Reference to Figure 87 Structures General ,Schematic

ATA 51 STRUCTURES

51–00 GENERAL

DESCRIPTION

Nose Forward Fuselage

This section of the fuselage (frame 1 to 24) contains in its upper forward region the flight deck and aft of that the entrance area of the forward passenger and service door. The lower region contains the nose landing gear bay, the electrics and avionics bay.

There are no stringers in this section but the frames are pitched at about half that of the typical pitch in the main fuselage. The aluminium alloy skin panels are chemically milled.

The skin panels below and above the center windshield are made of titanium to provide a good protection against bird impact. Frame 1 provides attachment for the machined flat front pressure bulkhead and a mounting for the radome.

Forward Fuselage (Section 13/14)

This section is of conventional construction consisting primarily of chemical milled skin panels, frames and stringers formed from sheet metal. The ends of the cabin floor cross beams are attached to the frames, supported on each side of the freight compartment by extruded aluminium alloy struts. In the lower region of each frame an aluminium alloy structure is installed to support the cargo floor. The fuselage frames are arranged at regular intervals of 533,3 mm (21 in).

Forward Fuselage (Section 14A ON A321)

This region of the fuselage lies between frames 35.1 and 35.8. It contains also the front part of the passenger cabin and beneath the cabin floot; the forward freight compartment. It has, on both sides emergency exits and containers to carry the slide rafts for this exits. Construction like section 13/14.

Center Fuselage (Section 15)

This region of the fuselage is located between frames 35 and 47. It provides part of the cabin together with the integration structure for the wing centre box. Beneath the cabin floot; it comprises the air conditioning, hydraulic and main landing gear bay in conjunction with a belly fairing. The zone beneath the cabin floor is unpressurized1 the actual pressure boundary being formed by the upper skin panels of the centre wing box and a pressure diaphragm extending from the wing box to frame 46 above the main landing gear bay.

The main landing gear bay panels are chemically milled, with externally riveted stringers.

Longitudinal structural continuity of the lower fuselage is maintained by a keel beam which transmits the overall fuselage bending loads. This beam is a box stiffened by internal ribs, which also provides attachment points for the landing gear bay doors and door actuators. The beam is attached to frames 35 and 46/47 and to the lower part of the centre wing box.

Rear Fuselage (Section 16/17 and 18)

This part of the fuselage lies between frames 47 and 70. To ease production this part is divided into two sections and jointed together at frame 64. The forward component (designated as section l6/l7), contains part of the passenger cabin and beneath the cabin floor the aft freight compartment with the associated cargo door. The constructional principles are similar to those of the forward fuselage. The rear region (section l8) of the aft fuselage contains the rearmost part of the passenger cabin. It incorporates the port passenger door and the starboard service door. The fuselage frames are arranged at irregular intervals between 497 mm and 584 mm. Frame 66 and 68 which form part of the door surrounding structure of the rear doors are curved in their plane to match the side shapes of the doors.
Section 16A is an additonal section and installed on A321 only.

Tail Cone (Section 19/19.1)

Section between Frames 70 and 77

This section provides the mounting structure for the fin and tailplane and is of conventional monocoque design, consisting of skin, riveted stringers and frames.

The machined frame 70 supports the rear pressure bulkhead which is designed as a pressure diaphragm, made in four segments and having eight radial stiffeners.

Between frames 71 and 72 and stringers 27 and 32 on the right hand side is a door for access into this region of the fuselage.

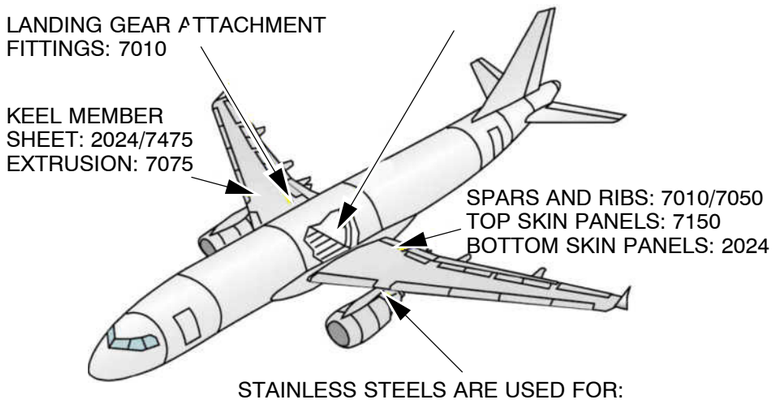
Fin Attachment Structure

The fin attachment fittings are located on frames 70, 72 and 74. They consist of six fail safe yokes which transmit the fin loads via shear bolts into the fuselage frames. This attachment structure is such that should there be a failure of any bolt or fitting the fail safety of the structure is ensured.

METALLIC MATERIALS

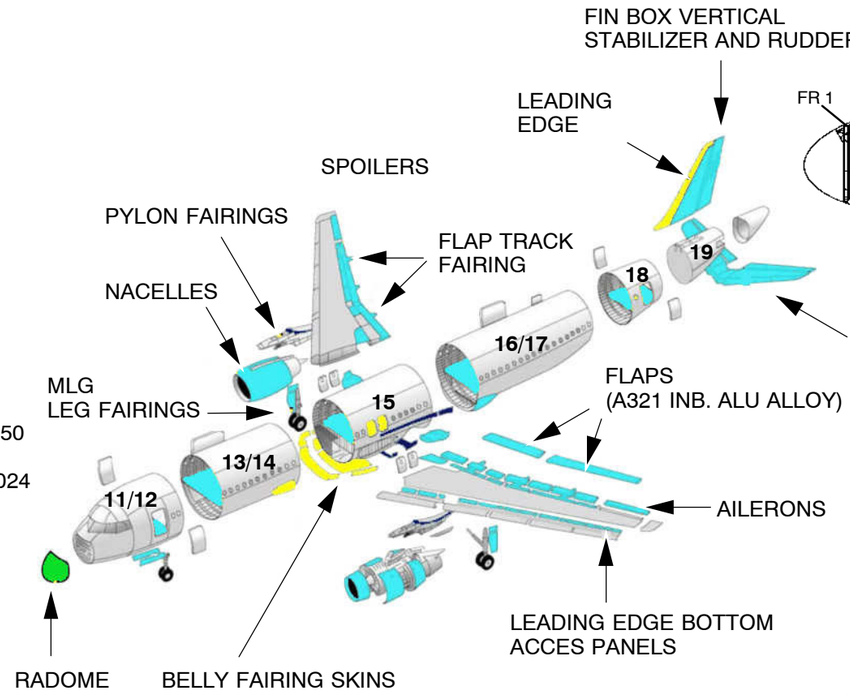
ALUMINUM/COPPER ALLOY: 2024
ALUMINUM/ZINC ALLOY: 7075/7175/7475/7010

