

pilot's guide

Collins FMS-4200 Flight Management System

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***Rockwell
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For product orders or inquiries, please contact:

Rockwell Collins, Inc.
Customer Response Center
400 Collins Rd NE M/S 133-100
Cedar Rapids, IA 52498-0001

TELEPHONE: 1.888.265.5467
INTERNATIONAL: 1.319.265.5467
FAX NO: 1.319.295.4941

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Printed in the USA

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* The asterisk indicates pages changed, added, or deleted by this revision.

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INTRODUCTION

The FMS-4200 Flight Management System includes the Flight Management Computer (FMC), Control Display Unit (CDU), and a Database Unit (DBU). The system is used to control EFIS displays, FMS, AFIS, radio tuning, and other airplane functions. This pilot's guide provides operating information for this system. It is not a training manual; it is a guide to understanding the operation of the FMS-4200 Flight Management System designed by Business and Regional Systems of Rockwell Collins, Inc.

Basic operating procedures described in the blue tabbed section of this book are arranged approximately in the order of their use in the various phases of flight, from preflight through missed approach. Additional functions of the FMS-4200 (hereafter referred to as the FMS) such as radio tuning, database loading, and other operating information are also described.

Not all display elements and/or annunciations shown in the figures and described in this pilot's guide show on every system installation. Some of the information shown is determined by other equipment installed in the airplane, the FMS options installed, the interconnect wiring on the airplane, and the regime of flight. Also, some display elements and/or annunciations may not show on the displays at the same time as other elements and/or annunciations. In some instances, the data shown on a specific CDU page may, depending on variations in installations, show on a previous or following display page. The colors of the some of display elements may also vary. Refer to the appropriate airplane flight manuals for your specific airplane for information related to the installed options and variations.

In some cases, there is more than one way to accomplish a task related to flight planning, changing a flight plan, or other FMS functions. In general, this guide describes only one method for accomplishing any specific task. You may use others as appropriate.

WARNING

THE FMS-4200 FLIGHT MANAGEMENT SYSTEM AND RELATED COMPONENTS EXHIBIT A VERY HIGH DEGREE OF FUNCTIONAL INTEGRITY. HOWEVER, USERS MUST RECOGNIZE THAT IT IS NOT PRACTICAL TO PROVIDE MONITORING FOR ALL CONCEIVABLE SYSTEM FAILURES, AND THAT ERRONEOUS OPERATION COULD OCCUR WITHOUT A FAULT INDICATION. THE PILOT HAS THE RESPONSIBILITY TO DETECT SUCH AN OCCURRENCE BY MEANS OF CROSS-CHECKS WITH REDUNDANT OR CORRELATED INFORMATION AVAILABLE IN THE COCKPIT.

WARNING

SUNGLASSES WITH POLARIZED LENSES OR LENSES THAT FILTER SPECIFIC COLORS/FREQUENCIES OF LIGHT MAY ADVERSELY AFFECT A PILOT'S ABILITY TO SEE SOME COLORS SHOWN ON COLOR LCD OR CRT DISPLAYS. AS A RESULT, SOME OF THE ELEMENTS SHOWN ON THESE DISPLAYS CAN BE COMPLETELY INVISIBLE WHILE WEARING THESE TYPES OF SUNGLASSES. ALSO, THE COLOR OF SOME ELEMENTS SHOWN ON THE DISPLAYS MAY BE CHANGED. FOR EXAMPLE: SOME BLUE LIGHT FILTERING LENSES CAN CHANGE MAGENTA TO RED.

NOTE

Individual operators may set specific operating procedures which may not be the same as those described in this guide. Refer to the appropriate airplane flight manuals for information specific to your airplane.

NOTE

The FMS-4200 has the ability to store an extensive database of navigation facilities and aids as well as airport information. However, use of the FMS and its database information, does not relieve pilots from the responsibility for carrying and using the appropriate charts, terminal procedures, and facility directories required for any given flight in accordance with federal regulations.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 1-2

The following NOTE is added after the second NOTE on the page.

NOTE

Distances have been changed from nearest mile to nearest tenth of a mile for distances less than 100 nautical miles (NM) on the LEGS, FPLN, FIX INFO, FLIGHT LOG, TRIP, and PROGRESS pages on the CDU, and on the FPLN, PROGRESS, SEC FPLN, and POS REPORT text pages on the MFD, as well as the MFD VNAV Window. The readout is "XX.X" NM for distance values less than 100 NM, and "XXX" or "XXXX" for distance values greater than or equal to 100 NM. If the distance value is less than 1 NM, a zero is displayed in front of the decimal point.

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DISPLAYS AND CONTROLS

This section describes the controls and display elements and pages related to FMS-4200 operations. It includes descriptions of:

- CDU-4200 display pages and controls
- Primary Flight Displays (PFD)
- Multifunction Displays (MFD)
- Database Units (DBU).

CDU-4200

Operating Philosophy

The CDU-4200 is the pilot's interface with the various functions of the FMS-4200. It has a color display to show the FMS-related information and function modes, and a set of line select keys around the display for mode selections and copying or transferring displayed information. The CDU has a set of function keys for directly selecting many of the FMS functions and display modes. It also has a full alphanumeric keypad for entering data.

All operations for entering a flight plan, modifying an existing flight plan, or entering data for other FMS operating functions are done through the use of a scratchpad entry system. Flight plan data, or data for other FMS operations, is entered into the scratchpad with the alphanumeric keypad, or by pushing a line select key to copy data shown on the display to the scratchpad. From the scratchpad, data is transferred by pushing the line select key for the entry position to transfer the data to its appropriate location.

A scratchpad entry error results in a message indicating the nature of the error. Refer to the **MESSAGES AND ANNUNCIATIONS** chapter for a description of the scratchpad messages.

FMS operating modes are selected directly by pushing the appropriate function key, or by pushing a line select key adjacent to an item in a menu shown on the display. Some functions are alternately switched on and off with sequential pushes of the associated line select key or function key.

Some functions and operating modes require more than one display page to show all of the associated data. The **PREV PAGE** and **NEXT PAGE** keys change the display pages, and the current page and total number of pages, when applicable, show in the upper right corner of the display.

Display

The display shows up to 15 lines of 24 characters of text in five colors. Text shows in either a large or small size font. The top line of display shows a display page's title/mode and the current page and total number of pages, if applicable, of that display mode. Below the title/mode line, there are six data lines and six label lines to show data for a given display page. The two bottom lines on the display are used for the scratchpad and message lines. Many of the display pages are configured to show two columns of information, which allows the line select keys on both sides of the display to select, copy, or transfer displayed data.

Text

Text shows in a large or small font depending on its use. Generally, display page titles, data lines with a mode selection or data entry capability, manual or override data entries, and active mode selections show in the large font. Label lines, FMS-calculated data entries, and unselected mode functions show in the small font.

Title/Mode Line

The top line of the CDU display always shows the display page title or mode, and the current page and total number of pages when applicable.

Data Lines

Data lines align with the line select keys. They show specific information related to the selected display page. On many of the display pages, the line select keys can copy the associated data line information into the scratchpad to use on another data line on the same page or on another display page.

Prompts

Prompts show on data lines as small square boxes. A prompt indicates you must input data to perform the function related to the prompt's description on the label line. If no data is entered for a specific prompt, the FMS may not be able to perform the related function or will have degraded performance. To enter data to replace a prompt, it must be entered into the scratchpad, then transferred to the prompt.

Dashes

Dashes show on data lines where data can be entered. Unlike a prompt, dashed data lines are for optional information and do not require input. However, a specific format may be required for the data that is entered on a dashed data line. To enter data into a dashed data line, the data must be entered into the scratchpad, then transferred to the data line with its associated line select key.

Label Lines

Label lines show above each data line. They describe the information in a data line or provide additional information related to the data.

Function Lines

Many of the display pages use the two bottom line select keys for additional function selections. To separate functional selection lines from the data lines, the display page shows a dashed line across the display on the label line above the bottom two line select keys. For some functions, in addition to the dashed line, there may also be a label on the line that describes the functional operations of one or both of the bottom line select keys.

Scratchpad

The scratchpad display line shows just below the bottom line select keys with brackets [] at each end of the line to help identify it. Unless otherwise specified, all data entered, changes made to a flight plan, or other FMS-controlled function, must be done through the scratchpad. When the scratchpad is empty (no text or messages shown between the brackets), enter data into it using the alphanumeric keypad, or copy data directly from the display by pushing the appropriate line select key. Once data is in the scratchpad, transfer it to the desired data line on the appropriate display page by pushing the line select key for that data position. Messages show momentarily on the scratchpad line for data entry errors and other scratchpad operating errors. Scratchpad messages are described in detail in the MESSAGES AND ANNUNCIATIONS section of this pilot's guide.

Message Line

Below the scratchpad on the bottom line of the display is the message line. Various messages show on the message line to alert you to various functional operations. Each message is described in detail in the MESSAGES AND ANNUNCIATIONS section of this pilot's guide.

Colors

Five colors, cyan, yellow, magenta, white, and green, are used to show text on the various CDU display pages. How the colors are used may vary in some installations.

Cyan is generally used for:

- Display page titles and page numbers
- Label line text (except on the RADIO TUNING page)
- Active mode selections on the RADIO TUNING page
- FROM waypoint on the ACT/MOD LEGS page
- Scratchpad brackets.

Green is generally used for active mode selections, except on the RADIO TUNING page where it is used for frequencies and transponder codes. It is also used on the LEGS pages for speed, VNAV altitudes, and the VPA.

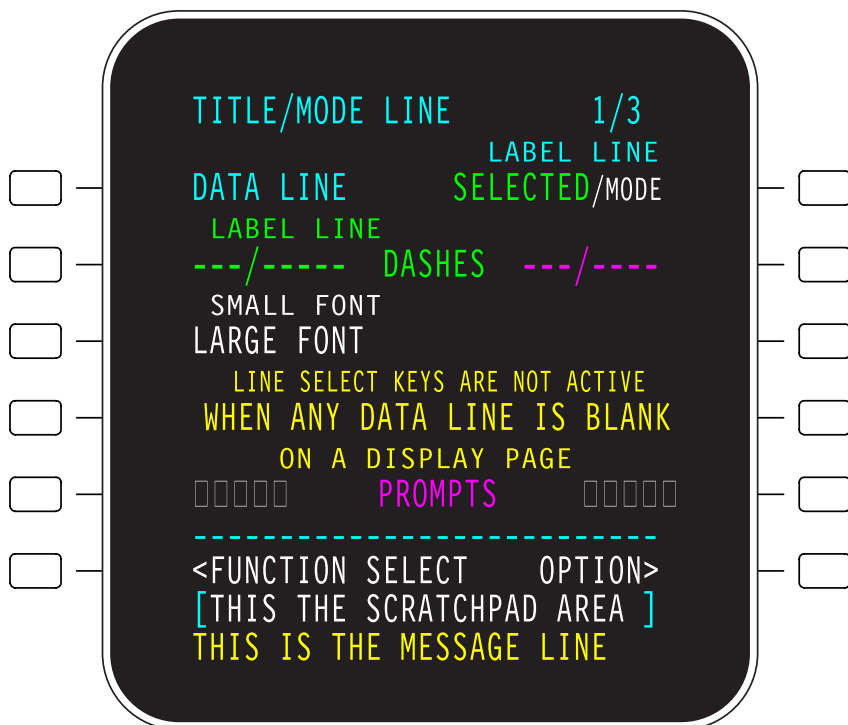
White is generally used for:

- Line select key functions
- Scratchpad entries and error messages
- Selected messages on the message line and MESSAGES page
- Data lines except for those with mode selections and the TO waypoint
- Unselected modes
- The word MOD on the modified FPLN and LEGS display page titles
- TO waypoint on the MOD FPLN and MOD LEGS display pages
- ACT LEGS and RADIO TUNING page label lines
- MSG, EXEC, and OFFSET annunciations on the message line.

Yellow is generally used for selected messages on the message line and MESSAGES page, and for an expired active database.

Magenta is generally used for the active TO waypoint and its associated data on the ACT FPLN and ACT LEGS pages.

EXAMPLES OF DISPLAY LINES



Line select keys

Push a line select key to copy or transfer its associated display data to or from the scratchpad, or to select an associated operating mode or function shown on a display page.

Function Keys

The CDU function keys operate the various FMS functions. Push a function key to select the associated FMS function and CDU display mode. The following describes the operation of each of the FMS functions and the associated displays.

PREV PAGE and NEXT PAGE

Many CDU display modes, such as ACT LEGS and ACT FPLN, may require several pages to show all their information. Page numbers in the upper right corner show the current page and total number of pages of the display mode.

Push the NEXT PAGE key to advance to the next page of the selected display mode. Push the PREV PAGE key to go back to a previous page of a selected display mode. When the last page of a display mode shows on the display, push the NEXT PAGE key to return to page one of the display, or push the PREV PAGE key to go backward one page at a time. You can also push the PREV PAGE key from page one of a display mode to go directly to the last page of a display mode.



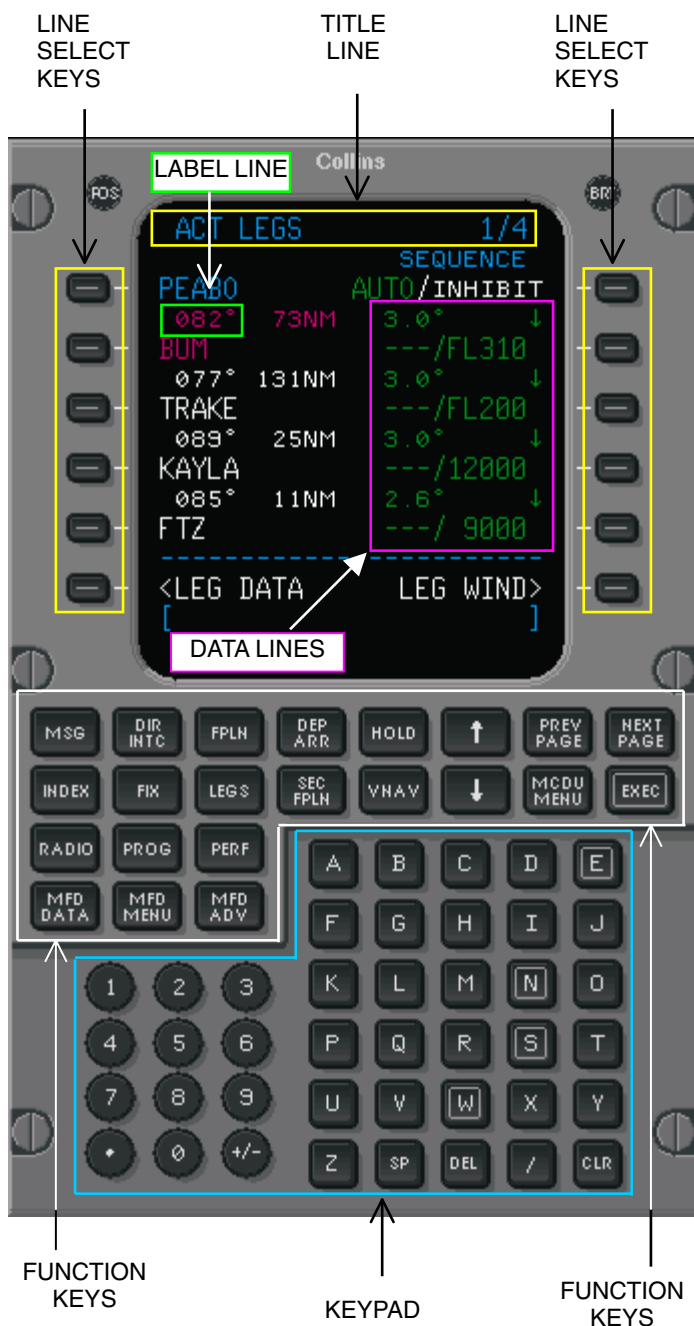
Push the up and down arrow keys to change the center waypoint position on the MFD PLAN MAP. The annunciation <CTR> shows on the waypoint line of the waypoint where the MFD PLAN MAP is centered. The MFD must be in PLAN MAP mode and the ACT LEGS page showing on the CDU for these keys to function.

EXEC

Push the EXEC key to execute a flight plan and change the MOD LEGS to the ACT LEGS or MOD FPLN to the ACT FPLN page. You must push the EXEC key for the FMS to use the flight plan to generate steering commands for the flight control systems if any of the following apply:

- A new flight plan is entered on the FPLN or LEGS pages
- An existing active flight plan is modified on the ACT FPLN or ACT LEGS pages
- Selected entries or changes are made on the PERF INIT pages

This method of flight plan activation allows you to enter, change, and review a flight plan before it is activated for use as a steering source by the FMS.



INDEX

Push the INDEX key to show the INDEX page. The INDEX page shows a menu of additional FMS functions that do not have direct access function keys. In dual FMS installations, the menu includes identifiers for the associated sensor sides and FMS control pages (i.e., FMS1 IRS CONTROL, FMS2 GPS CONTROL, etc.). The functions available from the INDEX page vary with the equipment installed in the airplane, the interconnect wiring on the airplane, and the options installed in the FMS-4200.

NOTE

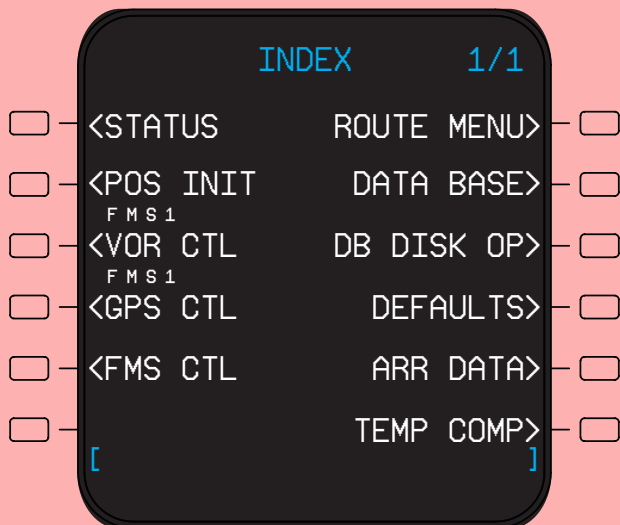
In some installations more than one INDEX page is used to show all of the available functions. Push the NEXT PAGE or PREV PAGE key as necessary to view all INDEX pages.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 2-9

The illustration below replaces the illustration on the page.



TPG6057_01

STATUS

The STATUS page shows on the CDU display at initial power-up or when selected from the INDEX page. On the STATUS page, you can verify, set, or select the following:

- A NAV DATA identifier for the installed navigation databases
- The ACTIVE DATA BASE and SECond DATA BASE effective dates
- UTC time and DATE currently set for the FMS
- A PROGRAM identification code for the operating software installed in the FMS
- Line key selections for returning to the INDEX page or for going on to the position initialization (POS INIT) page.

An out of date ACTIVE DATA BASE shows in yellow and a corrupted database (either the ACTIVE or SEC) shows dashed lines in place of the effective dates. If a database is not loaded, the effective dates are blank.

In dual FMS installations set to the SYNC mode, STATUS page data is automatically copied to the cross-side FMS. In the INDEP mode, each FMS STATUS page must be modified separately.

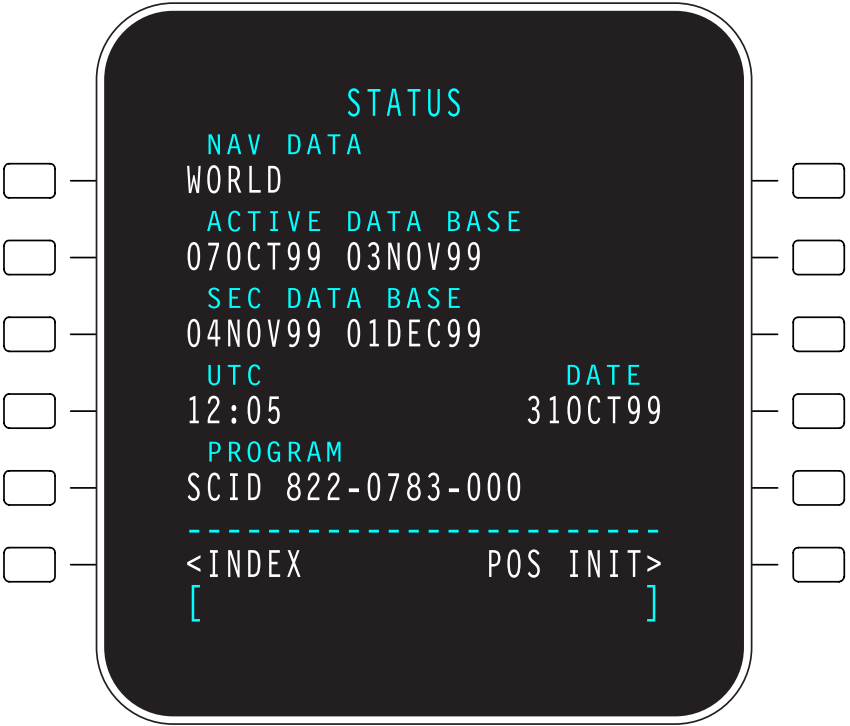
STATUS page 2/2, if available, shows the following performance database information for your verification, as necessary:

- The Aircraft MODEL name
- Aircraft VARIANT
- Maximum Takeoff Weight (MTOW)
- ENGINES type name/number
- The PERF DATA BASE identifier for the performance database installed in the FMS.

NOTE

A performance database is optional and not available in all installations. STATUS page 2/2 is available only in installations with a performance database installed.

STATUS PAGE



POS INIT

Push the POS INIT line select key on the INDEX page to show the POS INIT page. Use this page to display and update the position data for the FMS and compatible IRS systems if installed. Depending on the equipment installed in the airplane, there may be several POS INIT pages. Page 1 always shows:

- The current FMS POSition
- An AIRPORT and its position (when on the ground)
- A PILOT/REF WPT and its position (for entering a specific waypoint to use for a position update or initialization)
- A GATE (when specified) and its position (only in selected installations)
- SET POS with a LAT/LON position, prompt boxes or dashes. (The prompt boxes show when the FMS needs a position update. Otherwise, a position or dashes shows.)

When an appropriate identifier is entered into the AIRPORT or PILOT/REF WPT data line, the associated LAT/LON position shows adjacent to the identifier. You can use any of the LAT/LON positions shown on the page as a SET POS entry.

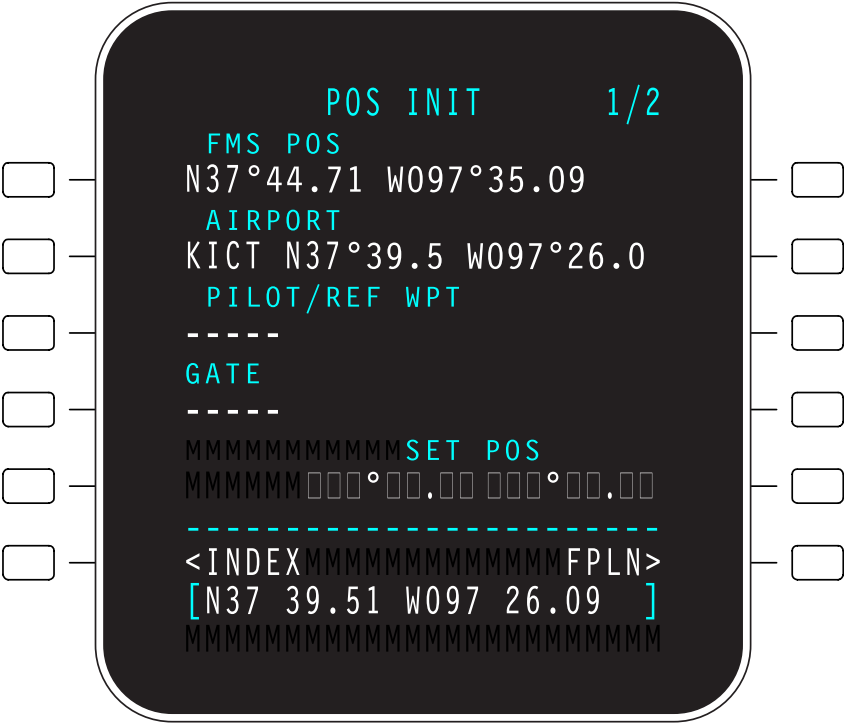
When the airplane is on the ground, the AIRPORT or PILOT/REF WPT data line is normally pre-filled with the destination airport from the last flight (if one was defined for that flight). Regardless of the pre-fill, you may enter the ICAO identifier of any airport in the navigation database. When an airport identifier is entered into the AIRPORT data line, the airport reference point lat/long position shows adjacent to the identifier. You can use an AIRPORT entry to set the FMS position only when the airplane is on the ground. Display of the AIRPORT identifier and its location is cleared at takeoff.

The PILOT/REF WPT line is pre-filled with a waypoint identifier when there is a PILOT-DEFINED WPT within 3 NM of the current FMS position. Any PILOT-DEFINED WPT, or any waypoint in the navigation database, can be used in the PILOT/REF WPT line. You can use the PILOT/REF WPT entry to set the FMS position only when the airplane is on the ground. Display of the PILOT/REF WPT and its location is cleared at takeoff.

The SET POS line shows prompt boxes any time the FMS requires a position initialization or update. Entering a position into the SET POS line from the scratchpad updates the FMS to that position. If the position is more than 40 NM from the last known position, the message "RESET INITIAL POS" shows on the message line. If the IRS does not get updated when you enter the SET POS, the message "RE-ENTER SET POS" shows on the CDU message line. This can occur if you set the position before selecting the NAV mode for the IRS. Push the SET POS line select key twice to re-enter or reset the position. The SET POS line shows dashes two minutes after an entry is made if the airplane is airborne, or two minutes after the airplane becomes airborne if the entry is made when the airplane is on the ground.

POS INIT PAGE

"SET POS" PROMPT SHOWING



Additional POS INIT pages show position information for other sensors that are available for use by the FMS, as well as the UPDATE FROM NAVAID function. You can use the position information from any of the available sensors to initialize or update the FMS position. The UPDATE FROM NAVAID FUNCTION is available **only when the airplane is airborne**.

The UPDATE FROM NAVAID line is pre-filled with the identifier of a navaid that meets the following conditions:

- It is not disabled for use on the VOR CONTROL page
- It has collocated VOR and DME components (VOR/DME or VORTAC)
- Both on-side VOR and DME frequencies are tuned to the navaid
- Both on-side VOR and DME data are valid
- The current position based on the VOR/DME signals is within 30 NM of the FMS position
- DME distance measures less than 100 NM
- If a DME identifier is received, it must match the navaid identifier.

If no navaid satisfies the above conditions, the NAVAID entry shows dashes.

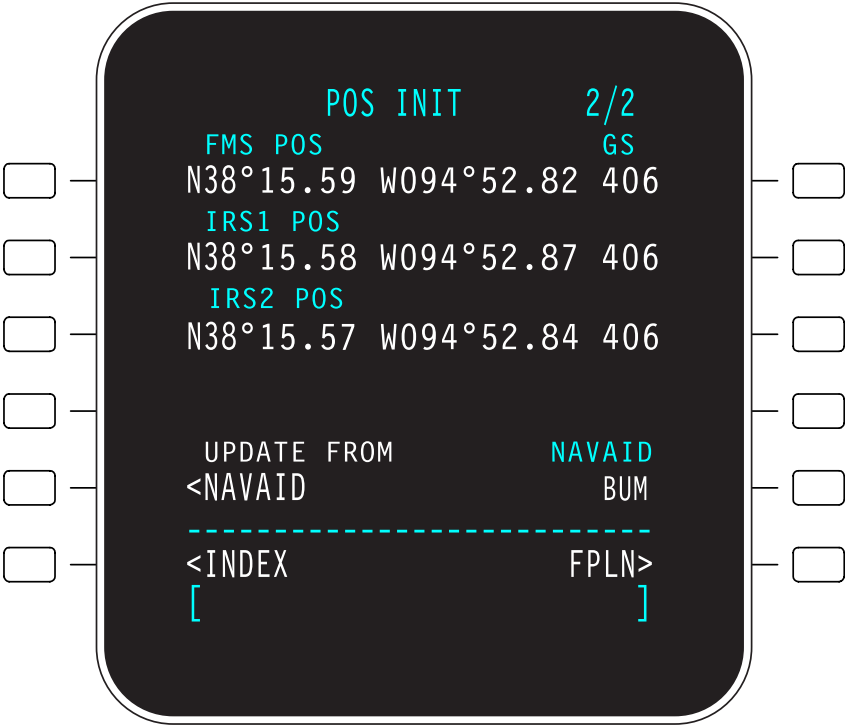
You can manually enter an identifier to replace the dashes. You can also enter an alternate navaid to the one currently showing. A manually entered navaid shows in large font characters and remains on the navaid line until another identifier is entered, the NAV radio frequency changes, or the DME identifier differs.

Manually entering a navaid identifier is accepted by the FMS provided the entered navaid has collocated VOR and DME components. Entering a navaid identifier tunes the on-side VOR radio to the navaid frequency, and sets the tuning mode of that radio to MAN on the RADIO TUNING page. If you enter an identifier which is not in the database, or is an unacceptable navaid, the appropriate scratchpad message ("NOT IN DATA BASE, NOT A COLLOCATED NAVAID, NOT A VOR/DME, NAVAID INHIBITED") shows on the CDU message line.

If the VOR or DME components of a manually selected navaid are not received within five seconds after the selection, the identifier field changes to dashes and the scratchpad shows the message "NAVAID NOT RECEIVED."

The navaid position data is initially displayed as a radial and distance from the navaid. If you want to see the position as a lat/long position, push the LAT/LON line select key. The position is updated regularly using the signals received from the specified navaid. Push the CONFIRM POS line select key to update the FMS position. LRNs capable of being updated will also be initialized to the updated navaid position. If the position update from the navaid causes the message "RESET INITIAL POS" to show, a second UPDATE FROM NAVAID is required and must be accomplished within 5 NM of the first NAVAID update.

POS INIT PAGE 2 WITH
UPDATE FROM NAVAID SELECTION



IRS CTL

NOTE

IRS is an optional feature and may not be available in some installations.

Push the FMS IRS CTL line select key on the INDEX page to show the FMS IRS CONTROL page. Push the left side line select key of a sensor to alternately ENABLE or DISABLE use of that sensor by the FMS.

The FMS IRS CTL page shows position differences (POS DIFF) between each IRS sensor's position and the position calculated by the FMS. Both direction and distance (up to 99.9 NM) are given for a POS DIFF, as well as the current DRIFT rate (in NM/hr) if the IRS is set to the NAV mode. Any POS DIFF greater than 99.9 NM shows as 99.9 NM. Dashes show for the POS DIFF and DRIFT if insufficient data is available for their determination. Dashes also show for DRIFT if IRS is **NOT** set to the NAV mode or for 30 minutes after an initialization.

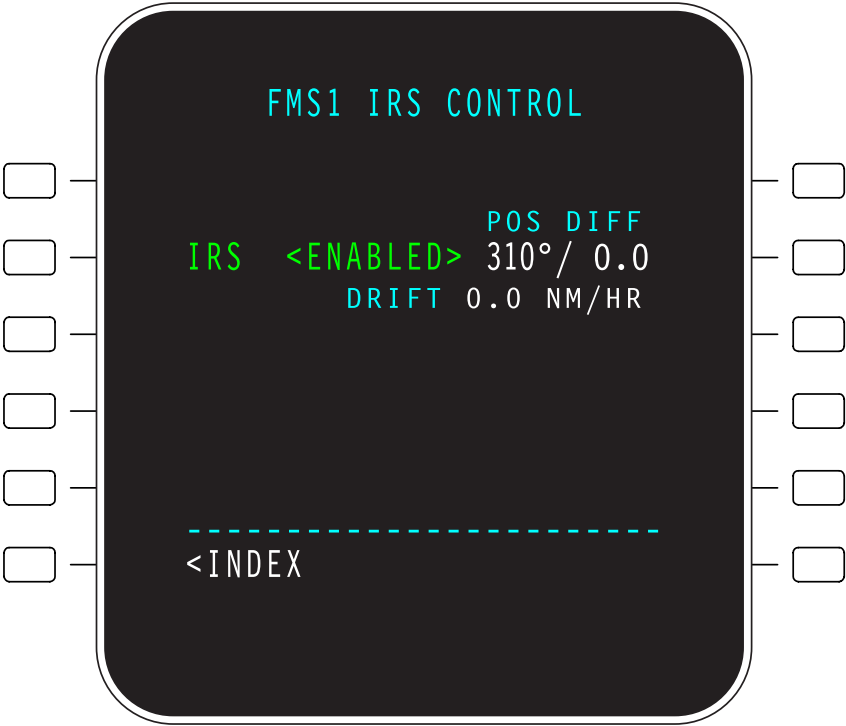
In some installations, remote switches in the cockpit are used to select the IRS sensors available for use by the FMS. If only one sensor is available to the FMS, the other sensors' POS DIFF and DRIFT data lines are dashed.

When an IRS is set to the ATTITUDE mode and is indicating a heading entry is required, the FMS IRS CTL page shows the "SET IRS HDG" prompt. Enter the necessary heading into the scratchpad and transfer it to the prompt.

NOTE

An IRS set to the ALIGN or ATTITUDE mode is not used by the FMS in its calculations to determine position.

IRS CONTROL PAGE

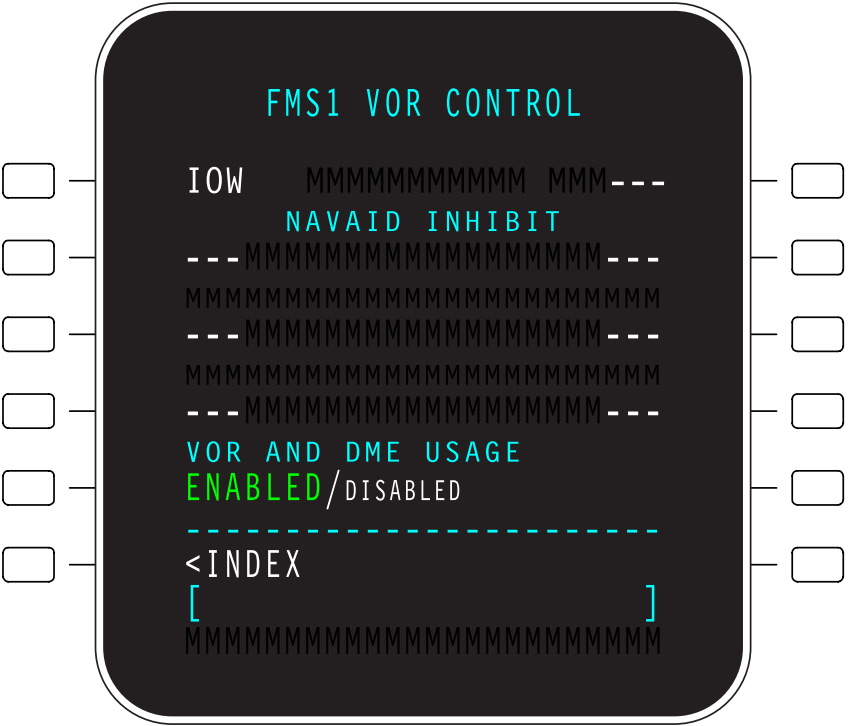


VOR CTL

Push the FMS VOR CTL line select key on the INDEX page to show the FMS VOR CONTROL page. Use this page to disable or enable the use of VOR/DME sensor data in the FMS's calculations to determine position, and to inhibit up to eight specific nav aids from use by the FMS.

Push the ENABLE/DISABLE line select key to alternately enable and disable VOR AND DME USAGE. To disable use of an individual VOR, enter its IDENT into the scratchpad and transfer it to one of the NAVAID INHIBIT data lines. Up to eight nav aids may be inhibited from use by the FMS. Individually inhibited nav aids will remain inhibited until they are deleted from the data lines, or until a new navigation database is selected.

VOR CONTROL PAGE WITH
ONE NAVAID INHIBITED



GPS CTL

Push the FMS GPS CTL line select key on the INDEX page to show the FMS GPS CONTROL page. Use this page to:

- Disable or enable the use of GPS sensor data in the FMS calculations to determine position
- Determine if APPR RAIM is available for the selected time that an approach will be accomplished
- Deselect specific GPS satellites from use.

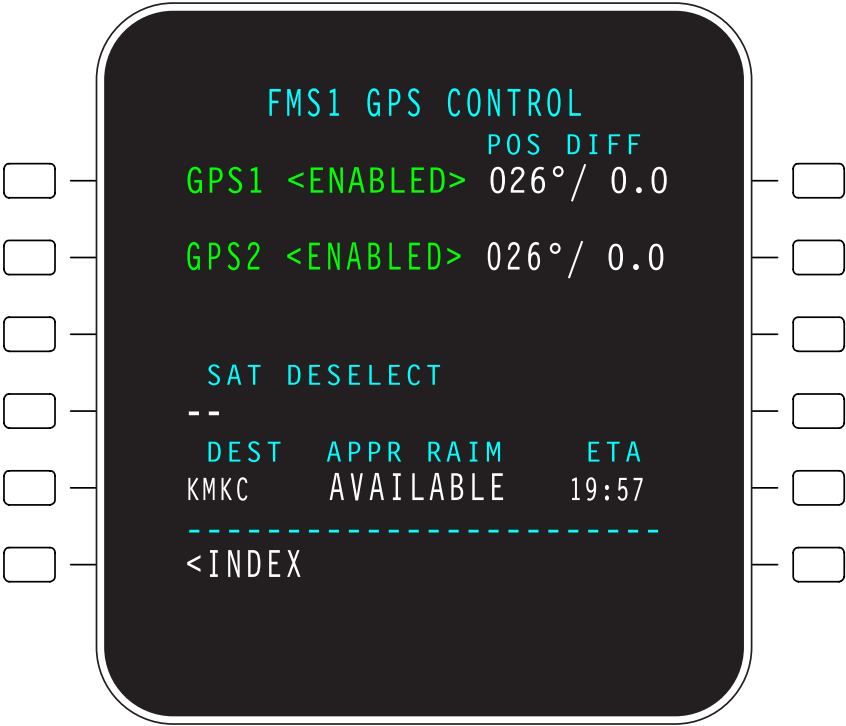
To alternately enable or disable use of a specific GPS sensor, push the left side line select key of that sensor. ENABLED sensors show in green large font and DISABLD sensors are shown in white small font.

The POS DIFF is the position difference between each GPS sensor's position and the FMS-calculated position. Both direction and distance (up to 99.9 NM) are shown. A POS DIFF greater than 99.9 NM shows as 99.9 NM. Dashes show for the POS DIFF if there is insufficient data to calculate a difference.

The DEST and ETA entries, by default, are those of the active flight plan. You can manually enter changes to see if RAIM is available for other destinations and/or arrival times.

You can deselect up to 8 satellites that are scheduled to be out of service as identified in NOTAMs. Deselected satellites are not included in the predicted RAIM computations. Enter the satellite numbers one at a time. Enable all DESELECTed satellites at once with the DELETE key function, or enable individual satellites from the DESELECT list by reentering the satellite number.

GPS CONTROL PAGE



FMS CTL

Push the FMS CTL line select key on the INDEX page to show the FMS CONTROL page. Use this page to select the MAG or TRUE FMS display mode, and the SYNC or INDEP FMS coordination modes.

The MAG/TRUE selection selects the course and bearing reference that is shown on the CDU and EFIS. MAG is for Magnetic north, TRUE is for TRUE north. When TRUE is selected as the reference, courses and bearings shown on the CDU and the MFD text pages show the letter "T" in place of the degree symbol.

NOTE

VOR bearing data shown on the MFD VOR/DME STATUS page is not affected by the MAG/TRUE selection. Also, on CDU PROGRESS page 2/2 and the MFD NAV STATUS page, the WIND is always shown as TRUE.

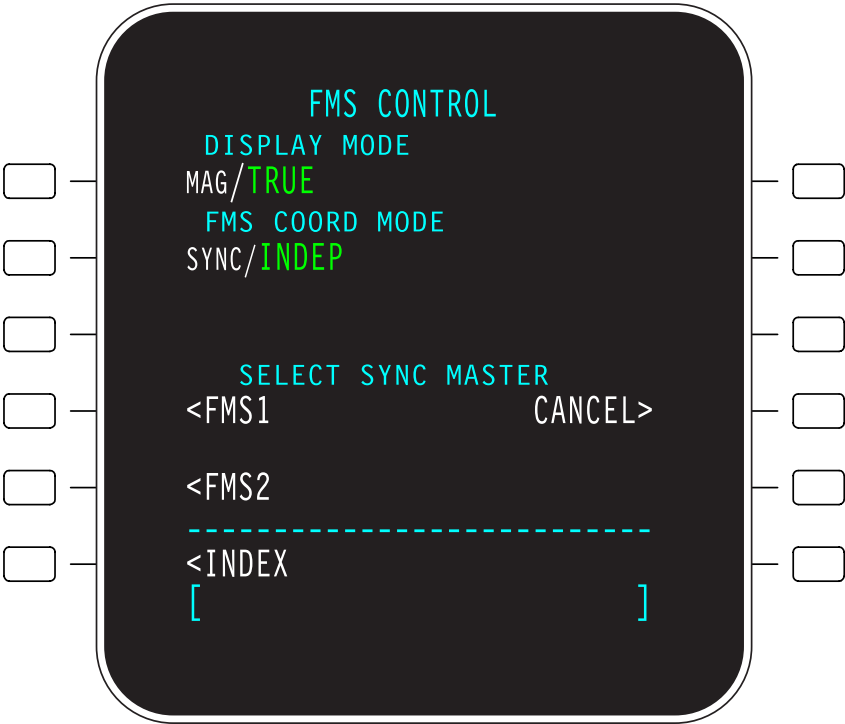
On IRS equipped aircraft, the IRS indicates to the FMS when it no longer supports magnetic heading. If any one of the installed IRS units indicates it is in the TRUE mode, the MAG/TRUE selection is automatically set to TRUE and you will not be able to select MAG. The message "MAG N/A" shows on the CDU when you attempt to force the selection to MAG. When the IRS units transition to magnetic heading output, the MAG/TRUE selection remains set to TRUE, but you can manually select MAG. The FMS does not return to MAG automatically.

When changing from INDEP to SYNC, you will be asked to select a sync master. Choose whichever FMS that you wish to retain its existing flight plans. When you select an FMS as master, its flight plans are transferred to the other FMS during the change to the sync mode. Any flight plans in the other FMS are lost.

When changing from SYNC to INDEP, you are prompted to confirm that you want to make the change. Push the CONFIRM line select key to confirm the change or push the CANCEL line select key to cancel the operation.

FMS CONTROL PAGE

DISPLAY & COORD MODE OPTIONS



ROUTE MENU

Push the ROUTE MENU line select key on either the INDEX page or the SEC FPLN page to show the ROUTE MENU page. This page shows an index of the route lists available from which you can select preplanned flight plan routes. Depending on the installation, the route lists available may include:

- PILOT ROUTE LIST (optional)
- CO ROUTE LIST (optional)
- DISK ROUTE LIST

In addition to the routes already loaded into the FMS in the PILOT ROUTE LISTS and CO ROUTE LISTS (if available), the DISK ROUTE LIST feature gives you the ability to load a flight plan from a disk.

ROUTE MENU PAGE



The PILOT ROUTE LIST and CO ROUTE LIST pages show a list of the routes stored in the FMS. Select a route from the list by pushing the line select key adjacent to the desired route. The PILOT ROUTE LIST page has additional line select key functions for:

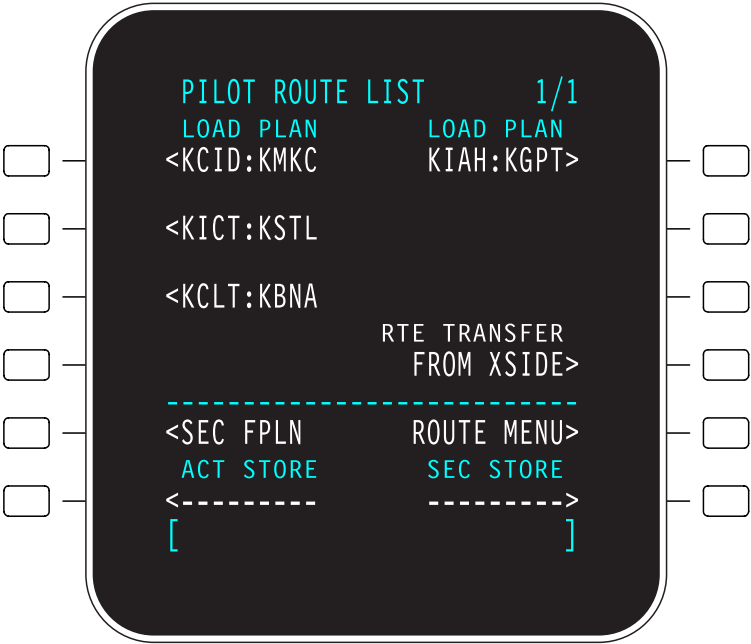
- RTE TRANSFER FROM XSIDE (Transfers cross-side FMS pilot routes to the FMS requesting the routes.)
- ACT STORE and SEC STORE (These line select keys save the current ACT FPLN and SEC FPLN, adding them to the PILOT ROUTE LIST.)
- SEC FPLN and ROUTE MENU (For selecting the SEC FPLN and ROUTE MENU pages).

NOTE

ACT STORE, SEC STORE, and RTE TRANSFER FROM XSIDE are options and may not be available in all installations. In those installations without the ability to store or transfer flight plans, the PILOT ROUTE LIST will not appear on the ROUTE MENU page.

On the DISK ROUTE LIST page you can load a route from a disk. Insert a disk that contains the desired routes into the DBU, then push the DISK ROUTE LIST line select key. The CDU shows "READING DISK", then the list of flight plan routes on the disk. Push the line select key adjacent to the desired route to load that route into the SEC FPLN. You can then activate and execute the flight plan.

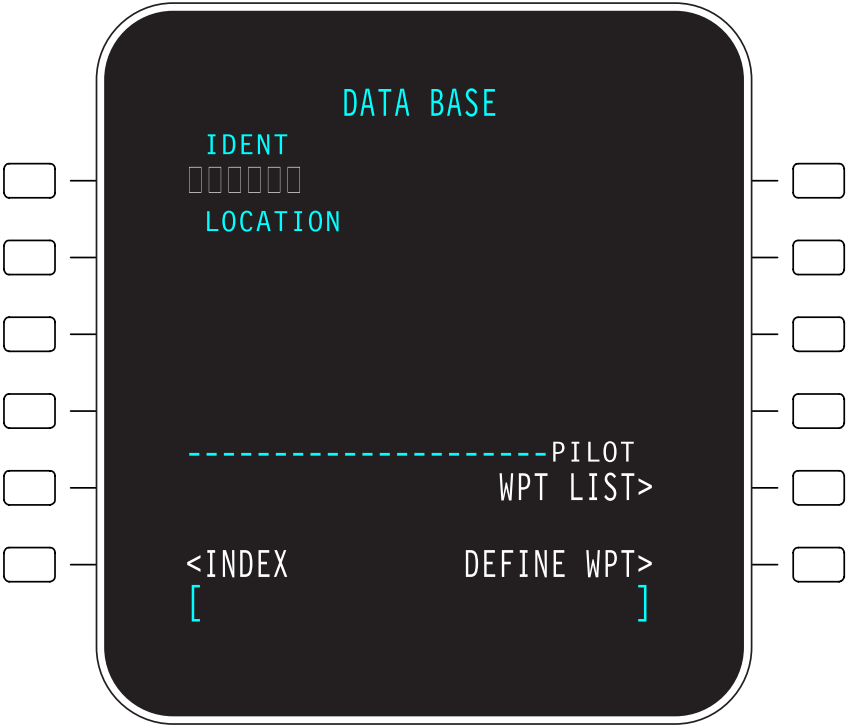
PILOT ROUTE LIST PAGE



DATA BASE

Push the DATA BASE line select key on the INDEX page to show the DATA BASE page. Use this page to display information about a specific airport, navaid, intersection, or PILOT WPT. To show the desired information, enter the facility or waypoint identifier into the scratchpad and transfer it to the IDENT prompt.

DATA BASE PAGE



For airports, the DATA BASE page shows:

- Longest operational hard surface runway (LONG RWY) in FEET or METERS
- LAT/LON position of the airport's geographical center
- Magnetic Variation (MAG VAR)
- Airport elevation (ELEV) in feet
- Localizers used at the airport, along with their associated runway, inbound course, and the frequency of the transmitter (the identifier or frequency of a localizer can be copied to the scratchpad). [Localizer information is selected by pushing the LOCALIZERS line select key on the DATA BASE page.]
- RWYs available at the airport, along with their LENGTH, ELEV and LAT/LON (LAT/LON of a runway can be copied to the scratchpad). [Runway information is selected by pushing the RWYS line select key on the DATA BASE page.]
- Terminal waypoints around the airport and their LAT/LON (the identifier or the LAT/LON of a terminal waypoint can be copied to the scratchpad; however, the identifier can be used only in association with an ORIGIN/DEST airport). [Terminal waypoints information is selected by pushing the TERM WPTS line select key on the DATA BASE page.]

For VOR, VOR/DME, DME, VORTAC, and TACAN nav aids, the DATABASE page shows:

- Type of equipment (VOR, VOR/DME, VORTAC, or TACAN)
- Transmitter frequency
- LAT/LON for VOR and DME facilities, as appropriate
- MAG VAR (for facilities that include VOR equipment)
- ELEV

For intersections, the DATA BASE page shows LAT/LON and MAG VAR.

For PILOT WPTs, the DATA BASE page shows the LAT/LON, MAG VAR, and the basis for the definition of the waypoint.

For waypoints in the FMS database, the DATA BASE shows the name, the LAT/LON, the ICAO country code and location, the type of waypoint, and the MAG VAR.

DATA BASE PAGE
SHOWING AIRPORT INFORMATION

DATA BASE

IDENT

LONG RWY

KCID AIRPORT

8600 FT

ARP LOCATION

MAG VAR

N41°53.08 W091°42.65 E2

RUNWAY LENGTH

ELEV

<FEET/METERS

860 FT

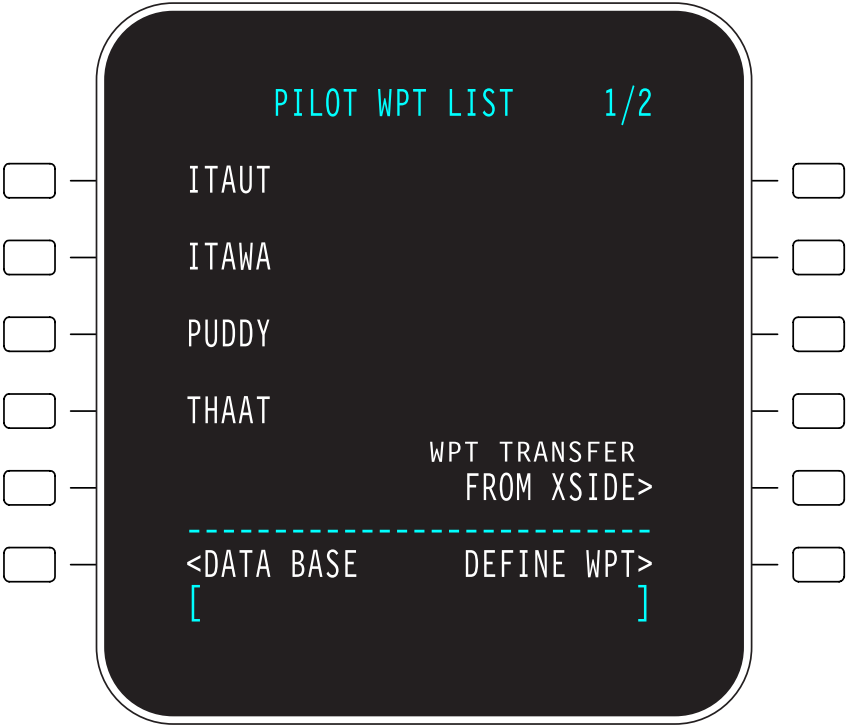
<LOCALIZERS

<RUNWAYS

TERM WPTS>

Also shown on the DATA BASE page are line key selections for the PILOT WPT LIST page and the DEFINE PILOT WPT page. On the PILOT WPT LIST page, you can view the list of available pilot-defined waypoints and copy them to the scratchpad. You can also transfer the PILOT DEFINED WPTs from a cross-side FMS with the WPT TRANSFER FROM XSIDE line select key function, and show the DEFINE PILOT WPT page to define or edit a pilot-defined waypoint. To delete a waypoint from the list, use the DEL key to enter DELETE into the scratchpad, then transfer it to the waypoint that you want to delete.

