

	LANDING GEAR GEARS AND DOORS		1.32.10	P 1
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DESCRIPTION

GENERAL

The landing gear consists of :

- Two inboard retracting main gears,
- A forward retracting nose gear,
- A forward retracting center gear.

Gear doors enclose the landing gear bays. Gears and doors are electrically-controlled and hydraulically-operated.

The doors which are fitted to the landing struts are mechanically-operated by the gear, and close at the end of gear retraction.

All gear doors open during landing gear transit. The hydraulically operated doors close at the end of each retraction and extension sequence.

Gears and doors' actuation are electrically-signalled by two Landing Gear Control and Interface Units (LGCIUs).

The LGCIUs process gear and door positions, sequencing control and gear lever selection. They also provide landing gear information on the ECAM, and ground/flight signals for other aircraft systems.

MAIN AND CENTER GEARS

Each main and center gear is a four-wheel, twin tandem bogie assembly having an oleopneumatic shock absorber.

Each main and center wheel is fitted with an antiskid brake.

A shortening mechanism, attached to the wing, reduces main and center gear length by retracting the shock absorber into the main and center leg during retraction.

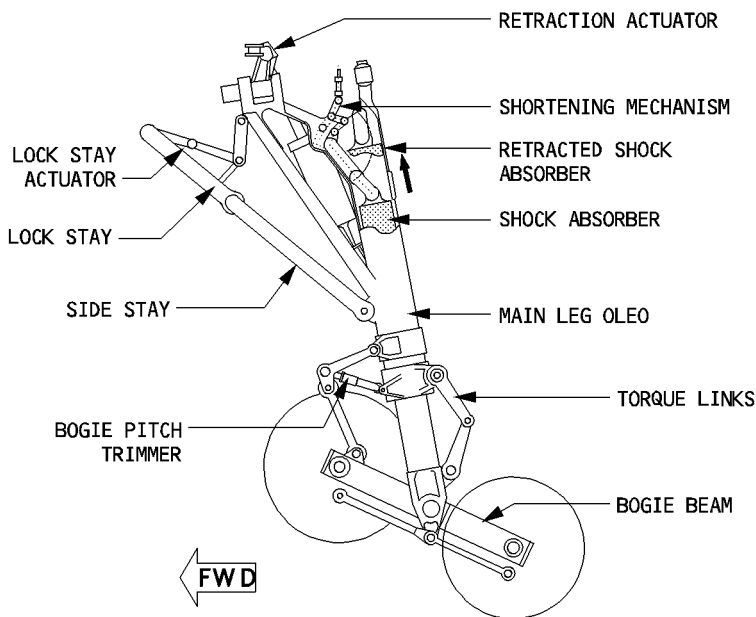
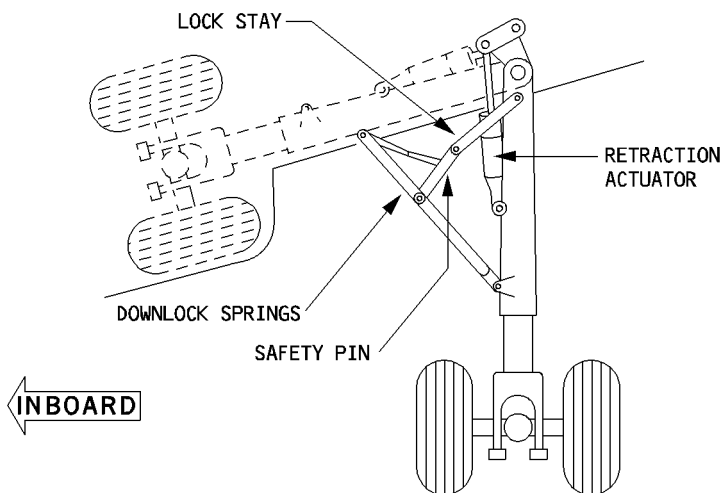
A hydraulically-operated pitch trimmer on each bogie beam damps the movement and ensures return to normal position after liftoff.

NOSE GEAR

The two-wheel nose gear comprises an oleopneumatic shock strut and a nosewheel steering system. It retracts forward into the fuselage.

