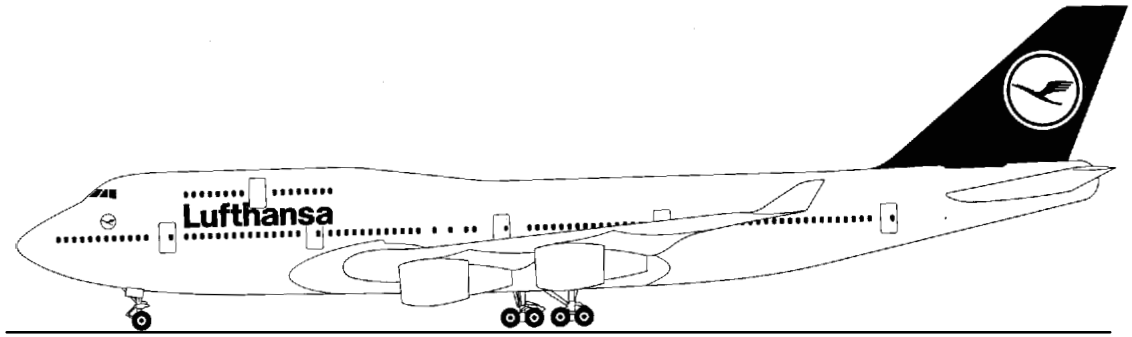
Lufthansa Technical Training

Training Manual B 747-400



ATA 22-14
AFDS

Annunciation & Warning

ATA Spec. 104 Level 3

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ATA 22-14 AFDS ANNUNCIATION & WARNING

ANNUNCIATION AND WARNING INTRODUCTION

General

The purpose of annunciation and warning is to provide normal and non-normal indications of autopilot system performance. These indications are shown over the entire range of the aircraft operation.

Description

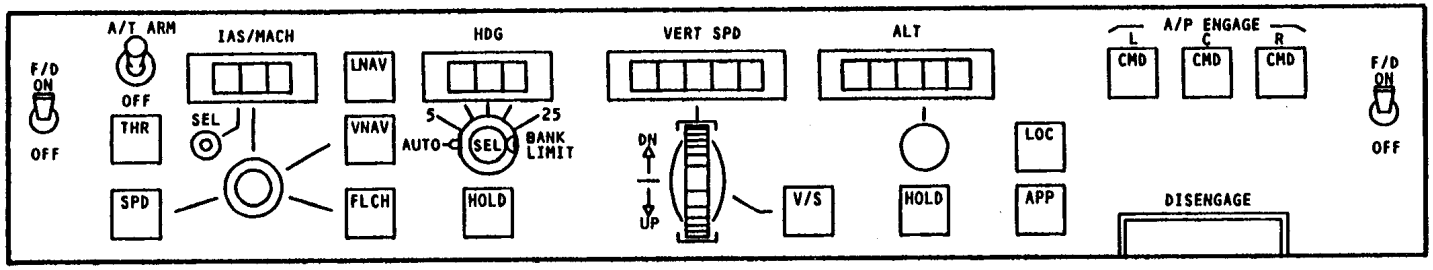
All three flight control computers (FCCs) supply each EFIS/EICAS interface unit (EIU) with mode, status and flight director commands. Mode, status and flight director commands show on the primary flight display (PFD).

Each FCC sends an autopilot disengage warning signal to the modularized avionics warning electronics assembly (MAWEA). The MAWEA turns on the captain's and first officer's master warning lights and generates the level A two-tone siren aural warning.

Each FCC sends an autopilot caution signal to each EIU which turns on the captain's and first office's master

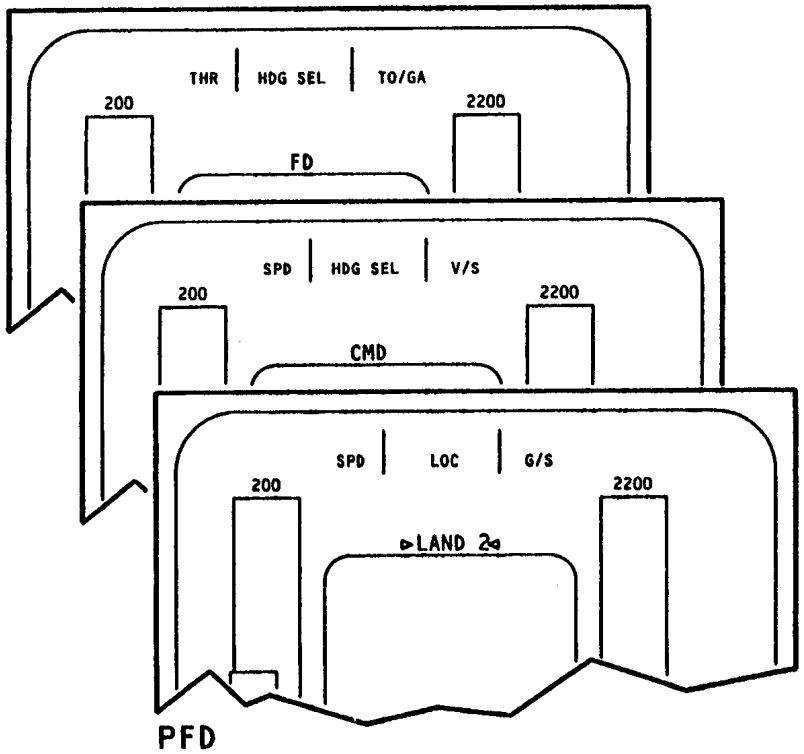
caution lights. The EIU provides a signal to the MAWEA which generates the level B caution aural.

During approach, each FCC sends autopilot engage status and autoland status messages to the captain's and first officer's PFD. It also sends messages to the main EICAS display. These provide the pilot with the autoland status of the aircraft.

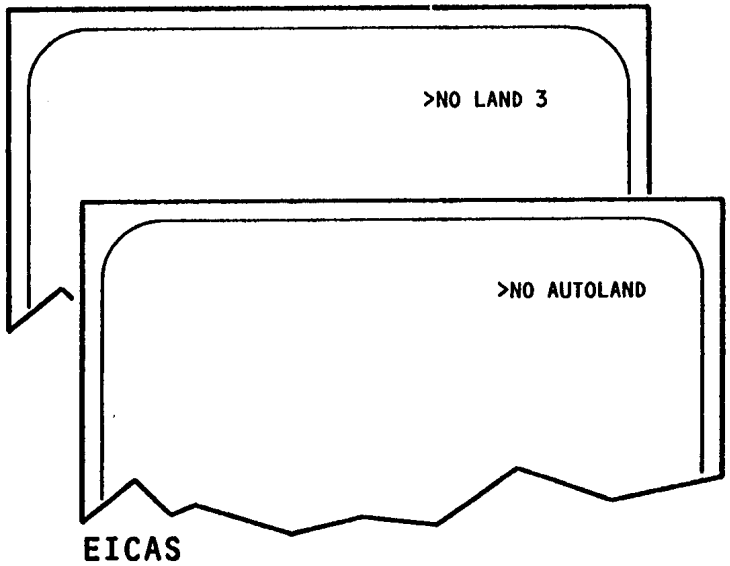


AFCS MCP

MASTER
WARNING
AND CAUTION



PFD



EICAS

Figure 1 ANNUNCIATION AND WARNING INTRODUCTION

PRIMARY FLIGHT DISPLAY

General

The primary flight display (PFD) shows messages to advise the flight crew of the mode and status of the autopilot/flight director system. The PFD also shows flight crew selected (mode control panel) data.

AFDS Modes

The top of the PFD shows the flight modes. This area is referred to as the flight mode annunciator (FMA). A green box appears around the operate mode for 10 seconds when the mode changes.

AFDS Mode Source Selection

The EIU selects the FCC for the source of this data based on this priority sequence:

- A/P engaged: use data from the engaged FCC. For the Captain's PFD, priority is L, C, R. For the first officer's PFD, priority is R, C, L.
- A/P armed: same as A/P engaged priority.
- F/D only: use FCC selected by flight crew with F/D source select switches.

Mode Fail Annunciation

The failure of sensor data necessary for the operate mode causes a yellow bar through the mode on the FMA. It also causes the flight director commands to be removed (F/D bar bias).

Flight Director Commands

The source for flight director commands is determined by the F/D source select switches.

Flight Director Fail Flag

The flight director fail flag shows if the data bus from the FCC selected by the F/D source select switches is invalid (no activity, improper word length or improper parity).

AFDS Engage/Autoland Status Annunciation

The PFD shows the AFDS engage status. When in approach and below 1500 feet radio altitude, autoland status replaces the AFDS engage status.

The autopilot engage/autoland status annunciation can be one of six messages.

AFDS Engage/Autoland Status Source Selection

The EIU selects the FCC for the source of this data based on this priority sequence:

- Autoland status: EIU shows status if any FCC sets status bit true. Priority is NO AUTOLAND, LAND 21 LAND 3.
- TEST: EIU shows TEST if any FCC sets TEST bit true.
- CMD: EIU shows CMD if any FCC sets CMD bit true.
- FD: EIU shows FD if selected FCC sets FD bit true.

Flight Crew Selected Data

The flight crew selected data is:

- Selected heading
- Selected airspeed
- Selected altitude
- Selected vertical speed

Flight Crew Selected Data Source Selection

The EIU selects the FCC for the source of this data based on data valid for the data word. The selection logic is:

- Captain's PFD, priority is L, C, R
- First officer's PFD, priority is R, C, L

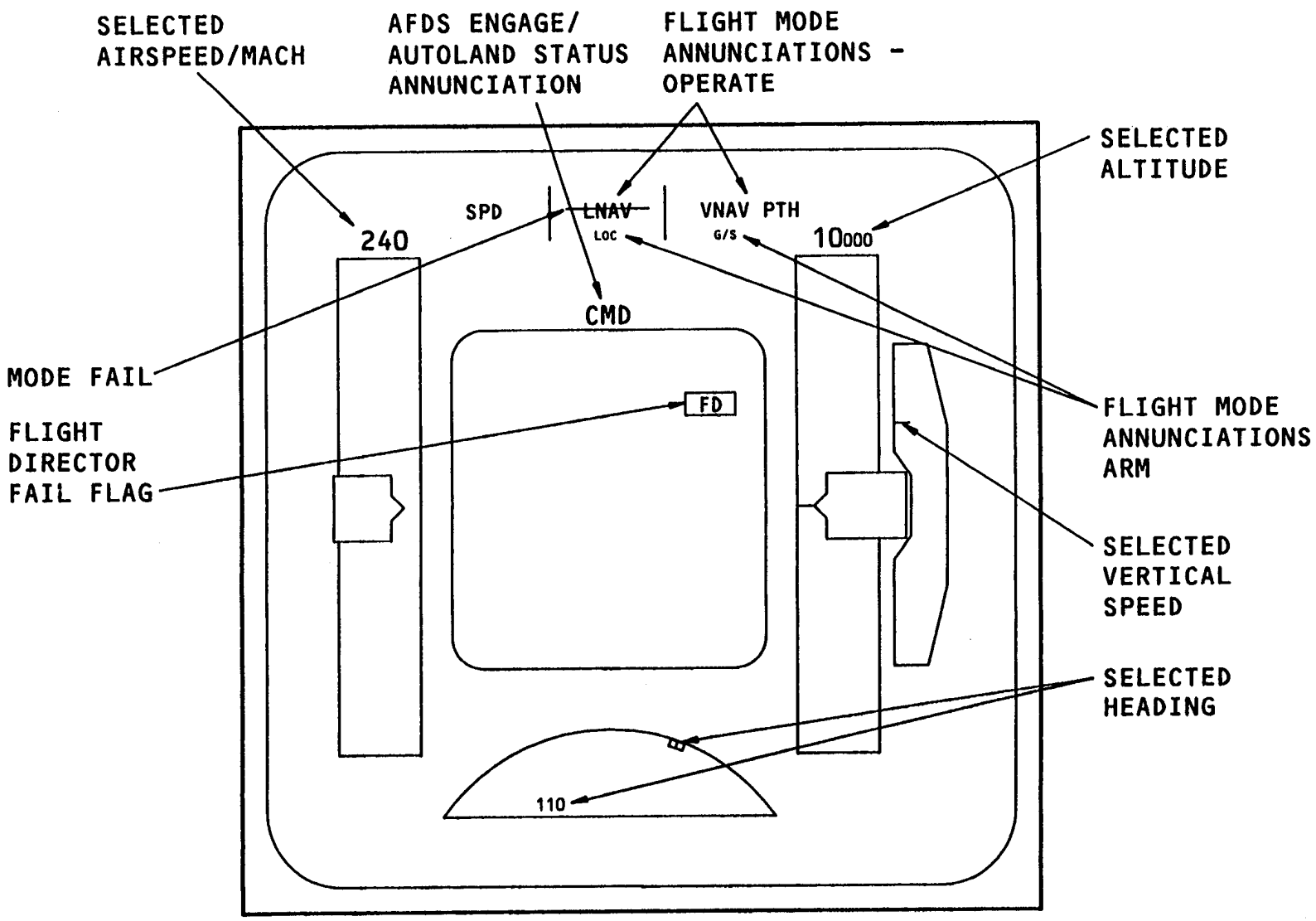


Figure 2 Primary Flight Display

EICAS MESSAGES

General

The EICAS displays show messages for the autopilot flight director system and autoland capability. These messages also affect the master warning and caution lights.

EICAS Display

The EICAS displays show four levels of messages for the AFDS status and autoland capability. These are:

- Level A warning
- Level B caution
- Level C advisory
- Level S status

Level A Warning

The level A warning is an >AUTOPILOT DISC message. This is caused by a disconnect of all engaged autopilot channels.

Level B Caution

The level B caution messages are:

- >AUTOPILOT: this shows a total fail of sensor data for the active autopilot mode, an autostab trim fail or non normal autopilot operation.
- >NO LAND 3: this shows a degradation of autoland capability when multi-channel engaged and above 200 feet radio altitude. The degradation is such that the autopilot does not have a LAND 3 capability. The autopilot does have LAND 2 capability, however.
- >NO AUTOLAND: this shows a degradation of autoland capability when multi-channel engaged. The degradation is such that the autopilot does not have either a LAND 3 or LAND 2 capability.

Level C Advisory

The level C advisory messages are:

- >NO LAND 3: this shows a degradation of autoland capability when not multichannel engaged. The degradation is such that the autopilot does not have a LAND 3 capability. The autopilot does have LAND 2 capability, however.
- >NO AUTOLAND: this shows a degradation of autoland capability when not multi-channel engaged. The degradation is such that the autopilot does not have either a LAND 3 or LAND 2 capability.

Level S Status

If a failure occurs which causes a level B or level C message, this also causes the same unlatched level S status message.

In addition, there are some failures that the FCC detects which do not affect autoland capability. For these, a latched status message, NO LAND 3 or NO AUTOLAND occurs.

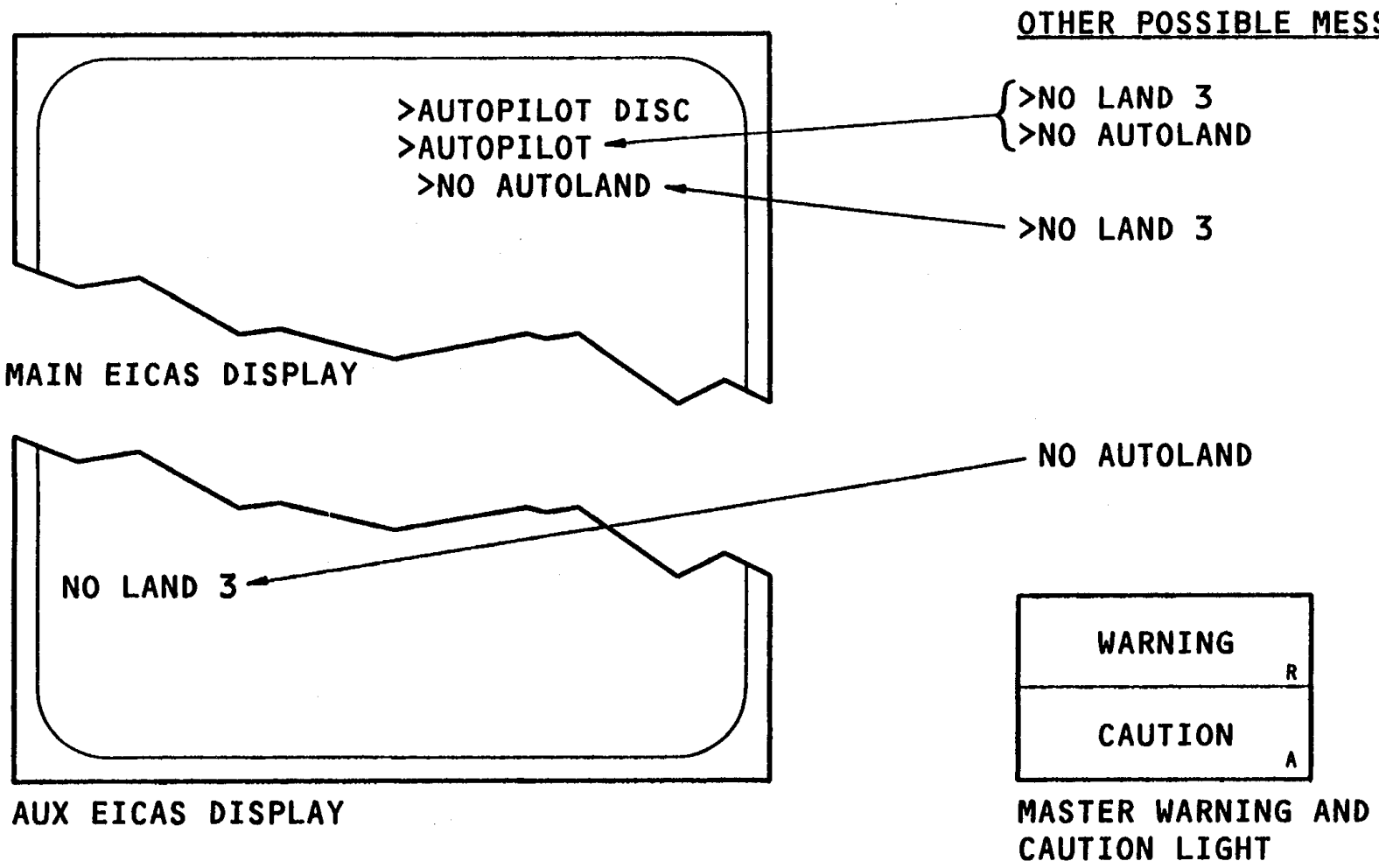


Figure 3 EICAS MESSAGES

ROLL MODE ANNUNCIATIONS

Roll Mode Arm and Operate Signal Initiation

Roll mode arm and operate annunciations start in mode logic. They are a result of requests from the MCP or from other logic.

FCC/EIU Signal Processing

The FCC determines the desired mode, processes this data into ARINC 429 format and sends it to the EFIS/EICAS Interface Unit (EIU). The EIU sends this data to the PFD for the FMA display.

Primary Flight Display (Normal)

The PFD shows the roll mode annunciations. The operate mode annunciations are green, while one line below, arm annunciations are white.

Primary Flight Display (Non Normal)

Removal of the roll mode annunciations (arm and operate) occurs when:

- There is no activity on the data bus.
- Parity is incorrect.
- The data word is invalid.
- The data word is NCD (No Computed Data).

The roll mode annunciation has a yellow line drawn through it when that mode fails.

Mode Control Panel (MCP)

When selecting a roll mode, the FCC sends a signal to the MCP to turn on that mode pushbutton light.

