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BASIC PRINCIPLES

The following two principles have been adopted :

- “All flight deck lights out” concept
In normal operation, all the lights are extinguished (except sometimes green or blue light for transient phases).
- Detection sequence
The detection sequence comprises three different phases.

PHASE	FUNCTION	MEANS OF DETECTION
1	ALERT	AURAL + MW/MC light
2	IDENTIFICATION	CAP
3	ISOLATION	LOCAL ALERT

ALERT LEVELS

The alerts are classified in 4 levels according to their importance and to the urgency of the corrective action required.

LEVEL 3 : WARNINGS

This corresponds to an emergency situation requiring crew prompt corrective action. The following alerts fall into this category :

- aircraft in hazardous configuration or limiting flight conditions (e.g. stall warning)
- serious system failure (e.g. engine fire)

These warnings are identified by :

- The MW light flashing red associated with a continuous repetitive chime (CRC) and a red warning light on the CAP.
- a specific aural warning.

LEVEL 2 : CAUTIONS

This corresponds to an abnormal situation of the aircraft requiring timely crew corrective action. Time for taking action will be left to crew's discretion.

This level mainly comprises system failures having no immediate impact on safety (e.g. engine overheat).

The cautions are identified by the MC light flashing amber associated with a single chime (SC) and an amber light on the CAP.

LEVEL 1 : ADVISORIES

This corresponds to a situation requiring crew monitoring.

This level mainly comprises failures leading to a loss of redundancy or degradation of a system (e.g. A/ERECT FAIL).


These advisories are identified by an amber local light without chime.

LEVEL 0 : INFORMATION

This corresponds to an information situation action (e.g. DME hold).

This information is provided by blue, green or white lights on the control panels.

Note : Levels 1 and 0 are not taken into account by the MFC.

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ALERT INHIBITION

In order to avoid alerts when not desired, inhibition follows the conditions below :

- All the CAP amber lights except PRKG BRK, GPWS FAULT, MAINT PANEL may be extinguished by pressing CLR pb on CAP.
 - ENG oil, smoke warnings and some caution alerts may be inhibited before take off by depressing TO pb.
- R Associated aural alerts are also inhibited.
- These inhibitions will be cancelled :
- automatically as soon as one gear leg is not locked down,
 - by pressing RCL pb.
- An emergency audio cancel sw allows the crew to cancel a nuisance aural for a whole flight (except for LDG GEAR, VMO, VFE, VLE, Stall Warning, Whooper, AP Disconnect). Associated aural will be reactivated :
- at next aircraft energization,
 - after MFC 1B/2B reset,
 - after pressing RCL pb,
 - after T.O. Config test.


AURALS

Three types of aural have been defined to alert the crew :

- A continuous repetitive chime (CRC) is used for all warnings directly identified by a specific CAP light
 - A single chime (SC) is used for all cautions directly identified by a CAP system light
 - Specific aural for alerts not directly identified by a specific CAP light and which are of a particular operational significance :
- | | | |
|--|---|----------|
| <ul style="list-style-type: none"> • stall (cricket) • overspeed : VMO, VFE, VLE (clacker) • AP disconnect (cavalry charge) • Trim in motion (whooper) | } | warnings |
| <ul style="list-style-type: none"> • altitude alert ("c chord") • calls (door bell) • AP capability downgrading (3 click) | } | cautions |

Note : A priority order has been defined for aural in case of simultaneous occurrence of warnings :