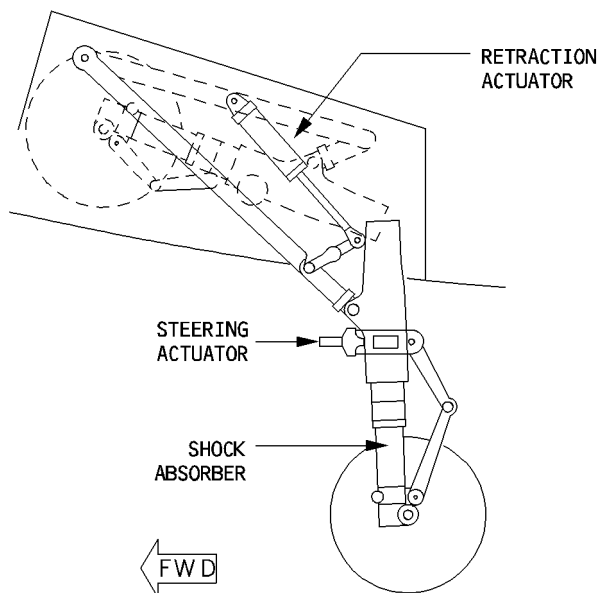
SCHEMATICS

MAIN L/G



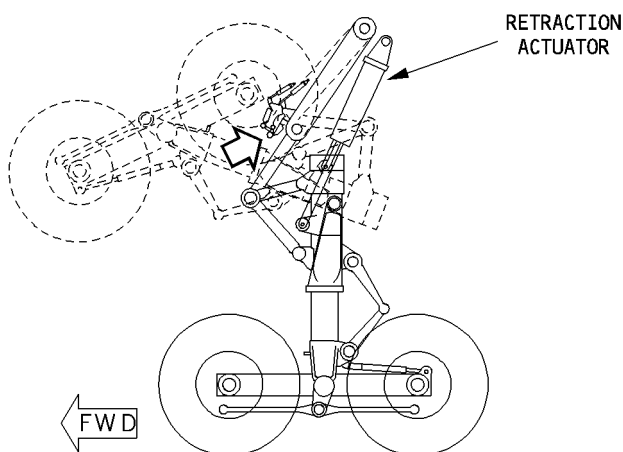
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NOSE LANDING GEAR



