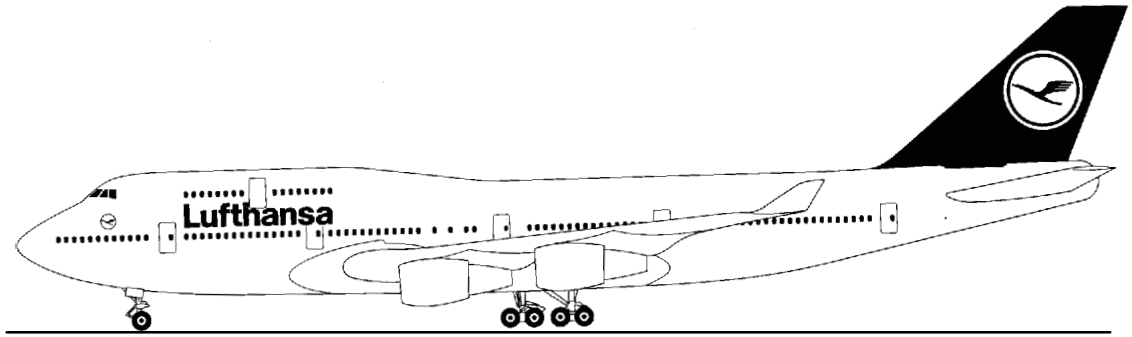
Lufthansa
Technical Training

Training Manual
B 747-400



ATA 31-62
EICAS
ATA Spec. 104 Level III

GE Engine

Book No:

Lufthansa
Technical Training GmbH
Lufthansa Base

Issue: APR 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 31-62 IDS - EICAS

ENGINE INDICATING AND CREW ALERTING SYSTEM

General

EICAS provides:

- Color coded displays and alert messages
- Comprehensive monitor of airplane systems
- Dispatch information
- Storage of maintenance related data

Main EICAS Display

The upper IDU normally shows primary engine indications, crew alert messages, flaps and landing gear status, fuel quantity and environmental control system information. The formats available on the main EICAS display include:

- Primary
- Compacted-full
- Compactedpartial
- Mini synoptics

Auxiliary EICAS Display

The lower IDU normally shows the auxiliary EICAS formats. During normal flight, the lower IDU will be blank. The available aux EICAS formats are:

- Secondary engine
- Secondary-partial
- Status page
- Synoptics
- Maintenance pages

Control

The EICAS control panel provides EIU selection, brightness control and maintenance page snapshot control.

The display select panel provides main and aux EICAS display control and message paging control.

Maintenance pages are controlled through the central maintenance computer using any of the control display units.

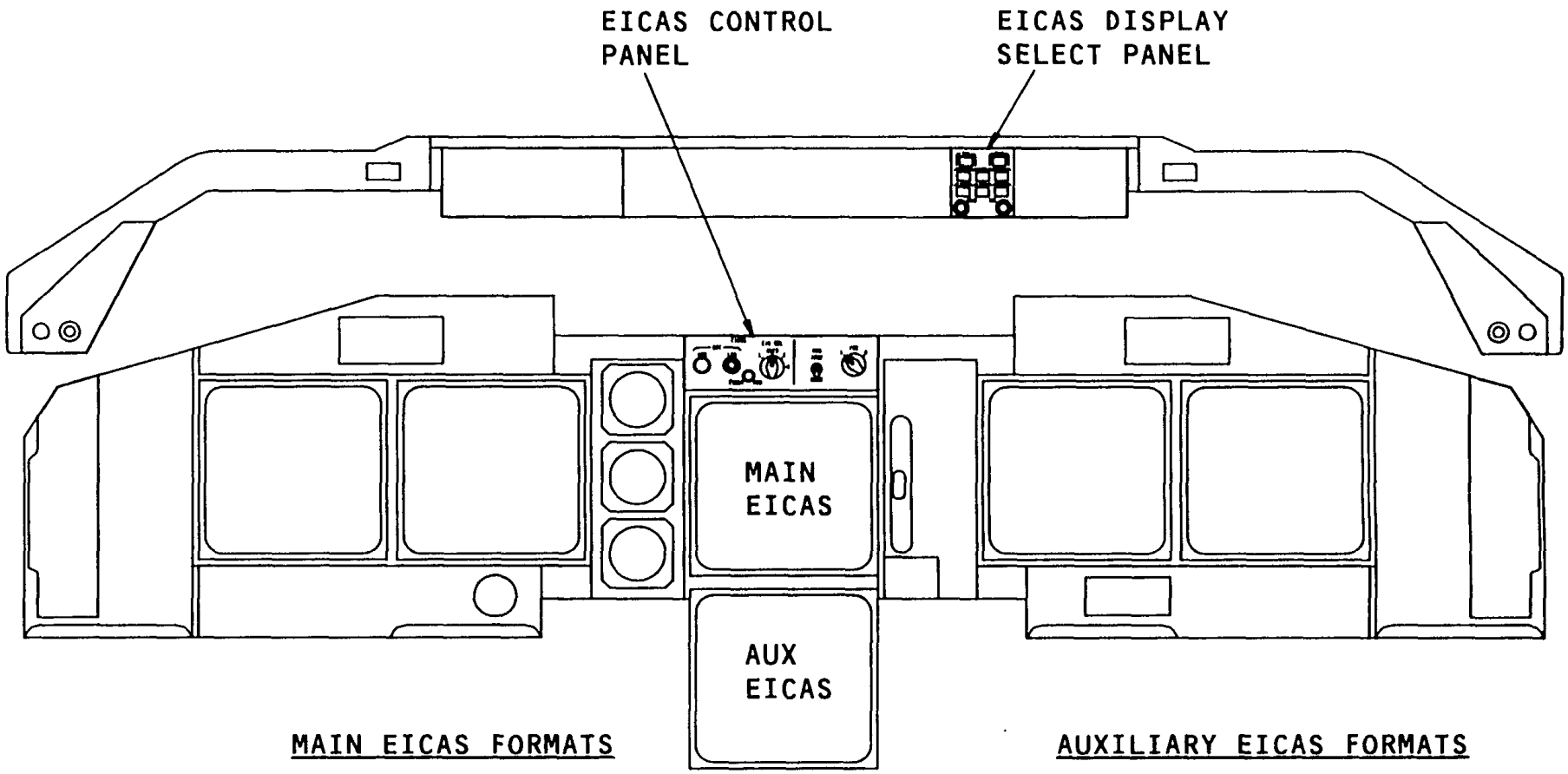


Figure 1 ENGINE INDICATING & CREW ALERTING SYSTEM

MAIN EICAS - PRIMARY FORMAT

General

The EICAS primary format shows on the main EICAS display at power-up and during normal operation. Color changes can indicate degraded system operation and miscellaneous prompts are used to monitor related system operation.

To maintain a ”quiet, dark” flight deck, information that is not required is removed. Primary engine parameters and the fuel system data always show.

Engine Parameters

The primary engine parameters are:

- N1 rotor speed
- Exhaust gas temperature (EGT)

Message Field

The alert message field shows:

- Level A warning messages in red
- Level B caution messages in amber
- Level C advisory messages in amber and indented
- Level D memo messages in white

Gear and Flaps

The landing gear status shows when the gear is down or when a gear malfunction exists. The area blanks when the airplane is in the air and the gear has retracted normally.

The flaps indications monitor flap position and flap movement. The indications change to show abnormal conditions or alternate flap selection. The area blanks with the flaps set at zero and the flaps fully retracted.

Fuel

Fuel system data shows:

- Total fuel in kilograms x 1000
- Fuel temperature
- Fuel to remain in a fuel jettison condition

Environmental Control System

The environmental control system data block shows:

- Duct pressure
- Cabin altitude
- Landing altitude
- Cabin differential pressure

The ECS data block shows when certain ECS related events or messages occur. The conditions that cause the data block to show are:

- Manual landing altitude shown - Cabin altitude readout is amber/red
- Cabin delta pressure readout is amber/red
- ECS maintenance pages or ECS synoptic or EICAS secondary-full is selected

The ECS data block is available on all main EICAS formats.

FMC Data

Thrust mode and total air temperature show above the primary engine parameters.

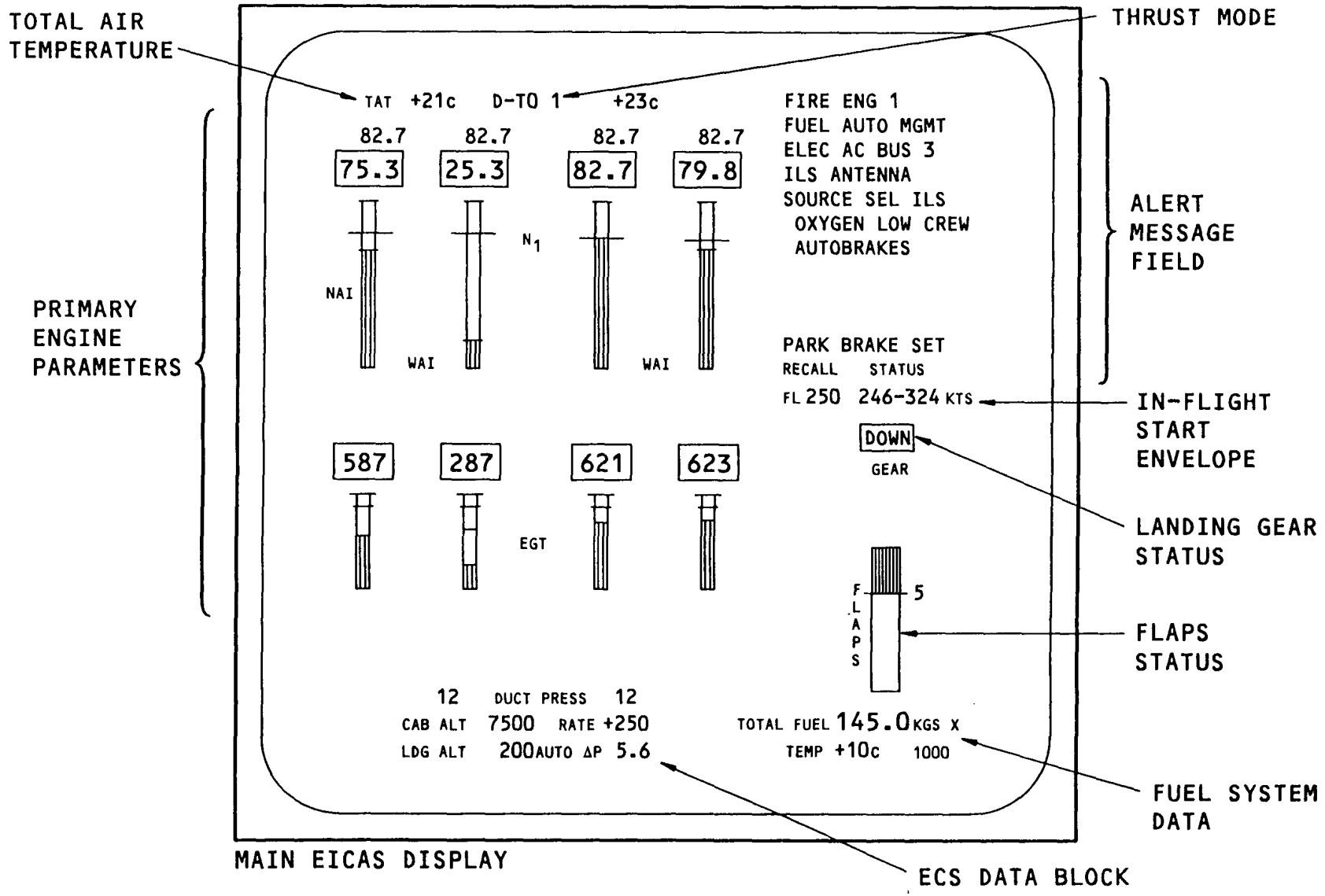


Figure 2 MAIN EICAS - PRIMARY FORMAT

AUXILIARY EICAS - SECONDARY ENGINE FORMAT

The secondary engine format shows on the auxiliary EICAS display at power-up. This format consists of secondary engine parameters. They are:

- N2 rotor speed in percent
- Fuel flow in lbs. or kg X1000 per hour
- Oil pressure in psi
- Oil temperature in ° C
- Oil quantity in quarts or liters
- Engine vibration in relative units

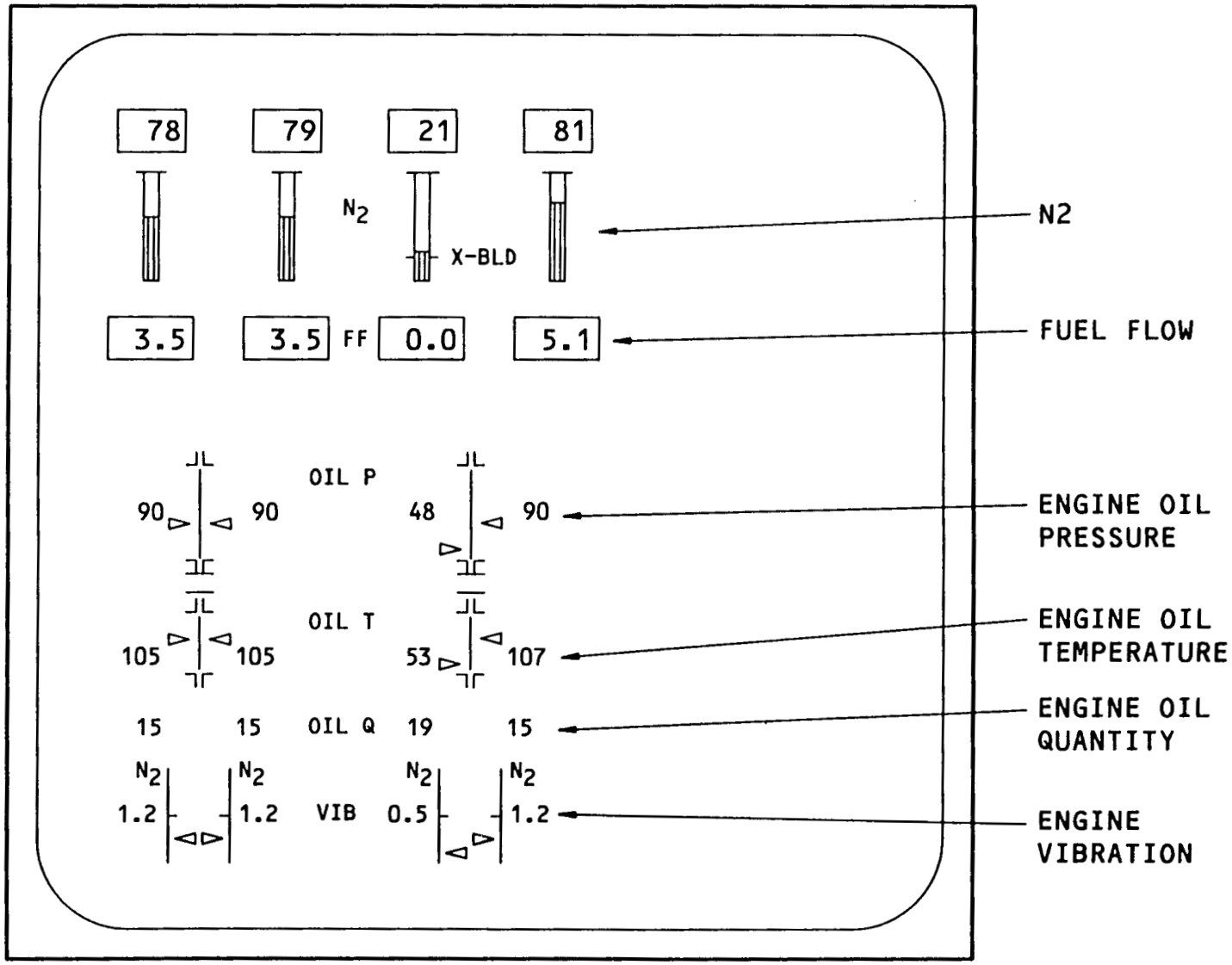


Figure 3 AUXILIARY EICAS - SECONDARY ENGINE FORMAT

EICAS ENGINE KEY - NORMAL OPERATION

General

The EICAS secondary format page shows when the ENG (engine) key on the EICAS display select panel (DSP) is pushed.

Operation

At initial power-up, the secondary format automatically shows.

Push the ENG key (with secondary engine data already on the display) to make the auxiliary EICAS display go blank.

Normal operation in-flight is a blank auxiliary EICAS display. Push the ENG key to show the secondary engine data on the auxiliary EICAS display.

Additional functions of the engine key will be discussed later.

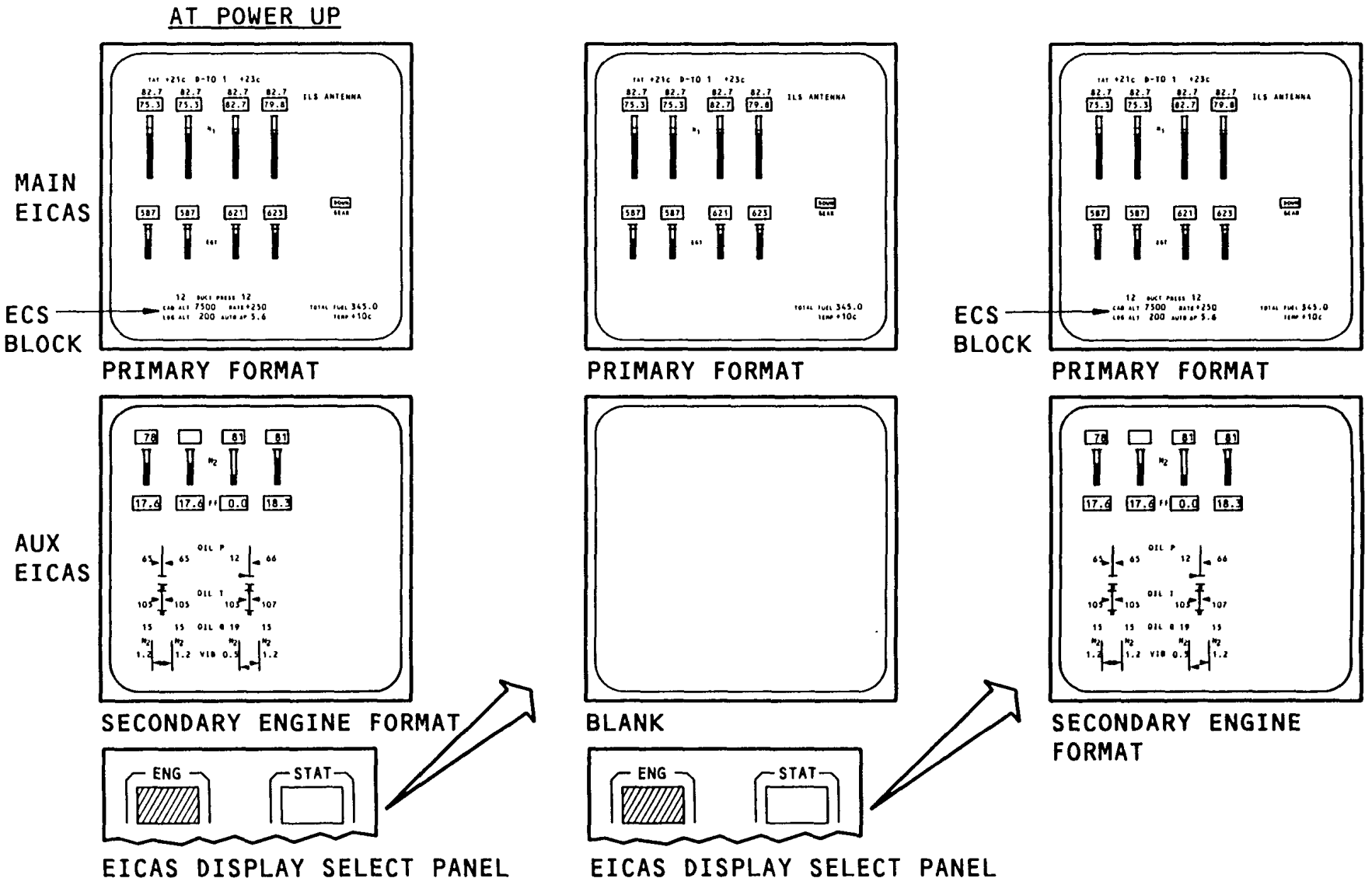


Figure 4 EICAS ENGINE KEY - NORMAL OPERATION

MAIN EICAS - COMPACTED - FULL FORMAT

General

The EICAS compacted format combines the EICAS primary and EICAS secondary parameters. It is displayed on the main EICAS. In the compacted format, the EICAS secondary parameters are displayed in digital format only.

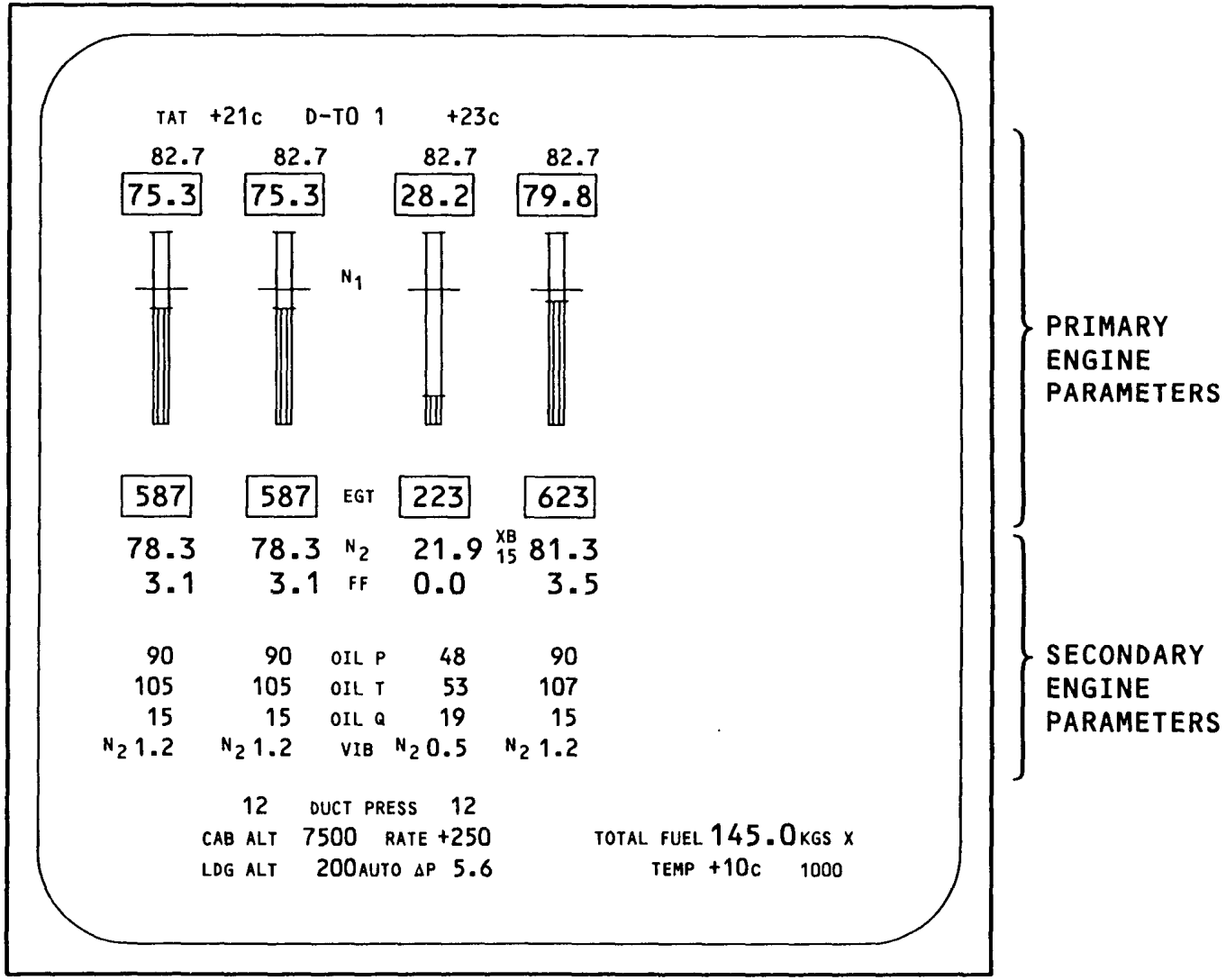
Display Processing

The compacted format shows during the following conditions:

- Any time a maintenance page shows while the airplane is on the ground
- When EICAS is in a degraded mode (only one display available for EICAS)

The engine key is used to select the compacted format. Push the engine key a second time to return to the primary format.

The message field, gear, and flap information is available for display if required. The conditions for display are the same as the primary format.



MAIN EICAS DISPLAY

Figure 5 MAIN EICAS - COMPACTED-FULL FORMAT

AUXILIARY EICAS - SECONDARY - PARTIAL FORMAT

General

EICAS secondary-partial is the result of one or more secondary engine exceedances:

- N2 exceedances
- Engine oil exceedances
- Vibration exceedances

These indications show automatically and independently on the auxiliary EICAS display in the event of an exceedance.

N2 Exceedance

When a new N2 redline exceedance occurs, N2 indication for all four engines show.

