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Airbus
A318/A319/A320/A321

ATA 33
Lights

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Lufthansa Technical Training

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ATA 33 LIGHTS

33–00 LIGHTS-GENERAL

INTRODUCTION

The aircraft lighting system provides internal and external illumination.

The lighting system comprises the following subsystems :

- cockpit lights
- cabin lights
- cargo and service compartment lights
- exterior lights
- emergency lights.

Cockpit Lights (33–10)

The cockpit lighting system consists of general and instrument illumination.

Cabin Lights (33–20)

The cabin lighting system provides illumination of the entry areas, the cabin, the lavatories, the galleys and the attendant work areas.

Cargo And Service Compartment Lights (33–30)

The cargo and service compartment lighting system provides illumination of the cargo and service compartments. Electrical outlets are also provided for portable maintenance light connection.

Exterior Lights (33–40)

The exterior lighting system provides illumination of runway, taxiway, logo, engine air intake and wing leading edge for ice detection, navigation and anti–collision lights.

Emergency Lights (33–50)

The emergency lighting system provides illumination of the cabin, and the exit signs, if the main lighting system fails.

EPSUs (**E**mergency **P**ower **S**upply **U**nits) supply electrical power independently from the aircraft power supply.

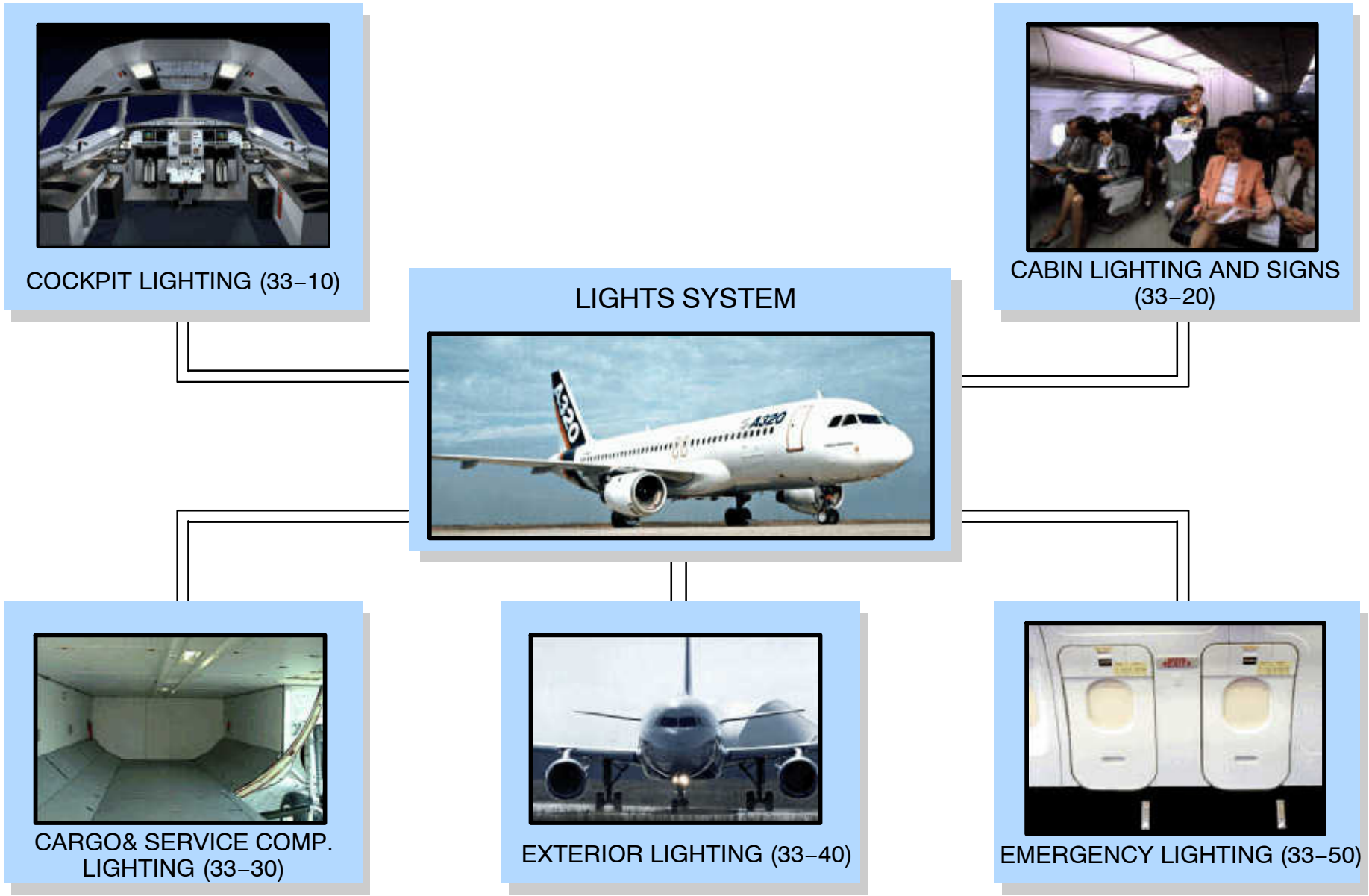


Figure 1 Lights General

33–10 COCKPIT LIGHTS

COCKPIT LIGHTS-DESCRIPTION

General

The cockpit light system consists of:

- general lighting of cockpit panel, instruments and work surfaces,
- integral lighting of panels and instruments,
- test system for annunciator lights,
- dimming system for annunciator lights.

The light system permits to see all equipment details, all inscriptions and indications easily, whatever the level of darkness. It is especially used at night for check lists.

The cockpit light system comprises:

- cockpit lighting: dome lights
- panel and instrument lighting: flood lights and lamps
- work surface lighting: reading lights
- console lighting: lamps
- integral lighting of VU panels and instruments
- lighting of annunciators and pushbuttons

There are also two electrical outlets in the cockpit.

DESCRIPTION

Flood Lighting

The flood lighting of captain, first officer and centre main instrument panels is ensured by four lights, located under the glareshield.

A flood light located on the overhead panel is used to illuminate the instruments and panels on the pedestal.

The CAPT, F/O and Centre lights illuminate only the instruments and the placards located in four zones of the main instrument panel (CAPT, LH CENTRE, RH CENTRE, F/O).

NOTE: In electrical emergency configuration, the lighting of the CAPT and LH CENTRE zones remains available. The pedestal flood light swivels towards the rear of the pedestal.

Reading Lights

The captain and the first officer reading lights are fitted on the upright of the cockpit side windows. Supplementary reading lights are located on the overhead panel.

The CAPT and F/O reading lights swivel in order to illuminate the captain and first officer sliding tables, the consoles and the ceiling if necessary. The supplementary reading lights swivel.

Panel/Inst Integral Lighting

The panel and instrument integral lighting allow the crew to read the corresponding indications during night flights or flights in stormy conditions.

This integral lighting consists of miniature lamps supplied by AC power from lighting controllers.

There are 3 independent controllers to supply integral lighting of

- the overhead panel,
- the instrument panels, consoles and the centre pedestal.
- glareshield and FCU (**F**light **C**ontrol **U**nit).

Each controller generates a variable low voltage current source with high intensity (from 0 to 5 Volts).

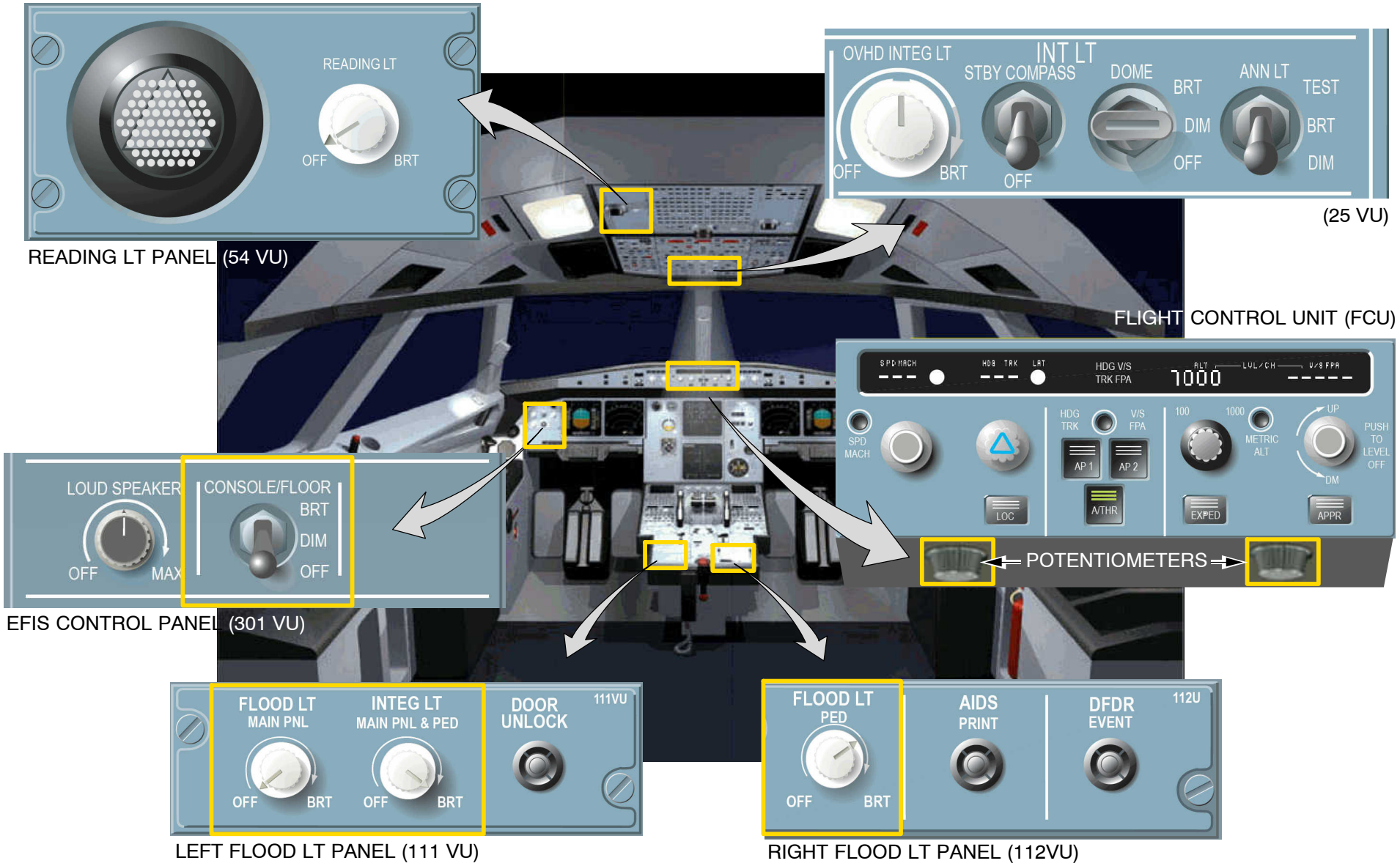


Figure 2 Cockpit Controls

Dome Light System

The cockpit lighting consists of two dome lights.

Each dome light has four halogen long life lamps.

NOTE: In electrical emergency configuration, the Dome light of the F/O side remains available, provided the dome light control is not set to OFF.

Console Lighting

Each console, briefcase and associated floor area are illuminated.

Three lights are used for each console lighting and one for each briefcase lighting. Four lights, fitted at the base of CAPT and F/O seats, are used for floor lighting.

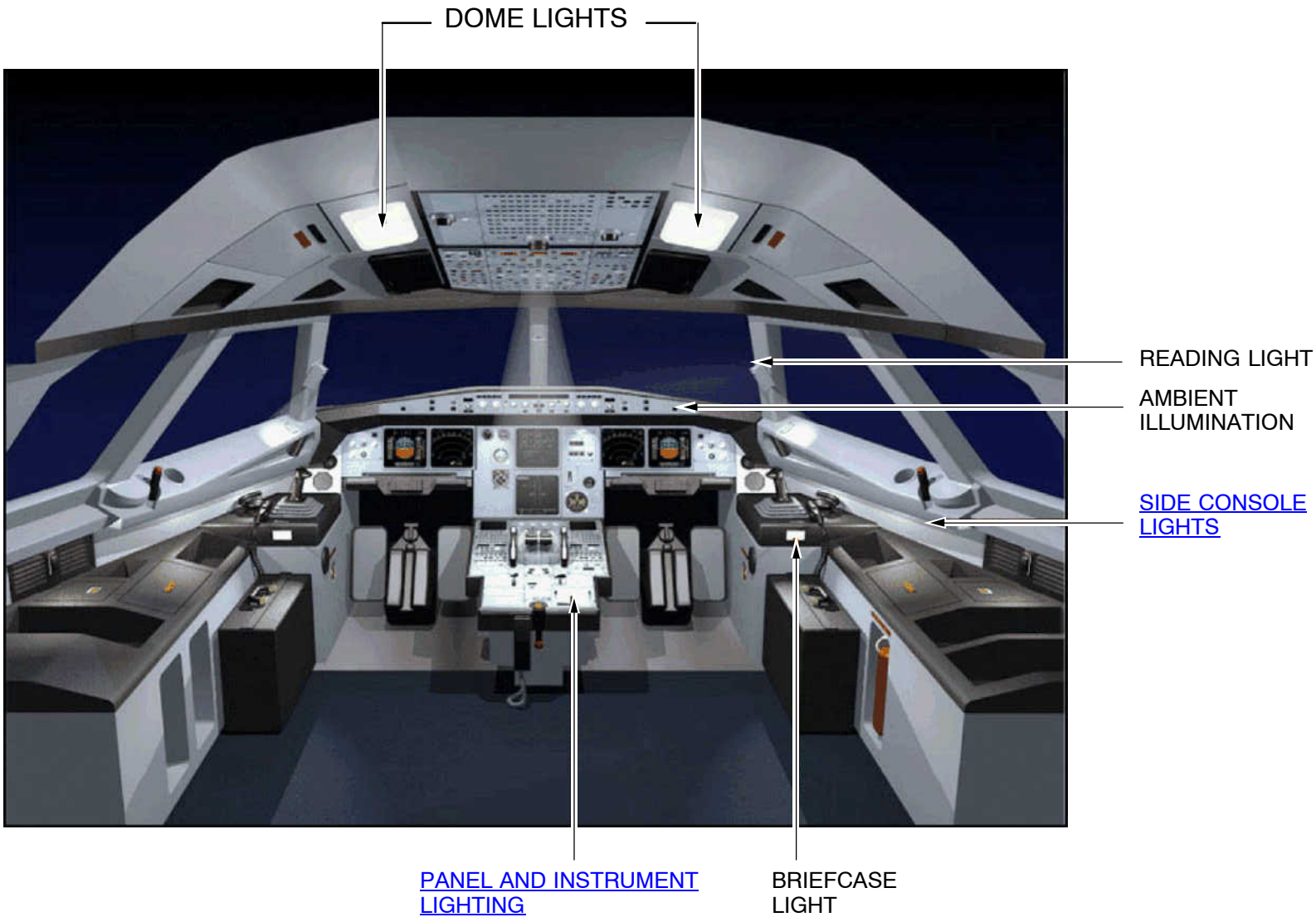


Figure 3 Cockpit Lights

DOME LIGHTS-OPERATION

The INT LT/DOME switch 14LE with 3 positions (OFF, DIM, BRIGHT) located on the overhead control and indicating panel 25VU controls the two dome lights.

Each dome light has four halogen long lasting lamps.

1. Normal Operation

When the INT LT/DOME switch 14LE is in the BRT position:

- the dome light in 453VU is supplied with 28VDC from busbar 601PP through circuit breaker 3LE on the rear C/B panel 122VU.
- the dome light in 452VU is supplied with 28VDC from essential busbar 401PP through circuit breaker 1LE on the overhead C/B panel 49VU.

When the switch is in the DIM position the light intensity decreases.

In the BRT position, the lights are supplied in parallel and in the DIM position they are supplied in series by groups of two.

2. Emergency Lighting

If the busbar 601PP is lost, only the dome light in 452VU on the cockpit right side remains on. It is supplied by essential busbar 401PP through circuit breaker 1LE.

In this configuration, the 3 positions: OFF, DIM and BRT of the switch 14LE are operational.

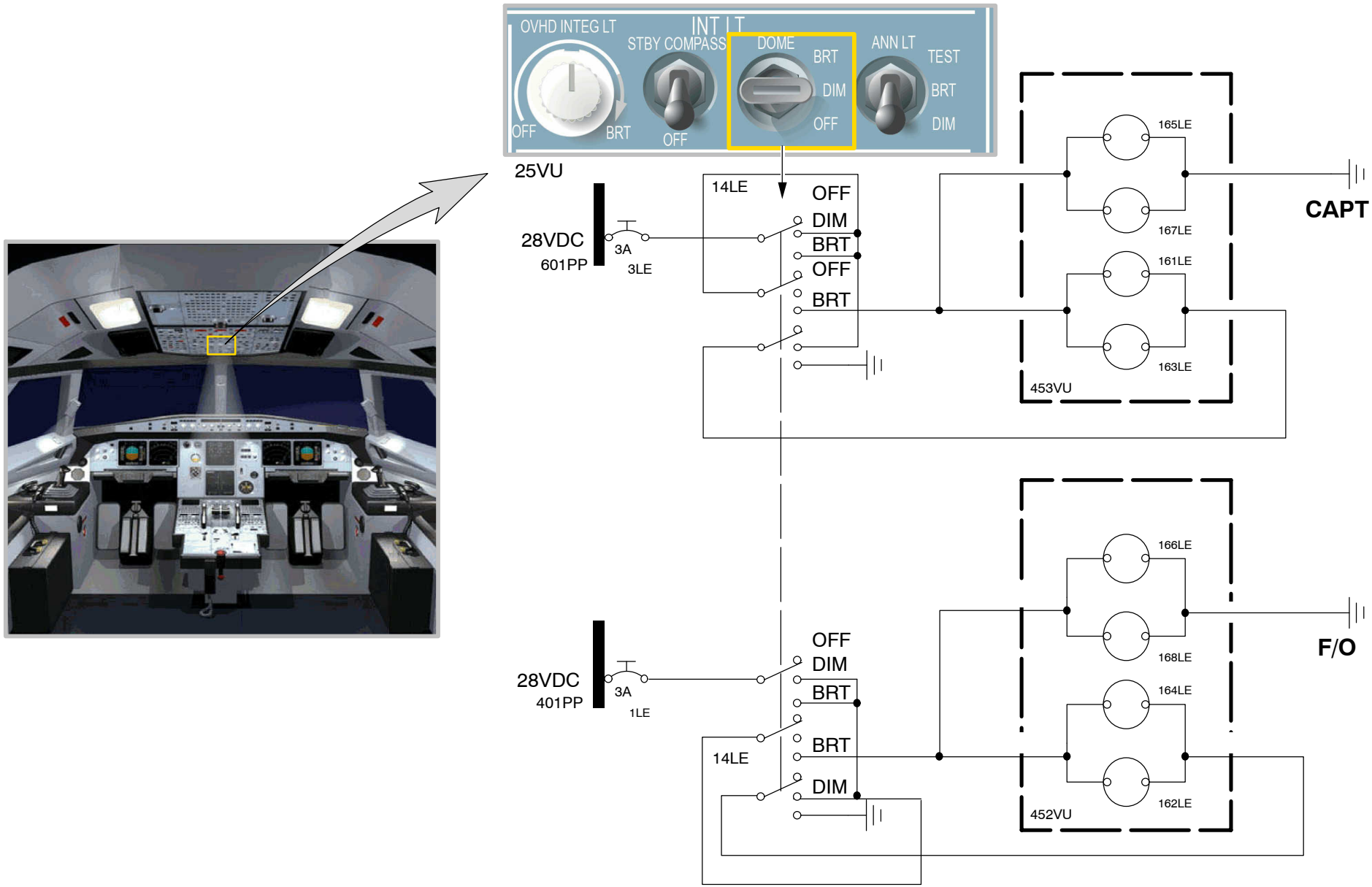


Figure 4 Dome Lights Schematic

CONSOLE AND FLOOR LIGHTING OPERATION

Four lights are used for the lighting of each console (3 for the console itself and 1 for the briefcase).

The associated floor lighting consists of four lights fitted at the base of the Captain and First Officer seats.

(1) Captain Console And Floor Lighting

The CONSOLE/FLOOR switch 15LE with 3 positions: OFF–DIM–BRT controls the 28VDC supply to these lighting systems.

The switch is located on the Captain lighting/loudspeaker control panel 301VU.

The normal busbar 103PP supplies the 8 lights through the circuit breaker 5LE located on the rear circuit breaker panel 122VU.

(2) First Officer Console And Floor Lighting

The CONSOLE/FLOOR switch 16LE with 3 positions:

OFF–DIM–BRT controls the 28VDC supply to these lighting systems.

The switch is located on the F/O lighting/loudspeaker control panel 500VU.

The normal busbar 204PP supplies the 8 lights through the circuit breaker 4LE located on the rear circuit breaker panel 122VU.

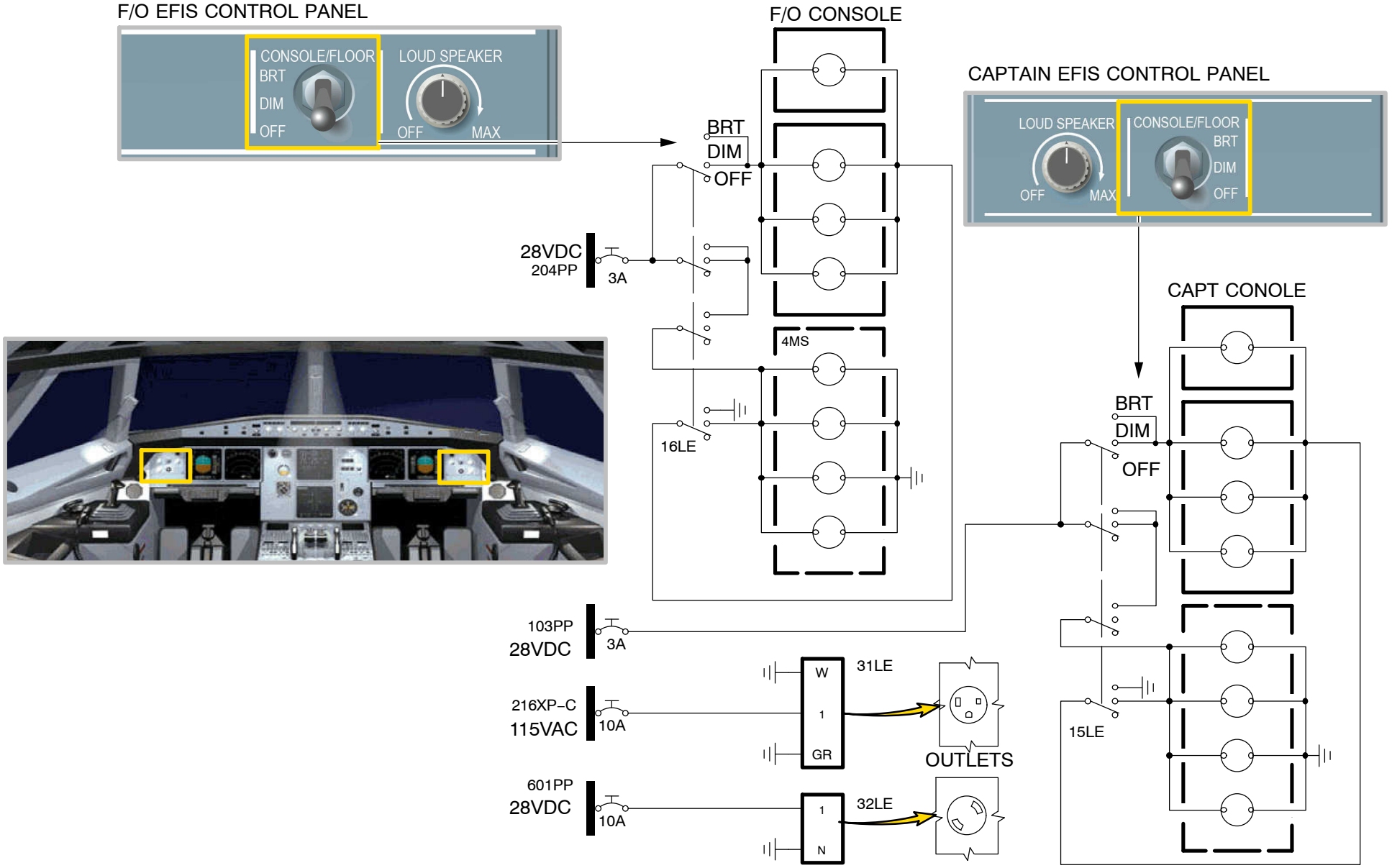


Figure 5 Side Console Lights and Cockpit Outlets Schematic

INSTRUMENT PANEL LIGHTING AND READING LIGHTS-OPERATION

INSTRUMENT PANEL LIGHTING

Three lights 36LE (First Officer), 37LE (Captain) and 38LE (center) provide the ambient lighting of the Captain, First Officer and center main instrument panels.

They are installed under the glareshield and illuminate only the instruments and the placards located on four zones of the main instrument panels:

- 2 zones at the ends of the main instrument panels, 301VU and 500VU,
- 2 zones on the center instrument panel:

  One on the left side which has the emergency equipments, one on the right side which has items of equipment such as the landing gear control lever, clock, the landing gear control and indicating panel 402VU etc.

The single control dual rheostat 35LE located on the center pedestal on the FLOOD LT/INTEG LT panel 111VU controls these lights:

- The first rheostat controls:
  - The brightness of the 11.5W halogen lamps of the First Officer light 36LE:
  - the section of the center instrument panel light 38LE which illuminates the right zone. The normal busbar 103PP supplies the lamps with 28VDC through circuit breaker 2LE located on rear circuit breaker panel 122VU.
- The second rheostat controls:
  - The brightness of the 11.5W halogen lamps of the Captain light 37LE and the section of the center instrument panel light 38LE which illuminates the left zone (standby equipment).

READING LIGHTS

Captain And First Officer Reading Lights

The two reading lights are fitted on the upright of the side windows of the cockpit. They swivel and illuminate the sliding tables of the Captain and First Officer, the consoles and the ceiling if necessary.

Each reading light has:

- a 11.5W, 28V halogen bulb of the long lasting type (2000 hours),
- a rheostat which provides the three functions OFF – DIM – BRIGHT,
- a variable diameter diaphragm to reduce or increase the lighted surface (the diameter varies from 100 mm to 350 mm).

NOTE: Very often this light is named incorrectly as map light,

Supplementary Reading Light (First Officer)

The supplementary reading light 29LE is equipped with a long lasting halogen lamp and swivels. The READING LT rheostat 30LE is used to control the reading light brightness.

Center Pedestal Light

The center pedestal light 27LE is equipped with a 11.5W long–lasting lamp. It swivels towards the rear of the pedestal.

The FLOOD LT/PED rheostat 28LE is used to control the light brightness.

Second Supplementary Reading Light (Captain)

The installation of the second supplementary reading light 29LE in 54VU, its power supply (103PP) and control (rheostat 30LE) are identical to those of the first supplementary reading light.

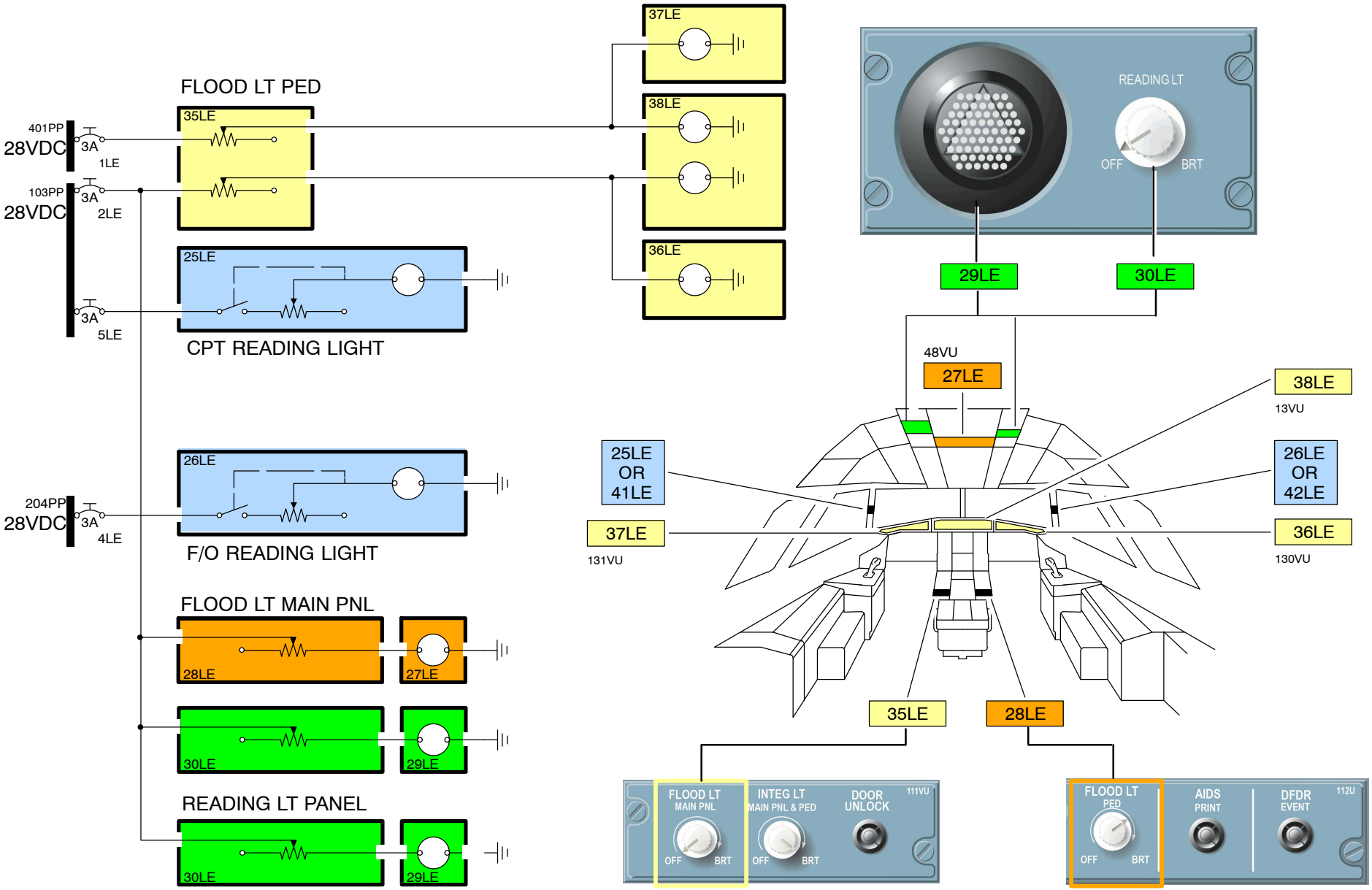
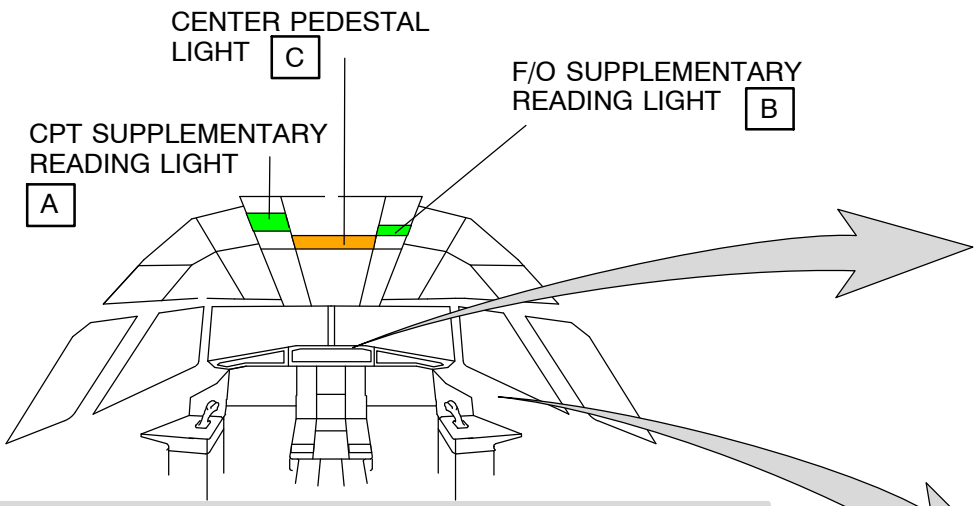
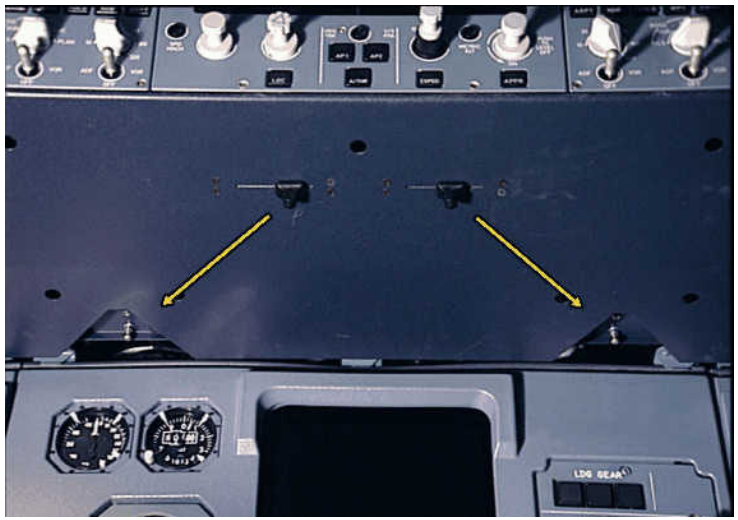


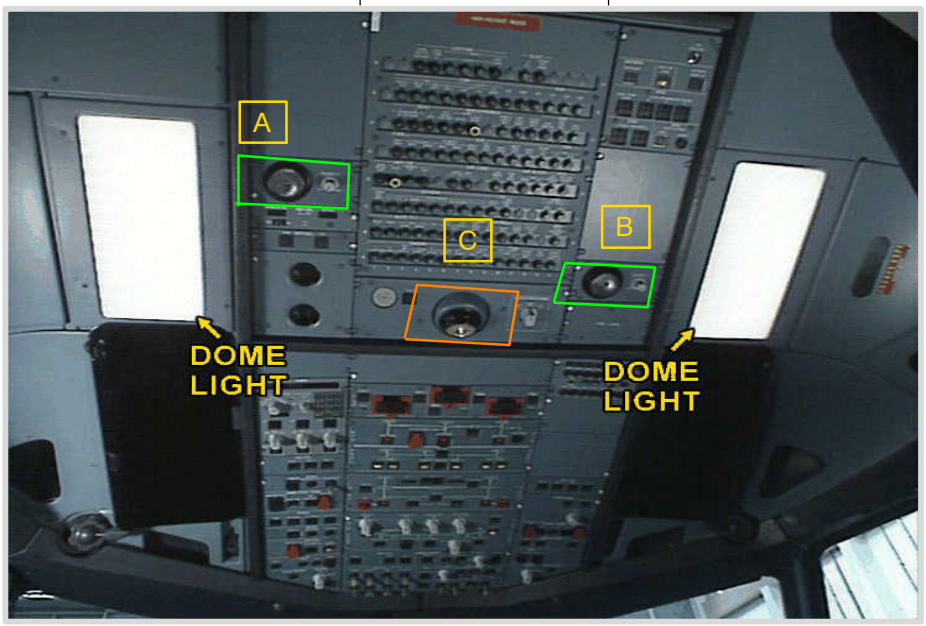
Figure 6 Instrument Panel Lighting and Reading Lights Schematic

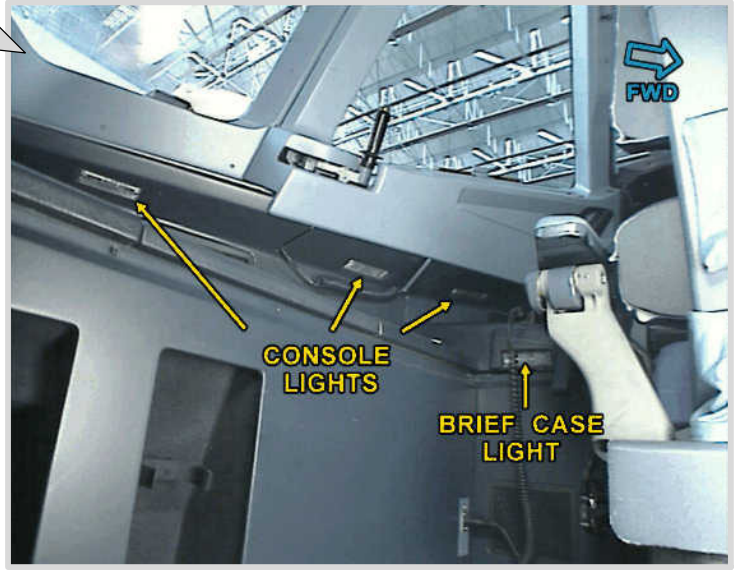
DOME LIGHTS/READING LIGHTS-LOCATION





FCU INTEGRAL LIGHTING





CONSOLE& BRIEF CASE LIGHTS

Figure 7 Cockpit Lights Location

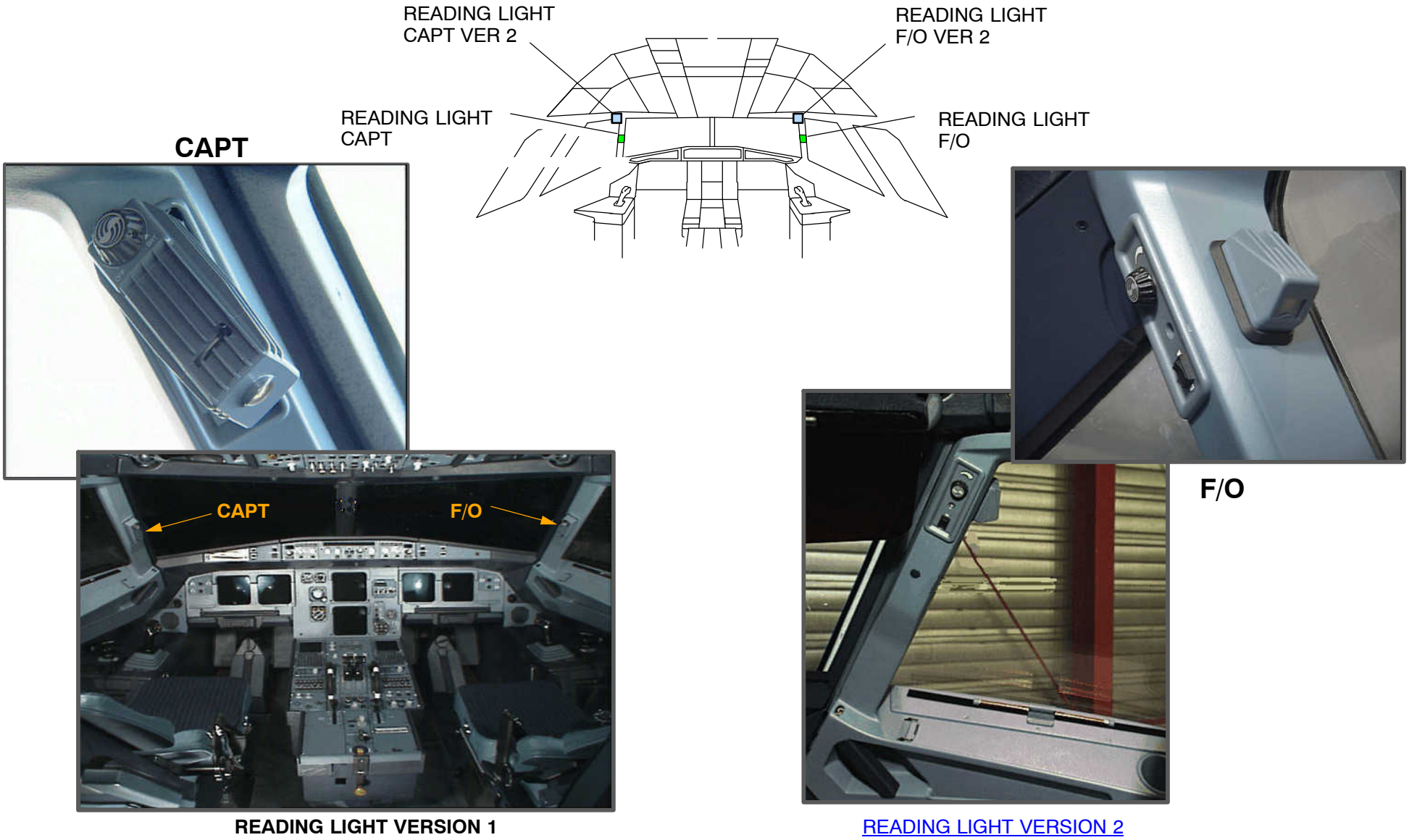


Figure 8 Reading Lights Location

PANEL/ INST INTEGRAL LIGHTING-OPERATION

The panel and instrument integral lighting allow the crew to read the corresponding indications during night flights or flights in stormy conditions.

This integral lighting consists of miniature lamps supplied by AC power from lighting controllers.

There are 3 independent controllers to supply integral lighting of

- the overhead panel,
- the instrument panels, consoles and the centre pedestal.
- glareshield and FCU (**F**light **C**ontrol **U**nit).

Each controller generates a variable low voltage current source with high intensity (from 0 to 5 Volts).