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CENTER GEAR



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GEAR AND DOOR OPERATION

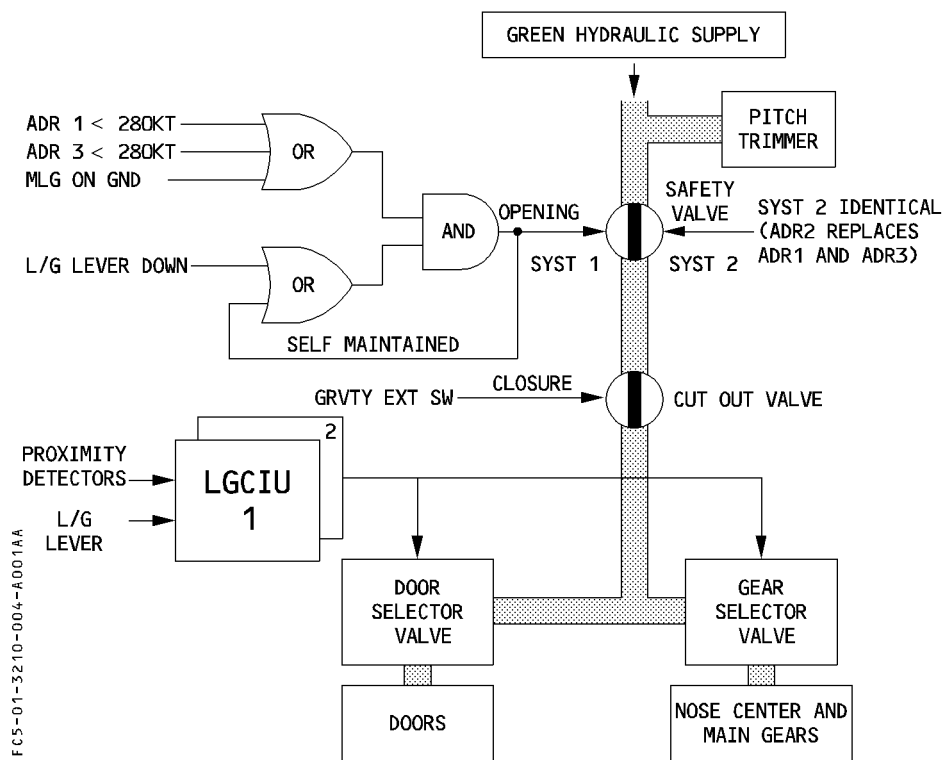
NORMAL OPERATION

Landing gear normal operation is controlled through the lever located on the center instrument panel. Gear and door sequencing is electrically controlled by LGCIUs. Each LGCIU controls one complete gear cycle and switches over automatically at each landing gear retraction cycle or in case of failure.

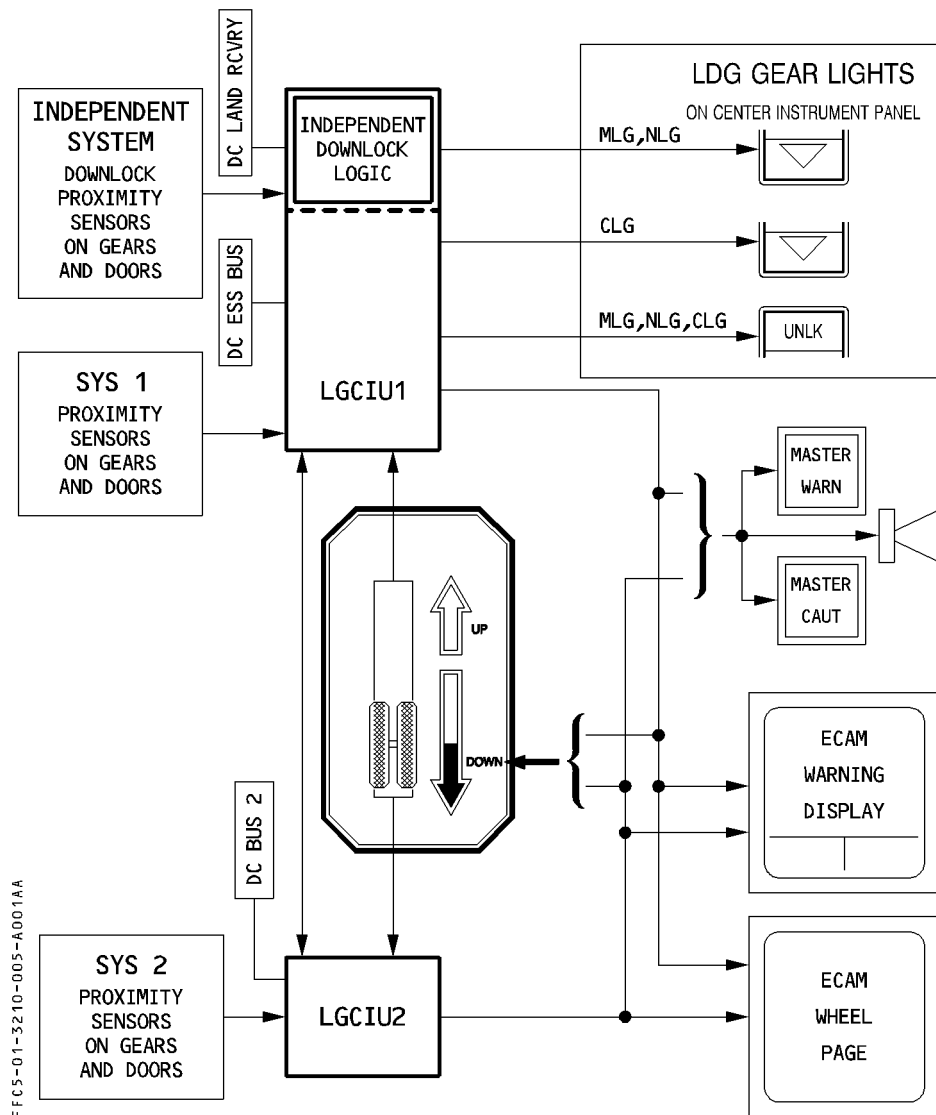
All gears and doors are hydraulically actuated by the green hydraulic system. Hydraulic supply is automatically isolated by a safety valve above 280 knots, and maintained closed as long as the landing gear lever is up.