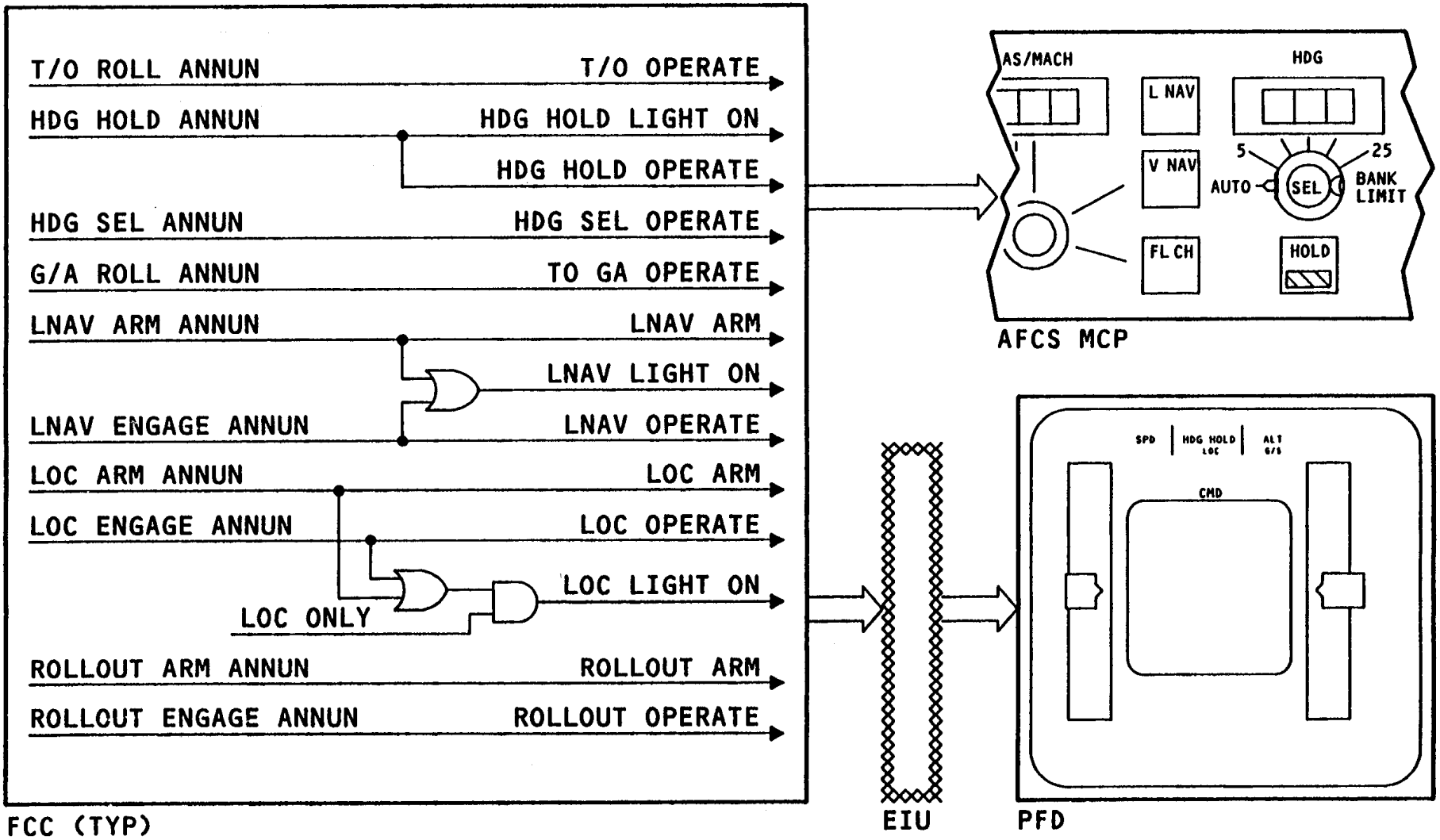


Figure 4 ROLL MODE ANNUNCIATIONS

PITCH MODE ANNUNCIATIONS

General

Pitch mode arm and operate annunciations start in mode logic. They are a result of requests from the MCP or from other logic.

The FCC determines the desired mode, processes this data into ARINC 429 format and sends it to the (EIU). The EIU sends this data to the PFD for the FMA display.

Primary Flight Display (Normal)

The PFD shows the pitch mode annunciations. The operate mode annunciations are green. one line below, arm annunciations are white.

Primary Flight Display (Non Normal)

Removal of the pitch mode annunciations (arm and operate) occurs when:

- There is no activity on the data bus.
- Parity is incorrect.
- The data word is invalid.
- The data word is NCD (no computed data).

The pitch mode annunciation has a yellow line drawn through it when that mode fails.

Mode Control Panel (MCP)

When selecting a pitch mode, the FCC sends a signal to the MCP to turn on that mode push button light.

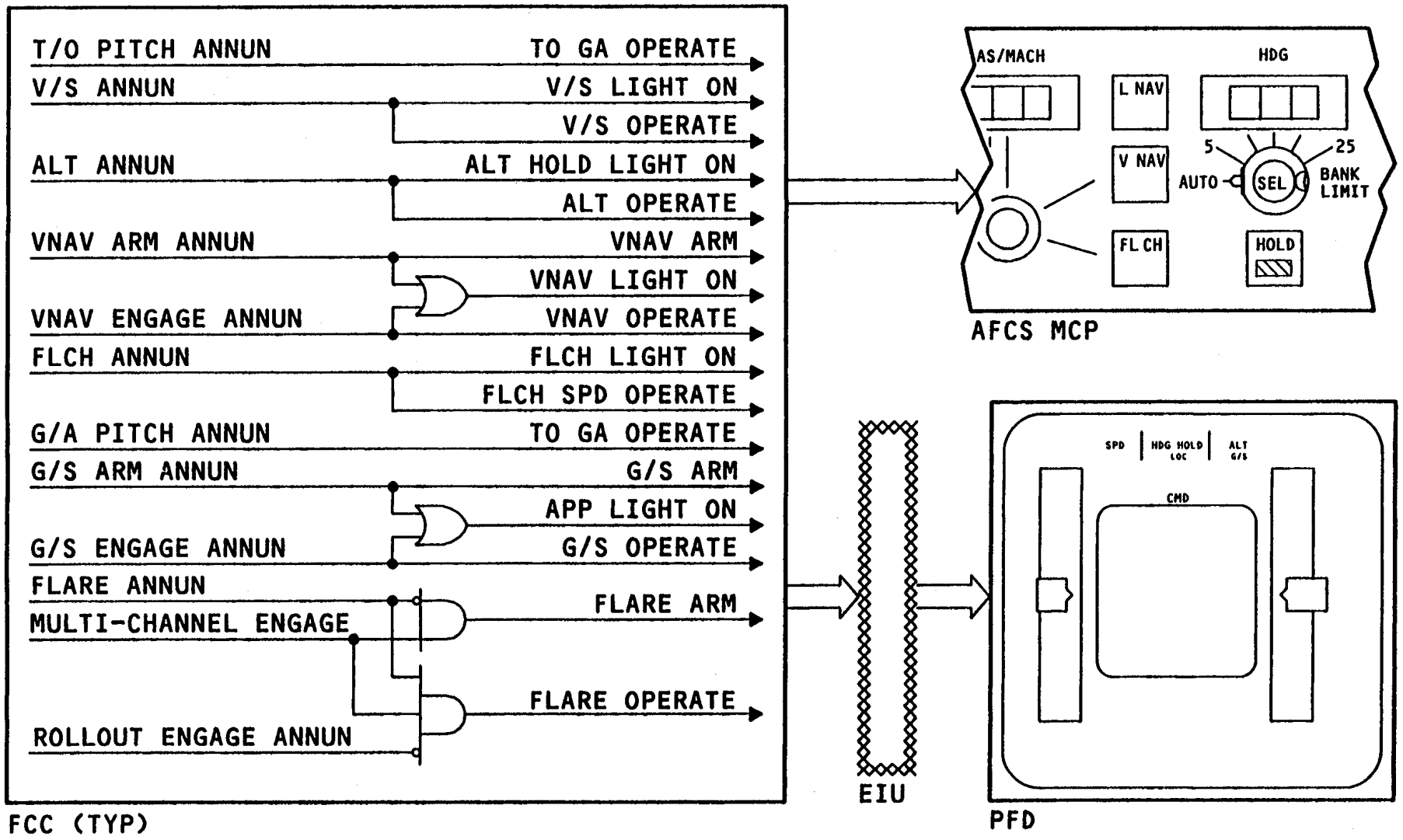


Figure 5 PITCH MODE ANNUNCIATIONS

WARNING ANNUNCIATION

General

The following indications occur in the flight deck when the servos of all channels become disengaged:

- master warning lights turn on
- Level A warning aural sounds
- Level A warning EICAS message shows

The above indications are generated through the following two sets of signals from each FCC:

- A/P WARNING 1 NORMAL
- A/P WARNING 1 BATTERY
- A/P WARNING 2 NORMAL
- A/P WARNING 2 BATTERY

A/P warning 1 sets the EICAS message >AUTOPILOT DISC, while A/P warning 2 sets the MAWEA generated indications. Both sets of signals are generated at the same time from any or all FCC's. If the normal source of power to the FCC's fails, the A/P WARNING 1 and 2 BATTERY signals ensure that the disconnect annunciations are generated.

Push either the captain's or the first officer's master warning light to turn off the light. The EICAS message and the warning aural may be cleared through one of these two methods:

- Re-engage an autopilot channel
- Push the manual disconnect switch on either the captain's or first officer's control wheel.

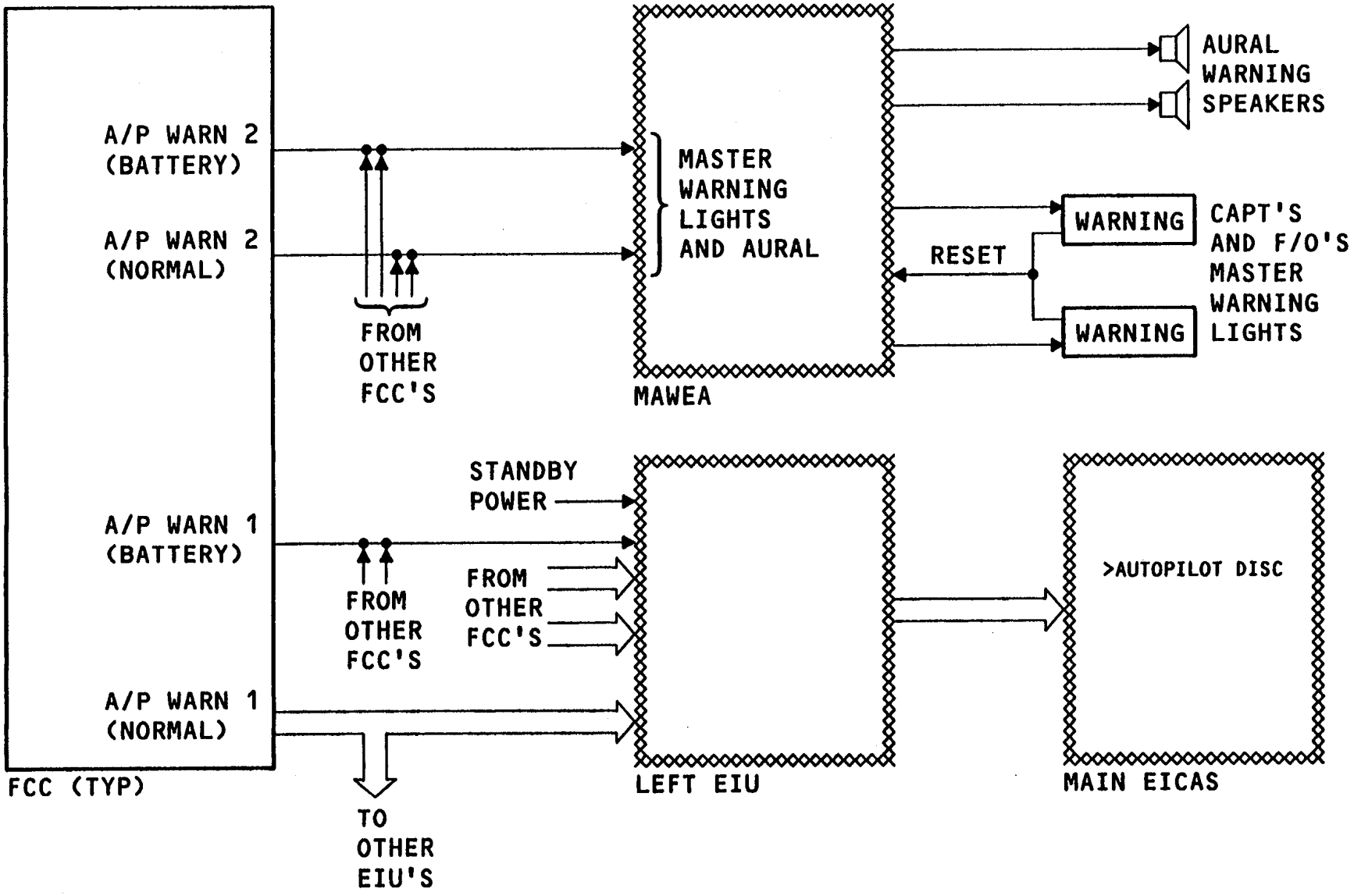


Figure 6 WARNING ANNUNCIATION

CAUTION ANNUNCIATION

General

Certain autopilot conditions require crew awareness. These turn on the caution annunciation. This sounds the level B caution aural and shows a yellow >AUTOPILOT message on EICAS.

