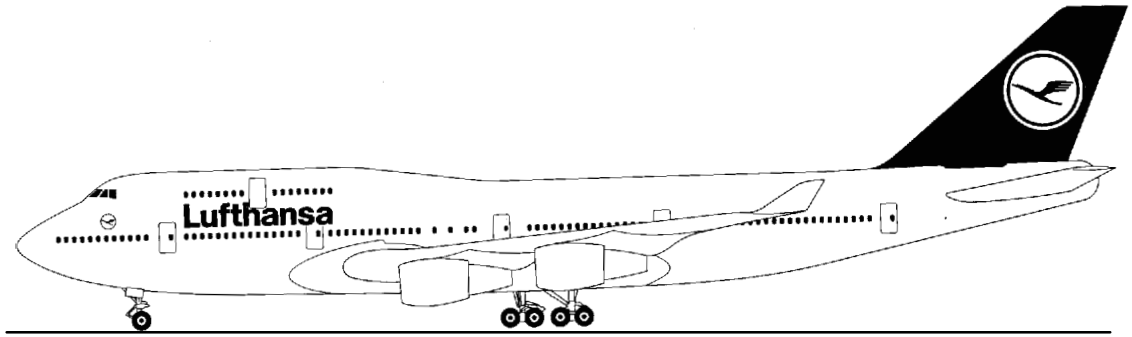
Lufthansa Technical Training

Training Manual B 747-400



ATA 45
Central Maintenance Computer System

ATA 104 Level 3

Book No: B747-400 45 L3 e

Lufthansa
Technical Training GmbH
Lufthansa Base

Issue: Mar.2003

Lufthansa Technical Training

Lufthansa Technical Training GmbH

Lufthansa Base Frankfurt

D-60546 Frankfurt/Main

Tel. +49 69 / 696 41 78

Fax +49 69 / 696 63 84

Lufthansa Base Hamburg

Weg beim Jäger 193

D-22335 Hamburg

Tel. +49 40 / 5070 24 13

Fax +49 40 / 5070 47 46

ATA 45 CENTRAL MAINTENANCE COMPUTER SYSTEM

INTRODUCTION

The central maintenance computer system (CMCS) provides a centralized location for airplane fault information. It also provides a centralized location for conducting system tests.

CMCS OVERVIEW

General

The central maintenance computer system (CMCS) has two central maintenance computers (CMCs) installed. Both CMCs receive and store fault information, and send test commands to airplane systems. Normally the data of the left CMC are shown.

If CMC L is faulty the data of the right CMC are send via the left CMC.

IDS

The integrated display system (IDS) monitors airplane systems operation. The IDS shows failure conditions as flight deck effects (FDEs).

Flight deck effects can be EICAS messages, engine exceedences, or a flight director bar bias. The IDS sends FDEs and failure information to the CMCs. The CMCs evaluate the failure information to determine which failures cause each FDE. The CMCs correlate failures with FDEs and record the fault message, with its correlated FDE, into memory. This helps the maintenance personnel isolate faults and correct log book reports.

Some systems report failures directly to the CMCs.

Some status messages are stored in the EIUs (EFIS/EICAS Interface Units). They can only be erased from the CDUs via the CMCs.

Manual and automatic snopshots can be stored in the EIUs. Those data can be shown in rel time on the lower EICAS display unit.

They can be called from the CDUs as MAINTENANCE PAGES via the CMCs.

CDUs

Three control display units (CDUs) act as keyboards for the CMCS in the control cabin. You can only use one CDU at a time.

An other CDU may be installed in the main equipment center (optional).

Fault messages show on the CDUs.

System tests are also started from the CDUs. Test results show on the CDUs.

You can communicate from the CDUs with the LRUs via the CMCs.

Ground Test Enable Switches

Some ground tests are only active if one of the ground test enable switches is in ENABLE position.

They are located in the control cabin and the main equipment center.

Printer

CMCS fault information can be printed on the multiple input printer.

ACARS

CMCS fault data can be downlinked to a ground station through ACARS. The CMCS can receive an uplink request for fault data. The CMCS responds with the requested fault data.

Software Data Loader Panel

Operational software goes to the CMCS from the software data loader panel via the source selector.

CMCS fault data can also be recorded onto a floppy disk through the software data loader panel.

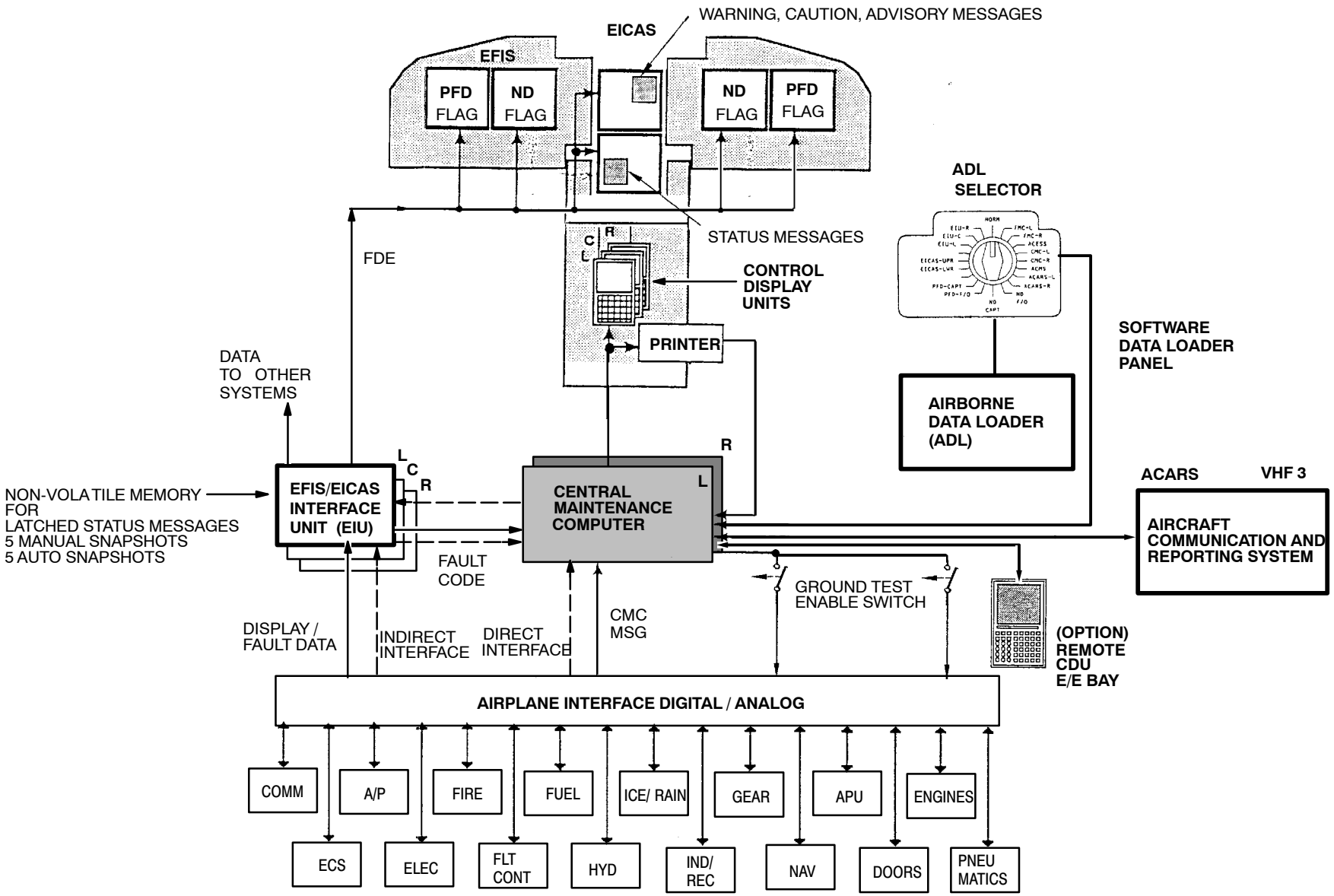


Figure 1 CMCS Basic Schematic

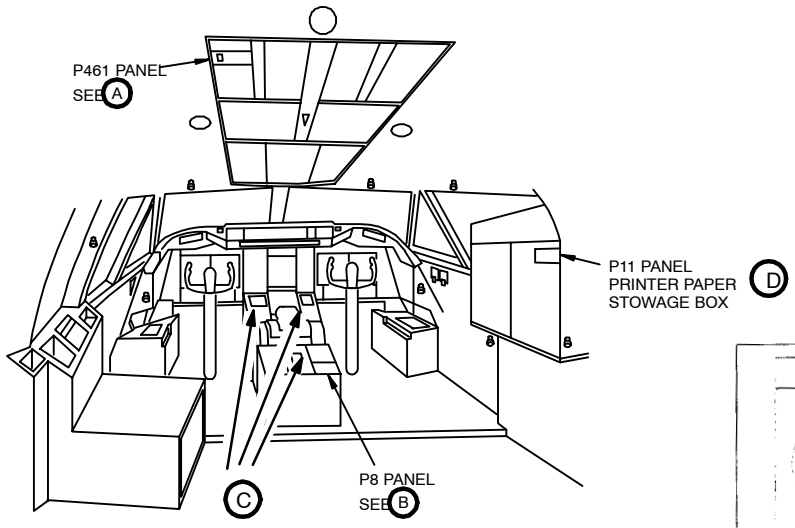
CMCS - COMPONENT LOCATIONS - FLIGHT DECK

These CMCS components are located in the flight deck:

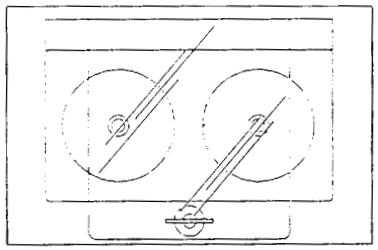
- Multiple-input printer
- Ground test enable switch

These CMCS interfacing components are located in the flight deck:

- Left control display unit
- Center control display unit
- Right control display unit

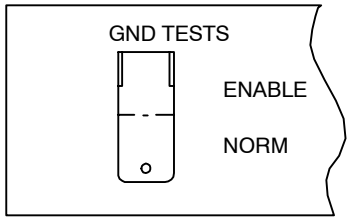


FLIGHT COMPARTMENT



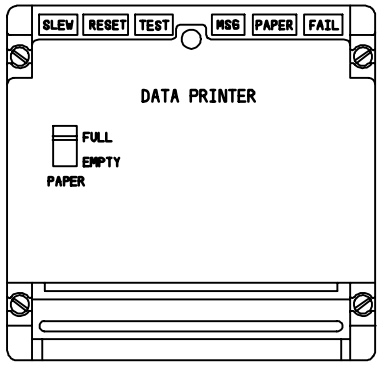
PRINTER PAPER STOWAGE BOX

D



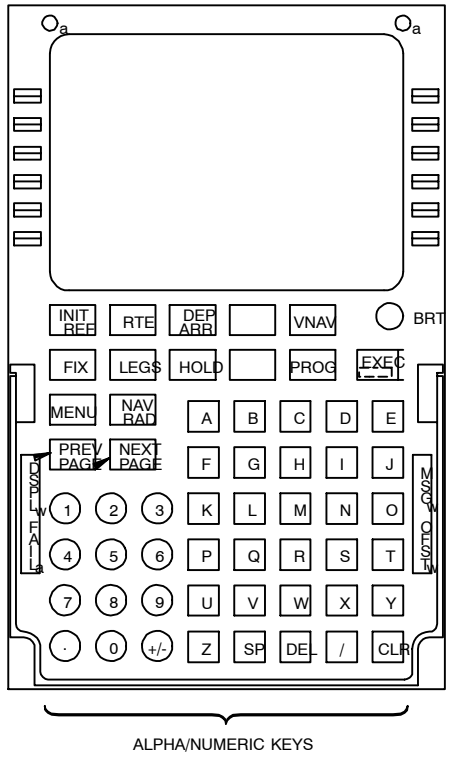
GROUND TEST SWITCH, S2089

A



MULTIPLE-INPUT PRINTER, B7064

B



ALPHA/NUMERIC KEYS

C CONTROL DISPLAY UNIT

Figure 2 CMC Components Location

CMCS - COMPONENT LOCATIONS - MAIN EQUIPMENT CENTER

These CMCS components are located in the main equipment center (MEC):

- Left central maintenance computer
- Right central maintenance computer
- Left and right central maintenance computer circuit breakers
- Left central maintenance computer fail switch circuit breaker
- Central maintenance computer enable switch circuit breaker
- Ground test enable relays
- Remote ground test enable switch
- Printer circuit breaker

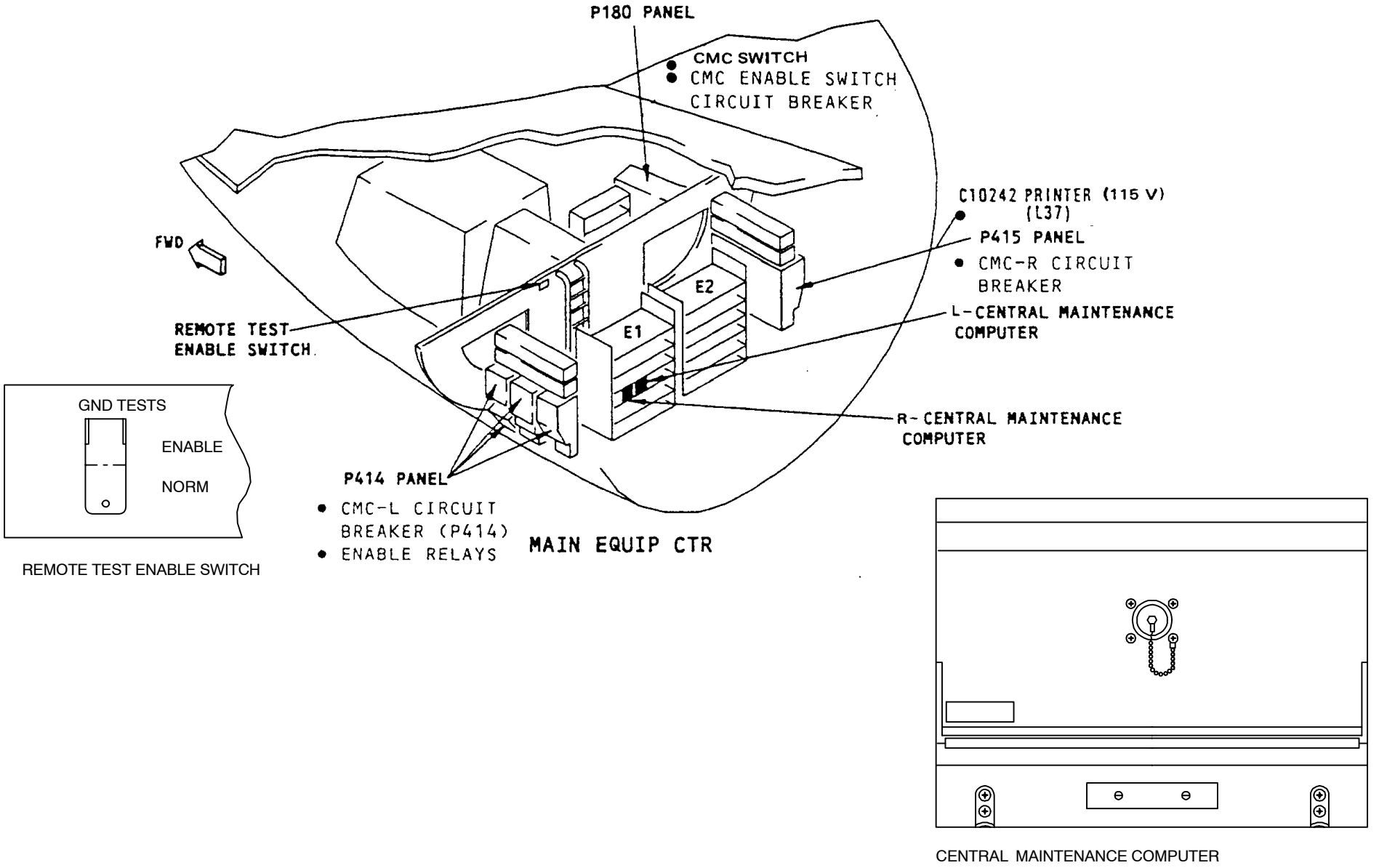


Figure 3 CMC Components Location

CMCS - POWER SUPPLY

The left CMC receives 115v ac from bus 1 and 28v dc from bus 4. The 28v dc is used to power the switching relay within the left CMC. The right CMC receives 115v ac from bus 3.

The multiple input printer receives 115v ac from bus 3.

The ground test enable relays receive 28v dc through the ground test enable switch or the remote ground test enable switch from bus 4.

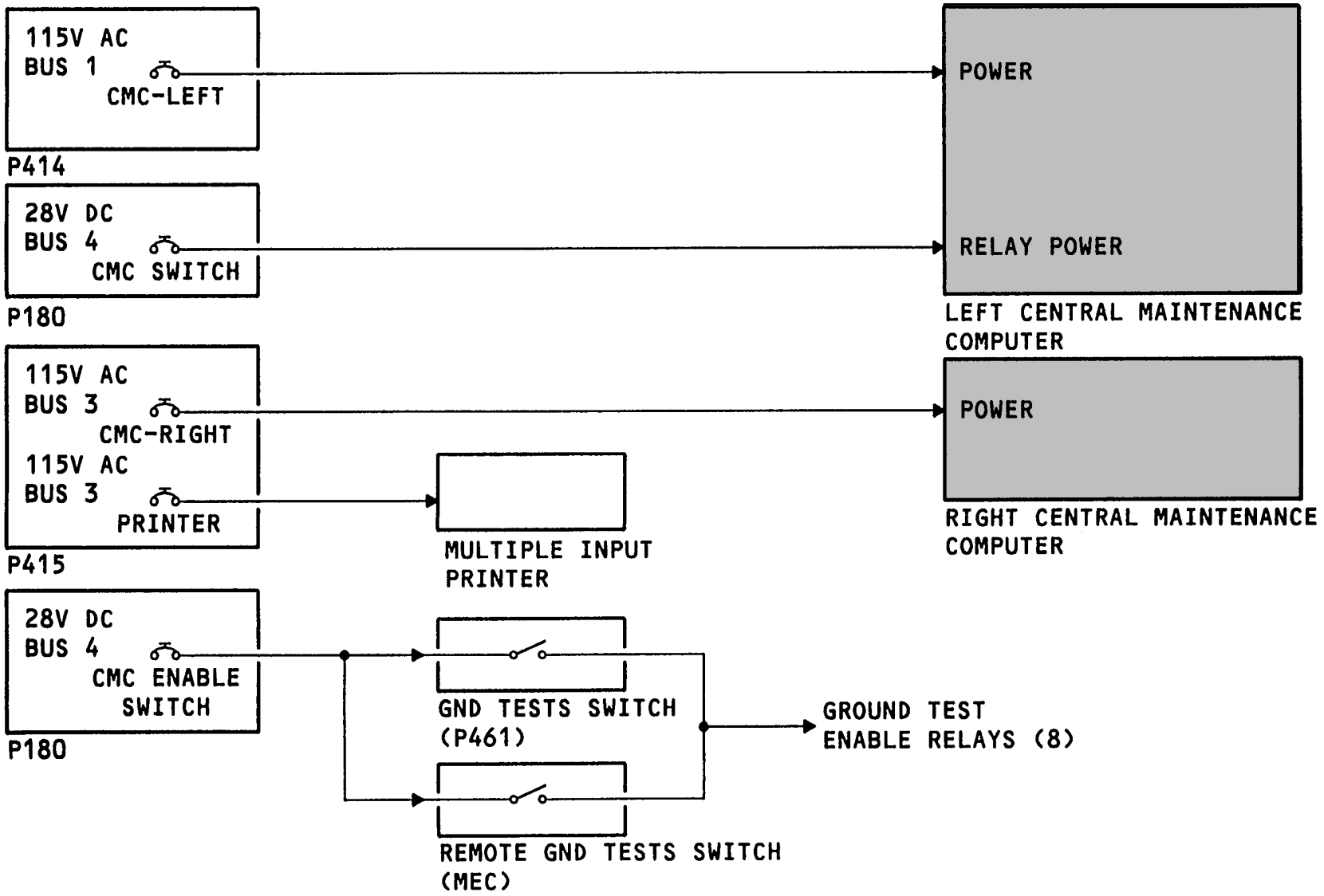


Figure 4 CMCS - Power

CMCS - GENERAL INTERFACE

General

With two central maintenance computers (CMCs) installed, a failure of one CMC does not affect system operation.

Discrete Interfaces

All discrete inputs go to both CMCs. Each discrete output ties together with the same output of the other CMC.

Digital Interfaces

All ARINC 429 inputs go to both CMCs.

Each CMC has ten ARINC 429 outputs. One is a crosstalk bus that goes to the other CMC. The other nine buses of the right CMC go to switch relays in the left CMC. The nine outputs of the left CMC go to airplane systems.

The right CMC outputs are cut off within switch relays of the left CMC. If the left CMC detects an internal failure, the switch relays energize. Now, the right CMC outputs pass through the left CMC to the airplane systems. Since airplane wiring connects to the left CMCr if only one CMC is available, it must be installed in the left CMC position.

CDUs

The control display units (CDUs) provide control of the CMCs and allow access to CMC fault data. System tests are also started from the CDUs. Test results show on the CDUs.

Printer

CMC fault information can be printed on the multiple input printer.

ACARS

CMCS fault data can be downlinked to a ground station through ACARS. The CMCS can receive an uplink request for fault data. The CMCs respond with the requested fault data.

Software Data Loader Panel

A software data loader is used to load operational software into the CMCs. It is also used to record fault data onto a floppy disk.

The software data loader sends operational software to both CMCs. Only the selected CMC accepts the data and responds through its crosstalk bus output.

To record fault data onto a floppy disk, the CMC sends data to the software data loader on the same output as the printer.

Operation

The CMCs receive fault data from airplane systems and the EFIS/EICAS interface units (EIUs). The EIUs also send flight deck effects (FDEs) to the CMCs. The CMCs record failure messages in non-volatile memory. The CMCs also correlate FDEs to failure messages. This assists maintenance personnel to isolate the cause of a FDE.

The CMCs send a test command as either a discrete or digital output to start a system test. The CMCs monitor the results and indicate the result of the test on the CDU.

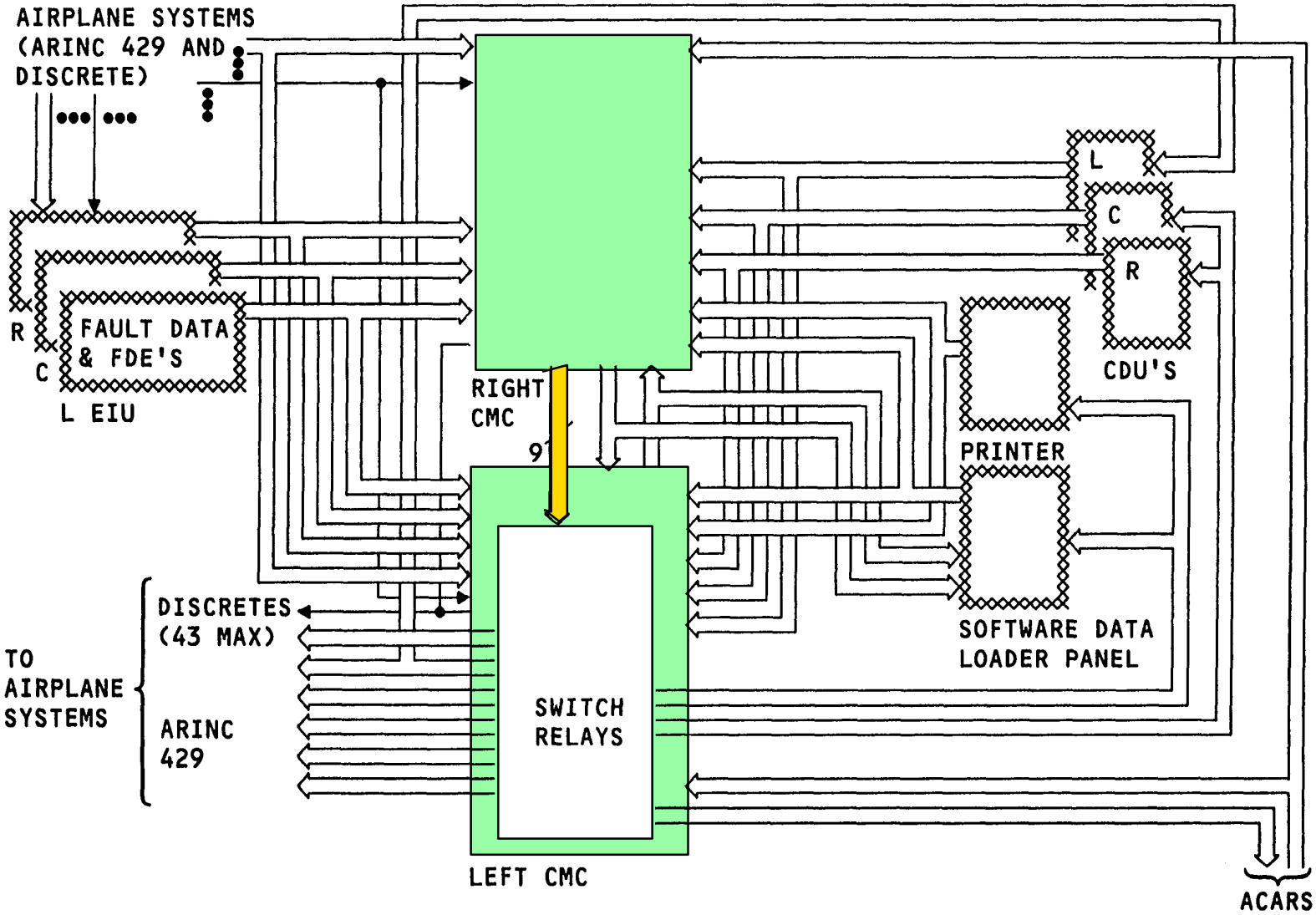


Figure 5 CMCS - General Interface

CENTRAL MAINTENANCE COMPUTER SYSTEM

General

The central maintenance computer (CMC) collects and stores information on failed components, initiates component and system tests, and monitors the integrity of input systems.

General Features

An ATE (automatic test equipment) connector on the front of the unit may be used to access CMC stored information.

Testing

When power is first applied, each CMC does a power-up BITE. If a failure is found, a message shows in the CDU scratchpad.

There is no manually initiated CMC self test.

CAUTION: STATIC SENSITIVE. DO NOT HANDLE BEFORE READING PROCEDURE FOR HANDLING ELECTROSTATIC DISCHARGE SENSITIVE DEVICES (REF 20-41-02/201). CONTAINS DEVICES THAT CAN BE DAMAGED BY STATIC DISCHARGE.

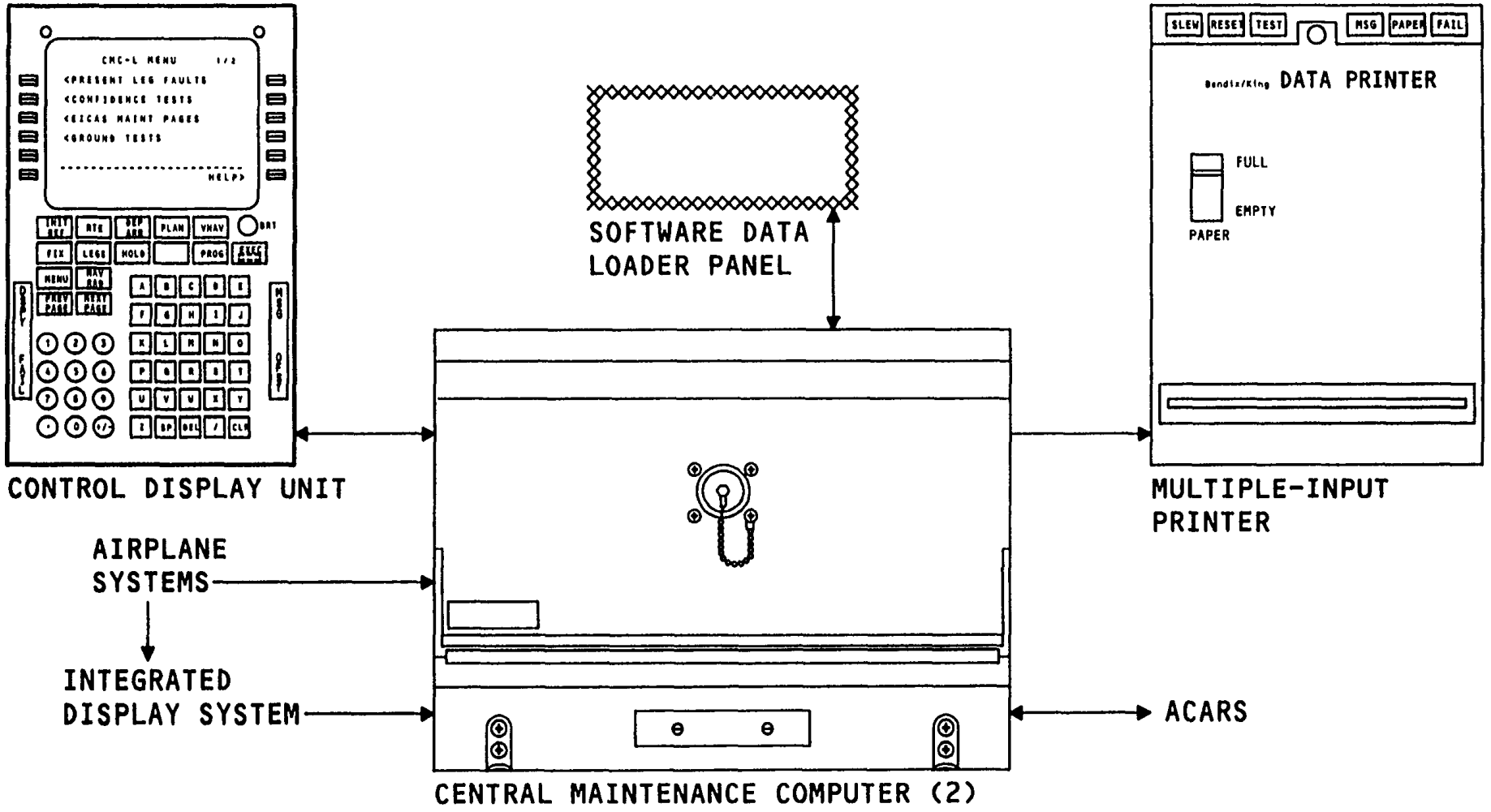


Figure 6 Central Maintenance Computer System

CMCS - CMC OPERATION

Operation

The microprocessor receives all fault and flight data. It stores all active faults in random access memory (RAM). The microprocessor analyzes the flight data and determines the proper flight phase. It analyzes the fault data and refers to the fault message logic. If a fault occurs during a storable flight

phase the CMC logs the fault into nonvolatile memory (NVM) as part of fault history.

The microprocessor also receives all FDEs. It checks the FDEs and fault messages it receives for correlation, and correlates FDEs to the appropriate CMC fault message(s) and stores them in present leg faults.

Fault Message Categories

Existing faults are faults that reside in RAM.

Present leg faults are faults that reside in fault history NVM for the present flight leg (leg 00).

Fault history faults are faults that reside in fault history NVM for all flight legs.

Inputs

Each CMC receives up to 56 ARINC 429 inputs (six high speed and 50 low speed) and 30 discrete inputs.

Each EFIS/EICAS interface unit (EIU) sends one high speed ARINC 429 input to both CMCs. The EIUs provide fault information for various systems. They also send flight deck effects to both CMCs. Upon power-up, the EIUs send initialization data to both CMCs.

Many other systems send fault data as well as test results directly to both CMCS on an ARINC 429 bus. Some systems that run a continuous BITE, send a BITE status discrete to both CMCs.

Outputs

Each CMC sends up to 43 discrete outputs. The outputs are normally test commands.

Each CMC sends ten ARINC 429 outputs. One output goes to the other CMC as the crosstalk bus. It also goes to the software data loader panel. The remaining nine buses go through relays K1 through K9.

Relays Kl through K9 are normally relaxed. The watchdog circuit monitors internal operation of the CMC. If a failure occurs in the CMC, it outputs a ground to energize relays Kl through K9. This removes the normal ARINC 429 outputs and passes the right CMC outputs directly through the left CMC.

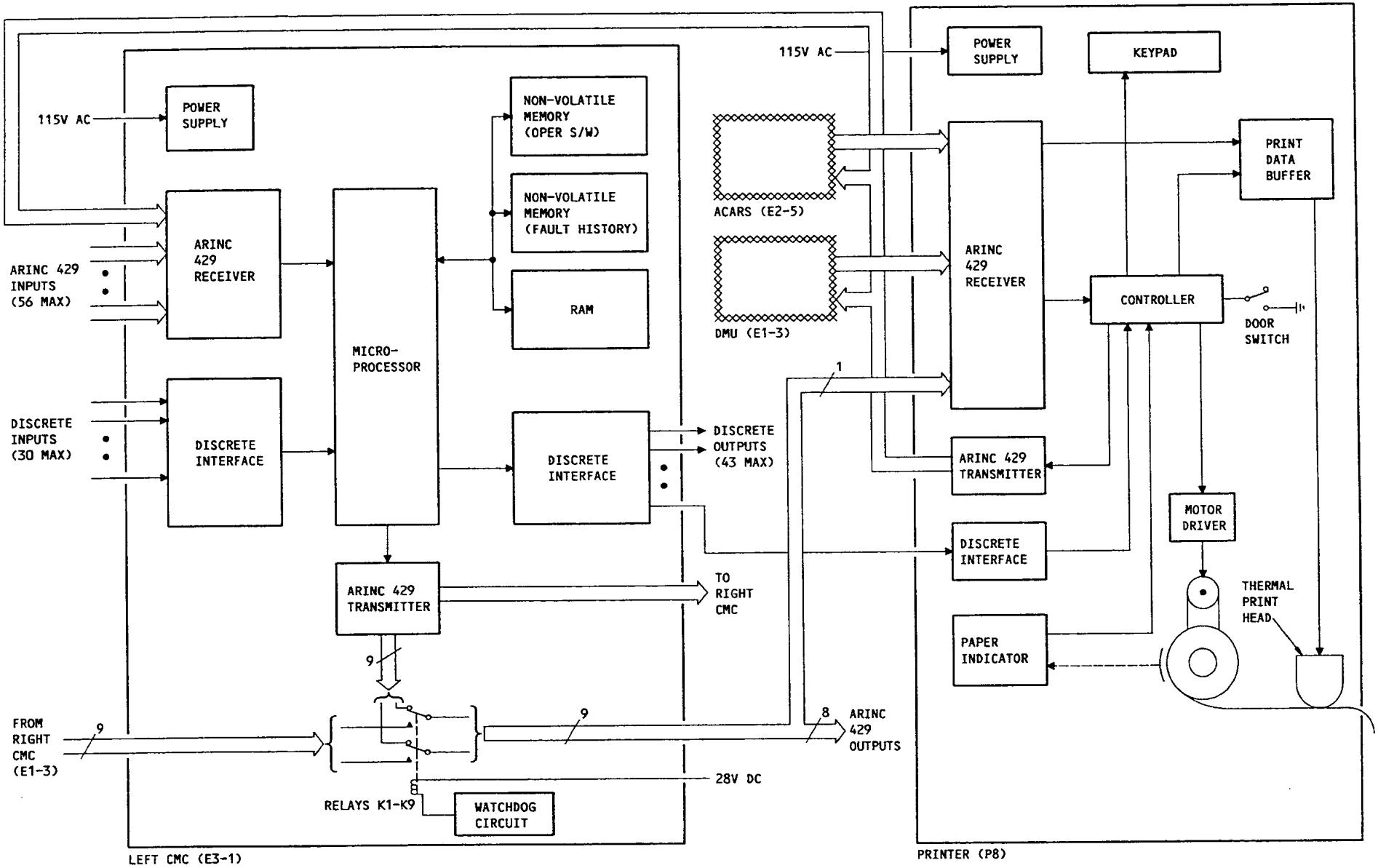


Figure 7 CMCS – Schematic Diagram

CONTROL DISPLAY UNIT (CDU)

CDU Pushbuttons

These control display unit (CDU) pushbuttons are used with the CMC:

- **MENU** key to display the CDU menu.
- **LINE SELECT** keys to select functions/data from CMC menus (Active keys are identified by a caret (> or <) on the screen).
- **NEXT** and **PREV** (previous) page keys to advance (NEXT) or backup (PREV) in multiple page menus.
- **ALPHA/NUMERIC keys** for making alphabetic/numeric entries. The alpha/numeric entries show in the CDU scratchpad.

Message Annunciator

When a message shows on the CDU scratchpad, the white message (MSG) annunciator turns on.

CMC Selection

All of the CMC functions are menu driven from a CDU.

To access the CMC menu from any CDU, press the MENU key.

Then press the LINE SELECT KEY (LSK) next to CMC on the CDU menu to display the CMC menu.

CAUTION: STATIC SENSITIVE. DO NOT HANDLE BEFORE READING PROCEDURE FOR HANDLING ELECTROSTATIC DISCHARGE SENSITIVE DEVICES (REF 20-41-02/201). CONTAINS DEVICES THAT CAN BE DAMAGED BY STATIC DISCHARGE.

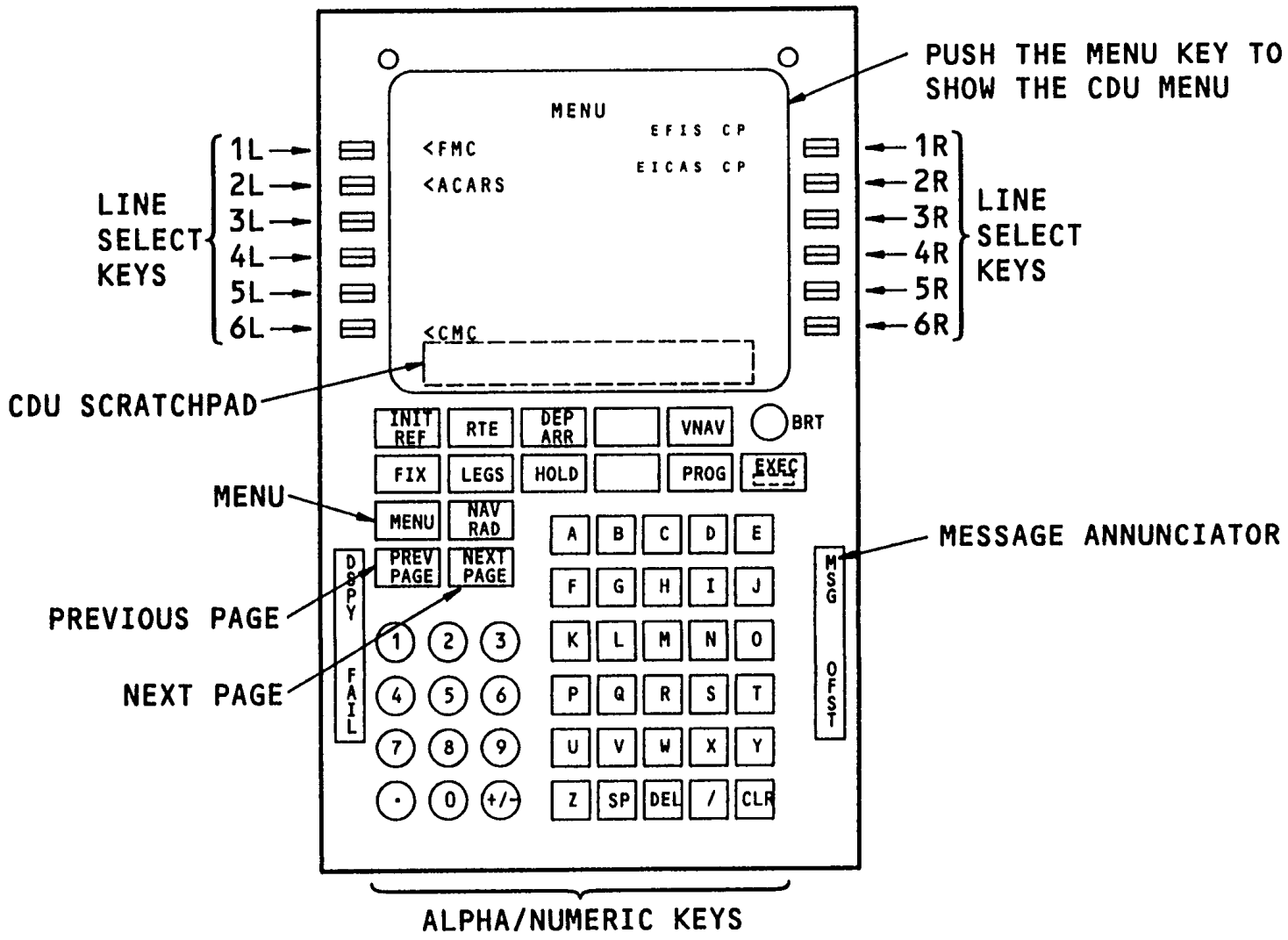


Figure 8 CMCS - CDU CMC Pushbuttons

CMC MENU

General

The CMC menu allows selection of CMC functions.