PILOT WAYPOINT LIST
WITH TYPICAL WAYPOINTS



Pilot-Defined WPTs

On the DEFINE PILOT WPT page, you can create and name your own waypoints and store them in the PILOT WPT LIST. You can store up to 100 pilot-defined waypoints, and you can use up to 50 pilot-defined waypoints in a single flight plan.

NOTE

You can also create pilot-defined named or unnamed waypoints in the scratchpad and load them directly into a flight plan. Named waypoints created in this manner are automatically added to the PILOT WPT LIST. The FMS creates a default name for unnamed waypoints; however, it does not add them to the PILOT WPT LIST.

To create a pilot-defined waypoint on the DEFINE PILOT WPT page:

- Enter a name for the IDENT,
- Enter a LAT/LON, PLACE BRG/DIST, or PLACE BRG/PLACE BRG,
- Verify your entries,
- Push the STORE WPT line select key to store the waypoint.

Stored waypoints show in the PILOT WPT LIST.

Enter LAT/LON into the scratchpad by any of three ways:

- CDU keypad entry
- Copying the latitude/longitude from another data line on a CDU display page, such as on a database page, to the scratchpad
- Joystick entry from the MFD.

The format for LAT/LON data entry is (N or S)DDMM.MM(W or E)DDDMM.MM where D represent degrees and M represents minutes. For example, N40°15.30' W003°05.50' must be entered as "N4015.30W00305.50". If coordinates are in whole degrees of latitude or longitude (or both), you need not enter the minutes (e.g., N40, S09, W030, E142). If you enter minutes, you must use two digits before a decimal point. If you enter a decimal point, you must use at least one number after it. The acceptable range for entering minutes is 00.00 to 59.99. Optional spaces may be placed between the degrees and minutes fields, and between the latitude and longitude fields.

DEFINE PILOT WPT PAGE

DEFINE PILOT WPT

IDENT

THAAT

LATITUDE

LONGITUDE

N23°13.28

W088°35.32

PLACE BRG

/DIST

PDQ270.0/66.6

PLACE BRG

/PLACE BRG

<STORE WPT

RETURN>

[

]

The format for PLACE BRG/DIST entries is “base waypoint identifier” followed by a bearing in degrees, a slash, and a distance value (i.e., CID005.3/23.5).

The format for PLACE BRG/PLACE BRG entries is “base waypoint identifier” followed by a bearing in degrees, a slash, the second “base waypoint identifier”, and a bearing in degrees (i.e., CID090/IOW360).

Base waypoint identifiers must be valid nav aids, en route intersections, non-directional beacons, airport reference points, or pilot-defined waypoints. Bearings must be specified with three numbers for the whole degree part, with leading zeros if necessary (i.e., 005). You can also specify bearings in tenths of degrees if necessary (i.e., 034.5). Distance entries are limited to 199.9 NM. Zero distance values are not accepted.

Bearing references vary depending on the type of “base waypoint”. If the base waypoint has a VOR component, then bearing is referenced to the VOR zero degree radial. If the base waypoint is an airport reference point or a runway threshold, then bearing is referenced to the North Datum of the airport. For other “base waypoints”, bearing is referenced to either magnetic north or true north, depending upon the latitude of the “base waypoint”. For “base waypoints” between the latitudes of 73 degrees north and 60 degrees south, the entered azimuth data is referenced to magnetic north using a computed value for the magnetic variation. Otherwise, the entered azimuth is referenced to true north. Suffixing the bearing with the letter “T” for true north overrides the logic mentioned above and fixes the reference to true north (i.e., CID034T/15). North bearings may be entered as 000 or as 360. The FMS always shows North as 360.

This page intentionally left blank.

DB DISK OPS

Push the DB DISK OPS line select key on the INDEX page to show the DATA BASE DISK OPS page. Use this page to update the FMS databases or to copy your own routes and waypoints to a disk.

To load a database, insert the database disk into the DBU and push the READ DISK line select key. More than one disk may be required for a complete navigation database load. In such cases, the operator is prompted to insert additional disks when necessary. Once the read or write function is selected, the CDU function keys are not operative until the load is complete or the process is canceled.

NOTE

You can load a database or write routes or waypoints to a disk only when the airplane is on the ground.

The CDU shows various status pages while a database is loading. When a database is finished loading, the display indicates that the load is complete, then shows the status page.

To copy routes or waypoints to a disk, insert a disk into the DBU and push the WRITE RTES or WRITE WPTS line select key to copy the routes or waypoints.

NOTE

WRITE RTES and WRITE WPTS are optional and may not be available in all installations.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 2-38

The following NOTE is added after the second NOTE on the page.

NOTE

The PCD-3000 data loader may be used instead of the DBU to initiate a database read or write. Refer to the Rockwell Collins PCD-3000 Data Loader user's guide (CPN 523-0780041) for instructions on how to upload and download data to the FMS.
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DATA BASE DISK OPS PAGE



DEFAULTS

Push the DEFAULTS line select key on the INDEX page to show the DEFAULTS pages. Use this page to set or change the default settings for:

- Basic Operating Weight (BOW)
- Average Passenger Weight (AVG PASS WT)
- TAXI FUEL Weight (only available in installations that include the performance database option)
- MAX MAP SYMBOLS
- RESERVE FUEL Weight
- CLIMB SPEED
- CRUISE SPEED
- DESCENT SPEED
- DESCENT ANGLE
- SPD/ALT LIMIT
- FUEL FLOW CORRECTION (only available in installations that include the performance database option)
- REDUCED HALF BANK (optional)

The settings on the DEFAULTS page remain in effect until they are changed. However, for any individual flight plan, you can override any of the defaults on the appropriate display page of a flight plan. When you override a default setting from within a flight plan, it does not change the settings on the DEFAULTS page. Also, when you make changes to the settings on the DEFAULTS page, they do not affect an existing ACT/MOD FPLN or SEC FPLN. Changes made on the DEFAULTS pages are applied only when a new flight plan is created, or one is selected from the PILOT ROUTES LIST. BOW is an exception to this rule. The BOW value is applied to the ACT/MOD/SEC FPLN as soon as the BOW is entered/changed on the DEFAULTS page.

In installations with performance database option, the FUEL FLOW CORRECTION factor is used to adjust the performance computations to the observed performance of the airplane. The factor may be entered by the pilot as a percentage degradation in fuel consumption.

Installations with the optional REDUCED HALF BANK feature can set a reduced half bank limit that is used by the FMS for early turn anticipation. With the half bank mode selected on the autopilot, in shallow turns that require less than the normal full turn anticipation distance, the FMS uses the reduced half bank angle to execute the turn. For sharper turns, the FMS ignores the reduced limit and uses progressively steeper turns, up to the half bank limit of the autopilot, to avoid an overshoot. The reduced bank limits range is from 5° to 12.5°. REDUCED HALF BANK settings, other than the system default setting shown at power-up, are not saved when power is removed from the FMS. Deleting a setting returns the system to the default setting.

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PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 2-40

The following bullet item is added after the bullet item SPD/ALT LIMIT.

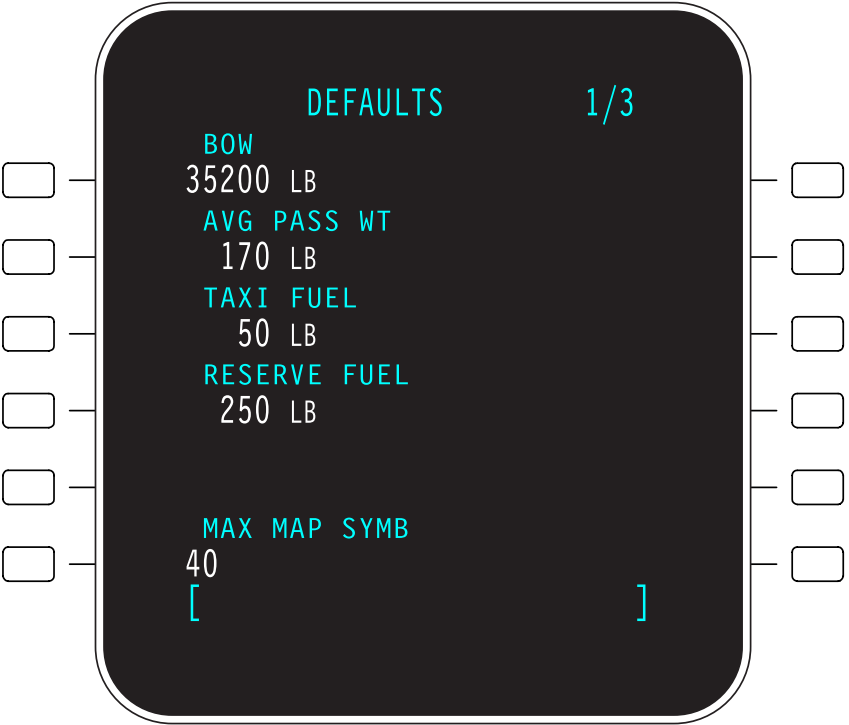
- FL/TRANS ALT

The following text is added after the last bullet item REDUCED HALF BANK (optional).

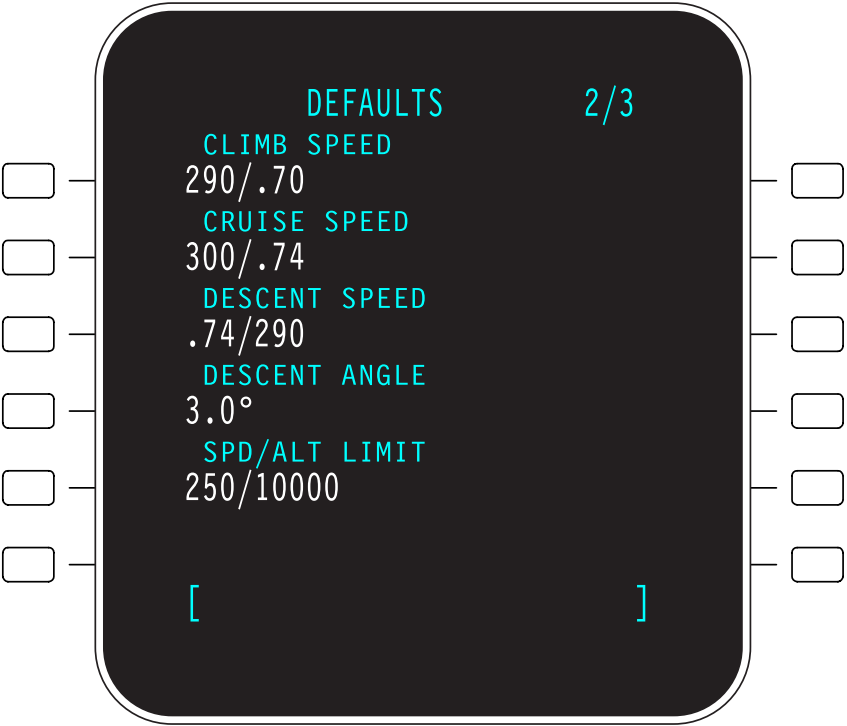
- FPLN WINDS/TEMP PWR UP — Controls the option at system power up to CLEAR or RETAIN wind and temperature data that was previously entered into a flight plan.
- TEMP COMP — Controls the option at system power up for temperature compensation to be ON or OFF.

MAX MAP SYMBOLS determines the maximum number of all types of map symbols that can be displayed on the MFD MAP. A detailed description of how symbols are prioritized for display can be found in the MFD section of this chapter.

TYPICAL DEFAULTS PAGE 1



TYPICAL DEFAULTS PAGE 2



**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 2-42

The illustration below replaces the illustration on the page.

DEFAULTS		2/3
☐	CLIMB SPEED 290/.74	☐
☐	CRUISE SPEED 300/.80	☐
☐	DESCENT SPEED .74/290	☐
☐	DESCENT ANGLE 3.0°	☐
☐	SPD/ALT LIMIT 250/10000	☐
☐	FL/TRANS ALT FL180	☐
	[	]

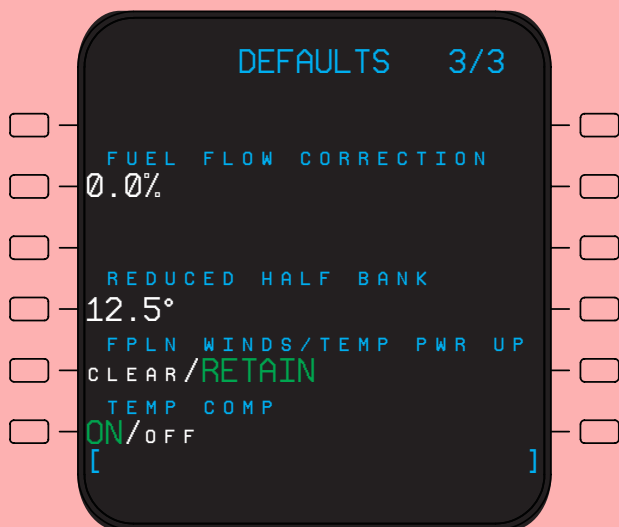
TPG6057_02

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

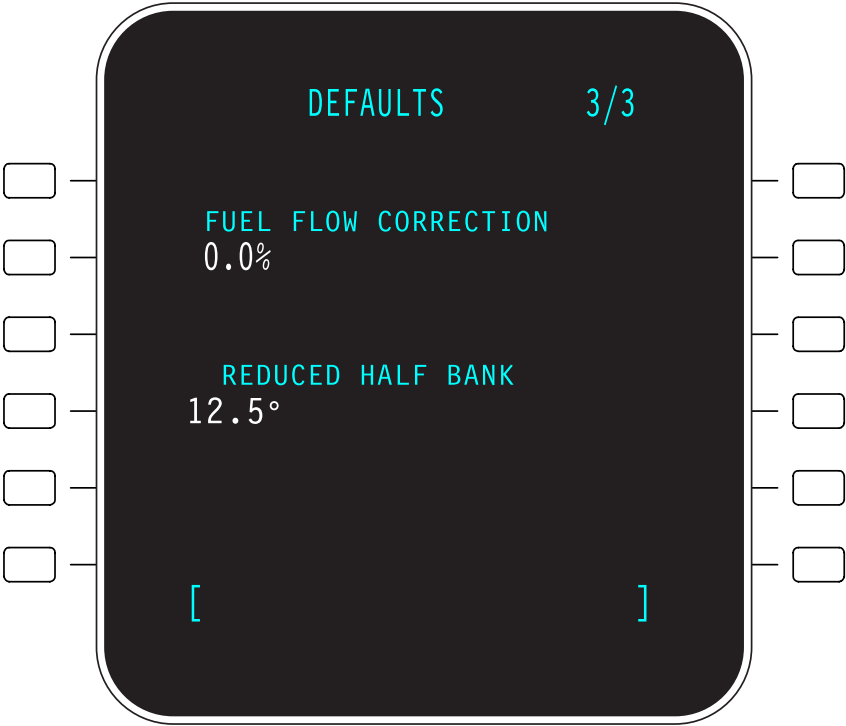
Insert this addendum sheet facing page 2-43

The illustration below replaces the illustration on the page.



TPG6057_03

TYPICAL DEFAULTS PAGE 3



ARR DATA

Push the ARR DATA line select key on the INDEX page to show the ACT ARRIVAL DATA page. This page shows information on the destination airfield. If no approach is selected, only the four letter airport ICAO identifier shows. If a non-precision approach has been selected, the approach designation and runway, and runway threshold altitude are also displayed. If an ILS approach is selected, the glide slope angle, localizer true bearing, and localizer frequency are displayed in addition to the information already described.

The information presented on the ARRIVAL DATA page is for display only. To change the display, you must select a new approach at the destination airport through the ARRIVAL page. If no destination airport has been entered, all display fields will be blank.

ACT ARRIVAL DATA PAGE

ACT ARRIVAL DATA

ARR AIRPORT

KSTL

APPR

ILS12R

GS ANGLE

3.00°

LOC TRUE BRG

122T

RWY THRESHOLD ALT

540 FT

<INDEX

LEGS>

[

]

FPLN

Push the FPLN key to show either the ACT FPLN or MOD FPLN page. Each of these pages shows the same information. The page shown depends on the current activity and status of the flight plan as described below:

- If no flight plan exists, or an unmodified active flight plan is being used, the ACT FPLN page shows.
- If a flight plan modification is in progress, the MOD FPLN page shows.

Information shown on the ACT/MOD FPLN pages varies with the equipment and options installed in the airplane. Items shown on the ACT/MOD FPLN pages may include:

- ORIGIN, DEST and ALTN airports
- Distance to the destination airport (DIST)
- ROUTE identifier
- Departure runway (ORIG RWY)
- The beginning of the flight plan route (VIA and TO)
- Flight number (FLT NO)
- Offset track distance (OFFSET).

All subsequent ACT/MOD FPLN pages show up to 5 lines of flight plan routing data and line key selections for the SEC FPLN and PERF INIT pages. The active route shows in magenta; all other route data shows in white.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
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Insert this addendum sheet facing page 2-46

The information that follows is added to the guide before the heading **FPLN**.

TEMP COMP

The TEMP COMP page allows the pilot to enter OAT at the arrival airport and have the FMS calculate and display corrections to the vertical path angles (VPA) and altitude constraints associated with the approach and missed approach procedures. This feature is an installation option and may not be available for all aircraft.

TEMP COMP PAGE

KSTL TEMP COMP

APPROACH AIRPORT DATA

SEL APT OAT

KICT/KSTL 30° C

ISA DEV

-21° C

TEMP COMP

ON/OFF

MSL ALT CORR COMP ALT

12300 FT 452 12752 FT

CORRECT APPR ALT DOWN?

<CONFIRM CANCEL>

[]

TPG6057_04

The OAT must be entered before temperature compensation can be computed. A valid OAT is in the range from -55° C to 70° C. The OAT entered and displayed is the aerodrome temperature that is associated with the airport that is selected via the SEL APT line select key. Upon initial entry of a new OAT value, the FMS will calculate ISA using the value entered for OAT and the elevation of the associated airport.

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When ISA is equal to or less than 0° C (cold temperature), the OAT value is accepted for temperature compensation calculations and is displayed in large white font. The calculated ISA DEV is displayed in small white font.

When ISA is greater than 0° C (hot temperature), the OAT value is displayed in large yellow font, the calculated ISA DEV is displayed in small yellow font, and the message "CORRECT APPR ALT DOWN?" and the options <CONFIRM CANCEL> are displayed in large white font. Pushing the CONFIRM line select key will cause the FMS to accept the OAT value for temperature compensation calculations and display OAT in large white font and ISA DEV in small white font. Pressing the CANCEL line select key will cause OAT and ISA DEV to be returned to their previous states.

NOTE

The "CORR APPR ALT DOWN?" prompt refers to the indicated altitudes and not the true altitudes.

- **SEL APT** — Used to select the airport for which temperature compensation is to be applied. Pushing the line select key cycles between the departure airport and the destination airport. The selected airport shows in large green text; the unselected airport shows in small white text.
- **OAT** — Used to enter the outside air temperature for the airport shown in the SEL APT field. Prompt boxes show to indicate the OAT value is a required entry.
- **ISA DEV** — Shows the FMS-calculated ISA deviation based on the OAT value and the elevation of the airport.
- **TEMP COMP** — Used to select Temperature Compensation ON or OFF. At initial power-up or upon a new flight plan, the selection (ON or OFF) defaults to the setting specified on the DEFAULTS page.

NOTE

Changing the TEMP COMP setting always creates a MOD FPLN condition.

- **MSL ALT** — When OAT for an airport has been entered, the MSL ALT field allows entry of an altitude. MSL ALT entries show in large white text.
- **CORR** — Show the correction value to be applied to the MSL based on the OAT entered for the airport. A negative correction value is indicated by a minus (-) sign.
- **COMP ALT** — Shows the compensated altitude derived from applying temperature compensation to the MSL ALT.

Addendum 3
3 May 04

ADDENDUM 4 TO ROCKWELL COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM PILOT'S GUIDE

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert facing Addendum 3 page 8.

This addendum supersedes Addendum 3 page 9.

Last sentence of the note is deleted. Black bar in the margin identifies change.
When TEMP COMP is active, the FMS adds a copyright symbol (©) to indicate temperature compensation has been applied to a database altitude or database VPA.

ACT LEGS PAGE WITH TEMP COMP ON

ACT LEGS		1/2	
		SEQUENCE	
☐ RW14	1 2 9 ° 1 0 8 NM	AUTO/INHIBIT	3 . 0 ° ↓
☐ BECTO	1 7 7 ° 4 NM	---	/ 3500A© ↓
☐ DWNB	1 7 7 ° 6 NM	---	/ 2400A© ↓
☐ RW18L	1 7 7 ° 2 NM	---	/ RWY © ↓
☐ (1600)		MISSED APPR	---
☐		/ 1600A	
COMPLETED-----			
☐ <RWY UPDATE	LEG WIND>		
☐	[		

TPG6057_05

NOTE

Temperature compensation is not applied to altitudes above the flight level transition altitude. However, when the FMS is applying temperature compensation to an altitude below the transition altitude, it is possible the resulting altitude may be above the transition altitude. These situations will result in a flight level altitude with a copyright symbol (©), which indicates a temperature-compensated flight level altitude. Since flight level altitudes are rounded to the nearest hundredths, the indicated altitude is not the corrected true altitude.

NOTICE

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

The technical data in this document (or file) is controlled for export under the Export Administration Regulations (EAR), 15 CFR Parts 730-774. Violations of these laws may be subject to fines and penalties under the Export Administration Act.

**ADDENDUM 4
TO
ROCKWELL COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert backing Addendum 4 page 1.

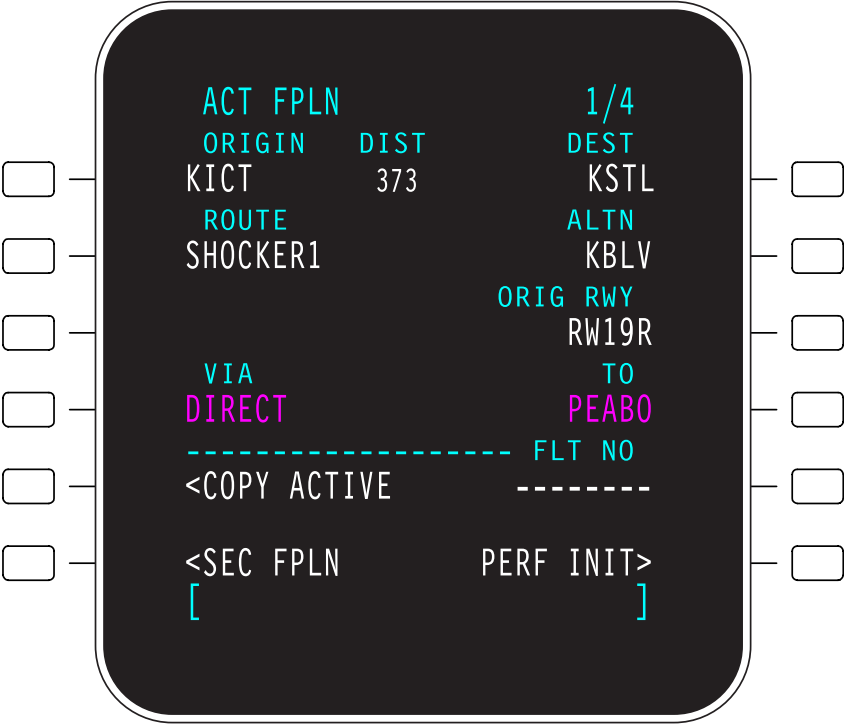
This addendum supersedes Addendum 3 page 10.

This addendum page contains the same information as Addendum 3 page 10.

NOTE

The temperature-compensated VPA displayed on the ACT/MOD LEGS pages is the value that results from the temperature compensated altitude and is not the actual VPA that the aircraft will fly. When temperature compensation is active, the aircraft will always fly the actual VPA contained in the database for that approach.

TYPICAL ACT FPLN PAGE

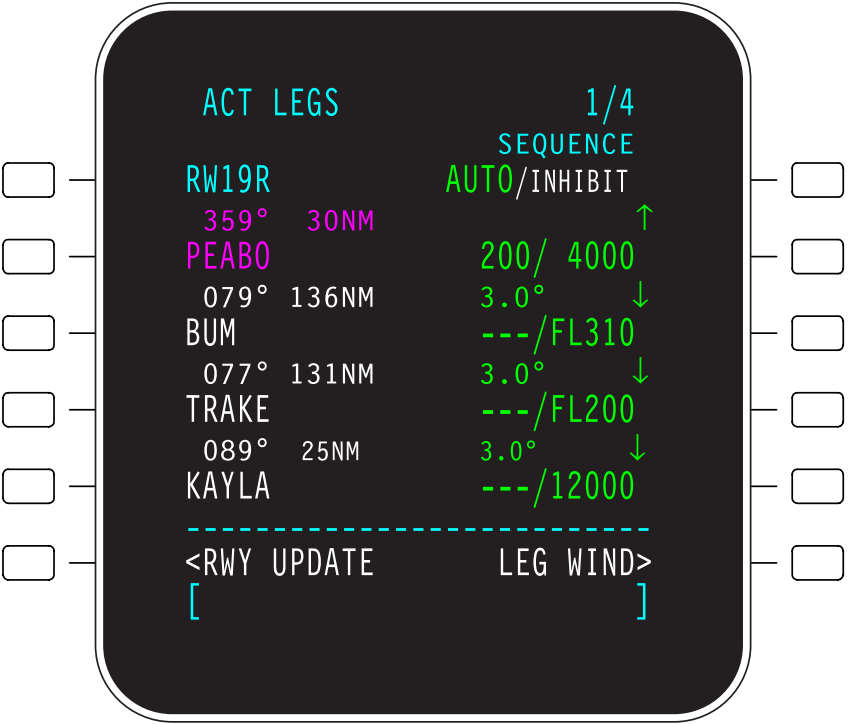


LEGS

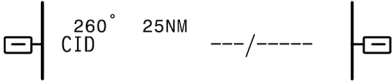
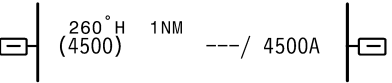
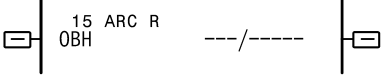
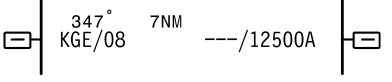
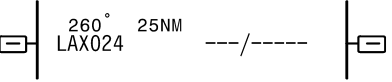
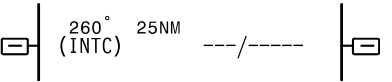
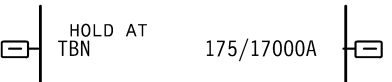
Push the LEGS key to show either the ACT LEGS or MOD LEGS page. Each of these pages shows the same information. The page shown depends on the current activity and status of the flight plan as described below:

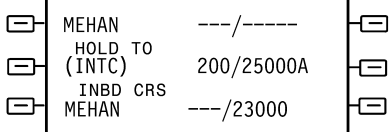
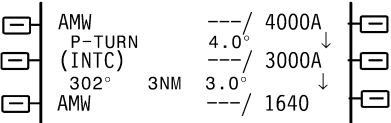
- If an unmodified active flight plan is being used, the ACT LEGS page shows.
- If a flight plan modification is in progress, the MOD LEGS page shows.

TYPICAL ACT LEGS PAGE



The ACT/MOD LEGS pages show a list of all of the leg segments that make up a flight plan route. The TO leg shows in magenta, the last waypoint passed (FROM waypoint) shows in cyan, and all other leg waypoints show in white. Various types of flight plan legs are identified by the information shown in the left column of the display page. The list below describes the information shown for each leg type.

For a magnetic or true course leg that terminates at a database or pilot-defined waypoint, the course direction and waypoint identifier are shown.	
For a magnetic or true heading leg with an altitude termination point, the heading and terminating altitude are shown.	
For a DME ARC leg, the distance and direction of the turn are shown along with a unique identifier.	
For a distance terminated leg, the course and waypoint with the terminating distance are shown.	
For a radial terminated leg, the course and waypoint with the terminating radial are shown.	
For an intercept leg that terminates when it intercepts the next leg, a course and the identifier (INTC) are shown.	
For a leg that is terminated manually when vectored from it, a course and the identifier (VECT) are shown.	
For a hold, HOLD AT and the holding fix identifier are shown.	

For a "hold to an inbound course" set of legs (i.e., some approach transitions use a course reversal holding pattern to establish the course into the final approach), HOLD TO, the intercept identifier (INTC) and INBD CRS (to identify the inbound waypoint) are shown. A course reversal hold terminates when the holding intercepts the course into the final approach.	
For a procedure turn set of legs, P-TURN and the intercept identifier (INTC) are shown. In the example, the procedure turn originates at AMW and terminates when the path intercepts the course into the final approach (also AMW).	

In addition to the leg type and course, a LEGS page also shows:

- The distance from the current position of the airplane to the waypoint
- A SID, STAR, approach, or pilot-entered reference airspeed at a waypoint
- A SID, STAR, approach, or pilot-entered constraint altitude or flight level at a waypoint
- Predicted altitude intercept at a waypoint
- AUTO/INHIBIT SEQUENCE mode selection
- Line key selections for additional LEG DATA and LEG WIND information
- A line key selection for RUNWAY UPDATE to update the FMS (and IRS in some installations) to the runway threshold position before takeoff. [Only available when the airplane is on the ground and an ORIGIN runway has been selected]

DEP ARR

Push the DEP ARR key to show the DEPART, ARRIVAL or DEP/ARR INDEX page. The page that shows depends on the following conditions.

The DEP/ARR INDEX page shows if one of the following applies:

- Neither an active or modified flight plan exists,
- The SEC FPLN or SEC LEGS page is displayed,
- The origin or destination airport is not specified.

The DEPART page for the origin airport shows if all of the following apply:

- An active or modified flight plan exists,
- Neither the SEC FPLN or SEC LEGS page is displayed,
- The airplane is on the ground.

The ARRIVAL page for the origin airport shows if all of the following apply:

- An active or modified flight plan exists,
- Neither the SEC FPLN or SEC LEGS page is displayed,
- The airplane is airborne and less than 50 NM from the origin airport or less than halfway to the destination airport.

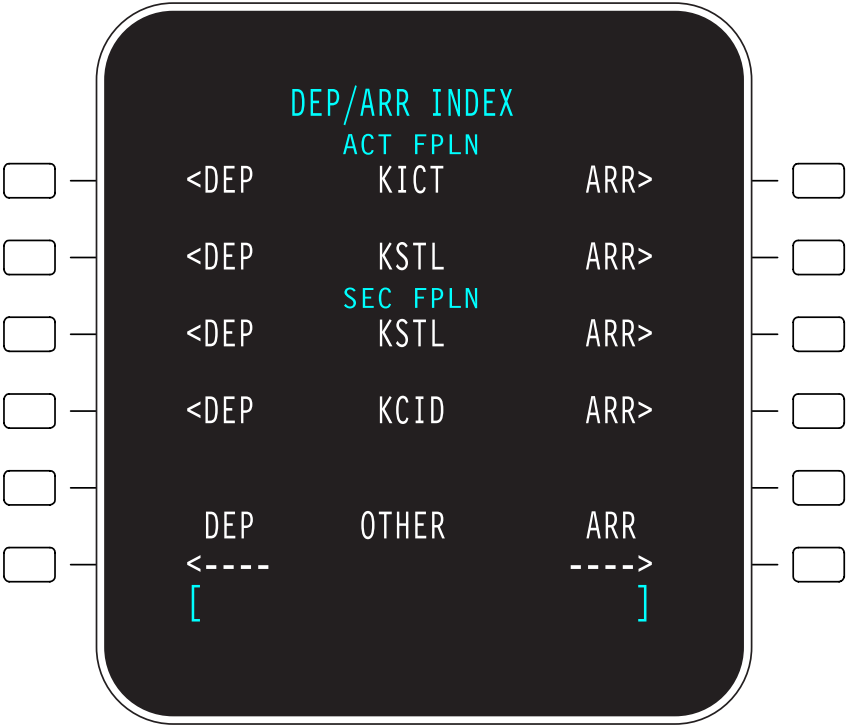
The ARRIVAL page for the destination airport shows if all of the following apply:

- An active or modified flight plan exists,
- Neither the SEC FPLN or SEC LEGS page is displayed,
- The airplane is airborne and more than 50 NM from the origin airport or more than halfway to the destination airport.

DEP/ARR INDEX

The DEP/ARR INDEX page shows the identifiers for the origin and destination airports for the ACT FPLN and the SEC FPLN if the airports have been entered on the respective flight plan pages. Also shown is an entry line labeled OTHER for displaying departures and arrivals for an airport that is not associated with either flight plan. You cannot select a departure or arrival from an airport entered on the OTHER entry lines; you can only view what is available.

DEP/ARR INDEX PAGE



DEPART

The DEPART page shows a list of runways and a list of SIDs, arranged in alphabetical and numerical order. From these lists, you can select a runway and a SID. Pushing a line select key to select a runway on the DEPART page clears all other runways from the display, and the list of SIDs is restricted to those applicable to the selected runway. If, on the other hand, a SID is selected, all other SIDs are cleared from the list and only applicable runways are displayed on the runway list.

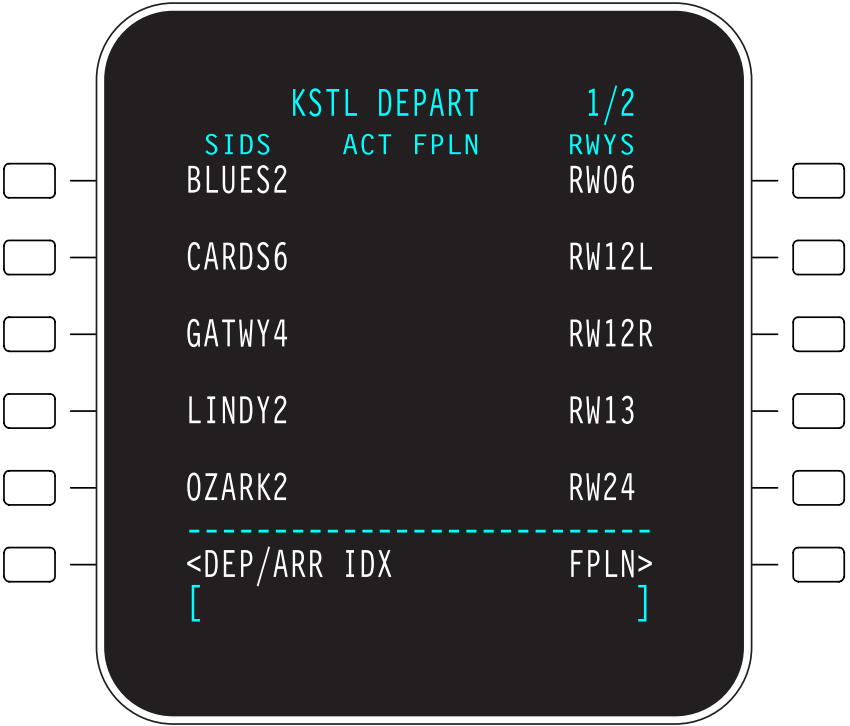
Until the EXEC key is pushed, you can use the CANCEL MOD line select key to clear the pending changes. When you select a runway or a SID, the "EXEC" annunciation shows to indicate the EXEC key will execute the pending flight plan changes.

After selecting either a runway or a SID, you can then select from the items remaining in the other list. After a SID has been selected, a list of en route transitions (if available) shows below the selected SID. Use the NEXT PAGE and PREV PAGE keys as necessary to sequence through multiple DEPART pages.

If the DEPART page is selected to show when either runway or SID has been previously selected, the DEPART page shows the selected items along with the unselected items. Selected items are shown at the top of the lists, and the remaining items are arranged in alphabetical and numerical order. You can reselect either the runway or the SID, or select different ones. If a newly selected item is incompatible with a previous selection, the previous selection is removed. For example, if a new SID is selected, but is not associated with the previously selected runway, the runway selection is removed. If a SID is reselected and a leg of that SID happens to be active, that leg will remain in the flight plan as the active leg, with the new SID, which is preceded by a discontinuity, following the active leg.

After the departure selections are made, the first FPLN page shows the selections of runway, SID, and en route transition, as appropriate. If the flight plan contains waypoints when the SID is selected, and the first waypoint is not the SID exit point, a discontinuity is inserted after the SID procedure. After passing the first waypoint, the departure runway display on the first FPLN page is removed and another VIA data line is added.

TYPICAL DEPART PAGE



ARRIVAL

The ARRIVAL page shows a list of approaches and runways, along with a list of STARs. From these lists you can select an approach, runway, and/or a STAR. Use the NEXT PAGE or PREV PAGE key as necessary to sequence through multiple ARRIVAL pages.

Pushing a line select key to select an approach or runway on the ARRIVAL page clears all other approaches and runways from the display, and the list of STARs is restricted to those associated with the selected approach or runway. If, on the other hand, a STAR is selected, all other STARs are cleared from the list and only applicable runways and approaches show on the approach and runway list. After a STAR is selected, the available transitions for the chosen STAR are shown.

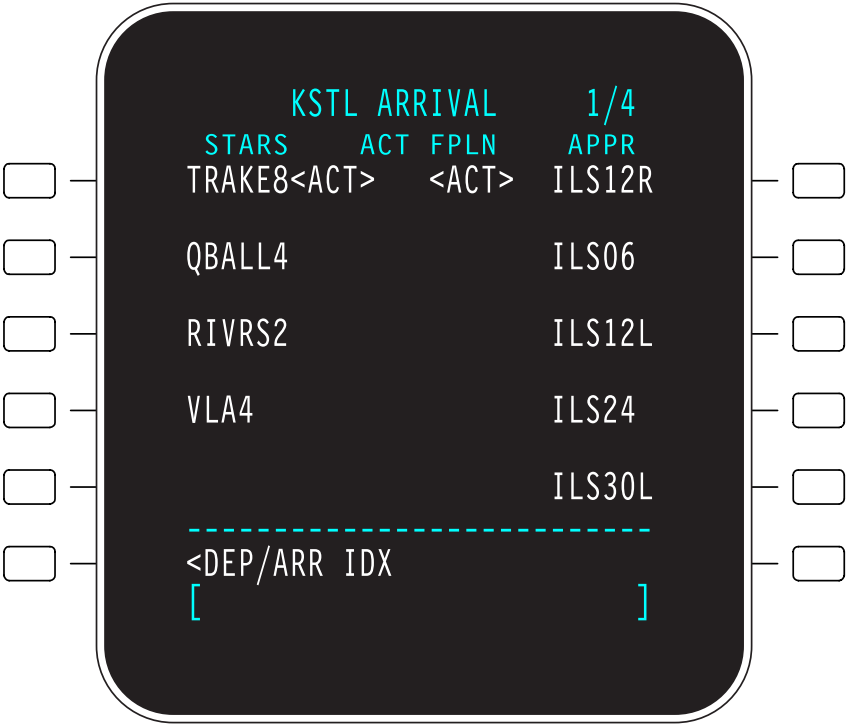
Until the EXEC key is pushed, you can use the CANCEL MOD line select key to clear the pending changes. When you select a runway or SID, the "EXEC" annunciation shows to indicate the EXEC key will execute the pending flight plan changes.

If the ARRIVAL page is selected to show when an approach, runway, or STAR has been previously selected, the ARRIVAL page shows the selected items along with the unselected items. Selected items are shown at the top of the lists and the remaining items are shown in normal order. You can select either the approach, runway, and/or the STAR. If a newly selected item is incompatible with a previous selection, the previous selection is removed. For example, if a new STAR is selected, but is not associated with the previously selected approach or runway, the approach or runway selection is removed. If a STAR is reselected and a leg of that STAR happens to be active, that leg will remain in the flight plan as the active leg, with the new STAR, which is preceded by a discontinuity, following the active leg.

Changing the selection of a STAR removes the previous STAR from the flight plan. The new STAR is inserted in place of the old STAR, unless a leg of the previous STAR happens to be active. In that case, the new STAR is inserted after the active waypoint. Additionally, if the selected runway is not associated with the newly selected STAR, the runway is removed from the flight plan.

After the arrival selections are made, the associated FPLN page shows the selections of STAR, en route transition, approach procedure, runway, and runway extension, as appropriate.

TYPICAL ARRIVAL PAGE



The table below cross-references TERMINAL PROCEDURE DESIGNATION names to those shown on the CDU. For simplicity, the table lists only the root designations without the various suffix designations that define specific runways or procedure types. The CDU does show the appropriate suffix with the designations listed in the table (i.e., VORA, ILS21R, etc.). Also, some circling approaches have unique names that do not follow the conventions described in the table, but they are shown correctly on the CDU.

TERMINAL PROCEDURE DESIGNATION	CDU DESIGNATION
ILS	ILS
LOC	LOC
B/C	B/C
LDA	LDA
SDF	SDF
GPS	GPS
LORAN	LRN
VOR or GPS	GVOR
VOR DME or GPS	GVOR
VOR	VOR
VOR DME	VOR
NDB or GPS	GNDB
NDB DME OR GPS	GNDB
NDB	NDB
NDB DME	NDB
IGS	IGS
TACAN	TCN
RNAV or GPS	GRNV
RNAV	RNV
VISUAL Approaches To A Runway	RW

This page intentionally left blank.

PERF

The PERF MENU page shows a menu of the available performance functions, allows the pilot to enable the VNAV advisory function, and displays enables the VNAV PLAN SPD

PERF MENU

The PERF MENU shows a list of other performance functions. The list may include:

- **THRUST LIMIT** — The THRUST LIMIT page shows table-based settings for takeoff (TO), go around (GA), climb (CLB), cruise (CRZ), and single engine maximum continuous thrust (MCT), as well as Reduced (FLEX), and target N% thrust reference settings
- **PERF INIT** — Up to three pages for setting or reviewing various attributes used to initialize performance functions.
- **VNAV SETUP** — Three pages for setting/showing target speeds, altitude limits, vertical path angle, and initial vertical speed as well as other attributes in the climb, cruise, and descent phases of flight.
- **FUEL MGMT** — Up to three pages for setting/showing the various elements for fuel management, selecting the performance operating mode, and a trip planning function/calculator.
- **FLT LOG** — A page to track the takeoff (T/O), en route (EN ROUTE), and landing (LDG) times, as well as the FUEL USED, average true airspeed/ground speed (AVG TAS/GS), air distance (AIR DIST), and ground distance (GND DIST)
- **FLX TEMP** — Temperature entry to support FLX THRUST computation by a FADEC.
- **SEC PERF** — Access to the performance functions for the SEC FPLN.

NOTE

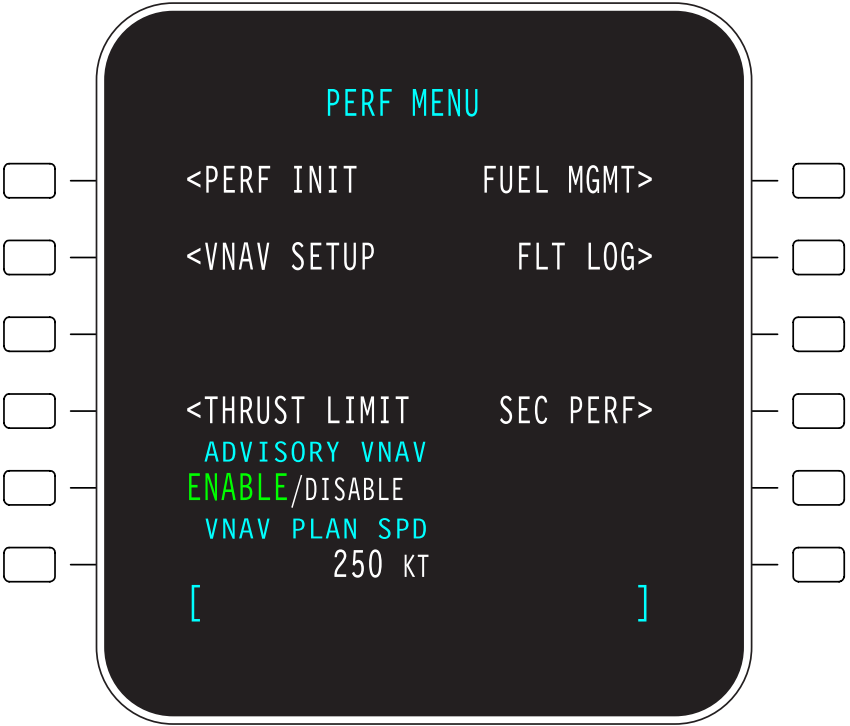
Some FMS-4200 performance functions are optional and may not be installed in all airplanes. Some of the performance pages, data lines, and modes described may not be available in all airplanes.

Some elements of the performance functions have defaults that can be changed as necessary on the DEFAULTS page. For additional flexibility, some of the defaults may be changed on the performance pages for an individual flight.

VNAV PLAN SPD

VNAV PLAN SPD, shown at the bottom left of the PERF MENU page, shows the VNAV speed for the current flight phase that is specified on the VNAV SETUP pages, or a flight plan speed restriction, whichever is the most restrictive. See the Performance chapter of this pilot's guide for a more detailed description of VNAV PLAN SPD.

PERF MENU PAGE



THRUST LIMIT

The THRUST LIMIT pages shows table-based N1% settings for takeoff (TO), go-around (GA), climb (CLB), cruise (CRZ), and single engine maximum continuous thrust (MCT). It also has pilot-entered target (TGT) references for N1. You can also set the FMS to compensate N1 computations for the effects of the anti-ice system (ENG BLEED). Each push of the ENG BLEED line select key selects a configuration setting to match the actual aircraft configuration.

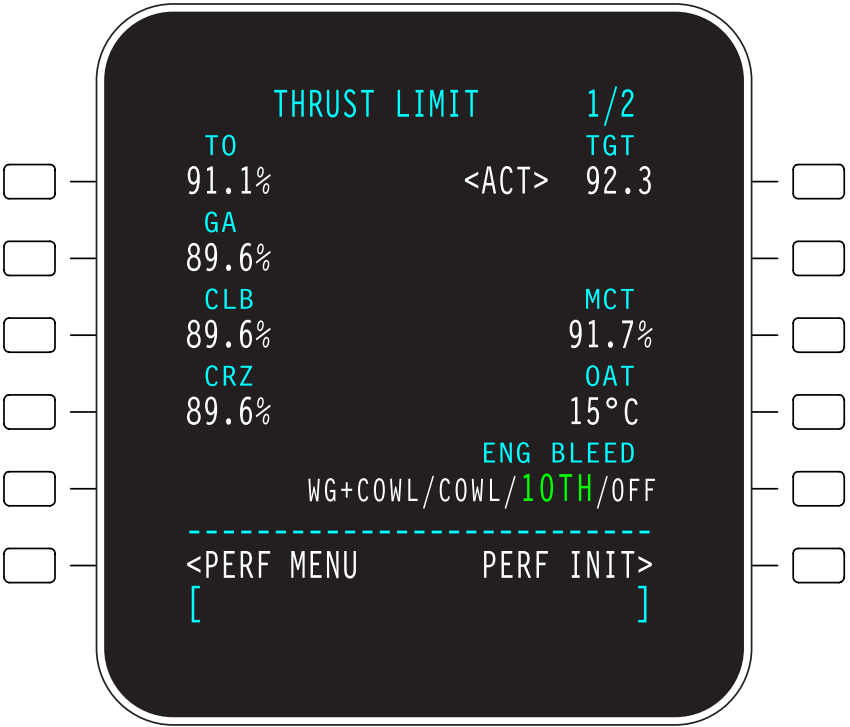
NOTE

SEC FPLNs do not have a THRUST LIMIT page. However, the SEC PERF line select key on the PERF MENU or SEC FPLN pages shows the SEC PERF pages.

MANUAL ENTRY OF N1 FOR TGT

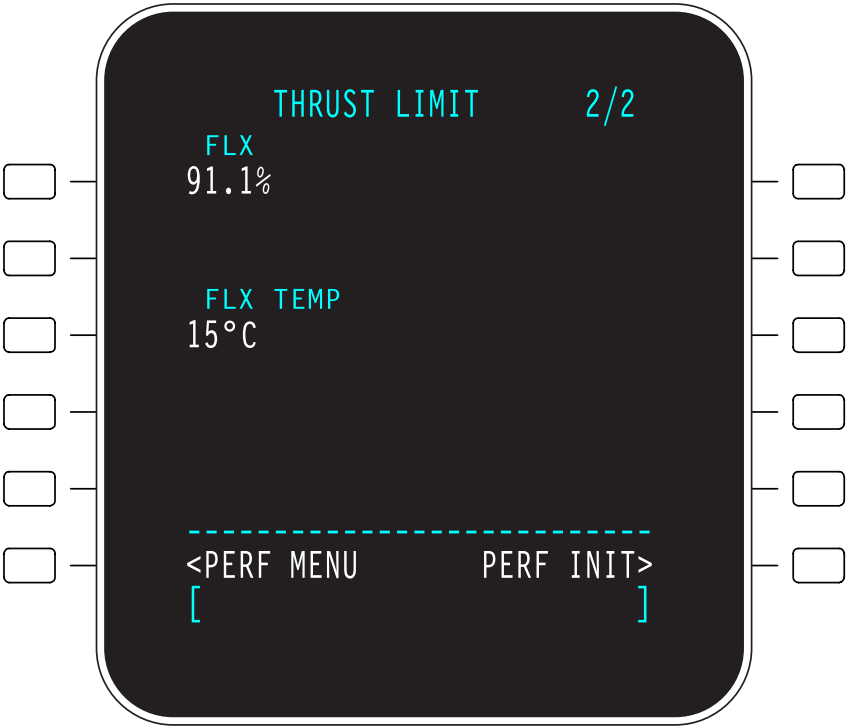
On the THRUST LIMIT page, you can enter reference percentages for TGT N1 settings.

THRUST LIMIT PAGE 1



A second, optional THRUST LIMIT page provides flex (reduced) thrust capability. This page is only available on selected aircraft. If an assumed temperature (FLX TEMP), and values for OAT/SAT are displayed (THRUST LIMIT page 1/2), the FMS will calculate a reduced thrust setting for all engines, and if the airplane is on the ground, will automatically select the FLX N1 setting as the <ACT> value.

THRUST LIMIT PAGE 2



PERF INIT

Push the PERF INIT line select key on the PERF MENU, ACT/MOD FPLN, or VNAV SETUP pages to show the PERF INIT pages.

Prompt boxes (□□□□□) for FUEL and CRZ ALT, on PERF INIT page 1/3, identify the entries required to activate the performance functions. Initializing the PERF functions can be very simple or very detailed depending on the pilots' needs.

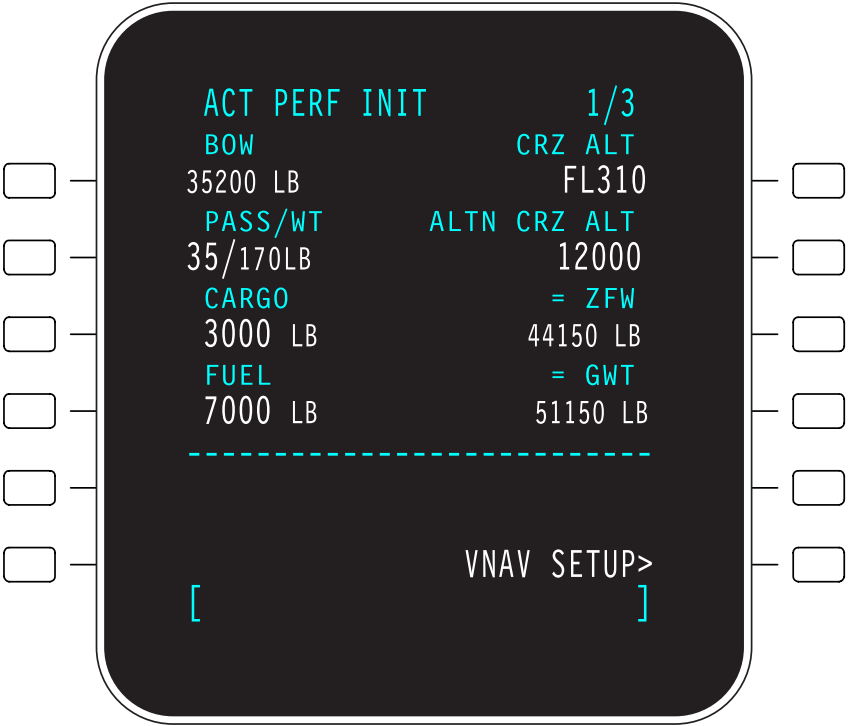
PERF INIT page 2/3 allows you to enter the expected winds and air temperature (ISA) for a flight. The FMS uses the average winds in the climb, cruise and descent, as well as winds on individual cruise legs in its performance predictions of fuel consumption, flight plan legs, etc. The FMS also uses ISA inputs for both individual flight plan cruise legs and average cruise ISA in its performance calculations. It also uses ISA inputs, along with airspeed, altitude and winds, to maintain a holding pattern within its protected airspace.