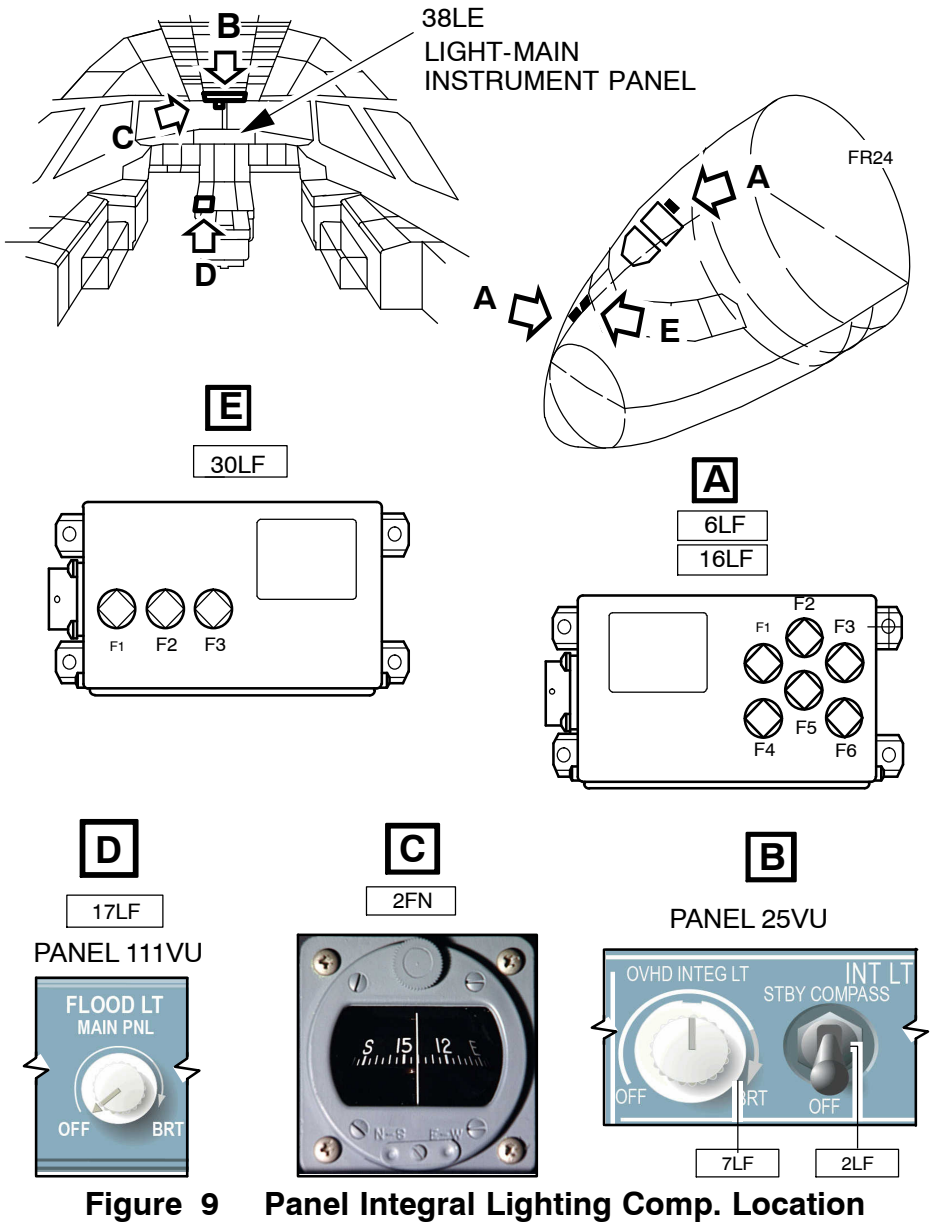


Figure 9 Panel Integral Lighting Comp. Location

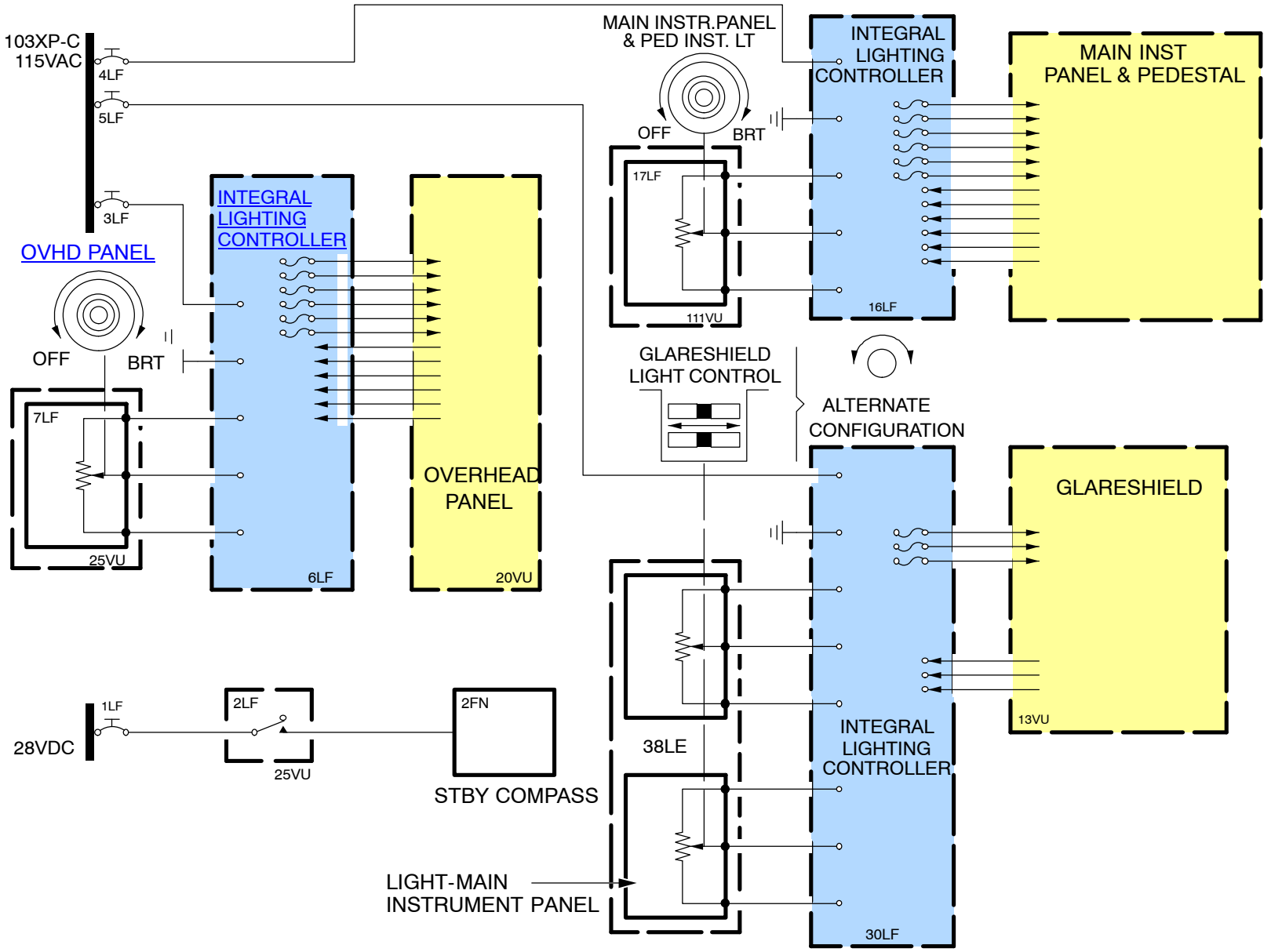


Figure 10 Panel Integral Lighting Schematic

ANNUNCIATOR LIGHT TEST AND DIMMING-DESCRIPTION

General

Bulbs supplied with 5VAC–400Hz are used for the lighting of the sun readable lights in the cockpit. The current is delivered by the 115V/5V transformers. Each light is parted in two sections; each one has two 5V bulbs.

An annunciator light test switch permits illumination of all annunciators and therefore check of all lights.

Switch 33LP

A switch with 3 positions: DIM, BRT, TEST is located on the overhead control and indicating panel 25VU.

System Description

Miniature lamps (115 mA, 5VAC) are used for the lighting of the annunciator lights mounted on the panels and instruments in the cockpit.

A relay (system) or internal contacts (case of ON–OFF position indication pushbutton switches) control illumination of each annunciator light. Four different busbars:

- AC1 supply: 103XP
- AC2 supply: 202XP
- 115VAC STAT INV BUS: 901XP
- Essential supply: 801XP

supply the annunciator lights with 5VAC–400Hz through the transformers. In the case of emergency supply only busbar 901XP is serviceable.

The system comprises

- Four Identical Transformers
- Five Circuit Breakers
- Switch 33LP
- Fourteen Annunciator Light Test and Interface Boards
- Four–Stage Relays

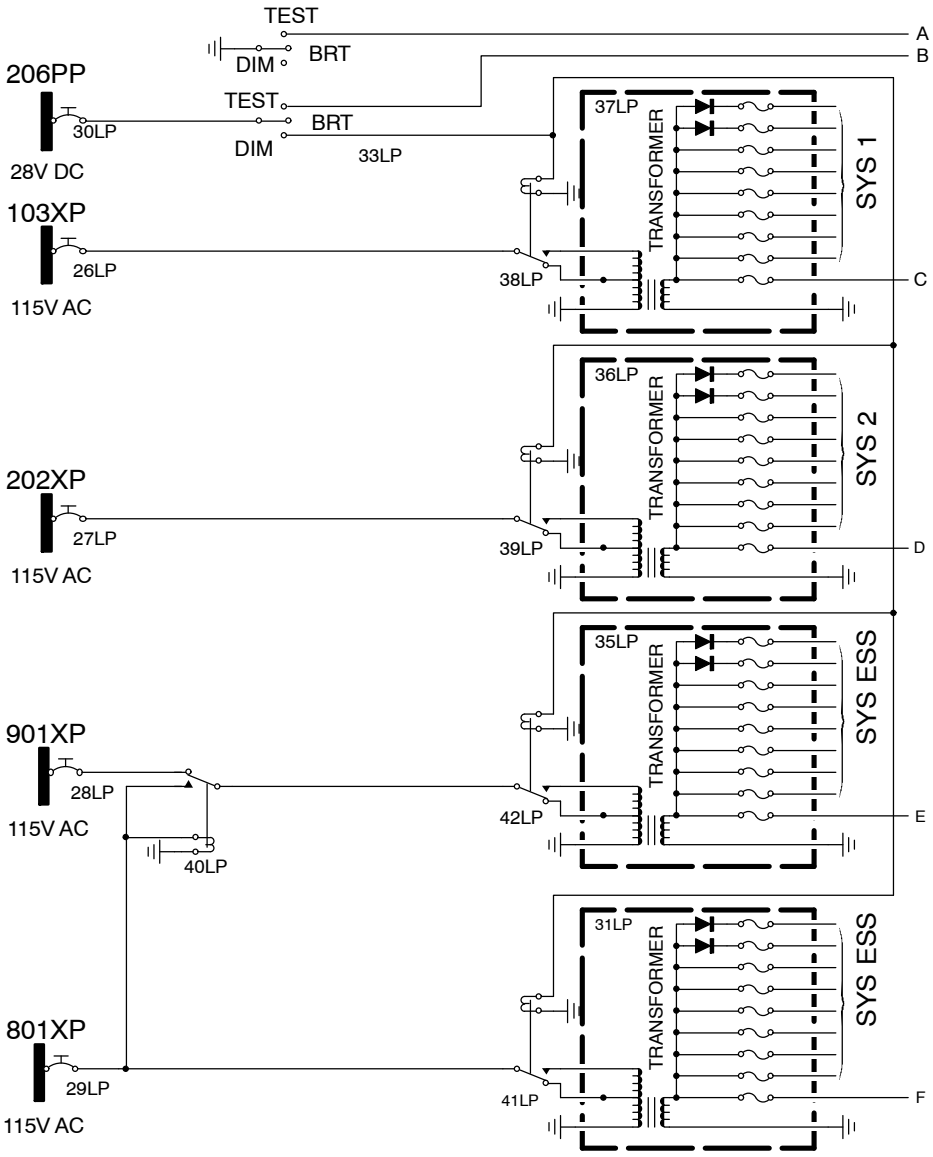


Figure 11 Annunciator Light Test & Dimming Schematic

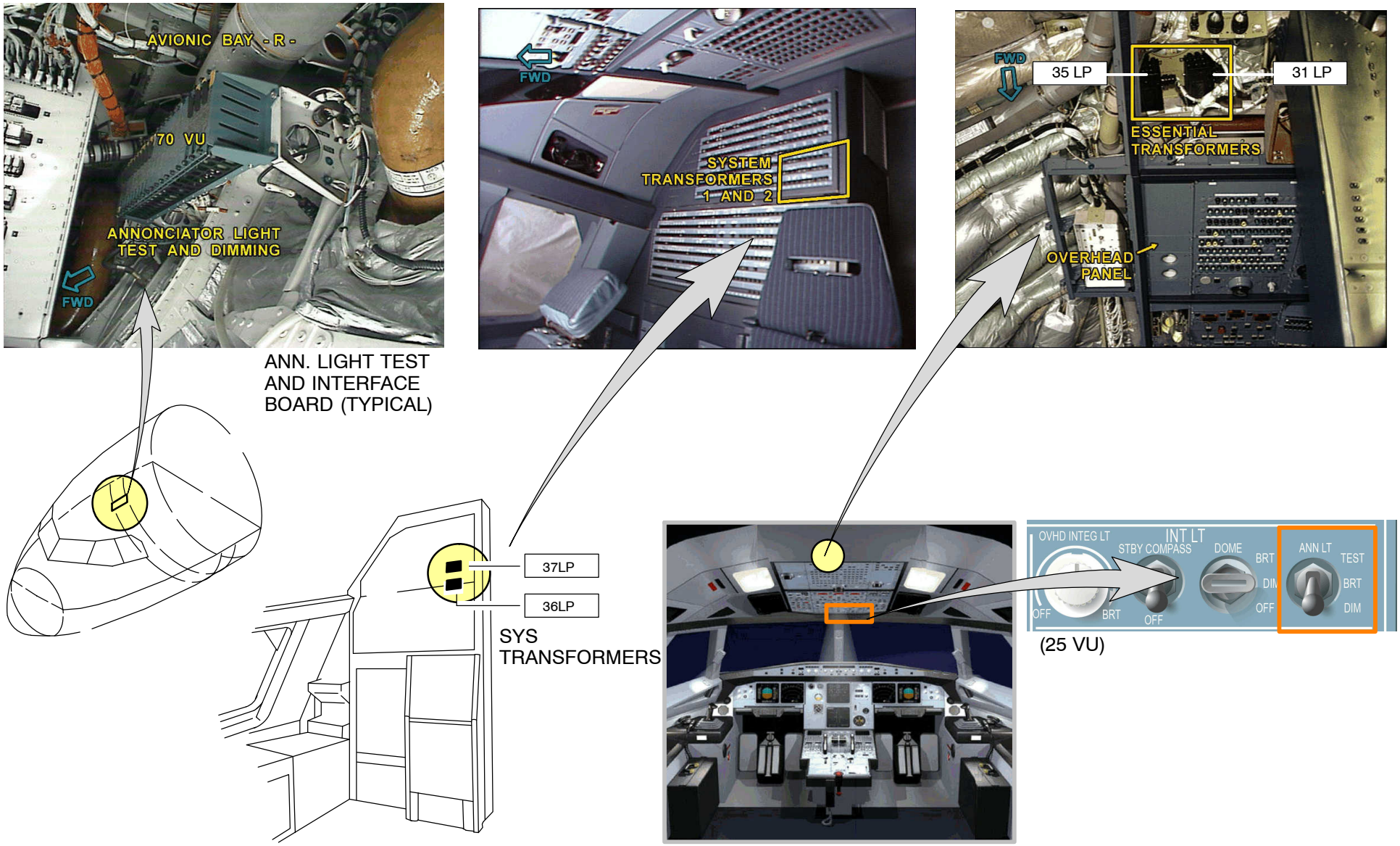
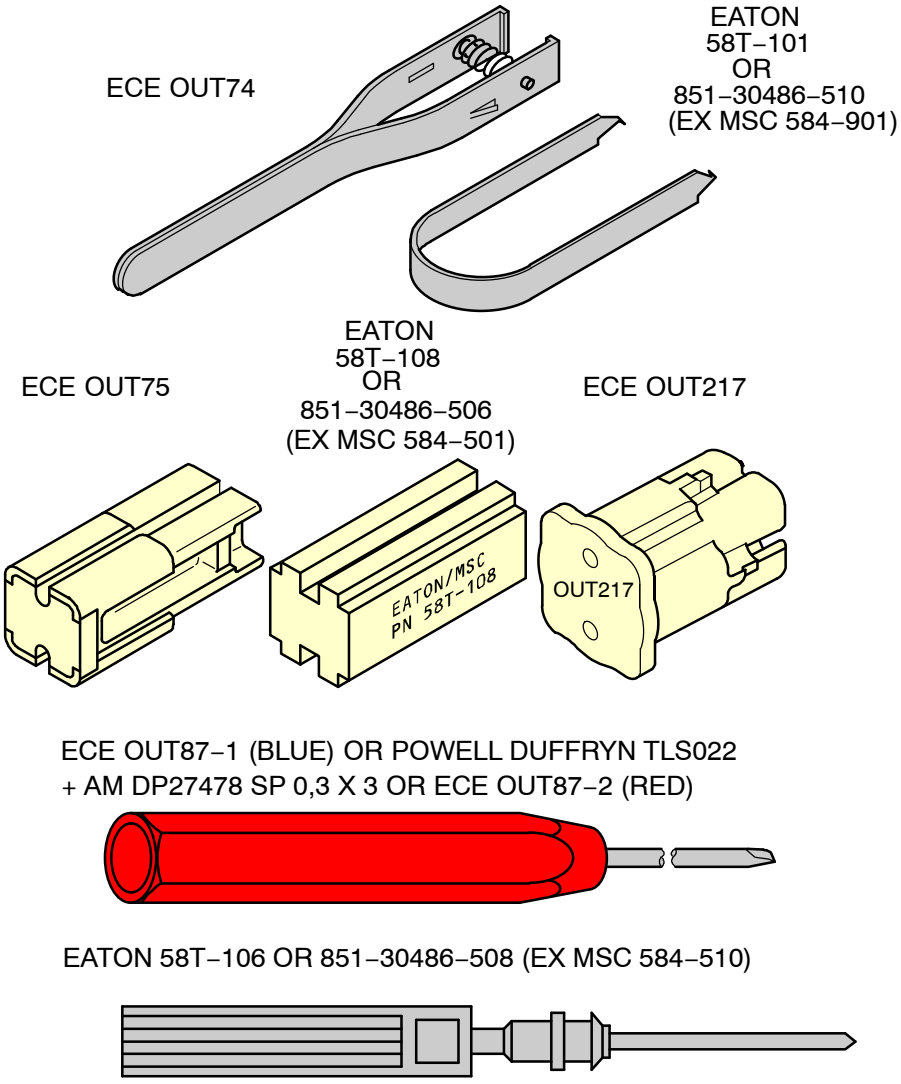


Figure 12 Annunciater Light Test & Dimming-Location

SPARE BULB BOX AND ANN. LIGHT LOCATION



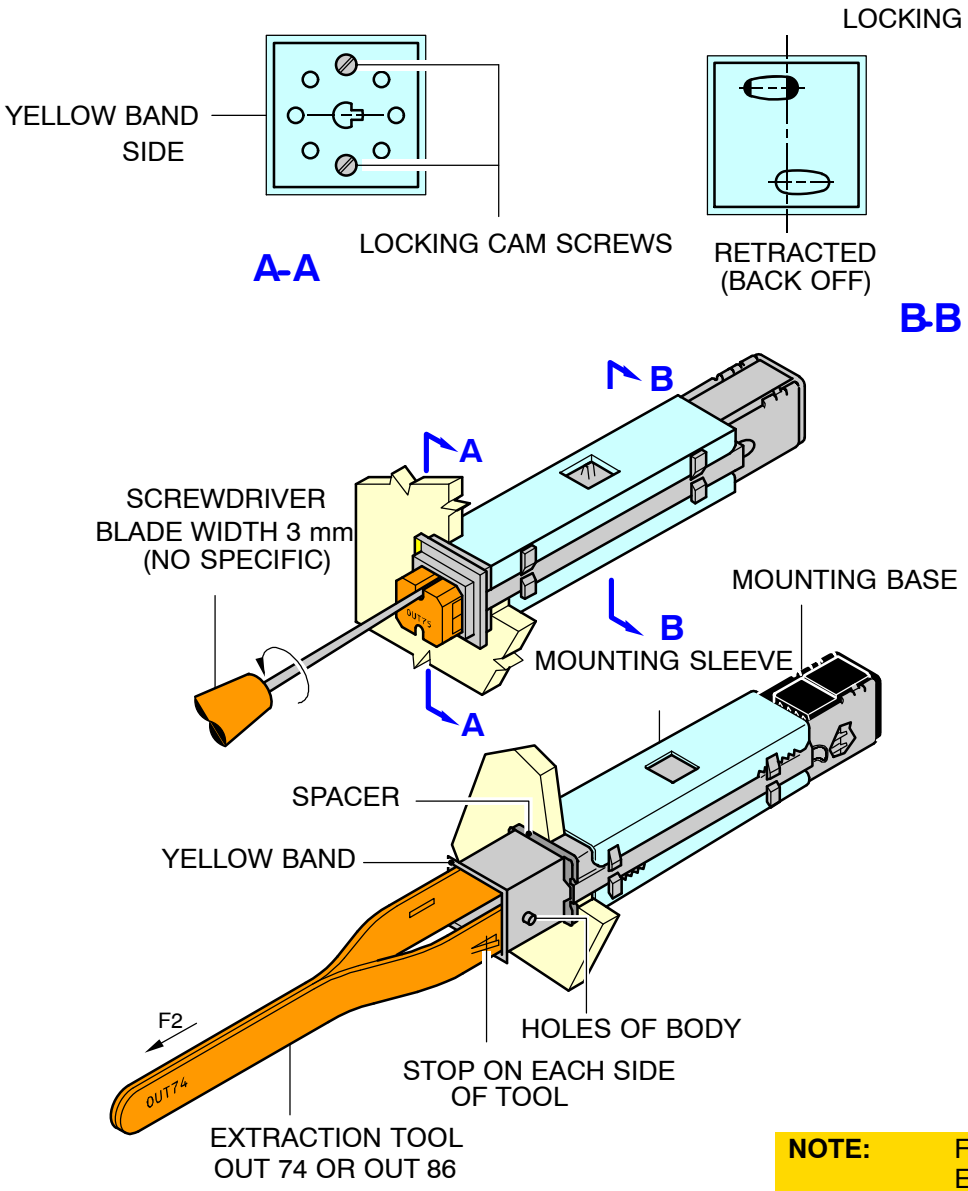
– THESE TOOLS ARE USED TO REMOVE THE HEAD.

– THESE TOOLS ARE A SCREWDRIVER GUIDE.

– THESE DYNAMOMETRIC SCREWDRIVERS ARE USED TO INSTALL PUSHBUTTON BODY.

Figure 13 Switch and Indicator Light Tools

SPARE BULB BOX



NOTE: For further details refer to ESPM 20–45–11 (Airbus)

Figure 14 Spare Bulb Box and Ann. Lt. Removal/Installation

ANNUNCIATOR LIGHT TEST AND DIMMING-OPERATION

General

One adjustment light selector serves to test and to adjust the brightness of all annunciator lights.

- TEST

  All annunciator lights illuminate. All LCDs (**L**iquid **C**rystal **D**isplays) indicate ”eight”. On PFD (**P**rimary **F**light **D**isplay), ND (**N**avigation **D**isplay) and ECAM all flags appear.

- BRT

  Full intensity.

- DIM

  The annunciator light power supply voltage is reduced.

Lamps supplied with 5VAC–400Hz are used for the lighting of the sun readable lights in the cockpit. The current is delivered by the 115/5VAC transformers. Each light is divided in two sections; each one has two 5V lamps. An annunciator light test permits illumination of all annunciators and therefore check of the operation of all lights.

Supply

Four different busbars:

- SYS 1 supply: 103XP,
- SYS 2 supply: 202XP,
- Essential supply: 901XP,
- Essential supply: 801XP,

supply the annunciator lights with 5VAC–400Hz through the transformers. In the case of emergency supply only the busbar 901XP is serviceable. The system comprises:

- Four Stage Relays

  They are located on removable cards in the box 70VU(mid, right avionics compartment). They are used for the test of the annunciator lights on the equipment (high intensity).The busbar 206PP supplies 28VDC to the coil of these relays through the circuit breaker 30LP located on the circuit breaker panel 122VU and through the switch 33LP in the TEST position.

- Four Identical Transformers

  They are supplied with 115V–400Hz.

  Each one is connected to a different busbar.

  They supply 5VAC–400Hz for the annunciator lights installed on the overhead panel and on the instrument panel and 4.3V / 6.3V current (full wave rectified) to supply the AUTO LAND, MASTER WARNING and CAUTION lights and ACP (**A**udio **C**ontrol **P**anels).

  The secondary winding of each transformer has:

  – seven 3V / 5VAC outputs mounted in parallel ; each one is protected by a delayed action quick removable fuse set at 4A,

  – two 4.3V / 6.3V outputs protected by the same type of quick removable fuse.

  The primary winding of each transformer has two inputs to get the correct dimming level (DIM position).

  If the 115V supply is switched over to either input the secondary winding delivers:

  – the 5VAC,or

  – the 3VAC for alternating voltages,

  – the 6.3VAC or 4.3VAC for rectified voltages.

  These four transformers are in the cockpit.

- Ann. Light Test and Interface Board (14 Places in 70 VU)

  Each board contains 10 relays for the annunciator light control and one test relay.

  The location of 70 VU is in the mid right avionics compartment.

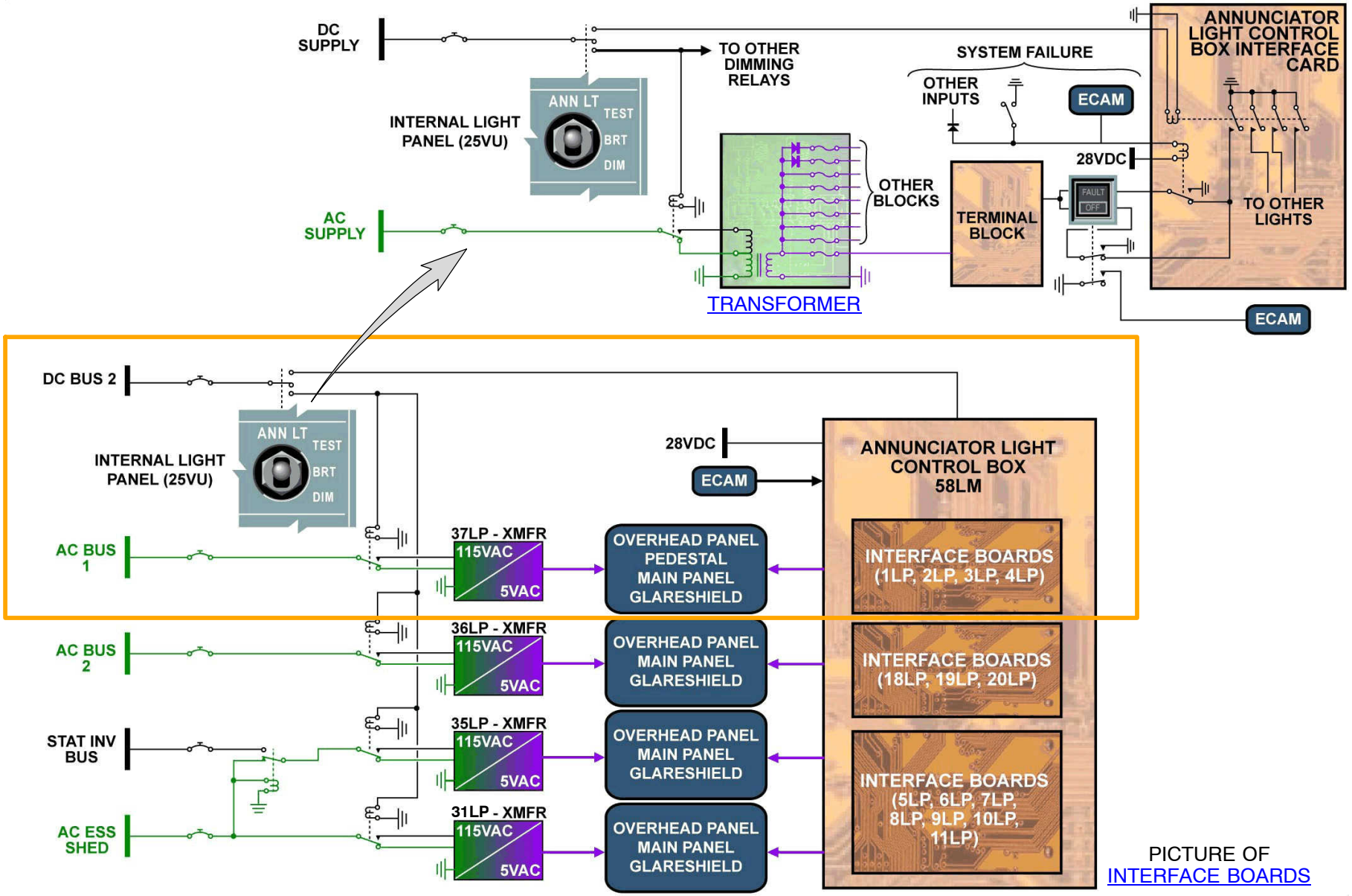


Figure 15 Annunciator Lights Test and Dimming Schematic

33–20 CABIN LIGHTS

CABIN LIGHTS-DESCRIPTION

General

The cabin lighting system illuminates the cabin, the entrances, the lavatories, the galley and the attendant work areas.

The system has these sub–systems:

- General Illumination (Ref. 33–21–00)
- Call System (Ref. 33–23–00)
- Lavatory Lighting (Ref. 33–24–00)
- Passenger Reading Lights (Ref. 33–25–00)
- Lavatory Lighted Signs (Ref. 33–26–00)
- Cabin Attendant Work–Lights (Ref. 33–27–00).

NOTE: The Call System and the lighted signs NO SMOKING, FASTEN SEAT BELT and RETURN TO SEAT (NS/FSB/RTS) are part of the CIDS (**C**abin **I**ntercommunication **D**ata **S**ystem)

(Ref. 23–73–00)

Cabin General Illumination

The general illumination consists of fluorescent tubes installed in the hatracks and the ceiling panels. In each cabin zone the four strips are divided into two groups for control purposes.

Group I: Lighting strips on the outer side of the lateral hatracks (WINDOW LIGHTS).

Group II: Lighting strips in the ceiling panels (inboard side) (CEILING LIGHTS).

The entry areas illumination consists of fluorescent tubes installed on the entrance area ceiling panels.

The cabin attendants control the general illumination through the FAP (**F**orward **A**ttendant **P**anel) and the AAP (**A**dditional **A**ttendant **P**anel(s)), which are part of the CIDS

Lavatory Lighting

The lavatory lights are installed above each lavatory door.

A microswitch, installed at each lavatory door controls the brightness of the lavatory lighting system and the indication signs.

Passenger Reading And Cabin Attendant Work Lights

The passenger reading and cabin attendant work lights are high intensity lights.

Attendant work lights are installed at each attendant station.

Each passenger seat is provided with a reading light installed in the PSU (**P**assenger **S**ervice **U**nit).

Passenger Lighted Signs

There are four passenger lighted signs:

- The LAVATORY OCCUPIED sign
- The FASTEN SEAT BELT sign
- The NO SMOKING sign
- The RETURN TO SEAT sign.

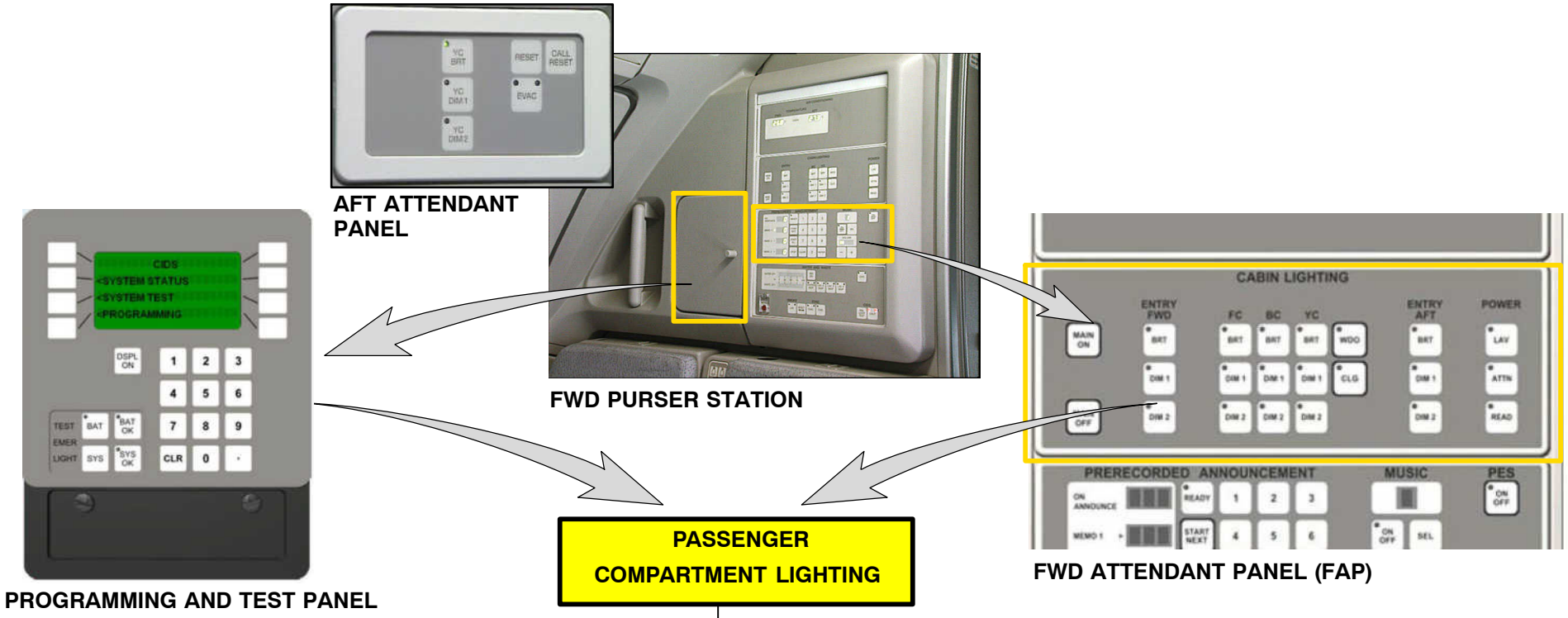


Figure 16 Cabin Lights General

CABIN LIGHTS SYSTEM-DESCRIPTION

General

The cabin lights are controlled through the CIDS (**C**abin **I**ntercommunication **D**ata **S**ystem) which includes a FAP (**F**orward **A**ttendant **P**anel), two directors (DIRs) one active and one in standby, and DEUs (**D**ecoder/**E**ncoder **U**nits). Some DEUs are used for the light system, they are called type ”A” DEUs. Signals from the FAP are processed by the DIRs to control the cabin lights. The DIRs transmit these signals to each DEU.

Cabin General Lights

The related DEUs control the cabin fluorescent lamps according to the selection on the FAP. The FAP controls the DEUs via the CIDS DIRs to give brightness (BRT) levels which are: full or 100% BRT, 50% BRT (Dimming 1) and 10% BRT (Dimming 2) for their related window and/or ceiling lights.

Entry Lights

The related DEUs control the entry fluorescent lamps according to the FAP selection. The FAP controls the DEUs via the CIDS DIRs in order to give BRT levels (100%, 50% or 10%).

NOTE: If the engines are running and the cockpit door is open, the CIDS directors signal the DEU of the left forward entry light to set the intensity to 10%.

Passenger Reading Lights

There is one light for each passenger seat. Each passenger reading light is controlled with an integrated pushbutton.

The FAP controls the activation of the passenger reading lights. The related DEU supplies DC control power (28V DC) for individual switching. The power unit receives 115V AC for the light operation. The test of the passenger reading lights is done via the DEUs, using the PTP (**P**rogramming and **T**est **P**anel).

Attendant Work Lights

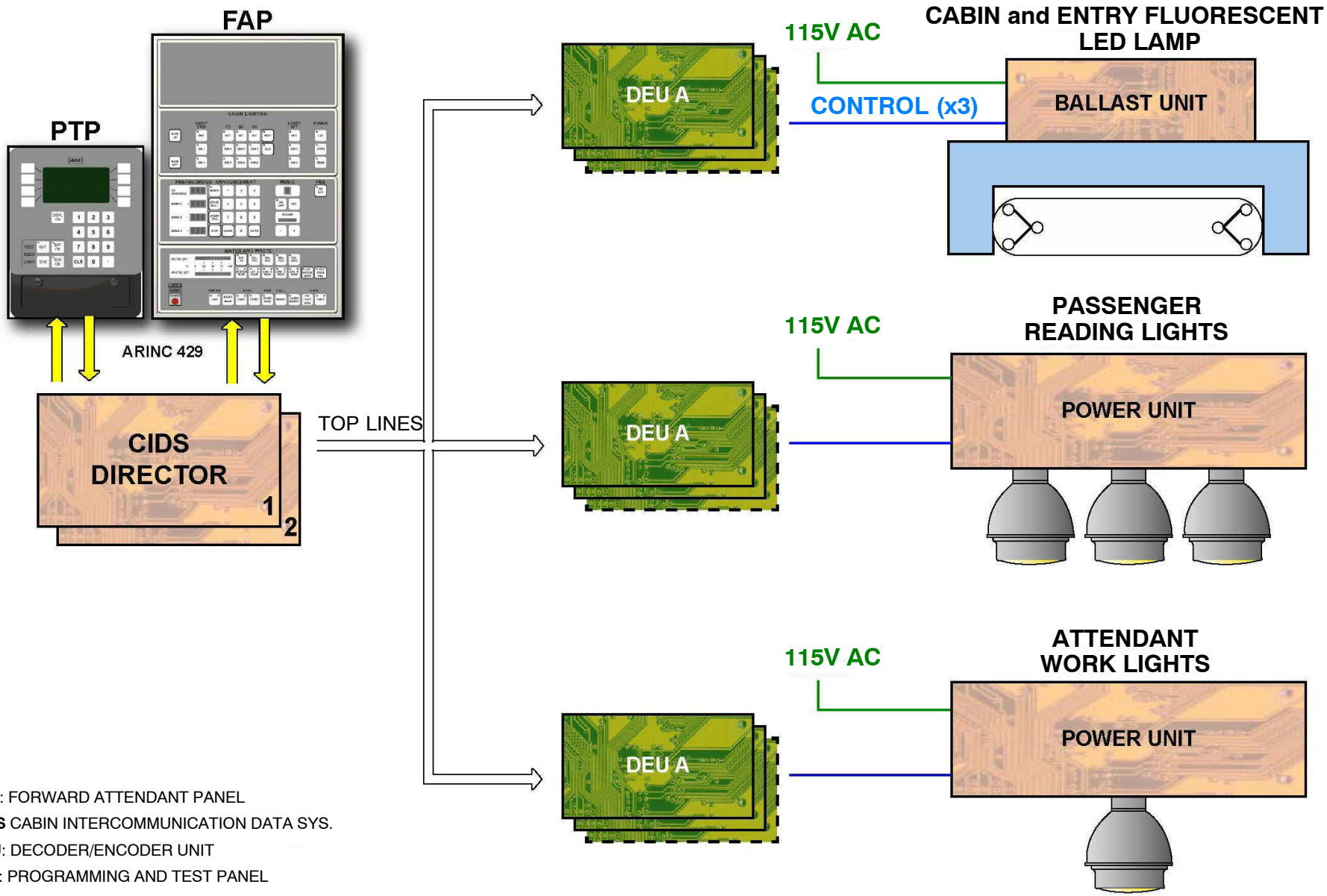
The FAP controls the activation of the attendant work lights. The power units are installed in the overhead panels above the cabin attendant seats, and receive 115V AC for the light operation. Each power unit is connected to a DEU of the CIDS DIRs for light test activation, using the PTP.

Option: LED cabin lights

The general illumination system has **Cabin LED Units (CLEDUs)** which are installed in the ceiling panels along the center aisle (CEILING lights), above the windows (WINDOW lights) and at each entrance.

The cabin lamps are divided in four lighting strips throughout the cabin zones. The four lighting strips in each cabin zone are divided into two pairs for control purposes. The two outboard strips are designated as WINDOW (WDO) lights and the two center strips as CEILING (AISLE) lights. The system is designed so that the window and ceiling lights in the cabin zone can be on together or separately.

When on, the CLEDUs can be set to 100% (BRT), 50% (DIM1) or 10% (DIM2) intensity. The units are supplied with 115VAC from busbars 212XP and 214XP. The lighting system is controlled from FAP 120RH and AAP 126RH.



FAP: FORWARD ATTENDANT PANEL
CIDS CABIN INTERCOMMUNICATION DATA SYS.
DEU: DECODER/ENCODER UNIT
PTP: PROGRAMMING AND TEST PANEL

Figure 17 Cabin Lights

CABIN LED UNITS (CLEDU) DESCRIPTION

Each CLEDU has an integrated power–supply unit, which gives low voltage power to the LED board. The power supply contains the voltage converter and the control module. There is a galvanic isolation between the high voltage supply and the low voltage LED Printed Circuit Board (PCB).

The cabin and entrance lighting is set to on, when the Decoder/Encoder Unit (DEU) A gives no in–put signals to the CLEDU. The CLEDU is on with 100% intensity level. The CLEDUs are made to give a continuous dimming from 100% to 0,1% light intensity level.

