

CHAPTER 45 - CENTRAL MAINTENANCE SYSTEM

TABLE OF CONTENTS

GENERAL 45-1

CENTRAL MAINTENANCE SYSTEM..... 45-2

LIST OF FIGURES

45-1	Central Maintenance System Block Diagram	45-1
45-2	CMS Flight Phases.....	45-3
45-3	MCDU Start Menu	45-4
45-4	CMS Start page.....	45-4
45-5	In-flight Fault Report Output Screen	45-5
45-6	On-line Maintenance Initialization Screen.....	45-6
45-7	Subsystem Selection Screen (INL Maintenance)	45-6
45-8	LRU Selection Screen (INL Maintenance).....	45-7
45-9	Subsystem Status Display (INL Maintenance)	45-7
45-10	System Selection Screen (System Status)	45-8
45-11	LRU Selection Screen (System Status)	45-8
45-12	Subsystem Status Display Screen (System Status).....	45-9
45-13	In-flight Failures Report Confirmation Screen.....	45-9
45-14	In-flight Displayed Failures Upload Screen.....	45-10
45-15	Mission Data Upload Confirmation Screen.....	45-10
45-16	Mission Displayed Data Upload Screen.....	45-10
45-17	CMS Subsystem Classification Structure	45-11
45-18	MCDU	45-12
45-19	Hierarchical Line.....	45-13

GENERAL

Central Maintenance System (CMS) is intended to monitor each and every avionic system component.

The system allows to:

- get knowledge of monitored components current status.
- perform specific, but separately, functional tests on each component.
- record any component failure data.
- upload system-stored data.

CMS interactive management is performed through the Multipurpose Control and Display Unit (MCDU). For further details on MCDU complete operation, refer to Chapter 31 relevant section (Indication and Recording).

CMS monitors the following avionics system integrated devices:

- Automatic Pilot Flight Director System: performs automatic pilot functions providing flight manoeuvres instructions, through the flight director.
- Communications system: comprising radio communications components.
- Data Centering System: interconnects diverse avionics devices, performing both data process and transfer.
- Navigation System: includes relevant devices in order to acquire process and display required navigation data.
- Display System: Information device in order to display both data and images as required for and flight and navigation purposes.

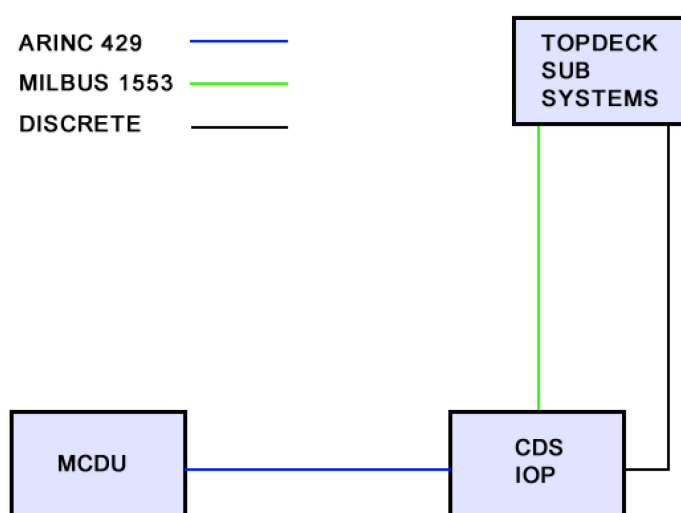


Figure 45-1 Central Maintenance System Block Diagram

CENTRAL MAINTENANCE SYSTEM

Central Maintenance System (CMS) provides both system status and failure information, enabling to test each (LRU) controlled component.

DESCRIPTION

CMS includes:

- BIT function for each LRU.
- Centralized diagnostic system (CDS) for data acquisition from BIT functions. The system is built into the input output processors (IOP).
- MCDU working as system user interface.
- Airborne Data Loader (ADL) unit to upload system-recorded failure data.

This includes two CDS devices connected to each controlled LRU. Both CDS functions are accessible from each MCDU.