CMC-L or CMC-R at the top of the menu page shows the CMC in control.

The CMC menu consists of two pages which display all of the CMC functions. To go from one page to another, push the NEXT PAGE or PREV PAGE key on the CDU.

To select a function, push the line select key (LSK) next to the desired function.

Fault Message Display Functions

The PRESENT LEG MSG, EXISTING FAULTSexisting faults, and fault history functions show:

- Flight deck effects (FDEs), which can be an EICAS message or an exceedence.
- Fault messages from various airplane systems (The fault messages are correlated to the FDE by the CMC).

These three CMC functions relate to each other in this manner:

- Existing faults lists the faults that are active at the time the existing faults function is selected.
- Present leg faults lists the faults that were reported to the CMC during the present flight leg (active or not).
- Fault history lists up to 500 faults stored in the CMC during present and previous flight legs.

Test Functions

The ground tests and confidence tests functions allow the CMCS to start various line replaceable unit (LRU) or system tests.

EICAS Maintenance Pages

The EICAS maintenance pages function allows selection of real time system maintenance page displays or, recall of automatic and manual maintenance page snapshots. The maintenance pages show on the auxiliary EICAS display.

Other Functions

Other functions are:

- Input monitoring (allows monitoring of ARINC 429 inputs to the EIUs and CMCS)
- Shop faults (shows LRU internal faults)
- Configuration (allows the display of the CMC software/hardware part numbers.)

NOTES and HELP

Throughout the CMC menus, there are NOTES and HELP pages. These NOTES and HELP pages reside in the airline database and may be customized. The purpose of the HELP pages is to guide the CMC operator through the various CMC functions and operations.

The purpose of the NOTES pages is to correlate information to a specific fault message.

To display the NOTES pages on the CDU, select the LSK next to NOTES.

To display the HELP pages on the CDU, select the LSK next to HELP.

CMCS Inhibit

CMC INHIBITED shows in the CDU scratch pad when the airplane is above 50 knots ground speed, the baro altitude is below 10,200 feet and CMC is selected from the CDU main menu.

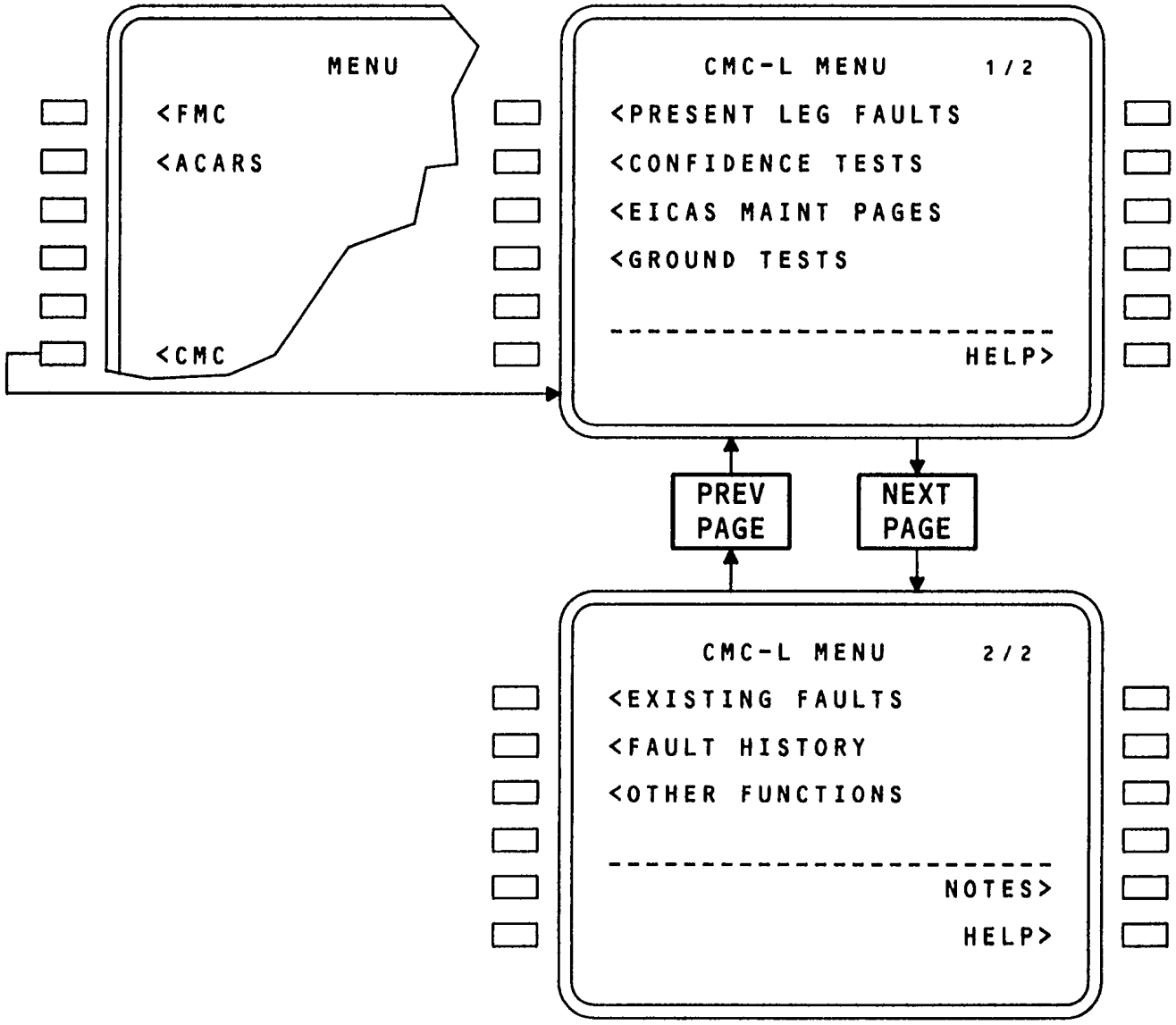


Figure 9 CMCS - CMC Menu

CMCS - CMC MENU TREE

All CMC functions are menu driven. The graphic shows the different menus used for different CMC functions.

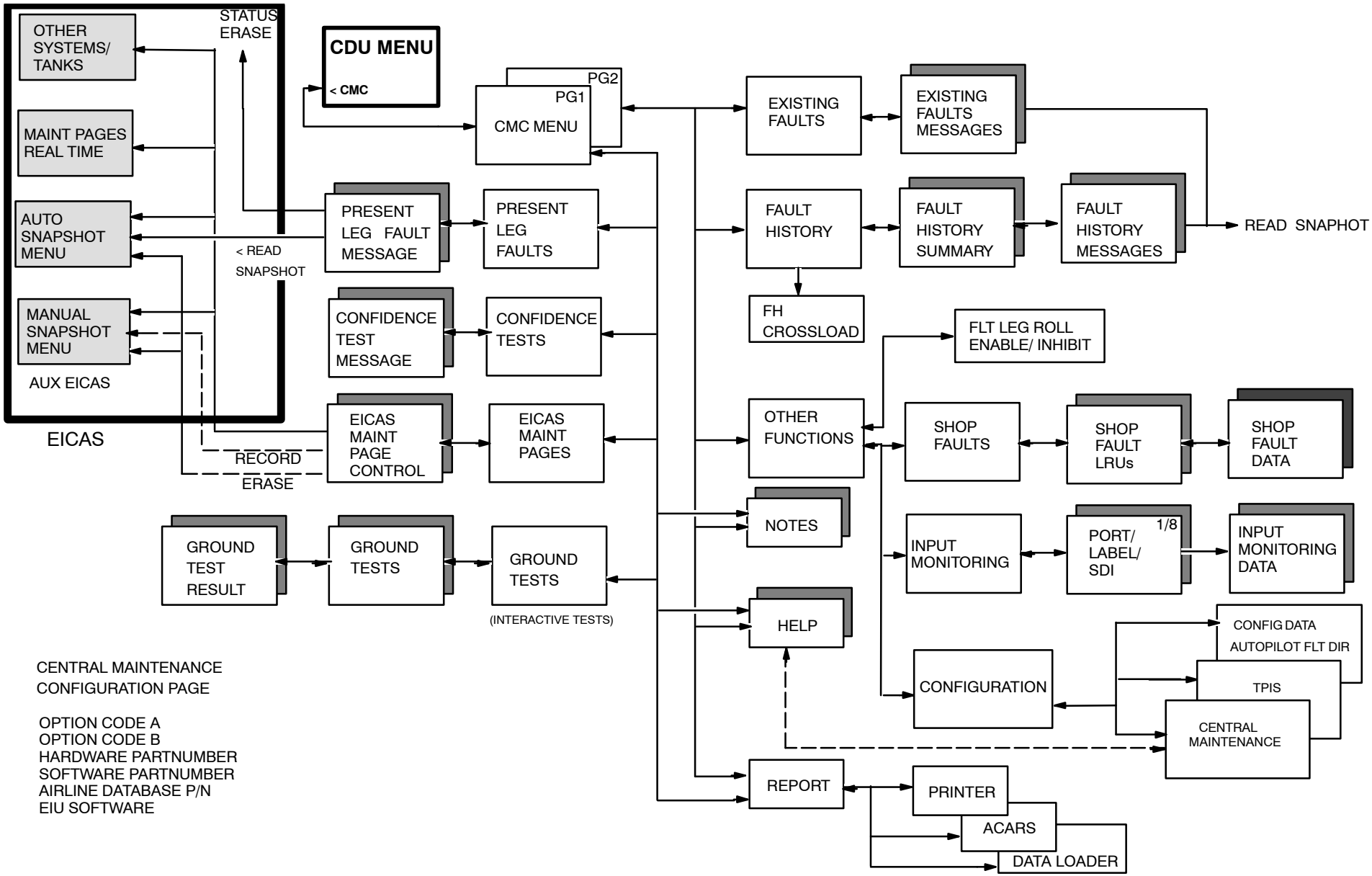


Figure 10 CMCS Menu Tree

CMCS - PRESENT LEG FAULTS

General

The present leg faults function shows faults, and correlated flight deck effects, that have occurred since the start of the present flight leg.

Present Leg Faults Menu

To select the present leg faults function, push the line select key (LSK) next to PRESENT LEG FAULTS. The control display unit (CDU) lists all maintenance related flight deck effects (FDEs) which have occurred since the beginning of the present flight leg.

The FDEs are listed in time order sequence beginning with the most recent listed first. A brief description of each FDE shows above each FDE. The description indicates the type of FDE. The possible types of FDEs are:

- WARNING (EICAS level A)
- CAUTION (EICAS level B)
- ADVISORY (EICAS level C)
- STATUS (EICAS level S)
- DISPLAY (EICAS exceedance display or FD bias)

Fault Code

An eight digit code shows next to the FDE description. The code is the fault reporting manual (FRM) code assigned to the FDE.

The asterisk (*) next to a FDE means the FDE is still shown on EICAS.

If more than four FDEs are listed, then additional FDEs show on subsequent pages.

ERASE

The word ERASE shows next to FDEs that are latched status messages. Latched status messages are status messages that remain shown on the auxiliary EICAS display until they are erased by the central maintenance computer system (CMCS).

Once the condition causing the status message is corrected, push the LSK next to ERASE to remove the status message from the auxiliary EICAS display. This also removes the ERASE prompt from the CDU.

Non-FDE Faults

If there are CMCS present leg fault messages that do not have correlated FDEs, the line following the last FDE shows the message NON-FDE FAULTS. Push the LSK next to NON-FDE FAULTS to show the fault messages.

To select the report menu, push the LSK next to REPORT.

To return to the previous menu, push the LSK next to RETURN.

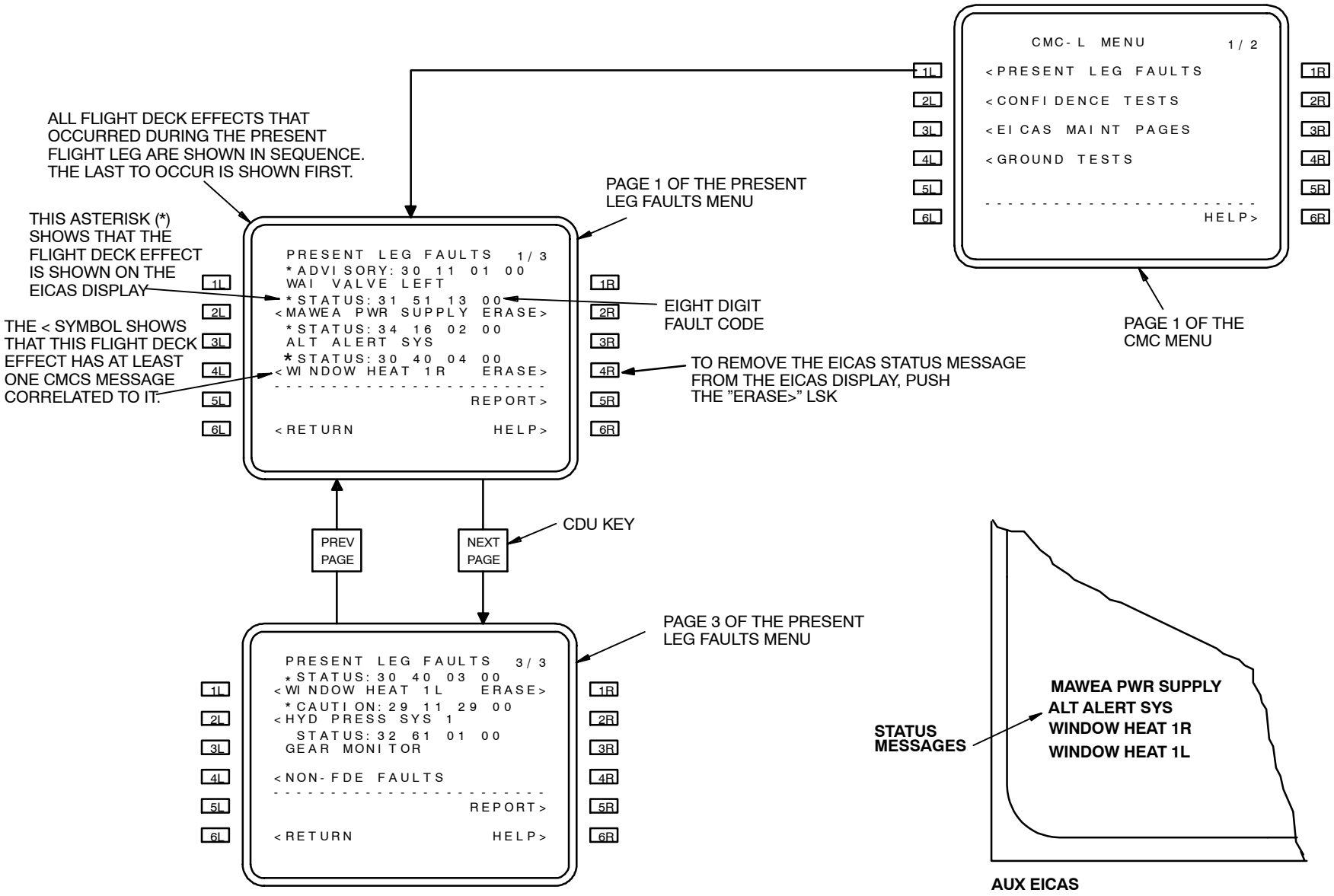


Figure 11 PRESENT LEG FAULTS Pages

Present Leg Message

All FDEs should have a correlated CMCS fault message. The correlated fault message indicates the cause of a FDE. To show the correlated fault message, push the LSK next to the FDE.

The only exception is an active latchable status message where there is no CMCS fault message. All latchable status messages require a means of erasure. Since the procedure for erasing a latched status message is from the CMCS present leg faults menu, all latchable status messages show on

PRESENT LEG MSG whether a fault message has been correlated or not.

The present leg CMCS fault message page shows this information:

- CMC fault message.
- asterisk (*) next to the fault message indicates the fault is still shown.
- CMCS fault message number (5 digits)(referenced in the fault isolation manual FIM).
- date and time at which the fault first became active.
- equipment number of the failed LRU.
- ATA chapter and section of the wiring diagram showing the failed LRU.
- flight phase in which the fault first became active.

Present leg faults only shows an FDE if it is correlated to a CMCS fault message stored in NVM or it is an active latchable status message. Thus the only exception to flight phase screening is for latchable status messages. Latchable status messages are always temporarily shown in present leg faults with any correlated CMCS fault messages.

- A hard (HRD) or intermittent (INT), N/A (not applicable) indication
- The correlated FDE.

The possible flight phases are are shown on the HELP page.

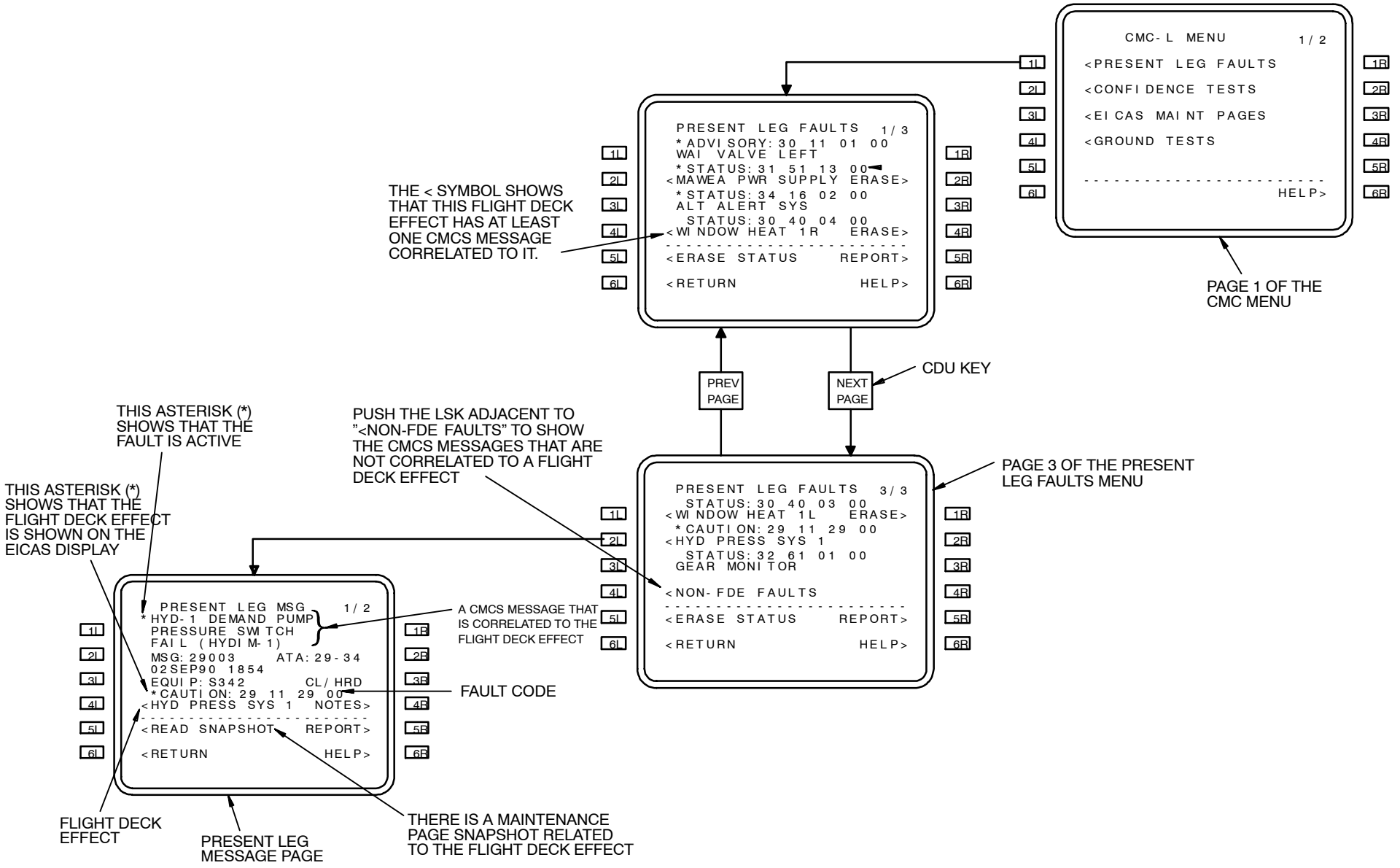


Figure 12 PRESENT LEG FAULTS/ MSG Pages

HARD Fault

A fault is considered hard (HRD) if the fault becomes active and remains active until the beginning of the maintenance period.

Intermittent Fault

A fault is considered intermittent (INT) if it occurs and becomes inactive at least once before the maintenance period begins.

Not Applicable (N/A)

N/A is assigned to all engine faults.

Maintenance Period

The shutdown (SD), power on (PD), and preflight (PF) flight phases are considered the maintenance period. If a fault occurs during the maintenance period, the fault is considered nondetermined. When a fault is nondetermined, the HRD/INT portion of the message is blank.

An asterisk (*) next to the FDE indicates the FDE is still shown.

Diagnostic Codes

When a CMCS fault message is generated by a flight control computer (FCC), the message DIAG CODE shows. To read the diagnostic code, press the LSK next to DIAG CODE. The diagnostic code starts with a letter (L, R, or C). The letter represents the FCC that generates the message (left, right, or center). The following three digits represent the diagnostic code. The diagnostic code is referenced in the FIM.

Flight Phase Screening

The CMCS is programmed with message logic for every CMCS fault message. The message logic causes the CMCS to generate a fault message when the conditions defined in the logic are true. Part of the message logic for each fault message is a list of storable flight phases for that fault. When a fault occurs, the CMCS checks the flight phase list for the fault and determines if the current flight phase is in a storable region of the fault.

If the fault occurs during a flight phase that is not within a storable flight phase, then the message is not stored in present leg faults and thus does not show in present leg faults. If the fault is still active when a storable flight phase is reached, then the fault is stored in non-volatile memory (NVM) with its original time of occurance.

Most flight phase screening occurs on the ground. This prevents nuisance messages from being stored as a result of normal operation, such as maintenance or preflight actions.

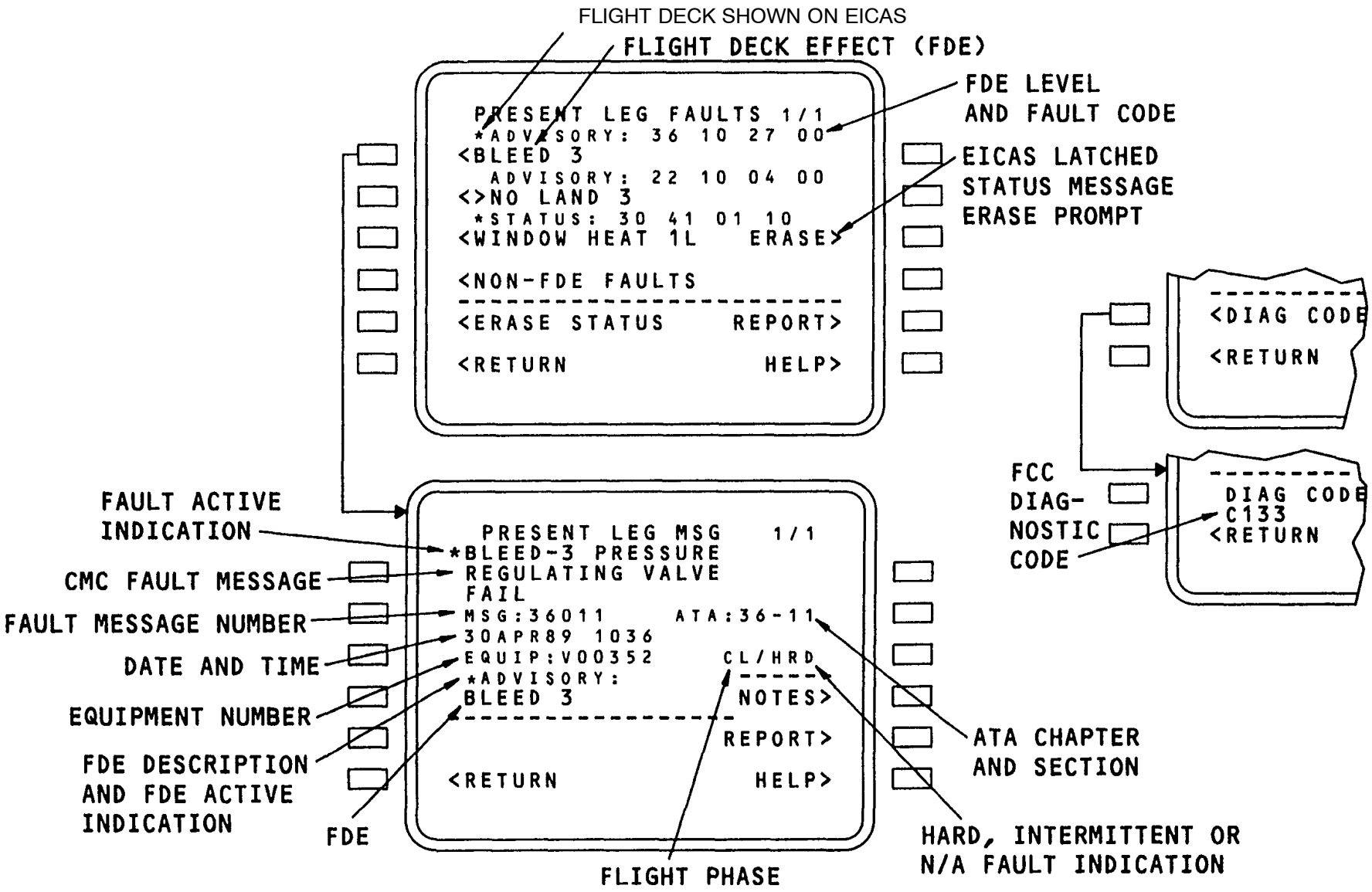


Figure 13 CMCS - PRESENT LEG MSG

CMCS - PRESENT LEG FAULTS - MULTIPLE FAULTS/FDES

General

The central maintenance computer system (CMCS) can correlate more than one CMCS fault messages to a flight deck effect (FDE). The CMCS can also correlate more than one FDE to a CMCS fault message.

Multiple Fault Messages

To see the correlated CMCS fault message for a FDE, push the line select key (LSK) next to the FDE. The correlated CMCS fault message shows on the control display unit (CDU).

If there is more than one CMCS fault message correlated to the FDE, the page indication shows multiple pages. The page indication reflects the number of messages correlated to the FDE. That is, if there are two correlated messages, the CDU shows 1/2 in the upper right corner. Push the NEXT PAGE key to see additional CMCS fault messages.

Multiple FDEs

To see the correlated CMCS fault message for a FDE, push the LSK next to the FDE. The correlated CMCS fault message shows on the CDU.

If there is more than one FDE correlated to the CMCS fault message, a prompt (<) shows next to the FDE. Push the LSK next the FDE to see the additional FDE. Push the LSK again to see if there are any additional FDEs correlated to the fault message.

READ SNAPSHOT

The <READ SNAPSHOT prompt is shown if there is a maintenance page (automatic snapshot) that is related to the flight deck effect (FDE).

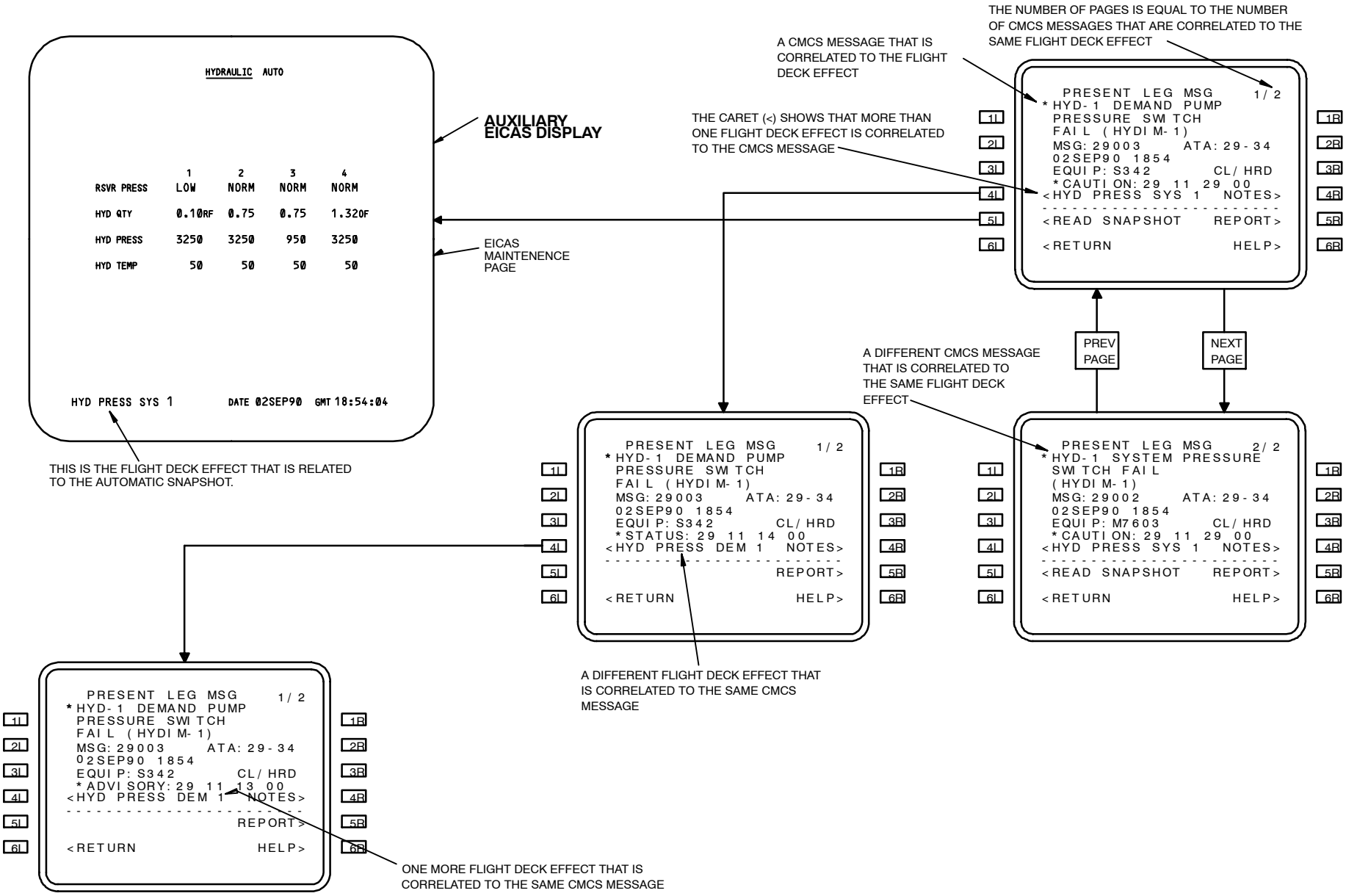


Figure 14 PRESENT LEG MSG Pages

NO PRESENT LEG FDES

If there are no flight deck effects (FDEs) correlated to a CMCS fault message during the present leg, then the message NO FLIGHT DECK EFFECTS REPORTED DURING THIS FLIGHT shows on the CDU when present leg faults is selected.

If there are no NON-FDE correlated CMC fault messages during the present flight leg, then NON-FDE FAULTS does not show next to LSK 4L.

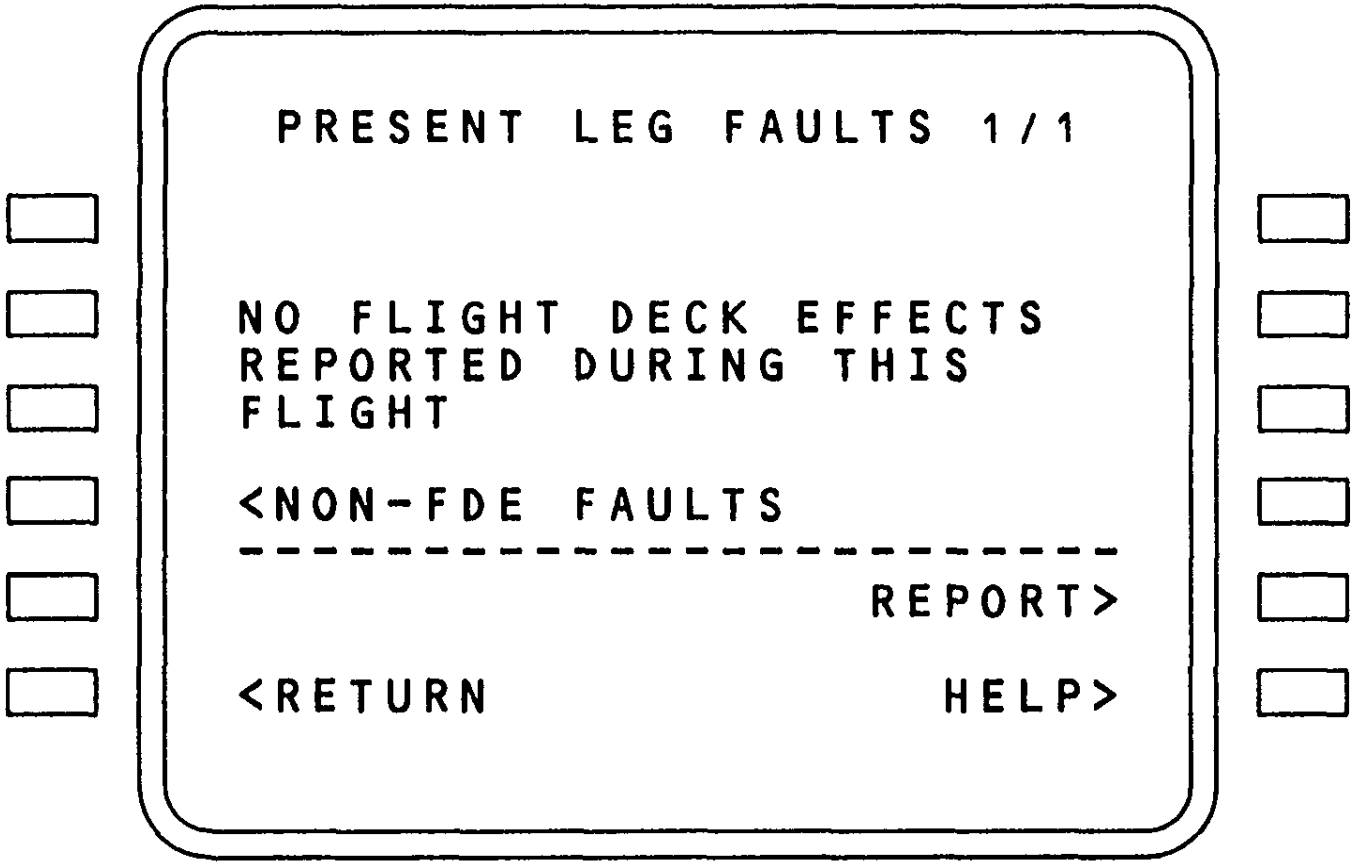
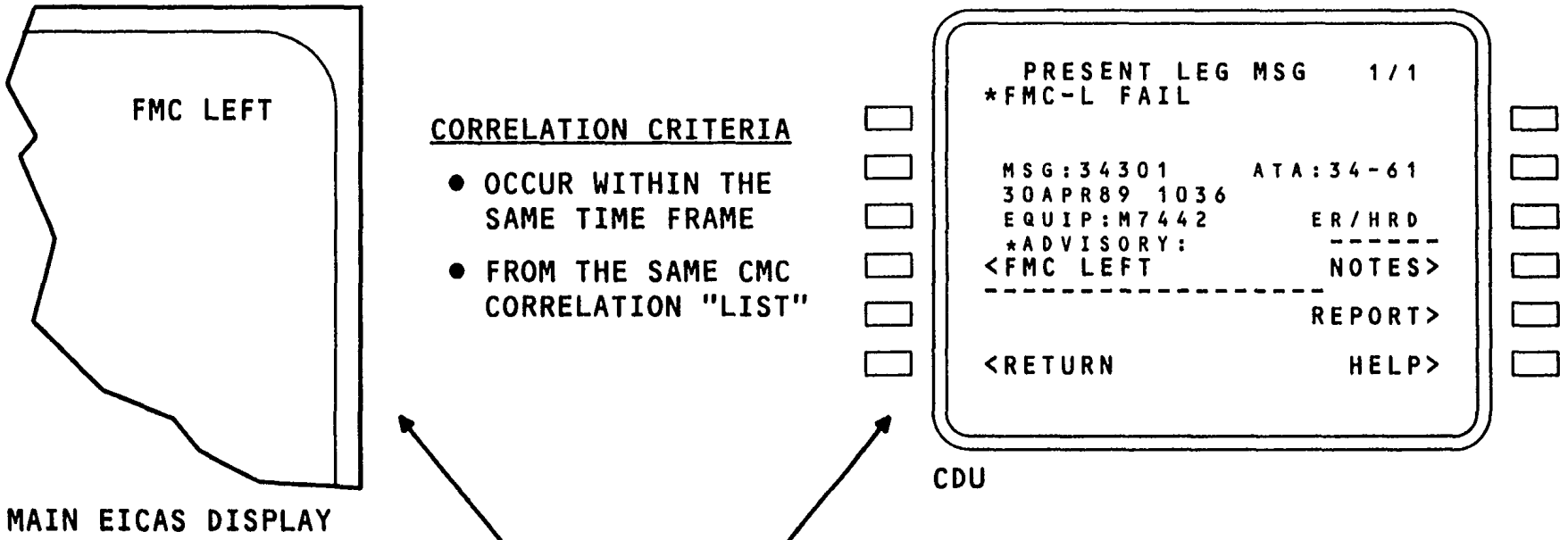


Figure 15 CMCS - NO PRESENT LEG FDES

CMCS - FDE/FAULT MESSAGE CORRELATION

Certain criteria must be met to correlate a CMCS fault message to a flight deck effect (FDE).

- They must occur within the same time frame.
- The FDE and fault message are matched on the CMC correlation list. (For each FDE, the CMCS is programmed with a list of CMCS fault messages that can be correlated to that FDE.)