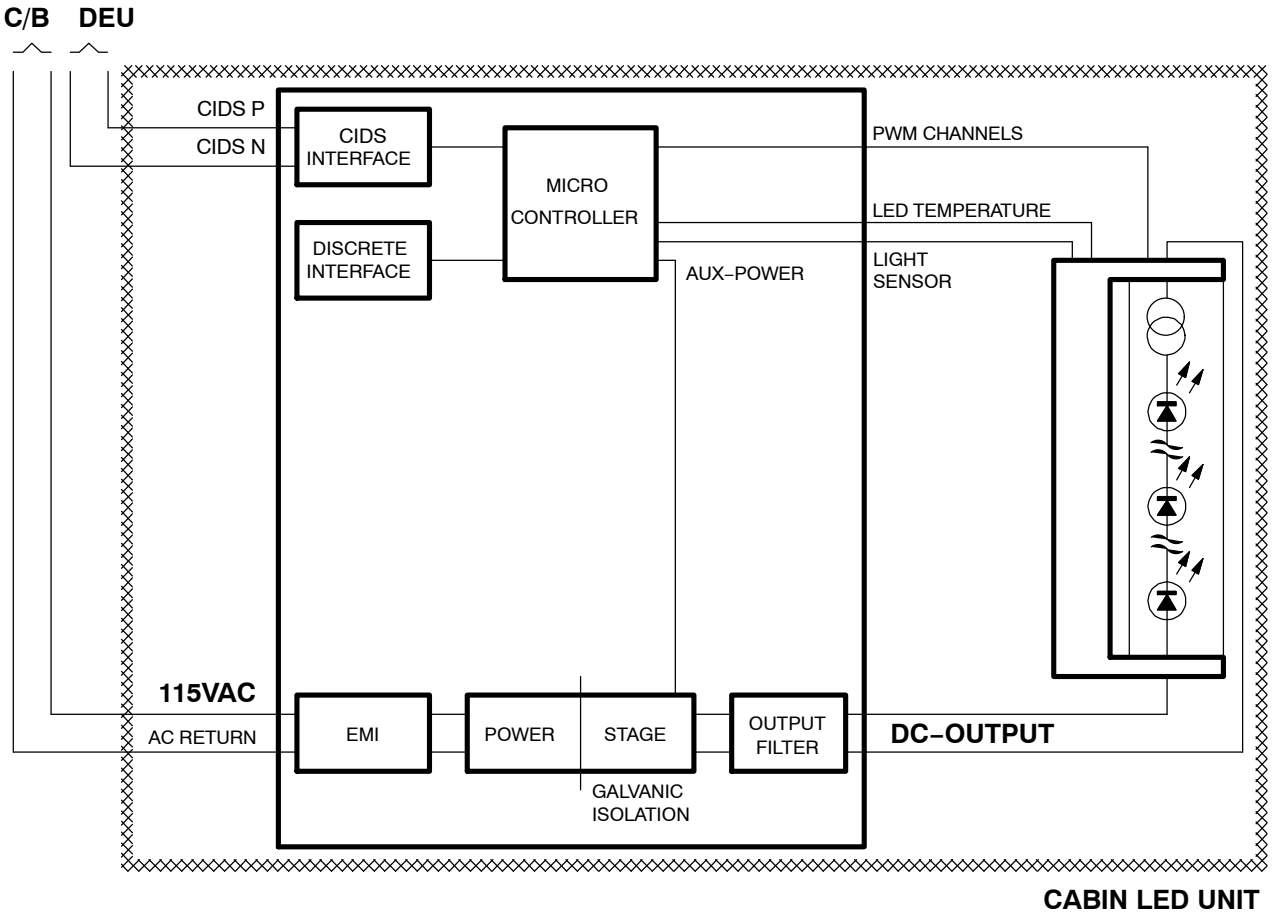
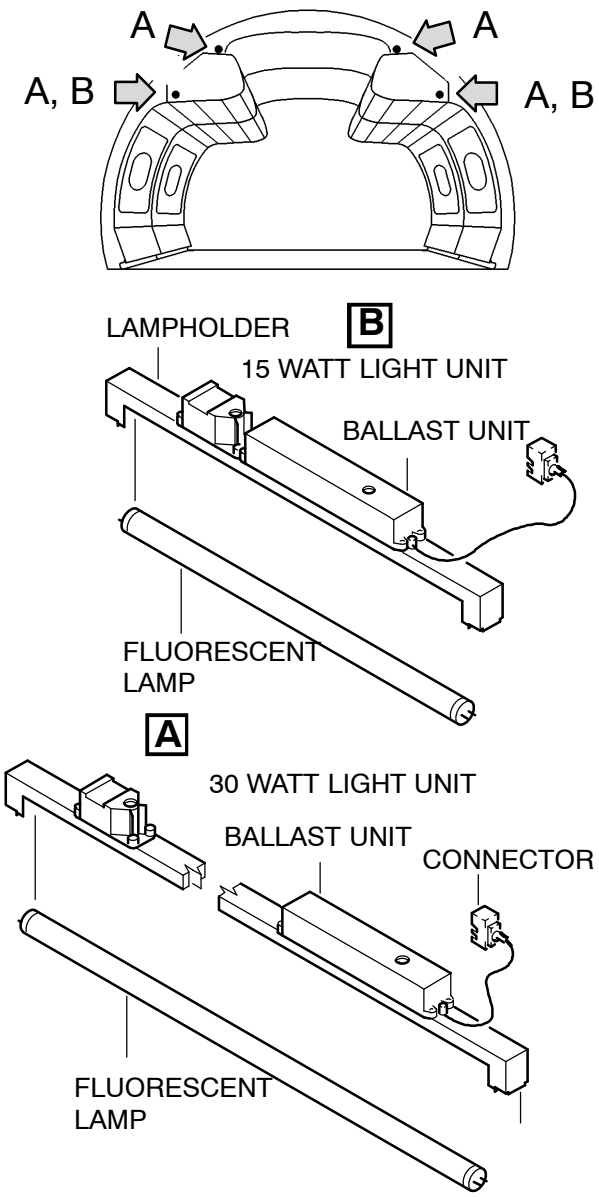


Figure 18 CLEDU

CABIN LIGHTS LOCATION



WINDOW LIGHT **A, B**

PASSENGER READING LIGHTS

CEILING LIGHTS **A**

Figure 19 Cabin Lights Location

FAP (CABIN LIGHTING PANEL) & PTP DESCRIPTION

FORWARD ATTENDANT PANEL

General

The FAP (**F**orward **A**ttendant **P**anel) is located at the purser's station. With the FAP the various cabin systems can be controlled and monitored. It is connected to the directors (DIRs) and to the type B DEUs (**D**ecoder/**E**ncoder **U**nits). The FAP is composed of four parts:

- the air conditioning panel,
- the light panel,
- the audio panel,
- the water and miscellaneous panel.

Cabin Lighting

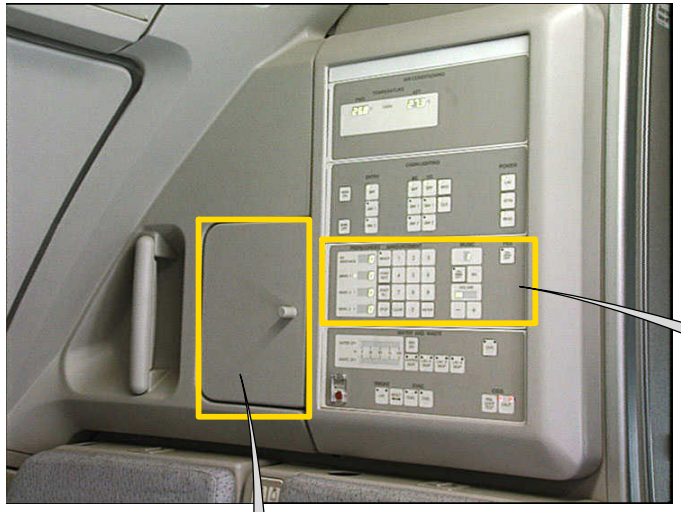
The cabin light panel comprises control keys for the various cabin lights. There are controls for the entrance areas and the different cabin sections. The MAIN ON key when pushed, switches on the cabin zones and entrance areas lighting with 100% intensity, and contrary the MAIN OFF key when pushed, switches off the cabin zones and entrance areas lighting. The BRighTness, DIMming 1 and DIM2 keys respectively switch on the lights at 100%, 50% and 10% intensity, for the FWD, AFT and MID (only for A321) entrance areas. In addition, POWER LAVatory, ATTeNdant and READing keys provide the supply respectively for the lavatory lights, attendant work lights and the passenger reading lights. The WinDoW and CeiLinG keys enable respectively to control windows and ceiling lights. Specific zone such as first class, business class or tourist class can be controlled via the FAP, the light intensity for these zones is adjustable with the BRT, DIM1 or DIM2 key. All pushbuttons, except for MAIN ON and MAIN OFF, have integral lights for visual indication of the activated functions.

Programming Test Panel (PTP)

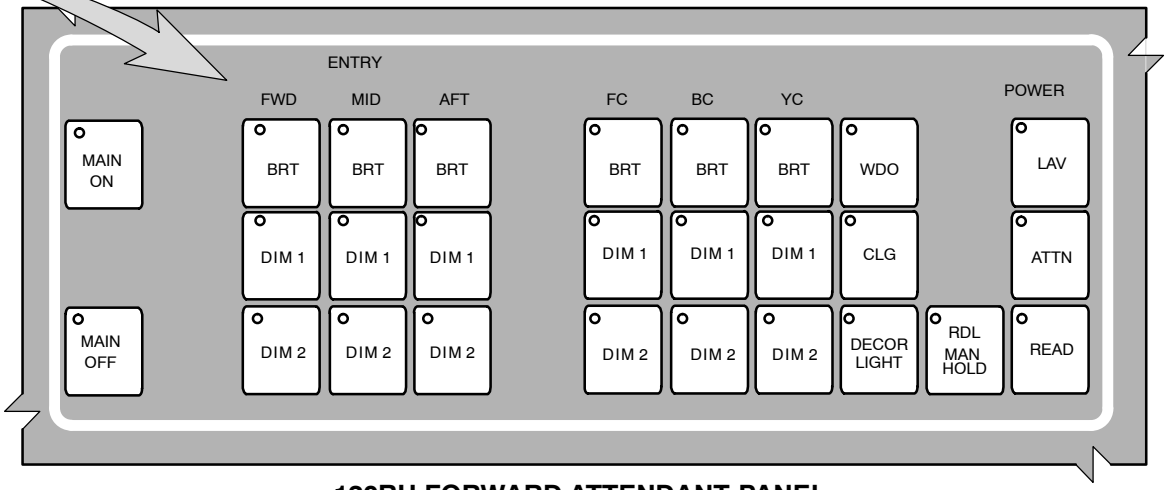
The PTP is located next to the FAP. It is equipped with a CAM which contains all the software of customer specific layouts.

The PTP is used for the reprogramming of lights related cabin items and a test of the emergency lights system.

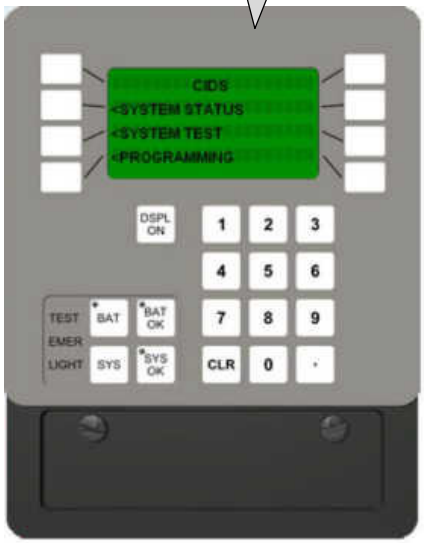
The TEST EMER LIGHT SYS switch, on the PTP, starts a test procedure of the complete emergency light system



FWD PURSER STATION



120RH FORWARD ATTENDANT PANEL



PROGRAMMING AND TEST PANEL

Figure 20 FAP & PTP Location

CABIN LIGHT-OPERATION

Cabin Illumination

The cabin lamps are distributed in four strips throughout the cabin zones.The four strips in each cabin zone are divided into two pairs for control purposes. The two outboard strips are designated as WINDOW (WDO) lights and the two center strips as CEILING (CLG) lights. The system is designed so that the window and ceiling lights in each cabin zone can be on together or separately. When on, the fluorescent lamps can be selected to 100 % (BRT), 50 % (DIM 1) or 10 % (DIM 2) intensity. Each fluorescent lamp is installed in a holder which contains an integral ballast unit. The units are supplied with 115VAC from busbars 212XP and 214XP through circuit breakers 300LG thru 307LG (cabin lighting) and 308LG (entrance lighting). The lighting system is controlled from the forward attendant panel 120RH and the aft attendant panel 126RH, which contains the following membrane switches:

Forward Attendant Panel (FAP)

MAIN ON when pushed, switches on the cabin zones and entrance areas lighting with 100 % intensity. It also causes the integral light in all BRT, WDO and CLG membrane switches to come on.

MAIN OFF when pushed, the cabin zones and entrance area lights goes off

Also any light of the general illumination switch goes off. This function is disabled in flight.

ENTRY FWD BRT and **ENTRY AFT BRT** – when initially pushed, causes the related entrance area lighting to come on with 100 % intensity,

ENTRY FWD DIM1 and **ENTRY AFT DIM1** with 50 %,intensity and

ENTRY FWD DIM2 and **ENTRY AFT DIM2** with 10 % intensity.

It also causes the integral light under the membrane switch foil to come on. The lights may be switched off by pushing the membrane switch twice in succession.

FWD BRT and **AFT BRT** – when initially pushed, causes the related cabin zone lighting to come on with 100 % intensity,

FWD DIM1 and **AFT DIM1** come on with with 50 % intensity and

FWD DIM2 and **AFT DIM2** come on with with 10 % intensity.

It also causes the integral lights in the related BRT, WDO and CLG membrane switch to come on. The lights may be switched off by pushing the membrane switch twice in succession.

WDO – With the cabin lighting set on at any intensity. On pushing this membrane switch, the window lights in each cabin zone and the light under the membrane switch foil go off. Pushing the membrane switch again will cause the lights to come on.

CLG – With the cabin lighting set on at any intensity. On pushing this membrane switch, the ceiling lights in each cabin zone and the light under the membrane switch foil go off. Pushing the membrane switch again will cause the lights to come on.

Operation/Control and Indication

The forward attendant panel 120RH and the aft attendant panel 126RH are connected to the Directors 101RH and 102RH of the CIDS (**C**abin **I**ntercommunication **D**ata **S**ystem).The input signals from the forward attendant panel 120RH and the aft attendant panel 126RH are processed by the director and transmitted to the Decoder/Encoder Units (DEUs). The DEUs accept the input data and activate the output to the fluorescent lamps with ballast units in accordance with the code presented at the input. The DEU is capable of handling up to four fluorescent lamps with ballast units. Three signal lines connect each fluorescent lamp with ballast unit to the related DEU. The DEU output signal has two levels 0 (0VDC) and 1 (28VDC). As can be seen in the schematic with no output signal from the associated DEU the fluorescent lamps will illuminate at full brightness.

The entrance lighting has fluorescent lamps with ballast units installed in the ceiling panels at the forward and aft entrances. Two fluorescent lamps are installed in the LH and RH ceiling panels at each entrance. The operation is the same as the cabin lighting.

1. The entrance lighting at entrance 1 LH is automatically dimmed to DIM2 level (10%) whenever the cockpit door is opened with the engines running.
2. The CIDS directors 101RH and 102RH receive one signal from the engine oil–pressure system and another signal from the cockpit door microswitch.

The directors 101RH and 102RH transmit their output signal to the DEU which controls the entrance 1 LH fluorescent lamp with ballast unit.The DEU provides a DIM2 signal and the light dims to 10% intensity.

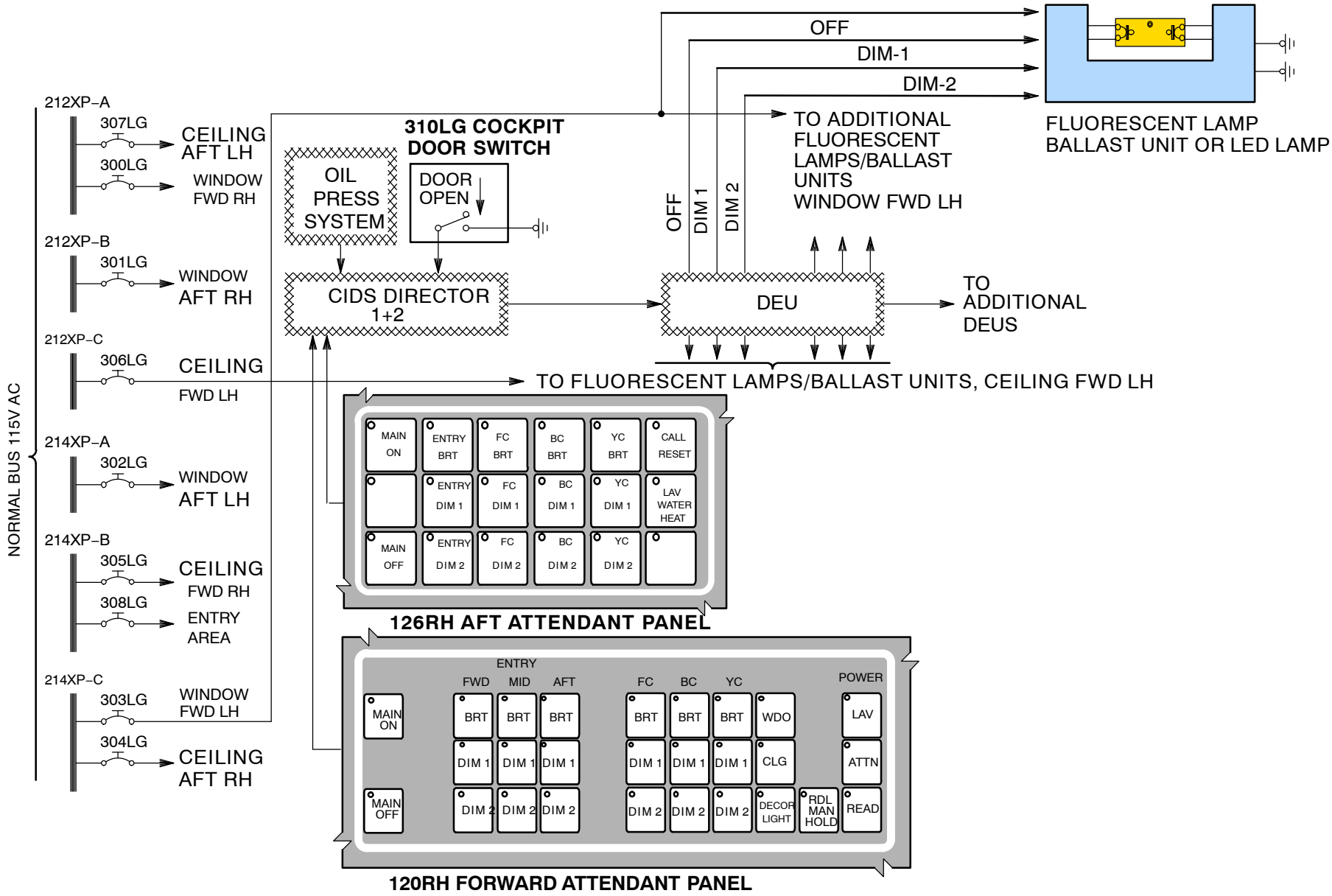


Figure 21 Cabin Lights Block Diagram

33–24 LAVATORY LIGHTING

LAVATORY LIGHTING-DESCRIPTION

General

The lavatory lighting system consists of a fluorescent lamp, an integrated ballast unit and a halogen lamp installed in each lavatory.

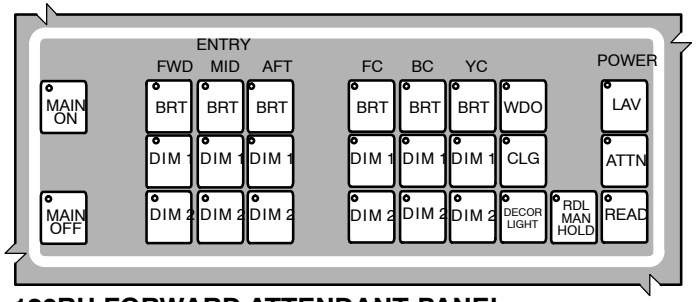
The POWER LAV membrane switch on the forward attendant panel 120RH controls the power for the fluorescent lamps.

A microswitch is installed in each lavatory door frame and controls the halogen lamp and the illumination level of the fluorescent tube.

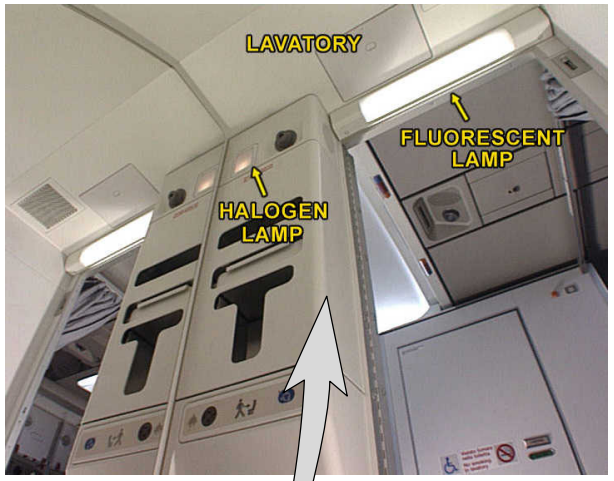
System Description

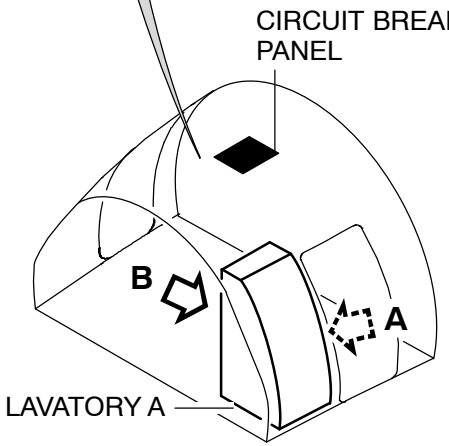
The lavatory lighting system has:

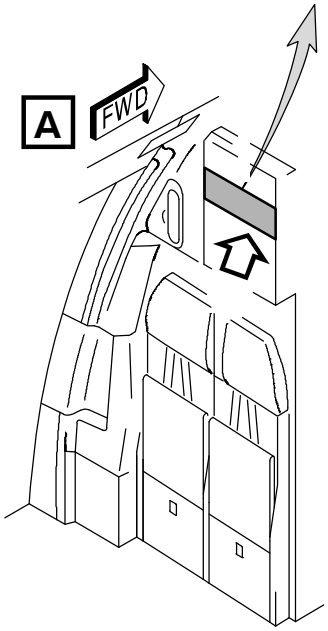
- a fluorescent lamp with a ballast unit installed above the lavatory door in each lavatory.
- a halogen lamp installed adjacent to the lavatory mirror in each lavatory.
- a microswitch installed at each lavatory door frame. The microswitch is part of the lavatory lighted signs system (Ref. 33–26–00).



120RH FORWARD ATTENDANT PANEL







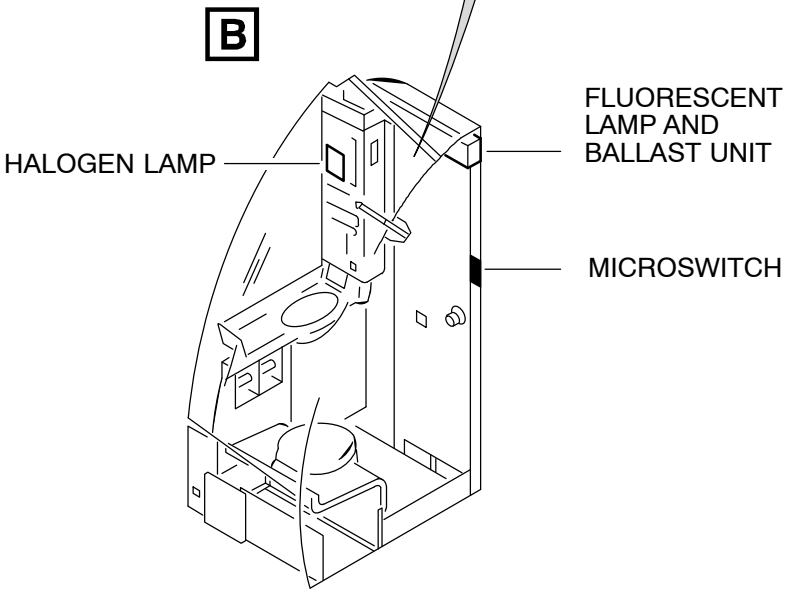


Figure 22 Lavatory Lighting

LAVATORY LIGHTING OPERATION

SYSTEM OPERATION

Power Supply

The 115VAC from the busbar 214XP supplies the fluorescent lamps through the circuit breaker 1LQ and the power control relay 2LQ. The pushbutton membrane–switch POWER LAV, on the forward attendant panel 120RH, controls the power supply for the fluorescent lamps.

The 28VDC from the busbar 208PP supplies the lavatory occupied signs and auxiliary lights through the circuit breakers 1WJ, 11WJ and the door microswitches.

Operation

The system is supplied with power when the busbars are energized and the circuit breakers 1LQ, 1WJ and 11WJ are closed. With the door microswitch in the FREE position the halogen lamp is disconnected from the 28VDC. The DIM 1 (50 %) input of the ballast unit is supplied with 28VDC.

When the switch POWER LAV on the forward attendant panel 120RH is pushed relay 2LQ energizes. Each lavatory ballast unit is supplied with 115VAC and the fluorescent lamp comes on with 50 % intensity.

When the lavatory door is locked, the related door microswitch changes over to the ENGAGED position and the halogen lamp is supplied with 28VDC. The 28VDC is disconnected from the DIM 1 input of the ballast unit and the fluorescent lamp illuminates with 100 % intensity.

The integral light under the POWER LAV membrane switch foil (on the forward attendant panel 120RH) comes on when the membrane switch is initially pushed.

When the membrane switch is pushed again, the fluorescent lamps in the lavatory go off. Also the integral light under the POWER LAV membrane switch foil goes off.

All fluorescent lights go off when the membrane switch LIGHT MAIN OFF on the forward attendant panel 120RH is pushed. Other systems are also switched off with this membrane switch at the same time.

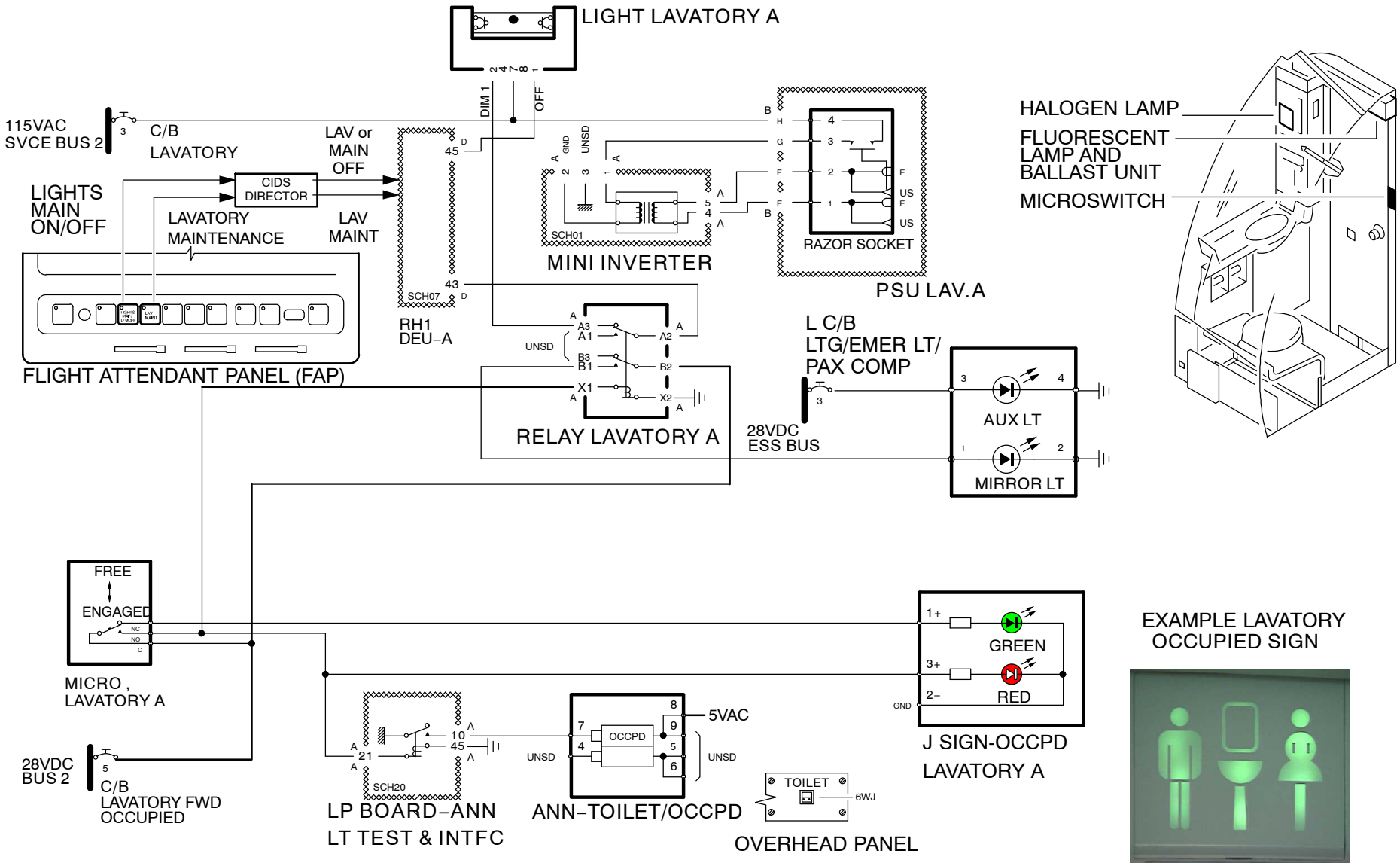


Figure 23 Lavatory Lighting Schematic

33–25 PASSENGER READING LIGHTS

PASSENGER READING LIGHTS-OPERATION

System Description

The reading lights are installed in the combi–panels. The combi–panels are installed in the PSUs (**P**assenger **S**ervice **U**nits) channel above the passenger seats. The number of combi–panels on each side of the cabin must agree with the number of seat rows.

Power Supply

115VAC is supplied to the reading lights from the busbars 110XP and 210XP. This is controlled through the circuit breakers 1LW thru 6LW and the relays 7LW and 8LW.

The power units change the 115VAC to 6VAC for the light operation on classic aircraft types. On enhanced systems the PISA (Passenger interface Supply Adapter) changes the 115VAC into 28VDC. A fuse in each line gives protection for the transformer and the related PCB (**P**rinted **C**ircuit **B**oard). A membrane switch POWER READ on the FAP (**F**orward **A**ttendant **P**anel) 120RH controls the power supply for the reading lights.

Operation

When the POWER READ membrane switch on the FAP 120RH is pushed, the power units 511RH and 512RH are activated. The coils of the relays 7LW and 8LW in the panel 2000VU are energized. This closes the contacts of the relays and 115VAC is supplied to the power units.

When the reading–light membrane switches 501RH thru 503RH are pushed, a ground pulse is supplied to the voltage control circuit. This completes the primary circuit of the step–down transformer. The transformer changes the 115VAC down to 6VAC which causes the lights to come on.

A test of the reading lights, the work lights and the PCB circuits is made by the related BITE test on the PTP(**P**rogramming and **T**est **P**anel) 110RH. In this test all reading lights and work lights come on for approximately 3 s and then go off. After the test the PTP 110RH shows the status of the reading lights, the work lights and the PCBs.

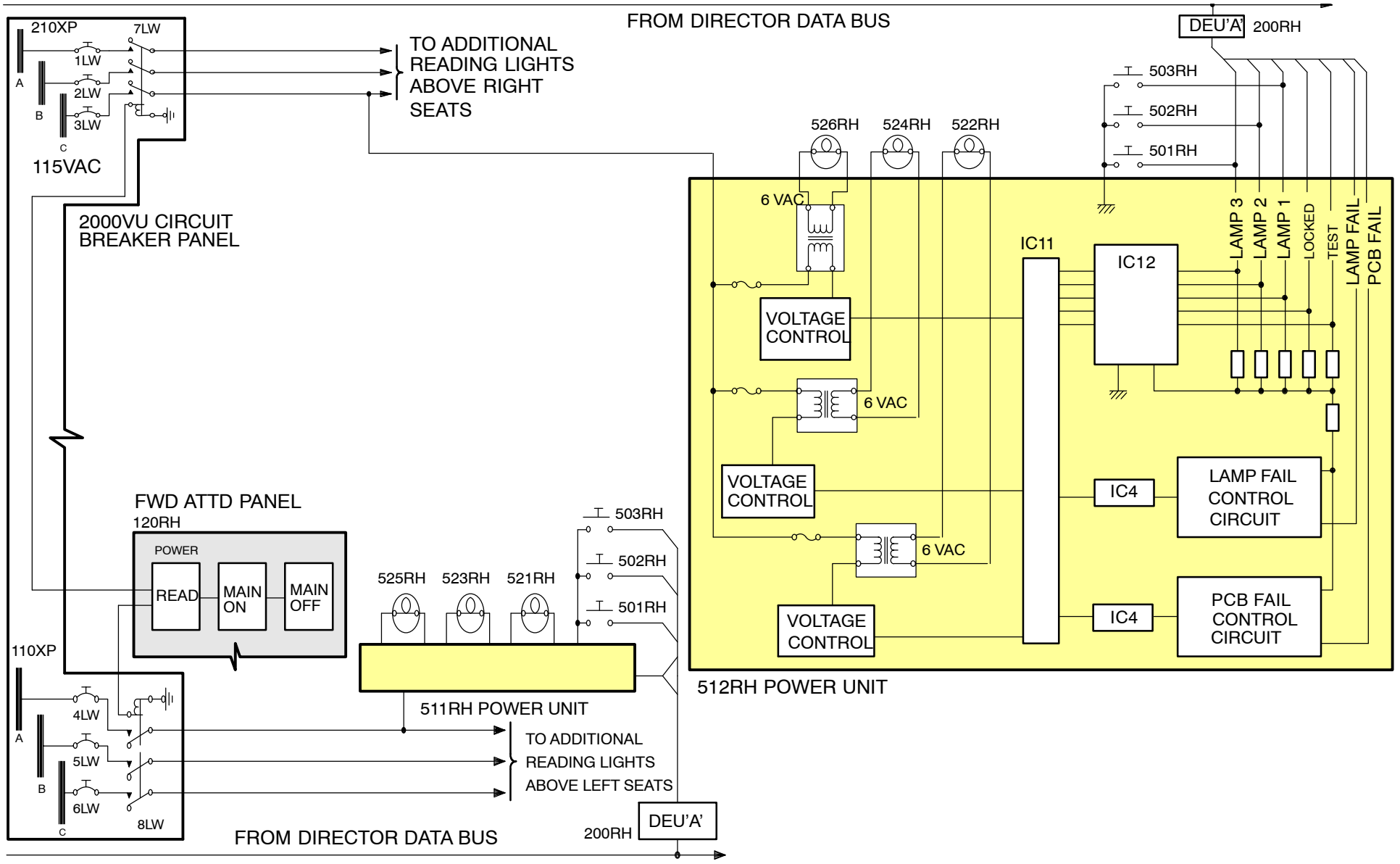


Figure 24 Passenger Reading Lights Schematic

BITE/TEST FUNCTION ON THE PTP

READING/WORK LIGHT

General

A test of the reading lights, the work lights and the PCB circuits is made by the related BITE test on the PTP (**P**rogramming and **T**est **P**anel) 110RH. In this test all reading lights and work lights come on for approximately 3 s and then go off. After the test the PTP 110RH shows the status of the reading lights, the work lights and the PCBs.

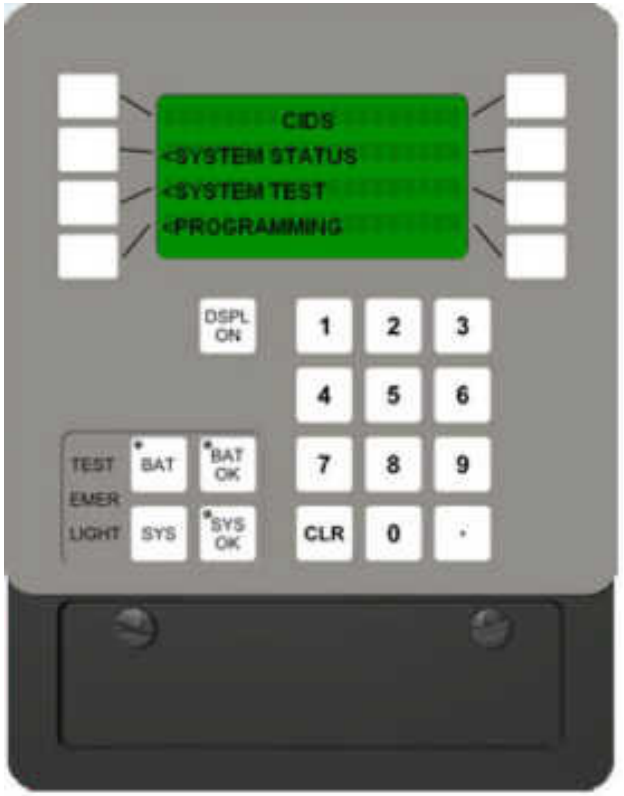
The test of the reading lights includes the test of the Attendant work lights, the decoration lights (option) and the related reading light power unit (each power unit can drive three separate lights).

Before activation of the test, the pushbuttons POWER ATTN and POWER READ on the FWD ATTND PNL have to be pressed to energize the reading/work light system. If not, a SWITCH ON POWER message will be displayed on the PTP.

Failure Test

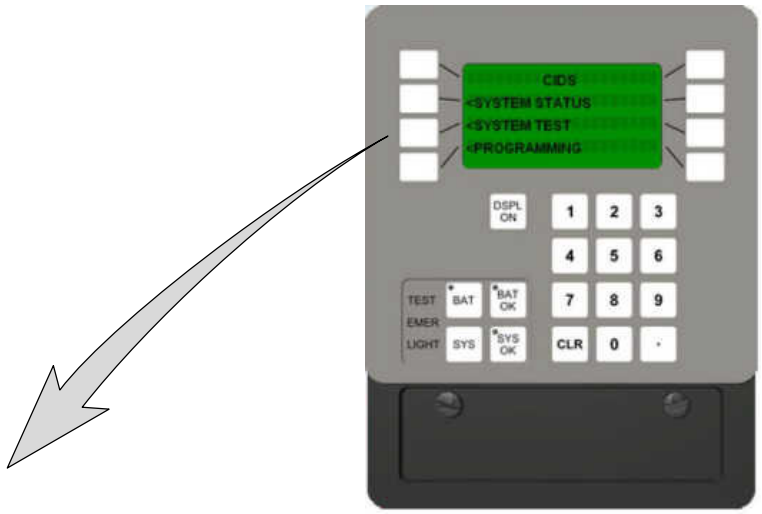
In case of failure, the respective result will appear on the PTP display and will be written into the Director class 3 Fault-memory.

After the test, the Reading/work light system is still energized to give the maintenance crew the possibility for visual check of the lamps.



PROGRAMMING AND TEST PANEL

Figure 25 PTP (Programming and Test Panel)



PROGRAMMING AND TEST PANEL

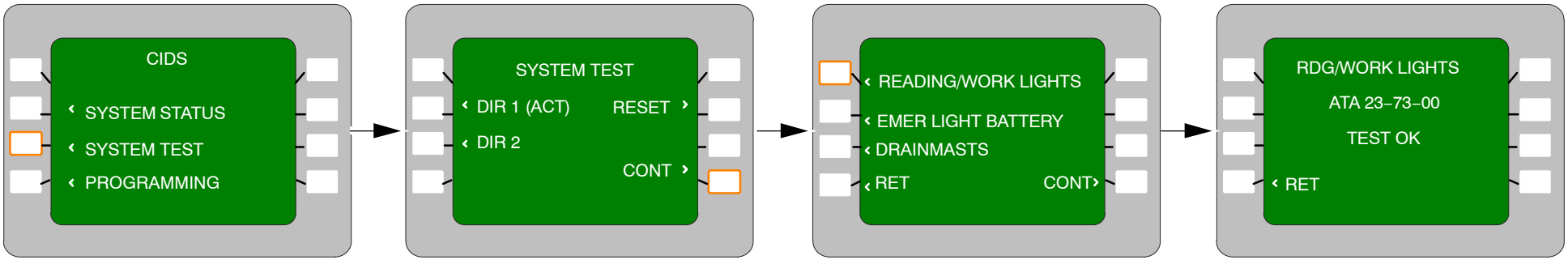


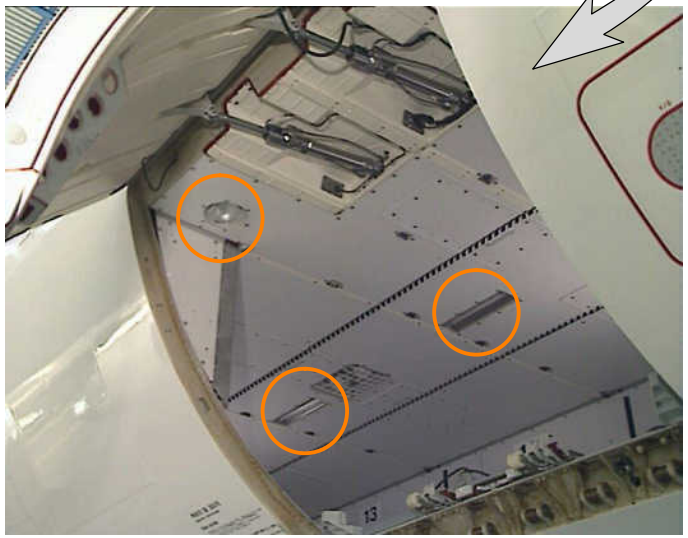
Figure 26 PTP-Reading Light Test

33–30 CARGO AND SERVICE COMPARTMENTS

INTRODUCTION

General

The cargo and service compartment lighting–system provides illumination to the service area, forward and aft cargo compartment, avionics compartment and wheel wells. A maintenance outlet is installed in the air conditioning duct and accessory compartment.



FORWARD CARGO

AVIONICS BAY

Figure 27 Cargo and Service Compartment Lights

33–30 CARGO AND SERVICE COMPARTMENTS

AVIONICS COMPARTMENT LIGHTING-DESCRIPTION

General

To help servicing and maintenance operations, some of the compartments are equipped with lighting facilities.