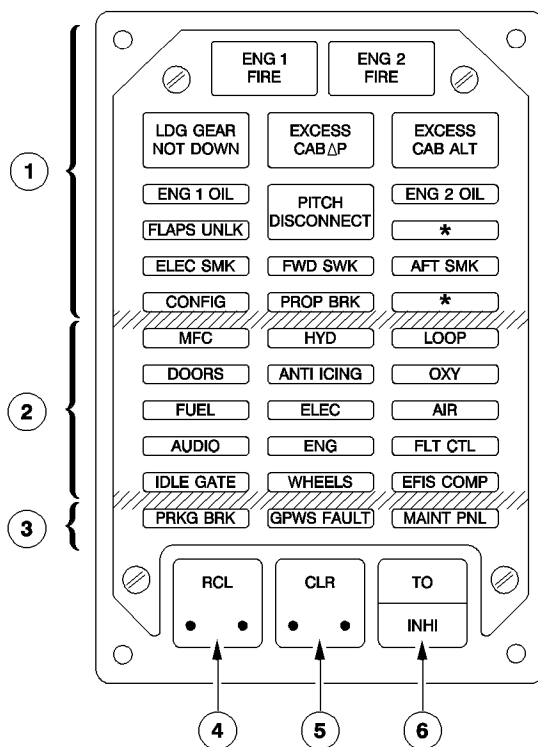
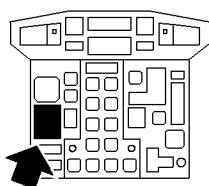
- | | |
|---|---|
| <ul style="list-style-type: none"> – Stall (cricket) – Overspeed (clacker) – Flaps unlocked (CRC) – Config (CRC) – Propeller brake failure (CRC) – Engine fire (CRC) – Pitch Disconnect (CRC) – Excess cabin altitude (CRC) | <ul style="list-style-type: none"> – Nac OVHT (CRC) – Excess cab ΔP (CRC) – Trim in motion (whooper) – Smoke detection (CRC) – Oil low press (CRC) – Landing gear not down (CRC). – AP disconnection (cavalry charge) |
|---|---|
- R

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10.2 CONTROLS

CAP



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* NAV OVHT, OR NAC 1 OVHT AND NAC 2 OVHT (dépendant on the version)

① *WARNING lights*


Red lights.

② *CAUTION lights (level 2)*

Amber lights.

R ③ *ADVISORY lights (level 1)*

Amber lights that can be cleared only by corrective action.

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④ RCL pb

When depressed :

- All inhibited or cancelled caution lights will illuminate if the respective system is still degraded.
- All aural warnings previously cancelled are reactivated. Recall is possible during all phases of operation.

⑤ CLR pb

R When depressed, certain zone 2 caution lights will be cleared. (see page 3).

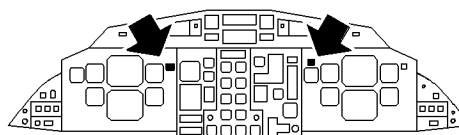
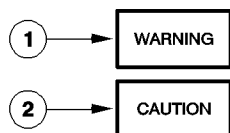
⑥ TO pb

When depressed, the INHI light illuminates blue and the ENG OIL warning lights, the smoke warning lights, all CAP amber lights except EFIS COMP, PRKG BRK, GPWS FAULT, MAINT PNL, ENG (for an ADC sw fault alert), FLT CTL (for a TLU fault alert or FLAP ASYM alert), and associated aural warning are inhibited. Other warnings are not inhibited.

The blue light extinguishes when the TO INHI function is cancelled.

MW/MC LIGHT

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① MW light


Illuminates in case of a warning associated with a CAP red light.

When depressed, light will extinguish and associated aural warning will be cancelled.

② MC light

Illuminates in case of a caution associated with a CAP amber light.

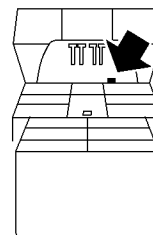
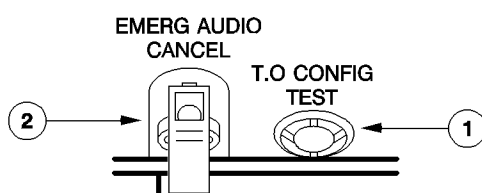
When depressed, light will extinguish.

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CONTROL PANEL

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① TO CONFIG TEST pb

Is used before take-off :

- to check if aircraft configuration is correct for take-off by simulating power levers at TO position (except PARK BRAKE) ;
- to perform an automatic RECALL (thus reactivating all aural warnings previously cancelled by Emerg Audio/Cancel).

② EMER AUDIO CANCEL sw

Is safety wired guarded. If a false system indication generates and undue continuous aural, the use of this SW will cancel the aural specific of this false alert.