Caution Classification Logic

These condition will cause an autopilot caution followed by autopilot disengage:

- FCC faults with the 1/0 buffer and MCP wrap around
- MCP faults with data path and computation
- IRU vertical acceleration local failure after second failure
- ADC second failure of altitude, airspeed, or impact pressure data

These conditions will cause an autopilot caution and cause the PFD to show a yellow line through the operate autopilot mode:

- Master FMC fail in LNAV or VNAV
- Either selected ADC fail in multi-channel go-around
- LOC or G/S local fail after second failure in LOC or G/S capture
- Radio altitude local fail after second failure if LOC and G/S capture and below 1500 feet
- IRU outer loop data local fail after second failure
- ILS frequency change after capture
- Two or three ILS NCD (ILS anomally or ground transmitter fail)

These conditions will cause an autopilot caution:

- Ground test mode
- Single channel flare mode
- Stabilizer trim failure
- Transition to V/S from FLCH or VNAV without pilot request
- FCC program pin parity error
- IAS at 1.3 V stall in V/S with greater than 100 ft/min climb selected
- Pilot override if single channel engaged (servo detent trip)

Source Selection

The EIU gives caution indications if any FCC sends a caution signal with no FCC sending a warning signal.

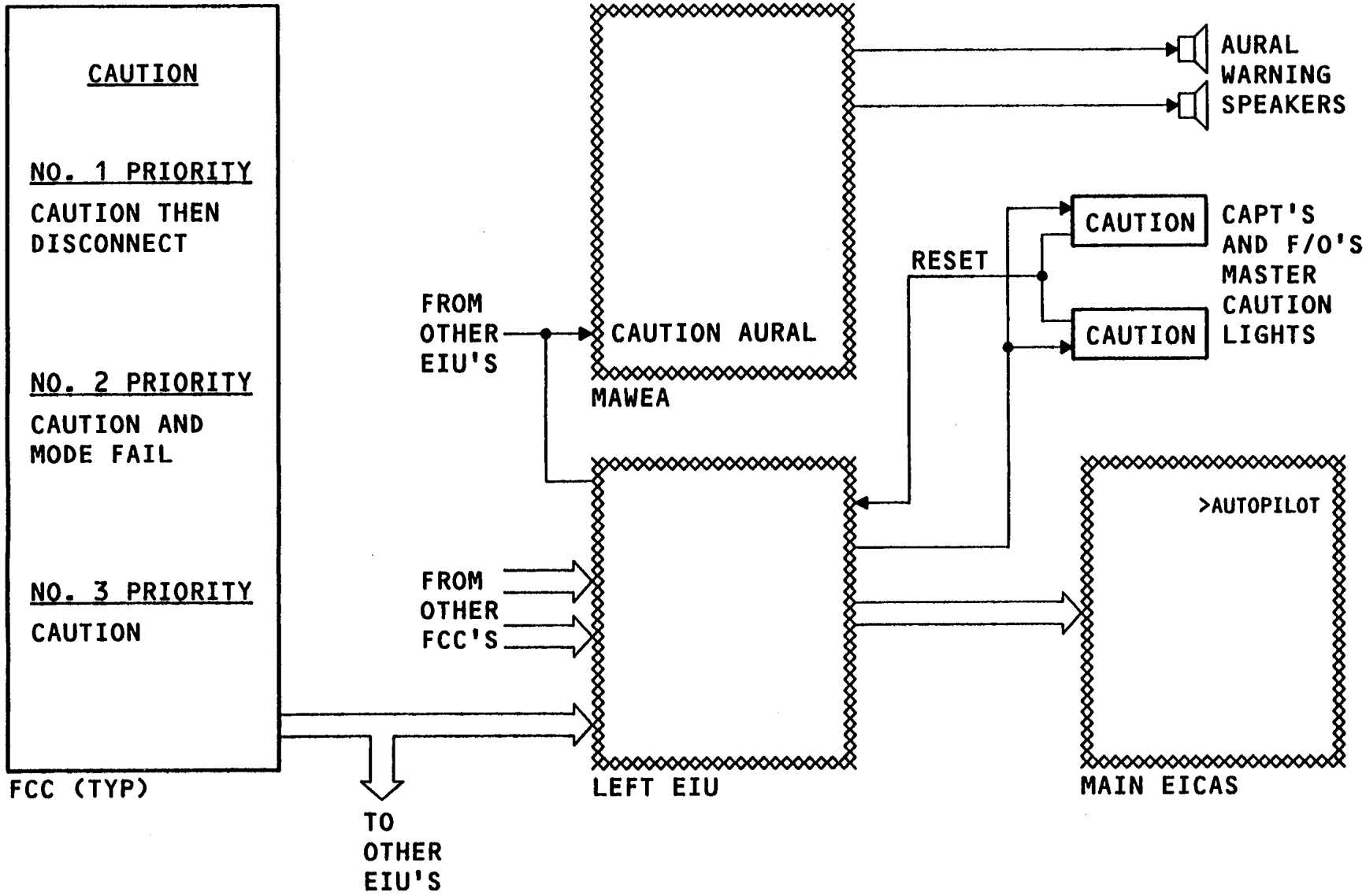


Figure 7 CAUTION ANNUNCIATION

STATUS ANNUNCIATION

PFD Primary Flight Display

The PFD shows the status of the flight director and autoland system.

A flight director switch in the ON position causes the onside PFD to show PD. An autopilot in CMD causes both PFDs to show CMD.

Autoland Status Annunciation - Not Multi-Channel (EICAS)

The main EICAS display shows the degraded status of the autoland system.

EICAS shows NO LAND 3 if the autoland capability has degraded from fail-operational to fail-passive. This may be caused by:

- One IRU (inner or outer loop), ILS receiver, or radio altimeter fail
- one flap/stab control unit failure
- one localizer or glideslope antenna switch failure
- One FCC, servo, or servo loop failure
- One ILS receiver or radio altimeter does not respond to tune/test inhibit
- Electric buses do not isolate when requested
- MCP wrap around test fail

In addition, there are some failures that the FCC detects which do not affect autoland capability. For these failures, a latched EICAS status message, NO LAND 3, shows.

EICAS shows NO AUTOLAND if two failures of the same kind occur.

These level C messages may show on EICAS anytime the airplane is not multi-channel engaged.

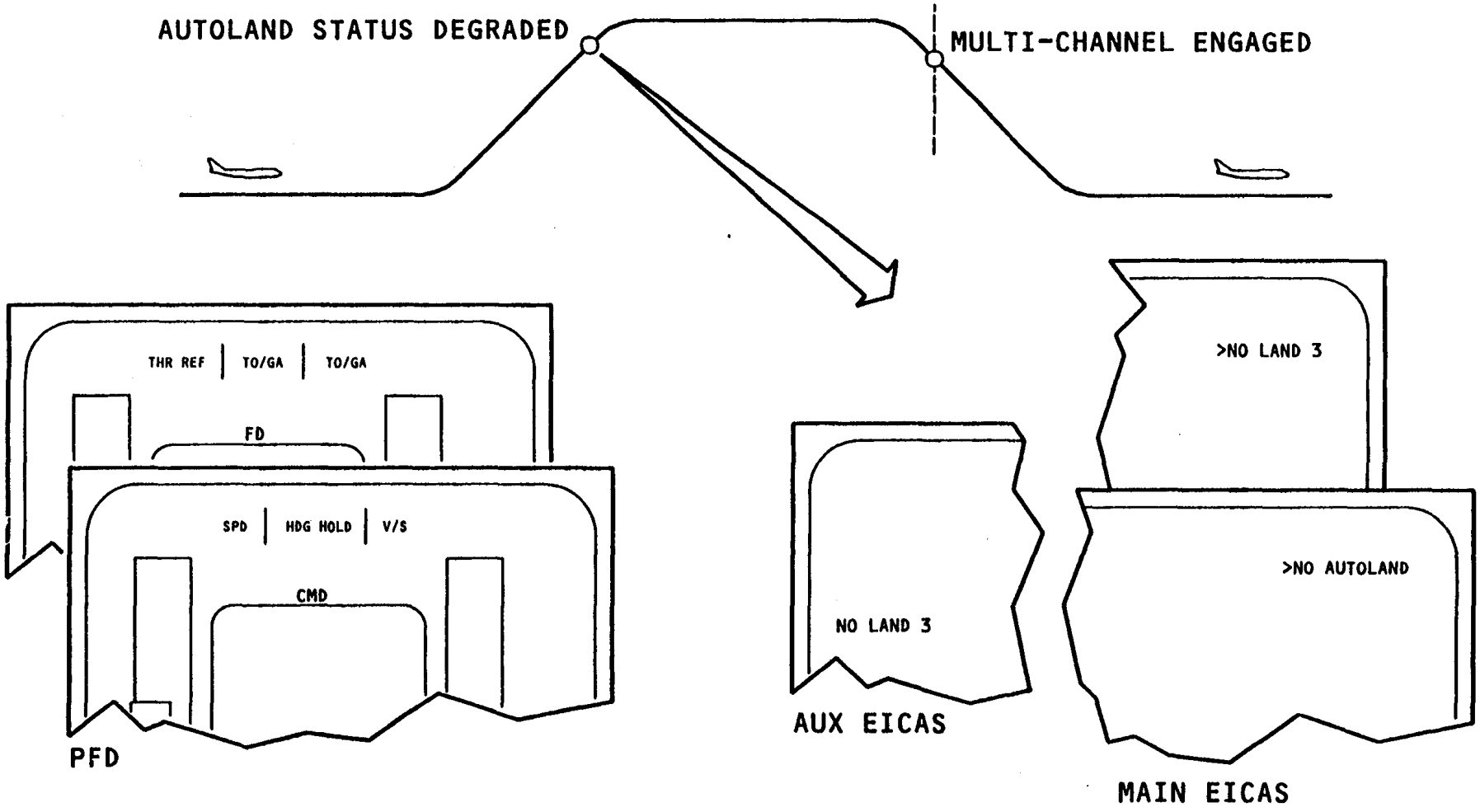


Figure 8 STATUS ANNUNCIATION

AUTOLAND STATUS ANNUNCIATION

Primary Flight Display

The PFD shows the status of the autoland system when multi-channel engaged.

The PFD shows LAND 3 if the autoland status is fail-operational. If the autoland status has degraded from fail-operational to fail-passive, the PFD shows > LAND 2 <.