The lighting system comprises lamps, fluorescent tubes, control switches and electrical outlets used for portable maintenance lights.

AVIONICS COMPARTMENT LIGHTING

The avionics compartment lighting system consists of a number of lights and maintenance outlets. The busbar 601PP supplies the five maintenance outlets with 28 VDC through circuit breaker 11LS. The busbar 216XP supplies the three maintenance outlets with 115 VAC through circuit breaker 12LS. The outlets are located in the forward and aft parts of the avionics compartment.

Six dome lights provide the illumination of the avionics compartment.

The busbar 601PP supplies the lights with 28 VDC through circuit breaker 1LS and relays 24LS and 25LS. The relay 24LS controls the power supply to the lateral L, aft L and R dome lights. The relay 25LS controls the power supply to the lateral R, forward L and R dome lights. The door proximity switches transmit the ground signal to relays 24LS and 25LS.

Auto Mode

When the service door in zone 125 or zone 128 is open, the associated proximity switch removes the ground for relay 24LS. Relay 24LS de–energizes and the L lateral, L and R aft dome lights come on.

When the service door in zone 120 or zone 126 is open, the associated proximity switch removes the ground for relay 25LS. Relay 25LS de–energizes and the R lateral, L and R forward dome lights come on.

Manual Mode

When the pushbutton switch 23LS is pressed, the two relays 24LS and 25LS de–energize and the avionics compartment lights come on. The integral light in the pushbutton switch comes on.

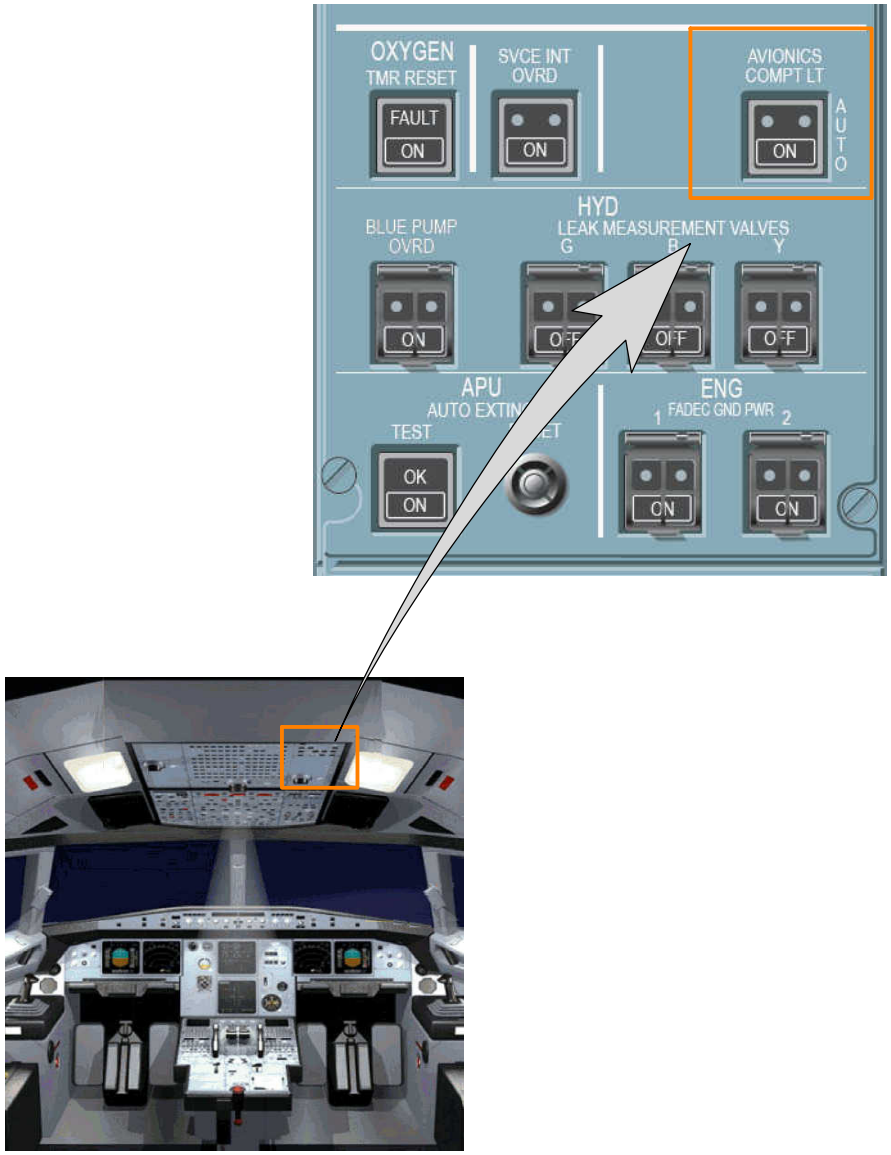


Figure 28 Avionics Comp. Sw. Location

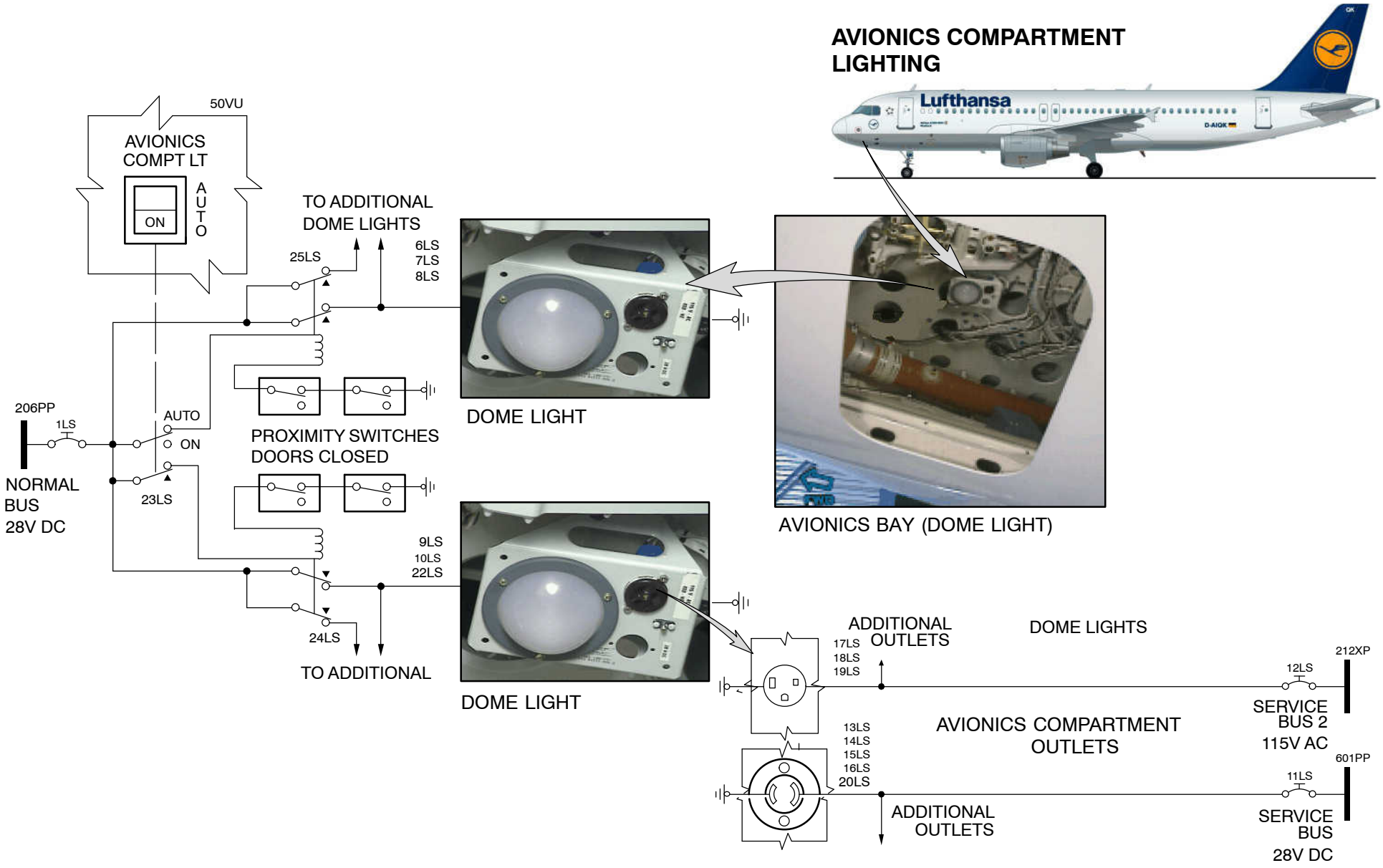


Figure 29 Avionics Compartment Lights

WHEEL WELL LIGHTING–DESCRIPTION

General

The wheel well lighting–system has the lighting of the main wheel wells and the hydraulic compartment. For maintenance practices an electrical outlet is installed at the front wheel well and in the hydraulic compartment.

Wheel Well Lighting

One dome light is installed in each of the main–wheel well compartments. Two dome lights are installed in the hydraulic compartments LH and RH. The busbar 202PP supplies 28 V DC to all four lights through the circuit breaker 2LL and the control switch 12LL. An outlet 3LL is provided in the nosewheel well for maintenance purposes. Another outlet 4LL is provided in the hydraulic compartment, adjacent to the control switch 12LL, on panel 2025VU. When the control switch is placed to the ON position, all lights come on.

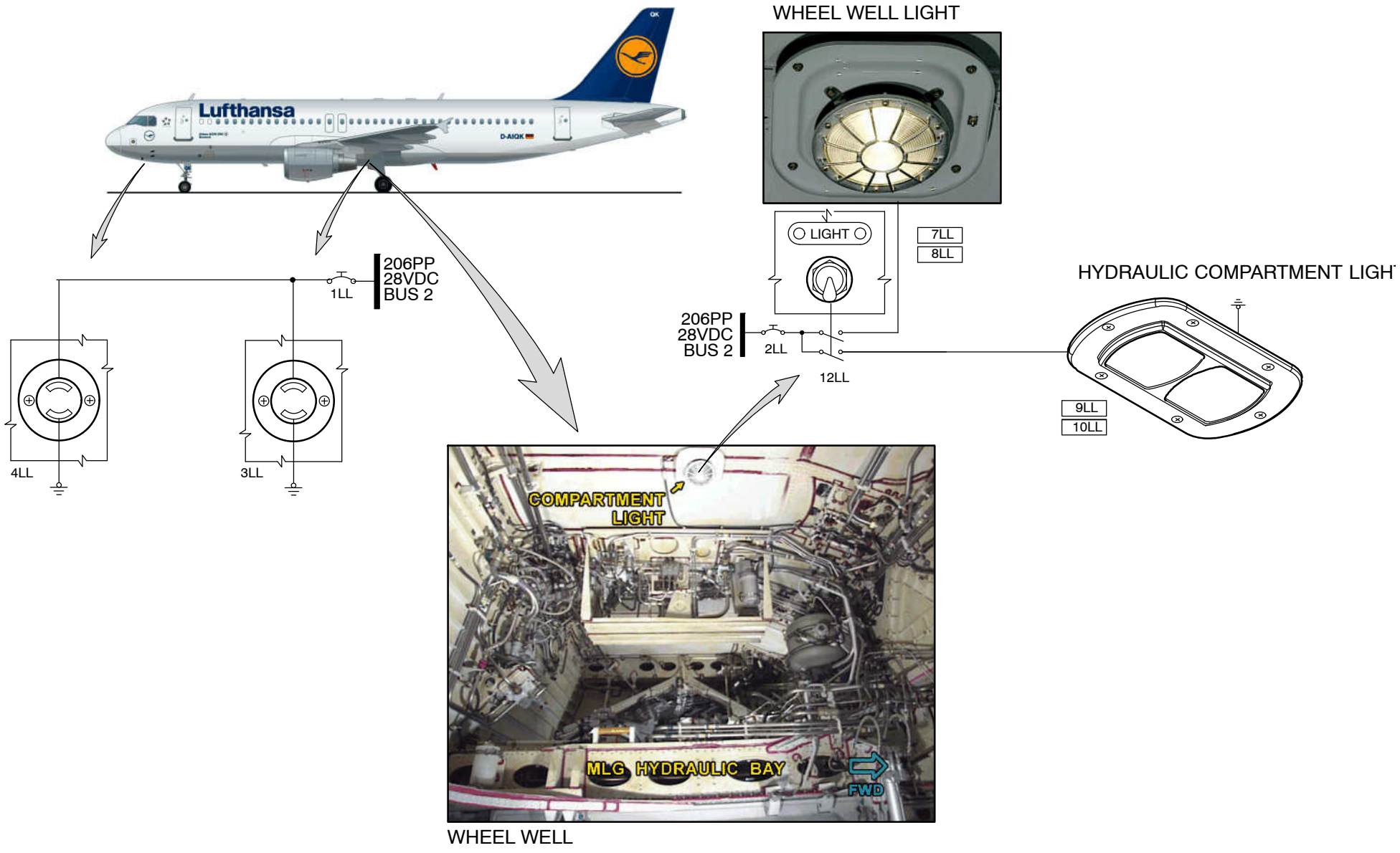


Figure 30 Wheel Well Compartment Lights

SERVICE&CARGO COMPARTMENT LIGHTING-DESCRIPTION

Service Area Lighting

The service area lighting system comprises the lights installed in the APU compartment and in Section 19. Electrical outlets are provided for portable maintenance lights.

The lights and outlets are supplied with 28 V DC from busbar 208PP through the circuit breakers 2LJ and 1LJ. Switch 11LJ controls the APU light 6LJ and switch 3LJ controls the two lights 4LJ and 5LJ in Section 19. When busbar 208PP is energized and the circuit breaker 1LJ is closed, power is available at the two maintenance outlets in Section 19.

Air–conditioning and Accessory Compartment Lighting

The air conditioning compartment is provided with a 28 VDC outlet for a portable maintenance light.

Cargo Compartment Lighting

Forward, aft and bulk cargo compartments are lit by fluorescent tubes. Lighting is also available at the forward and aft loading areas.

The fluorescent tubes are installed in the ceilings of the FWD, AFT and BULK cargo compartments. They are controlled by three switches, located close to the doors.

Each loading area light is controlled by a switch, located close to the cargo door. The loading area light is bracket mounted and its direction can be adjusted.

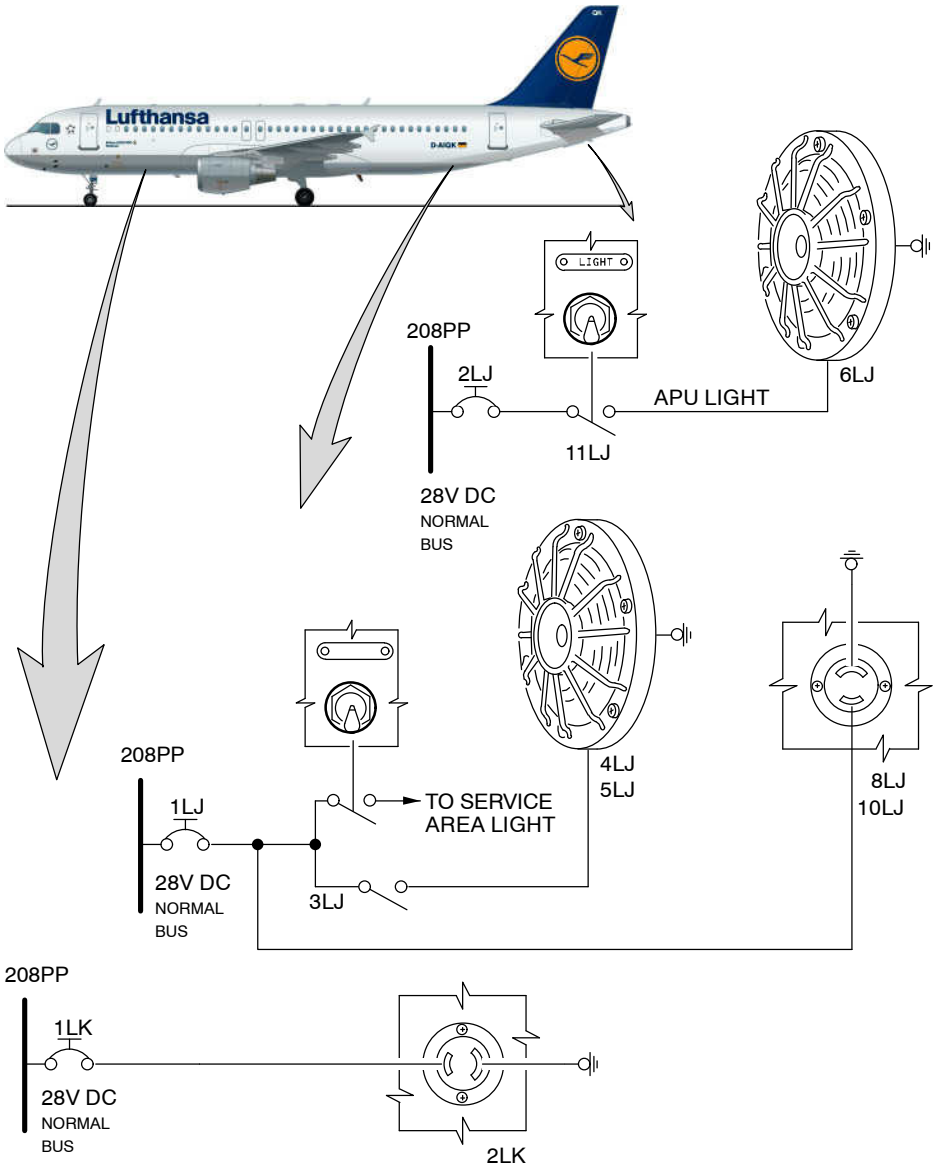


Figure 31 Service Area Lighting

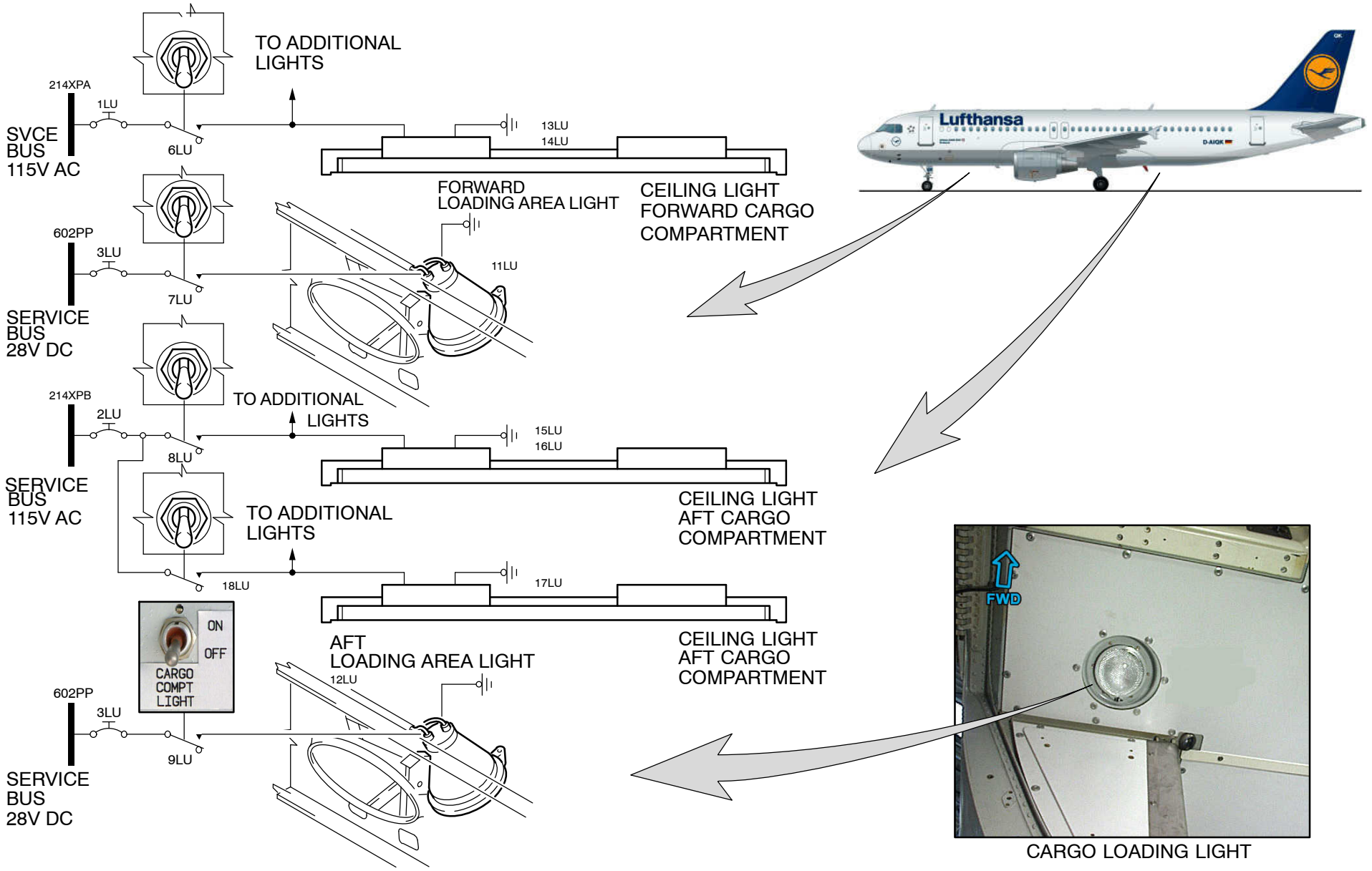


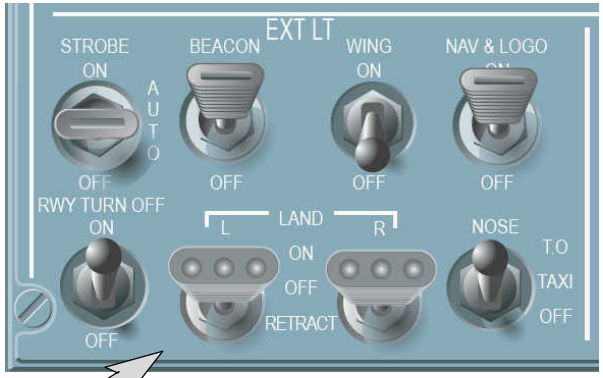
Figure 32 Cargo Compartment Lights

33–40 EXTERIOR LIGHTS

GENERAL

The exterior lighting system fulfils various functions:

- illuminating the runway and taxiway
- illuminating the wing leading edges and engine air intakes
- indicating the aircraft position and direction
- reducing collision risk in flight and on ground.



EXT LT PANEL (25VU)

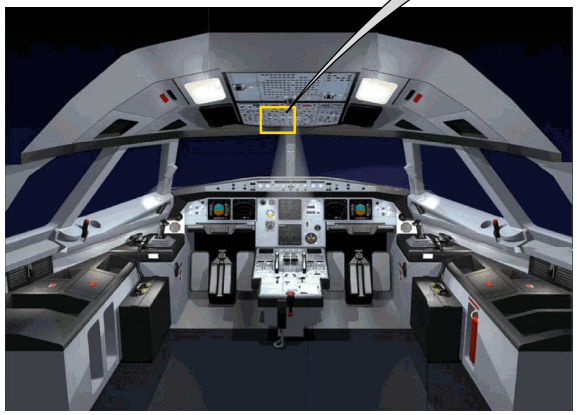


Figure 33 EXT Light Panel

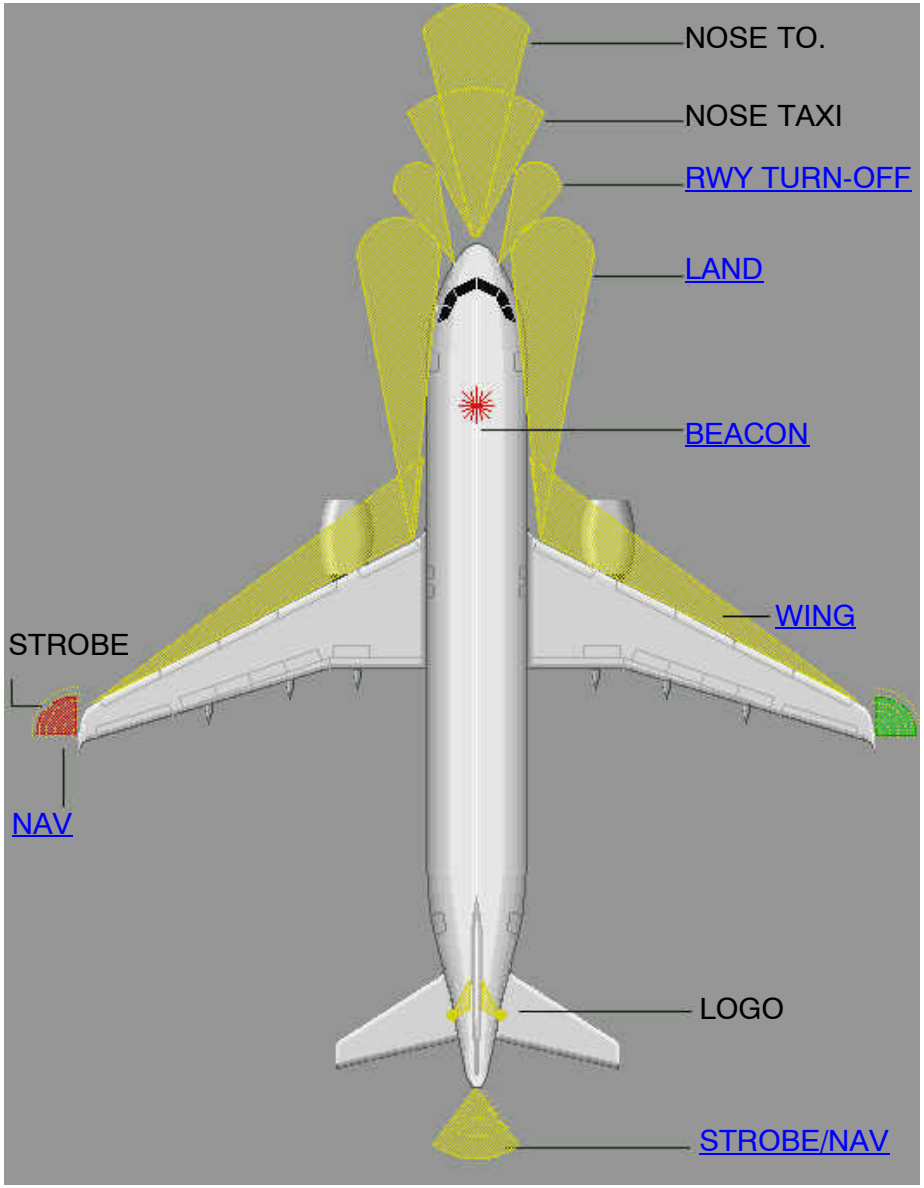


Figure 34 Exterior Lights-General

Figure 35 Exterior Lights-Component Location

LED EXTERIOR LIGHTS

Anti-Collision Beacon lights

The LED anti–collision lights (6LV and 7LV), which do not turn, flash at a rate of 45 plus or minus two flashes per minute or 55 plus or minus five flashes per minute in relation to the power supply unit. Each light gives 360 degrees of horizontal diffusion and 75 degrees of vertical diffusion.

Strobe lights

Two forward pointing LED strobe lights flash at the same time at a rate of 60 +/– 5 flashes per minute. Rearward pointing tail strobe light flashes at a rate of 60 +/– 10 flashes per minute. This gives 120 +/– 10 flashes per minute in the forward direction and 60 +/– 10 flashes per minute in the rearward direction. The Near End Of Life (NEOL) indication is a blue LED light that flashes when the light assembly is near the end of life. Degradation can occur after 1000 Flight Hours (FH).

Runway turnoff-lights

Two LED runway turnoff–lights (3LC1, 3LC2), installed on the nose landing gear. One transformer, that gives the rated operating voltage.

Taxi and Take-off lights

For GLS LEDs Light Unit technology the taxi and take–off light system consists of a series of LED lights 8LR, rated at 70 Watts, installed on the nose landing gear in a fixed position, a transformer to produce rated operating voltage, a LED light 7LR, rated at 220 Watts installed on the nose landing gear in a fixed position and a transformer to produce rated operating voltage and two power supply relays 5LR.

Logo lights

For GLS filament light technology each logo light consists of a housing that contains the lamp assembly and a step–down transformer. For GLS LEDs light unit technology each logo light consists of a housing assembly, lens assembly and optics assembly. The step–down transformer changes the aircraft's 115VAC to a 28VAC power supply.

Wing and Engine Scan lights

The wing and engine scan light system has two LED lights 3LX and 4LX.

Landing lights

The landing lights consist of one single–phase motor which has an electromagnetic brake. This is connected to a gearbox which moves a screw–jack that extends and retracts the lamp housing, one lamp housing which has installed a 28V AC, 220 WATT quartz, sealed–beam unit, one step–down transformer, attached to the gearbox housing, two sealed limit microswitches, one power relay, and one full–wave rectifier.

LED LAND LIGHT

LED STROBE LIGHT

LED BEACON LIGHT

LED NAV LIGHT

Figure 36 LED EXTERIOR LIGHTS EXAMPLES

TAXI AND TAKE OFF LIGHTS-DESCRIPTION

General

The taxi and take–off light system illuminates the runway during the taxi and the take off phase. Two light units provide the lighting. They are installed on the nose landing gear.

System Description

The taxi and take–off light system consists of:

- a single filament light (or halogen lamp in alternate solution) 8LR, rated at 450 Watts, installed on the nose landing gear in a fixed position,
- a transformer, to produce rated operating voltage,
- a single filament light (or halogen lamp in alternate solution) 7LR, rated at 600 Watts, installed on the nose landing gear in a fixed position,
- a transformer, to produce rated operating voltage,
- two power supply relays 5LR for the takeoff and 6LR for the taxi light,
- a switch 4LR, on the cockpit overhead panel.

The 115 VAC busbar 204XP supplies power to the taxi light through the circuit breaker 1LR and relay 6LR. The 115 VAC busbar 103XP supplies power to the take off light through the circuit breaker 3LR and relay 5LR. The 28 VDC busbar 202PP supplies power to the switch 4LR through the circuit breaker 2LR. The landing–gear computer supplies the power supply relays 5LR and 6LR with a ground signal when the nose landing gear is downlocked.

Operation

With energized busbars and closed circuit breakers, 115 VAC is supplied to the contacts of the power relays. The control switch is supplied with 28 VDC. When the nose landing gear is downlocked, the power supply relays get a ground signal. When the control switch 4LR is in the TAXI position, the relay 6LR energizes and the taxi light 8LR comes on.

With the switch 4LR in the T.O position, the relay 5LR energizes and continues to energize the relay 6LR. The taxi light 8LR and the take off light 7LR come on. When the nose landing gear is unlocked, the ground signal for the power supply relays is removed.

The take off light and the taxi light go off. You can also switch off the lights with the switch 4LR in the OFF position.

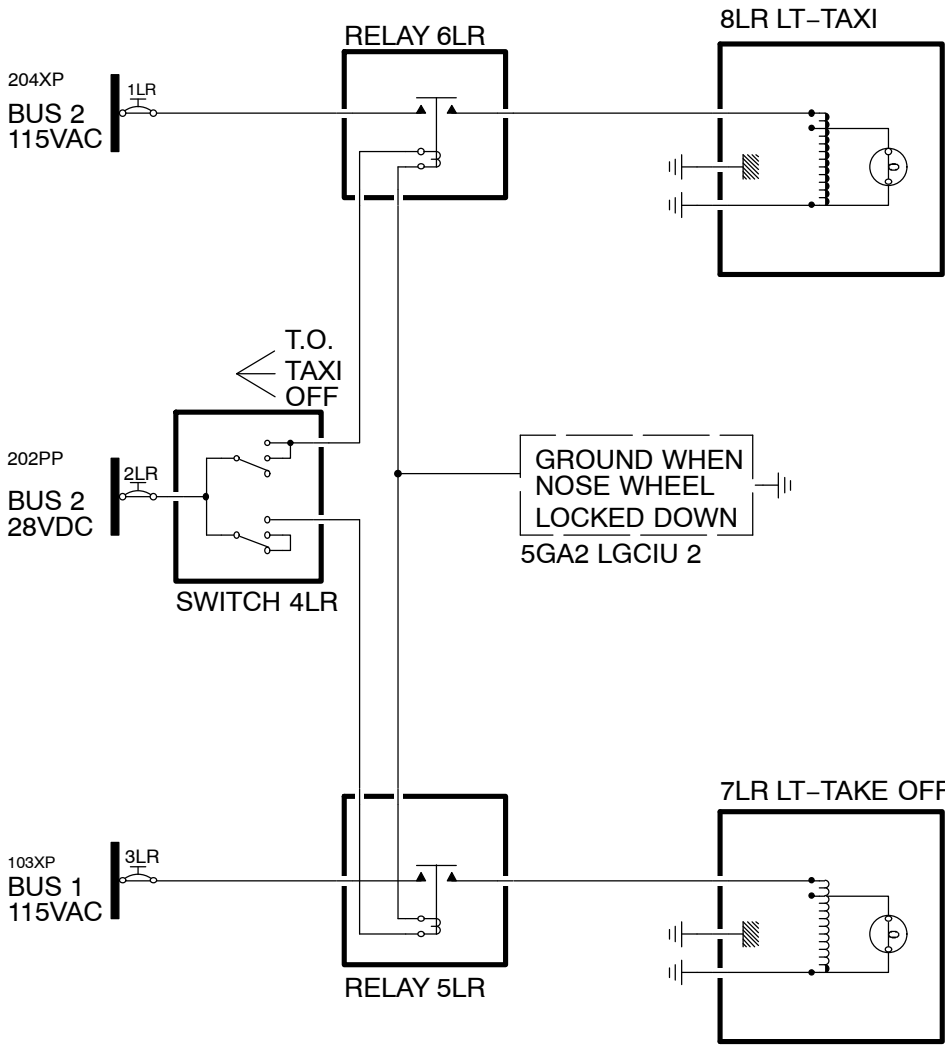
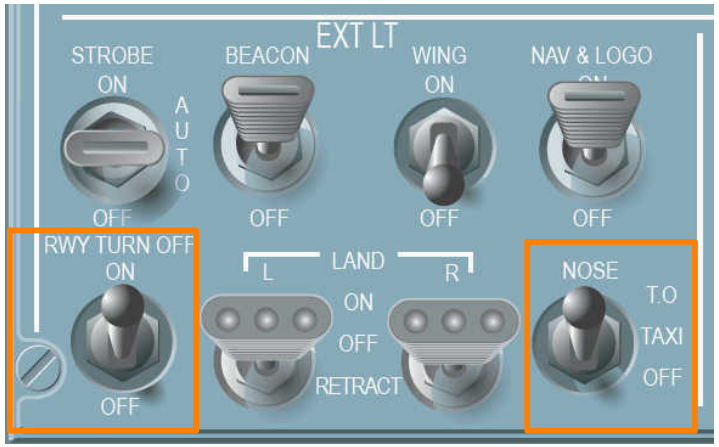
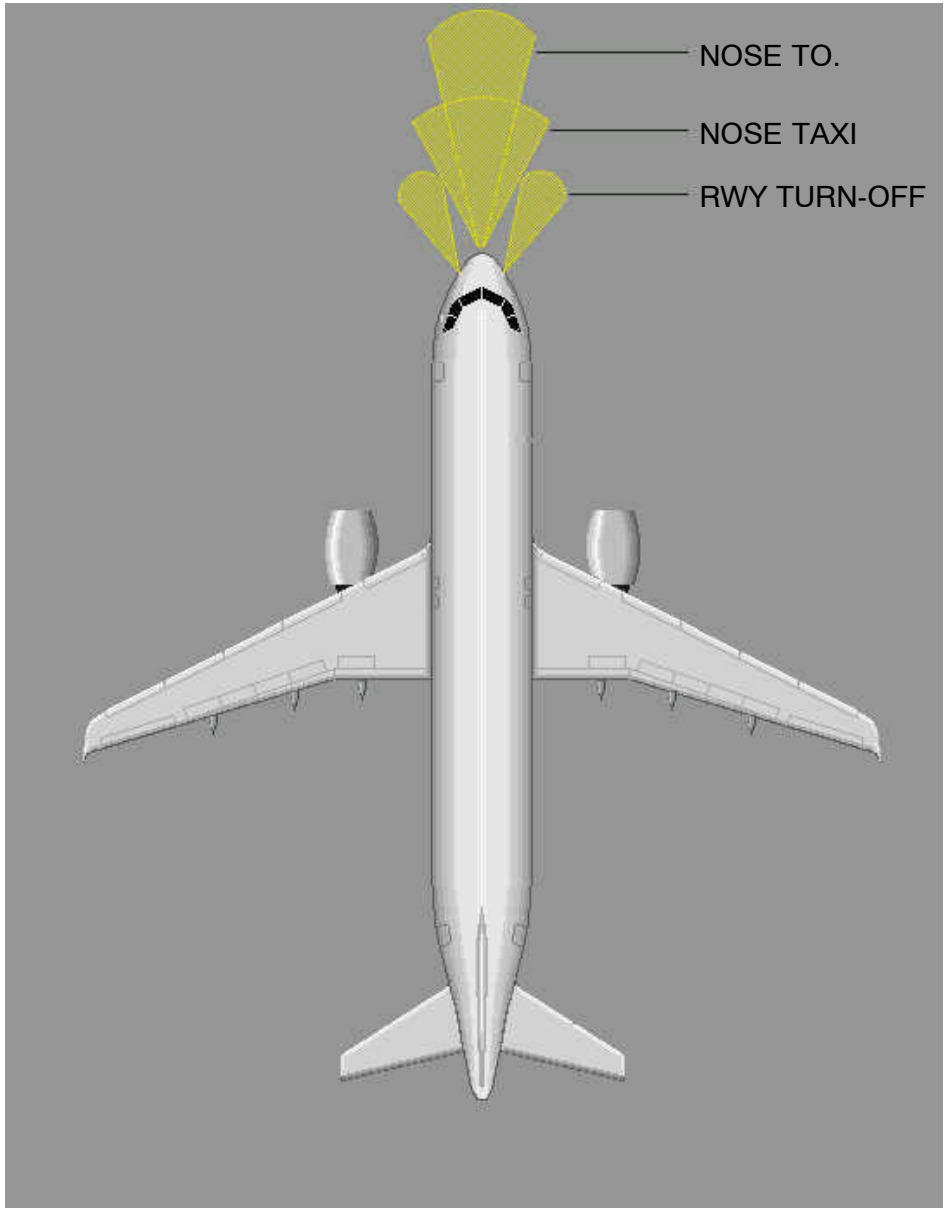


Figure 37 Taxi&Take-off Lights-Schematic



EXT LT PANEL (25VU)



TAXI AND TAKE-OFF LIGHTS

The taxi and take-off lights illuminate the runway during the take-off phase.

There is one taxi and one take-off light installed on the nose landing gear in a fixed position.

NOTE: The power supply of the lights is only provided when the nose landing gear is downlocked

RUNWAY TURN OFF LIGHTS

The runway turn off lights illuminate the lateral areas of the runway.

Two turn off lights are installed on the nose landing gear in a fixed position.

NOTE: The power supply of the lights is only provided when the nose landing gear is downlocked

Figure 38 Exterior Lights: Taxi/Take–off,Runway Turn Off

WING & ENGINE SCAN LIGHTS DESCRIPTION

General

Two lights are installed, one on each side of the forward fuselage. They illuminate the engine air intakes and the wing leading edges. It is possible to examine these areas in flight; for example, to determine the build up of ice.

The toggle switch 2LX controls the lights.

Description

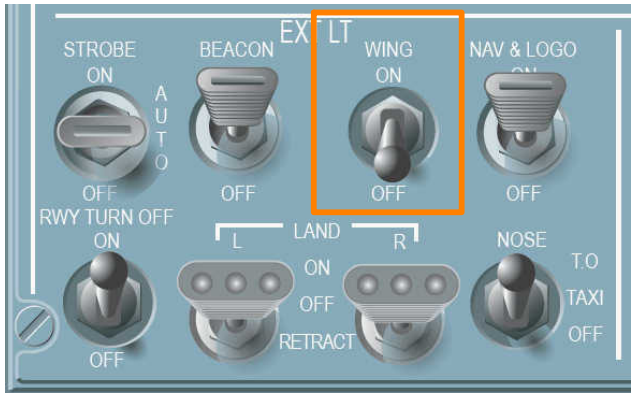
The wing and engine scan light system has two lights 3LX and 4LX with a fixed single filament. The lights are installed one on each side in the forward fuselage of the aircraft. An attached transformer gives the rated operation voltage to each light. Electrical power comes from the 115 VAC busbars 202XP and 103XP through the circuit breakers 1LX and 5LX.

Operation

The switch 2LX is supplied with 115 VAC when:

- the busbars 202XP and 103XP are energized,
- the circuit breakers 1LX and 5LX are closed.

The wing and engine scan lights come on when the switch 2LX is in the ON position.