Example : If the SW is used to cancel a system X failure CRC, CRC is not cancelled for the systems other than system X.


Cancelled aural warning will be reactivated

- at next aircraft energization (MFC reset)
- after MFC 1B/2B reset
- after pressing RCL pb
- following T.O. Config test

Except for aural warning associated with :

- landing gear (landing configuration)
- VMO, VFE, VLE
- Stall warning
- Pitch trim whooler
- AP Disconnect

Which will be rearmed as soon as the triggering condition disappears.

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10.3 OPERATION

NORMAL OPERATION

WITHOUT AIRCRAFT SYSTEM FAILURE

After engines start :

No alert light illuminated in the cockpit except PRK-BRK on the CAP if the parking brake is set.

Before take off :

Press TO CONFIG TEST

- if aircraft is in correct configuration, no light will illuminate.
- if aircraft is not in correct configuration :
 - MW light will flash red,
 - CRC aural will be generated,
 - CONFIG red light will illuminate on the CAP associated with
 - FLT CTL when pitch trim, and/or wing flaps are not in the TO configuration and/or AIL LOCK is illuminated indicating a disagree between the gust lock control and the actuators.
 - ENG when PWR MGT is not set to TO position.
 - the TLU FAULT It if the Travel limiting unit is not in LO SPD configuration.

Press TO pb on CAP, INHI light illuminates blue. Take off may be initiated.

At gear retraction, inhibition is disengaged, INHI light extinguishes.

Before starting descent :


Press RCL pb on CAP.

No light will illuminate on CAP provided no failure occurred in flight.

OVERSPEED ALERT

When the aircraft is in overspeed conditions (VMO, VFE, VLE), a specific aural alert is generated which will persist until return into the following flight envelope is performed.

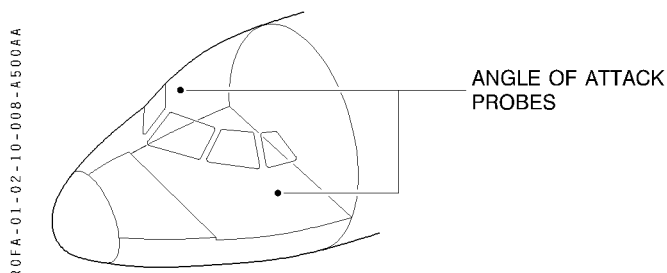
ALERTS	VFE	VLE	VMO
Flaps 0°		180 kt	250 kt
Flaps 15°	180 kt		
Flaps 30°	145 kt		

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STALL ALERT

To generate this alert (cricket and stick shaker), aircraft is fitted with two angle of attack probes, one on each side of the forward fuselage.



Angle of attack probe information is directly processed by CCAS.

Critical angle of attack detected by angle of attack probes leads to aural alert (cricket), stick shaker activation, and then stick pusher activation.

In normal conditions, stick shaker and stick pusher triggering thresholds are elaborated by adding a " $\Delta\alpha$ " value to angles of attack corresponding to the basic protections. $\Delta\alpha$ depends on engine 1 and engine 2 torques and flaps configuration. Engine 1 torque signal is processed by MFC 1A and engine2 torque signal is processed by MFC 2A. So, two $\Delta\alpha$ are computed, but only the longer one is considered.

The monitoring system uses:


- a microswitch signal on PL handles
- both EECs
- the four MFC modules

The failure of one of these elements invalids the associated $\Delta\alpha$.

If a $\Delta\alpha$ is invalidated, the system takes into account the other one. If both $\Delta\alpha$ are invalidated, system choses $\Delta\alpha = 0$.

Note : System operation goes unnoticed for the crew.

