

 <b>A340</b> <small>SIMULATOR</small> <b>FLIGHT CREW OPERATING MANUAL</b>	<b>HYDRAULIC</b>	1.29.00	P 1
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## GENERAL

The aircraft has three continuously operating hydraulic systems : blue, green, and yellow. Each system has its own hydraulic reservoir. Normal system operating pressure is 3000 PSI (2500 PSI when powered by the RAT). Hydraulic fluid cannot be transferred from one system to another.

The system is monitored by a Hydraulic System Monitoring Unit (HSMU).

## GENERATION

### GREEN SYSTEM PUMPS

Two pumps driven by engines 1 and 4 pressurize the green system.

An electric pump which can be manually or automatically controlled can also pressurize the green system.

- R The electric pump automatically runs :
  - in flight for 25 seconds in the event of failure of engine 1 or 4, when landing gear lever is selected up (to ensure gear retraction in a proper time).
  - on the ground when engines 1 and 4 are stopped and engines 2 and 3 are running (to provide braking and nose wheel steering for taxi).
- R A pump driven by a ram air turbine (RAT) pressurizes the green system in an emergency. When the RAT pressurizes the green system, the aileron, elevator and spoiler servo control operating speeds are reduced.

### BLUE SYSTEM PUMPS

A pump driven by engine 2 pressurizes the blue system.

A manually controlled electric pump can also pressurize the system.

### YELLOW SYSTEM PUMPS

A pump driven by engine 3 pressurizes the yellow system.

In addition, an electric pump which can be manually or automatically controlled can also pressurize the yellow system. This enables ground operations when the engines are stopped.

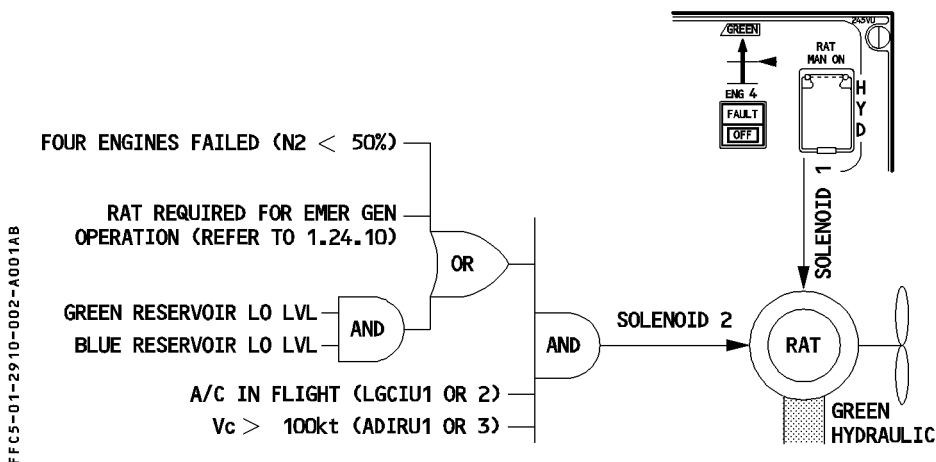
- R The electric pump runs :
  - in flight, in the event of engine 3 failure, if the FLAPS lever is not at 0 and aircraft speed is above 100 knots (to ensure flap retraction in a proper time at takeoff).  
In this case, the pump runs continuously until last engine shut down.
  - on the ground during cargo door operation.

Crew members can also use a hand pump to pressurize the yellow system in order to operate the cargo doors when no electrical power is available.

*Note :* On each system, the electric pump flow is about 18 % of the engine driven pump flow capacity. It can be used to retract the surfaces but should not be used to replace the engine driven pumps.

## RAM AIR TURBINE (RAT)

A drop-out RAT coupled to a hydraulic pump allows the green system to function. The RAT may be extended at any time by pressing the RAT MAN ON pushbutton. The RAT deploys automatically in the event of four engine failure or electrical power loss when engines 1 and 4 are stopped (RAT required for EMER GEN operation) or a low level in the green and blue reservoirs. It can be deployed manually from the overhead panel. It can be stowed only when the aircraft is on the ground.

**FOR INFO**

*Note :* The RAT flow varies between 15 % and 45 % of an engine driven pump flow capacity according to the aircraft speed.