Engine Oil Exceedances

The following are the possible engine oil exceedances:

- Low oil pressure redline
- High oil temperature redline
- High oil temperature amber limit - Low oil quantity magenta limit

In the event of any of the above engine oil exceedances, the entire engine oil indication shows.

Vibration Exceedances

Vibration exceedances occur in the following areas:

- BB (broad band vibration)
- Fan
- LPT
- N2

New Exceedances

When a new secondary exceedance occurs, the auxiliary EICAS shows the secondary-partial format, unless it is already displaying secondary-full.

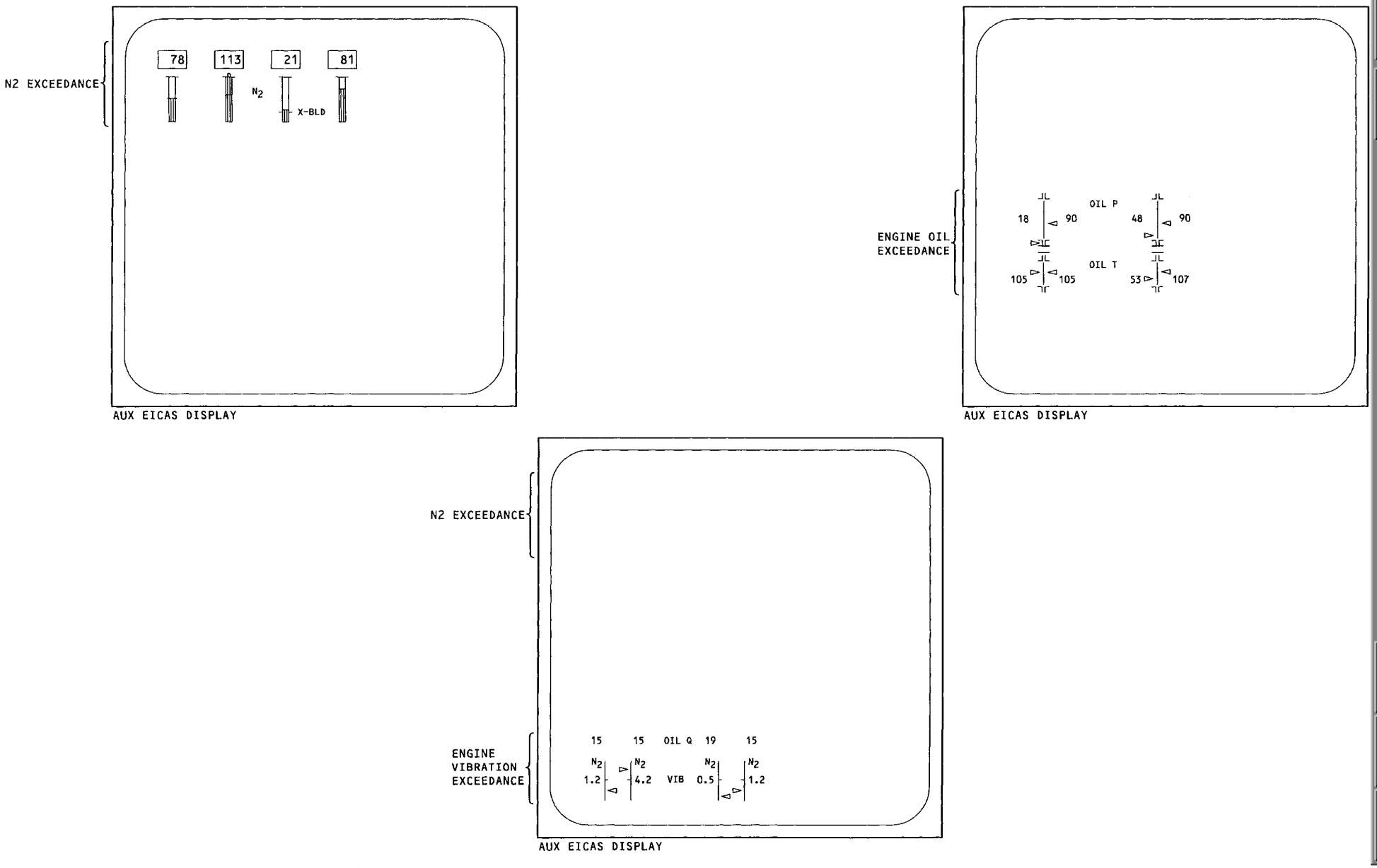


Figure 6 AUXILIARY EICAS - SECONDARY-P ARTIAL FORMAT

MAIN EICAS - COMPACTED-PARTIAL FORMAT

The EICAS compacted-partial format appears when a secondary-partial format shows on the AUX EICAS display and either a synoptic or the status page, or a maintenance page (in the air only) is called up.

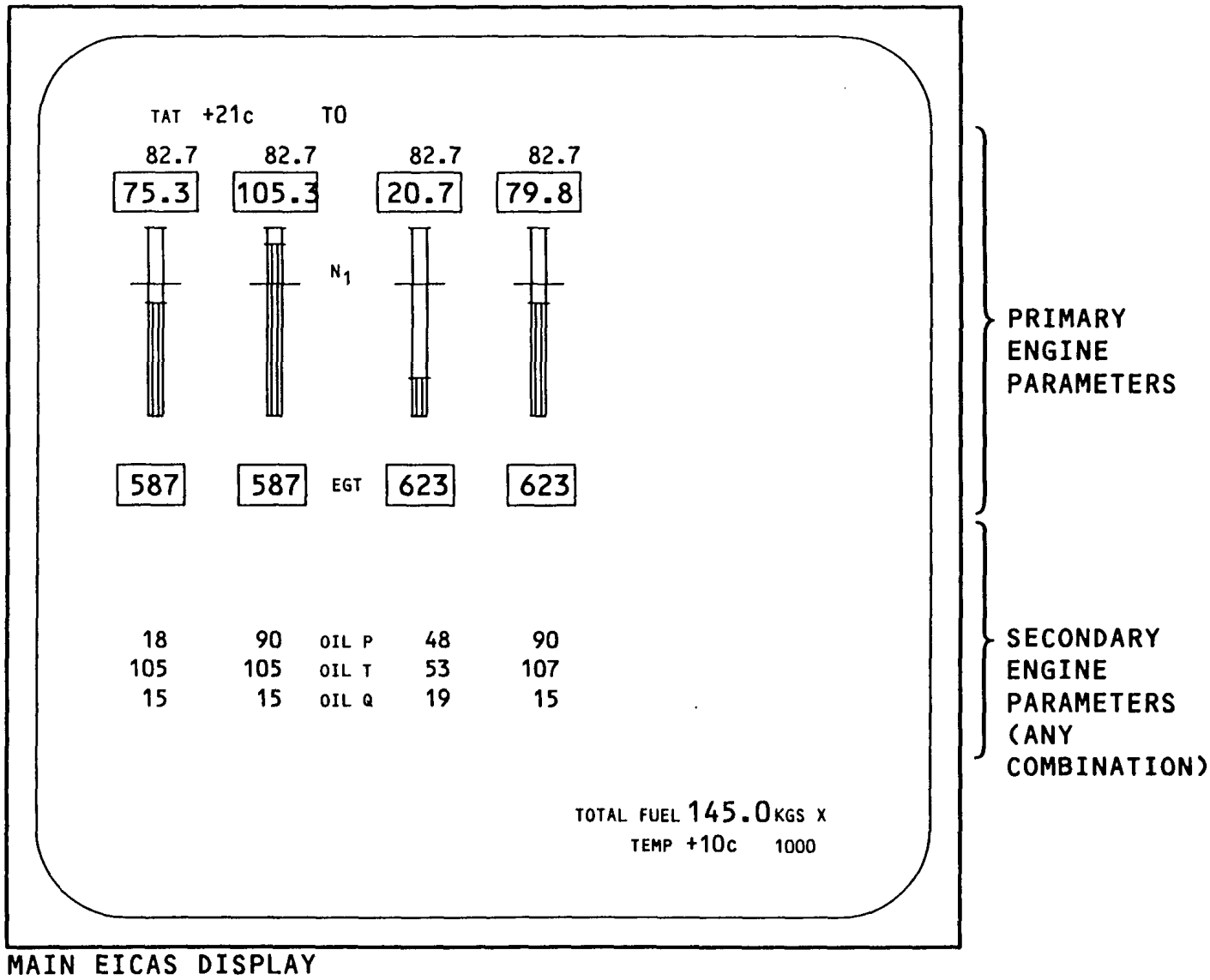
The EICAS compacted-partial format shows:

- N1 in digital and analog indications
- EGT in digital form only

It also shows N2 (digital only) and/or oil pressure parameters (digital only) and/or vibration parameters.

Push the engine key to alternate the main EICAS display between the compacted-full and the compacted-partial format.

EICAS messages, gear, flap and ECS data will be shown as required.



MAIN EICAS DISPLAY

Figure 7 MAIN EICAS - COMPACTED-P ARTIAL FORMAT

ENGINE EXCEEDANCE ANNUNCIATIONS

Redline Exceedance Annunciations

When there is an engine N1 N2, EGT redline exceedance stored in EIU engine exceedance nonvolatile memory (NVM), push the RCL(recall)/CANC(cancel) keys to turn the box around the readout from red to white. Push the line select key next to the ERASE prompt on the engine exceedance maintenance page menu to erase the exceedance from NVM. An amber engine N1 N2, EGT exceedance is not latched into memory.

Secondary Engine Data Cue

When any secondary engine parameter is in exceedance, the cyan, secondary engine data cue shows on the main EICAS display. This protects the crew against an undetected lower IDU failure.

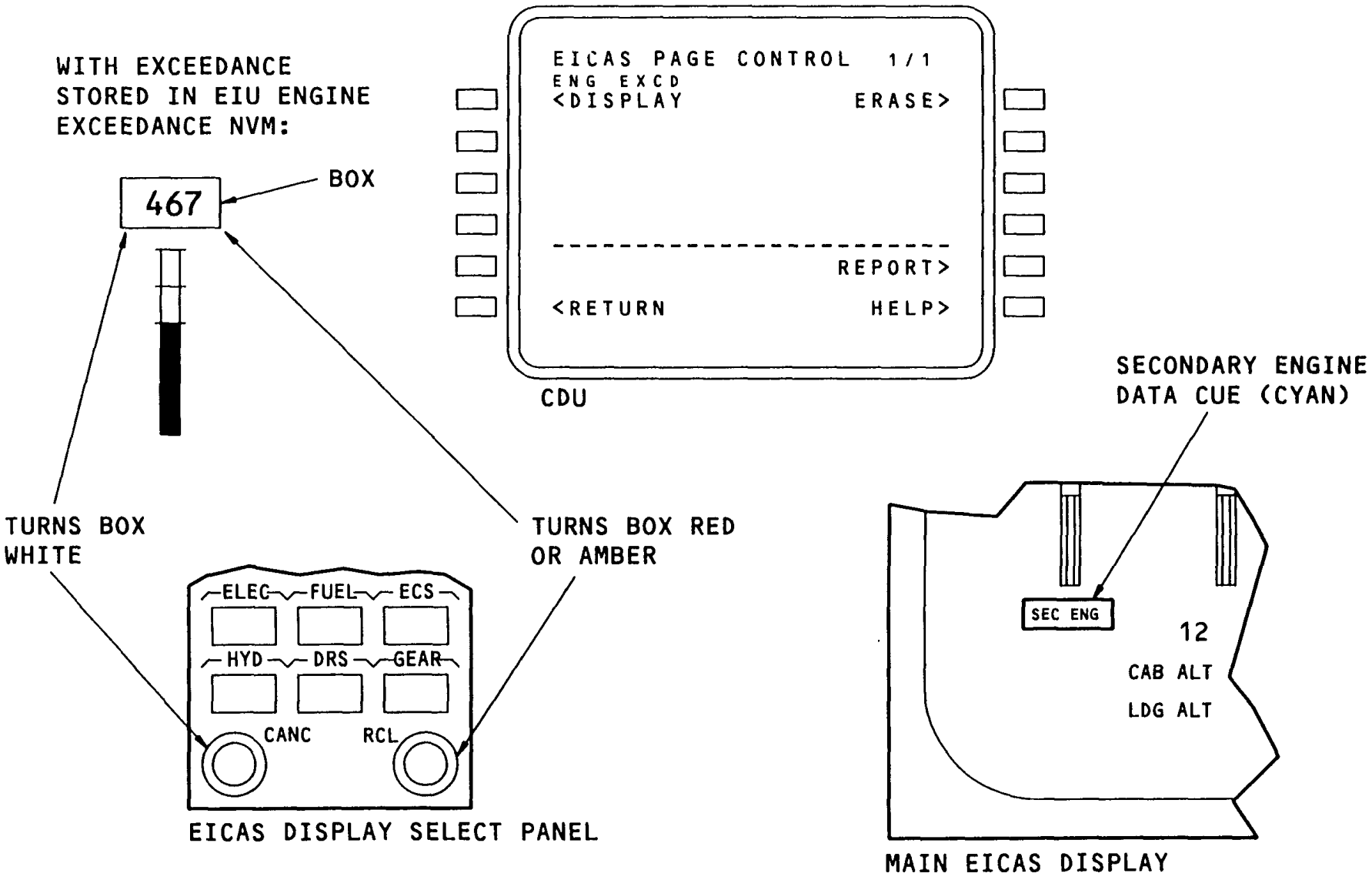


Figure 8 ENGINE EXCEEDANCE ANNUNCIATIONS

MAIN EICAS - CREW ALERTING AND MEMO MESSAGES

General

The Main EICAS formats show these types of messages:

- Warnings - Level A
- Cautions - Level B
- Advisories - Level C
- Memos - Level D

Level A, B, and C messages are alert messages. Level D messages are memos or annunciations of normal crew procedures. There are eleven messages available on each page. The cancel/recall keys are used to access overflow messages. A caret (>) preceeding a message indicates that there is no quick reference handbook (QRH) procedures for that message.

Warnings - Level A

Warning messages are related to conditions that require immediate crew action. When there is a warning message, the indications are:

- A red warning message at the top of the message field. The most recent message is always on top.
- A fire bell, siren or wailer sounds over the aural warning speakers.
- Both master warning lights come on.

Level A messages cannot be cancelled. Some level A aurals and the master warning light indications can be reset. Push either master warning light to reset both. The message goes away when the conditions that caused the message are no longer valid.

Cautions - Level B

Caution messages require immediate crew awareness and future crew action. Level B indications are:

- An amber message immediately below the last level A message or, if no level A message exists, at the top of the message field. The newest level B message is always on top.
- An owl sound over the aural warning speakers
- Both master caution lights come on.

Level B messages can be cancelled (paged) to view overflow messages or to clean up the display. The master caution lights can be reset. Push either light to reset both lights. The message goes away when the condition that caused the message no longer exists.

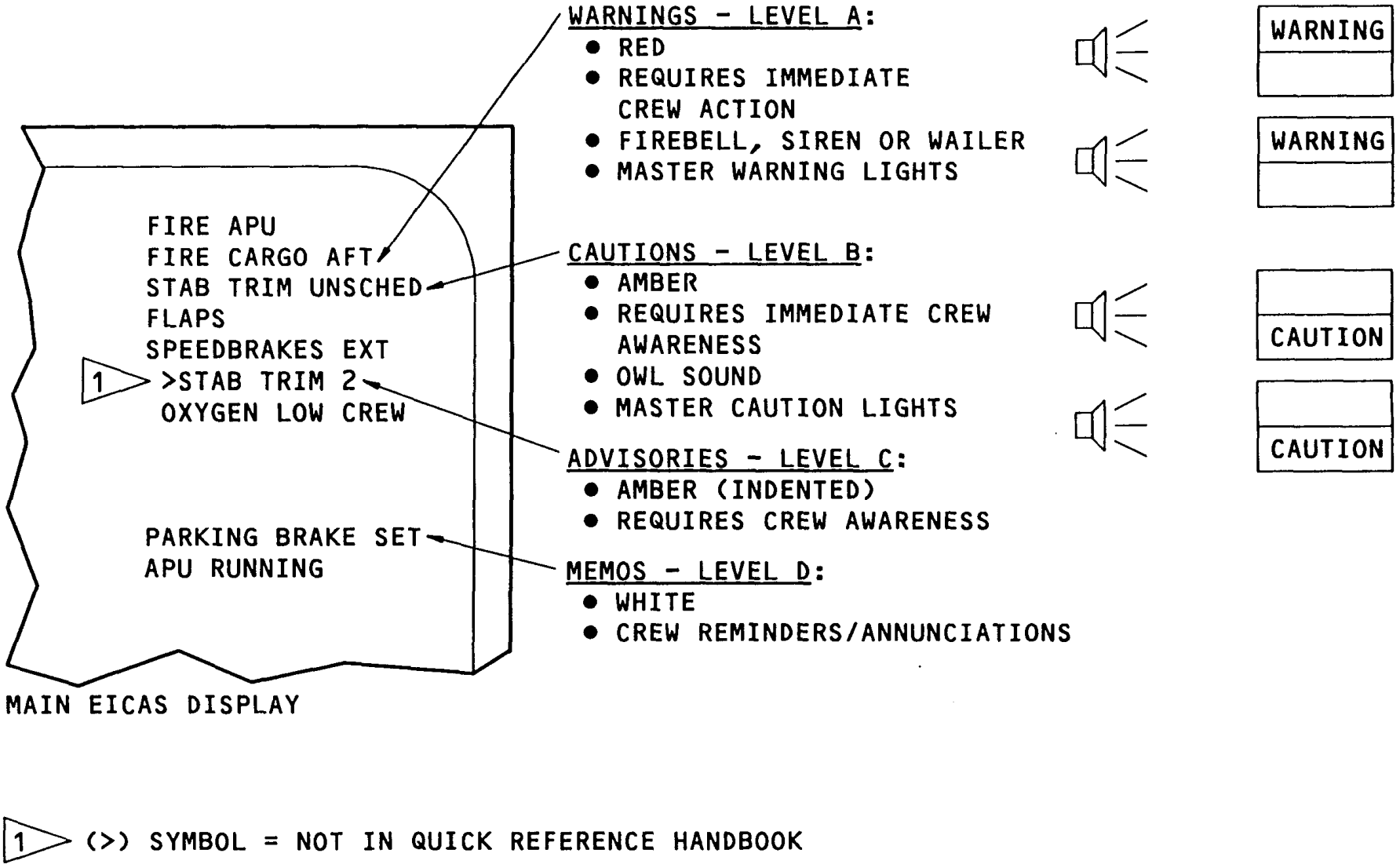
Advisories - Level C

Level C messages require crew awareness and possible future crew action. Level C messages are amber and indented one space. There is no level C aural. The newest message is always on top, immediately following the last message

of a higher priority. Level C messages can also be cancelled (paged).

Memos - Level D

Memo messages are crew reminders or annunciations of normal conditions. The messages are white and the first message shows on line eleven of the message field. The messages will move up the field with the newest message on line eleven. Memo messages can appear on different pages (overflow). Use the cancel key to page the messages. Unlike caution and advisory messages, memo messages cannot be cancelled.



BACK
TOC
TOF
NEXT

Figure 9 CREW ALERTING AND MEMO MESSAGES

MAIN EICAS - ALERT MESSAGE PAGING

The main EICAS display shows up to eleven messages at a time. If more than eleven messages exist, a (PG 1) prompt appears below and to the right of line eleven.

Push the CANC (cancel) key on the EICAS display select panel (DSP) to page or access the additional messages. Only caution and advisory messages can be paged. When the cancel key is pushed repeatedly, it causes the next page of messages to show until the message field has no caution or advisory messages. Warning messages and memo messages cannot be cancelled.

If a new message is generated during paging, it will appear at its proper location on the page being shown. If the new message is a caution or advisory message, it can be cancelled.

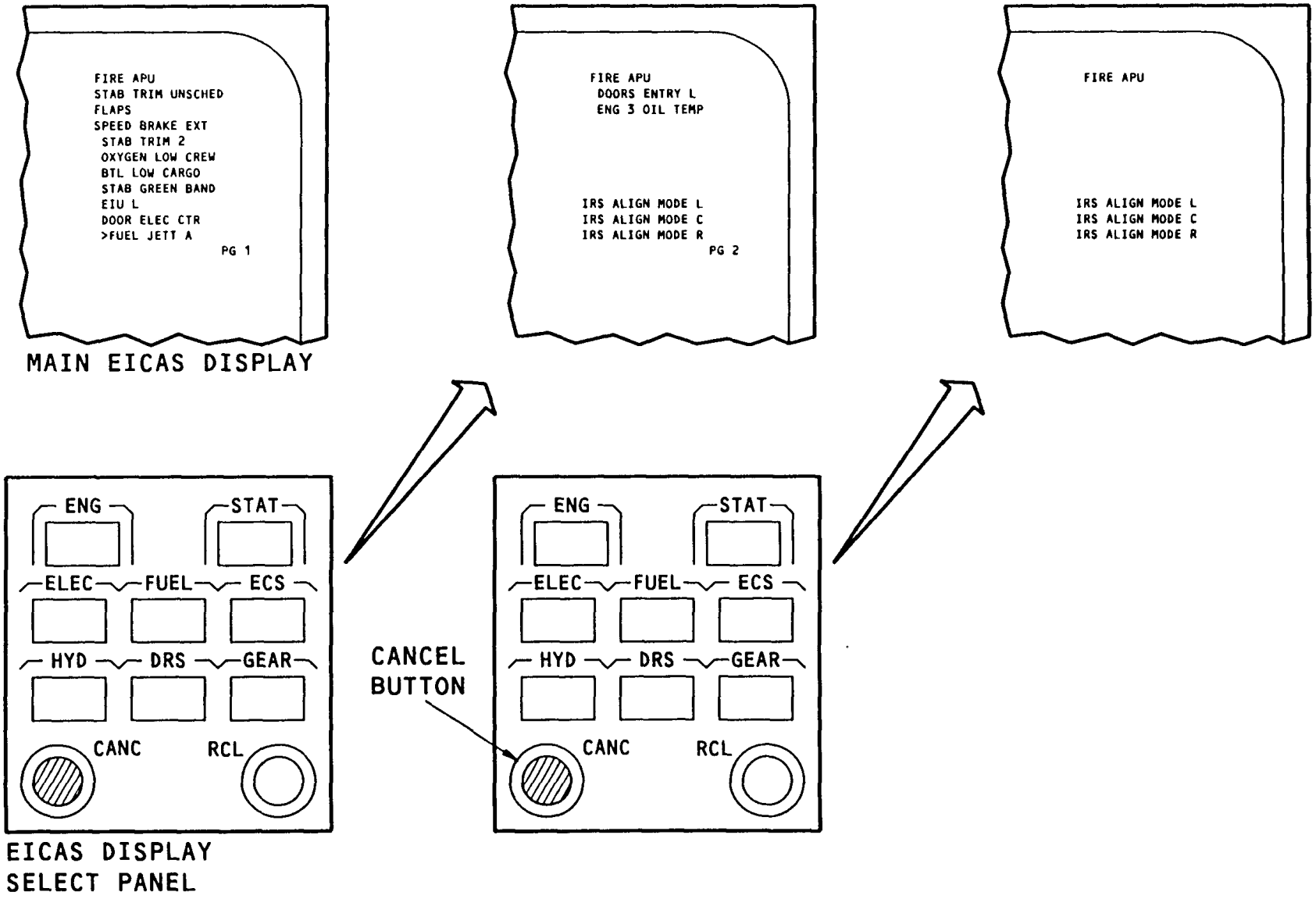


Figure 10 MAIN EICAS - ALERT MESSAGE PAGING

MAIN EICAS - ALERT MESSAGE RECALL

Push the RCL (recall) switch on the EICAS DSP to cause caution and advisory messages that were previously cancelled to show. If the conditions still exist, the messages show by priority.

A RECALL prompt appears on the display each time the RCL switch is pushed. The prompt disappears one second after the switch is released.