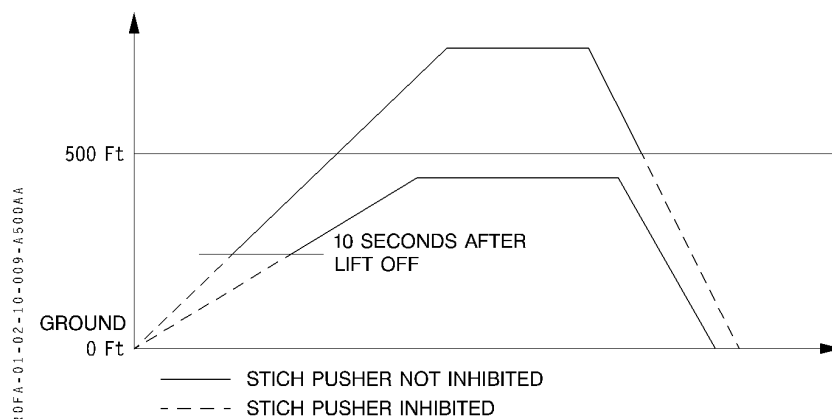
	AIRCRAFT CRITICAL ANGLE OF ATTACK					
	ALERT and STICK SHAKER ACTIVATION			STICK PUSHER ACTIVATION		
	FLAPS 0°	FLAPS 15°	FLAPS 30°	FLAPS 0°	FLAPS 15°	FLAPS 30°
HIGH POWER	10.9°	10.9°	9.9°	13.4°	14.1°	12.8°
LOW POWER	10.9°	10.9°	10.4°	13.4°	14.1°	14.3°

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Whenever ICING AOA is illuminated, the aircraft is protected by an earlier stall threshold as follows :

	AIRCRAFT CRITICAL ANGLE OF ATTACK					
	ALERT and STICK SHAKER ACTIVATION			STICK PUSHER ACTIVATION		
	FLAPS 0°	FLAPS 15°	FLAPS 30°	FLAPS 0°	FLAPS 15°	FLAPS 30°
TAKE OFF	8.0°	8.4°		10.6°	10.9°	
EN ROUTE	8.0°	8.4°	7.7°	10.6°	10.9°	10.8°

- R Notes - *EN ROUTE* values occurs, when 10 mn have elapsed after lift off or when flaps are retracted to 0 whichever occurs first.
- Stall alarm alert and shaker are inhibited when aircraft is on the ground
 - Stick pusher activation is inhibited :
 - on ground
 - during 10 seconds after lift off
 - in flight, provided radio altimeter is operative, when the aircraft descends below 500 ft.
- R



- If radio altimeter gives an erroneous "< 500 ft" signal meanwhile IAS > 185 kt for more than 120 seconds (cruise), STICK PUSHER FAULT amber light will come on to notify the crew that stick pusher is inhibited.

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WITH AIRCRAFT SYSTEM FAILURE

LEVEL 3	LEVEL 2
Failure detection	
<ul style="list-style-type: none"> – aural alert : CRC – MW light flashing red – red warning light on the CAP identifying the failure – for some cases, a red light on the affected system control panel 	<ul style="list-style-type: none"> – aural alert : SC – MC light flashing amber – amber caution light on the CAP identifying the failure – local alert light on the affected system control panel
Acknowledgement of the failure by the crew	
<ul style="list-style-type: none"> – Press MW light • MW light extinguishes • aural alert is cancelled 	<ul style="list-style-type: none"> – Press MC light • MC light extinguishes
Corrective action	
<ul style="list-style-type: none"> ■ If the failure disappears, associated local alert light and CAP light extinguish. ■ If the failure does not disappear, associated local alert light and CAP light remain illuminated : 	
Press CLR on CAP (after Check list application) CAP light does not extinguish	CAP light extinguishes Before starting descent, press RCL on CAP CAP light, associated with systems where a failure persists, or, with a white light illuminated on the associated control panel will illuminate. If necessary, take into account the failure consequences for the landing. Press CLR on CAP

Note : The local alert lights always reflect directly the system status : they never are inhibited nor cleared by any other means than restoring normal functioning. When a local alert light disappears, the other alert sequence elements (MW/MC lt, CAP, aural) also disappear.


OPERATION WITH CCAS FAILURE

In case of MFC 1B and 2B failure :

- MC illuminates without flashing
- MFC amber light illuminates on CAP
- MFC 1B and 2B amber FAULT lights illuminate on overhead panel

In these conditions, processing of alerts is as follows :

- All level 2 alerts and "CONFIG" + "ENG OIL" + "PROP BRK" level 3 alerts are not processed. The crew has to monitor the overhead panel where the local alerts are still active.
- All other level 3 alerts are processed on CAP (without MW and CRC).