## SYSTEM ACCUMULATORS

An accumulator in each system helps to maintain a constant pressure by covering transient demands during normal operation.

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## PRIORITY VALVES

A priority valve cuts off hydraulic power to heavy load users if green system hydraulic pressure gets low.

## FIRE SHUTOFF VALVES

- Each of the green, blue and yellow systems has a fire shutoff valve in its line upstream of its engine-driven pump. The flight crew can close it by pushing the FIRE pushbutton. The ENG 1 and ENG 4 fire shutoff valves are automatically closed by the HSMU in the event of green reservoir low level. This enables isolation of a possible leak in the engine pylon allowing restoration of the green system using the RAT, in the event of a further blue reservoir low level. The flight crew cannot re-open the fire shutoff valves in flight once they have been automatically closed.

## FILTERS

**FOR INFO**

*Filters clean the hydraulic fluid as follows :*

- *HP filters on each system and on the reservoir filling system and the normal braking system*
- *return line filters on each line*
- *case drain filters on engine pumps (which permit maintenance to monitor engine wear by inspecting the filters for the presence of metallic particles).*

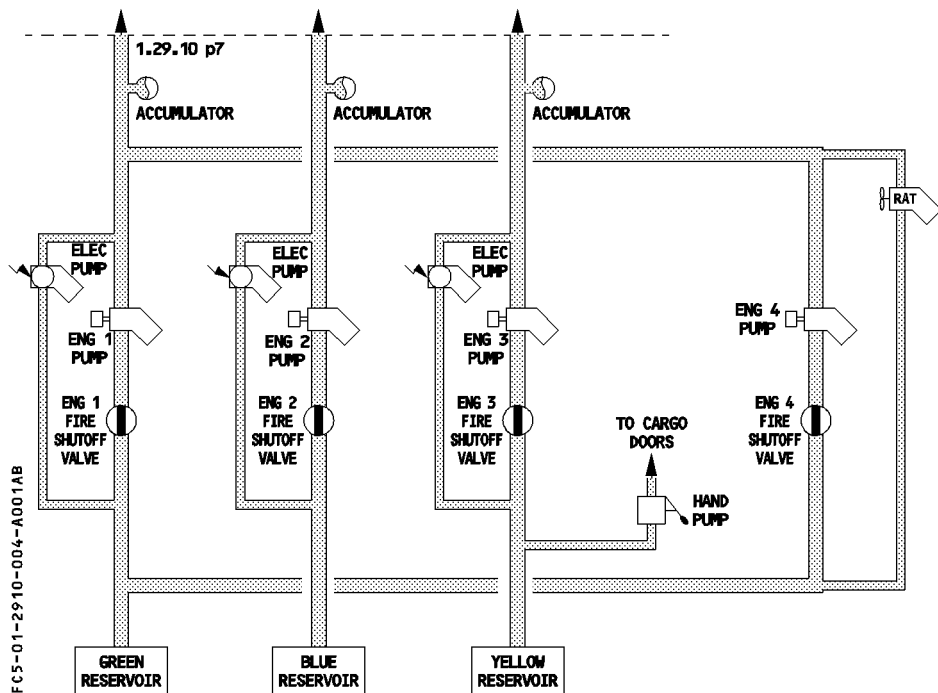
## HYDRAULIC SYSTEM MONITORING UNIT (HSMU)

The HSMU monitors the hydraulic system.

It processes :

- R – Control and monitoring of electric pumps
- RAT extension
- ENG 1 and ENG 4 fire shutoff valve closure in case of green reservoir low level
- Hydraulic quantity indication correction for fluid temperature
- Reservoir overheat warning
- FAULT light illumination logic
- LEAK MEASUREMENT VALVE control (closure inhibited in flight, closure of yellow valve during cargo door operation).