ALUMINUM ALLOY FRAMES
SHEET: 2024
MACHINED: 7010/7050/2024/7075
FORGED: 7175



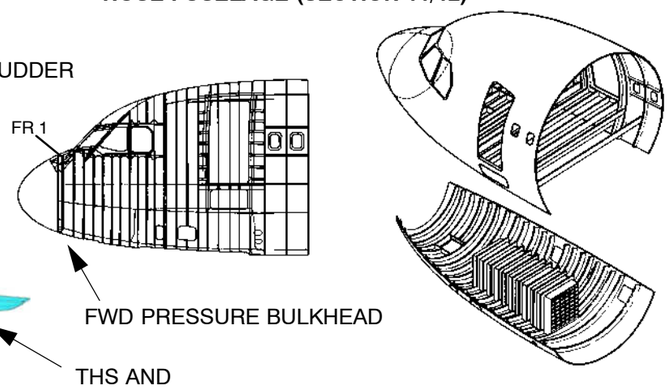
Titanium alloy 6AL4V is used for:
-Pylon: ribs/panels/fittings
-Wing: manhole doors/spar straps, flap track racks
-Fuselage: windshield surrounding panels/APU/fire walls

COMPOSITE MATERIALS

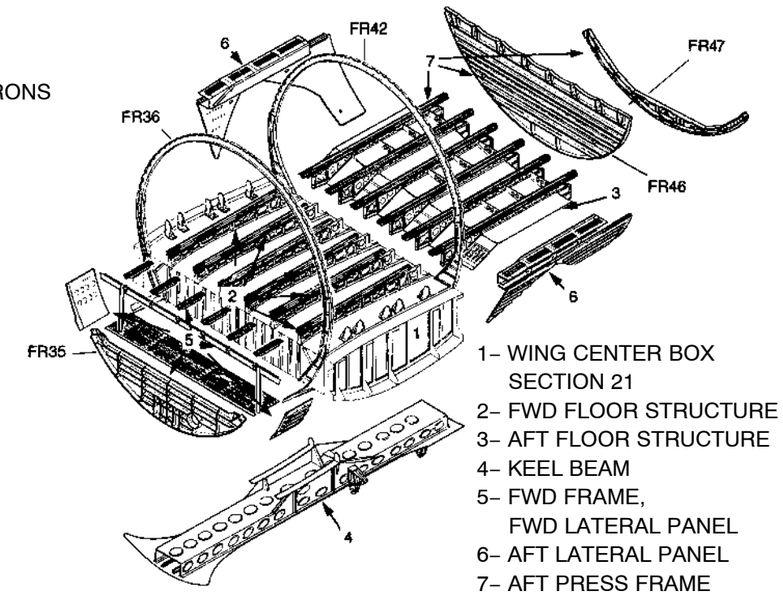


CFRP: CARBON FIBER REINFORCED PLASTIC
GFRP: GLASS FIBER REINFORCED PLASTIC
AFRP: ARAMID FIBER REINFORCED PLASTIC
QFRP: QUARTZ FIBER REINFORCED PLASTIC (OPTIONAL GLASS FIBER)

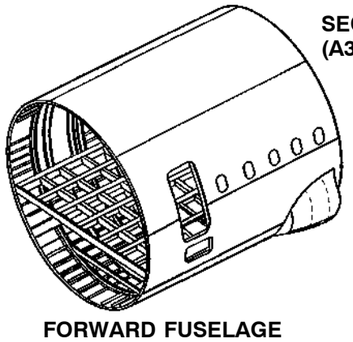
NOSE FUSELAGE (SECTION 11/12)



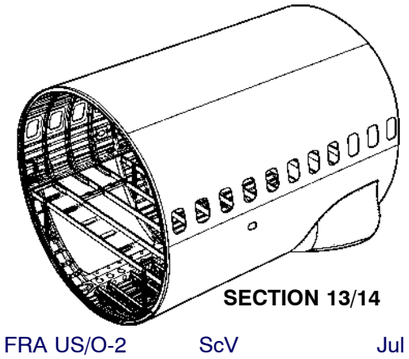
SECTION 15 (WING BOX)



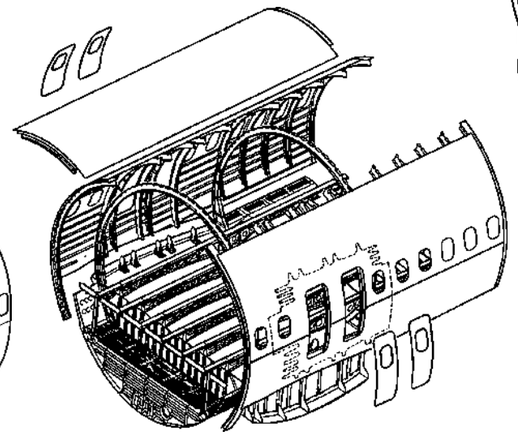
SECTION 14A (A321)



