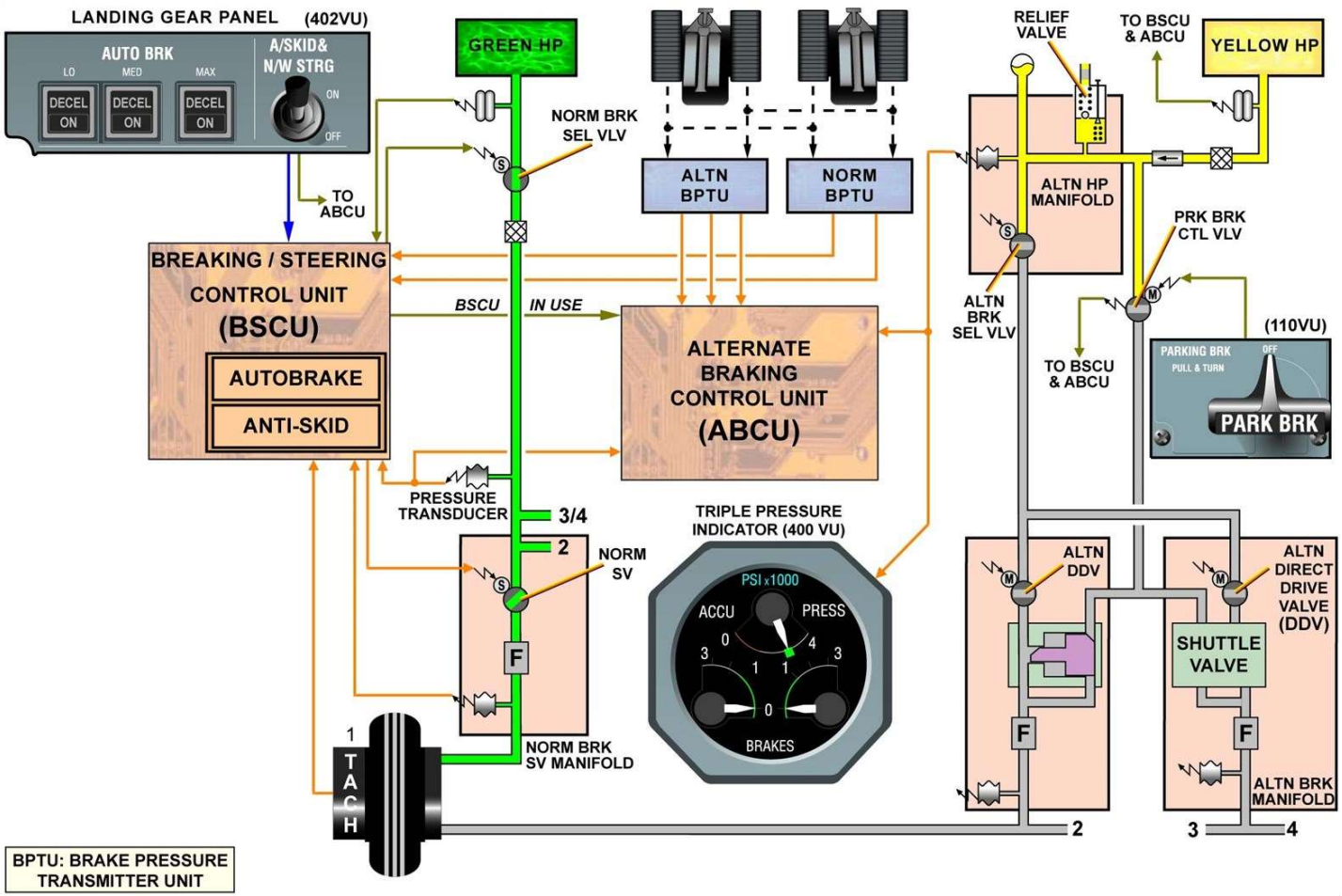
The normal SV is connected to the BSCU. The two coils of the normal SV are connected to systems 1 and 2 respectively.

The alternate DDV is connected to the ABCU which controls it.



ADIRU (g)
The required reference speed during braking is directly obtained from the average between the values from the three ADIRUs. In case the ADIRU data is not valid, the reference speed is equal to the maximum of either MLG wheel speeds. A/C deceleration is limited to 1.7 m/s^2 (5.6 ft/s^2).

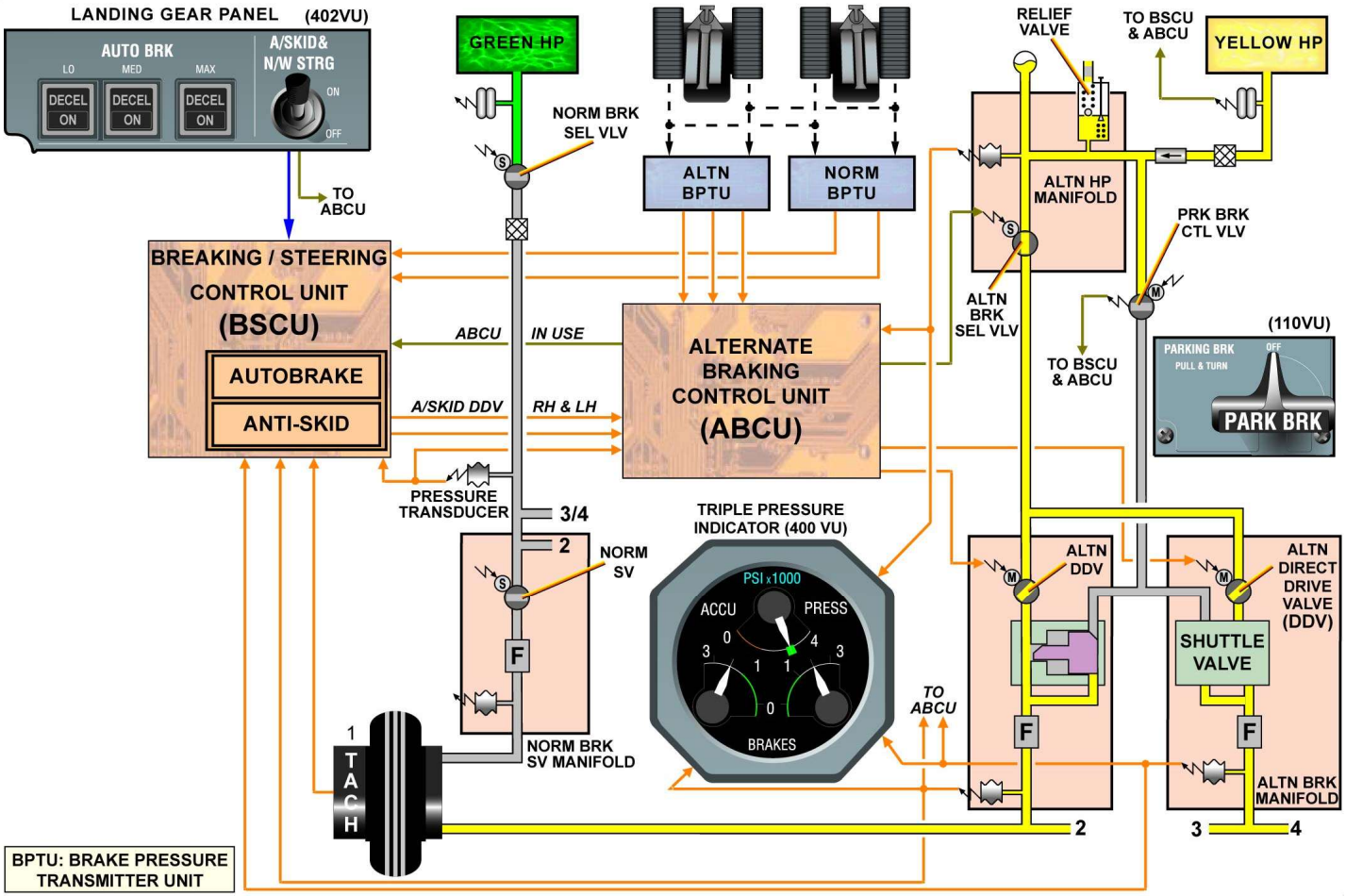

Brake System
Operation
OVRD
APU
AUTO EXTING
TEST
RESET
1 FADEC GND PWR 2
HYD
YELLOW
3000
PSI
PTU
RAT
ELEC
1
2
A/SKID &
N/W STRG
ON
OFF



GENERAL (a)
The hydraulic braking architecture is shown with all components. Note that only their main functions are shown.

NORMAL BRAKING (b)
The hydraulic braking operation is identical for automatic braking, manual braking and in-flight braking.
Note that during in-flight braking, Anti-Skid (A/SKID) function is inhibited by the Braking and Steering Control Unit (BSCU).
Normal braking and A/SKID regulations are electrically controlled by the BSCU.

NORMAL BRAKING (c)
OPERATION: The selector valve is energized. The normal brake servovalves supply a pressure which depends on the control current delivered by the BSCU. The manifold comprises the servovalves, the pressure transducers and the hydraulic fuses. The hydraulic fuses stop the flow in the lines in case of leakage. During manual braking, the brake pedal transmitter units provide an artificial feel at the pedals. The artifical feel at the pedals is provided by means of 2 sets of spring rods, that are as well putting the pedals to its initial position when the force is removed. A pressure transducer downstream of the normal brake selector valve sends the hydraulic pressure information to the BSCU and the ALTN Braking Control Unit (ABCU). A pressure lower than 90 bar or all other normal braking failure lets the ABCU activate the ALTN braking mode.

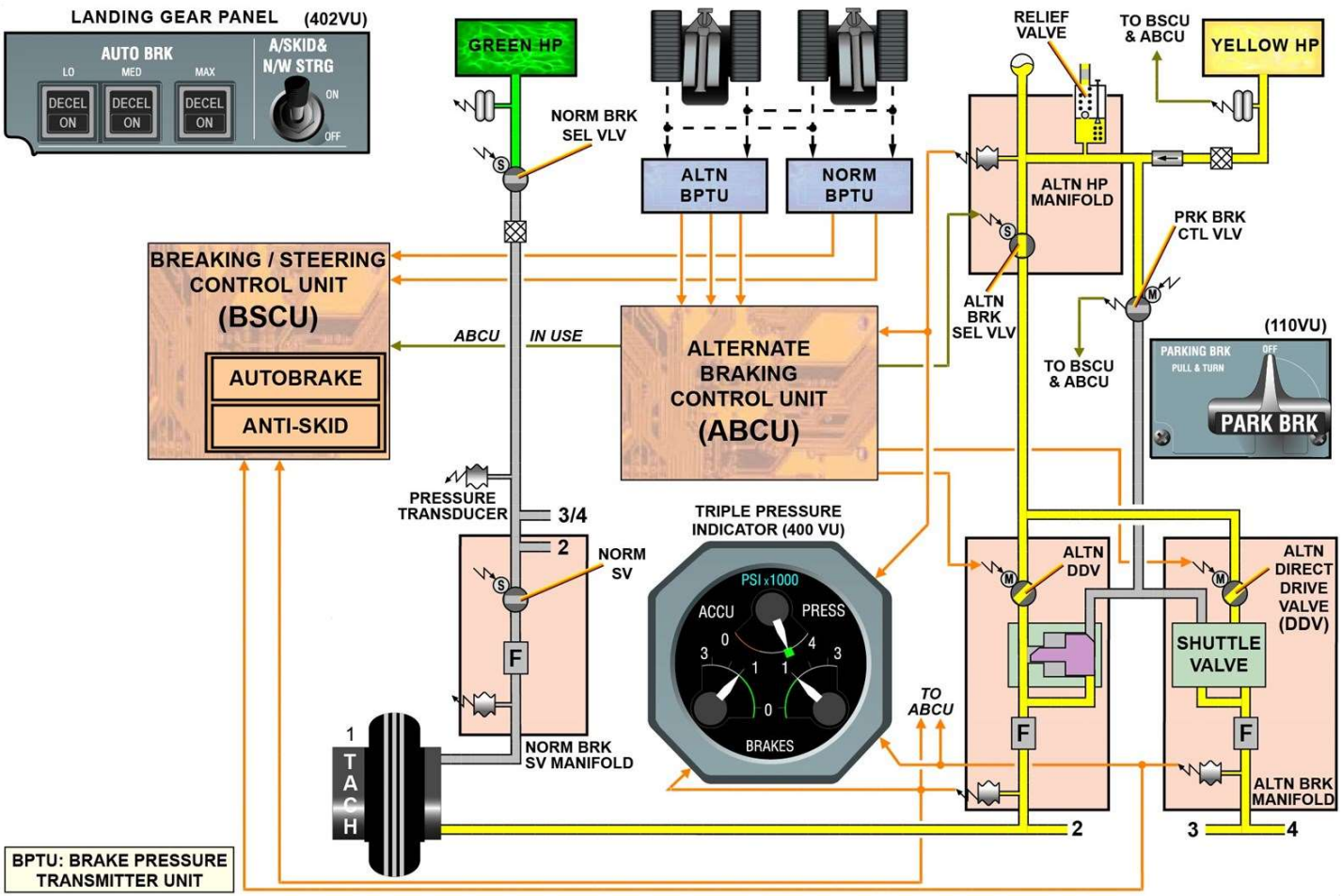


ALTN BRAKING WITH A/SKID (a)

The ALTN braking with A/SKID is electrically controlled and hydraulically operated. The yellow High Pressure (HP) system supplies the ALTN braking. A pressure transducer informs the ABCU in case of yellow LP. When the normal braking is faulty or the pressure downstream the normal selector valve drops, the BSCU informs the ABCU, which becomes active.

ALTN BRAKING WITH A/SKID (b)

OPERATION: The orders are entered through the pedals and an ALTN brake pedal transmitter unit transmits the orders to the ABCU. The ABCU opens the ALTN brake selector valve. The current sent to the Direct Drive Valves (DDVs) is proportional to the pressure applied on the brake pedals. The pressure output from each DDV goes through its related shuttle valve and the hydraulic fuse. Each ALTN brake manifold comprises one alternate DDV and one hydraulic fuse. One ALTN brake pressure transducer is installed at each alternate brake manifold, downstream of the hydraulic fuse. They transmit brake pressure data to the ACCU/PRESS triple indicator to ABCU and the BSCU. The BSCU uses it for the A/SKID function. If a wheel starts to skid, the BSCU sends a signal to the ABCU to reduce the current in the related DDV. The hydraulic fuse stops the flow in the line in case of leakage.

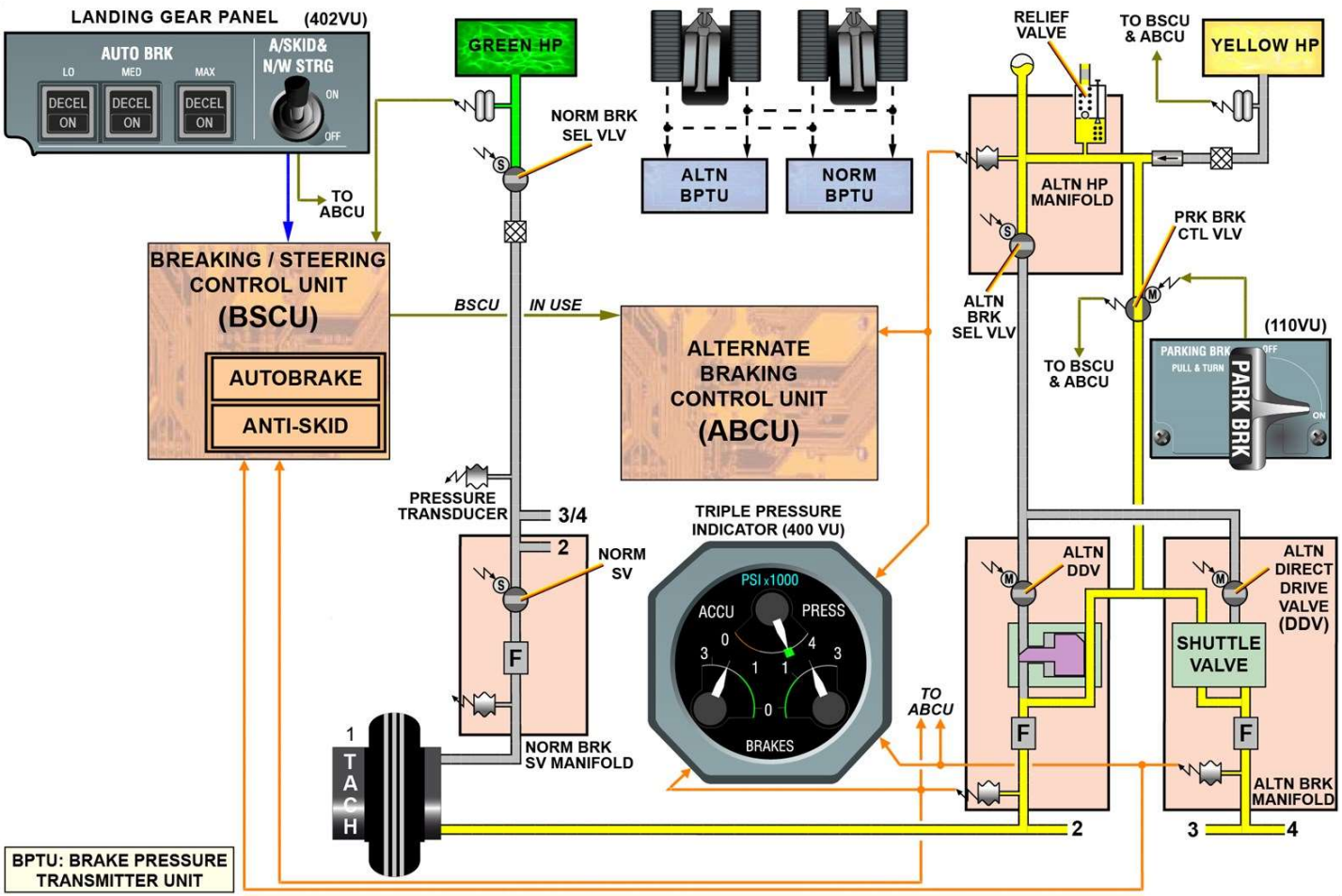


ALTN BRAKING WITHOUT A/SKID (a)

In case of A/SKID failure during the ALTN braking with A/SKID, the ABCU automatically controls the ALTN braking system without A/SKID protection. Moreover, in the event of insufficient yellow hydraulic pressure, the brake accumulator supplies the brakes (emergency braking). Thus, the ABCU inhibits the antiskid protection and maintains a predetermined level of braking even when the brake pedals are fully released. This is to prevent the loss of hydraulic fluid from the accumulator.