PERF INIT page 3/3 allows you to set an ETD, and shows you the ETA, default RESERVES and TAXI FUEL, and the total FUEL requirements.

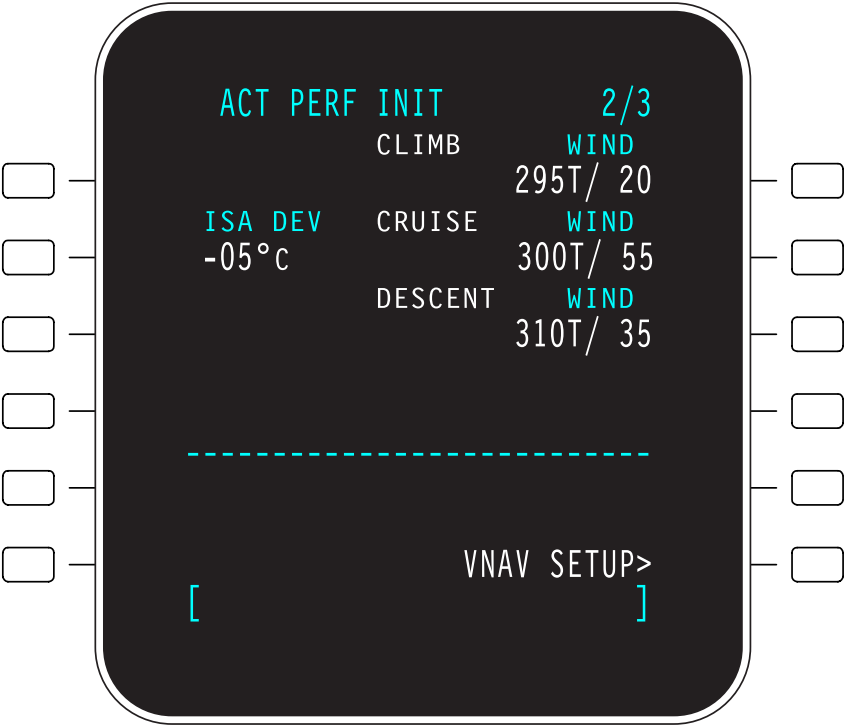
NOTE

Performance information is added to the SEC FPLN in the same manner as an ACT/MOD FPLN. Push the SEC PERF line select key on the SEC FPLN and PERF MENU pages to show the SEC PERF pages.

ACT PERF INIT PAGE 1



ACT PERF INIT PAGE 2



ACT PERF INIT PAGE 3



FUEL MGMT

Push the FUEL MGMT line select key on the PERF MENU page to show the FUEL MGMT pages. The FUEL MGMT pages show:

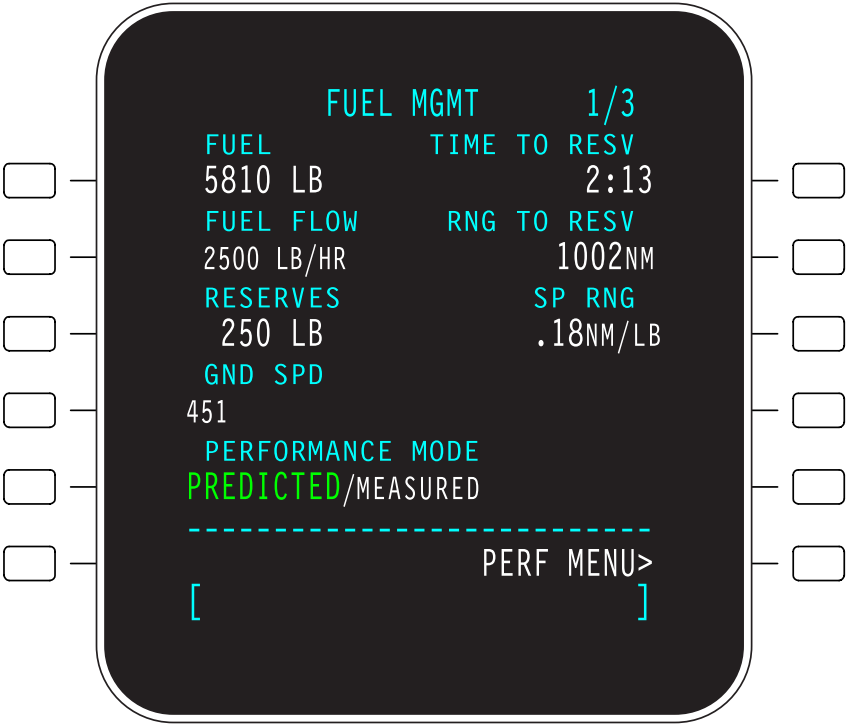
- Total quantity of FUEL
- Total FUEL FLOW
- Total RESERVES
- Ground speed (GND SPD)
- Time to reserves (TIME TO RESV)
- Range to reserves (RNG TO RESV)
- Specific range for the current fuel burn (SP RNG)
- The selected operating mode for the performance calculations (PREDICTED, MEASURED or MANUAL)
- Fuel FLOW rate and fuel USED for each ENGINE individually and the TOTAL for both (shown on page 2/3 of the FUEL MGMT pages)
- PERFORMANCE TRIP calculator to determine the approximate fuel required for a flight, a specified leg of a flight, or a specified distance (FUEL MGMT page 3/3).

Default values shown for each of the parameters on the FUEL MGMT pages are the current values. You can change the FUEL FLOW, RESERVES, and GND SPD to see the affect the change makes to each of the other parameters. You cannot directly change the TIME TO RESV, RNG TO RESV and SP RNG. These parameters are calculated from the FUEL, FUEL FLOW, RESERVES, and GND SPD data. To make TIME TO RESV calculations, the FMS requires FUEL, FUEL FLOW, and RESERVES data. To make RNG TO RESV and SP RNG calculations, the FMS requires the addition of GND SPD data.

NOTE

The FUEL quantity can only be changed on PERF INIT page 1/3. FUEL quantity on the FUEL MGMT is display only.

FUEL MANAGEMENT PAGE 1



The FMS can calculate performance data in one of two modes: PREDICTED or MEASURED/MANUAL.

NOTE

PERFORMANCE MODE selection is an optional function; installations without the mode selection operate only in the MEASURED/MANUAL mode.

On the CDU, the mode selected affects:

- Altitude predictions shown on the ACT LEGS pages
- ETA, ETE and FUEL shown on ACT PERF INIT page 3/3
- ETE and FUEL-LB/KG shown on the PROGRESS pages.

On the MFD, the mode selected affects the ETA and FUEL shown on the ACT FPLN PROGRESS pages.

In PREDICTED mode, the data shown is based on the airplane's performance tables as they relate to the flight plan route and profile for the entire planned flight. In MEASURED/MANUAL mode, the data shown is based on the current sensor-measured data for FUEL FLOW and GND SPD (MEASURED mode), or pilot-entered FUEL FLOW and GND SPD (MANUAL mode). In MEASURED mode, you will see wide variations in the performance data during climb and descent phases of flight. Also, the altitude predictions shown on the ACT LEGS pages are not available in the MEASURED/MANUAL mode.

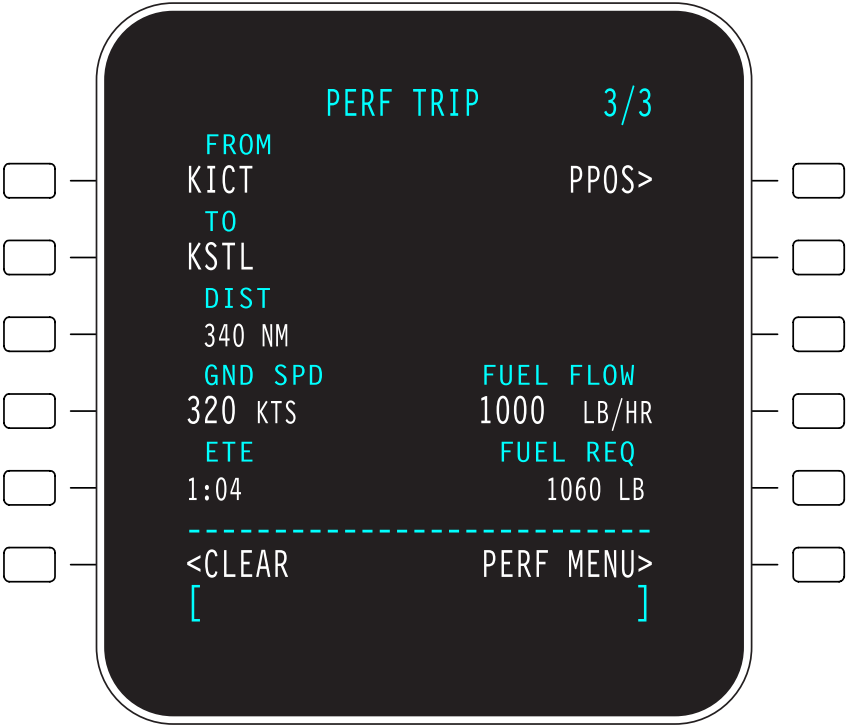
NOTE

To help differentiate sensor-measured FUEL FLOW and GND SPD from pilot entries, sensor-measured data shows in small font characters and pilot entries show in large font characters. To return the FMS to MEASURED mode after you have made manual entries, which automatically selects the MANUAL mode, you must delete **all** of the manual entries you made. Use the DEL key function to enter DELETE into the scratchpad and transfer it to the entry to be deleted. When a manual entry is deleted, the current sensor measured value is shown.

FUEL MGMT page 2/3 shows the FUEL FLOW and the FUEL USED for each engine and the TOTAL for both engines. Values shown are display only.

FUEL MGMT page 3/3 shows the PERF TRIP page which you can use to calculate ETE and FUEL REQ based on DIST, GND SPD, and FUEL FLOW. Distance can be specified either FROM a specific waypoint, or the present position (PPOS), to a specific waypoint (TO) or a specified distance (DIST). You can also specify a GND SPD and FUEL FLOW instead of the defaults. To reset the page, push the CLEAR line select key.

TYPICAL PERF TRIP PAGE

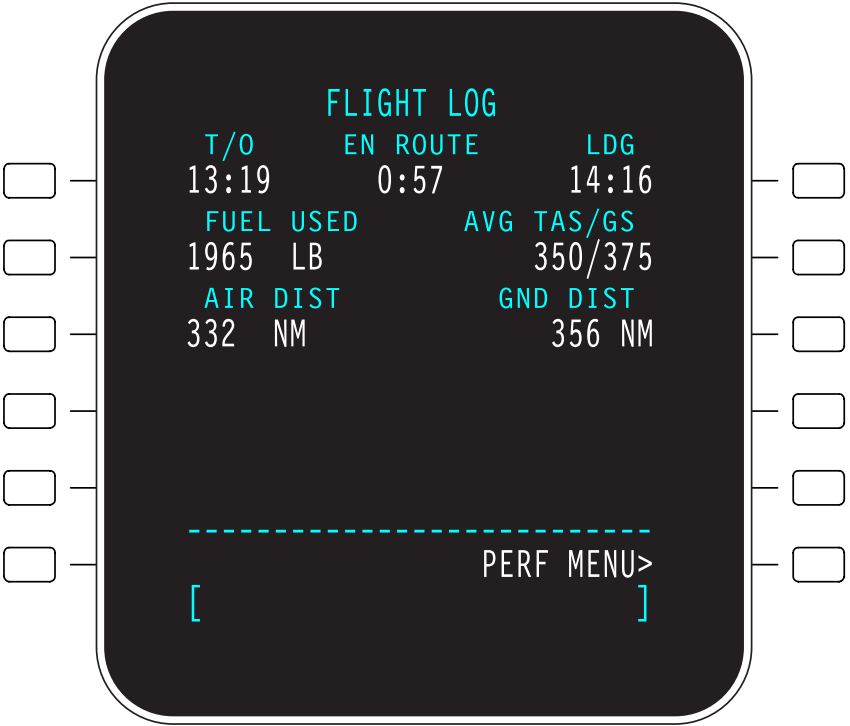


Flight Log

Push the FLT LOG line select key on the PERF MENU page to show the FLIGHT LOG page. The FLIGHT LOG page shows:

- Takeoff time (T/O)
- EN ROUTE time
- Landing time (LDG)
- FUEL USED
- Average true airspeed and ground speed (AVG TAS/GS)
- AIR DIST
- GND DIST
- A line key selection to return to the PERF MENU page.

FLIGHT LOG PAGE



VNAV

Push the VNAV key or the VNAV SETUP line select key on the PERF MENU page to show the VNAV CLIMB, CRUISE, or DESCENT page. The page shown is determined by the airplane's current phase of flight. For example, if you are in the cruise phase of flight, the ACT/MOD VNAV CRUISE page 2/3 shows on the CDU. If you need a page other than the one shown, push the PREV PAGE or NEXT PAGE key as necessary.

Default speed/altitude limits are also shown on each of the VNAV pages. The IAS and Mach speeds shown on each page are independent so you may set individual speeds for each phase of flight. IAS is used below the TRANS FL altitude and MACH is used at or above the TRANS FL altitude. The speed/altitude limits are also independent on each page. The ACT/MOD VNAV DESCENT page has an additional default setting for vertical path angle (VPA). All of the default values on each of these pages can be changed on the DEFAULTS page, or for a single flight, on these VNAV SETUP pages. (However, changes made on the DEFAULTS page will not take affect for the current flight plan.) On the CLIMB and DESCENT pages, you can add an additional speed/altitude limit to the existing defaults.

**ADDENDUM 5
TO
ROCKWELL COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 2-76.

The second VNAV paragraph is rewritten with deleted information as follows.

Default speed/altitude limits are also shown on each of the VNAV pages. The speeds shown on each page are independent so you may set individual speeds for each phase of flight. The altitudes below the TRANS FL are displayed in the CDU and MFD map as altitudes (i.e. 10000). Above the TRANS FL, the display of altitudes on the CDU and MFD appear as flight levels (i.e. FL230). The speed/altitude limits are also independent on each page. The ACT/MOD VNAV DESCENT page has an additional default setting for vertical path angle (VPA). All of the default values on each of these pages can be changed on the DEFAULTS page, or for a single flight, on these VNAV SETUP pages. (However, changes made on the DEFAULTS page will not take affect for the current flight plan.) On the CLIMB and DESCENT pages, you can add an additional speed/altitude limit to the existing defaults.

NOTICE

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

The technical data in this document (or file) is controlled for export under the Export Administration Regulations (EAR), 15 CFR Parts 730-774. Violations of these laws may be subject to fines and penalties under the Export Administration Act.

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CLIMB

The ACT/MOD VNAV CLIMB page (1/3) shows default settings for:

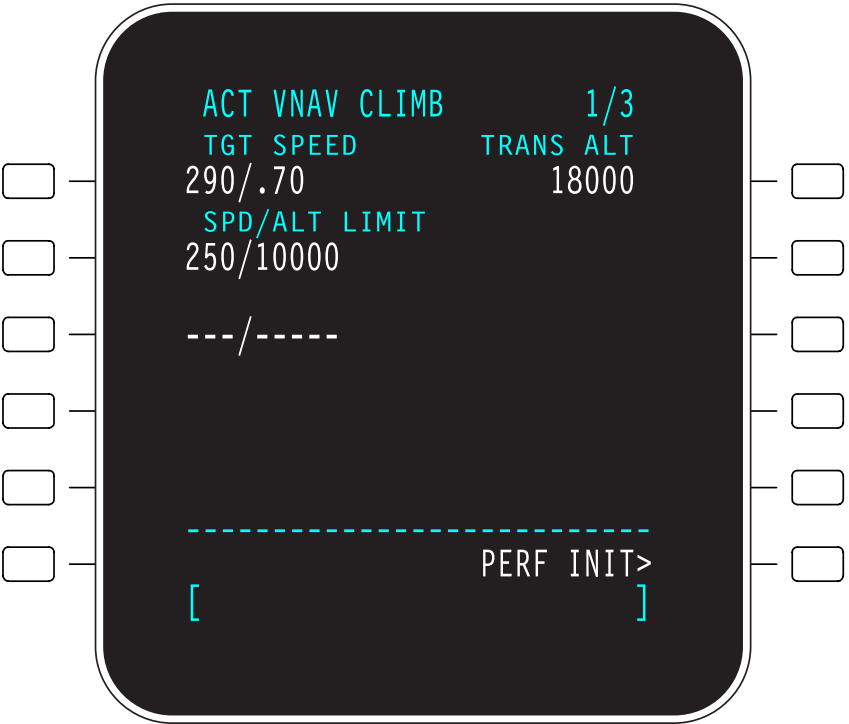
- Target Speed in IAS/Mach (TGT SPEED)
- Transition Altitude (TRANS ALT)
- Speed/Altitude Limit (SPD/ALT LIMIT).

You can change any of these parameters as necessary and add an additional SPD/ALT LIMIT if one is necessary.

NOTE

TRANS ALT on the CLIMB page and TRANS FL on the DESCENT page are interconnected. Changing either one results in a concurrent change in the other.

VNAV SETUP PAGE 1 (CLIMB)



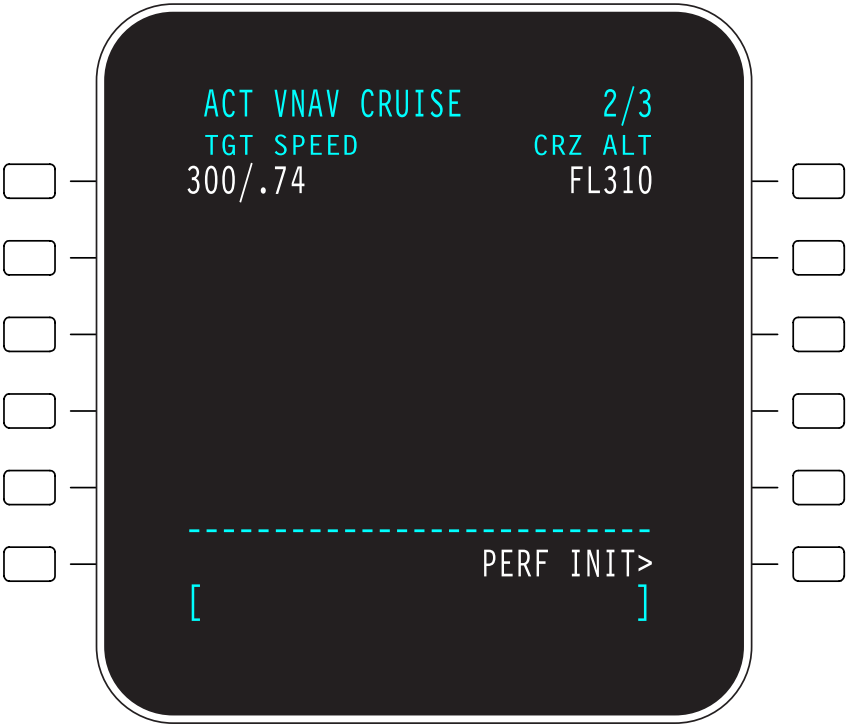
CRUISE

The ACT/MOD VNAV CRUISE page (2/3) shows a default setting for TGT SPEED and your selected CRZ ALT. You can change either of these parameters as necessary.

NOTE

The CRZ ALT is the same altitude that is entered on the PERF INIT page. When you change the CRZ ALT on the VNAV CRUISE page, it also changes on the PERF INIT pages.

VNAV SETUP PAGE 2 (CRUISE)



DESCENT

The ACT/MOD VNAV DESCENT page (3/3) shows default settings for:

- Target Speed (TGT SPEED)
- Transition Flight Level (TRANS FL)
- Speed/Altitude Limits (SPD/ALT LIMIT)
- Vertical Path Angle (VPA)

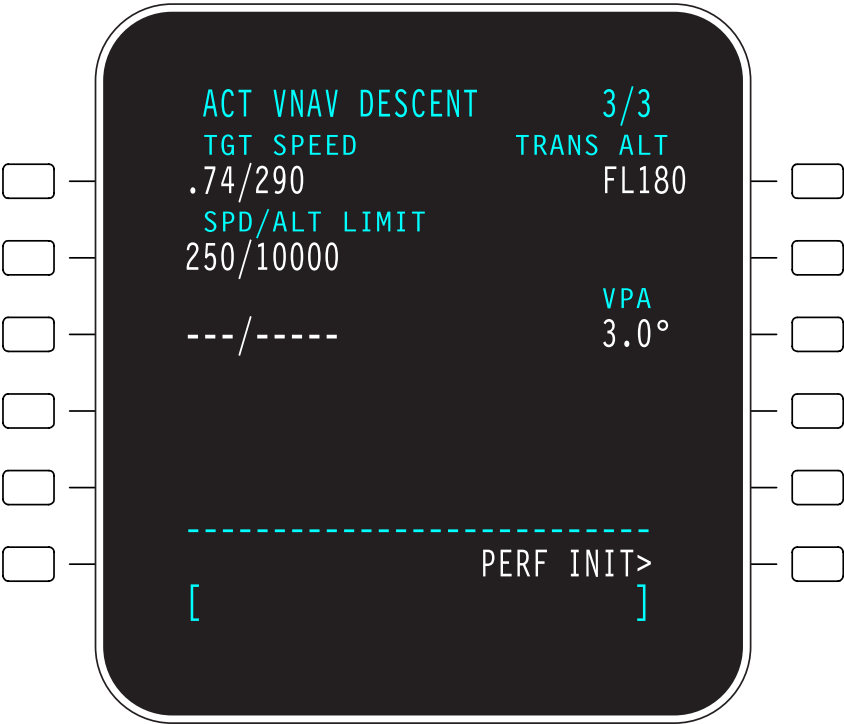
You can change any of these parameters as necessary and add an additional SPD/ALT LIMIT if one is necessary.

Changing the default vertical path angle (VPA) on the ACT/MOD VNAV DESCENT page changes the VPA for all descents in the flight plan. However, on the LEGS page you can change the VPA for any individual descent. Refer to the "VNAV" section for information on setting the VPA for individual descent.

NOTE

TRANS ALT on the CLIMB page and TRANS FL on the DESCENT page are interconnected. Changing either one results in a concurrent change in the other.

VNAV SETUP PAGE 3 (DESCENT)



DIR INTC

Push the DIR INTC key to show the ACT DIRECT-TO pages. The DIRECT-TO pages show a list of waypoints in the active flight plan. You can select a DIRECT-TO waypoint from the list, or enter any valid waypoint into the top (dashed) waypoint line as a DIRECT-TO waypoint.

NOTE

Many SIDs and STARs contain conditional waypoints that have no fixed geographical location, such as a heading to an altitude leg or a vectors leg. Although these types of waypoints show on the ACT DIRECT-TO pages, they cannot be selected for DIRECT-TO navigation.

On the right side of the DIRECT-TO pages, you can enter a DIRECT-TO altitude for the waypoints shown in the list. The current preselector altitude shows in white in the lower right corner of the display.

From ACT DIRECT-TO page 1, you can page forward through the list of waypoints from the current TO waypoint to the last waypoint in the active flight plan, or you can page backward through a HISTORY list of the waypoints already passed in the flight plan. Use the NEXT PAGE key to page forward and the PREV PAGE key to show the HISTORY pages.

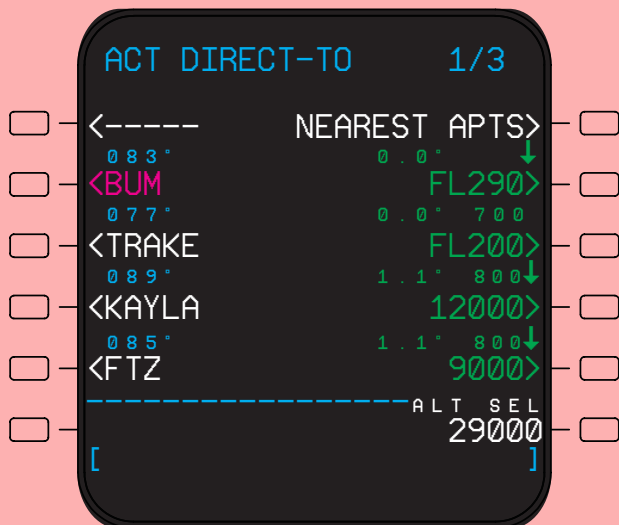
When you select a DIRECT-TO waypoint, the FMS changes to the MOD FPLN page with the selected waypoint in the TO waypoint position. Also shown is a line key selection for an INTC CRS to the TO waypoint. If desired, you can change the intercept course before executing the modified flight plan.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

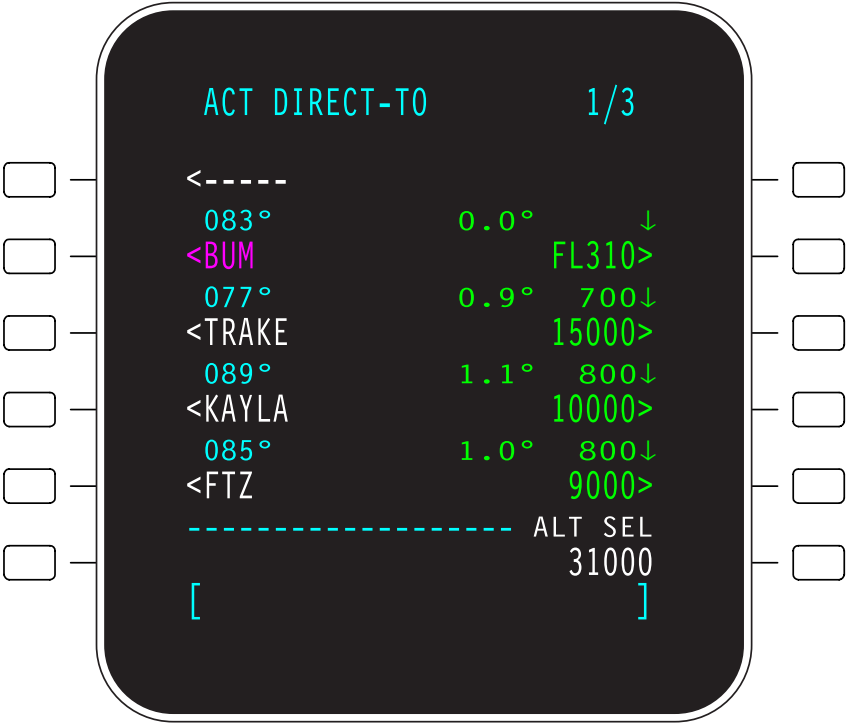
Insert this addendum sheet facing page 2-85

The illustration below replaces the illustration on the page.



TPG6057_06

ACT DIRECT-TO PAGE
(SELECTED WITH DIR INTC KEY)



FIX

Push the FIX key to show the FIX INFO pages. Use the FIX INFO pages to enter reference fixes. A flight plan can have up to two fixes, with two references per fix. Each reference fix shows on an individual FIX INFO page.

There are four types of fixes: abeam, radial, distance, and LAT or LON CROSSing point. An abeam fix is the point on your flight plan where the REF waypoint is perpendicular to a flight plan leg. A radial fix is the point at which a specific radial from the REF waypoint intersects your flight plan. A distance fix is the point at which a specific distance from the REF waypoint intersects your flight plan. A LAT or LON CROSS fix is the point where the specified LAT or LON entry intersects your flight plan.

On the MFD, a radial fix or abeam fix shows as a small green circle around the fix reference, with a dashed green line from the circle to a small white circle on the course line at the fix point. A distance fix shows as a large green circle (or partial circle), centered over the fix reference, with a radius equal to the specified distance from the fix reference, and a small white circle at the point where the large circle intersects the course line. A LAT or LON CROSS fix shows as a small white circle at the point on the flight plan where the specified LAT or LON intersects the flight plan.

LAT or LON CROSS fixes do not use REF waypoints. You cannot enter a REF waypoint, and you may enter either a latitude or longitude, but not both. The fix coordinates must intersect the flight plan or the message "NO INTERSECTION" shows in the scratchpad. When a correct LAT or LON entry is made, it shows in large font text and the corresponding LON or LAT for the intersecting point shows in small font text.

Enter the reference fix into the scratchpad and transfer it with the REF line select key at the top left of the FIX INFO pages. A fix reference can be a waypoint, navaid, or airport. Once a fix reference is entered into the REF prompt from the scratchpad, the FIX INFO page shows the course (CRS), distance (DIST), estimated time en route (ETE), and estimated FUEL remaining from the fix reference to the present position of the airplane.

NOTE

Gates and runway threshold waypoints cannot be used as fix references.

NOTE

Fixes can be converted to waypoints for use in a flight plan. See the ENROUTE section of this pilot's guide for instructions on how to turn a fix into a waypoint.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 2-86

The following information (text and illustration) is added to the guide before the heading **FIX**.

NEAREST AIRPORTS

The NEAREST AIRPORTS page shows a list of five airports that includes the departure (ORIG) and arrival (DEST) airports, as well as three other airports that are closest to the present position of the aircraft. If the origin and destination airports are the same, the list shows the four closest airports along with the ORIG/DEST airport. If no ORIG or DEST airport is defined in the active flight plan, the list shows the five closest airports.

NEAREST AIRPORTS PAGE

NEAREST AIRPORTS			
[]	1 6 0 ° / 2 7	0 : 0 4 9 8 5 9 LB	[]
	<KNVP	5900FT RW02>	
[]	3 6 0 ° / 3 7	0 : 0 6 9 8 2 9 LB	[]
	<KGVW	8700FT RW01>	
[]	3 3 5 ° / 3 9	0 : 0 6 9 8 2 9 LB	[]
	<KIXD	7340FT RW17>	
[]	2 2 5 ° / 1 5 0	0 : 2 2 9 5 5 9 LB	[]
	<KICT	10300FT RW01L>	
[]	0 7 5 ° / 1 9 2	0 : 2 9 9 4 4 4 LB	[]
	<KSTL	10570FT RW12R>	
[]	-----UPDATE		[]
	AIRPORTS>		
	[		]

TPG6057_07

The closest airports are listed by the ICAO airport identification code, and are arranged in order of increasing distance from the present position of the aircraft. If two or more airports are equidistant from the aircraft, the airports are listed in order of increasing course change required to proceed to the airport (i.e., the airport that requires the lesser course change is listed first).

**ADDENDUM 3
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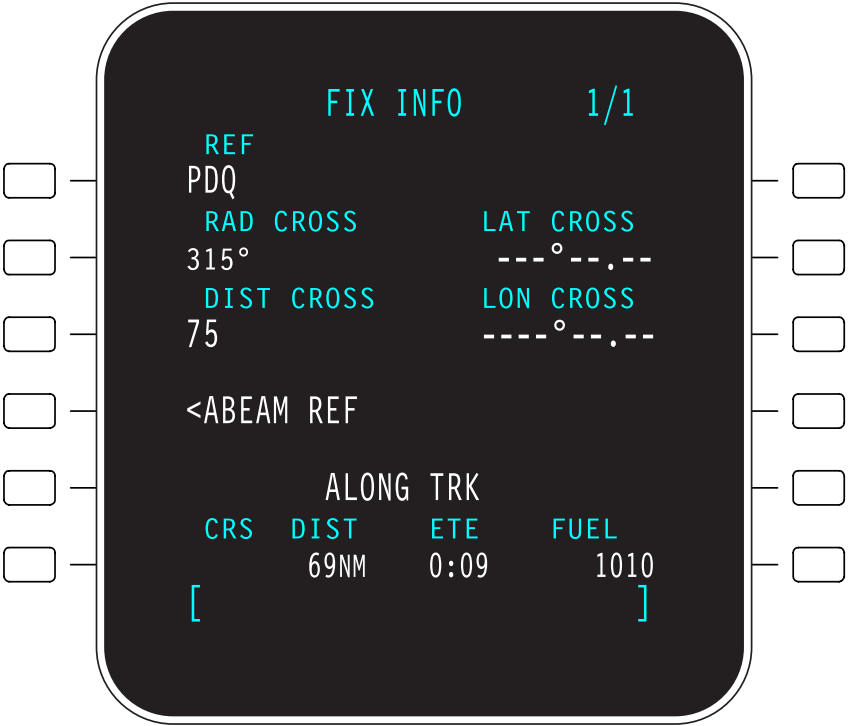
For each airport, the NEAREST AIRPORTS page shows the bearing and distance from the present position of the aircraft to the airport reference point, the estimated time en route (ETE), the fuel remaining at the that airport, which may or may not be the original destination airport, the designation of the longest runway (e.g., RWY23, RWY03L), and the length of the longest runway. If more than one runway is the longest at the airport (same length), the runway is chosen by alphabetical order.

The pilot may select between setting a direct course to the airport reference point (ARP) or the runway extension point of the longest runway for a visual approach. If the pilot chooses the airport reference point, the FMS calculates the course and distance to the ARP for the modified flight plan. The FMS does not include any STARs or runways associated with the airport, nor does it include any VNAV constraints associated with the airport.

If the pilot selects the longest runway for the direct-to course, the FMS calculates the course and distance to the runway extension point for a visual approach, and includes the VNAV constraint associated with the visual approach in the modified flight plan. The FMS also inserts the selected runway for a RWY type approach.

The NEAREST AIRPORTS page shows the airports closest to the present position of the aircraft when the page is first shown. The FMS does not automatically update the page based on the current position of the aircraft while the NEAREST AIRPORTS page shows. To have the FMS recalculate the closest airports for the new position, push the line select key next to the UPDATE AIRPORTS> prompt on the NEAREST AIRPORTS page.

FIX INFO PAGE
WITH DISTANCE CROSS FIX



HOLD

Push the HOLD key to show the ACT/MOD LEGS page with the HOLD AT prompt, the ACT FPLN HOLD page, or the ACT HOLD LIST page. The ACT/MOD LEGS page with the HOLD AT prompt shows if no holds currently exist in the flight plan when the HOLD key is pushed. If the flight plan already has at least one hold entered, then the ACT FPLN HOLD page shows. If the flight plan has two or more holds, the ACT HOLD LIST page shows. To access the ACT FPLN HOLD page from the ACT HOLD LIST page, push the line select key for any hold listed on that page.

From the ACT/MOD LEGS pages, you can enter a holding fix into the scratchpad by copying the fix waypoint identifier from the existing flight plan, or by entering a hold waypoint with the alphanumeric keypad. You can then transfer it to the flight plan by pushing the line select key for the HOLD AT prompt.

On the ACT FPLN HOLD page, you can modify an existing hold, or enter a new hold with the NEW HOLD line select key. A flight plan can have up to six holds. To modify more than one hold, push the NEXT PAGE or PREV PAGE key as necessary to show the desired hold(s). When you push the NEW HOLD line select key, the ACT LEGS page with the HOLD AT prompt shows.

The ACT FPLN HOLD page shows:

- The waypoint identifier of the holding FIX
- The type of ENTRY the FMS is going to use to enter the hold
- FAA/ICAO holding speed selection
- QUAD/RADIAL for the hold entry
- Maximum KIAS holding speed
- Inbound course to the fix and the turn direction of the hold (INBD CRS/DIR)
- ETA at the fix (FIX ETA)
- LEG TIME and LEG DIST of the hold
- A pilot-entered expect further clearance time (EFC TIME)
- A line key selection for entering a NEW HOLD.

ACT HOLD LIST PAGE



Each hold can be set up at a waypoint on the flight plan, at a waypoint off the flight plan, or at the present position of the airplane. A hold can be defined with an inbound course and turn direction, or a quadrant and a radial, either from a navaid or from the hold point itself. The following examples show valid entries for inbound course and turn direction:

- CRS/R (275/R)
- CRS/L (318/L)
- CRST/R (182T/R)
- CRST/L (090T/L)

CRS = Inbound Course T = True
L = Left turns R = Right turns

The following examples show valid quadrant and radial entries:

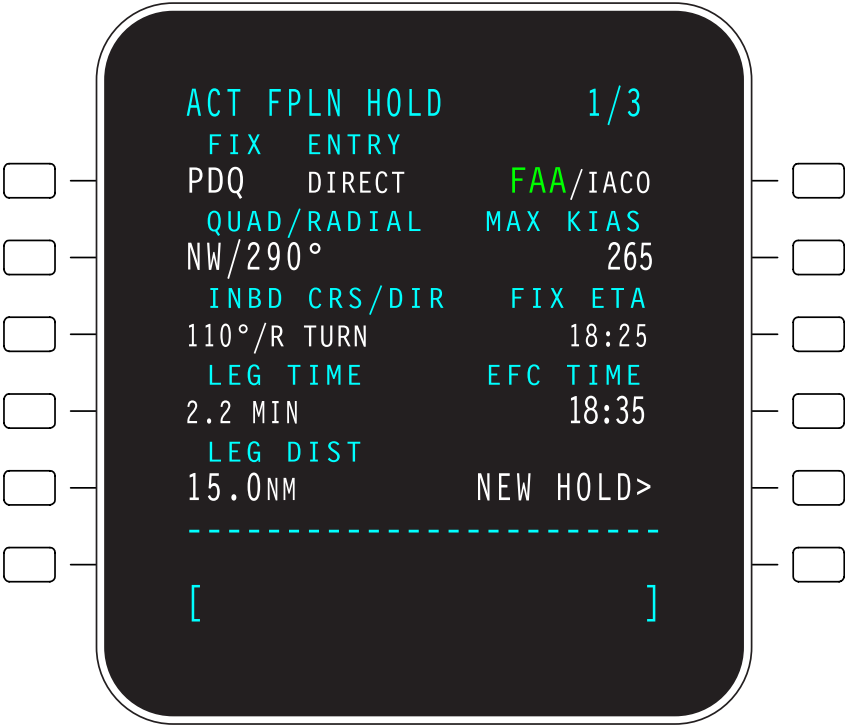
- X/YYY (S/185)
- XX/YYY (NE/017)

X and XX = N, NE, E, SE, S, SW, W, or NW
YYY = Three digit radial

The QUAD/RADIAL is used only if you are cleared to hold in a particular cardinal direction (quadrant) from a specified fix defined off a VOR radial. When QUAD/RADIAL is entered, the FMS automatically computes the inbound course for the hold. Depending on the radial, the resulting inbound course may be a reciprocal heading of the radial. For example, if you are holding NW of a fix on a 290° radial from a VOR station, the hold inbound course would be 110°. The QUAD/RADIAL entry **never** determines the direction of turn of the hold itself. Standard hold pattern turns are to the right; non-standard holding instructions (i.e., left turns) will be issued by the controlling authority.

Expect Further Clearance (EFC) time is an optional pilot entry. Entry format for EFC is HHMM or HMM (i.e., 1345 or 020). Entering EFC will not create a MOD FPLN and EFC may be edited at any time during a hold. When the EFC time arrives and the aircraft has not exited the hold, the message "HOLD EFC EXPIRED" will show.

ACT FLPLN HOLD PAGE



PROG

Push the PROG key to show the PROGRESS pages. PROGRESS page 1/2 shows flight plan and performance data on the CDU, and PROGRESS page 2/2 shows the wind and temperature effects on the airplane. In the PREDICTED performance mode, the performance data shown on these pages is based on the performance database for the airplane and the planned speed schedule. In the MEASURED performance mode, the data is based on the measured fuel flow and ground speed. The page title changes to MEASURED PROGRESS when you select the MEASURED mode on the FUEL MGMT page.

PROGRESS page 1/2 shows:

- LAST, TO, NEXT, DEST, and ALTN waypoints
- Distance (DIST) to or from the associated waypoints
- ETE to the TO, NEXT, DEST, and ALTN airport waypoints
- FUEL-LB remaining at the LAST, TO, NEXT, DEST and ALTN waypoints
- NAVIGATION sensors the FMS is using.

The LAST waypoint is the last waypoint passed in the flight plan. Distance shown for the last waypoint is the distance from that waypoint. FUEL-LB is the fuel remaining at that waypoint.

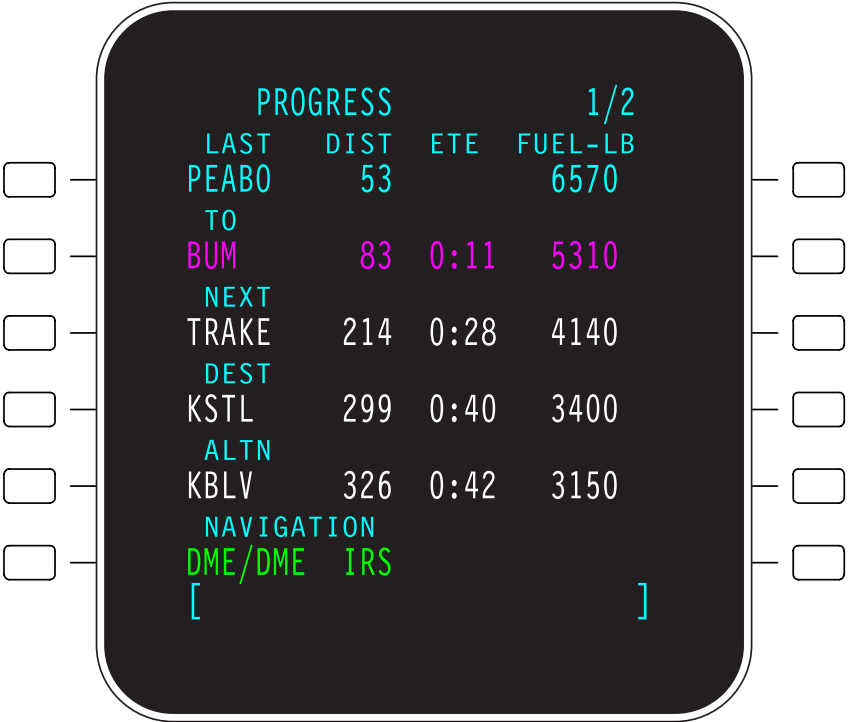
The TO waypoint is the active waypoint. Dashes show for the TO waypoint if there is no active waypoint due to a discontinuity, or after passing the last waypoint at the end of the flight plan. DIST is the distance to the TO waypoint. (For a holding fix, the TO waypoint DIST is the distance from the current position of the airplane around the holding pattern to the fix). ETE is the estimated time en route to the TO waypoint. FUEL-LB is the current remaining fuel.

The NEXT waypoint is the waypoint following the TO waypoint in the flight plan, except when that waypoint is a holding fix. If the leg following the TO waypoint is a hold, then the NEXT waypoint is the waypoint following the holding fix. DIST for the NEXT waypoint is the distance from the current position of the airplane to the NEXT waypoint. ETE for the NEXT waypoint is the estimated time en route to the NEXT waypoint. FUEL-LB is the projected remaining fuel upon reaching the NEXT waypoint.

The DEST waypoint is the same as the DEST airport on the ACT FPLN page. If no destination airport is selected, then dashes show for the DEST waypoint. DIST, ETE, and FUEL are projected for the DEST airport, or runway threshold if an arrival runway has been selected, and are calculated from the current position of the airplane along the flight plan route

The ALTN waypoint is the same as the ALTN airport on the ACT FPLN page. If no ALTN is entered, then dashes show for the ALTN. DIST, ETE, and FUEL are projected for the ALTN airport and are calculated from the current position of the airplane to the ALTN airport.

TYPICAL PROGRESS PAGE 1



Navigation sensors the FMS is currently using are annunciated under the NAVIGATION title. The annunciations are based on the equipment installed in the airplane. The available annunciations are:

- DME/DME - (indicates two or more DMEs are being used for position data)
- VOR/DME1 - (indicates that DME/DME is not being used and that the VOR and DME on side one are being used)
- VOR/DME2 - (indicates that DME/DME is not being used and that the VOR and DME on side two are being used)
- IRS
- IRS1
- IRS2
- GPS1
- GPS2.

NOTE

When both VOR and DME sensor pairs are being used to determine position, the pair tuned to the closest navaid is annunciated.

PROGRESS page 2/2 shows:

- HEADWIND or TAILWIND component
- CROSSWIND component
- WIND direction and speed
- Cross track (XTK) distance in nautical miles
- SAT/ISA temperature and deviation (DEV)
- True airspeed (TAS)
- Expected POS ACCURACY in nautical miles
- Required Navigation Performance (RNP). (See the Required Navigation Performance section of the Principles of FMS Navigation chapter for an explanation of RNP and POS ACCURACY.)

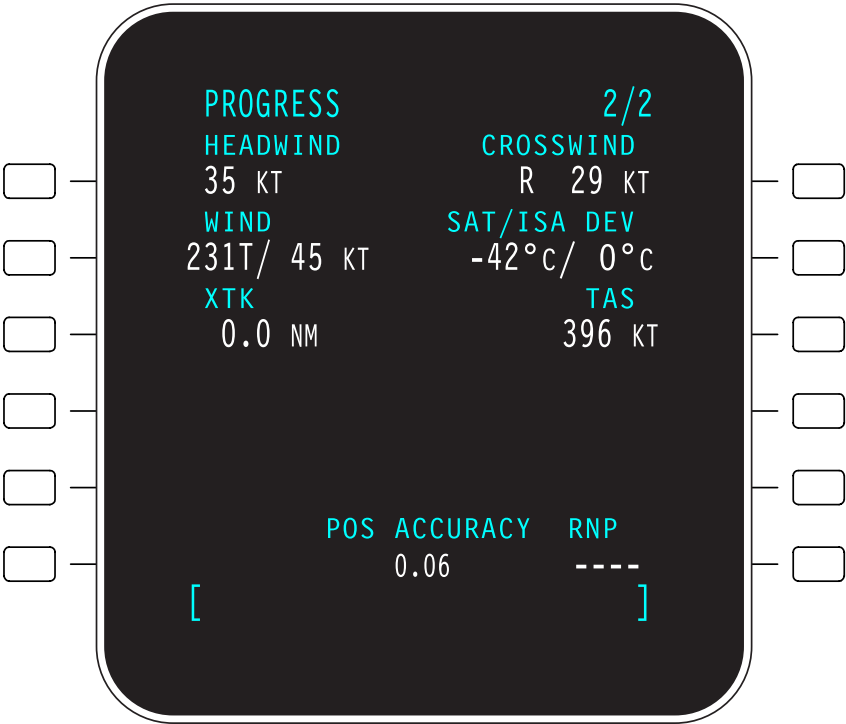
NOTE

An RNP value is an optional pilot entry. Dashes show: if no value has been entered, following an on-ground cold start, or if the flight plan has been cleared by entering a new origin airport.

NOTE

Wind direction is always referenced to true north on the PROGRESS page.

TYPICAL PROGRESS PAGE 2



SEC FPLN

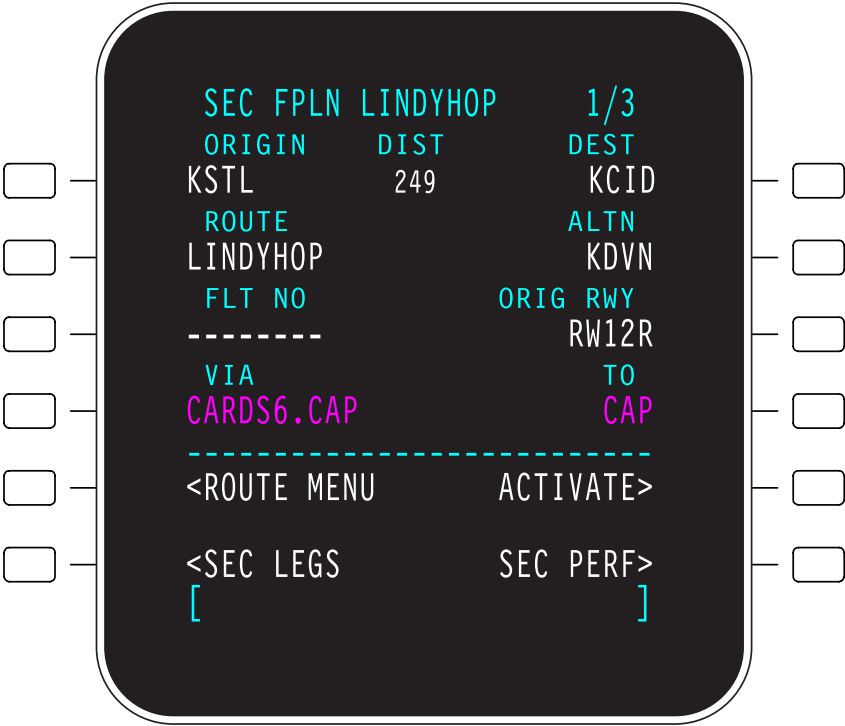
Push the SEC FPLN line select key on either the INDEX page or the FPLN page to show the SEC FPLN page. The SEC FPLN pages show the same information as the ACT FPLN pages. In addition, SEC FPLN pages show line key selections for accessing the ROUTE MENU pages and SEC LEGS pages, and an ACTIVATE line select key for activating the SEC FPLN. Also, in dual FMS installations, the SEC FPLN page with the last waypoint or route entry, shows a line key selection for SEC TRANSFER FROM XSIDE which is used to transfer the SEC FPLN from the cross-side FMS. (Only available if FPLN TRANSFER option is installed.)

Like the ACT/MOD FPLN, the SEC FPLN is complete. It includes both the lateral and vertical segments, plus the expected flight conditions required for time and fuel calculations. Unlike the ACT/MOD FPLN, the SEC FPLN does not use sensor data to estimate time, fuel, and weight calculations (estimates are based on the performance database of the airplane). Only manual changes affect SEC FPLN performance calculations. Time and fuel estimates are not available on the SEC FPLN if the performance database option is not installed in the FMS. Also, the SEC PERF pages are not available if the performance option is not installed.

There are five ways to create/load a SEC FPLN, depending on the options installed on your airplane:

- Manually enter the flight plan route
- Transfer a cross-side SEC FPLN (dual FMS installations in the INDEP mode) [Optional]
- Copy the ACT/MOD FPLN with the COPY ACTIVE line select key on the ACT/MOD FPLN page
- Select a route from the PILOT ROUTE LIST page [Optional]
- Load a route from a disk on the DISK ROUTE LIST page.

TYPICAL SEC FPLN PAGE



RADIO

Push the RADIO key to show the RADIO TUNING page. The RADIO TUNING page shows:

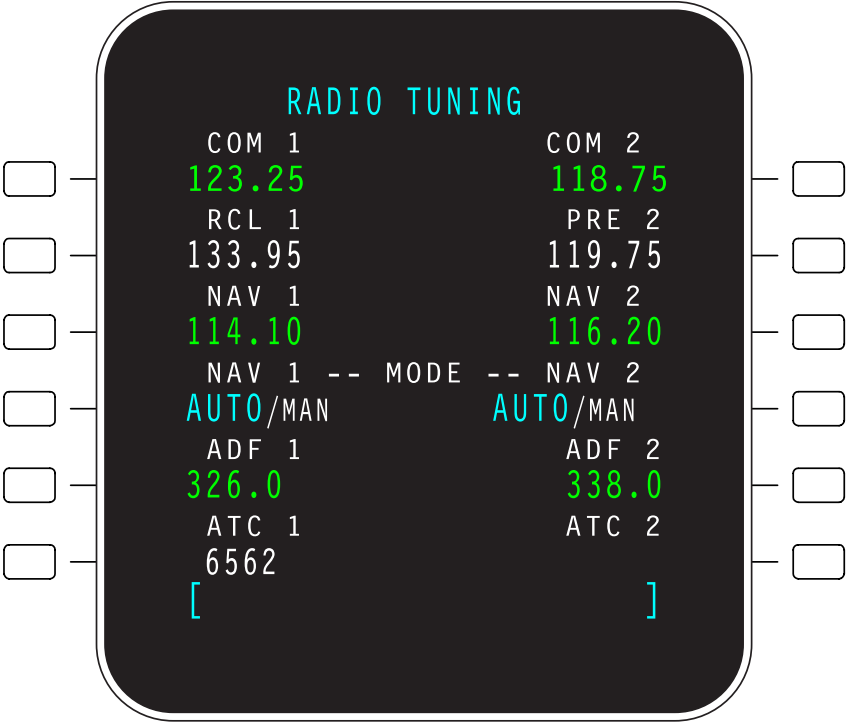
- Currently selected frequencies for the COM, NAV, and ADF radios
- NAV radio tuning mode (AUTO/MAN)
- Selected transponder codes
- STANDBY annunciation for the active transponder when it is set to the STANDBY mode.

Radio tuning PRESET pages 2,3, and 4 show the currently tuned frequency and the preset channels for each radio.

NOTE

The equipment installed in the airplane, the interconnect wiring in the airplane, and the FMS options installed determine what radio controls are available on the RADIO TUNING page, and the availability of the PRESETS pages.