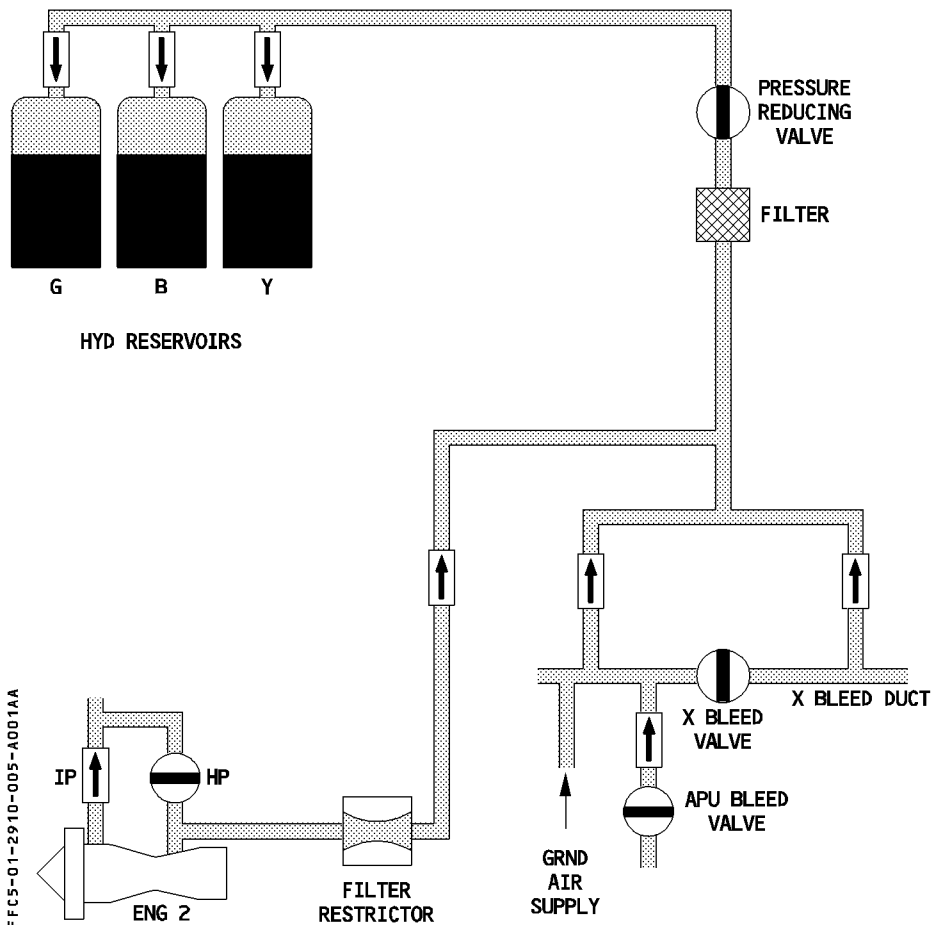
**HYDRAULIC GENERATION**



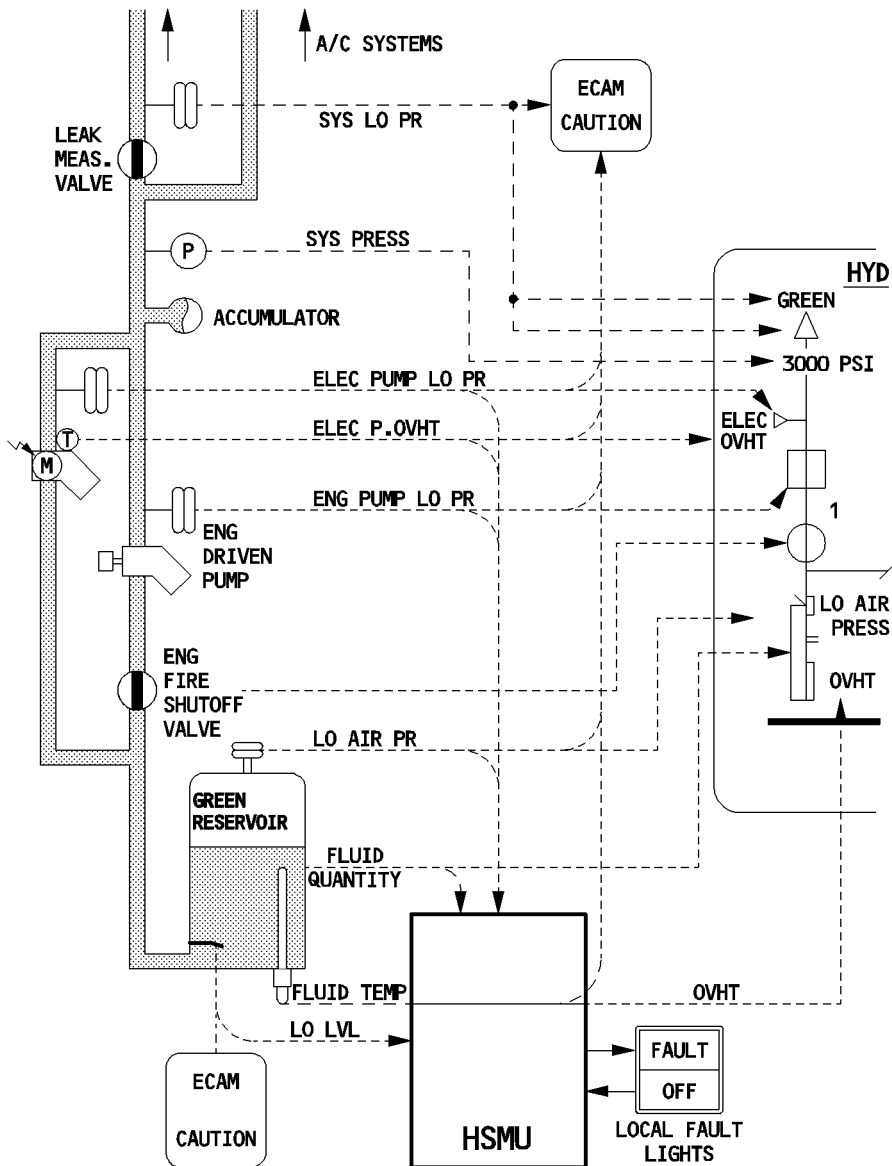
**RESERVOIR PRESSURIZATION**

Normally, HP bleed air from engine 2 pressurizes the hydraulic reservoirs automatically. If the bleed air pressure is too low, the system takes bleed air pressure from the crossbleed duct.

The systems maintain a high enough pressure to prevent their pumps from cavitating. **FOR INFO**