ALTN BRAKING WITHOUT A/SKID (b)

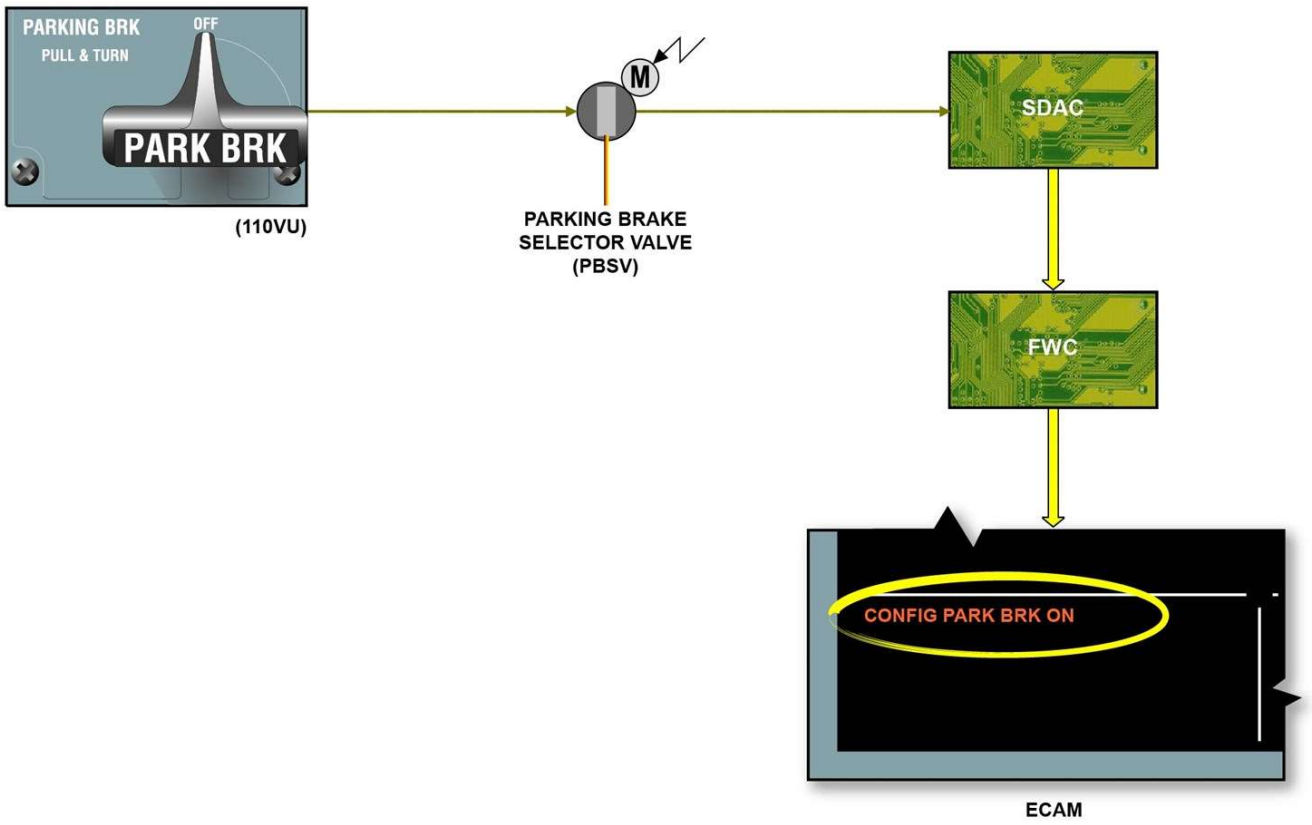
OPERATION: braking orders are sent to the ABCU via the ALTN brake pedal transmitter unit. The ABCU energizes the ALTN brake selector valve and applies to the DDV a current proportional to the ALTN brake pedal transmitter unit signals. To reduce the risk of tire burst when A/SKID is not available, the ABCU limits the brake pressure to 1000 psi (70 bar). To release this limitation, the ALTN brake pressure transducers measure the brake pressure and send this data to the ABCU. These transducers give visual indication on the yellow ACCU/PRESS triple indicator. A third set of potentiometers in the ALTN brake pedal transmitter unit supplied by the HOT BATTERY BUS lets the ABCU brake the A/C during towing operation.



PARKING BRAKE/ULTIMATE EMERGENCY BRAKING (a)
The brakes are supplied either by the yellow HP manifold or the brake accumulator.

PARKING BRAKE/ULTIMATE EMERGENCY BRAKING (b)
OPERATION: When the parking brake handle is set to the "ON" position, the shuttle valves give the hydraulic priority for the brake supply to the parking brake. When the parking brake control valve is open, a signal is sent to the BSCU and the ABCU in order to override all other braking modes.

PARKING BRAKE/ULTIMATE EMERGENCY BRAKING (c)
If the brake accumulator pressure becomes low when the parking brake is on, normal braking using the pedals can be applied to stop the A/C. When the pedal deflection order exceeds the pressure delivered by the parking brake, the BSCU sends a complement of pressure to the normal set of pistons to reach the commanded value.

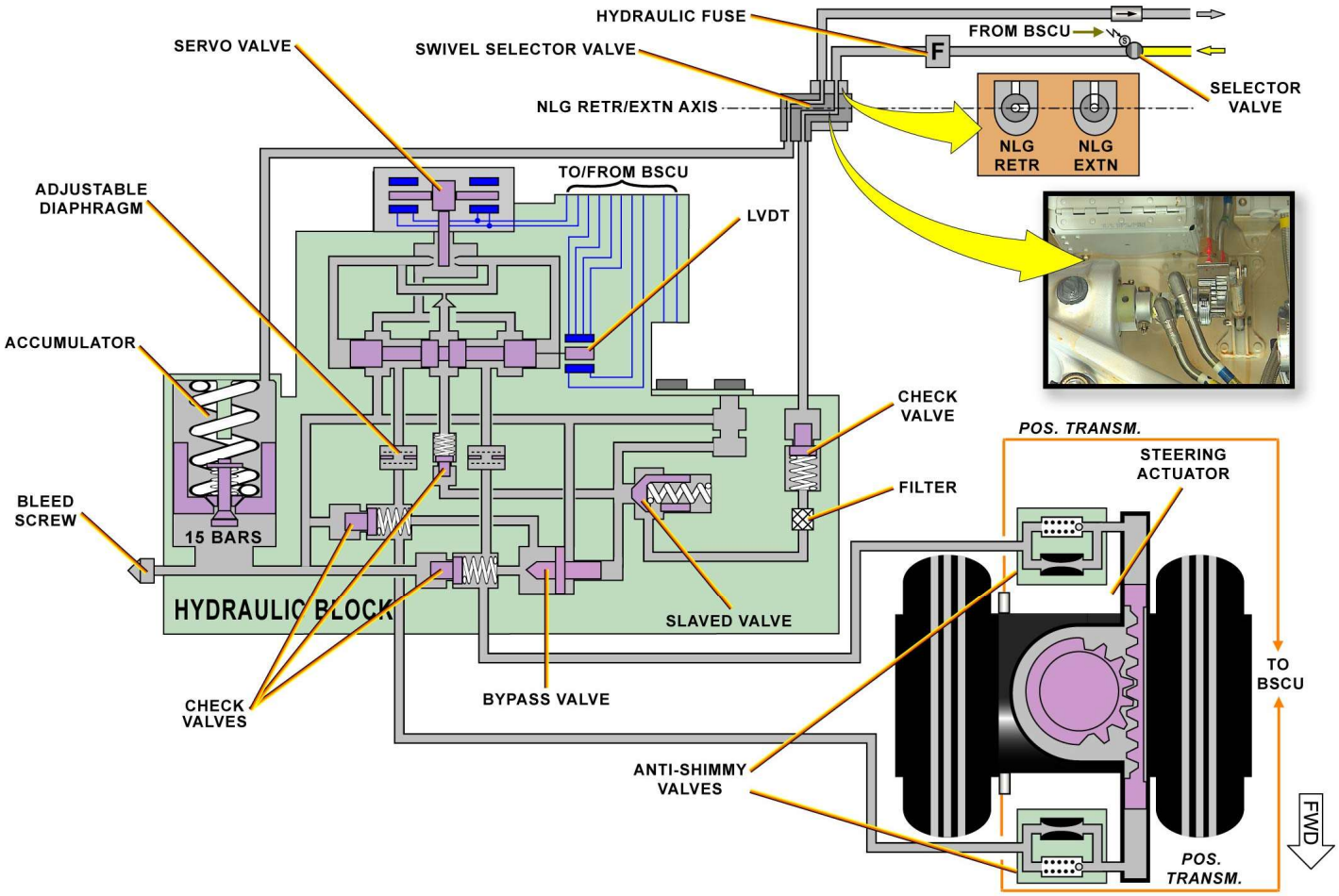


PARKING BRAKE MONITORING

The parking brake monitoring function is used to detect a difference between the position of the parking brake handle and the condition of the Parking Brake Selector Valve (PBSV) and to prevent a Rejected Take Off (RTO).

If there is a PBSV failure, a message is displayed on the ECAM.

Nose Wheel Steering System Description and Operation

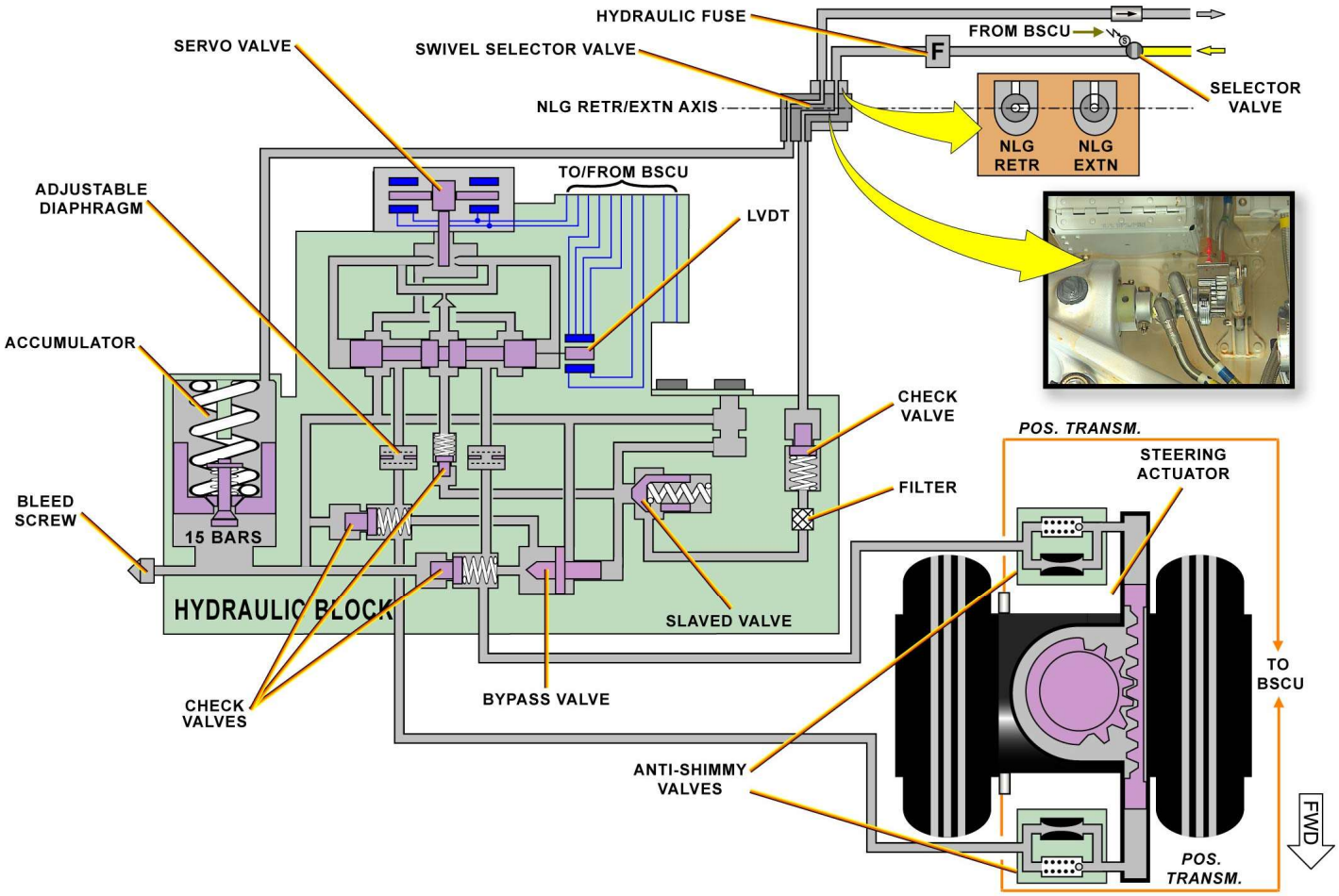


B2 SCOPE (a)
MODULE TAGGED B2 SCOPE.
BE AWARE THAT ONLY AVIONICS/ELECTRICAL TOPICS SHOULD BE LEARNED FOR A T2 COURSE.

GENERAL (b)
The nose wheel steering system is supplied by the yellow hydraulic system and is composed of several components which are described in detail in the following sections.

GENERAL - SWIVEL SELECTOR VALVE (c)
The swivel selector valve is installed co-axially with respect to the L/G retraction axis and provides hydraulic power supply when the gear is extended. When the gear starts to retract, the swivel selector valve cuts the hydraulic power supply.

GENERAL - CHECK VALVE/FILTER (d)
A 40-micron filter and a check valve are installed in the hydraulic power supply line followed with a second check valve mounted between the filter and the servo valve.



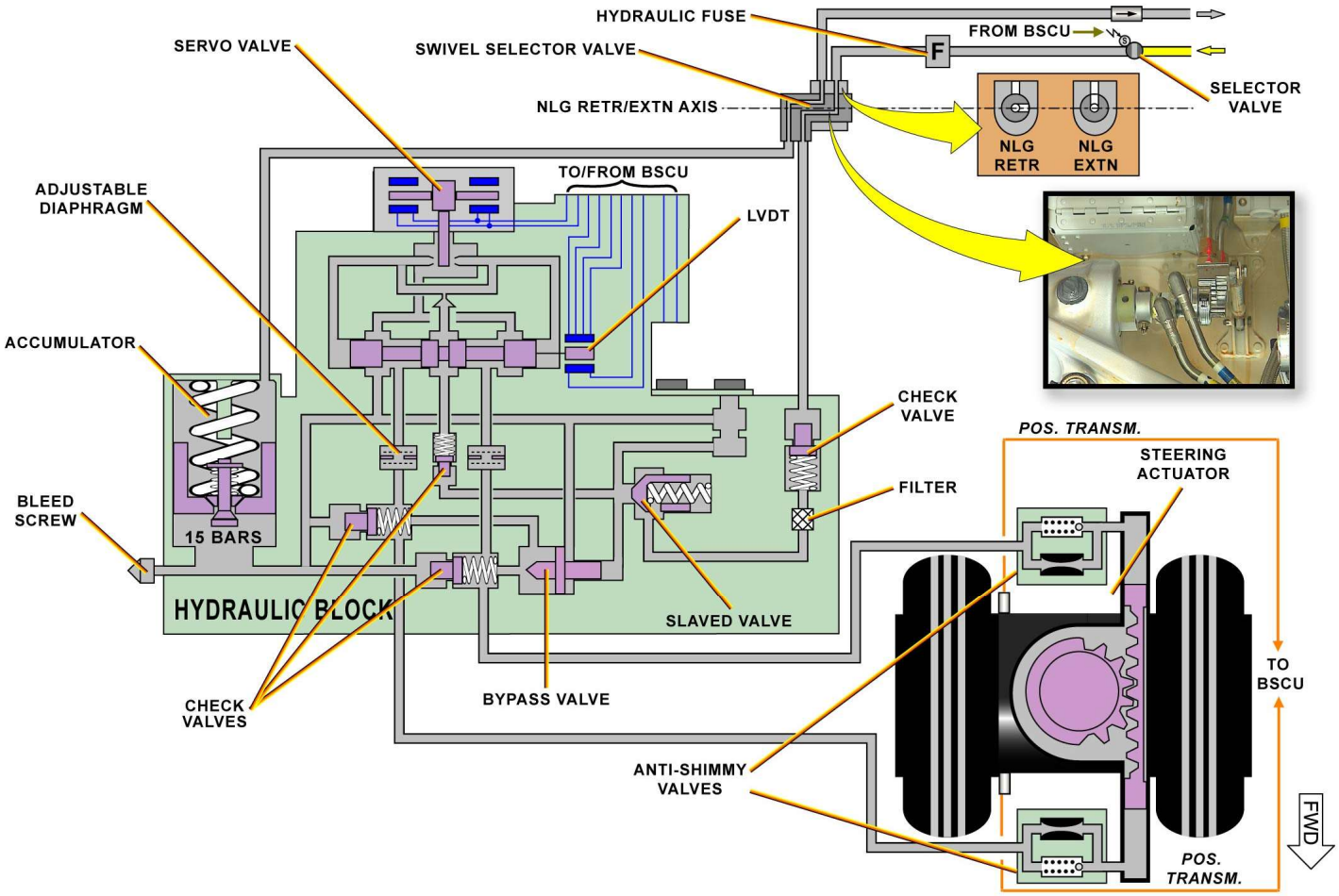
GENERAL - ADJUSTABLE DIAPHRAGM (f)
The adjustable diaphragms are used to adjust the flow to each actuating cylinder chamber and consequently the wheel steering speed.