CMC FDE/FAULT MESSAGE CORRELATION LIST (EXAMPLE)

FDE	CMCS FAULT MESSAGES
FMC LEFT	FMC-L FAIL
	FMC-L → FMC-R BUS FAIL
	FMC-L → EIU BUS FAIL
FMC RIGHT	FMC-R FAIL
	FMC-R → FMC-L BUS FAIL
	FMC-R → EIU BUS FAIL

Figure 16 CMCS - FDE/ Fault Message Correlation

CMCS - CORRELATION CRITERIA

Airplane Systems

The airplane systems detect failures and send the fault data to the CMCs or the EIUs on ARINC 429 data buses.

Fault data that goes directly to the CMCs are called direct inputs.

Fault data that goes to the EIUs, and then to the CMCs are called indirect inputs.

EICAS messages alert the crew of system level faults related to safe flight. CMC fault messages provide detailed fault isolation to assist maintenance personnel in fault isolation.

A fault can cause a CMCS fault message, and/or an EICAS message. Often it causes both, it is the job of the CMC to correlate these two messages.

The airplane systems send EICAS message data and CMC fault message data.

EIUs

The EIUs get both data from the airplane systems. The EIUs

re-transmit the CMC fault message to the CMCs. This is an indirect input.

Logic within the EIUs set EICAS messages when the EIUs get the message data. When the EIUs set EICAS messages, they send fault codes (8 digits) for the EICAS message to the CMCs.

CMCs

Logic within the CMCs stores fault messages when the CMCs get the message data. When the CMCs store fault messages, they examine the fault codes from the EIUs. The CMCs examine its database to determine if the fault correlates to any of the EIU fault codes. When the CMCs find a match, the CMC then examine its database for the defined correlation time frame (typically +/-90 seconds).

Correlation occurs when the CMCs get a fault code from the EIUs, store a fault message, and is within the time frame.

Some systems do not cause EICAS messages. These systems report by direct input to the CMCs.

CMCS - FLIGHT PHASE SCREENING

Flight Phase Screening Logic

The CMCS is programmed with message logic for every CMCS fault message. The message logic causes the CMCS to generate a fault message when the conditions defined in the logic are true. Part of the message logic for each fault message is a list of non-storable flight phases for that fault.

When a fault occurs, the CMCS checks the flight phase list for the fault and determines if the current flight phase is in a storable region of the fault. If the fault occurs during a flight phase that is not within a storable flight phase, then the message is not stored in present leg faults.

If the fault is still active when a storable flight phase is reached, then the fault is stored in non-volatile memory (NVM) with its original time of occurance. Most flight phase screening occurs on the ground. This prevents nuisance messages from being stored as a result of normal operation, such as maintenance or preflight actions.

Present leg faults only shows an FDE if it is correlated to a CMCS fault message stored in NVM, or if it is an active latchable status message. The only exception to flight phase screening is for latchable status messages.

Latchable status messages temporarily show in present leg faults with any correlated CMCS fault message. If any other FDE is not correlated to a CMCS fault message stored in NVM, then it does not show in present leg faults.

A latchable status message active during non-storable phases is removed from present leg faults when the condition clears.

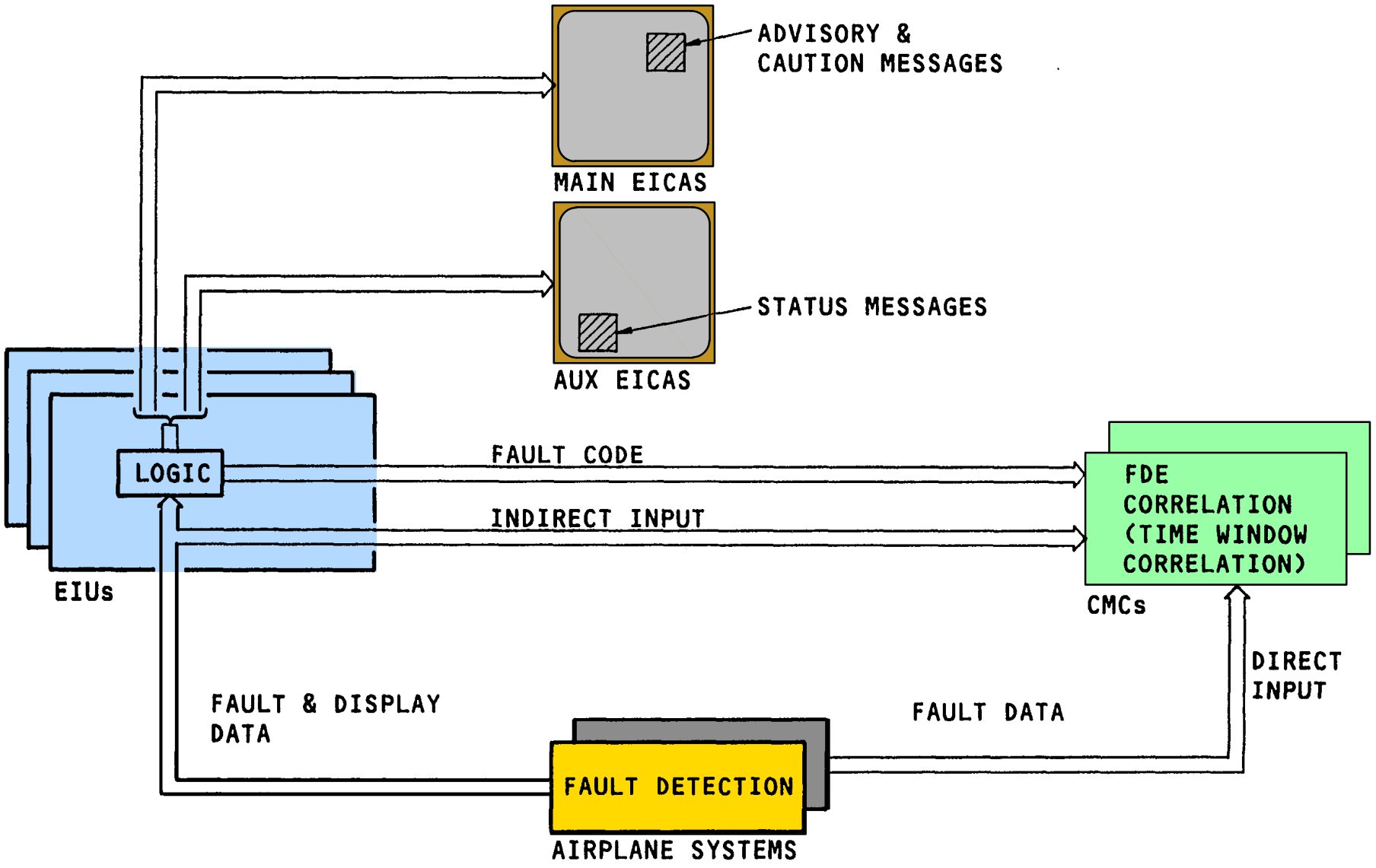


Figure 17 CMCS - Correlation Criteria

FAULT CODE INDEX

General

The fault isolation manual (FIM) provides a guide to isolate faults. The FIM is divided into ATA chapters. Each chapter is divided into six sections. The fault code index is one of the sections.

Fault Code Index

The fault code index lists all the eight digit fault codes for each ATA chapter. These are the same codes as the fault reporting manual (FRM) codes. The codes are listed in numerical order. The first two digits of each code represents the ATA chapter.

Each flight deck effect (FDE) has it's own fault code. For most fault codes related to a FDE, the fault code index directs the operator to figure 1 (Fault Isolation Procedure with the CMCS) at the front of the fault code index. The fault isolation procedure diagram gives a step-by-step procedure to isolate the cause of a FDE using the CMCS.

The fault code index lists all the CMCS fault messages that can be correlated to the respective FDE.

NOTE: THE FAULT ISOLATION PROCEDURE DIAGRAM ASSUMES YOU HAVE CHECKED THE FAULT CODE INDEX FOR ANY SPECIAL FAULT ISOLATION PROCEDURES OR CORRECTIVE ACTION. IT IS IMPORTANT TO REFER TO THE FAULT CODE INDEX FOR EACH FDE.

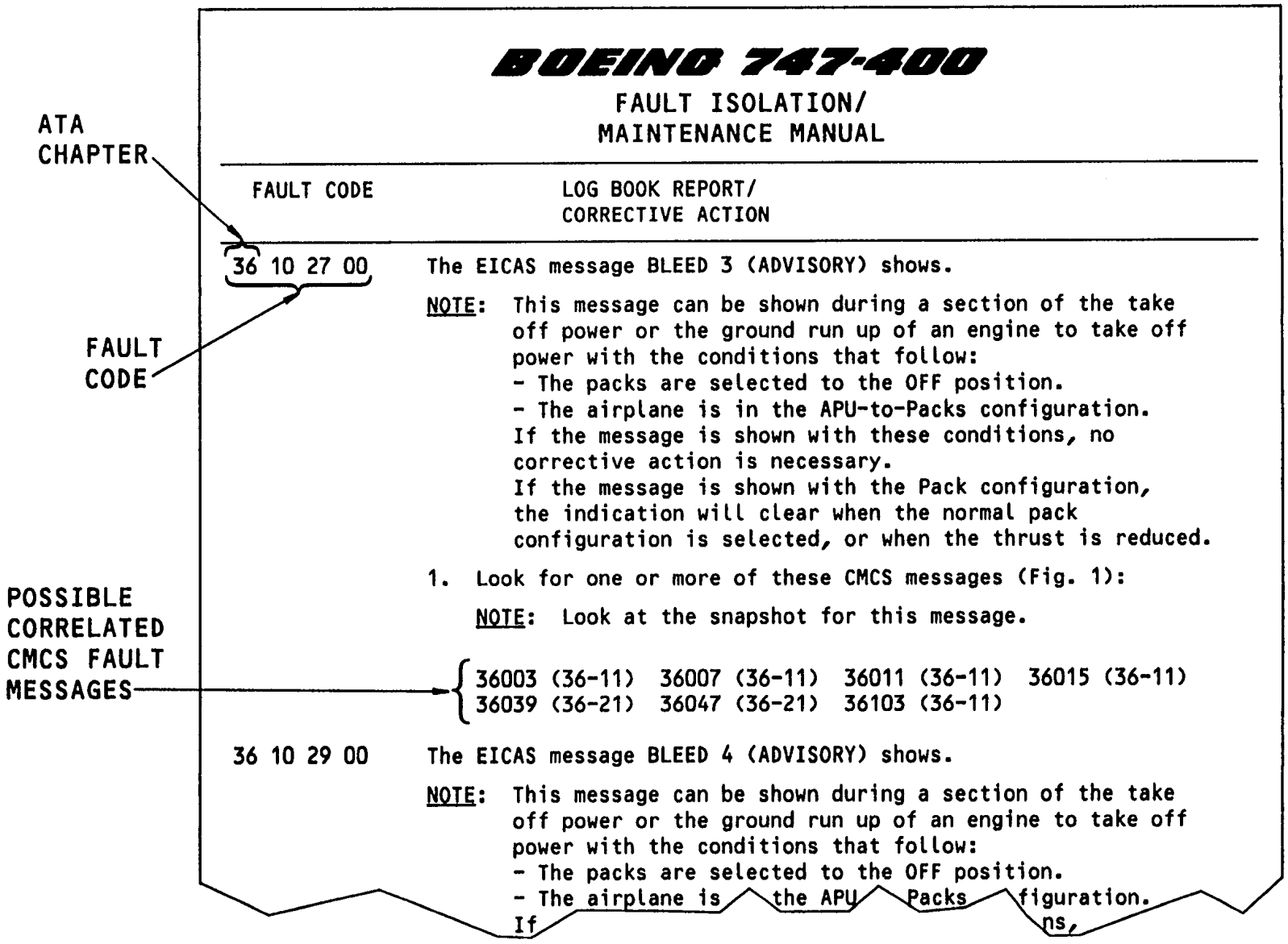


Figure 18 CMCS - FIM - Fault Code Index

CMCS - FIM - CMCS MESSAGE INDEX

General

The fault isolation manual (FIM) provides a guide to isolate faults. The FIM is divided into ATA chapters. Each chapter is divided into six sections. The CMCS message index follows the fault code index section.

CMCS Message Index

In the first box, the CMCS messages list in numerical order. The first two digits of the CMCS message number represent the ATA chapter. The fault message shows below the message number.

The second box lists all the flight deck effects (FDEs) that can be correlated to the CMCS fault message.

The lower box shows the corrective action. It also shows the equipment number of the failed LRU and the maintenance manual procedure for performing the corrective action.

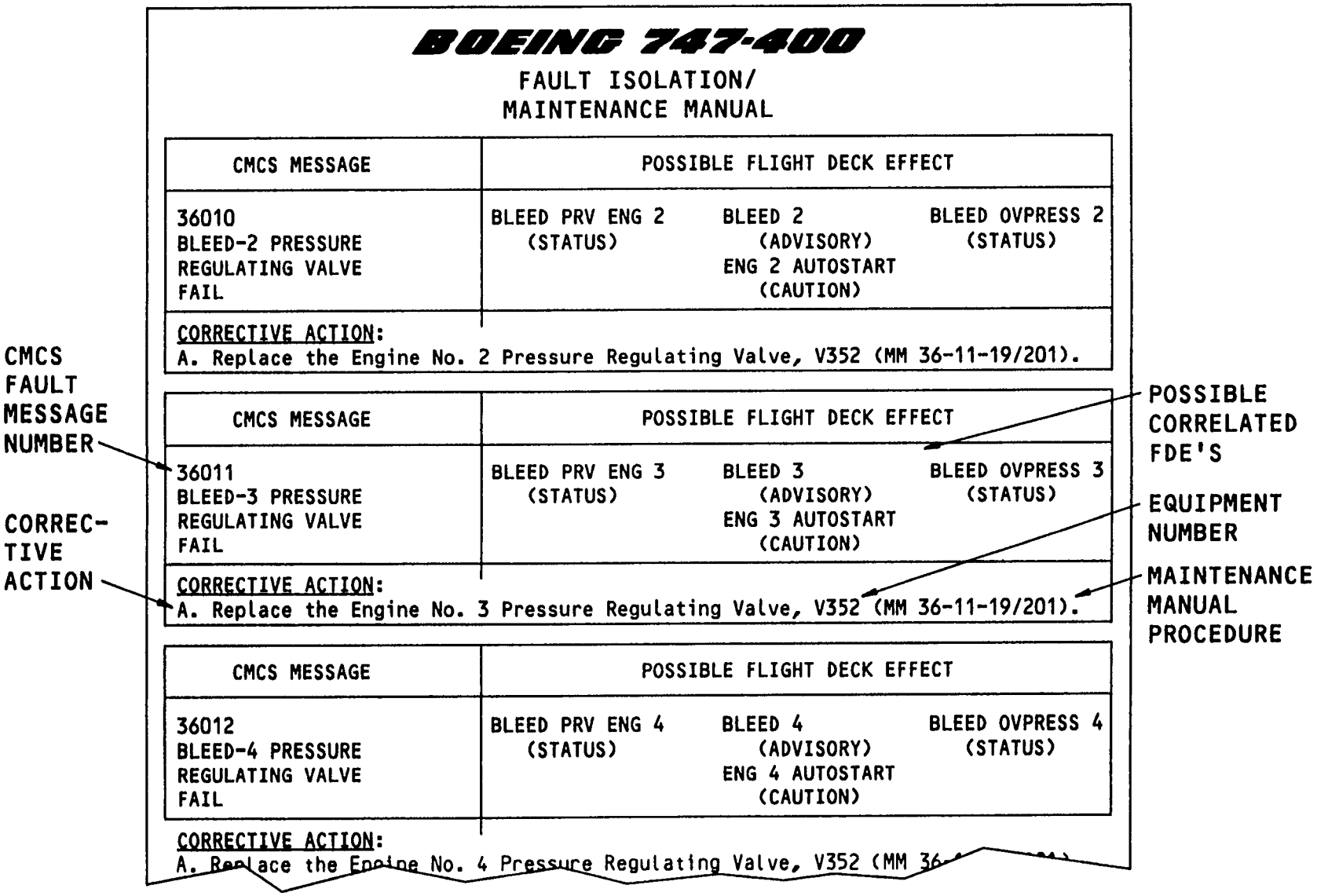


Figure 19 CMCS - FIM - CMCS Message Index

NON-FDE PRESENT LEG FAULTS

To show CMCS fault messages that do not have correlated FDEs, push the LSK next to NON-FDE FAULTS on the present leg faults page. This causes the most recent CMCS fault message to show. If there is more than one non-FDE fault, then the next most recent fault shows on the next page, and so on.

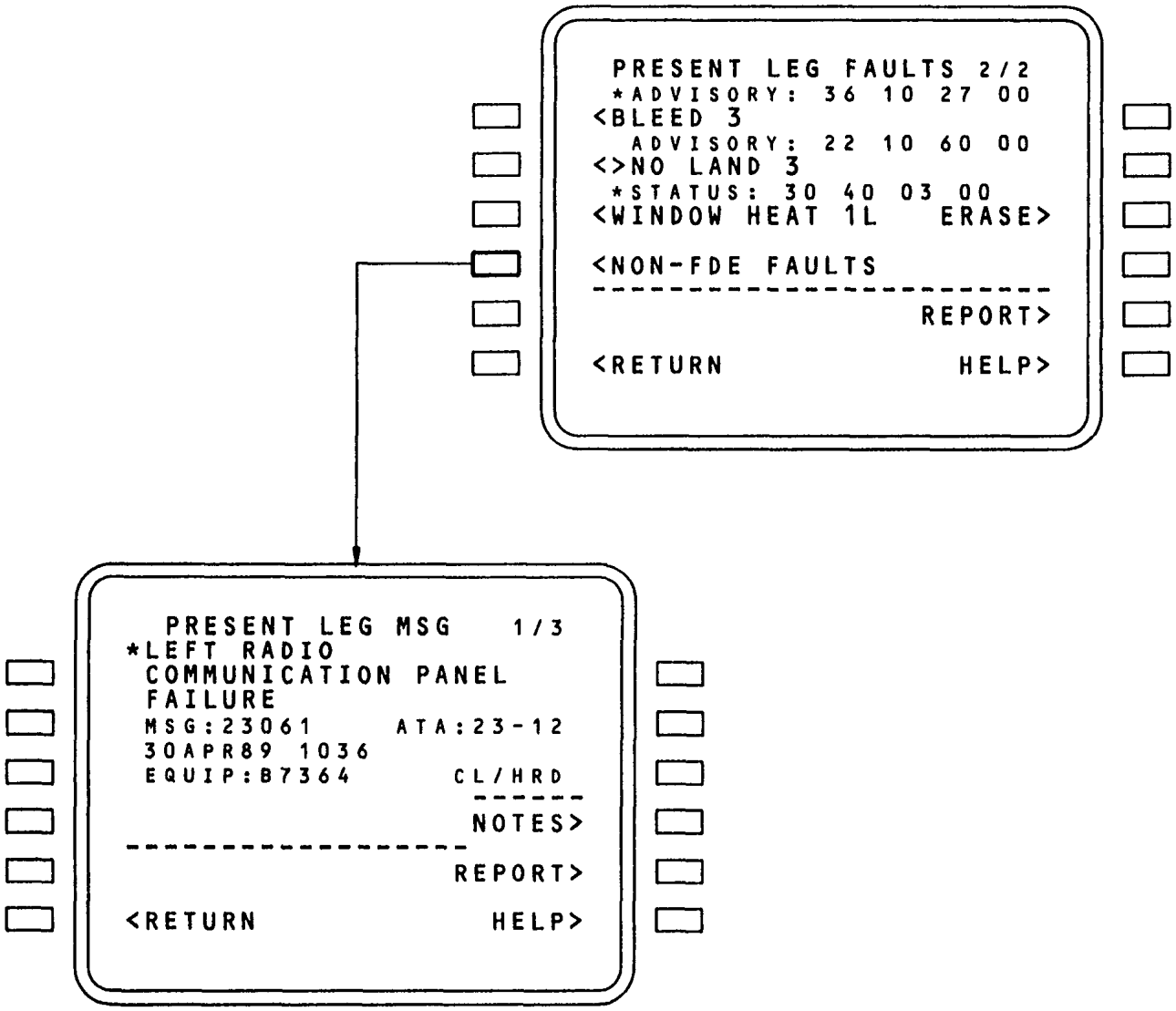


Figure 20 CMCS - NON-FDE PRESENT LEG FAULTS

CMCS - FLIGHT PHASES

General

The CMCS receives airplane systems data from the EFIS/EICAS interface units (EIUs) to determine the airplanes current flight phase. A two letter flight phase designator shows on the CMCS fault message pages to indicate the flight phase a fault first becomes active.

The CMCS also sends out the flight phase information to other airplane systems.

Flight Phases

Possible flight phase are:

- Power on (PO)
- Preflight (PF)
- Engine start (ES)
- Leg transistion (LT)
- Taxi out (TO)
- Initial climb (IC)
- Climb (CL)
- Enroute cruise (ER)
- Descent (DC)
- Approach/autoland (AL)
- GO around (GA)
- Rollout (RO)
- Taxi in (TI)
- Engine shutdown SD

Leg Transition

Leg transistion (LT) is assigned to a fault that is active at the start of a new flight leg. Flight phase screening and engine conditions determine if the fault is stored. With the fault in a storable flight phase, the fault is stored with the date and time of the flight leg transistion. LT is used to inform maintenance personnel the fault became active in a previous flight leg.

Maintenance Period

A fault is non-determined if it occurs in the maintenance period. The maintenance period is defined as these flight phases:

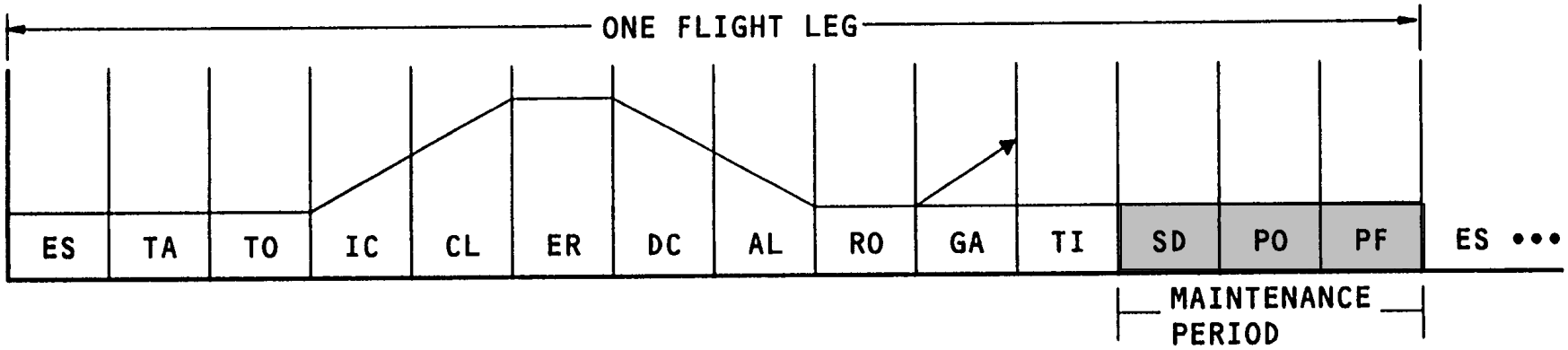
- Power on
- Preflight
- Engine shutdown

A fault is hard if the fault is active and remains active at the start of the maintenance period.

A fault is intermittent if the fault is active and then clears (not active), before the maintenance period begins.

All engine faults are assigned N/A (not applicable). Engine faults are latched into the electronic engine controllers (EECs).

For a non-determined fault, the HRD/INT for the fault message blanks.



ES (ENGINE START): ON GROUND, START VALVE OPEN & ASSOCIATED FUEL VALVE OPEN
TA (TAXI-OUT): ON GROUND, ONE OR MORE ENGINES RUNNING, GROUND SPEED <50 KNOTS
TO (TAKEOFF): ON GROUND, PARKING BRAKE RELEASED, N1 >70%, LE FLAPS EXTENDED, PREVIOUS PHASE TA, TI OR RO
IC (INITIAL CLIMB): IN AIR, LE FLAPS EXTENDED, TE FLAPS <20
CL (CLIMB): IN AIR, LE FLAPS RETRACTED, FMC IN CLIMB MODE
ER (ENROUTE CRUISE): IN AIR, LE FLAPS RETRACTED, FMC IN CRUISE MODE
DC (DESCENT): IN AIR, LE FLAPS RETRACTED, FMC IN DESCENT MODE
AL (APPROACH/LAND): IN AIR, LE FLAPS EXTENDED, FLAPS IN LANDING RANGE (25-30)
RO (ROLLOUT): ON GROUND, GROUND SPEED >50 KNOTS OR N1 >70% WITH AIRPLANE PREVIOUSLY IN AIR

TI (TAXI-IN): AN ENGINE RUNNING, ON GROUND, GROUND SPEED <50 KNOTS, PREVIOUS PHASE = RO OR TA, FIRST DOOR NOT OPEN
GA (GO AROUND): FLAPS 18° TO 22°, RA <1000 FT (AFTER AL OR RO ONLY)
SD (ENGINE SHUTDOWN): ALL ENGINES OFF, TIME <10 MINUTES SINCE LAST ENGINE OFF
PO (POWER ON): ALL ENGINES OFF, ON GROUND, ELECTRICAL POWER ON
PF (PREFLIGHT): ALL ENGINES OFF, ON GROUND, IRS IS ALIGNING

Figure 21 CMCS - Flight Phases

CMCS - FLIGHT LEG LOGIC

General

The CMC is always in a flight leg, when one flight leg ends, the CMC transitions to the next flight leg.

Flight Leg Transition Logic

Flight leg transitions occur an the ground, with the left and right IRUs on, or the left and center IRUs on and after the flight leg roll is enabled. There are two ways to transition a flight leg:

- At the first engine start (starter valve open)
- One or more engines running and the last door transitions from open to close.

NOTE: ENGINE RUNNING IS SIMULATED WHEN FOLLOWING CIRCUIT BREAKERS ARE OPEN:
ENG1(2,3,4) FUEL CONT VALVE 6L10,(11,12,13)

Flight Leg Enable Logic

The flight leg enable is stored and used in the logic for the next flight leg transition. Once the flight leg transitions, a new flight leg enable is needed for the next flight leg to transition.

The flight leg transition enable is qualified two ways:

- Takeoff thrust is applied and the parking brake is released.
- From the CDU with the CMCS OTHER FUNCTIONS menu.

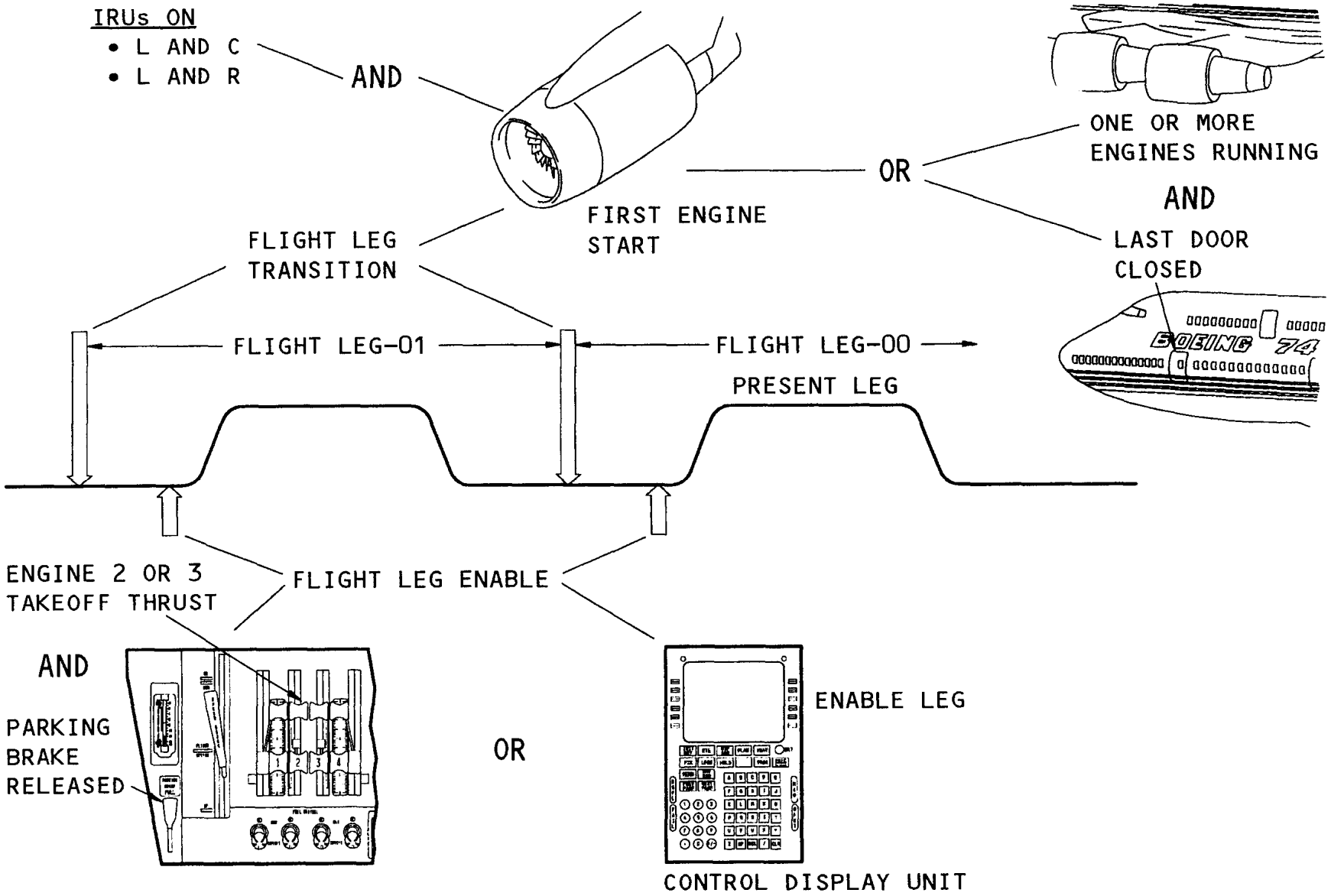


Figure 22 Flight Leg Enable Schematic

CMCS - FLIGHT LEG LOGIC

General

The flight leg logic defines the flight leg period. There are no time gaps between flight legs; when one ends the next flight leg begins.

Flight Leg Transition Logic

A flight leg normally begins when the first engine starts with the airplane on the ground. If, however, the engines are not shut down from the previous flight, then the flight leg starts when the last door transition goes from open to close.

Flight Leg Enable Logic

The flight leg enable is used to prevent nuisance flight legs from occurring because of engines start and shutdown or doors open and closed.

Once the enable occurs, it is stored and not used until the flight leg transition logic is satisfied.

Once the flight leg enable is used, a new one must occur before the next flight leg transitions.

The flight leg enable occurs when takeoff thrust is applied with the parking brake released. The enable goes to a flip flop where it is ”latched”. The output of the flip flop remains high until the flight leg transition logic is satisfied.

When the flight leg transition logic goes high, the flip flop is cleared. The output of the flip flop then remains low until the flight leg enable logic is satisfied again.

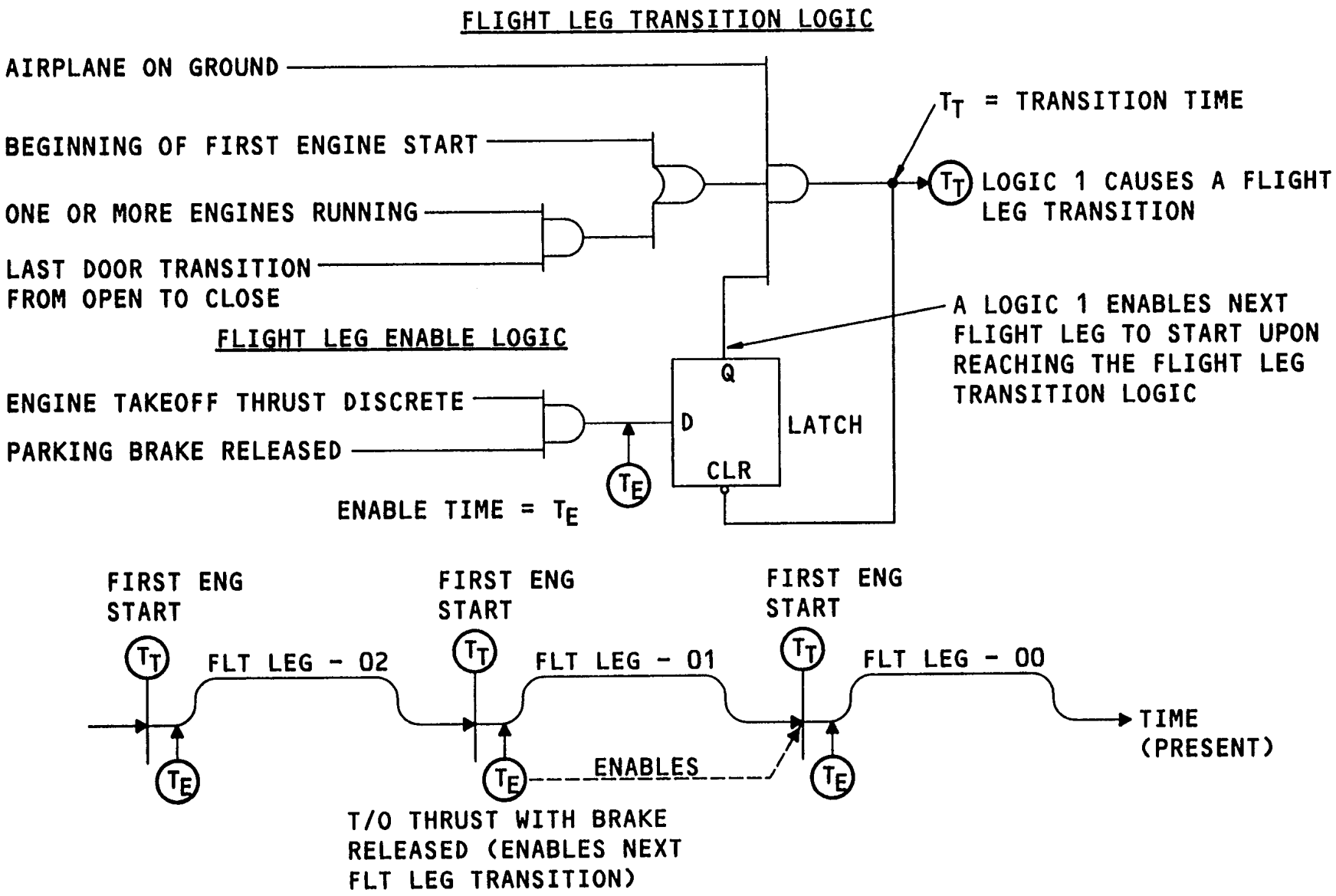


Figure 23 CMCS - FLIGHT LEG LOGIC

CMCS - OTHER FUNCTIONS/FLIGHT LEG ENABLE

Push the LSK next to OTHER FUNCTIONS to show the other functions menu.

This menu allows for selection of these functions:

- SHOP FAULTS
- INPUT MONITORING
- CONFIGURATION

This page also allows for control of the flight leg enable logic.

When a flight leg advance is enabled, INHIBIT LEG > shows at LSK 5R.

Push the LSK at 5R to inhibit a leg advance from occuring at the first engine start (or last door close if engines are not shut down).

If a leg advance is inhibited, or the leg has already advanced, then ENABLE LEG > shows at 5R.

Push the LSK to enable a leg advance to occur.

The flight leg enable function can be used to store a separate engine run leg. To start the leg, simply let the first engine start begin the leg. When the engine run tests are complete, push the LSK next to ENABLE LEG > so a new flight leg will start when the flight crew starts the first engine.

If a leg is inhibited manually, be sure to re-enable the leg before the flight crew comes on,

NOTE: THE CROSSTALK FUNCTION DOES NOT OPERATE FOR THE -006, -007, AND -902 CMCS SOFTWARE VERSIONS. THUS, IF A MANUAL INHIBIT OR ENABLE IS SELECTED, IT MUST BE DONE FOR BOTH CMCS.

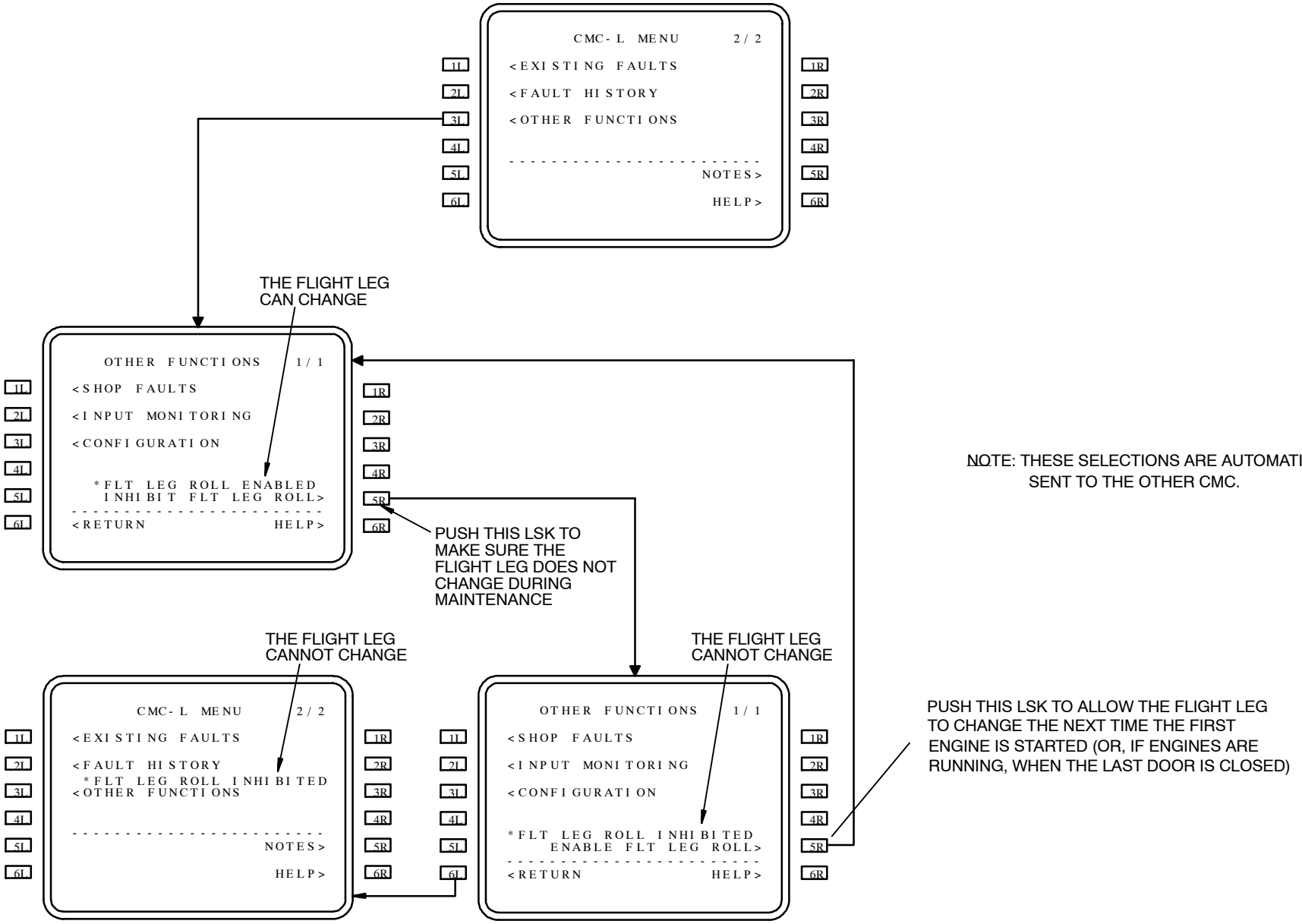


Figure 24 Flt Leg Roll Inhibition

CMCS - REPORT MENU

General

The report menu allows the CMCS to send fault reports to:

- A ground station through the ARINC communication addressing and reporting system (ACARS)
- The multiple input printer, which generates a hard copy of the report

To access the report menu, press the line select key (LSK) next to REPORT.