The PFD shows NO AUTOLAND if the autoland status degrades to the point where an autoland is not possible.

Below 200 feet, the autoland status changes only if the status has degraded to NO AUTOLAND.

EICAS

If the status of the autoland system degrades when multi-channel engaged, the main EICAS shows NO LAND 3 or No AUTOLAND as a level B message with a level B aural tone. The conditions for these messages are the same as when not multi-channel engaged.

Below 200 feet, the autoland status changes only if the autoland status degrades to NO AUTOLAND.

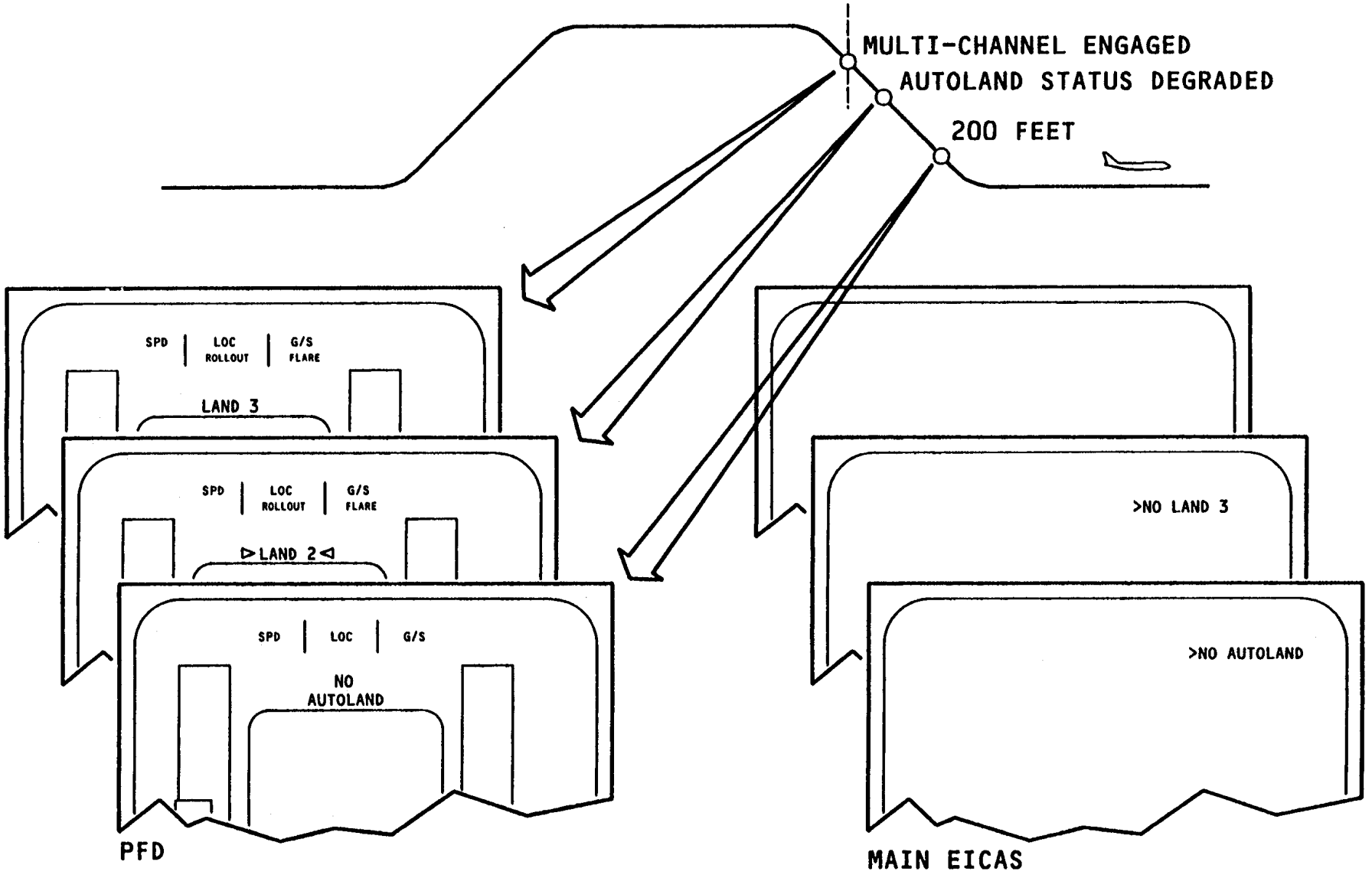


Figure 9 AUTOLAND STATUS ANNUNCIATION

GROUND TESTS (SHEET 1)

General

The autopilot flight director system ground tests start from the CMC ground test menu page. Push the chapter 22 - AUTOPILOT FLT DIR line select key. This is a short explanation of the available ground tests.

The PRECONDITION pages are shown for these tests where applicable. Each flight control computer (FCC) requires that the airplane be on ground and that no autopilot is engaged for any ground test to be enabled.

FCC Tests

In the FCC ground tests, the FCC do a self-test. The FCCs monitor all systems and sensors which interface with them. Interface faults show at this time. Failed units (as detected with the sign-status-matrix data) show on the EXISTING FAULT page for chapter 22.

Mode Control Panel Test

The FCCs do a test of all MCP functions (switches, controls and displays) during the mode control panel ground test.

Aileron Servo Test

In the aileron servo test, the autopilot channels engage and command signals go to the aileron servos (central lateral control packages and lateral autopilot servo). The FCCs monitor proper response and interface.

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERON, RUDDERS, ELEVATORS, FLAPS, SPOILER, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

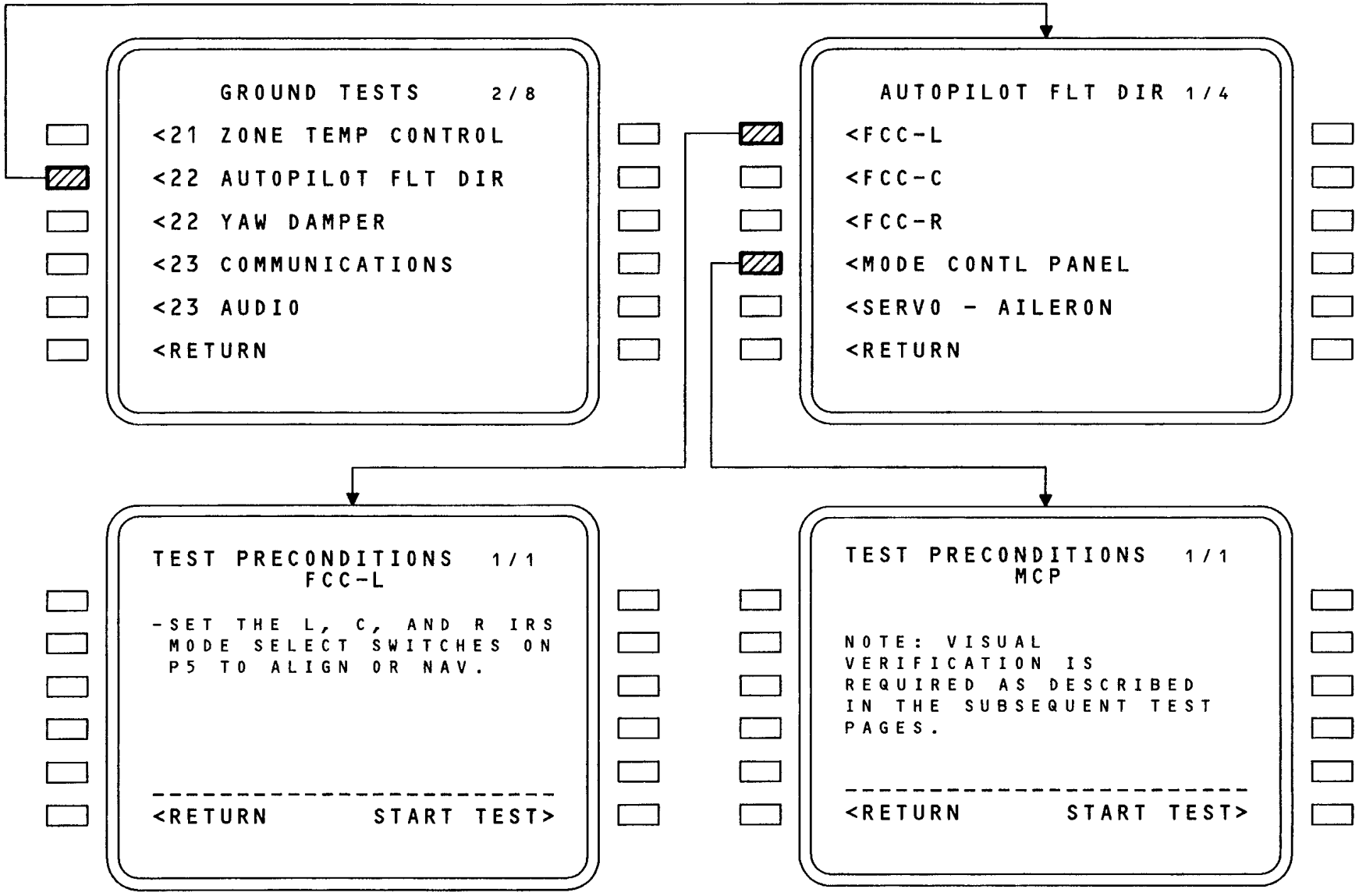


Figure 10 GROUND TEST (SHEET 1)

GROUND TESTS SHEET 2

Elevator Servo Test

This test is for the elevator autopilot servos. It is similar to the aileron servo test.

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERON, RUDDERS, ELEVATORS, FLAPS, SPOILER, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

Rudder Servo Test

This test is for the rudder servo (rollout power control packages). It is similar to the aileron servo test.

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERON, RUDDERS, ELEVATORS, FLAPS, SPOILER, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

Note: Lock out nose gear steering to prevent nose gear movement during a rudder system test.

Autopilot Disconnect Switch Test

This test monitor the function of the autopilot disconnect switches.

Go-around Switch Test

This test monitors the function of the go-around switches.