FORWARD FUSELAGE

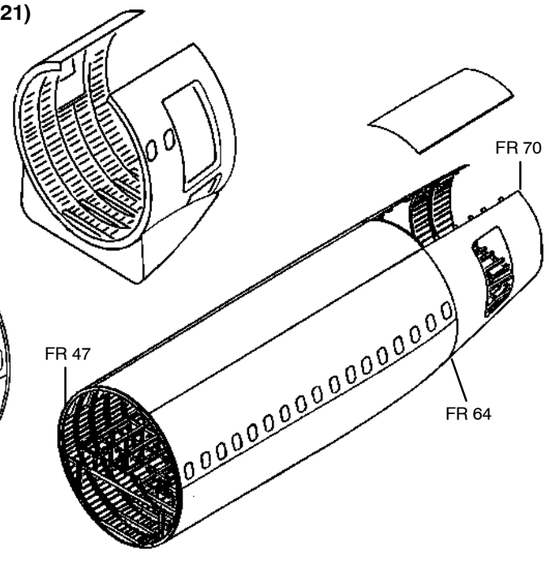


SECTION 13/14



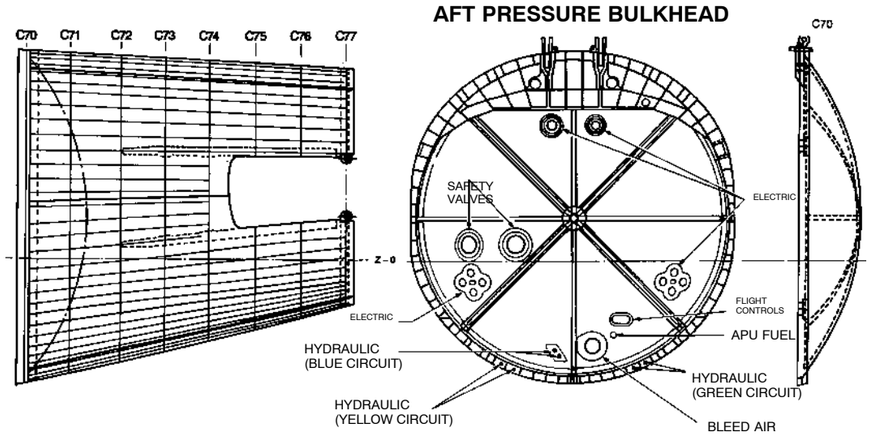
CENTER FUSELAGE (SECTION 15)

SECTION 16A (A321)



REAR FUSELAGE (SECTION 16/17/18)

AFT PRESSURE BULKHEAD



Reference to Figure 88 Passenger Door System Schematic

52–10 PASSENGER CREW DOORS

DAMPER ACTUATOR, EMERGENCY CYLINDER, DOOR WARNING LIGHTS

Description and Operation

The damper and emergency cylinder, installed on the support arm, damps door movement during opening/closing especially under abnormal conditions (heavy wind). Damping is effected by hydraulic fluid flowing from one chamber to an another chamber within the actuator through a restrictor.
The damper and emergency cylinder is also an emergency actuator and assists the opening of the door in an emergency condition (emergency control lever in ARMED position). This is effected by a chargeable gas cylinder. The gas which operates the actuator is released when the door moves upward, causing the pivoting stop lever to actuate the gas release lever (percussion mechanism), if the slide release system is armed (ARMED) position.
The nitrogen bottle (cylinder) is charged to 1.740 psig. This pressure can be checked on a gage and be refilled if necassary. In case of emergency the door will be opened in 2 to 3 sec.

NOTE: After an emergency operation it is madatory to change the diaphragm, recharge the nitrogen and replace the shear pin. Please observe all debris of the diaphragm must be removed.
The damping function is automatic at the end of the door travel (door open).
It is possible to close the door again after a complete emergency opening.

WARNING: For safety reason during maintenance there has to be :
- Safety pin inserted to avoid an uncontrolled activation of the percussion system.
-Release lever moved to maintenance position.

Optionally the nitrogen pressure from damper/ actuator system and of escape slide inflation reservoir can be checked at the CIDS (Cabin Intercommunication System).

Cabin Overpressure Warning Light

Description

A red Cabin Overpressure Warning Light in the windows of the passenger/ crew doors indicates (flashing) a residual cabin pressure when both (or one on enhanced A/C) engines have been cut off and the emergency control handle stays in DISARMED position. All passenger/ crew doors (and emergency doors on A321 aircrafts) are equiped with this light.

Three conditions must be fullfilled to warn the door operator for residual cabin pressure, so that the red light is flashing:
– Escape slide in DISARMED position
– Both (or one) engine been cutoff (engine low oil pressure)
– Pressure switch 14WM detects residual cabin pressure of 2.5 mb for more than 5 sec.

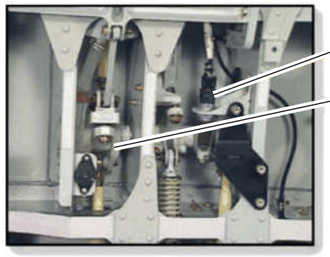
In case of emergency (escape slide in armed) and the door will be opened, the warning is suppressed.
On ECAM that certain door symbol changes to amber.

Slide Armed Light

Description

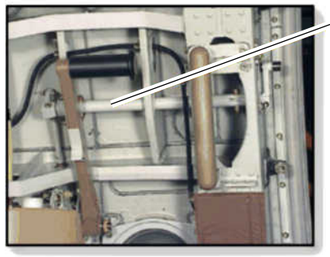
A white Slide Armed Light in the windows of the passenger/ crew doors indicates the emergency control handle stays in ARMED position and the door control handle is not closed anymore.
All passenger / crew doors (and emergency doors on A321 aircrafts) are equiped with this light.

Two conditions must be fullfilled to warn the door operator for activating the slide by a white light on:
– Escape slide in ARMED position
– Door control handle not closed
In case of emergency (escape slide in armed) and the door will be opened, this light will be ignored by the operator.