ACARS Report

To start a report, push the LSK next to ACARS.

- IN PROGRESS shows above ACARS to indicate the CMCS is transferring data.
- IN PROGRESS goes away when the transfer is complete.
- COMPLETE TO GROUND shows when the report is sucessfully downlinked to a ground station.

other non-normal ACARS responses are NO RESPONSE, MU-FAIL, and NO COM. If the ACARS management unit does not respond, NO RESPONSE shows. If a ground station is not reached, NO COM shows.

Printer Report

To start a report, press the LSK next to PRINTER.

- IN PROGRESS shows above PRINTER to indicate the CMCS is transferring data.
- REPORT COMPLETE shows when the transfer is complete.

If the printer does not respond, NO RESPONSE shows.

Push the LSK next to ABORT to terminate the data transfer at any time.

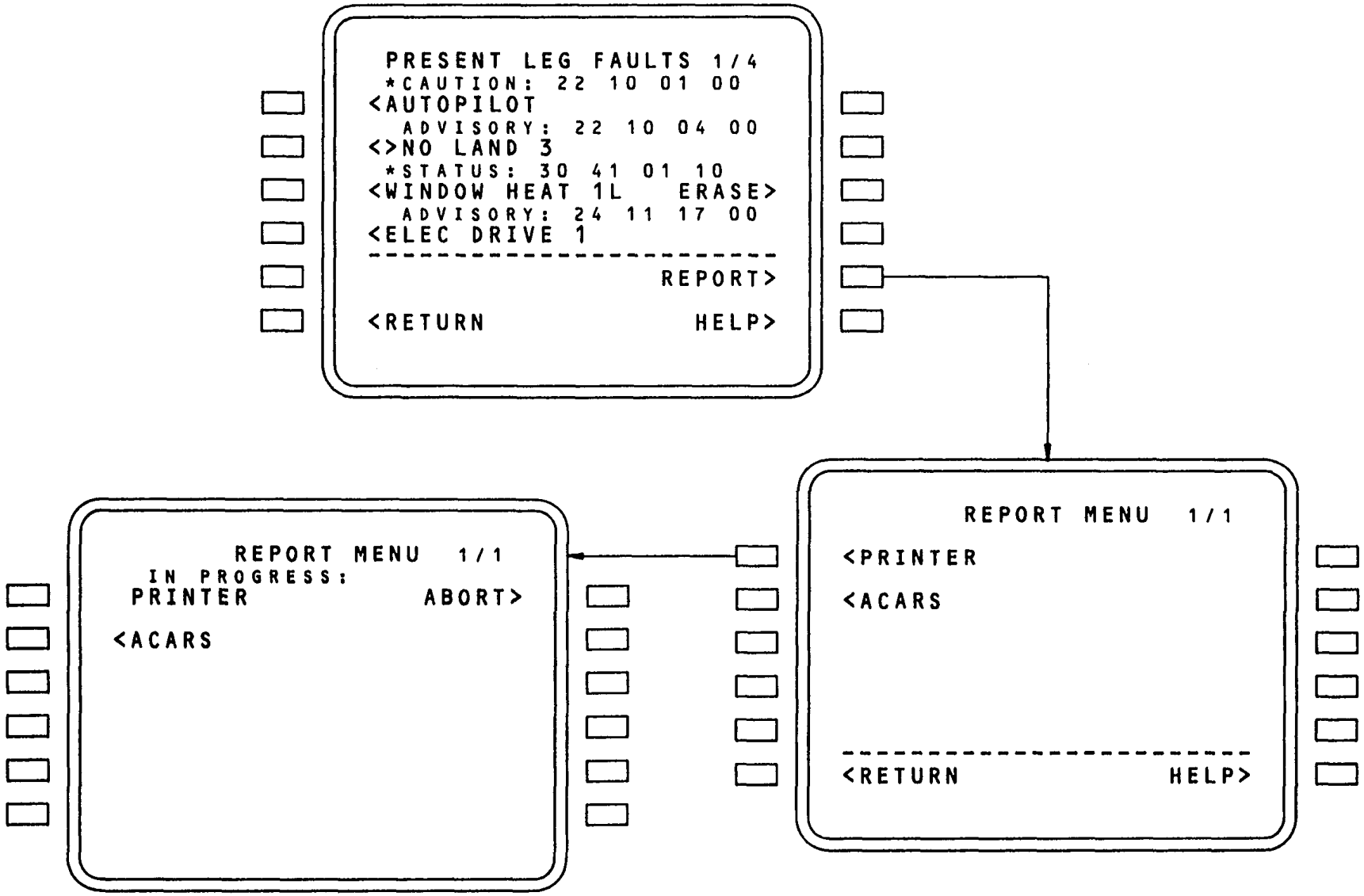


Figure 25 CMCS - REPORT MENU

REPORT PRINTOUT

The graphic shows an example of a present leg faults summary report.

To print all present leg faults, select REPORT then PRINTER from the present le faults menu.

The printer lists all flight deck effects (FDEs) in reverse order of occurrence. All CMCS fault messages correlated to a FDE show below the FDE. The CMCS fault messages are indented five spaces from the FDEs.

The CMCS fault message includes:

- Date and time of occurrence
- Equipment number of failed LRU
- Hard or intermittent status
- ATA chapter of wiring diagram showing failed LRU
- Flight phase
- The fault message number
- Active (A) if fault is still shown on EICAS

CAUTION: IF AN „A“ IS SHOWN IN CORRELATION WITH A STATUS MESSAGE IT IS NOT NECCESARILY AN ACTIVE FAULT (STATUS MESSAGES MAY BE STORED IN THE NON VOLATILE MEMORY)
LOOK FOR „NVM“, „NVM-G“. „NVM-A“ MESSAGE IN THE FAULT ISOLATION MANUAL.

The NON-FDE FAULT messages show at the end of the list.

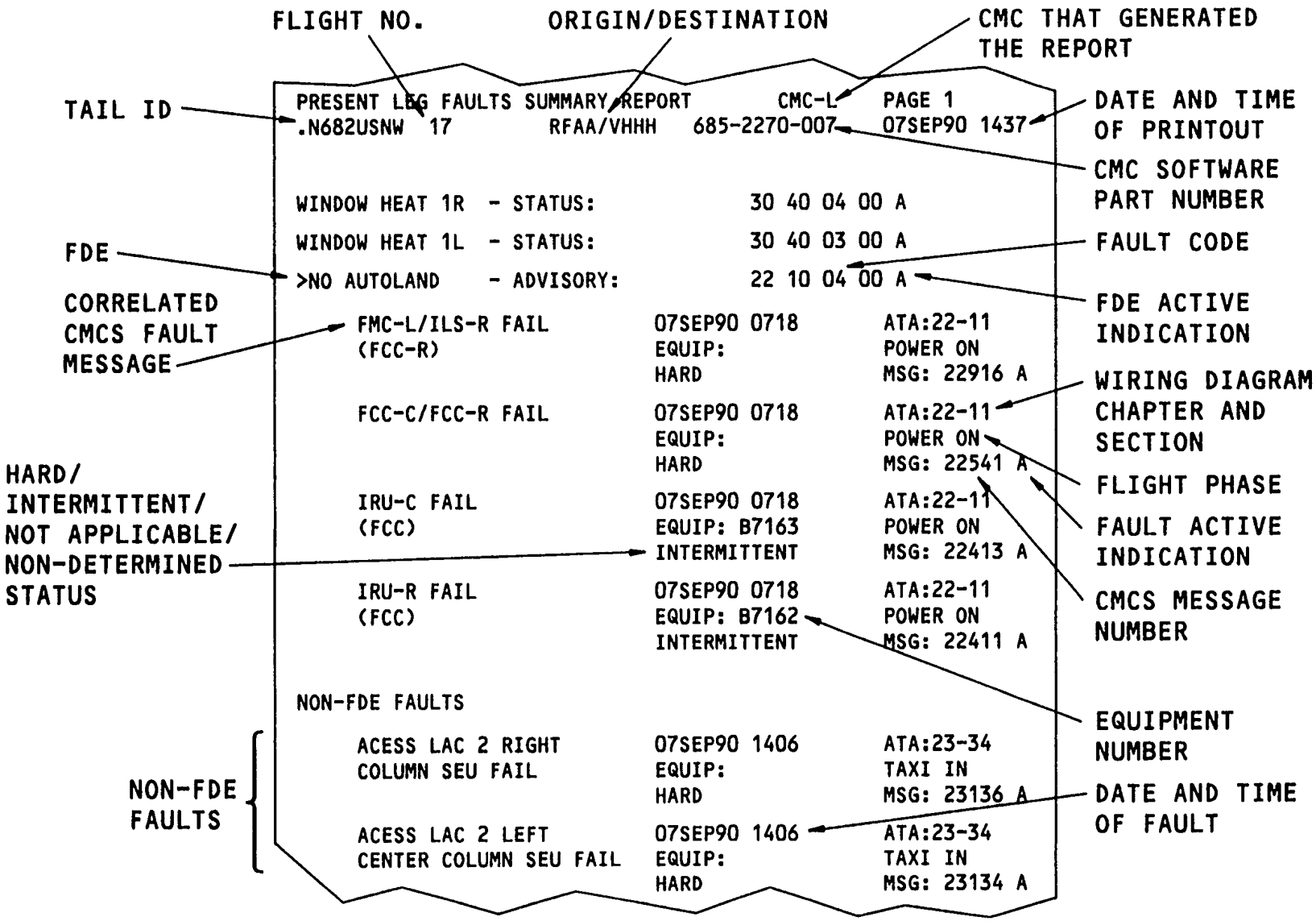


Figure 26 CMCS - REPORT PRINTOUT

CMCS - HELP PAGES

The help pages show text which describes CMCS operation. They are used to guide the CMCS operator through the various CMCS functions. The help pages are part of the airline database (ALDB).

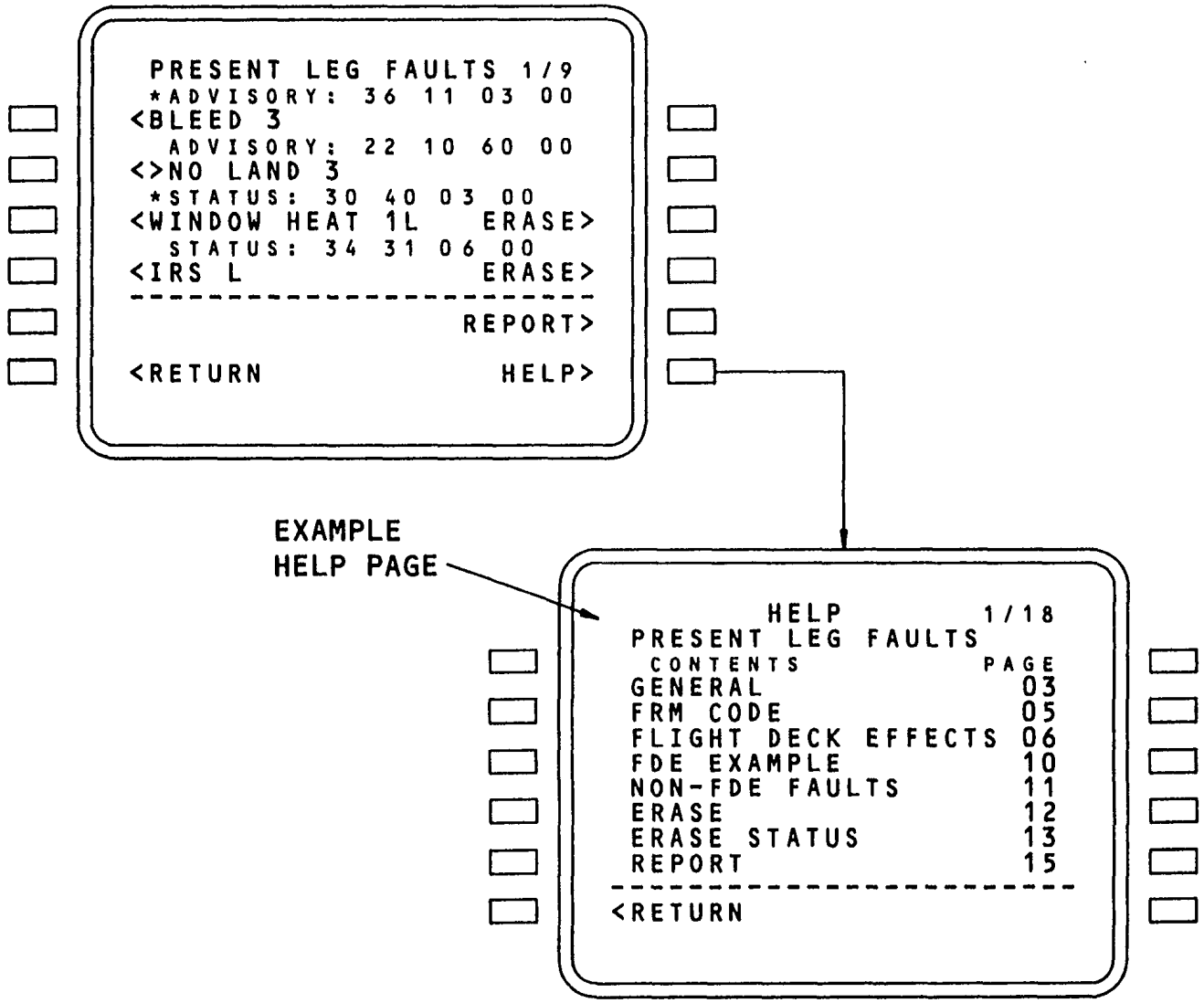


Figure 27 CMCS - HELP Pages

CMCS - NOTES PAGES

The notes pages show airline data which may be correlated to specific fault message pages. The notes pages are part of the airline database (ALDB).

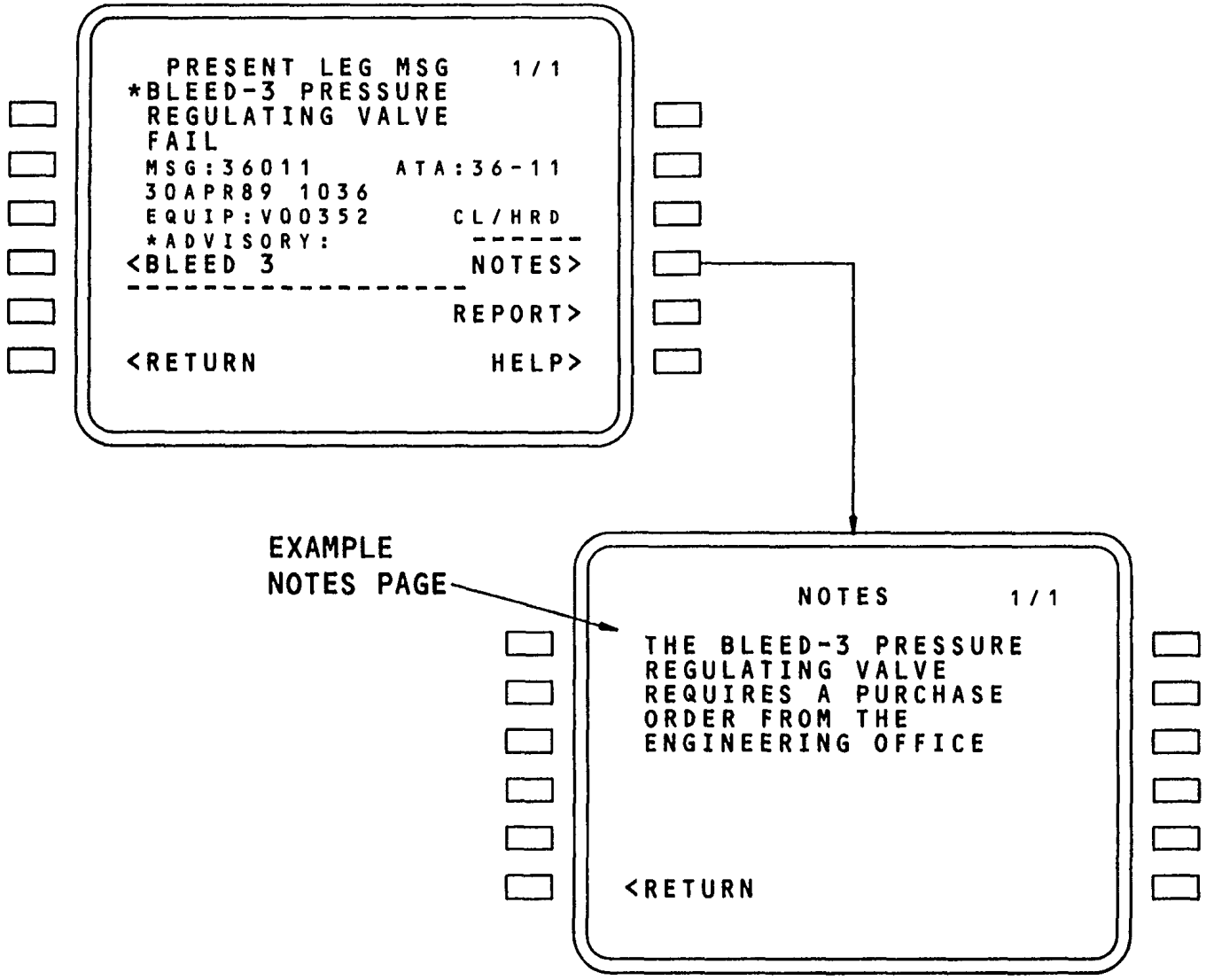


Figure 28 CMCS - NOTES Pages

CMCS - CONFIDENCE TESTS

General

The confidence test function provides the ability to start tests that are traditionally performed during pre-flight. These same tests are also found in ground tests. The procedures to do a confidence test is the same as the ground test.

Test Selection

Push the line select key (LSK) next to CONFIDENCE TESTS to select the confidence test menu.

The CONFIDENCE TESTS menu shows the confidence tests that can be selected.

To start a test, push the LSK next to the system. While the test is being performed, IN PROGRESS shows.

For the stall shaker and the takeoff configuration test, the test ends with PASS or FAIL message that shows to the right.

If a test cannot be performed, due to flight conditions, INHIBITED shows above the selected system.

For the ground proximity warning computer (GPWC) test the preconditions must be set before the test can be started.

PASS shows next to GPWC if the GPWC test passes.

If the GPWC test fails, FAIL shows. Push the LSK next to FAIL to see the fault message.

The fault message page shows:

- The fault message that caused the GPWC confidence test to fail
- The fault message number (referenced to the Fault Isolation Manual)
- The ATA chapter and section which shows the failed LRU.
- The equipment number for the failed LRU.
- The correlated FDE (if there is one) and description.

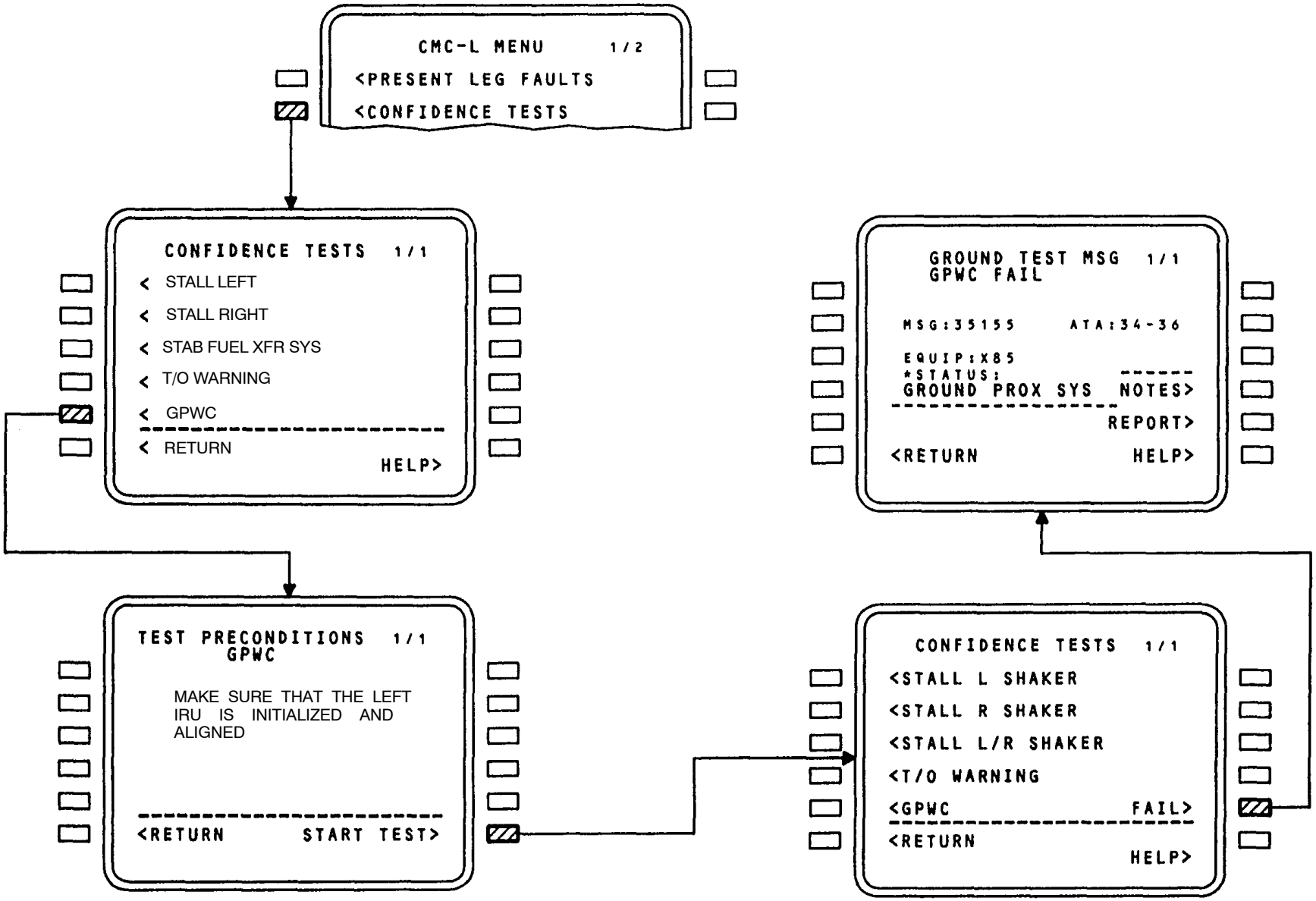


Figure 29 CMCS - CONFIDENCE TESTS

CMCS - EICAS MAINTENANCE PAGES

Push the line select key (LSK) next to EICAS MAINT PAGES to show the EICAS maintenance pages menu.

The EICAS maintenance pages menu allows for selection of a maintenance page to show on the auxiliary EICAS display.

These ATA chapter systems can be selected:

- 21 ECS (environmental control system)
- 24 ELECTRICAL
- 27 FLT CONT (flight controls)
- 28 FUEL
- 29 HYDRAULIC
- 31 CONFIGURATION
- 32 GEAR -49 APU
- 73 EPCS (electronic propulsion control system)
- 73 PERFORMANCE
- 73 ENG EXCD (engine exceedance)

The CMCS sends a command to the EFIS/EICAS interface units (EIUs). The EIUs send the maintenance page data to the auxiliary EICAS display.

The auxiliary EICAS display shows the maintenance page. The maintenance page shows real-time parameters.

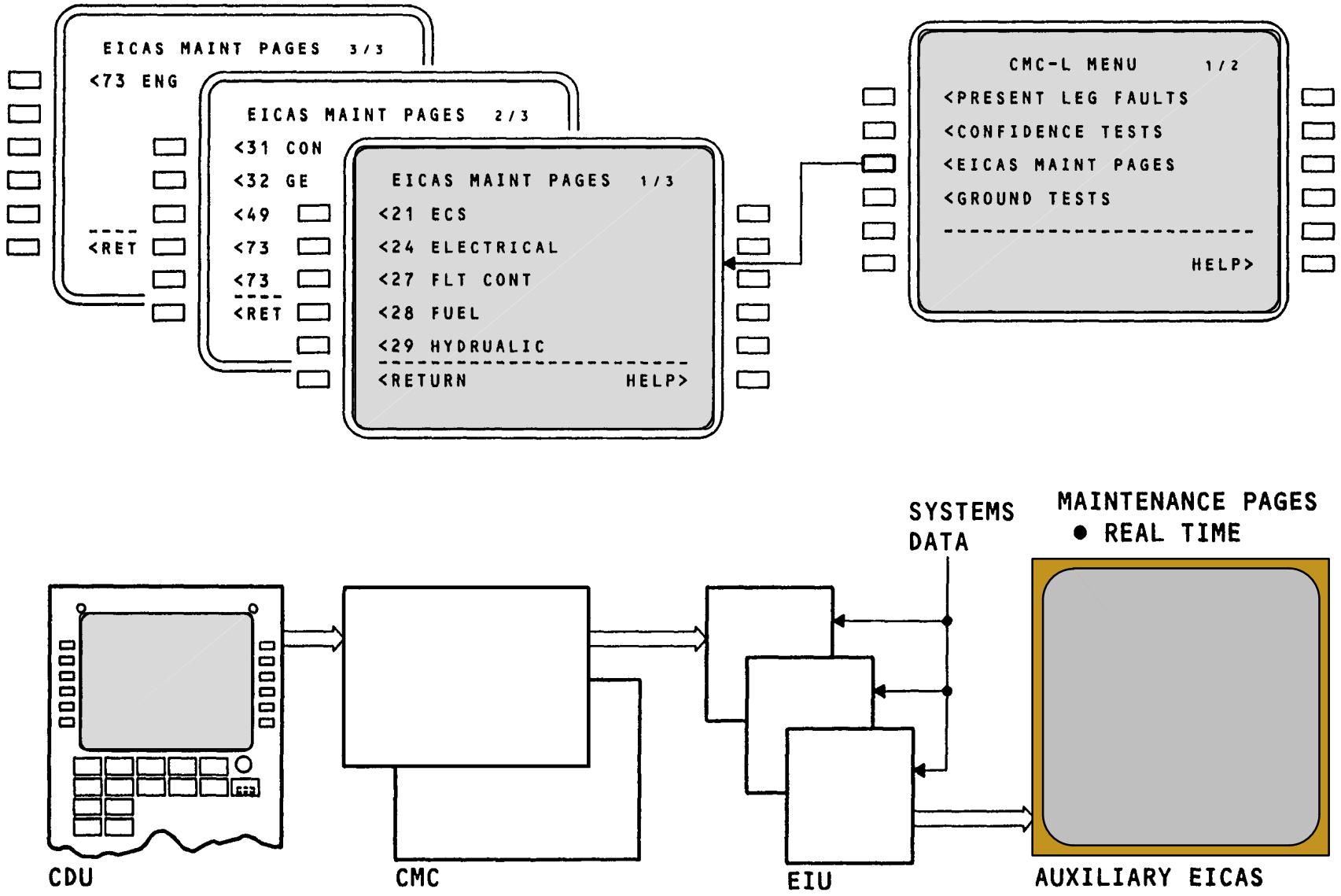


Figure 30 CMCS - EICAS MAINTENANCE PAGES

EICAS MAINTENANCE PAGE

General

If you press the line select key LSK 3L on the CMC MENU EICAS MAINTENANCE PAGES will be called.

EICAS MAINT PAGES

Data Source

The data sources for the CMC (in this example EIU-L) and EICAS (in this example EIU-L) are shown.

Selectable ATA Chapters

On the EICAS PAGE CONTROL menu the ATA-chapters for the ”EICAS MAINT PAGES” 1/3, 2/3, 3/3 can be selected.

Selectable ATA chapters:

21- ECS
24- ELECTRICAL
27- FLIGHT CONTROL
28- FUEL

29- HYDRAULIC
31- CONFIGURATI0NS
32- GEAR
49- APU

73- EPCS
73- PERFORMANCE
73- ENG EXCD

ERASE ALL

All stored snapshots will be erased.

RECORD ALL

A snapshot of all ATA chapters will be stored.

EICAS PAGE CONTROL

Modes of operation will be shown.

DISPLAY

The paramters will be shown in real time.

RECORD

The data of the selected ATA chapter are stored.
5 maintenance pages can be stored for each ATA chapter.

MANUAL SNAPSHOTS

Max. 5 SNAPSHOTS are listed.

The maint. pages can only be called when both EICAS display units are available.

AUTO SNAPSHOTS

On these pages you will see max. 5 SNAPSHOTS with

flight leg, date and time.

On the lower section of the maint. page you will see the cause of the snapshot.

ERASE SYSTEM

The snapshots of the selected ATA chapters will be erased.

REPORT

The maintenance page will be printed (EIU Software -009 and on).

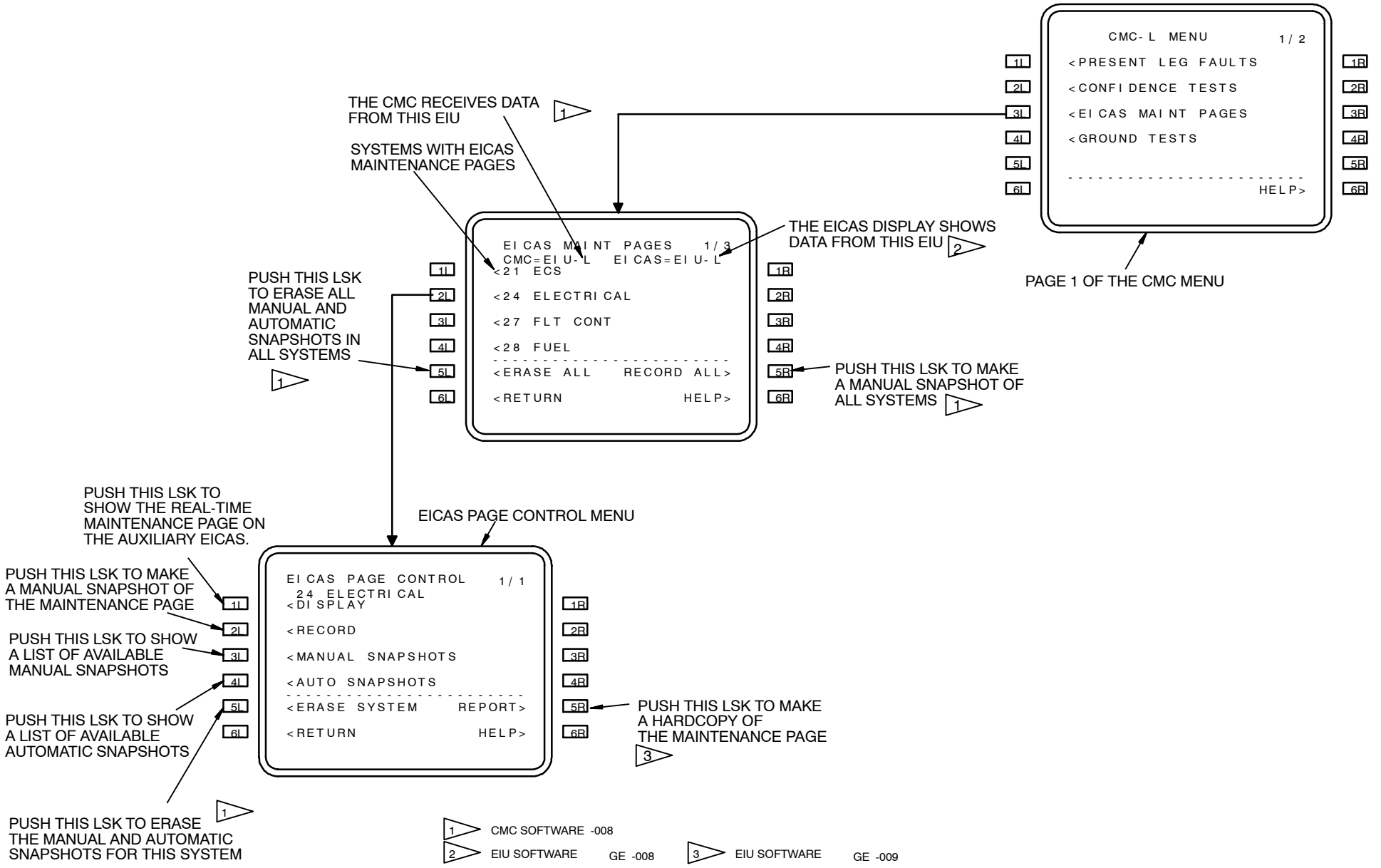


Figure 31 EICAS Maintenance Pages

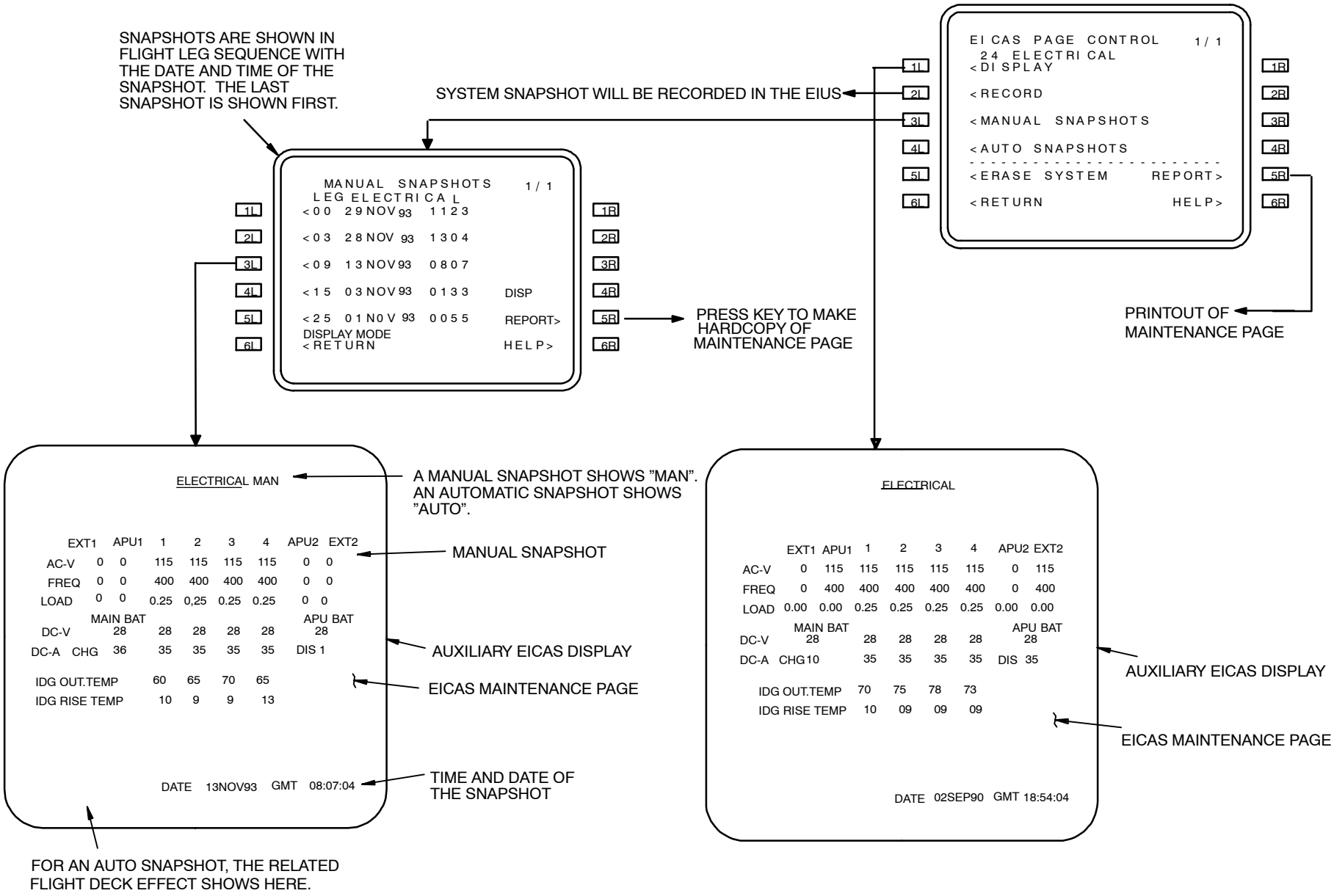


Figure 32 Maintenance Page Display

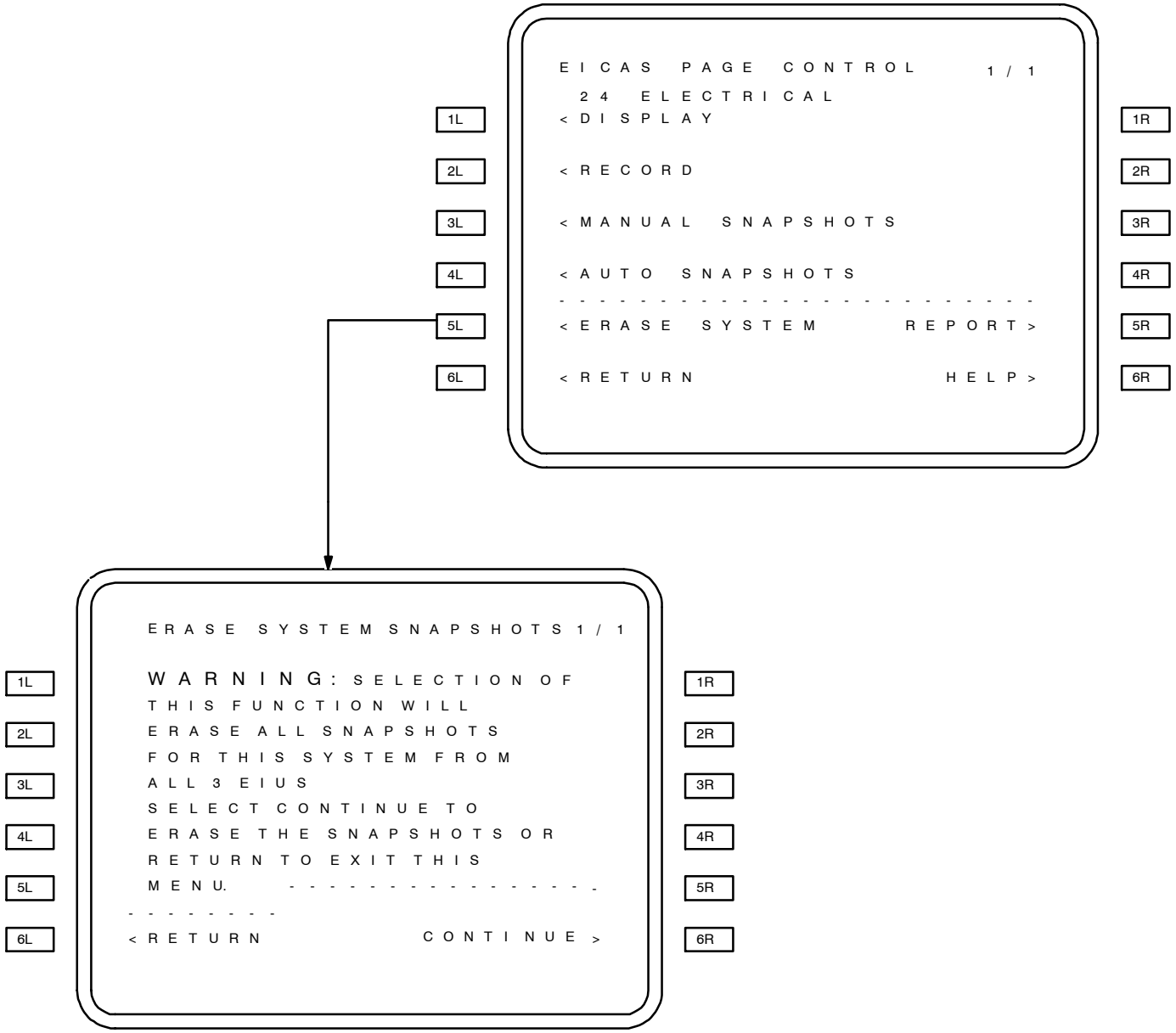


Figure 33 Snapshot Erase

MAINTENANCE PAGES PRINT-OUTS

```
EICAS MAINT PAGE - ECS AIR SUP SYS AUTO    EIU-L  PAGE 1
D-ABTC  LH575    FAJS/EDDF  685-2270-008  GE-009  06SEP95 1040


                          1        2        3        4
    HIGH PRESS CONT    OPEN     OPEN   CLOSED     OPEN
     HIGH PRESS VLV    OPEN     OPEN   CLOSED     OPEN
      PRESS REG VLV    OPEN     OPEN     OPEN     OPEN
  ENG DUCT PRESSURE      17       30       21       43
PRECOOLER OUT TEMP       95       96      148       79
       FAN AIR VLV    OPEN     OPEN   CLOSED     OPEN
       STARTER VLV  CLOSED   CLOSED   CLOSED   CLOSED
  PRESS REG S/O VLV    OPEN     OPEN     OPEN   REGLTG
        BLEED FLOW       77      101        0       61

                          L        R
MANIFOLD DUCT PRESS      15       14


      CABIN PRESSURE SYSTEM:
          CPC IN CONTROL  A
          CAB ALT     5800             RATE     -300
          LDG ALT     5500 AUTO   DELTA P      8.3




                          L        R
    OUTFLOW VALVES    0.12     0.12
                      AUTO     AUTO

                      DATE   04SEP95       GMT  16:22:10

  BLEED HP ENG 3      00-13-66-13
```

Figure 34 Maintenance Page

CMCS - GROUND TESTS MENU

The ground test function provides the ability to start a system tests from the CDU. The test results show on the CDU.