Autoland Unique Test

The autoland unique test monitors operation of these functions:

- ILS tune inhibit
- Radio altitude test inhibit
- Localizer antenna switch
- Bus Isolation

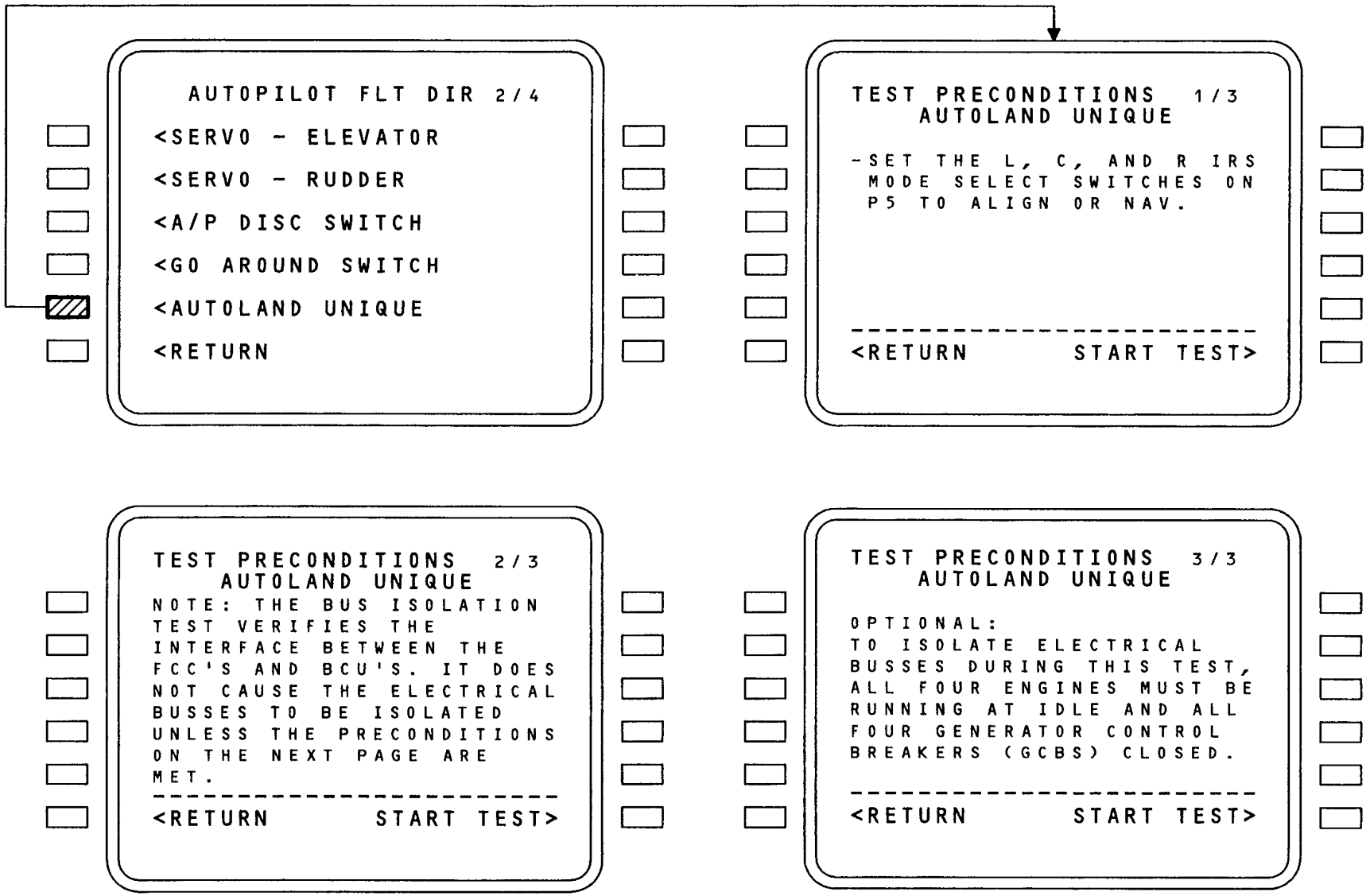


Figure 11 GROUND TEST (SHEET 2)

GROUND TESTS (SHEET 3)

Air/Ground Relay Test

The air/ground relay test monitors that all FCCs receive the same status from the air/ground system.

FCC Configuration Test

This test shows the option pin configuration of the FCCs.

FCC Instrument Test

The FCC Instrument test monitors the interface of the FCCs and the integrated display system including the flight director source select switches. This test also monitors the instrument switches /FMC and heading reference).

Flap Transducer Test

This test monitors the function and interface of the flap transducers.

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERON, RUDDERS, ELEVATORS, FLAPS, SPOILER, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

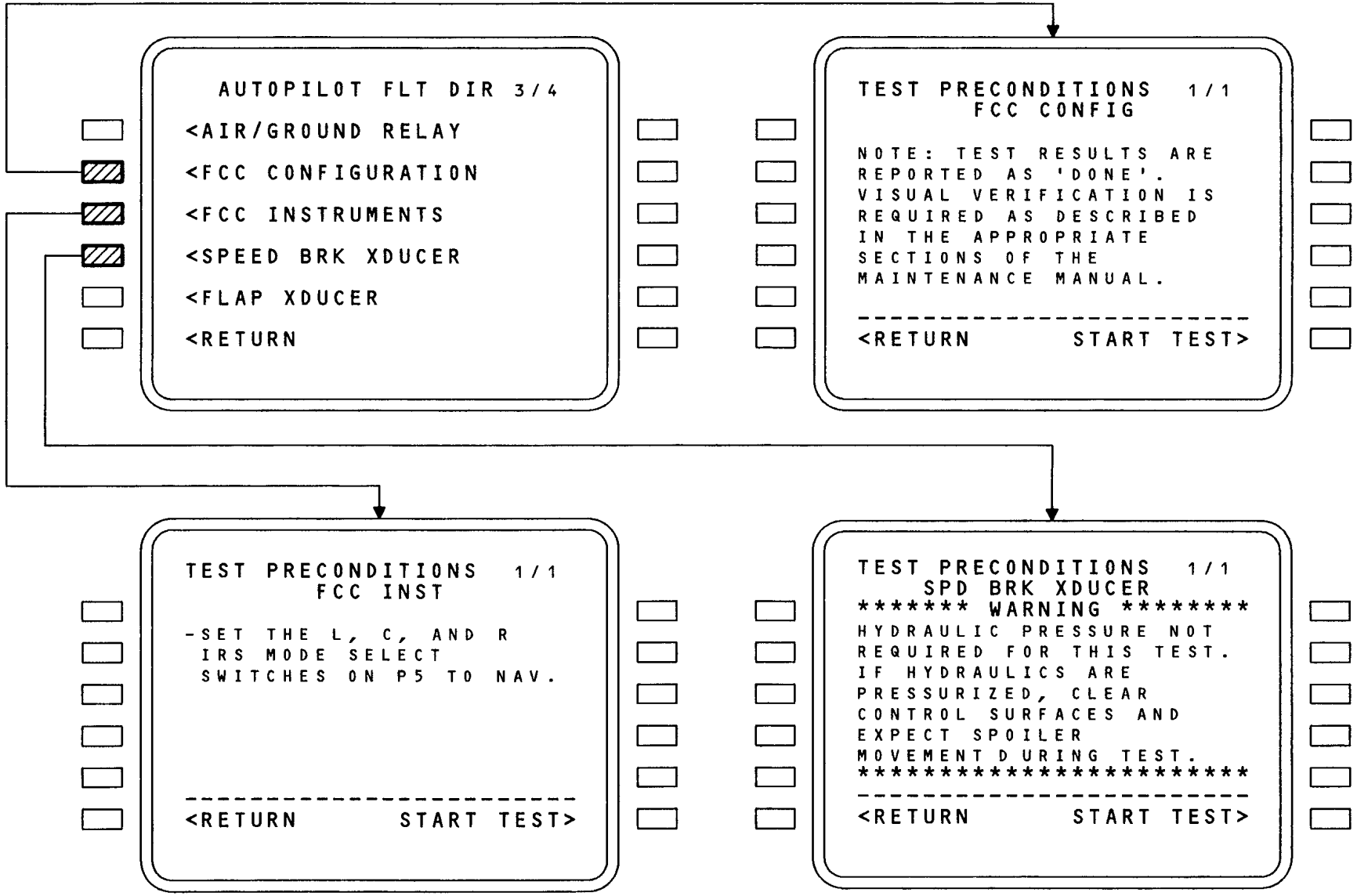


Figure 12 GROUND TESTS (SHEET 3)

GROUND TEST (SHEET 4)

Stabilizer Trim

In the stabilizer trim test, the autopilot channels engage one at a time and trim signal go to the stabilizer trim system. The FCCs monitor proper stabilizer operation and interface.

Surface Limit Tests

The aileron, elevator and rudder surface limit tests make sure that the FCCs have the same limit authority. Each control axis is operated (in separate tests) to the limit of the FCC with all channels engaged.

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERON, RUDDERS, ELEVATORS, FLAPS, SPOILER, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

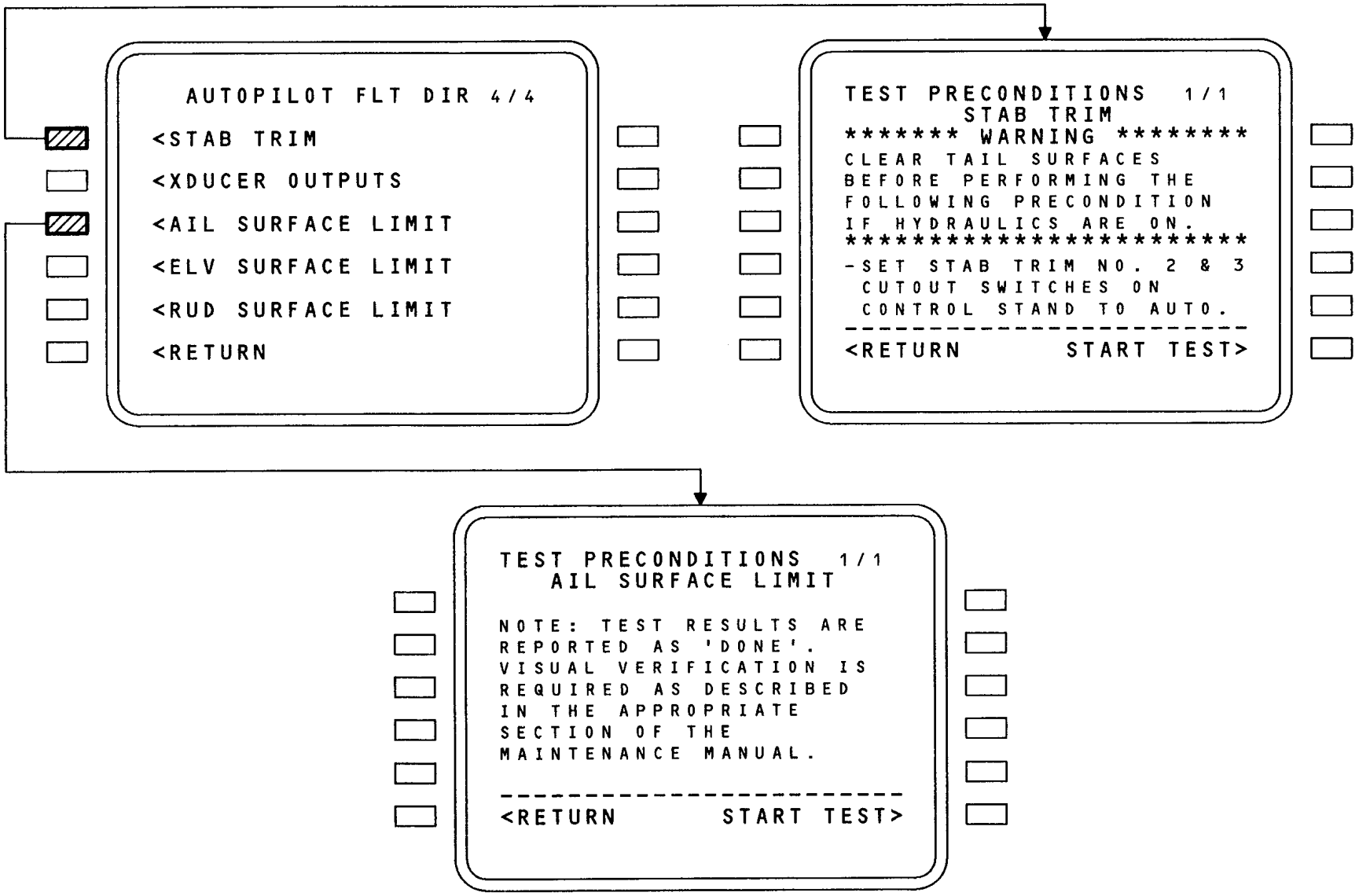


Figure 13 GROUND TESTS (SHEET 4)

GROUND TESTS (SHEET 5)

Transducer Output Test

The transducer output test shows real-time transducer values for these transducers:

- Stabilizer position
- Aileron surface position
- Elevator surface position
- Rudder surface position
- Speed brake position
- Flap position

These outputs may be monitored or the values may be used for transducer adjustment after maintenance action.