The centerline gear may be inhibited by ground maintenance action. Therefore it will be mechanically fixed in the uplock position while doors will continue to operate during the landing gear retract/extend sequence.

FOR INFO



LANDING GEAR INDICATION AND WARNING ARCHITECTURE



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Note: The landing gear position indications on center instrument panel are still provided by LGCIU 1 even when LGCIU 2 is controlling gear cycle.

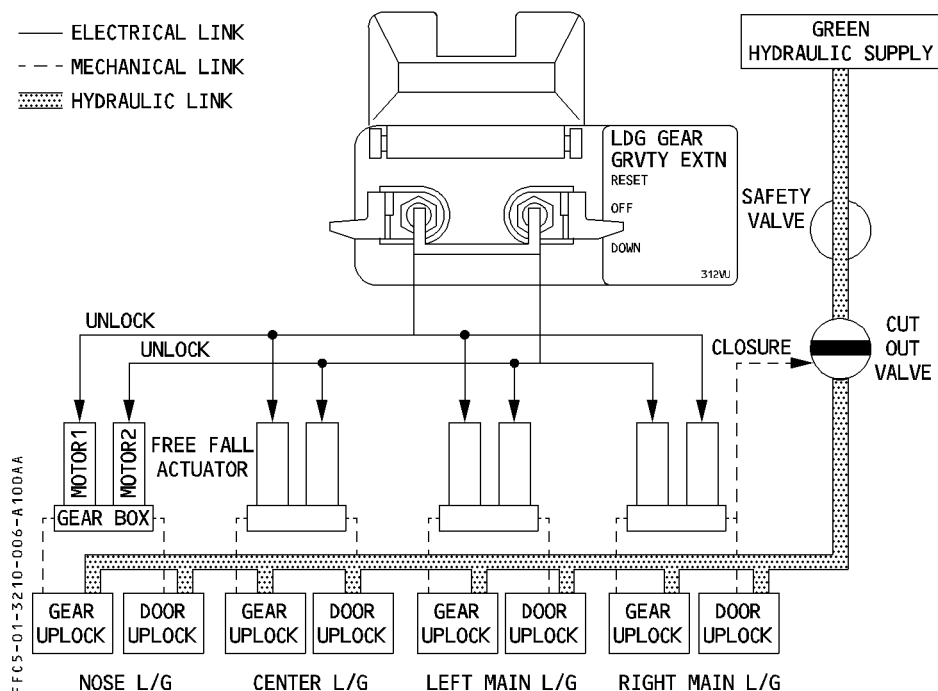
GRAVITY EXTENSION

The gravity extension system is an electro-mechanical system, controlled through two selectors located on the center instrument panel. It permits main, center, and nose landing gear extension in case of a normal extension system failure.

When the related electrical selectors are set to down, the :

- Landing gear hydraulic system is isolated from the green hydraulic system
- Main, center nose landing gear doors, and gears electrically unlock
- Main, center, and nose landing gears extend by gravity
- Locking springs assist the downlocking
- Main, center, and nose landing gear doors remain open.

After a free fall extension, it is possible to restore normal operation, provided green hydraulic pressure is available.



The cockpit indications are the same as those for normal extension and retraction.

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L/G SYSTEM INTERFACE

LGCIU

Two LGCIUs receive landing gear position information from the proximity detectors : landing gear downlocked or uplocked, shock absorber compressed or extended, door open or closed.

This information is sent by the LGCIUs to other aircraft systems.

Proximity detector failures :

- electrical failure is detected by the LGCIU which signals the associated output to the flight position (shock absorber not compressed or landing gear uplocked).

Landing gear operation is then automatically controlled by the non affected LGCIU.