Push the line select key (LSK) next to GROUND TESTS to select the ground tests menu,

The ground tests menu shows all the systems with CMCS ground test capability.

Each ground tests systems page provides selection for up to 5 systems. The system with the lowest ATA chapter shows first, and systems with higher ATA chapter numbers show on subsequent pages.

These are the ATA chapters and major sections with CMC ground test capability:

- **Chapter 21**
  AIR CONDITIONING
  CABIN PRESSURE
  EQUIPMENT COOLING
- **Chapter 22**
  AUTOPILOT FLT DIR
  YAW DAMPER
- **Chapter 23**
  COMMUNICATIONS
- **Chapter 24**
  ELECTRICAL POWER
- **Chapter 26**
  FIRE PROTECTION
- **Chapter 27**
  FLAPS CONTROL
  STALL WARNING
- **Chapter 28**
  FUEL
- **Chapter 29**
  HYDRAULIC POWER
- **Chapter 30**
  ICE AND RAIN
- **Chapter 31**
  INDICATING/WARNING
  RECORDING
- **Chapter 32**
  BRAKE CONTROL
  PSEU SYSTEM
  TIRE PRESSURE
  BRAKE TEMPERATURE
- **Chapter 34**
  AIR DATA
  INERTIAL REFERENCE
  NAVIGATION RADIOS
  FLIGHT MANAGEMENT
- **Chapter 36**
  PNEUMATICS
- **Chapter 45**
  CENTRAL MAINTENANCE
- **Chapter 49**
  APU
- **Chapter 73**
  ENGINE FUEL & CONTROL

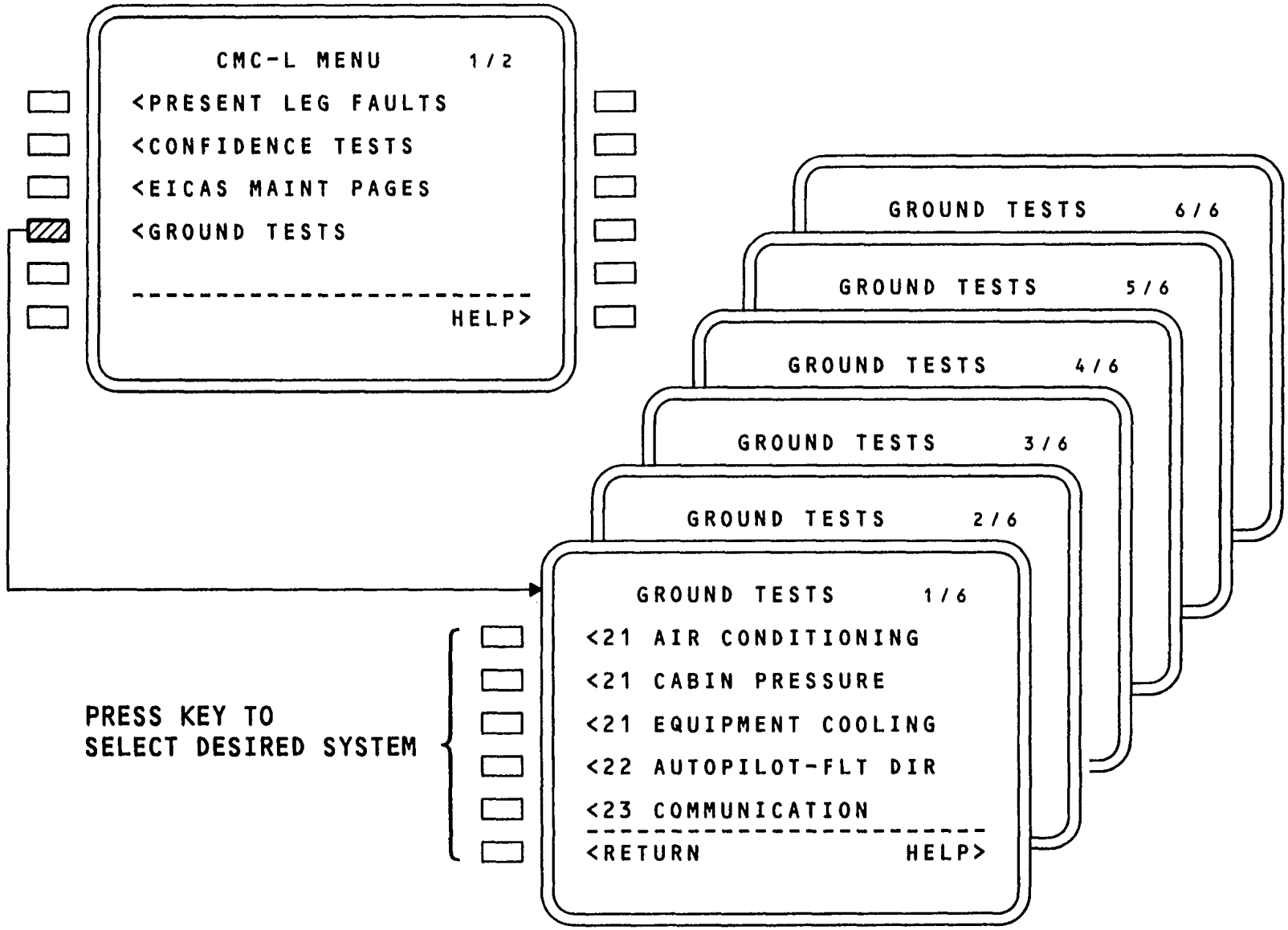


Figure 35 CMCS - GROUND TESTS Menu

CMCS - GROUND TESTS SELECTION

Push the line select key (LSK) next to the ATA chapter to show the ground tests available for that chapter and system.

For example, when the LSK next to chapter 34 NAVIGATION RADIOS is selected from the GROUND TESTS MENU, the CDU shows the components of that system that have ground tests.

To start a ground test, push the LSK next to the component or system. This causes the CMCS to send out a test command to the selected component.

Some test commands are transmitted from the left CMC on an ARINC 429 bus. When the selected component receives the test command, it sends a test acknowledge signal back to the CMC on an ARINC 429 bus. The test results go to the CMCS at the completion of the test.

Some test commands from the CMCS use analog discrete outputs instead.

During the test IN PROGRESS shows.

After the ground test is complete, PASS, FAIL or DONE shows to the right of the component.

PASS shows when the LRU responds to the CMCS with a pass indication. FAIL shows when the LRU detects a failure and sends the fault indication to the CMCS.

DONE shows for an open loop test where the LRU does not send a response to the CMCS. In this case, the LRU or system does an action and the operator must determine if it was the proper action.

The PASS or FAIL indications show until the operator returns to the CMC menu. To do the ground test again, push the LSK again.

If the < symbol does not show to the left of the component, and INHIBITED shows above the component, then that component ground test is disabled.

If the ground test fails, FAIL shows to the right of the component. Push the LSK next to FAIL to see the ground test fault message page.

For example, some possible failure indications for the DME system are:

- EIU BUS FAIL
- NO TEST RESPONSE
- TRANSCEIVER FAIL
- PROGRAM PIN FAILURE

Only one failure indication shows per page. Thus, multiple failures show on multiple pages.

The message number, ATA chapter/section, and the equipment number for the failed component shows.

If the message is correlated to a FDE, the FDE and fault code shows.

If there is more than one FDE, then the < symbol shows to the left of the FDE. Push the LSK next to the FDE to show other correlated FDEs.

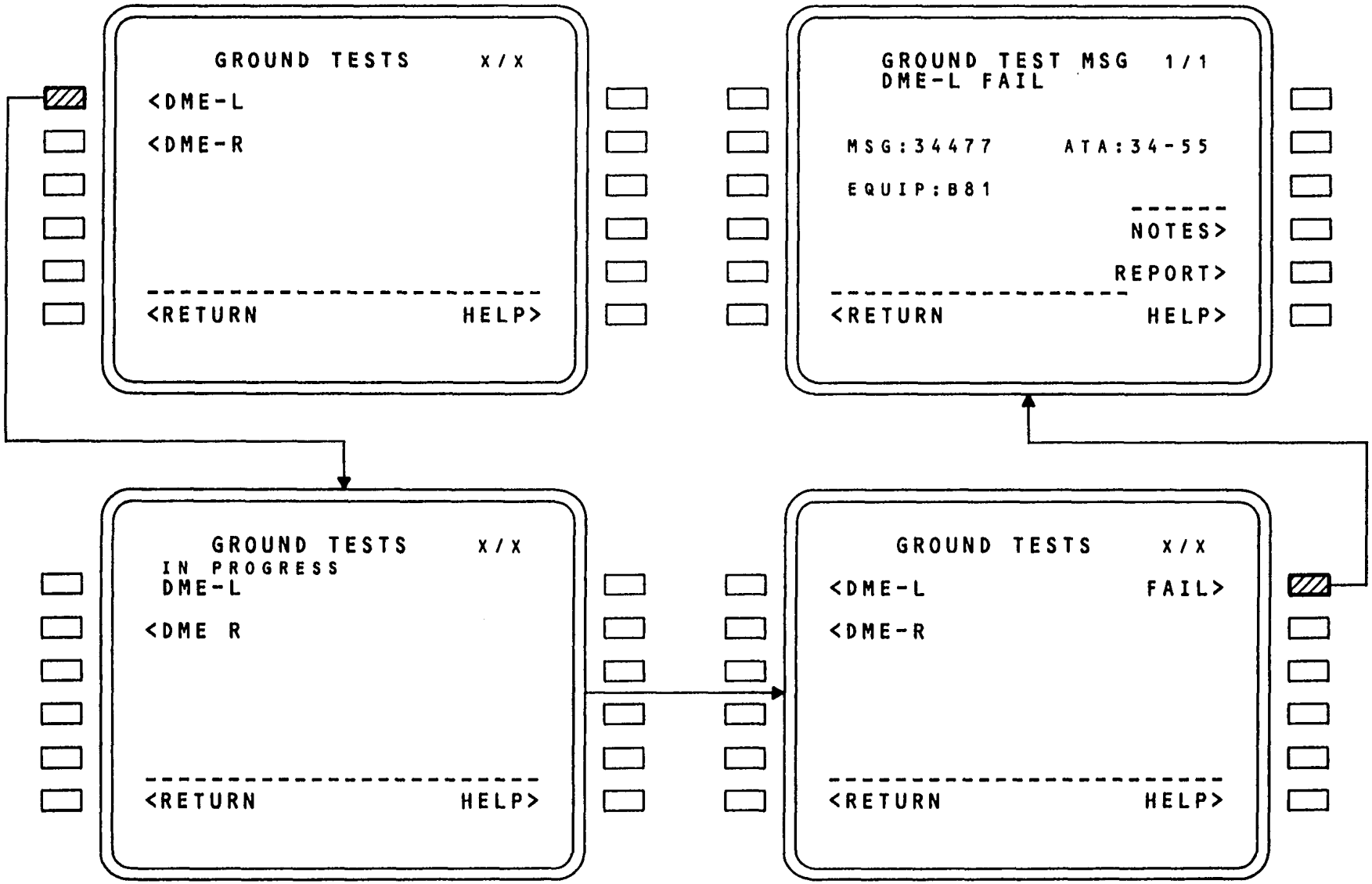


Figure 36 CMCS - GROUND TESTS Selection

CMCS - GROUND TEST - ENABLE PAGE

Many tests are inhibited under normal operation. ENABLE screens show what has to be done to start a test.

INHIBITED shows above the system or component when specific actions are required. If INHIBITED shows, the ENABLE screen shows when the LSK next to the system or component is pushed. When the cause of the inhibit is removed, push the LSK next to RETURN to return to the previous menu page. INHIBITED should now be removed.

To start a ground test now, push the LSK next to the component or system.

If a condition that would inhibit a test is removed, INHIBITED does not show above the component or system. Push the LSK next to the component or system to start the test.

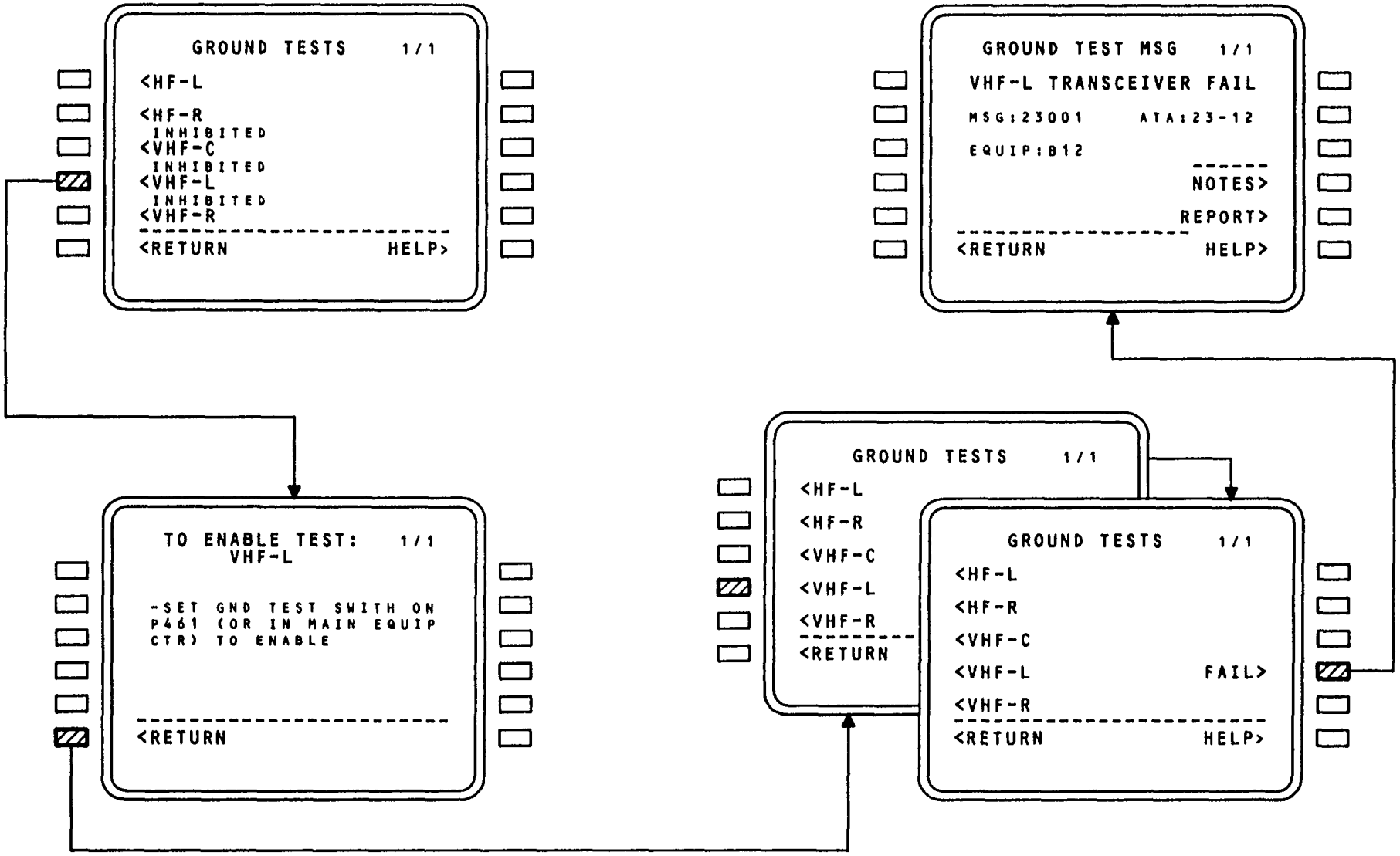


Figure 37 CMCS - GROUND TEST - Enable Page

CMCS - GROUND TEST ENABLE RELAYS

The ground test enable relays provide added protection to inhibit some LRU system tests.

There are eight ground test enable relays. The relays energize when either the GND TESTS switch or the remote GND TESTS switch is in the ENABLE position.

In the energized position, ground tests are enabled by one of two ways:

- A ground test enable discrete goes through one of the relays to the LRU.
- A CMCS ground test command discrete goes through one of the relays to the LRU.

For the air data computers (ADCs), the CMCS ground test discrete outputs go through a ground test enable relay and an air/ground relay before going to the respective ADC.

The EFIS/EICAS interface units (EIUs) monitor the status of the ground test enable relays.

When any relay is energized, the status message GND TESTS ENABLE shows on the auxiliary EICAS display. The EIUs monitor relays 4, 6, 7, and 8 directly. Other systems monitor the status of the other relays and send the information to the EIUs.

If any relay fails to energize it will be shown on the STATUS page.

The CMCS stores a fault message for the failed relay.

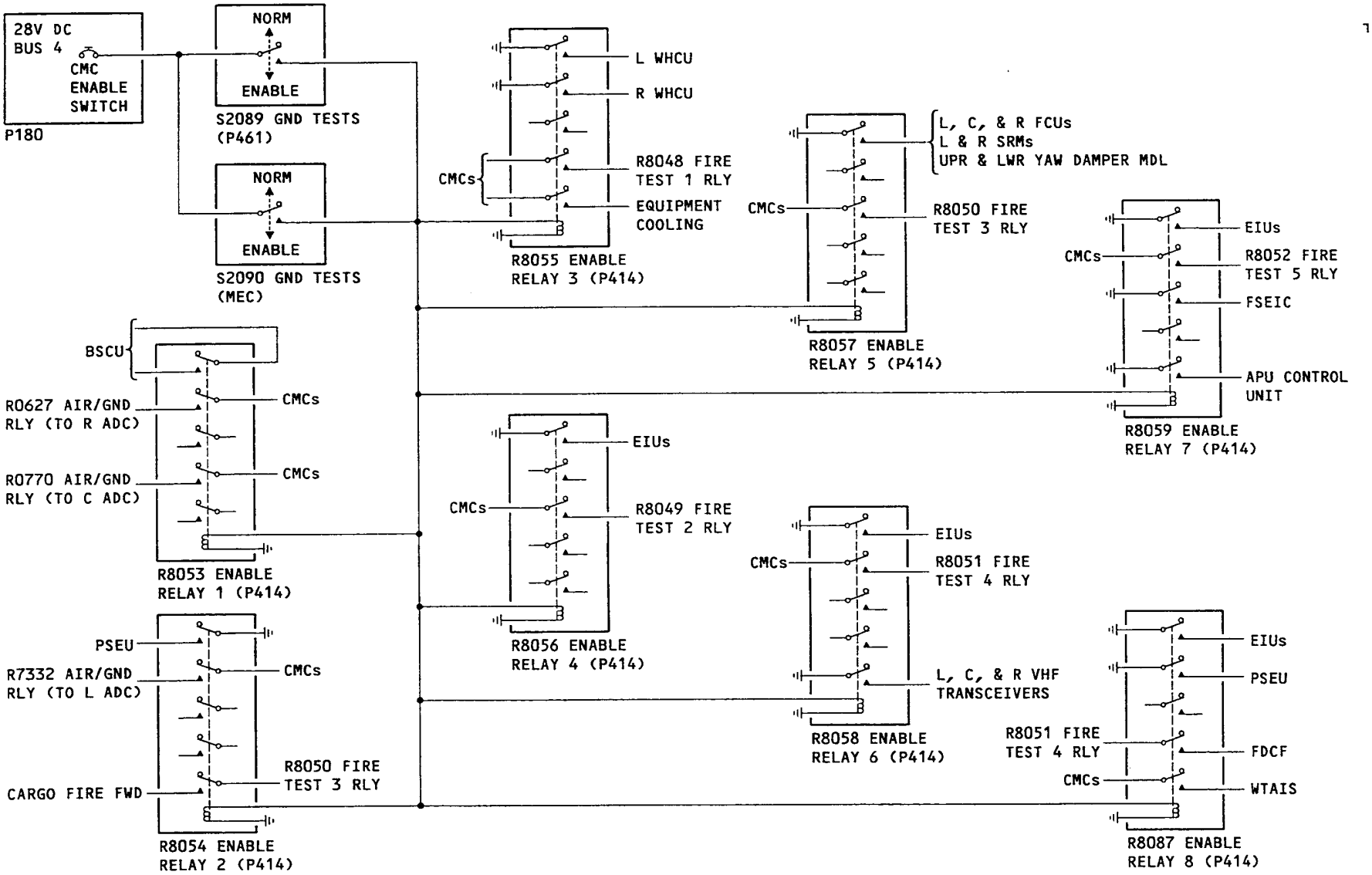


Figure 38 CMCS – Ground Test Enable Relay Diagram

CMCS - GROUND TEST - PRECONDITION PAGE

Many tests require conditions to be set before a ground test can be run. PRE-CONDITION pages show these conditions. PRECONDITION pages can also show warnings or other important information related to the ground test.

The PRECONDITION page shows automatically when some ground tests are selected. After the conditions have been met, push the START TEST key on the PRECONDITION page to start the ground test.

The PRECONDITION page always shows for the related ground tests.

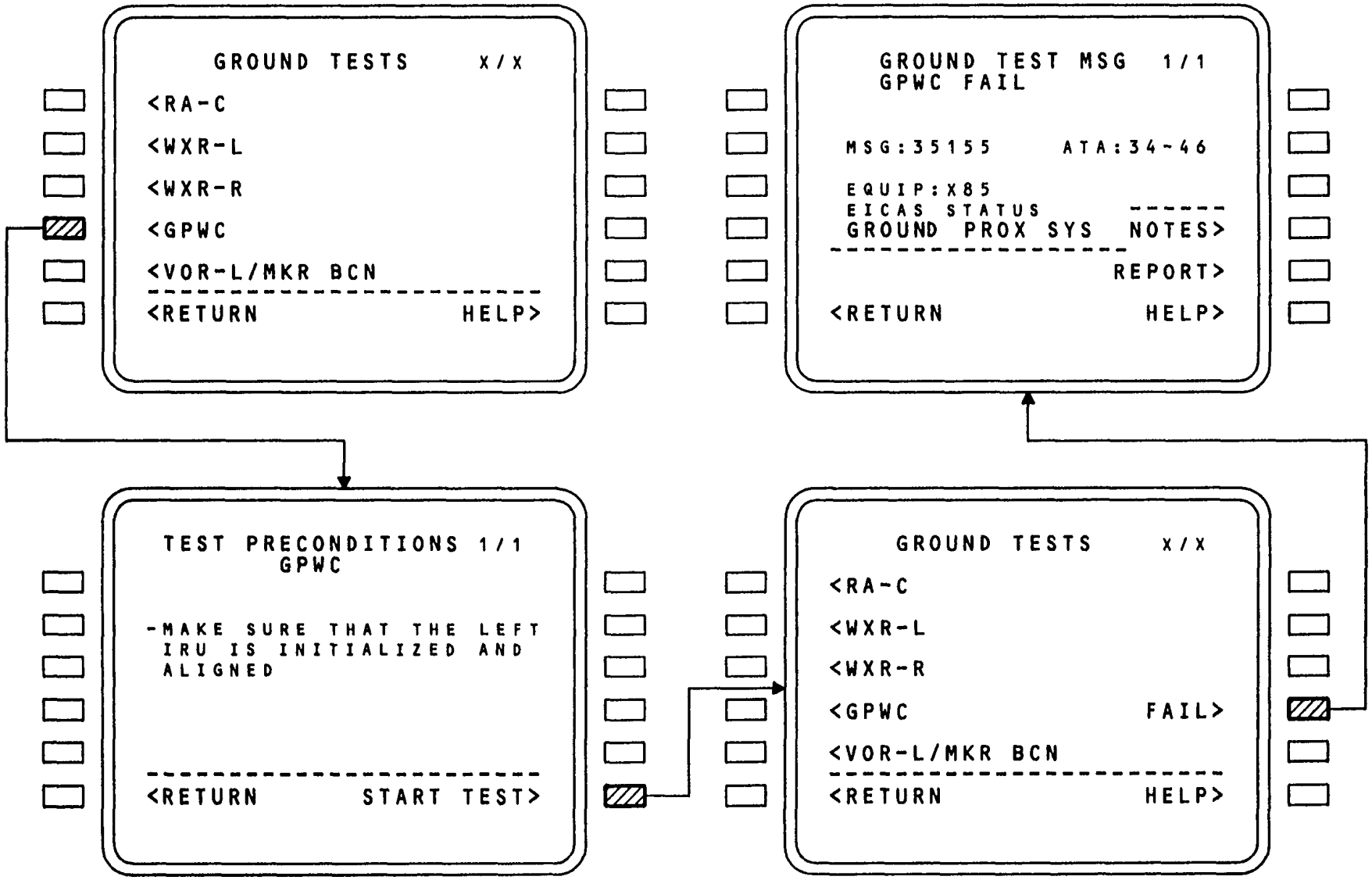


Figure 39 CMCS - TEST PRECONDITIONS Page

CMCS - EXISTING FAULTS

General

The existing faults function shows all active faults and correlated flight deck effects (FDEs).

Push the line select key (LSK) next to <EXISTING FAULTS to show the existing faults menu. The menu lists the systems that have active fault messages at the time existing faults is selected. The menu lists the systems in ATA chapter order with the lowest ATA chapter number first.

If there are existing faults for more than four ATA chapters, then the higher numbered chapters show on subsequent pages.

Push the LSK next to a system to show the existing fault messages for that system.

If there are no existing faults for any system, then NO ACTIVE FAULTS shows on the CDU.

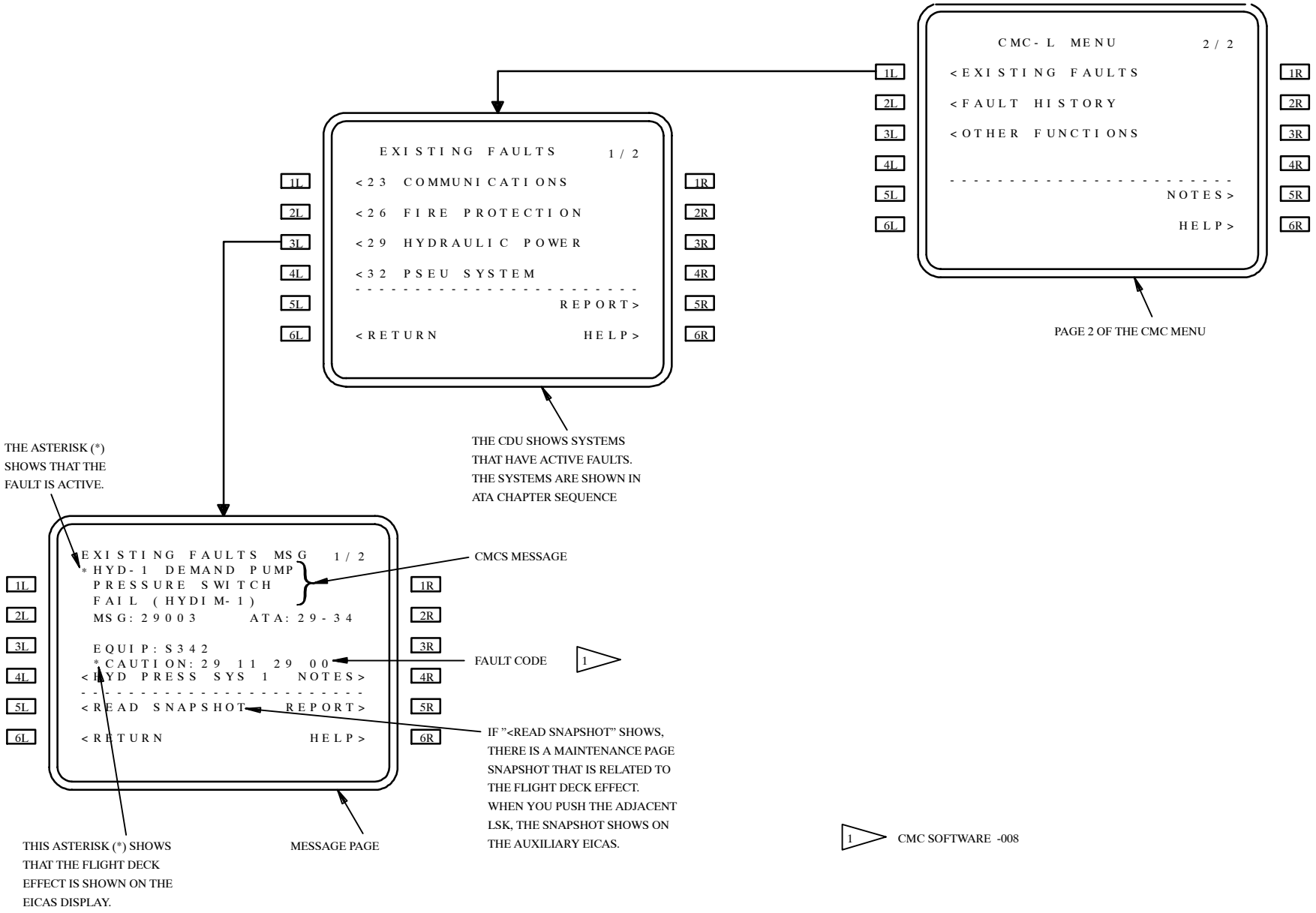


Figure 40 Existing Faults Page

Existing Faults Message

An existing faults message shows if the fault condition is active when the system is selected from the existing faults menu. If any new faults occur, they are added to the menu. If a fault clears, only the asterisk goes away until you exit existing faults.

The existing faults message pages shows information and fault messages for the selected system.

Only one existing faults message shows per page. The most recent existing fault shows on the first page, the next most recent fault shows on the second page, and so on.

Existing Faults Message Page

The existing faults message page shows:

- The CMC fault message.
- (An asterisk (*) next to the fault message indicates the fault is still active).
- The CMCS fault message number.
- The equipment number of the failed LRU.
- The wiring diagram ATA chapter and section of the failed LRU.
- The correlated FDE and fault code.

EICAS SNAPSHOTS

If a CMCS fault message is correlated to a snapshot, READ SNAPSHOT shows in 5L. To show the snapshot on the auxiliary EICAS display, push the LSK next to <READ SNAPSHOT.

REPORT

Push the LSK next to REPORT>, to show the REPORT menu.

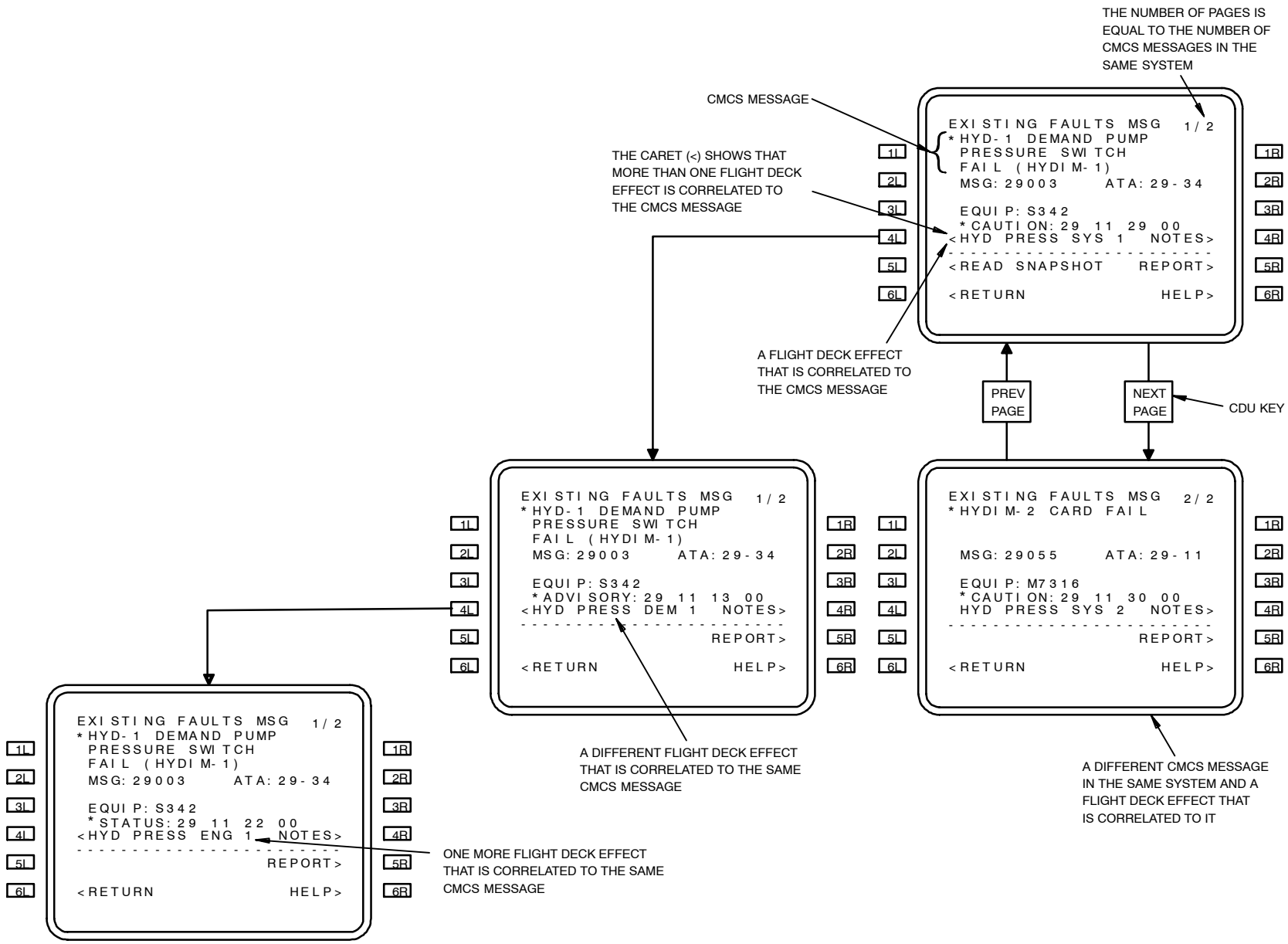


Figure 41 Existing Faults Message Page

CMCS - FAULT HISTORY

General

The fault history function shows fault messages that are stored in the CMC non-volatile memory (NVM).

Each fault message is stored in the nonvolatile memory (NVM) of the CMCS. The CMCs can store up to 500 fault messages in the NVM. If the flight leg number for a fault exceeds -99, the fault no longer shows on the CDU.

These rules apply to the addition of new faults to the NVM:

- If the NVM is not full, then the new fault is stored in the NVM and no faults are erased or overwritten.
- If the NVM contains 10 or more occurrences of the new fault, then the new fault replaces the oldest occurrence of that fault.
- If there are less than 10 occurrences of the new fault and the NVM is full, then the new fault replaces a fault in the oldest flight leg stored in NVM.

Fault History Menu

Push the LSK next to FAULT HISTORY to show the fault history menu.

The fault history menu shows a list of systems which have fault messages stored in the fault history. The systems are listed according to ATA chapter number, beginning with the lowest chapter number.

If there are more than five systems with fault messages stored in the fault history, then the higher numbered chapters show on subsequent pages.

Push the LSK next to an ATA chapter system to show a fault history summary page for the selected system.

NO FAULTS IN FAULT HISTORY shows if there are no faults in the fault history.

Fault History Summary Page

This page provides a summary of the occurrences of a particular fault.

The page contains this information:

- The CMC fault message
- A list of the flight legs during which the CMC stored an occurrence of the fault. (A maximum of 9 occurrences show)
- The hard or intermittent status of the fault

Push the LSK next to the fault message to show the most recent fault history message corresponding to the fault message.

If there are additional faults stored in fault history for the selected system, additional pages show on the CDU.

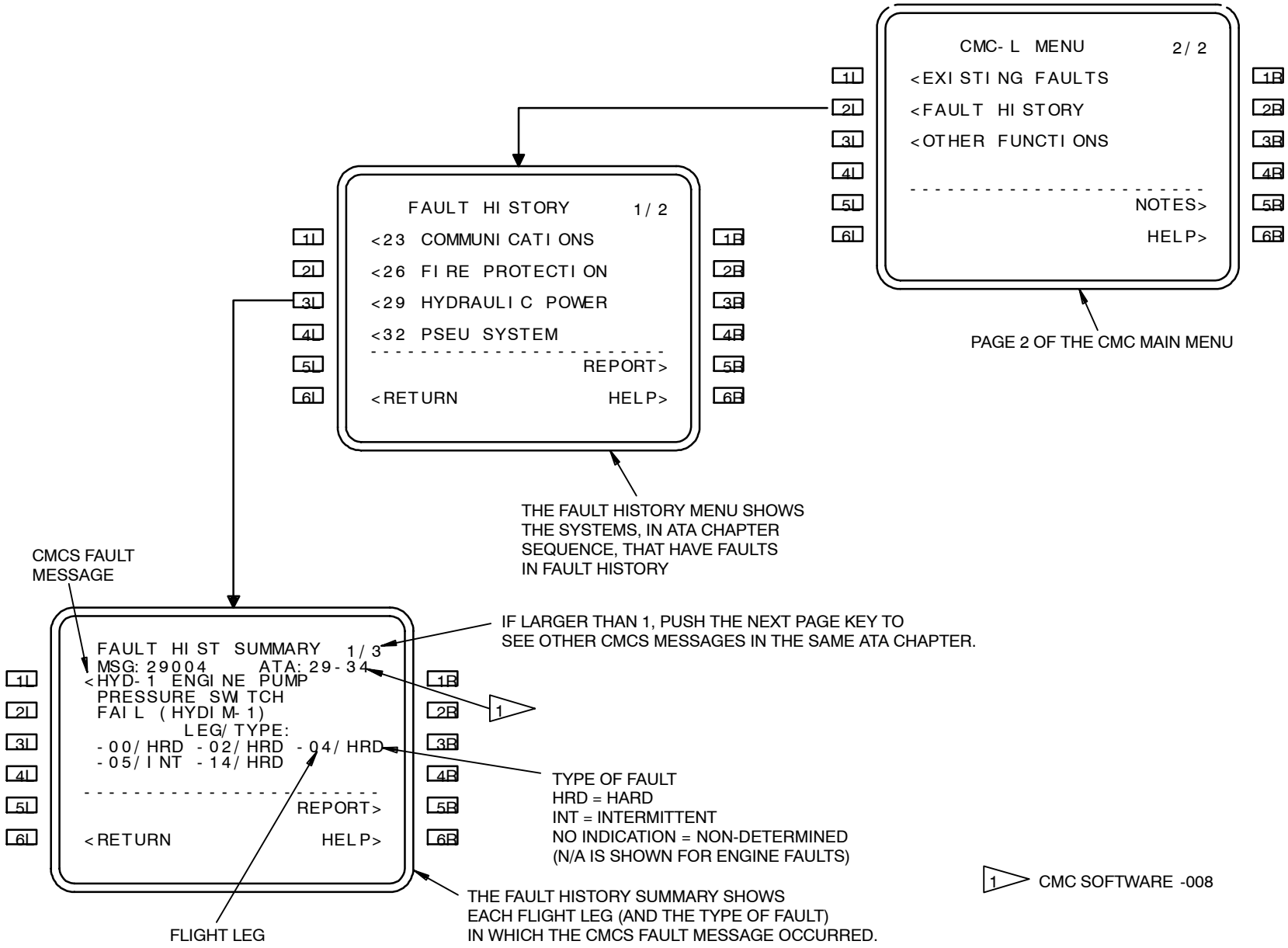


Figure 42 Fault History Summary

Fault History Message Page

This page provides information about the most recent occurrence of the fault selected from the fault history summary page. Additional occurrences of the fault are listed on subsequent pages. The fault message is similar to present leg fault messages.