WARNING: MAKE SURE THAT PERSONS AND EQUIPMENT ARE CLEAR OF ALL CONTROL SURFACES BEFORE YOU SUPPLY HYDRAULIC POWER. AILERONS, RUDDERS, ELEVATORS, FLAPS, SPOILERS, LANDING GEAR, AND THRUST REVERSERS CAN MOVE QUICKLY WHEN YOU SUPPLY HYDRAULIC POWER. THIS CAN CAUSE INJURY TO PERSONS AND DAMAGE TO EQUIPMENT.

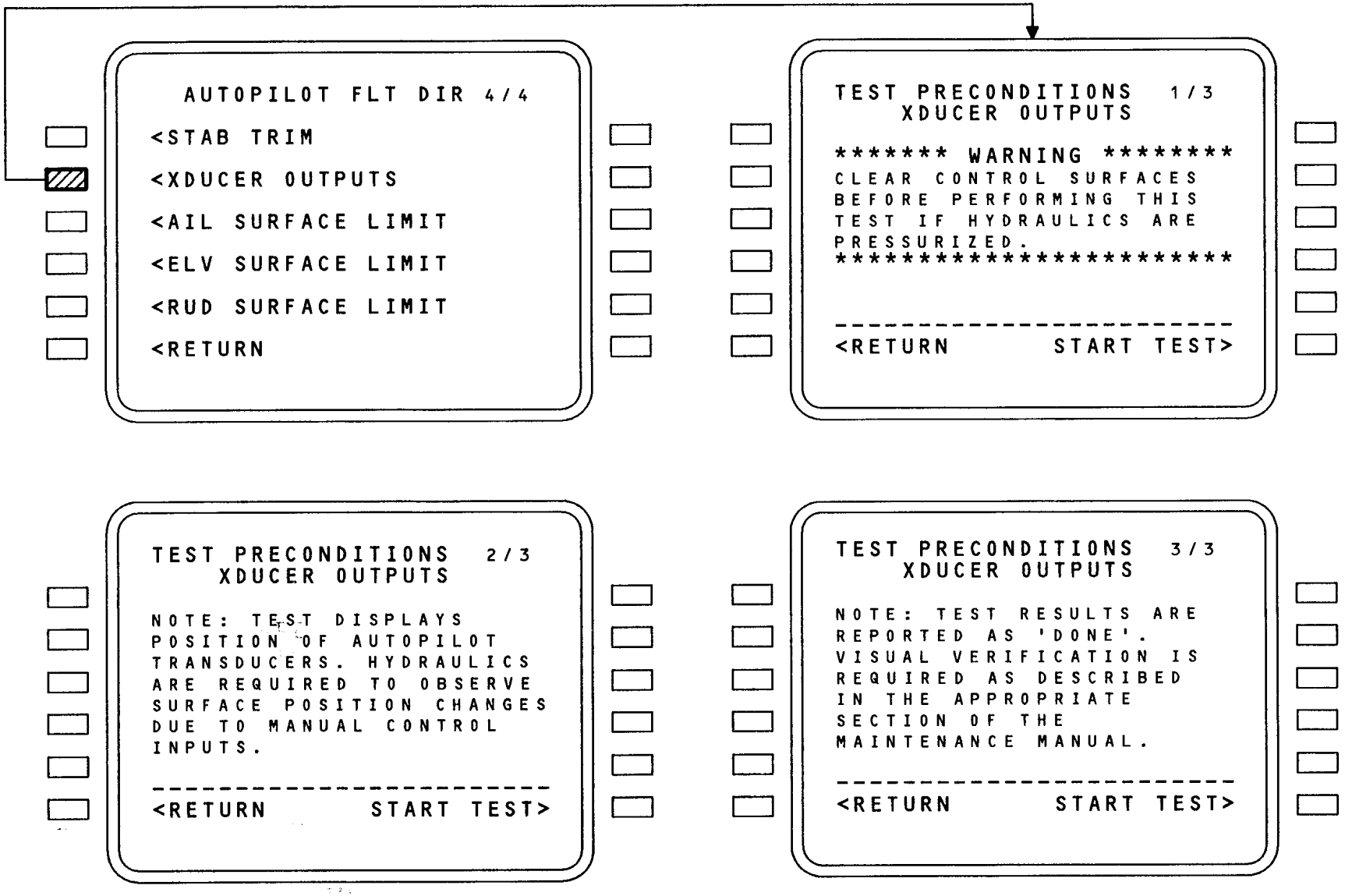


Figure 14 GROUND TEST (SHEET5)

FLIGHT DECK EFFECTS

The flight deck effects for the autopilot/flight director system are in these categories:

- EICAS warning message
- EICAS caution message
- EICAS advisory message
- EICAS status message
- PFD message
- PFD flag

The A/P DISCONNECT EICAS message occurs anytime the autopilot has a total disconnect. This may be due to a failure or a disconnect by the flight crew. If due to intentional disconnect, it is not logged in the CMC as a flight deck effect.

All other AFDS flight deck effects log in the CMC for recall and possible maintenance action.

FLIGHT DECK EFFECT	TYPE	DESCRIPTION
>A/P DISCONNECT	EICAS WARNING MESSAGE	ALL AUTOPILOT CHANNELS HAVE DISCONNECTED
>AUTOPILOT	EICAS CAUTION MESSAGE	PILOT OVERRIDE, SENSOR FAIL, MCP FAIL, ILS FREQUENCY CHANGE, IAS NEAR STALL, GROUND TEST, SINGLE CHANNEL FLARE, STAB TRIM FAIL, PROGRAM PIN FAIL OR MODE ERROR
>NO LAND 3	EICAS CAUTION MESSAGE	AUTOLAND SENSOR FAIL DURING MULTI-ENGAGE
>NO AUTOLAND	EICAS CAUTION MESSAGE	DUAL AUTOLAND SENSOR FAIL DURING MULTI-ENGAGE
NO AUTOLAND	PFD MESSAGE	DUAL AUTOLAND SENSOR FAIL DURING MULTI-ENGAGE
>NO LAND 3	EICAS ADVISORY MESSAGE	AUTOLAND SENSOR FAIL BEFORE MULTI-ENGAGE
>NO AUTOLAND	EICAS ADVISORY MESSAGE	DUAL AUTOLAND SENSOR FAIL BEFORE MULTI-ENGAGE
NO LAND 3	STATUS MESSAGE	UNLATCHED MESSAGE IF AUTOLAND SENSOR FAILURE. LATCHED MESSAGE IF NON-CRITICAL FAILURE
NO AUTOLAND	STATUS MESSAGE	
F/D BAR BIAS	PFD FLIGHT DECK EFFECT	SENSOR FOR SELECTED MODE FAIL
F/D FLAG	PFD FLAG	F/D BUS TO EIU INTERFACE FAIL FOR SELECTED FCC

Figure 15 FLIGHT DECK EFFECTS

CMC MESSAGES DURING SYSTEM OPERATION

The CMC messages which may occur during system operation are in these categories:

- Component failure
- Input sensor failure
- Interface failure

Some of these messages may also occur during ground test.

CMC MESSAGES DURING SYSTEM OPERATION

MCP ~ FCC-X BUS FAIL
A/P DISCONNECT SWITCH ~ FCC-X
INTERFACE FAIL
MCP ~ FCC-X INTERFACE FAIL
"28V DC ENGINE DISCRETE"
MCP ~ FCC-X INTERFACE FAIL
"28V DC ARM DISCRETE"
FCC-X ~ MCP (A OR B) BUS FAIL
FMC-X ~ MCP A (B) BUS FAIL (FCC)
ADC-L (R) ~ FCC-X BUS FAIL
IRU-X ~ FCC-X BUS FAIL
ILS-X ~ FCC-X BUS FAIL
RADIO ALTIMETER-X ~ FCC-X BUS FAIL
FLAP CONTROL UNIT-X ~
FCC-X INTERFACE FAIL
"STABILIZER POSITION"
("FLAP POSITION")
ELEVATOR SERVO-X ~ FCC-X
INTERFACE FAIL
"SERVO POSITION"
("SURFACE POSITION")
AILERON SERVO-X ~ FCC-X
INTERFACE FAIL
"SERVO POSITION"
("SURFACE POSITION")
RUDDER SERVO-X ~ FCC-X
INTERFACE FAIL
"SERVO POSITION"
("SURFACE POSITION")
SPEED BRAKE XDUCER ~ FCC-X
INTERFACE FAIL "HANDLE POSITION"
SRM-X ~ FCC-X INTERFACE FAIL
"AUTOTRIM VALID (2)"
FCC-X ~ FCC-X CROSS CHANNEL
INTERFACE FAIL
"SERVO ENGAGE DISCRETE"
GO AROUND SWITCH ~ FCC-X
INTERFACE FAIL
SHELF ~ FCC-X INTERFACE FAIL
BCU-2 ~ FCC-X INTERFACE FAIL
"A/L BUS ISOLATED"
28V DC POWER ~ FCC-X
INTERFACE FAIL
"SERVO ARM (ENGAGE) POWER"
BATTERY PWR/GND ~ FCC-X
INTERFACE FAIL
FCC-X ~ LOC ANTENNA RLY
INTERFACE FAIL
AIR DATA SYSTEM-X FAIL (FCC)