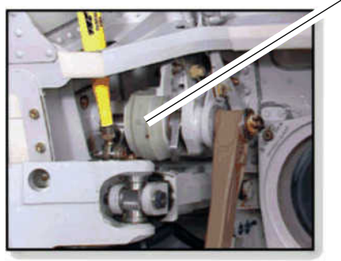


PROXIMITY SWITCH

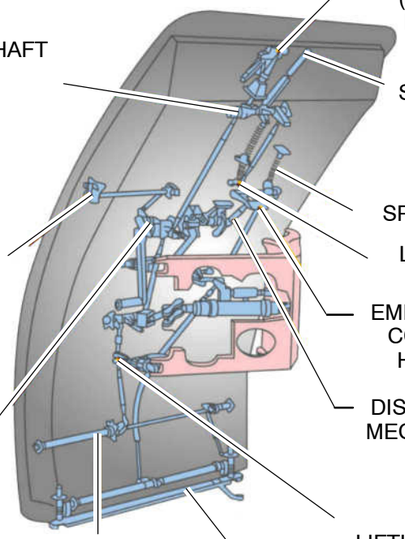
LOCKING SHAFT



LOWERING SHAFT

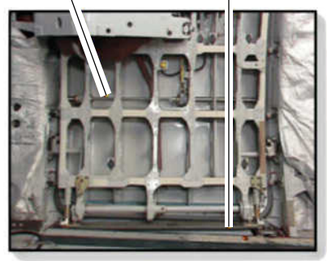


GEARBOX



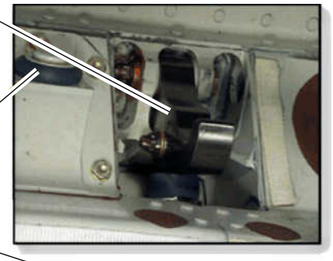
TORSION BAR SPRING

GIRT BAR



LOCKING HOOK (PROX SW IN DOOR FRAME)