The page contains this information:

- The CMC fault message.
- The fault message number (reference to the Fault Isolation Manual).
- The date and time (UTC) when the fault first became active.
- The ATA chapter and section of associated wiring diagrams.
- The flight phase and flight leg when the fault occured.
- A hard (HRD) or intermittent (INT) designation.
- The equipment number associated with the failed LRU.
- The FDE correlated to the fault message (if there is one)
- A brief description of the FDE

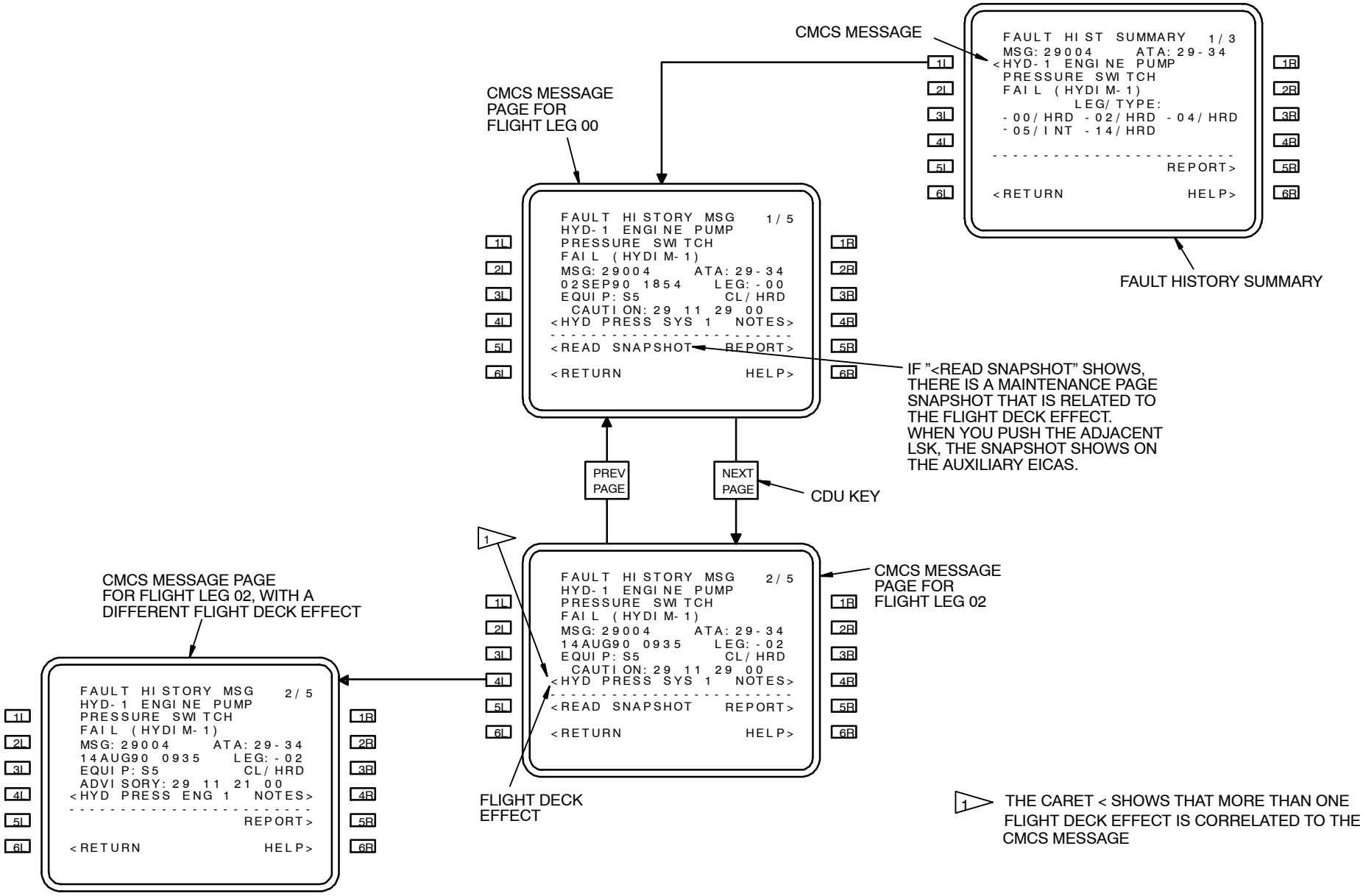


Figure 43 Fault History Message Page

CMCS - FAULT HISTORY SUMMARY AND FAULT HISTORY MESSAGE

Fault History Summary Page

This page provides a summary of the occurrences of a particular fault.

The page contains this information:

- The CMC fault message
- A list of the flight legs during which the CMC stored an occurrence of the fault. (A maximum of 9 occurrences show)
- The hard or intermittent status of the fault

Push the LSK next to the fault message to show the most recent fault history message corresponding to the fault message.

If there are additional faults stored in fault history for the selected system, additional pages show on the CDU.

Fault History Message Page

This page provides information about the most recent occurrence of the fault selected from the fault history summary page. Additional occurrences of the fault are listed on subsequent pages. The fault message is similar to present leg fault messages.

The page contains this information:

- The CMC fault message.
- The fault message number (reference to the Fault Isolation Manual).
- The date and time (UTC) when the fault first became active.
- The ATA chapter and section of associated wiring diagrams.
- The flight phase and flight leg when the fault occured.
- A hard (HRD) or intermittent (INT) designation.
- The equipment number associated with the failed LRU.
- The FDE correlated to the fault message (if there is one)
- A brief description of the FDE

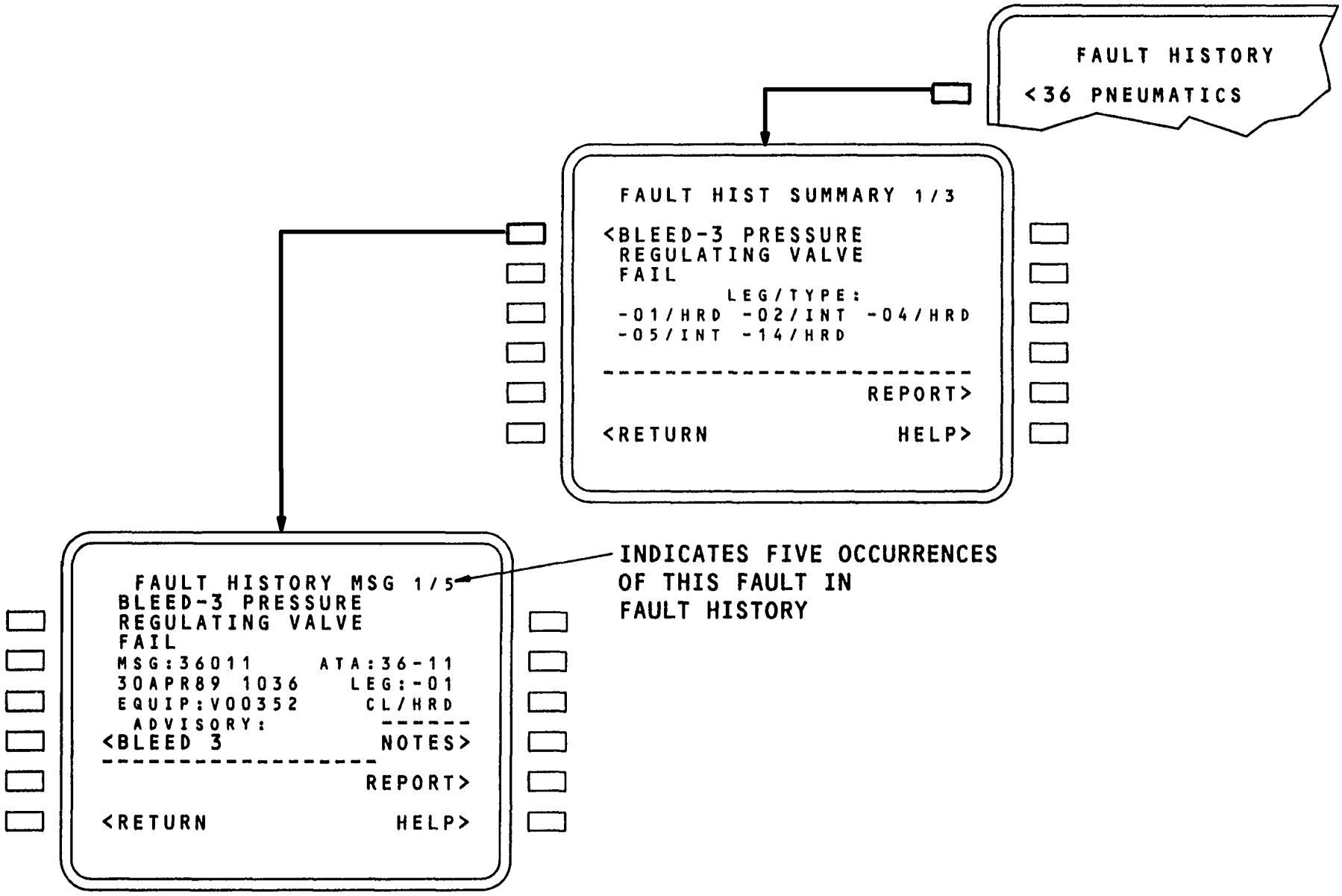


Figure 44 CMCS - FAULT HISTORY SUMMARY AND FAULT HISTORY MESSAGE

CMCS - FAULT HISTORY DISAGREE

General

The left and right CMCs continuously compare their fault histories. Any disagreement in the fault history causes:

- The message FAULT HISTORY DISAGREE to show on the CDU scratch pad.
- XLOAD to show on the CMC menu (PG2) next to FAULT HISTORY.

Automatic Fault History Erase

Both CMCs receive the airplane tail ID number from the EFIS/EICAS interface units (EIUs). The CMCs store the tail ID number in NVM. When each CMC powers up, it checks the stored tail ID number with the number it is currently receiving from the EIUs. If the numbers do not match, the fault history for that CMC is automatically erased.

Manual Fault History Crossload

To start the crossload process:

- Push the LSK next to XLOAD to show the XLOAD menu
- Push the respective LSK to start the crossload process (left CMC to right CMC or right CMC to left CMC)

NOTE: THE FAULT HISTORY CROSSLOAD FUNCTION DOES NOT OPERATE FOR VERSIONS -006, -007, AND -902 CMCS SOFTWARE. THUS, IF A CMC IS REPLACED, IT SHOULD BE INSTALLED IN THE RIGHT POSITION.

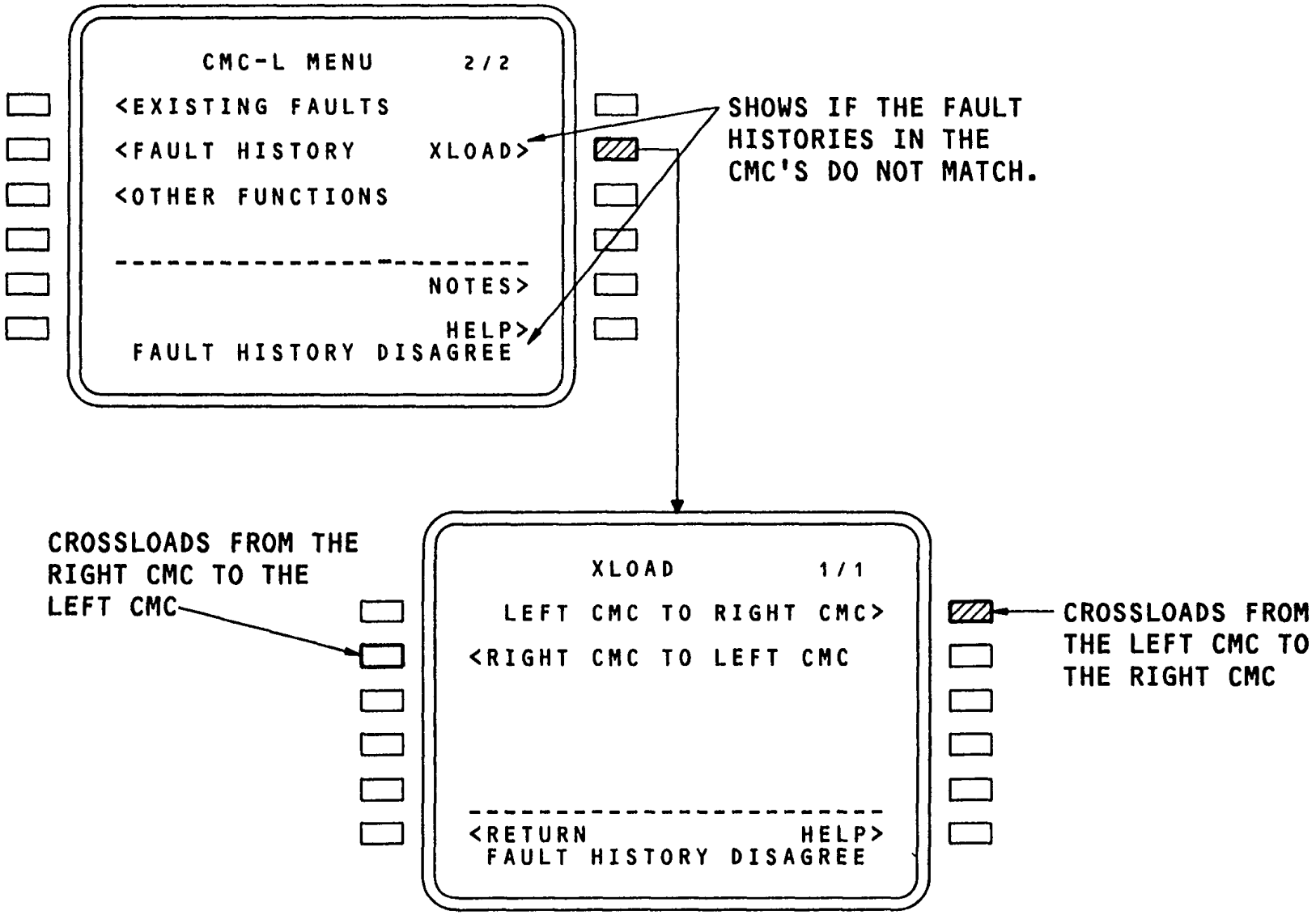


Figure 45 CMCS - FAULT HISTORY DISAGREE

AIRBORNE DATA LOADER

General

The airborne data loader can be used to load software into an LRU that is software data loadable. For some systems the ADL is also used for data download from specified LRU

Software Installation

The software that is loaded into an LRU is stored on a 3 1/2 inch floppy diskette. More than one diskette may be required to complete the software installation. The software can only be loaded while the airplane is on the ground.

Some systems have more than one LRU that is software data loadable. These LRUs are independently selected at the data loader control panel. In most cases, when multiple LRUs must contain the same software the diskettes must be loaded into each LRU.

AIRPLANES WITH DISKETTE STORAGE BOX

The diskettes can be kept in a diskette storage box at the P11 first observer's console panel. There is space for 15 diskettes.

Data Download

The ADL can download and record data on diskette for the FMC, CMC or the ACMS. A configuration file on the diskette identifies the LRU.
The data download can be done while the airplane is on the ground.

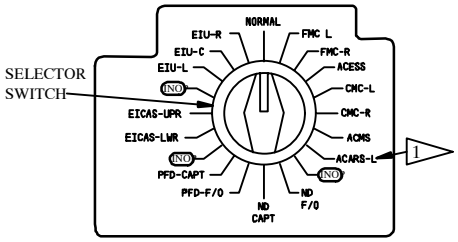
Data Loader Operation

When power is supplied, the ADL does a self-test that automatically tests

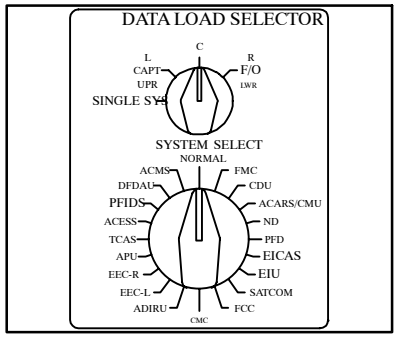
the correct operation of the internal hardware and software. If the self-test fails, the ADL FAIL indicator comes on.

After the data loader is energized, if a diskette is not installed, the data loader remains in a ready condition. When a diskette is put into the disk drive, the ADL will try to communicate with the LRU set on the data loader selector switch. After four failed tries, the applicable indicator on the ADL comes on and the tries at communication stop. Remove and put the diskette back into the disk drive to start the communications between the data loader and the applicable LRU again.

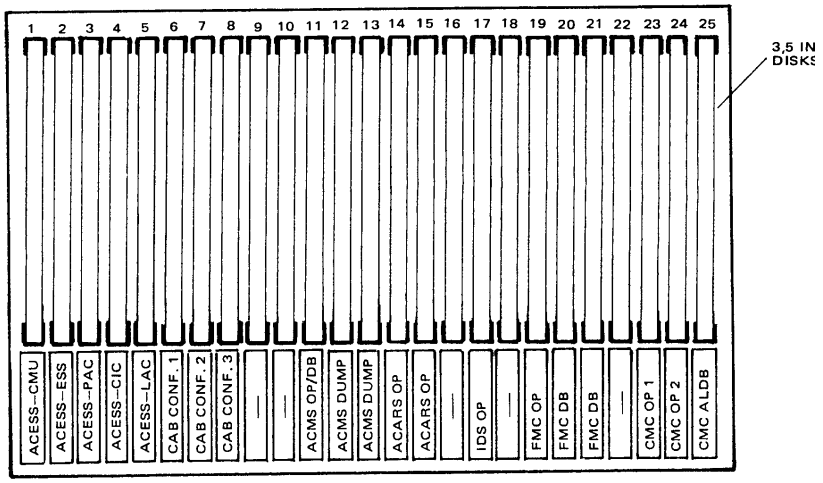
Detailed description of the data loader is in the maintenance manual ATA chapter 34-61.



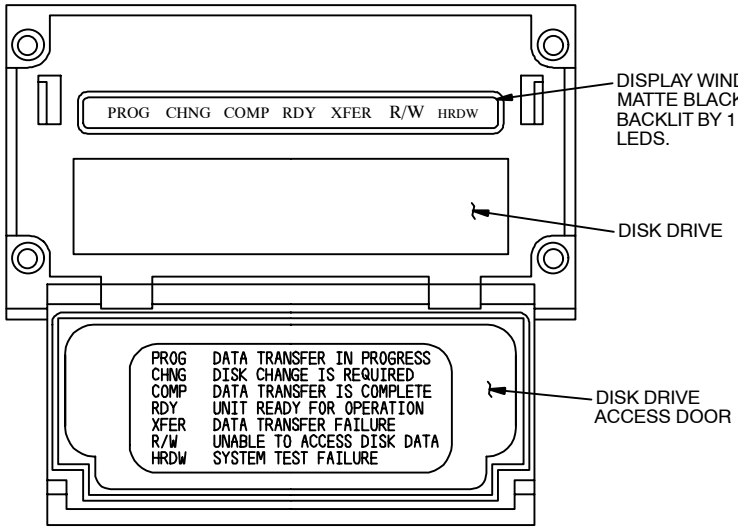
DATA LOADER CONTROL PANEL



DATA LOADER CONTROL PANEL 2



DISKETTE STORAGE BOX



AIRBORNE DATA LOADER

1 AFA 201-270; DLH 001-011, 018-124
2 AFA 271-999; DLH 012-017, 125-999

Figure 46 Airborne Data Loader and Disk Storage

CMCS - CROSSTALK AND SOFTWARE DATA LOADER INTERFACE

Crosstalk

The left and right CMCs monitor each other through crosstalk buses. This allows them to monitor for failure conditions and to compare fault histories.

Software Data Loader

The CMCS software may be loaded on or off the airplane. The software data loader allows the CMCS software to be loaded on the airplane. The CMCS software consists of two parts:

- Operational software (the operating software which causes the CMCs to perform all their normal functions).
- Airline database software (NOTES/ HELP text that is airline unique data to aid the operator with various information during CMCS operation).

Only one CMC can be loaded at a time. To program a CMC, select a CMC with the software data loader switch. The software data loader sends a ground enable discrete through the switch to the selected CMC. The data output of the software data loader goes to both CMCs. The selected CMC reads the data input and sends a data accept response out on its crosstalk output. The crosstalk output goes through the software data loader switch to the software data loader. This starts the data transfer. Since the other CMC does not receive the enable discrete, it ignores its software data loader input. Loading indications show on the software data loader front panel.

Data Download

Fault data can be recorded onto a floppy disk inserted in the software data loader. This is part of the normal data output and uses the same output as the printer. It does not pass through the software data loader switch.

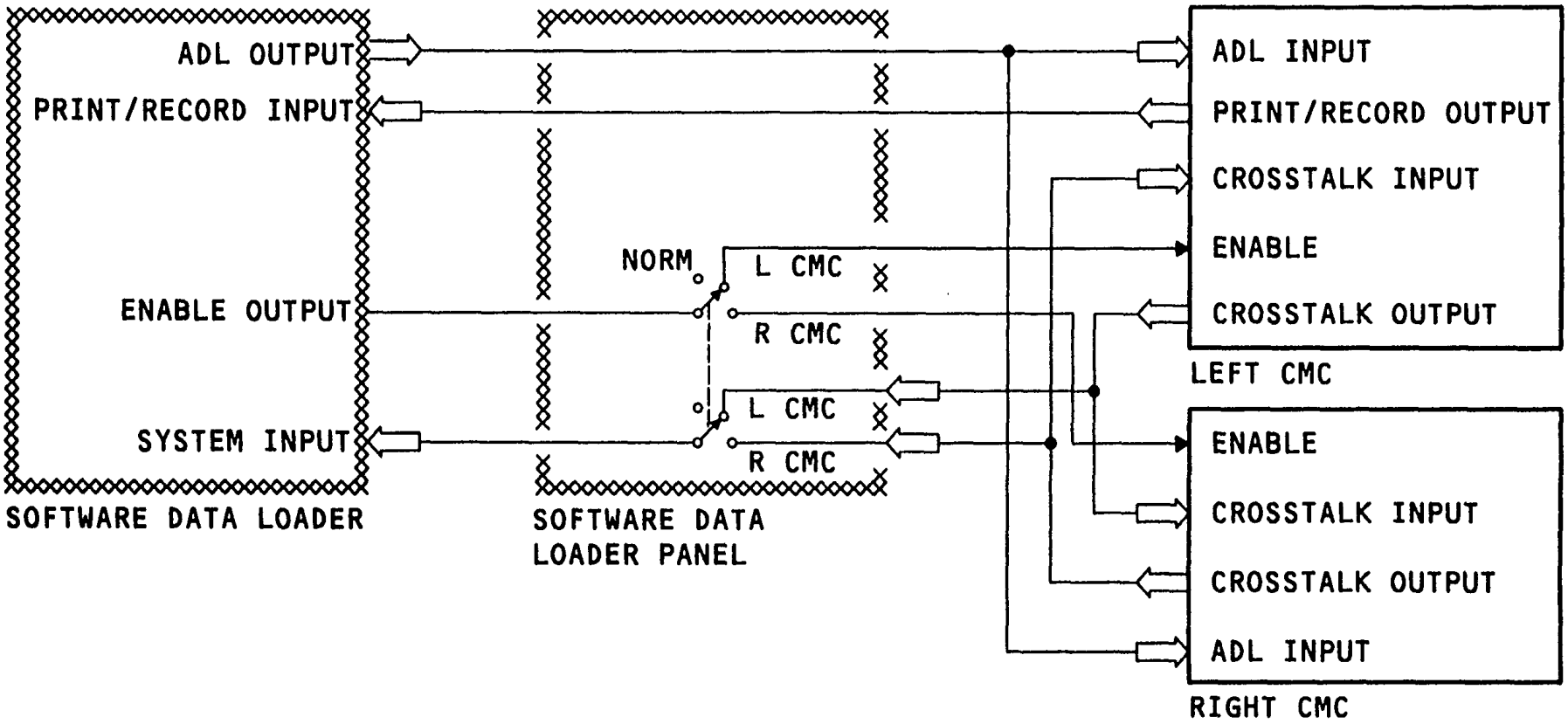


Figure 47 CMCS - CROSSTALK AND SOFTWARE DATA LOADER INTERFACE

REMOVAL OF FAULT HISTORY

NOTE: These functions may be deactivated by the option codes.

To remove all occurrences of one CMCS fault message from fault history, do these steps:

- Show the FAULT HIST SUMMARY page for the CMCS fault message to be erased.
- Push the LSK that is adjacent to <ERASE.

To remove all CMCS fault messages from fault history, do these steps:

- Show page 2 of the CMC MENU.
- Use the alpha-numeric keys on the CDU to put ERASE-FH-ALL in the CDU scratchpad (the bottom of the CDU screen).
- Push the LSK that is adjacent to <FAULT HISTORY.

NOTE:

IN PROGRESS shows above <FAULT HISTORY while the CMC erases fault history.
When all messages are erased, ERASE COMPLETE shows above <FAULT HISTORY.

GLOBAL STATUS ERASE

To remove all status messages press <ERASE STATUS at the lower end of the PRESENT LEG fault page.

Use this function only if all systems shown are repaired.

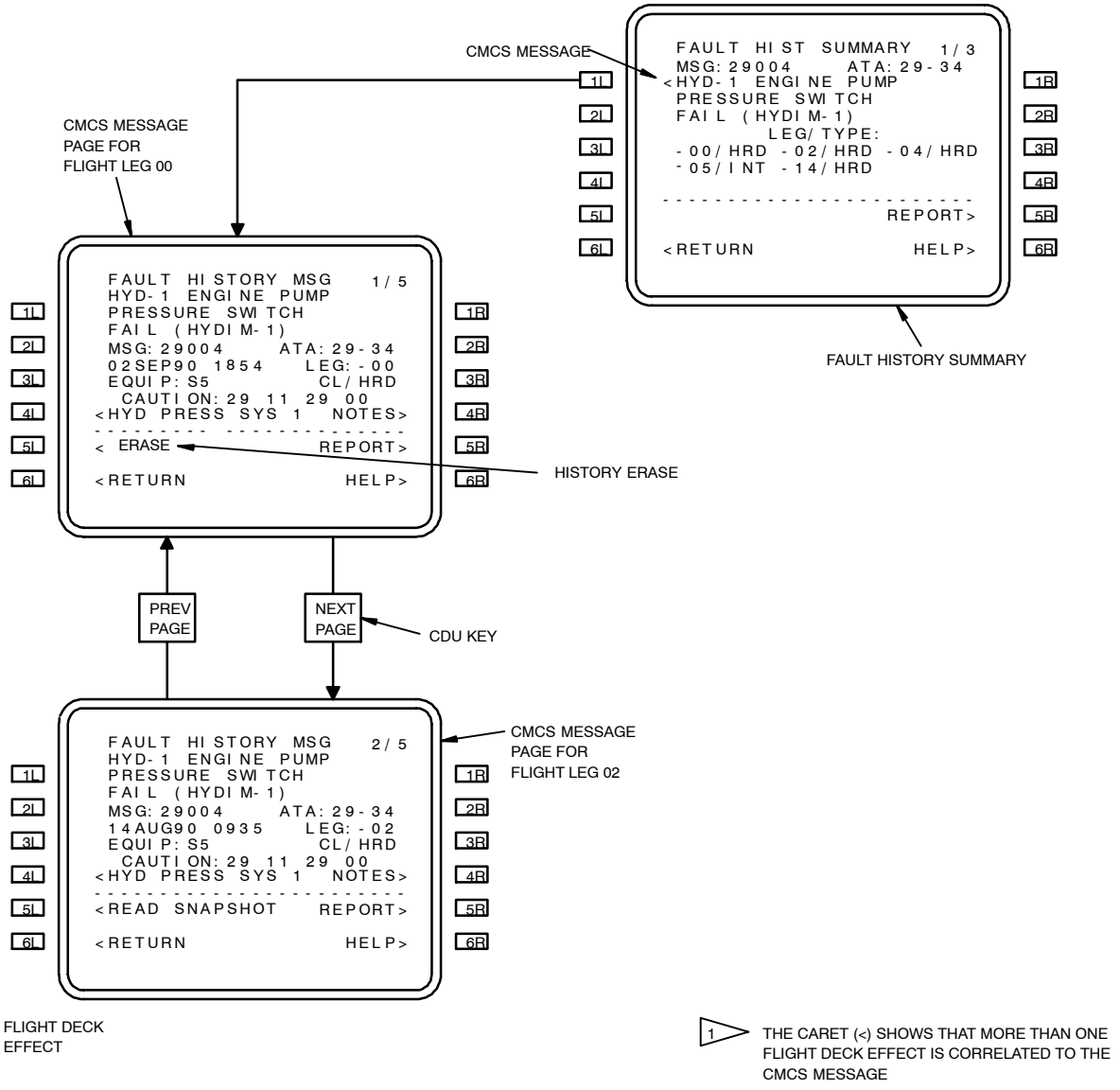


Figure 48 Fault History Message Page

CMCS - FAULT MESSAGE TYPES

General

There are four basic types of CMCS fault messages. They are:

- LRU internal fault messages
- LRU faults reported by other LRUs.
- Interface faults
- Other messages

LRU Internal Fault Messages

Most LRUs do a continuous BITE. The BITE monitors the internal operation of the LRU. Many of these LRUs send the status of the continuous BITE directly to the CMCS or through the EFIS/EICAS interface units (EIUs) to the CMCS.

LRU Faults Reported by Other LRUs

Some systems do a continuous BITE and report the status of the BITE to another LRU. The other LRU reports the status to the CMCS.

Some systems drive electro-mechanical or mechanical devices. These systems monitor the operation of the devices. If a failure of the device occurs, the LRU that controls the device reports the failure to the CMCS.

Interface Faults

Many systems interface with each other on ARINC 429 data buses. The activity of each bus is monitored by LRUs receiving data on the ARINC 429 bus. If a receiving LRU stops receiving data on the bus, it reports the loss of activity to the CMCS.

The CMCS records the interface faults as a BUS FAIL message. When many buses fail, the CMCS has additional logic to isolate the cause of the failure and consolidates the failures into one message. This is called ”bus fault consolidation”.

Other Messages

There are some messages that do not fall into the above categories. Some examples are:

- NO TEST RESPONSE
- EECS NOT POWERED
- PRINTER OUT OF PAPER

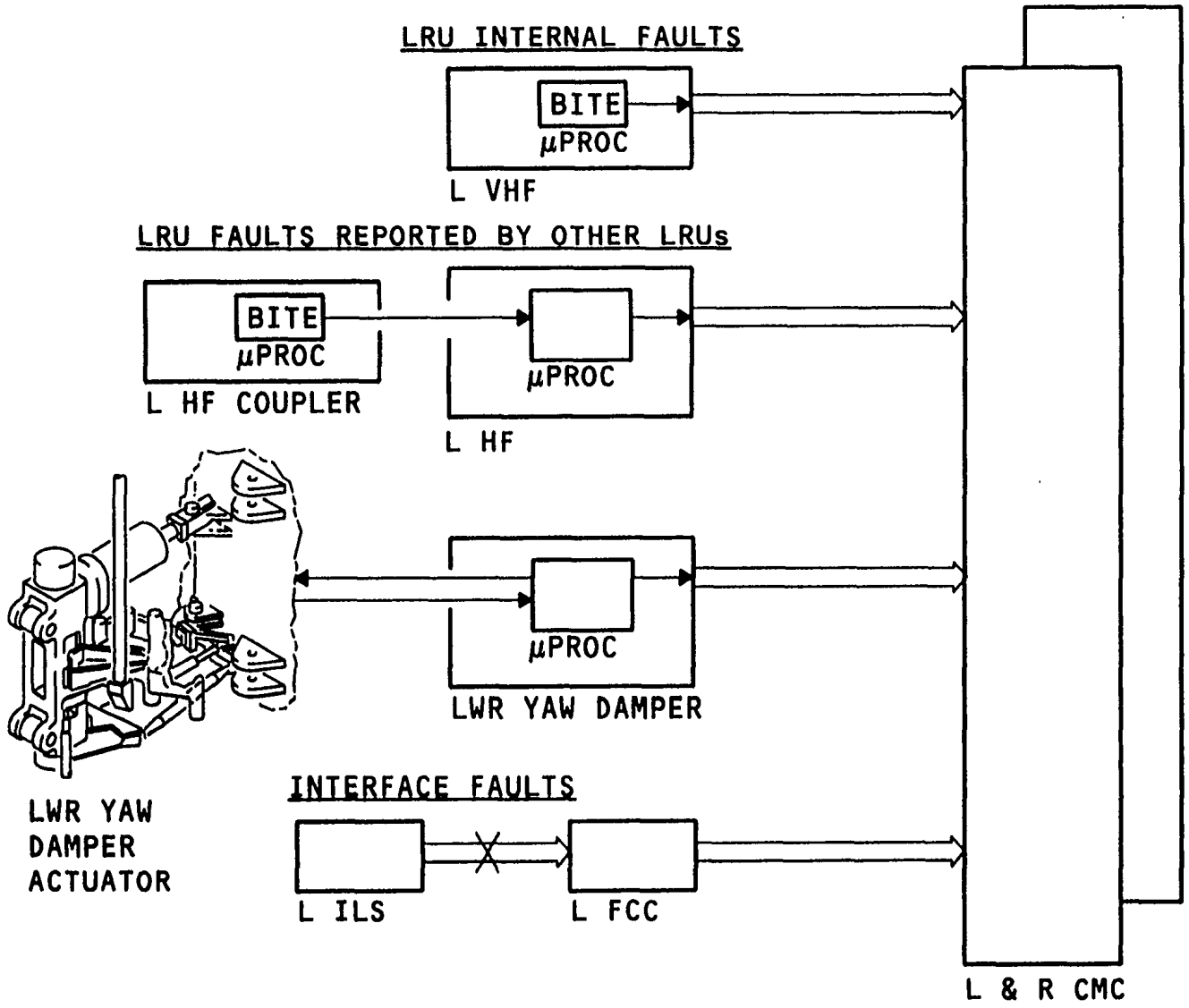


Figure 49 CMCS - Fault Message Types

CMCS - BUS FAULT CONSOLIDATION

General

The CMCS uses ARINC 429 bus failure information to identify the most probable cause of a failure.

Most LRUs that get ARINC 429 inputs report the status of the input to the CMCS. If the CMCS receives reports of several failures about one ARINC 429 output, the CMCS determines that the cause of the failure is most likely the source and consolidates the multiple failures into one message.

No Bus Outputs (Fault 1)

If a LRU has multiple ARINC 429 outputs and if all receiving LRUs on all outputs report their input as failed, the CMCS determines that the source has failed. It sets a message of the form: LRU-X FAIL (NO BUS OUTPUTS).

LRU Fail or Output Fail (Fault 2)

If a LRU has multiple ARINC 429 outputs and if all receiving LRUs on one output report their input as failed, the CMCS determines there are two possible failures. The two possible failures are:

- The ARINC 429 transmitter is failed.
- A common piece of wiring is shorted or open. The CMCS sets a message of the form: LRU-X FAIL or LRU-X OUTPUT BUS 2 FAIL.

For LRUs that have only one ARINC 429 output and all receiving LRUs report their inputs failed, the CMCS sets a similar message. Its form is the same as above except the output bus is not assigned a number.

Receiving LRU Fail or Input Fail (Fault 3)

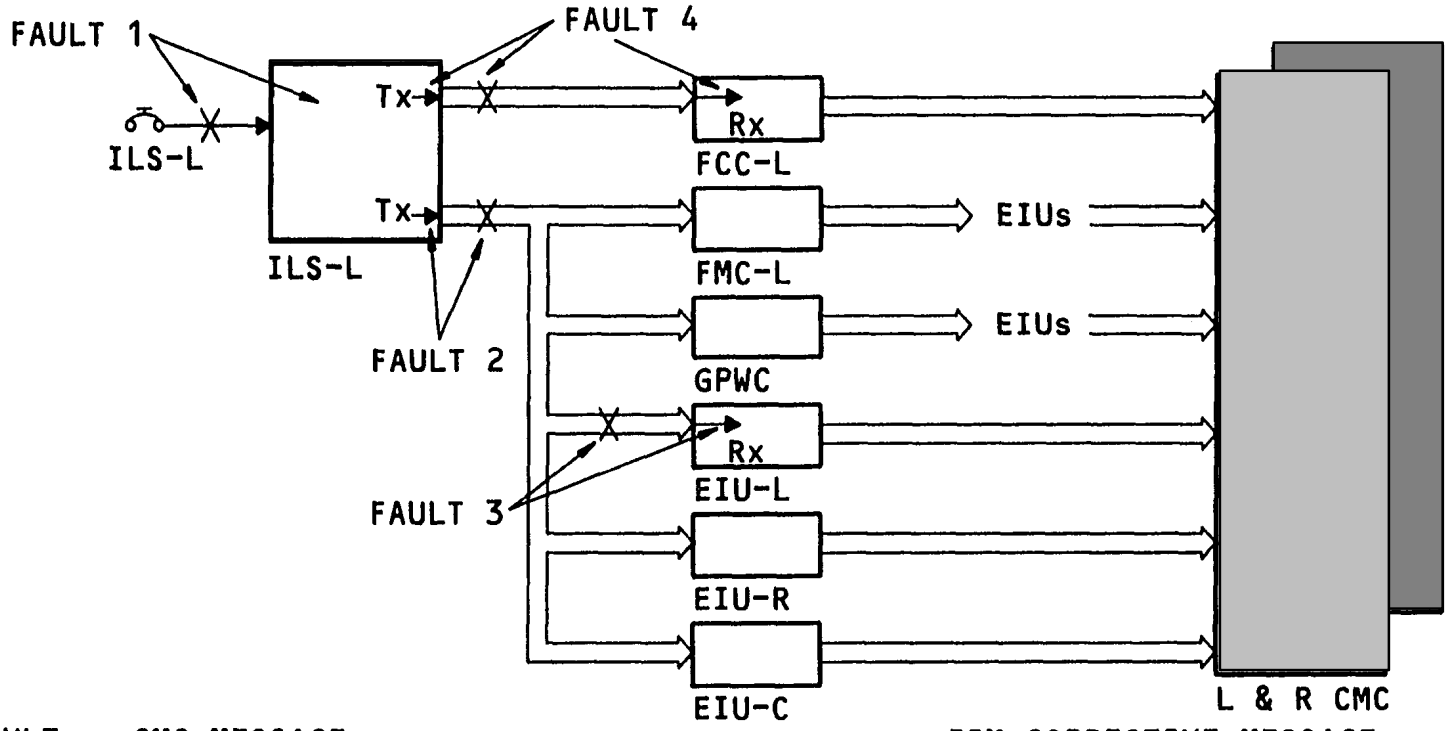
If only one of multiple receiving LRUs reports its input as failed, the CMCS determines there are two possible failures. The two possible are:

- the ARINC 429 receiver is failed.
- a unique piece of wiring is shorted or open. The CMCS sets a message of the form: LRU-Y FAIL or LRU-LRU-Y BUS FAIL.