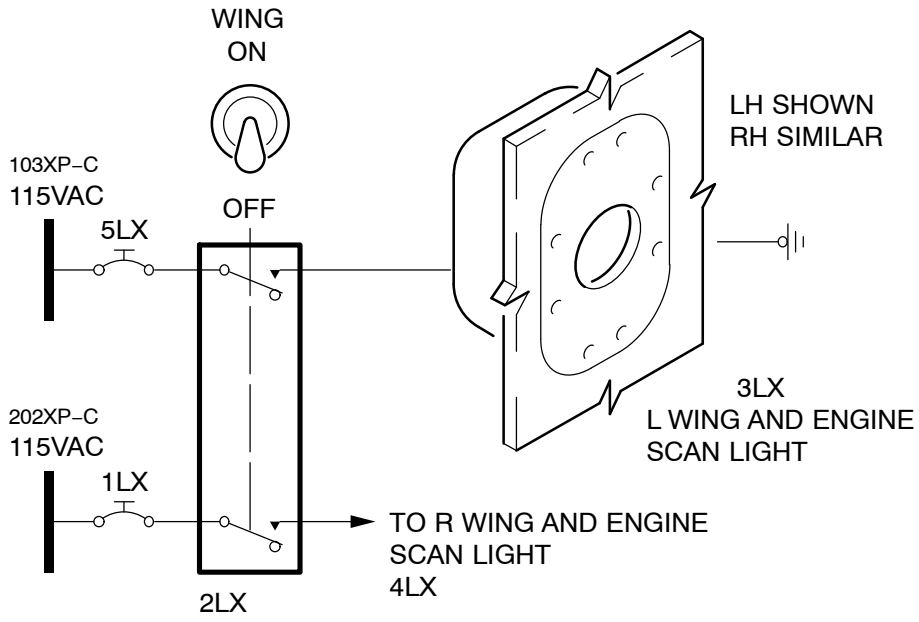


EXT LT PANEL (25VU)

WING&ENGINE SCAN LIGHTS

The wing and engine scan lights illuminate the wing leading edge and the engine nacelle on each side of the aircraft fuselage. These areas can be examined in flight or on the ground.

There is one light installed on each side in the forward fuselage.



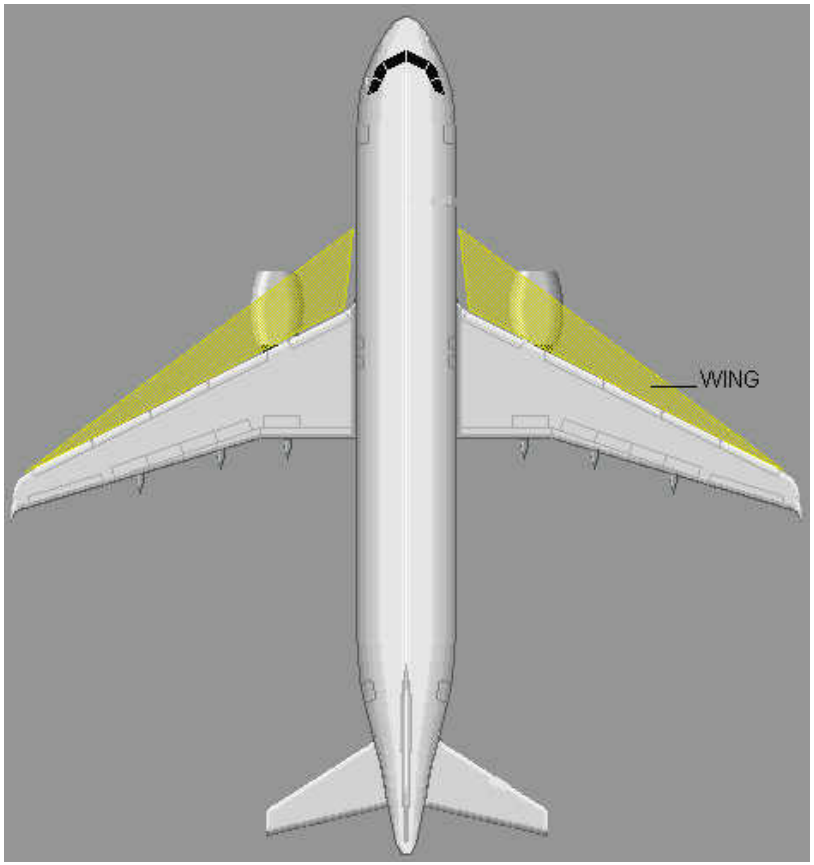


Figure 39 External Lights: Wing and Engine Scan

NAV&LOGO LIGHTS-DESCRIPTION VERSION 1

NAVIGATION LIGHTS

The Navigation Light system gives an external, visual indication of the position of the aircraft and its direction of flight.

A forward–facing light is installed at the edge of each wing tip.

A rearward–facing light is installed on the tail cone below the Auxiliary Power Unit (APU) exhaust.

System Description

A forward–facing navigation light assembly is installed at the leading edge of each wing tip. A rearward–facing navigation light assembly is installed on the tail cone, below the APU exhaust. Each light assembly has a different colored lens:

- the left wing–tip navigation light has a red lens
- the right wing–tip navigation light has a green lens
- the tail navigation light has a clear lens.

The navigation lights are controlled by the toggle switch 3LA which is installed on the overhead panel 25VU in the cockpit. The switch has two positions, which are identified NAV & LOGO ON/OFF

Operation/Control and Indicating

With the switch 3LA set to ON, the 115V AC SERVICE BUS 2, 216XP supplies power through:

- the circuit breaker 1LA
- the switch 3LA (to energize the relay 6LA)
- the relay 6LA to the step–down transformers of the wing–tip navigation light assemblies 9LA(10LA)
- the relay 6LA to the step–down transformer 13LA.

The step–down transformers in the wing–tip navigation light assemblies supply 28V AC to the lights. The lamps come on.

The step–down transformer 13LA supplies 12V AC to the tail navigation light. The lamp comes on.

With the switch 3LA set to OFF:

- the relay 6LA is de–energized
- the lamps go off.

When the towing tractor is connected it supplies 115V AC through:

- the electrical box 5GC,
- the closed contacts in the relay 6LA to the step–down transformer in the wingtip navigation light assemblies 9LA(10LA),
- the closed contact in the relay 6LA to the step–down transformer 13LA.

The step–down transformers in the wing–tip navigation light assemblies supply 12V AC to the lights. The lamps come on.

The step–down transformer 13LA supplies 12V AC to the tail navigation light. The lamp comes on. When the towing tractor is disconnected the lamps go off.

LOGO LIGHTS

The logo lights 4LY and 5LY are installed on the horizontal stabilizer in the zones 334 and 344. Each logo light consists of a housing which contains the lamp assembly and a step–down transformer. The step–down transformer lower the aircraft's 115VAC to 28VAC power supply.

The toggle switch 'NAV/LOGO' 3LA, installed on the cockpit overhead panel 25VU, controls the logo lights together with the navigation lights.

The toggle switch has an ON and OFF position.

When you set the toggle switch 3LA to the ON position the logo lights come on automatically during taxiing, take-off and landing.

With the switch NAV & LOGO (3LA) set to ON,115 V AC is supplied to the relay 6LA. When the flaps are lowered to 15 degrees or more, or the landing–gear struts are compressed, a ground signal is received. This energizes the coil of the relay 5LY. Power is then supplied to the step–down transformer of the light assemblies. From these transformers a decreased voltage of 28 V DC is supplied to the logo lights 3LY (4LY) which causes the logo lights to go on.

When the landing–gear is retracted, and the flaps are retracted to less than 15 degrees, the ground signal is removed. In this condition, the logo lights go out. Also, with the switch NAV & LOGO (3LA) set to OFF, the relay 6LA is de–energized which causes the logo lights to go out.

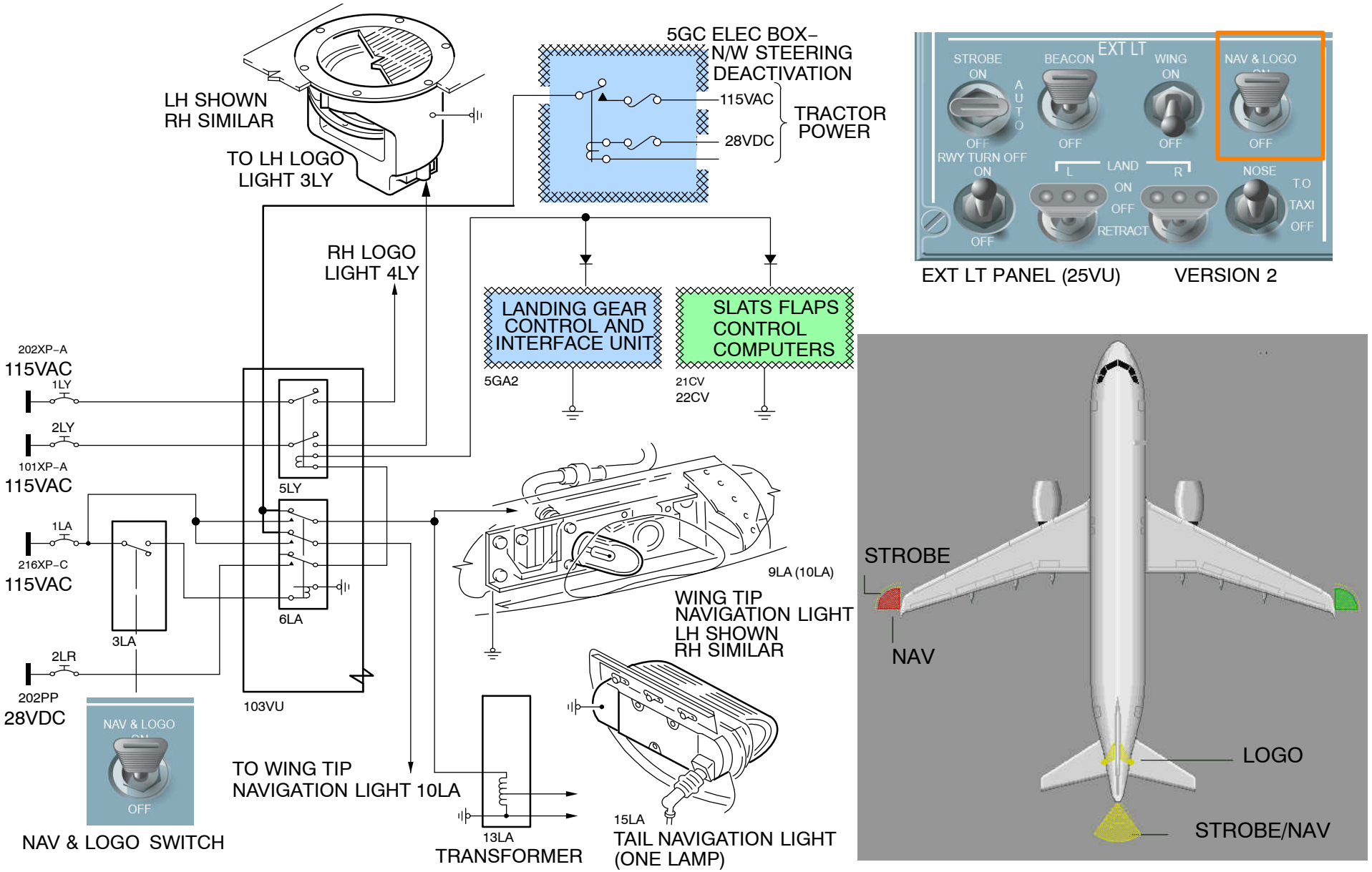


Figure 40 Nav&Logo Lights Schematic Vers. 1

NAV & LOGO LIGHTS-DESCRIPTION VERSION 2

NAVIGATION LIGHTS VERSION

The Navigation Light system gives an external, visual indication of the position of the aircraft and its direction of flight.

System Description

A forward–facing navigation light assembly is installed at the leading edge of each wing tip. A rearward–facing navigation light assembly is installed on the tail cone, below the APU exhaust. Each light assembly has a different colored lens:

- the left wing–tip navigation light 9LA has two lamps and a red lens
- the right wing–tip navigation light 10LA has two lamps and a green lens
- the tail navigation light 15LA has two lamps and a clear lens.

The navigation lights are controlled by the toggle switch 3LA which is installed on the overhead panel 25VU in the cockpit. The switch has three positions, which are identified NAV & LOGO 2/1/OFF.

Operation/Control and Indicating

With the switch 3LA set to position 1, the 115V AC SERVICE BUS 2, 216XP supplies power through:

- the circuit breaker 1LY
- the switch 3LA (to energize the relay 6LA)
- the relay 6LA to the step–down transformers of the related navigation lights.

The step–down transformers in the wing–tip navigation light assemblies supply 28V AC to the related lamp. The lamp comes on.

Each step–down transformer in the step–down transformer assembly 13LA supplies 12V AC to its related tail navigation light. The lamp comes on. With the switch 3LA set to position 2, the operation is almost the same, but this time the power is supplied through the circuit breaker 2LA and the relay 7LA.

With the switch 3LA set to OFF:

- the relays 6LA and 7LA are de–energized
- the lamps go off.

LOGO LIGHTS DESCRIPTION VERSION

Operation/Control and Indicating

The logo lights 4LY and 5LY are installed on the horizontal stabilizer . Each logo light consists of a housing which contains the lamp assembly and a step–down transformer. The step–down transformer lower the aircraft's 115VAC to 28VAC power supply.

The toggle switch 'NAV/LOGO', installed on the cockpit overhead panel 25VU, controls the logo lights together with the navigation lights.

The toggle switch has the positions 2, 1 and OFF.

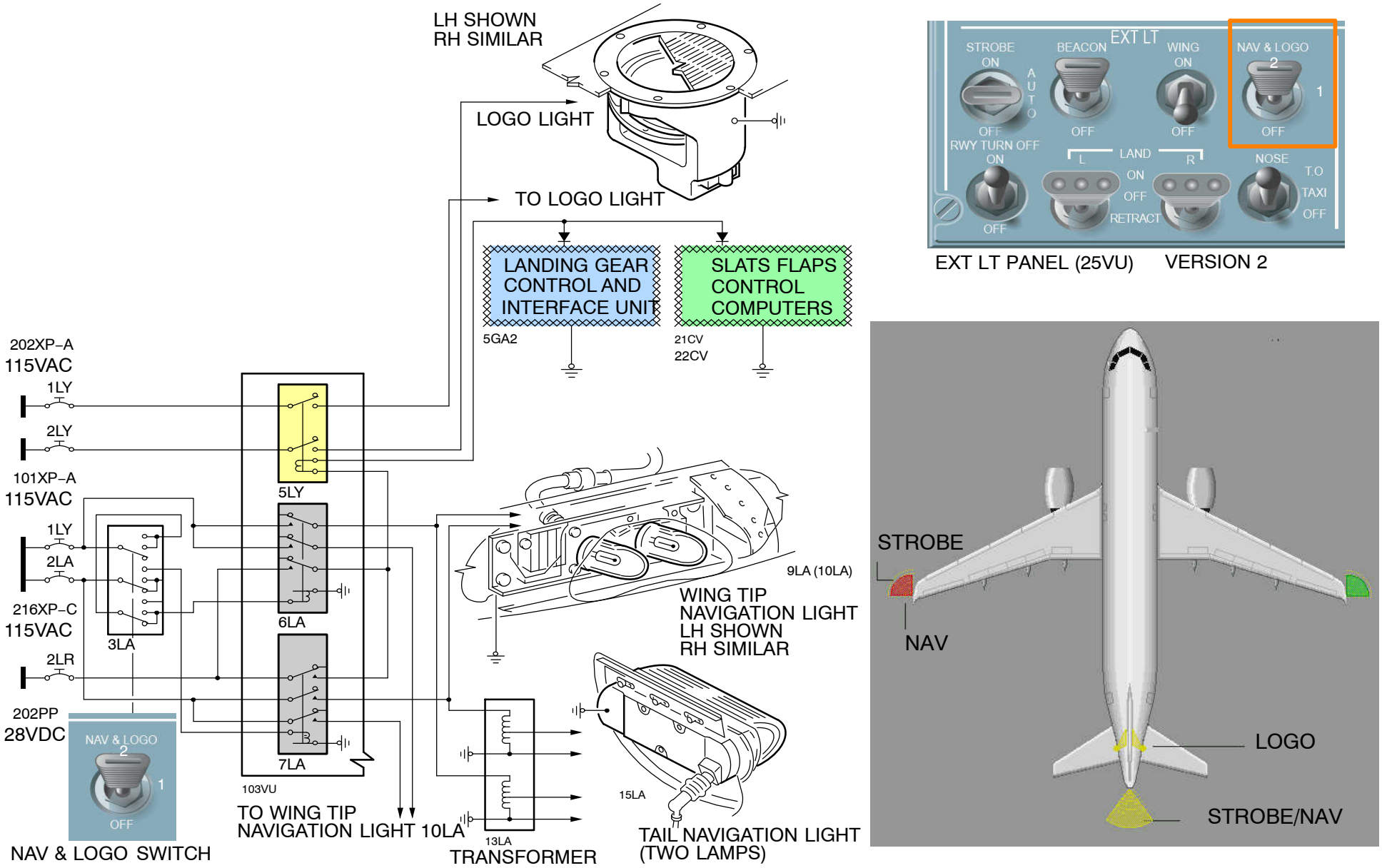
When you set the toggle switch 3LA to the 1 (2) position the logo lights come on automatically with the NAV1 (NAV2) lights during taxiing, take off and landing.

Operation

115 V AC is supplied to each logo light from the normal busbars 101XP and 202XP. This is controlled through the circuit breakers 1LY and 2LY.

With the switch NAV & LOGO (3LA) set to 1 or 2, 115V AC is supplied to the relays 6LA and 7LA. When the flaps are lowered to 15 degrees or more, or the landing–gear struts are compressed, a ground signal is received. This energizes the coil of the relay 5LY. Power is then supplied to the step–down transformer of the light assemblies. From these transformers a decreased voltage of 28V AC is supplied to the logo lights which causes the logo lights to go on.

When the landing–gear is retracted, and the flaps are retracted to less than 15 degrees, the ground signal is removed. In this condition, the logo lights go out. Also, with the switch 3LA set to OFF, the relays 6LA and 7LA are de–energized which causes the logo lights to go out.



EXT LT PANEL (25VU) VERSION 2

Figure 41 Nav&Logo Lights Schematics Vers.2

NAV LIGHTS-DESCRIPTION LED VERSION

SYSTEM DESCRIPTION

A forward–facing LED navigation light assembly with Near End–Of–Life (NEOL) indication is installed at the leading edge of each wing tip.

The NEOL indication is a blue LED light that flashes when the LED light assembly has a remaining operation life of 950 hours.

A rearward–facing navigation light assembly is installed on the tail cone, below the APU exhaust.

Each light assembly has a different color:

- The left wing–tip navigation light 9LA has red LEDs
- The right wing–tip navigation light 10LA has green LEDs
- The tail navigation light 15LA has a clear lens.

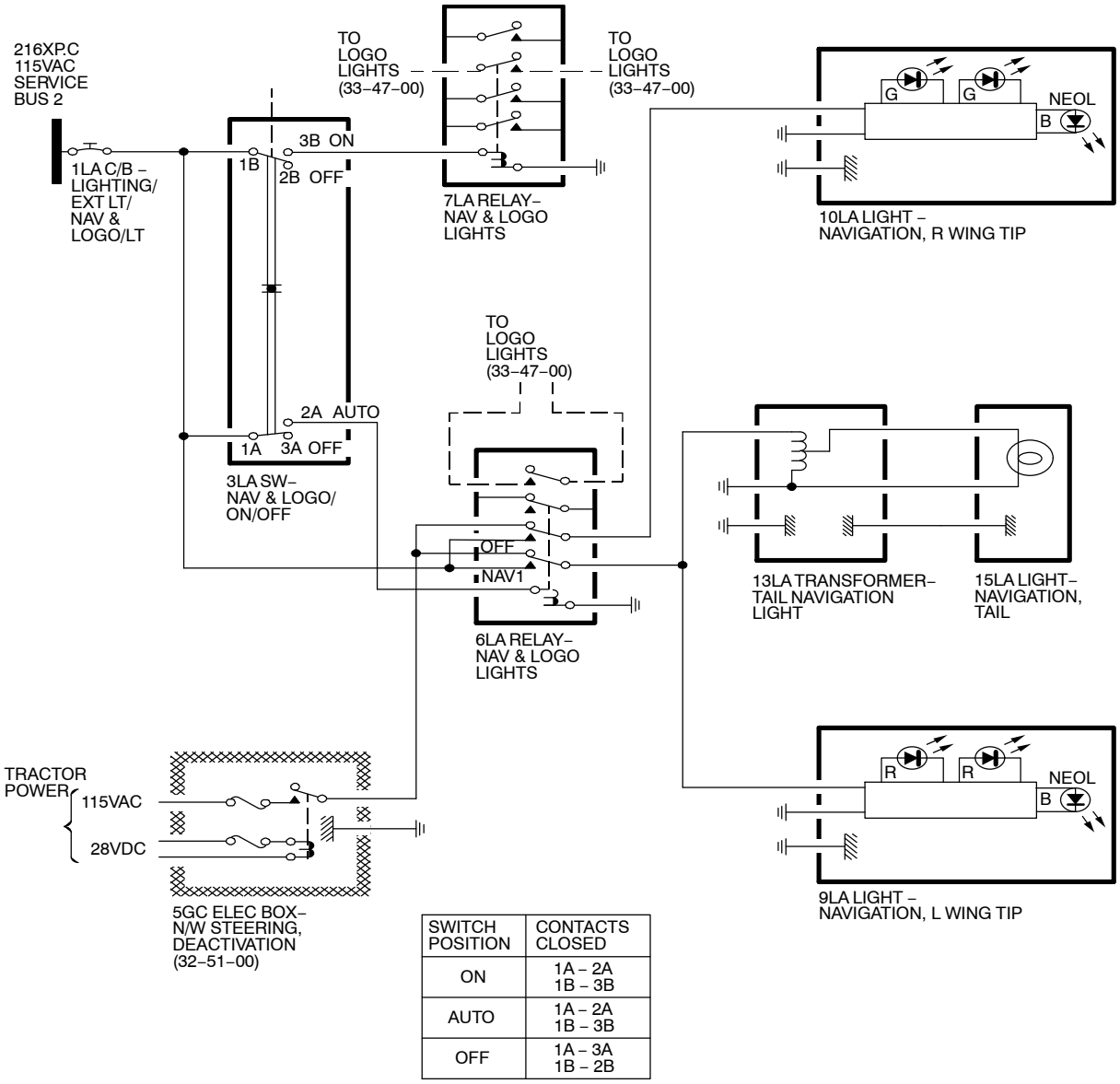
The navigation lights are controlled with the toggle switch 3LA which is installed on the overhead panel 25VU in the cockpit.

The switch has three positions, which are identified NAV & LOGO 2/1/OFF or two positions which are identified NAV & LOGO ON/OFF.

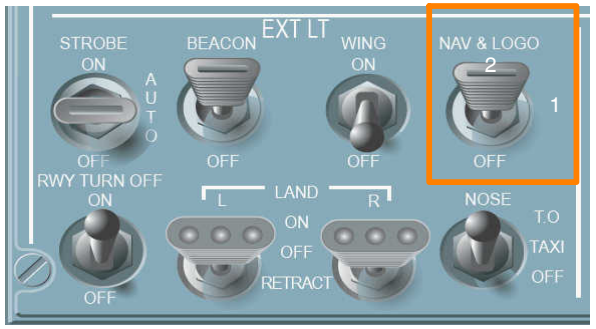
Each forward–facing LED navigation light assembly contains two light units which operate independently.

Power supply:

115V AC, 0.17A maximum – for each light channel 15 WATT per LED light assembly.



SWITCH POSITION	CONTACTS CLOSED
ON	1A – 2A 1B – 3B
AUTO	1A – 2A 1B – 3B
OFF	1A – 3A 1B – 2B



EXT LT PANEL (25VU) VERSION 2

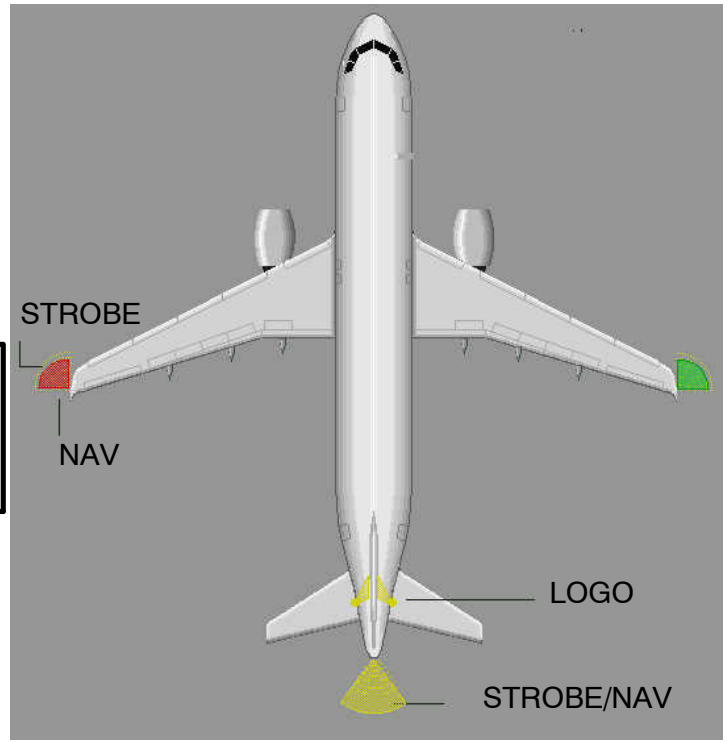


Figure 42 Nav Lights LED Version

ANTICOLLISION LIGHTS DESCRIPTION

ANTICOLLISION LIGHTS

General

The aircraft recognition lighting system is designed as a visual aid to other aircraft, so reducing the possibility of a collision.

The system consists of:

- an anti–collision light providing a high–intensity red flashing light on the top and on the bottom of the aircraft fuselage.
- a strobe light providing a high–intensity white flashing light. One light is installed in each wing tip facing forward and one is installed in the tailcone, below the APU exhaust, facing rearwards.

Description

Two anticollision/beacon lights are installed, 7LV on the top and 6LV on the bottom of the aircraft fuselage. The anticollision/beacon lights are high intensity red discharge lamps. Each lamp is supplied from an individual power unit. The anticollision/beacon lights flash at approx. 60 flashes per minute, when the BEACON switch 2LV is in the ON position.

Three strobe lights are installed, two at each wing tip on the leading edges 16LV and 17LV and one on the tail cone 19LV. The strobe lights are high intensity white lights synchronized to operate alternately with the anticollision/beacon light. The forward facing strobe lights flash at approx. 120 flashes per minute and the rearward facing strobe light flashes at approx. 60 flashes per minute. This occurs when the STROBE switch 11LV is either in the ON or AUTO position.

Operation

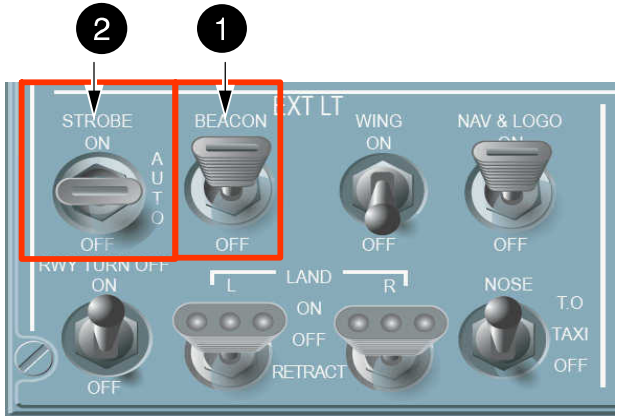
The aircraft recognition lighting system consists of two independent systems which are designed to operate alternately in synchronization:

- the anti–collision light system and
- the strobe light system.

The **anti–collision/beacon light system** operates, when the ”BEACON ON–OFF” control switch (2LV), located on the overhead panel 25VU, is in the ”ON” position. This causes the power supply units (3LV) and (4LV) to energize and supply the upper and lower anti–collision lights/beacon lights (6LV) and (7LV) with power.The upper beacon power unit supplies a start pulse for the anti–collision beacon and the strobe lights.

The **strobe light system** operates, when the ”STROBE ON–AUTO–OFF” control switch (11LV), located on the overhead panel 25VU, is in the ”ON/AUTO” position. This causes the power supply units (14LV), (15LV) and (18LV) to energize and supply the two strobe lights (16LV) and (17LV) on each wing tip and the strobe light (19LV) on the tailcone with power.

If a malfunction should occur at the high–intensity strobe lights (white) or their power supply units, this does not have an affect of the function of the fuselage anti–collision light (red).



EXT LT PANEL (25VU)

1 BEACON sw

This switch turns on and off the two flashing red lights, one on top and one on the bottom of the fuselage.

2 STROBE sw

This switch turns on and off the three synchronized strobe lights, one on each wing tip and one below the tail cone.

ON: The strobe lights flash white.

AUTO: The strobe lights come on automatically when the main gear strut is not compressed.

OFF : The strobe light are off.

Figure 43 Strobe & Beacon Light Switches

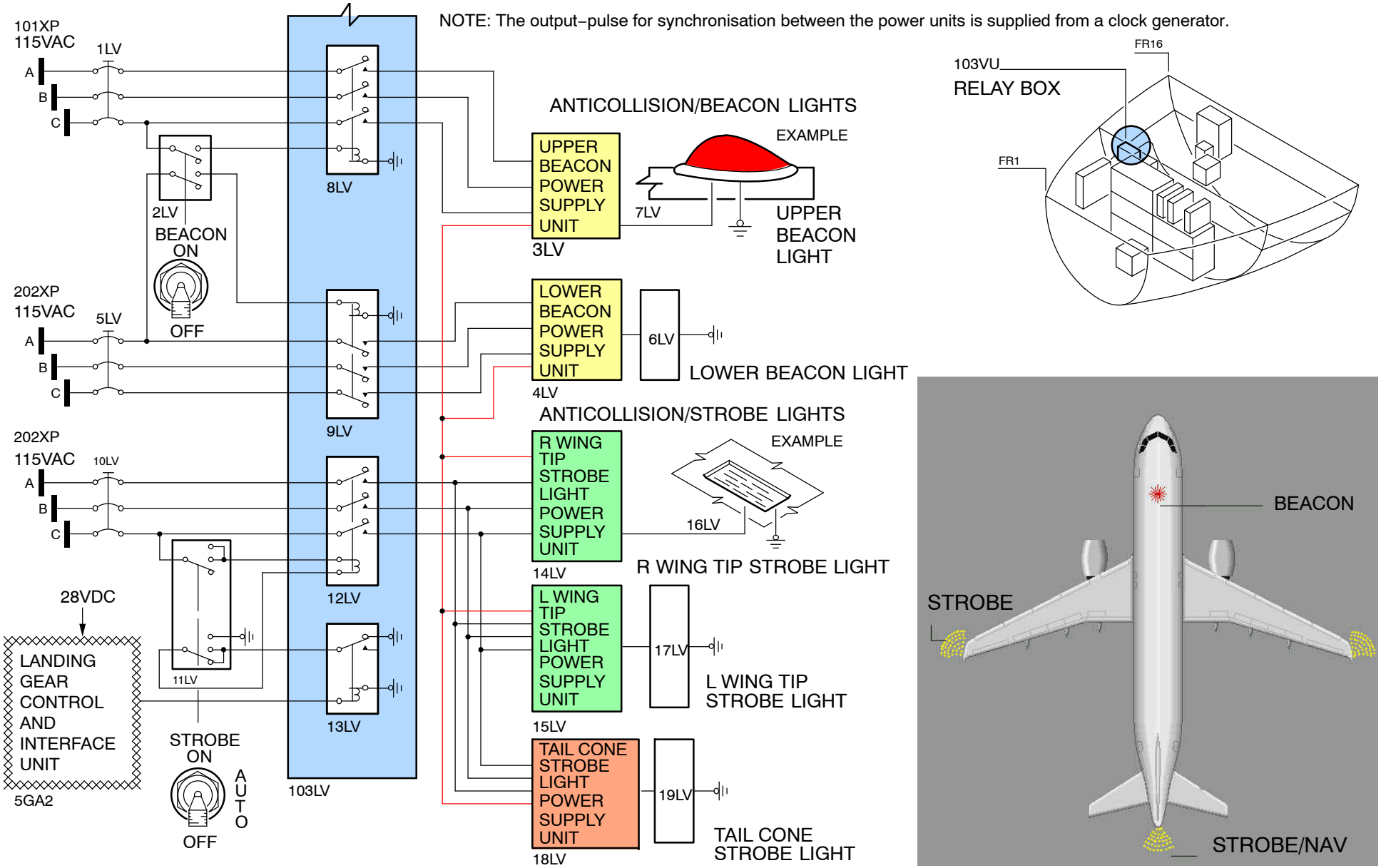


Figure 44 Anticollision & Strobe Lights Schematic

LANDING LIGHT DESCRIPTION

General

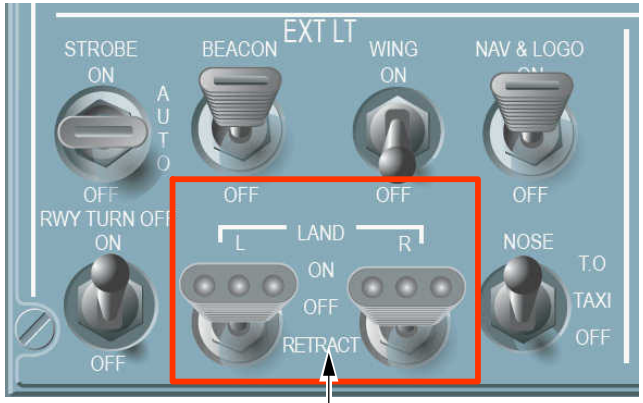
Two retractable landing lights are installed on the bottom of the wings. The lights operate through maximum operating speeds (VMo).

The landing light system provides lighting to illuminate the runway when the aircraft lands at night. Two landing lights 7LB and 8LB are installed one on the underside of each wing. Each light has a separate control switch 5LB and 6LB. They can be extended at all aircraft speeds.

System Description

The left–hand (LH) landing light 7LB and the right–hand (RH) landing light 8LB are installed on the bottom of the LH and RH wings. Each landing light has an independent extension/retraction and illumination circuit. Two toggle switches, LAND L 5LB and LAND R 6LB, control the landing light system.

These switches are installed on the overhead panel 25VU in the cockpit. When the landing lights are extended, an indication 'LAND LT' is shown on the CRT (**C**athode **R**ay **T**ube) as a memo message. The CRT is a part of the Electronic Centralized Aircraft Monitoring system (ECAM) (Ref. 31–52–00).



EXT LT PANEL (25VU)

1

1 L and R LAND SELECTOR

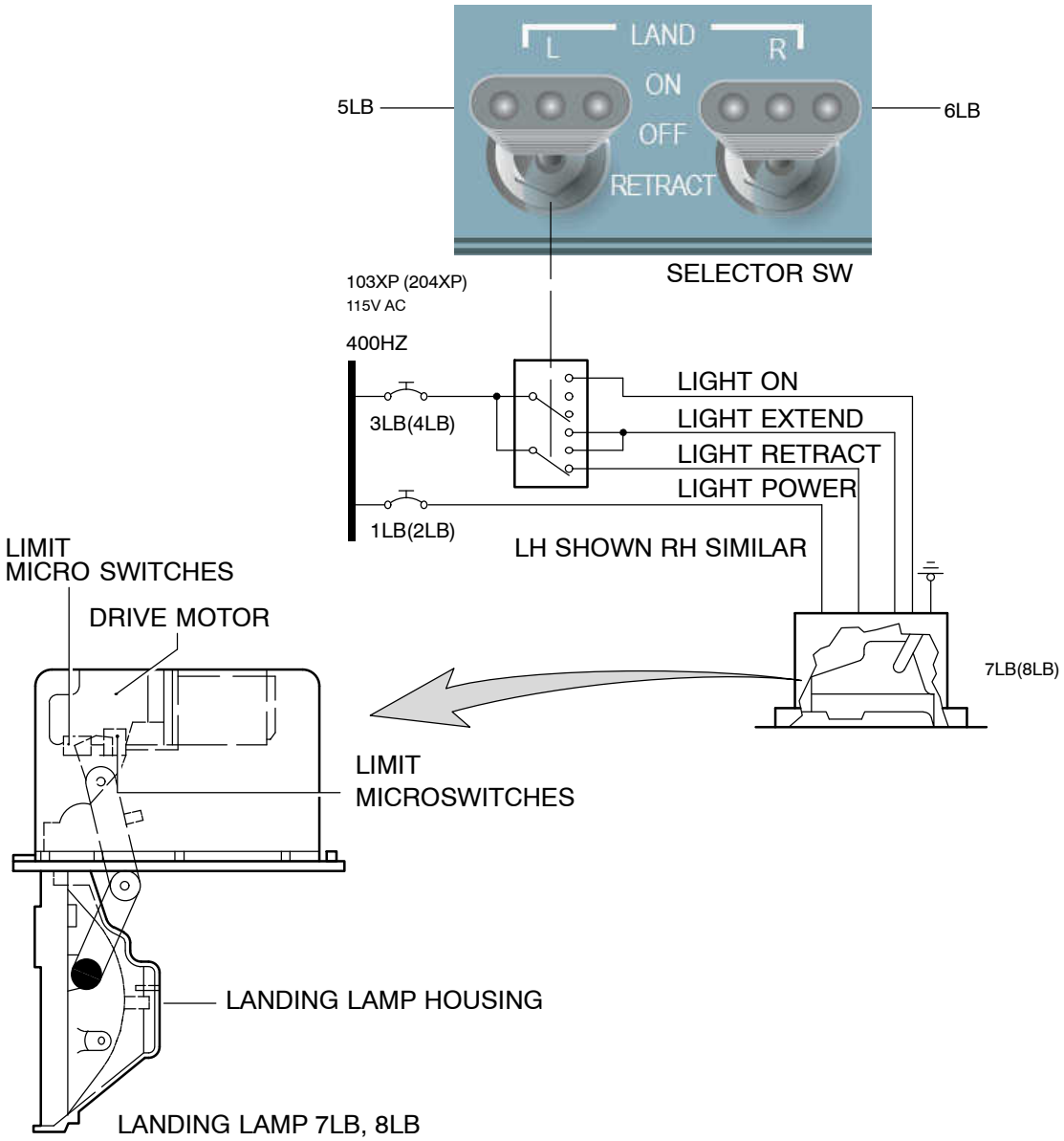
These selectors control the landing light.

ON: Extends the (left or right) landing light which comes on automatically when fully extended.

OFF: Shut off the landing light but leaves it extended.

RETRACT: Retracts the landing light and shuts it off.

Figure 45 L&R Landing Light Switches



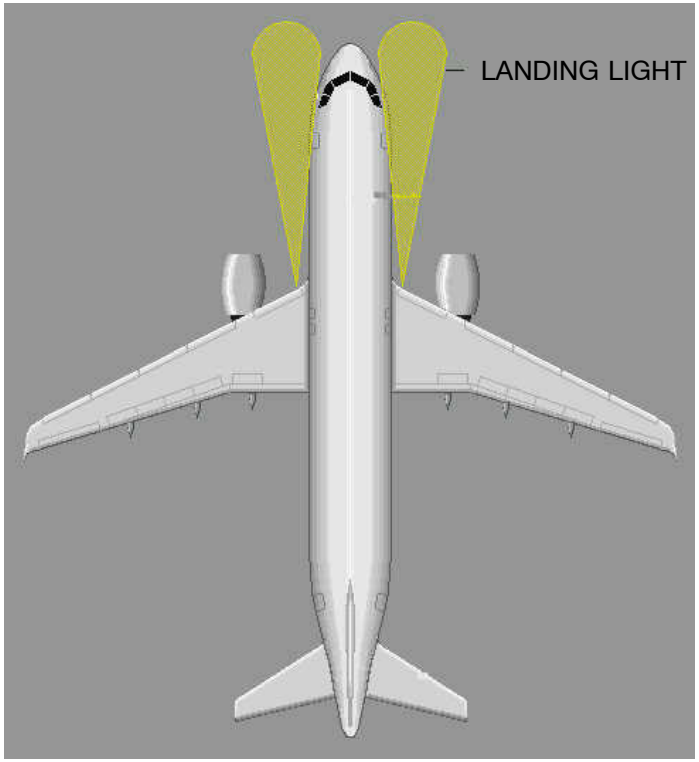


Figure 46 Landing Lights

LANDING LIGHT OPERATION

Power Supply

The 115V AC busbars, 101XP and 202XP, supply power to the LH and RH landing lights through the circuit breakers 1LB, 2LB, 3LB and 4LB. These circuit breakers are installed on panel 122VU in the cockpit. The circuit breakers 1LB and 2LB control the power supply to the LH and RH landing light step–down transformers. The circuit breakers 3LB and 4LB control the power supply to the LH and RH single–phase motors of the landing lights.

Operation/Control and Indicating

Two control switches 5LB and 6LB are installed on the overhead panel 25VU. The switch LAND L controls the left–hand landing light and the switch LAND R controls the right–hand landing light. These switches are operated from RETRACT to OFF to ON for extension and illumination of the landing lights. Then from ON to OFF to RETRACT, to set the landing lights to off and to retract them.

These operations are as follows:

- RETRACT to OFF

  Power is supplied to the extend coil of the related motor, through a microswitch, to extend the related landing light.
- OFF to ON

  Power is supplied to the related power relay, through the full–wave rectifier and the closed contacts of a microswitch. This connects 115V AC, 400Hz, to the step–down transformer which decreases the voltage to 28V AC. The related landing light comes on.
- ON to OFF

  This removes power from the related power relay and opens the contacts of the microswitch. This removes 115V AC, 400 Hz, from the step–down transformer and the related landing light goes off.
- OFF to RETRACT

  Power is supplied to the retract coil of the related motor, which retracts the related landing light. The landing light stays off.