RADIO TUNING PAGE



MCDU MENU

The MCDU key shows the MCDU MENU page. Use this page to select other devices and functions, such as AFIS, that can be controlled from the CDU. Refer to the appropriate airplane flight manuals for information specific to your airplane for operation of any devices or functions (other than AFIS) available for control from the CDU.

MCDU MENU PAGE



AFIS

Push the AFIS MENU line select key on the INDEX page to show the AFIS MENU page. The AFIS MENU page shows a list of the available AFIS functions. Refer to the AFIS section of this pilot's guide for detailed descriptions and operating instructions for the AFIS functions.

AFIS MENU PAGE



MSG

Push the MSG key to show the MESSAGES display page. Push the MSG key while the MESSAGES display page is showing returns to the CDU display mode that was showing before the MESSAGES display mode was selected.

Refer to the MESSAGES AND ANNUNCIATIONS section of this pilot's guide for detailed descriptions of the messages that show on the MESSAGES page and message line.

MESSAGES PAGE
WITH TYPICAL MESSAGES



MFD MENU

Use the MFD MENU pages on the CDU to select the display of airports, navigation facilities, and other navigation-related display elements, modes or options for the FMS MAP, PLAN MAP, and TEXT PG display modes of the MFDs.

To show the menus for the MFD MAP or TEXT display modes:

1. Set the MFD to the FMS MAP, PLAN MAP, or TEXT PG display mode as appropriate
2. Push the MFD MENU key on the CDU to show the MFD MENU pages
3. Push the line select key adjacent to the mode or menu option to alternately enable or disable it for display on the MFD.

Items enabled for display on the MFD show in green in the menu; disabled items show in white.

MAP DISPLAY Menu

The FMS MAP DISPLAY menu may require up to three display pages on the CDU (depending on the installation) to show all of the items available for display on the MFD. Any number or combination of items in the menu can be shown on the MFD (up to the limit specified for MAX MAP SYMBOLS on the DEFAULTS page). Items available for display on the MFD in the MAP DISPLAY mode are as follows:

- HI NAVAIDS — Shows the high altitude navaids
- LO NAVAIDS — Shows the low altitude navaids
- INTERS — Shows intersections
- ARPTS — Shows airports
- TERM WPTS — Shows terminal waypoints
- WINDOW OFF/ON/VNAV/COMP — Shows at the top of the MFD, when ON or VNAV is enabled, a 4-line text display of navigation progress data when the MFD is set to the FMS MAP or PLAN MAP display modes. (In some installations, this mode is set by the airplane wiring and is not shown in the menu as a display mode option.)
- NDBS — Shows non-directional beacons
- ETA — Shows the ETA adjacent to waypoints, intersections, or navaids
- SPEED — Shows the current speed adjacent to waypoints, intersections, or navaids
- ALTITUDE — Shows reference altitude data adjacent to waypoints, intersections, or navaids
- MISS APPR — Shows the plan path for the published missed approach procedure (based upon the approach selected on the ARRIVAL page)

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 2-106

The following text is added before the bullet item HI NAVAIDS under the heading **MAP DISPLAY MENU**.

- **NEAREST APTS** — Shows the five airports closest to the present position of the aircraft. The display is continuously updated as the aircraft proceeds along the flight plan route. However, if the CDU is showing the NEAREST AIRPORTS page, the five airports shown on the MFD match the five airports listed on the CDU page.

The bullet item ARPTS is amended to read APTS.

The bullet item NDBS and accompanying text are deleted from this page.

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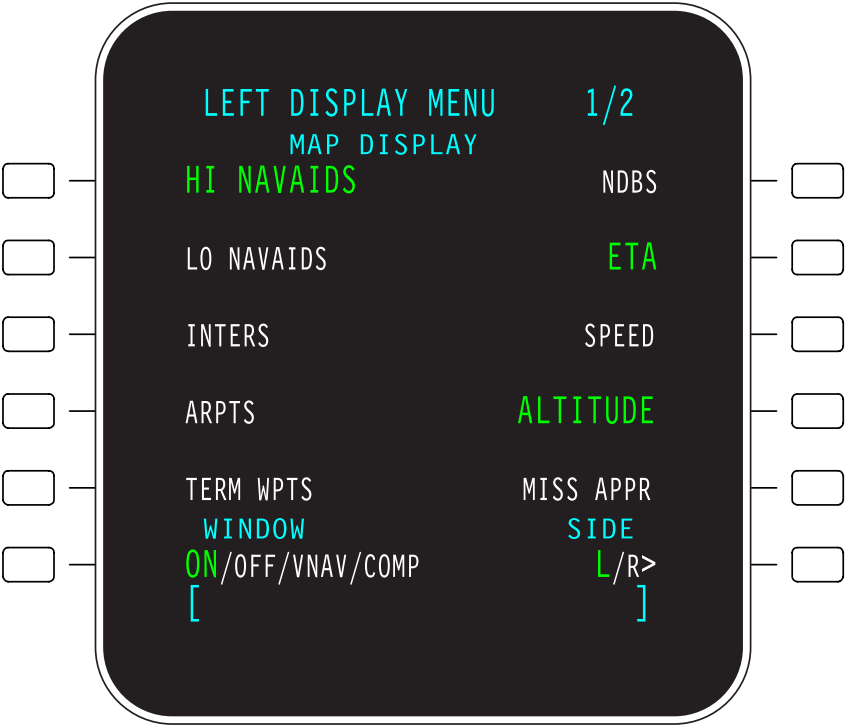
Insert this addendum sheet facing page 2-107

The illustration below replaces the illustration on the page.



TPG6057_08

MFD MENU PAGE 1
MAP DISPLAY OPTIONS



- **RNG TO ALT** — Shows the arch symbol along the flight path to indicate the position along the flight path where the airplane will reach its target altitude
- **LRN POS** — Shows the LRN sensor position symbol
- **ALTN FPLN** — Shows the alternate flight plan route on the MFD PLAN MAP.

The **DISPLAY MENU** page **WINDOW** line select key turns the navigation window shown at the top of the MFD on and off, selects the display of VNAV information within the window, or selects the **COMP**ass rose display format.

The **MFD MENU** page **SIDE** line select key control which MFD (left side or right side) the CDU is controlling.

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The following text is added to the top of the bulleted list.

- NDBS — Shows non-directional beacons

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The illustration below replaces the illustration on the page.



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MFD MENU PAGE 2
MAP DISPLAY OPTIONS

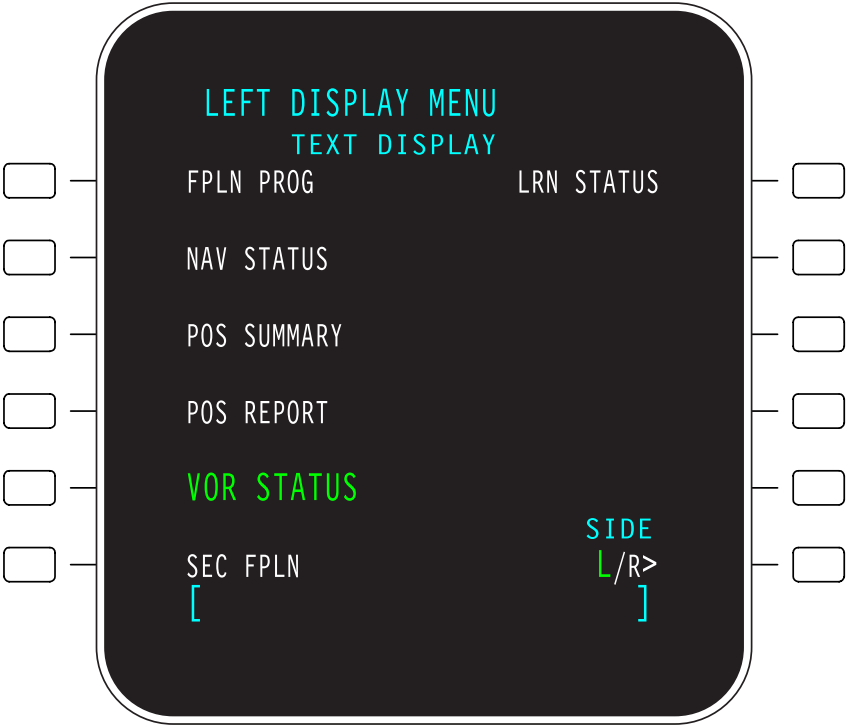


TEXT DISPLAY Menu

The TEXT DISPLAY menu shows a list of text page display modes for the MFD. Each MFD can show only one text page at a time, therefore, only one menu item can be selected at any time for each MFD. The TEXT DISPLAY modes are:

- **FPLN PROG** - Shows DIST, ETA, and FUEL information for the waypoints in the flight plan
- **NAV STATUS** - Shows navigation information for the TO waypoint
- **POS SUMMARY** - Shows the navigation sensors in use and their position determinations relative to the FMS current position
- **POS REPORT** - Shows all information, including points, times, fuel and weather information, needed for making position reports
- **SEC FPLN** - Shows DIST ETA and FUEL for the second flight plan
- **VOR STATUS** - Shows VOR/DME navigation information to include the identifier, frequency, and bearing and distance data
- **LRN STATUS** - Shows status information for the long range navigation sensors.

MFD MENU
TEXT DISPLAY OPTIONS



MFD DATA

Push the MFD DATA key to alternately switch display modes between the MAP DISPLAY and TEXT DISPLAY on the MFD and CDU when the MFD MENU page is selected on the CDU. In dual FMS installations, the MFD DATA key toggles between the map and text pages of the on-side MFD. In single FMS installations, the MFD DATA key toggles between the map and text pages of the MFD selected on the FMS CONTROL page under the MFD DATA KEY option.

NOTE

MFD text page displays can also be turned off by selecting a different MFD display mode with the FORMAT knob on the DCP.
--

Refer to the MFD section of this chapter for a description of each of the MFD TEXT pages.

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MFD ADV

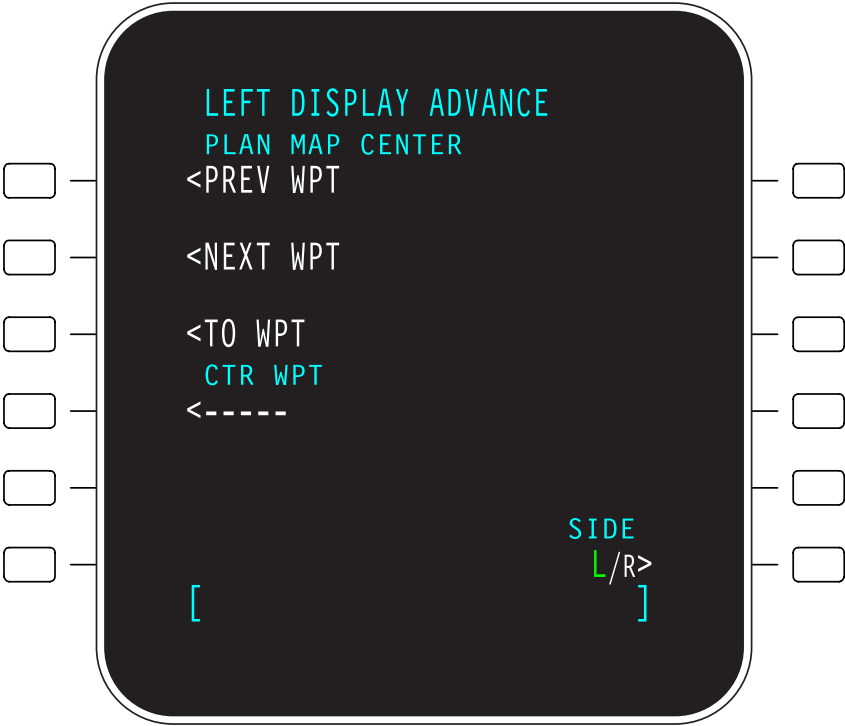
Push the MFD ADV key to show the DISPLAY ADVANCE page. Use this page to move through the MFD text pages or to move the center waypoint on the MFD PLAN MAP. This page shows either a TEXT DISPLAY menu or a PLAN MAP CENTER menu. The menu shown is dependent on the selected MFD display mode. If the TEXT DISPLAY mode is selected on the MFD, the TEXT DISPLAY menu for DISPLAY ADVANCE shows for that MFD. If the PLAN MAP mode is selected on the MFD, then the PLAN MAP CENTER menu shows for that MFD.

On the TEXT DISPLAY menu, use the PREV PAGE and NEXT PAGE line select keys to change the text page shown on the MFD. These line select keys can only change the pages within the selected text page. If you want to select another type of text page, press the MFD MENU key to show the MFD MENU page.

Use the menu PREV WPT and NEXT WPT line select keys on the PLAN MAP CENTER page to move the MFD PLAN MAP center from waypoint to waypoint. You can center the MFD PLAN MAP on the current TO waypoint with the TO WPT line select key. You can also enter any valid waypoint into the CTR WPT data line to center the MFD PLAN MAP on that waypoint. The CTR WPT does not have to be a waypoint in a flight plan.

In dual FMS installations, the MFD DISPLAY ADVANCE menus affect the text pages of the on-side MFD. In single FMS installations, the MFD ADVANCE menu affects the MFD selected on the FMS CONTROL page under the MFD DATA KEY option.

MFD ADVANCE
PLAN MAP CENTER OPTIONS



Letter Keys

Push the keys of the letter keypad to enter characters into the scratchpad. The letter keypad includes the 26 letters of the alphabet and six special keys (•, +/-, SP, DEL, /, and CLR).

Number Keys

Push the keys of the number keypad to enter numbers into the scratchpad. The number keypad includes the numbers 0-9, a decimal point, and +/- key.

Special Keys

Six special keys (• [decimal point], +/-, SP, DEL, /, and CLR) in the letter and number keypads perform special functions related to the entry of data.

• (Decimal Point)

Push the • [decimal point] key to enter a decimal point in the scratchpad.

+/-

Push the +/- key to enter a – for a specifically negative number or a + for a specifically positive number entry in the scratchpad. The first push of the +/- key shows a – in the scratchpad; a second push of the +/- key changes the – to a +. Each subsequent push of the +/- key at the same character position on the scratchpad alternates the + and – selection.

SP

Push the SP key to enter a space in a scratchpad entry. Each push enters a single character space.

DEL

Push the DEL key to enter the word DELETE into the scratchpad. You can then transfer this entry to various functions or data fields of the CDU display pages to delete the data currently entered for that function or field.

On some display pages, such as the PERF INIT pages, you can override default or FMS-calculated data with your own data entry. Use the DEL key function to delete an override entry and reset the data to the default or FMS-calculated value.

CLR

Push and release the CLR key to backspace (delete/erase) one character at a time (right to left) from a scratchpad entry. Push and hold the key for more than one half second to clear the entire scratchpad at once.

/ (Slash or Virgule)

Push the / key to enter a / in a scratchpad entry. Use the / to separate multiple entries into a single data field. For example, to enter both a reference airspeed and an altitude in a single entry for a selected leg of a flight plan on the LEGS page, enter 240/FL210. In general, if a data entry field shows a /, you can enter the data on either side of the slash as two separate entries, or as one single entry with the slash separating the two fields.

BRT

The fingertip BRT knob adjusts the brightness of the CDU display. Turn clockwise to increase the brightness; turn counterclockwise to decrease the brightness.

POS

Turn the fingertip POS knob, as necessary, to move the CDU display pages up or down on the display to adjust the parallax between the line select keys and their associated data lines.

PFD

This section describes only the generic elements of a PFD that are related to or used by the FMS.

Display

A PFD display shows the following information related to FMS operations:

- NAV source annunciation
- TO waypoint identifier annunciation
- Course/deviation bar
- Distance to the TO waypoint in nautical miles
- Course to the TO waypoint
- NAV-ILS PREVIEW function (The Principles of VNAV chapter of this pilot's guide provides an explanation of the NAV-ILS PREVIEW display mode)
- VNAV altitude constraint annunciations, along with vertical deviation and vertical speed advisories. (See Principles of VNAV)
- Two message lines for FMS annunciations and messages

Controls

The DCP and FCP provide the controls for displaying information on the PFD. Specifically, the DCP selects the NAV modes, and the FCP selects the autopilot and flight director modes that are annunciated on the PFD. Controls for other sensors, such as those for air data and attitude, also control the information shown on the PFD. The fingertip BRT knob is the only control on the PFD itself.

BRT Knob

Turn the BRT knob as necessary to adjust the brightness of the PFD.



MFD

This section describes only the display elements of MFD displays that show information related to or used by the FMS.

Controls

Controls for the MFD are provided primarily on the airplanes DCP and the FMS CDU. The fingertip BRT knob is the only user control on the MFD.

BRT Knob

Turn the BRT knob as necessary to adjust the brightness of the MFD.

Displays

For FMS functions, the MFD shows the FMS MAP, PLAN MAP, and TEXT PG display modes. In the FMS MAP and PLAN MAP display modes, symbols are used to identify and show the various navigation facilities in relation to the current position of the airplane (FMS MAP) or a selected waypoint along the flight plan (PLAN MAP). Also shown in these display modes are:

- Track for the active flight plan (shown as a solid white line)
- Track for a modified flight plan (shown as a dashed white line)
- Track for the second flight plan (shown as a solid cyan line)
- Any parallel offset track (shown as a dashed magenta line)
- The TO waypoint (shown in magenta)
- Runways (shown by two different symbols which depends on the selected display range)
- Holding patterns (shown as racetracks that change size relative to the speed of the airplane and the distance or time base for the hold)
- Special turns from a SID or STAR
- A green circle around a selected fix reference point
- A conditional waypoint, which shows in white, created from a reference fix
- Altitude and ETA waypoint data (shows next to each flight plan waypoint)
- A VOR/DME signal position indicator for a currently tuned navaid (only shows in the FMS MAP display mode)
- Five-pointed star symbols to show the position determination of each LRN sensor relative to the FMS position, which is the airplane symbol, and each other (only shows in the FMS MAP display mode).

NOTE

Some of the symbols described above may not show on the MFD in all installations, depending on the equipment installed in the airplane and the airplane wiring.

The symbols shown on the MFD in the FMS MAP and PLAN MAP modes are selected from the MFD DISPLAY MENU on the CDU. In both the FMS MAP and PLAN MAP display modes, the number of symbols shown on the MFD is limited to 40 of all types. The number of map symbols selected for display is set on the DEFAULTS page. Map symbols are selected for display based on the following priorities:

- High altitude nav aids (HI NAVAIDS)
- Low altitude nav aids (LO NAVAIDS)
- Intersections (INTERS)
- NDBs (NDBS)
- Airports (ARPTS)
- Terminal waypoints (TERM WPTS).

Map symbols selected on the DISPLAY MENU are displayed approximately in order of distance from the reference point of the map. The prioritization of symbols causes the selected highest priority items that are closest to the map reference point to be displayed first, i.e., HI NAVAIDS will take priority over INTERS if both are selected for display. The selection continues at expanding ranges until either the total count has been reached, or all highest priority selected items within the map range have been included. If the total number of display symbols has not yet been reached, the FMS continues to display items based on priorities until the maximum count is attained, or all available data has been included for the map. The FMS will fill the map display using the MAX MAP SYMBOLS setting on the DEFAULTS page, the display hierarchy described previously, and the range selected for the map display.

Even when selected for display, not all symbols show for all display ranges. The following is a list of the symbols and the ranges at which they are shown on the MFD.

- HI NAVAIDS - shown at all display ranges
- LO NAVAIDS - shown at all display ranges
- INTERS - shown at ranges of 50 NM or less
- NDBS - shown at ranges of 50 NM or less
- ARPTS - shown at all display ranges
- TERM WPTS - shown at map ranges of 25 NM or less.

The following figure identifies each of the symbols shown on the MFD in the FMS MAP and PLAN MAP display modes.

	VOR		ENERGY MANAGEMENT FIX OR SELECTED REFERENCE POINT
	VOR/DME		
	VORTAC		ALTITUDE REFERENCE POINT OR CONDITIONAL WAYPOINT
	DME		
	TACAN		MARKER BEACON
	NDB		LONG RANGE NAV SENSOR
	AIRWAY INTERSECTIONS AND TERMINAL WAYPOINTS		NAVAID POSITION
	ARRIVAL RUNWAY (MAP RANGE GREATER THAN 50 NM)		VOR/DME SIGNAL POSITION (EFIS 4077)
	ARRIVAL RUNWAY (MAP RANGE LESS THAN OR EQUAL TO 50 NM)		TURN ARROW
	HOLDING PATTERN (AS SYMBOL)		JOY STICK CURSOR
	PROCEDURE TURN (AS SYMBOL)		MODIFIED HOLDING PATTERN (AS SYMBOL)
	FLIGHT PLAN WAYPOINT		MODIFIED PROCEDURE TURN
	AIRPORT		RANGE TO ALTITUDE (OPTION)
	ACTIVE FLIGHT PLAN (GREEN)		MODIFIED FLIGHT PLAN (WHITE)
	SECONDARY FLIGHT PLAN (CYAN)		OFFSET FLIGHT PLAN (MAGENTA)

FMS MAP

The FMS MAP display mode is a heading up display page with the airplane symbol located just below the middle of the display and two range rings centered on the airplane symbol.

Depending on the installation and mode selections, the FMS MAP display mode shows in one of four ways: without a navigation progress data window, with a navigation progress data window, with VNAV or Advisory VNAV data included in the progress window, or a compass rose map display with no text window. The WINDOW line select key on the MFD MENU page on the CDU selects what shows on the FMS MAP.

NOTE

In some installations, the WINDOW mode on the CDU is set by the airplane interconnect wiring, and the WINDOW mode selection option is not available on the MFD MENU page.

WINDOW (ON/OFF/VNAV/COMP)

In installations where it is available, the navigation data progress window at the top of the MFD in the FMS MAP display mode shows, when activated:

- LAST waypoint passed, including the distance from the last waypoint and the time of passage
- TO waypoint, including the distance and time-to-go to the waypoint, and the ETA at the waypoint
- NEXT waypoint after the TO waypoint, including the distance and time-to-go to the waypoint, and the ETA at the waypoint
- DEST (destination) waypoint, including the distance and time-to-go to the destination, and the ETA at the destination
- FUEL available at the destination airport
- GW of the airplane at the destination airport
- If the FMS is set to MEASURED fuel flow and ground speed for the performance calculations, the annunciation "MEASURED" shows
- If the FMS is set to MANUAL fuel flow and ground speed for the performance calculations, the annunciation "MANUAL" shows.

When the VNAV display option is selected, VNAV window data is displayed above the present position and plan maps. Selecting VNAV clears destination airport fuel and gross weight information, and the ETA column from the display. Vertical data relating to the next VNAV climb or descent in the flight plan replaces fuel, GW, and ETA data, separated from the progress data by either a white vertical bar or vertical dotted line.

When VNAV display option is selected, the next altitude constraint in the flight plan shows. If the next constraint is a climb, the VNAV window displays "CLIMB", the constraint altitude, the waypoint name, and time and distance to the constraint waypoint. If there are no down track climb constraints and the airplane is not close to a top of descent (TOD), the VNAV window is blank..

The TOD line shows when the distance to TOD is less than 50 NM or 20% of the total flight plan distance, whichever is less, but not less than 20 NM. The next descent altitude constraint and time and distance to that point also show along with the TOD line. If the airplane begins an early descent before the TOD would normally be displayed, the next altitude constraint information will show, but the TOD line will not because it is no longer relevant.

For descents, the VNAV window gives vertical Direct-To information when the required minimum descent rate exceeds 500 FPM. The descent window shows the vertical speed required and VPA to fly directly to the next altitude constraint while following the flight plan, as well as the waypoint information previously described.

If there are no further altitude constraints, the VNAV data window is blank. However, if the airplane has not begun descent to the destination airport, DES ADVISORY with a time and distance to a recommended descent point will appear in the window. This point is based on following a descent profile that has the airplane arriving at 1500 FT AGL not later than 10 NM from the destination airport.

When COMP is selected, the compass rose map is displayed on the MFD with no accompanying text window.



PLAN MAP

Select the PLAN MAP display mode with the DCP FORMAT knob. The PLAN MAP display shows a north up map centered on a selected waypoint. If there is no active flight plan, then the center waypoint is the TO waypoint. If the flight plan shown on the CDU is the active or second flight plan, then the first waypoint of the respective flight plan is the center waypoint, unless otherwise selected on the CDU.

Use the MFD ADVANCE page on the CDU to move the center waypoint on the MFD.



TEXT PG

Push the MFD DATA key on the CDU to show the TEXT DISPLAY mode on the MFD. The TEXT DISPLAY mode shows various pages of text related to FMS functions. The pages include:

- FMS ACT FPLN PROGRESS
- FMS FPLN HISTORY
- FMS NAV STATUS
- FMS POSITION SUMMARY
- FMS POSITION REPORT
- FMS SEC FPLN
- VOR/DME STATUS
- LRN STATUS.

This page intentionally left blank.

FMS ACT FPLN PROGRESS/HISTORY

The FMS ACT FPLN PROGRESS and HISTORY text pages on the MFD show:

- Last waypoint passed
- Active TO waypoint (PROGRESS pages)
- A sequence of waypoints following the TO waypoint (PROGRESS pages)
- Destination airport
- ALTN airport
- RESERVE FUEL
- EXTRA FUEL.

On the PROGRESS pages, distance from the waypoint and the actual time of arrival (ATA) at the waypoint are shown for the last waypoint passed. For the TO waypoint and each successive waypoint in the flight plan, including the DESTINATION waypoint, the FMS ACT FPLN PROGRESS page shows:

- Distance in nautical miles to the waypoint
- ETA at the waypoint
- FUEL upon arrival at the waypoint.

Numbers that show to the left and right of both the ETA and FUEL columns indicate deviations from the original flight plan. A plus sign in the FUEL column indicates more fuel remaining than originally planned; a minus sign means less fuel remaining than planned. A plus sign in the ETA column means an arrival later than originally planned; a minus sign means an arrival earlier than planned.



6RT

SHOCKER1	FMS1	ACT	PROGRESS	1/2
WPT	DIST	ETA	FUEL (LB)	-MEASURED-
RW19R	38NM	12:30	6990	
TOD	115NM	12:58	5120	
BUM	115NM	12:58	5120	
TOD	212NM	13:13	4120	
TRAKE	247NM	13:18	3770	
KAYLA	272NM	13:22	3510	
FTZ	283NM	13:23	3400	
COORS	293NM	13:25	3300	

DEST				
KSTL	331NM	13:31	2910	
ALTN				
KBL V	359NM	13:35	2630	
		RESERVE	250	
		EXTRA	2380	

For the HISTORY page waypoints, the FMS shows:

- Distance in nautical miles from the waypoint
- ATA for the waypoints
- FUEL used at the waypoints.

To move forward or backward through the FMS ACT FPLN PROGRESS and HISTORY pages, first push the MFD ADV key on the CDU to show the MFD ADVANCE page, then push the PREV PAGE or NEXT PAGE line select key as necessary to show the desired page. The page numbers in the upper right corner of the MFD shows the current and total pages of the list and the title line identifies the PROGRESS and HISTORY pages.

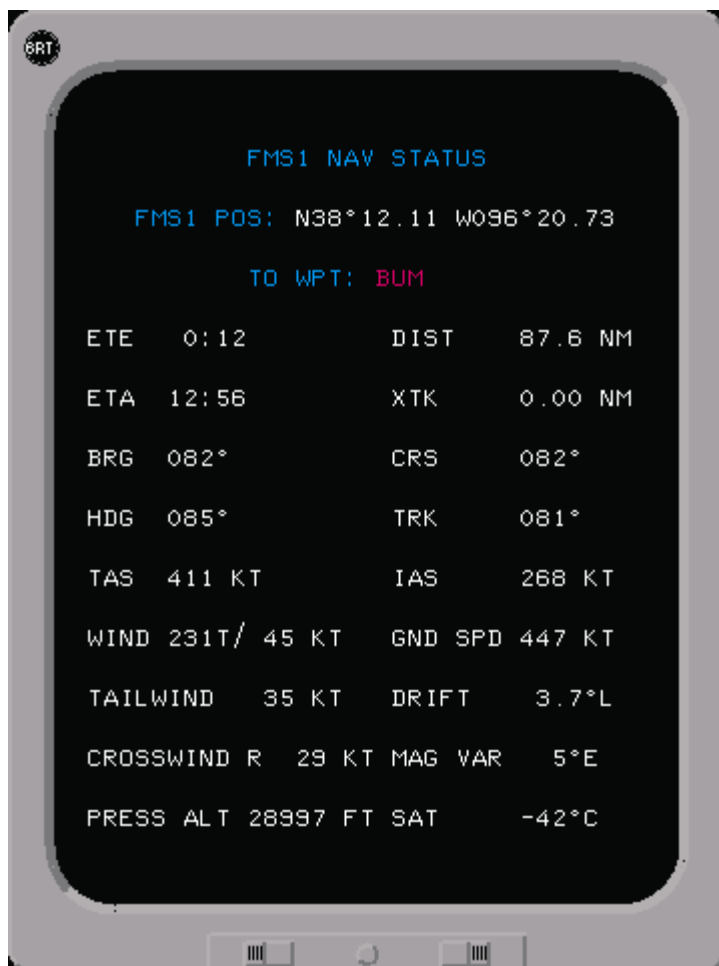
6RT

SHOCKER1 FMS1 FPLN HISTORY 1/1			
-MEASURED-			
WPT	DIST	ATA	FUEL (LB)
RW19R	334NM	12:30	6990
BUM	190NM	12:55	5270
TRAKE	58NM	13:13	4090
KAYLA	33NM	13:20	3600
FTZ	22NM	13:23	3420
COORS	12NM	13:26	3200
COORS	12NM	13:32	2800
SNYDR	1NM	13:35	2610
----- ACT FPLN -----			
DEST			
KSTL	26NM	13:44	2020
ALTN			
KBL V	54NM	13:53	1450
		RESERVE	250
		EXTRA	1200

FMS NAV STATUS

The FMS NAV STATUS text page on the MFD shows:

- FMS current lat/long position
- TO waypoint
- ETE(estimated time en route)
- DTG (distance to go)
- ETA (estimated time of arrival)
- XTK (cross track position (L or R) and distance)
- BRG (bearing)
- CRS (course)
- HDG (heading)
- TRK (track)
- TAS (true airspeed)
- IAS (indicated air speed)
- WIND direction and speed
- GND SPD (ground speed)
- HEADWIND/TAILWIND speed
- DRIFT in degrees and direction (L or R)
- CROSSWIND direction (L or R) and speed
- PRESSure ALT
- MAG VAR (magnetic variation)
- SAT (Static Air Temperature).



FMS POSITION SUMMARY

The FMS POSITION SUMMARY text page on the MFD shows:

- FMS lat/long position
- Each of the NAV sensors installed in the airplane (SENSOR)
- Position difference for each sensor as appropriate (POS DIFF -bearing and distance)
- Usage status of each of the sensors (USE - YES or NO).

The POS DIFF is in radial and distance format, and is measured from the FMS position to the sensor's position. The USE indicates the current status of the sensors in use by the FMS to determine position. YES indicates a sensor is in use, NO indicates it is not in use, and DIS indicates the sensor is disabled for use by the FMS.

**ADDENDUM 3
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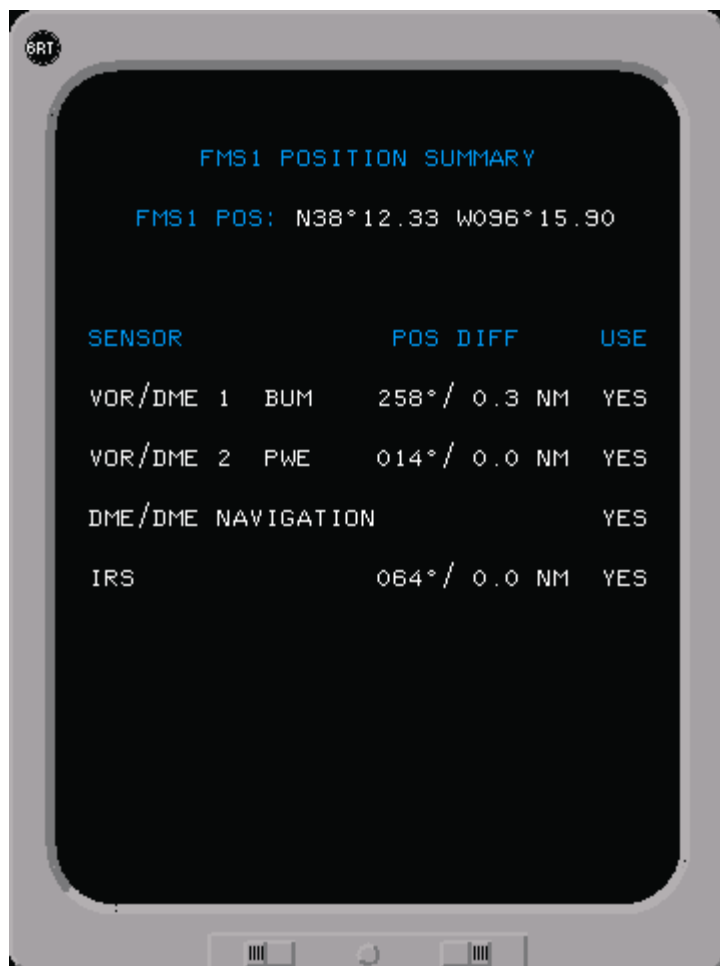
Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

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The following NOTE is added after the last paragraph.

NOTE

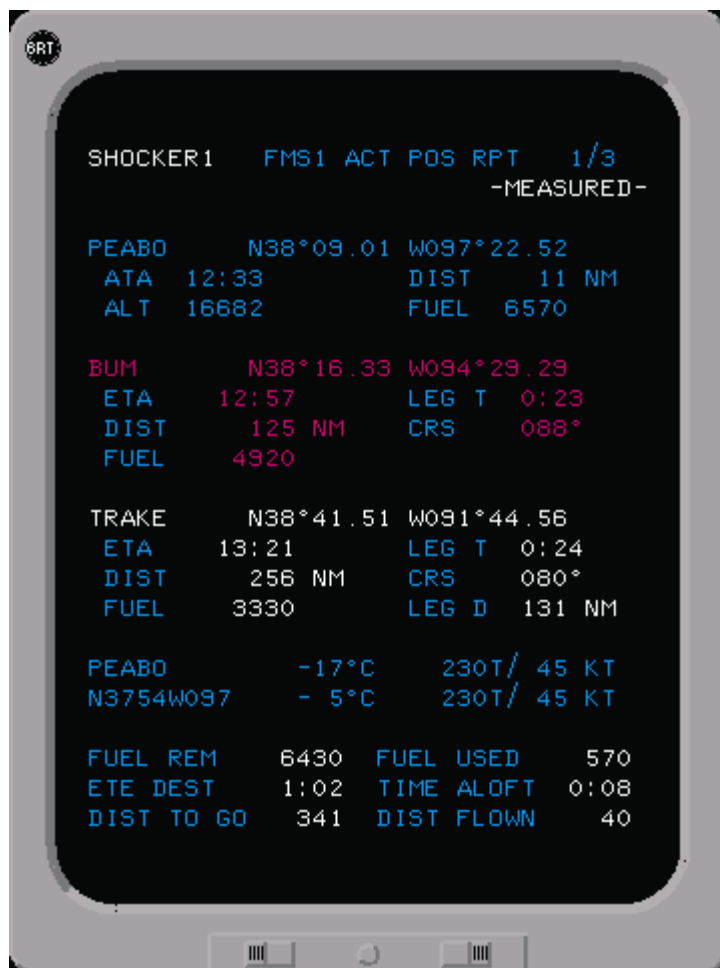
The FMS POSITION SUMMARY page includes a list of navigation sensors (or combination of sensors) that may be used by the FMS to determine position. One of the columns on the page is labeled USE. For airplanes equipped with an IRS, the IRS is not part of the FMS navigation solution when any other sensors are being used (GPS/DME/VOR). NO will be displayed in the USE column to indicate IRS is not being used by the FMS. When position fixing sensors are used, the IRS position errors are determined and stored. Once the FMS is not able to use position fixing sensors, it attempts to use the IRS position data if IRS is selected for use by the crew (i.e., ENABLED on the IRS CONTROL page.) The IRS position is then corrected using the stored IRS position errors. YES will be displayed in the USE column when IRS is being used by the FMS for position.



POSITION REPORT

The FMS POSITION REPORT page shows all information including points, times, fuel, and weather information needed for making position reports:

- FROM point, including latitude and longitude coordinates, Actual Time of Arrival (ATA), altitude at crossing, distance from that point, and fuel at the point.
- TO point, including coordinates, Estimated Time of Arrival (ETA), distance to the point, estimated fuel, leg time (in minutes), and course.
- NEXT point with coordinates, ETA, distance, fuel, leg time, course, and leg distance.
- Meteorological Report information giving temperature and winds aloft information for the FROM waypoint just passed and the temperature and winds aloft for the midpoint between the previous waypoint and the FROM waypoint.
- FUEL remaining, ETE to destination, distance to go, fuel used, time aloft, distance flown.



FMS SEC FPLN

The FMS SEC FPLN page shows all waypoints, distance to the next waypoint, ETE, and FUEL at each waypoint for the SEC FPLN. ETE and fuel remaining remain blank until the SEC FPLN is activated. Distance to the destination airport for the SEC FPLN and any specified alternate shows at the bottom of the page, with ETE and fuel information remaining blank until the SEC FPLN is activated.

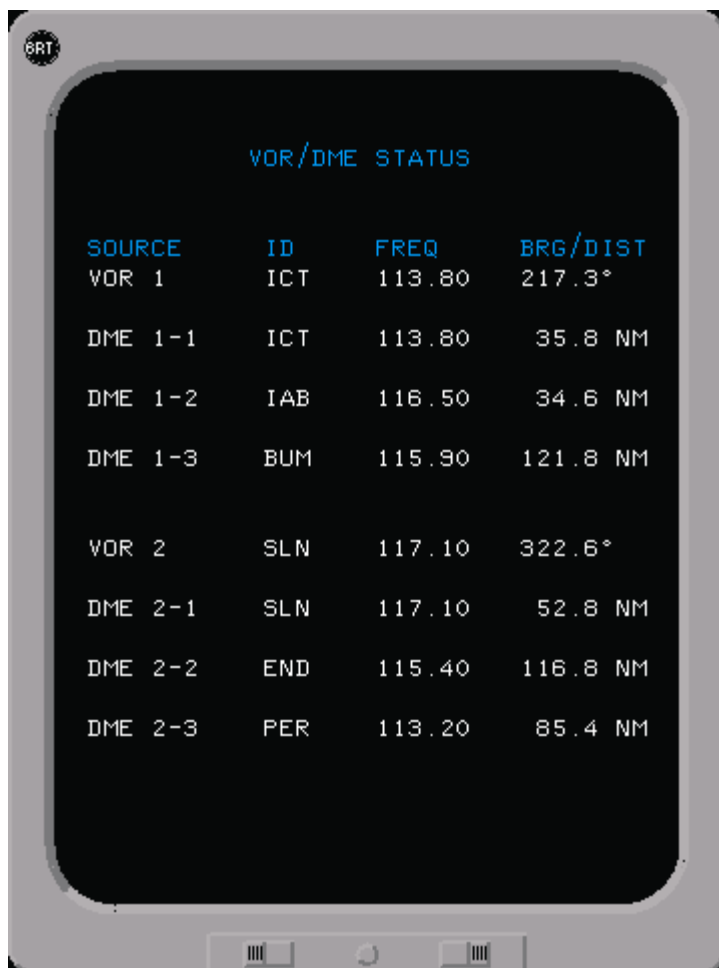


VOR/DME STATUS

The VOR/DME STATUS text page on the MFD shows:

- A list of the installed VOR/DME NAV sensors (SOURCE)
- Identifier (ID) of the NAV facility from which the sensor is receiving a valid signal
- Frequency of the current NAV facility (FREQ)
- A hold indication (H) for a DME sensor that is set to DME HOLD
- Bearing/distance to the NAV facility (BRG/DIST).

Dashes indicate the sensor data is invalid or unavailable.



LRN STATUS (IRS and/or GPS)

The LRN STATUS page shows:

- Each installed IRS and/or GPS (SENSOR)
- Each sensor's current LAT/LONG position (POSITION)
- Each sensor's current tracking direction and speed (TRK/SPD)
- Each sensor's current operating MODE
- The number of satellites in use by each sensor (GPS only)
- Each sensor's RAIM ACCURACY LIMIT (GPS only)
- Each sensor's MEAS ACCURACY LIMIT (GPS only)
- Each sensor's DRIFT RATE (IRS only)
- Each sensor's PROBABLE ERROR (GPS only).



DBU

The DBU is the data loader for the FMS-4200 and other airplane systems. Depending on the installation, it may be mounted in the airplane, in an avionics bay, in the cockpit, or it may be a remote portable unit that plugs into a connector located in an avionics bay or the cockpit. The DBU accepts both the 750kb and 1.44mb 3.5 inch diskettes.



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PREFLIGHT

Typical FMS preflight procedures include:

- Verifying/selecting the navigation and performance databases installed in the FMS
- Checking/setting the current date and time (as necessary)
- Checking/setting the initial position
- Ensuring VOR/DME USAGE is enabled (and, if desired, inhibiting the use of any VOR/DME nav aids which have been NOTAMed out of service)
- Checking/setting the FMS display mode (MAG/TRUE)
- Checking/setting the SYNChronized or INDEPendent operating mode for systems with dual installation FMS
- Setting display mode options for the MAP display mode on the MFD

Optional equipment and functions installed in an airplane and operational variations may delete or add additional preflight functions for the FMS. Refer to the appropriate airplane flight manuals for specific FMS preflight procedures for your airplane.

INDEX Page

INDEX pages on the CDU are used to select available functions that are not directly selectable with the function keys. The number of INDEX pages and the functions available are dependent upon the equipment installed in the airplane, as well as the installed FMS 4200 options. Push the INDEX key to show the INDEX page. Once the INDEX page shows on the display, push the PREV PAGE and NEXT PAGE keys to show any additional INDEX pages.

STATUS Page Check

The STATUS page shows on the CDU display at initial power-up or when selected from the INDEX page.

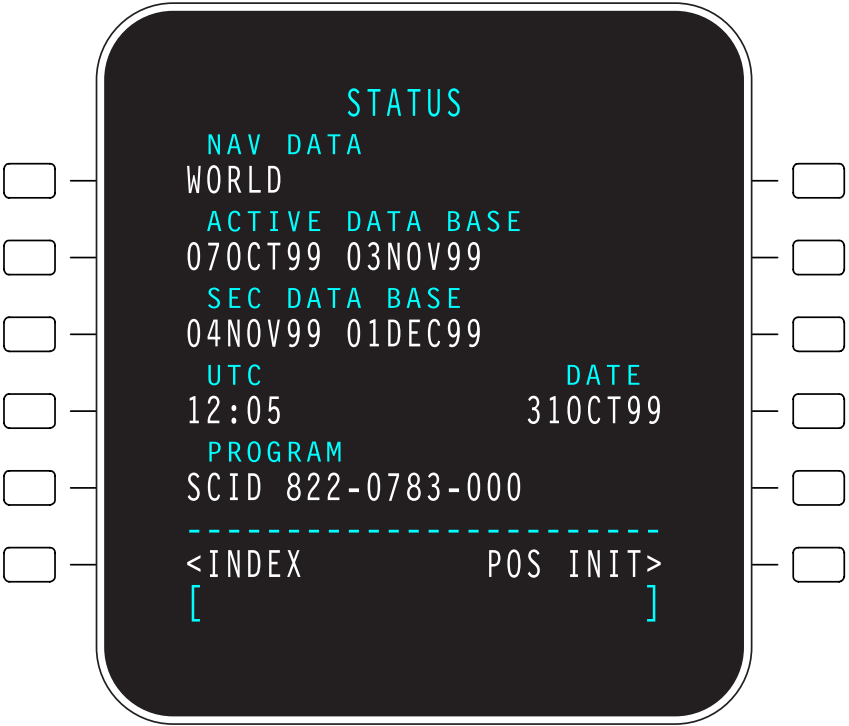
To check the status page:

1. Push the IDX key to show the INDEX display page.
2. Push the STATUS line select key to show the STATUS display page to verify the information shown on the page is correct.

NOTE

There may be more than one STATUS page. Push the NEXT PAGE key to view STATUS page 2/2.
--

STATUS PAGE



Time Check/Set

NOTE

In installations with GPS sensors enabled for use by the FMS, the FMS time and date are automatically updated with GPS time and date; manual updating is not allowed. Also, some FMS installations automatically get time and date from the airplane clock; again, manual updating is not allowed. Refer to the appropriate airplane flight manuals to set the airplane clock.

Time (UTC) is set on the STATUS page 1/2. The STATUS page shows on the CDU display at initial power-up or when selected from the INDEX page. If the STATUS page is not showing on the CDU, use the "STATUS PAGE CHECK" procedure on the previous page to display the STATUS page, then use the procedure below to set the time.

To set the FMS UTC on STATUS page 1/2:

1. Enter the desired time into the scratchpad.
2. Push the UTC line select key to transfer the scratchpad time entry to the UTC data line.

Date Check/Set

NOTE

In installations with GPS sensors enabled for use by the FMS, the FMS time and date are automatically updated with GPS time and date; manual updating is not allowed. Also, some FMS installations automatically get time and date from the airplane clock; again, manual updating is not allowed. Refer to the appropriate airplane flight manuals to set the airplane clock.

To set the FMS date on the STATUS page:

1. Enter the desired date into the scratchpad.
2. Push the DATE line select key to transfer the scratchpad date entry to the DATE data line.

Database Check/Change

NOTE

The airplane must be on the ground to change the navigation database.

The navigation database is changed on the STATUS page. The STATUS page shows on the CDU display at initial power-up or when selected from the INDEX page.

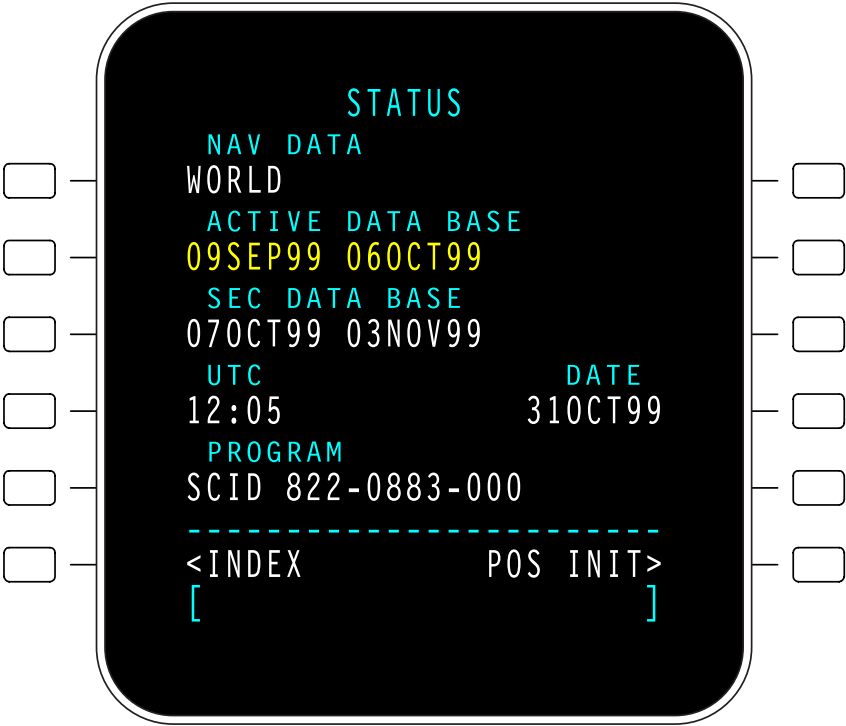
To make the secondary database the active database:

1. Push the SEC DATA BASE line select key to enter the secondary database into the scratchpad
2. Push the ACTIVE DATA BASE line select key to move the secondary database from the scratchpad to the active database line. (The previous effective date of the active database automatically moves to the secondary database line.)

NOTE

Changing the navigation database clears the ACT and SEC FPLNs.

STATUS PAGE
WITH EXPIRED ACTIVE DATA BASE



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Initial Position Check/Set

The FMS (and IRS) position is initialized via the POS INIT page. The POS INIT page is selected from the INDEX page or with the line select key on the STATUS page.

To initialize the FMS and IRS positions:

1. Push the IDX key to show the INDEX page.
2. Push the POS INIT line select key on the INDEX page to show the POS INIT page.
3. Push the AIRPORT display line right side line select key to copy the airport's lat/long, shown to the right of the airport identifier, into the scratchpad.

NOTE

Airport lat/long position data is used in this example to initialize position. If available in your system, you may alternately use PILOT/REF WPT, GATES, GPS, IRS, or FMS lat/long position data to initialize position. You should use the most accurate position data available when initializing the position. GPS, IRS, or FMS lat/long position data is available on POS INIT pages 2/3 and 3/3. Push the PREV PAGE and NEXT PAGE keys as necessary to show the desired page, then push the line select key for the desired lat/long data to copy it to the scratchpad.

4. Push the SET POS line select key to move the lat/long from the scratchpad to the SET POS display line.

NOTE

The message "RESET INITIAL POS" shows on the message line if the initialized position is greater than 40 nautical miles from the last known FMS position. This situation may occur if a maintenance action replaced the FMS since the last flight. If the position is correct, clear the message by pushing the SET POS line select key two more times to enter the position. If the position is not correct, enter the correct position in the SET POS.

NOTE

The message "RE-ENTER SET POS" shows on the message line if the IRS requires confirmation of the new position. This may occur if the pilot entered a position that differs significantly from the IRS position at the time the IRS was turned off. If the position is correct, clear the message by pushing the SET POS line select key two more times to enter the position. If the position is not correct, enter the correct position into the SET POS. IRS is an optional feature and may not be available in all installations.

NOTE

In airplanes with an IRS installed that is capable and configured for remote initialization, initializing the FMS position also initializes the IRS. Refer to the appropriate aircraft flight manuals for specific information related to initializing the IRS system on your airplane.

VOR/DME Navaid Inhibit

Individual VOR NAV sensor operation is controlled from the FMS VOR CONTROL page. The FMS VOR CONTROL page is selected from the INDEX page.

The FMS VOR CONTROL page is used to enable or disable VOR/DME USAGE by the FMS in calculating the position solution. In addition, this page is also used to inhibit the FMS from using up to eight individual VORs for navigation.

To enable or disable VOR AND DME USAGE by the FMS:

1. Push the ENABLED/DISABLED line select key to select and deselect VOR/DME usage. Each push of the line select key toggles the selection between ENABLED and DISABLED. The selected mode show in green.

To disable the use of a specific VOR for FMS navigation:

1. Push the IDX key to show the INDEX page
2. Push the FMS1 VOR CTL line select key to show the FMS1 VOR CONTROL page
3. Enter the VOR identifier into the scratchpad (example: IOW)
4. Push the line select key on either side of the NAVAID INHIBIT display line to move the VOR identifier from the scratchpad to the right or the left NAVAID INHIBIT prompt.

NOTE

A disabled navaid is re-enabled only when it is deleted from the NAVAID INHIBIT data line, or when the active navigation database is changed on the STATUS page. To clear a navaid from the NAVAID INHIBIT data lines, either enter the identifier for a different navaid to inhibit, or enter DELETE, with the DEL key into the scratchpad and transfer it to the appropriate NAVAID INHIBIT data line.

FMS Control Modes

The FMS CONTROL page is selected from the INDEX page. Through the FMS CONTROL page you may select a MAG or TRUE display mode for the FMS heading reference, SYNC or INDEP coordination mode, and RIGHT or LEFT MFD control (available in installations with single FMS and dual MFD).

NOTE

Some installations may not have any selectable control modes. In these cases, when the FMS CONTROL page is selected, the page will appear with no information lines or modes available.