Each unit BIT function checks the LRU where it is included, and sends the results to the CDS to be processed. Diverse BIT function procedures are available, thus varying both given function and response modes.

Centralized maintenance carries out the following functions:

1. While airborne, records LRU reported failures.
2. While grounded, interactively provides:
 - Each LRU BIT initiation.
 - Each LRU current status presentation.
 - Each LRU last flight recorded failures display.
 - Previous mission recorded in-flight failures external upload.
 - Previous mission recorded in-flight data.

System operation modes can be classified according to several criteria:

1. Depending to the type of system performed test:
 - Power-on Self Test (POST): to be carried out when the system is powered-up.
 - Initialize Tests: to be carried out as personally-requested by a CMS operator.
 - Continuous tests (CBIT): autonomous and continuously-performed by each LRU BIT function.

2. Depending on the system operation mode:
 - Normal operation mode: CDS continuously receives status responses from each LRU, and records any system-reported failure.
 - Interactive mode: allows identifying and isolating faults, displaying failure reports, performing initialize tests, and uploading system-recorded failures. This mode of system operation gets in process when the operator interacts with the system through the MCDU, while the aircraft is grounded and CAS is below 50Kt.
3. Depending on current flight phase and CDS-received information management:
 - Null phase: includes taxi to parking, parking, and taxi from parking. This phase is identified by CAS below 50Kt. Only through this time period, CDS can be interactively-operated. The system does not record any failure-warning signal received by the system, while at this flight phase.
 - DC2 phase: concerning take-off phase identified by CAS between 50 and 80kt. CDS only records each unit internal failures due to electrical system power fluctuations and vibrations recorder through, this phase. Therefore, signals identified as non-internal failures are not recorded.
 - DC1 phase: comprising from CAS > 80Kt take-off to CAS < 50Kt landing; obviously including cruise flight phase. Throughout DC1 phase, CDS records every error signal as received.