LRU to LRU Bus Fail (Fault 4)

If there is only one receiving LRU on a bus and the receiving LRU reports its input as failed, the CMCS cannot isolate the cause of the failure. There are three possible failures:

- the source is failed.
- the ARINC 429 receiver is failed.
- the wiring between the two is shorted or opened.
  The CMCS sets a message of the form: LRU-X -- LRU-Y BUS FAIL.



FAULT	CMC MESSAGE	FIM CORRECTIVE MESSAGE
1	ILS-L FAIL (NO BUS OUTPUTS)	REPLACE LEFT ILS
2	ILS-L FAIL OR ILS-L OUTPUT BUS 2 FAIL	1. REPLACE LEFT ILS 2. CHECK ILS-L OUTPUT BUS 2 WIRING
3	EIU-L FAIL OR ILS-L~ EIU-L BUS FAIL	1. REPLACE LEFT EIU 2. CHECK WIRING
4	ILS-L~ FCC-L BUS FAIL	1. REPLACE LEFT ILS 2. REPLACE LEFT FCC 3. CHECK WIRING

Figure 50 CMCS - Bus Fault Consolidation

CMCS - SHOP FAULTS

The shop faults function shows LRU stored internal fault data.

Push the LSK next to SHOP FAULTS to show the shop faults menu.

This menu provides access to systems which have LRUs with accessible shop fault data.

Push the LSK next to a system to show all LRUs that have accessible shop fault data for that system. Push the LSK next to a particular LRU to show the shop faults for that LRU on the shop faults data page. The particular shop faults available for the different LRUs are found in the component maintenance manual (CMM).

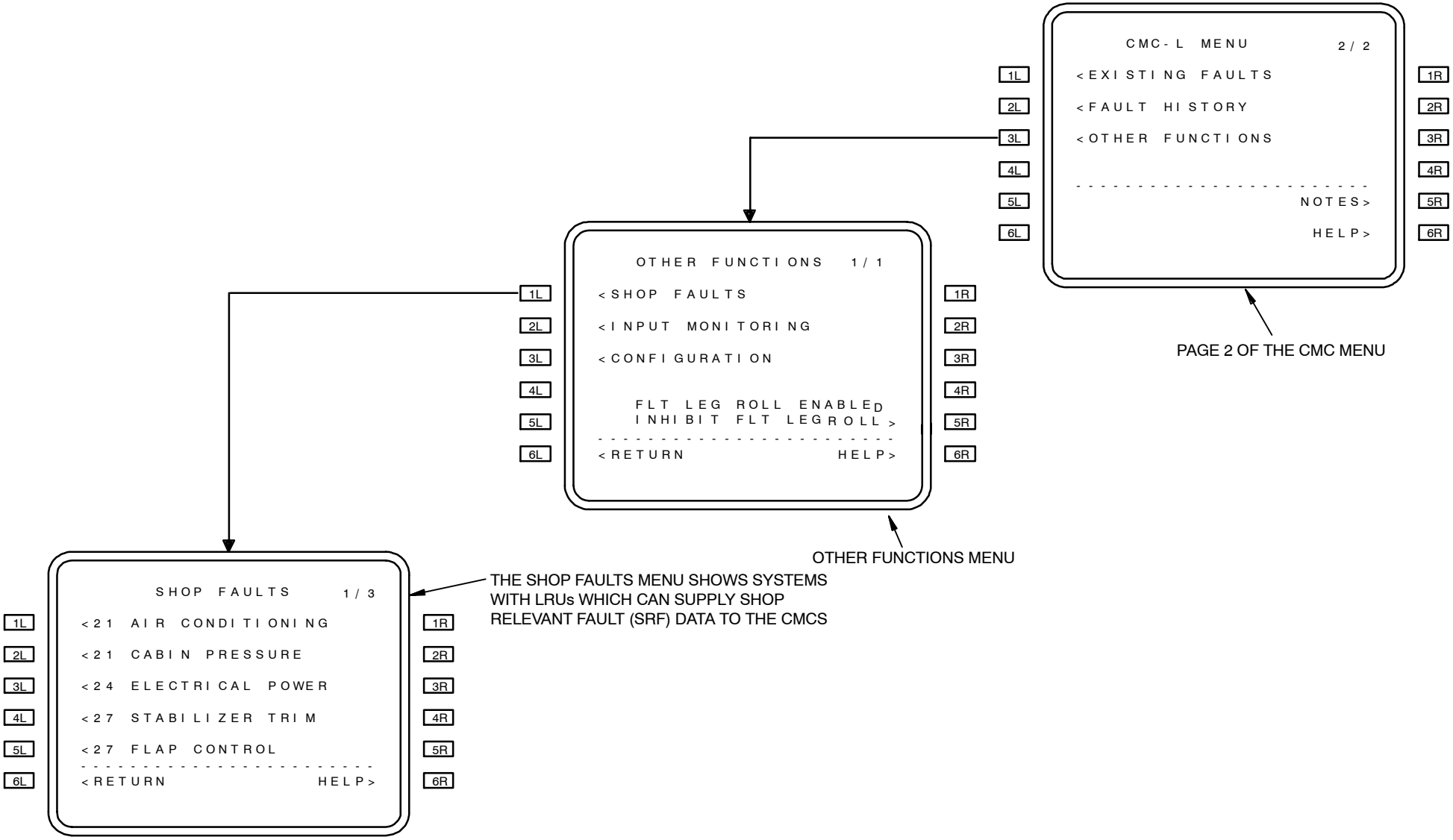


Figure 51 Shop Faults

THIS PAGE INTENTIONALLY LEFT BLANK

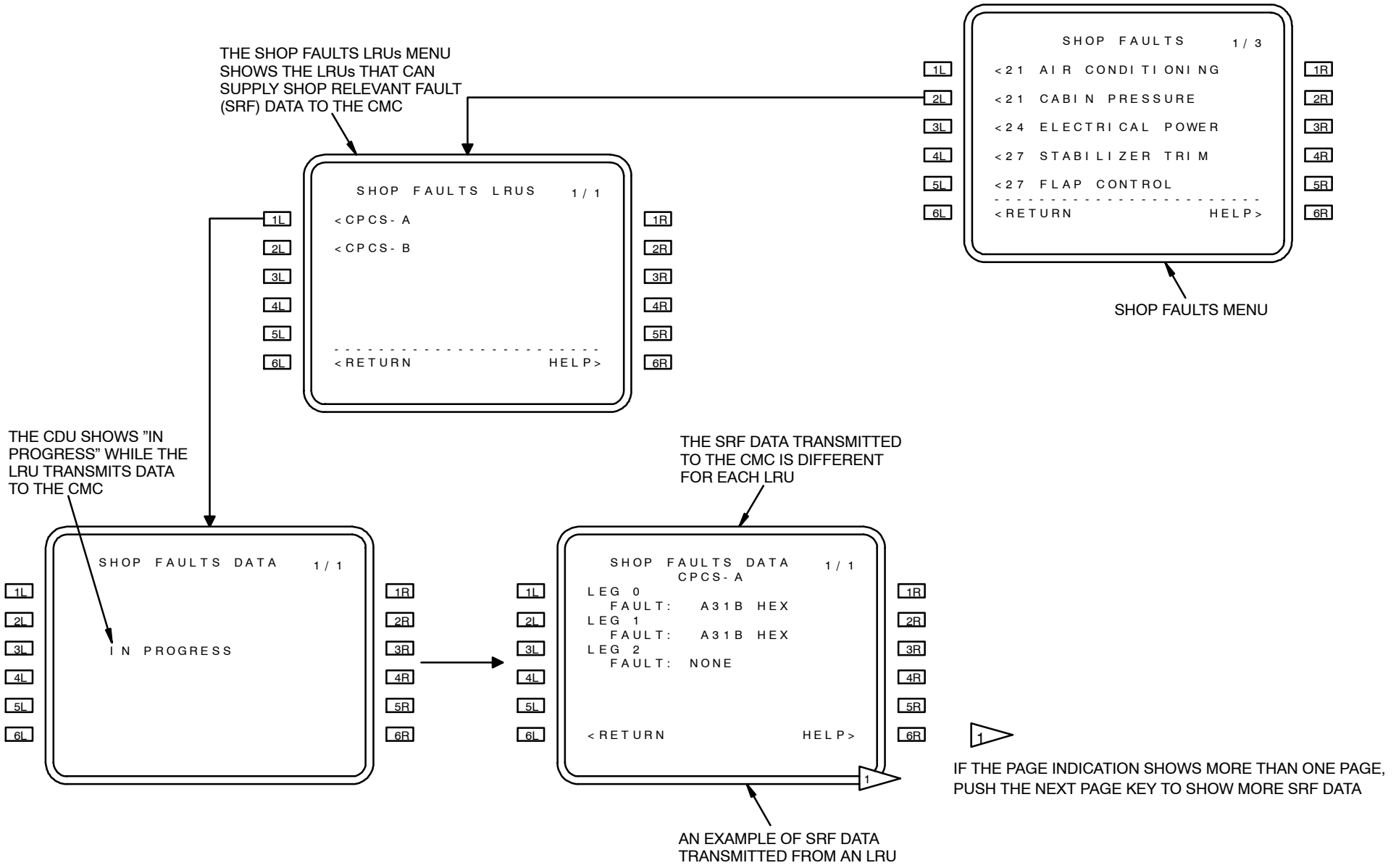


Figure 52 Shop Faults

CMCS - INPUT MONITORING

The input monitoring function allows monitoring of ARINC 429 input buses of the CMCs or the EFIS/EICAS interface units (EIUs).

Push the LSK next to INPUT MONITORING to show the input monitoring menu.

The input monitoring menu allows selection of information to show on the CDU.

To select an input to monitor, use the CDU keypad to enter:

- C or E (C for CMC inputs or E for EIU inputs)
- Slash (/)
- The input port number (3 digits)
- Slash (/)
- The octal label to be monitored
- Slash (/)
- The source destination identifier (SDI)

Characters entered show in the scratch pad.

Push LSK 1L next to ”-/ --- / --- /--I’ to enter the characters.

The scratchpad clears as you line select the characters to line 1L.

INVALID ENTRY shows in the scratchpad when the entry is invalid. For example, an input port that does not exist or a label that is not on the selected input port.

To clear the message, push the clear key or enter a new number.

The selected real-time ARINC 429 data shows.

The CDU:

- Shows three samples of data on the selected input port, updated at a one sample per second rate. The most recent data is on top.
- Shows SAMPLING when the contents of the data fields are updating. SAMPLING is removed after selection of the freeze function, or if data input is lost.
- Allows unit selection (either in engineering, binary or hexadecimal format). To show the data in the desired units, push the LSK next to the desired units.
- Allows the data to freeze at any time, push the LSK next to FREEZE. Only the CDU display freezes. If the report function is activated, the CMC continues to send the data.

The word FREEZE changes to RESUME whenever FREEZE is selected. Push the LSK next to RESUME to begin the update again.

There are a total of eight input monitoring pages to monitor up to eight input ports at a time. To select another input, push NEXT PAGE.

NOTE: A FULL LIST OF PORT NUMBERS FOR CMC AND EIU INPUTS IS CONTAINED IN THE HELP PAGES. TO SHOW THE PORT NUMBERS, SELECT INPUT MONITORING, THEN PUSH THE LSK NEXT TO HELP.

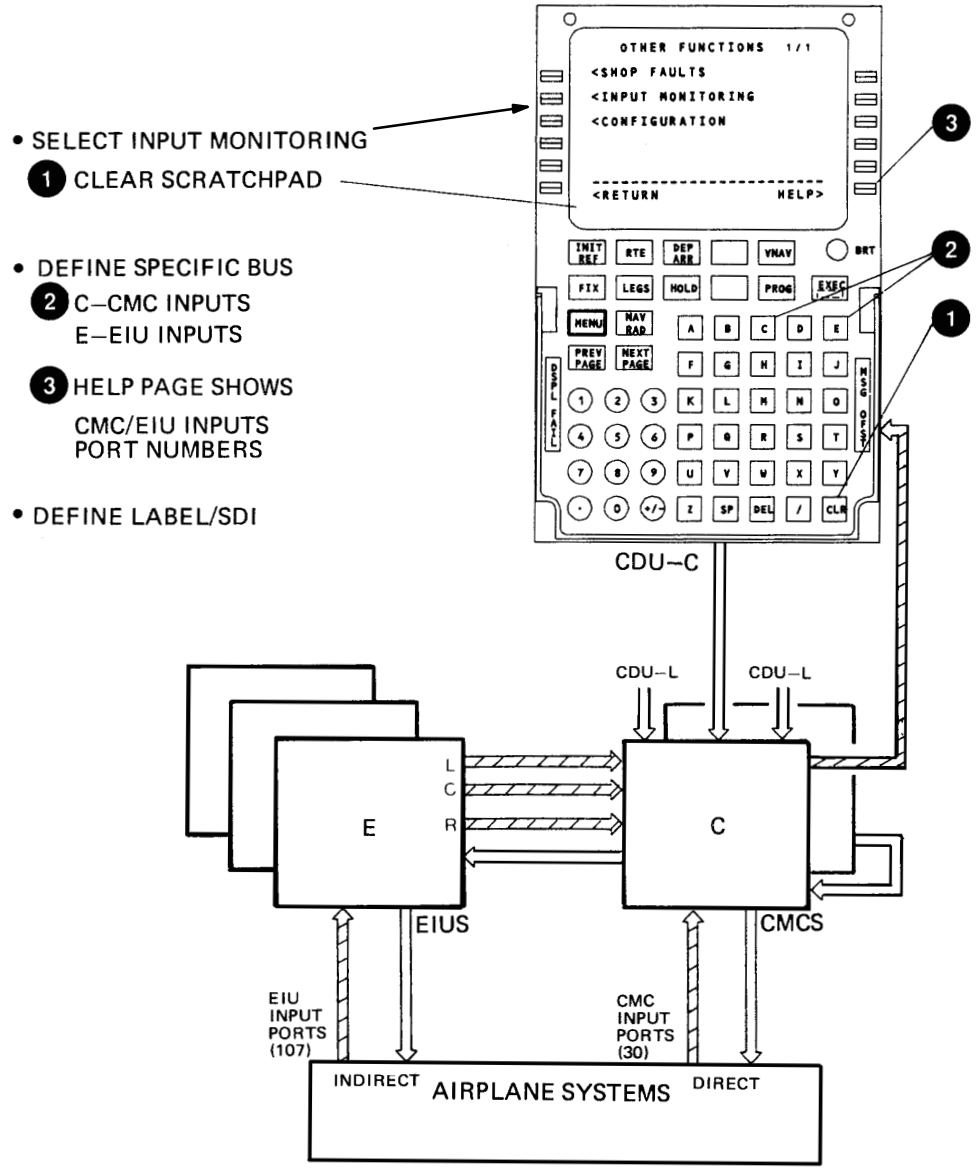


Figure 53 CMC Input Monitoring

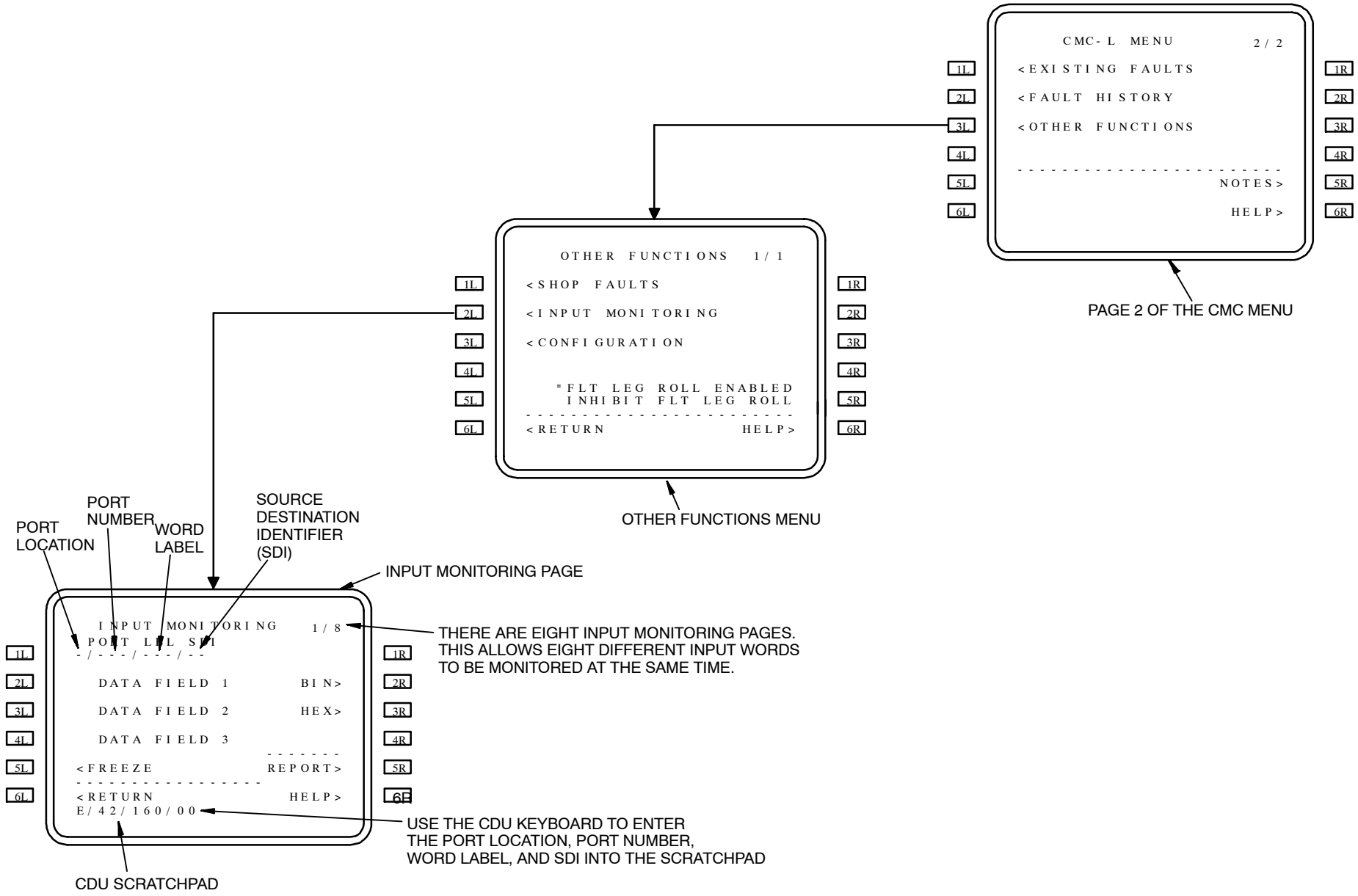


Figure 54 Input Monitoring

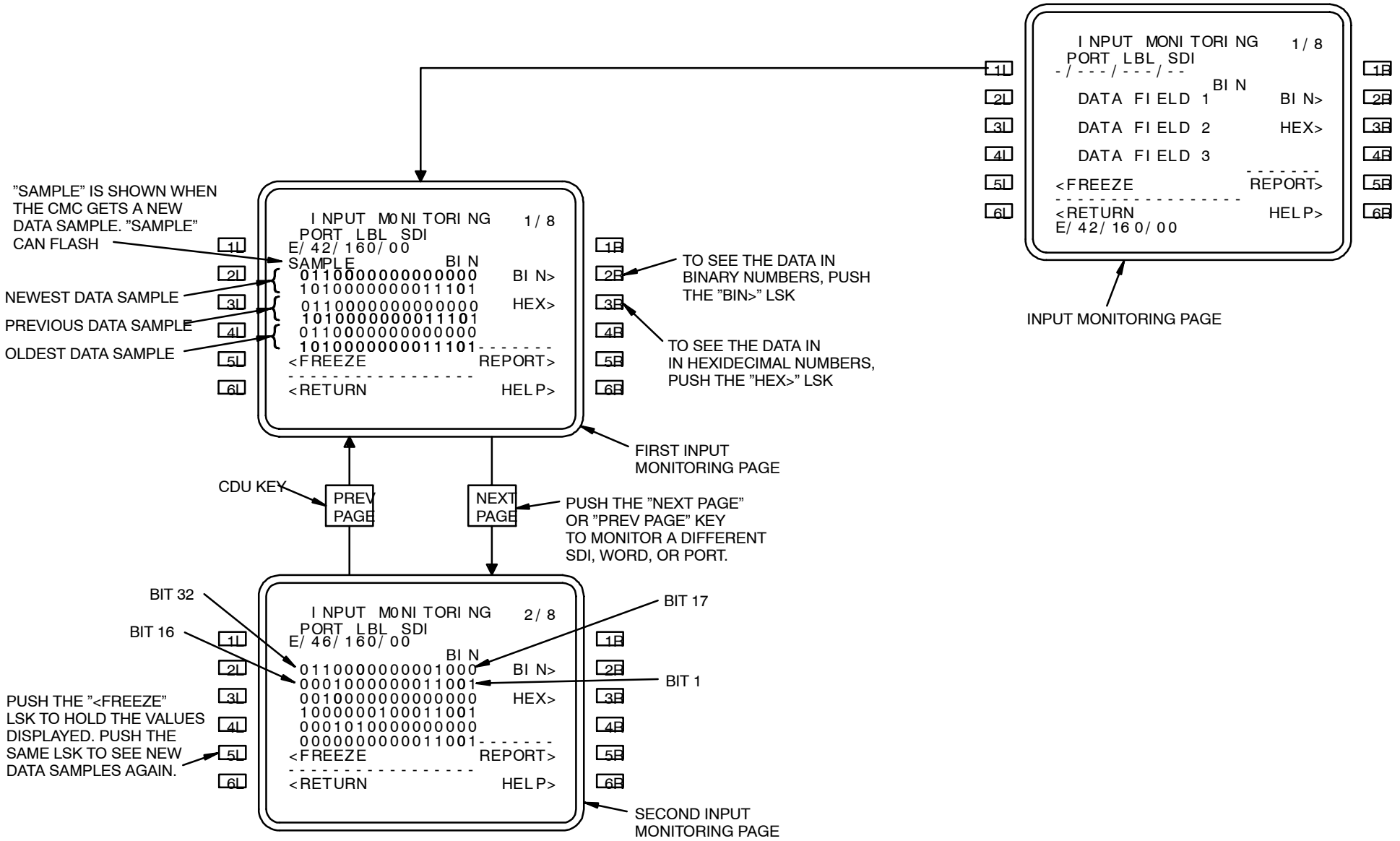


Figure 55 Input Monitoring Data Field

CMCS - CONFIGURATION

General

The configuration function shows configuration data for the CMCS.

Push the line select key (LSK) next to CONFIGURATION to show the configuration menu.

Push the LSK next to 45 CENTRAL NAINTENANCE to show the central maintenance menu.

Configuration Page

Push the LSK next to CMC-L to show the configuration page. The configuration page shows configuration data for the left CMC.

Part Numbers

These part numbers show on the configuration page:

- H/W: (Shows the hardware part number)
- SIW: (Shows the software part number)
- ALDB: (Shows the airline database part number)
- EIU: (Shows the EIU software version number)
- PROG PINS: (Shows the hexidecimal equivalent of the hardware program pins)

Option Code

The option code represents customer selected CMCS options. There are two parts of the option code, option code A (OC A) and option code B (OC B). Each portion of the option code contains 14 hexidecimal characters. The 14 characters represent the status of 48 software program pins and eight check bits.

The option code is entered from the alphanumeric keyboard into the CDU scratchpad then line selected to either OC A or OC B.

The CMCs do an option code verification check. The option code is invalid if:

- The CMCs are reprogrammed from the software data loader.
- Both CMCs are replaced.

If the option code is invalid, the CMCS only shows the configuration page on the CDU with ENTER OPTION CODE shown in the scratchpad.

All other CMCS activity stops until a valid option code is entered.

To enter the option code:

- Obtain the proper option code from the maintenance manual.
- Enter option code A into the CDU scratchpad and push LSK 1 left.
- Enter option code B into the CDU scratchpad and push LSK 2 left.

NOTE: VERSION -006, -007, AND -902 CMCS SOFTWARE DOES NOT AUTOMATICALLY CROSSLOAD OPTION CODES WHEN A CMC IS REPLACED. THUS IF A CMC IS REPLACED, THE OPTION CODE MUST BE ENTERED INTO THE NEW CMC.

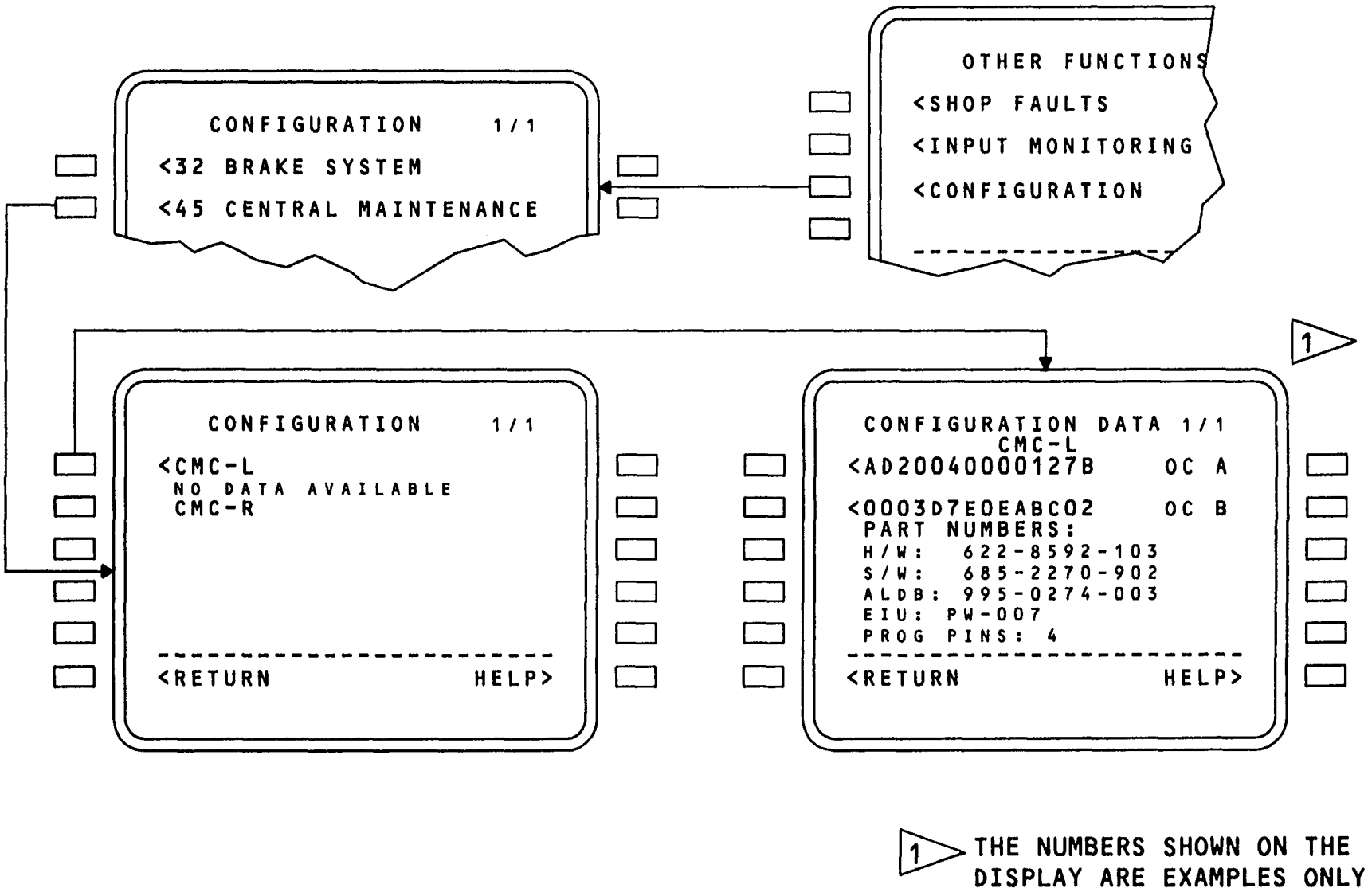


Figure 56 CMCS - CONFIGURATION

HOW TO CHANGE AUTOMATIC PLF DOWNLINK OPTIONS

General

Downlinks of the present leg faults summary report are made automatically at set flight phase transitions. You can set one or more flight phase transitions to cause a downlink. You can also set the number of flight legs that occur between downlinks.

This procedure tells how to set or change these:

- The flight phase transitions that cause downlinks (flight phase activation pairs).
- The number of flight legs that occur between downlinks (leg frequency setting).
- You use page 2 of the CONFIGURATION DATA display to make changes. You must put in a security code before you make changes. You can find the security code on page 1 of the CONFIGURATION DATA display.

Preparing to Change Options

Make sure the captain's clock and the first officer's clock are set to the correct date and time (GMT +/-12 seconds).

If the left CMC is in control, push the LSK adjacent to <CMC-L to see page 1 of the CONFIGURATION DATA display for the left CMC.

If the right CMC is in control, push the LSK adjacent to <CMC-R to see page 1 of the CONFIGURATION DATA display for the right CMC.

The Security Code

Find the security code:
Look on page 1 of the CONFIGURATION DATA display at the last two digits of OC-B and OC-A.

NOTE:

The security code is the last two digits of OC-B followed by the last two digits of OC-A.

Put in the security code:

Push the NEXT PAGE key to show page 2 of the CONFIGURATION DATA display.

Use the CDU keypad to put in the security code (the four digits will show at the bottom of the CDU display).

Push the LSK adjacent to SETUP FOR AUTO PLF.

The Flight Phase Activation Pairs

Change the status of the flight phase activation pairs:

NOTE:
ON shows adjacent to the flight phase transition or transitions that are set to cause an automatic downlink. As many as five transitions can be set.

An asterisk (*) shows that a report was transmitted.

Push the LSK adjacent to a flight phase activation pair.

- If ON did not show before, make sure that ON now shows.

- If ON did show before, make sure that ON goes out of view.

The Leg Frequency Setting

Change the leg frequency setting:

Use the CDU keypad to put in the new leg frequency setting (the digits will show at the bottom of the CDU display).

NOTE:

You must put in a number between 01 and 30.

Push the LSK adjacent to FREQUENCY>.

Make sure the new leg frequency setting shows adjacent to EVERY.

Put the airplane back to its usual condition

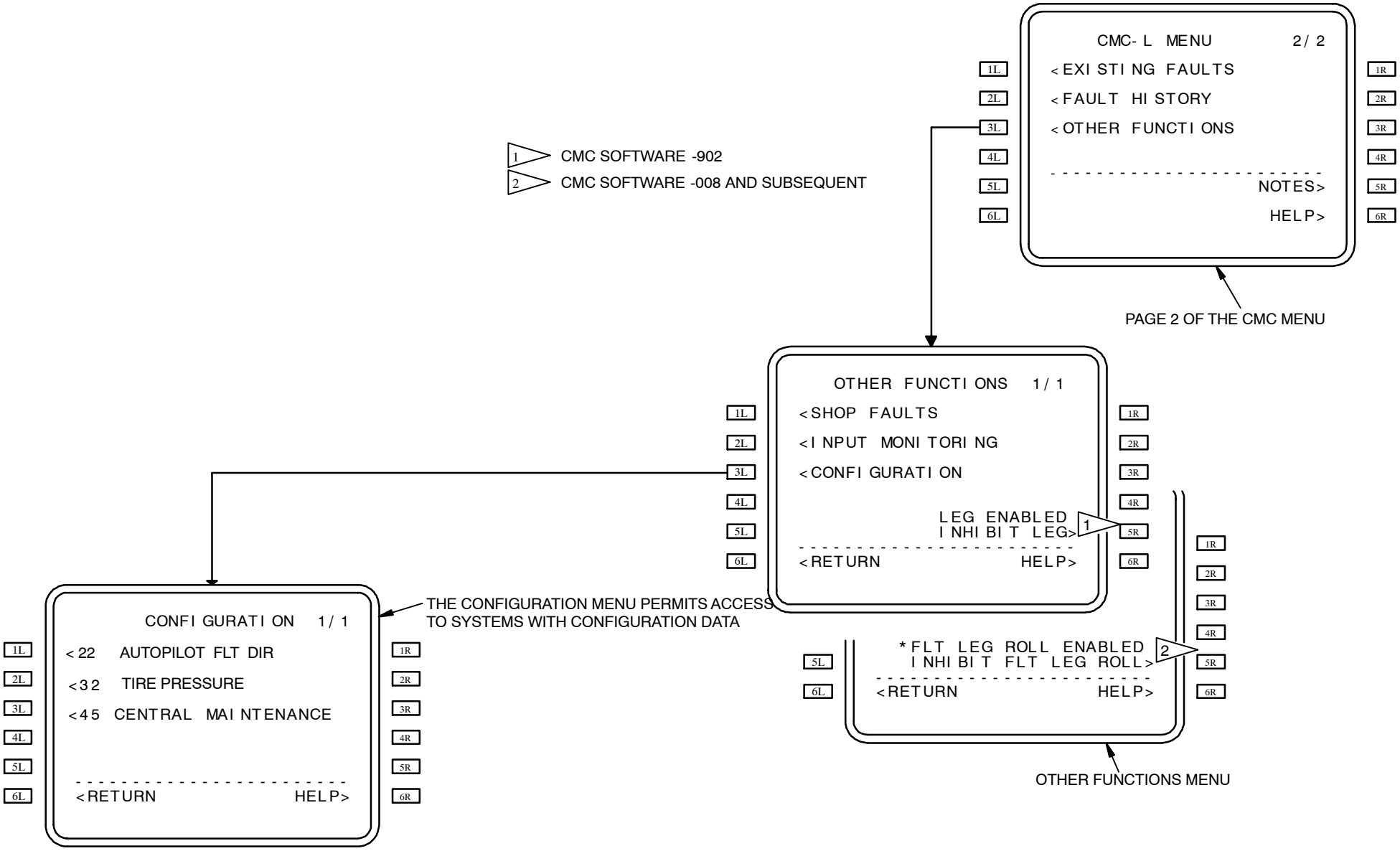


Figure 57 Selection of CONFIGURATION Page

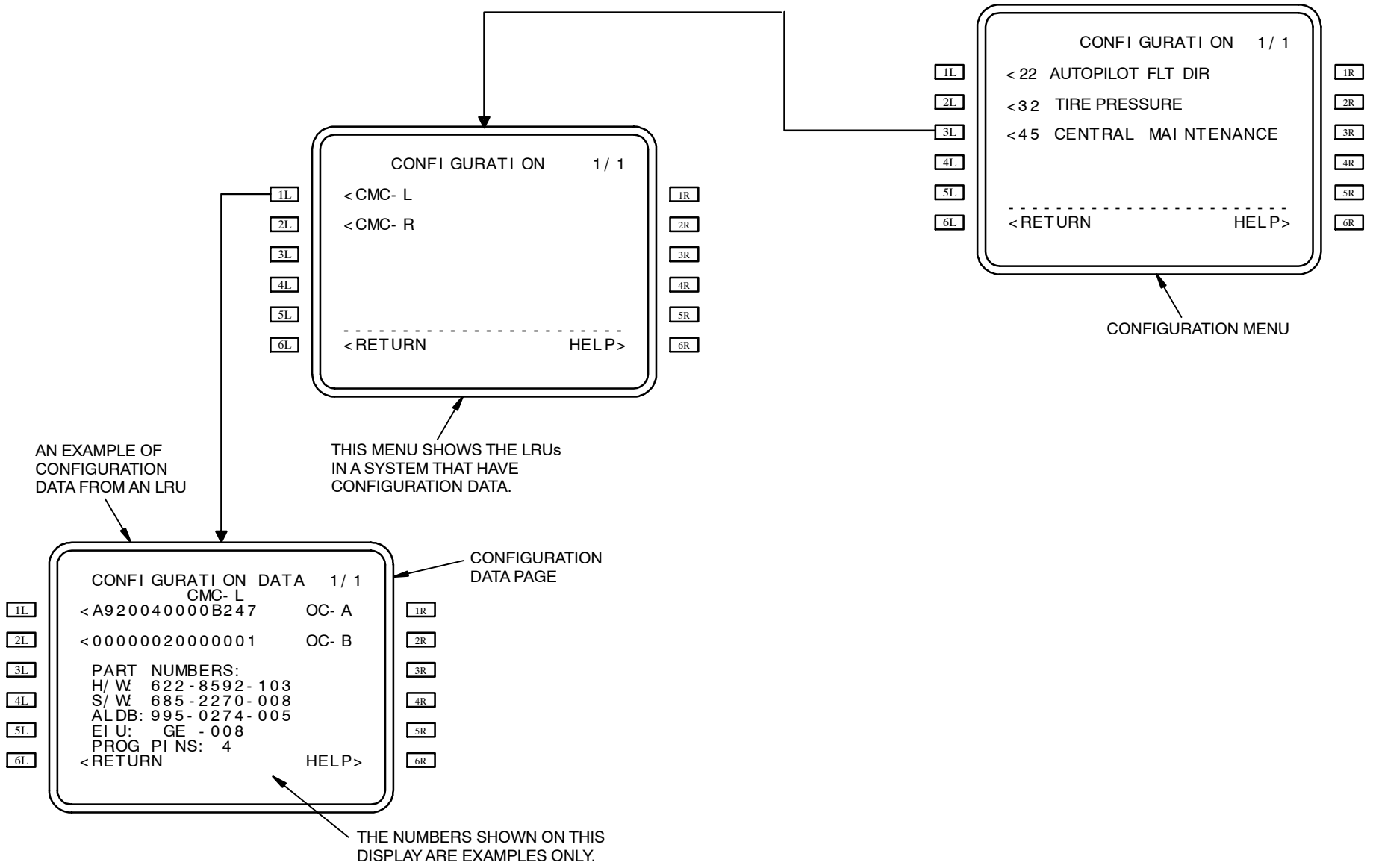


Figure 58 Configuration Page

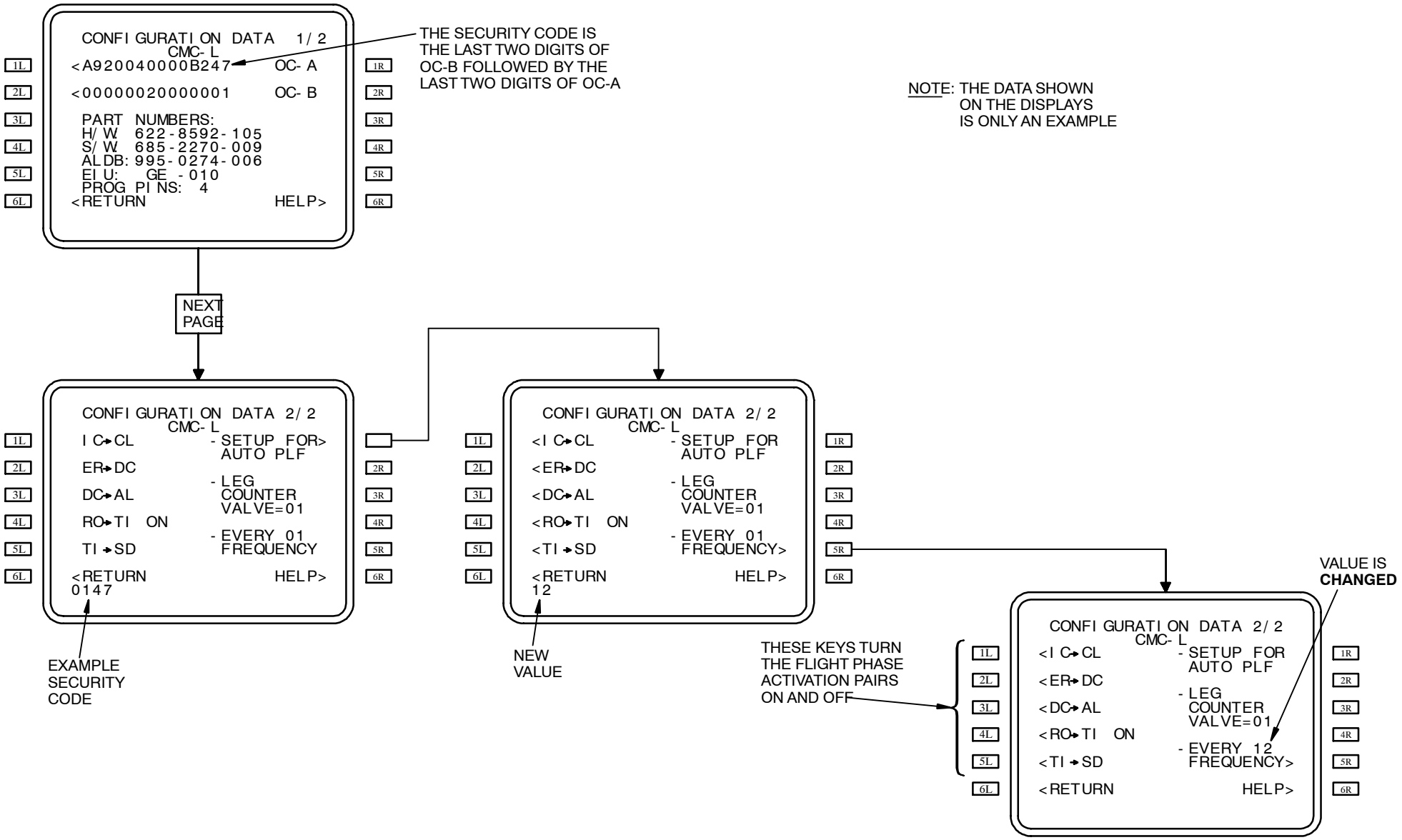


Figure 59 Configuration Changed

MULTIPLE INPUT PRINTER

General

The multiple input printer provides a paper copy of various reports. The systems which report to the printer are:

- Central maintenance computer system (CMCS)
- Airplane condition monitoring system (ACMS)
- ARINC communications addressing and reporting system (ACARS)

ACARS is highest in priority. ACMS is second highest in priority. CMCS is lowest in priority.