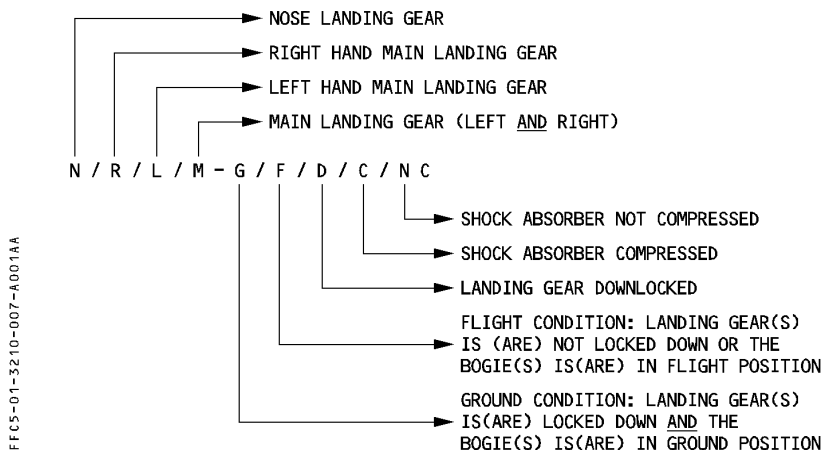
- mechanical failure is not detected by the LGCIU. The effect on the interfaced system depends on which condition is incorrectly signalled.

In case of LGCIU electrical failure :

- The landing gear is controlled by the remaining healthy LGCIU
- The outputs of the failed LGCIU are not forced to the safe (flight) position :
some users will see "flight" condition,
some other will see "ground" condition.

LANDING GEAR-AIRCRAFT SYSTEM INTERFACE

The two LGCIUs provide following discrete logic signals to various aircraft systems.



A semicolon (;) separates different signals send to the same system.

Two additional discretes are provided by the LGCIUs.

OP : Applicable LGCIU is signalled operative as long as system is supplied by power.

E : External power connected.

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	SYSTEM	LGCIU1 OUTPUT	LGCIU2 OUTPUT
AIR COND	Packs bay ventilation	L-F	R-G
	Avionics equipment ventilation	R-G	L-G ; OP
	Fwd and aft cargo compartment vent.		R-F
	Pressure control and monitoring	R-G	R-G
	Pack control and indicating		L/R-G
	Cockpit and cabin temperature control		R-G
FM	FMGS	N-C	N-C
COMMUNICATIONS	HF System	L-F	R-F
	VHF System	L-F	L/R-F
	Satellite communication		R-F
	Cockpit to ground crew call system	N-NC	
	Audio management	L-F	
	CVR	N-C/NC	
	CIDS	N-C/D ; E	N-C/D ; E
	Radio management	L-F	L/R-F
ELEC	ACmain generation	N-C	
	AC emergency generation	N-NC	
	ECMS	N-C	
	DC essential normal generation switching	N-NC	
	Battery DC generation	N-C	
	GPCU	N-C	
	Circuit breaker monitoring	N-C	
APU	Control and monitoring	L-G	
	APU generator (GCU)	N-C	
FIRE	Engine fire and overheat protection	L/R-G	L/R-G
	APU fire and cargo compartment overheat detector	M-G	M-G
	Cargo compartment smoke detector	N-C ; E	N-C ; E
	APU fire extinguishing	M-G	

(Cont'd)

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(Cont'd)

	SYSTEM	LGCIU1	LGCIU2
FLT CTL	Flaps control and monitoring	M-G	M-G
	Slats control and monitoring	M-G	M-G
	EFCS	L/R-D ; N-C	L/R-D ; N-C
FUEL	APU fuel pump system	M-G	
	FCMS	L-D ; N-C	L-D ; N-C
HYD	Green main hydraulic power	M-G	M-G
ICE	Wing ice-protection	M-F	M-F
	Probe ice-protection	L/R-G ; E N-C ; OP	L/R-G ; E N-C ; OP
	Windscreen anti-icing and defogging	L/R-G	L/R-G
EIS	FWC - acquisition interface	R-G	L-G
	SDAC- acquisition interface	R-G	L-G
	DMC - acquisition interface	R-G	L-G
GEAR	Normal extension and retraction	R-G ; E	R-G ; E
	Normal braking	L/R-G ; N-C/D	R-G ; N-D
	Brake cooling		L-D
LIGHTS	Runway turn off lights	N-D	N-D
	Taxi and take off lights	N-D	N-D
	Logo lights		M-G
	Toilet system		N-C
NAVIGATION	Sensors	N-C	
	Altitude and airspeed standby data	L-G	
	ILS	L-F	R-F
	Weather radar system	L-F	R-F
	Radio altimeter	L-F	L-F
	TCAS	L-G/D	
	GPWS	L-D	
	DME	L-F	R-F
	ATC/MODE S	L-G	R-G
	ADF	L-F	R-F
MAIN	VOR/MARKER	L-F	R-F
	CMS acquisition interface	N-C ; E	
	Up and down data loading system	R-G	
DOOR	Doors and escape slide control system	N-C ; E	N-C ; E
ENG	FADEC	L/R-G ; DP	L/R-G ; DP
		N-C	N-C