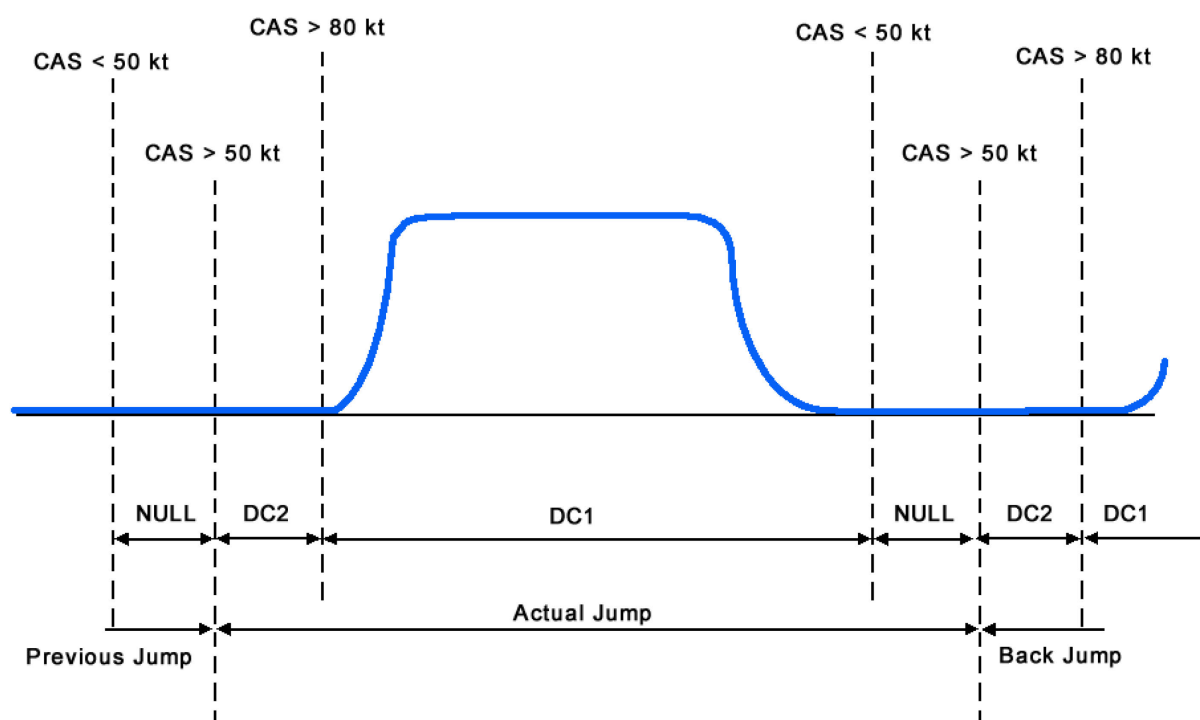


Figure 45-2 CMS Flight Phases

SYSTEM OPERATION

To access Central Maintenance System, start MCDU MENU page. Both Central Maintenance Systems (CDS1 or CDS2) can be either accessed using the line selection keys. This is possible when the Central Maintenance interactive mode is available, this means the aircraft must be grounded, and with CAS below 50kt.



Figure 45-3 MCDU Start Menu

Once selected either one of the two systems, a screen is displayed, where relevant operations selection is available. Functions are as follows:



Figure 45-4 CMS Start page

- In-flight Failures Report: enables access to last flight system-recorded failures. Failures are chronologically displayed, starting with the oldest and ending with the most recent one. Once the system has recorded no failures, "NO FAULT REPORTED" message is displayed. Failures are displayed depending on the interface mode used by the failure-reporting equipment.

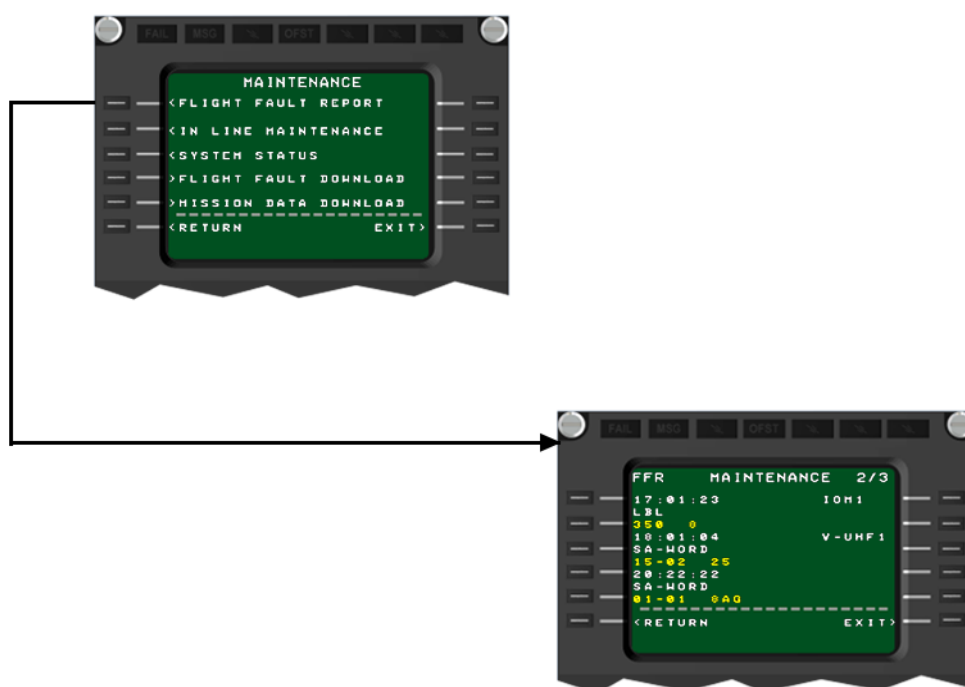


Figure 45-5 In-flight Fault Report Output Screen

- On-line Maintenance: this mode makes available diverse actions to be performed concerning selected component. Actions to be performed comprise:
 - Recorded failures report (Sub-System Report) viewing. At this point, CMS displays every selected LRU last flight system-recorded failure. Failures are chronologically displayed, starting with the oldest and ending with the most recent one. Once the system has recorded no failures, "NO FAULT REPORTED" message is displayed. Failures are displayed depending on the interface mode used by the failure-reporting equipment.
 - Selected LRU BIT test (Sub-System Test) performance. The system indicates several actions to be performed as, required to complete such type of test.
 - Selected LRU current status (Sub-System Status) display. Comprising every information continuously system-rendered by each unit BIT function.