MAG/TRUE

To show the FMS CONTROL page and select the MAG or TRUE heading reference display mode:

1. Push the IDX key to show the INDEX page.

NOTE

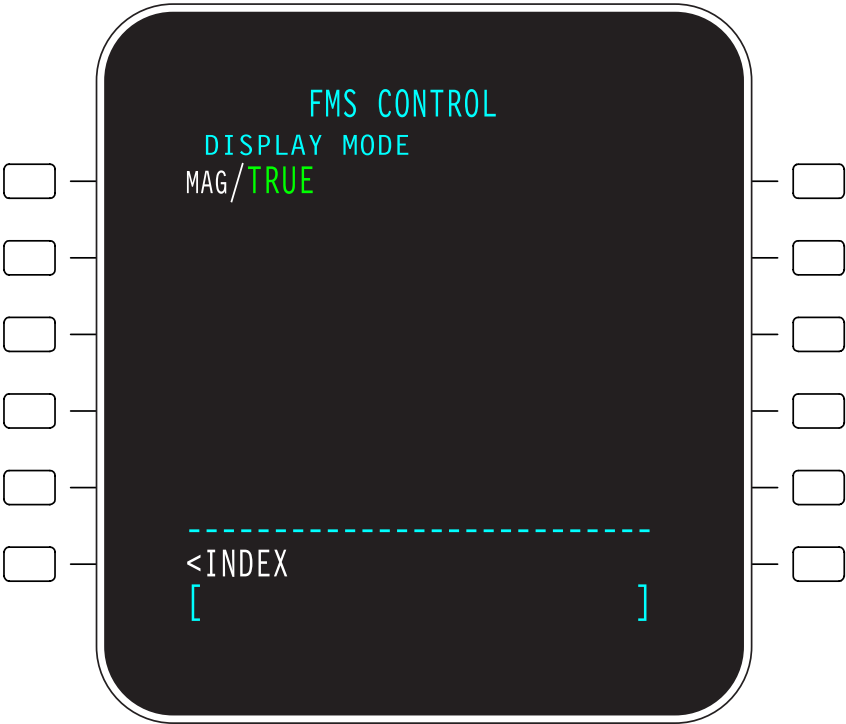
In some installations the FMS CTL line key selection may be on page 2/2 of the INDEX page. Push the NEXT PAGE or PREV PAGE key as necessary to show the INDEX page with the FMS CTL line key selection.

2. Push the FMS CTL line select key to show the FMS CONTROL page.
3. Push the DISPLAY MODE line select key to alternately select the MAG or TRUE heading display mode.

NOTE

MAG/TRUE mode selection is an option and may not be available in all installations. In those installations without the MAG/TRUE mode selection, the FMS is configured to be either always in MAG mode or to respond to a MAG/TRUE switch elsewhere in the cockpit. Refer to the appropriate airplane flight manual for your airplane for information on how your FMS is configured.

FMS CONTROL PAGE
WITH DISPLAY MODE OPTION



SYNC/INDEP

To select the SYNC or INDEP coordination mode from the FMS CONTROL page:

1. Push the IDX key to show the INDEX page.

NOTE

In some installations the FMS CTL line key selection may be on page 2/2 of the INDEX page. Push the NEXT PAGE or PREV PAGE key as necessary to show the INDEX page with the FMS CTL line key selection.

2. Push the FMS CTL line select key to show the FMS CONTROL page.
3. Push the SYNC/INDEP line select key to change the mode.
4. Push the FMS1 or FMS2 line select key to select the SYNC MASTER.

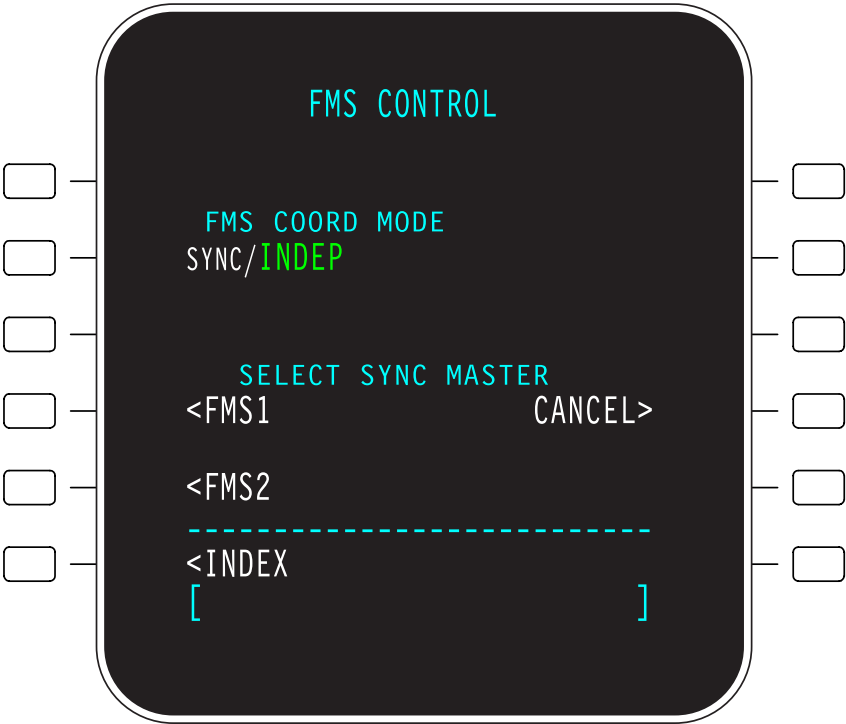
NOTE

When you select SYNC mode, you must designate which FMS is the MASTER. The flight plans in the FMS selected as the MASTER are transferred to the other FMS, thereby replacing any previously existing flight plans in that FMS. This may influence your decision on which FMS to select as the MASTER. Once SYNC mode is selected, flight plan changes made on either FMS are automatically made to the other FMS regardless of which one was initially selected as the MASTER.

NOTE

SYNC/INDEP mode selection is an option and may not be available in all installations. In those installations without the SYNC/INDEP mode selection, the FMS is configured to be either always in SYNC mode or always in INDEP mode. Refer to the appropriate airplane flight manual for your airplane for information on how your FMS is configured.

FMS CONTROL PAGE
WITH COORD MODE OPTION



MFD Data Window (OFF/ON/VNAV/COMP)

The MFD Data Window is controlled from the MFD MENU page. Push the MFD MENU key to show the MFD MENU page.

To turn the navigation data progress window on the MFD on or off (in the FMS MAP display mode), to show VNAV data in that display window, or to change the map display to a compass rose without a text window:

1. Push the MFD MENU key to show the MFD MENU page
2. Push the WINDOW line select key to turn the navigation data display window ON or OFF, select VNAV data to show in the MFD display window, or change the map display to compass rose.

NOTE

Each push of the WINDOW line select key sequentially selects a mode.
--



MFD WITH VNAV WINDOW DISPLAY SELECTED

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FLIGHT PLANNING

The procedures in this guide apply to creating active flight plans (ACT/MOD FPLN) and second flight plans (SEC FPLN). An ACT FPLN is used by the FMS to generate steering commands for use by the airplane's flight control system. A SEC FPLN can be saved into and recalled from FMS memory, but cannot be used to generate steering commands. Creating a flight plan on the SEC FPLN pages is identical to creating an ACT FPLN, except you must select the SEC FPLN page.

TIP

When creating a flight plan from scratch, think of the EXEC key as a save function. You can save a MOD FPLN in its current state at any time by pushing the EXEC key. If you do this at the end of each task while creating a flight plan, you will not have to start over from the beginning if you discover a mistake and need to push the CANCEL MOD line select key. The CANCEL MOD line select key will delete all changes made since EXEC key was last pushed. Remember to verify the flight plan before executing it with the EXEC key.

NOTE

All flight plans should be verified before they are executed. Verify a flight plan by reviewing it on the MOD LEGS pages on the CDU and on the MFD in the PLAN MAP display mode. The PLAN MAP shows a North-up pictorial presentation of the flight plan route that can be scrolled from waypoint to waypoint along the route.

Select, Activate and Execute a Company Route

Company route flight plans are loaded into the ACT/MOD FPLN page by entering the route identifier into the ROUTE data line on the FPLN page. Push the FPLN key to show the ACT/MOD FPLN page.

NOTE

Company routes and route identifiers are uniquely defined for the individual user. A route may consist of only the flight legs from the origin to the destination, or it may include any combination of additional information including the flight number, an origin airport, a departure runway, a SID, a STAR, a destination airport, a runway extension, and an arrival runway. Refer to Create a Flight Plan for instructions and examples for modifying a flight plan.

To select, activate and execute a company route:

1. Push the FPLN key to show the FPLN page.
2. Enter the company route identifier in the scratchpad.

NOTE

You can also select a route from the company route list. The company route list is selected from the ROUTE MENU which is selected from either the INDEX page or the SEC FPLN page.

3. Push the ROUTE line select key to transfer the route name to the ROUTE data line.
4. Verify the flight plan on the CDU and MFD Plan Map, then push the EXEC key to execute the flight plan.

COMPANY ROUTE LOADED
INTO FLIGHT PLAN PAGE

	ACT FPLN	1/4		
	ORIGIN	DIST	DEST	
☐	KMSP	330	KGFK	☐
	ROUTE	ALTN		
☐	02BNHAYE	KFAR		☐
		ORIG RWY		
☐		RW12R		☐
	VIA	TO		
☐	DIRECT	OLLEE		☐
	-----	FLT NO		
☐	<COPY ACTIVE	-----		☐
	<SEC FPLN	PERF INIT>		
☐	[	]		☐

Create A Flight Plan

Each procedure for a task in this section begins with selecting the appropriate CDU display page. This allows any one task to be accomplished independently from any other. If you intend to accomplish more than one task, or repeat a task more than once on a specific display page (very likely when creating a flight plan), you can skip the steps for selecting the display page (if that page is already shown on the display), and continue with the steps for entering the data.

Flight plans can be created from scratch by:

- Entering/selecting each navigation facility for the desired flight plan route
- Selecting a stored pilot-defined flight plan route
- Selecting a stored route and modifying it by entering, changing, or deleting the navigation facilities used for that route.

Navigation facilities/procedures that may be entered/selected for a flight plan include, but are not limited to:

- | | | |
|-----------------|-----------|--------------|
| • Airports | • Airways | • STARs |
| • Nav aids | • Holds | • Approaches |
| • Intersections | • SIDs | |

The basic steps to creating a flight plan include:

- Entering the origin, destination and alternate airports, or a pilot-defined route.
- Selecting a departure runway or a SID with a departure runway.
- Entering a route from the departure to the arrival.
- Selecting the arrival route (STAR) with or without a transition and an approach.

You must enter at least one waypoint into a flight plan, whether or not you enter an ORIGIN or DEST airport, for the FMS to show a route on the MFD maps.

NOTE

When entering airport identifiers, you must use the ICAO standard airport identifiers which include the country code for the airport.

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Origin Airport

An ORIGIN airport is an optional entry. However, you cannot select a SID or departure runway without entering an ORIGIN airport. In some systems, you may have to enter the ORIGIN airport each time a flight plan is created. In others, the last DEST airport is restored as the ORIGIN airport when the FMS is first turned on, unless the flight plan was changed after landing. However, in all systems after a maintenance action, the FMS may turn on with no ORIGIN airport showing.

NOTE

Changing or deleting the ORIGIN airport erases any existing ACT/MOD FPLN. In addition, changing or deleting the ORIGIN airport while the airplane is airborne is prohibited ("NOT ON GROUND" shows on the message line).

To enter an ORIGIN airport:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Enter the desired airport identifier into the scratchpad.
3. Push the ORIGIN line select key to transfer the scratchpad entry to the ORIGIN prompt.

MOD FPLN PAGE WITH
ORIGIN AIRPORT ENTERED

	MOD FPLN		1/2	
	ORIGIN	DIST	DEST	
☐	KICT	----	□□□□	☐
	ROUTE		ALTN	
☐	-----		----	☐
			ORIG RWY	
☐	VIA		TO	☐
☐	-----		-----	☐
	-----		FLT NO	
☐	<COPY ACTIVE		-----	☐
	<SEC FPLN	PERF INIT>		☐
☐	[		]	
		EXEC		

DEST (Destination) Airport

A DEST airport is an optional entry. However, you cannot select a STAR or an approach unless you enter a DEST airport. Enter the DEST airport on ACT FPLN page one. The FPLN key shows the ACT FPLN or MOD FPLN page, depending on the current status of a flight plan.

To enter a destination airport:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Enter the destination airport identifier into the scratchpad.
3. Push the DEST line select key to move the airport identifier from the scratchpad to the DEST prompt.

MOD FPLN PAGE WITH
DEST AIRPORT ENTERED

	MOD FPLN		1/2	
	ORIGIN	DIST	DEST	
☐	KICT	340	KSTL	☐
	ROUTE		ALTN	
☐	-----		----	☐
			ORIG RWY	
☐	VIA		TO	☐
☐	-----		-----	☐
			FLT NO	
☐	<COPY ACTIVE		-----	☐
☐	<SEC FPLN	PERF INIT>		☐
	[		]	
			EXEC	

ALTN (Alternate) Airport

An ALTN airport is an optional entry. An alternate airport is entered on ACT/MOD FPLN page one. The FPLN key shows the ACT FPLN or MOD FPLN page, depending on the current status of a flight plan.

To enter an alternate airport:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Enter the alternate airport identifier into the scratchpad.
3. Push the ALTN line select key to move the airport identifier from the scratchpad to the ALTN prompt.

MOD FPLN PAGE WITH
ALTN AIRPORT ENTERED

	MOD FPLN	1/2		
	ORIGIN	DIST	DEST	
☐	KICT	340	KSTL	☐
	ROUTE		ALTN	
☐	-----		KBLV	☐
			ORIG RWY	
☐				☐
	VIA		TO	
☐	----		----	☐
	-----		FLT NO	
☐	<COPY ACTIVE		-----	☐
☐	<SEC FPLN	PERF INIT>		☐
	[		]	
			EXEC	

ROUTE Name

A ROUTE is an optional entry on the first ACT FPLN page. The FPLN key shows the ACT FPLN or MOD FPLN page, depending on the current status of a flight plan.

When you enter the name of a route that is stored in the PILOT ROUTE LIST or COMPANY ROUTE LIST, the FMS automatically loads that route directly into the MOD FPLN. If you are creating a new route that you intend to store in the PILOT ROUTE LIST, enter a unique name for the route (one not already in the PILOT ROUTE LIST or COMPANY ROUTE LIST).

To enter a route name (not stored in the PILOT ROUTE LIST or COMPANY ROUTE LIST):

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Enter the name of the new route into the scratchpad.
3. Push the ROUTE line select key to move the route name from the scratchpad to the ROUTE prompt.

MOD FPLN PAGE WITH
ROUTE NAME ENTERED

	MOD FPLN	1/2		
	ORIGIN	DIST	DEST	
☐	KICT	340	KSTL	☐
☐	ROUTE		ALTN	☐
	SHOCKER1		KBLV	
☐		ORIG RWY		☐
	VIA		TO	
☐	-----		-----	☐
☐	-----	FLT NO		☐
☐	<COPY ACTIVE	-----		☐
☐	<SEC FPLN	PERF INIT>		☐
	[		]	
		EXEC		

ORIG (Origin) RWY

The ORIG RWY identifies the selected departure runway. When the ORIG RWY is selected, the flight plan begins at the runway threshold versus the airport reference point (only if the ORIGIN airport is entered). It is an optional entry. However, without an ORIG RWY, the FMS cannot perform a RUNWAY UPDATE at the runway threshold. An ORIG RWY is selected from the DEPART page for the ORIGIN airport.

To select a departure runway:

1. Push the DEP ARR key to show the DEPART page for the ACT FPLN.

NOTE

When the DEP ARR key is pushed, one of three pages shows: the DEPART, ARRIVAL, or DEP/ARR INDEX page. If the airplane is on the ground, or airborne but less than either 50 NM from the origin airport or halfway to the destination airport, the DEPART page for the origin airport shows. If the airplane is airborne and more than halfway to the destination airport or more than 50 NM from the origin airport, the ARRIVAL page for the destination airport shows. If no active flight plan exists, or no origin or destination airport is specified, the DEP/ARR INDEX page shows. If you desire a page other than the one currently showing, pushing the line select key for the DEP/ARR INDEX page, or pressing the DEP ARR key a second time, will show the DEP/ARR INDEX page where you can select the desired page for the appropriate airport.

2. Push the line select key next to the desired runway in the RWYS column.

NOTE

For some airports the runway list fills more than one page. Push the NEXT PAGE or PREV PAGE key as necessary to show the desired runway, then push the line select key for that runway.

3. Push the FPLN line select key or FPLN key to return to the FPLN page.

MOD FPLN PAGE WITH
ORIG RUNWAY SELECTED

	MOD FPLN	1/2		
	ORIGIN	DIST	DEST	
☐	KICT	340	KSTL	☐
☐	ROUTE		ALTN	
	SHOCKER1		KBLV	☐
☐		ORIG RWY		
		19R		☐
☐	VIA	TO		
	-----	-----		☐
☐	-----	FLT NO		
	<COPY ACTIVE	-----		☐
☐	<SEC FPLN	PERF INIT>		
	[	]		☐
		EXEC		

SIDs

Select a SID on the DEPART page. The DEP ARR key shows the DEPART page.

Selecting a SID may also include selecting a transition route and a departure runway. Each of these additional selections are included as part of the procedure below. However, selecting a transition route, when available, or a departure runway is not required, and will not be included in the flight plan if left unselected.

Only the approved combinations of transition routes and runways are shown for each SID. Therefore, if your first selection is the departure runway, only transition routes and SIDS for that runway show in the SIDS and TRANS columns on the DEPART page. Likewise, if your first selection is the SID, only transition routes and runways for that SID show under the TRANS and RWYS columns.

To select a SID:

1. Push the DEP ARR key to show the DEPART page.

NOTE

One of three pages shows when the DEP ARR key is pushed: the DEPART, ARRIVAL, or DEP/ARR INDEX page. If a page other than the DEPART page is showing, pushing the line select key for the DEP/ARR INDEX page, or pressing the DEP ARR key a second time, will show the DEP/ARR INDEX page where you can select the DEPART page for the appropriate airport.

2. Push the line select key next to the desired SID.
3. Push the line select key next to the desired transition route.
4. Push the line select key next to the desired runway.
5. Push the FPLN line select key or FPLN key to return to the FPLN page.

SID AND TRANS SELECTION
ON KSTL DEPART PAGE

KSTL DEPART

SIDS MOD FPLN

CARDS6<SEL>

TRANS

BDF

CAP

LEBOY

NEENS

<CANCEL MOD

[

1/2

RWYS

RW06

RW12L

RW12R

RW13

RW24

FPLN>

]

EXEC

Flight Plan Legs

Via Direct

Direct legs of a flight plan are defined by entering each waypoint in the TO column on the right side of the appropriate flight plan page. When a waypoint is entered, DIRECT shows in the VIA column on the left side of the page.

To enter a direct waypoint leg into a flight plan:

NOTE

A new flight plan route may have many direct waypoints or only one direct waypoint. The following procedure adds two direct waypoints to the flight plan. If you were to add only one direct waypoint, you would skip steps 5 and 6. Conversely, you can repeat steps 2, 4, 5, and 6 as many times as necessary to enter as many direct waypoints as desired into a flight plan.

1. Push the FPLN key to show the ACT/MOD FPLN page (if not already showing).
2. Enter the desired waypoint into the scratchpad.
3. Push the NEXT PAGE key to show the next page of the ACT/MOD FPLN.
4. Push the TO column line select key to move the waypoint from the scratchpad to the TO prompt.
5. Enter the next direct waypoint into the scratchpad.
6. Push the TO column line select key to move the waypoint from the scratchpad to the TO prompt.

NOTE

Occasionally a waypoint identifier (such as BLH) may be used more than once in the navigation database. In such instances, the SELECT WPT page shows when the TO line select key is pushed in the previous step. On the SELECT WPT page, identically named waypoints are arranged from closest to the waypoint before the insertion point to farthest from the insertion point. If there is no preceding waypoint in the flight plan, then they are arranged from the waypoint closest to the current FMS position to the waypoint farthest from that position. Select the waypoint by pushing the line select key adjacent to the desired waypoint.

NOTE

If you enter a wrong waypoint, enter it into the wrong place, or need to change or delete a waypoint after executing the FPLN with the EXEC key, refer to the CHANGE/CORRECT A FLIGHT PLAN section in this chapter.

FLIGHT PLAN
WITH DIRECT WAYPOINT



Via Airways

In order to enter an airway into the flight plan, both the entry waypoint, which precedes the airway in the flight plan, and the exit waypoint of the airway itself (as defined in the navigation database) must be on that airway. When an airway is entered into the flight plan, all intermediate waypoints along the airway are automatically entered as well. These waypoints show on the ACT/MOD LEGS pages on the CDU, and on the MFD in the FMS MAP and PLAN MAP display modes.

Enter airway identifiers as shown on the navigation charts (i.e., V29, J65, etc.) into the VIA column on the left side of the ACT/MOD FPLN pages; enter entry and exit waypoints into the TO column on the right side of these pages. You may enter any combination of airways and direct legs as required for your flight plan, as long as you observe the entry and exit waypoint requirements. If you try to enter either an entry or exit waypoint that is not on the airway, the FMS will generate the message "NOT ON AIRWAY." You also cannot use two airways that cross without a defined crossing intersection.

To enter an airway leg into a flight plan:

1. Push the FPLN key to show the ACT/MOD FPLN page.

NOTE

A flight plan usually fills several pages. Push the NEXT PAGE or PREV PAGE key as necessary to show the desired VIA entry line on the display, then proceed with the steps below.

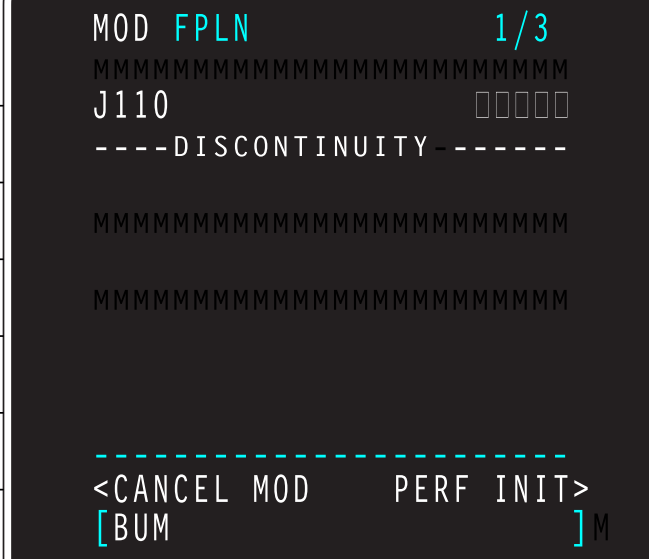
2. Push the NEXT PAGE key to show the next page of the ACT/MOD FPLN.
3. Enter an airway identifier into the scratchpad.
4. Push the VIA column line select key to move the airway identifier from the scratchpad to the VIA line.

NOTE

When the airway identifier is entered, the FMS generates a discontinuity in the flight plan. The discontinuity is cleared when the airway exit waypoint is entered.

5. Enter the airway exit point into the scratchpad.
6. Enter the exit waypoint into the discontinuity prompts. (This will clear the discontinuity.)
7. Enter the next airway or direct waypoint into the scratchpad.

FLIGHT PLAN WITH AIRWAY LEG
(AIRWAY EXIT POINT IN SCRATCHPAD)



```
MOD FPLN 1/3
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
J110      □□□□
-----DISCONTINUITY-----
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM
MMMMMMMMMMMMMMMMMMMMMMMMMMMMMMMM

-----
<CANCEL MOD    PERF INIT>
[BUM                               ]M
EXEC
```

Transfer a Cross-Side Flight Plan (INDEP Mode)

When the FMS-4200 is operating in the INDEPendent mode, flight plans entered into one FMS are not automatically transferred to the other. However, you can still transfer the ACT FPLN and SEC FPLN from one FMS to the other.

NOTE

The following procedure describes transferring the ACT FPLN. You can also transfer the SEC FPLN, in the same manner, from the SEC FPLN pages. When a SEC FPLN is transferred from the cross-side FMS, it becomes a SEC FPLN on the on-side FMS.

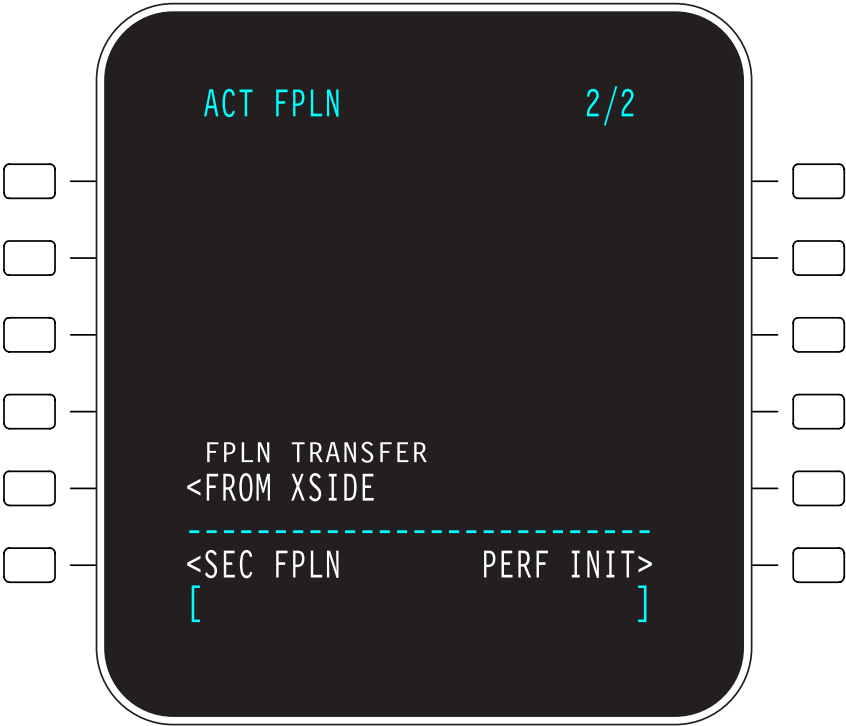
To transfer the ACT FPLN from the cross-side FMS to the on-side FMS:

1. Push the FPLN key to show the ACT FPLN page
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the last ACT FPLN page with the FPLN TRANSFER FROM XSIDE prompt.
3. Push the FPLN TRANSFER FROM XSIDE line select key to transfer the cross-side ACT FPLN to the on-side FMS. The CDU annunciates "FPLN TRANSFER IN PROGRESS." When the transfer is complete, the CDU changes back to the MOD FPLN page
4. Verify the correct FPLN, then push EXEC to execute the flight plan.

NOTE

When dual FMSs are in INDEP mode, using the above procedure allows the pilot to transfer flight plans from one FMS to the other. However, if a MOD FPLN exists on the cross-side FMS, the MOD FPLN will be transferred to the on-side FMS, but the unexecuted edits/changes will not. Therefore, it is possible to have two different flight plans in the two FMSs following a flight plan transfer. As a precaution, push the EXEC key to execute any changes to the flight plan before initiating FPLN transfer.

TRANSFER CROSS-SIDE FPLN



Verify a Flight Plan

All flight plans should be verified before they are executed. They can be verified by reviewing the flight plan route on the MFD, when it is set to the PLAN MAP display mode, and on the appropriate LEGS pages on the CDU.

MFD Plan Map Scrolling

The MFD plan map can be scrolled from waypoint to waypoint along a flight plan route. Scrolling is controlled on the MFD ADVANCE page. Push the MFD ADV key to show the MFD ADVANCE page.

To change the center waypoint on the MFD plan map:

1. Set the MFD to the PLAN MAP display mode and select the desired display range
2. Push the MFD ADV key to show the MFD ADVANCE page
3. Push the PREV WPT or NEXT WPT line select key to move the display center point to the previous or next waypoint along the flight plan route, **or**

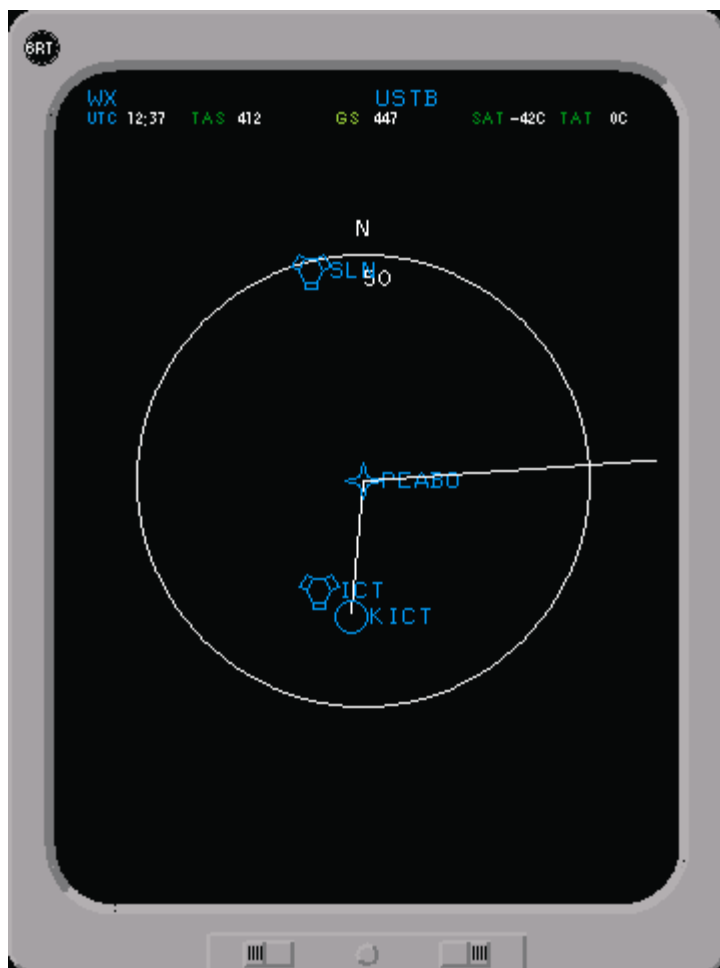
Push the TO WPT line select key to place the current TO waypoint in the center of the display, **or**

Enter a waypoint identifier into the scratchpad, then push the CTR WPT line select key to center the display on that waypoint.

NOTE

Any waypoint can be entered on the CTR WPT line. It does not have to be a waypoint on the flight plan route.

You may also use the arrow keys to scroll through the flight plan. Push the ↑ (up) and ↓ (down) arrow keys to change the center waypoint position on the MFD PLAN MAP. The annunciation <CTR> shows on the waypoint line of the waypoint where the MFD PLAN MAP is centered. The MFD must be in PLAN MAP mode and the ACT LEGS page showing on the CDU for these keys to function.



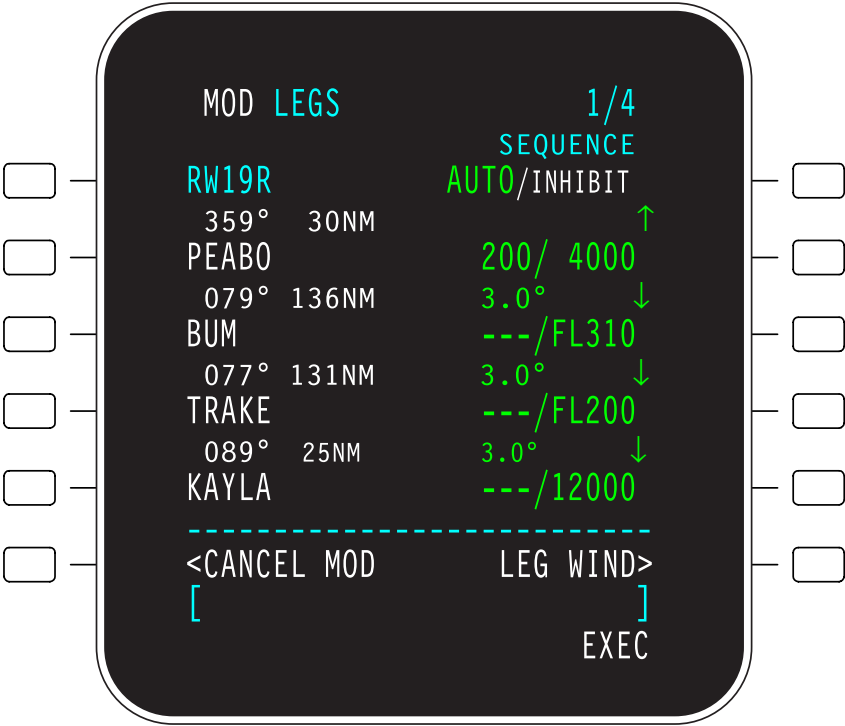
CDU (FPLN or LEGS Pages)

You can use the MOD FPLN or MOD LEGS pages to verify the modified route. The FPLN pages will show filed flight plan routing (but will not show each individual waypoint on the route.) On the LEGS pages, you can see each waypoint used to define the flight plan route, including those conditional waypoints used in SIDs, STARs, and approaches.

To verify a modified flight plan on the MOD FPLN or MOD LEGS pages on the CDU:

1. Push the FPLN key to show the MOD FPLN pages or the LEGS key to show the MOD LEGS pages.
2. Push the NEXT PAGE and PREV PAGE keys as necessary to move from page to page to review the flight plan.

TYPICAL MOD LEGS PAGE



Change/Correct a Flight Plan

The procedures in this section apply to changing or correcting the ACT/MOD FPLN pages and the ACT/MOD LEGS pages. They will also work for the SEC FPLN and SEC LEGS pages when these pages are selected, instead of the equivalent ACT/MOD pages. Changes to the flight plan will not take effect until the EXEC key is pushed.

FPLN Pages

Delete an Airway

To delete an airway:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the page with the airway to be deleted.
3. Push the DEL key to enter DELETE into the scratchpad.
4. Push the VIA column line select key adjacent to the airway to be deleted.

NOTE

When the VIA line select key is pushed in step 4 above, you will note that "DIRECT" now appears in the VIA column and will be the new routing for the selected flight plan leg.

NOTE

You cannot delete the first line of the FPLN page while the airplane is airborne. However, any line on the LEGS pages can be deleted.

Insert/Add an Airway

To insert/add an airway:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the page where the airway is to be inserted.

NOTE

An airway must be preceded in the flight plan by the entry waypoint and it must also have an exit waypoint.

3. Enter the route identifier into the scratchpad.
4. Push the VIA column line select key below the airway entry waypoint to transfer the airway to the flight plan.

Delete a DIRECT Waypoint

To delete a DIRECT waypoint:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the page with the DIRECT waypoint to be deleted.
3. Push the DEL key to enter DELETE into the scratchpad.
4. Push the TO column line select key adjacent to the DIRECT waypoint to be deleted.

Insert/Add a DIRECT Waypoint

To insert/add a DIRECT waypoint:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the page where the waypoint is to be inserted.
3. Enter the waypoint identifier into the scratchpad.
4. Push the TO column line at the position where the waypoint is to be entered to transfer it to the flight plan.

Change a SID and/or a Departure Runway

When changing a SID, you can change to:

- A completely different SID
- A different transition route for the existing SID
- A different runway for the existing SID
- Any available combination of transition routes and runways for the existing SID.

NOTE

The procedure example below changes a transition route for the SID in the flight plan. You can select any of the elements for change as described above.

To change the selected SID and/or departure runway:

1. Push the DEP ARR key to show the DEPART page.

NOTE

One of three pages shows when the DEP ARR key is pushed: the DEPART, ARRIVAL, or DEP/ARR INDEX page. If a page other than the DEPART page is showing, pushing the line select key for the DEP/ARR INDEX page, or pressing the DEP ARR key a second time will show the DEP/ARR INDEX page where you can select the DEPART page for the appropriate airport.

2. Push the line select key for the desired SID or runway.
3. Push the line select key for the desired transition route if one is available.
4. Push the FPLN line select key or FPLN key to return to the ACT/MOD FPLN page.

NOTE

After selecting a SID and transition, the only way to display the entire TRANS list again is to reselect the SID.

DEPART PAGE SHOWING
ORIGIN RUNWAY SELECTED

KICT DEPART		1/2
SIDS	ACT FPLN	RWYS
NONE	<ACT>	RW19R
		RW01L
		RW01R
		RW14
		RW19L

<DEP/ARR IDX		FPLN>
[		]

Delete a Discontinuity

Discontinuities are used to indicate a break in a flight plan sequence. They are used, for example, to separate the approach segment from the arrival segment. They are also used to segregate a changed portion of a flight plan from an unchanged portion during certain flight plan edits or changes. They can be deleted with a DEL key entry (DELETE) from the scratchpad, or by entering the next desired waypoint into the discontinuity prompts. When a discontinuity is deleted, a direct-to course is created to the next waypoint in the flight plan. Also, once a discontinuity is deleted, additional changes to the flight plan may be required or desired, depending on the resulting construction of the flight plan.

NOTE

Some discontinuities cannot be deleted with the DEL key entry, such as one preceding an approach with an initial leg that is a radar vectored leg, or one at the end of an airway where the next waypoint is not on that airway. In these cases, you must enter the next desired waypoint into the discontinuity prompts.

To delete a discontinuity:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the page with the discontinuity to be deleted.
3. Push the DEL key to enter DELETE into the scratchpad, or press the line select key for the next desired waypoint to enter that waypoint into the scratchpad.
4. Push the line select key for the prompt boxes above the discontinuity.

FLIGHT PLAN
WITH DISCONTINUITY

☐	ACT FPLN	2/4	☐
☐	VIA	TO	☐
☐	DIRECT	BUM	☐
☐	BUM.TRAKE8	SNYDR	☐
☐	-----	□□□□□	☐
☐	----- DISCONTINUITY	-----	☐
☐	DIRECT	MENNA	☐
☐	VECTORS.ILS24	RW24	☐
☐			
	<SEC FPLN	PERF INIT>	
	[	]	

LEGS Pages

Changes can be made to the individual legs that make up a flight plan route on the ACT/MOD LEGS pages. Changes can include deleting a waypoint, adding a waypoint, entering or changing VNAV data for each leg, deleting discontinuities, and entering leg winds and ISA for each leg. The LEGS key shows the ACT/MOD LEGS pages.

Delete a Waypoint

To delete a waypoint from a flight plan:

1. Push the LEGS key to show the ACT/MOD LEGS pages.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the waypoint to be deleted.
3. Push the DEL key to enter the word DELETE into the scratchpad.
4. Push the line select key of the waypoint to delete.

Insert/Add a Waypoint

To insert a waypoint:

1. Push the LEGS key to show the ACT/MOD LEGS pages.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the location where the waypoint is to be added on the display.
3. Enter the new waypoint into the scratchpad.
4. Push the line select key at the entry point for the waypoint.

Enter/Change VNAV Data

VNAV entries include altitude constraints, speeds (IAS or Mach), and vertical path angles (VPA) for climbs and descents. You may enter each singly, or as combined entry (speeds and altitude only). For more specific information regarding VNAV entries, see the VNAV chapter of this pilot's guide.

To enter or change VNAV data for an individual leg in the flight plan:

1. Push the LEGS keys to show the ACT/MOD LEGS pages.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the location where the VNAV entry is to be entered.
3. Enter the data into the scratchpad.
 - For speeds, enter a three digit number (IAS) from 100 to 499, or a two digit Mach setting from .10 to .99 (with the decimal point prefix).
 - For VPA, entry range is from 1.0 to the maximum VPA (usually 6.0) specified for the airplane.
 - For altitude, entries may be barometric pressure altitudes or flight levels. Altitude entry range is from -1300 feet to 65000 feet, and FL0 to FL650. Altitudes may be suffixed with the letter "A" (at or above) or "B" (at or below). Flight level entries are prefixed with "F" or "FL". You may also enter "C" only to change a descent to a climb, or "D" to change a climb to a descent.

NOTE

If entering barometric pressure altitudes, if the altitude is less than 500 feet, you must prefix the altitude with a / (slash) to prevent the FMS from misidentifying the altitude as a speed or VPA.

- Speeds and altitude entries may be combined if separated by a / (slash) mark (e.g., 250/10000, .78/F290).
4. Push the line select key for the appropriate waypoint to transfer the information from the scratchpad.

NOTE

If entering the same information into several waypoints, you can copy the VNAV information to the scratchpad by pushing the appropriate right side line select key (instead of manually entering the data), then transferring the data to another waypoint.

5. Verify the data, then push the EXEC key to execute the MOD FPLN.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 4-38

The following information is added to the guide before the heading **ENTER/CHANGE VNAV DATA.**

CREATE A FLYOVER WAYPOINT

Waypoints can be designated as flyover waypoints, which require the airplane to fly over the waypoint before initiating a turn.

Any non-flyover waypoint can be transformed into a flyover waypoint. On the MFD Plan map, when the flyover attribute is added, the flight plan route is drawn as a line through the flyover waypoint. An arrowhead that points toward the waypoint that follows the flyover waypoint indicates an offset from the next course because of the flyover.

To create a flyover waypoint:

1. Push the LEGS button to show the ACT/MOD LEGS page.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the page with the waypoint to be designated a flyover waypoint.
3. If the scratchpad is not empty, use the CLR function key to clear the scratchpad.
4. Push the left side line select key next to the desired waypoint to copy the waypoint identifier to the scratchpad.
5. Using the keypad, add a /0 (slash – zero) suffix to the waypoint identifier to enable the flyover attribute.
6. Push the line select key for the waypoint identifier to transfer the modified waypoint identifier from the scratchpad.

NOTE

When the modified waypoint has been inserted into the flight plan, the waypoint identifier is appended with an @ symbol to indicate this is a flyover waypoint.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

ACT LEGS PAGE WITH FLYOVER WAYPOINT

	ACT LEGS	1/4	
		SEQUENCE	
☐	RW19R 359° 30 NM	AUTO/INHIBIT	☐
☐	PEABO 079° 136 NM	200/ 4000	☐
☐	BUM 077° 131 NM	---/FL290	☐
☐	TRAKE 089° 25 NM	---/FL200	☐
☐	KAYLA	3.0° ---/12000	☐
☐	<RWY UPDATE LEG WIND> [PEABO/O]		☐

TPG6057_10

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

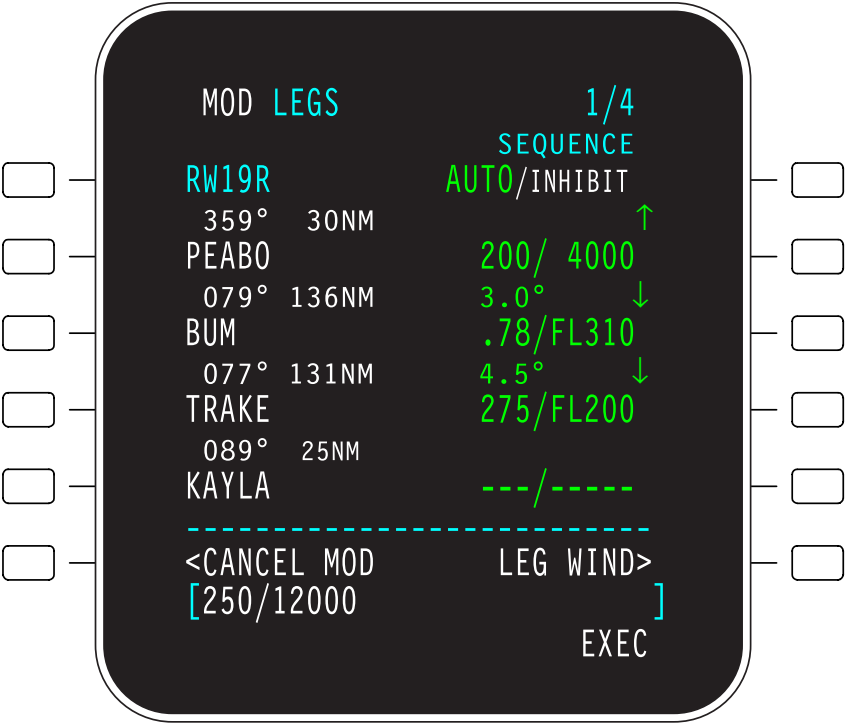
DELETE A FLYOVER WAYPOINT

Waypoints that have been user-defined as flyover waypoints can have the flyover attribute removed if the flyover requirement no longer exists. When the flyover attribute is removed from the waypoint, the course is drawn on the MFD Plan map from point to point as usual (with no course offset) for non-flyover waypoints.

To delete the flyover attribute from a user-defined flyover waypoint:

1. Push the LEGS button to show the ACT/MOD LEGS page.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the page with the waypoint that is designated a flyover waypoint., indicated by the @ suffixed to the waypoint identified
3. If the scratchpad is not empty, use the CLR function key to clear the scratchpad.
4. Push the left side line select key next to the desired waypoint to copy the waypoint identifier to the scratchpad.
5. Using the keypad, add a /0 (slash – zero) suffix to the waypoint identifier to disable the flyover attribute.
6. Push the line select key for the waypoint identifier to transfer the modified waypoint identifier from the scratchpad.

MOD LEGS PAGE WITH
TYPICAL VNAV ENTRIES



Delete a Discontinuity

To delete a discontinuity on a LEGS page:

NOTE

Some discontinuities cannot be deleted with the DEL key entry, such as one preceding an approach with an initial leg that is a radar vectored leg, or one at the end of an airway where the next waypoint is not on that airway. In these cases, you must enter the next desired waypoint into the discontinuity prompts.

NOTE

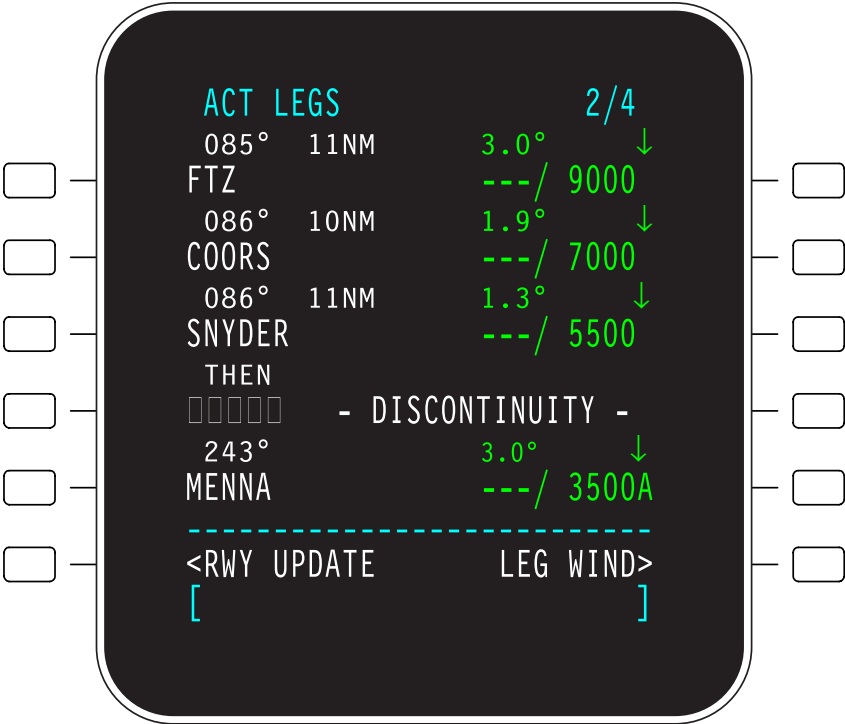
The following procedure deletes a discontinuity by entering the next waypoint in the flight plan. You can also use the DEL key to enter DELETE into the scratchpad to delete a discontinuity. However, the restrictions noted for deleting a discontinuity on a FPLN page also apply to deleting one on the LEGS page.

1. Push the LEGS key to show the ACT/MOD LEGS pages.
2. Push the NEXT PAGE or PREV PAGE key as necessary to show the prompt boxes next to the discontinuity to be deleted.
3. Push the line select key of the waypoint following the discontinuity.
4. Push the line select key for the prompt next to the discontinuity to transfer the waypoint from the scratchpad.

NOTE

To skip a leg or legs following a discontinuity, select the waypoint to which you want to go that follows the discontinuity, then enter it into the THEN prompt of the discontinuity. It will replace the discontinuity and all intermediate waypoints between the discontinuity and the selected waypoint will be deleted from the flight plan.

ACT LEGS PAGE WITH
A DISCONTINUITY



ISA Deviation (ISA DEV) and Winds Aloft

ISA deviation and winds aloft for each leg of the flight plan are entered through the LEG WIND pages which are accessed from the LEGS pages. The FMS uses winds and ISA deviation in its performance calculations such as fuel consumption, leg times and ETAs. Each LEG WIND page correlates with a LEGS page, i.e., pushing the LEG WIND line select key on ACT/MOD LEGS page 3/6 shows ACT/MOD LEG WIND page 3/6.

In some installations, you cannot enter ISA DEV and winds for climbs and descents (designated on the LEG WIND pages as CLB and DES respectively). If you entered an ISA DEV and/or winds for the climb, cruise, or descent on PERF INIT page 2/3 (see the Performance section), the FMS will load the ISA DEV and wind values as appropriate into the LEG WIND pages for each leg. However, you may manually change the values for each individual leg. Manual ISA DEV and wind entries show in large font text; FMS-generated entries show in small font. Winds may be entered in any one of the following formats:

- Direction and speed (280/25)
- Headwind or tailwind (H32 or T85)
- Plus wind or minus wind (P102 or M50) [Plus is a tailwind.]

To enter or change the ISA DEV and/or winds aloft for each leg of the flight:

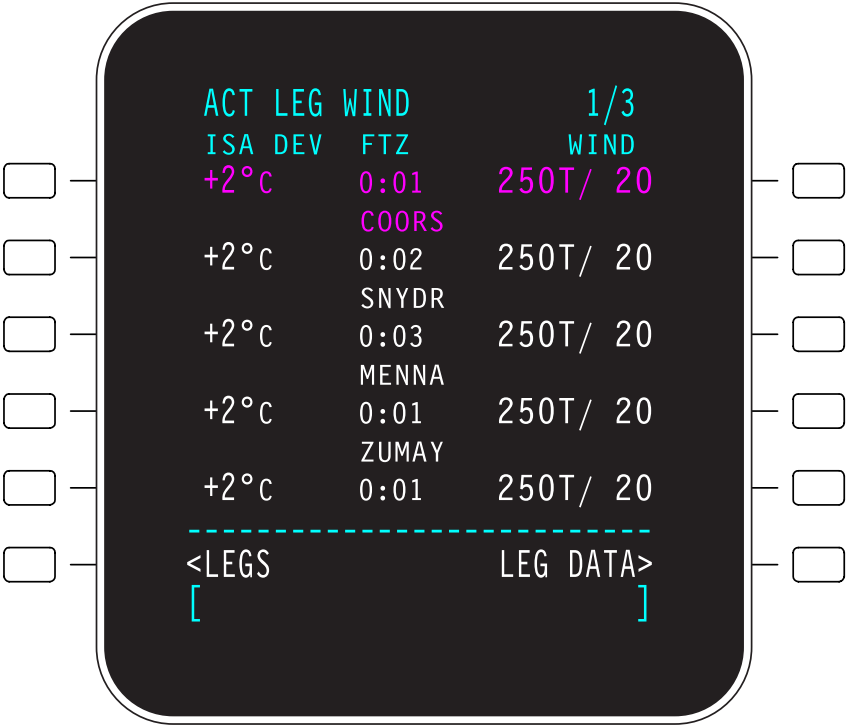
1. Push the LEGS key to show the current ACT/MOD LEGS page.
2. Push the LEG WIND line select key to show the correlating ACT/MOD LEG WIND page.
3. On the appropriate ACT/MOD LEG WIND page, enter the ISA deviation and/or wind data into the scratchpad for the individual leg.

NOTE

ISA DEV and winds aloft data may be entered independently of each other. You may enter ISA DEV, or winds, or both for each leg.

4. Push the appropriate line select key for the leg where the data is to be entered to transfer it from the scratchpad.

ACT LEG WIND/ISA DEV PAGE



Store an ACT FPLN

The ACT FPLN can be stored directly to FMS memory for later retrieval.

NOTE

The ability to store flight plans in the FMS memory is an optional item and may not be available in all installations. If the ACT STORE option is not available, the PILOT ROUTE LIST selection will not appear on the ROUTE MENU page.

To store an ACT FPLN:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Push the SEC FPLN key, or the SEC FPLN line select key on the ACT/MOD FPLN page, to show the SEC FPLN page.
3. Push the ROUTE MENU line select key on the SEC FPLN page to show the ROUTE MENU page.