LANDING GEAR
GEARS AND DOORS

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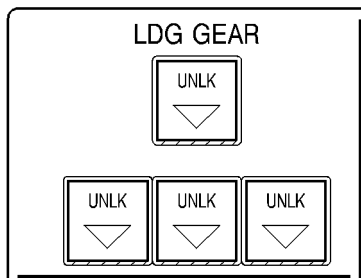
The following systems get landing gear position selection data from the landing gear lever

SYSTEM	L/G lever position
Refuel on battery	DOWN
FCMS	DOWN
Normal braking	UP
Cabin emergency lighting	UP

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CONTROLS AND INDICATORS

LDG GEAR INDICATOR PANEL



Connected to LGCIU 1 which receives signals from proximity detectors.

- UNLK light : illuminates red if the landing gear is not locked in selected position.
- ▽ lights : illuminate green if the landing gear is locked down.
- Light off : indicates landing gear is retracted and locked up with landing gear lever selected up.

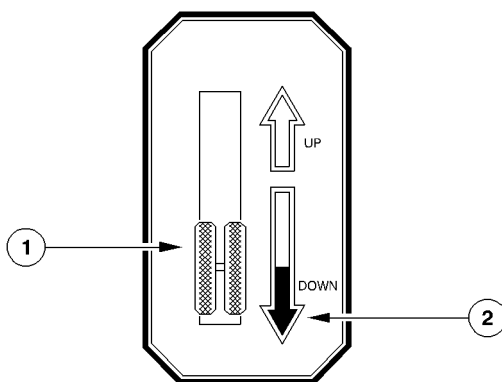
Note : ▽ lights on the LDG GEAR indicator panel light up as long as the LGCIU 1 is electrically supplied, except for the center landing gear, which may not light up, depending on the LGCIU failure.

LANDING GEAR SELECTOR LEVER

A two-position selector lever provides electrical signals to the two LGCIUs, which control green hydraulic supply by means of selector valves.

Upon selection of UP or DOWN, and provided the airspeed is below 280 knots :

- All landing gear doors open, then
- Landing gears move to the new selected position, then
- All doors close.



① L/G LEVER

UP : Landing gear retraction is selected.
During gear door opening, main and center gear wheels are automatically braked by the normal braking system. The nose gear wheels are braked by a brake band in the gear well.

DOWN : Landing gear extension is selected.
An interlock mechanism prevents unsafe retraction by locking the lever in the DOWN position, when either :

- Both main landing gear bogies are not trailed (aircraft on ground), or
- The center landing gear shock absorber is not fully extended, or
- The nose landing gear shock absorber is not fully extended, and the nose wheels are not in the center position.

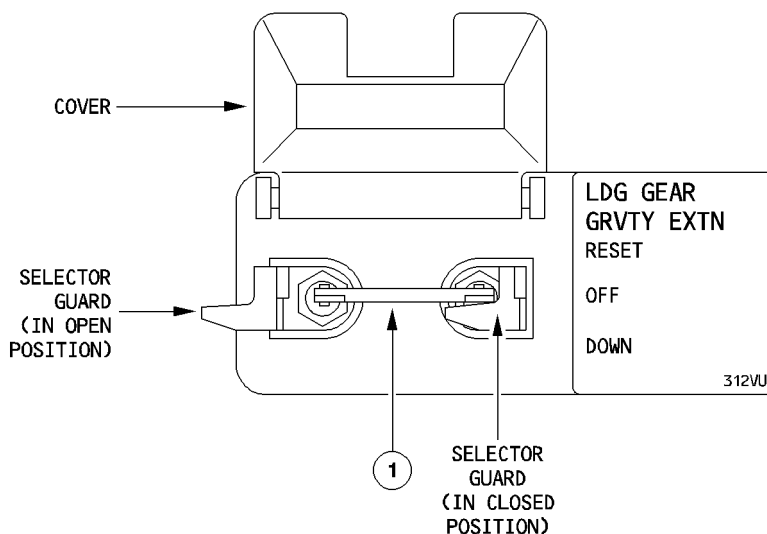
When the landing gear is extended, the system remains pressurized (if green hydraulic pressure is available).