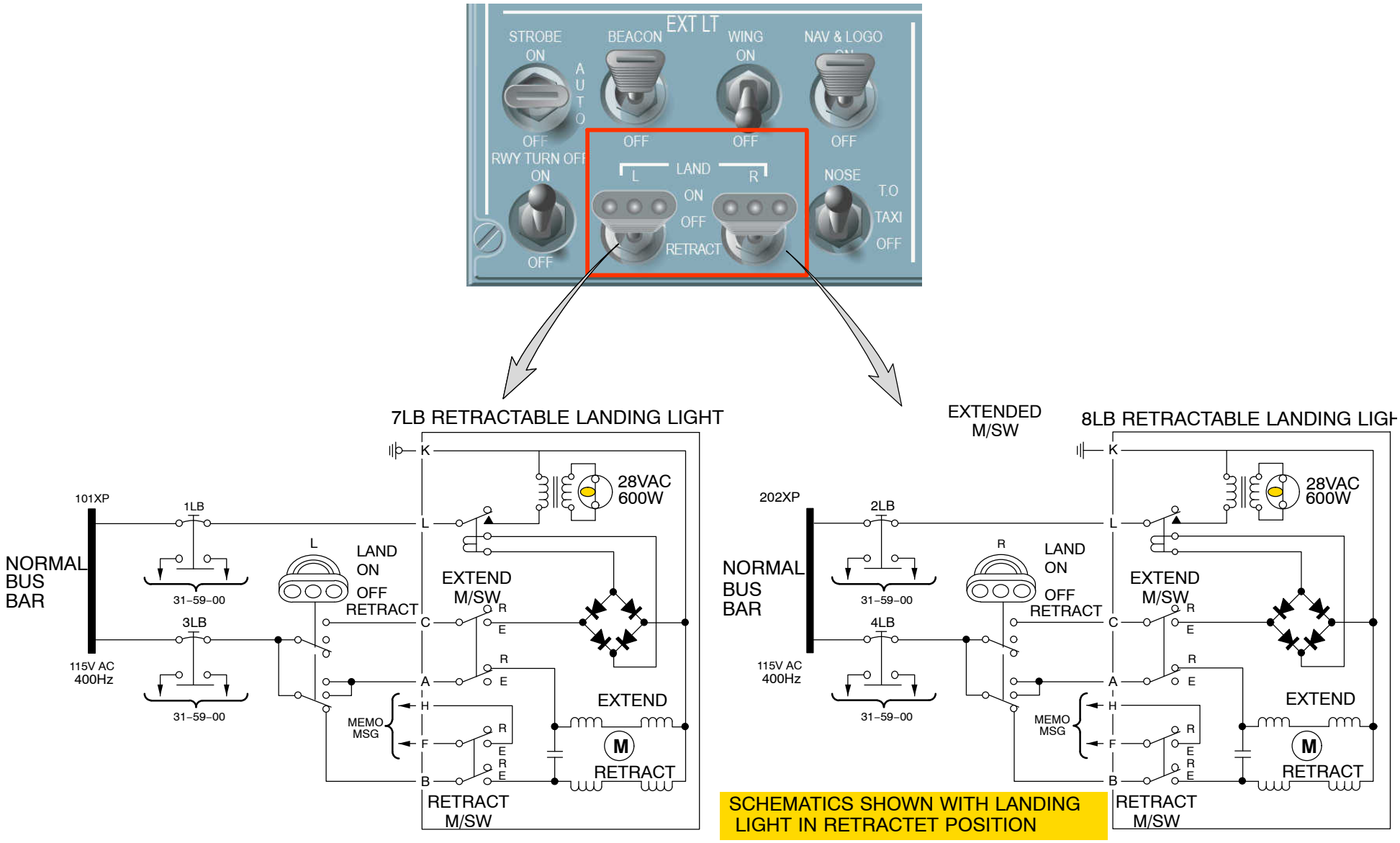


Figure 47 Landing Lights Schematic

ANTICOLLISION & STROBE LIGHT COMP. LOCATION

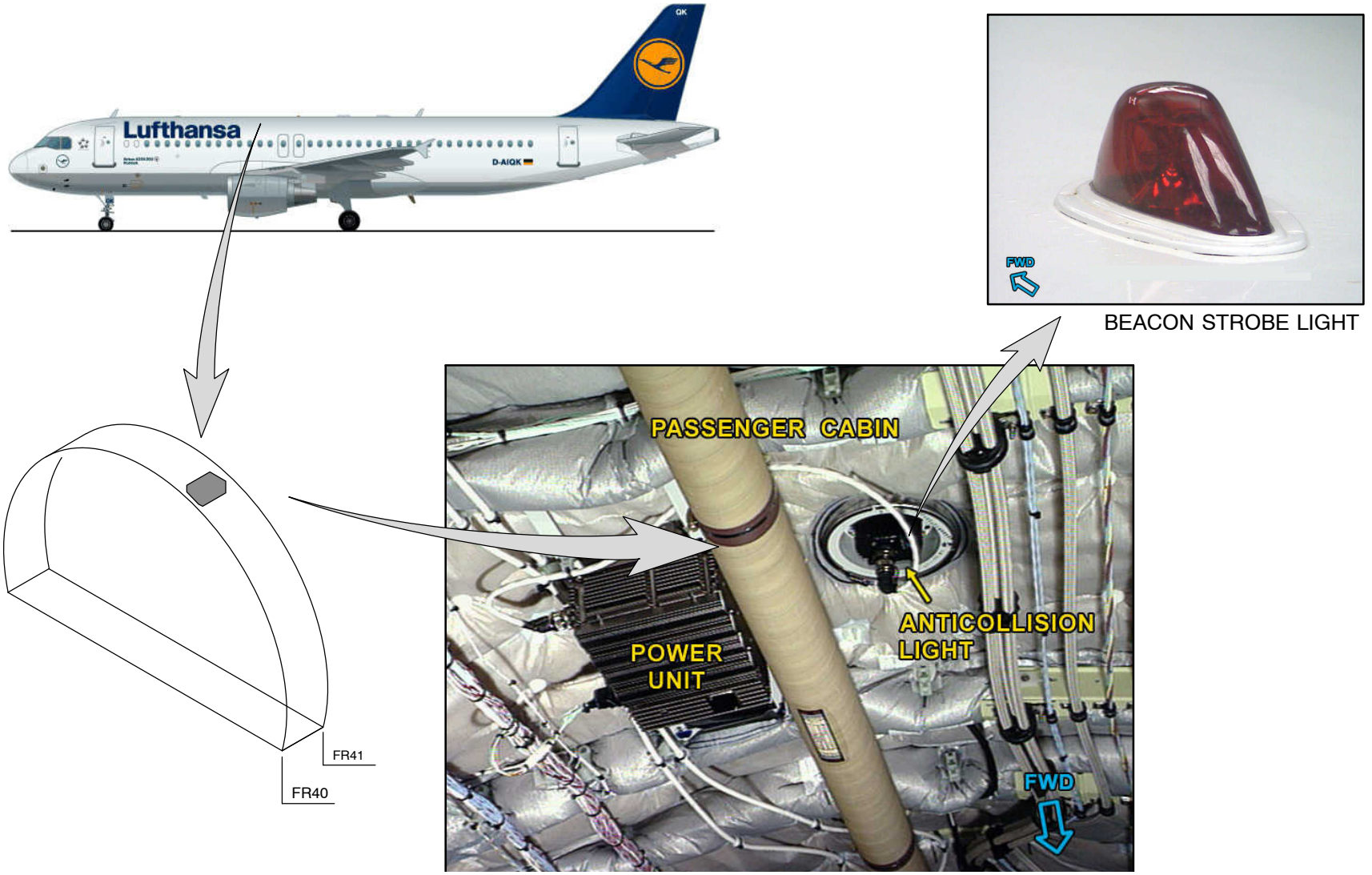


Figure 48 Upper Anticollision Light Comp. Location

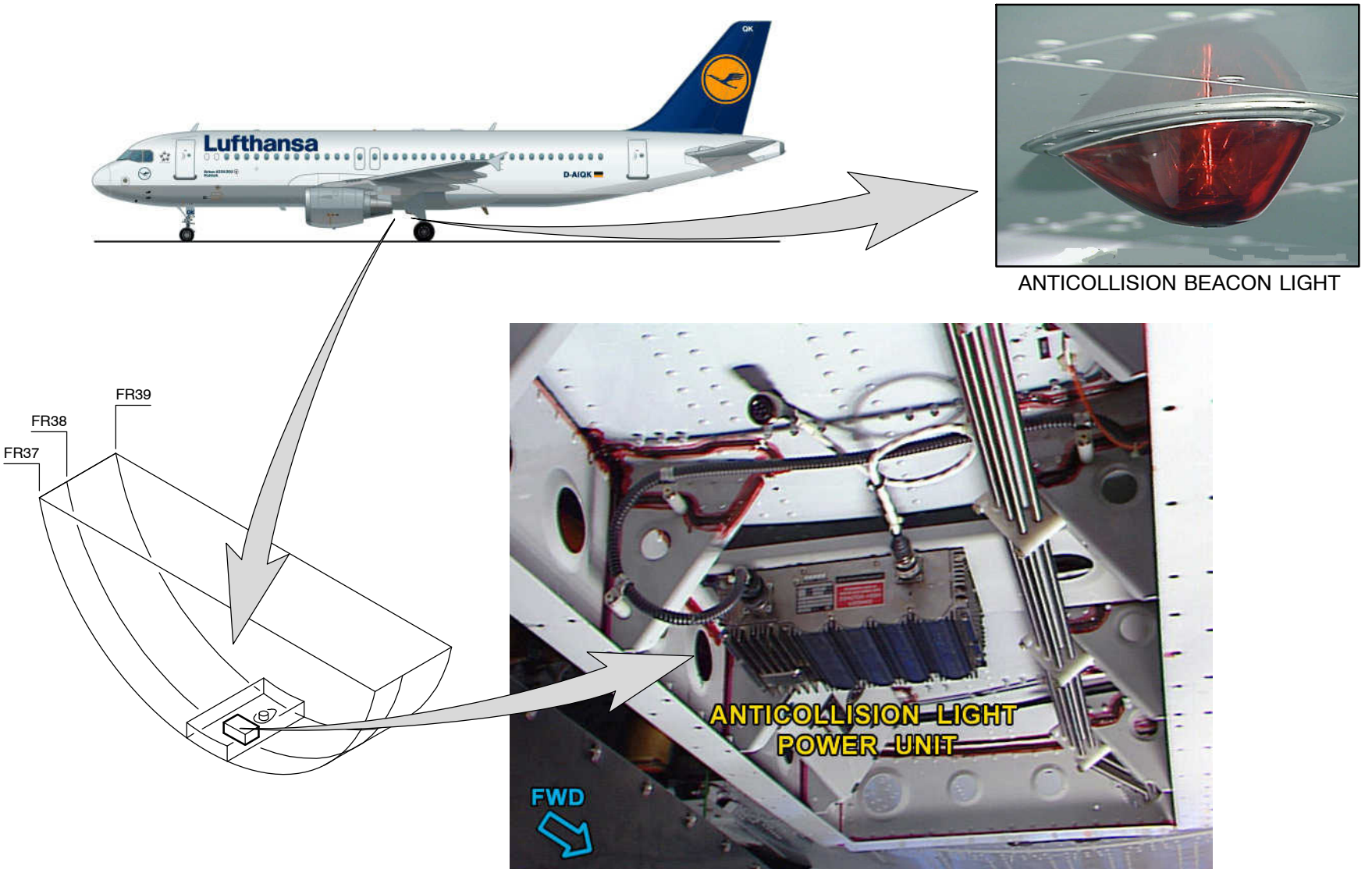


Figure 49 Lower Anticollision Light Compartment Location

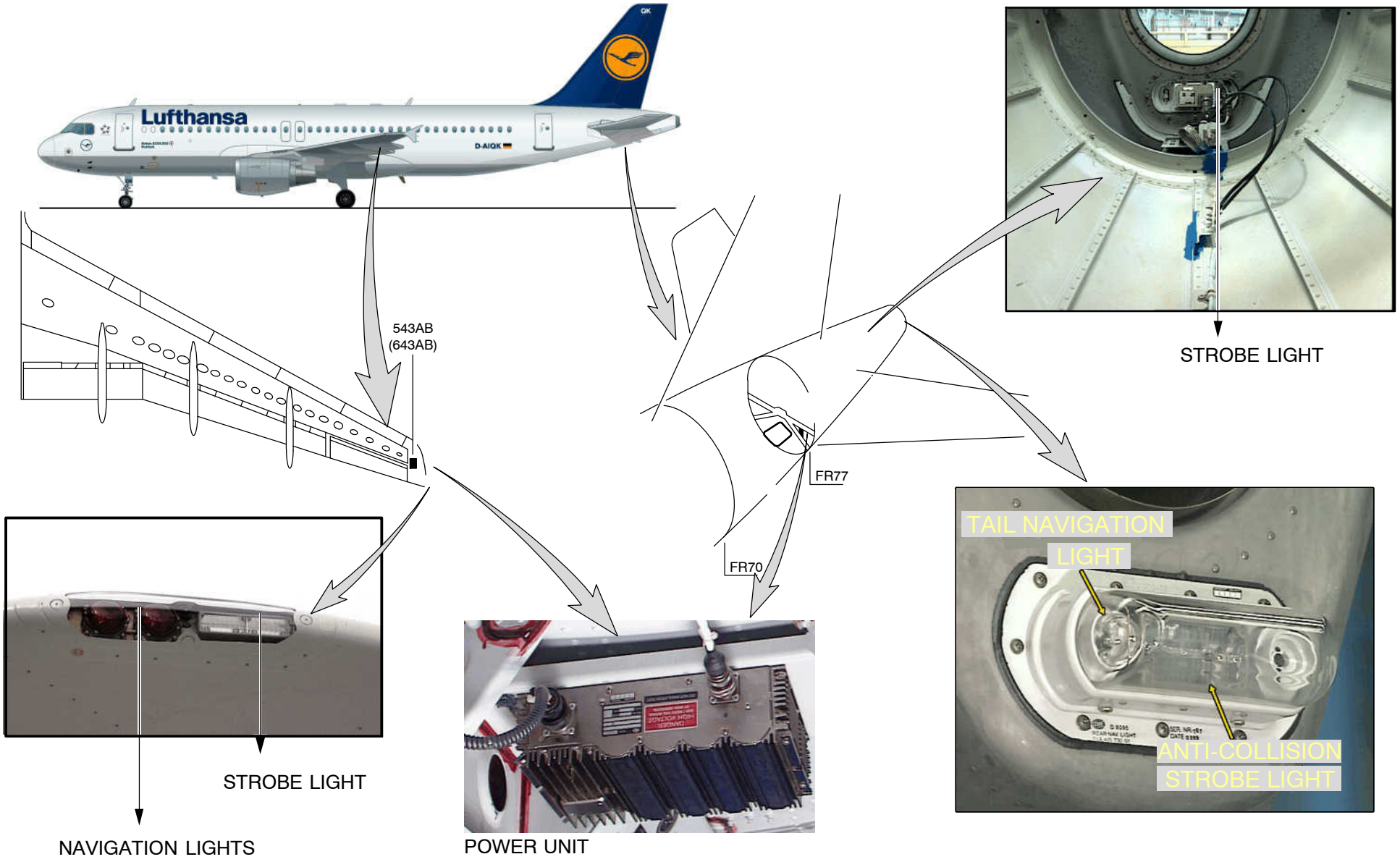
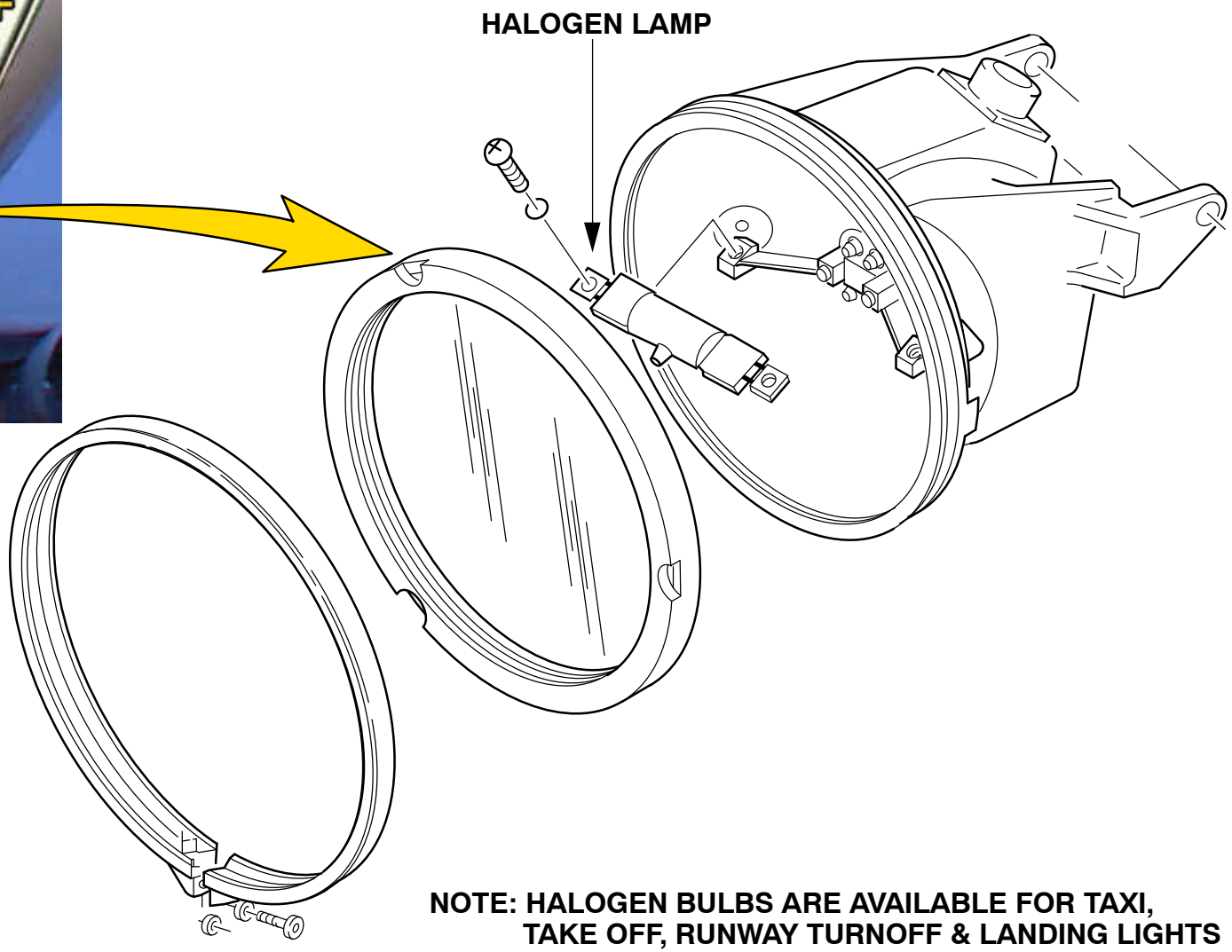


Figure 50 Wing&Tail Strobe Light Comp Location



NOTE: HALOGEN BULBS ARE AVAILABLE FOR TAXI, TAKE OFF, RUNWAY TURNOFF & LANDING LIGHTS

Figure 51 Example for Halogen Bulb Installation

SAFETY PRECAUTIONS

When you work on the lights system, make sure that you obey all the AMM (**A**ircraft **M**aintenance **M**anual) safety procedures. This will prevent injury to persons and/or damage to the aircraft.

Here is an overview of main safety precautions related to the lights system. Isolate the electrical circuits from the related equipment and the environment to prevent injury to persons and/or aircraft damage. Do not disconnect the electrical connections for at least two minutes after you de–energize the electrical circuits. When you change a lamp, do not touch the glass with your fingers. The oils from your skin will quickly cause deterioration of the lamp. If you accidentally touch the lamp glass, clean it with a lint–free cloth. Do not look directly towards the lights without eyes protection. Their intensity can be high enough to cause permanent damage to your eyes. Make sure that there are no signs of fuel contamination in the landing light assembly. If you find fuel contamination, the landing light must not be operated.

If you do not obey this precaution, ignition of the remaining fuel in the landing light can occur.

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 landing gear and the related doors,
- components that move.

Do not remove a strobe light for at least ten minutes after you de–energize the electrical circuits. The high voltage electrical current in the capacitor of the strobe light is dangerous.

Do not touch the strobe lights for at least 5 minutes after operation. The strobe light will still be hot. Use gloves when removing lamps, oils from your skin can deteriorate the life of the bulbs.

Be careful if you touch the strobe light with the cover removed and the power on. Some components have dangerous voltages.

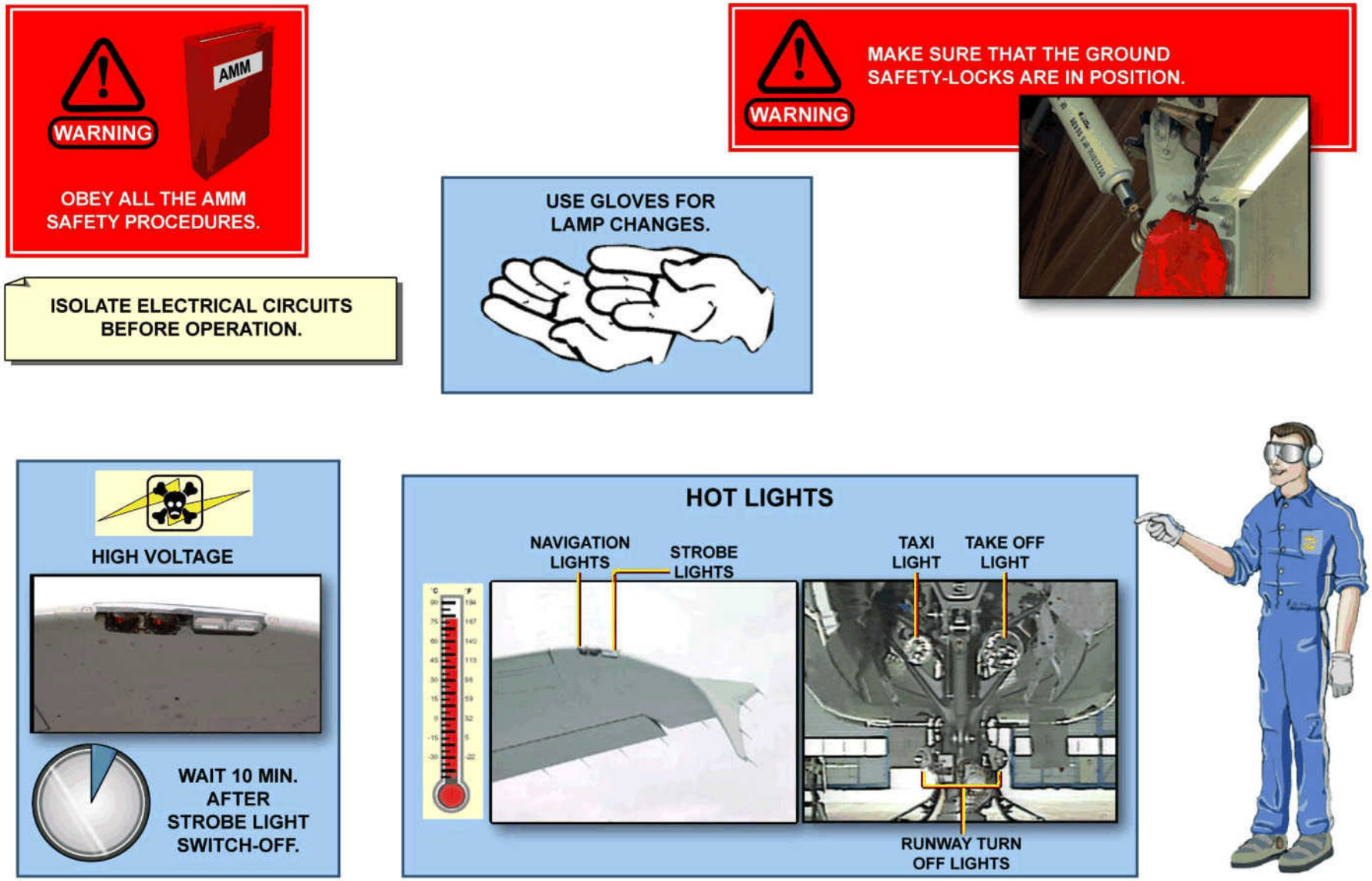


Figure 52 Safety Precautions

33–50 EMERGENCY LIGHTING

EMERGENCY LIGHTING-DESCRIPTION

General

The Emergency Lighting System of the cabin is separately controlled and supplied from the other lighting system.

There are lights installed in the hatracks, in the areas of exits, in the escape slides and in the fuselage in the overwing area.

They shall be supplied automatically by the EPSU (**E**mergency **P**ower **S**upply **U**nits) with 6V DC, after loss of AC BUS 1. In this case the lights will be supplied from the DC ESS SHED BUS via 28/6V DC/DC Converters.

If the DC ESS SHED BUS is loss of power, the lights will be supplied by the battery packs installed on the EPSUs.

During normal operation the battery packs will be charged by a battery charge device inside the EPSU.

The EXIT signs will be switched on (except automatic), when:

- NO SMOKING switch in ON, or
- NO SMOKING switch in AUTO and landing gear extended, or
- a very low cabin pressure is monitored by the Cabin Pressure Controllers.

If the Emergency Exit Doors are open and the Slides are armed, the Overwing Emergency lights and the Escape Slide lights illuminate.

If the Main Doors are open and the Slides are armed, the lights in the Main Exit Escape Slides illuminate.

The control of the Emergency Lighting system happens via the following switches:

- EMER EXIT light switch on the cockpit overhead panel
- EMER pushbutton switch on the FAP (**F**wd **A**ttendant **P**anel).

Test

The Emergency Lighting System can be tested via the PTP (**P**rogramming and **T**est **P**anel) of the CIDS.

When you push the SYS pb–switch on the PTP the EPSUs will be tested one after another. If all EPSUs monitor no failures of the connected internal and external loads and the battery packs, the SYS OK light on the PTP illuminates after approximately 30s.

When you push the BAT pb–switch on the PTP a test of the batteries capacity will be initiated. A security code has to be entered first on the PTP.

The test lasts app. 2h because the batteries will be discharged and recharged after that.

(The exact test description follows in the chapter 23 CIDS).

Housed in the fuselage, there are 4 exterior emergency lights. These lights are automatically activated when an overwing emergency exit door is opened in the armed configuration. The lights come on all along the escape route leading to the aft wing slide. Each escape slide has integrated lighting strips.

Figure 53 Exterior Emergency Lights

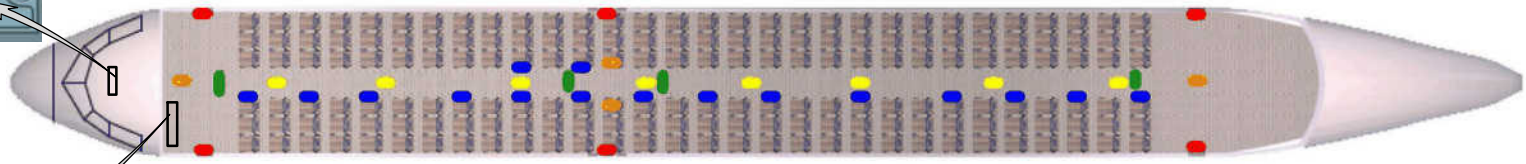
EMERGENCY EXIT SIGNS

CABIN EMER. EXIT LOCATION LIGHT

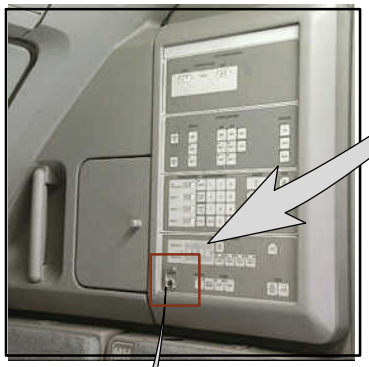
CEILING EMERGENCY LIGHTS VERSION 1

CEILING EMERGENCY LIGHTS VERSION 2

EMER EXIT LT

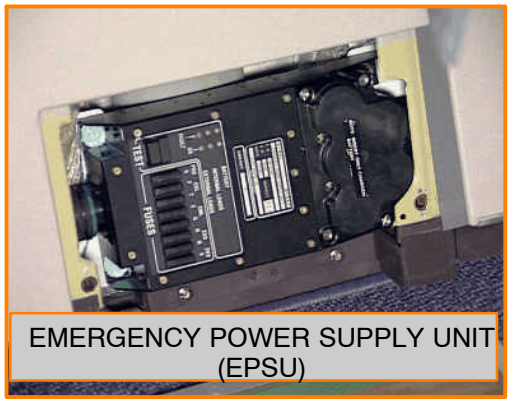


FWD PURSER STATION



EMERGENCY LIGHT PUSHBUTTON

ESCAPE PATH LIGHTING



EMERGENCY POWER SUPPLY UNIT (EPSU)

Figure 54 Emergency Lights Component Location

EPSU FUNCTIONAL OPERATION

The EPSUs (**E**mergency–**P**ower **S**upply **U**nits) supply different lights. These lights are exit signs, cabin emergency lights, overwing emergency lights, escape slide lights, emergency–escape hatch–handle lights and, through the inverter units, floor–proximity lights.

The emergency–power supply unit consists of:

Electronic logic and switching circuits.

A 28 V DC/6 V DC converter which supplies the loads whenever the essential busbar is energized and the emergency lighting system is activated.

A 6 V battery supplies the loads whenever the system is not selected OFF and the power supply from the DC ESS SHED BUS is not available. The DC ESS SHED BUS charges the battery through the 28 V DC/6 V DC unit converter.

Whenever the ambient temperature falls below +20 DEG. C (68 DEG. F) the 28 V DC ESS SHED provides electrical heating for the battery. The battery is changed without removal of the power supply unit.

A test circuit tests the condition of the unit battery, the unit logic and the related loads. The battery test procedure starts after coding selection when the TEST EMER LIGHT BAT membrane switch on the programming and test panel 110RH (CIDS) is pushed.

If all batteries are serviceable, the annunciator BAT OK adjacent to the membrane switch comes on. The system test procedure starts when the TEST EMER LIGHT SYS membrane switch on the programming and test panel 110RH is pushed. The test circuit carries out an interrogation of the units and monitors the output current.

If all units are serviceable the annunciator SYS OK adjacent to the membrane switch comes on. This test loop completes only when all unit output currents are within the expected value. An individual test on each power supply unit must be carried out when either the BAT OK or SYS OK annunciator does not come on.

The individual test starts when the pushbutton on the unit is pushed. A defective unit will cause a red LED on the unit to come on. A green light in the LED indicates a serviceable power supply unit. There are three pairs of red and green LEDs. One pair provides indication of defects in the external loads (i.e. slides, overwing lights).

One pair provides indication of defects in the internal loads. One pair provides indication of defects in the battery. Each output is separately fused. The fuses are installed on top of the power supply unit.

Load Programming (Teach in)

The EPSU determines INTERNAL respectively EXTERNAL faults by measuring the resistance of the connected loads. Therefore the resistance value has once to be covered and memorized. As the EPSU accepts each value, it must be controlled before, that all connected lights function.

The TEACH–IN starts automatically when:

- The 115VAC and the 28VDC power are available.
- On forward attendant panel 120RH the LIGHT EMER pushbutton switch is in the released position.
- On overhead panel 25VU EMER EXIT LT switch 4WL is in the OFF position.
- On overhead panel 25VU NO SMOKING switch 190RH is in the OFF position. The overwing emergency lights are off.
- The emergency power–supply unit is installed on the A/C for the first time, or The battery was removed for more than 5 s and is then installed again.

EPSU BITE

Each EPSU has two different integrated BITE functions:

- A system test
- A battery capacity test

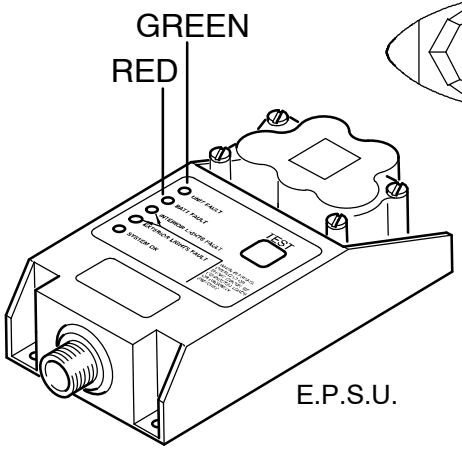
The EPSUs have an interface to the CIDS to read the BITE results of a system test and a battery capacity test.

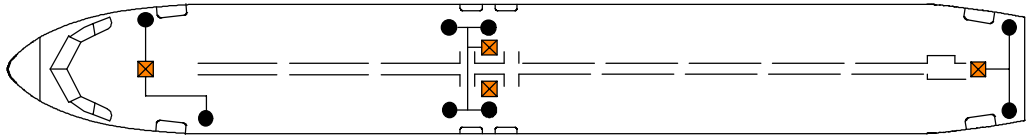
System Test

The system test monitors the subsequent functions:

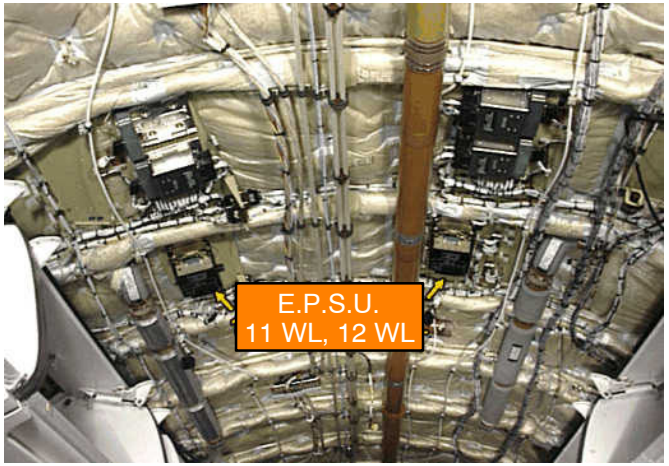
- The aircraft AC power supply
- The aircraft DC power supply
- A short circuit on each output
- An overvoltage on each output
- The output voltage of the battery pack
- The battery heating device
- The proper function of the EPSU logic and switching circuits
- If the connected loads are in the pre–determined values

The system test has a limit of 20 seconds to prevent discharge of the battery pack.





e.g. A320



EMERGENCY POWER SUPPLY UNIT

WALL MOUNTED EXIT MARKING SIGN

FLOOR PROXIMITY EMERGENCY ESCAPE PATH MARKING PHOTOLUMINESCENT STRIP

Figure 55 EPSU (Emergency Power Supply Unit)

OPERATION

The EMERgency EXIT LighT switch on the overhead panel controls the emergency lighting system. The EMER EXIT LT switch has three positions:

- OFF,
- ARMed,
- ON.

Each of these positions sends a discrete ground signal to the EPSUs.

OFF Position

In the OFF position a ground signal prevents the emergency lighting system from being switched on when the AC NORM and DC ESS SHED BUS voltages are not available. The EMER EXIT LT OFF annunciator light comes on. The Batteries are no longer charged.

NOTE: The EXIT signs and the emergency escape hatch–handle lights come on with EMER EXIT LT switch OFF, when the NO SMOKING switch is in ON position or in AUTO position with landing gear extended.

ARM Position

In the ARM position the EMER EXIT LT OFF annunciator light goes off. When the 115V AC NORM BUS voltage is not available, the cabin emergency lighting and the FPEEPMS lights come on. The power is supplied from the 28V DC/6V DC converter in the corresponding EPSU. When the 28V DC ESS SHED BUS voltage is not available, the batteries of all EPSUs supply the emergency lighting system for few minutes. The batteries are no longer charged.

ON Position

In the ON position the emergency lighting system comes on, as if the LIGHT EMER P/B on the Forward Attendant Panel (FAP) was pushed.

The cabin emergency lights, the exit signs, the escape hatch–handle lights and the floor proximity lights come on. The 28V DC/6V DC converters of the EPSUs supply these loads as long as the 28V DC ESS SHED BUS is available. If the 28V DC ESS SHED BUS voltage falls below 16V, the EPSUs internal batteries continue to supply the loads for few minutes. The batteries are no longer charged.

Other Cases

Independently of the switch positions, the integral lights in the respective escape slides come on when the passenger/crew doors or the emergency exit doors are opened with the escape slides armed.

When the emergency exit hatches are open and the slides are released, the respective over–wing emergency lights and the integral lights in the respective escape slide come on. In the event of excessive cabin depressurization, the exit marking signs and the exit location signs automatically come on.

Test

Each EPSU has a test circuit which test the condition of the battery unit, the logic unit and the related loads. This test is normally performed from the Programming and Test Panel (PTP), When the BATtery OK or SYStem OK annunciator light does not come on, an isolated test can be be performed with the P/B located on each EPSU.

Battery Capacity Test

The battery capacity test monitors:

- If the capacity of each EPSU battery is sufficient enough to supply its emergency lights for at least 10 minutes
- If the loss of the capacity of each battery, between two consecutive battery capacity tests, is smaller than 0.40 Ah
- It can take up to three hours to complete the battery capacity test.

115 VAC NORM BUS 103XP	28VDC ESS SHED BUS 801PP	25VU EMER EXIT LT (ON / ARM / OFF)	FAP 120RH LIGHT EMER	25VU NO SMOKING (ON / AUTO / OFF)	25VU (OFF)	SLIDE ARMED & PAX/CREW DOOR OPEN + SLIDE RELEASED & EMER EXIT OPEN	LANDING GEAR POSITION ESCAPE PATH MARKING LIGHTS	EMERGENY CEILING LIGHTS	OVERWING EMERGENCY LIGHTS & EMER SLIDE LIGHTS	EXIT SIGNS
YES	YES	OFF	OFF	OFF	ON	NO	UP/DOWN	OFF	OFF	OFF
YES	YES	OFF	OFF	AUTO	ON	NO	DOWN	OFF	OFF	ON (1)
YES	YES	OFF	OFF	AUTO	ON	NO	UP	OFF	OFF	OFF
YES	YES	OFF	OFF	ON	ON	NO	UP/DOWN	OFF	OFF	ON (1)
YES	YES	OFF	OFF	OFF	ON	YES	UP/DOWN	OFF	ON (1)	OFF
YES	YES	ARM	OFF	OFF	OFF	NO	UP/DOWN	OFF	OFF	OFF
YES	YES	ARM	OFF	AUTO	OFF	NO	DOWN	OFF	OFF	ON (1)
YES	YES	ARM	OFF	AUTO	OFF	NO	UP	OFF	OFF	OFF
YES	YES	ARM	OFF	ON	OFF	NO	UP/DOWN	OFF	OFF	ON (1)
YES	YES	ARM	OFF	OFF	OFF	YES	UP/DOWN	OFF	ON (1)	OFF
YES	YES	ON	ON/OFF	ON/AUTO/OFF	OFF	NO	UP/DOWN	ON (1)	OFF	ON (1)
YES	YES	OFF	ON	ON/AUTO/OFF	ON	NO	UP/DOWN	ON (1)	OFF	ON (1)
YES	YES	ON	ON/OFF	ON/AUTO/OFF	OFF	YES	UP/DOWN	ON (1)	ON (1)	ON (1)
NO	NO	OFF	OFF	ON/AUTO/OFF	OFF	YES/NO	UP/DOWN	OFF	OFF	OFF
NO	NO (A)	ARM/ON	ON/OFF	ON/AUTO/OFF	OFF	NO	UP/DOWN	ON (2)	OFF	ON (2)
NO	YES (B)	ARM/ON	ON/OFF	ON/AUTO/OFF	OFF	NO	UP/DOWN	ON (1)	OFF	OFF
NO	NO (C)	ARM/ON	ON/OFF	ON/AUTO/OFF	OFF	NO	UP/DOWN	ON (2)	OFF	ON (2)
NO	NO (C)	NO (D)	NO (D)	ON/AUTO/OFF	OFF	NO	UP/DOWN	ON (2)	OFF	ON (2)
NO	NO (C)	NO (D)	NO (D)	ON/AUTO/OFF	OFF	YES	UP/DOWN	ON (2)	ON (2)	ON (2)

(A) OFF FOR APPROX. 10S. UNTIL RAM AIR TURBINE IS EXTENDED AND CSM/G IS ON-LINE

(B) RAM AIR TURBINE IS EXTENDED AND CSM/G IS ON-LINE

(C) SPEED < 50KTS. RAM AIR TURBINE IS NO MORE ACTIVE (GSM/G IS OFF)

(D) NO SIGNAL FROM 'EMER EXIT LT' AND 'EMER LT' SWITCHES (BROKEN FUSELAGE)

(1) SUPPLIED BY 28V TO 6V CONVERTER

(2) SUPPLIED BY INTEGRATED BATTERY PACK

Figure 56 Emergency Lights Function Table

EMERGENCY LIGHTING SYSTEM

The emergency lighting system of the cabin consists of (A320):

- four emergency power–supply units,
- four 6VDC overwing emergency lights, installed in the wing fairings,
- a number of 6VDC escape slide lights as parts of the escape slides,
- twelve 6VDC cabin emergency lights,
- four 6VDC escape hatch–handle lights,
- four 6VDC exit location signs,
- six 6VDC exit marking signs,
- eight 6VDC wall–mounted exit–marking signs,
- photoluminescent strips in the aisle and at the convertible seats for the marking system of the floor–proximity emergency escape–path,
- three 28VDC auxiliary lights, one installed in each lavatory.

Power Supply

The 28VDC essential busbar 801PP and the 115VAC normal busbar 103XP supply the Emergency Power Supply Units (EPSUs). The EPSUs convert 28VDC into 6VDC to operate the lights in the system. A battery in each EPSU is charged continuously when the essential busbar is energized and the circuit breakers are closed. Each of the four EPSUs supplies electrical power to different emergency lights and signs. The emergency lights and signs are always supplied with power, even if the aircraft has crashed and the fuselage has broken. This is because the four EPSUs are installed in different places in the cabin.

The EMER EXIT LT switch 4WL on the overhead panel 25VU controls the emergency lighting system. Self–monitoring circuit breakers 1WL, 2WL and 3WL protect the system from too much current flow. The EMER EXIT LT switch 4WL has three positions, OFF, ARM and ON. Each of these positions gives a discrete ground signal to all EPSUs. The EPSUs also monitor the correct voltage of the AC and DC busbars. When the voltage on these busbars falls below a specified level, the emergency lighting automatically comes on. This is when the EMER EXIT LT switch 4WL is in the ARM position.

When only the AC normal busbar fails:

- the 28VDC essential busbar supplies the emergency lighting system through the 28VDC/6VDC converter in each EPSU.

When the 28VDC essential busbar fails:

- the internal batteries in the EPSUs supply the emergency lighting system.

When the EMER EXIT LT switch 4WL is in the ON position:

- the converters or the internal batteries in the EPSUs supply the emergency lighting system.

When the LIGHT EMER pushbutton switch and its integral light on the forward attendant panel 120RH are on:

- the converters or the internal batteries in the EPSUs supply the emergency lighting system.