GENERAL - CHECK VALVES (g)
Two check valves ensure the distribution of fluid from the accumulator to the chamber of the steering actuator.

GENERAL - BYPASS VALVE (h)
The bypass valve interconnects the two chambers of the steering actuator in the event of hydraulic system depressurization. The bypass valve opens if the pressure exceeds 273 bar (4000 psi).

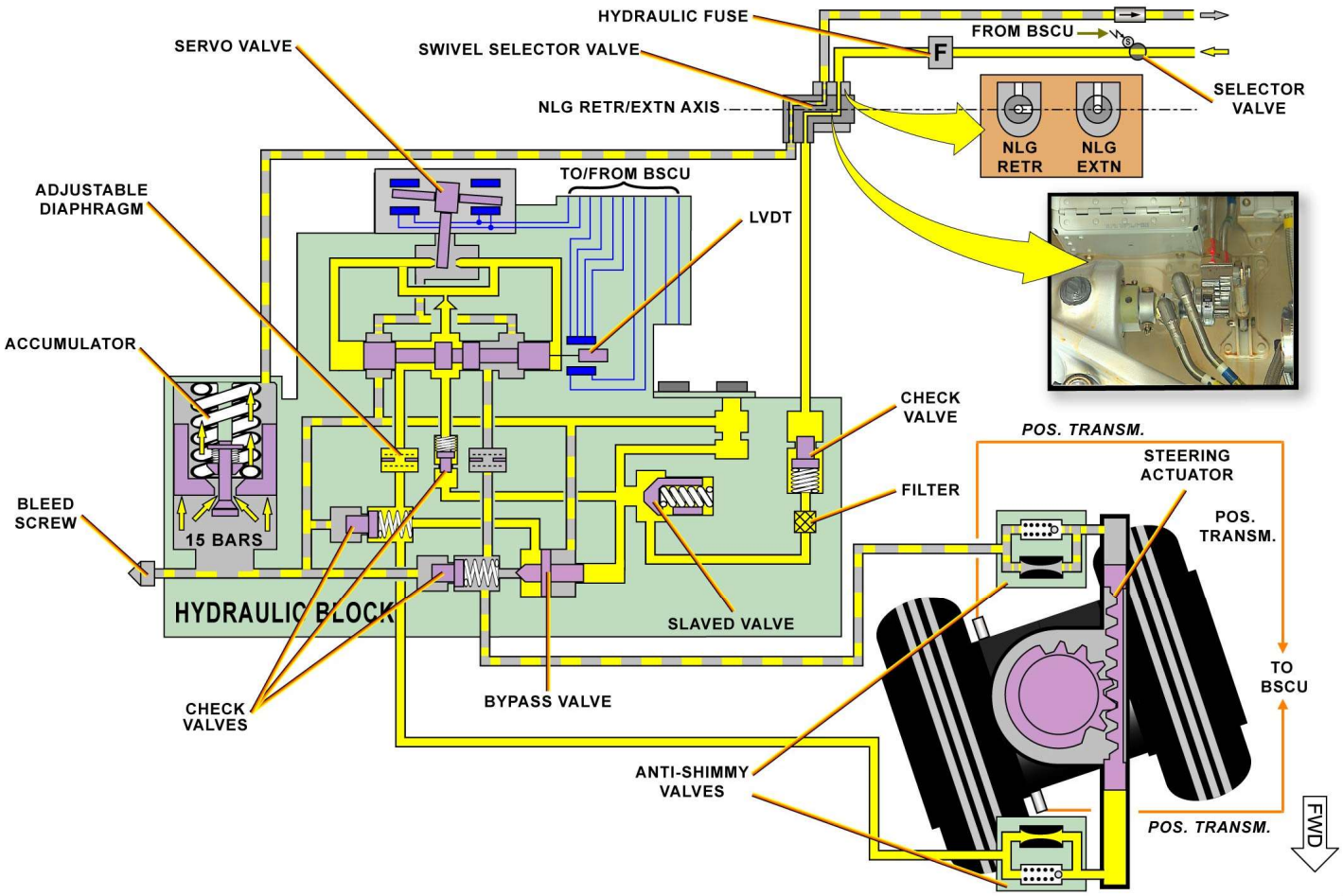
GENERAL - ANTI-SHIMMY VALVES (i)
There is one anti-shimmy valve per steering actuator chamber.

GENERAL - STEERING ACTUATOR (j)
The steering actuator drives the rotating tube, which is part of the NLG structure, via a rack-and-pinion assembly.



GENERAL - ACCUMULATOR (k)
The anti-shimmy accumulator supplies pressurized fluid in case of cavitation in one of the two chambers of the steering actuator. The accumulator can supply fluid pressurized up to 15 bar (220 psi).

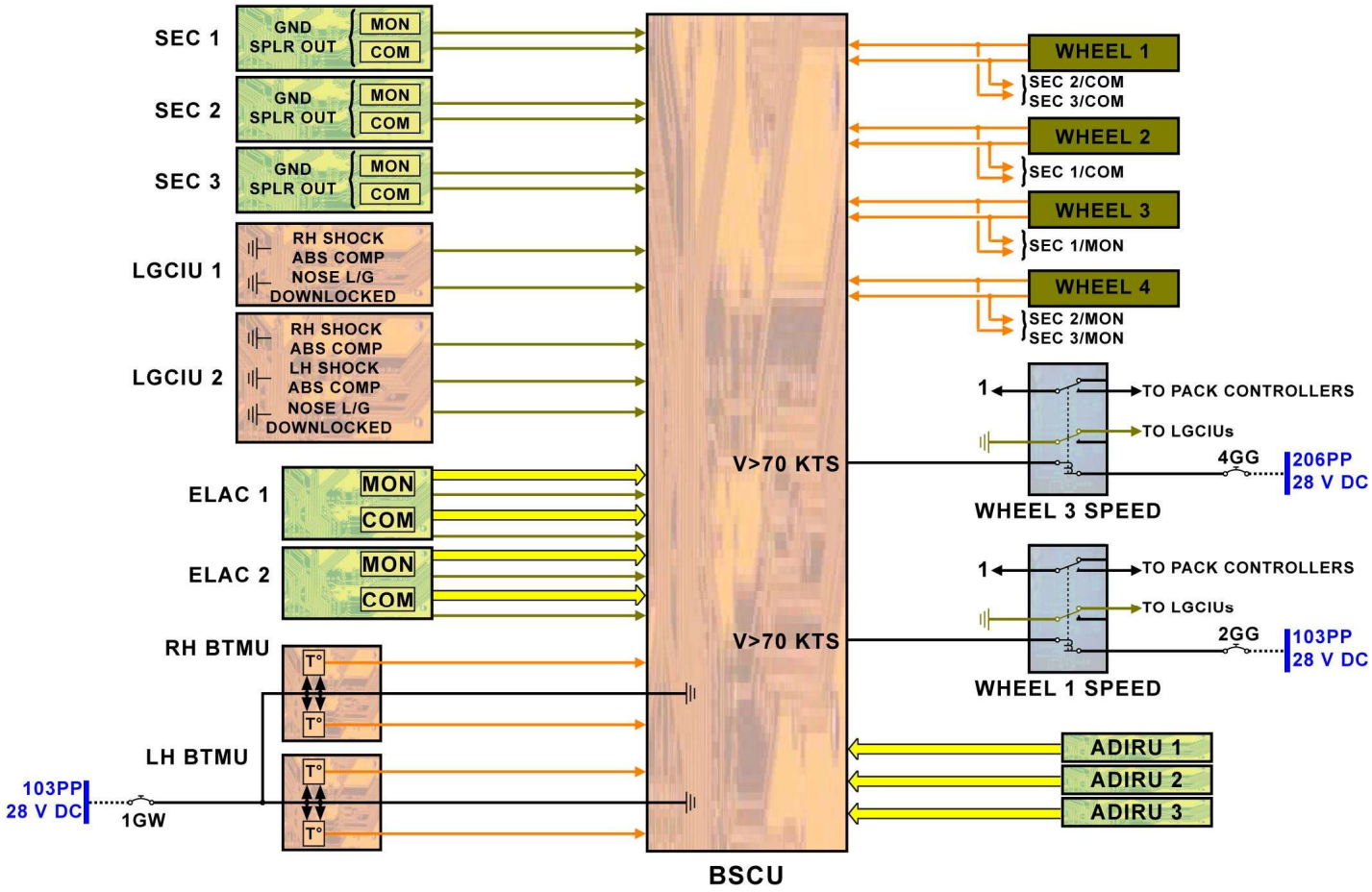
GENERAL - BLEED SCREW (l)
A bleed screw allows bleeding and depressurization of the hydraulic block.



OPERATION

When the nose gear is extended, the hydraulic block is pressurized. When the MLG is compressed, both chambers of the steering actuator are supplied and the nose wheels servoed to an angle of 0. Depending on the BSCU reference speed and the nose wheel steering orders, the nose wheels are steered.


BSCU Control
Interfaces
OVRD
APU
AUTO EXTING
TEST
RESET
1 FADEC GND PWR 2
HYD
YELLOW
3000
PSI
3000
PSI
3000
PTU
RAT
ELEC
1
ELEC
2
A/SKID &
N/W STRG
ON
OFF



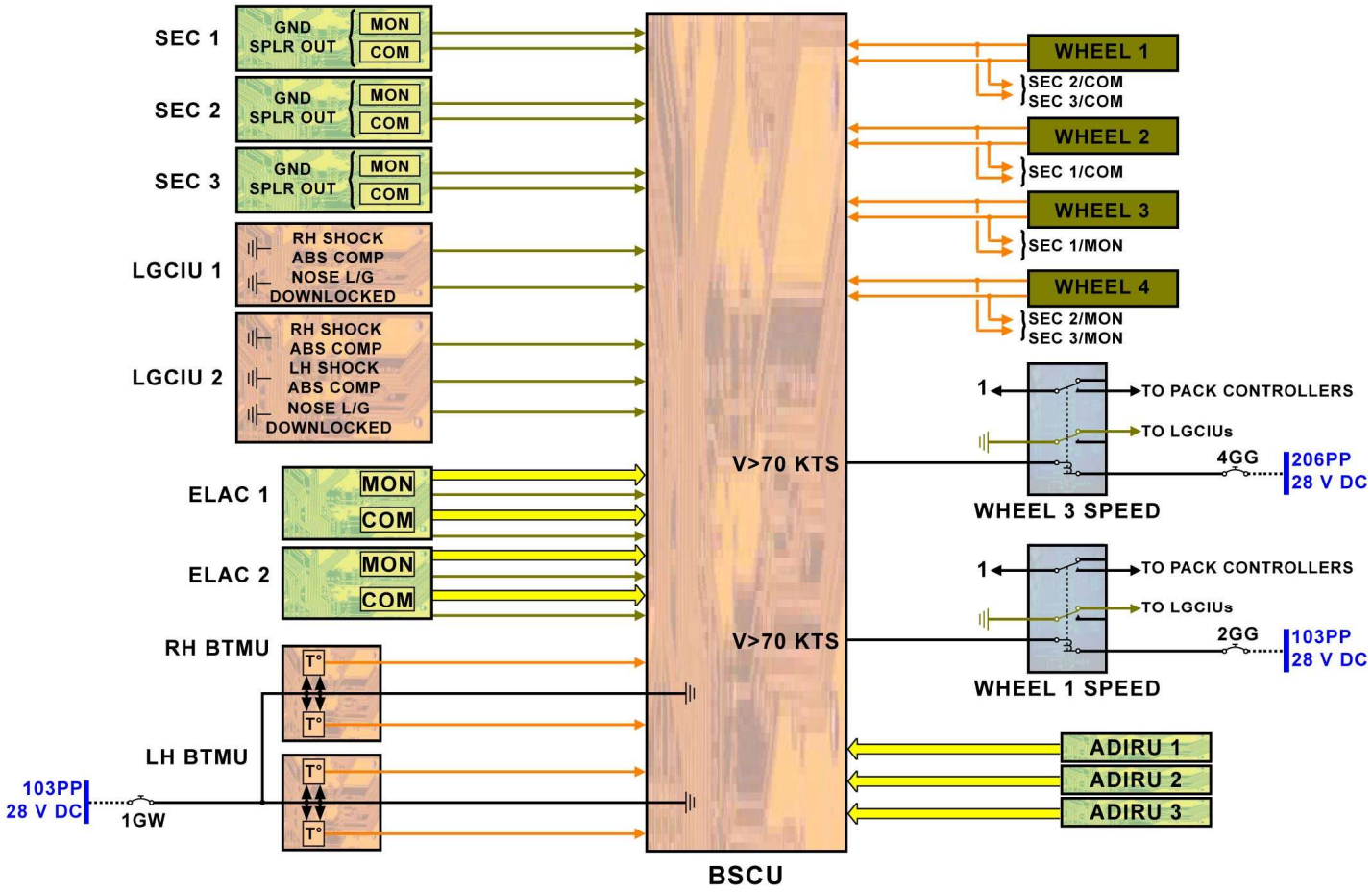
ADIRU (a)
The aircraft reference speed for nose wheel steering and anti-skid functions is obtained by processing the inertial deceleration from the Air Data Inertial Reference Units (ADIRUs).

SEC (b)
Two of the three ground spoilers extended signals coming from the Spoiler Elevator Computers (SECs) must be present to enable automatic braking.

LGCIU (c)
Inputs from both Landing Gear Control and Interface Units (LGCIUs) serve for braking and nose wheel steering functions control logic. LGCIUs receive wheel speed indications. These signals are used for BITE inhibition.

ELAC (d)
The link between the Braking Steering Control Unit (BSCU) and the ELevator Aileron Computer (ELAC) serves for nose wheel steering purposes with orders coming from rudder pedals and autopilot.

BTMU (e)
The BSCU changes analog signals from the Brake Temperature Monitoring Units (BTMUs) into digital ones for temperature indication on the lower ECAM display unit.

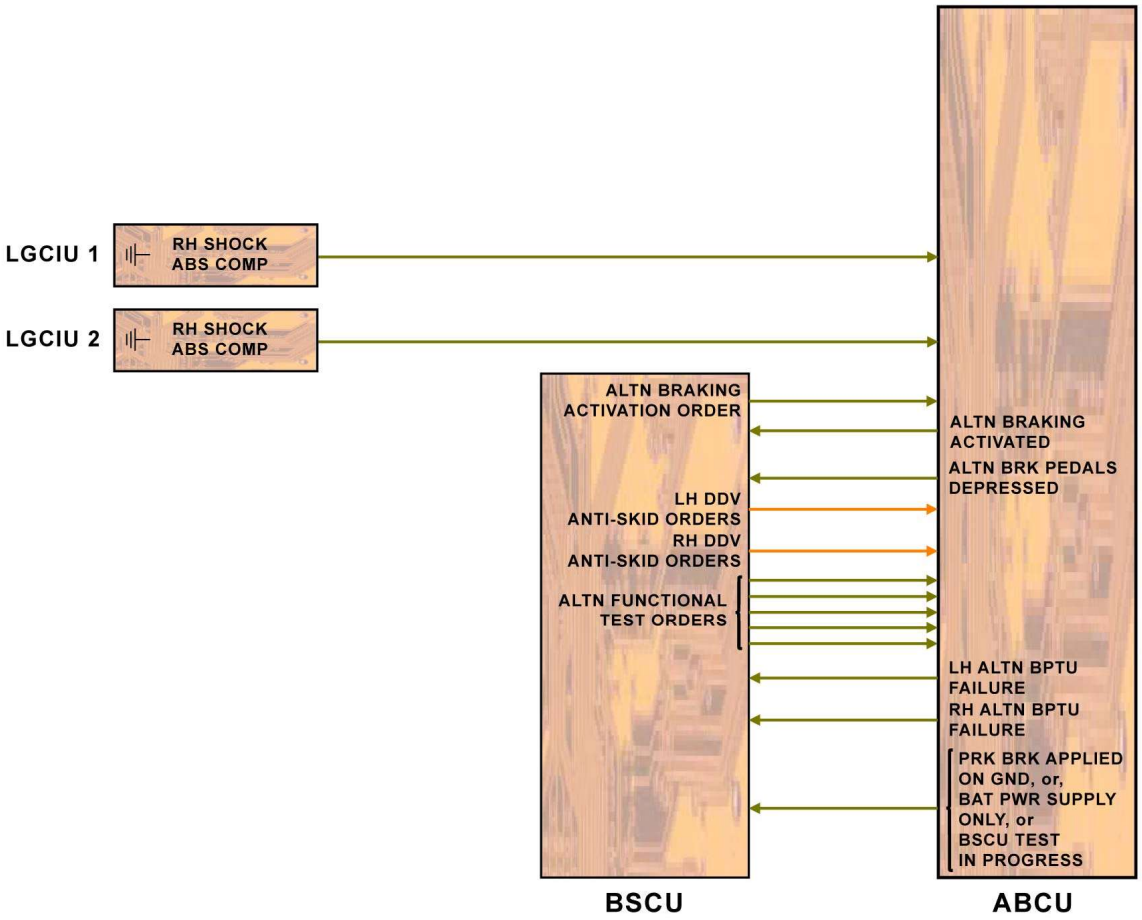


TACHOMETERS (f)

Tachometers send wheel speed values to the BSCU enabling reference speed computation and also to the SECs for ground spoilers extension logic.