NOTE

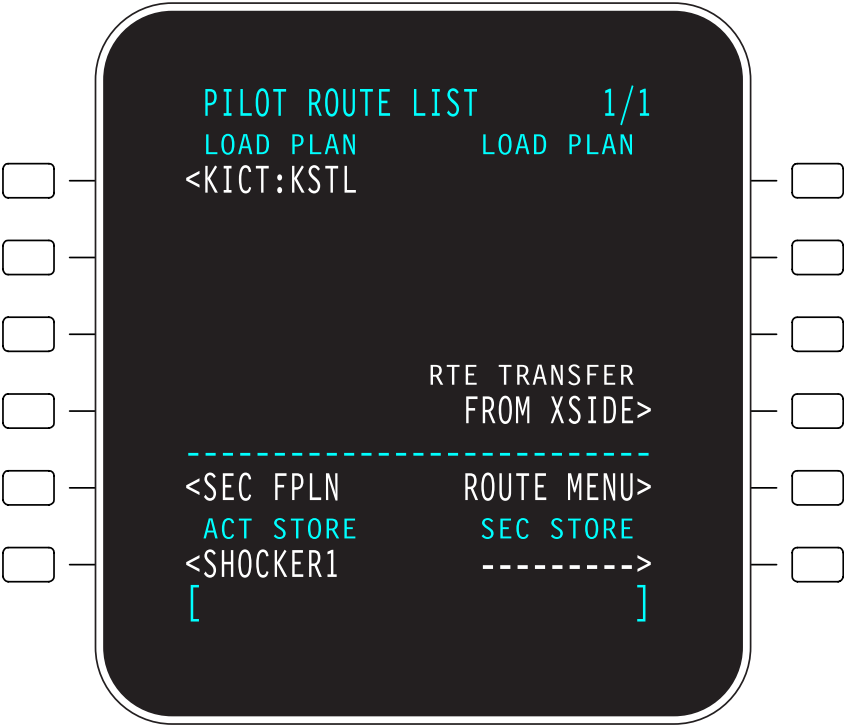
You can also access the ROUTE MENU page from the INDEX page. Push the INDEX key to show the INDEX page, then push the ROUTE MENU line select key to show the ROUTE MENU page.

4. Push the PILOT ROUTE LIST line select key to show the PILOT ROUTE LIST page.
5. Push the ACT STORE line select key to save the active flight plan with the route name shown.

NOTE

If a route with the same name is already stored in memory, the CDU shows "OVERWRITE ROUTE?" with YES and NO line key selections. To overwrite the existing route with the new route, push the YES line select key. To change the route name, enter the new name into the scratchpad and push the ACT STORE line select key to transfer the new name to the ACT STORE line; push the ACT STORE line select key again to save the ACT FPLN with the new name.

STORE ACT FPLN



Activate and Execute a SEC FPLN

To activate and execute a SEC FPLN:

NOTE

A flight plan should be verified by reviewing the route on the MFD PLAN MAP and/or CDU LEGS pages before it is activated and executed.

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Push the SEC FPLN key, or the SEC FPLN line select key on the ACT/MOD FPLN page, to show the SEC FPLN page.
3. Push the ACTIVATE line select key to activate the flight plan and show the MOD FPLN page.
4. Push the EXEC key to execute the flight plan and show the ACT FPLN page.

NOTE

In addition to the SEC FPLN key, and the SEC FPLN line select key on the ACT/MOD FPLN page, used in step 2 above, you can access the SEC FPLN pages with the SEC FPLN line key selection on the INDEX pages.

NOTE

When a SEC FPLN is activated and executed, the ACT FPLN and SEC FPLN exchange places. This prevents losing the previous flight plan in case you want to return to it.

TYPICAL SEC FPLN PAGE

	SEC FPLN LINDYHOP	1/3		
	ORIGIN	DIST	DEST	
☐	KSTL	249	KCID	☐
	ROUTE		ALTN	
☐	LINDYHOP		KDVN	☐
	FLT NO		ORIG RWY	
☐	-----		RW12R	☐
	VIA		TO	
☐	CARDS6.CAP		CAP	☐

☐	<ROUTE MENU		ACTIVATE>	☐
	<SEC LEGS		SEC PERF>	
☐	[		]	☐

Cross-Side PILOT ROUTE LIST Transfer

NOTE

Cross-Side PILOT ROUTE LIST transfers are only allowed when the airplane is on the ground.

NOTE

The ability to transfer flight plans from the cross-side FMS to the on-side FMS is an optional item and may not be available in all installations. If the RTE TRANSFER FROM XSIDE option is not available, the PILOT ROUTE LIST selection will not appear on the ROUTE MENU page.

To transfer the PILOT ROUTES from the cross-side FMS:

1. Push the INDEX key to show the INDEX page.
2. Push the ROUTE MENU line select key to show the ROUTE MENU page.

NOTE

You may also access the PILOT ROUTE LIST through the SEC FPLN function. Push the SEC FPLN key, or the SEC FPLN line select key on the ACT/MOD FPLN page, then push the ROUTE MENU line select key on the SEC FPLN page to show the PILOT ROUTE LIST.

3. Push the PILOT ROUTE LIST line select key to show the PILOT ROUTE LIST page.
4. Push the RTE TRANSFER FROM XSIDE line select key on the last page of the PILOT ROUTE LIST pages to copy the cross-side FMS routes to the on-side FMS.

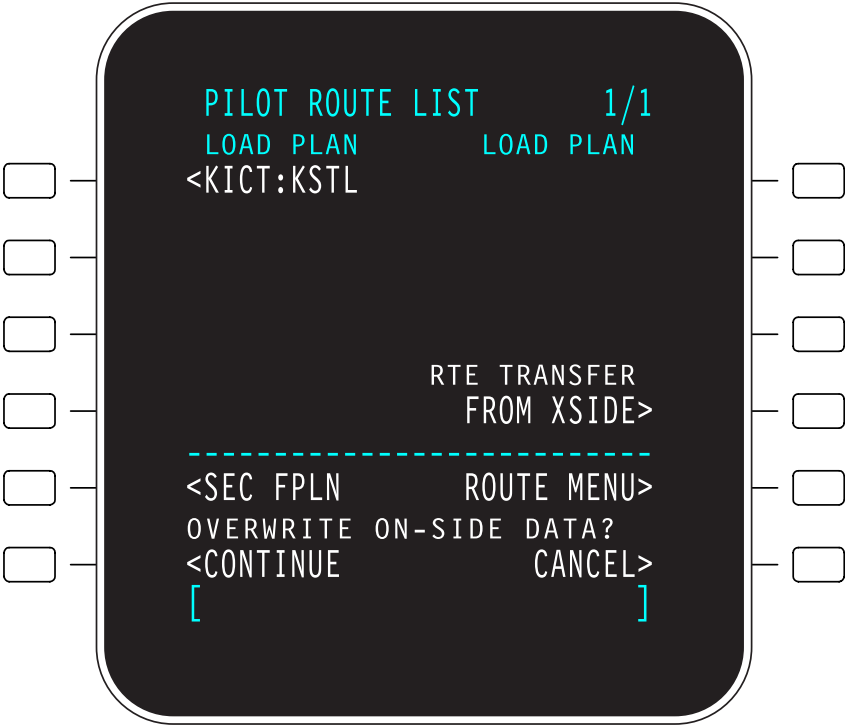
NOTE

When the RTE TRANSFER FROM XSIDE line select key is pushed, if the on-side FMS already contains routes in the PILOT ROUTE LIST, the FMS prompt "OVERWRITE ON-SIDE DATA?" will appear. Push the CONTINUE line select key to complete the transfer, or push the CANCEL line select key to end the procedure.

NOTE

Pilot routes are automatically stored in both FMSs if they are in SYNC mode. The PILOT ROUTE LIST may differ on the two FMSs if routes were stored while the FMS was in INDEP mode or one of the FMCs was replaced after routes stored.

PILOT ROUTE LIST TRANSFER



Select, Activate, and Execute Stored PILOT ROUTES

NOTE

The ability to store PILOT ROUTES in the FMS memory is an optional item and may not be available in all installations. If the ACT STORE (on the SEC FPLN page) option is not available, the PILOT ROUTE LIST selection will not appear on the ROUTE MENU page.

Stored PILOT ROUTES are selected on the PILOT ROUTE LIST pages and are entered into the SEC FPLN pages. Once a route is selected, it must be activated to become a MOD FPLN, then executed to become the ACT FPLN.

A PILOT ROUTE can consist of any combination of the elements that make up a flight plan route. It can be used as is, or modified and stored as a new route or as a replacement of the existing route. Refer to Create a Flight Plan for the procedures to modify a PILOT ROUTE.

NOTE

PILOT ROUTE names are defined by the individual user.

To select, activate, and execute an existing PILOT ROUTE:

1. Push the INDEX key to show the INDEX page.
2. Push the ROUTE MENU line select key to show the ROUTE MENU page.

NOTE

You can also access the ROUTE MENU page through the SEC FPLN function. Push the SEC FPLN key, or the SEC FPLN line select key on the ACT/MOD FPLN page, then push the ROUTE MENU line select key on the SEC FPLN page to show the PILOT ROUTE LIST.

3. Push the PILOT ROUTE LIST line select key to show the PILOT ROUTE LIST page.
4. Push the line select key adjacent to the desired flight plan.
5. Verify the flight plan on the CDU and on the MFD PLAN MAP, then push the ACTIVATE line select key to activate the route as a MOD FPLN.

NOTE

With the MOD FPLN function, you have the ability to modify and verify a flight plan before executing it for use as an ACT FPLN.

6. Push the EXEC key to execute the MOD FPLN.

NOTE

In place of steps 2 through 5 above, if you know the name of a desired route that exists in the PILOT ROUTE LIST, enter that name directly into the scratchpad and transfer it to the ROUTE data line on the ACT/MOD FPLN or SEC FPLN pages. The FMS automatically finds the route in the PILOT ROUTE LIST and loads it into the flight plan.

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PERFORMANCE

A variety of performance function and information is available from the FMS-4200. The basic functions are selected from the PERF MENU page. (VNAV is one exception as it also has a separate function key.)

PERF MENU

The PERF MENU includes:

- **PERF INIT** — Up to three pages for setting or reviewing various attributes used to initialize the performance functions.
- **VNAV SETUP** — Three pages for setting/showing target speeds, altitude limits, vertical path angle, and initial vertical speed, as well as other attributes in the climb, cruise and descent phases of flight.
- **FUEL MGMT** — Up to three pages for setting/showing the various elements for fuel management, selecting the performance operating mode, and a trip planning function/calculator.
- **FLT LOG** — The FLIGHT LOG page keeps track of the take off (T/O), en route (EN ROUTE), and landing (LDG) times as well as the FUEL USED, average true airspeed/ground speed (AVG TAS/GS), air distance (AIR DIST), and ground distance (GND DIST).
- **THRUST LIMIT** — The THRUST LIMIT page shows table-based settings for takeoff (TO), go around (GA), climb (CLB), cruise (CRZ), and single engine maximum continuous thrust (MCT), as well as Reduced (FLEX), and target N% thrust reference settings.
- **FLX TEMP** — Temperature entry to support FLX THRUST computation by a FADEC.
- **SEC PERF** — Selects the SEC PERF pages for performance functions/information related to the SEC FPLN.
- **ADVISORY VNAV** — Enables and disables advisory VNAV features including the required vertical speed, vertical deviation scale, and constraint altitudes.
- **VNAV PLAN SPD** — Shows the speed bug setting the FMS is using or will use when VNAV PLAN SPD is active or resumed.

NOTE

Some FMS-4200 performance functions are optional and are not installed in all airplanes. Therefore, some of the performance pages, data lines, and/or modes shown in this section may not be available in some airplanes.

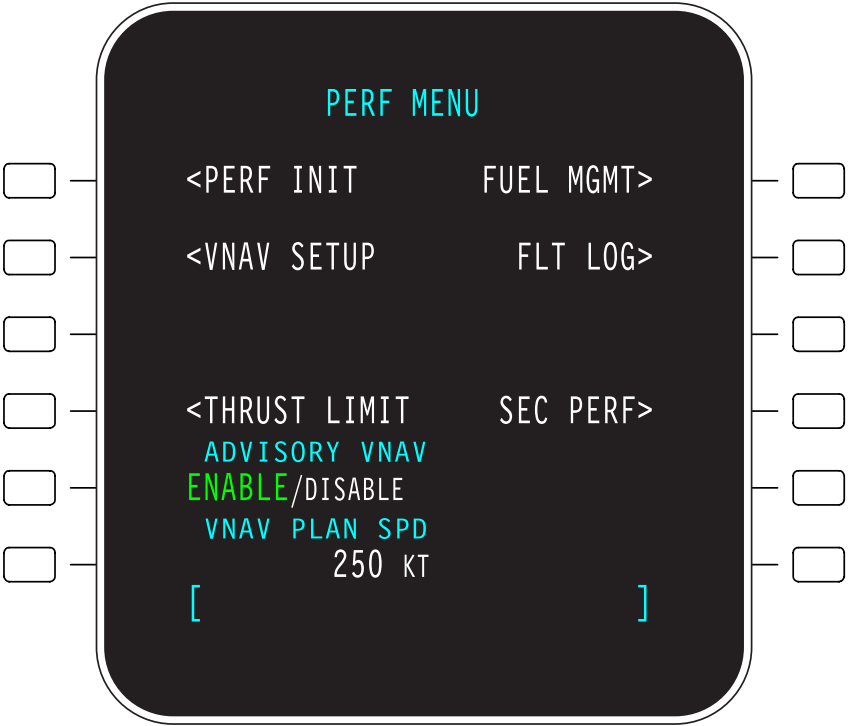
Some elements of the performance functions have default values that can be changed as necessary on the DEFAULTS page. For additional flexibility, some of the defaults may be changed on the performance pages for an individual flight.

NOTE

Procedures for entering or changing performance information for a SEC FPLN are similar to those for the ACT/MOD FPLN. However, on the SEC PERF pages you do not have to enter a fuel quantity. Instead, the FMS calculates the fuel required if it is not entered on the SEC PERF pages.

VNAV PLAN SPD display will indicate the VNAV planned reference speed for the aircraft's current position in the flight plan. The VNAV value will be dashed when VNAV is invalid.

PERF MENU PAGE



THRUST LIMIT

Push the PERF key or the THRUST LIMIT line select key on the PERF MENU page to show the THRUST LIMIT page. Additional sequential pushes of the PERF key alternately show the PERF MENU or the THRUST LIMIT page.

NOTE

The THRUST LIMIT page is an optional feature and may not be available in all installations. In installations without the feature, the PERF key shows the PERF MENU page only.

The THRUST LIMIT page shows table-based N1% settings for takeoff (TO), go-around (GA), climb (CLB), cruise (CRZ), and single engine maximum continuous thrust (MCT). It also has pilot-entered target (TGT) references for N1. You can also set the FMS to compensate N1 computations for the effects of the anti-ice system (ENG BLEED). Each push of the ENG BLEED line select key selects a configuration setting to match the actual aircraft configuration.

NOTE

SEC FPLNs do not have a THRUST LIMIT page. However, the SEC PERF line select key on the PERF MENU or SEC FPLN pages shows the SEC PERF pages.

Manual Entry of N1 For TGT:

1. Push the PERF key, or if the PERF MENU page is showing, push the THRUST LIMIT line select key to show the THRUST LIMIT page
2. Enter the desired reference percentage into the scratchpad.
3. Push the appropriate line select key to transfer the scratchpad entry.

ADDENDUM 1
To
Collins FMS-4200
Flight Management System Pilot's Guide

Part Number 523-0778363-002117, 2nd Edition
Dated 15 December 1999

Insert this addendum sheet facing page 5-4.

The paragraph following the first NOTE is changed to read as follows:

The THRUST LIMIT page shows table-based N1% settings for takeoff (TO), go-around (GA), climb (CLB), cruise (CRZ), and single engine maximum continuous thrust (MCT). It also has pilot-entered target (TGT) references for N1. Values for TO, GA, CLB, CRZ, and MCT will not be displayed on-ground for aircraft with non-aspirated temperature probes unless an OAT (outside air temperature) value is manually entered. Once the aircraft is airborne, the OAT legend will be changed to SAT, and the manually entered value will be overwritten with the sensed SAT provided by the temperature probe. You can also set the FMS to compensate N1 computations for the effects of engine bleeds (ENG BLEED): 10th stage engine bleeds (for packs) open and closed, and cowl and wing anti-ice systems on and off. Each push of the ENG BLEED line select key selects a configuration setting to match the actual aircraft configuration.

Add the following text after item 3 at the bottom of the page:

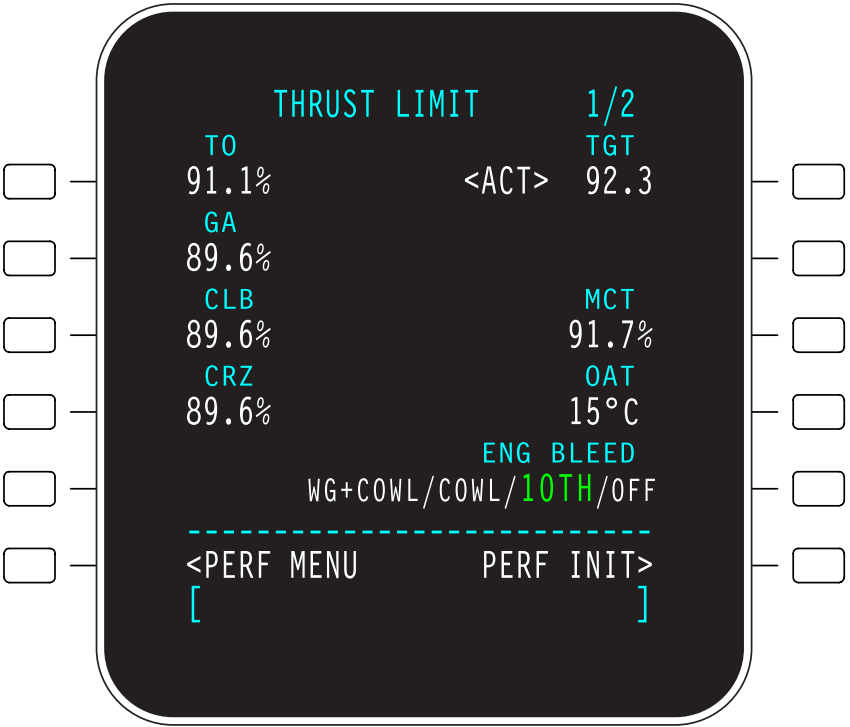
Active N1 Setting

When the aircraft is on-ground, if the line select key corresponding to TO, FLX, or TGT is pressed when the scratchpad is empty, that thrust setting shall become the active (<ACT>) setting and will be posted on the EICAS N1 display. Additionally, TO and FLX settings may not be selected while in-air (the scratchpad message KEY NOT ACTIVE is displayed if an attempt is made).

When the aircraft is airborne, if the line select key corresponding to CLB, CRZ, MCT, GA, or TGT thrust is pressed when the scratchpad is empty, that thrust setting shall become the active (<ACT>) setting and will be posted on the EICAS N1 display. Thrust limits for CLB, CRZ, MCT, and GA are not eligible for selection as active N1 when the aircraft is on the ground.

The FMS DELETE function may be used to delete an active N1 thrust setting, removing the active (<ACT>) label from the CDU THRUST LIMIT page, and removing the active N1 thrust setting from the EICAS N1 display.

THRUST LIMIT PAGE 1



FLX Thrust

THRUST LIMIT page 2/2 (optional) allows you to compute and select FLX (reduced) thrust for takeoff. When a FLX TEMP is entered on THRUST LIMIT page 2/2, the FMS calculates FLX thrust for the all engines available condition, and automatically selects the N1 FLX setting for display.

To enter FLX TEMP and calculate FLX thrust:

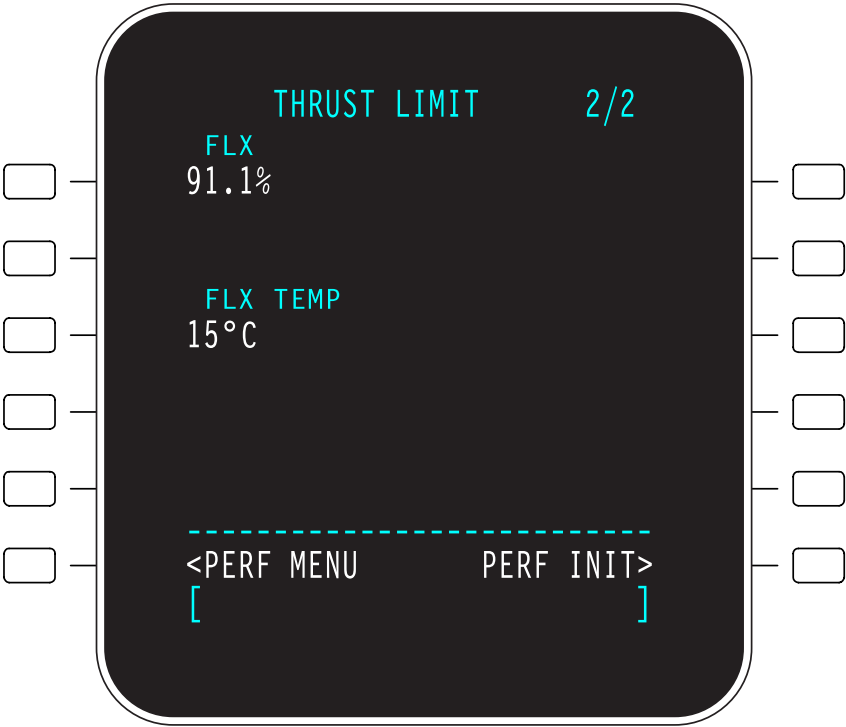
1. From THRUST LIMIT page 1/2, push the NEXT PAGE key to show THRUST LIMIT page 2/2.
2. Enter the current or projected temperature for TAKEOFF into the scratchpad. Entry range is from -99° C to +99° C.
3. Push the FLX TEMP line select key to transfer the temperature setting from the scratchpad.

NOTE

FLX TEMP entry is only allowed/displayed on the ground. If you attempt to enter a FLX TEMP when the aircraft is airborne, the message "NOT ON GROUND" shows.

4. To cancel the FLX thrust mode, delete the FLX TEMP entry.

THRUST LIMIT PAGE 2



PERF INIT

You can show the PERF INIT pages on the CDU with a line key selection on the ACT/MOD FPLN, PERF MENU, THRUST LIMIT, and VNAV SETUP pages.

Prompt boxes (□□□□□) for FUEL and CRZ ALT, on PERF INIT page 1/3, identify the required entries to activate the performance functions. Initializing the PERF functions can be simple or detailed depending on the needs of the pilots. Procedures for both a simple PERF initialization and a detailed PERF initialization follow.

Simple

For a simplified performance initialization you can enter just:

- Zero Fuel Weight (ZFW) or Gross Weight (GWT)
- Total FUEL weight
- Cruise altitude (CRZ ALT).

However, when you use the simplified performance initialization, the Basic Operating Weight (BOW), PASS/WT, and CARGO entries are not used and show as dashes.

For a simple PERF initialization:

1. Push the PERF key to show the PERF MENU page.
2. Push the PERF INIT line key to show ACT/MOD PERF INIT page 1/3.
3. Enter the ZFW or GWT into the scratchpad.
4. Push the ZFW or GWT line key to transfer the entry to the necessary data line.
5. Enter the total FUEL weight into the scratchpad.
6. Push the FUEL line key to transfer the entry to the FUEL data line.
7. Enter the planned CRZ ALT into the scratchpad.
8. Push the CRZ ALT line key to transfer the entry to the CRZ ALT data line.
9. Verify the flight plan change on the CDU, then push the EXEC key to execute the modified flight plan.

NOTE

You can reset the ZFW and/or GWT values to the default settings, or clear the CRZ ALT entry, by entering DELETE into the scratchpad with the DEL key, then transferring it to the desired data line.

SIMPLE PERF INIT

ACT PERF INIT

BOW

----- LB

PASS/WT

--/--LB

CARGO

----- LB

FUEL

7000 LB

CRZ ALT

FL310

ALTN CRZ ALT

12000

= ZFW

44150 LB

= GWT

51150 LB

VNAV SETUP>

[]

Detailed

For a more detailed performance initialization, there are up to three PERF INIT pages for performance data that you can enter and review.

NOTE

The performance database installed on the aircraft determines the availability of all three PERF INIT pages.

On PERF INIT page 1/3 you can enter or modify:

- Number of passengers and/or the weight used for each passenger (PASS/WT)
- CARGO weight
- Total FUEL weight
- Cruise altitude (CRZ ALT)
- Cruise altitude to your alternate airport (ALTN CRZ ALT)

NOTE

Basic Operating Weight (BOW) shown on PERF INIT page 1/3 may only be modified on the DEFAULTS page.

On PERF INIT page 2/3 you can enter the Winds aloft for CLIMB, CRUISE and DESCENT, and the ISA temperature deviation (ISA DEV).

On PERF INIT page 3/3 you can enter an Estimated Time of Departure (ETD) and review the TAXI FUEL, RESERVES, ETE, ETA, and FUEL required. You can also change TAXI FUEL and RESERVES as necessary.

In this "DETAILED" section, the first procedure begins with selecting the PERF INIT page. Each procedure thereafter begins on the PERF INIT page. Unless otherwise specified, you can perform any combination of the procedures together and execute the flight plan after you have completed all the desired changes. You may also perform each procedure independently, executing the flight plan after each one.

NOTE

On PERF INIT page 1/3, you can reset ZFW, GWT, PASS/WT, and CARGO entries to the default settings, or clear the CRZ ALT and ALTN CRZ ALT entries, by entering DELETE into the scratchpad with the DEL key, then transferring it to the desired data line.

To show the PERF INIT pages:

1. Push the PERF key to show the PERF MENU page
2. Push the PERF INIT line select key to show ACT/MOD PERF INIT page 1/3.

NOTE

You can also push the PERF INIT line select key on the ACT/MOD FPLN page to show the ACT/MOD PERF INIT pages.

PASS/WT

To enter PASS/WT on PERF INIT page 1/3:

1. On the ACT/MOD PERF INIT page, enter the number of passengers into the scratchpad, or the number of passengers and a new weight per passenger.
2. Push the PASS/WT line select key to transfer the scratchpad entry to the PASS/WT line.

CARGO

To enter or change the CARGO weight on PERF INIT page 1/3:

1. On the ACT/MOD PERF INIT page enter the cargo weight into the scratchpad.
2. Push the CARGO line select key to transfer the scratchpad entry to the CARGO line.

FUEL (Total Weight)

To enter or change the FUEL weight on PERF INIT page 1/3:

1. On the ACT/MOD PERF INIT page enter the fuel weight into the scratchpad.
2. Push the FUEL line select key to transfer the scratchpad entry to the FUEL line.

NOTE

Any fuel entry zeroes the fuel consumed readout on the EICAS 2000. A fuel entry also changes the fuel reading on FUEL MGMT page 1/3 when on the ground.

NOTE

You do not have to execute the flight plan to enter or change fuel weight.

CRZ ALT

To enter or change a CRZ ALT on PERF INIT page 1/3:

1. On the ACT/MOD PERF INIT page, enter the cruise altitude into the scratchpad.
2. Push the CRZ ALT line select key to transfer the scratchpad entry to the CRZ ALT line.

DETAILED PERF INIT

ACT PERF INIT	1/3
BOW	CRZ ALT
35200 LB	FL310
PASS/WT	ALTN CRZ ALT
35/170LB	12000
CARGO	= ZFW
3000 LB	44150 LB
FUEL	= GWT
7000 LB	51150 LB

VNAV SETUP>

[]

Winds Aloft and ISA DEV

Winds aloft for the climb, cruise, and descent phases of a flight are entered on PERF INIT page 2/3. The FMS uses the average winds in the climb, cruise and descent, as well as winds on individual cruise legs in its performance predictions of fuel consumption, flight plan legs, etc. The FMS also uses ISA inputs for both individual flight plan cruise legs and average cruise ISA in its performance calculations. It also uses ISA inputs, along with airspeed, altitude and winds, to maintain a holding pattern within its protected airspace. Setting ISA DEVIation on PERF INIT page 2/3 will load ISA DEV for the flight plan into the ACT LEG WIND pages (see the FLIGHT PLANNING section). Winds can be entered in any of the following formats:

- Direction and speed (280/25)
- Headwind or tailwind (H32 or T85)
- Plus wind or minus wind (P102 or M50) [Plus is a tailwind.]

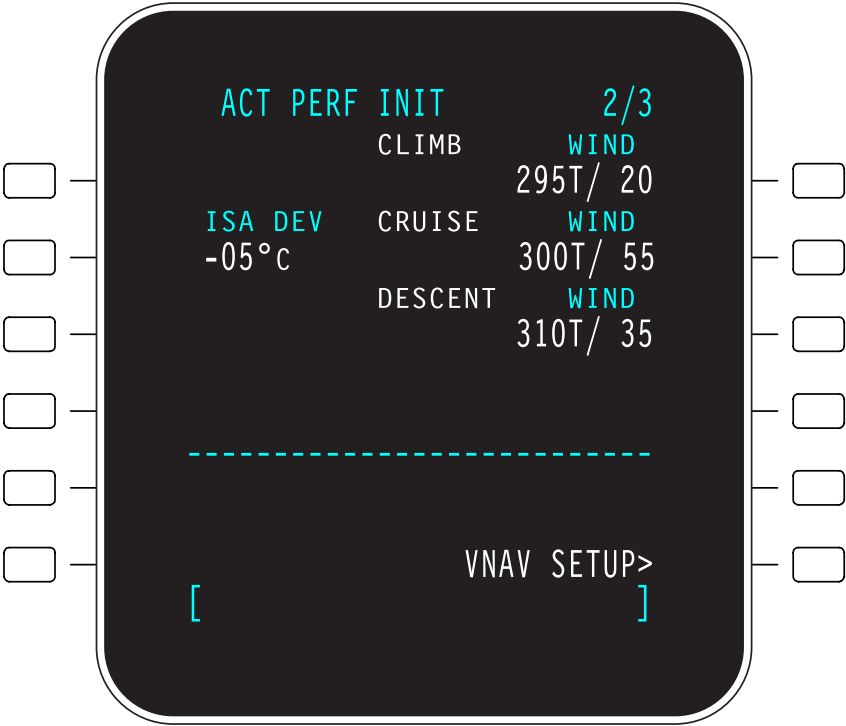
To enter or change the cruise ISA DEV and/or CLIMB, CRUISE, and DESCENT winds on PERF INIT page 2/3:

1. Push the NEXT key to show ACT/MOD PERF INIT page 2/3.
2. On the ACT/MOD PERF INIT page, enter the ISA deviation or wind data for one of the phases of flight into the scratchpad.
3. Push the ISA DEV, CLIMB, CRUISE, or DESCENT line select key as appropriate to transfer the scratchpad entry to the necessary display line.

NOTE

Repeat steps 2 and 3 as necessary to enter ISA deviation/winds for each phase of flight.

ACT PERF INIT PAGE 2



ETD/ATD, ETE, ETA, and FUEL Required

ACT/MOD PERF INIT page 3/3 shows the default Fuel requirements for RESERVES and TAXI FUEL, along with ETE, ETA, and FUEL requirements to the DEST and ALTN airports. You can also enter an estimated time of departure in the ETD data line. ETD switches to the actual time of departure (ATD) when the airplane lifts off.

To review the FUEL requirements and set an ETD, or change the default settings for the RESERVES and/or TAXI FUEL requirements:

1. Push the NEXT PAGE or PREV PAGE key as necessary to show ACT/MOD PERF INIT page 3/3.
2. Enter the desired change into the scratchpad.
3. Push the line select key of the desired data line to transfer the scratchpad entry to the desired data line.
4. Enter the ETD (if desired) into the scratchpad.
5. Push the ETD line select key to transfer the information.

ACT PERF INIT PAGE 3

ACT PERF INIT 3/3
 RESERVES TAXI FUEL
 250 LB 50 LB
 ATD
 12:10
 ETE ETA FUEL
 DEST 1:06 13:18 4650 LB
 ALTN 1:10 13:28 4490 LB

 VNAV SETUP>
 []

VNAV Setup

Push the VNAV key or the VNAV SETUP line select key on the PERF MENU or PERF INIT page to show the ACT/MOD VNAV CLIMB, CRUISE, or DESCENT page.

NOTE

When VNAV is selected, the airplane's current phase of flight determines the initial page shown on the CDU. For example, if you are in the cruise phase of flight, the ACT/MOD VNAV CRUISE page 2/3 shows on the CDU. If you need a page other than the one shown, push the PREV PAGE or NEXT PAGE key as necessary.

In this section, the first procedure begins with selecting the ACT/MOD VNAV CLIMB page. Each procedure thereafter begins from the ACT/MOD VNAV CLIMB page. You can perform any combination of the procedures together and execute the flight plan after you have completed all the desired changes. You may also perform each procedure independently, executing the flight plan after each one.

ACT/MOD VNAV CLIMB, CRUISE, and DESCENT pages show default IAS and Mach TGT SPEEDs. On each page, the IAS and Mach speeds are independent from each other, allowing you to set an individual speed for each. Default speed/altitude limits are also shown on the ACT/MOD VNAV CLIMB and DESCENT pages. Each of these default values can be changed on the DEFAULTS page, or for a single flight, on the appropriate VNAV SETUP pages. In addition, on the CLIMB and DESCENT pages, you can add a speed/altitude limit to the existing defaults.

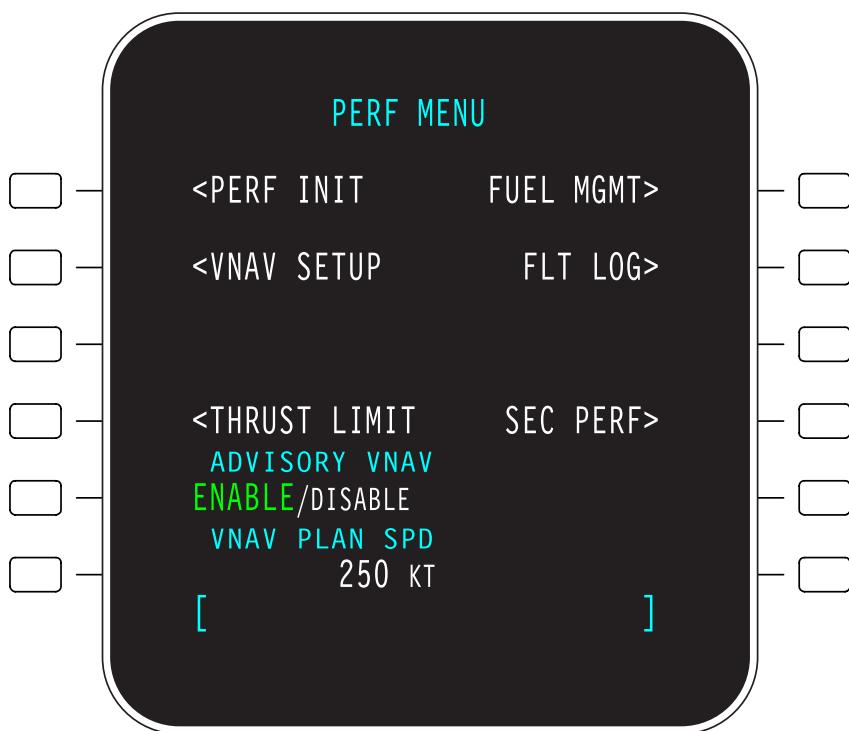
To show the VNAV SETUP pages:

1. Push the VNAV key to show the ACT/MOD VNAV CLIMB, CRUISE, or DESCENT page PERF MENU page.

NOTE

You can also push the VNAV SETUP line select key on the PERF MENU and ACT/MOD PERF INIT pages to show the ACT/MOD VNAV CLIMB/CRUISE/DESCENT pages.

PERF MENU PAGE



CLIMB

The ACT/MOD VNAV CLIMB page (1/3), shows default settings for:

- Target Speed in IAS/Mach (TGT SPEED)
- Transition Altitude (TRANS ALT)
- Speed/Altitude Limit (SPD/ALT LIMIT).

You can change any of these parameters as necessary and add an additional SPD/ALT LIMIT if more than one is necessary.

To change the default settings or add an additional SPD/ALT LIMIT to the CLIMB page:

1. Enter the desired change into the scratchpad.
2. Push the line select key for the appropriate data line to transfer the scratchpad entry to that data line.

NOTE

The default SPD/ALT LIMIT may also be deleted if it does not apply to the airplane.

NOTE

TRANS ALT on the CLIMB page and TRANS FL on the DESCENT page are interconnected. Changing either one results in a concurrent change to the other.

VNAV SETUP PAGE 1 (CLIMB)

☐
☐
☐
☐
☐
☐

ACT VNAV CLIMB

TGT SPEED

290/.70

SPD/ALT LIMIT

250/10000

---/-----

[

1/3

TRANS ALT

18000

PERF INIT>

]

☐
☐
☐
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CRUISE

The ACT/MOD VNAV CRUISE page (2/3) shows a default setting for TGT SPEED and your selected CRZ ALT. You can change either of these parameters as necessary.

NOTE

The CRZ ALT is the same altitude that is entered on the PERF INIT page. If you change the CRZ ALT on the VNAV CRUISE page, it will also change on the PERF INIT pages.

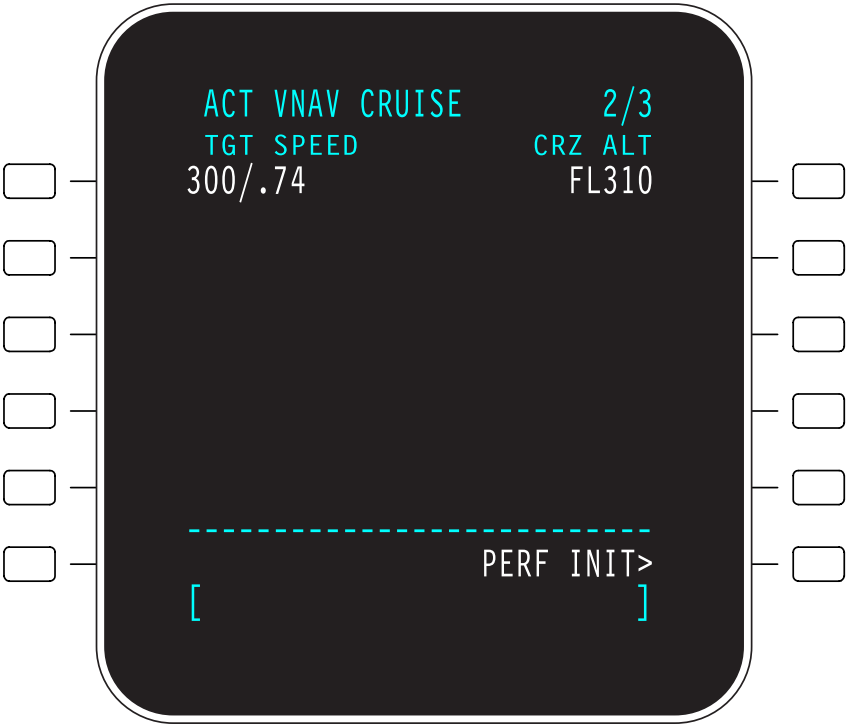
To change the default TGT SPEED or the CRZ ALT:

1. Push the PREV PAGE or NEXT PAGE key as necessary to show the ACT/MOD VNAV CRUISE page
2. Enter the desired change into the scratchpad
3. Push the line select key for the appropriate data line to transfer the scratchpad entry to that data line.

NOTE

You can use the above procedure to change any of the parameters shown on the CRUISE page.

VNAV SETUP PAGE 2 (CRUISE)



DESCENT

The ACT/MOD VNAV DESCENT page (3/3), shows default settings for:

- Target Speed (TGT SPEED)
- Transition Flight Level (TRANS FL)
- Speed/Altitude Limits (SPD/ALT LIMIT)
- Vertical Path Angle (VPA).

You can change any of these parameters as necessary, and add an additional SPD/ALT LIMIT if one is necessary.

TGT SPEED, TRANS FL, and SPD/ALT LIMIT

To add or change a TGT SPEED, TRANS FL, or SPD/ALT LIMIT:

1. Push the PREV PAGE or NEXT PAGE key as necessary to show the desired ACT/MOD VNAV CLIMB, CRUISE, or DESCENT page.
2. Enter the appropriate information into the scratchpad.
3. Push the line select key for the appropriate data line to transfer the scratchpad entry to that line.

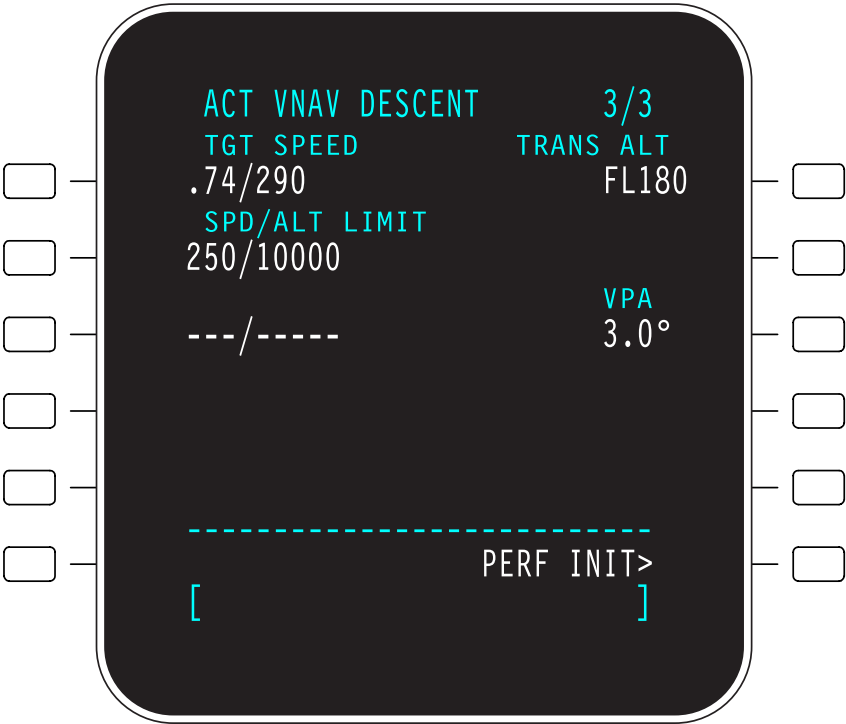
NOTE

The default SPD/ALT LIMIT may also be deleted if it does not apply to the airplane.

NOTE

TRANS ALT on the CLIMB page and TRANS FL on the DESCENT page are interconnected. Changing either one results in a concurrent change to the other.

VNAV SETUP PAGE 3 (DESCENT)



Vertical Path Angle (VPA)

Changing the default vertical path angle (VPA) on the ACT/MOD VNAV DESCENT page changes the VPA for all descents in the flight plan that are not smoothed or specified otherwise in the flight plan. However, on the LEGS page, you can specify the VPA for any individual descent, thereby overriding the settings on the ACT/MOD VNAV DESCENT page.

To change the VPA for a descent:

1. Enter the desired descent path angle into the scratchpad.
2. Push the appropriate line select key to transfer the scratchpad entry to the appropriate data line.

Fuel Management

Push the PERF key to show the PERF MENU page. (Push the PERF MENU line select key if the THRUST LIMIT page shows.) Push the FUEL MGMT line select key on the PERF MENU page to show the FUEL MGMT pages.

In this section, the first procedure begins with selecting the FUEL MGMT page. Each procedure thereafter begins on the FUEL MGMT page. You can perform any combination of the procedures, or you can perform each procedure independently.

FUEL MGMT page 1/3 shows:

- Total quantity of FUEL
- Total FUEL FLOW
- Total RESERVES
- Ground speed (GND SPD)
- Time to reserves (TIME TO RESV)
- Range to reserves (RNG TO RESV)
- Specific range for the current fuel burn (SP RNG)

FUEL MGMT page 2/3 shows:

- Fuel FLOW rate and USED fuel for each ENGINE individually and the TOTAL for both.

FUEL MGMT page 3/3 is the PERF TRIP page.

Default values shown for each of the parameters on the FUEL MGMT page are the current measured values for each parameter. The total quantity of FUEL is the same as the fuel remaining on the PERF INIT page and cannot be changed on the FUEL MGMT page. However, you can change the FUEL FLOW, RESERVES, and/or GND SPD to see the affect the change has on each of the other values shown on the FUEL MGMT page. After you have made changes, to return to the measured values, you must use the DEL key to delete all the changes you made.

TIME TO RESV, RNG TO RESV and SP RNG are calculated from the FUEL, FUEL FLOW, RESERVES, and GND SPD data. You cannot make direct changes to TIME TO RESV, RNG TO RESV, and SP RNG. To make TIME TO RESV calculations, the FMS requires FUEL, FUEL FLOW, and RESERVES data. To make RNG TO RESV and SP RNG calculations, the FMS requires the addition of GND SPD data.

To show the FUEL MGMT pages:

1. Push the PERF key to show the PERF MENU page
2. Push the FUEL MGMT line select key to show the FUEL MGMT pages.

PERFORMANCE MODE SELECTION

The FMS calculates performance data in a PREDICTED or a MEASURED/MANUAL mode. A line key selection on FUEL MGMT page 1/3 selects the desired mode.

NOTE

PERFORMANCE MODE selection is an optional function; installations without the mode selection operate only in the MEASURED/MANUAL mode.

On the CDU, the mode selected affects:

- Altitude predictions shown on the ACT LEGS pages
- ETA, ETE and FUEL shown on ACT PERF INIT page 3/3
- ETE and FUEL (LB) shown on the PROGRESS pages.

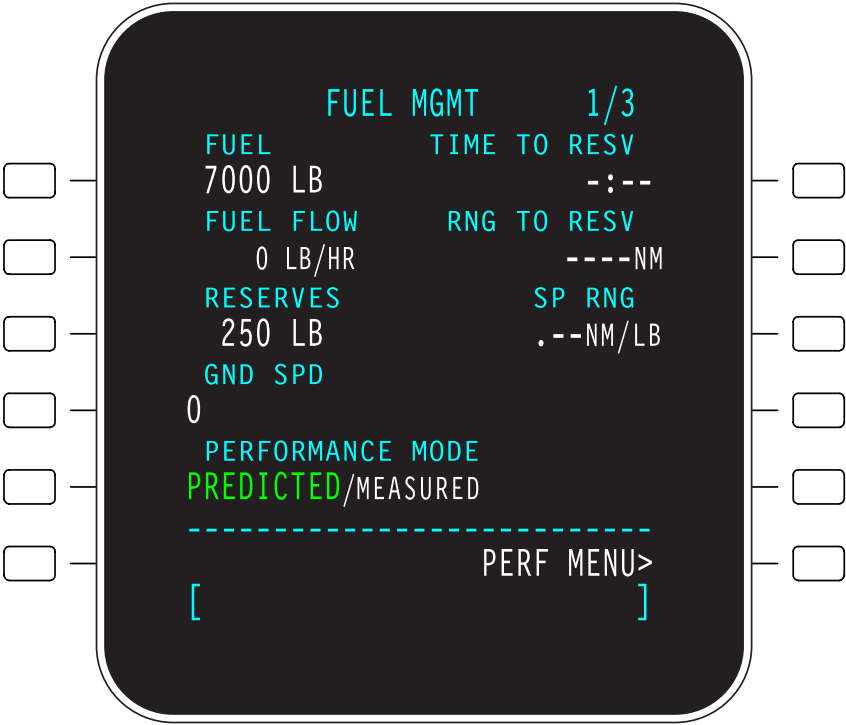
On the MFD, the mode selected affects the ETA and FUEL (LB) shown on the ACT FPLN PROGRESS pages.

In PREDICTED mode, the data shown is based on the airplane's performance tables as they relate to the flight plan route and profile for the entire planned flight. In MEASURED/MANUAL mode, the data shown is based on the current sensor-measured data for FUEL FLOW and GND SPD (MEASURED mode), or pilot-entered FUEL FLOW and GND SPD (MANUAL mode). In MEASURED mode, you will see wide variations in the performance data during climb and descent phases of flight. Also, the altitude predictions shown on the LEGS pages are dashed in the MEASURED/MANUAL mode.

To select the PERFORMANCE MODE from FUEL MGMT page 1/3:

1. Push the PERFORMANCE MODE line select key to alternately select the PREDICTED or MEASURED mode.

FUEL MANAGEMENT PAGE 1



TIME TO RESV, RNG TO RESV and SP RNG Calculations

To make or review TIME TO RESV, RNG TO RESV, and SP RNG fuel calculations:

1. Enter the desired change into the scratchpad.
2. Push the line select key for the appropriate data line to transfer the scratchpad entry to that line.

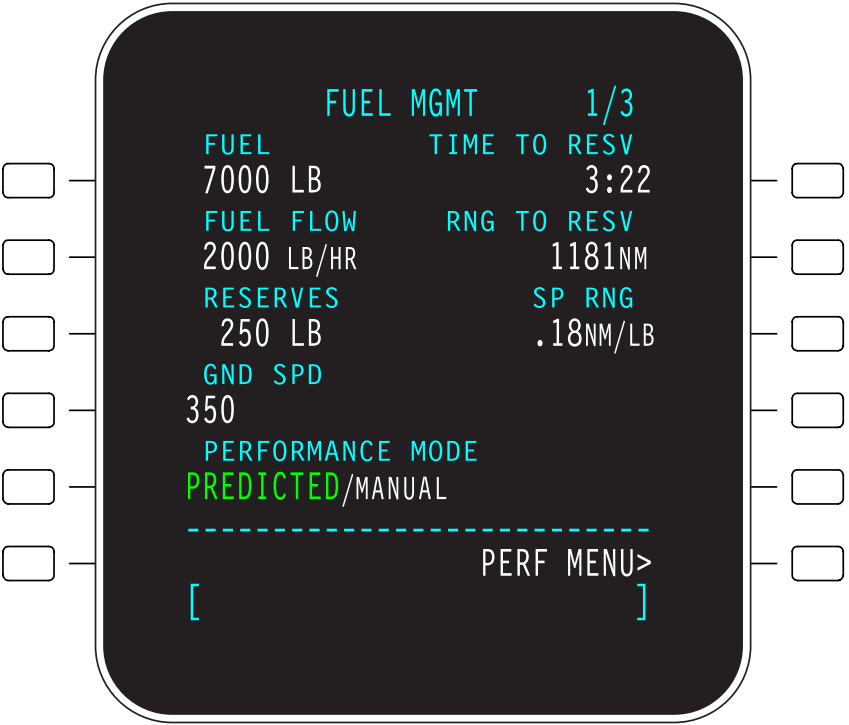
NOTE

You can repeat the above to make as many changes as desired to the FUEL, FUEL FLOW, RESERVES, and GND SPD.

NOTE

Sensor-measured data (MEASURED mode) shows in small font characters; pilot entries (MANUAL mode) show in large font characters. You must delete all manual entries to return to MEASURED mode after you have made MANUAL entries. To delete a manual entry, enter DELETE into the scratchpad with the DEL key, then push the line select key for the data to be deleted. When a manual entry is deleted, it is automatically replaced with a measured or default value.

TIME TO RESERVES
& RANGE TO RESERVES



ENGINE FUEL FLOW RATES

FUEL MGMT page 2/2 shows the ENGINE FUEL FLOW in pounds per hour, FUEL USED, in pounds, for each engine, and the combined burn rate and total fuel consumption. Direct entries are not allowed.

To review the FUEL FLOW and FUEL used:

1. Push the NEXT PAGE or PREV PAGE key as necessary to show FUEL MGMT page 2/3.

PERF TRIP

FUEL MGMT page 3/3 is the PERF TRIP page. This page shows the TOTAL FUEL FLOW, FUEL REQ, ETE, and GND SPD. On this page, you can make fuel calculations from the present position (PPOS) of the airplane to a specified waypoint, a specified distance, or from one specific waypoint to another. You may also modify fuel flow and ground speed to determine fuel requirements and/or time to the specified point or distance.

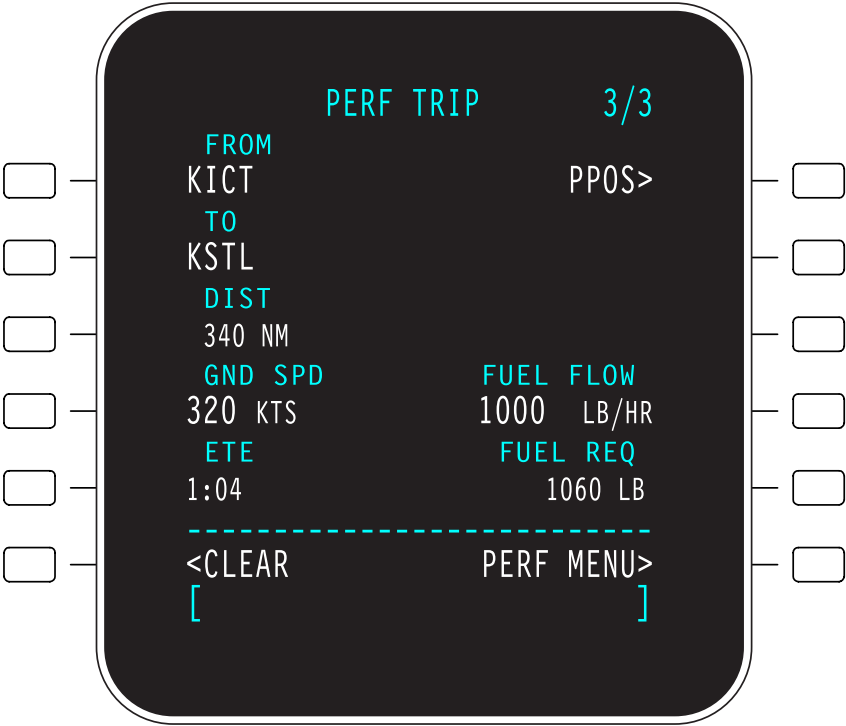
To use the PERF TRIP page to make fuel or time calculations:

1. From a FUEL MGMT page, push the PREV PAGE or NEXT PAGE key as necessary to show the PERF TRIP page.
2. Use the scratchpad to enter either FROM and TO waypoints, or push the PPOS line select key to enter the airplane's present position as the FROM waypoint (shown as a lat/long position), and enter a TO waypoint or distance.
3. Use the line select keys to transfer the entries to the appropriate data lines in the calculator.