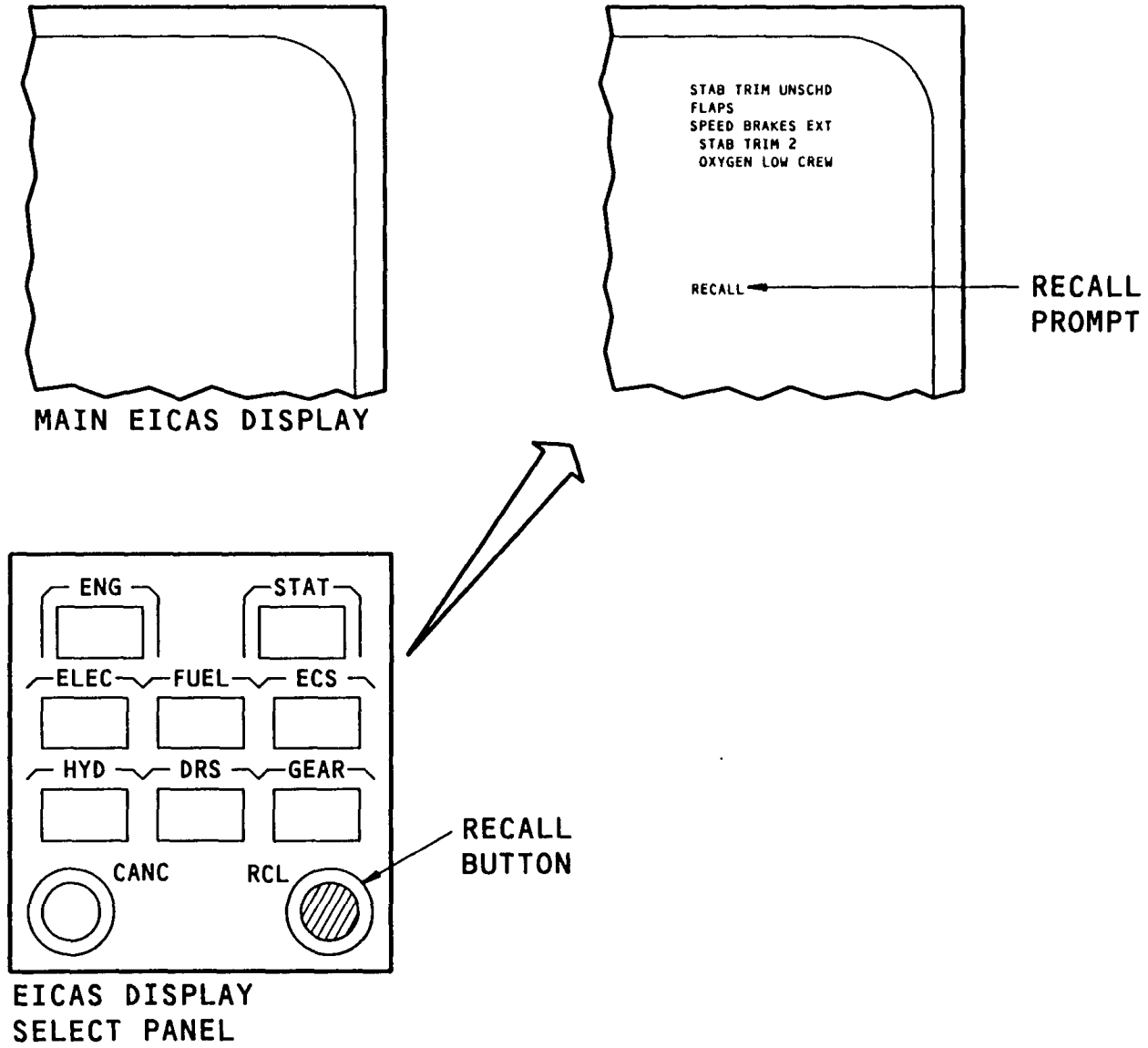


Figure 11 MAIN EICAS - ALERT MESSAGE RECALL

EICAS - INHIBITS

Several conditions affect the messages, aural tones, and master caution lights generated by the EFIS/EICAS interface units.

Three conditions inhibit master caution light and aural tone outputs:

- Engine shutdown inhibit
- Engine start inhibit
- Airplane takeoff inhibit

Two conditions affect the messages that show

- Starter cutout inhibit
- Engine start inhibit

The engine start inhibit also inhibits certain maintenance page automatic snapshots.

The takeoff/go-around (TO/GO) inhibit inhibits amber band exceedances during takeoff or go-around for 5 minutes.

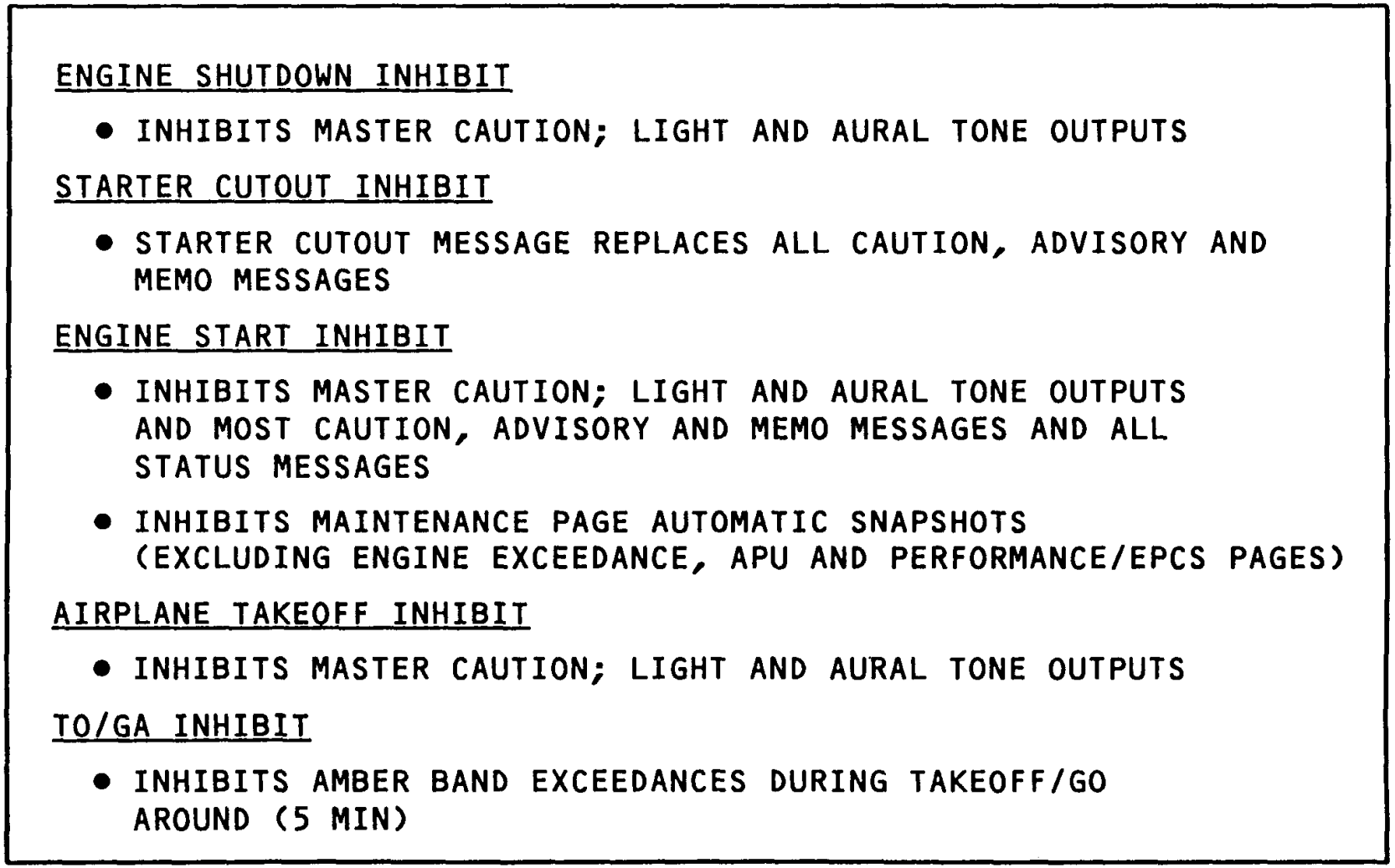


Figure 12 EICAS - INHIBITS

EICAS - ENGINE START INHIBIT

General

Engine start inhibit (ESI) inhibits most new caution, advisory and memo messages, and all new status messages.

ESI is present during engine start to prevent displays of messages and aural tones due to automatic bus load shedding and generator switching.

Operation

ESI starts when these are true:

- Engine is not running.
- Engine is not shut down, and ESI already exists, or engine start control switch is pulled and latched to the start position.

ESI exists when the above is true for any engine.

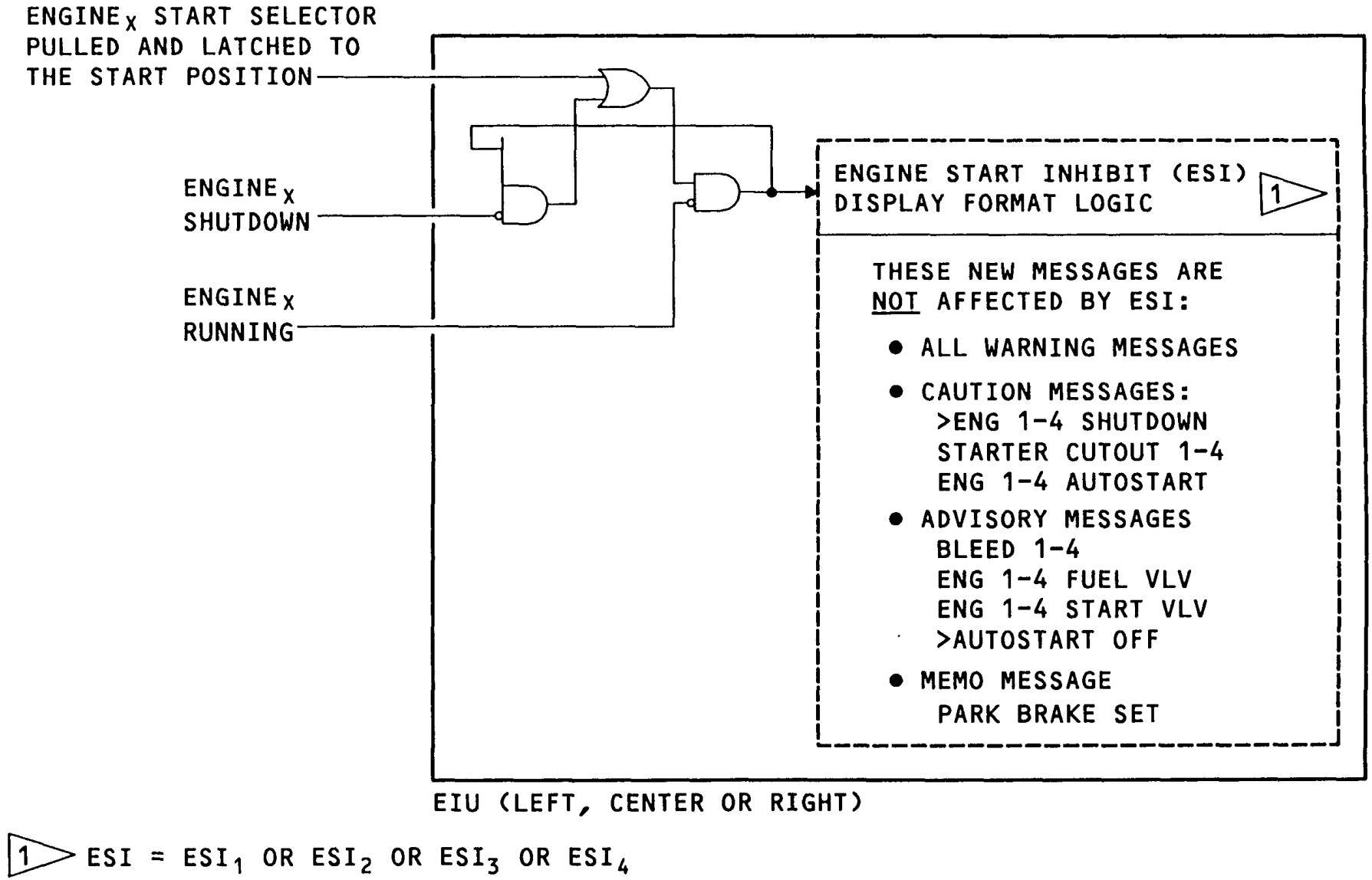


Figure 13 EICAS - ENGINE START INHIBIT

EICAS - STARTER CUTOUT INHIBIT

General

The starter cutout inhibit is enabled when the airplane is on the ground.

Operation

When an engine starts and the starter fails to disengage (cut out), the electronic engine controller (EEC) sends a digital discrete to the EIUs. Logic in the EIU causes the applicable STARTER CUTOUT 1-4 caution message to replace all caution, advisory and memo messages. When the starter cutout inhibit is removed, all messages show including any new messages that occurred during the inhibit.

The starter cutout inhibit is removed when:

- 20 seconds has elapsed from the start of the inhibit, or
- A new caution message occurs, or
- The cancel or recall switch on the EICAS display select panel is pushed, or
- The starter cutout failure no longer exists.

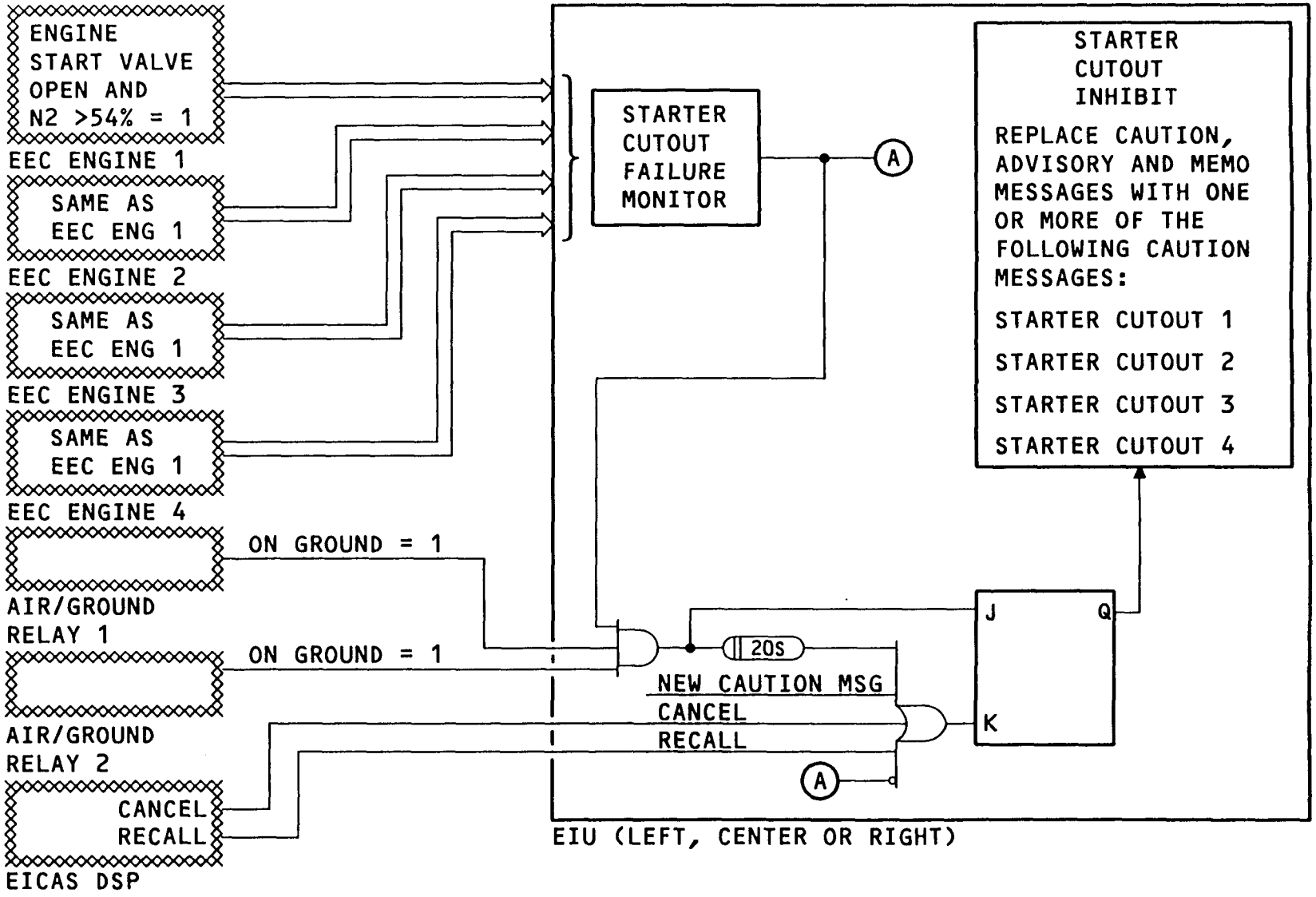


Figure 14 EICAS - STARTER CUTOUT INHIBIT

EICAS - ENGINE SHUTDOWN INHIBIT

General

The engine shutdown inhibit, inhibits master caution (MC) and aural tone (AT) commands from being sent to the MAWEA.

The master caution lights go off when the inhibit begins.

Operation

If a caution condition occurs during engine shutdown inhibit and still exists when the inhibit is removed, then no aural tone command goes to the MAWEA and no discrete goes to the master caution lights.

The engine shutdown inhibit begins when both of the conditions listed below are true, and stops when either is no longer true:

- All engines are shut down
- Airplane is on the ground

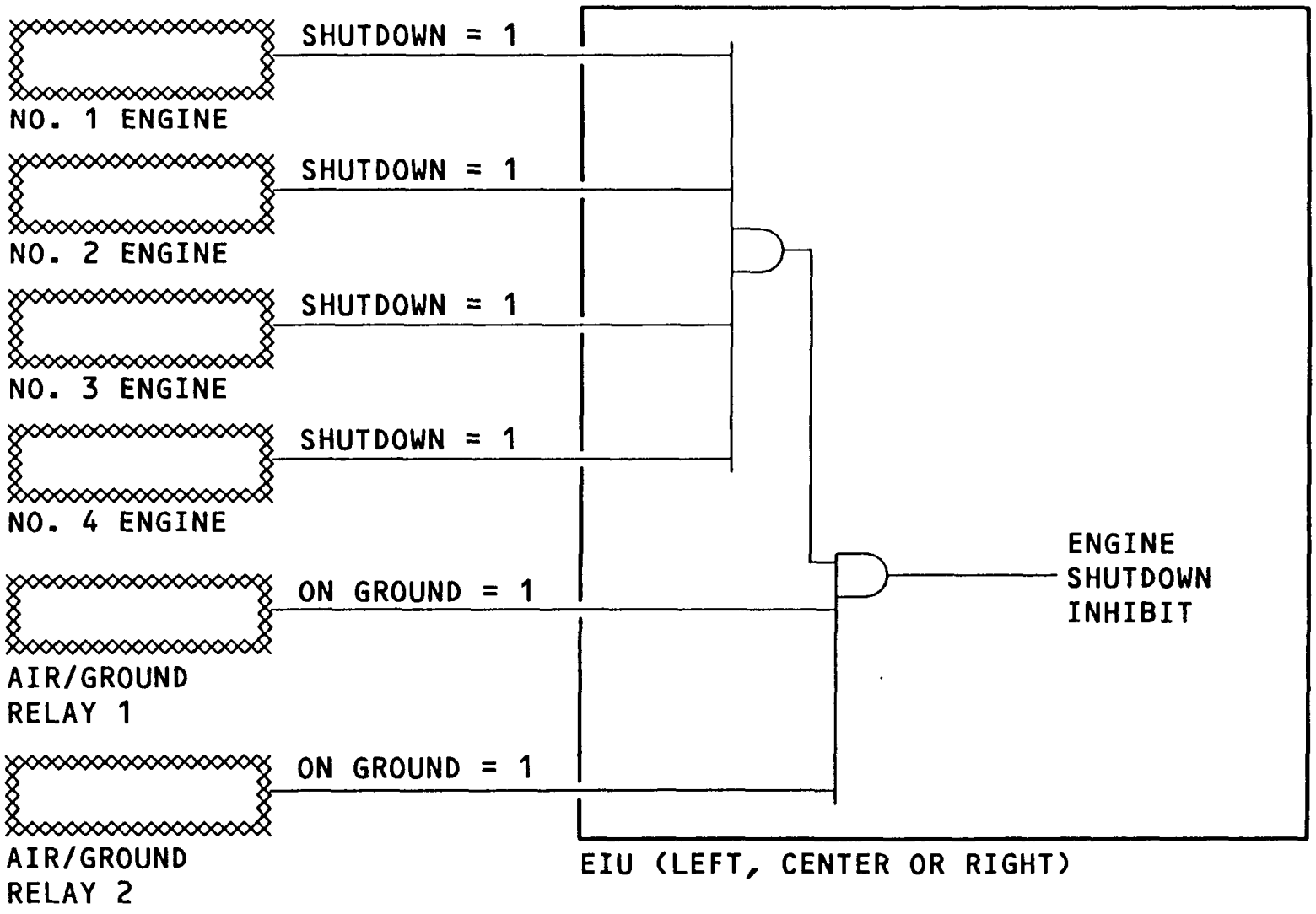


Figure 15 EICAS - ENGINE SHUTDOWN INHIBIT

EICAS - AIRPLANE TAKEOFF INHIBIT

General

The airplane takeoff inhibit prevents all aural tone and master caution light outputs during takeoff. This removes flight crew distractions during takeoff.

Operation

The airplane takeoff inhibit starts when these conditions are true:

- Air data computer (ADC) computed airspeed (CAS) is more than 80 knots.
- CAS has not been more than 80 knots before.

The airplane takeoff inhibit goes away when one of these conditions is true:

- CAS goes below 75 knots
- Airplane rotates through 50 pitch angle and 20 seconds elapse
- Radio altitude is more than 400 feet

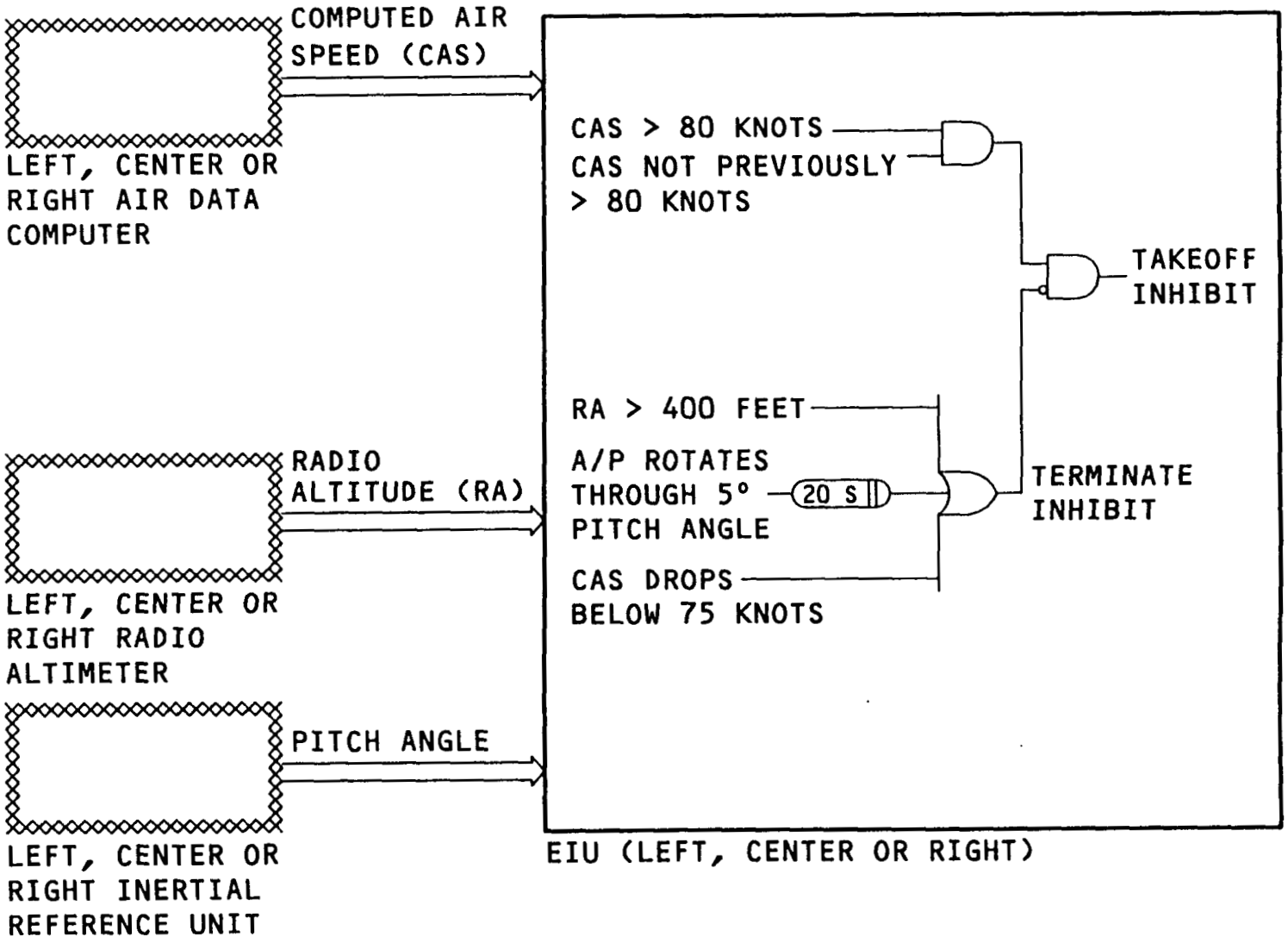


Figure 16 EICAS - AIRPLANE TAKEOFF INHIBIT

EICAS - TAKEOFF/GO AROUND INHIBIT

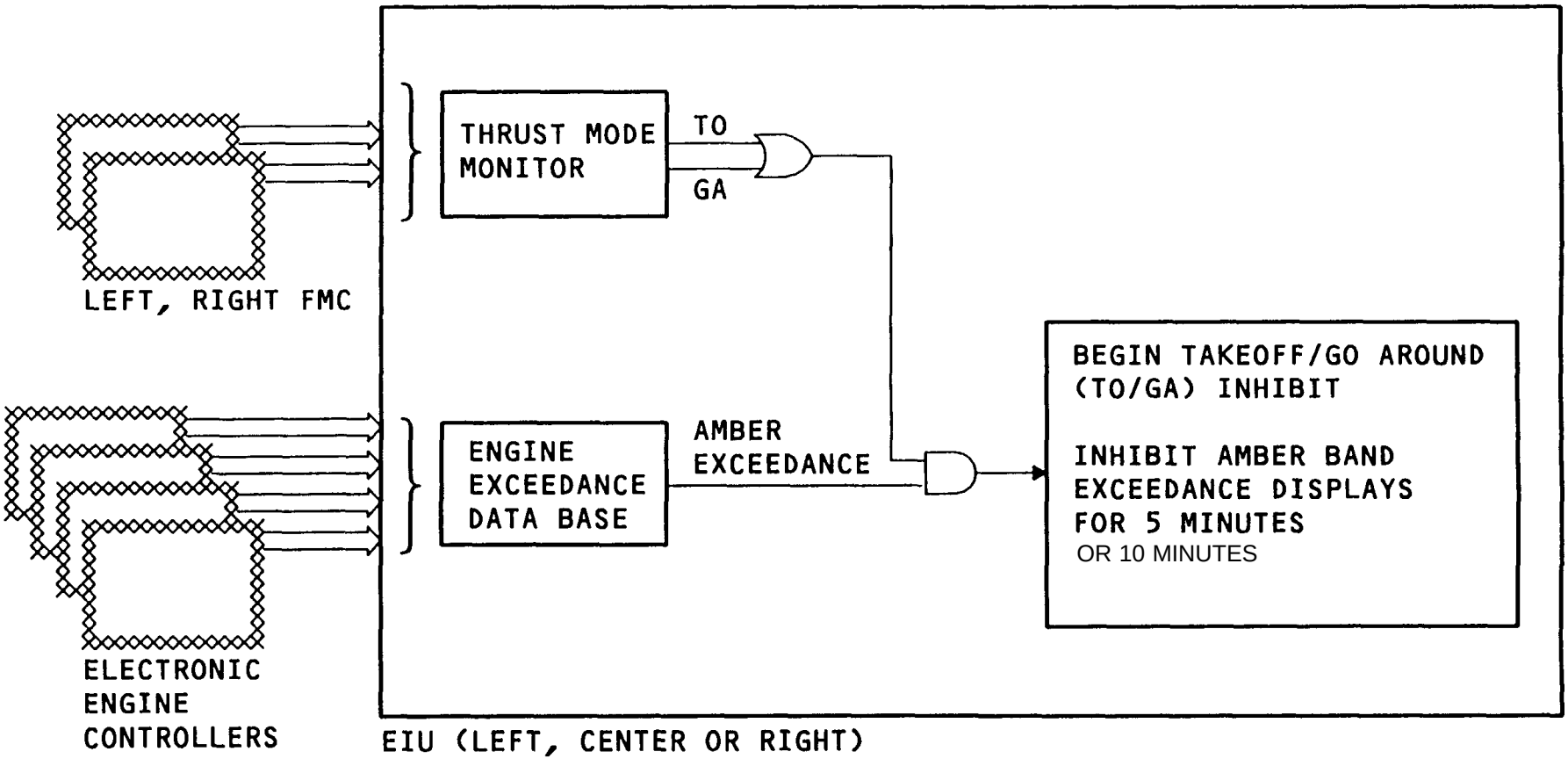
General

The takeoff/go around inhibit inhibits amber band exceedance displays on EICAS if they occur during the takeoff (TO) or go around (GA) thrust limit modes.