PACK CONTROLLERS (g)

After wheel speed computation the BSCU energizes wheel speed relays. These relays send a signal to the pack controllers for pack ram air inlet operation during take-off and landing phases.

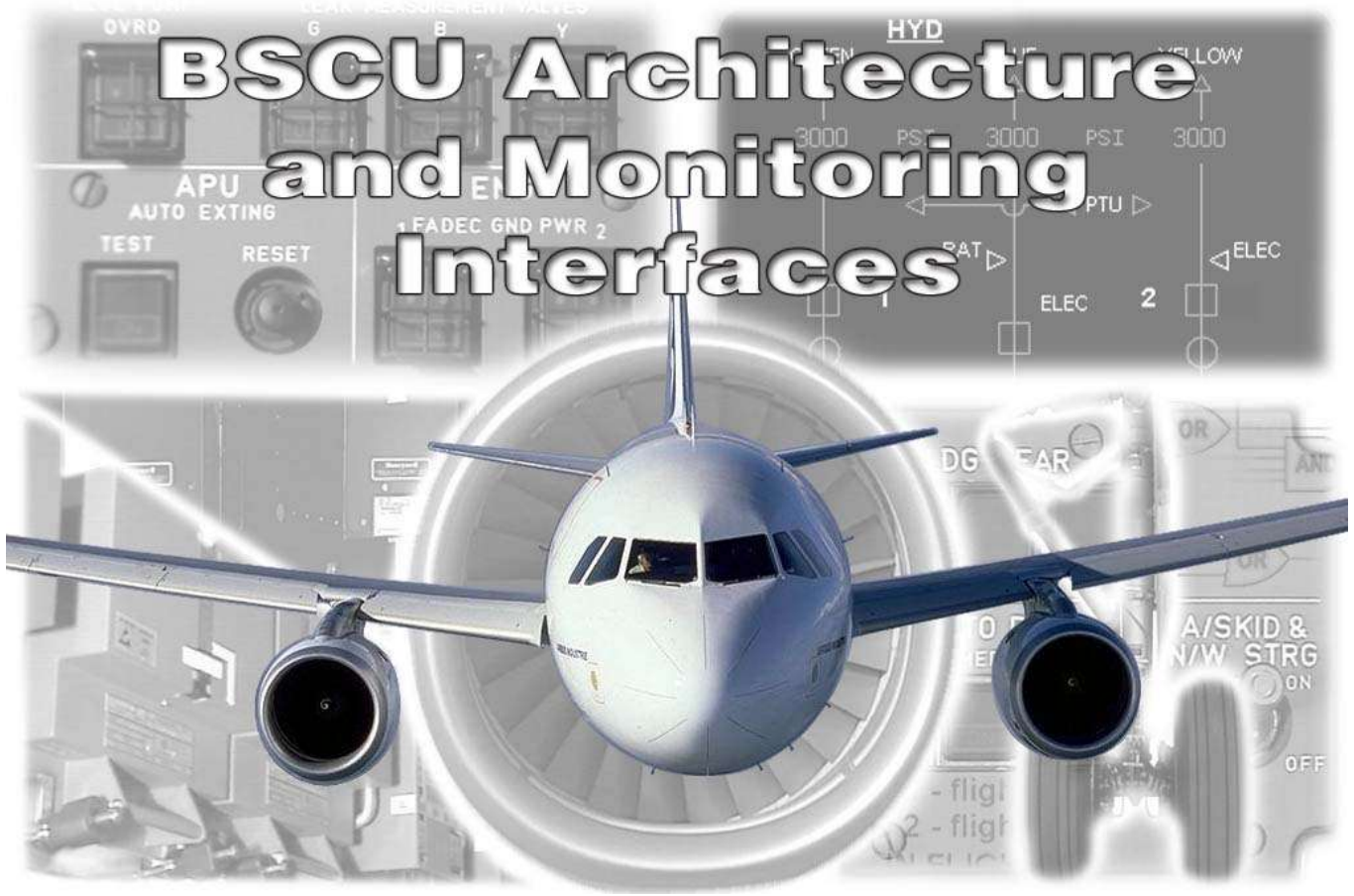


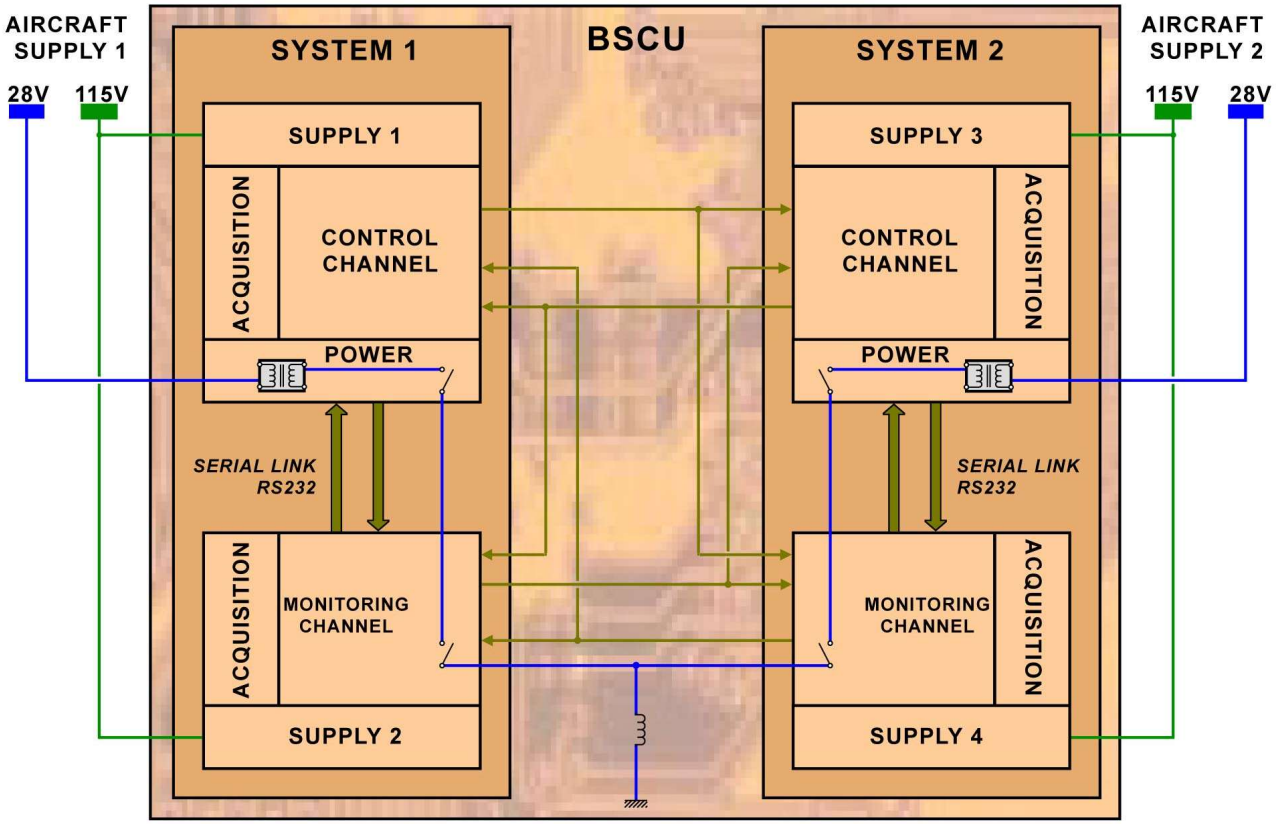
ABCU

The BSCU requests for alternate braking when necessary and provides anti-skid orders to be applied to both DDV.

In order to test the alternate braking capability, the BSCU sends functional test orders to the Alternate Braking Control Unit (ABCU) in predetermined test sequences. For safety reasons, these tests are inhibited by the main landing gear compressed position signal by the ABCU.

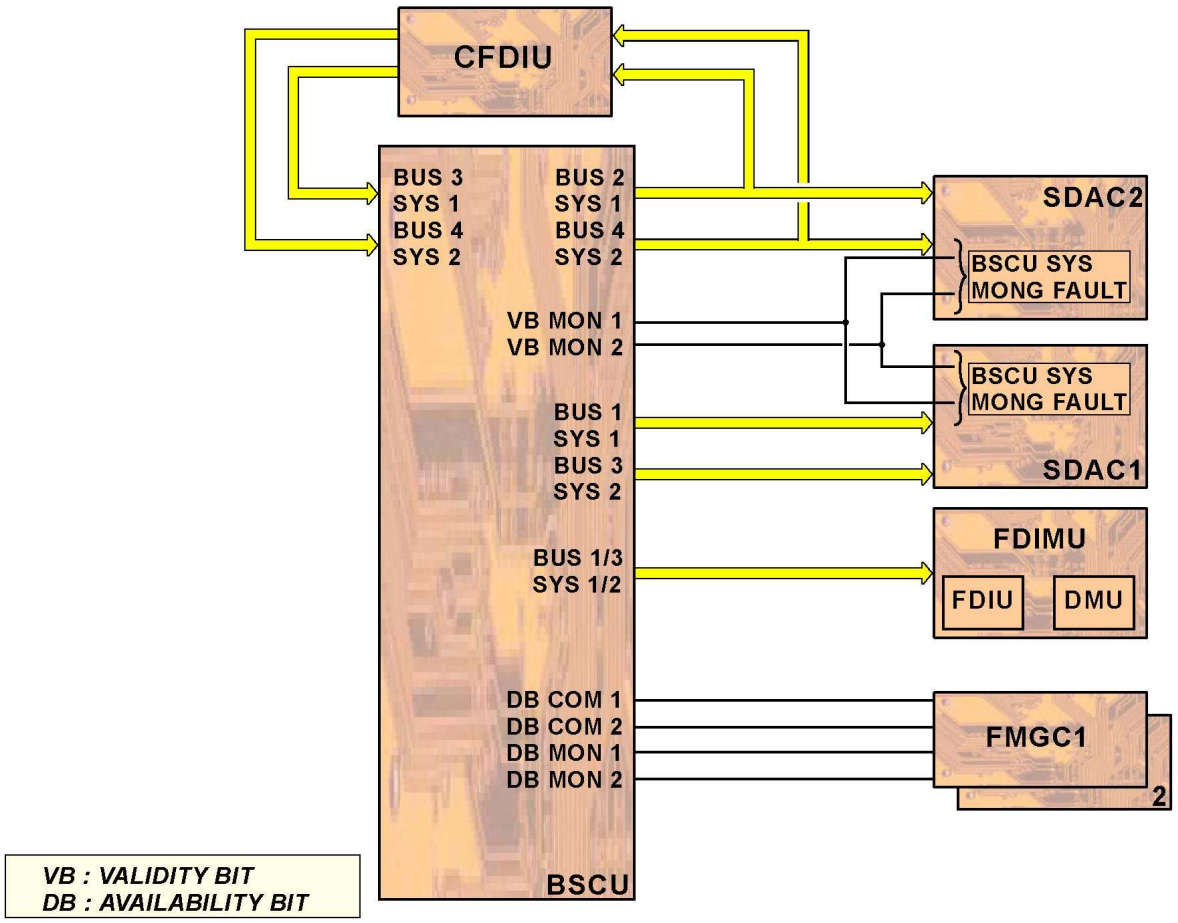
Moreover the ABCU sends alternate Brake Pressure Transmitter Unit (BPTU) failure and alternate system status to the BSCU.


BSCU Architecture
and Monitoring
Interfaces
OVRD
APU
AUTO EXTING
TEST
RESET
FADEC GND PWR
HYD
YELLOW
3000
PSI
PTU
ELEC
2
A/SKID &
N/W STRG
ON
OFF



ARCHITECTURE

The Braking/Steering Control Unit (BSCU) has two power supply units, one for each systems. At each power up the system supplied first takes the control. If both systems are powered up at the same time, system 1 has priority. At each extension of the L/G, the system on command will go to standby and the other system will take over the control. If there is a disagreement between the control and the monitoring channels, the related system is disengaged and the system in standby takes over.

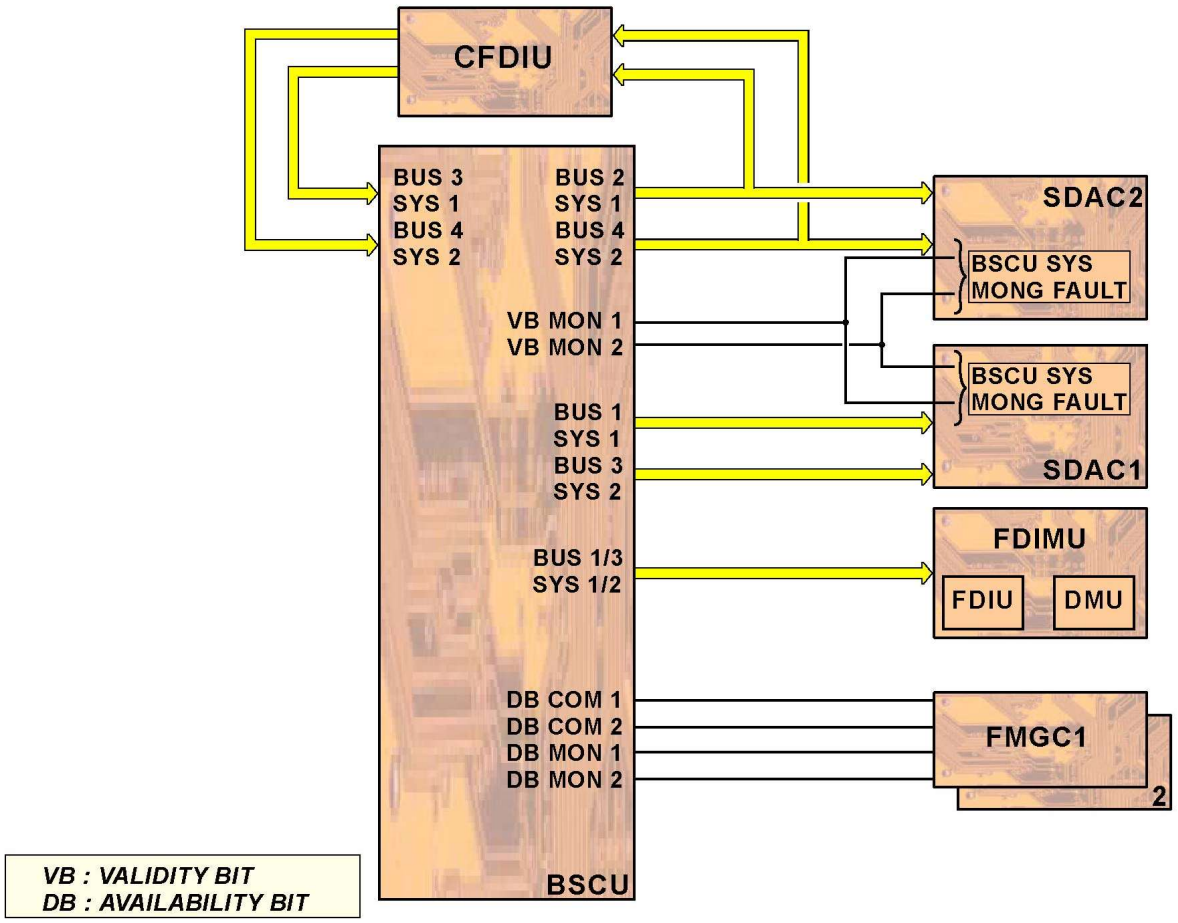


MONITORING (a)
The monitoring is carried out by various computers described below.

MONITORING - CFDIU (b)
The BSCU sends BITE data to the Centralized Fault Display System (CFDS) by a bi-directional ARINC 429 link. This link transmits the failure messages.

MONITORING - SDAC (c)
The System Data Acquisition Concentrators (SDACs) receive ARINC 429 bus signals for acquisition and processing of all the data necessary for the generation of warnings.