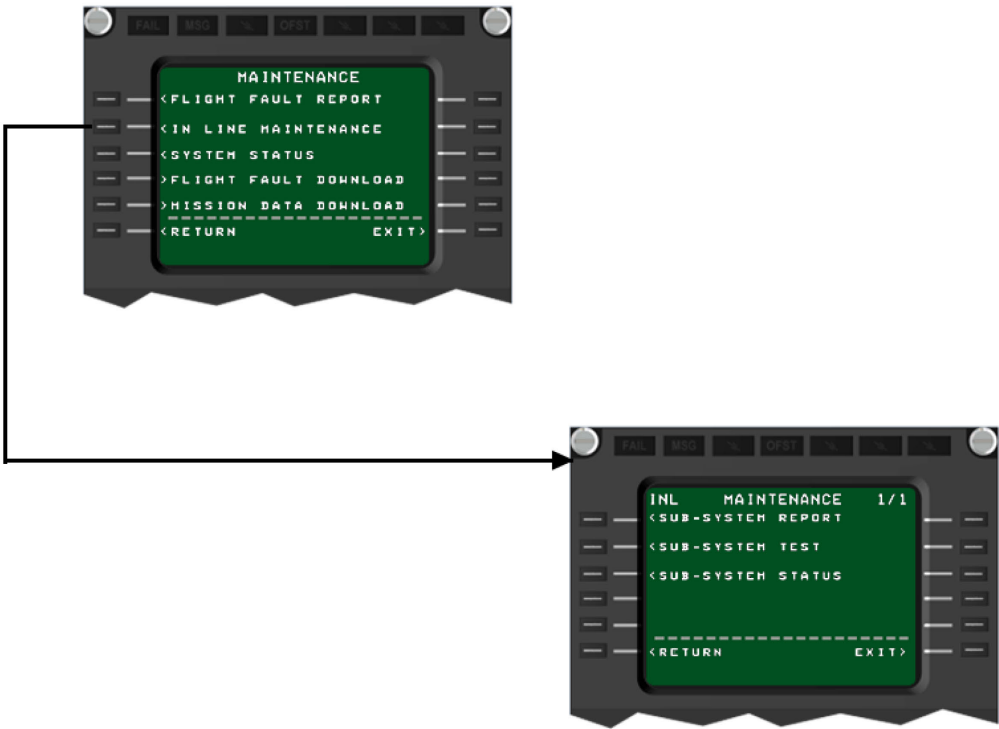


Figure 45-6 On-line Maintenance Initialization Screen

- Sub-System Selection (On-line Status): displays unit-controlled different subsystems. Once a subsystem has been selected, its various components are displayed.



Figure 45-7 Subsystem Selection Screen (INL Maintenance)

- LRU Selection: displays subsystem-controlled relevant LRU.



Figure 45-8 LRU Selection Screen (INL Maintenance)

- Subsystem Status Screen: displays relevant LRU status-reporting codes and keywords. LRU displays in green if there are no failures; yellow if failures are detected.



Figure 45-9 Subsystem Status Display (INL Maintenance)

Other instances procedures and screens are similar to the above mentioned, hence they are not shown. Although screen names do change, depending on the option selected, essential philosophy is the same.

- System Status: displays diverse controlled subsystems, and their colour-coded status. Subsystems not reporting failures, display in green, those reporting failures display in amber. Failures are displayed depending on the interface mode used by the failure-reporting system. If no response is received from the selected unit within the expected response time, "DATA NOT REFRESHED" message will display. When the system has recorded no failures, "NO FAULT REPORTED" message displays.