Operation

The EIUs receive a thrust limit mode digital discrete from the FMCs. When either the takeoff or go around thrust mode is detected, amber band exceedances are monitored by the engine exceedance data base. When an amber engine exceedance is detected, the TO/GA inhibit time delay begins to increase.

The time delay is five minutes or ten minutes depend on pin program.



BACK
TOC
TOF
NEXT

Figure 17 EICAS - TAKEOFF/GO AROUND INHIBIT

AUXILIARY EICAS - STATUS PAGE

The status page is used to determine if the airplane is ready for dispatch and to show system data.

When the STAT key is pushed, the status page shows on the auxiliary EICAS display if:

- EICAS is not in the degraded mode
- The status page is not already shown.

The status page contains:

- Hydraulic system quantity, temperature and pressure information
- APU EGT, N1 N2 and oil quantity data
- Crew and passenger oxygen pressure data
- Main/APU battery data
- Dynamic flight surface position indicators
- The status message field

The status messages show the system's status for the current flight leg. Evaluation of the messages using the fault isolation manual and the minimum equipment list aid in determining the maintenance actions required to dispatch the airplane.

The message field can accommodate eleven messages. overflow messages show on additional pages as required. The newest message always appears on the top line.

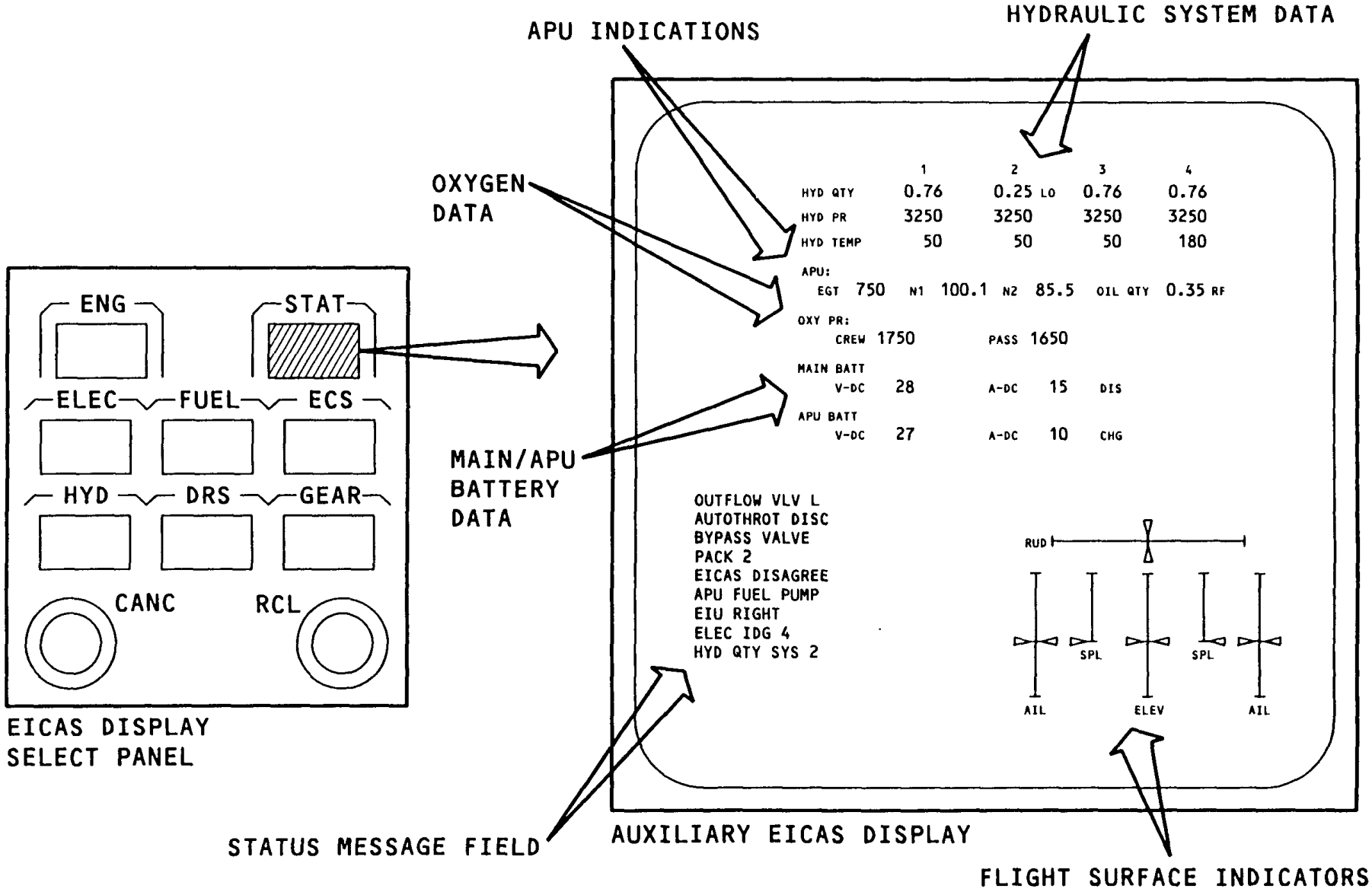


Figure 18 AUXILIARY EICAS - STATUS PAGE

EICAS STATUS KEY - NORMAL OPERATION

General

The EICAS status page is selected when the STAT (status) key on the EICAS display select panel (DSP) is pushed.

Selection of the status page has no effect on the main EICAS display if there are no secondary engine exceedances.

Operation

When the STAT key is pushed, it shows the status page on the AUX EICAS. When the STAT key is pushed with the status page already shown, it causes the AUX EICAS to blank or it will show the next page of status messages. A (PG 1) prompt will appear at the bottom and to the right of the message field if there is more than one page of messages. After the last page of messages show, the display blanks if the STAT key is pushed again.

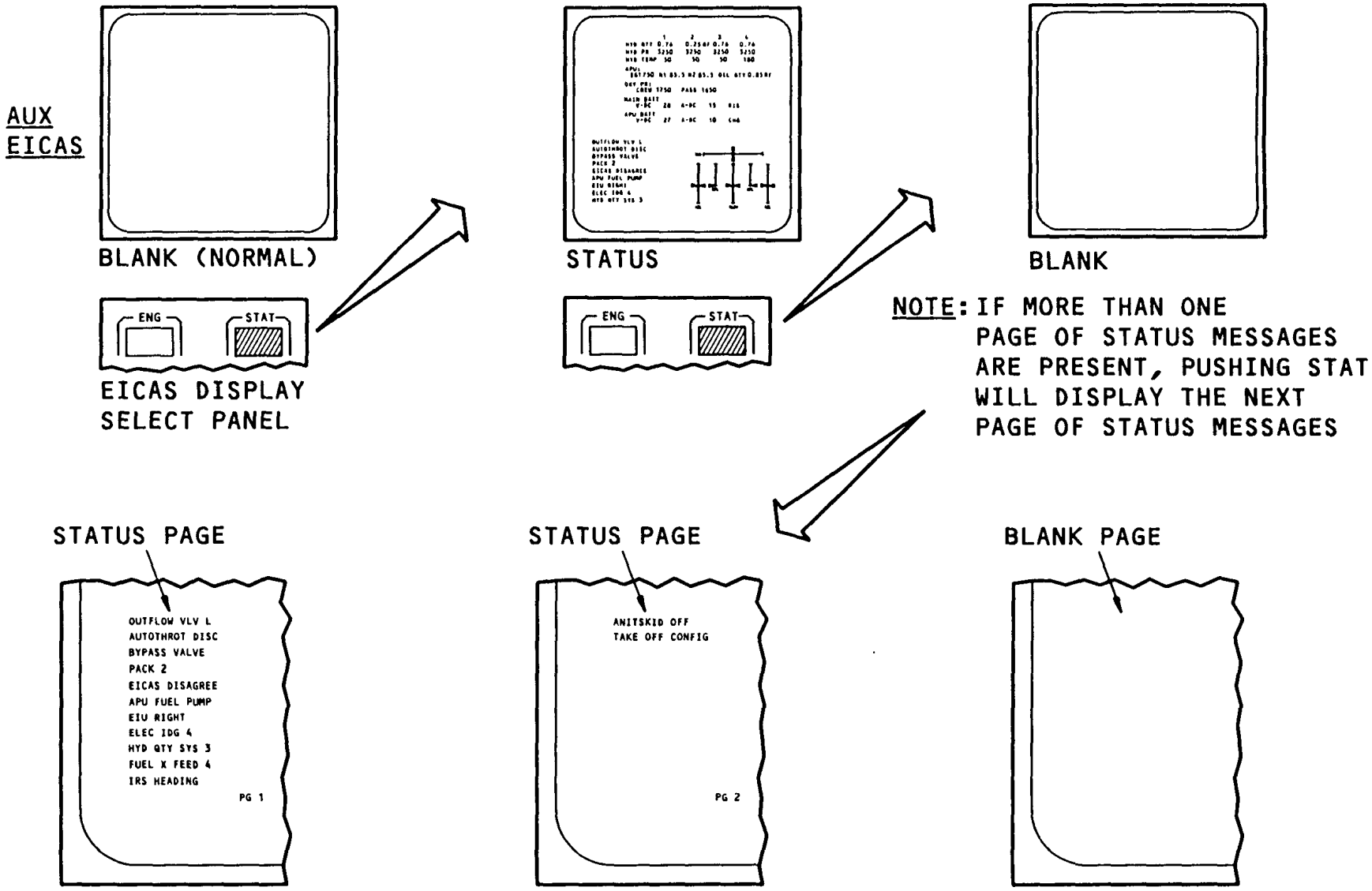


Figure 19 EICAS STATUS KEY - NORMAL OPERATION

AUXILIARY EICAS - STATUS MESSAGE GENERATION

Status Messages

There are two types of status messages:

- Nonlatched
- Latched

Nonlatched status messages show on the status page when a malfunction occurs in any of the systems monitored by the EIUs. The newest message is listed first. When the condition clears that caused the message, it is automatically removed from the status page.

Latched status messages appear on the status page just as the nonlatched type. They have the same priority with the newest of either type listed first.

There are three types of latched status messages:

- Ground only
- Air only
- Unconditional (can occur anytime)

Latched status messages are stored in the EIU's nonvolatile memory. Latched status messages do not disappear when the condition clears. Special

procedures are required to erase latched status messages.

Messages are latched to enable maintenance personnel to review failures that occur in specific flight phases and may not be present or active all the time.

The status messages (all types) are sent to the central maintenance computers for flight deck effect correlation.

Status Cue

The status cue appears on the main EICAS display any time a new status message is generated. There is a fifteen-second time delay before the status cue shows. The cue goes away when:

- The status page is selected on the display select panel
- The condition that caused the message clears itself

Status Cue Inhibit

Display of the status cue is inhibited at any engine start if the airplane is on the ground.

The status cue inhibit stops:

- 30 minutes after takeoff, or
- When any engine fuel control switch transistions from run to cutoff, or
- When the airplane transistions from an in air to on ground condition.

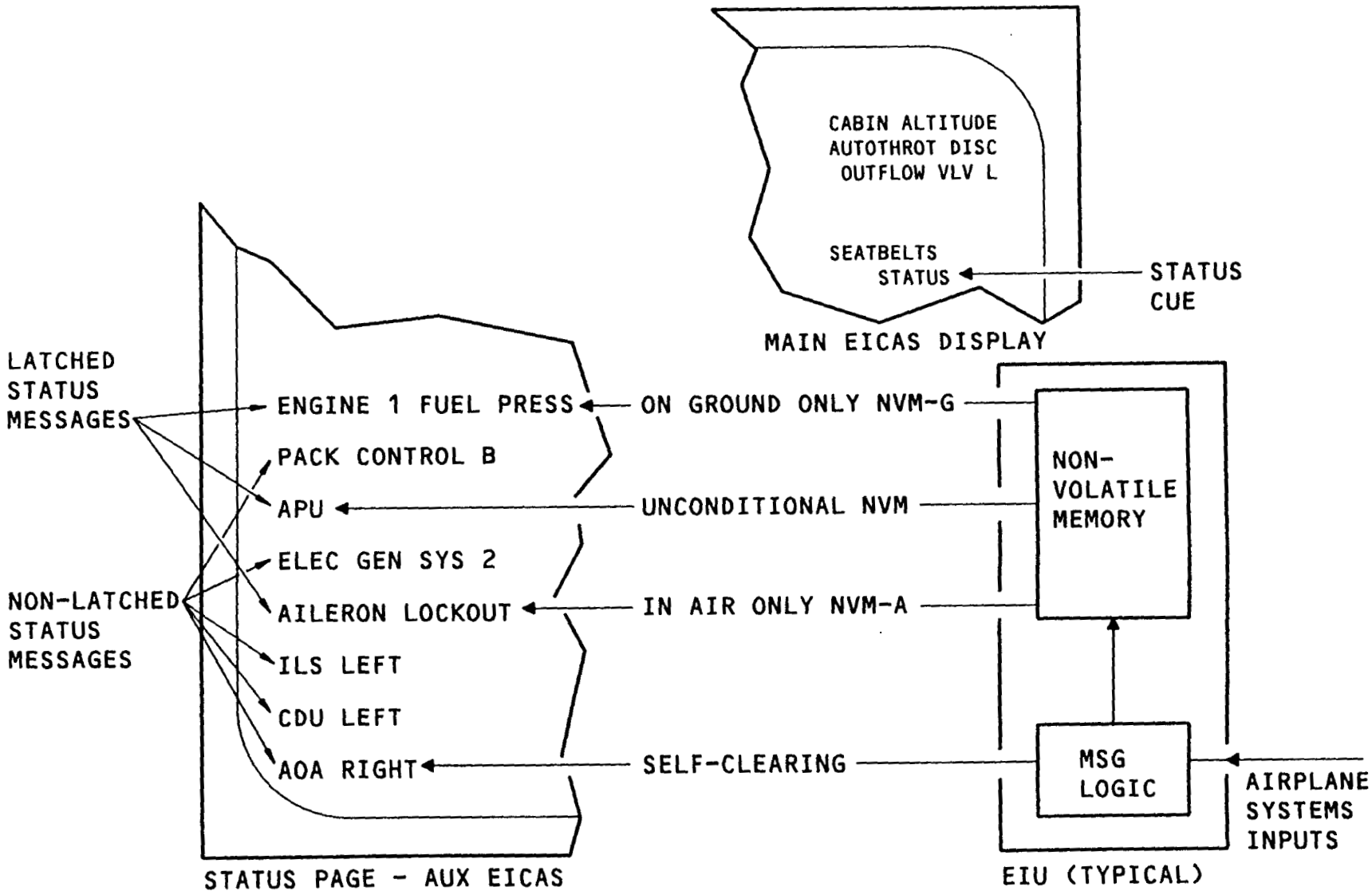


Figure 20 STATUS MESSAGE GENERATION

AUXILIARY EICAS - LATCHED STATUS MESSAGES - ERASE

General

Latched status messages must be erased to remove them from the status page. The primary method to erase the messages from EIU NVM is to use the ERASE prompt on the CDU. The alternate method is to use the CANCEL/RECALL keys on the EICAS display select panel.

Primary Method

Status messages are individually erased when the appropriate line select key is pushed on the CMC present leg faults page on the CDU. The present leg faults page is accessed from the CMC menu.

When a latched status message shows on the present leg faults page, an ERASE prompt shows next to it. The status message is erased when the adjacent LSK is pushed if the condition that caused the message has been cleared. The asterisk (*) adjacent to the flight deck effect indicates that the flight deck effect (status message) still shows.

Alternate Method

Latched status messages can be erased by an alternate method. The CANCEL/RECALL keys on the DSP can be used when these conditions exist:

- No operational CMCs
- Airplane is on the ground
- Last page of status messages show

The two keys must be pushed simultaneously for three seconds.

This is a global erase. All latched status messages that have been corrected will be removed from the status page at the same time.

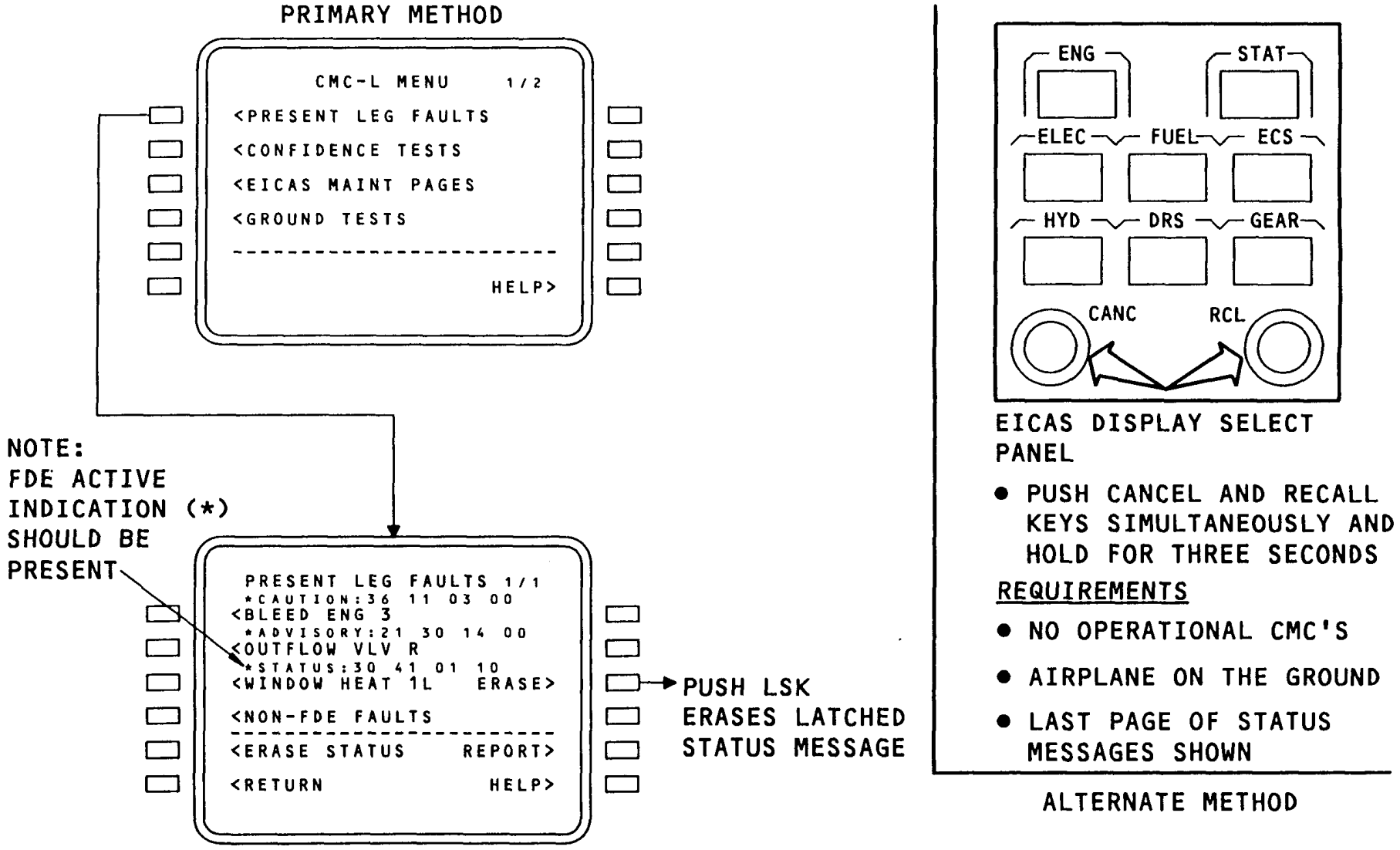


Figure 21 AUXILIARY EICAS - STATUS MESSAGES - ERASE

AUXILIARY EICAS - SYNOPTIC PAGES

The word SYNOPTIC is a combination of the words synopsis (summary) and optic (visual). Synoptics are dynamic displays of real-time systems data. The display is a pictorial representation similar to the configuration on the overhead panel.

The synoptics show when the appropriate key is pushed on the EICAS display select panel. Synoptics normally show on the AUX EICAS display. If the same synoptic key is pushed a second consecutive time, the AUX EICAS display blanks.