Control and Indications

The green SLEW switch advances the paper.

The blue MSG light comes on when a

report is received.

The green RESET switch resets the message light.

Push the TEST switch to start a built-in test. If the test sequence finds a failure, the yellow FAIL light comes on.

Push and hold both the TEST and RESET switches to print out a test pattern. The printout includes diagnostic messages and an active port list.

The yellow PAPER light comes on when the printer is out of paper.

The PAPER FULL-EMPTY indicator shows the amount of paper that remains in the printer.

Turn the latch counterclockwise to open the front panel door. This allows access to the paper roll.

CAUTION: STATIC SENSITIVE. DO NOT HANDLE BEFORE READING PROCEDURE FOR HANDLING ELECTROSTATIC DISCHARGE SENSITIVE DEVICES (REF 20-41-02/201). CONTAINS DEVICES THAT CAN BE DAMAGED BY STATIC DISCHARGE.

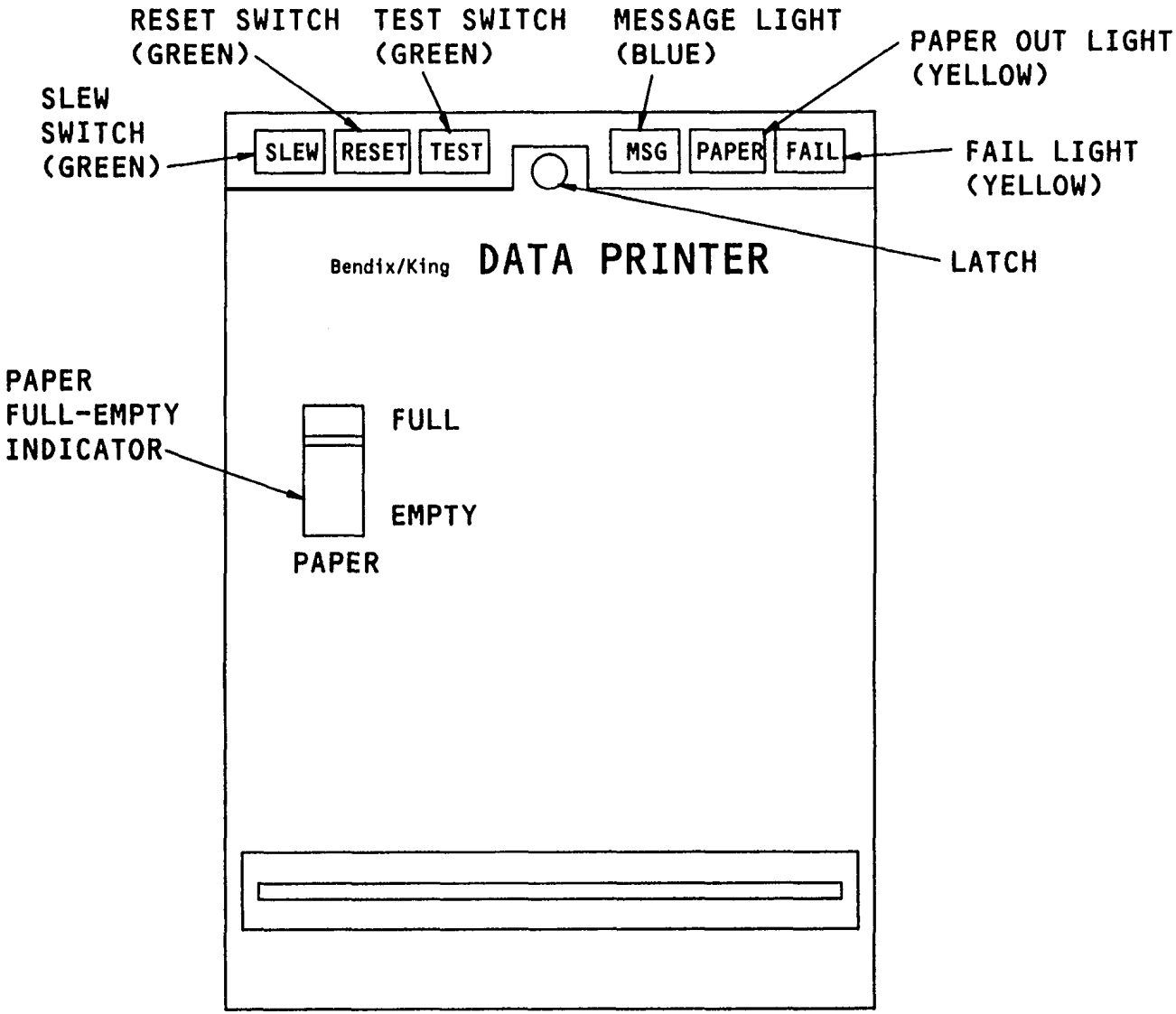


Figure 60 CMCS - Multiple Input Printer

Change of Printer Paper Roll

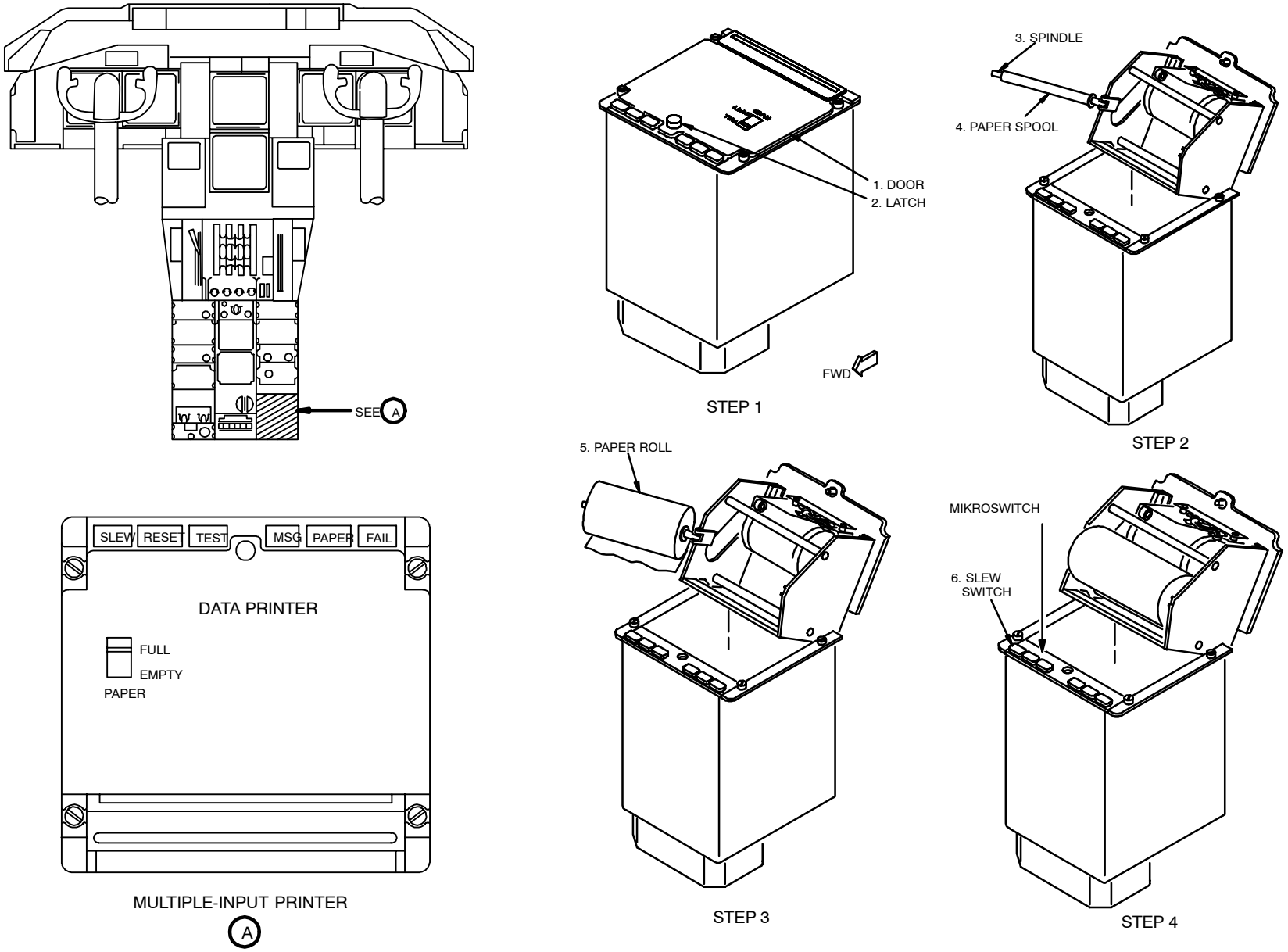


Figure 61 Change of Printer Paper Roll

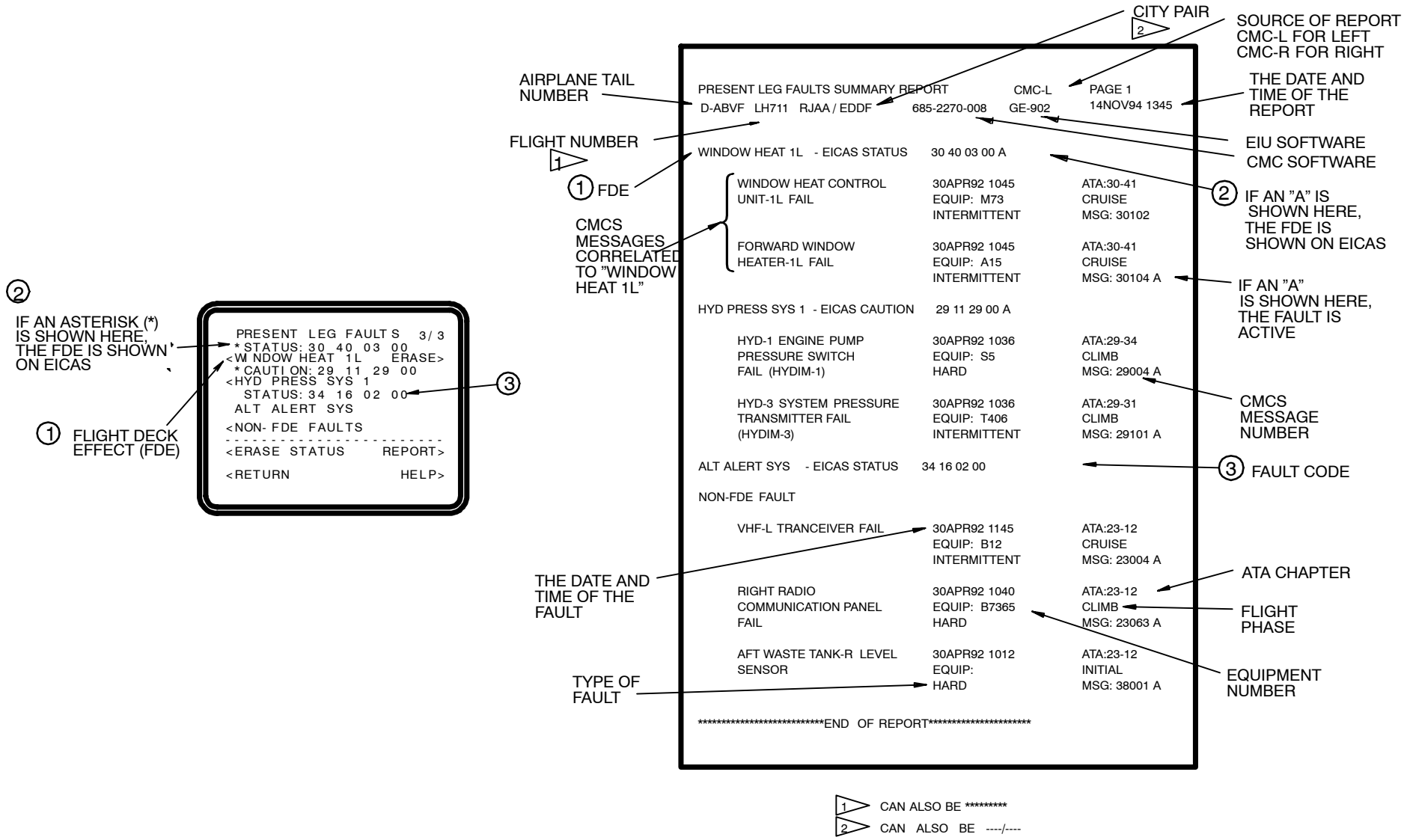
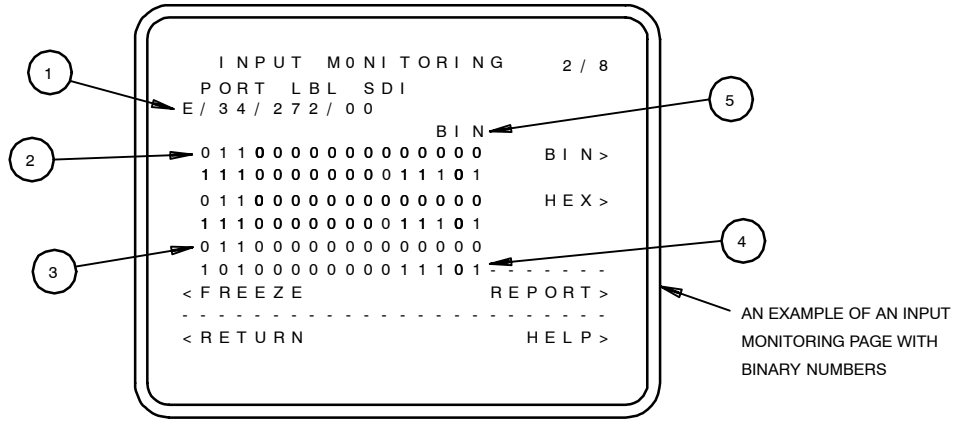


Figure 62 PLF Printout



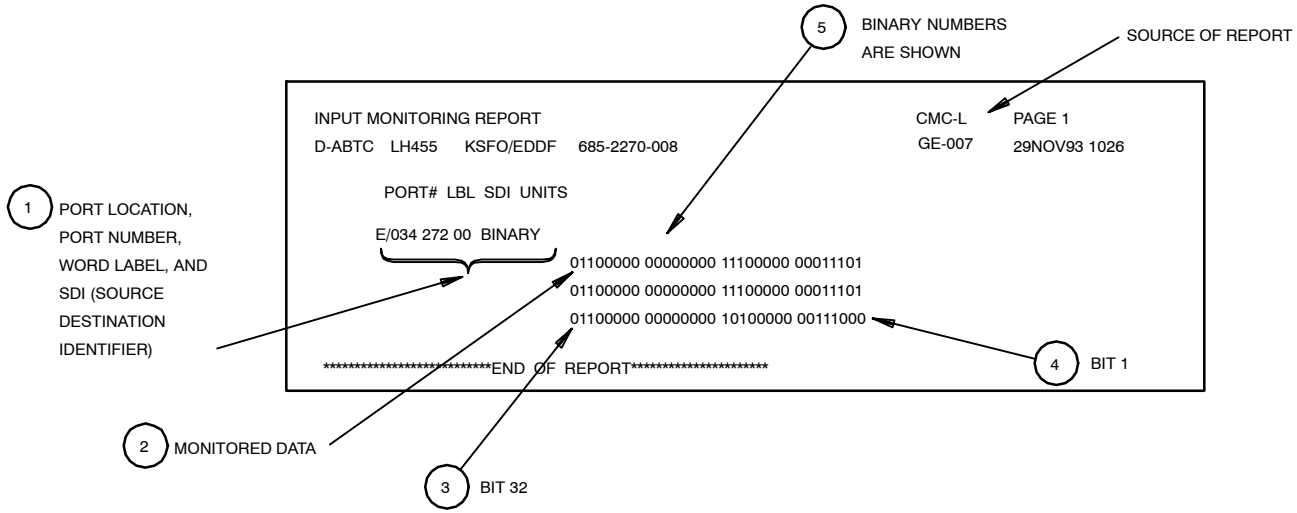


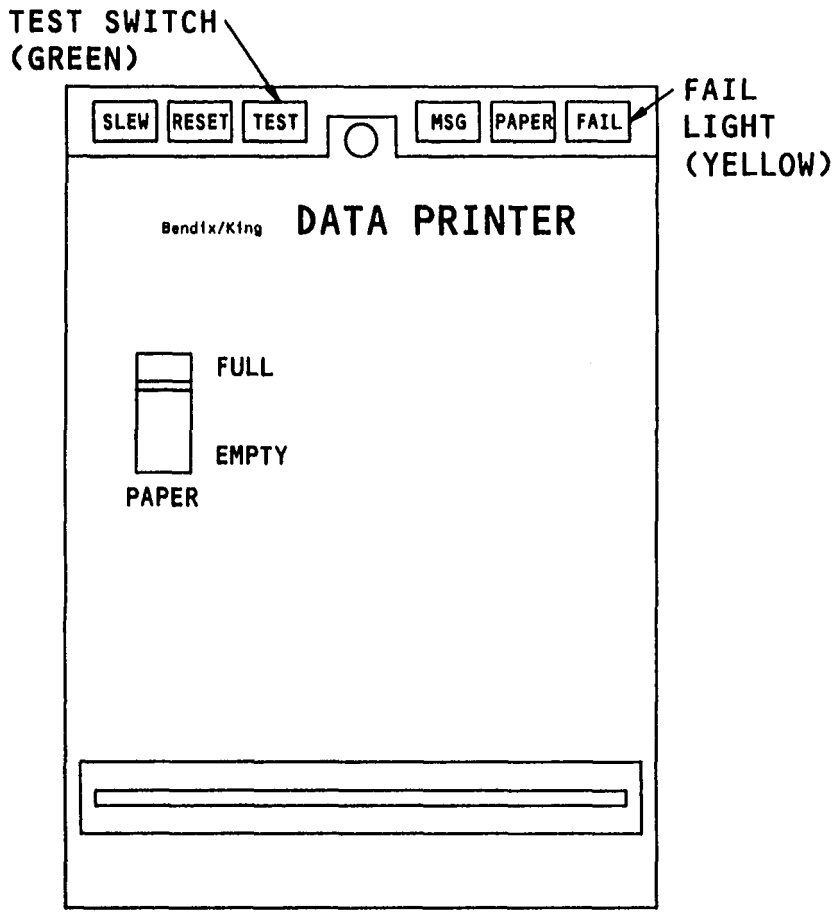
Figure 63 Input Monitoring Printout

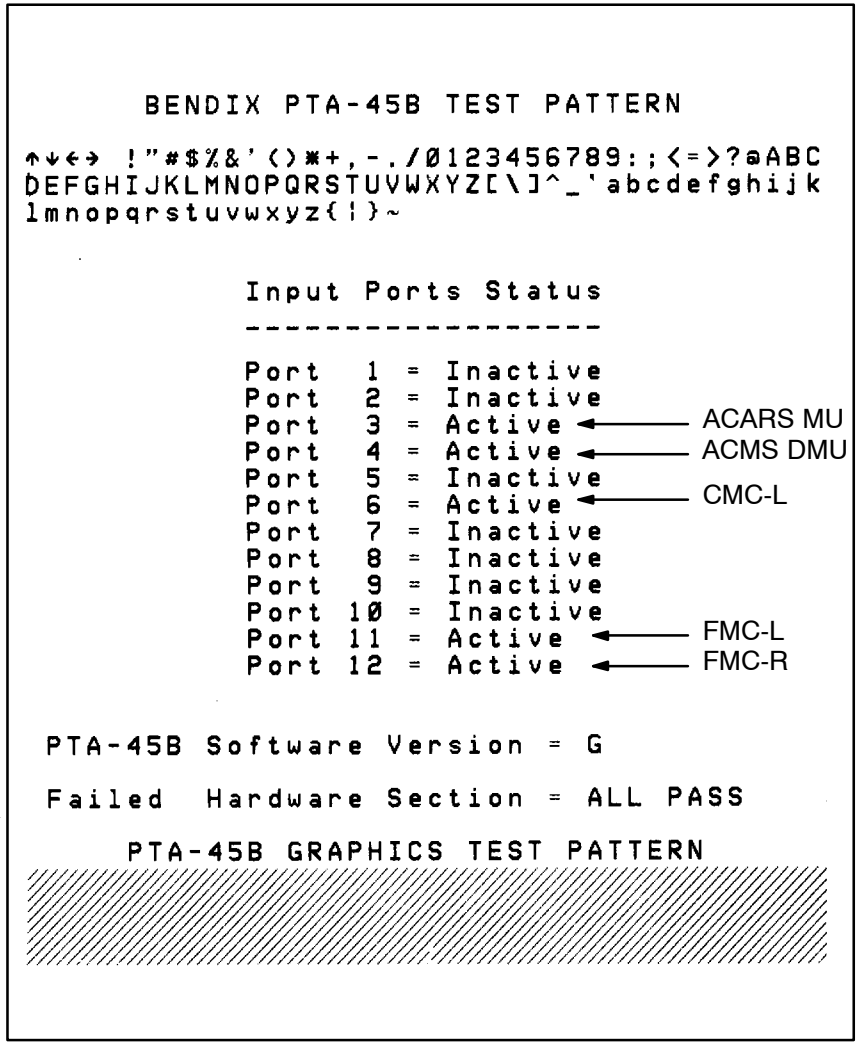
CMCS - PRINTER SELF-TEST

Push the TEST button to start the self-test, the printer checks internal operation. If a failure is detected, the yellow FAIL lamp illuminates.

The printer prints a test pattern if the self test passes. The test pattern shows all the printer characters and the active/inactive status of each input port.

Push the RESET and TEST buttons at the same time to include a graphics test pattern on the printout.





PRINTER TEST- PRINTOUT

Figure 64 CMCS - PRINTER SELF-TEST

CMCS - MULTIPLE-INPUT PRINTER GROUND TEST

A test of the multiple-input printer can be done through the CMC ground test menu.

Start the test from the ground test menu for chapter 45.

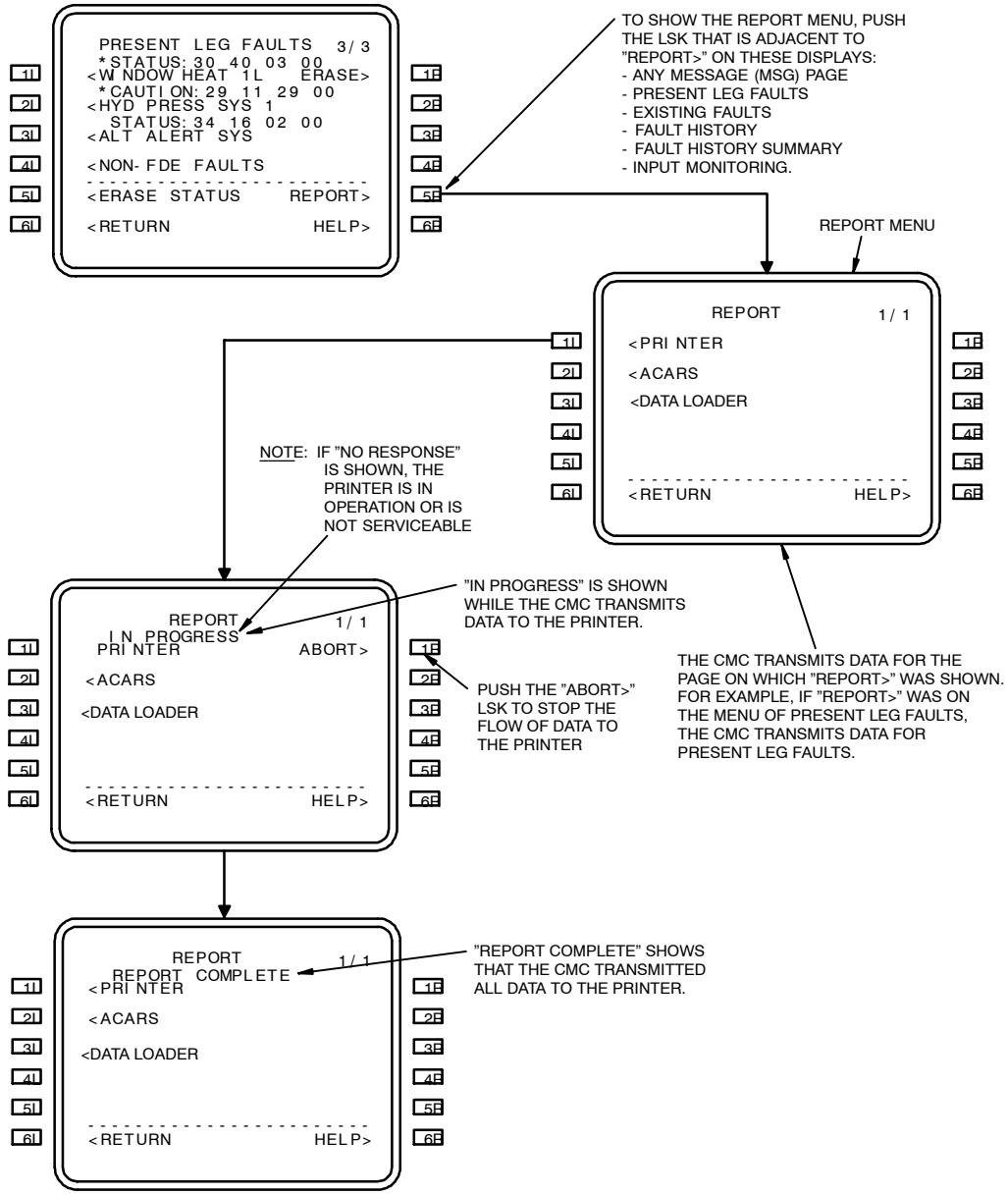


Figure 65 CMC Output to Printer

FULL FORMAT PRINTER

Purpose

There is a printer (full format) installed in this aircraft located on the rear of the pedestal in the flight deck (F/D).

The full format printer provides an 8.5” wide hard copy of information.

Power for the printer is supplied by an AC bus.

The printer can send or get data from the:

- CMC left or right
- ACARS management unit (MU)
- Digital flight data acquisition unit (DFDAU)
- Flight management computer left and right (FMC-L & FMC-R).

Data is transfered between the printer and these systems on ARINC 429 data busses. The output of the printer goes to the systems to request data or for control. The ARINC 429 word output of the printer will contain the label (address) for the system to receive the data. The other systems connected to the output bus will ignore the word because the label is not for them.

Description

The printer ....

is approximately 5“ x10.25” x 9.75”.

weighs a maximum of 13 pounds.

uses 115 volts ac power.

paper supply is a continuous roll of paper 125 feet long.

In the event of a temporary power loss, unprinted data will be retained in the-printer for approximately 3 minutes.

Operation

The printer controls and indicators are described below:

OFF - Light

Alternately turns printer ac power off and on when pressed - (automatically turns on when ac power is initially applied). Has illuminating indicator bar that illuminates to show unit is powered on.

FAULT-Light

Illuminates when printer senses out of paper. Also illuminates to indicate a self-test failure - illuminates in conjunction with the test indicator.

ALRT/RST Pushbutton

Resets printer aural/visual alert functions (MEMO Message - “PRINTER MSG“).

TEST Pushbutton

Prints test pattern when push button is activated. Has illuminating indicator bar that illuminates while self-test is running, also illuminates in conjunction with FAULT indicator when the self-test fails.

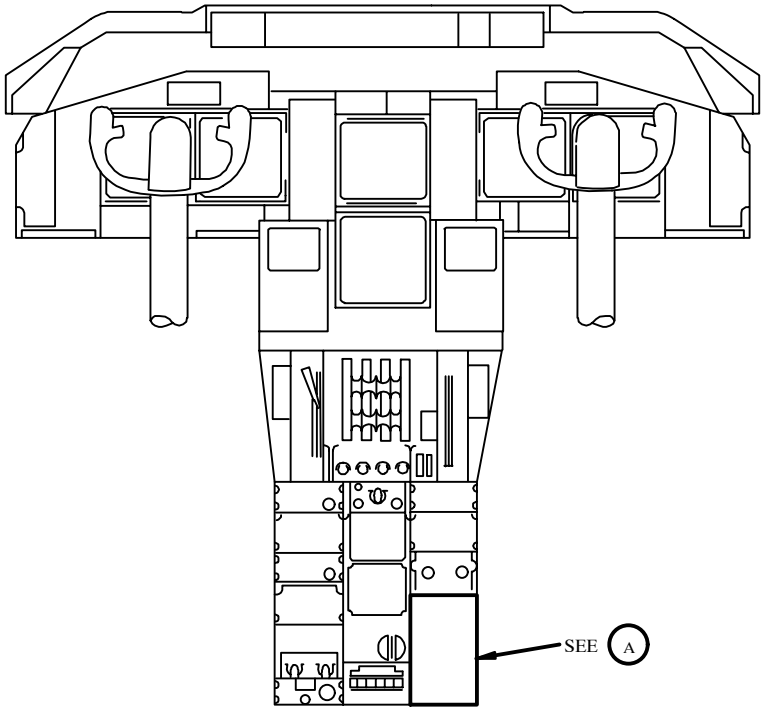
Periodic cleaning of the print head is required.

LOW PPR light

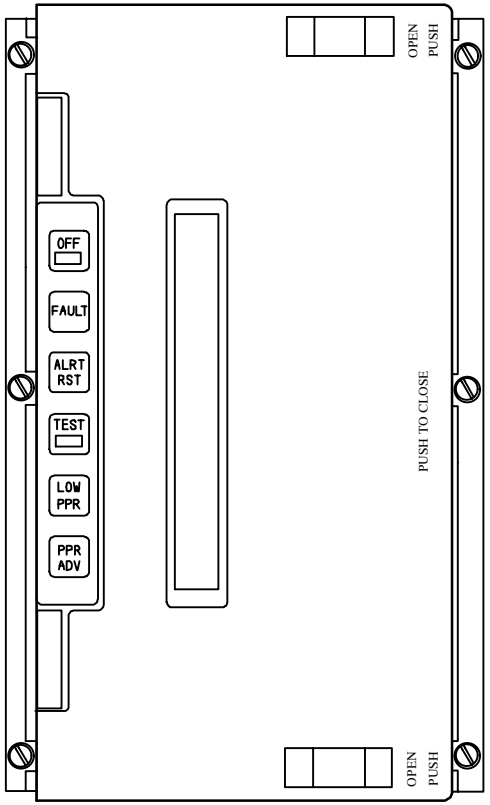
Illuminates when the printer senses the last 10 feet of paper on the supply roll. Red paper warning stripe appears when 6 feet or less remains.

PPR ADV pushbutton

Continuously advances paper when push button is activated.



FLIGHT COMPARTMENT



FULL-FORMA T PRINTER

A

Figure 66 Full Format Printer

PRINTER SERVICING

Full - Format- Printer Paper Replacement

Open this circuit breaker PRINTER (415L37)

Push the two latches (1) on the front of the printer and open the door(2).

To remove the empty spool (4), pull the empty spool and spindle (5) out of the spindle clamps(3).

Pull the spindle (5) out of the empty spool(4) and discard the spool.

To install a new roll of paper push the the spindle (5) into a new roll of paper(6). Push the ends of the spindle (5) into the spindle clamps.

Make sure the paper extends over the edge of the printer.

Close Circuit breaker: PRINTER (415 L37)

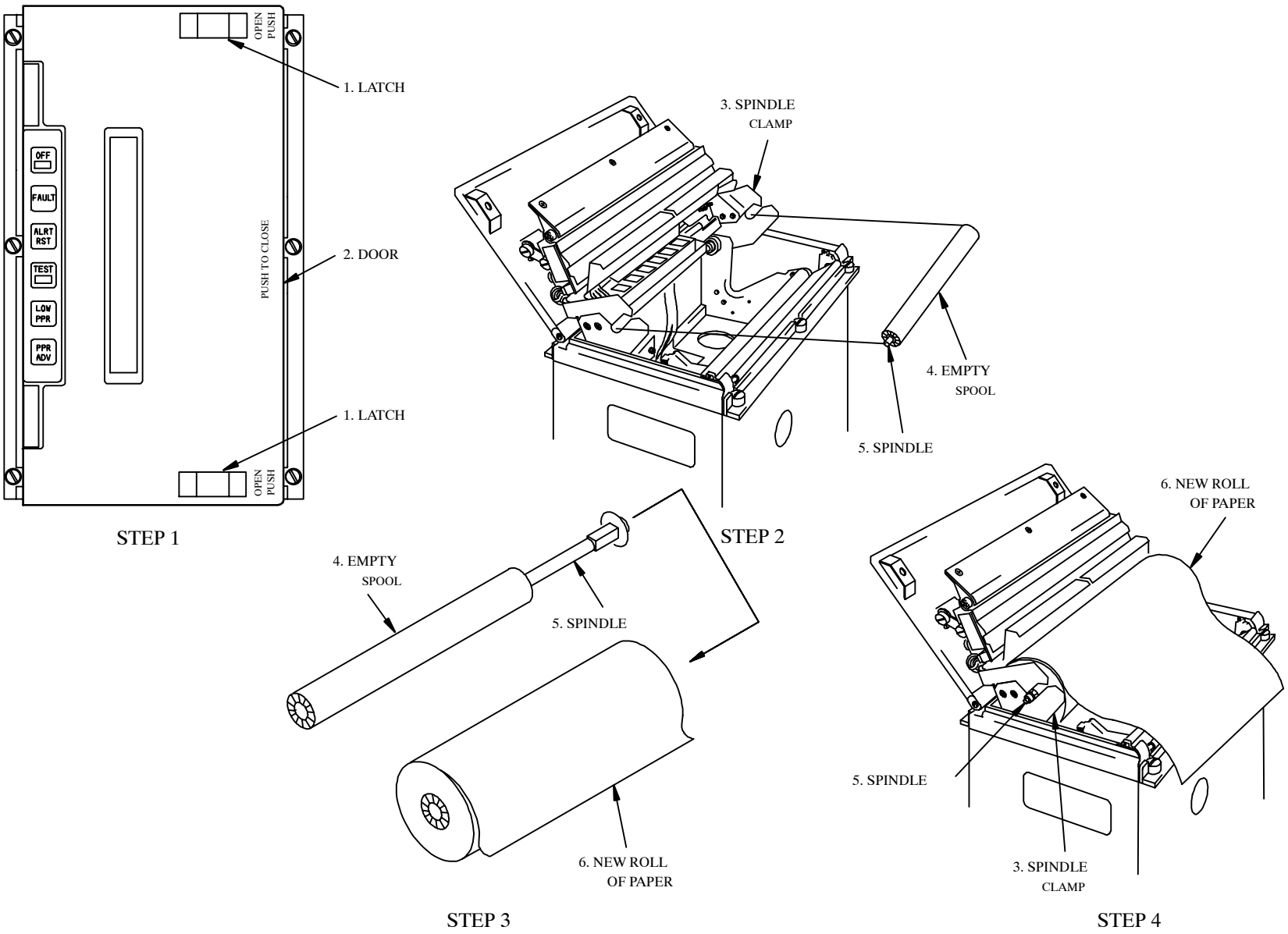


Figure 67 Paper Replacement

THIS PAGE INTENTIONALLY LEFT BLANK

ACARS - ARINC COMMUNICATIONS ADDRESSING & REPORTING SYSTEM
ADC - AIR DATA COMPUTER
ADL - AIRBORNE DATA LOADER
ALDB - AIRLINE DATA BASE
AMU - AUDIO MANAGEMENT UNIT
ATC - AIR TRAFFIC CONTROL
BSCU - BRAKE SYSTEM CONTROL UNIT
CDU - CONTROL DISPLAY UNIT
CMC - CENTRAL MAINTENANCE COMPUTER
CMCS - CENTRAL MAINTENANCE COMPUTER SYSTEM
DFDAC - DIGITAL FLIGHT DATA ACQUISITION CARD
DMU - DATA MANAGEMENT UNIT
EIU - EFIS/EICAS INTERFACE UNIT
FCC - FLIGHT CONTROL COMPUTER
FCE PSM - FLIGHT CONTROL ELECTRONICS POWER SUPPLY MODULE
FDCF - FIRE DETECTION CARD FILE
FDE - FLIGHT DECK EFFECT
FIM - FAULT ISOLATION MANUAL
FRM - FAULT REPORTING MANUAL
FSEIC - FUEL SYSTEM EICAS INTERFACE CARD
IDS - INTEGRATED DISPLAY SYSTEM
IRU - INERTIAL REFERENCE UNIT
LSK - LINE SELECT KEY
MAWEA - MODULARIZED AVIONICS AND WARNING ELECTRONICS ASSEMBLY
PSEU - PROXIMITY SWITCH ELECTRONICS UNIT
RCP - RADIO COMMUNICATION PANEL
SRF - SHOP RELEVANT FAULTS
SRM - STABILIZER TRIM/RUDDER RATIO MODULE
WHCU - WINDOW HEAT CONTROL UNIT
WTAIS - WING THERMAL ANTI-ICE SYSTEM

Figure 68 CMCS – ABBREVIATION/ACRONYM LIST

TABLE OF CONTENTS

TABLE OF FIGURES

TABLE OF FIGURES