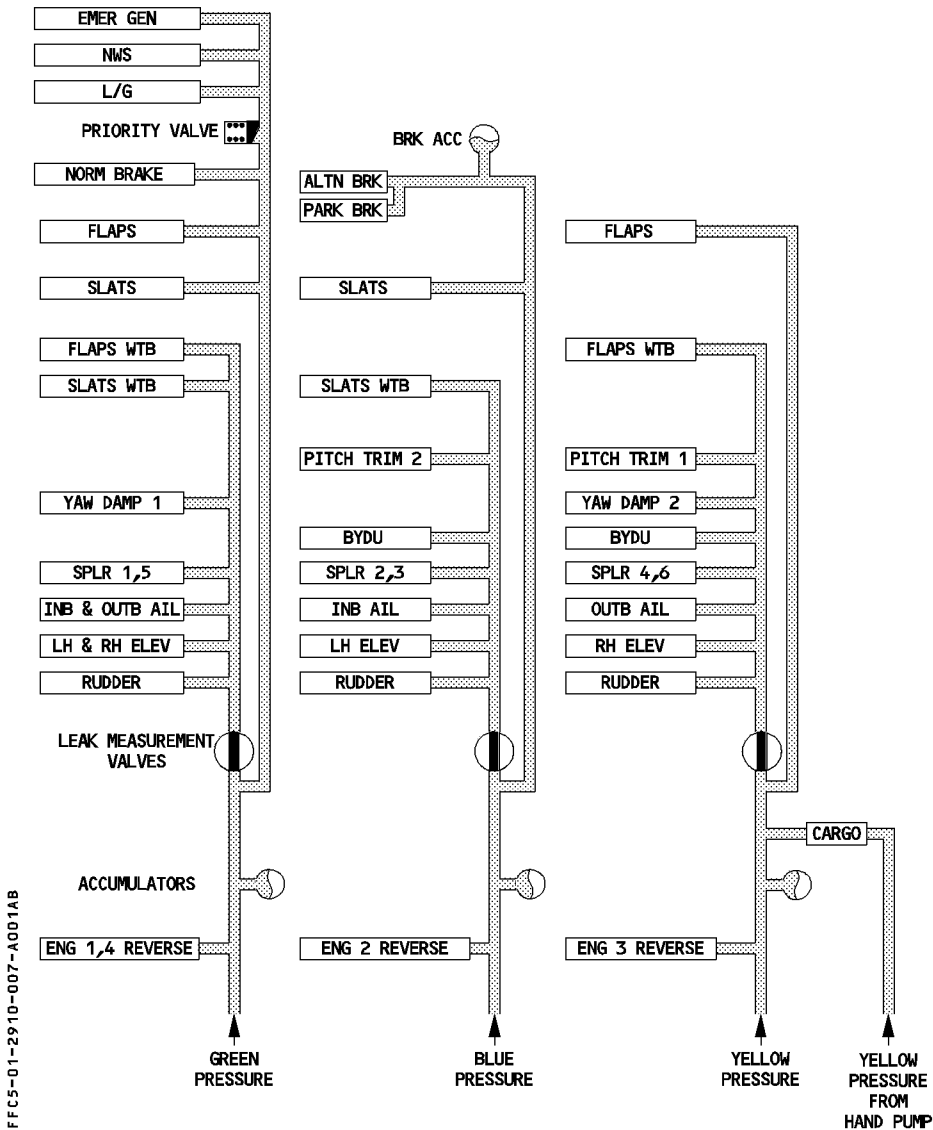


**INDICATIONS**



FFCS-01-2910-006-A001AC

**DISTRIBUTION**





**LEAK MEASUREMENT VALVES**

Used only on ground.

Leak measurement valves are positioned upstream of the primary flight controls. They are used for the leak measurement of each system and may only be closed on ground, by using the LEAK MEASUREMENT VALVES pushbutton on the maintenance panel. The yellow valve is automatically closed during cargo door operation.

- R The HSMU inhibits the closure of the green, blue and yellow hydraulic leak measurement
- R valves in flight.

**PRIORITY FUNCTION**

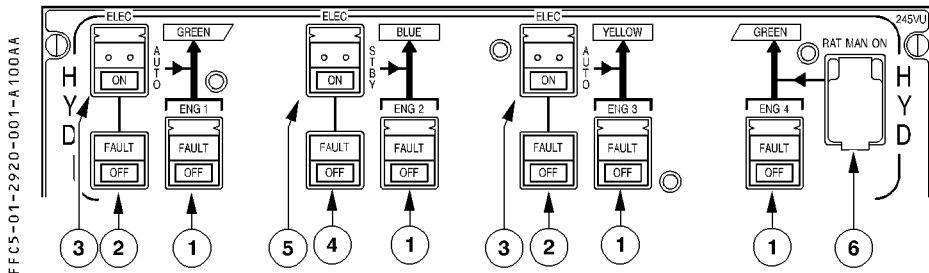
In the event of low hydraulic pressure, a priority valve cuts off hydraulic power to heavy load users (emergency generator, nosewheel steering, landing gear) in order to keep the pressure for normal braking and flight controls.

- R A Pressure-Off Brake system (installed on the flaps, slats, and THS actuator) ensures the same function.



## OVERHEAD PANEL

R



## ① ENG 1 (2, 3, or 4) PUMP pushbutton (guarded)

- On : The pump pressurizes the system, when the engine is running.  
 OFF : The pump is depressurized. Hydraulic power generation stops.  
 FAULT It : This amber light and an associated ECAM caution come on, if :
- The reservoir level is low
  - The reservoir overheats
  - Reservoir air pressure is low
  - The pump pressure is low (inhibited on ground, when the engine is stopped).
- This light goes off, when the crew selects OFF, except during an overheat. (The light stays on, for as long as the overheat lasts).

## ② GREEN (or YELLOW) ELEC PUMP pushbutton

- AUTO** : The HSMU automatically controls the pump :
- The green electric pump runs :
    - For 25 seconds, in the event of an Engine 1 or 4 failure, when the landing selector lever is selected up and the aircraft speed is above 100 knots.
    - On ground, when Engines 1 and 4 are stopped, and Engines 2 and 3 are running.
  - The yellow electric pump runs :
    - In the event of an Engine 3 failure, if the FLAPS lever is not at zero and the aircraft speed is above 100 knots. It remains running until the last engine shutdown.
    - On ground, when the lever of the cargo door manual selector valve is set to the OPEN or CLOSE position. In this case, the yellow leak measurement valve closes, and yellow flap motor operation is inhibited.