SAFETY PIN



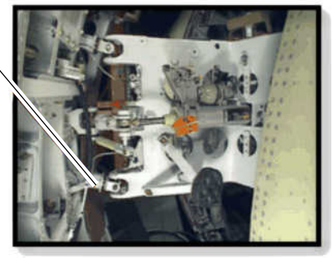
SPRING ROD

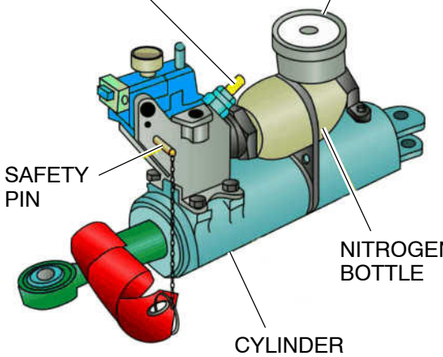
LOCKING UNIT

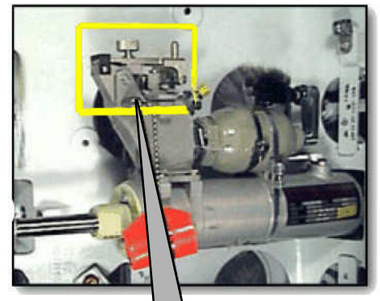
EMERGENCY CONTROL HANDLE

DISARMING MECHANISM

LIFTING LEVER

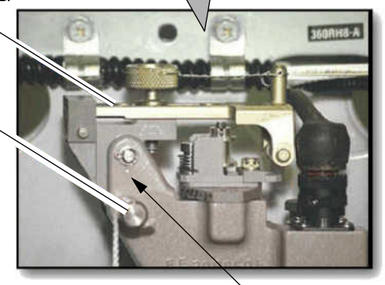






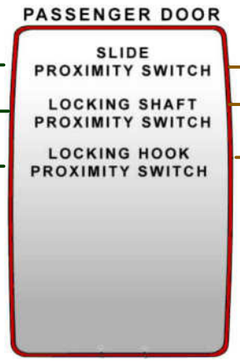
OPERATING STRIKER LEVER

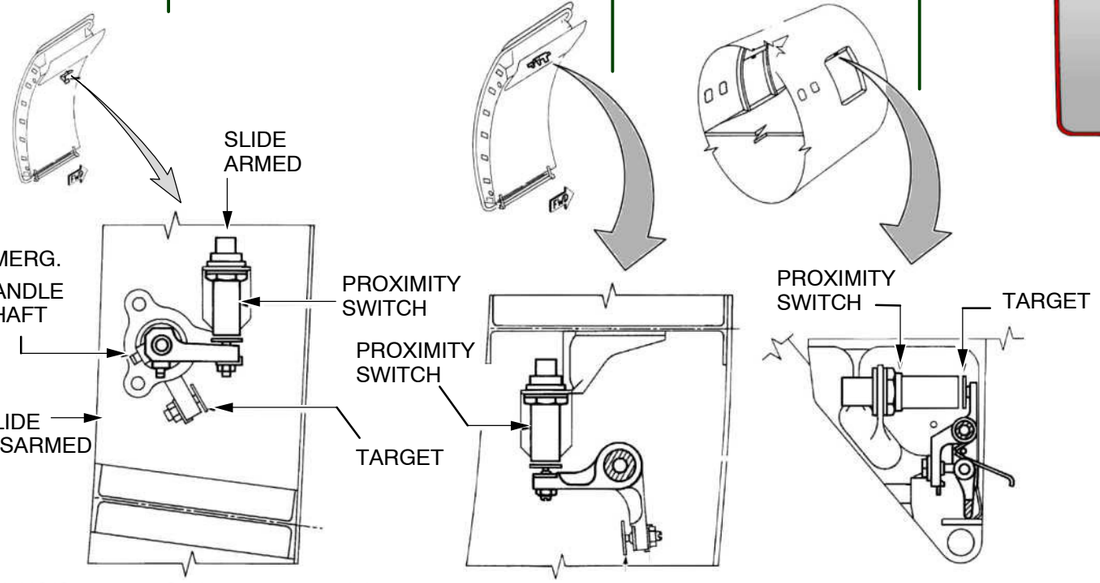
SAFETY PIN

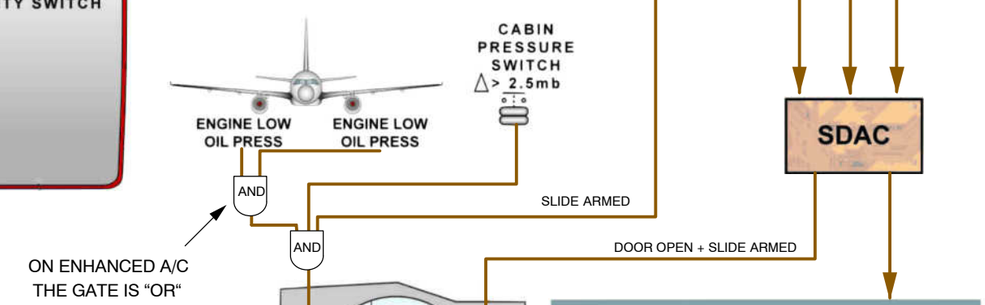


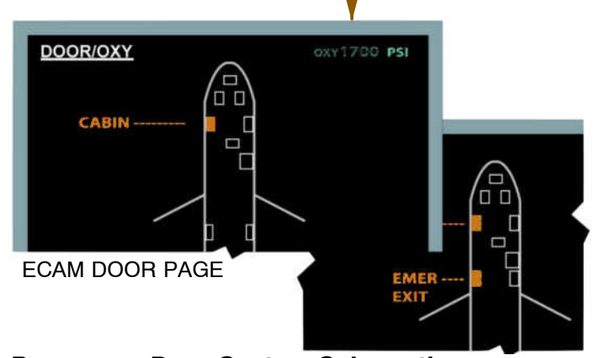
SHEAR PIN

Safety Pin installed & Percussion lever disengaged from Percussion Mechanism.









Reference to Figure 89 Emergency Exit Schematic

52–20 EMERGENCY EXIT

EMERGENCY EXIT HATCHES A318/319/320

Passengers/Crew can open the overwing emergency exit hatches manually. This operation releases and inflates the related off-wing escape slide in the wing to fuselage fairing. The emergency exit hatches are also of plug type construction. All exits have the same construction and function beside of LH/RH installation. They can be opened from in-and outside. A mechanical connection exists between the emergency exit hatches and the release mechanism of the escape slides. The system is normally in armed position.

In every emergency exit fuselage frame a red manual inflation handle can be used to release and inflate the escape slide, when the auto activation has refused. Access to the red handle is possible when the exit hatch is removed.

To get access to the hatch control handle, pull down the cover flap from the recess. When the cover flap is opened, a proximity switch is operated and gives two different warning signals. One signal is sent to the ECAM system for the door indication.

The other signal is sent to a visual warning in the cabin, to tell the attendants that one of the emergency exit hatches is not correctly closed.

NOTE: Only if the latch pin is in DISARMED position, the exit hatch can be opened safely without releasing and inflate the escape slide. Make sure before opening of the emegency hatch, that the SAFETY PIN of the inflation reservoir is installed (Aft Cargo Compartment).

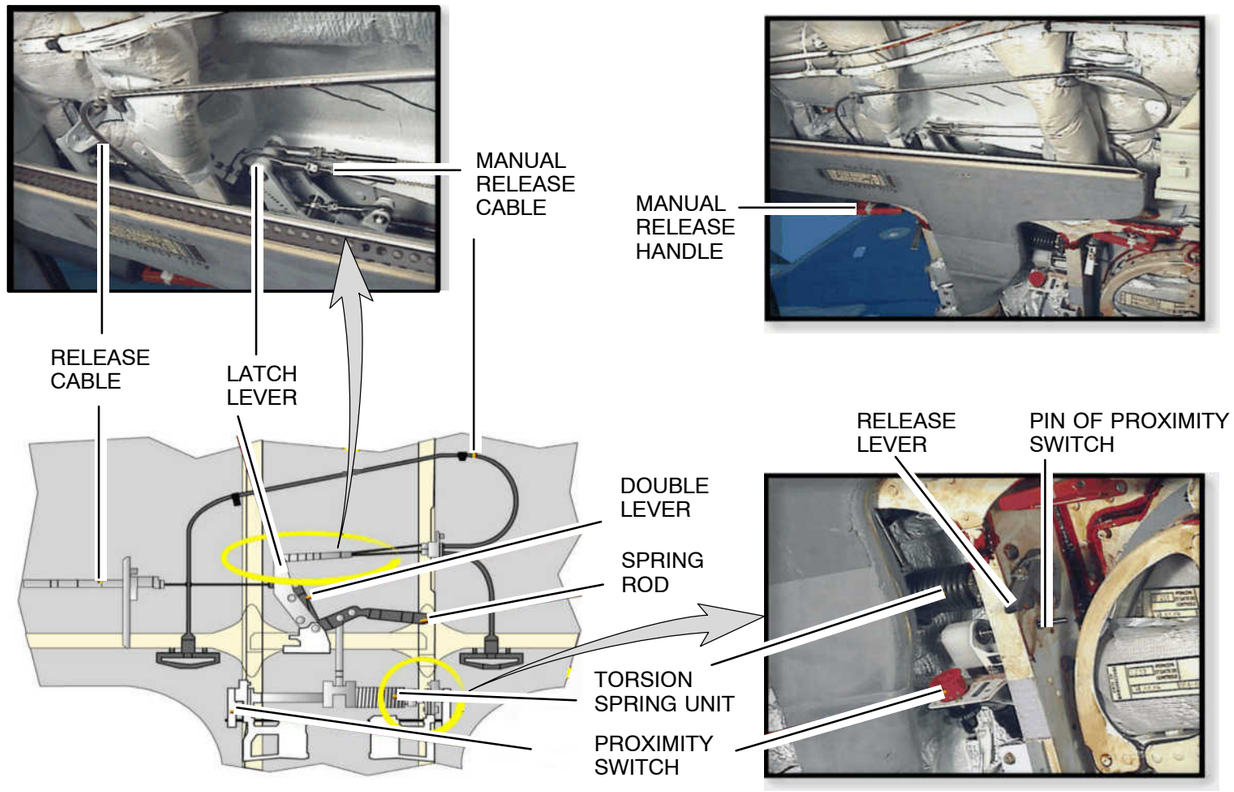


Figure 89 Emergency Exit Schematic

Reference to Figure 90 Cargo Doors Schematic

52–30 CARGO DOORS

SYSTEM DESCRIPTION

Cargo Door Control Panel

To operate the FWD(AFT) cargo door, a control panel is installed on the fuselage. To get access to the control panel, open the access panel. On the control panel there is a selector to operate the manual selector valve and a green indicator light.
The selector is spring-loaded to the neutral position. When you release it in the " Open " or " Closed " position, it moves back to the neutral position.