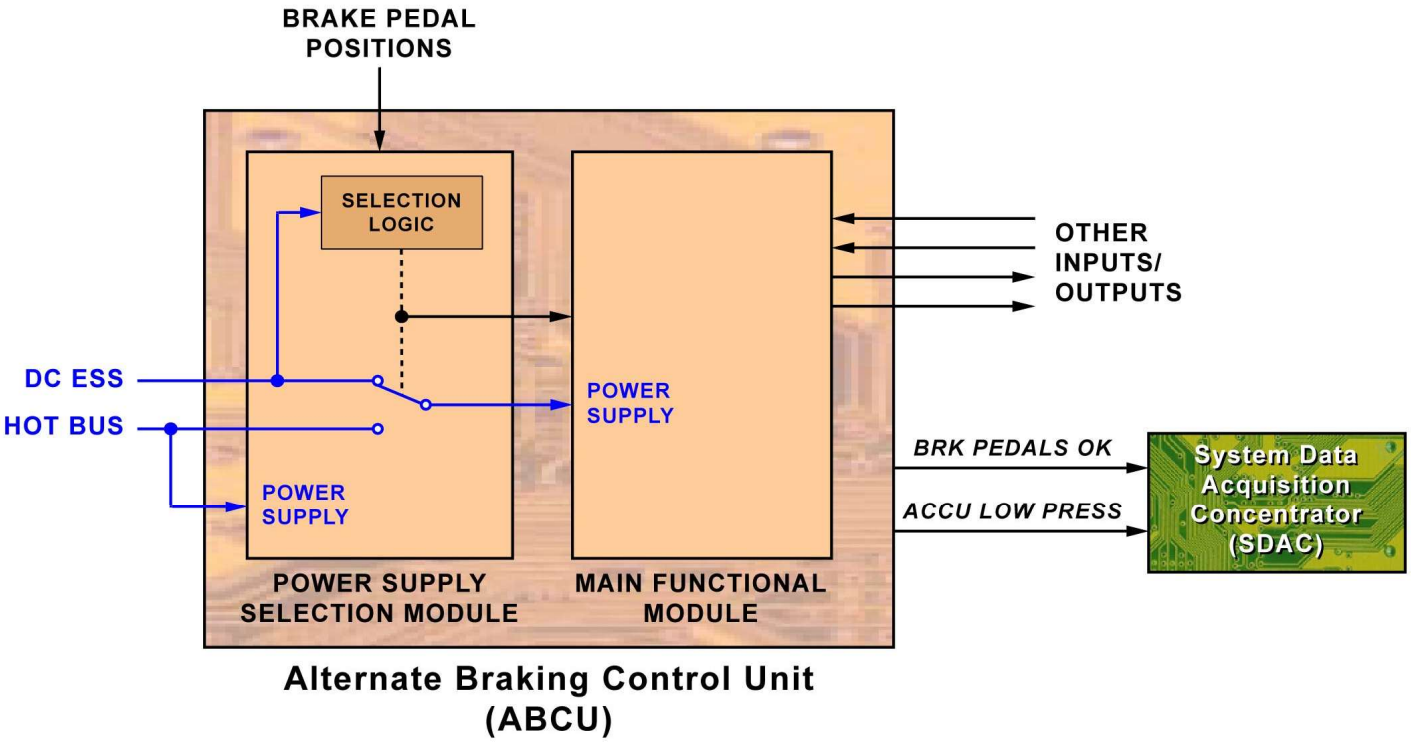
MONITORING - FDIMU (d)
The Flight Data Interface Unit (FDIU) part of the Flight Data Interface and Management Unit (FDIMU) collects braking system data like braking pressure, braking pedal position, auto brake status and maintenance data in order to send them to the flight data recorder. The Digital Management Unit (DMU) part of the FDIMU receives maintenance data for reports used in preventive maintenance.



MONITORING - FMGC (e)

The BSCU sends 4 availability discretes to the Flight Management and Guidance Computers (FMGCs). This is to meet the safety requirements of a category 3B landing.


ABCU Architecture
and Monitoring Interfaces
OVRD
G
B
Y
AUTO EXTING
TEST
RESET
1 FADEC GND PWR 2
HYD
YELLOW
PTU
RAT
ELEC
1
ELEC
2
A/SKID &
N/W STRG
ON
OFF



Alternate Braking Control Unit (ABCU)

architecture (a)
The Alternate Braking Control Unit (ABCU) is made of two functional modules:
- The power supply selection module,
- The main functional module.

The ABCU is supplied with two different DC power supplies:
- DC Essential power supply,
- DC Battery power supply.

SDAC (b)
Two discrete signals are sent to the System Data Acquisition Concentrators (SDACs) by the ABCU:
- Both left and right alternate brake pedals operate correctly.
- Brake accumulator pressure is low.


Landing Gear System
Line Maintenance
A320
AIRBUS
AIRBUS
12

NOSE LANDING GEAR

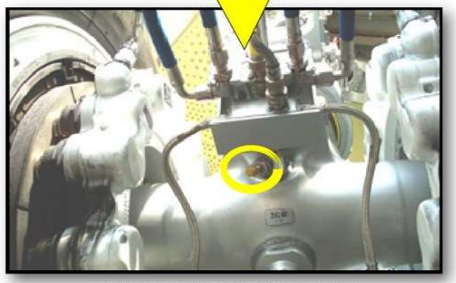
NLG CHARGING VALVE

MAIN LANDING GEAR

TOP CHARGING VALVE

BRAKE ACCUMULATOR

SPARE SEAL ACTIVATING VALVE



BOTTOM CHARGING VALVE

SERVICING - MLG SHOCK ABSORBER (a)
Charging valves are installed on the MLG to fill the two-stage shock absorber with nitrogen.
As a Maintenance Planning Document (MPD) task, the check of the Main Landing Gear (MLG) shock absorber charge is done by measuring and recording the dimension H.
Correct values will be found in the AMM and instructions are given on the MLG strut cylinder.

Each MLG fitting has a spare seal-activating valve.
This valve is used to isolate the bottom gland seal if a hydraulic leak occurs from that position.
Closing the spare seal-activating valve will isolate the bottom gland seals and activate the top gland seals.
The spare-seal-activating-valve is equipped with a color indicator to show if the secondary seal has been activated:
- Green= Primary Seal activated,
- Red= Secondary Seal activated.

NOTE: If the secondary seal is operated to stop the leak, then activate (open) the primary in seven days. This is to make sure that the seals do not dry out.
AIRBUS recommends that ALL gland seals on the applicable MLG are replaced at the next maintenance schedule (1200 FH/670 FC/200 days):
- To decrease the risk of unscheduled maintenance,
- If the primary seal is activated and there is a leak found,
- If the primary seal is not activated in seven days after deactivation.

NOSE LANDING GEAR

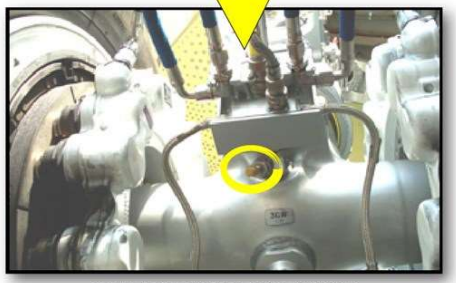
NLG CHARGING VALVE

TOP CHARGING VALVE

MAIN LANDING GEAR

BRAKE ACCUMULATOR

SPARE SEAL ACTIVATING VALVE



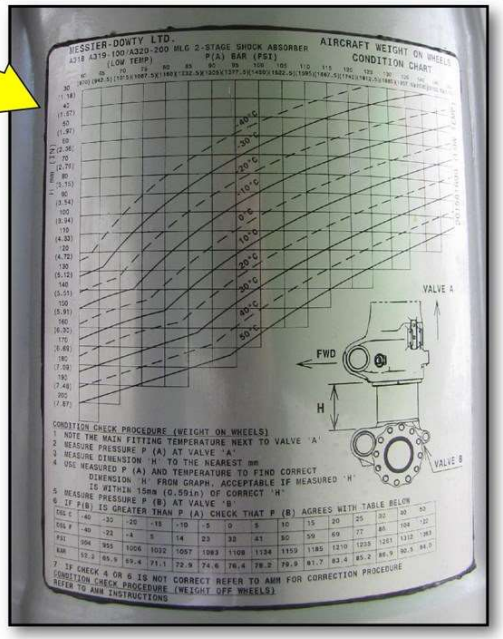
BOTTOM CHARGING VALVE

As a MPD task, the check of the NLG shock absorber charge pressure is performed by measuring and recording the dimension H on the NLG strut.
Correct values of this dimension are given in the AMM and on the NLG servicing chart.
If nitrogen refilling is necessary, it can be done via the charging valve.
NOTE: You can complete this procedure with the A/C on the ground or on jacks. If the A/C is on jacks, it must be positioned correctly.

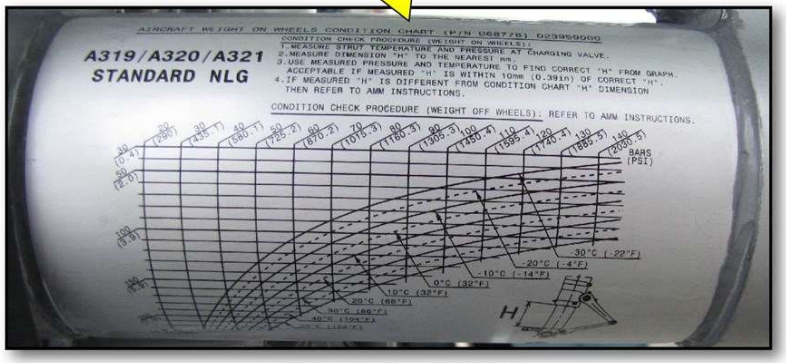
SERVICING - ACCUMULATOR (d)
A check of the nitrogen fill pressure is performed via the accumulator pressure gage on the yellow brake accumulator.
The relief valve allows the hydraulic depressurization of the accumulator to check its nitrogen pre-charge as required by the MPD.

NOSE LANDING GEAR

This chart is shown as example.
It is applicable to A318, A319-100/A320-200 equipped with an MLG 2-stage shock absorber.



MLG SERVICING CHART



NLG SERVICING CHART

SERVICING - SERVICING PLACARDS

Placards are installed on the NLG and the MLG to give the necessary instructions related to pressure check and nitrogen filling.

They also tell the user to refer to the AMM for servicing.

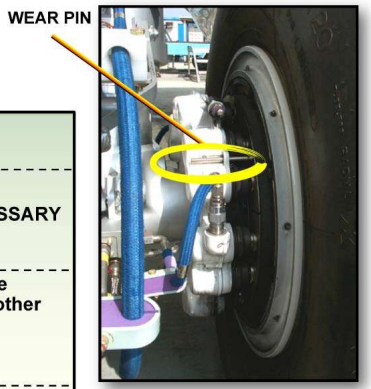
LANDING GEAR DOORS

LANDING GEAR STRUCTURE

FOR TRAINING ONLY

MRW 93.4T/93.9T

TIRE PRESSURE		TIRE CONDITION/ACTION NECESSARY
NLG 30X8.8-15 30X8.8R15	MLG 49X18-22 1270x455R22	
More than 12.2 bars (177 psi)	More than 15.7 bars (227 psi)	Over-inflation. Make sure that the measurement is correct with another pressure gage. If it is correct, deflate the tire to the maximum normal pressure.
11.6 to 12.2 bars (168-12psi)	15 to 15.7 bars (217-227psi)	Normal pressure range. Do not adjust the tire pressure.
11 to 11.6 bars (160-168psi)	14.2to 15 bars (206-217psi)	Inflate the tire to the maximum normal pressure.
10.4 to 11 bars (151-160psi)	13.5 to 14.2 bars (196-206psi)	Inflate the tire to the maximum normal pressure. You must measure the tire pressure again the next day. If the tire is under-inflated again, you must replace the wheel.
9.3 to 10.4 bars (135-151psi)	12 to 13.5 bars (174-196psi)	You must replace the wheel.
0 to 9.3 bars (0-133psi)	0 to 12 bars (0-174psi)	You must replace the wheel and the adjacent wheel.



WHEEL BRAKE

GEAR PROXIMITY SENSOR

WHEEL & TIRE

DAILY CHECK (a)

During the Daily check the external walk around will include the Visual check of the Nose Landing Gear and LH/RH Main Landing Gear assemblies for general condition including:

- Doors and wheel well,
- Gear structure,
- Shock Absorber sliding tube for correct extension (dimension H) and cleanliness,
- Proximity detectors,
- Wheels (rim damage, sheared or missing bolts),
- Tires (wear, damage, and correct pressure),
- Brake units for evidence of leakage or overheating,
- Heat-Pack wear indicators (check with parking brake applied).

NOTE: The visual check of the Landing Gear Wheel Well is done with the Landing Gear Doors in the closed position.

LANDING GEAR DOORS

LANDING GEAR STRUCTURE

FOR TRAINING ONLY

MRW 93.4T/93.9T

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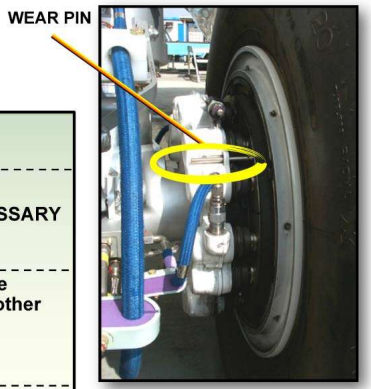


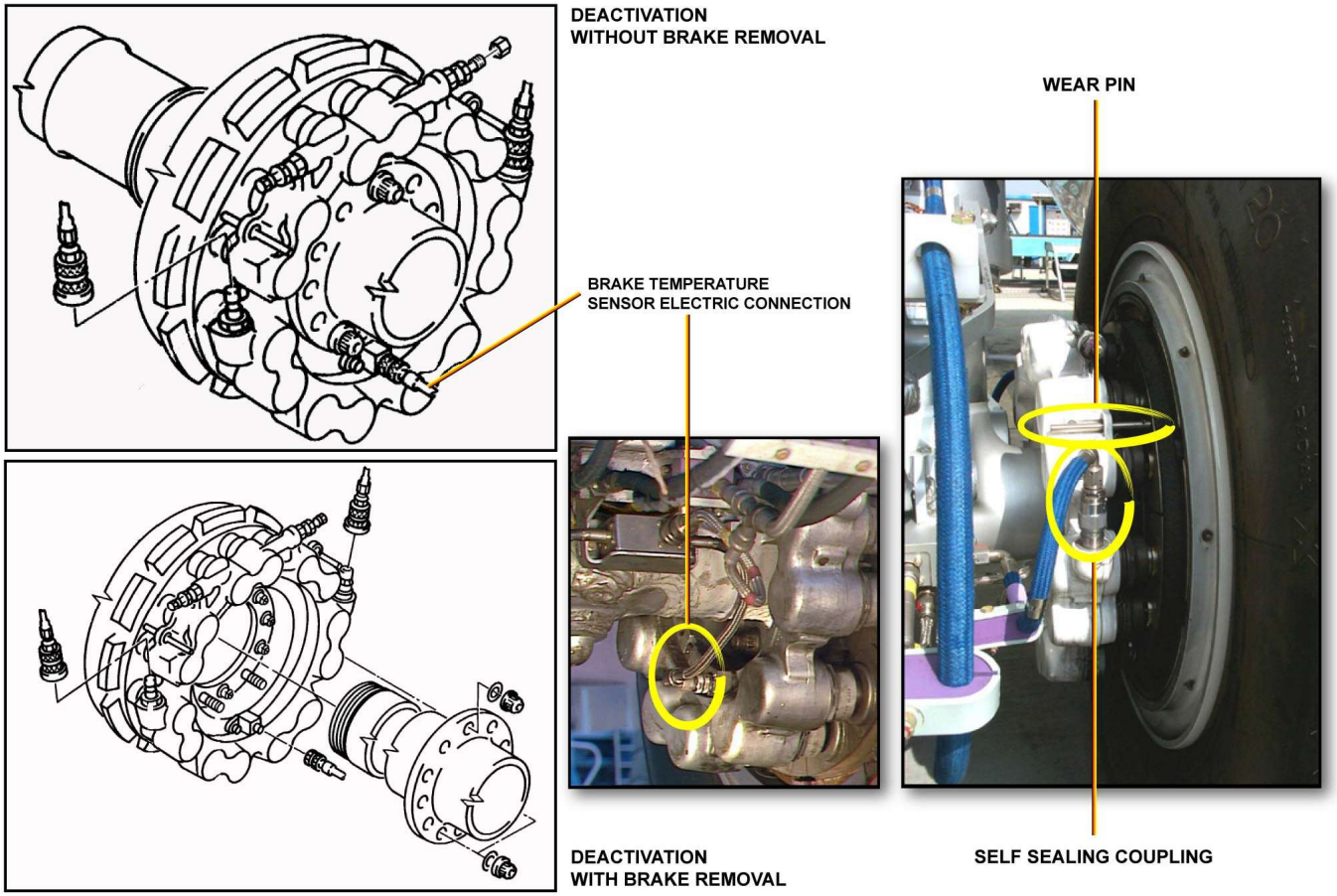
WHEEL BRAKE

GEAR PROXIMITY SENSOR

WHEEL & TIRE

DAILY CHECK (b)
When it is possible, do the Tire Pressure Check when the tires are cold.
If it is necessary to do the check when the tires are hot: the pressure in the tires will be higher than the nominal value (you must not deflate a hot tire).