NOTE

Repeat steps 2 and 3 as necessary to enter additional information, such as fuel flow and ground speed, or press the CLEAR line select key to reset the page.

TYPICAL PERF TRIP PAGE



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ADDENDUM 1
To
Collins FMS-4200
Flight Management System Pilot's Guide

Part Number 523-0778363-002117, 2nd Edition
Dated 15 December 1999

Insert this addendum sheet facing page 5-35.

The text on page 5-35 is changed to read as follows:

VNAV PLAN SPEED

On the PERF MENU page, the VNAV PLAN SPD shows the most restrictive of any one of the speeds listed below:

- A climb or descent speed constraint set on the ACT LEGS page
- A SPD/ALT LIMIT set on the ACT VNAV CLIMB or DESCENT pages
- A TGT SPEED for the current phase of flight as specified on the ACT VNAV CLIMB, CRUISE, or DESCENT pages
- A decelerating speed when approaching a lower speed limit
- A V_{MO}/M_{MO} .

Climb speed limits are indicated with up () arrows and descent speed limits are indicated with down () arrows on the ACT LEGS pages.

Climb speed limits on waypoints apply before passing the waypoint. If the climb speed limit is no longer appropriate, it may be deleted on the ACT/MOD LEGS page. Speed limits on holding patterns apply to the holding pattern leg only.

Descent speed limits on waypoints on the ACT LEGS pages apply after passing the waypoints. If the descent speed limit is no longer appropriate after the waypoint has been sequenced, it may be deleted on the ACT/MOD LEGS page.

VNAV PLAN SPEED

On the PERF MENU page, the VNAV PLAN SPD shows the most restrictive of any one of the speeds listed below:

- A climb or descent speed constraint set on the ACT LEGS page
- A SPD/ALT LIMIT set on the ACT VNAV CLIMB or DESCENT pages
- A TGT SPEED for the current phase of flight as specified on the ACT VNAV CLIMB, CRUISE, or DESCENT pages
- A decelerating speed when approaching a lower speed limit
- A V_{MO}/M_{MO} .

When VNAV PLAN SPD is in use, the manner in which the FMS sets the speed bug depends on whether it sequences to a waypoint that requires an increase in speed during a climb, or one that requires a decrease in speed during a descent. When sequencing to a waypoint with a speed requirement higher than the previous waypoint's speed, the FMS immediately sets the speed bug to the higher speed. When sequencing to a waypoint with a speed requirement lower than the previous waypoint's speed, the FMS smoothly sets the speed bug to the lower speed, timed so the airplane arrives at the lower speed approximately 3 NM before reaching that waypoint. In both the climb and descent phases, the FMS uses the most restrictive speed from the ACT LEGS page, SPD/ALT LIMITS, TGT SPEED, or V_{MO}/M_{MO} for the current phase of flight.

Climb speed limits are indicated with up (↑) arrows and descent speed limits are indicated with down (↓) arrows on the ACT LEGS pages.

Climb speed limits on waypoints apply before passing the waypoint. If the climb speed limit is no longer appropriate, it may be deleted on the ACT/MOD LEGS page. Speed limits on holding patterns apply to the holding pattern leg only.

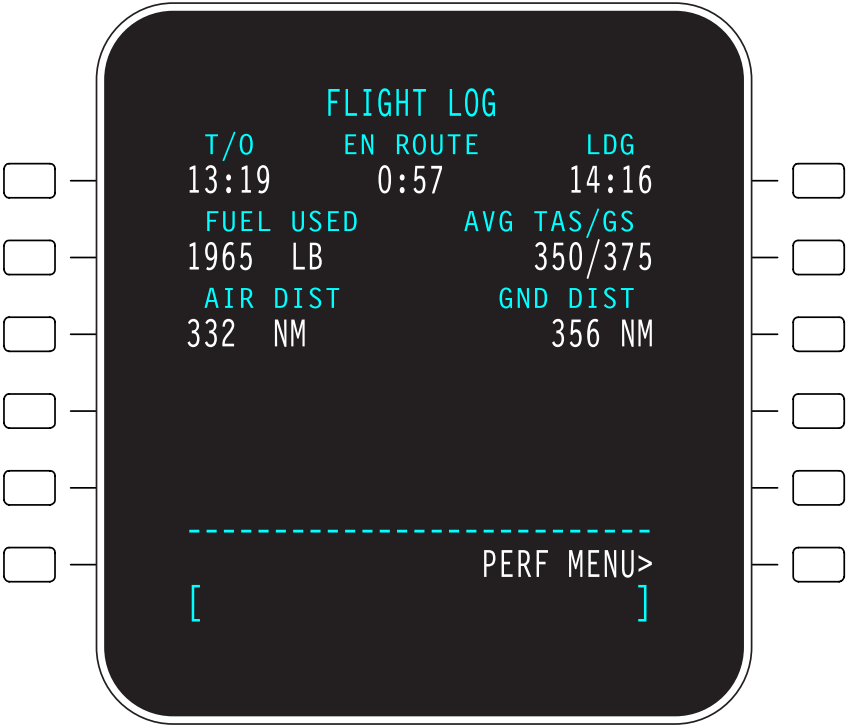
Descent speed limits on waypoints on the ACT LEGS pages apply after passing the waypoints. If the descent speed limit is no longer appropriate after the waypoint has been sequenced, it may be removed by entering DELETE in the scratchpad with the DEL key, then pressing the RESUME VNAV PLAN SPD line select key on the PERF MENU page.

Flight Log

To review the FLIGHT LOG page:

1. Push the PERF key to show the PERF MENU page
2. Push the FLT LOG line select key on the PERF INIT page to show the FLIGHT LOG page.

FLIGHT LOG PAGE



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DEPARTURE

This chapter includes some of the functions likely to be used during the departure phase of flight. With the exception of RWY UPDATE, these functions can also be used in other phases of flight as well.

Setup

To configure your airplane to use FMS as the navigation source for a departure and for other phases of flight, you must select FMS as the NAV source as indicated on the PFD. Also, depending on the equipment installed in the airplane, you may want to update the position of the FMS to the runway threshold before departure to get the most accurate navigation data during and after takeoff. To update the FMS position, use the RWY UPDATE function on the ACT/MOD LEGS page on the CDU, or in some installations, the TOGA button.

NAV Source

1. Set FMS as the active NAV source.

RWY UPDATE

The RWY UPDATE prompt shows on the ACT LEGS page when a departure runway is included in the flight plan and the airplane is on the ground. The LEGS key shows the ACT LEGS page.

Depending on which source was used for initializing the position, the FMS provides greater navigation accuracy during takeoff and climb-out when its position is updated at the runway threshold just before takeoff.

NOTE

If GPS data is available to the FMS, it is not necessary to do a RWY UPDATE to improve navigation accuracy.

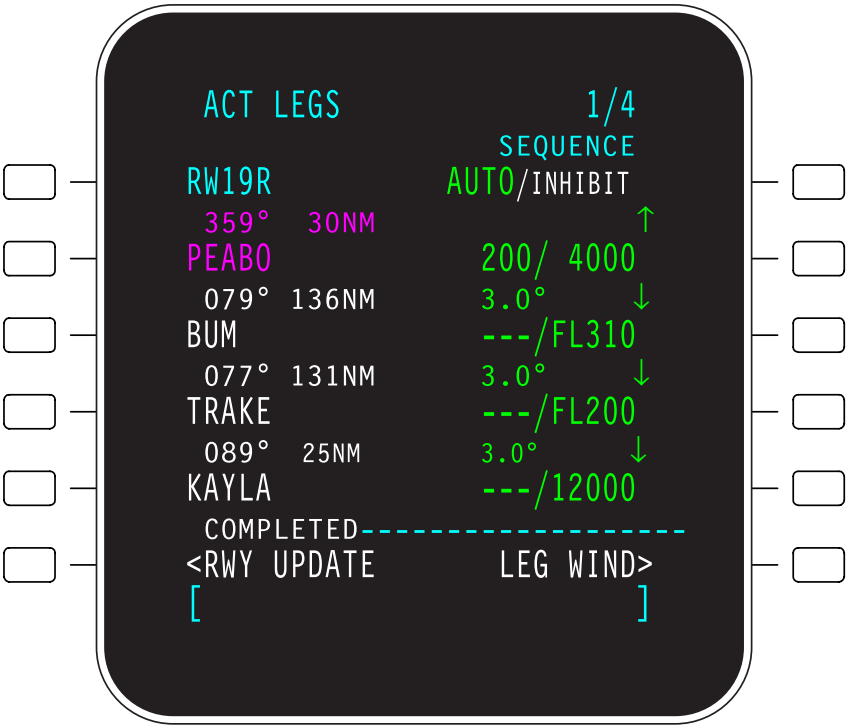
NOTE

The TOGA button also initiates a runway update in some installations.

To update the FMS position to the runway threshold coordinates:

1. Push the LEGS key to show the ACT LEGS page.
2. Push the RWY UPDATE line select key to update the FMS to the departure runway threshold coordinates. When the position update is complete, the annunciation "COMPLETED" shows above RWY UPDATE on the CDU that issued the runway update request.

RUNWAY UPDATE COMPLETE



Flight Control System

To use the FMS steering commands provided for the flight control system to laterally guide the airplane along the ACT FPLN route:

1. Verify/Set FMS as the NAV source.
2. Select the NAV mode on the autopilot flight control panel.

This page intentionally left blank.

Direct-To

You can select a Direct-To waypoint by using the DIR key or from the LEGS page. Once a Direct-To waypoint is selected, the FMS gives steering commands to the flight control system to fly directly to that waypoint.

DIR Key

The DIR key shows the ACT DIRECT-TO page. From this page, you can page forward (NEXT key) to see the down track waypoints, or you can page backward (PREV key) to review the waypoint history. The annunciation "HISTORY" shows at the top of the page just below the title line when a DIRECT-TO HISTORY page shows on the CDU.

To select a Direct-To leg using the DIR key:

1. Push the DIR key to show the ACT DIRECT-TO page.

NOTE

The ACT DIRECT-TO page may consist of several pages. To find a waypoint that is part of the active flight plan, but not shown on the current page, push the NEXT or PREV key as necessary to show the desired waypoint.

2. Push the line select key next to the identifier of the waypoint that you intend to fly Direct-To.

NOTE

Many SIDs and STARs contain conditional waypoints that have no fixed geographical location, such as a heading to an altitude leg or a vectors leg. Although these types of waypoints show on the ACT DIRECT TO page, they cannot be selected for DIRECT-TO navigation.

NOTE

To intercept and fly a specific course to the Direct-To waypoint, enter the course into the scratchpad, then transfer it to the INTC CRS line on the MOD LEGS page before executing the modified flight plan.

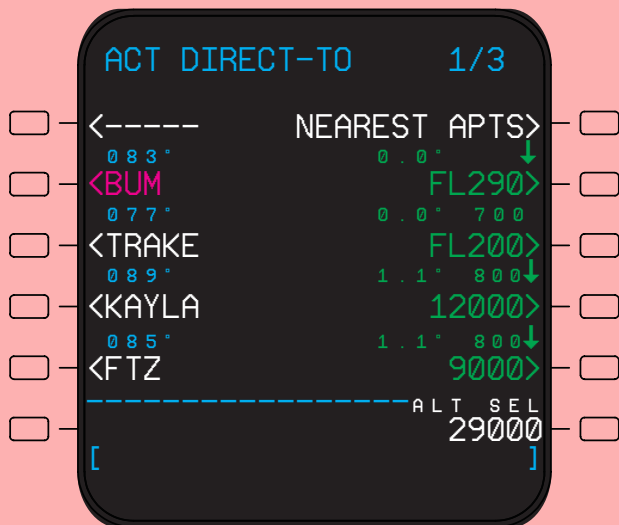
3. Verify the flight plan change on the MFD and CDU, then push the EXEC key to execute the modified flight plan.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

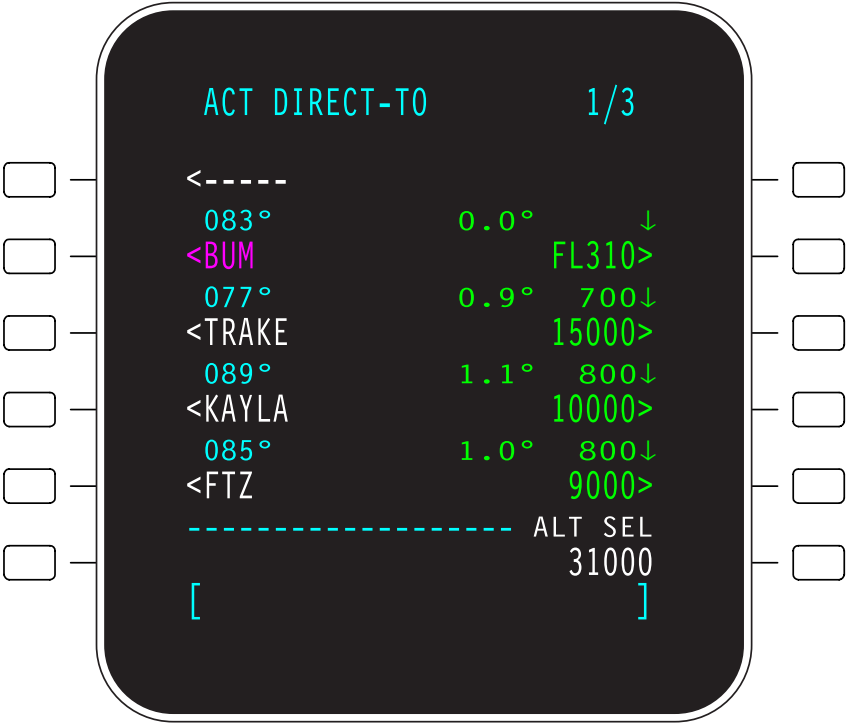
Insert this addendum sheet facing page 6-7

The illustration below replaces the illustration on the page.



TPG6057_06

ACT DIRECT-TO PAGE
(SELECTED WITH DIR INTG KEY)



ACT LEGS Page

To create a Direct-To on the ACT LEGS page, change the current TO waypoint to the waypoint to which you want to go direct. You can use an existing down-track waypoint in the current flight plan or any other valid waypoint.

To go Direct-To a waypoint using the LEGS page:

1. Push the LEGS key to show the ACT/MOD LEGS page.

NOTE

The ACT LEGS page may consist of several pages. To find a waypoint that is part of the active flight plan, but not shown on the current page, push the NEXT or PREV key as necessary to show the desired waypoint.

2. Enter a waypoint into the scratchpad by either pushing the line select key next to the identifier of the waypoint that you intend to fly Direct-To, or by manually entering the waypoint identifier with the keypad.

NOTE

When you select a down track waypoint as your Direct-To waypoint, any waypoints on the flight plan between your current waypoint and the selected waypoint will be deleted when the Direct-To waypoint is transferred from the scratchpad to the TO waypoint line. However, the FMS will store the intermediate waypoints in the DIRECT-TO history, and the intermediate waypoints are still available for use if the pilot accesses the DIRECT-TO history pages.

3. Push the line select key next to the current TO waypoint (shown in magenta on ACT/MOD LEGS page 1) to move the waypoint from the scratchpad to the TO waypoint display line.

NOTE

To intercept and fly a specific course to the Direct-To waypoint, enter the course into the scratchpad, then transfer it to the INTC CRS line on the MOD LEGS page before executing the modified flight plan.

4. Verify the flight plan change on the MFD and CDU, then push the EXEC key to execute the modified flight plan.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
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Insert this addendum sheet facing page 6-8

The following information is added to the guide before the heading **ACT LEGS Page**.

Direct-To NEAREST AIRPORTS

The NEAREST APTS> prompt shows on the ACT DIRECT-TO page. Pushing the line select key next to the NEAREST APTS> selection shows the NEAREST AIRPORTS page on the CDU. The NEAREST AIRPORTS page shows a list of five airports that normally included the origin and destination airports, as well as the three nearest airports. The airports are listed by the ICAO identification code, and are arranged by distance from the present position of the aircraft. The pilot may select a course either direct to the airport reference point, or to the longest runway at the selected airport. The NEAREST AIRPORTS page has a page refresh feature (UPDATE AIRPORTS>) that updates the page using the current position of the aircraft.

To select a Direct-To Nearest Airport course:

1. Push the DIR INTC key to show the ACT DIRECT-TO page.
2. Push the NEAREST AIRPORTS line select key to show the NEAREST AIRPORTS page.
3. Push a line select key for the desired airport:
 - Pushing the airport ICAO line select key causes the FMS to compute a course direct to the airport reference point.
 - Pushing the runway line select key causes the FMS to compute a course direct to the longest runway at the airport for a visual approach.
4. The FMS shows the MOD LEGS page with the course and distance to the selected airport.
 - If the airport reference point was selected, the MOD LEGS page shows the course and distance to the airport reference point.
 - If the longest runway was selected, the MOD LEGS page shows the course and distance to the runway extension point, along with the VNAV constraint associated with the visual approach point, followed by the selected runway as a visual approach procedure.

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NOTE

To intercept and fly a specific course to the airport reference point or the runway extension point, enter the course into the scratchpad, then transfer it to the INTC CRS line on the MOD LEGS page before executing the modified flight plan.

NEAREST AIRPORTS PAGE

NEAREST AIRPORTS			
☐	1 6 0 ° / 2 7	0 : 0 4 9 8 5 9 LB	☐
☐	<KNVP	5900FT RW02>	☐
☐	3 6 0 ° / 3 7	0 : 0 6 9 8 2 9 LB	☐
☐	<KGVW	8700FT RW01>	☐
☐	3 3 5 ° / 3 9	0 : 0 6 9 8 2 9 LB	☐
☐	<KIXD	7340FT RW17>	☐
☐	2 2 5 ° / 1 5 0	0 : 2 2 9 5 5 9 LB	☐
☐	<KICT	10300FT RW01L>	☐
☐	0 7 5 ° / 1 9 2	0 : 2 9 9 4 4 4 LB	☐
☐	<KSTL	10570FT RW12R>	☐
☐	-----UPDATE		☐
	AIRPORTS>		☐
	[	]	

TPG6057_07

5. Verify the flight plan change on the MFD and CDU, then push the EXEC key to execute the modified flight plan.

NOTE

If the Direct-To course is to the airport reference point, no STAR or runway associated with the selected airport shows in the new flight plan. There are also no VNAV constraints associated with the selected Direct-To in the new flight plan.

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
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NOTE

The NEAREST AIRPORTS function replaces all the waypoints remaining in the active flight plan with only the selected nearest airport or visual approach for the selected nearest airport. After a Direct-To the nearest airport is executed with the EXEC function key, all of the replaced waypoints are permanently deleted from the active flight plan.

DIRECT-TO ON LEGS PAGE

MOD LEGS

RW19R

069° 136NM

BUM

077° 131NM

TRAKE

089° 25NM

KAYLA

085° 11NM

FTZ

<CANCEL MOD

[

1/4

SEQUENCE

AUTO/INHIBIT

3.0° ↓

---/FL310

3.0° ↓

---/FL200

3.0° ↓

---/12000

1.7° ↓

---/ 9000

INTC CRS

069°>

EXEC

From Waypoint Edit

By changing the FROM waypoint (shown on the LEGS page above the TO waypoint) you can establish the leg from that waypoint to the next waypoint as the active leg. This "Direct-From" edit allows the pilot to set a radar vector/heading leg to intercept a specified flight plan leg. The FMS will then arm to intercept the route and fly the new course to the TO waypoint.

A FROM waypoint edit is done from the LEGS page. The LEGS key shows the ACT/MOD LEGS page.

To edit the FROM waypoint:

1. Push the LEGS key to show the LEGS page.
2. Enter the FROM waypoint into the scratchpad.

NOTE

The top waypoint in cyan on LEGS page 1 is the FROM waypoint.

3. Push the FROM waypoint line select key to transfer the waypoint from the scratchpad to the FROM waypoint display line.
4. Verify the flight plan change on the CDU and MFD, then push the EXEC key to execute the modified flight plan.

NOTE

When you select a down track waypoint as your new FROM waypoint, any waypoints on the flight plan between your current FROM waypoint and the selected waypoint will be deleted when the Direct-From waypoint is transferred from the scratchpad to the FROM waypoint line.

FROM WAYPOINT HAS BEEN
CHANGED FROM PEABO TO ICT

MOD

LEGS

1/4

SEQUENCE

AUTO/INHIBIT

ICT

069° 95NM

BUM

077° 131NM

TRAKE

089° 25NM

KAYLA

085° 11NM

FTZ

<CANCEL MOD

LEG WIND>

[

EXEC

]

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EN ROUTE

This chapter shows how to insert a hold into a flight plan, modify a holding pattern, and exit a holding pattern. In addition, it describes how to update the FMS and IRS positions while en route. Some of the procedures in the FLIGHT PLANNING and DEPARTURE chapters, such as inserting or deleting waypoints and Direct-To functions, may also be used for en route changes to a flight plan. However, descriptions for operation of these functions are not repeated in this chapter.

Holds

Pushing the HOLD key shows the ACT LEGS page with the HOLD AT prompt at the bottom of the page if there are no holds in the flight plan. If one hold exists in the flight plan, the ACT FPLN HOLD page for the hold shows when the HOLD key is pushed. If two or more holds already exist, the ACT HOLD LIST page shows when HOLD is selected.

A flight plan can have up to six holds. Each hold can be set up at a waypoint on the flight plan, at a waypoint off the flight plan, or at the airplane's present position. A hold can be defined with an inbound course and turn direction, or a quadrant and a radial, either from a navaid or from the point on which the hold is defined.

The following examples show valid entries for inbound course and turn direction:

- CRS/R (275/R)
- CRS/L (318/L)
- CRST/R (182T/R)
- CRST/L (090T/L)

CRS = Inbound Course T = True
L = Left turns R = Right turns

The following examples show valid quadrant and radial entries:

- X/YYY (S/185)
- XX/YYY (NE/017)

X and XX = N, NE, E, SE, S, SW, W, or NW
YYY = Three digit radial

The QUAD/RADIAL is only used if you are cleared to hold in a particular cardinal direction (quadrant) from a specified fix defined off a VOR radial. When QUAD/RADIAL is entered, the FMS automatically computes the inbound course for the hold. Depending on the radial, the resulting inbound course may be a reciprocal heading of the radial. The QUAD/RADIAL entry **never** determines the direction of turn of the hold itself.

Flight Plan Waypoint

To add a hold to the flight plan at a waypoint on the flight plan:

1. Push the HOLD key.

NOTE

When the HOLD key is pushed, one of three pages appears, depending on the number of holds in the flight plan. If no holds exist, the ACT LEGS page with the HOLD AT prompt appears. If only one hold exists, the ACT FPLN HOLD page for that hold appears. If two or more holds exist, the ACT HOLD LIST page shows. This page shows all holds currently in the flight plan. Missed approach and alternate flight plan holds are identified as such on the ACT HOLD LIST page. From either the ACT HOLD LIST page or the ACT FPLN HOLD page, push the NEW HOLD line select key to show the ACT LEGS page with the HOLD AT prompt.

2. If either the ACT FPLN HOLD page or the ACT HOLD LIST page is showing, push the NEW HOLD line select key.
3. Push the left side line select key of the waypoint for the hold to copy the waypoint to the scratchpad.

NOTE

The ACT LEGS usually consists of several pages. Push the NEXT PAGE or PREV PAGE key as necessary to show the desired waypoint on the CDU.

4. Push the line select key for the HOLD AT prompt to move the waypoint from the scratchpad to HOLD AT prompt.
5. Verify the flight plan change on the MFD and on the CDU, then push the EXEC key to execute the modified flight plan.

NOTE

The following step is added to return the CDU to the LEGS page so you can see the hold as it is shown there. You can remain on the ACT/MOD FPLN HOLD page, or select any other function.

6. Push the LEGS key to return to the ACT LEGS page.

ACT LEGS PAGE
WITH HOLD AT PROMPT



Off-Flight Plan Waypoint

To add a hold to the flight plan at a waypoint that is **NOT** on the flight plan:

1. Push the HOLD key.

NOTE

When the HOLD key is pushed, one of three pages appears, depending on the number of holds in the flight plan. If no holds exist, the ACT LEGS page with the HOLD AT prompt appears. If only one hold exists, the ACT FPLN HOLD page for that hold appears. If two or more holds exist, the ACT HOLD LIST page shows. This page shows all holds currently in the flight plan. Missed approach and alternate flight plan holds are identified as such on the ACT HOLD LIST page. From either the ACT HOLD LIST page or the ACT FPLN HOLD page, push the NEW HOLD line select key to show the ACT LEGS page with the HOLD AT prompt.

2. If either the ACT FPLN HOLD page or the ACT HOLD LIST page is showing, push the NEW HOLD line select key.
3. Enter the waypoint identifier of the desired holding fix into the scratchpad.
4. Push the line select key for the HOLD AT prompt to move the waypoint from the scratchpad to the prompt (HOLD AT [IDENT] shows in scratchpad).
5. Push the line select key of the waypoint that the HOLD is to precede.
6. Verify the flight plan change on the MFD and on the CDU, then push the EXEC key to execute the modified flight plan

NOTE

The following step is added to return the CDU back to the LEGS page so you can see the hold as it is shown there. You can remain on the ACT/MOD FPLN HOLD page, or select any other function.

7. Push the LEGS key to return to the ACT LEGS page.

ACT LEGS PAGE WITH HOLD AT
OFF FLIGHT PLAN WAYPOINT



Present Position

The HOLD AT prompt shows at the bottom of the ACT LEGS page when the HOLD key (depending on whether or not there is a hold already in the flight plan) or NEW HOLD line select key is pressed. When the airplane is airborne, there are two HOLD AT selections: a waypoint entry prompt on the left side and a present position (PPOS) line key selection on the right side. The PPOS line select key selects the airplane's current position as the holding fix.

To initiate a hold at the airplane's present position:

1. Push the HOLD key.

NOTE

When the HOLD key is pushed, one of three pages appears, depending on the number of holds in the flight plan. If no holds exist, the ACT LEGS page with the HOLD AT prompt appears. If only one hold exists, the ACT FPLN HOLD page for that hold appears. If two or more holds exist, the ACT HOLD LIST page shows. This page shows all holds currently in the flight plan. Missed approach and alternate flight plan holds are identified as such on the ACT HOLD LIST page. From either the ACT HOLD LIST page or the ACT FPLN HOLD page, push the NEW HOLD line select key to show the ACT LEGS page with the HOLD AT prompt.

2. If either the ACT FPLN HOLD page or the ACT HOLD LIST page is showing, push the NEW HOLD line select key.
3. Push the PPOS line select key to show the HOLD page with the present position as the holding fix (PPOS).

NOTE

Present position holds are inbound on the current heading with right hand turns and leg lengths of 1.0 or 1.5 minutes, depending on the altitude. However, both the turn direction and length of a present position hold can be changed as necessary.

4. Verify the flight plan change on the MFD and on the CDU, then push the EXEC key to execute the modified flight plan

NOTE

If LNAV is active, when you push the EXEC key, the FMS will immediately begin steering the airplane to hold at the airplane's present position.

ACT LEGS PAGE WITH HOLD
AT PRESENT POSITION



This page intentionally left blank.

Modify

When a hold already exists in the flight plan, pushing the HOLD key shows the ACT FPLN HOLD page for the existing hold. If the flight plan has two or more holds within it, pushing the HOLD key shows the ACT HOLD LIST page. The following procedure modifies the various elements of an existing hold. You can modify each element of a hold individually, or in any combination, in any order. You can also modify a hold at the time it is created before executing the flight plan change.

To modify an existing hold:

1. Push the HOLD key to show either the ACT FPLN HOLD page or the ACT HOLD LIST page.

NOTE

The ACT HOLD LIST page shows all holds currently in the flight plan. Missed approach procedure holds and holds in the alternate flight plan are identified as such on the ACT HOLD LIST page.

2. If the ACT HOLD LIST page is showing, push the line select key for the desired hold to be modified to display the ACT FPLN HOLD page.
3. To change the inbound course and direction of turn of a hold, or quadrant and radial, enter the appropriate information into the scratchpad.
4. Push the appropriate line select key to enter the information from the scratchpad.

The QUAD/RADIAL is used only if you are cleared to hold in a particular cardinal direction (quadrant) from a specified fix defined off a VOR radial. When QUAD/RADIAL is entered, the FMS automatically computes the inbound course for the hold. Depending on the direction of the hold off the fix, the resulting inbound course may be a reciprocal heading of the radial. For example, if you are holding NW of a fix on a 290° radial from a VOR station, the hold inbound course would be 110°. The QUAD/RADIAL entry **never** determines the direction of turn of the hold itself. Standard holding pattern turns are to the right; non-standard holding instructions (i.e., left turns) will be issued by the controlling authority.

NOTE

The inbound course of a hold in progress cannot be changed.

5. Push the appropriate line select key to enter the information from the scratchpad.

6. To change a time-based leg to a distance-based leg, enter the distance into the scratchpad.

NOTE

A leg time or leg distance modified from the defaults provided by the FMS shows in large size text

7. Push the LEG DIST line select key to move the leg distance from the scratchpad to the LEG DIST entry line.
8. To change or enter the Expect Further Clearance (EFC) time, enter the time into the scratchpad.

NOTE

Entering EFC time is optional; the modified hold may be executed without the EFC time.

9. Push the EFC TIME line select key to move the time from the scratchpad to the EFC TIME entry line.
10. Verify the flight plan change on the MFD and on the CDU, then push the EXEC key to execute the modified flight plan.

NOTE

The MAX KIAS or MACH speed setting is the default speed limit for the hold; it also shows on the LEGS page as a speed constraint for the holding waypoint, unless a SID, STAR, or approach procedure specified a speed limit for the hold. The speed can be changed on the LEGS page, but not on the HOLD page. The speed setting allows the FMS to generate a "CHECK SPEED" message two minutes before reaching the holding fix if the airplane's airspeed is above the prescribed limit. The size of the holding pattern is based on either the airplane's true airspeed or MAX KIAS, whichever is lower, when the airplane crossed the holding fix.

NOTE

To modify or view the hold data for another existing hold from the ACT/MOD FPLN HOLD page, push the NEXT PAGE or PREV PAGE key to show the appropriate ACT FPLN HOLD page. This allows you to bypass the ACT HOLD LIST page when modifying or viewing more than one existing hold.

MOD FPLN HOLD PAGE

	MOD FPLN HOLD	1/2	
	FIX ENTRY		
☐	ELSTO DIRECT	FAA/IACO	☐
	QUAD/RADIAL	MAX KIAS	
☐	NW/290°	265	☐
	INBD CRS/DIR	FIX ETA	
☐	110°/R TURN	13:52	☐
	LEG TIME	EFC TIME	
☐	1.5 MIN	14:04	☐
	LEG DIST		
☐	10.2 NM	NEW HOLD>	☐

☐	<CANCEL MOD		☐
	[	]	
		EXEC	

HOLD Entry

Once a hold has been entered into the flight plan, the FMS automatically enters the holding pattern upon reaching the holding fix. For a more detailed description of flying holding patterns, see the Holding Patterns section of PRINCIPLES OF FMS NAVIGATION in this Pilot's Guide.

HOLD Exit

You can initiate a hold exit from either the ACT LEGS page or the ACT FPLN HOLD page. To exit holding, arm the FMS for the exit, then execute the flight plan change. The FMS steers the airplane to exit the hold in one of three ways:

- If the airplane is already on the inbound turn or inbound leg of the hold, the FMS will steer the airplane along the existing holding track to exit the hold.
- If the airplane is on the outbound turn, the FMS will continue the turn through the outbound leg heading and back to the holding fix.
- If the airplane is on the outbound leg of the hold, the FMS will start an immediate turn to the inbound leg to exit the hold.

The FMS-calculated exit path will show on the MFD map.

To exit holding from the ACT LEGS page:

1. Push the EXIT HOLD line select key.
2. Push the EXEC key to execute the change and exit the holding pattern.

NOTE

Course reversal holds that commonly appear in approach transitions are automatically armed for exit once the airplane is established in the hold. However, the exit may be cancelled by the pilot before reaching the final course intercept point.

HOLDING WITH EXIT ARMED

MOD

LEGS

ELSTO

HOLD AT

ELSTO

070° 29NM

TRAKE

089° 25NM

KAYLA

085° 11NM

FTZ

-----EXIT

<CANCEL EXIT

[

1/4

SEQUENCE

AUTO/INHIBIT

3.0° ↓

---/FL310

3.0° ↓

---/FL310

265/-----

1.7° ↓

---/ 9000

ARMED-----

LEG WIND>

]

EXEC

To exit a hold from the ACT FPLN HOLD page:

1. Push the EXIT HOLD line select key.
2. Push the EXEC key to execute the change and exit the holding pattern.

NOTE

Course reversal holds that commonly appear in approach transitions are automatically armed for exit once the airplane is established in the hold. However, the exit may be cancelled by the pilot before reaching the final course intercept point.

EXIT HOLDING FROM
ACT FPLN HOLD PAGE

ACT FPLN HOLD

FIX ENTRY

ELSTO DIRECT

QUAD/RADIAL

NW/290°

INBD CRS/DIR

110°/R TURN

LEG TIME

1.5 MIN

LEG DIST

10.2 NM

[

1/2

MAX KIAS

265

FIX ETA

13:52

EFC TIME

14:04

NEW HOLD>

EXIT HOLD>

]

Cancel An Exit

You can cancel a holding exit at any time or any point around the holding pattern before crossing the holding fix for the exit. However, exit from course reversal holds used in instrument approach procedures may only be cancelled before sequencing to the inbound course INTC waypoint. The FMS steers the airplane to continue the hold in one of three ways:

- If an outbound turn is in progress, the FMS will complete the turn to the outbound leg and continue the hold.
- If an inbound turn is in progress, the FMS will complete the turn to the inbound leg and continue the hold.
- If you are on the inbound leg, the FMS will continue the hold as if exit was never selected.

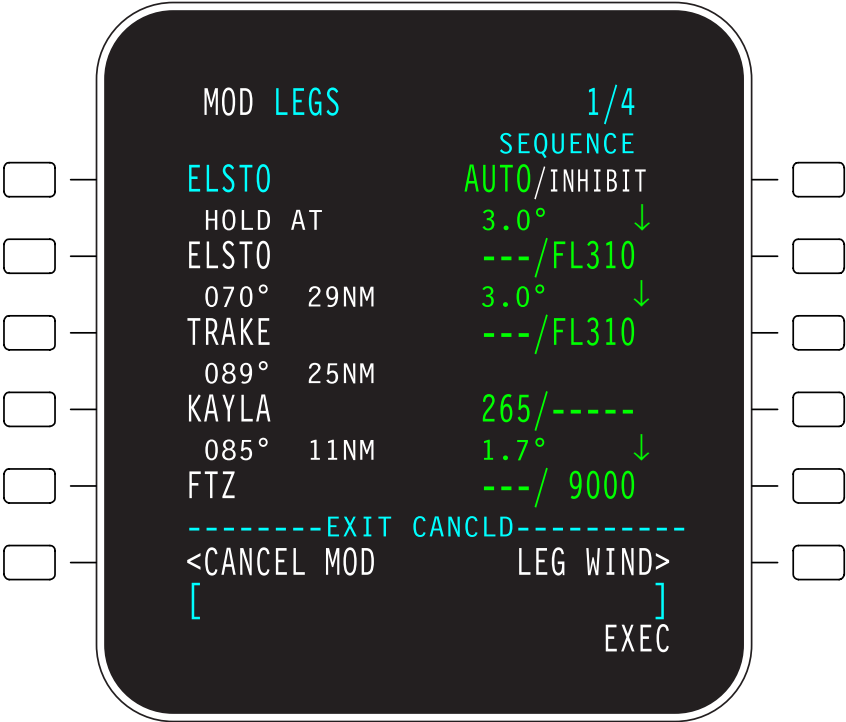
To cancel a holding exit:

1. Push the LEGS key to show the ACT LEGS page.
2. Push the CANCEL EXIT line select key to cancel the hold exit.
3. Push the EXEC key to execute the change and remain in the hold.

NOTE

You may also select CANCEL EXIT from the ACT FPLN HOLD page.
--

CANCEL EXIT HOLDING



Pilot-Defined Waypoints

Pilot-defined waypoints can be created on the ACT/MOD FPLN or LEGS pages, or on the DEFINE PILOT WPT page where they may also be stored/saved for recall from the PILOT WPT LIST page.

You can define a waypoint in one of five ways:

- Along-Track Offset — A waypoint offset a specified distance that either precedes or follows a specified existing waypoint on your flight plan route.
- PLACE BRG/DIST — A waypoint defined as a bearing and distance from another waypoint.
- PLACE BRG/PLACE BRG — A waypoint defined as the intersection created by bearings from two different waypoints.
- LATITUDE and LONGITUDE — A waypoint defined by latitude and longitude.
- Shorthand LATITUDE and LONGITUDE — A waypoint defined by shorthand (hemispheric) latitude and longitude.

NOTE

Up to 100 pilot-defined waypoints can be stored in the FMS with no more than 50 in any one flight plan.

Pilot-defined waypoints may be stored with or without a name assigned by the pilot. If you do assign a name to a pilot-defined waypoint on the ACT/MOD FPLN or LEGS pages, the waypoint name will be saved in the PILOT WPT LIST. If the waypoint name already exists in the PILOT WPT LIST, the prompt "WPT ALREADY EXISTS <REPLACE, CANCEL>" will appear. If you select the <REPLACE option, the new waypoint definition replaces the old one in the PILOT WPT LIST. If you select CANCEL, or do not make a choice, the original definition remains in the PILOT WPT LIST and the flight plan is not updated.

FPLN/LEGS Pages

You can define a waypoint from the FPLN or LEGS page by entering the waypoint data into the scratchpad and transferring it to the appropriate data line. There are five formats for defining a waypoint and a description of each follows the procedure example.

To enter a pilot-defined waypoint into a flight plan from the FPLN or LEGS page:

1. Select the desired entry page.
2. Enter the waypoint definition into the scratchpad.
3. Push the line select key at the location in the flight plan where you want to enter the waypoint.
4. Verify the flight plan change on the CDU and MFD, then push the EXEC key to execute the flight plan change.

Along-Track Offset

Definition of an along-track offset waypoint is based on an existing waypoint in the flight plan. By definition, the waypoint must be along the route of flight, not off-track. The entry format is [IDENT/DIST]. IDENT is the name of the waypoint on which the offset waypoint is based. DIST is the distance from the base waypoint. A positive value for distance inserts the along-track offset waypoint down-track from the base waypoint in the flight plan; a negative distance value inserts it before the base waypoint in the flight plan. The distance cannot be less than the length of the leg from the new waypoint to the following waypoint, or less than the distance from the airplane's current position to the new waypoint.

You can also add your own specific name to the waypoint using this format: [IDENT]/[DIST]/[NAME]. If you add a name to the waypoint, the FMS will automatically store the waypoint in the PILOT WPT LIST. Some examples of along-track offset waypoint entries include: CID/10, DSM/-11.5, ALO/-25/PDL, DBQ/4.5/MYWPT, etc.

ALONG TRACK OFFSET WPT
WITH PILOT-ASSIGNED NAME

ACT LEGS

1/4

SEQUENCE

PEABO

079° 75NM

BUM

077° 131NM

TRAKE

089° 25NM

KAYLA

085° 11NM

FTZ

<LEG DATA

LEG WIND>

[BUM/-35/PUDDY]

PLACE BRG/DIST

Definition of a PLACE BRG/DIST waypoint is based on any valid geographically-fixed point to include:

- Navaids
- En route intersections
- Non-directional beacons
- Airports
- Runway threshold of the origin, destination, or alternate airport
- Terminal waypoints of the origin, destination, or alternate airport
- Pilot-defined waypoints (except those defined with shorthand lat/long)

The scratchpad entry format is: [IDENT][BRG]/[DIST] with the base waypoint's identifier for IDENT, a numeric value for BRG, a slash, and a numeric value for DIST (i.e., CME025/7, TCS360/105, TAGGS275.3T/15.5, etc.)

All bearings are based on:

- Zero degree radial for a VOR
- North datum for an airport
- Magnetic North for all other navaids or facilities between North 73 degrees latitude and South 60 degrees latitude
- True north for all other navaids or facilities above North 73 degrees and below South 60 degrees latitude.

NOTE

To force the bearing to True north, add the letter "T" as a suffix to the BRG.

There are a few specific requirements for a BRG entry: it must be a three digit number (or four digits with a decimal point for tenths of a degree); all leading zeros must be entered (i.e., 005, 040, 007.1, 055.2T, etc.); and 000 or 360 can be used for North. However, the FMS always shows North as 360.

Distance entries must be between 0.1 and 199.9 NM. A leading zero must be used for a distance of less than 1 NM.

You can add your own name for a PLACE BRG/DIST waypoint using the following format: [IDENT][BRG]/[DIST]/[NAME]. If you do not specify a name, the FMS will use the base waypoint identifier with a number added as a suffix to give it a unique name in the flight plan.

PLACE BRG/DIST WPT
WITH PILOT-ASSIGNED NAME

ACT LEGS

1/4

SEQUENCE

PEABO

079° 75NM

BUM

077°M131NM

TRAKE

089°M 25NM

KAYLA

085° 11NM

FTZ

<LEG DATA

[SGF025/72/ITAUT

LEG WIND>

]

PLACE BRG/PLACE BRG

You can define PLACE BRG/PLACE BRG waypoints using the same criteria, with the addition of runway extensions for the destination airport, for defining PLACE BRG/DIST waypoints. The scratchpad entry format is: [IDENT][BRG]/[IDENT][BRG] with the waypoint's identifier as the IDENT and a numeric value for BRG. Bearing and distance entry formats and references are the same as those previously described for PLACE BRG/DIST waypoints.

For PLACE BRG/PLACE BRG waypoints, the FMS uses the first waypoint and bearing entry as the base waypoint. The second waypoint and bearing are used to determine the intersection point of the specified bearings. The FMS then converts the intersection into a PLACE BRG/DIST waypoint based on the first waypoint. You can see this by copying the waypoint from the flight plan (once you have entered it into the flight plan) back into the scratchpad.

PLACE BRG/DIST WPT
WITH PILOT-ASSIGNED NAME

ACT LEGS

1/4

SEQUENCE

PEABO

079° 75NM

BUM

077° 131NM

TRAKE

089° 25NM

KAYLA

085° 11NM

FTZ

<LEG DATA

LEG WIND>

[SGF025/MKC125/ITAWA]

LATITUDE and LONGITUDE

You can define a waypoint using latitude and longitude with the following scratchpad entry format: [(N or S)DDMM.MM(W or E)DDDMM.MM]. The hemisphere designation (N/S, E/W) must always precede the coordinates, and coordinates are entered using a standard of four (for latitude) and five (for longitude) digits. If waypoint coordinates are in whole degrees of either latitude or longitude (or both), you need not enter the minutes (e.g., N40, S09, W030, E042). Degrees of longitude must always be expressed in three digits. If you enter minutes, you must use two numbers before a decimal point; if you enter a decimal point, you must enter at least one number after it. The minutes entry range is from 00.00 to 59.99. You can also name lat/long entries using the following format:

[(N or S)DDMM.MM(W or E)DDDMM.MM]/[NAME]

LATITUDE AND LONGITUDE WPT
WITH PILOT-ASSIGNED NAME

	ACT LEGS	1/4	
		SEQUENCE	
☐	PEABO	AUTO/INHIBIT	☐
☐	079° 75NM	3.0° ↓	☐
☐	BUM	---/FL310	☐
☐	077° 131NM	3.0° ↓	☐
☐	TRAKE	---/FL310	☐
☐	089° 25NM	3.0° ↓	☐
☐	KAYLA	---/FL200	☐
☐	085° 11NM	1.7° ↓	☐
☐	FTZ	---/ 9000	☐
☐	-----		
	<LEG DATA	LEG WIND>	
	[N3825.09W09313/IDEED]		

Shorthand LATITUDE and LONGITUDE

Shorthand latitude and longitude entries differ from regular latitude/longitude entries in that shorthand entries are resolved to only one degree of both latitude and longitude. Shorthand entries must be five (5) characters, and may not be assigned a name. Positions are defined by the following rules:

- Positions in the Northern hemisphere are identified with "N" or "E". "N" indicates North latitude and West longitude; "E" indicates North latitude and East longitude.
- Positions in the Southern hemisphere are identified with "S" or "W". "S" indicates South latitude and East longitude; "W" indicates South latitude and West longitude.
- Latitude always precedes longitude and two digits are allowed for each. The placement of the letter indicates the value of the longitude hundreds digit. If the longitude is 100 degrees or more, the letter will be in the third character position which allows it to function as the 100 digit in the longitude. If the longitude is less than 100 degrees, the letter will be the last of the five characters.

The following examples show valid latitude/longitude entries using the shorthand format:

- N35.00 W150.00 — 35N50
- N22.20 E030.15 — 2230E
- N62.00 E100.00 — 62E00
- S25.10 E051.00 — 2551S
- S09.15 W173.12 — 09W73

**ADDENDUM 4
TO
ROCKWELL COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert facing page 7-28.

Corrections are made to latitude/longitude entries. Changes shown in **bold text**.

The following examples show valid latitude/longitude entries using the shorthand format:

- N35.00 W150.00 — 35N50
- **N22.20 E030.00** — 2230E
- N62.00 E100.00 — 62E00
- S25.10 E051.00 — 2551S
- **S09.15 W173.00** — 09W73

SHORTHAND LAT/LONG WPT

ACT LEGS 1/4

SEQUENCE

Waypoint	Distance	Heading
PEABO	079°	75NM
BUM	077°	131NM
TRAKE	089°	25NM
KAYLA	085°	11NM
FTZ		

---/FL310

---/FL310

---/FL200

---/ 9000

<LEG DATA LEG WIND>

[3896N]

Storing Pilot-Defined Waypoints

You can define and store waypoints on the DEFINE PILOT WPT page. Once stored, you can select them for use in your flight plan from the PILOT WPT LIST page. Pilot-defined waypoints stored from the DEFINE PILOT WPT page remain in the FMS until they are deleted.

PILOT WPT LIST and DEFINE PILOT WPT pages are selected with their associated line select keys from the DATA BASE page. Push the DATA BASE line select key on the INDEX page to select the DATA BASE page.

To define and store a waypoint on the DEFINE PILOT WPT page:

1. Push the INDEX key to show the INDEX page.

NOTE

In some installations, the DATA BASE line key selection may be on INDEX page 2. Push the NEXT PAGE key to show the page with the DATA BASE line key selection.

2. Push the DATA BASE line select key to show the DATA BASE page.
3. Push the DEFINE WPT line select key to show the DEFINE PILOT WPT page.
4. Enter an identifier for the waypoint.
5. Push the IDENT line select key to transfer the scratchpad entry to the IDENT line.
6. Enter either a LATITUDE and LONGITUDE, a PLACE BRG/DIST, or a PLACE BRG/PLACE BRG into the scratchpad.
7. Push the line select key for the type of waypoint you are entering.
8. Push the STORE WPT line select key to store the waypoint in the FMS data base with the IDENT name you assigned it in steps 4 and 5 above.

DEFINE PILOT WPT PAGE

DEFINE PILOT WPT

IDENT
THAAT

LATITUDE LONGITUDE
N23°13.28 W088°35.32

PLACE BRG /DIST
PDQ270.0/66.6

PLACE BRG /PLACE BRG
-----.-/-----.-

<STORE WPT RETURN>

[]

Selecting Pilot-Defined Waypoints

To select a pilot-defined waypoint for use in a flight plan:

1. Push the INDEX key to show the INDEX page.

NOTE

In some installations, the DATA BASE line key selection may be on INDEX page 2. Push the NEXT PAGE key to show the page with the DATA BASE line key selection.

2. Push the DATA BASE line select key to show the DATA BASE page.
3. Push the PILOT WPT LIST line select key to show the PILOT WPT LIST page.

NOTE

The PILOT WPT LIST may require several pages to show the entire list. Push the NEXT PAGE or PREV PAGE key as necessary to show the desired waypoint on the display.

4. Push the line select key for the desired waypoint to copy it to the scratchpad.
5. Push the LEGS or FPLN key to show the LEGS or FPLN page.

NOTE

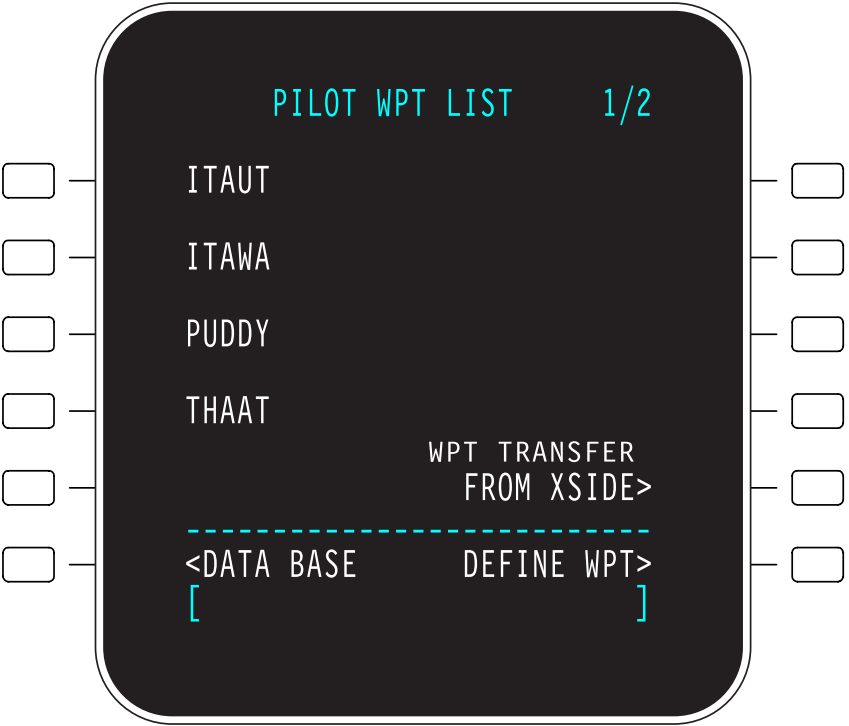
Push the NEXT PAGE or PREV PAGE key as necessary to show the desired location to insert the waypoint.

6. Push the line select key where the waypoint is to be inserted to transfer it from the scratchpad to the flight plan.
7. Verify the flight plan change on the CDU and MFD, then push the EXEC key to execute the flight plan.

NOTE

If you already know the name of a pilot-defined waypoint you wish to enter into the flight plan, you may also enter it directly into the ACT/MOD FPLN or LEGS pages through the scratchpad in the same manner as other waypoints in the FMS data base.

PILOT WAYPOINT LIST
WITH TYPICAL WAYPOINTS



The page intentionally left blank.

FIX INFO Entries

Fix entries are entered on the FIX INFO page. The FIX INFO page shows a reference (REF) waypoint and the fix data based on that waypoint. Up to two references per fix can be used to show two fixes. Each reference fix shows on an individual FIX INFO page.

There are four types of fixes: abeam, radial, distance, and LAT or LON CROSSing point. An abeam fix is the point on your flight plan where the REF waypoint is perpendicular to a flight plan leg. A radial fix is the point at which a specific radial from the REF waypoint intersects your flight plan. A distance fix is the point at which a specific distance from the REF waypoint intersects your flight plan. A LAT or LON CROSS fix is the point where the specified LAT or LON entry intersects your flight plan.

On the MFD, a radial fix or abeam fix shows as a small green circle around the fix reference, with a dashed green line leading from the green circle to a small white circle on the course line at the fix point. A distance fix shows as a large green circle (or partial circle) centered over the fix reference, with a radius equal to the specified distance from the fix reference, and a small white circle at the point where the large circle intersects the course line. A LAT or LON CROSS fix shows as a white circle at the point on the flight plan where the specified LAT or LON intersects the flight plan.

LAT or LON CROSS fixes do not use REF waypoints. You cannot enter a REF waypoint, and you may enter either a latitude or longitude, but not both. The fix coordinates must intersect the flight plan or the message "NO INTERSECTION" shows in the scratchpad. When a correct LAT or LON entry is made, it shows in large font text and the corresponding LON or LAT for the intersecting point shows in small font text.