Synoptics are available for these systems:

- Electrical
- Fuel
- Hydraulic
- Environmental control system
- Doors
- Gear

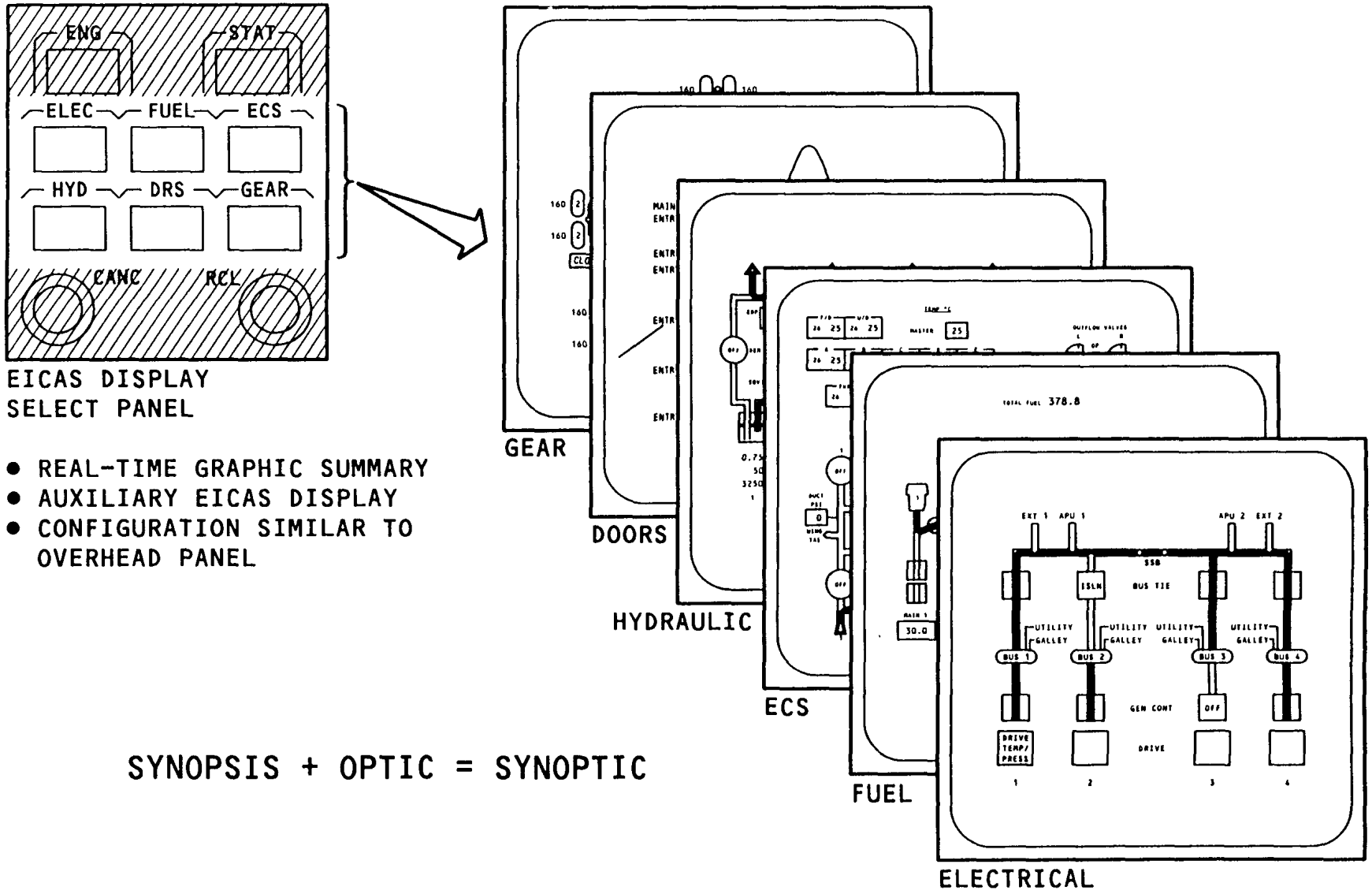


Figure 22 AUXILIARY EICAS - SYNOPTIC PAGES

AUXILIARY EICAS - SYNOPTIC (TYPICAL)

General

Synoptics use several methods to show system operation. These methods include:

- Flow bars
- Color and color changes
- Digital readouts
- Symbols

Flow Bars

Flow bars show the source and path of fluids, air or electricity. Flow bars are usually green.

Colors and Color Changes

Valves, switches and other component operations often show by colors and color changes. Generally, white is on or normal, and amber is abnormal.

Labels are normally cyan.

Digital Readouts

Numerical readouts show quantities, temperatures and pressures. Messages show component operational status.

Symbols

Symbols can show valve, pump or door status. The status can be shown by the presence, position or color of a symbol.

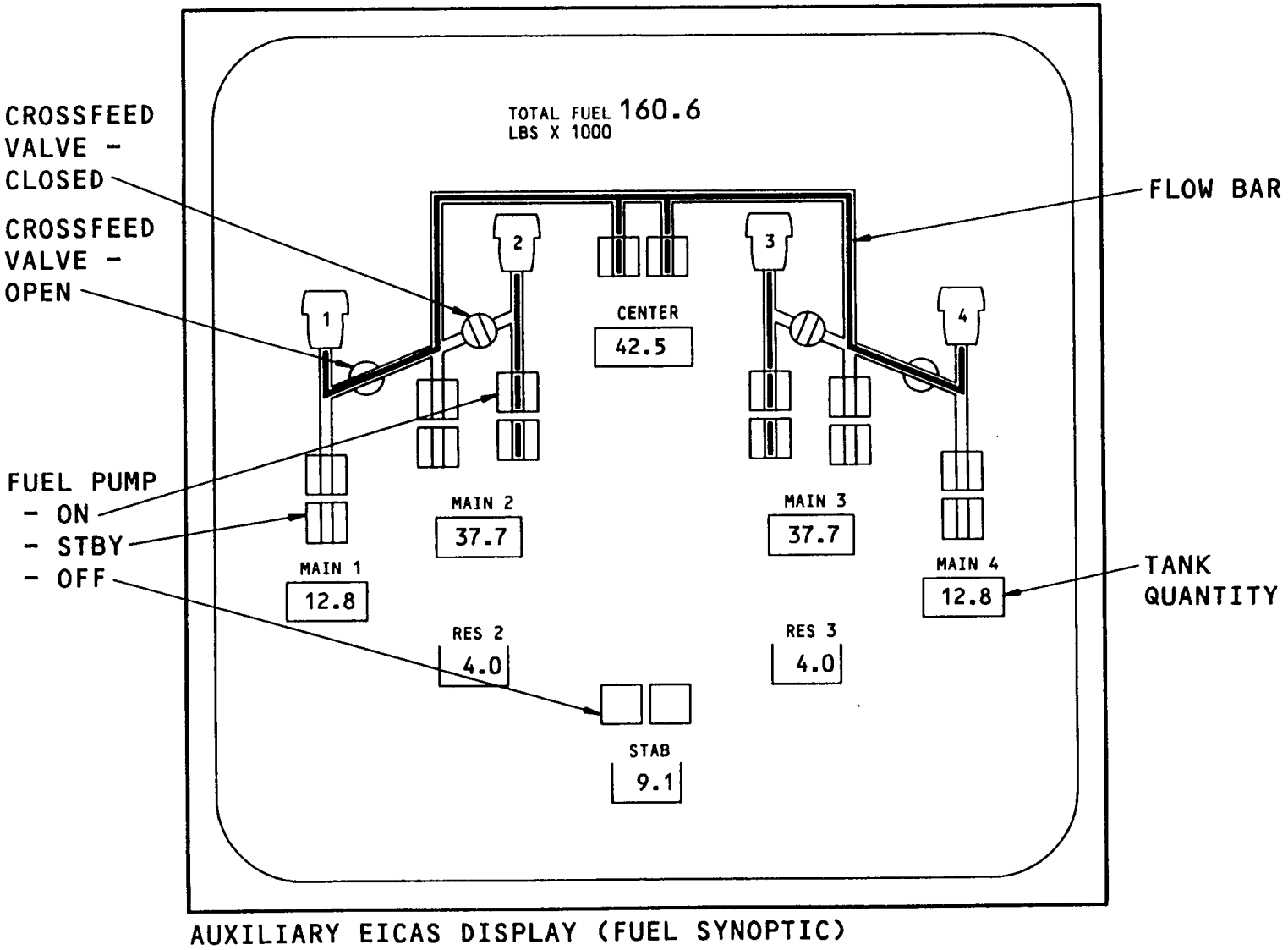


Figure 23 AUXILIARY EICAS - SYNOPTIC (TYPICAL)

AUXILIARY EICAS - SYNOPTIC PAGES DISPLAY EFFECT

Synoptic Display Logic

Synoptics are selected on the EICAS display select panel. They can be selected on the ground or in the air.

The selected synoptic is shown on the auxiliary EICAS display. If there are secondary engine exceedances at the time of a synoptic selection, the EICAS compacted-partial format will be shown on the main EICAS display. If there are no secondary engine exceedances, EICAS primary is shown on the main EICAS display.

Synoptic Removal

The selected synoptic is removed when the appropriate key on the EICAS display select panel is pushed. If secondary engine exceedances are there, EICAS secondary-partial shows on the auxiliary EICAS. If secondary engine exceedances are not there, the auxiliary EICAS display goes blank.

If a new secondary exceedance occurs while a synoptic is shown, the AUX EICAS automatically shows a secondary-partial display. The synoptic can then be selected again.

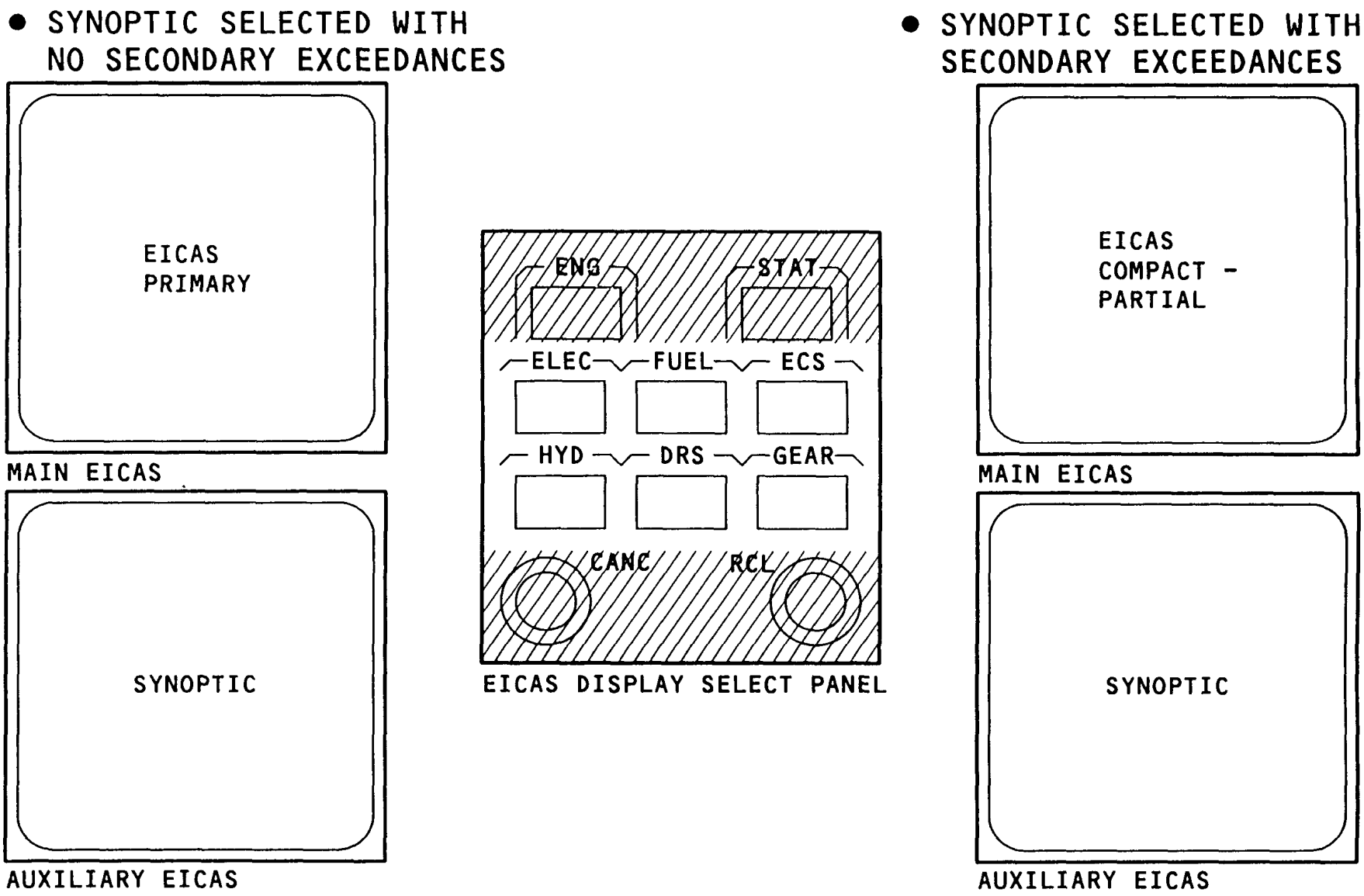


Figure 24 AUX EICAS - SYNOPTIC PAGES DISPLAY EFFECT

MAIN EICAS - MINI FORMATS

There are two mini formats available on EICAS:

- Brake temperature
- Fuel quantity

They show during a degraded display condition (only one display available for EICAS).

The brake temperature and fuel quantity mini formats are selected by the GEAR and FUEL keys on the DSP, respectively.

If a mini format is shown and a new secondary exceedance occurs, the mini format will automatically be replaced by the compacted-partial format. The mini format can then be reselected.

Push the engine key or the same synoptic key to replace the mini format with the compacted-full format, or with the compacted-partial format if a secondary exceedance still exists.

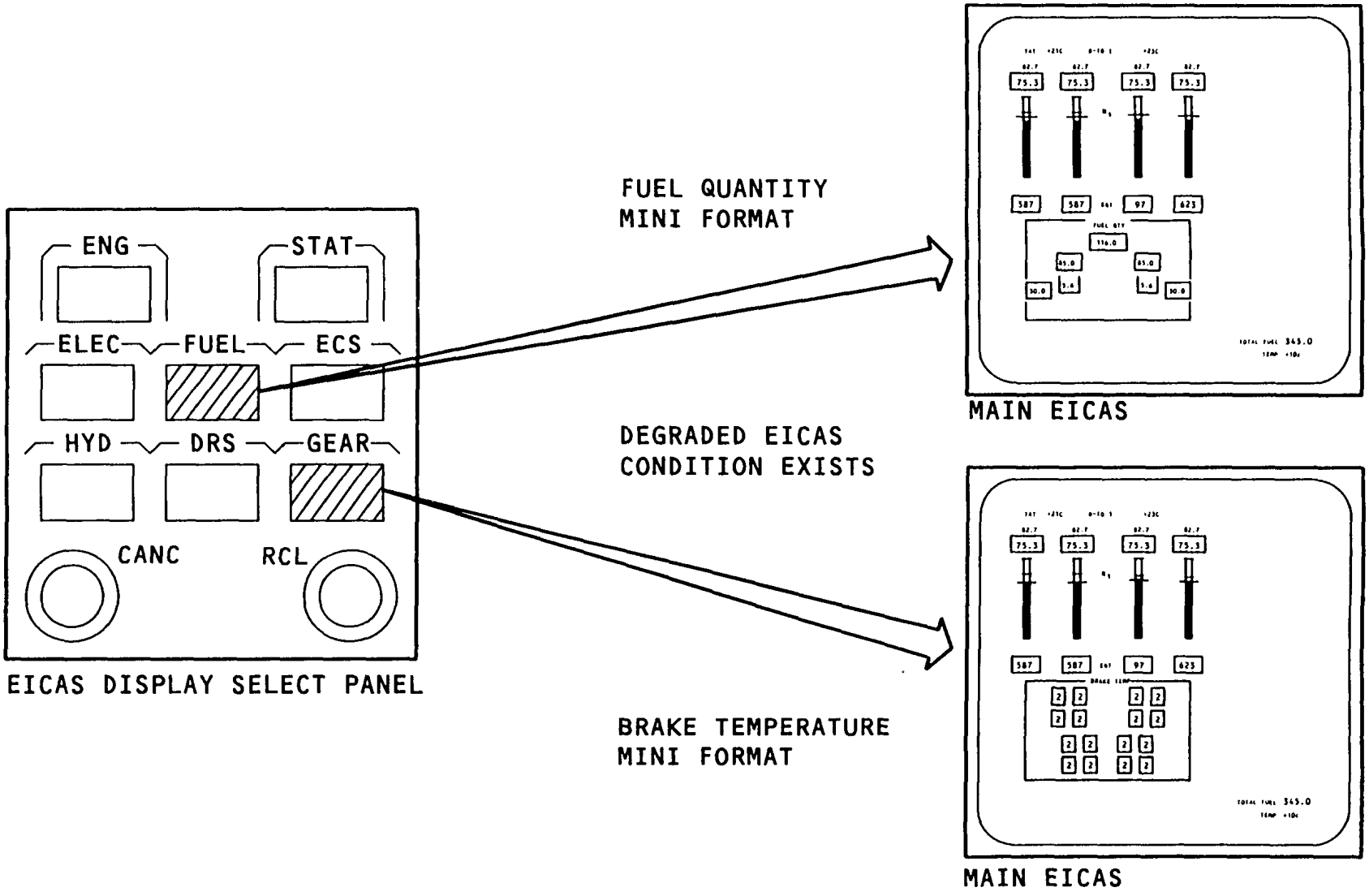


Figure 25 MAIN EICAS - MINI FORMATS

AUXILIARY EICAS - MAINTENANCE PAGES

EICAS maintenance pages provide systems data for maintenance. The maintenance pages are accessed through the CMC. These are the EICAS maintenance pages:

- Environmental control system (ECS)
- Electrical
- Flight controls
- Fuel
- Hydraulic
- Configuration
- Gear
- APU
- Electronic propulsion control system (EPCS)
- Performance
- Engine exceedance

The maintenance pages are selected on the CDU and shown on the AUX EICAS.

The next page key on the CDU is used to show the additional pages of the menu.

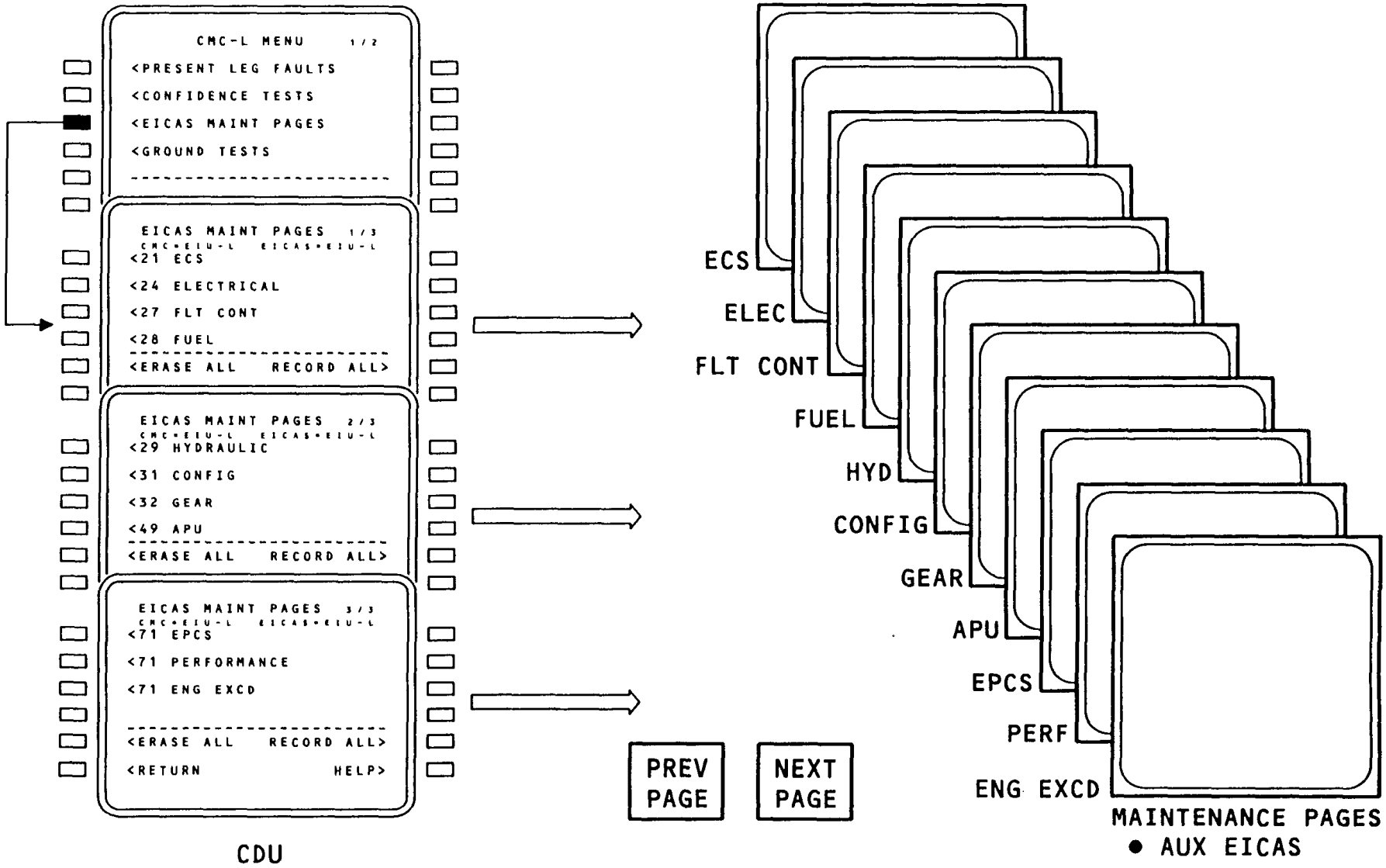


Figure 26 AUXILIARY EICAS - MAINTENANCE PAGES

AUXILIARY EICAS - MAINTENANCE PAGES MODES

General

Maintenance pages for specific systems show data in three modes. These modes are as follows:

- Real time (current dynamic data)
- Manual snapshot (a snapshot of the real time format due to flight or maintenance crew actions)
- Automatic snapshot (a snapshot of the real time format due to an out-of-limits condition)

Manual Snapshots

Manual snapshots are stored in manual event nonvolatile memory. Storage is available for up to 5 manual snapshots for each system.

Automatic Snapshots

Automatic (auto) snapshots are stored in auto event nonvolatile memory. Auto snapshots occur automatically for a system when parameters exceed preset values. Storage is available for up to 5 auto snapshots for each system.

Auto events for the performance, EPCS and APU maintenance pages are not inhibited. All other auto events require that any two engines are running and the parking brake is released.

Also, engine exceedance page storage is not inhibited.

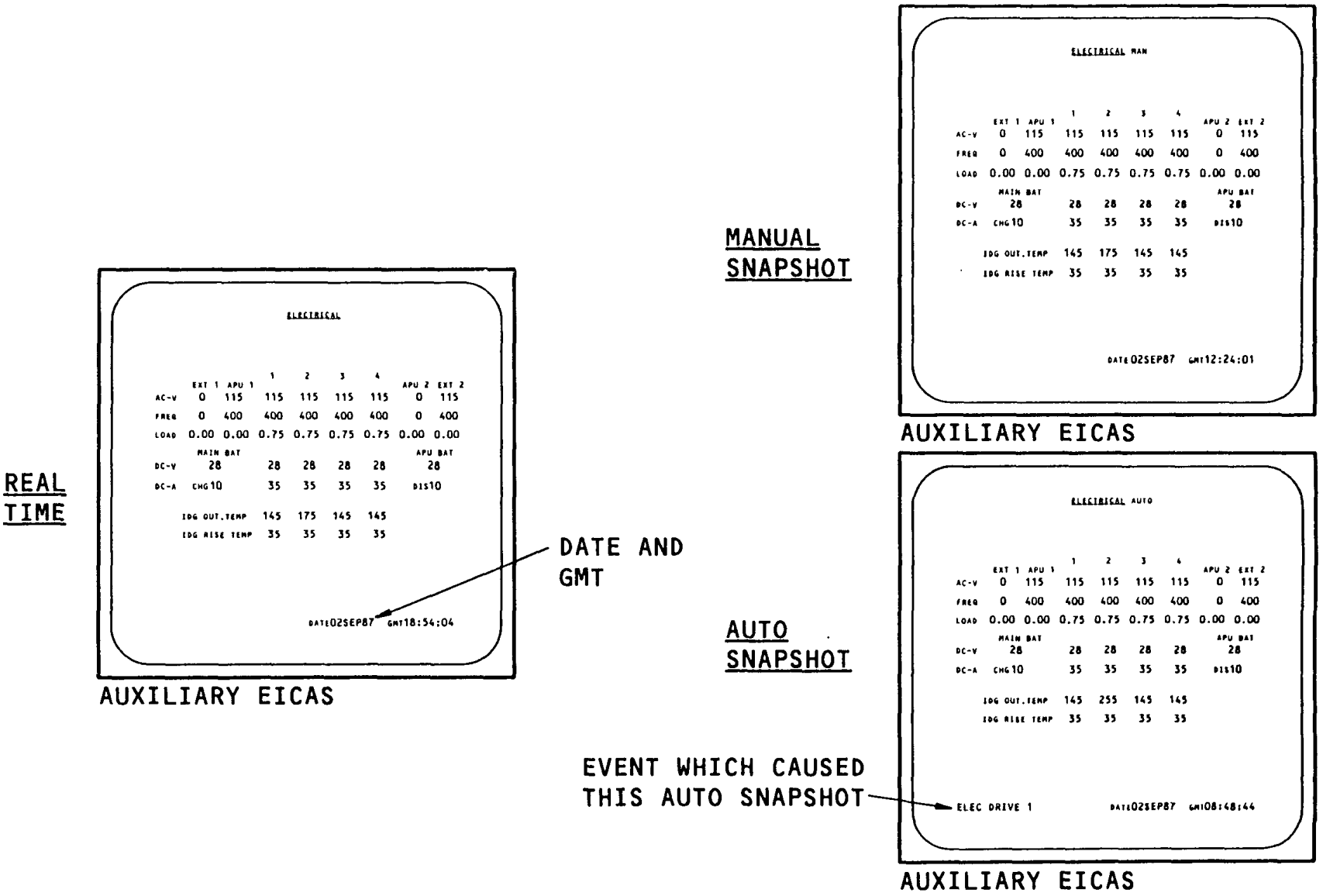


Figure 27 MAINTENANCE PAGES MODES

EICAS - EICAS MAINTENANCE PAGES MENU

General

Use the EICAS maintenance pages menu to:

- Identify to which EIU the CMC and EICAS are selected.
- Access any of the thirteen EICAS PAGE CONTROL menus.
- Erase all snapshots from memory.
- Request a manual snapshots for all systems.
- View help text from the airline database.
- Return to the CMC menu.