DAILY CHECK (c)
Readjust the tire pressure using Nitrogen only and refer to the AMM Tire inflation tables (32-41-00). The AMM Tire inflation tables give all the pressure values versus aircraft weight (MRW) and tire sizes.
This table is given as an example.



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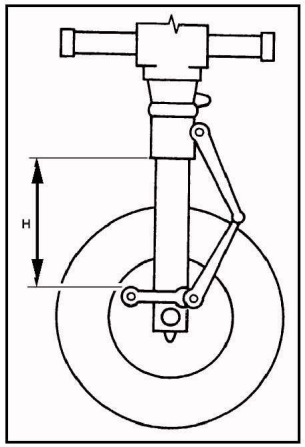
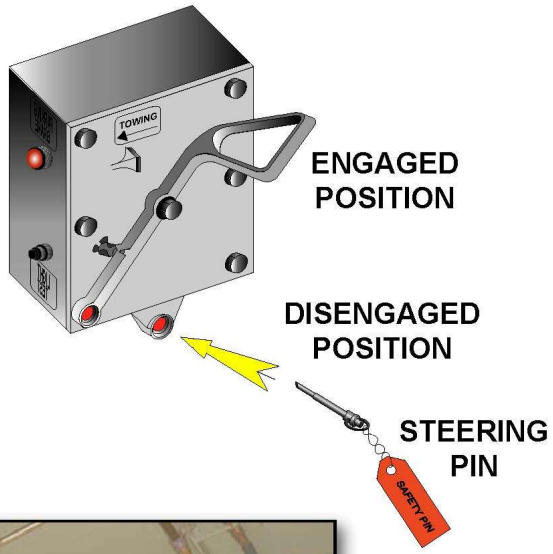
This table is given as an example.

MEL/DEACTIVATION - BTMU (b)
Two BTMUs are installed; one or both may be inoperative if the brake-cooling time is applied.

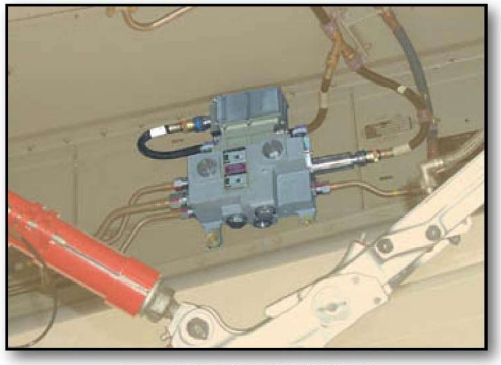
MEL/DEACTIVATION - MAIN WHEEL BRAKES (c)
Two wear pins give a visual indication of the overall wear of the heat pack. The wheel brake is a MMEL item.
In case of hydraulic leak on the brake assembly (piston), the brake can be deactivated for dispatch with or without brake removal.
For deactivation with the brake installed, disconnect the self-sealing coupling.



MAXIMUM EXTENSION OF THE NOSE GEAR SHOCK ABSORBER DURING TOWING



NORMAL BRAKE FUSES



ALTERNATE BRAKE FUSES

MAINTENANCE TIPS - HYDRAULIC FUSES (a)

A hydraulic fuse (normal or alternate), installed between the servo valve and the brake, stops the flow in the line in case of leakage.

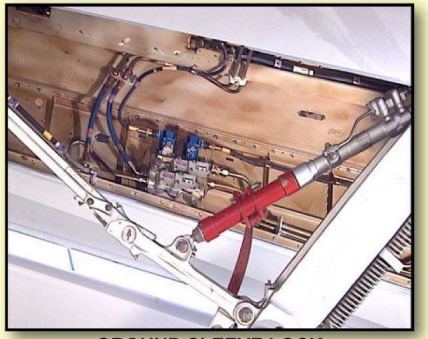
After trouble-shooting, the hydraulic fuse needs to be reset by opening its bleed screw.

NOTE: Be careful when opening the bleed screw of the brake bleed valve assembly, you could close the hydraulic fuse.

MAINTENANCE TIPS - NOSE WHEEL STEERING (b)

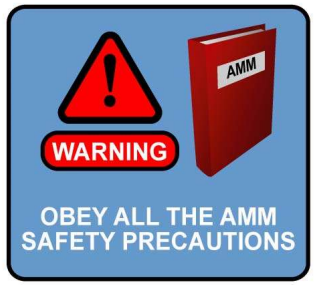
The maximum towing angle is 95 on each side. Before towing, the N/WS control lever has to be in the deactivation position with the safety pin installed and the maximum extension of the nose gear shock absorber (dimension H) must be less than 300mm (12 inches) to avoid upper cam damage. When resetting the steering function after towing, nose wheels must be centered to avoid injury.

MAIN LANDING GEAR



GROUND SLEEVE LOCK

DOOR SAFETY SLEEVE



NOSE LANDING GEAR

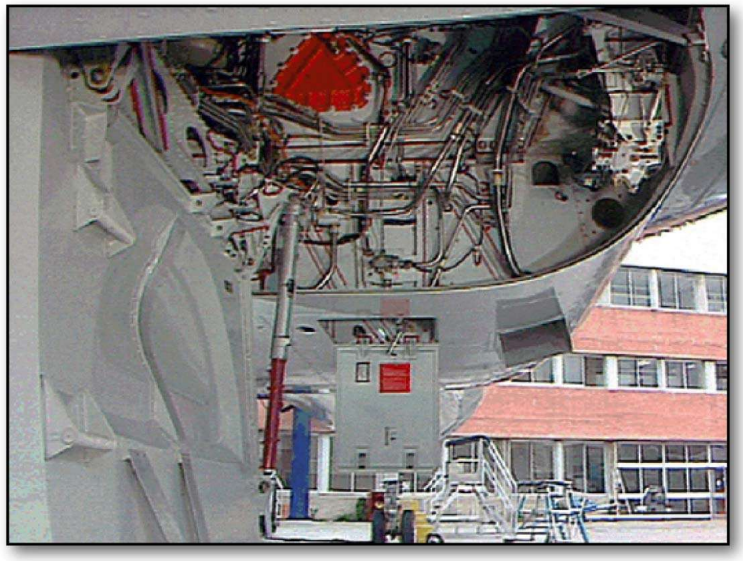
DOWNLOCK SAFETY PIN

DOOR SAFETY PIN

MAINTENANCE TIPS - SAFETY PRECAUTIONS (a)
Before working in the L/G wheel well, be sure that the safety sleeve is fitted on the MLG door (or for the NLG, safety pins installed).
Procedures related to L/G door safety devices installation are described in the AMM

MAINTENANCE TIPS - SAFETY PRECAUTIONS (b)
When towing, except for pushback, or working in the L/G wheel well, be sure that the safety sleeve is fitted on the MLG or safety pins are installed on the NLG.
Procedures related to L/G safety devices installation are described in the AMM.

MAINTENANCE TIPS - SAFETY PRECAUTIONS (c)
The LGCIU interfaces with many other A/C systems. Pulling LGCIU circuit breakers can cause unwanted operation of some systems. Before pulling LGCIU CBs, the AMM procedure about flight configuration precautions must be followed in order to protect these systems.



MAIN LANDING GEAR WHEEL WELL DOOR

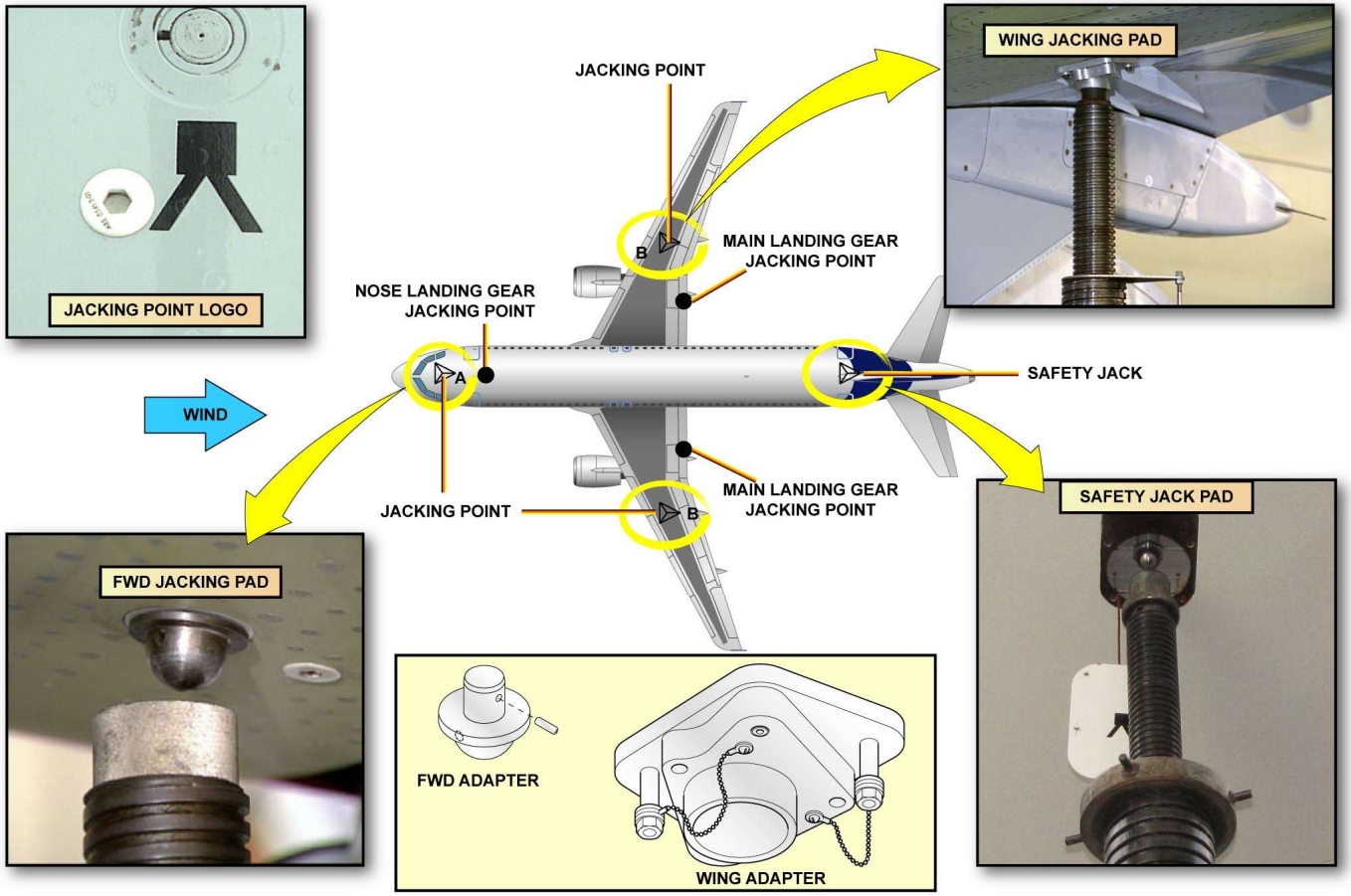
NOSE LANDING
GEAR WHEEL WELL

✓ Visual check of the MLG/NLG wheel with the L/G doors opened

MPD CHECK ITEMS (a)
In accordance with the MPD (600FH, 750FC or 100 days) the external walk around will include the Visual check of the Nose Landing Gear and LH/RH Main Landing Gear assemblies for general condition with the Landing Gear Doors opened for the Wheel Well inspection.

MPD CHECK ITEMS (b)
When opening the Main or the Nose Landing Gear Doors with the Ground Opening system, observe all the Safety Precautions as stated in the AMM Tasks.


Jacking
OVRD
G
B
Y
APU
AUTO EXTING
TEST
RESET
ENG
1 FADEC GND PWR 2
HYD
BLUE
YELLOW
3000
PSI
3000
PSI
3000
PTU
RAT
ELEC
1
ELEC
2
A/SKID &
N/W STRG
ON
OFF



GENERAL (a)

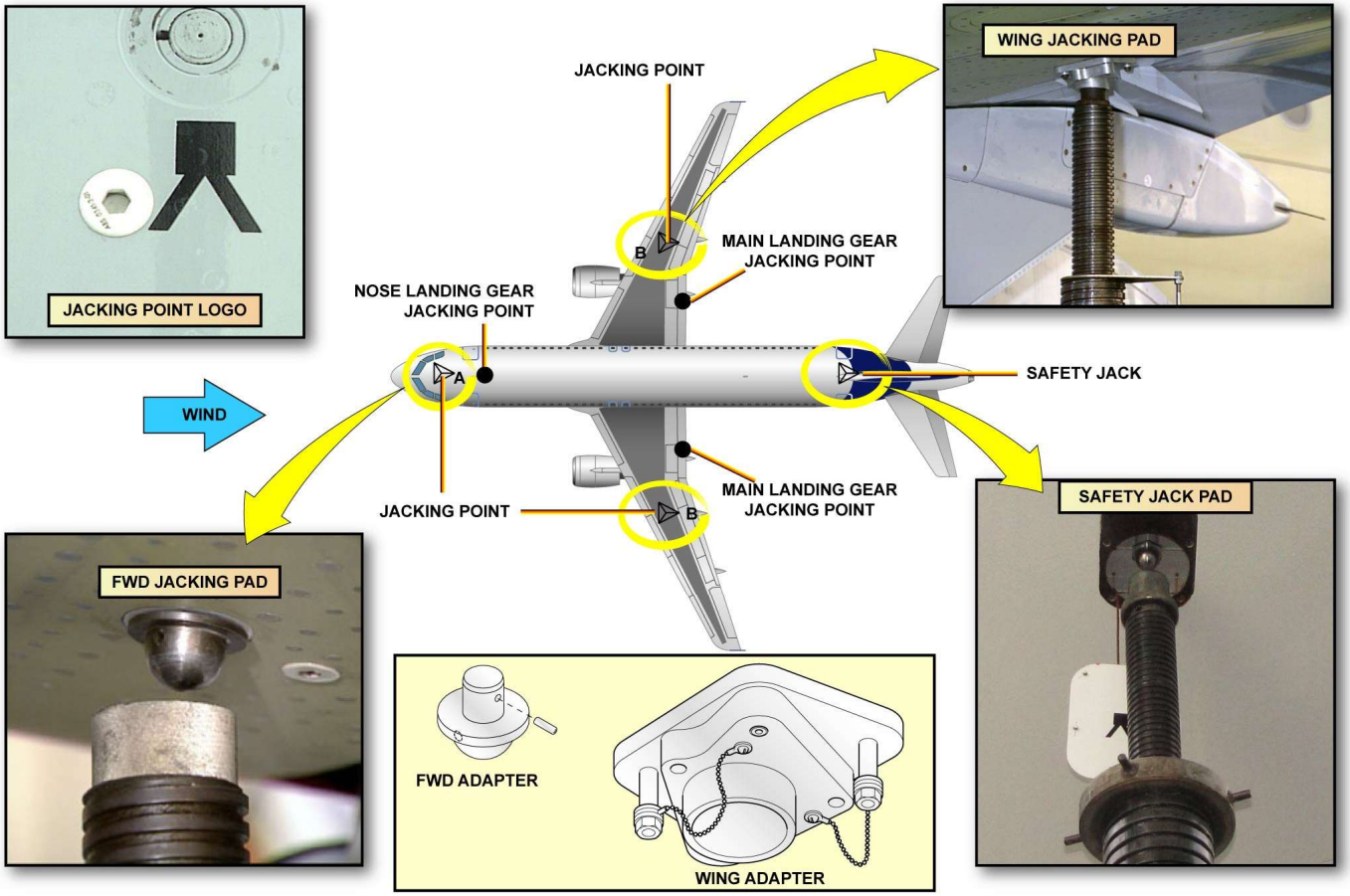
Three jacking points, when equipped with jacking pads, are used to lift the aircraft. The forward point "A" is located forward of the nose landing gear. The points "B" are located outboard of the engine pylons. A safety stay must be positioned at the rear of the aircraft after jacking to stabilize the aircraft. You can lift the aircraft at the forward jacking point only, with the wheels of the main landing gear on the ground.

When the aircraft is weighed on landing gear jacks the following jacking points must be used to lift it.

- 2 jacking points located in the main landing gear,
- 1 jacking point located in the nose landing gear.

LIMITATIONS (b)

The open air jacking operation is limited if the wind velocity exceeds permissible values which depend on aircraft gross weight and center of gravity position. In any condition, the aircraft must be pointing upwind.



PRECAUTIONS (c)

Before you lift the aircraft, you must be sure that the ground safety-locks are in position on the landing gears and the weight of fuel is applied equally on the two sides of the aircraft centerline. The three jacks must be operated together.

When the jacking operation is completed, install the safety stay to make the aircraft stable. Do not use the safety stay to lift the aircraft. The safety stay must be removed for the gear swing.