An open or short circuit in the control lines causes the emergency lighting to come on. The internal test program in the EPSUs finds defects in the load circuits.

When the emergency exit hatches are open and the slides are released, the respective overwing emergency lights and the integral lights in the respective escape slide come on. When the passenger/crew doors are open and the slides are armed, the integral lights in the respective escape slide come on.

In an emergency condition it is possible that the normal cabin emergency–lighting system is not sufficient. This is when smoke enters the cabin. In order to give sufficient illumination of the aisle, exits and emergency exits, a floor–level marking–system for the emergency escape–path is installed. The electrical marking system consists of a wall–mounted exit–marking sign at each passenger/crew door and emergency exit. They come on when the emergency lighting system is energized. The photoluminescent marking system consists of a number of flexible photoluminescent strips. They are installed on the bumper of the convertible seats and on the floor at both sides of the aisle. When the EMER EXIT LT control switch 4WL is in the OFF position and the DC essential busbar 801PP is energized:

- The EMER EXIT LT OFF annunciator light 5WL in the cockpit comes on.

NOTE: The exit location signs, the exit marking signs and the escape hatch–handle lights come on automatically when the NO SMOKING signs come on, or if selected, when the landing gear extends.

One 28VDC auxiliary light is installed in each lavatory. The light is permanently on when the essential busbar 401PP is energized and the circuit breaker 79WL is closed.

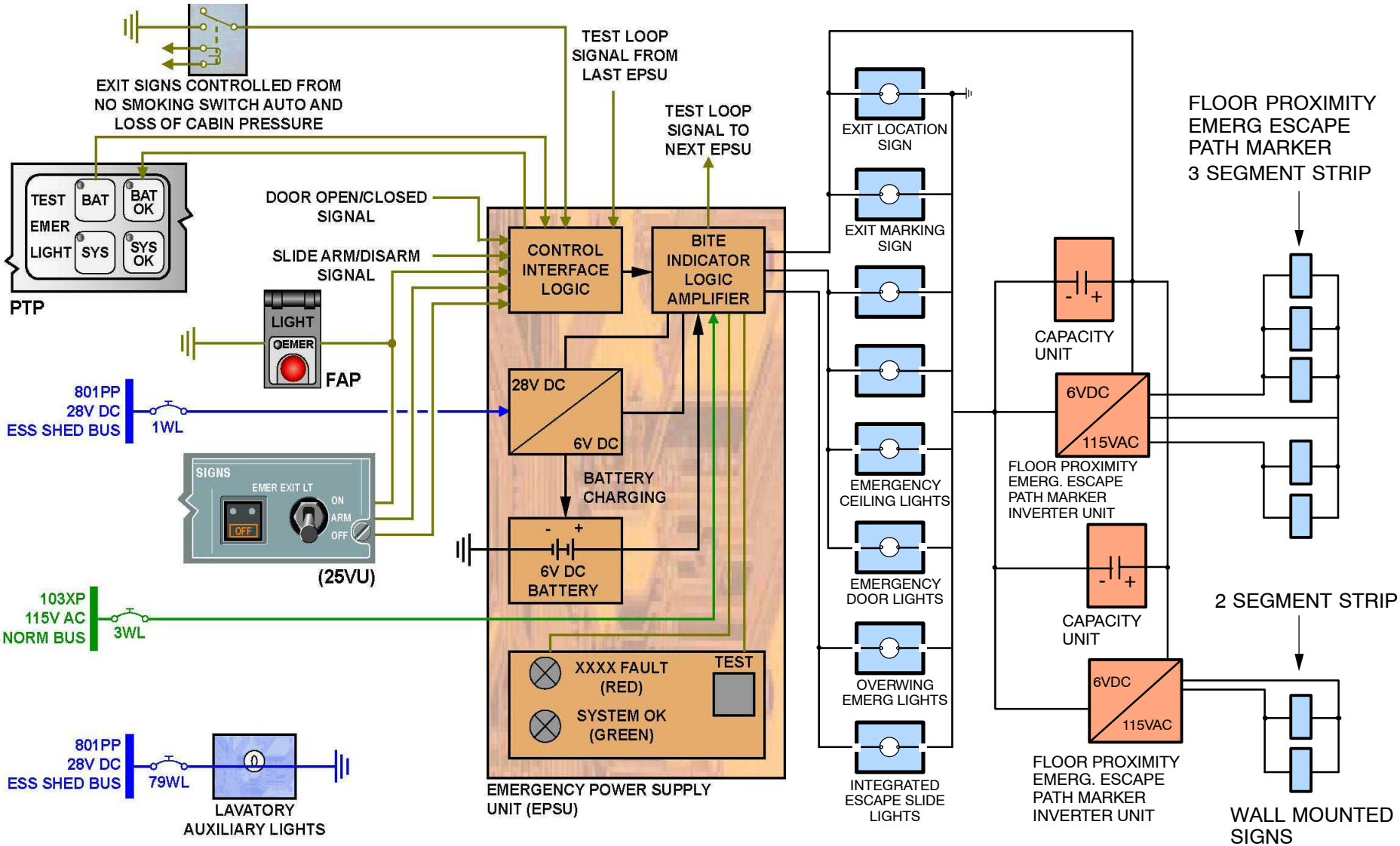


Figure 57 Emergency Lights Schematic

EMERGENCY LIGHTING TEST PROCEDURES

GENERAL

It is possible to the emergency lighting system through the Programming and Test Panel (PTP) 110RH of the Cabin Intercommunication Data System (CIDS) and at the EPSU itself.

NOTE: It is not possible to do any test of the emergency lighting system via the CFDS menu on the MCDU.

There are two tests available via the PTP:

- the BAT test indicates the battery capacity condition of the emergency power–supply units 10WL thru 13WL,
- the SYS test indicates the condition of the internal loads, the external loads and the battery charge limiter of the emergency power–supply units 10WL thru 13WL.

Internal loads are all electrical loads located inside the cabin and served by these emergency power–supply units.

External loads are all electrical loads located outside the cabin and served by these emergency power–supply units.

Emergency Lighting System Test

The system test mode, tests the emergency lighting battery and the whole of the emergency lighting system. The system test is activated by selecting the SYStem key at the bottom of the PTP.

To do the test correctly make sure that:

- on the overhead panel 25VU in the cockpit the EMER EXIT LT switch and the NO SMOKING switch are in the OFF position,
- on the Forward Attendant Panel (FAP) the LIGHT EMER pushbutton switch and its integral light is off.
- on the PTP push the TEST EMER LIGHT/SYS membrane switch for not less than 3 s.

If the test is OK, the SYS OK light comes on, and goes off automatically after a few seconds. If no other test or program is running on the PTP, the system test result appears on the PTP display. If a failure is present, the test result is stored in the DIR BITE ground memory.

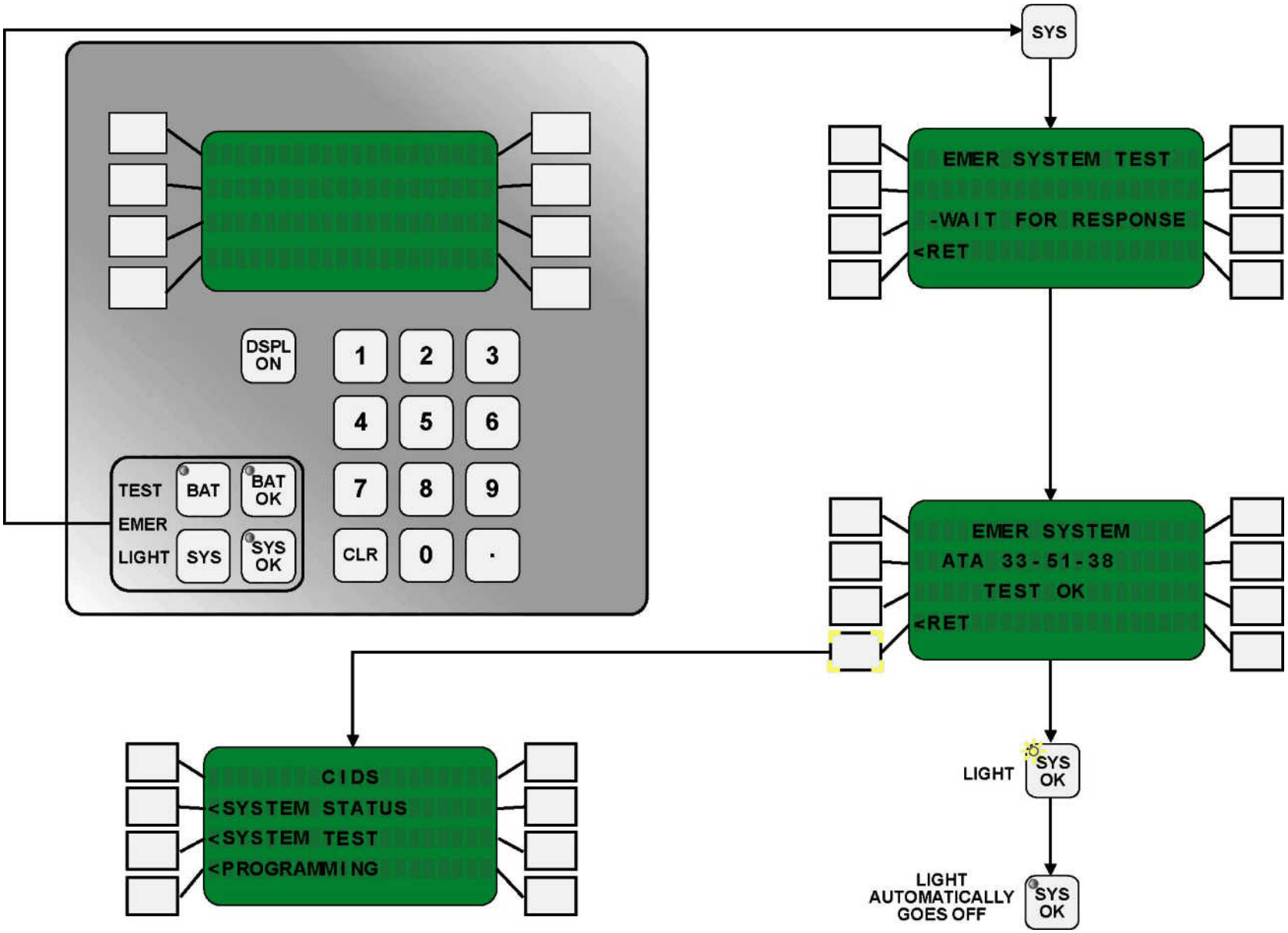


Figure 58 Emergency Light System Test via PTP

EPSU TEST

The test is activated by pressing the TEST P/B on the EPSU. The green Light Emitting Diode (LED) related to SYSTEM OK comes on if all test loops are completed without malfunctions.

If a failure occurs, for example on the cabin emergency lighting network, the red ”INTERIOR LIGHTS FAULT” LED comes on.

BATTERY CAPACITY TEST

Before activating a test, it is necessary to set the NO SMOKING and the EMERgency EXIT LighTing switches to the OFF position. The battery capacity test indicates the battery capacity condition of the Emergency Power Supply Units (EPSUs).

To start the test, the DiSPLay ON key must be pressed to activate the CIDS menu. The SYSTEM TEST function is available in order to test the battery. The SYSTEM TEST function allows the following units to be tested on ground only:

- active director (DIR),
- Cabin Intercommunication Data System (CIDS) BUS,
- Decoder/Encoder Unit (DEU) A,
- DEU B,
- Cabin Assignment Module (CAM),
- Programming and Test Panel (PTP),
- Forward Attendant Panel (FAP),
- Additional Attendant Panel (AAP),
- Attendant Indication Panel (AIP),
- loudspeakers,
- sign lamps,
- Area Call Panels (ACPs),
- passenger call lamps,
- reading work lights,
- **emergency light battery**,
- drainmasts.

To prevent unauthorized access it is necessary to enter a code (3351) for the battery test. The duration of the test will be up to two hours.

During the test, it is possible to use the PTP for other functions. When the test is activated the BATtery light in the BAT key comes on. An internal time count is started in the CIDS DIR.

If the test is OK, the BAT OK light beside the BAT key comes on. If there is a failure message on the PTP and if annunciator light does not come on, you may have to test each EPSU with their individual test button.

When the BAT TEST RESET has been selected, the BAT OK light and the BAT key light go off. In case of a failure, the respective result will be written into DIRs ground scan memory.

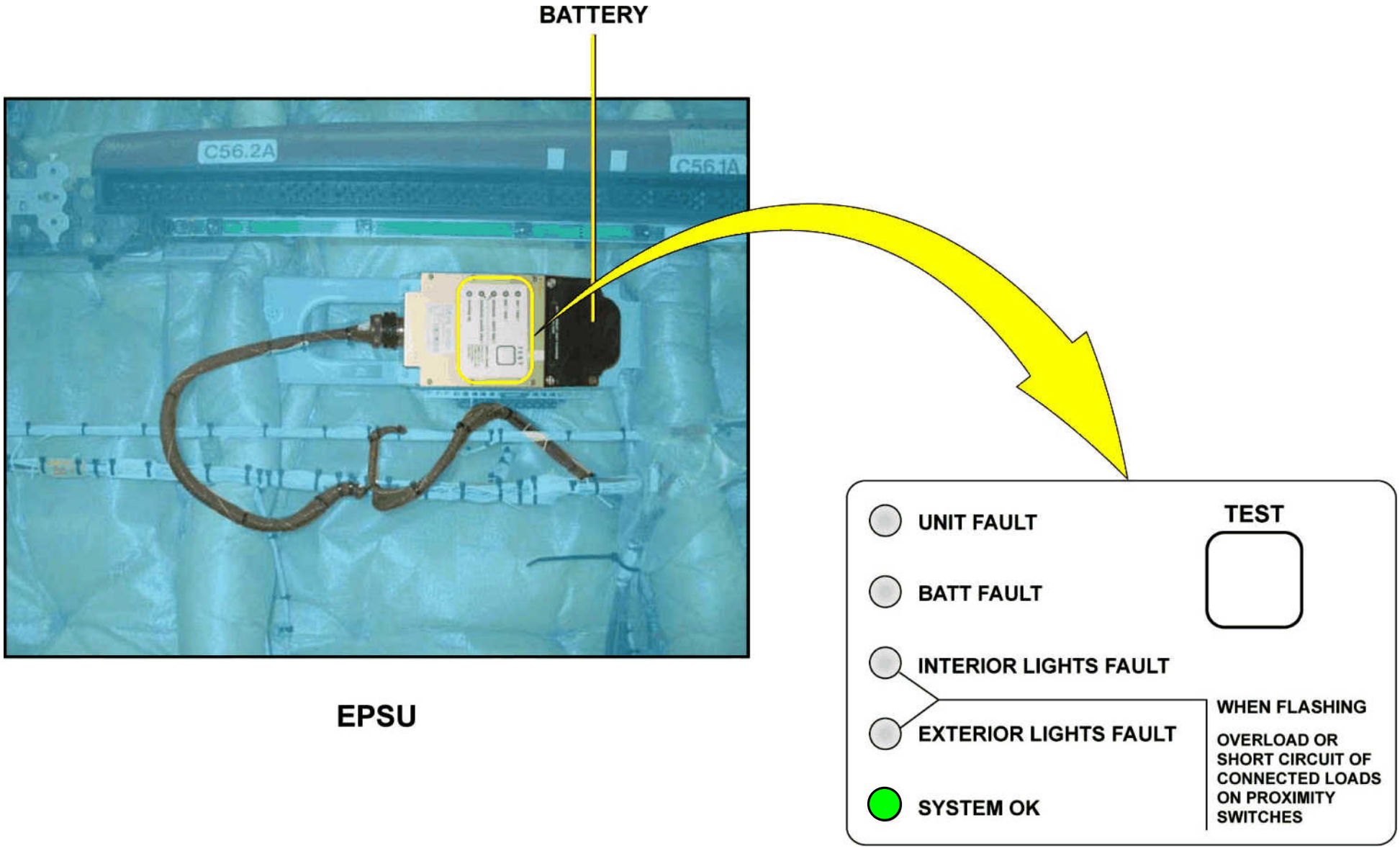


Figure 59 EPSU Test

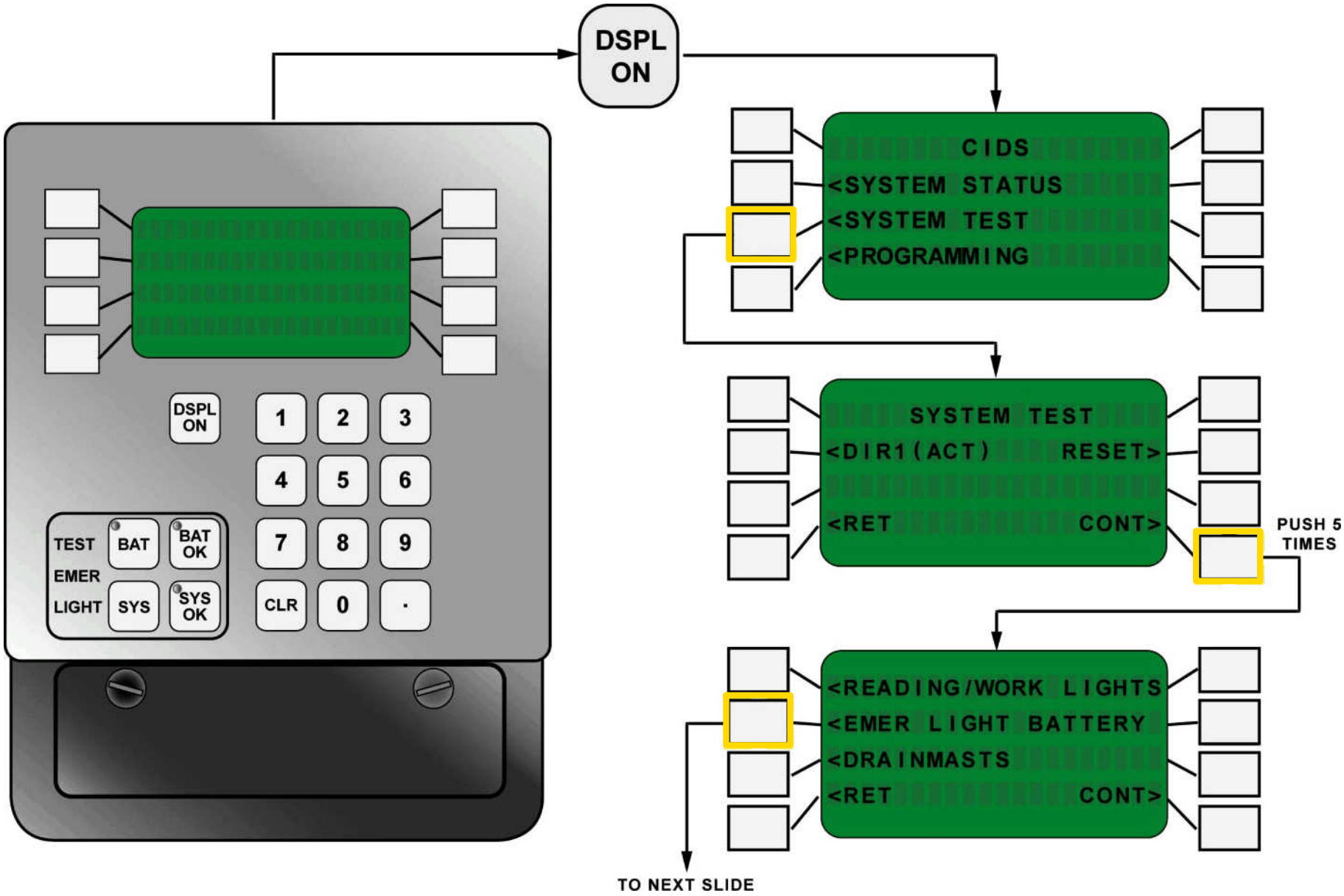


Figure 60 Battery Capacity Test via PTP (1)

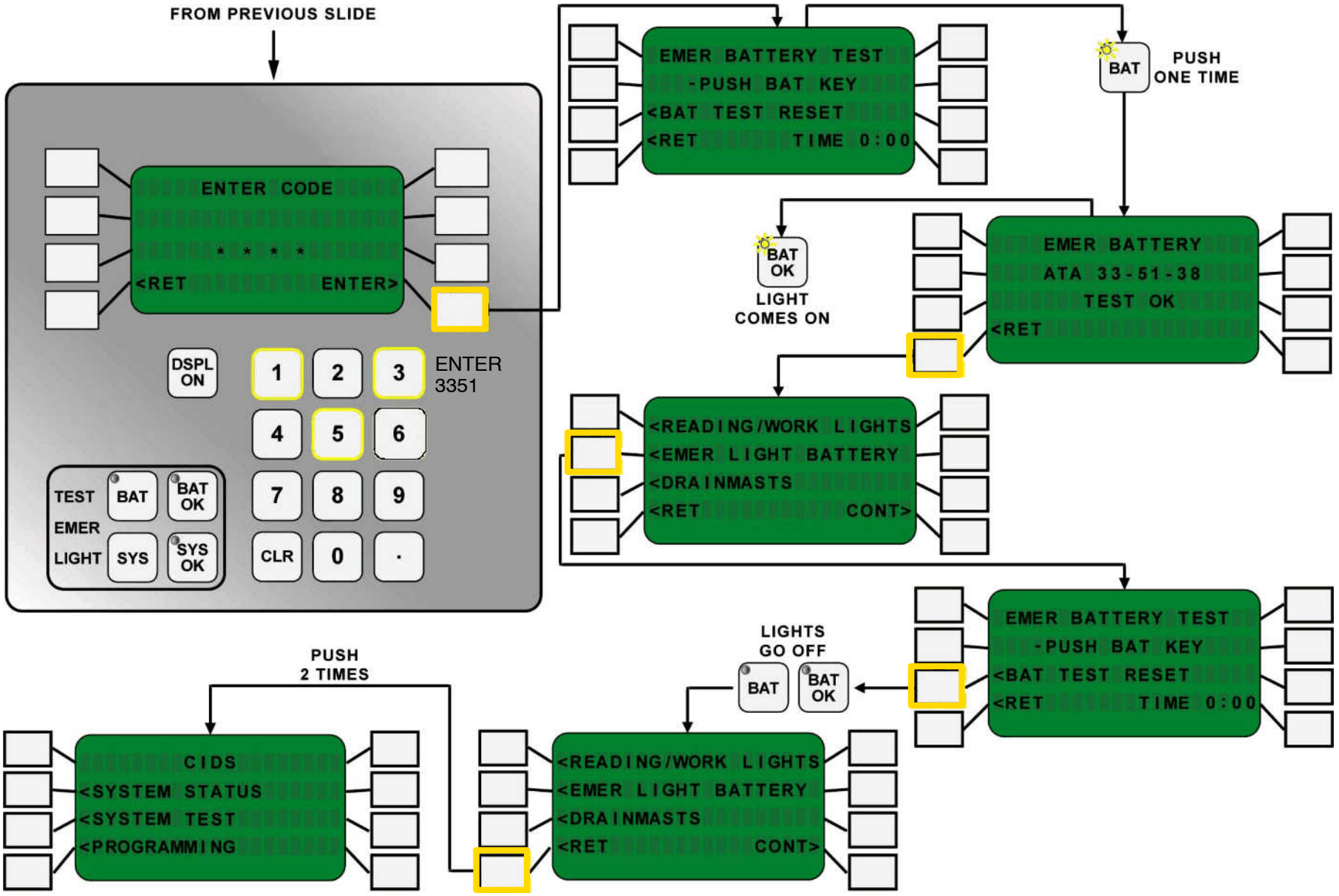


Figure 61 Battery Capacity Test via PTP (2)

33–10 COCKPIT

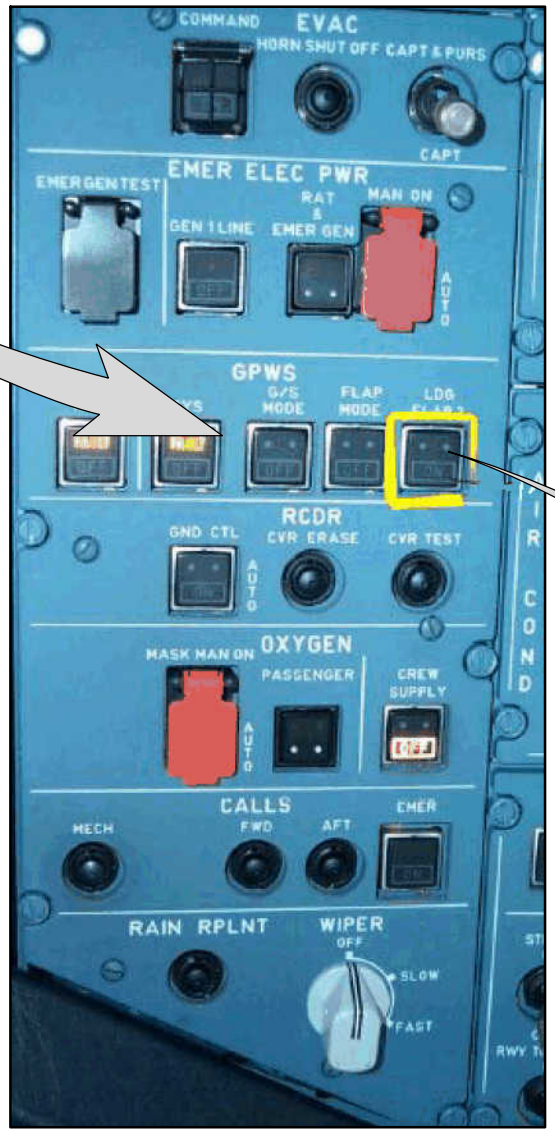
COCKPIT LIGHT DESCRIPTION (ENHANCED)

Annunciator Lights

The pushbutton switches annunciator lights have **L**ight **E**mitting **D**iodes (LEDs) instead of bulbs. They are electrically and mechanically interchangeable with the classic A320 bulb type.

The Power Supply is still 5VAC generated by the four Annunciator Light Transformers.

COCKPIT COMPARTMENT



OVERHEAD PANEL

COCKPIT PUSHBUTTON SWITCH

Figure 62 Cockpit (Bulbless) Push Button

33–20 CABIN

INTRODUCTION (ENHANCED)

Cabin Lights Description

The cabin fluorescent lamps have new AIBU (**A**dvanced **I**ntegrated **B**allast **U**nits). The ballast units receive FAP commands for BRT (100%) DIM 1 (50%) and DIM 2 (10%) light intensity. Optionally they can provide variable dimming, from 0 to 100% brightness. The number of brightness levels is 128 so that it seems to be without steps. This is according to different lighting scenarios programmed in the CAM (**C**abin **A**ssignment **M**odule).

There is one reading light for each passenger seat. There are LEDs (**L**ight **E**mitting **D**iodes) installed instead of halogen bulbs. The reading lights are not adjustable because the LED light diffusion angle is sufficient. Reading lights are supplied by the active CIDS Director via type A DEUs and PISA (**P**assenger **I**nterface **S**upply **A**dapters). The PISAs are in the Passenger Service Units (PSU).

Passenger Interface Supply Adapter (PISA)

The PISA is the interface between the DEU type A and components of the PSU (**P**assenger **S**ervice **U**nit).

The PISAs are installed in each PSU in the pressurized area of the cabin.

For detailed information refer to ATA 23–73–41.

NOTE: The MTBF (**M**ean **T**ime **B**etween **F**ailure) of LED reading lights is 100,000 flight hours. Thus, there is no replacement procedure apart from replacing the complete light assembly. Cabin signs must be replaced if three or more LEDs have failed (de–graded performance).

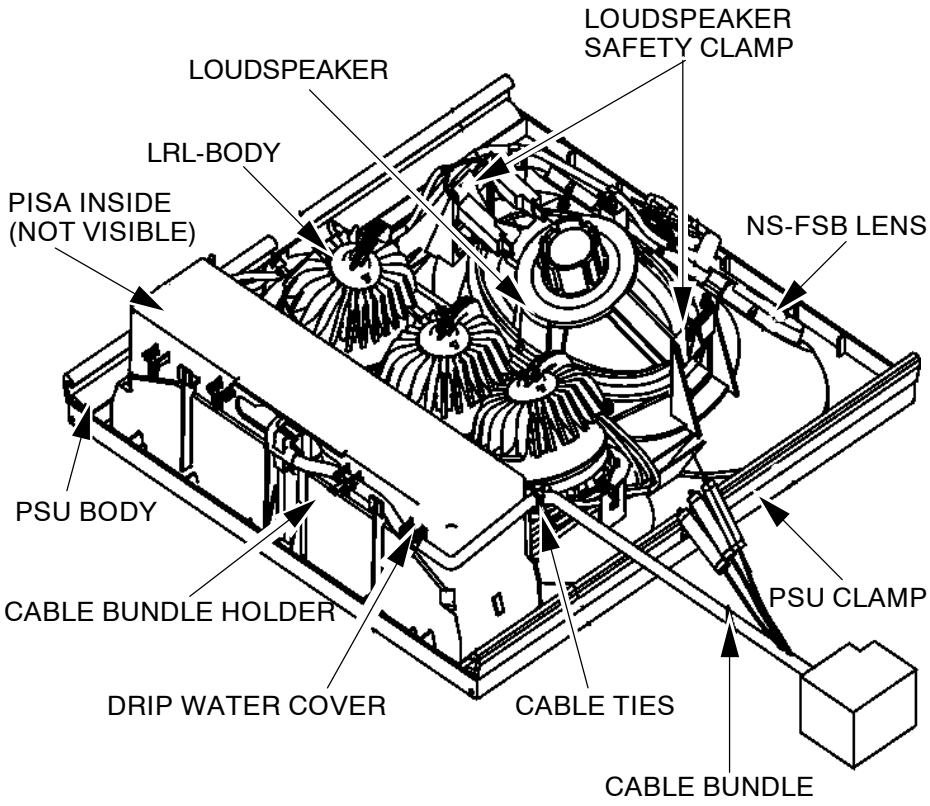
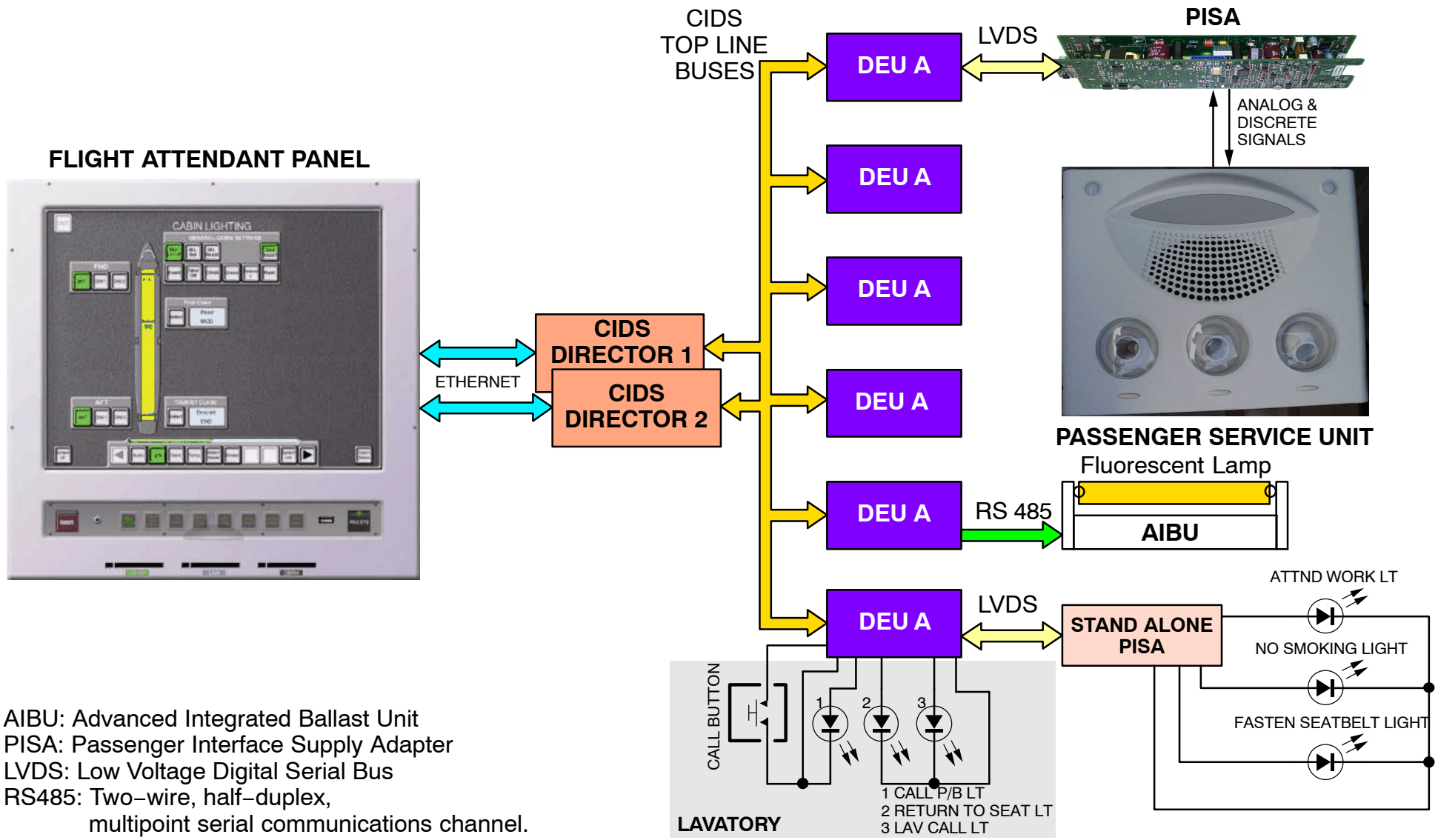


Figure 63 PSU Backside



AIBU: Advanced Integrated Ballast Unit
PISA: Passenger Interface Supply Adapter
LVDS: Low Voltage Digital Serial Bus
RS485: Two–wire, half–duplex,
multipoint serial communications channel.

Figure 64 Cabin Lights Control

FLIGHT ATTENDANT PANEL DESCRIPTION (ENHANCED)

Cabin Lighting Page

Select LIGHTS on the FAP tool bar, to display the CABIN LIGHTING page.

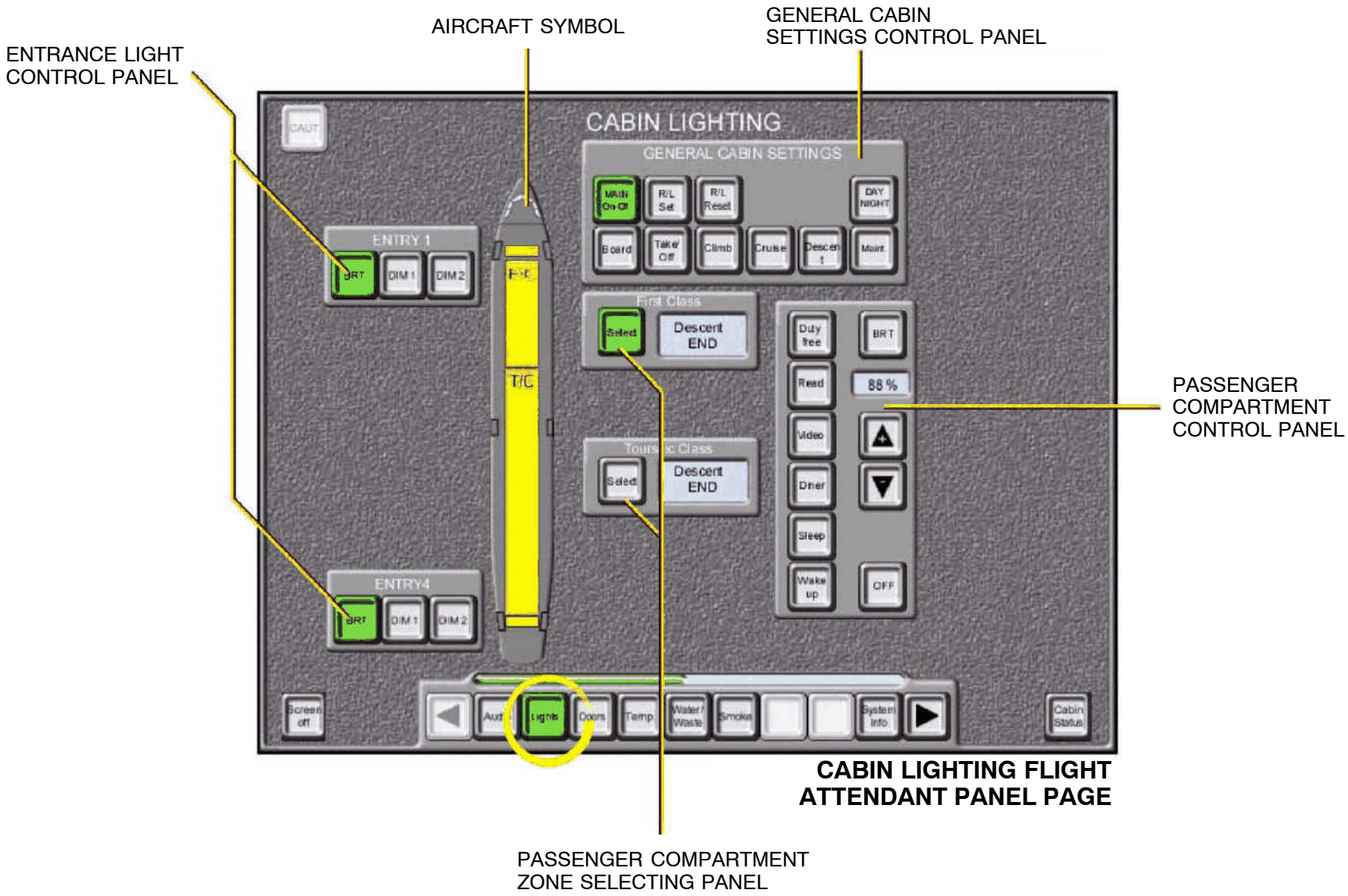
This page shows an aircraft symbol with the entry and class lighting zones.

The ENTRY 1/4 touch switches enable selection of entry lighting BRT, DIM 1, DIM 2. The GENERAL CABIN SETTINGS touch switches enable cabin lighting ON/OFF control and cabin lighting settings for Boarding, Take off, Climb, Cruise, Descent and DAY/NIGHT modes.

Additional functions are Reading light (R/L) SET (on) and RESET (off). The MAINT switch is for lavatory light full brightness control. The general cabin settings selections can be applied to individual class zones by selecting the Class SELECT touch switches.

Other optional light control functions are for selection and brightness control in the class zones, for various in flight situations (Duty free, Read, Video, Dinner, Sleep and Wakeup).

NOTE: There are variations of lighting control functions, depending on the options selected by the operator.



CABIN LIGHTING FLIGHT ATTENDANT PANEL PAGE

Figure 65 FAP CABIN LIGHTING page

HANDRAIL LIGHTING DESCRIPTION

The LED strips are located on the LH and RH handrail. The two LED–strips are installed and integrated with the hatrack. The strips are supplied with 28VDC from the busbar 214XP through the circuit breaker 312LG and the **ST**air **EL**ectrical **L**oad–**A**dapters 481LG and 482LG (STELLA).

The STELLA changes the 115VAC to 28VDC for the operation of the LED–strips. The handrail lighting system is controlled from the FAP 120RH.

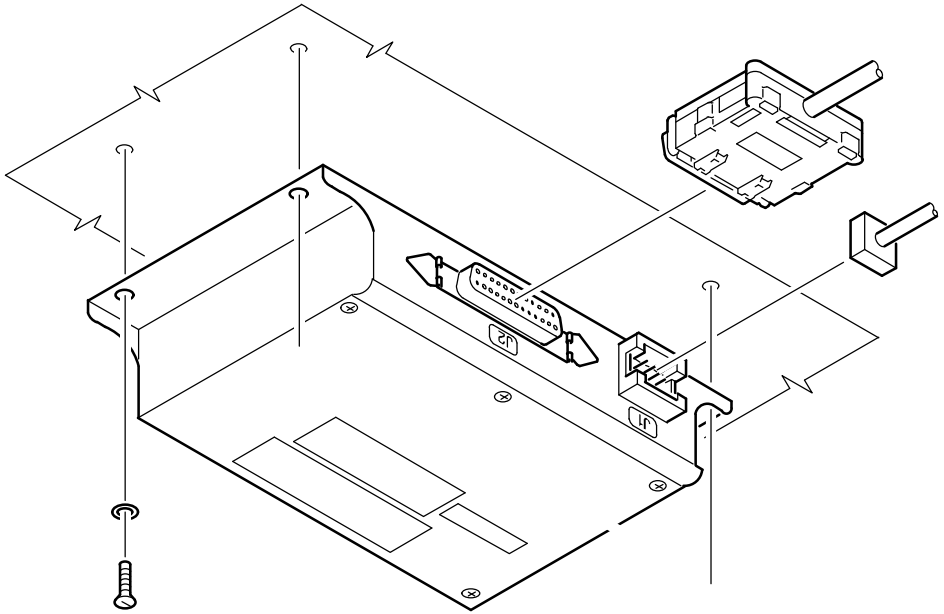
Removal of the LED Handrail Strips

Put the SCREWDRIVER – SMALL through the cable conduit of the related overhead stowage compartment into the handrail end cap.

Push the SCREWDRIVER – SMALL against the rear side of the LED handrail light strip. Do this to disengage the LED handrail light strip (2) from the recess.

Remove the LED handrail light strip.

Test is done via the general illumination test on the FAP.