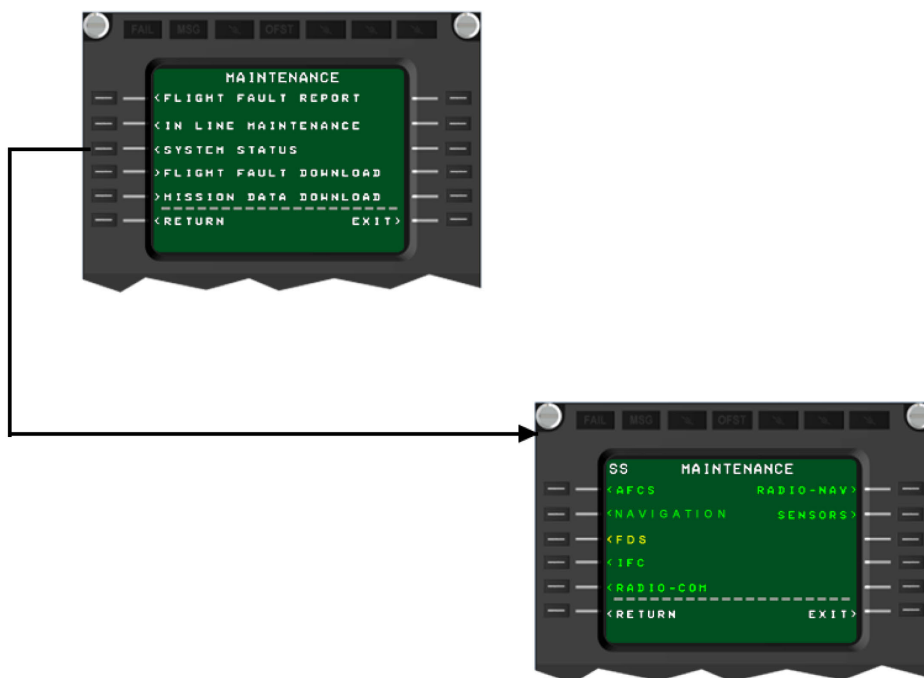


Figure 45-10 System Selection Screen (System Status)

- LRU Selection: allows same colour-coded diverse subsystem LRU selection. When LRU works correctly displays in green; otherwise displays in yellow.



Figure 45-11 LRU Selection Screen (System Status)

- Subsystem Status Screen: displays every relevant LRU status-reporting codes and keywords. When LRU works correctly, displays in green; otherwise displays in yellow.



Figure 45-12 Subsystem Status Display Screen (System Status)

- In-flight Failures Upload. The system allows non-volatile memory system-stored in-flight failures data to be transferred to magnetic media (DTM). A copy of stored non-volatile memory is DTM loaded. This function can only be selected when a DTM has been inserted in the Airborne Data Loader (ADL). Once this function is selected, the system asks for confirmation before data uploading, what is done by pressing-in EXEC key. While data are being DTM transferred, "XFER DATA IN PROGRESS" message will display at the bottom of the screen. Once data Transfer is completed, CMS main screen displays again. The system records CMS non-volatile memory failures. CMS is able to store up to 500 different fault reports from up to 50 different flights. The system records each type of error, once per flight. If memory capacity is exceeded, the system stops recording to avoid first record overwriting.



Figure 45-13 In-flight Failures Report Confirmation Screen

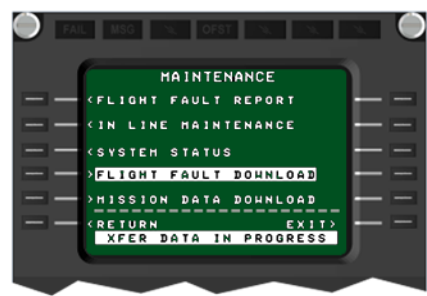


Figure 45-14 In-flight Displayed Failures Upload Screen

- Mission Data Uploading: system performs mission data uploading as non-volatile memory stored. System memory is able enough to store up to 5-hours time flight data, recorded at 10 seconds intervals. Once system memory capacity is exceeded, it continues recording data by overwriting the oldest. Data may be uploaded to a DTM in the same way as for In-flight Failures Upload procedure.