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10.4 ELECTRICAL SUPPLY/MFC LOGIC

ELECTRICAL SUPPLY

EQUIPMENT	DC BUS SUPPLY (C/B)
MFC 1B Primary supply Alternate supply MFC 2B Primary supply Alternate Supply MW light (2 bulbs) – MC light (2 bulbs) – CAP warning lights (1 bulb) – PRK BRK light (2 bulbs) – MAINT PNL light (2 bulbs) – MFC light (1 bulb) MW light (2 bulbs) – MC light (2 bulbs) – CAP warning lights (1 bulb) – CAP caution lights (2 bulbs) except PRK BRK – MAINT PNL – MFC light (1 bulb) – RCL, CLR. To INHI pb lights CAPT LS F/O LS Stall warning and stick pusher tests	DC BUS 1 (Upper panel 1B PRIM SPLY) DC EMER BUS (Upper panel 1B ALTN SPLY) DC BUS 2 (Upper panel 2B PRIM SPLY) DC EMER BUS (Upper panel 2B ALTN SPLY) DC EMER BUS (Upper panel 1B ALTN SPLY) DC BUS 2 (Upper panel 2B PRIM SPLY) DC ESS BUS (Upper panel AUDIO SYS CAPT) DC EMER BUS (Upper panel 2B ALTN SPLY) DC EMER BUS (Upper panel 1B ALTN SPLY)

MFC LOGIC

See chapter 1.01.

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10.5 LATERAL MAINTENANCE PANEL

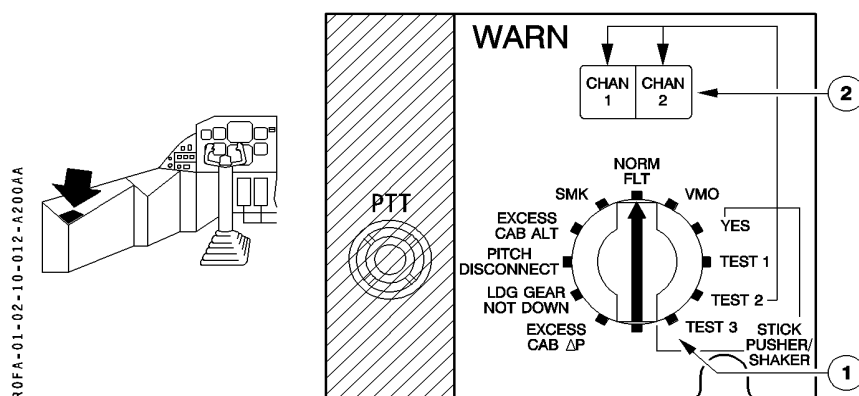
On LH maintenance panel, a "WARN" section allows testing, on ground, of several warnings which cannot be tested on their own system.

This section includes :

- a rotary selector to select the system to be tested ;
- a Push To Test (PTT) pushbutton to activate the selected test.

Note : The rotary selector must be replaced in NORM FLT position before flight.


WARN SECTION



① ROTARY selector

Systems which can be tested :

- EXCESS CAB Δ P : MW, CRC, "EXCESS CAB Δ P" red light on CAP
- LDG GEAR NOT DOWN : MW, CRC, "LDG GEAR NOT DOWN" red light on CAP, red light in landing gear lever.
- PITCH DISCONNECT : MW, CRC, "PITCH DISCONNECT" red light on CAP
- EXCESS CAB ALT : MW, CRC, "EXCESS CAB ALT" red light on CAP
- SMK : MW, CRC, "FWD SMK", "AFT SMK", and "ELEC SMK" red lights on CAP
- VMO : clacker
- STICK PUSHER SHAKER-YES :
 - Stall cricket and both stick shakers are activated
 - After 5 seconds, GPWS FAULT illuminates amber on CAP
 - After 10 seconds:
 - CHAN 1, CHAN 2 illuminate
 - Stick pusher is activated
 - Stick pusher indicators illuminate green