Figure 16 CMC MESSAGES DURING SYSTEM OPS

SERVO POWER-X ~ FCC-X FAIL
RADIO ALTIMETER-X FAIL (FCC)
GO AROUND SWITCH ~ FCC-X FAIL
A/P DISCONNECT SWITCH ~ FCC-X FAIL
SRM-X ~ FCC-X FAIL
MCP ~ FCC-X FAIL
STABILIZER-X/FCC-X FAIL
BUS CONTROL UNIT/FCC-X FAIL
HYDRAULIC SYSTEM-1 (2 OR 3)
POWER FAIL (FCC-X)
RUDDER SERVO-X FAIL (FCC-X)
FCU-X/FCC-X FAIL "FLAP POSITION"
FCU-X/FCC-X INTERFACE FAIL
FCU-X ~ FCC-X INTERFACE FAIL
FCU-X/FCC-X INTERFACE FAIL
"FLAP POSITION" ("STAB POSITION")
RADIO ALTIMETER-X ~ FCC-X BUS FAIL
FCC-X CONFIGURATION ERROR
FCC-X FAIL OR ADC-X ~ FCC-X BUS FAIL
MCP ~ FCC-X BUS FAIL
FMC-X ~ FCC-X BUS FAIL
GLIDESLOPE RELAY-X/FCC-X FAIL
LOC ANTENNA RLY ~ FCC-X INTERFACE FAIL
EXCESS WHEEL INPUT
LOC ANT RELAY-X/FCC-X FAIL

IRU-X ~ FCC-X BUS FAIL
ILS-X FAIL (FCC)
IRU-X FAIL (FCC)
ADC ~ IRU-X BUS FAIL (FCC-X)
MODE CONTROL PANEL FAIL
AILERON SERVO-X/FCC-X (OR-X) FAIL
RUDDER SERVO-X/FCC-X (OR-X) FAIL
ELEVATOR SERVO-X/FCC-X (OR-X) FAIL
MAG - TRUE SWITCH ~ FCC-X FAIL
FCC-X FAIL
GROUND SAFETY RELAY-X ~ FCC-X FAIL
SHELF ~ FCC-X FAIL

Figure 17 CMC Messages During System Ops (Sh 2)

CMC MESSAGES DURING GROUND TEST

The CMC messages which may occur during ground test are in these categories:

- Component failure
- Input sensor failure
- Interface failure

Most of these CMC messages show only as messages in response to a button push of a FAIL> prompt which occurs during the ground test operation. Some of the CMC messages log in the CMC for recall and possible maintenance action.

CMC MESSAGES DURING GROUND TEST

FCC-X FAIL
FCC-X ~ AILERON SERVO-X
INTERFACE FAIL
"COMMAND"
FCC-X ~ ELEVATOR SERVO-X
INTERFACE FAIL
"COMMAND"
FCC-X ~ RUDDER SERVO-X
INTERFACE FAIL
"COMMAND"
FCC-X ~ EIU-X INTERFACE
FAIL
"AUTOPILOT WARN-1 BAT"
FCC-X ~ AILERON SERVO-X
INTERFACE FAIL
"AIL HYDRAULIC ARM"
FCC-X ~ AILERON SERVO-X
INTERFACE FAIL
"AIL DETENT ENGAGE"
FCC-X ~ SRM-Y (AND R)
INTERFACE FAIL
"AUTOTRIM ARM"
FCC-X ~ FCC-X CROSS
CHANNEL INTERFACE FAIL
"DETENT TRIP DISCRETE"

FCC-X ~ ILS-X
INTERFACE FAIL
"TUNE INHIBIT"
FCC-X ~ ELEVATOR SERVO-X
INTERFACE FAIL
"ELEV HYDRAULIC ARM"
FCC-X ~ ELEVATOR SERVO
INTERFACE FAIL
"ELEV DETENT ENGAGE"
FCC-X ~ RADIO ALT-X
INTERFACE FAIL
"TEST INHIBIT"
FCC-X ~ BCU-1
INTERFACE FAIL
"A/L BUS ISOLATE CMD"
FCC-X ~ MAWEA
INTERFACE FAIL
"AUTOPILOT WARN-1 (-2) BATT (NRM)"
FCC-X ~ RUDDER SERVO-X
INTERFACE FAIL
"RUDDER HYDRAULIC ARM"
FCC-X ~ RUDDER SERVO-X
INTERFACE FAIL
"RUDDER DETENT ENGAGE"
ENGAGE FAIL LEFT (RIGHT OR CENTER)
NO HYDRAULIC PRESSURE
IN SYSTEM 1 (2 OR 3)

Figure 18 CMC MESSAGES DURING GROUND TEST

AILERON SERVO-X FAIL
(FCC-X)
ELEVATOR SERVO FAIL-X FAIL
(FCC-X)
CAPTAIN A/P DISC SW FAIL
(FCC-X)
CAPTAIN A/P WARN RESET FAIL
(FCC-X)
1ST OFFICER DISC SW FAIL
(FCC-X)
1ST OFFICER WARN RESET FAIL
(FCC-X)
CAPTAIN G/A SW FAIL
(FCC-X)
1ST OFFICER G/A SW FAIL
(FCC-X)
ADC SWITCHING FAIL
ADC-X ~ FCC-X
BUS FAIL
ILS TUNE INHIBIT FAIL (FCC-X)
RADIO ALTIMETER TEST INHIBIT FAIL
(FCC-X)
BUS ISOLATION FAIL (FCC-X)
GLIDESLOPE ANTENNA RLY ~ FCC-X
INTERFACE FAIL
PRIMARY (ALTERNATE) A/G SYSTEM ~
FCC-X INTERFACE FAIL
CAPTAIN (1ST OFFICER) FLT DIR
SEL SWITCH ~ FCC-X INTERFACE FAIL
FMC MASTER SWITCH-X FAIL (FCC-X)
HEADING SWITCH FAIL (FCC-X)
SPEED BRAKE XDUCER FAIL
"NOT UP" ("NOT ARM" OR "NOT DOWN")
(FCC-X)
FLAP XDUCER FAIL
"NOT 25" ("NOT 10" OR "NOT 0")
(FCC-X)
LEFT (RIGHT) STAB TRIM FAIL (FCC-X)
MODE CONTROL PANEL FAIL
"MCP-A ~ MCP-B SWITCHOVER"
LOCALIZER ANTENNA SWITCHING FAIL
(FCC-X)
RUDDER SERVO-X FAIL (FCC-X)
FCC-X ~ FCC-X BUS FAIL

Figure 19 CMC MESSAGES DURING GROUND TEST (SH 2)

FCC CONFIGURATION

General

Flight control computer (FCC) configuration page shows the hardware and software versions of the FCCs.

Operation

These are the steps to get FCC configuration page displayed on the control display unit (CDU):

- Select the MENU mode select key (MSK) on the CDU
- From the MENU page, select the line select key (LSK) for <CMC
- From the CMC MENU options page 1/2, select the NEXT PAGE MSK
- From the CMC MENU options page 2/2, select the 3R LSK for OTHER FUNCTIONS
- From the OTHER FUNCTIONS options menu page, select LSK 3R for CONFIGURATION
- From the CONFIGURATION options page, select LSK 1R (<22 AUTOPILOT FLT DIR) .

The FCC configuration options selection page shows on the CDU display. Select one of the three FCC selection options to see that FCC configuration. The CONFIGURATION DATA page for the selected FCC then shows on the CDU display.

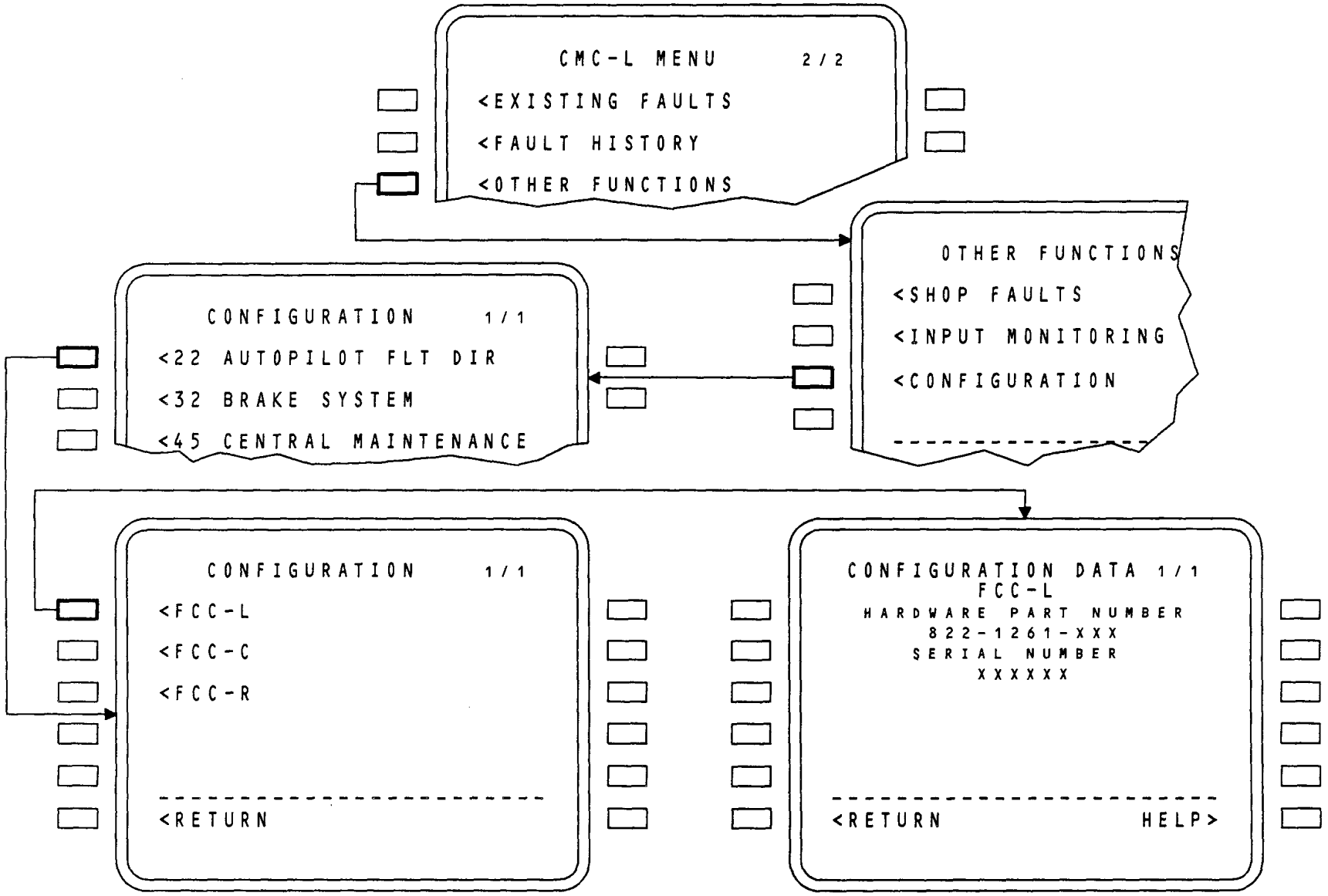


Figure 20 FCC CONFIGURATION

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