Indicator Light

The green indicator light gets a signal from the internal proximity switches of the door actuators. It is on when the door actuators are fully extended and locked.
The light goes off as soon as the Internal locking mechanism of the door actuator is released.
Internal proximity switches of the door actuators are connected in series.
They give a signal to show the operator that the door actuators are fully extended and locked.

Drift Pin Mechanism

The drift pin mechanism is installed in the middle of the cargo door. It decreases the contour off-set between the fuselage and the door when the A/C is pressurized.

Locking Mechanism

A lever mechanism operates the safety mechanism when the locking handle is pulled from the recess. The link rod connects the deflection unit with the handle bearing to transmit the sideward movement of the locking handle to the locking shaft. The shaft levers operate then the locking units which move their locking hooks into the locked or released position. The locked hooks stay in the overcenter position.

Interlock Mechanism

The interlock mechanism prevents the operation of the locking handle when the cargo door is still opened.
The spring unit moves the interlock lever to the blocked position so that its stop bolt touches the interlock cam.
At door–closing the interlock fitting in the door sill area will operate via roller lever and connecting rod the interlock lever with stop bolt.
Now the locking/ latching shaft is unblocked, the hooks can be closed.

Cargo Door Proximity Switches

On cargo compartment doors, because of the environmental conditions (pollution, no pressurization), proximity switches with a separate electronic system are used.
Signals from these switches are sent to the LGCIUs.

They transmit the indication of the position of the cargo compartment doors via the LGCIU 1 to the FWC.

The proximity switch on the door shaft sends a signal to the LGCIU 2 if the cargo door is released (handle in open locked position).
This enables the operation of the yellow electric hydraulic pump.

On bulk cargo doors proximity switches with built in electronic are used.

Open Mode

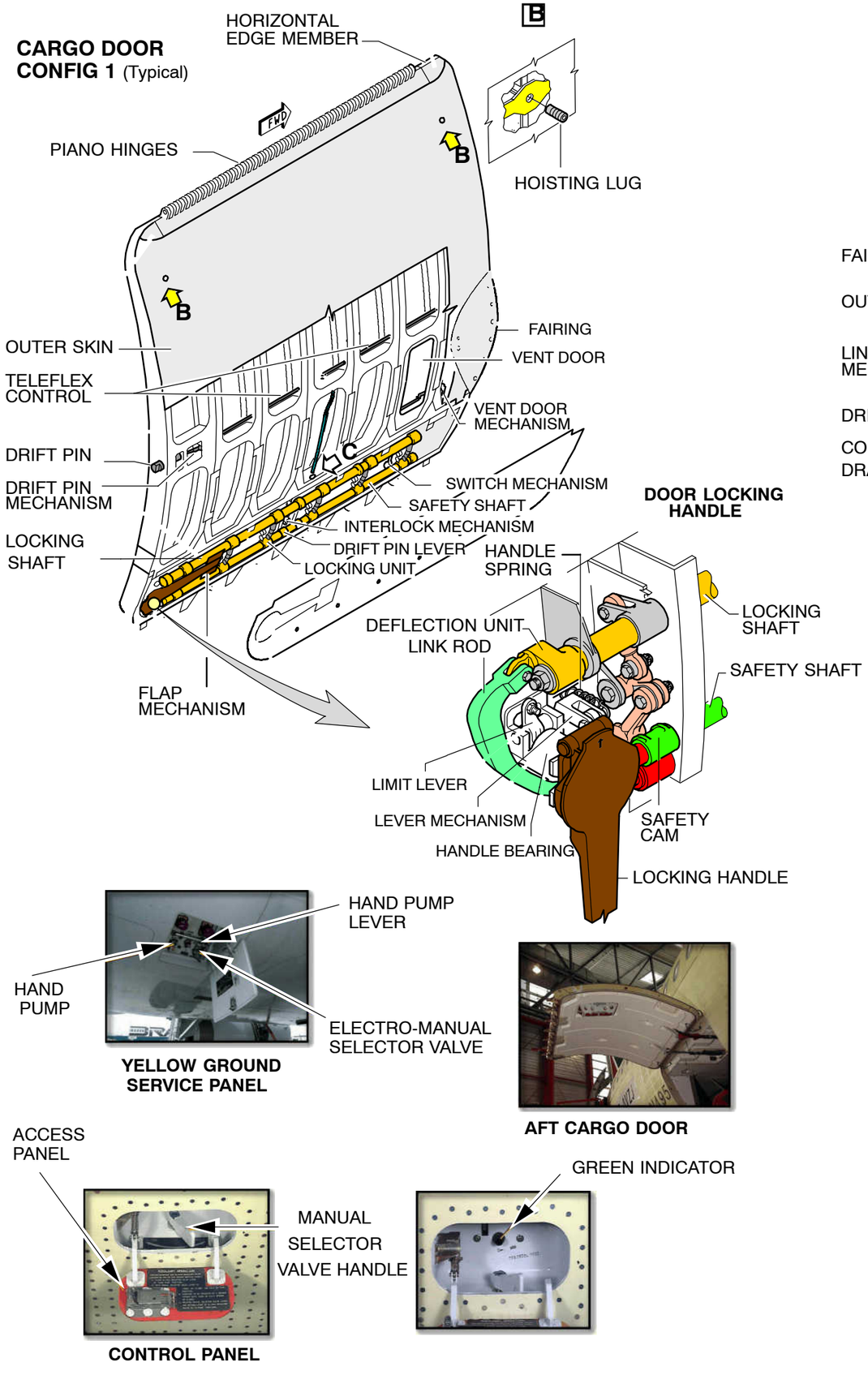
When the door locking handle is in the correct position it operates the proximity switch of the locking mechanism. The door control circuit is closed when the selector on the control panel is in the OPEN position. Then:

- the Electro (Manual) Selector valve opens,
- if the Manual Selector Valve moves in the extension mode, the yellow electric pump starts to pressurize the door hydraulic system.
  Then, the duplex door actuators extend until the cargo door is fully opened.