**OFF** : The pump is off.

- FAULT It** : This amber light, and an associated ECAM caution come on, if :
- The reservoir level is low, or
  - The reservoir overheats, or
  - Air pressure in the reservoir is low, or
  - The pump delivers low pressure (inhibited on the ground, when the engines are stopped), or
  - The pump overheats.

The light goes off when the crew selects OFF, except during an overheat. In case of a reservoir overheat, the fault light stays on, until the overheat stops. In case of an electrical pump overheat, the light stays on, even if the overheat has stopped, and until the system is reset on ground.

*Note: If the yellow/green electric pump overheats, the pump automatically shuts down.*


## ③ GREEN (or YELLOW) ELEC PUMP ON pushbutton (springloaded-guarded)

**AUTO** : The electric pump is controlled by the applicable ELEC PUMP pushbutton.

**ON** : The electric pump is on, provided the ELEC PUMP pushbutton is not selected OFF.

After an electrical power interruption, the pump does not restart (ON light stays off).

The ON light comes on blue when the pump is manually or automatically supplied.

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#### ④ BLUE ELEC PUMP pushbutton

- Standby : The pump is controlled by the BLUE ELEC PUMP ON pushbutton.
- OFF : The pump is off.
- R FAULT It : The amber fault light comes on (provided the blue electrical pump is running), along with an associated ECAM caution, if :
- R
- The reservoir level is low, or
  - Air pressure in the reservoir is low, or
  - The reservoir overheats, or
  - Pump pressure is low, or
  - The pump overheats.
- The light goes off when the crew selects OFF, except during an overheat. In case of a reservoir overheat, the fault light stays on until the overheat stops. In case of an electrical pump overheat, the light stays on, even if the overheat has stopped, and until the system is reset on ground.

*Note : If the blue electric pump overheats, the pump automatically shuts down.*

#### ⑤ BLUE ELEC PUMP ON pushbutton (springloaded-guarded)

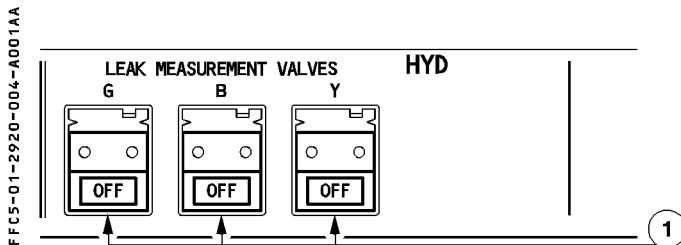
- ON : The electric pump is on, provided the ELEC PUMP pushbutton is not selected OFF.  
If the electrical power supply is removed, the pump remains off when electrical power is applied again.
- STBY : The pump is off.

#### ⑥ RAT MAN ON pushbutton

The flight crew may extend the RAT at any time by pressing the RAT MAN ON pushbutton.

*Note : The RAT automatically extends, if :*

- AC NORM buses, and Engines 1 and 4 fail, or
- Four engines fail, or
- GREEN + BLUE LO LVL



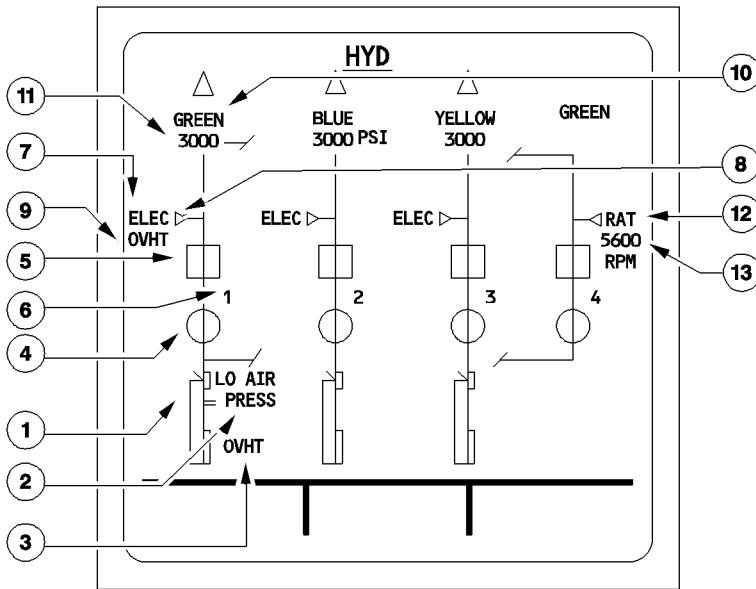
R ① LEAK MEASUREMENT VALVES pushbutton (to be used on ground only)

OFF : The corresponding electrohydraulic valve closes, and shuts off hydraulic supply to the primary flight controls.