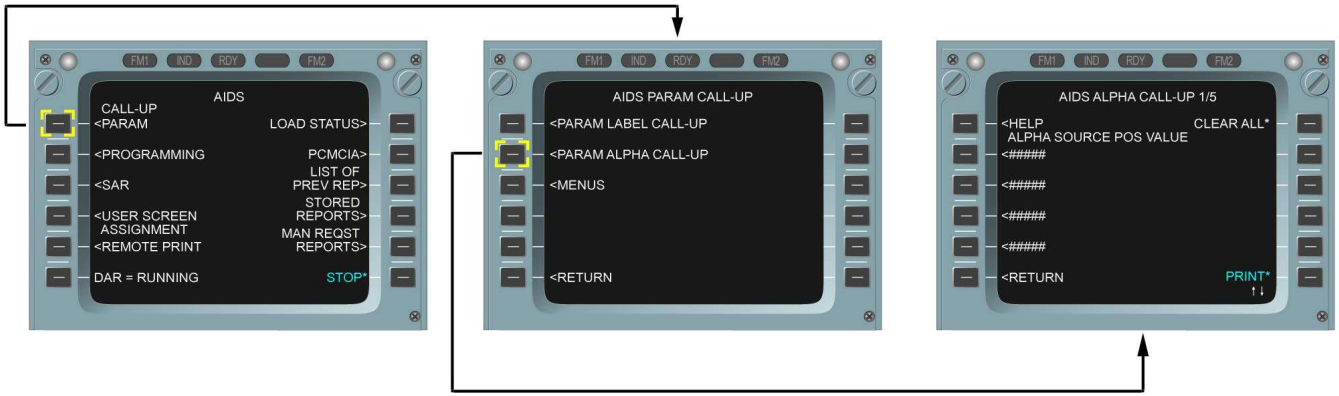
JACKING POINTS (d)

Put jacking pads below the jacking points to apply the loads equally.

NOTE: It is necessary to use the jack pad adapters when the aircraft is put on jacks.

The LH, RH and nose jack pad adapters are different and must not be interchanged.

Those for the A321 are also different from those of the other aircraft and must not be interchanged.



LEVELING AND WEIGHING - WEIGHING (a)

You can weigh the aircraft with:

- the aircraft on jacks,
- the aircraft on its wheels,
- the aircraft on landing gear jacks.

Load cells on each jack or platform scales are used for weighing.

LEVELING AND WEIGHING - QUICK LEVELING PROCEDURE WITH THE ADIRU (b)

First, follow the Inertial Reference (IR) alignment procedure. Then on the MCDU scratchpad the alpha call-up code has to be entered:

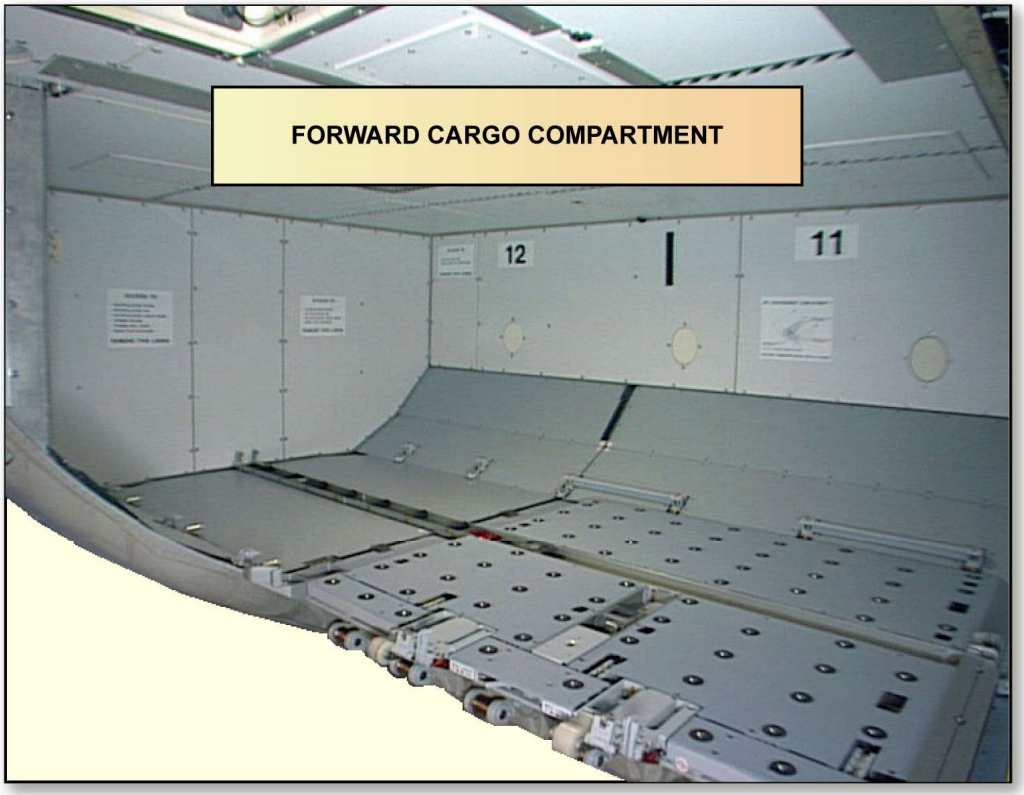
- PTCH for the pitch angle to do a check of the longitudinal alignment,
- ROLL for the roll angle to do a check of the transverse alignment.

To start this procedure, first of all the aircraft must be lifted. After that, read the pitch and roll angles in the MCDU scratchpad.

Then operate the hydraulic jack below the wing to get the transverse alignment.

Then operate the forward hydraulic jack to get the longitudinal alignment.

When you have done the longitudinal alignment, do a check of the transverse alignment.



SPIRIT
LEVEL

LEVELING AND WEIGHING - QUICK LEVELING WITH A SPIRIT LEVEL IN THE FWD CARGO COMPARTMENT (ALTERNATE METHOD)

The quick leveling with a spirit level is an alternative method of leveling while the ADIRUs are not available (no power supplied to the aircraft) and no attitude monitors are installed. For this method two persons are necessary:

- one in the cargo compartment to move the spirit level,
- another one near the aircraft to operate the jacks.

While the aircraft is being lifted, put a spirit level on a track:

- in the Y axis, perpendicular to the tracks, and operate the hydraulic jack below the wing to get the transverse alignment,
- in the X axis, and operate the forward hydraulic jack to get the longitudinal alignment.

When you have done the longitudinal alignment, do a check of the transverse alignment.


Towing and Taxiing
OVRD
G
B
Y
APU
AUTO EXTING
TEST
RESET
ENG
1 FADEC GND PWR 2
HYD
YELLOW
3000
PSI
3000
PSI
3000
PTU
RAT
ELEC
1
ELEC
2
A/SKID &
N/W STRG
ON
OFF

WARNING

MAKE SURE THAT THE GROUND SAFETY-LOCKS ARE IN POSITION ON THE LANDING GEAR.

MAKE SURE THAT WHEN THE A/C MOVES WITH ITS POWER ON THE GROUND:
- NO PERSONS GO WHERE THE A/C CAN CAUSE THEM INJURY OR CAN KILL THEM.
- NO OBJECTS STAY WHERE THE ENGINES CAN BLOW THEM AWAY OR CAN PULL THEM INTO THE ENGINES BY SUCTION.

OBEY THESE SAFETY PRECAUTIONS DURING TOWING, PUSHBACK OR MOVEMENT OF THE A/C.
MAKE SURE THAT THE PATH OF THE A/C IS CLEAR.
MAKE SURE THAT NO PERSONS SIT OR STAND ON THE TOW BAR OR USE THE TRACTOR AS TRANSPORT THIS IS TO PREVENT THE RISK OF INJURY.

THE PERSON WHO OPERATES THE BRAKES FROM THE COCKPIT DURING TOWING/TAXIING MUST HAVE HIS SIT BELT ATTACHED. IF NOT THERE IS A RISK OF INJURY IF THE A/C STOPS SUDDENLY.

WHEN YOU COMPLETE THE TOWING OPERATION, MAKE SURE THAT THE NOSE WHEELS ARE ALIGNED WITH THE A/C CENTERLINE. THE TWIN WHEELS MAY COME BACK TO THE CENTERED POSITION.

CAUTION

SET AND CALIBRATE THE TOWING AND TURN SHEAR PINS BEFORE YOU TOW OR PUSH BACK THE A/C. THIS IS TO PREVENT HIGH LOADS WHICH CAN CAUSE DAMAGE TO THE NOSE LANDING GEAR AND/OR THE A/C STRUCTURE.

DO NOT TOW OR MOVE THE A/C ON THE GROUND IF THE ENGINES COWLS ARE OPEN.
MOVEMENT OF THE A/C WITH THE COWLS OPEN CAN CAUSE DAMAGE TO THE COWLS AND THE NACELLE STRUCTURE.

TOWING - WARNINGS AND CAUTIONS

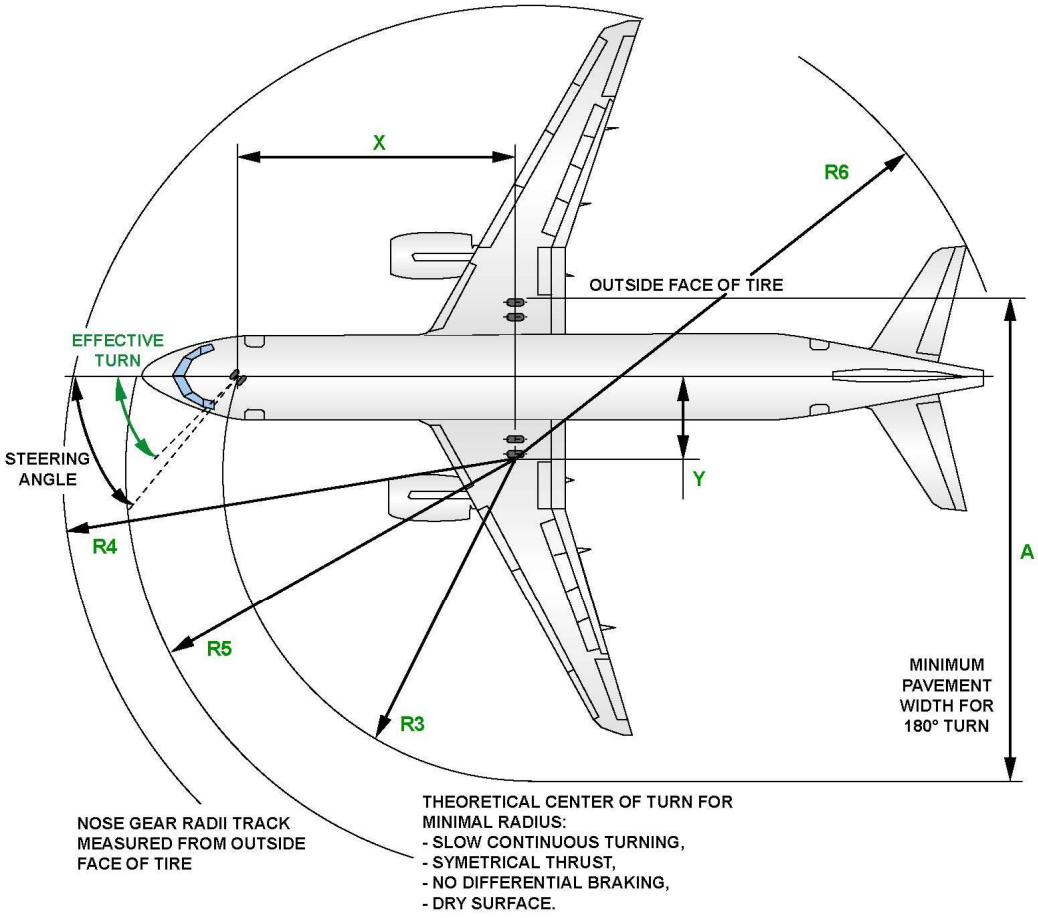
Obey the warning and cautions before, during and after to tow or pushback the A/C.

TOWING - TOWING WITH THE NOSE GEAR FROM THE FRONT
This film describes how to push the A/C rearwards or tow the A/C forwards with the nose gear.
The A/C may be towed or pushed back:
- at maximum ramp weight,
- with the engines shut down or running at idle.
To begin the procedure, make sure:
- that the safety devices are installed on the landing gears (L/G),
- the wheel chocks are in place,
- and check if the parking brake is ON.
Do not tow the A/C if the dimension H is more than 300 mm (11.8 in). If you do, you can cause damage to the internal centering cams of the nose landing gear (NLG).
Referring to your A/C maintenance manual, make sure that the A/C is stable. Let us suppose that this procedure has been correctly done. During this procedure, depending on the configuration you are in, the A/C needs to be energized either by using the APU, a specific ground cart, an engine running, or by using the tractor itself. Let us suppose that the A/C is already energized and the EIS start procedure done. Outside, on the nose wheel steering deactivation electrical-box, set the ground-towing control lever to the towing position and install the pin.
In the cockpit,
- on the upper ECAM page, the "Nose.WHEEL STEERinG DISConnected" message comes into view on the memo page.
- check on the Yellow brake-pressure triple-indicator that the accumulator pressure pointer is in the green range.
We recommend pressurizing the yellow hydraulic system using the yellow electrical pump, thus, the braking system will be more efficient and safer. Now, we have to install the tow bar.
Caution: make sure that the tow bar has:
- a damping system
- a calibrated shear pin
- two calibrated turn shear pins.
This is to prevent high loads causing damage to the L/G.
Refer to your A/C maintenance manual for the calibration of these pins.
On the NLG, install the tow bar on the tow fitting and connect the tow bar to the tractor.
Caution: put the parking brake control switch in the off position before you tow or push back the A/C. This is to prevent high loads causing damage to the NLG.
On the Yellow brake-pressure triple-indicator, the brakes pressure pointers go down.

In the cockpit, set the lighting system:
- set the exterior light navigation and logo switch to ON.
- at night, set the interior light dome switch to bright and if the anti-collision lighting is necessary for the local airport regulations or the airline procedures, set the exterior light beacon switch to ON.
On the VHF system:
- in order to communicate with the control tower during towing operations, release out the VHF pushbutton switch and select the control tower frequency on the radio management panel.
- in order to communicate with the ground mechanics, on the audio control panel, set the interphone radio switch to the interphone position and release out the interphone reception pushbutton.
For safety reasons, a distance of 3 meters (10 ft) must be kept clear around the nose wheels, tow bar and tractor when the aircraft moves.
Towing speed limitation depends on the position of the passenger/crew and cargo doors. For these speed limitations refer to your A/C maintenance manual.
The maximum permitted steering angle on each side of the A/C centerline is 95 degrees. At this point, be sure that all warnings and cautions of your A/C maintenance manual procedure and previous precautions are applied. Now, the A/C can be towed slowly and smoothly. Two other persons have to monitor the wing tips during the towing operation and one person is required in the cockpit in order to operate the brakes.
When you complete the towing operation, make sure that the nose wheels are aligned with the A/C centerline.
Inform the cockpit to apply the parking brake, and check that the parking brake light is ON on the nose wheel steering deactivation electrical-box.
Put the wheel chocks in position.
Disconnect the tow bar from the nose gear fittings. On the nose wheel steering deactivation electrical-box, remove the safety pin and set the ground-towing control lever to the normal position. At the same time, in the cockpit, on the ECAM memo display the message "N.WHEEL STEERG DISC" disappears.
On the lighting system:
- reset the exterior light beacon and navigation & logo switches to OFF.
- reset the interior light dome switch to OFF.
On the communication system:
- cut the cockpit/control tower VHF link by pressing in the VHF pushbutton on the radio management panel.
- reset the interphone radio switch to the neutral position.
Depressurize the yellow hydraulic system, do the EIS stop procedure and de-energize the A/C electrical circuits.