Installed in Zone 200 (ceiling) between FR41 and FR43

Figure 66 STELLA

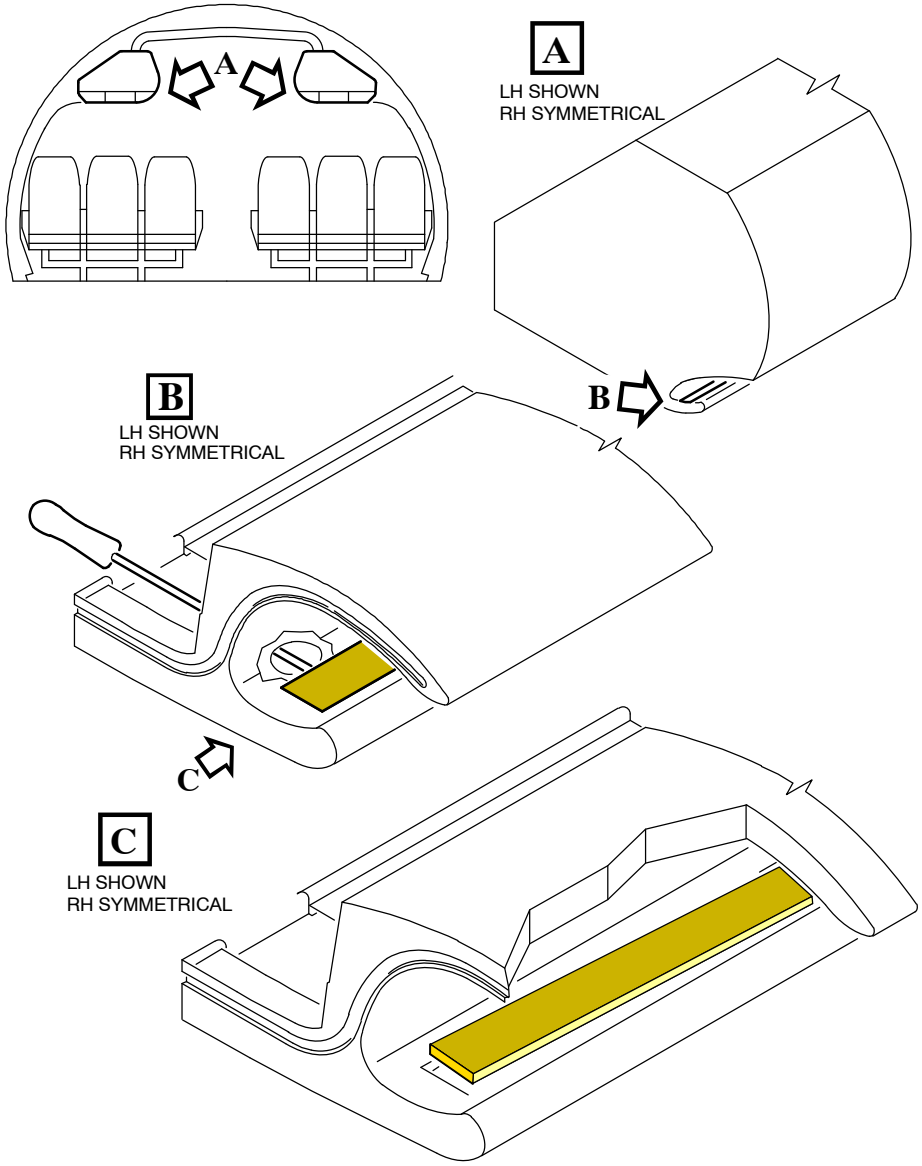
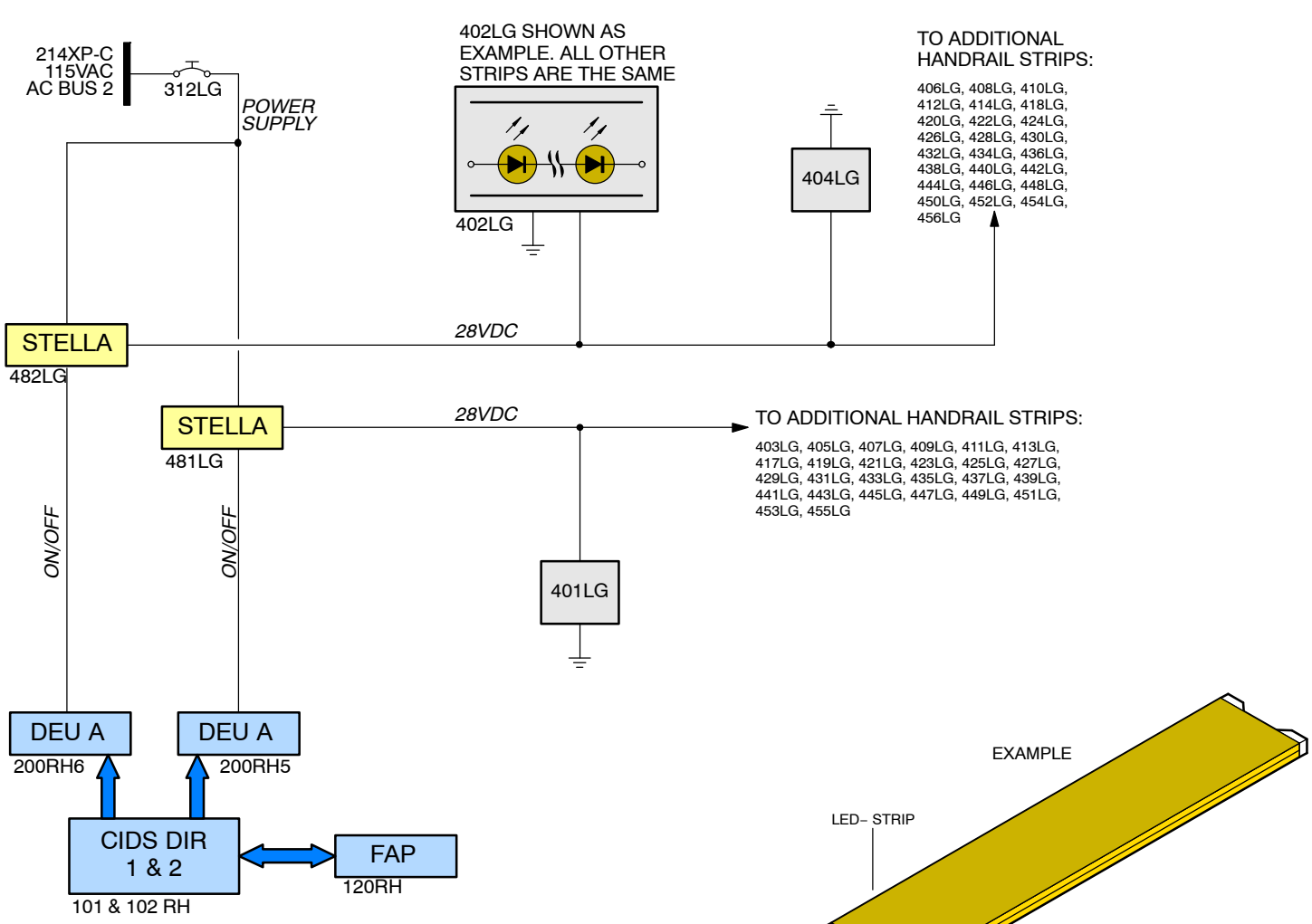


Figure 67 LED Handrail Strip Installation



STELLA: STair ELectrical Load–Adapters
DIR: Director
FAP: Flight Attendant Panel
DEU: Decorder Encoder Unit

Figure 68 Handrail Lighting Schematic

33–51 CABIN EMERGENCY LIGHTING

INTRODUCTION (ENHANCED)

The emergency lighting system supplies lighting in case of failure of the main lighting system or during emergency conditions. The **E**mergency **P**ower **S**upply **U**nits (EPSUs) supply all these different lights.

The emergency lights have 6V DC LEDs (**L**ight **E**mitting **D**iodes), except for lavatory auxiliary lights (28V DC LEDs).

The external emergency lights such as over–wing and escape slide use bulbs technology.

Electrical Supply

The EPSUs are supplied with 28V DC from the ESSential SHEDdable BUS for operation and 115V AC from the NORMal BUS **only for voltage sensing**.

EPSU

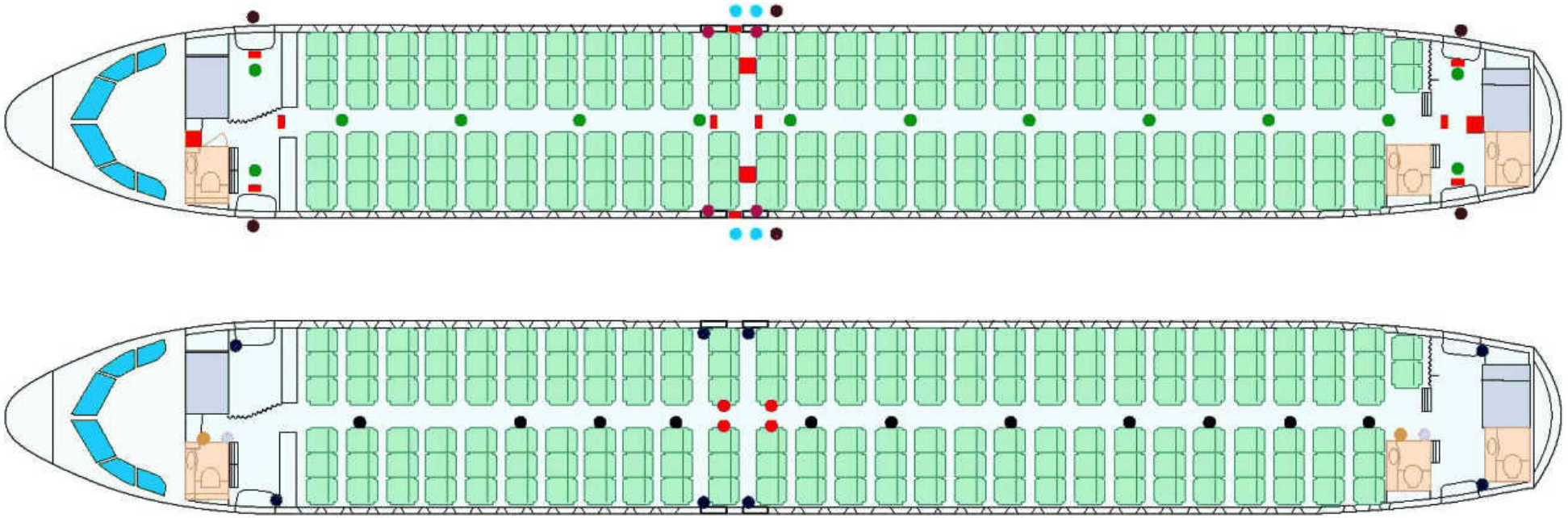
The EPSUs supply the following lights:

- exit signs lights,
- cabin emergency lights,
- seat mounted emergency lights and exit location lights,
- wall mounted emergency exit location light,
- wall mounted exit marking sign,
- wall mounted emergency exit,
- wall mounted emergency light,
- escape slide lights,
- over–wing emergency lights,
- lavatory auxiliary lights,
- and escape hatch–handle lights.

The EPSUs also monitor the correct voltage of the AC and DC buses.

The EPSUs convert 28V DC into 6V DC to operate their associated lights.

An internal 6V DC battery in each EPSU is charged continuously when the ESS SHED BUS is energized and the system is not activated.



Emergency Power Supply Unit

Exit Signs:
- Exit Location Signs
- Exit Marking Signs
- Escape Hatch - Handle Light

Escape Path Marking System:
- Wall Mounted Emergency Exit Location Light
- Wall Mounted Exit Marking Sign
- Wall Mounted Emergency Exit
- Seat Mounted Emergency Light (OPTION)
- Seat Mounted Emergency Exit Location Light (OPTION)

External Lights:
- Escape Slide Light
- Overwing Emergency Light

Cabin Emergency Lights:
- Cabin Emergency Light

Figure 69 General Cabin and Exterior Emergency Lights

PHOTOLUMINESCENT FLOOR PATH–MARKING–SYSTEM

Lufthansa Technik developed an easy–to–install non–electric floor path marking system called **GUIDELINE**. It has a significantly lower level of complexity, requires no maintenance and has 100% reliability compared to the standard electrically operated systems.

This emergency light system has already been installed and certified in all major types of Airbus, Boeing, ATR, CRJ, DO, EMB and Fokker aircraft.

General

The system consists of a number of flexible photoluminescent strips. They are installed on the floor and on convertible seats (if applicable) on the two sides of the aisle and the emergency–exit area. The system gives the floor–level illumination of the passenger aisles and escape routes in the event that smoke obscures normal emergency lighting.

The photoluminescent marking system supplies sufficient light for minimum eight hours in a dark area when it is fully charged. When the system is fully discharged, a charge time of at least ten minutes with full brightness of the cabin lighting is necessary

The non–electric photoluminescent marking system consists of photo–luminescent material. It does not need electricity or batteries.

The scratch, shock–resistant and fluid–resistant strips absorb energy when exposed to light and gradually release it in the form of light when in the dark.

In operation time with darkness the photoluminescent marking system safely leads the way to the exits up to 22 hours.

The charging and discharging time can be increased and decreased by the related conditions:

- Length of time of the charging
- Light intensity during the charging
- Color filter film (if installed).

The luminescence is a physical process without a half–time period, it can be repeated infinitely. Our environmental tests have proved an unlimited life–time for these photo luminescent strips. Once installed the photoluminescent strips will last longer than an aircraft life.

The system is designed for a very easy installation, no special tools are needed.

The brand new generation of the photoluminescent strips offers innovative design elements including a choice between many additional colors. In terms of color they fit in optimally with the carpeting, the galley and the cabin interior.

With regard to efficiency the photoluminescent strips can guarantee longer flight time in combination with shortest charging times due to the superior photo luminescent material.

The strips emit their yellow light only when the cabin is in darkness. Offering interior designers new options, this world premiere gives airlines an additional tool for individualized configuration of their cabins. The Guideline does pioneer work and holds the market leadership for aircraft types such as single aisle Airbus or Bombardier.

Electrical Escape Lighting System (Old Fashioned)

Non Electric Floor Path Marking System (Today Standard)

A choice between many colors

Figure 70 Photoluminescent Floor Path-Marking-System

EMERGENCY LIGHTS SYSTEM OPERATION (ENHANCED)

EMERGENCY LIGHTS SYSTEM

The new EPSUs have internal software changes and are not interchangeable with the other A320 family members. The EPSU functions are the same but the related ceiling and escape path lights are LED technology. The external emergency lights (over wing and escape slide) are unchanged (bulbs).

There are no more Static Inverter Units installed.

Operation

The EMERgency EXIT LighT switch on the overhead panel controls the emergency lighting system. The EMER EXIT LT switch has three positions such as OFF, ARMed and ON. Each of these positions sends a discrete ground signal to the EPSUs.

- **OFF** Position

  In the OFF position a ground signal prevents the emergency lighting system from being switched on when the AC NORM and DC ESS SHED BUS voltages are not available. The EMER EXIT LT OFF annunciator light comes on. The Batteries are no longer charged.

  NOTE: The EXIT signs and the emergency escape hatch–handle lights come on with EMER EXIT LT switch OFF, when the NO SMOKING switch is in the ON position or in AUTO position with landing gear extended.

- **ARM** Position

  In the ARM position the EMER EXIT LT OFF annunciator light goes off. When the 115V AC NORM BUS voltage is not available, the cabin emergency lighting and the FPEEPMS light come on.

  The power is supplied from the 28V DC/6V DC converter in the related EPSU.

  When the 28V DC ESS SHED BUS voltage is not available, the batteries of all EPSUs supply the emergency lighting system for few minutes.

  The batteries are no longer charged.

- **ON** Position

  In the ON position the emergency lighting system comes on, as if the EMERgency P/B on the Flight Attendant Panel (FAP) was pushed.

  The cabin emergency lights, the exit signs, the escape hatch–handle lights and the seat mounted lights come on.

  The 28V DC/6V DC converters of the EPSUs supply these loads as long as the 28V DC ESS SHED BUS is available.

  If the 28V DC SHED ESS BUS voltage falls below 16V, the EPSUs internal batteries continue to supply the loads for few minutes. The batteries are no longer charged.

- Other Cases

  Independently of the switch positions, the integral lights in the respective escape slides come on when the passenger/crew doors or the emergency exit doors are opened with the escape slides armed.

  When the emergency exit hatches are open and the slides are released, the respective over–wing emergency lights and the integral lights in the respective escape slide come on. In the event of excessive cabin depressurization, the exit marking signs and the exit location signs automatically come on.

Test

Each EPSU has a test circuit which tests the condition of the battery unit, the logic unit and the related loads. This test is done first from the MCDU, but an individual test on each EPSU must be carried out when the EPSU Battery TEST or the EPSU SYStem TEST through the MCDU fails.

This isolated test starts when you push the TEST P/B on the EPSU

NOTE: The EPSU System Test may be also carried out vie the CIDS BITE menu on the FAP, but the Capacity Test can only be activated from the CIDS-MCDU menu.

The access code is still 3351.

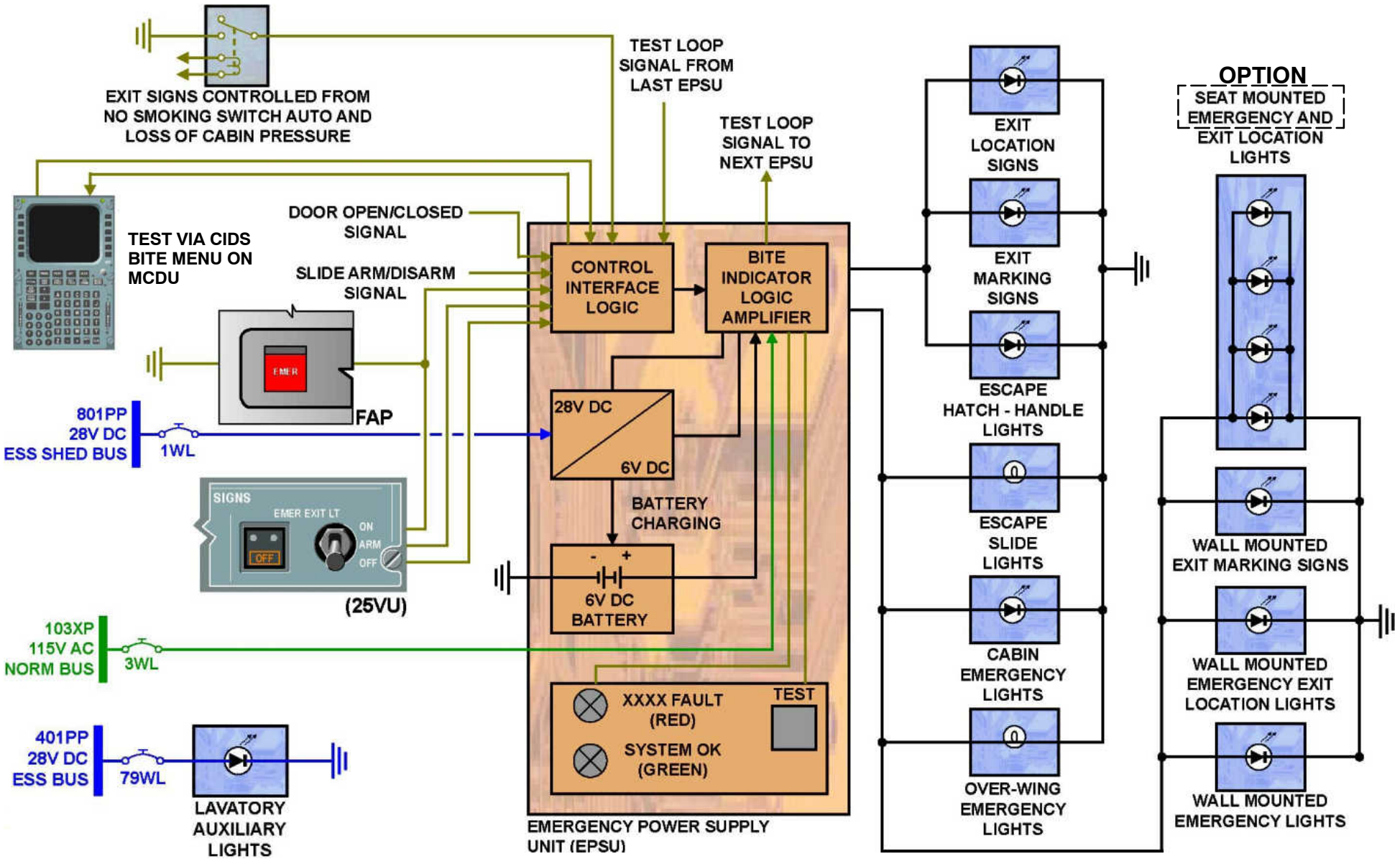


Figure 71 Emergency Light System Schematic

CABIN LIGHTS TESTS (ENHANCED)

MCDU pages

Lighting systems tests are done through the CFDS MCDU. Select the SYSTEM REPORT/TEST < COM < CIDS 1 (2) menu for the following sub menus:

- SYSTEM TESTS,
- EPSU BAT CAP TEST,
- OP TESTS.

SYSTEM TESTS opens a menu which includes

< ILLUMINATION TEST and

< EPSU SYS TEST.

EPSU SYS and EPSU BAT CAP TEST are similar to the tests done through the PTP (Programming and Test Panel) on the classic A320 family members. On enhanced aircraft types the PTP does not exist, therefore these tests are performed via the BITE menu of the CIDS on the MCDU.

NOTE: The EPSU BAT CAPACITY TEST can only be performed via the MCDU located in the cockpit (Code: 3351).

OP TESTS opens a menu which includes READING LIGHT + ACP + PAX CALL + SIGN < LAMPS ACTIVATION. This test activates all the related lights in the passenger cabin. The READING LIGHT + ACP + PAX CALL + SIGN LAMPS ACTIVATION test is similar to the tests done individually, through the MCDU on other A320 family members.

However, on the enhanced system the tests are all done at the same time. The related lights and signs are illuminated during the test. The ILLUMINATION TEST opens a 'set up' menu and request <START TEST. „TEST IN PROGRESS 5 S“ is displayed and then goes to „FAULT“ displays or „TEST OK“.

Faults are identified by ATA reference, FIN and CLASS.

EPSU Local Test P/B

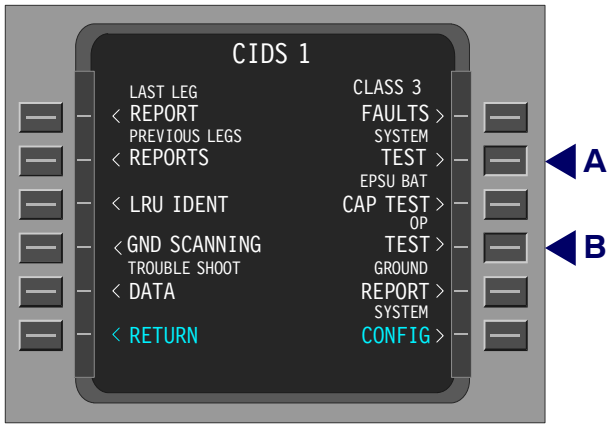
The isolated test starts when you push the TEST membrane switch on the EPSU. A defective emergency lighting system will cause a red LED on the EPSU to come on. The green LED SYSTEM OK on the EPSU shows a serviceable emergency lighting system.

The four red LEDs show the indication of defects:

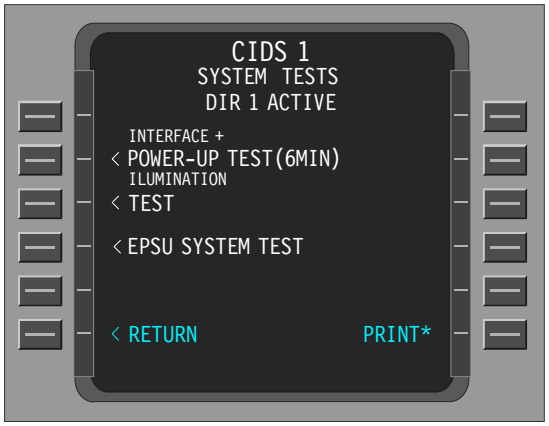
- in the exterior lights (external loads),
- in the interior lights (internal loads),
- in the battery,
- in the unit.

Each output has its own fuse. The fuses are installed inside the EPSU. (ASM 33–51–00 SCH01 P119 Figure 3)

Figure 72 EPSU Local Test



A



B

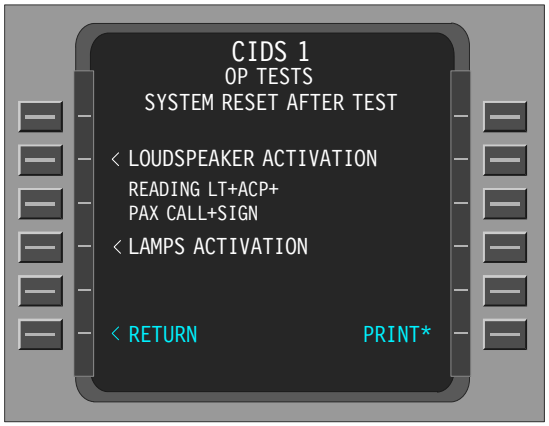


Figure 73 Cabin Lights BITE

EPSU BITE TESTS (ENHANCED)

General

Each EPSU has two different integrated BITE functions:

- a system test,
- a battery capacity test.

The EPSUs have an interface to the CIDS to read the BITE results of a system test and a battery capacity test.

The EPSUs and the CIDS use a RS232 interface for the data exchange of both BITE functions. You can start the two different BITE functions only on the ground with a related CFDS/MCDU test menu page.

Additionally the start of the battery capacity test is code protected against inadvertent action, because the batteries are discharged during the battery capacity test.

The EPSUs only accept the test start commands when the subsequent conditions are fulfilled:

- aircraft on ground,
- all emergency lights OFF,
- 28 V DC available,
- 115 V AC available,
- control switch 'EMER EXIT LT' 4WL in OFF position,
- pushbutton 'EMER' on the FAP in OFF position,
- control switch 'NO SMOKING' 190RH in OFF position

Emer Light System Test

The system test monitors the subsequent functions:

- a short circuit on each output,
- an overvoltage on each output,
- the output voltage of the battery pack,
- the battery heating device,
- the proper function of the EPSU logic and switching circuits,
- if the connected loads are in the pre–determined values.

The pre–determined resistance values are used as reference values. The referenced values are stored in a memory of the EPSU electronic and monitoring circuits during a load programming (**TEACH–IN**) procedure.

The procedure is accomplished as follows:

- disconnect EPSU from 28 V DC aircraft power supply,
- remove EPSU battery,
- re–connect EPSU to 28 V DC aircraft power supply,
- install EPSU battery.

NOTE: It is essential that all connected lights to the EPSU are operative when the TEACH-IN is done, otherwise the EPSU will declare a defective light as normal.

During the system test each EPSU measure the resistance values of its connected loads. These measured values are compared with the reference values.

The system test has a limit of 60 seconds to prevent discharge of the battery pack.

Emer Light System Test Description/Operation

When you start the system test via a CFDS/MCDU test page action the CIDS transmit the 'EPSU SYS TEST' data word through the related DEU Bs to the EPSUs. When the 'EPSU SYS TEST' data word is accepted the EPSUs are set to the system test mode.

When the EPSUs can start the system test the status message 'TEST IN PROGRESS' is send to the CIDS. The system test will be completed within approximately 60 seconds.

When the system test is completed the test results are sent to the CIDS and shown as a test result message on the CFDS/MCDU.

When the EPSUs cannot start the system test the reason for not starting the system test is sent to the CIDS and shown as a status message on the CFDS/MCDU.

NOTE: This test can also be activated from the optional CIDS BITE menu on the FAP (Flight Attendant Panel).

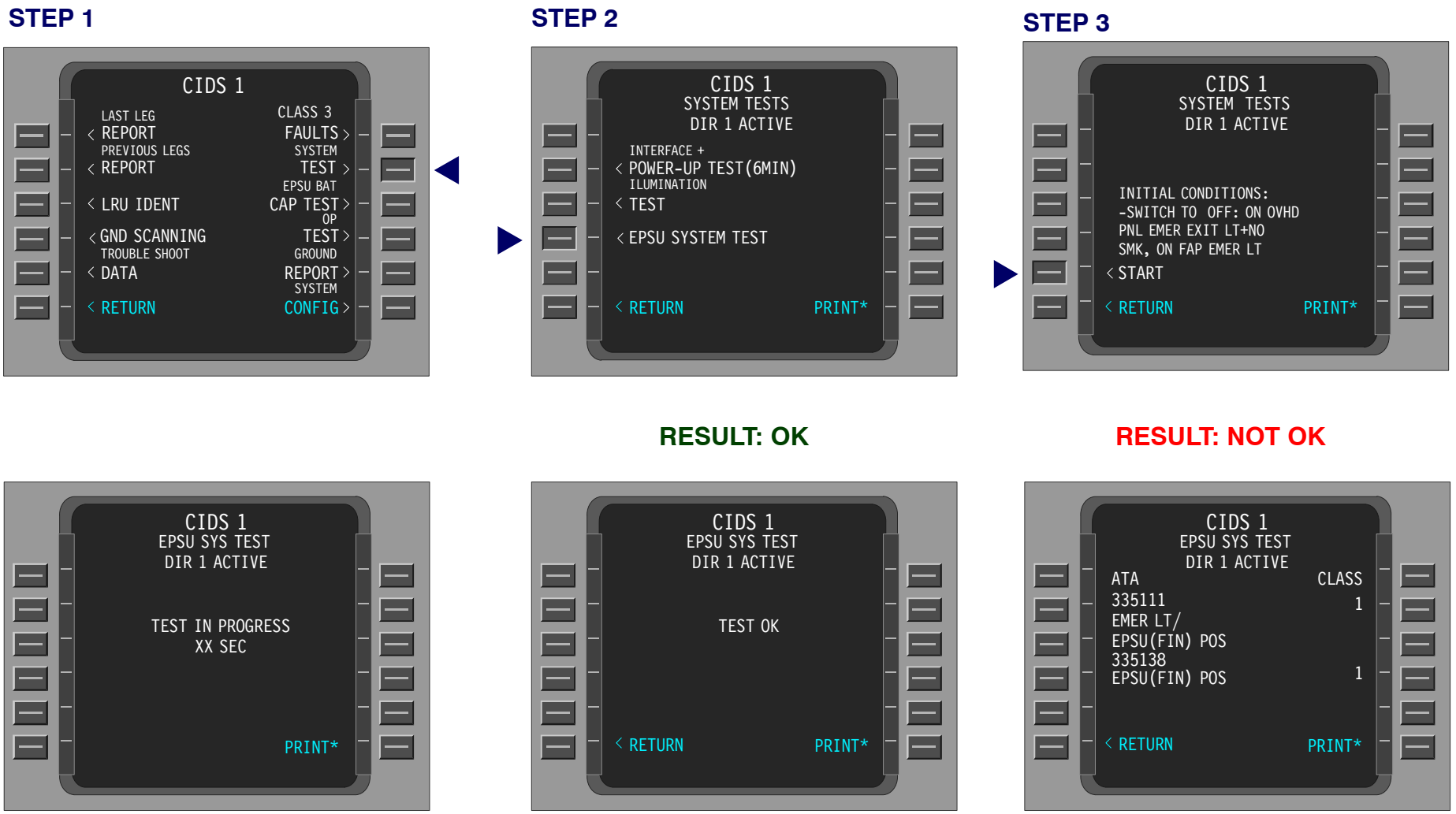


Figure 74 Emergency Light System Test

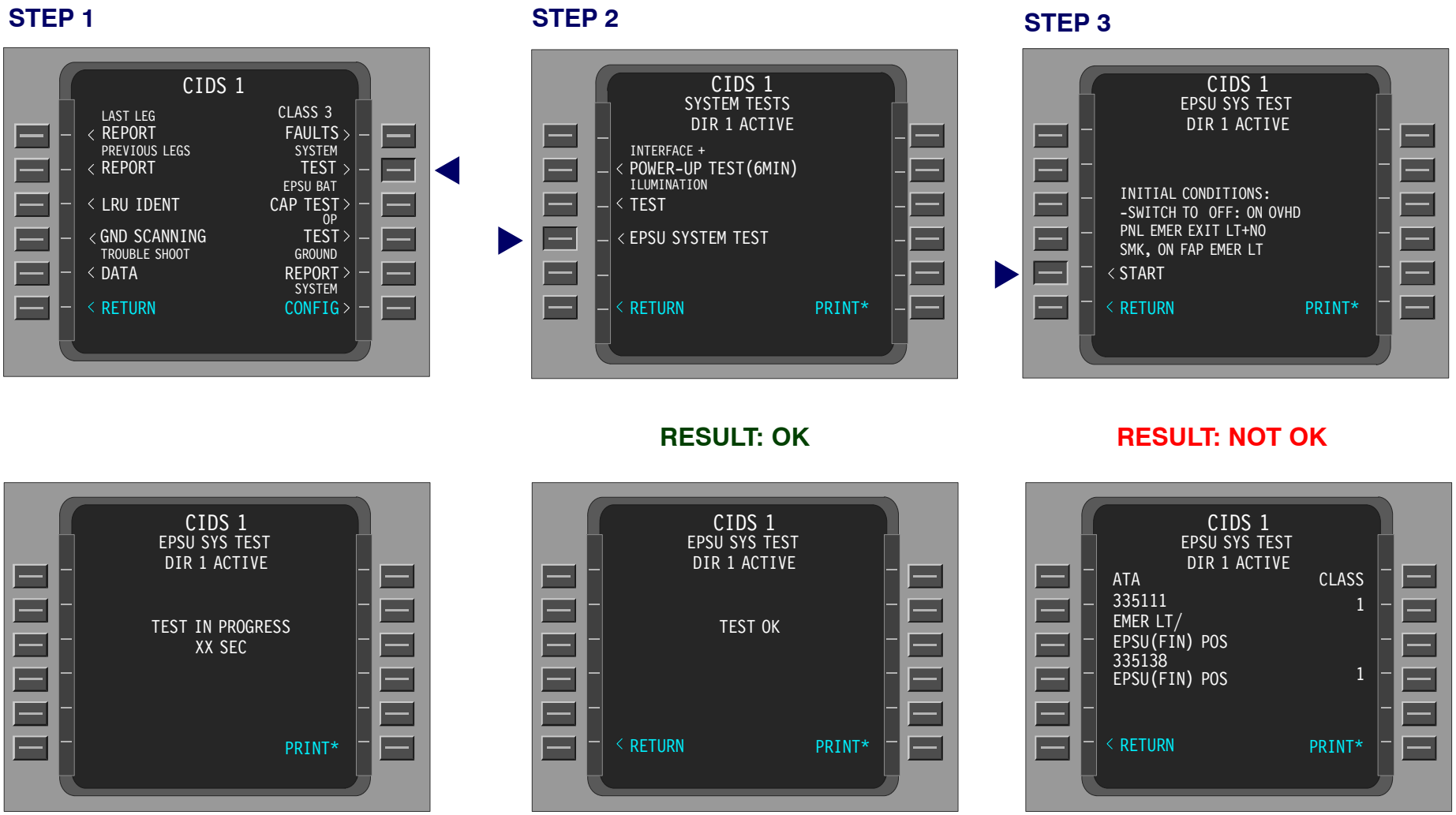


Figure 75 Emergency Light System Test

EMERGENCY LIGHT SYSTEM TESTS

Emer Light Capacitiy Test

The battery capacity test monitors:

- if the capacity of each EPSU battery is sufficient enough to supply its emergency lights for at least 10 minutes,
- if the loss of the capacity of each battery, between two consecutive battery capacity tests, is smaller than 0.40 Ah.
- The battery capacity test requires up to three hours to be completed.

External loads are:

- the overwing emergency lights,
- the escape slide lights.

Internal loads are:

- the cabin emergency lights,
- the escape hatch–handle lights,
- the exit location signs,
- the exit marking signs.

Emer Light Capacitiy Test Description/Operation

You can start the battery capacity test via a CFDS/MCDU test page action. The test start procedure is protected against accidental operation with a code. When the EPSUs accept the code you can start the battery capacity test and the EPSUs are set to the battery capacity test mode.

As long as the correct code is not entered and there are no test results of a previous test available there are no '<' prompts in front of the 'START TEST' and 'TEST RESULT' messages.

When you enter the code, the '<' prompt comes on in front of the 'START TEST' message. Now you can push the 'START TEST' line key and the '< CONFIRM START OF TEST' message comes on.

Push the 'CONFIRM START OF TEST' line key and the battery capacity test starts.

The message 'TEST IN PROGRESS 3HR' comes on.

When the battery capacity test cannot start, a status message shows the reason for not starting the test.

The status message 'EPSU BAT CAP TEST IN PROGRESS' is sent to the CFDS/MCDU. Before the main battery capacity test starts a system test is automatically done. If there is a system failure the battery capacity test is stopped.

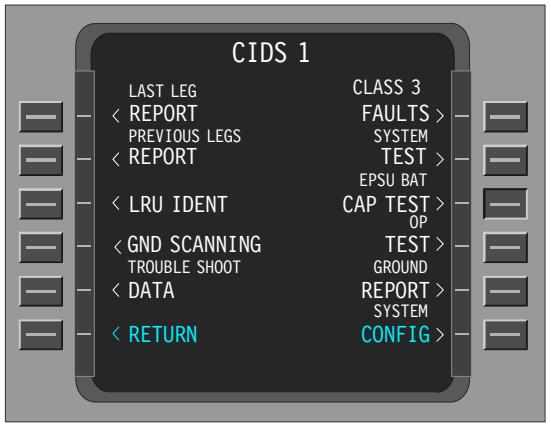
NOTE: In high environmental temperature conditions (e.g. > 45 °C) and if the status message "BAT OVERTEMP – END OF TEST DELAYED" is shown on MCDU, the test will stop. If the temperature decreases to a normal day profile, the test will continue. The message on the MCDU stays for information.

After approximately 3 hours, when the battery capacity is completed, a test result message or a status message comes on

The maximum time for a delayed battery capacity test is 24 hours. After a delay of more than 24 hours, the battery capacity test is stopped.

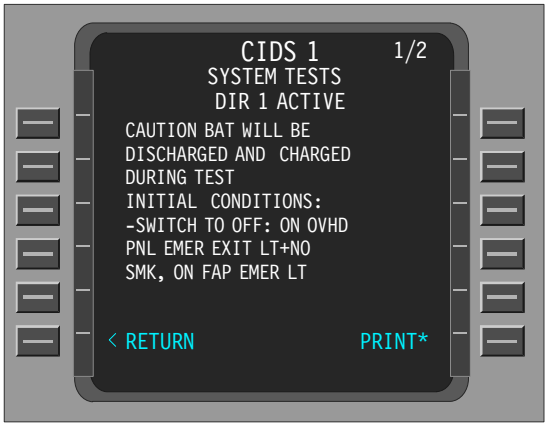
NOTE: This test can **not** be activated from the optional CIDS BITE menu on the FAP (Flight Attendant Panel).

STEP 1

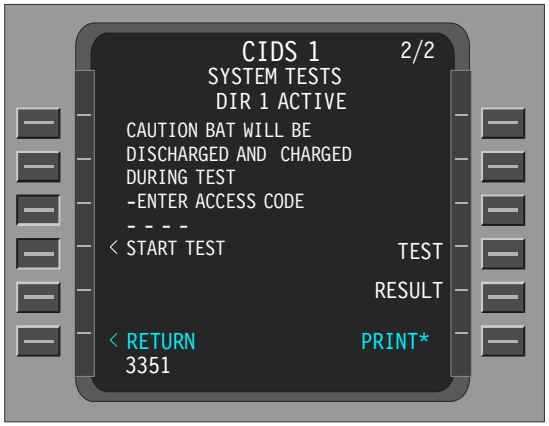


STEP 2

NEXT PAGE

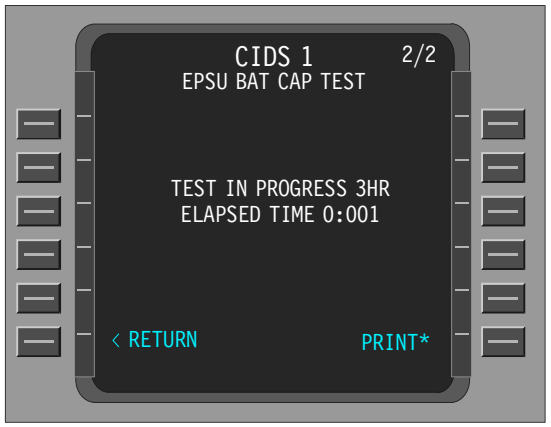


STEP 3

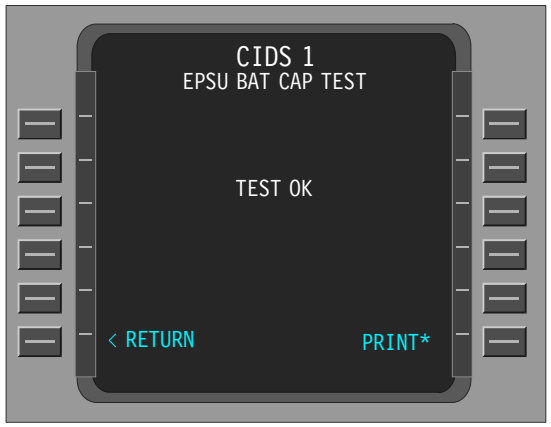


ENTER ACCESS CODE 3351 INTO SCRATCHPAD,
THEN LSK 3L. AFTER THAT TEST CAN BE ACTIVATED

STEP 4



AFTER MAX 3 HRS



IN CASE OF FAILURE

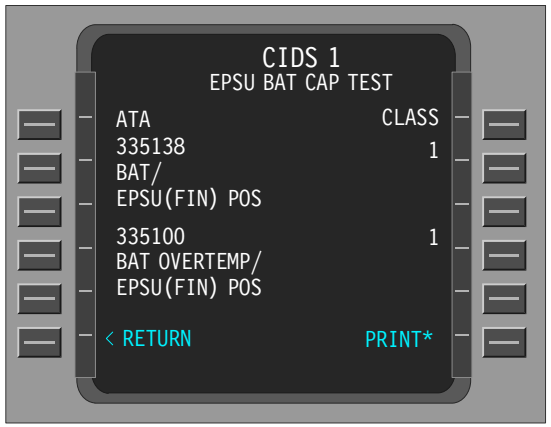


Figure 76 Emergency Light Capacitiy Test

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