R This function and the OFF light are inhibited, when the aircraft speed is above  
R 100 knots.

Note : *On ground, the yellow valve is automatically closed when the cargo door is activated (to avoid inadvertent movement of flight control surfaces). The OFF light comes on.*

**ECAM HYD PAGE**

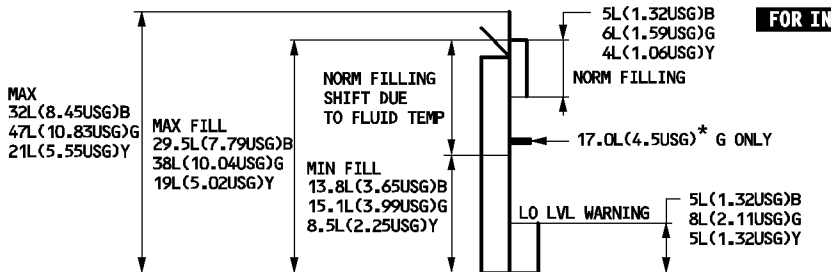


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**1 Reservoir quantity**

This indication is in green, unless the fluid level goes below the warning level, in which case it becomes amber.

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\* A SINGLE WHITE BAR IS DISPLAYED WHEN ACTUAL FLUID LEVEL IS ABOVE 17L (4.5USG) AND IS REPLACED BY TWO AMBER BARS WHEN BELOW 17L.

**R** Note : The normal filling range indication is corrected for fluid temperature effect. It is normally green. When the temperature information is not available, it is no longer corrected and the indication becomes white.

**②** Reservoir LO AIR PRESS

It is amber, and an associated caution appears on the ECAM, if the air pressure for the indicated reservoir drops below normal.

**③** Reservoir OVHT

It is amber, and an associated caution appears on the ECAM, if the temperature of the returning hydraulic fluid, at the inlet to its reservoir, is above normal.

**④** FIRE SHUTOFF VALVE

Crossline – Amber : The valve is fully closed.  
In line – Green : The valve is partially closed.

**⑤** ENG PUMPS control and low pressure indication

In line – Green : The designated PUMP's pushbutton is on, and hydraulic pressure is normal.

Crossline – Amber : The designated PUMP's pushbutton is off.

"LO" – Amber : The designated PUMP's pushbutton is on, and hydraulic pressure is low.

**⑥** PUMP

It is white, and becomes amber when the corresponding engine's N2 is below idle.

**⑦** ELEC

It is normally white. It becomes amber if the associated power supply fails, or if the pump is commanded on and does not provide normal pressure.

**⑧** ELEC PUMP control

▷ White : – The electric pump is not commanded.

▷ Amber : – The electric pump is off.

▶ Green : – The electric pump is on.

▶ Amber : – The electric pump is on and the system has low pressure.

**⑨** OVHT

R It is amber, if the electric pump for that system overheats. This indication remains  
R displayed on the ECAM, even if the overheat has stopped, and until the system is  
R reset on ground.

⑩ System label (SYS LO PR sw)

	PRESS > 1750 psi (press increasing)	PRESS < 1450 psi (press decreasing)
△	green	amber
GREEN	white	amber

⑪ System pressure

This legend, normally green, becomes amber when system pressure is below 1450 psi.

⑫ RAT control

△	RAT	MEANING
White	white	RAT stowed
Full green	white	RAT not stowed and RPM > 3000
White	amber	RAT fully stowed and stowing pressure applied
Full amber	amber	RAT not stowed and RPM < 3000

⑬ RPM

R This appears in green when the rotation speed of the RAT is above 100 RPM.