TAXIING AND ASSOCIATED PRECAUTIONS - TURNING RADII

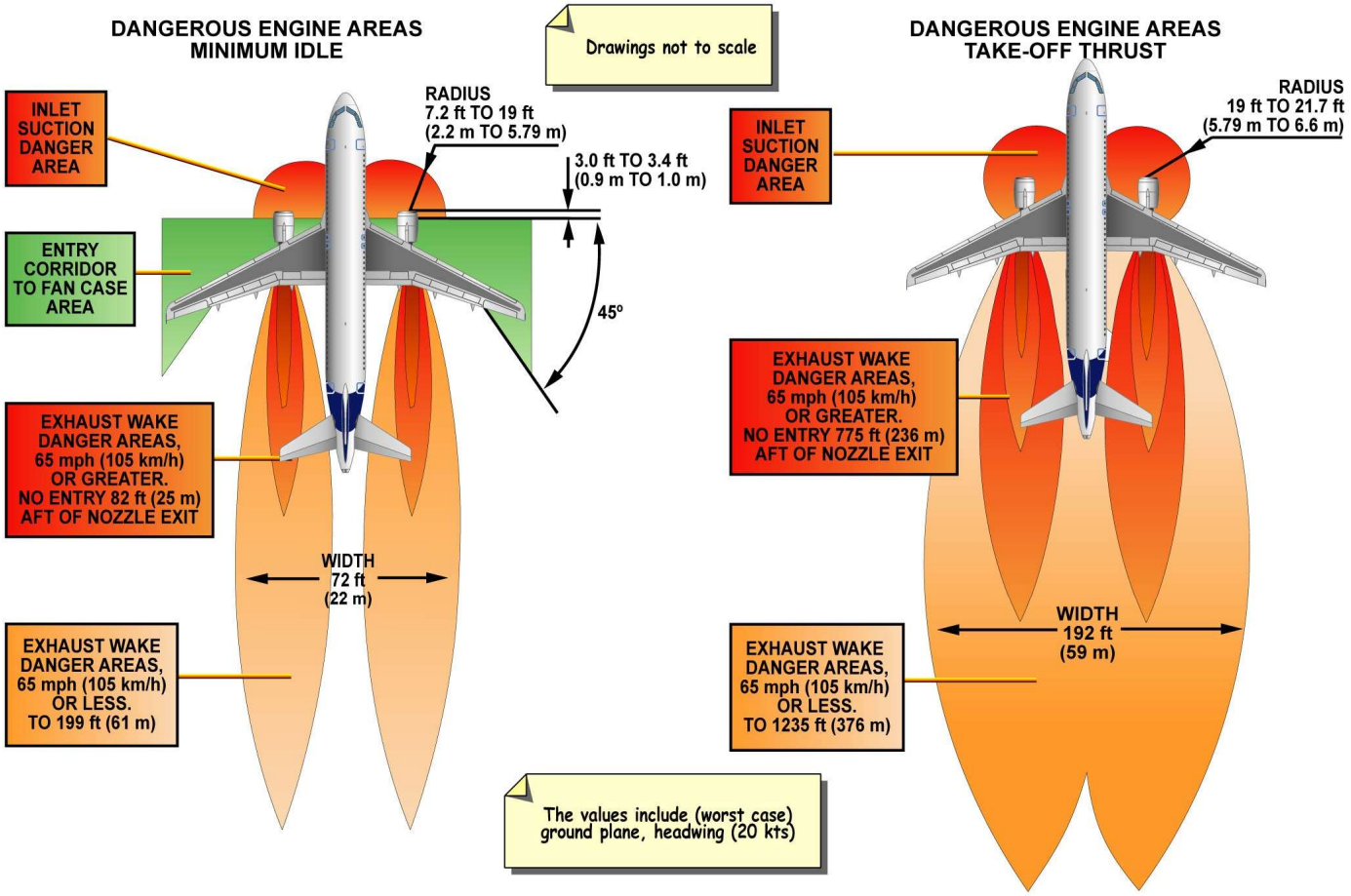
The movement of the aircraft with its power on the ground is called taxi of the aircraft. During taxi of the aircraft, the minimum turning radii must be respected.



AT 75° STEERING ANGLE:

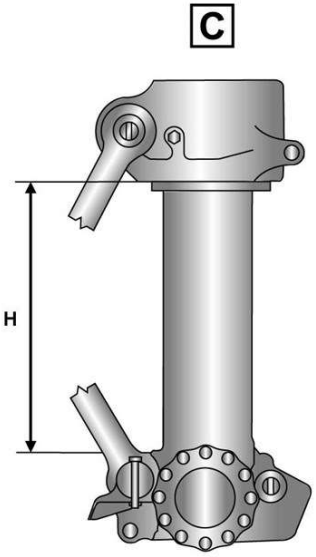
	A318	A319	A320	A321
EFFEC TURN	73.20°	70.03°	70°	73°
X	33.63 10.25	36.22 11.04	41.5 12.64	55.4 16.91
Y	10.1 3.1	13.2 4.01	15.1 4.6	16.6 5.1
A	61.2 18.7	67.7 20.64	75.1 22.9	90.5 27.6
R3	36.3 11.1	39.7 12.11	45.3 13.81	59.1 18
R4	67.6 20.6	70.8 21.58	72.2 21.99	74.3 22.7
R5	51.3 15.6	54.5 16.6	60 18.3	74 22.6
R6	58.8 17.9	64.9 19.77	71.9 21.91	80.3 24.5

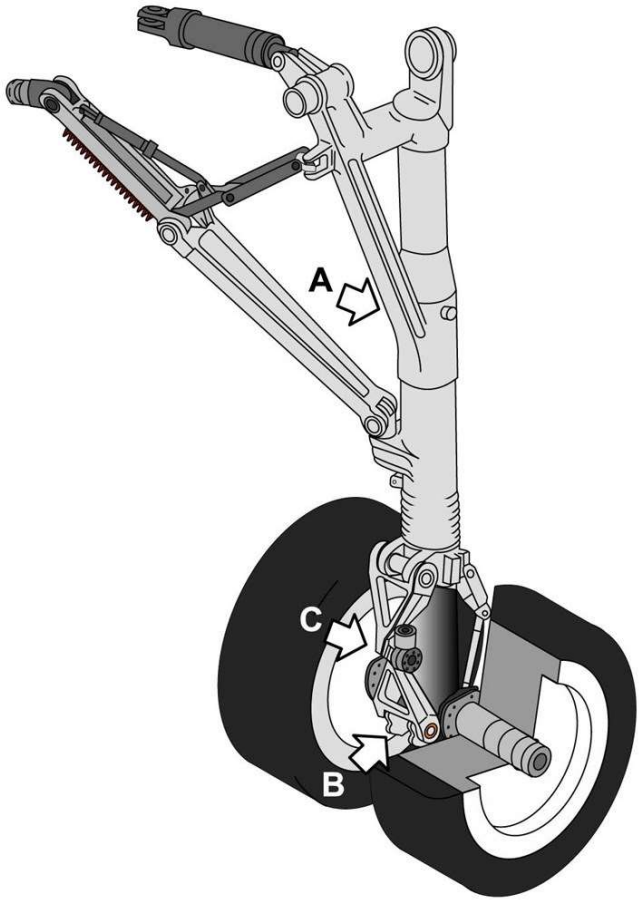
FEETS
METERS

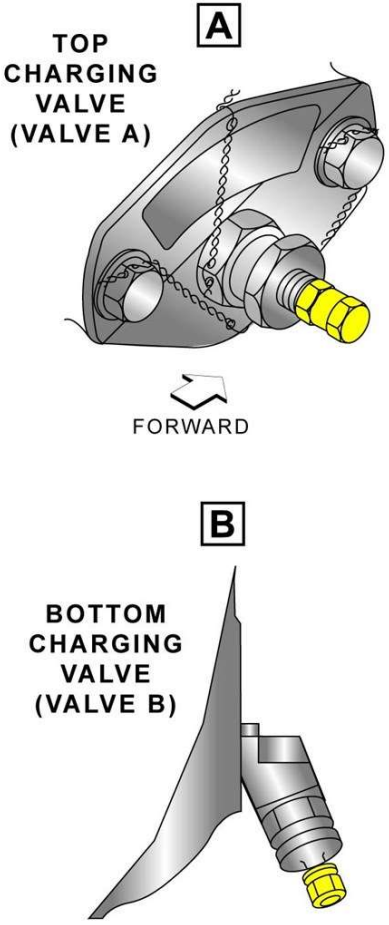


TAXIING AND ASSOCIATED PRECAUTIONS - DANGER AREAS
Safety precautions must be taken to avoid danger from engine suction and exhaust areas. Access to the engine is only allowed through the entry corridor. Note that the entry corridor must be closed for wind directions greater than 90°. There is no safe access corridor when the engine is running above minimum idle. Depending on the distance from the running engine and on its power setting, it is necessary to wear ear protection and to respect the maximum time exposure.


Main Landing Gear
Shock Absorber Servicing
OVRD
AUTO EXTING
TEST
RESET
1 FADEC GND PWR 2
HYD
YELLOW
PTU
RAT
ELEC
1
ELEC
2
A/SKID &
N/W STRG
ON
OFF







GENERAL (a)

WARNING: PUT THE SAFETY DEVICES AND THE WARNING NOTICES IN POSITION BEFORE YOU START A TASK ON OR NEAR:
- THE FLIGHT CONTROLS,
- THE FLIGHT CONTROL SURFACES,
- THE L/G AND THE RELATED DOORS,
- COMPONENTS THAT MOVE.

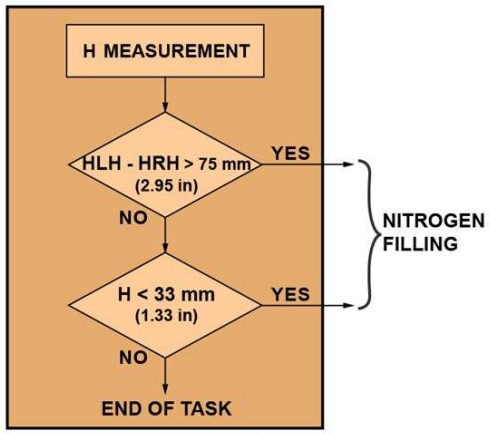
WARNING: MAKE SURE THAT THE GROUND SAFETY-LOCKS ARE IN POSITION ON THE L/G.

WARNING: DO NOT PUT COMPRESSED GAS IN CONTACT WITH YOUR SKIN. THE GAS CAN GO THROUGH THE SKIN AND MAKE BUBBLES IN THE BLOOD. THIS CONDITION CAN KILL YOU.

WARNING: IF YOU GET THE FLUID ON OR IN YOUR EYES:
- FLUSH IT AWAY WITH CLEAN WATER,
- GET MEDICAL AID.

GENERAL (b)

PA is the pressure measured at the top charging valve (valve A). PB is the pressure measured at the bottom charging valve (valve B). H is the height of the shock absorber measured as shown below.



INSPECTION OF THE MLG SHOCK ABSORBER BEFORE FLIGHT

Case shown in the film

Other cases not covered in the film

HLH :Dimension H measured on the left hand shock absorber

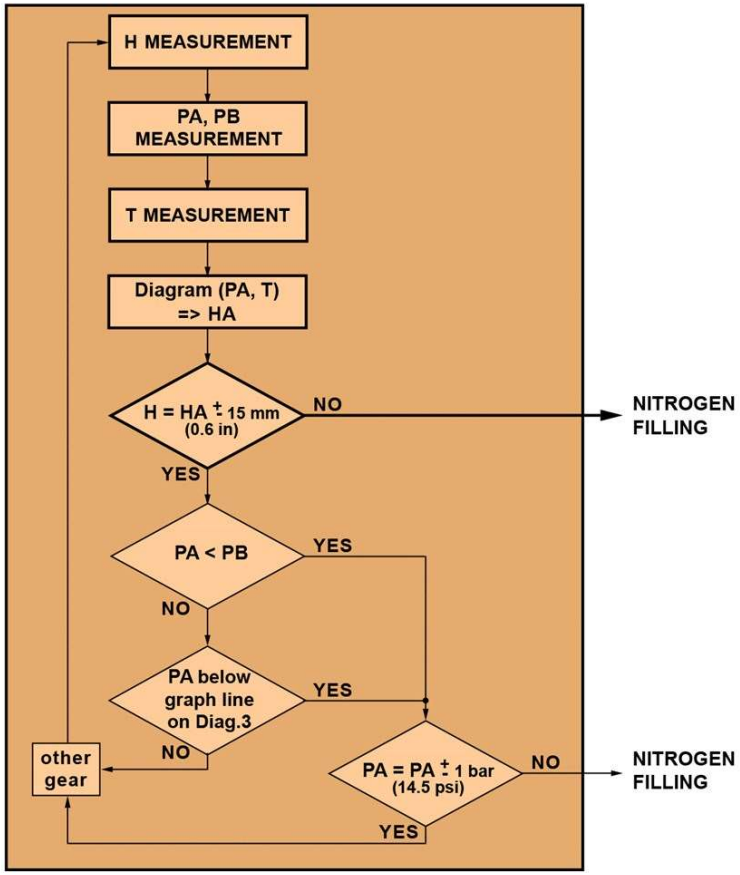
HRH :Dimension H measured on the right hand shock absorber

PA : Pressure measured at the top charging valve (valve A)

PB : Pressure measured at the bottom charging valve (valve B)

HA : Dimension H found in diagram 1 or 2 corresponding to the pressure measured at the top charging valve (valve A) and the measured temperature

T : Temperature



CHECK CHARGE AND NITROGEN FILLING OF THE MLG TWO-STAGE SHOCK ABSORBER

SERVICING PROCEDURES (a)

Before filling, it is necessary to perform a visual inspection of the MLG two-stage shock absorber for leakage of hydraulic fluid and to detect any damage on the sliding tube.

SERVICING PROCEDURES - INSPECTION OF THE MLG SHOCK ABSORBER BEFORE FLIGHT (b)

Check charge and nitrogen filling of the MLG two-stage shock absorber.

MLG CONDITION CHECK PROCEDURE

Before you start to work on the landing gear, make sure you have installed the safety sleeve on the lock-stay actuator and that you have placed wheel chocks in position.

In the cockpit make sure the Landing Gear Control lever is in the down position.

Place a warning notice to prevent others from operating the control lever.

NOTE: The shock absorber must be examined for any leak or damage.

Measure the dimension "H" of the sliding tube extension and measure the temperature of the shock-absorber at the top charging valve.

Compare the values with the placard on the shock-absorber.

If the result does not match the measured values, you should adjust the nitrogen pressure.

Unscrew the cap and connect the pressure gauge hose to the top-charging valve and open the valve in order to read the pressure at "A". Adjust the pressure according to the temperature value given in the graph of the service placard. Close the valve and release the pressure from the hose.

Use a second pressure gage to check the pressure at the bottom charging valve at "B". Unscrew the cap and connect the pressure gage hose to the bottom charging valve "B". Open the valve and read the pressure. Make sure the pressure is 18 bar or 262 PSI higher than at the top charging valve "A". Adjust the pressure if required. Close the bottom charging valve and release the pressure from the hose. Disconnect the hose and reinstall the protective cap.

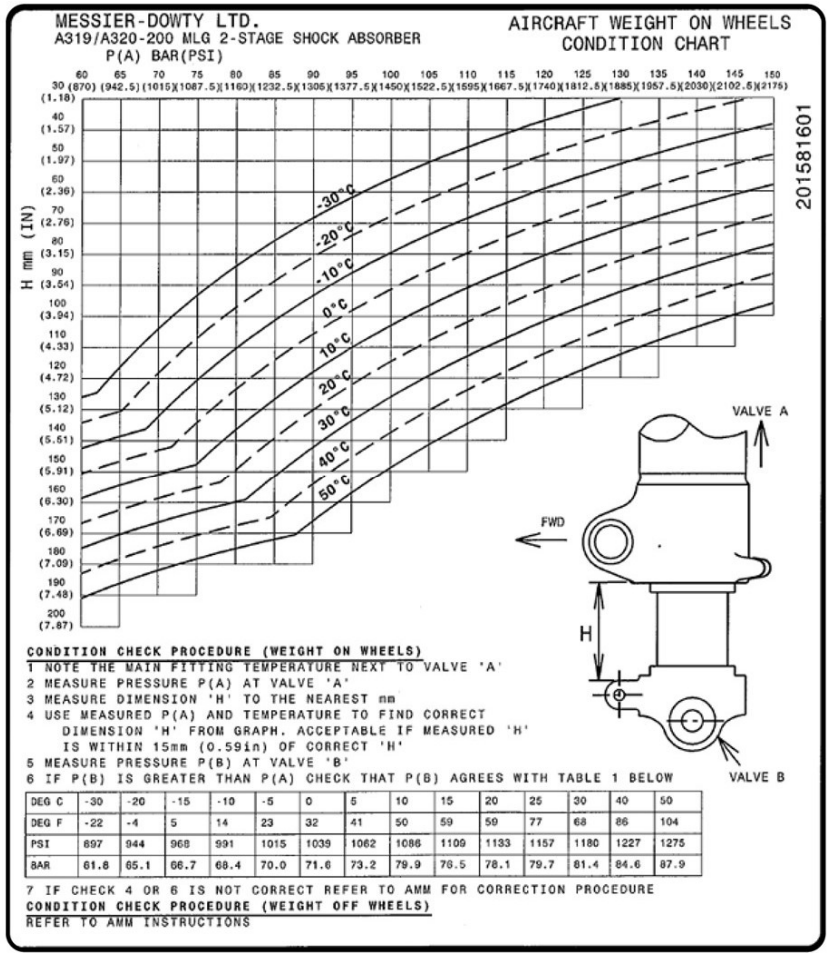
Open the top charging valve to adjust the pressure and the final extension height to its correct value. Close the charging valve and release the pressure from the hose. Disconnect the hose and reinstall the protective cap again.

Make sure that at the end of the procedure the pressure at valve "B" and "A" are the same +/- 1,5 bar or 21,76 psi.

Finally measure the dimension "H" of the sliding tube again, to confirm the correct extension height and pressure adjustment.

NOTE: Frequent nitrogen filling of the MLG shock absorber can be an indication of low oil level. Record all nitrogen servicing work in the aircraft log. This will let you monitor if the fluid level check Procedure is necessary.

If the shock absorber has been fully deflated and inflated again, it is recommended that you - do a check of the MLG shock absorber charging pressure between four and seven days after the first subsequent flight.



PRESSURE/EXTENSION GRAPH-VALUES OF THE FILM

Find below the points noticed during the film in their chronological order.

DIAGRAM 1:

(1) PA = 79 bar (1150 psi), T = 10°C (50°F)

HA = 141 mm (5.6 in)

(4) PA = 92 bar (1330 psi), T = 11°C (52°F

HA = 119 mm (4.7 in)

(5) PA = 86 bar (1250 psi), T = 11°C (52°F)

HA = 125 mm (4.9 in).

DIAGRAM 2:

(2) PA = 92 bar (1330 psi), T = 11°C (52°F)

HA = 140 mm (5.5 in).

DIAGRAM 3:

(3) PA = 92 bar (1330 psi).

END