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- STICK PUSHER SHAKER - TEST 1 :
 - Stall cricket and left stick shaker are activated
 - After 5 seconds :
 - GPWS FAULT illuminates amber on CAP
 - MC, FLT CTL on CAP and stick pusher FAULT pb illuminate amber
- STICK PUSHER SHAKER - TEST 2 :
 - Stall cricket and right stick shaker are activated
 - After 5 seconds :
 - GPWS FAULT illuminates amber on CAP
 - MC, FLT CTL on CAP and stick pusher FAULT pb illuminate amber
- STICK PUSHER SHAKER - TEST 3 :
 - CHAN 1, CHAN 2 illuminate
 - Stall cricket and both stick shakers are activated
 - After 5 seconds, GPWS FAULT illuminates amber on CAP

Note : If ICING AOA is illuminated:

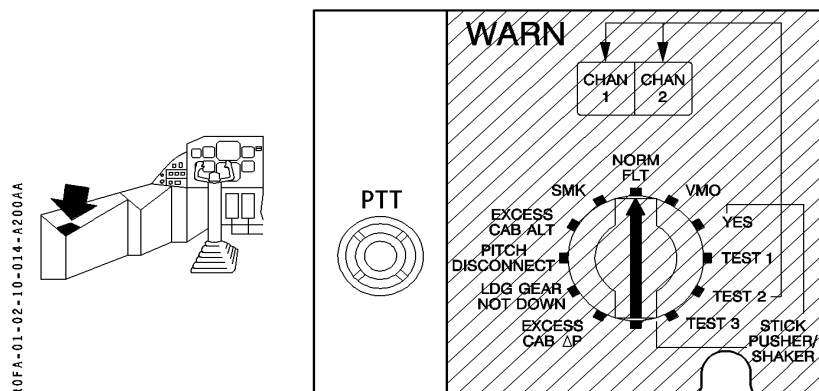
- YES procedure is the same.
- Test 1 procedure is the same except that CHAN 1, CHAN 2 illuminate.
- Test 2 procedure is the same except that CHAN 1, CHAN 2 illuminate.
- Test 3 procedure is the same except that stick pusher is activated in the same time as shakers.

② "CHAN' lights

Illuminates green to check the two angle of attack channels for correct operation.

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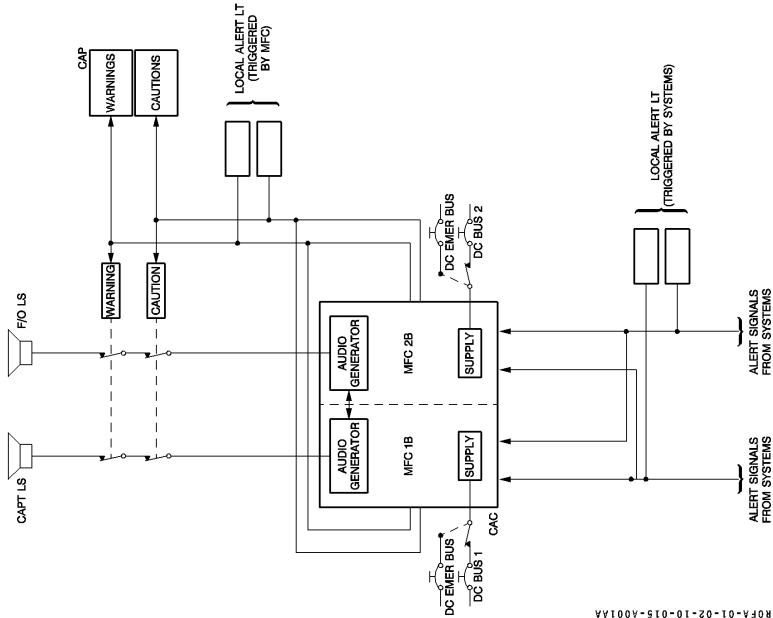
TEST PUSH-BUTTON



- After having selected a system with the rotary selector, use the PTT pb to activate the test.
- As soon as a test is initiated, MAIN PNL will come on amber on CAP.

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10.6 SCHEMATIC



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