Manual Opening Procedure

The manual opening procedure of the cargo door is an alternative procedure which is used, when there is a failure in the electrical system or the electric pump fails.
To release the cargo door, put the door locking handle in the " unlocked " position as for the normal opening procedure.
To operate the door hydraulic system manually, two persons are necessary :
– one must turn and hold the selector on the control panel to the " Open " position during the whole procedure. To get access to the control panel, open the access panel beneath the fuselage.
– the other must open the access panel in the right, aft belly fairing area and operate the lever (if present) of the electro (manual) selector valve into the "Hand Pump" position and then operate the hand pump on the yellow ground service panel.

CARGO DOOR CONFIG 1 (Typical)



CARGO DOOR CONFIG 2 (Typical)

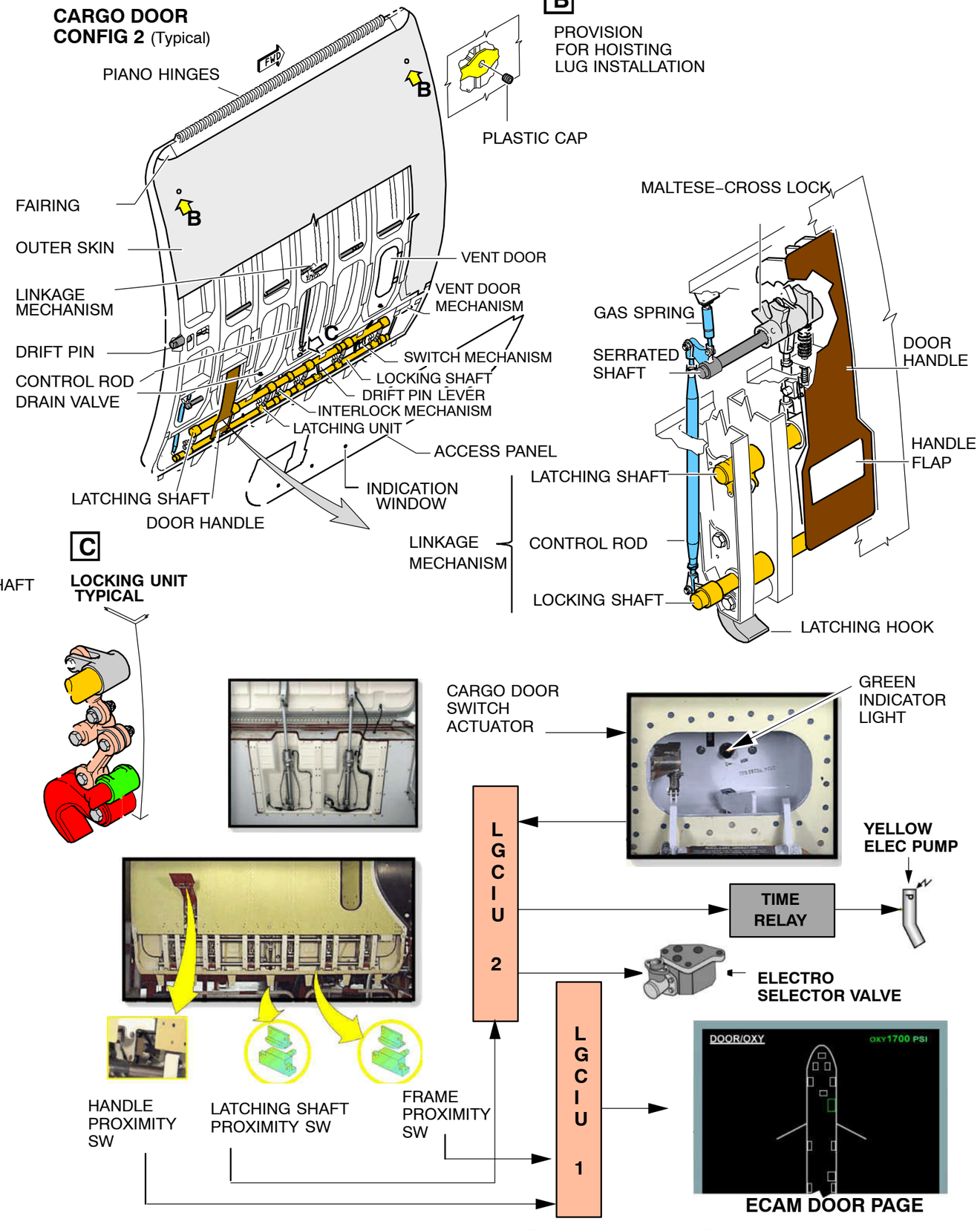


Figure 90 Cargo Doors Schematic

Reference to Figure 91 Cargo Compartment Door Hydraulic System Schematic

ATA 52 DOORS

52–36 CARGO COMPARTMENT DOOR HYDRAULIC SYSTEM

SYSTEM OPERATION

Manual Selector Valve

The manual selector valve is installed behind the control panel and controls the operation of the cargo door. This valve has an extension mode, a neutral mode, an interim mode and a retraction mode.

The extension mode makes sure that the HP (**H**igh-**P**ressure) fluid can flow through the valve to extend the door actuators.

In the neutral mode, the HP fluid can not flow through the valve.

For safety reasons, the interim mode pressurizes first the extension sides of the door actuators. This supports the unlocking of locking pawls within the door actuators and prevents a sudden movement of the cargo door to a lower position when it starts to close. When the pressure is sufficient, the valve can move in the retraction mode. The HP fluid then flows through the valve to pressurize the door actuators on the retraction sides.