Selected EIU

Line 2 shows the EIU that the CMC and EICAS are selected to.

”L”, ”C”, or ”R” show in place of the ”X”, to indicate which EIU the CMC is selected to (for example, CMC = EIU-L). Note that the CMC normally selects the left EIU. If the left EIU fails, the CMC will automatically switch to the center EIU and then the right.

”L”, ”C”, or ”R” show in place of the ”Y” to indicate which EIU the EICAS display is selected to (for example, EICAS = EIU - L). Asterisks show if the CMC cannot determine which EIU the EICAS display is selected to (for example, EICAS = *****). Note that the EICAS displays use the EIU selected on the EICAS control panel. If AUTO is selected, the EICAS displays automatically select the left EIU followed by the center and then the right if a failure occurs.

EICAS Page Control Menu

Push the line select key next to a chapter and system to access the EICAS PAGE CONTROL menu for that system.

Erase All

Push the line select key next to ERASE ALL to erase all auto and manual snapshots from the nonvolatile memory in all three EIUs.

Record All

Push the line select key next to RECORD ALL to request a manual snapshot for all systems.

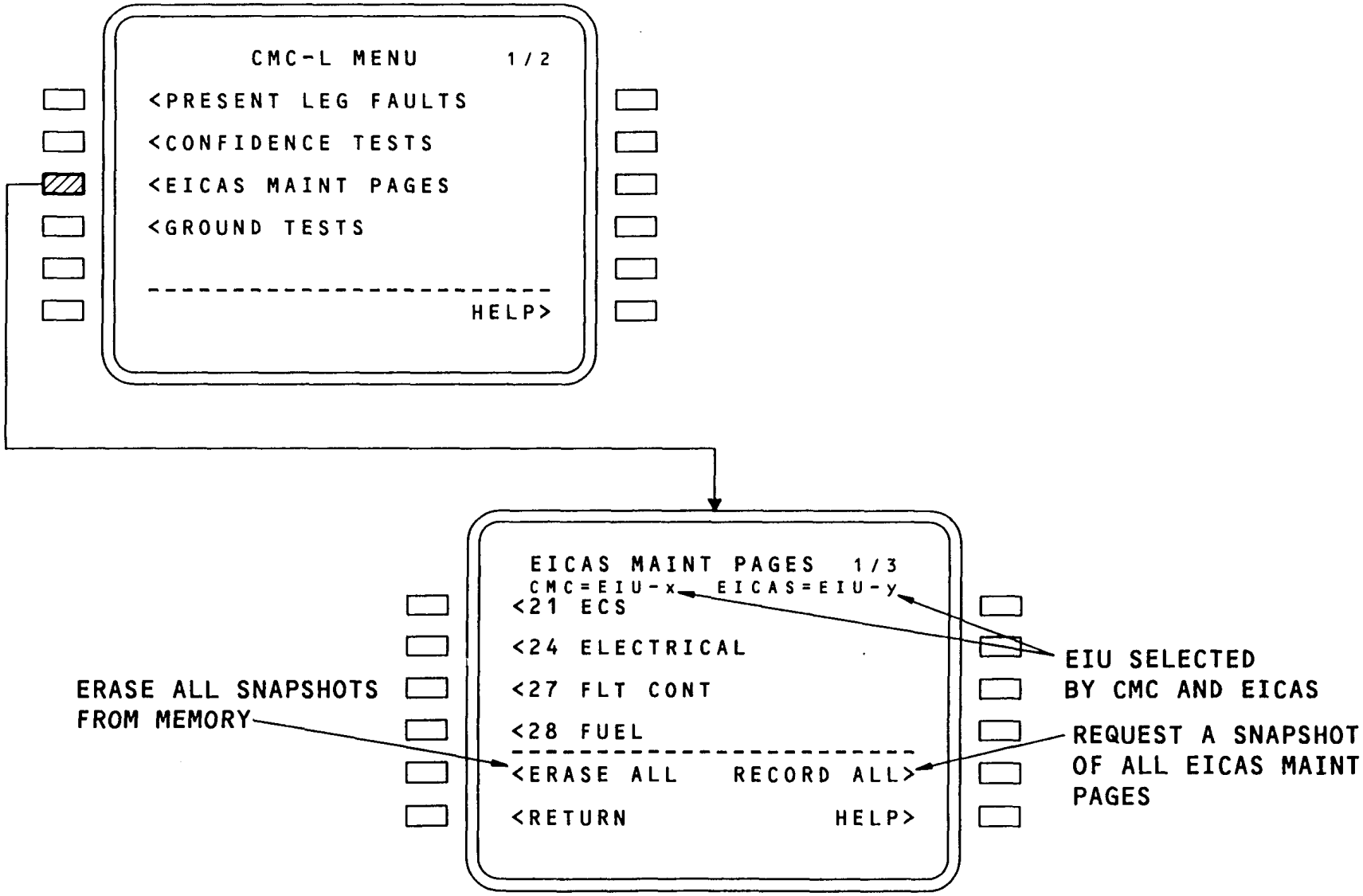


Figure 28 EICAS - EICAS MAINTENANCE PAGES MENU

MAINTENANCE PAGE REAL-TIME DISPLAY

Display Line Select Key

Use the DISPLAY line select key on the CDU to show real-time data of the selected maintenance page on the auxiliary EICAS display.

If the display key is pushed a second time, EICAS shows the primary format on the main EICAS and secondary format on the AUX EICAS.

Report Line Select Key

Push the REPORT line select key to access the REPORT menu. Use the REPORT menu to select a device to which real-time maintenance data will be sent.

Other Line Select Keys

The remaining line select keys on the EICAS PAGE CONTROL menu are discussed later in this lesson.

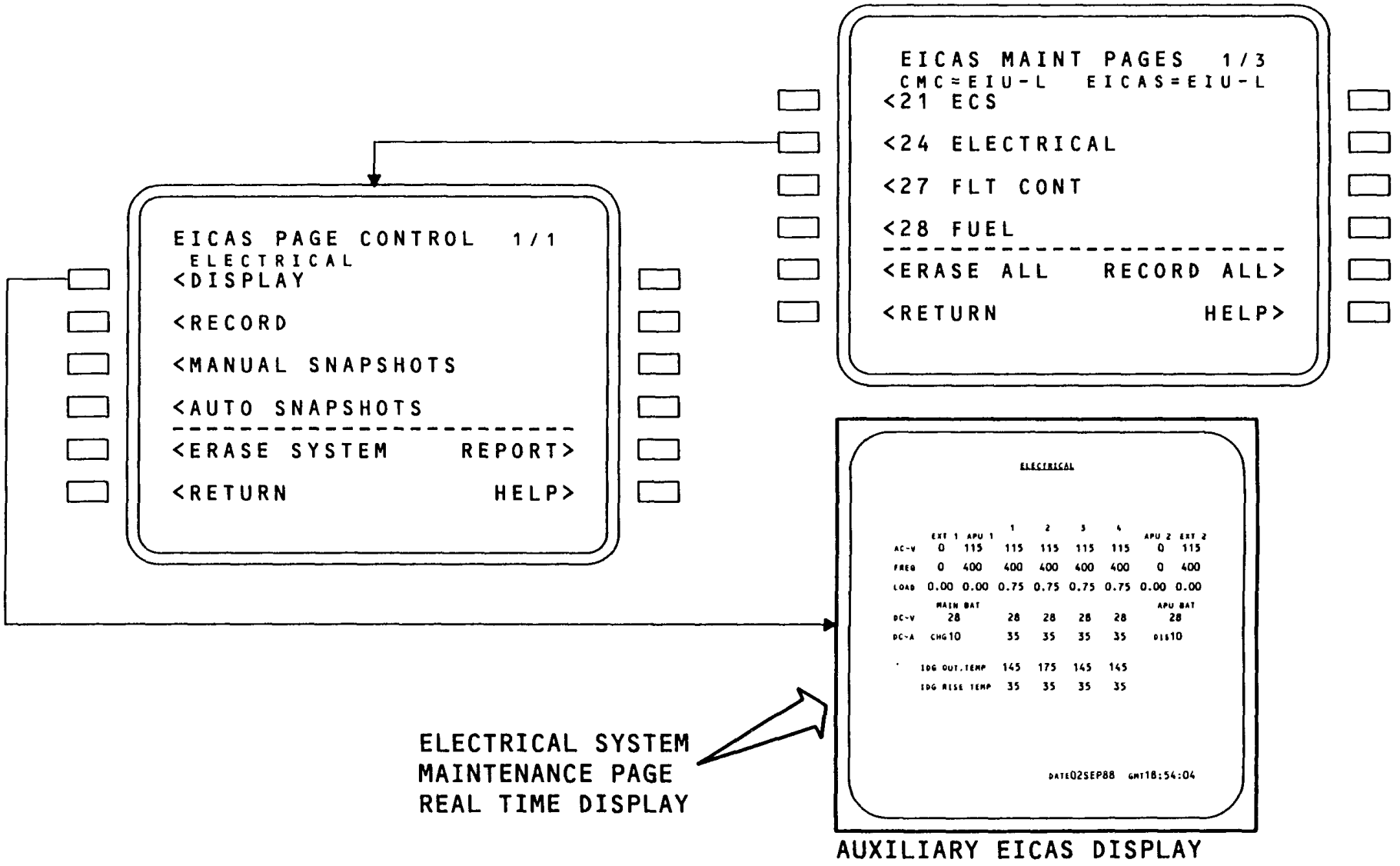


Figure 29 MAINTENANCE PAGE REAL-TIME DISPLAY

ECS MAINTENANCE PAGE SELECTION

There are two ECS maintenance pages:

- Air conditioning
- Air supply

When ECS is selected from the EICAS MAINT PAGE menu, the EICAS PAGE CONTROL menu for ECS shows. To access the EICAS PAGE CONTROL menu for ECS supply data, use the line select key next to OTHER DATA. The OTHER DATA menu will show.

The EICAS PAGE CONTROL menu for either conditioning or supply data may be selected. The EICAS PAGE CONTROL menu for the maintenance page that is selected (conditioning or supply) will show.

The functions available from either EICAS PAGE CONTROL menu for ECS are the same as for other maintenance pages.

When snapshots occur, both pages will be stored in memory.

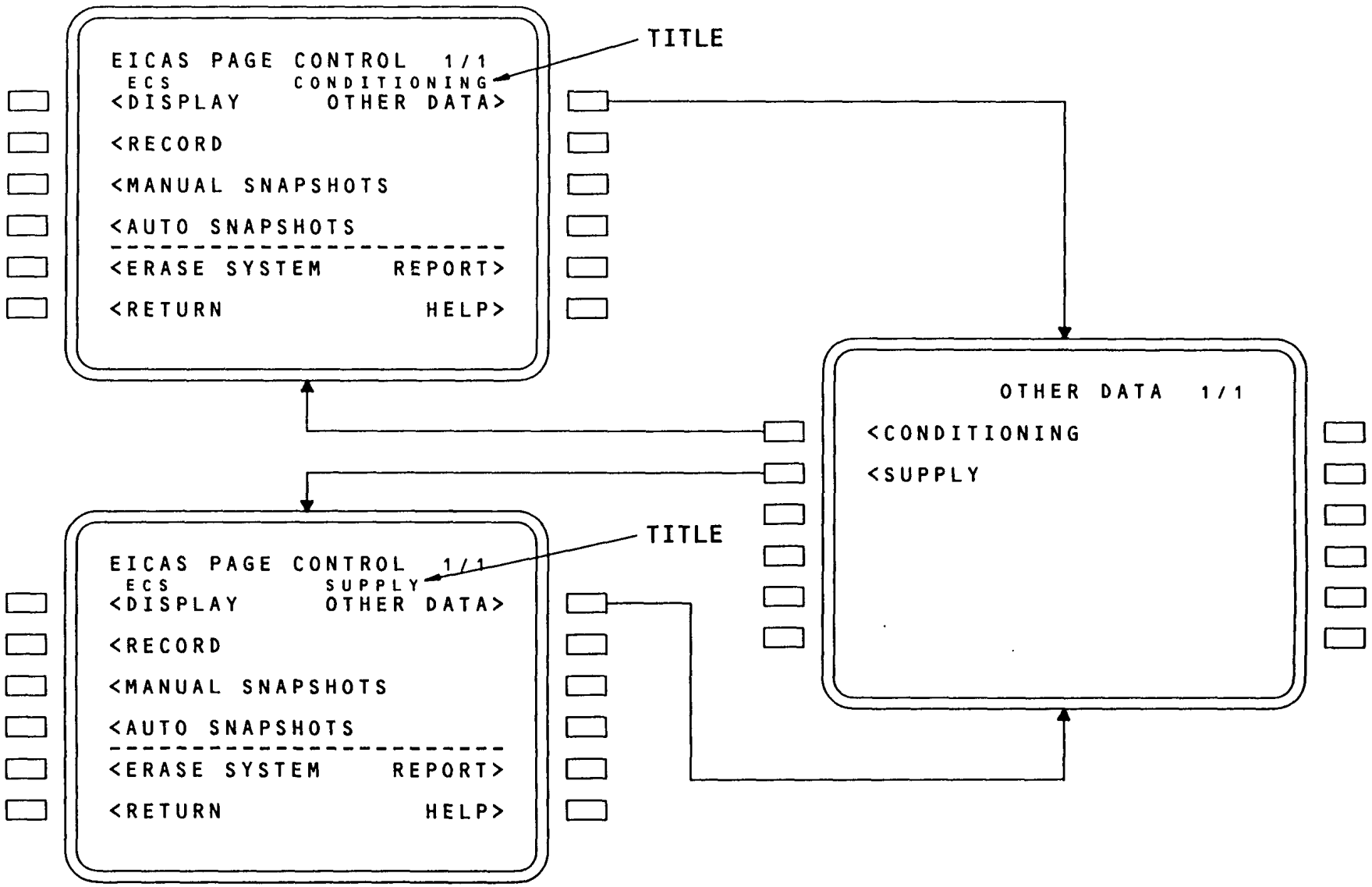


Figure 30 EICAS - ECS MAINTENANCE PAGE SELECTION

AUXILIARY EICAS - ECS MAINTENANCE PAGES

Maintenance pages show data for use in system evaluation and troubleshooting.

The ECS system has two maintenance pages to monitor the air conditioning system and the air supply system.

As a general rule, colors are less significant on maintenance pages. Labels are usually cyan and the data is white.

The data is available in real time (dynamic) or stored in either automatic or manually generated snapshots.

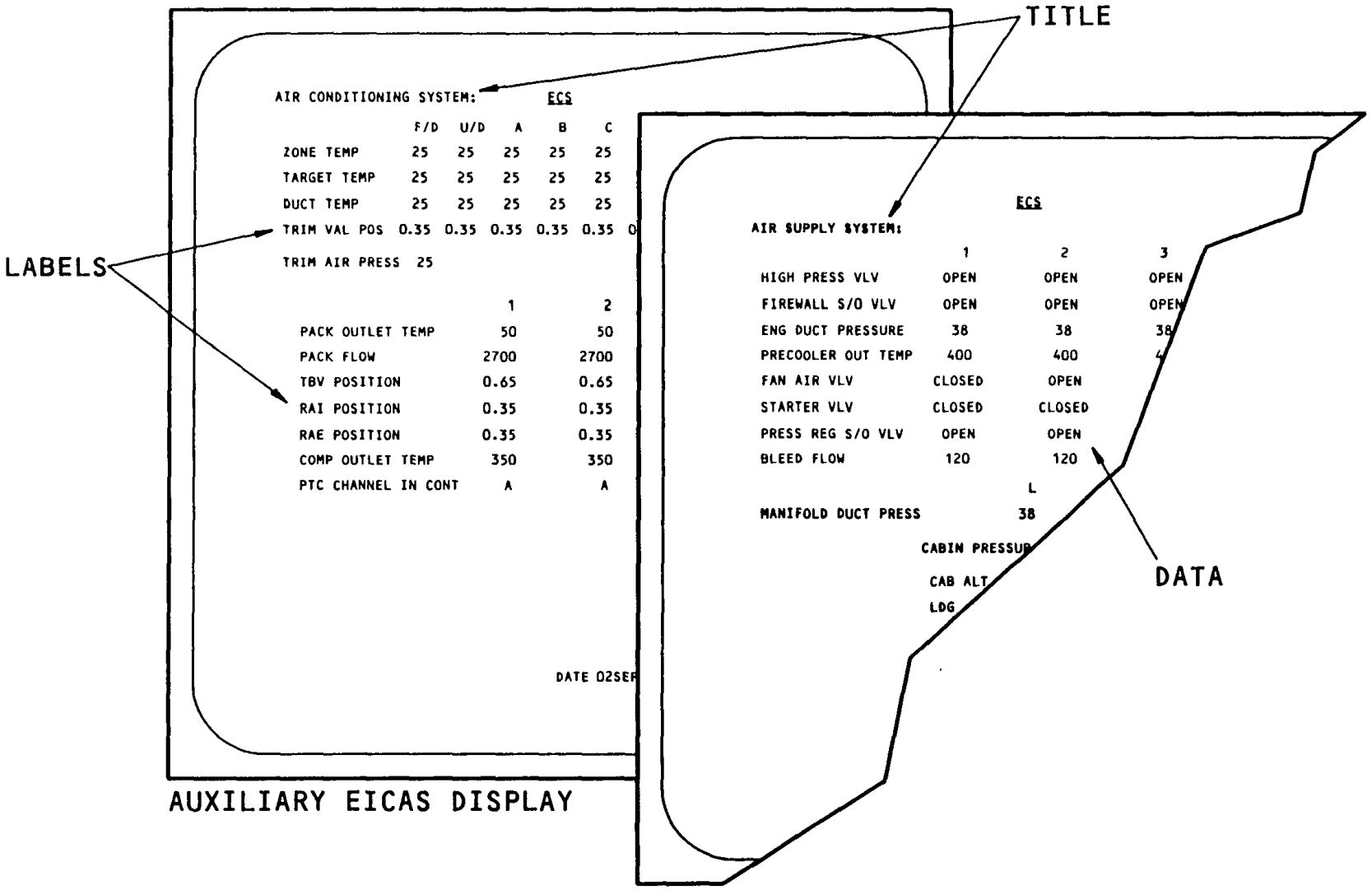


Figure 31 AUXILIARY EICAS - ECS MAINTENANCE PAGES

EICAS - FUEL MAINTENANCE PAGE SELECTION

There are four fuel maintenance pages. Each one shows two fuel tanks.

When FUEL is selected from the EICAS MAINT PAGE menu, it causes the EICAS PAGE CONTROL menu to show for tanks 1 and 4. To access the EICAS PAGE CONTROL menu for the other fuel maintenance pages, use the line select key next to OTHER TANKS. The OTHER TANKS menu will show.

The functions available from any fuel EICAS PAGE CONTROL menu are the same as for other maintenance pages.

Any snapshot includes all four fuel maintenance pages.

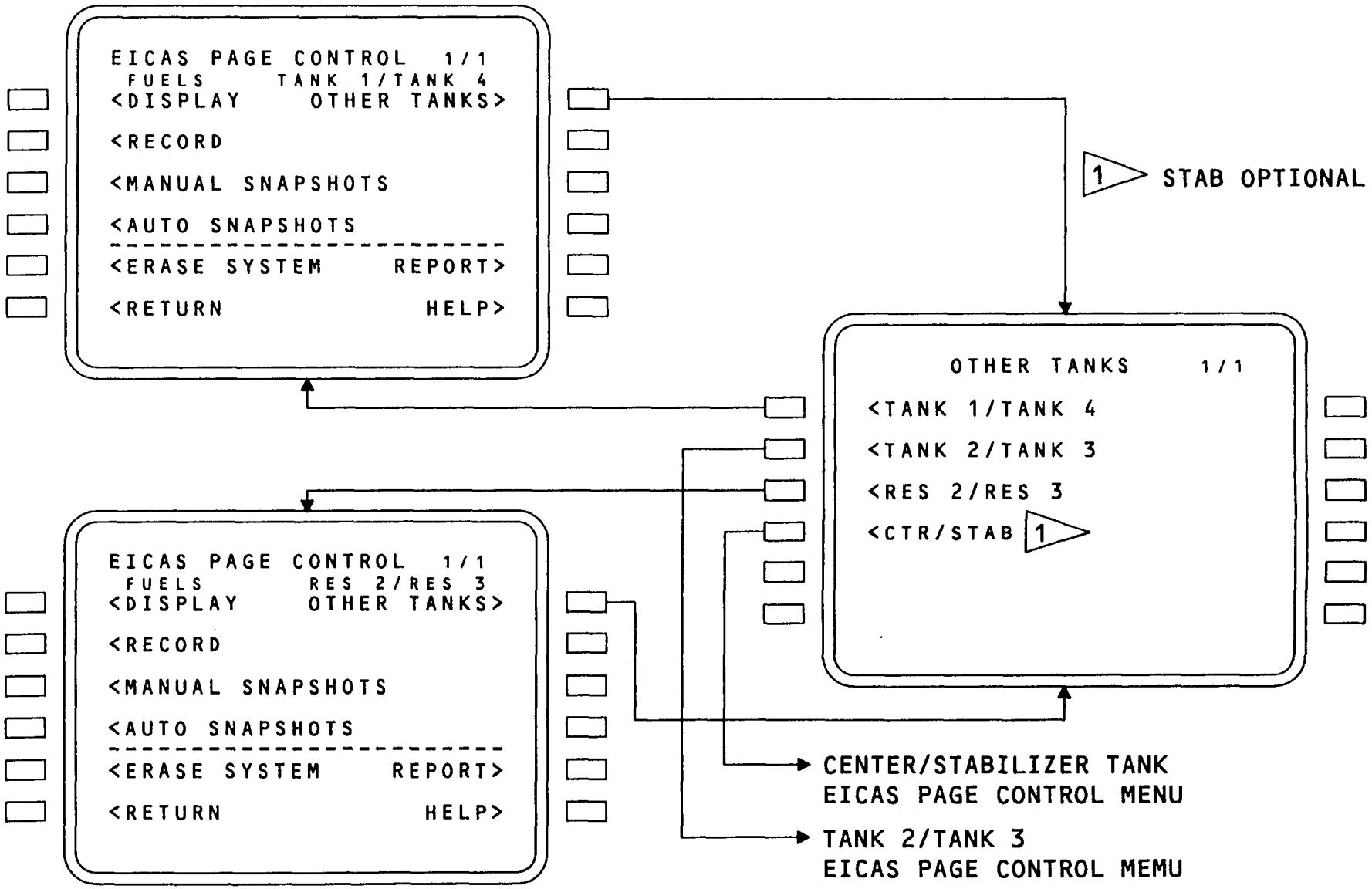
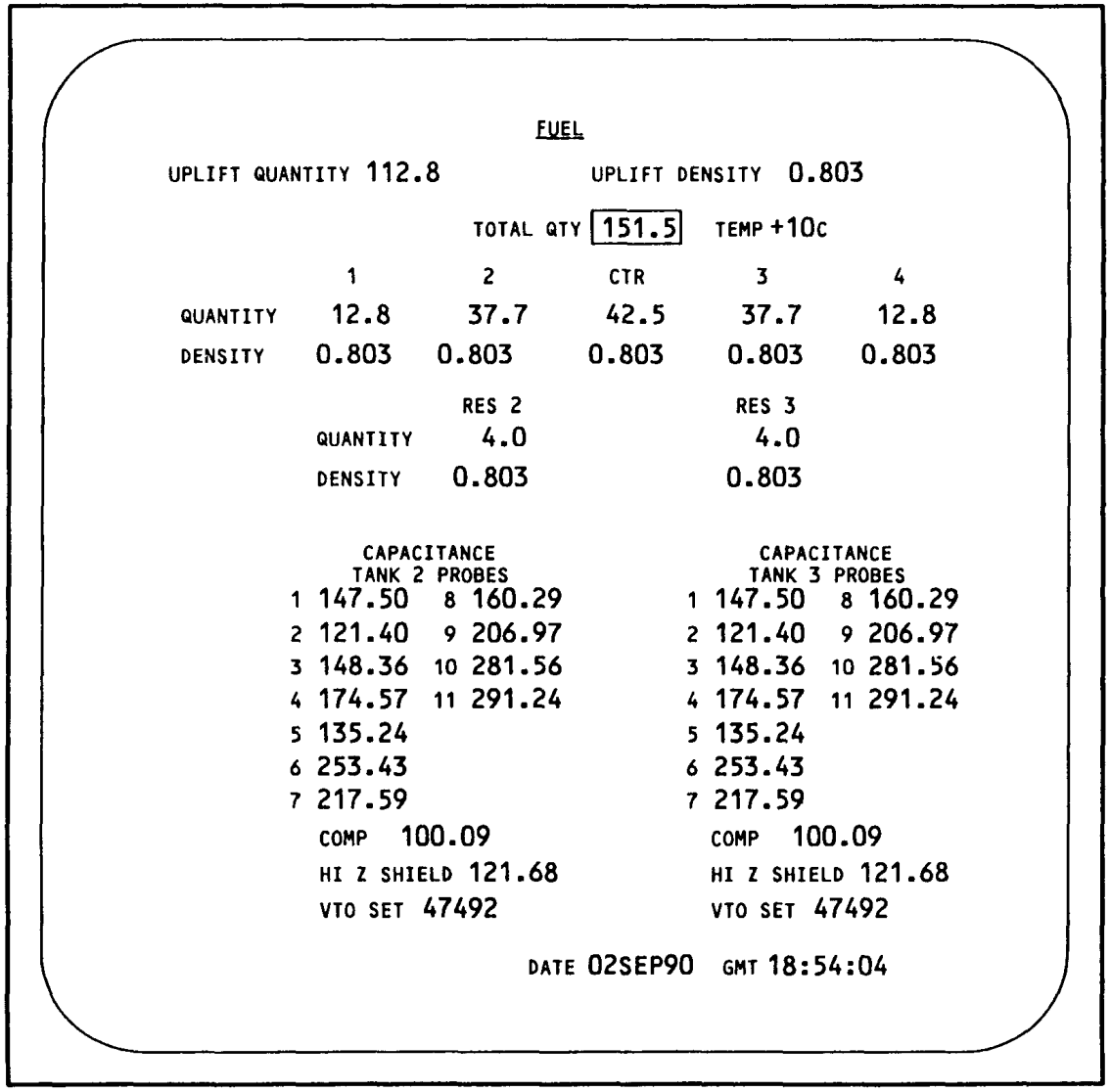


Figure 32 EICAS - FUEL MAINTENANCE PAGE SELECTION

AUXILIARY EICAS - FUEL MAINTENANCE PAGES

The top half of the fuel maintenance pages contains identical information.