Figure 45-15 Mission Data Upload Confirmation Screen



Figure 45-16 Mission Displayed Data Upload Screen

Controlled components are classified according to subsystem structure. CMS classification has a tree-directory structure, accessible through MCDU-displayed screens. Elements are classified as follows:

CMS SYSTEMS

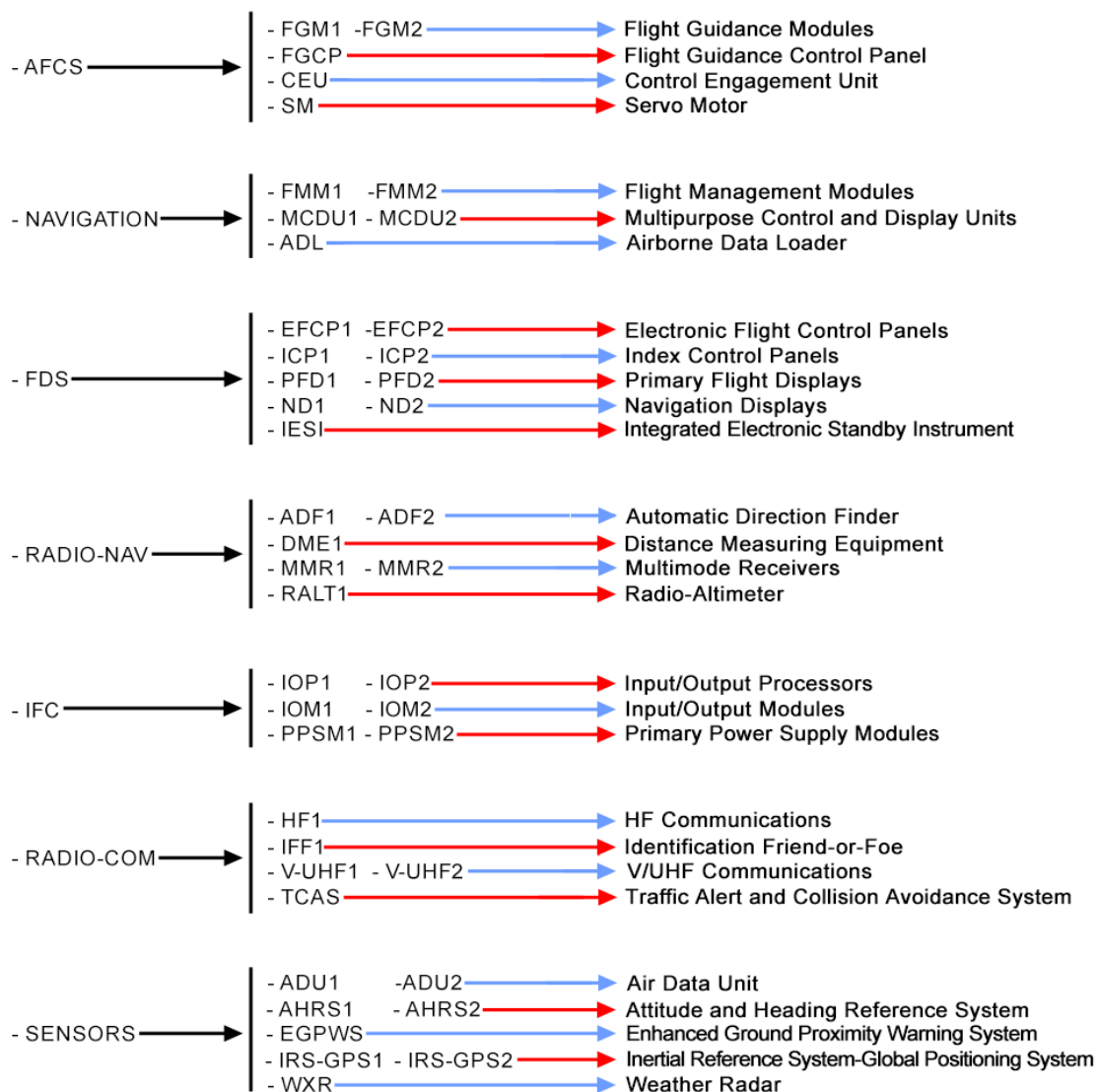


Figure 45-17 CMS Subsystem Classification Structure

CONTROLS AND INDICATORS

MCDU Controls to be used:

- Line selection keys (LSK): To perform relevant selected line function.
- MENU function key: displays MCDU MENU page.
- EXEC function key: EXEC annunciator comes on to confirm MCDU-displayed action is performed.

For MCDU controls and indicators remainder, refer to Chapter 31 Multifunction Control and Display Unit of this manual.

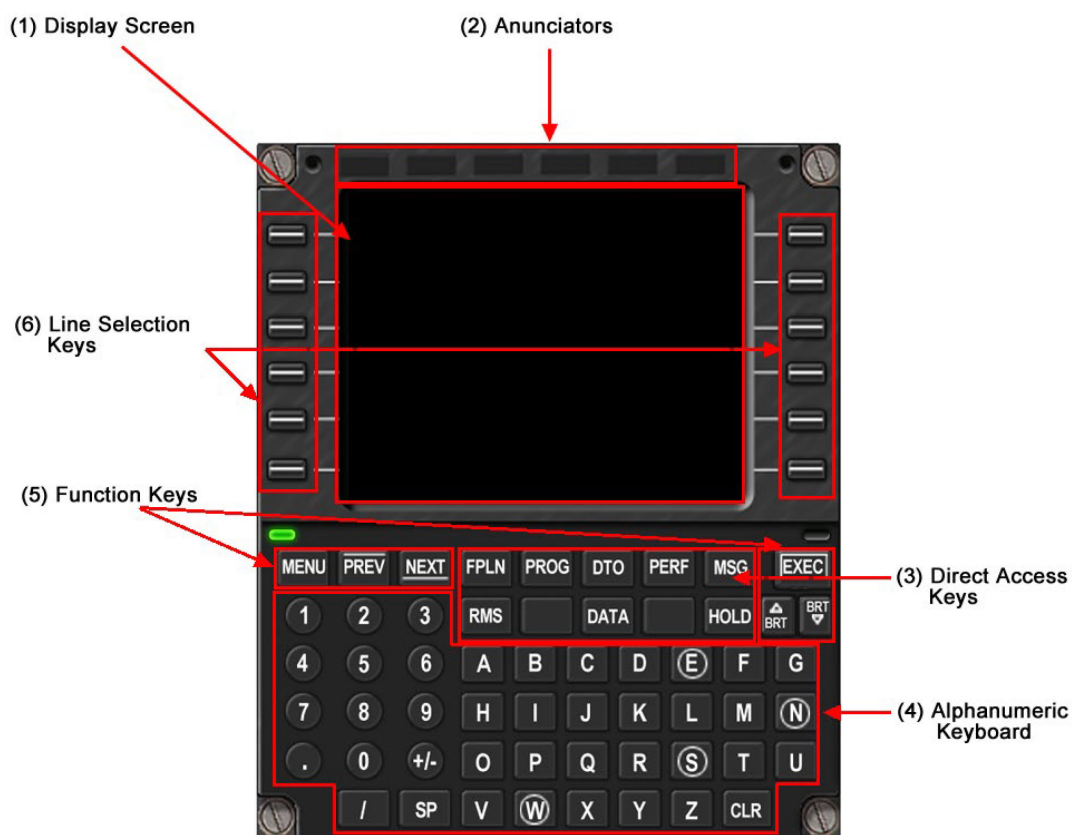


Figure 45-18 MCDU

Maintenance System diverse pages presented interconnection (hierarchical line), is displayed as a summary, with two examples. Diverse menus remainder options of the various menus are similar to this.