② RED ARROW

The red arrow, and associated ECAM warnings come on red, if the landing gear is not downlocked in landing configuration. (Refer to WARNINGS and CAUTIONS section).

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GRAVITY EXTENSION



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The landing gear gravity extension selectors are locked-toggle type selectors. The selectors are connected by a link, so that both are operated simultaneously.

When the link is disconnected, each selector can be independently operated.

① LDG GEAR GRVTY EXTN sel

Each selector has three positions :

- | | | |
|---------------|---|--|
| DOWN(guarded) | : | The two motorized actuators are electrically-powered to close the hydraulic cut-off valve and to disengage door and gear uplocks which permit the nose, center, and main gear to deploy by gravity and to automatically lock down. |
| OFF | : | Normal position. Landing gear operation is controlled by the LGCIU and the landing gear lever. |
| RESET | : | The actuators return to the initial position, and automatically set the system back to the normal extension and retraction mode. |

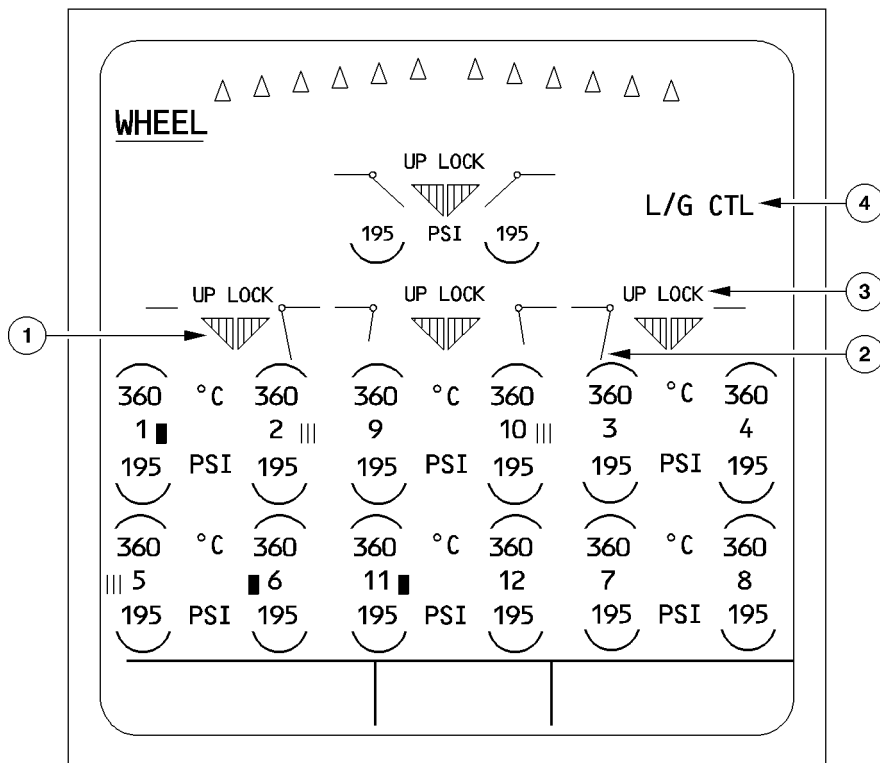
The selectors are then set to off for normal operation.

Note : To select the landing gear, both selector guards have to be open.

ECAM WHEEL PAGE

The wheel page is automatically displayed :

- On ground, before takeoff with engine running (flight phase 2) ; it disappears at engine TO power application.
- In approach, at landing gear down selection or below 800 ft radio altitude (flight phases 7, 8, 9) ; it disappears at engine shutdown.