The lower area shows data for tanks one and four, tanks two and three, reserve tanks two and three or the center tanks.



AUXILIARY EICAS DISPLAY

Figure 33 FUEL MAINTENANCE PAGES

MAINTENANCE PAGES RECORDING SUMMARY

Automatic and manual snapshots are available for the various maintenance pages as indicated (X) in the table.

There are two ECS maintenance pages. Snapshots of both pages always occur at the same time.

There are four FUEL maintenance pages. Snapshots of all four pages always occur at the same time.

When a snapshot of the performance maintenance page is initiated, a snapshot of the EPCS page automatically occurs.

Engine exceedances are stored automatically in a cumulative manner. The data continues to accumulate until erased using the CMC menu page ERASE prompt.

The APU, EPCS and performance maintenance pages are not inhibited for auto snapshots. The remaining maintenance page auto snapshots are inhibited until two or more engines are running and the parking brake is released.

ATA	MAINTENANCE PAGE	MANUAL	AUTO
21	ECS	X	X
24	ELECTRICAL	X	X
27	FLIGHT CONTROLS	X	NONE
28	FUEL	X	X
29	HYDRAULIC	X	X
31	CONFIGURATION	N/A	N/A
32	GEAR	X	X
49	APU	X	X
71	EPCS	X	1
71	PERFORMANCE	X	X
71	ENGINE EXCEEDANCE	N/A	2

ECS PAGES

- AIR CONDITIONING
- AIR SUPPLY

FUEL PAGES

- MAIN 1/MAIN 4
- MAIN 2/MAIN 3
- RESERVE 2/RESERVE 3
- CENTER MAIN/STABILIZER

1 STORE WHEN A PERFORMANCE AUTO SNAPSHOT IS TAKEN

2 STORES AUTOMATICALLY IN CUMULATIVE MANNER - ERASED THROUGH CMC

BACK

TOC

TOF

NEXT

Figure 34 MAINTENANCE PAGES RECORDING SUMMARY

MAINTENANCE PAGE AUTO EVENT DISPLAY

Auto event snapshots record maintenance page data on a maintenance page at the time that a parameter exceedance on that page occurs.

The auto snapshot menu shows when AUTO SNAPSHOTS is selected on the EICAS PAGE CONTROL menu. The AUTO SNAPSHOTS menu shows the snapshots by flight leg, date, and time. When a flight leg is selected, it causes the auto snapshot to show on the auxiliary EICAS display with AUTO displayed at the top.

Auto event snapshots are also accessible from the read snapshot option of these CMC menu pages:

- Present leg faults message page
- Confidence test message page
- Fault history message page

The date, and time of the snapshot are shown on the bottom of the display.

The cause of the auto snapshot shows at the bottom left of the display.

Up to five auto event snapshots (for each system) can be stored in the EIUs. The flight leg, date and time of the most recent snapshot shows at the top of the menu. The oldest snapshot shows at the bottom of the menu. When a new snapshot occurs, its flight leg, date and time go to the top of the menu, and the top four snapshots move down one line. The oldest snapshot is removed from memory.

Only five snapshots can be stored in one flight leg. Additional snapshots for that system cannot be stored unless the snapshot memory is erased, or a flight leg transition occurs.

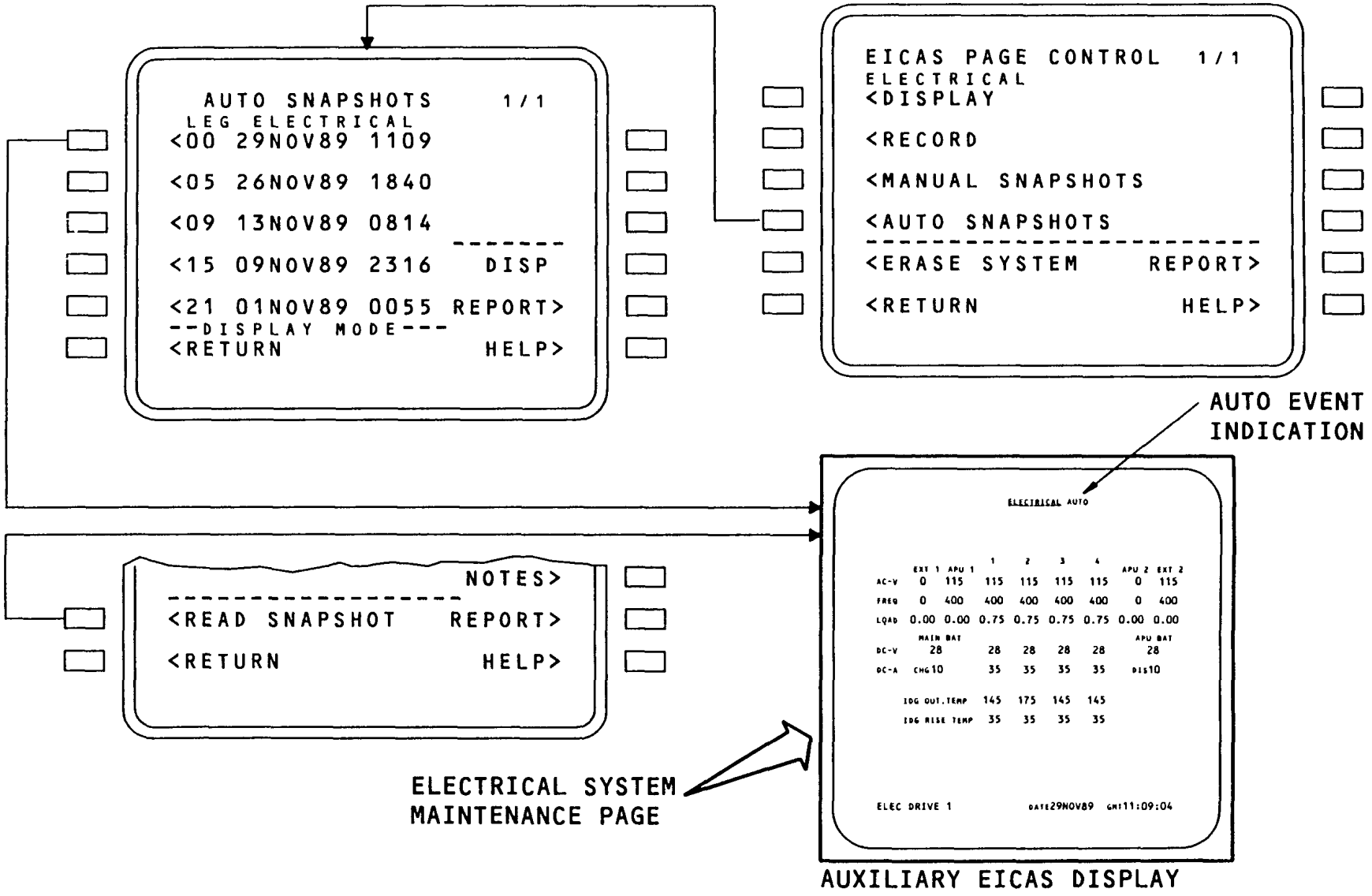


Figure 35 MAINTENANCE PAGE AUTO EVENT DISPLAY

MAINTENANCE PAGE MANUAL EVENT DISPLAY

The manual event snapshot menu shows when MANUAL SNAPSHOTS is selected on the EICAS PAGE CONTROL menu.

The MANUAL SNAPSHOTS menu shows the snapshots by flight leg, date, and time. When a flight leg is selected, it causes the manual snapshot (maintenance page) to show on the auxiliary EICAS display with MAN at the top.

The date, and time of the snapshot show on the bottom of the maintenance page.

Up to five manual event snapshots (for each system) can be stored in the EIUs. The flight leg, date and time of the most recent snapshot shows at the top of the menu. The oldest snapshot shows at the bottom of the menu. When a new snapshot occurs, its flight leg, date and time go to the top of the menu, and the top four snapshots move down one line. The oldest snapshot is removed from memory.

Only five snapshots can be stored in one flight leg. Additional snapshots for that system cannot be stored unless the snapshot memory is erased, or a flight leg transition occurs.

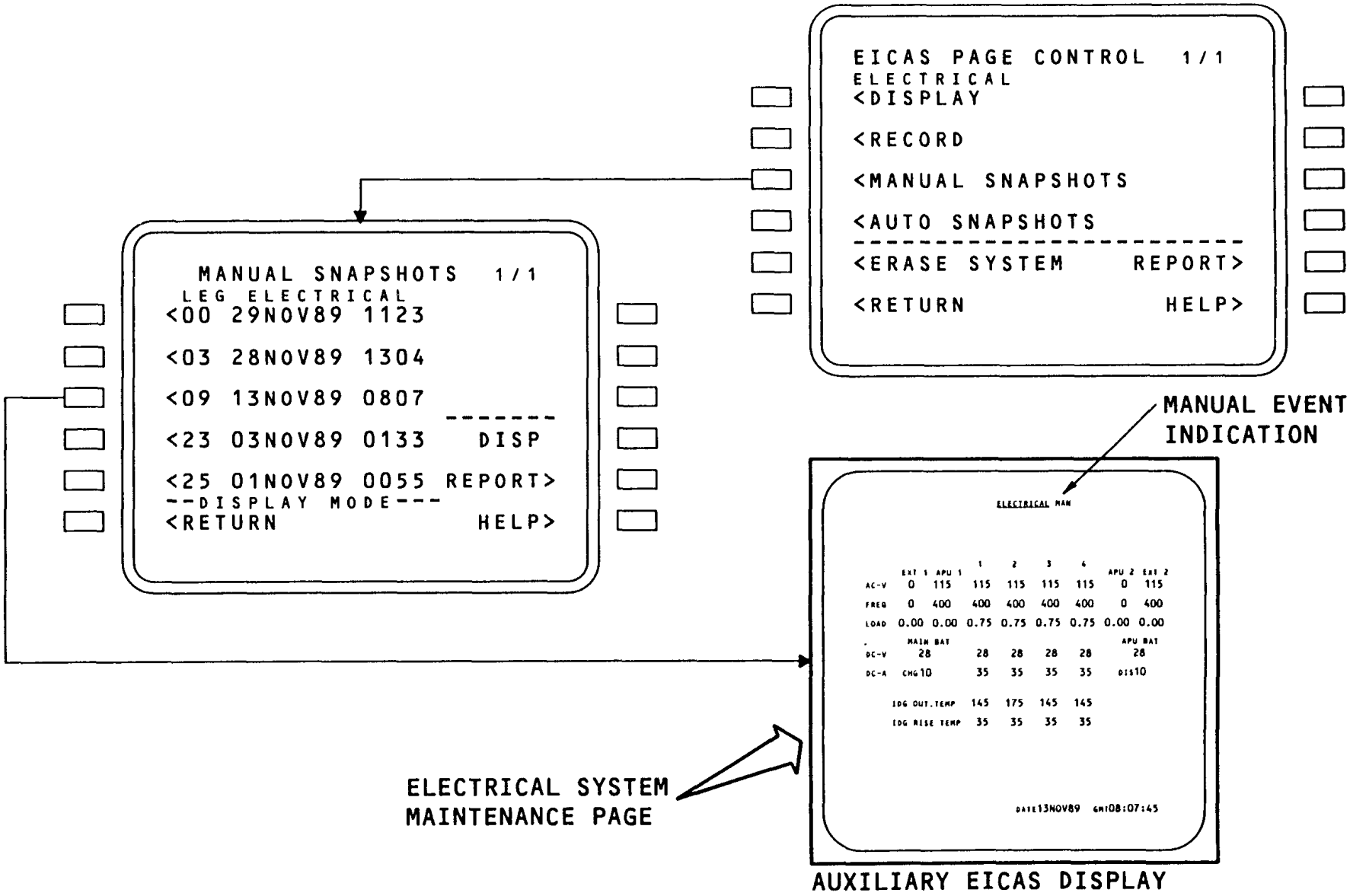


Figure 36 MAINTENANCE PAGE MANUAL EVENT DISPLAY

MAINTENANCE PAGE - MANUAL SNAPSHOTS

General

A manual snapshot occurs when:

- The EVENT RCD button on the EICAS control panel is pushed.
- The RECORD all line select key (LSK) on the EICAS MAINT PAGES menu on the CDU is pushed.
- The RECORD line select key (LSK) on the EICAS PAGE CONTROL menu on the CDU is pushed.

Manual Snapshot of all EICAS MAINT PAGES

Push the RECORD ALL LSK on the EICAS MAINT PAGES menu on the CDU, or push the EVENT RCD button on the EICAS control panel to get a snapshot of most EICAS maintenance pages (not configuration and engine exceedance).

Manual Snapshot of One Systems EICAS MAINT PAGE

Push the RECORD LSK on the EICAS PAGE CONTROL menu to get a snapshot of the selected systems EICAS maintenance page. In this example, an electrical system snapshot is recorded in EIU memory.

Systems with Multiple EICAS MAINT PAGES

If the system has multiple pages, snapshots of all pages will be taken (fuel and ECS).

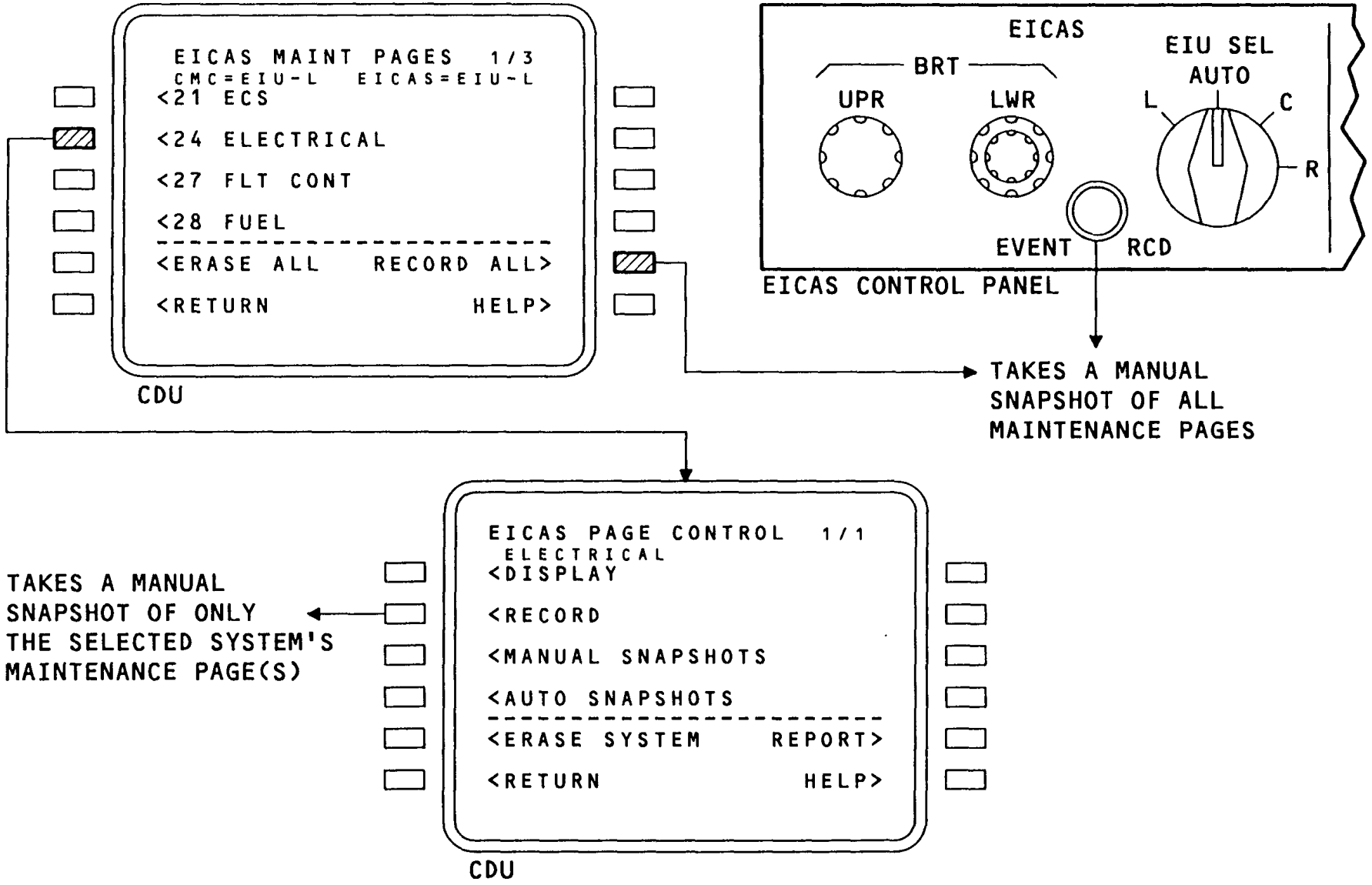


Figure 37 MAINTENANCE PAGE - MANUAL SNAPSHOTS

MAINTENANCE PAGE REPORTING

General

Real time EICAS maintenance page data, or manual or auto snapshot data goes to the multipurpose printer (via the CMCs) or to ACARS when a report is necessary.

Real Time Data

On the EICAS PAGE CONTROL menu, push the line select key (LSK) next to REPORT>. The REPORT menu shows. Push the LSK next to PRINTER or ACARS to start a report of real time EICAS maintenance page data.

Snapshot Data

On the EICAS PAGE CONTROL menu, push the LSK next to <MANUAL (or AUTO) SNAPSHOTS. The MANUAL (AUTO) SNAPSHOTS menu shows. Notice that the text next to LSK 6 left shows -- DISPLAY MODE

Use this mode to show snapshot data on the auxiliary EICAS display.

Push the LSK next to REPORT>. Notice that the system is now in the REPORT MODE. Push the LSK next to any of the snapshots shown. The REPORT menu shows. Push the LSK next to PRINTER or ACARS to start a report of the selected snapshot data.

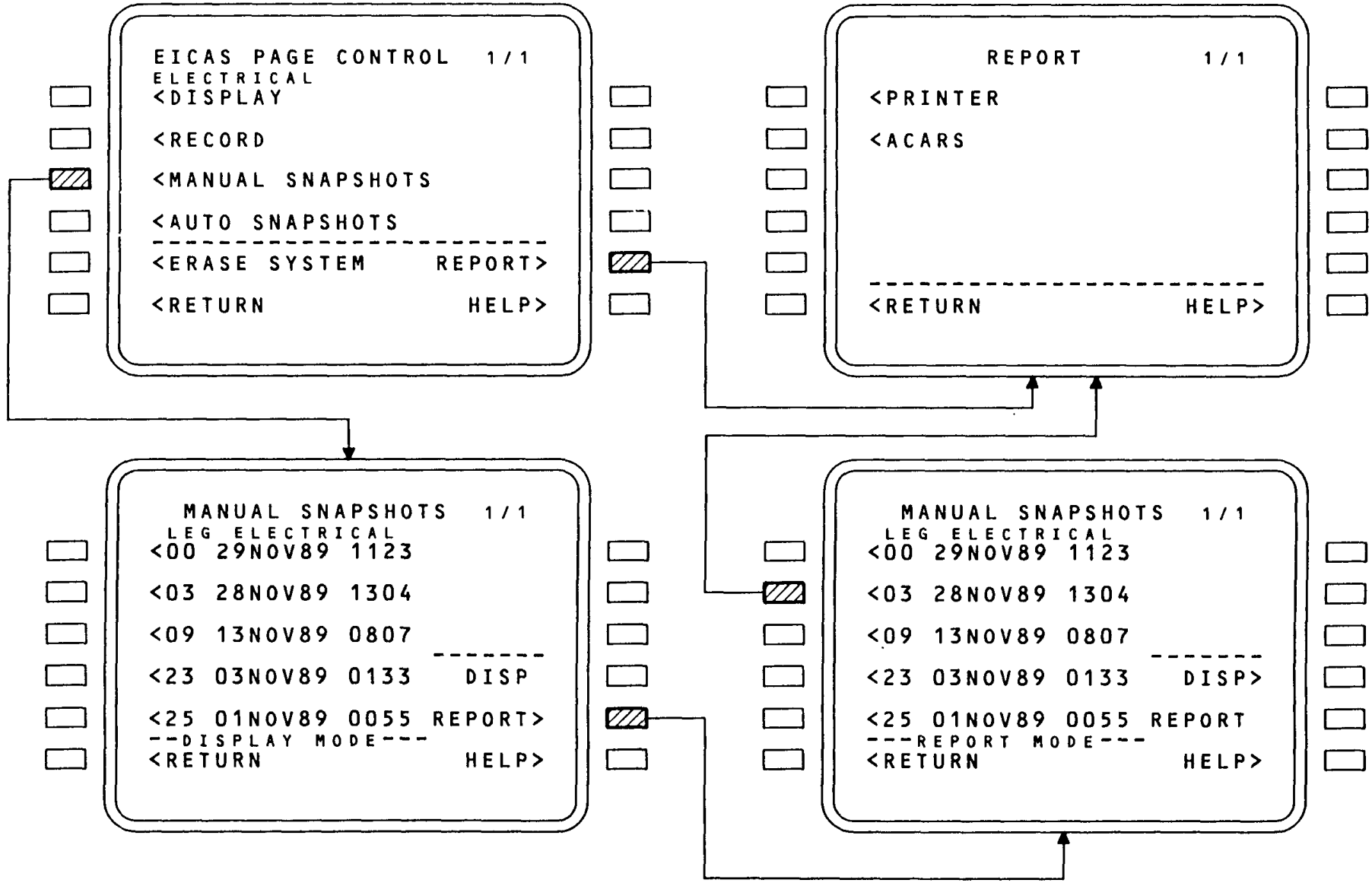


Figure 38 MAINTENANCE PAGE REPORTING

ERASE SYSTEM SNAPSHOTS MENU

General

Use the ERASE SYSTEM SNAPSHOTS menu to erase all the auto and manual snapshots stored in the non-volatile memory of all three EIUs. Only the selected system snapshots are erased.

Erase System Snapshots

To access the ERASE SYSTEM SNAPSHOTS menu:

- Push the line select key next to a chapter and system to access the EICAS PAGE CONTROL menu for that system.
- Push the line select key next to <ERASE SYSTEM. The ERASE SYSTEM SNAPSHOTS menu shows. The menu gives a warning and allows you to return to the previous menu or continue.
- Push the line select key next to CONTINUE>.
- The text ”IN PROGRESS” shows on the CDU and all of the selected systems snapshots are erased. After three seconds, the CDU shows the EICAS PAGE CONTROL menu.