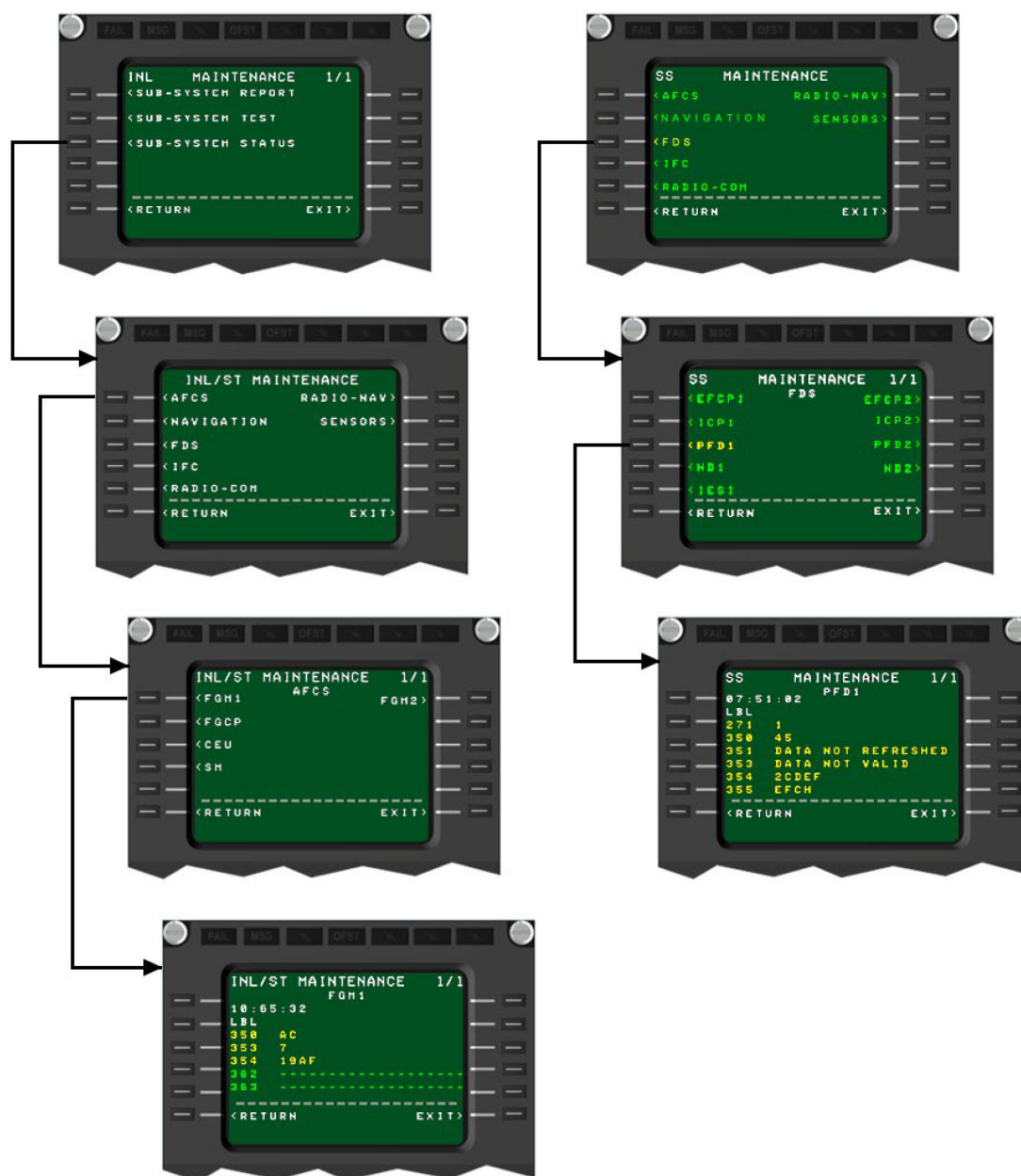


Figure 45-19 Hierarchical Line

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