A340

SIMULATOR

FLIGHT CREW OPERATING MANUAL

## HYDRAULIC

## CONTROLS AND INDICATORS

1.29.20

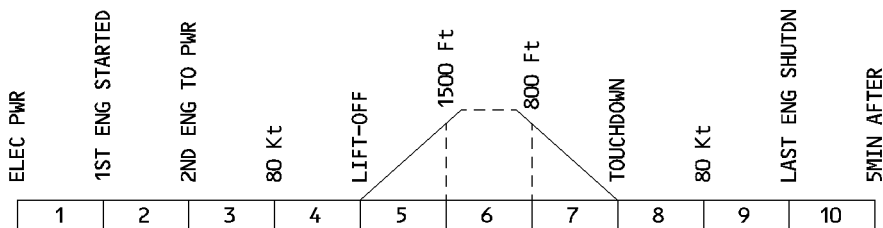
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SEQ 100

REV 18


## WARNINGS AND CAUTIONS

FFCS-01-2920-008-A 100AA



R

E / WD: FAILURE TITLE conditions	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNINGS	FLT PHASE INHIB
B + Y SYS LO PR or G + B SYS LO PR or G + Y SYS LO PR System pressure ≤ 1450 psi Reset, if pressure ≥ 1750 psi	CRC	MASTER WARN			4, 5
G (Y)(B) RSVR LO AIR PR Reservoir air pressure ≤ 22 psi Reset, if air pressure ≥ 25 psi	SINGLE CHIME	MASTER CAUT	HYD	FAULT It on associated pump(s) pb	3, 4, 5, 7, 8
G (Y)(B) RSVR OVHT Fluid temperature ≥ 95°C					
G (Y)(B) RSVR LO LVL Fluid quantity : < 8L (2.11 USG)(Green) < 5L (1.32 USG)(Blue-Yellow)					
G ENG 1(4) PUMP LO PR, or G ENG 1 + 4 PUMP LO PR, or B ENG 2 PUMP LO PR, or Y ENG 3 PUMP LO PR, or Engine pump pressure ≤ 1450 psi.					3*, 4, 5, 7, 8 * only for G ENG 1 (4)
G (Y)(B) ELEC PUMP FAULT Elec pump LO PR or ovht	NIL	NIL	NIL	NIL	3, 4, 5, 7, 8
G (B)(Y) SYS LO PR System pressure ≤ 1450 psi Reset, if pressure ≥ 1750 psi					
RAT FAULT RAT not fully stowed and not running, or stowing pressure applied.	NIL	NIL	NIL	NIL	3, 4, 5, 6 7, 8
MONITORING FAULT HSMU not racked.					
G RSVR UNDERFILLED On ground reservoir quantity < 17 l, if temperature > 0°C or RSVR QTY < quantity function of temperature	SC	MC	HYD		3, 4, 5 6, 7, 8
G SYS LEAK In flight only.					1 to 5 7 to 10

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<b>MEMO DISPLAY</b>
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HYD ELEC PUMP message appears in green when one of the three electric pumps is running (manually or automatic).

RAT OUT message appears in green if ram air turbine is not fully stowed. It becomes amber during flight phases 1 and 2.



<b>BUS EQUIPMENT LIST</b>
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**FOR INFO**

		NORM			EMER ELEC		
		AC	DC	DC BAT	AC ESS	DC ESS	HOT
HSMU	B, G CONTROL		DC1				
	Y, G CONTROL		DC2				
ENGINE DRIVEN PUMP CONTROL	ENG 4 and ENG 3		DC2				
	ENG 2 and ENG 1		DC1				
FIRE SHUT OFF VALVES	ENG 1		DC2			X (1)	
	ENG 2					X	
	ENG 3		DC2			X (1)	
	ENG 4					X	
ELECTRIC PUMPS	Green	AC1-1	DC1				
	Blue	AC2-3	DC1				
	Yellow	AC1-2 (2)	DC2 (3)				
LEAK MEASUREMENT VALVES			DC GND/FLT				
RAT	MANUAL CONTROL						X
	AUTO CONTROL					X	

- (1) DC ESS supplies the valve motor when NORM DC2 is lost.  
 (2) or directly from external power  
 (3) or from DC GND/FLT bus