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① Landing gear position indication

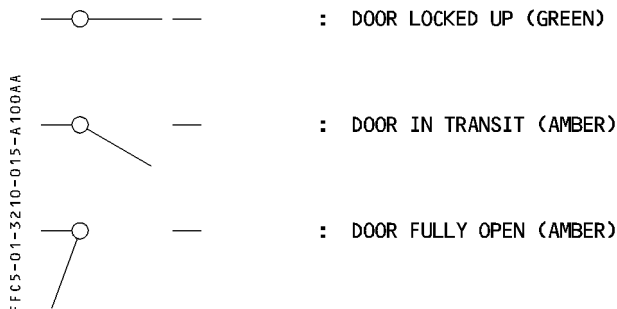
The landing gear positions are indicated by 2 triangles for each gear.

The left triangle is controlled by LGCIU 1, the right one by LGCIU 2.

- The triangle is green when the LGCIU detects landing gear downlocked.
- The triangle is red when the LGCIU detects landing gear in transit
- There is no signal when the LGCIU detects landing gear uplocked
- There are amber crosses, in case of an LGCIU failure.

virgin atlantic A340-600 <i>"Flight crew operating Manual"</i>	LANDING GEAR GEARS AND DOORS		1.32.10	P 15
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② Landing gear door position indication



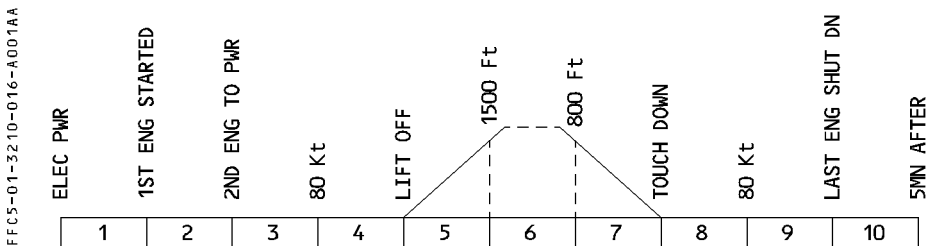
③ UPLOCK indication

The indication, associated with an ECAM caution, comes on amber, if the landing gear uplock is engaged when the landing gear is downlocked.

④ L/G CTL indication

It appears amber, with a 40 second time delay, when the position of any landing gear disagrees with the lever position. The associated ECAM caution is triggered.

WARNINGS AND CAUTIONS



EWD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
GEAR NOT DOWNLOCKED One or more gear(s) not downlocked and landing gear selected down	CRC	MASTER WARN	WHEEL	UNLK on LDG GEAR panel	3, 4, 5
GEAR NOT DOWN 1) Landing gear not downlocked and radio height lower than 750 ft and all engine not at TO power. or 2) Landing gear not downlocked and radio height lower than 750 ft and flaps 2, 3 or FULL or 3) Landing gear not downlocked and flaps at 2, 3 or FULL and both radio altimeters failed and all engines not at TO power NOTE : In the cases 2 above, the aural warning can only be cancelled by the emer canc pb.			NIL	RED ARROW It on LDG GEAR panel	1 to 5 8 to 10
DOORS NOT CLOSED One or more gear door(s) is not uplocked	SINGLE CHIME	MASTER CAUT	WHEEL	NIL	1, 3, 4, 5, 8, 9, 10
GEAR NOT UPLOCKED One or more gear(s) not uplocked and landing gear not selected down				UNLK It on LDG GEAR panel	3, 4, 7 to 10
GEAR UPLOCK FAULT One gear uplock engaged with corresponding gear downlocked			NIL	NIL	4, 7, 8
RETRACTION FAULT L/G selected up and - the bogie beam not in correct position or, - the pitch trimmer not in correct position or, - nose or center landing gear shock absorber not in correct position					1, 3, 4, 7, 8
LENGTHENING (L)(R) FAULT Landing gear downlocked but shortening mechanism has not locked long position					3, 4, 5, 8
LGCIU 1 + 2 FAULT					4, 5, 7, 8



LANDING GEAR
GEARS AND DOORS

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EWD : FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
LGCIU 1 (2) FAULT SYSDISAGREE Disagree between landing gear or door positions detected by the two LGCIUs	NIL	NIL	WHEEL	NIL	3, 4, 5, 7, 8