Electro/Manual Selector Valve

The Electro-Manual Selector Valve is installed on the Yellow ground service panel of the aft, right belly fairing. The valve housing includes:

- a solenoid-operated control valve,
- a hydraulically operated main valve,
- a manually operated shut off valve with a control lever

The Electro-Manual Selector Valve controls the normal and the manual mode of the door hydraulic system. When the solenoid is energized, it moves the control valve in position which lets the HP fluid operate the main valve. The pressure puts the main valve in position and the HP fluid can flow to pressurize the door hydraulic system (normal mode). In this mode, the control lever stays in the ” E-Pump ” position. The control lever must stay in the ”Hand Pump” position to pressurize the door hydraulic system with the hand pump (manual mode). In this position, the shut-off valve prevents the hydraulic fluid flow through the electro manual selector valve directly in the return line.

NOTE: On new versions the control lever has been removed and the function is achieved automatically.

Electrical Control System

The electrical control system of the FWD and AFT cargo-compartment doors controls the sequence of the hydraulic operation. It is possible to open or close the FWD and the AFT cargo doors hydraulically at the same time. Each cargo door has a separate circuit. The electrical control system of the cargo door controls the door hydraulic system as follows:

- The in series-connected limit switches in the cargo door sill area send a signal to the Landing Gear Control and Interface Unit ”LGCIU 2”.
- The shaft proximity switch also sends a signal to tell the LGCIU 2 if the cargo door handle is in the correct position.
- If the manual selector valve is operated, its internal proximity switch also sends a signal to the LGCIU 2.
- The logic of the LGCIU 2 processes these signals and produces an output signal to operate the L/G position relay.
- When the aircraft is on ground, the L/G position relay transmits the LGCIU output signal to time relay.
- The time relay then energizes the solenoid of the electro (manual) selector valve.
- The time relay also enegizes the electric pump of the yellow hydraulic system which pressurizes the door hydraulic system.
- When this door control circuit is interrupted, the electro(manual) selector valve and the electric pump remain energized for 10 seconds.
- When the door actuators are locked internally, their internal proximity switches send a signal to the green indicator light which indicates that the cargo door is „OPEN and LOCKED“.

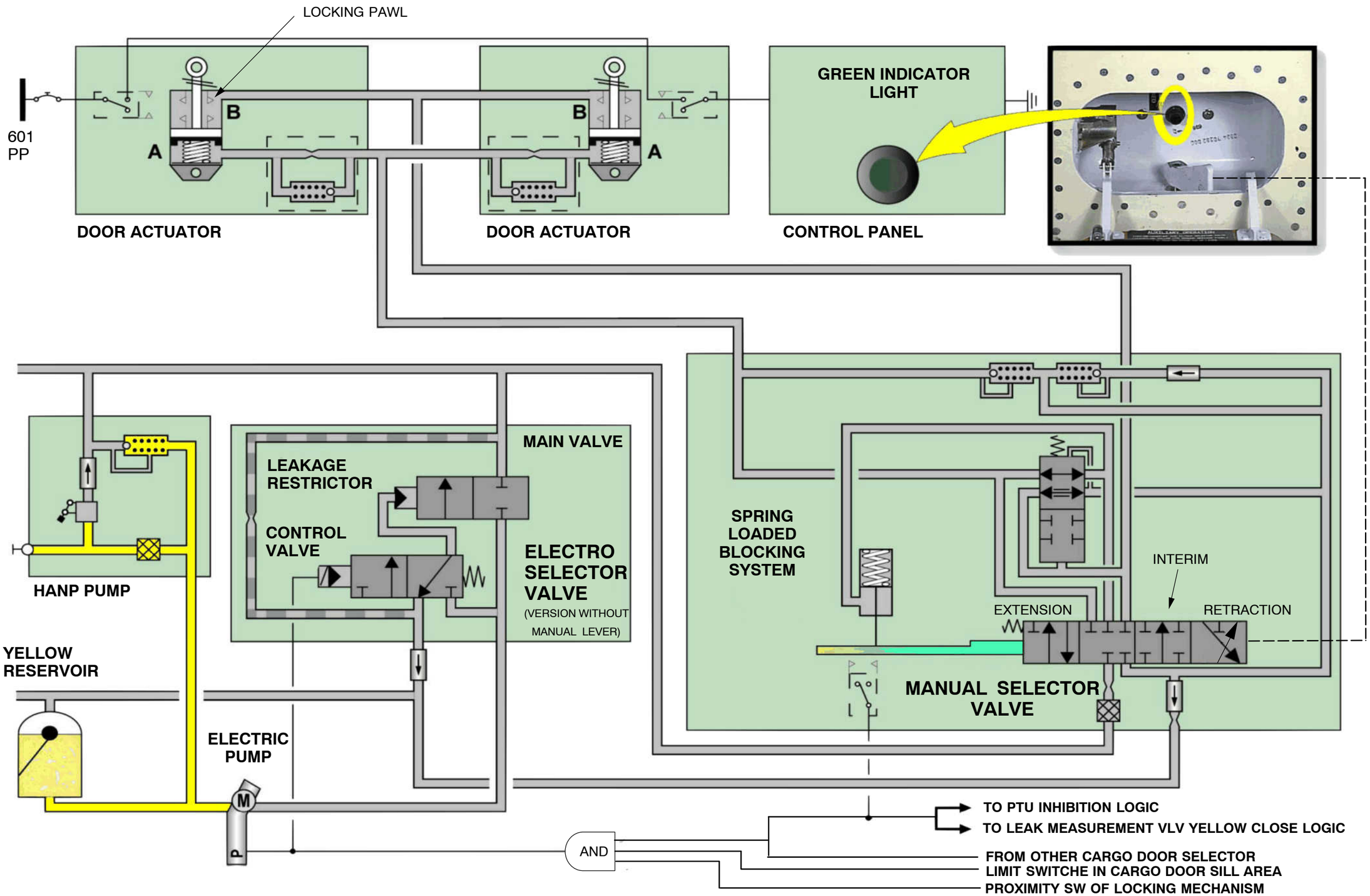


Figure 91 Cargo Compartment Door Hydraulic System Schematic