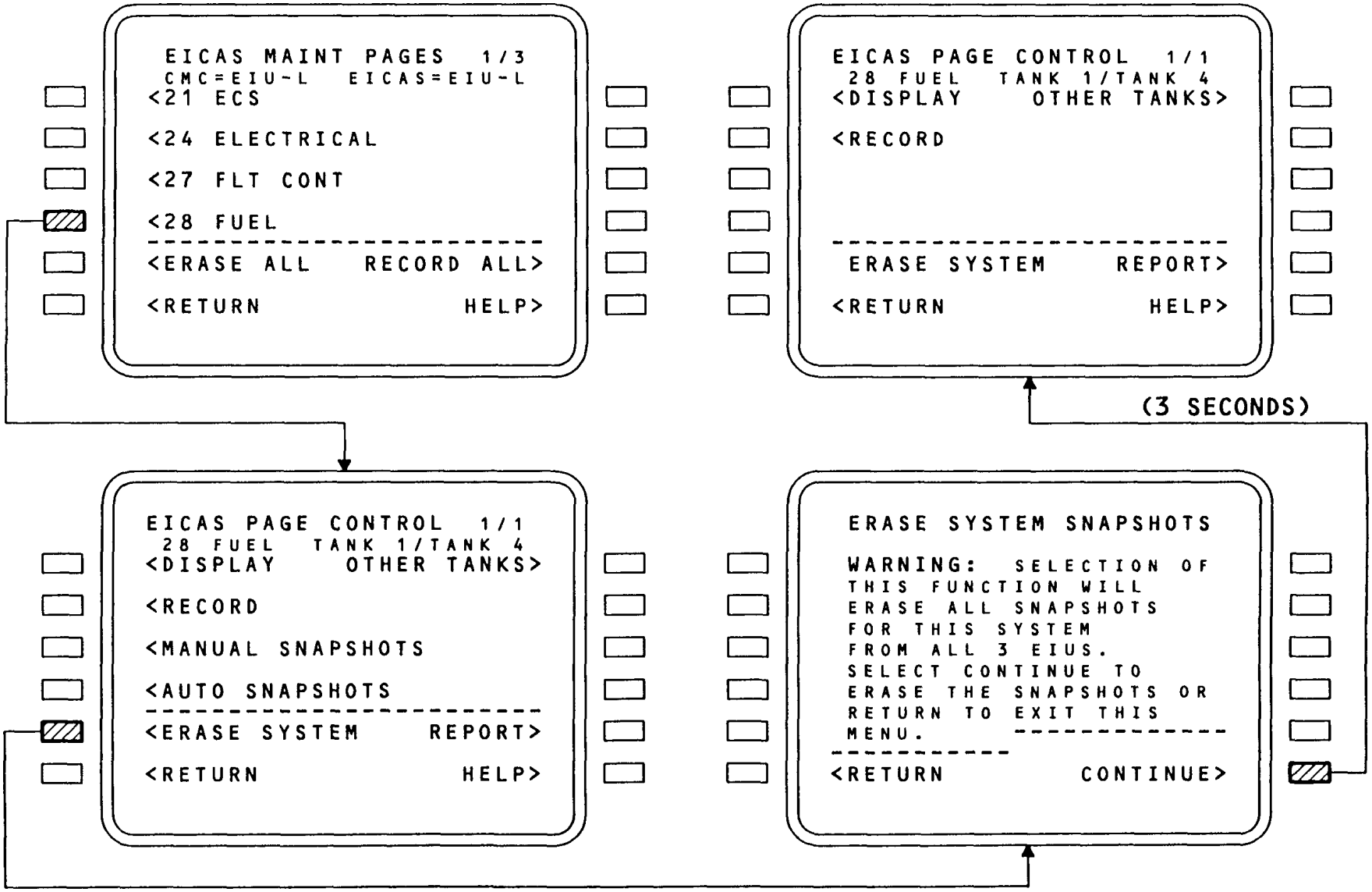


Figure 39 ERASE SYSTEM SNAPSHOTS MENU

ERASE ALL SNAPSHOTS MENU

General

Use the ERASE ALL SNAPSHOTS menu to erase all the auto and manual snapshots stored in the non-volatile memory of all three EIUs.

Erase All Snapshots

To access the ERASE ALL SNAPSHOTS menu:

- From the EICAS MAINT PAGES menu, push the line select key next to <ERASE ALL. The ERASE ALL SNAPSHOTS menu shows. The menu gives a warning and allows you to return to the previous menu or continue.
- Push the line select key next to CONTINUE>.
- The text ”IN PROGRESS” shows on the CDU and all snapshots are erased. After three seconds, the CDU shows the EICAS MAINT PAGES menu.

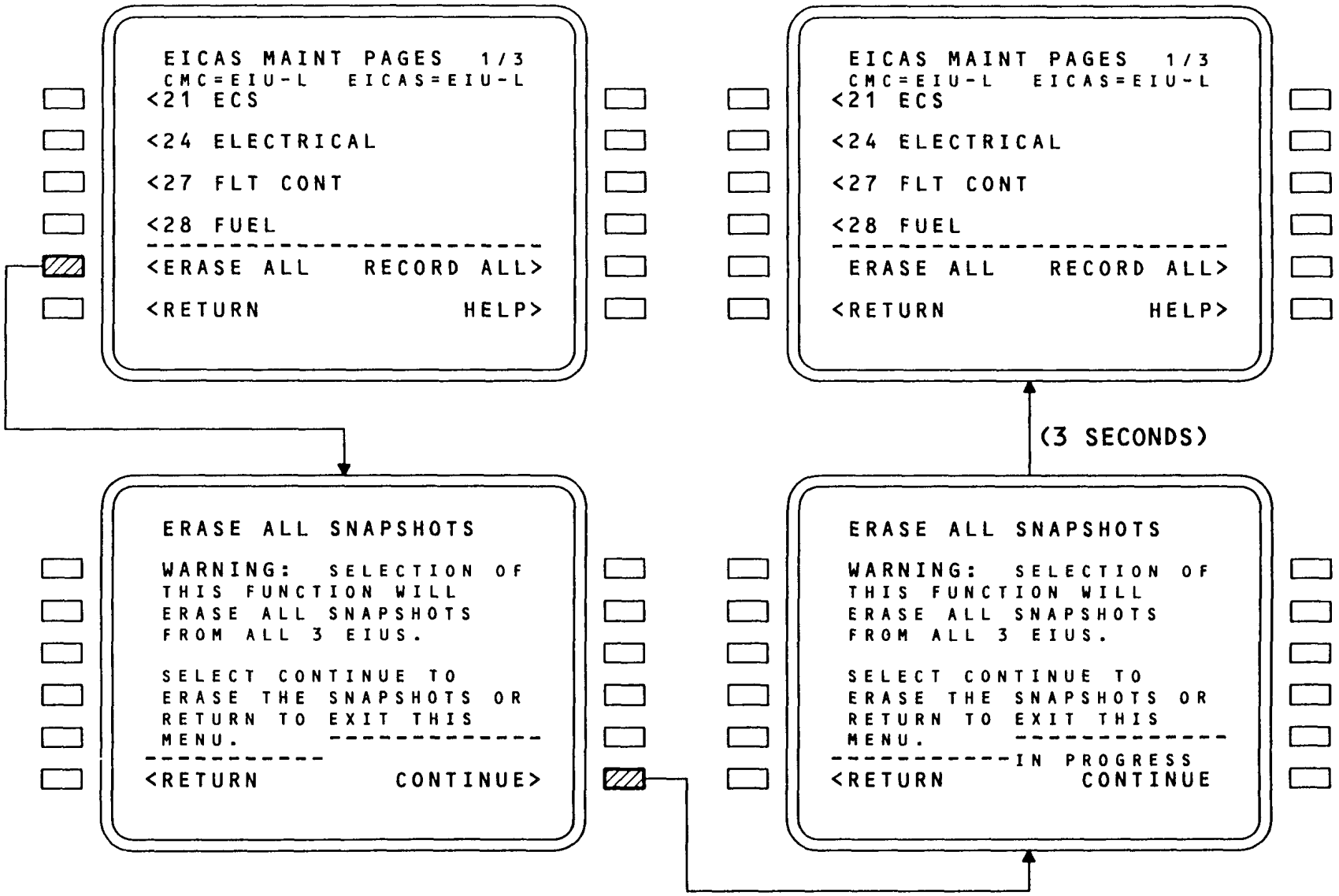


Figure 40 ERASE ALL SNAPSHOTS MENU

ENGINE EXCEEDANCE MAINTENANCE PAGE

The engine exceedance maintenance page stores and shows data in a unique manner. Certain exceedances are profiled on the lower portion before being shown above. Other data is added in a cumulative manner as it occurs.

The ERASE prompt on the menu page erases all stored data from EIU nonvolatile memory. This removes the data from the maintenance page and prevents the boxes around the digital readouts on the primary and secondary EICAS formats from changing colors when the CANCEL/RECALL keys are pushed.

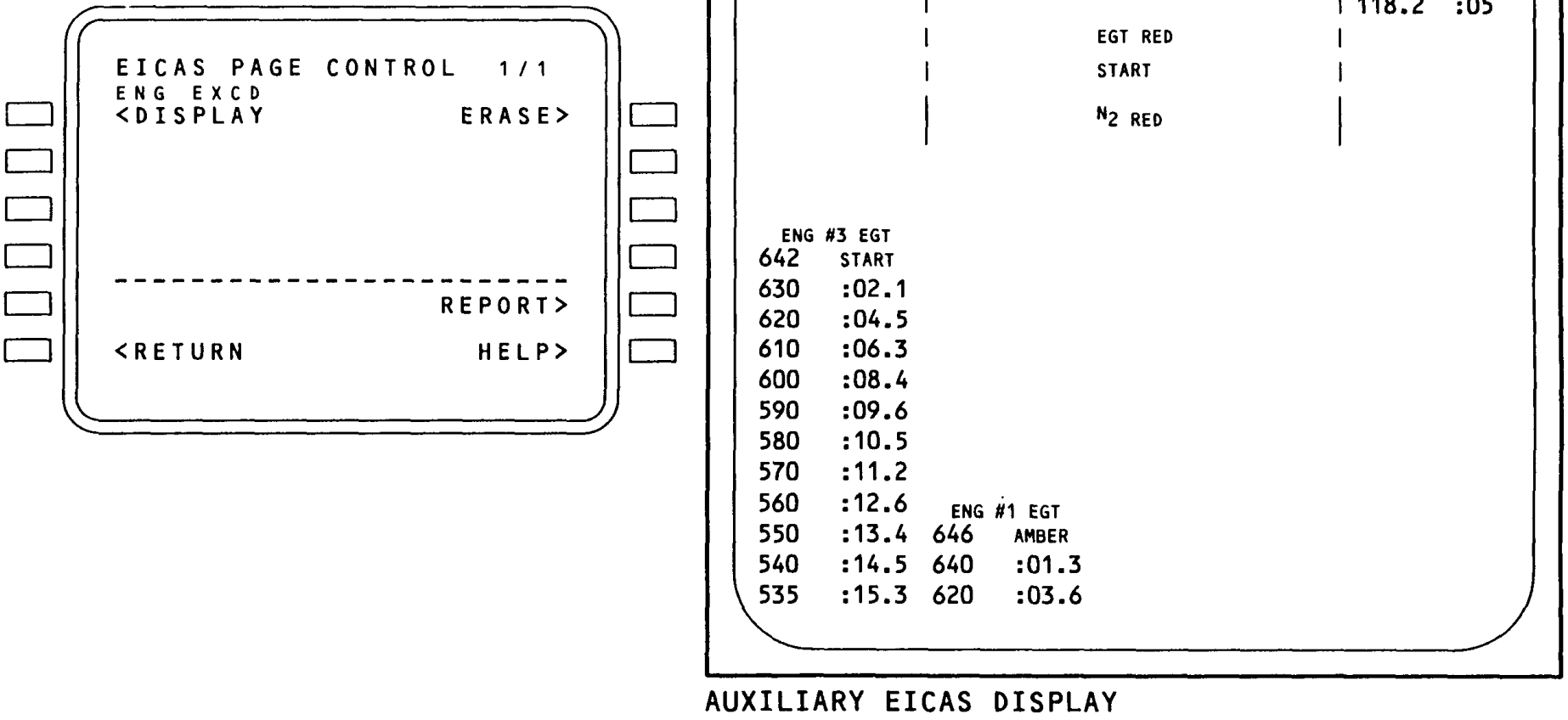


Figure 41 ENGINE EXCEEDANCE MAINTENANCE PAGE

CONFIGURATION MAINTENANCE PAGE

The configuration maintenance page has just a display function. There are no snapshots available. The IDS software number is displayed. If any IDU part number disagrees with any EIU part number, the part number will be replaced with an ERROR message.

The program pins show the latched state of the EIU program pins during normal operation.

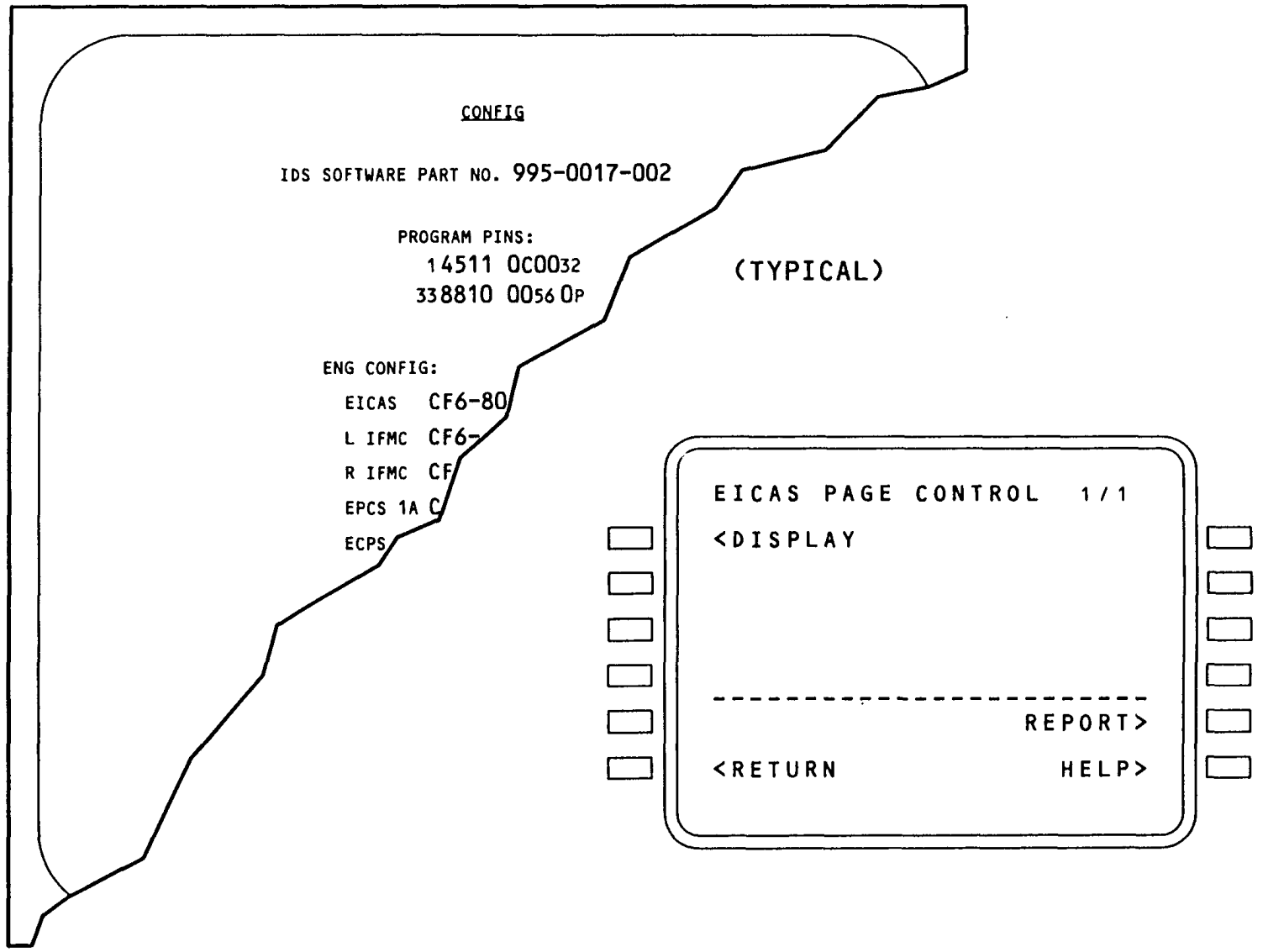


Figure 42 CONFIGURATION MAINTENANCE PAGE

MAINTENANCE PAGE SELECTION - DISPLAY EFFECT

When a maintenance page is selected during flight, the maintenance page shows on the auxiliary EICAS and primary format shows on the main EICAS. This occurs unless there is a secondary engine exceedance. Then compacted-partial shows on the main EICAS, and the selected maintenance page shows on the auxiliary EICAS.

on the ground, when a maintenance page is selected, compacted-full shows on the main EICAS.

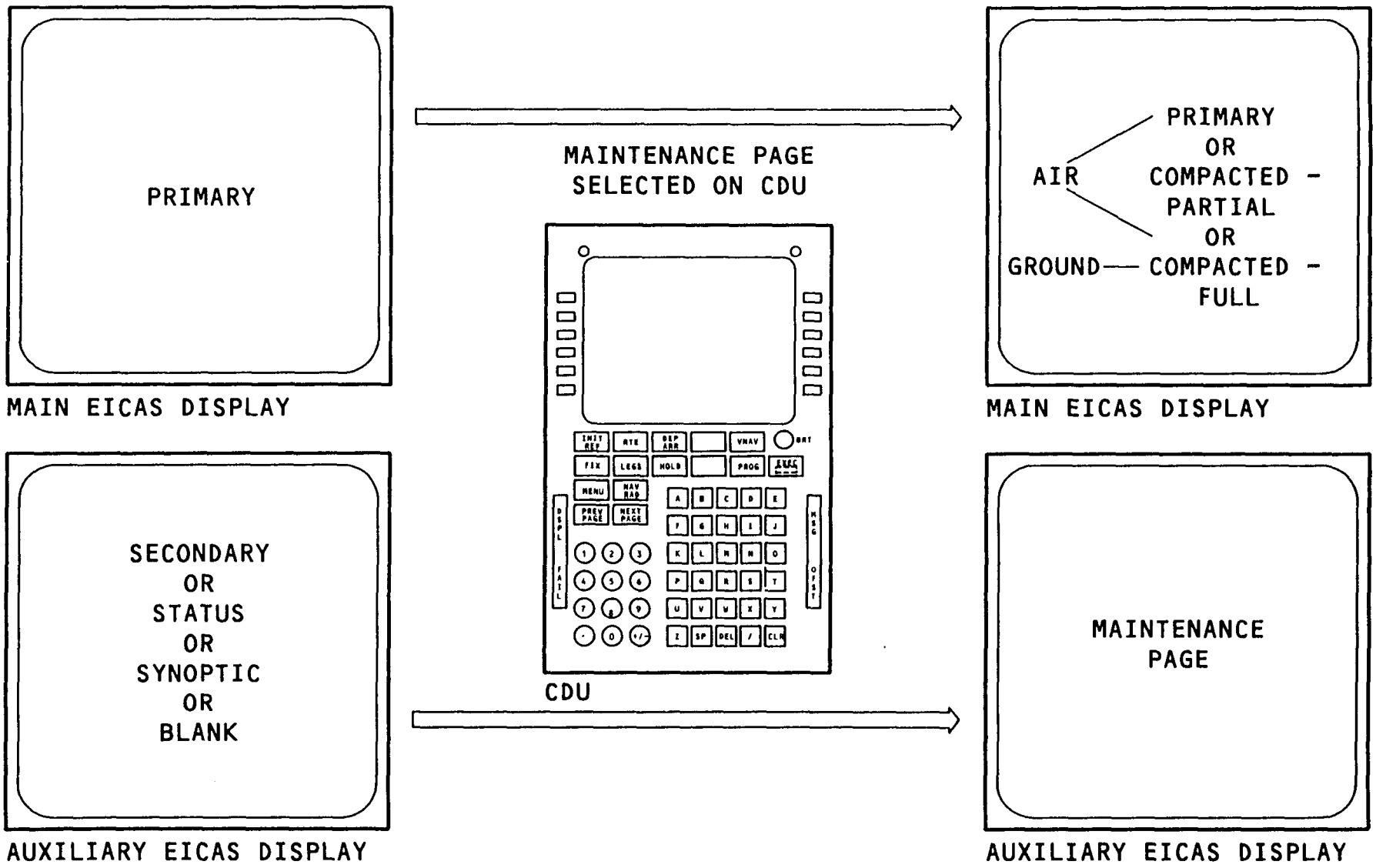


Figure 43 MAINT. PG SELECTION - DISPLAY EFFECT

DISPLAY OPERATION - FORMATS (1)

General

The formats for EICAS on the main and auxiliary displays can change because of switch selection or parameter exceedance.

Matrix Interpretation

The matrix shown on the graphic identifies the formats for different combinations of events.

The top row of the graphic shows the formats for the main and auxiliary EICAS displays. The left column shows an action that results from switch selection or an exceedance. The other columns show the new display that action causes.

EVENT		PRESENT DISPLAY STATES (PAGE 1)					
	MAIN	PRIMARY	PRIMARY	PRIMARY	PRIMARY	PRIMARY	PRIMARY
	AUX	BLANK	SEC-FULL	STATUS	SYNOPTIC	MAINT.PAGE	SEC-PART
ENGINE KEY DEPRESSED		PRIMARY	PRIMARY	PRIMARY	PRIMARY	PRIMARY	PRIMARY
		SEC-FULL	BLANK 1	SEC-FULL	SEC-FULL	SEC-FULL	SEC-FULL
STATUS KEY DEPRESSED		PRIMARY	PRIMARY 2	PRIMARY	PRIMARY	PRIMARY	COMP-PART
		STATUS	STATUS	BLANK 3	STATUS	STATUS	STATUS
SYNOPTIC SELECTED		PRIMARY	PRIMARY 2	PRIMARY	PRIMARY	PRIMARY	COMP-PART
		SYNOPTIC	SYNOPTIC	SYNOPTIC	SYNOPTIC 4	SYNOPTIC	SYNOPTIC
MAINTENANCE 5A PAGE SELECTED		PRIMARY	PRIMARY 2	PRIMARY	PRIMARY	PRIMARY	COMP-PART
		MAINT	MAINT	MAINT	MAINT	MAINT 5	MAINT
NEW PRIMARY EXCEEDANCE		PRIMARY	PRIMARY	PRIMARY	PRIMARY	PRIMARY	PRIMARY
		BLANK	SEC-FULL	STATUS	SYNOPTIC	SEC-FULL	SEC-PART
NEW SECONDARY EXCEEDANCE		PRIMARY	PRIMARY	PRIMARY	PRIMARY	PRIMARY	PRIMARY
		SEC-PART	SEC-FULL	SEC-PART	SEC-PART	SEC-PART	SEC-PART
DEGRADED		PRIMARY	COMPACTED	PRIMARY	PRIMARY	PRIMARY	COMP-PART

1 WITH NO SECONDARY EXCEEDANCES, ELSE PRI/SEC-PART

2 WITH NO SECONDARY EXCEEDANCES, ELSE COMP-PART/STATUS+ SYNOPTIC+MAINT PAGE

3 IF MORE THAN ONE PAGE OF MESSAGES, MESSAGE PAGING, THEN BLANK

4 IF SAME SYNOPTIC THEN BLANK

5 IF SAME MAINT PAGE THEN PRI/SEC-FULL

5A ON THE GROUND MAIN EICAS WILL DISPLAY COMPACTED - FULL

Figure 44 EICAS - DISPLAY OPERATION - FORMATS (1)

EICAS - DISPLAY OPERATION-FORMA TS (2)

Page two of the matrix shows how formats can change during degraded operation, and what additional formats are possible when secondary exceedances exist.

EVENT		PRESENT DISPLAY STATES (PAGE 2)						
	MAIN	COMP-PART	COMP-PART	COMP-PART	COMP FULL	PRIMARY	COMP PARTIAL	MINI SYNOPTIC
	AUX	MAINT	STATUS	SYNOPTIC				
ENGINE KEY DEPRESSED		PRIMARY	PRIMARY	PRIMARY	PRIMARY	COMP FULL	COMP FULL	COMP FULL
		SEC-FULL	SEC-FULL	SEC-FULL				
STATUS KEY DEPRESSED		COMP-PART	PRIMARY	COMP-PART	COMP FULL	PRIMARY	COMP PARTIAL	MINI SYNOPTIC
		STATUS	SEC-PART 6	STATUS				
SYNOPTIC SELECTED		COMP-PART	COMP-PART	COMP-PART	COMP FULL 8	PRIMARY 8	COMP 8 PARTIAL	MINI 9 SYNOPTIC
		SYNOPTIC	SYNOPTIC	SYNOPTIC 7				
MAINTENANCE 5A PAGE SELECTED		COMP-PART	COMP-PART	COMP-PART	COMP FULL	PRIMARY	COMP PARTIAL	MINI SYNOPTIC
		MAINT 5	MAINT	MAINT				
NEW PRIMARY EXCEEDANCE		PRIMARY	COMP-PART	COMP-PART	COMP FULL	PRIMARY	COMP PARTIAL	MINI SYNOPTIC
		SEC-FULL	STATUS	SYNOPTIC				
NEW SECONDARY EXCEEDANCE		PRIMARY	PRIMARY	PRIMARY	COMP FULL	COMP PARTIAL	COMP PARTIAL	COMP PARTIAL
		SEC-PART	SEC-PART	SEC-PART				
DEGRADED		COMP-PART	COMP-PART	COMP-PART	N/A	N/A	N/A	N/A

5 IF SAME MAINT PAGE THEN PRI/SEC-FULL

5A ON THE GROUND MAIN EICAS WILL DISPLAY COMPACTED - FULL

6 IF MORE THAN ONE PAGE OF MESSAGES, MESSAGE PAGING, THEN SEC-PART

7 IF SAME SYNOPTIC THEN PRI/SEC-PART

8 IF FUEL OR GEAR DISPLAY MINI

9 IF SAME MINI, DISPLAY PRIMARY, IF OTHER MINI, DISPLAY IT, ELSE NO CHANGE

Figure 45 EICAS - DISPLAY OPERATION-FORMA TS (2)

TABLE OF CONTENTS

TABLE OF FIGURES