NOTE

You can also use the FIX INFO page to get a direct-to course, distance (DIST), estimated time en route (ETE), and FUEL to a reference waypoint.

Abeam Fix

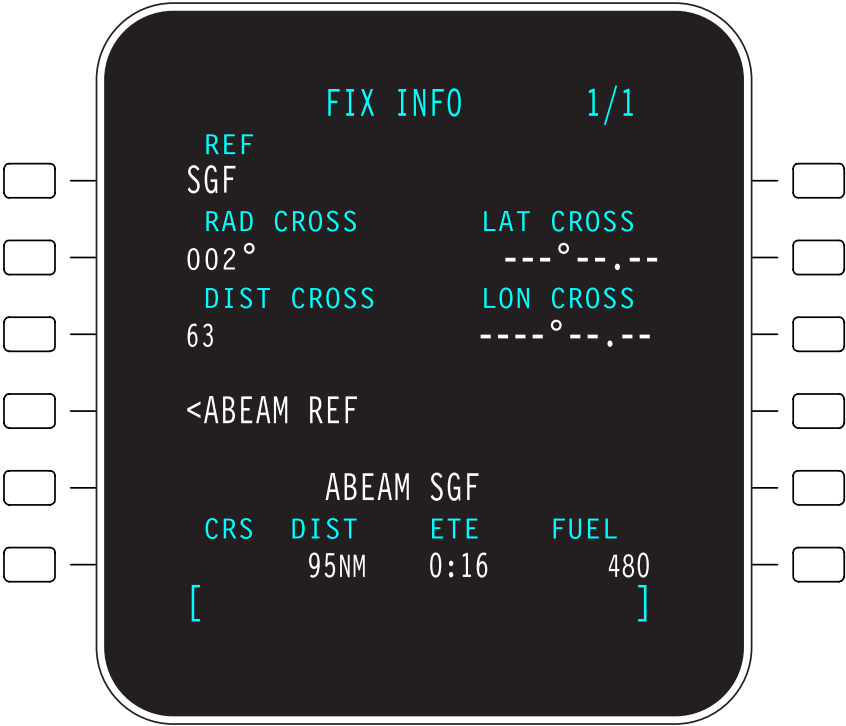
To show a fix along your flight plan that is abeam a waypoint:

1. Push the FIX key to show the FIX INFO page.
2. Enter a reference waypoint into the scratchpad.
3. Push the REF line select key to move the waypoint to the REF data line.
4. Push the ABEAM line select key to show the abeam fix.

NOTE

An abeam fix may be made into a waypoint by pushing the REF line select key to enter the fix into the scratchpad (appears as a PLACE BRG/DIST fix). Push the LEGS key to show the ACT LEGS page, then enter the waypoint at the appropriate place in the flight plan. Push the EXEC key to execute the change. The FMS will assign a name based upon the REF waypoint to the new waypoint.

FIX INFO PAGE
WITH ABEAM FIX



Radial Crossing Fix

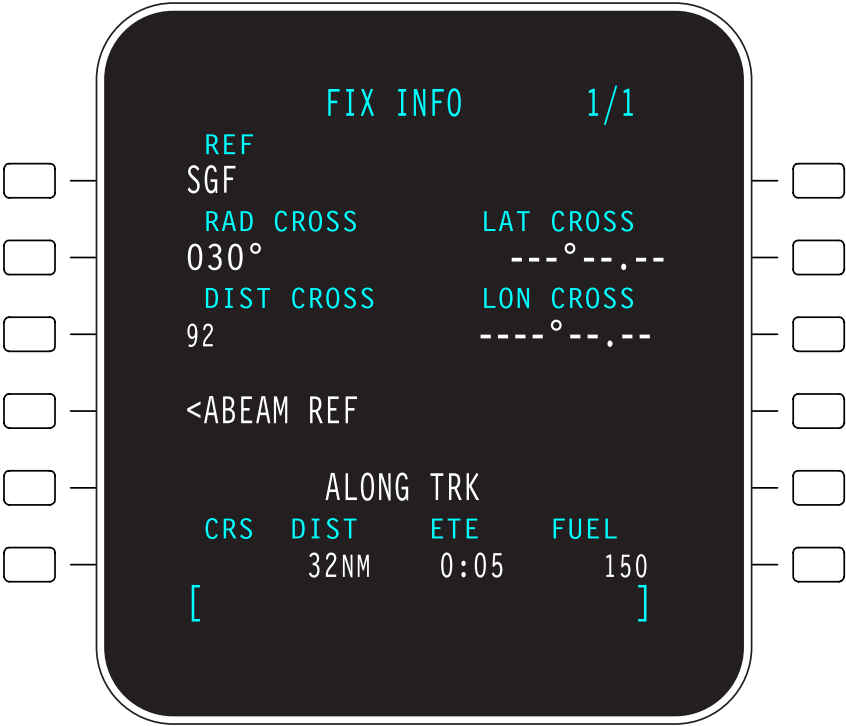
To show a fix along your flight plan on a specific radial from a waypoint:

1. Push the FIX key to show the FIX INFO page.
2. Enter a reference waypoint identifier into the scratchpad.
3. Push the REF line select key to move the waypoint from the scratchpad to the REF entry line.
4. Enter the desired radial into the scratchpad.
5. Push the RAD CROSS line select key to move the radial from the scratchpad to the RAD CROSS line.

NOTE

A radial crossing fix may be made into a waypoint by pushing the REF line select key to enter the fix into the scratchpad (appears as a PLACE BRG/DIST fix). Push the LEGS key to show the ACT LEGS page, then enter the waypoint at the appropriate place in the flight plan. Push the EXEC key to execute the change. The FMS will assign a name based upon the REF waypoint to the new waypoint.

FIX INFO PAGE
WITH RADIAL CROSS FIX



Distance Crossing Fix

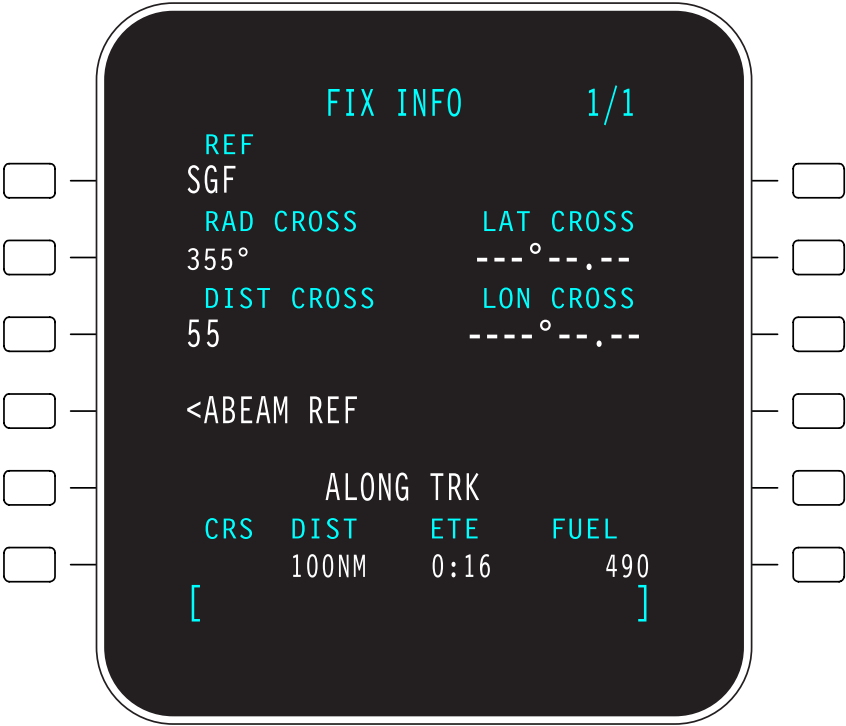
To show a fix along your flight plan that is a specific distance from a waypoint:

1. Push the FIX key to show the FIX INFO page.
2. Enter a reference waypoint identifier into the scratchpad.
3. Push the REF line select key to move the waypoint from the scratchpad to the REF entry line.
4. Enter the desired distance into the scratchpad.
5. Push the DIS CROSS line select key to move the radial from the scratchpad to the DIS CROSS line.

NOTE

A distance crossing fix may be made into a waypoint by pushing the REF line select key to enter the fix into the scratchpad (appears as a PLACE BRG/DIST fix). Push the LEGS key to show the ACT LEGS page, then enter the waypoint at the appropriate place in the flight plan. Push the EXEC key to execute the change. The FMS will assign a name based upon the REF waypoint to the new waypoint.

FIX INFO PAGE
WITH DISTANCE CROSS FIX



LAT or LON CROSSing Fix

To show a fix along your route that crosses a specific latitude or longitude:

1. Push the FIX key to show the FIX INFO page.
2. Enter a latitude or longitude coordinate which the flight path crosses.
3. Push the LAT CROSS or LON CROSS line select key to transfer the coordinate to the LAT CROSS or LON CROSS line.

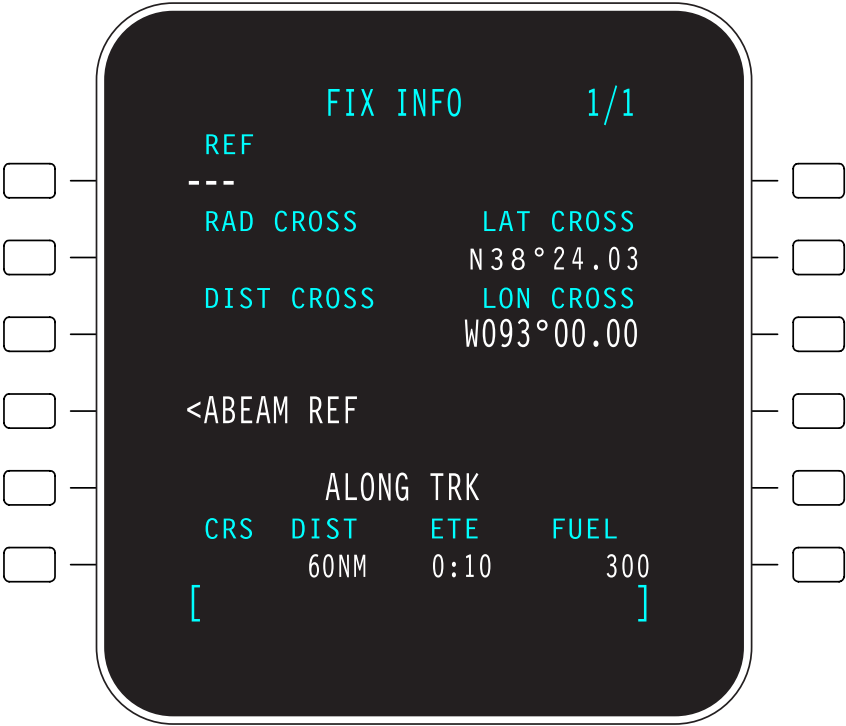
NOTE

When the appropriate latitude or longitude crossing coordinate is loaded into the LAT CROSS or LON CROSS line, the FMS will automatically load the corresponding longitude or latitude. Direct entry coordinates will appear as large font text; FMS-calculated coordinates will appear as small font text.

NOTE

A LAT or LON CROSSing fix may be made into a waypoint by pushing the LAT CROSS or LON CROSS line select key to enter the fix into the scratchpad (appears as a LAT/LON fix). Push the LEGS key to show the ACT LEGS page, then enter the waypoint at the appropriate place in the flight plan. Push the EXEC key to execute the change. The FMS will assign the name "LL[###]" to the new waypoint.

FIX INFO PAGE
WITH LAT/LON CROSS FIX



FIX Delete

Fix entries are deleted through the FIX INFO page by deleting the REF waypoint, RAD CROSS, DIS CROSS, or LAT or LON CROSS.

To delete a fix:

1. Push the FIX key to show the FIX INFO page.
2. Push the DEL key to enter DELETE into the scratchpad.

NOTE

Use the NEXT PAGE or PREV PAGE key as necessary to show the appropriate FIX INFO page for the fix to be deleted.

3. Push the line select key of the REF waypoint, or RAD, DIST, LAT, or LON CROSS, for the fix to be deleted.

NOTE

When you delete the REF of a FIX from FIX INFO page 1/2, if there is another FIX on page 2/2, it moves to page 1/2.

Offset Parallel Course

Offset parallel courses are entered on the ACT/MOD FPLN page.

Parallel offsets entries must be in whole numbers from 1 to 99 nautical miles, preceded or followed by "L" for left of the course, or "R" for right of the course (i.e., L2, 5L, R28, 17R etc.) Once an offset is entered, you can change the offset by reentering an entirely new offset, entering only numbers (one or two digits) for a new distance, or entering only a letter (L or R) to change the side of the offset.

Entering an offset shows the message "OFFSET" on the message line of the CDU and the annunciation "OFST" on the PFD. The MFD shows a dashed magenta line parallel to the course line for the active offset track.

Offsets terminate at flight plan discontinuities, DME arc legs, holding patterns, and any other leg type that does not terminate at a geographically-fixed waypoint. They also terminate at waypoints with course changes greater than 100 degrees. "OFFSET WILL END" shows on the message line approximately two minutes before arriving at the termination waypoint. "OFFSET TERMINATED" shows on the message line when the offset is terminated. Both messages are disabled for offsets that terminate at the last waypoint in a flight plan.

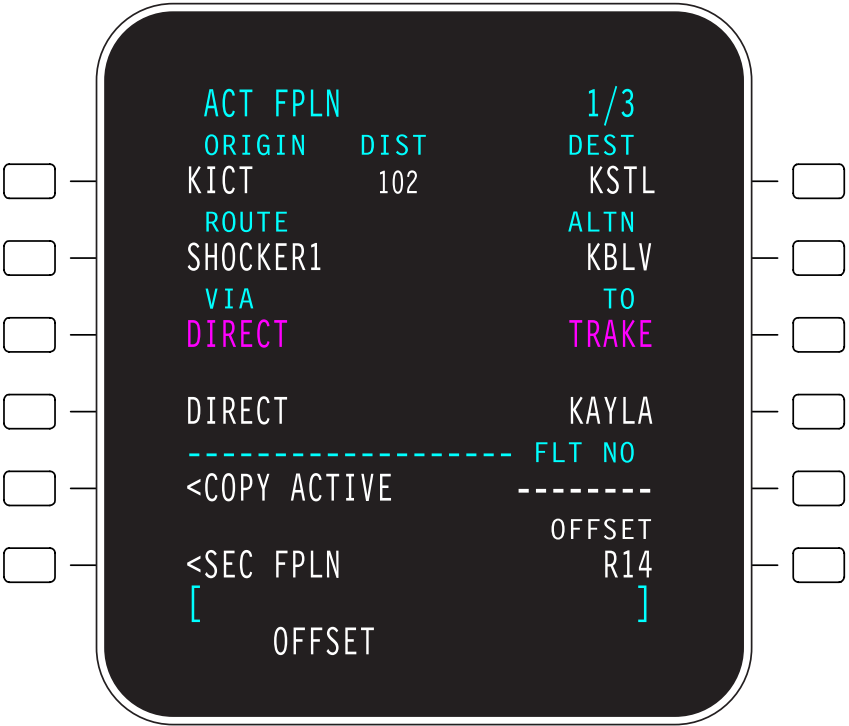
Enter/Change Offset

You can enter an offset only when the active leg is a fixed-track leg that terminates at a geographically-fixed waypoint. You cannot enter an offset when the active leg is another types of leg, such as DME arc legs.

To enter an offset parallel course:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Enter the desired offset into the scratchpad.
3. Push the OFFSET line select key to transfer the offset from the scratchpad to the OFFSET display line.
4. Verify the flight plan change on the CDU and MFD, then push the EXEC key to execute the flight plan.

TYPICAL ACT FPLN PAGE



Cancel Offset

Cancel an offset by entering a zero distance or DELETE (with the DEL key) into the OFFSET data line, or by completing a Direct-To edit on the flight plan. When you manually terminate or delete an offset, no messages are shown on the messages line.

To cancel an offset parallel track:

1. Push the FPLN key to show the ACT/MOD FPLN page.
2. Enter DELETE or a distance of 0 into the scratchpad.
3. Push the OFFSET line select key to delete the offset.
4. Verify the flight plan change on the CDU and MFD, then push the EXEC key to execute the flight plan.

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Position Update

En route position updates for the FMS are accomplished on the POS INIT page. Select the POS INIT page from the INDEX page: the INDEX key brings up the INDEX page.

GPS/IRS

To update the FMS position from a GPS or IRS sensor:

1. Push the INDEX key to show the INDEX page.
2. Push the POS INIT line select key to show the POS INIT page.
3. Push the NEXT PAGE or PREV PAGE key as necessary to show the desired position source for the update.
4. Push the left side line select key to copy the lat/long data from the desired sensor to the scratchpad.
5. Push the PREV PAGE or NEXT PAGE key as necessary to show POS INIT page 1 with the SET POS prompt.
6. Push the SET POS line select key to transfer the scratchpad entry to the SET POS line and update the FMS position.

IRS POSITION INFORMATION

COPIED TO SCRATCHPAD

☐
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POS INIT

2/2

FMS POS

GS

N38°15.59 W094°52.82 406

IRS1 POS

N38°15.58 W094°52.87 406

IRS2 POS

N38°15.57 W094°52.84 406

UPDATE FROM

NAVAID

<NAVAID

BUM

<INDEX

FPLN>

[N38°15.58 W094°52.87]

☐
☐
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NAVAID

On POS INIT page 2, push the UPDATE FROM NAVAID line select key on POS to update the FMS position from a selected navaid. When updating from a navaid, the FMS prompts you to CONFIRM the position for the update. The position shows on the scratchpad entry line as a radial and distance from the NAVAID. A LAT/LON line select key allows you to change the position data to latitude and longitude if desired. Push the CONFIRM line select key to complete the update.

To update the FMS position from a NAVAID:

1. Push the INDEX key to show the INDEX page.
2. Push the POS INIT line select key to show the POS INIT page.
3. Push the NEXT PAGE key to show POS INIT page 2 with the UPDATE FROM NAVAID line select key.

NOTE

A navaid identifier must show in the NAVAID display line on the lower right side of POS INIT page 2 to perform a navaid position update. If the NAVAID line shows dashes, or you desire a navaid other than the one showing, enter the identifier of an appropriate, receivable navaid into the scratchpad and transfer it to the NAVAID line. Continue with the following steps.

4. Push the UPDATE FROM NAVAID line select key.
5. Push the CONFIRM POS line select key to update the position.

NOTE

The UPDATE FROM NAVAID function is available only when the airplane is airborne.

POS INIT PAGE WITH
UPDATE FROM NAVAID POSITION

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POS INIT2/2

FMS POSGS

N38°15.59 W094°52.82 406

IRS1 POS

N38°15.58 W094°52.87 406

IRS2 POS

N38°15.57 W094°52.84 406

<CANCEL UPDATE

NAVAID
BUM

<CONFIRM POS

LAT/LON>

[BUM 260.8/19.2]

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2nd Edition
15 Dec 99

7-53

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ARRIVAL	8-1
Select/Change a STAR	8-2
Arrival Data	8-4

ARRIVAL

Arrivals are selected on the ARRIVAL page. Select the ARRIVAL page with the DEP ARR key or the appropriate line select key on the DEP/ARR INDEX page.

Selecting an arrival can include choosing an associated transition route and/or an approach procedure. You do not have to select all items. You have the option to select:

- A STAR (and transition)
- An approach (and transition).

Select/Change a STAR

To select or change a STAR, transition route (if available), and/or an approach:

1. Push the DEP ARR key to show the ARRIVAL page.

NOTE

When the DEP ARR key is pushed, one of three pages shows: the DEPART, ARRIVAL, or DEP/ARR INDEX page. If the airplane is on the ground, or airborne but less than either 50 NM from the origin airport or halfway to the destination airport, the DEPART page for the origin airport shows. If the airplane is airborne and more than halfway to the destination airport, the ARRIVAL page for the destination airport shows. If no active flight plan exists, or no origin or destination airport was specified, the DEP/ARR INDEX page shows. If you desire a page other than the one showing, push the DEP ARR line select key, or press the DEP ARR key a second time, then push the appropriate line select key on the DEP/ARR INDEX page.

2. Push the left side line key next to the desired STAR.

NOTE

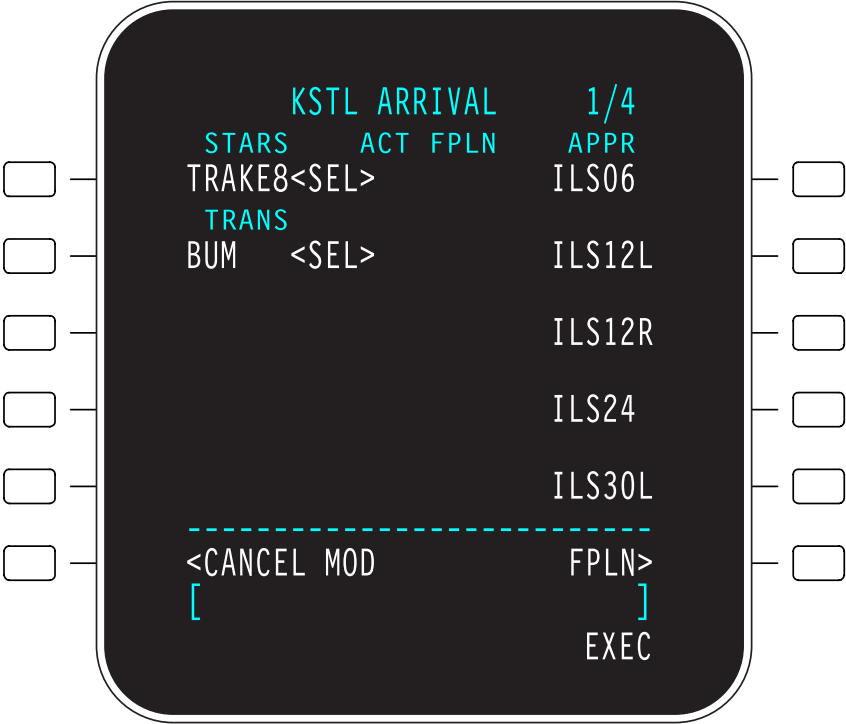
For some airports, the lists shown on the ARRIVAL page are large enough to fill several display pages. Push the NEXT or PREV key as necessary to show the desired STAR, transition route or approach, then push the line key for the desired item.

3. Push the NEXT PAGE or PREV PAGE key as necessary to show the desired transition route for the selected STAR.
4. Push the left side line key next to the desired transition route.
5. Verify the flight plan on the CDU and MFD, then push the EXEC key to execute the flight plan.

NOTE

If the destination airport is the last waypoint in the flight plan when either an arrival or approach is selected, the destination airport IDENT will be replaced with the selected arrival/approach procedure **unless the destination airport is the active (TO) waypoint**. If the destination airport is the active waypoint when the procedure is selected, the destination airport will remain the active waypoint to prevent the current airplane course from being unexpectedly changed when the MOD FPLN is executed.

STAR AND TRANS SELECTION
ON ARRIVAL PAGE



Arrival Data

Information on the destination airfield and approach, if specified, shows on the ACT ARRIVAL DATA page, which is accessed through the INDEX page. If no approach is selected, only the airport IACO identifier shows. If an approach is selected, the approach and runway, and runway threshold altitude show. If an ILS approach is selected, the glide slope angle, localizer true bearing, and localizer frequency show.

To view the arrival data for the destination airport:

1. Push the IDX key to show the INDEX page
2. Push the ARR DATA line select key to show the ACT ARRIVAL DATA page.

ACT ARRIVAL DATA PAGE

ACT ARRIVAL DATA

ARR AIRPORT

KSTL

APPR

ILS12R

GS ANGLE

3.00°

LOC TRUE BRG

122T

RWY THRESHOLD ALT

540 FT

<INDEX

LEGS>

[

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APPROACH.....	9-1
Select/Change an Approach	9-2

APPROACH

Approaches are selected from the APPR or VISUAL columns on the ARRIVAL page. Select the ARRIVAL page with the DEP ARR key or with the appropriate ARR line key on the DEP/ARR INDEX page. Both visual and instrument approaches can be selected from the ARRIVAL page.

Select/Change an Approach

To select or change an approach:

1. Push the DEP ARR key to show the ARRIVAL page.

NOTE

When the DEP ARR key is pushed, one of three pages shows: the DEPART, ARRIVAL, or DEP/ARR INDEX page. If the airplane is on the ground, or airborne but less than either 50 NM from the origin airport or halfway to the destination airport, the DEPART page for the origin airport shows. If the airplane is airborne and more than halfway to the destination airport, the ARRIVAL page for the destination airport shows. If no active flight plan exists, or no origin or destination airport was specified, the DEP/ARR INDEX page shows. If you desire a page other than the one showing, push the DEP ARR line select key, or press the DEP ARR key a second time, then push the appropriate line select key on the DEP/ARR INDEX page.

2. Push the line key next to the desired approach under the APPR list.

NOTE

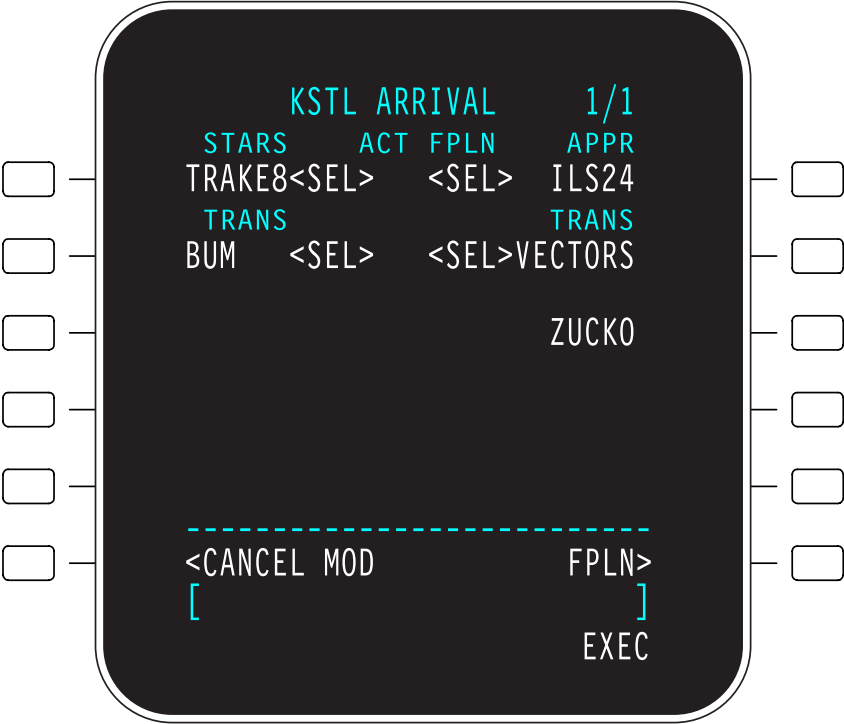
For some airports, the APPR and VISUAL lists are large enough to fill several display pages. Push the NEXT or PREV key as necessary to show the desired approach on the page, then push the line select key for that approach.

3. Push the line select key for the desired approach transition.
4. Push the LEGS key to show the ACT/MOD LEGS page.
5. Verify the flight plan change on the CDU and MFD, then push the EXEC key to execute the flight plan.

NOTE

If the destination airport is the last waypoint in the flight plan when either an arrival or approach is selected, the destination airport IDENT will be replaced with the selected arrival/approach procedure **unless the destination airport is the active (TO) waypoint**. If the destination airport is the active waypoint when the procedure is selected, the destination airport will remain the active waypoint to prevent the current airplane course from being unexpectedly changed when the MOD FPLN is executed.

APPROACH/RWY AND TRANS
SELECTION ON ARRIVAL PAGE



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MISSED APPROACH

Missed approach procedures are automatically inserted into the flight plan following the missed approach point (MAP) or runway threshold when an approach is selected. For the FMS to sequence beyond the MAP to the missed approach procedure, you must disable the approach or fly to the MAP waypoint with AUTO SEQUENCE selected. To prevent clutter on the MFD map display, the missed approach legs are inhibited from display unless the approach is disabled and the MAP is the active waypoint or has been sequenced. The missed approach procedure, including procedural holds, appears on the CDU, PFD, and MFD as a normal flight plan. Any legs in the flight plan following the missed approach will be display in the same format as an alternate flight plan.

There are several ways to disable an approach. You can:

- Push the TOGA button
- Select AUTO sequencing when you reach the MAP
- Push the APPR ENABLED line select key on the ARRIVAL page to select NO
- Delete the FAF or MAP waypoint
- Edit the flight plan to make a point in the missed approach procedure the active waypoint.

NOTE

The APPR ENABLED line key selection on the ARRIVAL page is available only for non-precision approaches.

Below are two simplified checklists, one for each type of approach (localizer-based and FMS-based) to aid in the transition to a missed approach.

To transition to a missed approach procedure from a **localizer-based** approach:

1. Select Go Around (GA).
2. Set power and configuration as required.
3. Verify AUTO sequence selected (LEGS page).
4. Verify the first waypoint of the missed approach is the TO waypoint.
5. Set FMS as NAV SOURCE.
6. Set the appropriate lateral and vertical flight director modes.
7. Engage the autopilot (if desired).

To transition to missed approach procedure from an **FMS-based** approach:

1. Select Go Around (GA).
2. Set power and configuration as required.
3. Verify AUTO sequence is selected (LEGS page).
4. Verify the first waypoint of the missed approach is the TO waypoint.
5. Set the desired lateral and vertical flight director modes.
6. Engage the autopilot (if desired).

VERTICAL NAVIGATION (VNAV)	11-1
Vertical Direct-To	11-4

ADDENDUM 1
To
Collins FMS-4200
Flight Management System Pilot's Guide

Part Number 523-0778363-002117, 2nd Edition
Dated 15 December 1999

Insert this addendum sheet facing page 11-1.

Add the following note at the bottom of the page:

NOTE

The FMS vertical speed advisory pointer displayed on the PFD vertical speed scale is available to provide the flight crew with awareness of the climb/descent rate that will be needed for the aircraft to achieve the next altitude constraint. It should be noted that the display of the vertical speed advisory pointer on the PFD vertical speed scale may be allowed in cases where FMS performance calculations indicate that the requirements to achieve flight plan altitude constraints fall outside the boundaries of expected aircraft operation. The vertical speed advisory pointer position on the VSI scale is a reflection of the FMS calculation of required climb/descent rates associated with the flight plan, and does not infer that the aircraft is capable of meeting the required rate of climb/descent.

VERTICAL NAVIGATION (VNAV)

VNAV information is shown on the LEGS pages. Push the LEGS key to show the LEGS page.

The FMS provides multiple waypoint VNAV for each phase of flight. VNAV aids the pilot in complying with:

- Altitude and speed constraints at waypoints
- Speed limits at altitudes
- The vertical flight profile as specified by the pilot.

During the various phases of flight, advisory VNAV follows the flight plan. It levels the airplane once the preselect altitude is captured and prompts a descent at a planned location. Step climbs can be initiated with the altitude preselector and selection of the desired climb mode. During descent, VNAV computes a geographical path to each waypoint with an altitude constraint, and provides guidance relative to that path. If there are multiple altitude constraints at various waypoints along the flight plan, the FMS automatically adjusts the descent path for a smooth stabilized descent while ensuring that the altitude constraints are honored.

In a flight plan, each waypoint can show, as appropriate:

- An altitude constraint
- Climb or descent applicability (↑ for climb, ↓ for descent)
- A vertical path angle
- A speed constraint.

With some exceptions, each of these can be changed. When any VNAV entries or changes are made, the FMS handles them by creating a MOD FPLN in the same manner as a lateral change. For the changes to be included in the ACT FPLN, you must push the EXEC key to execute the flight plan.

When a flight plan is created, the FMS automatically makes the first half of the waypoints in the flight plan climbs (↑) and the last half descends (↓), as shown by the up and down arrows. SID waypoints are automatically assigned as climbs and STAR and approach waypoints as descents. You can change this using the entry formats described above. The letters C and D do not show on the altitude constraints once they are transferred from the scratchpad into the flight plan.

An altitude constraint that shows in yellow indicates any of the following:

- You currently are not flying, or will not be able to fly, the airplane in a manner required to meet the specified altitude constraint.

- All climb altitude constraints do not precede all descent altitude constraints (except for the missed approach procedure).
- A climb altitude constraint is lower than the preceding altitude constraint.
- A descent altitude constraint is higher than the preceding descent altitude constraint.
- An altitude constraint is higher than the cruise altitude.

An altitude constraint shown in yellow is not necessarily an incorrect entry. You should review any altitude constraint shown in yellow so you are aware of why it is shown in yellow.

To enter or change VNAV data:

1. Push the LEGS key to show the LEGS page.
2. Enter the desired data into the scratchpad.
 - For speeds, enter a three digit number (IAS) from 100 to 499, or a two digit Mach setting from .10 to .99 (with the decimal point prefix).
 - For VPA, entry range is from 1.0 to the maximum VPA (usually 6.0) specified for the airplane.
 - For altitude, entries may be barometric pressure altitudes or flight levels. Altitude entry range is from -1300 feet to 65000 feet, and FL0 to FL650. Altitudes may be suffixed with the letter "A" (at or above) or "B" (at or below). Flight level entries are prefixed with "F" or "FL". You may also enter "C" only to change a descent to a climb, or "D" to change a climb to a descent.

NOTE

If entering barometric pressure altitudes, if the altitude is less than 500 feet, you must prefix the altitude with a / (slash) to prevent the FMS from misidentifying the altitude as a speed or VPA.

- Speeds and altitude entries may be combined if separated by a / (slash) mark (e.g., 250/10000, .78/F290).
3. Push the line select key for the appropriate waypoint to transfer the information from the scratchpad.

NOTE

If entering the same information into several waypoints, you can copy the VNAV information to the scratchpad by pushing the appropriate right side line select key (instead of manually entering the data), then transferring the data to another waypoint.

4. Verify the data, then push the EXEC key to execute the MOD FPLN.

TYPICAL VNAV INFORMATION
ON ACT LEGS PAGE



Vertical Direct-To

With the FMS-4200, you can enter a Direct-To descent to an altitude at a down-track waypoint; the FMS will calculate a VPA and provide steering guidance to fly Direct-To the selected altitude. The waypoint for the Direct-To altitude does not have to be the active lateral waypoint. It can be any down-track waypoint, but cannot be a waypoint beyond a discontinuity or a vectors leg. Also, you cannot create a Vertical Direct-To when the active waypoint is a holding pattern.

When you create a Vertical Direct-To, if there are other altitude constraints between the airplane's present position and the waypoint selected as the Vertical Direct-To, the intermediate constraints are automatically deleted when the Vertical Direct-To is executed.

NOTE

A Vertical Direct-To is limited to descents only and cannot exceed the maximum VPA specified for your airplane.

To enter a Vertical Direct-To into the flight plan:

1. Push the DIR key to show the ACT DIRECT-TO page.

NOTE

If the desired altitude is already displayed on a target waypoint, you may skip the following step.

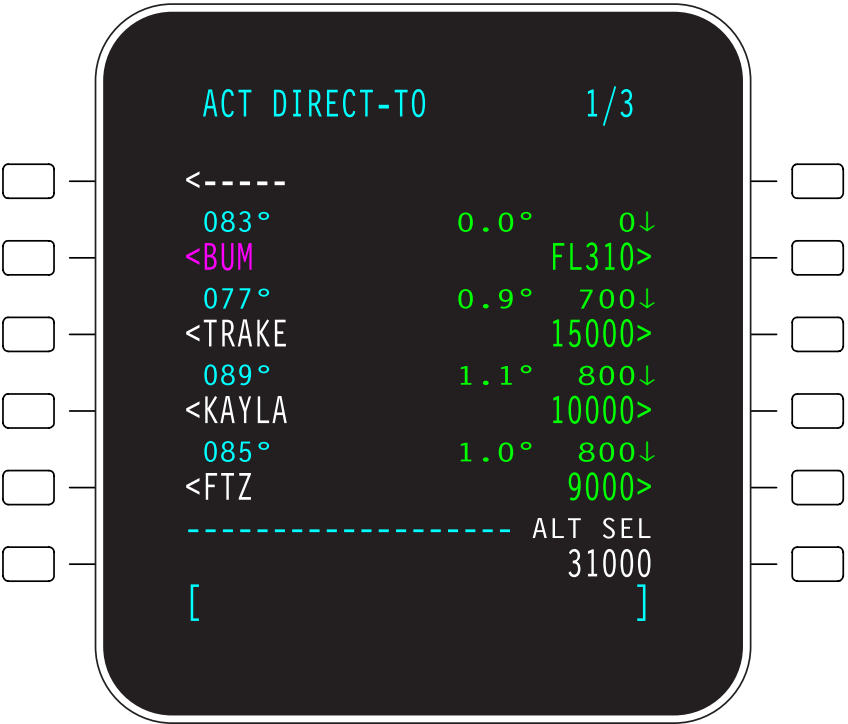
2. Enter the desired altitude into the scratchpad, or push the PRESEL line key to enter the preselector altitude into the scratchpad.

NOTE

The waypoint list may be large enough to fill several display pages. Push the NEXT or PREV key as necessary to show the desired waypoint on the display.

3. Push the right side line key of the waypoint to which you wish to fly Direct-To the altitude.
4. Verify the flight plan change on the CDU, then push the EXEC key to execute the flight plan.

ACT/VERTICAL DIRECT-TO PAGE



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AFIS™

The FMS-4200 AFIS function uses the AlliedSignal Airborne Flight Information System to make a data link connection from the airplane to the ground-based Global Data Center computers. The data link is used to transfer messages, weather data, flight plans, and associated performance predictions. To make the data link connection, it uses the ARINC, SITA, and Air Canada ground VHF networks, as well as the West Atlantic, East Atlantic, Pacific, and Indian Ocean satellite networks. The system can also retrieve the same information from a 3.5 inch computer diskette.

An AFIS installation on board the airplane consists of the AlliedSignal Data Management Unit (DMU), an AFIS adapter unit installed in the Database Unit (DBU), a Control Display Unit (CDU), and a Flight Management Computer (FMC). The DMU is the AFIS communications link with the Global Data Center. The AFIS adapter unit gives the DBU the capability to read AFIS diskettes to extract messages and to transfer flight plan information to the FMC.

In dual FMS installations, any CDU can show and control AFIS information. However, only one CDU at a time can access any specific AFIS data page type. The first CDU to access a specific page type retains control of that page type until another page type is selected.

AFIS MENU

The AFIS MENU page is selected, depending upon the installation, from a line key selection on either the INDEX page or the MCDU MENU page.

To show the AFIS MENU page (from the MCDU MENU page):

1. Push the MCDU MENU key to show the MCDU page.
2. Push the AFIS line select key to show the AFIS MENU page.

MCDU MENU PAGE



The AFIS MENU page shows selections for:

- Viewing Messages (DISP MSG)
- Editing Messages (EDIT MSG)
- AFIS Operating MODES
- AFIS Operating STATUS
- Viewing SIGMETS
- Viewing Terminal Weather (TERM WX)
- Viewing WINDS aloft data.

The annunciations "REQUEST" and "REPORT" show in green on the AFIS MENU page above the white AFIS menu items when:

- A request for information is made (REQUEST)
- Unread messages and/or weather information are available (REPORT)
- A STATUS change has occurred on the STATUS page since the last time it was reviewed (REPORT).

"REPORT" also shows in white on the dashed line at the bottom of all AFIS pages, except the AFIS MENU page, when new unread messages or weather data are available.

When the CDU is set to show information other than AFIS and there are new unread messages and/or weather data available to the AFIS system, the annunciation "AFIS" shows on the MESSAGE line.

When a ground station receives an AFIS message or a request for information, it transmits an acknowledgment back to the sender. When the DMU receives an acknowledgment, the annunciation "ACK" shows for approximately 30 seconds at the bottom of all AFIS pages.

AFIS MENU PAGE



DISP MSG

Received AFIS messages show on the DISP AFIS MSG page. This page is accessed from the AFIS MENU page.

To show any received AFIS messages, push the DISP MSG line select key on the AFIS MENU page.

The DISP AFIS MSG page always shows the most recent message first when the page is selected. To show the next previous message(s), push the NEXT MSG line select key.

Up to four messages can be reviewed. The current message number shows on the title line to the left of the display page numbers. The message number counts all messages received since power-up and resets to 1 after 99 messages. The text of a message may require multiple pages, and the display page number shows the current and total page numbers. Push the NEXT PAGE and PREV PAGE keys as necessary to show the additional pages of a multi-page message.

If a new message arrives while you are reviewing an existing message, or if other unread messages are available for other AFIS functions, the message "REPORT" shows at the bottom of the page. Push the NEXT MSG line select key to view a new message, or push the AFIS MENU line select key to return to the AFIS MENU page to select another function.

If the oldest message (fourth message) is showing on the display when a new message arrives, the oldest message will remain on the display. However, when you select another page, the oldest message will be replaced with the new message. If the display page remains on the oldest message while additional new messages arrive, new messages will continue to replace older messages, except for the message being shown.

DISPLAY AFIS MSG PAGE

	DISP AFIS MSG 31/1 15 NOV 99 00:01Z FR: TIS TO: AFIS USERS MESSAGE TEXT FILES USE AS MANY PAGES AS NECESSARY. SUBSEQUENT PAGES MAY BE VIEWED BY PUSHING NEXT PAGE AND PREV PAGE KEYS. THE MOST RECENT FOUR MESSAGES MAY BE VIEWED. PRESS THE NEXT MSG LINE SELECT KEY TO SHOW THE NEXT MSG. <NEXT MSG AFIS MENU>	
☐		☐
☐		☐
☐		☐
☐		☐
☐		☐
☐		☐

EDIT MSG

AFIS preprogrammed messages and the MSG EDITOR are selected from the EDIT MESSAGE page. To show the EDIT MESSAGE page, push the EDIT MSG line select key on the AFIS MENU page.

You can create up to four preset messages and permanently store them in AFIS memory to be recalled for editing and transmission. Stored messages can be changed and restored at any time. You can also create a new message and send it without storing it. Stored preset messages are retained until they are changed.

The EDIT MESSAGE page shows the titles of the stored messages. You can select any of the messages for display, editing, restoring, and/or transmission. A dashed title line indicates no message is stored in that location. Push the line select key adjacent to the desired message to show that message on the MSG EDITOR page, or push the COMPOSE MESSAGE line select key to go directly to the MSG EDITOR page.

If a preprogrammed message is selected, that message shows on the page. If the message editor was directly selected using the COMPOSE MESSAGE line select key, the last message edited on the message editor pages shows.

EDIT MESSAGE PAGE

EDIT MESSAGE

<1 MSG 1

<2 INFLIGHT REPORT

<3 -----

<4 -----

<COMPOSE MESSAGE

-----REPORT-----

AFIS MENU>

[]

MSG EDITOR

The MSG EDITOR consists of two display pages. The first page of the MSG EDITOR, called the MSG EDITOR HDR (header) page, allows you to create a title for the message, indicate who it is from, who it is going to, and give additional contact information for the intended recipient. The second page of the MSG EDITOR, called the MSG EDITOR TEXT page, is where you enter the text of the message itself. Push the NEXT or PREV key to show the desired MSG EDITOR page.

Creating

When creating a message, you must enter something into either the TO or CONTACT NO. data lines on the MSG EDITOR HDR page. The information provided in the CONTACT NO. data line may be used to automatically route your message through the AFIS Data Center. The CONTACT NO. entry may contain AFIS defined codes to identify telephone, aircraft, FAX, and digital transmissions.

The MESSAGE TITLE line is an optional entry. However, it is much easier to know what a message is about if a title is given to it, especially if the message is to be stored for later reuse. If no title is entered when the message is stored, a default name of "MSG [#]" is assigned by the AFIS.

The FROM data line is automatically filled in with the airplane tail number. However, you can modify this line as desired.

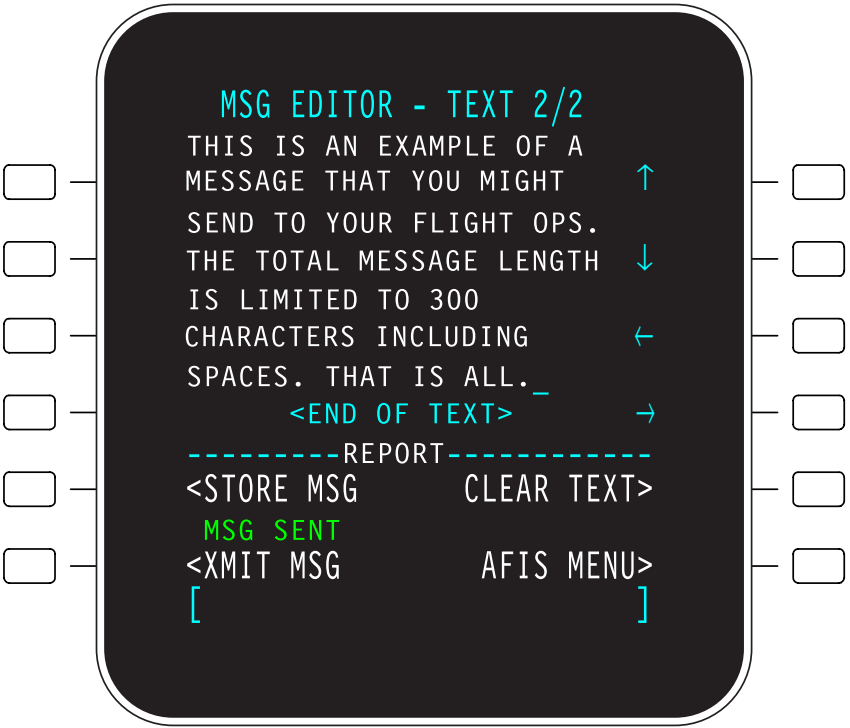
On the text page, the full screen above the dotted line, except for the page title line, and the left and right most columns are available for text entry. A green cursor shows on the page in the form of an underline. Key strokes are inserted at the location of the cursor on the page, not in the scratchpad. You can move the cursor to any valid text entry place on the display, allowing you to edit any existing text after it has been created. The arrows shown in cyan on the right side of the display indicate the adjacent line select key is used to move the cursor in the direction the arrow is pointing. Moving the cursor to the top or bottom of the page, then moving the cursor once more causes the display to scroll one line of text, if there is additional text in the direction that the cursor is being moved.

Enter text using the CDU keypad. Three of the keys on the keypad (+/-, DEL and CLR) have unique functions. Sequential pushes of the +/- key alternately enters either the + or - sign. The CLR key works like a backspace key at the cursor's current position, and the DEL key deletes the character directly above the cursor.

Text is entered with automatic word wraparound. When the bottom line of the screen is filled, the text automatically scrolls up one line. If a message fills more than one page, the entire text may be viewed by running the cursor to the top or bottom of the page to scroll the remaining text.

A message can consist of a maximum of 300 characters (including spaces). A warning, "MSG FULL", shows at the bottom of the page if you attempt to exceed the limit.

SAMPLE MSG ON MSG EDITOR



Transmitting

When a message is complete, push the XMIT MSG line select key on the MSG EDITOR page to transmit it. After the message has been sent, the message "MSG SENT" shows in green above the XMIT MSG line key selection.

Storing

If you exit the MSG EDITOR page after creating a message, the entire message is preserved, provided power is not cycled on the AFIS adapter/DBU. The message is available the next time the editor is accessed, unless another preprogrammed message is selected in its place.

You can store any message as a preprogrammed message. Push the STORE MSG line select key on the MSG EDITOR page to show the STORE PRE-PGM MSG page, then push the line select key for one of the four storage locations.

The message title, if entered, is automatically inserted with the information on the MESSAGE TITLE line of the message's header page. You may enter or change a title for the stored messages on the STORE PRE-PGM MSG page if desired. If the scratch pad is empty and a title is not entered before storing a preprogrammed message, a default title is entered (MSG 1, MSG 2, MSG 3, or MSG 4). If the scratchpad is not empty when the store location is selected, the scratchpad contents are used as the message title. If the scratchpad contains the DELETE command, the default name is used. When a new message is stored in a location where there is an existing message, the previous message and title are overwritten.

When you store a message, the current position of the cursor is also saved with the message. If you have a message in which the content is essentially the same all the time, except for a custom entry, leave the cursor at the position of the custom entry when you store the message. Since the cursor will remain at its last position, this allows you to quickly enter the desired change each time you recall the message.

Once a message has been stored, it cannot be deleted. The only way to "delete" a stored message is to overwrite it with a new message.

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SIGMETS

Viewing

Push the SIGMETS line select key on the AFIS MENU page to show any reported SIGMETS messages or to request a report on SIGMETS.

When viewing a SIGMET report, push the NEXT or PREV key as necessary to page through a multi-page report. The page numbers in the upper right corner of the display show the current and total page numbers.

Requesting

If you want to make a request for SIGMETS information, push the REQ SIGMETS line select key on the SIGMETS page to show the REQUEST SIGMETS page.

On the REQUEST SIGMETS page, enter the FROM and TO (origin/destination) locations so the appropriate SIGMETS can be provided for your request. Push the XMIT REQ line select key to transmit the request to the Global Data Center. After you push the XMIT REQ line select key, the message "REQ PENDING" shows in green above the XMIT REQ label until the new data arrives, or until an edit to the FROM or TO data lines is made.

The requested SIGMETS are available for viewing when they are received. When they are received, they overwrite any previous SIGMETS. However, if you are viewing the existing SIGMETS when the new ones arrive, the old data is not overwritten. The new SIGMETS will be loaded when you exit the SIGMETS pages. "REPORT" shows on the AFIS MENU page and on the dashed line of all AFIS pages when new information is received, either automatically or in response to a request.

The REQUEST SIGMETS page also shows a line key selection to READ DISK SIGMETS. With this function, you can read SIGMETS from a diskette placed into the DBU. When you load SIGMETS from a diskette, the information overwrites any previous SIGMETS in the same manner as if new information were received in response to a transmitted request.

If either the READ DISK SIGMETS or XMIT REQ are selected and the request cannot be honored, the message "REQ FAIL" shows above the selected function in green until another request for the data is made, the request TO or FROM lines are edited, or power is cycled on the AFIS DBU.

REQUEST SIGMETS PAGE

WITH REQUEST PENDING



TERM WX

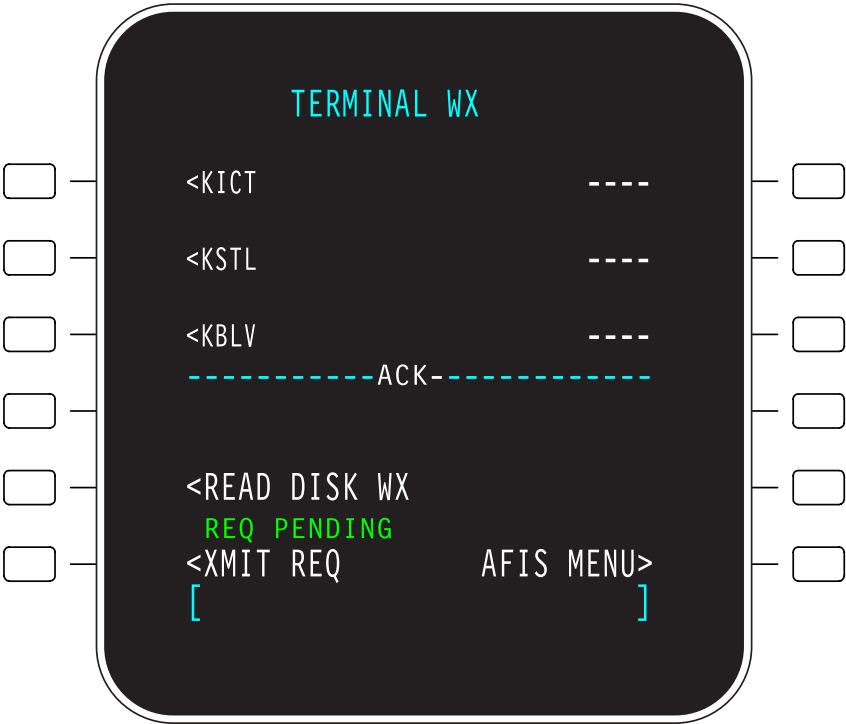
Terminal weather reports for up to six locations may be stored and available for display at any one time. When TERM WX is selected on the AFIS menu page, a list of terminal weather locations is shown.

Viewing

Push the TERM WX line select key on the AFIS MENU page to show the TERMINAL WX page. On the TERMINAL WX page, you select the airports for which you want to view weather reports. You can also transmit a request for weather reports or read them from a diskette.

On the TERMINAL WX page, push the line select key of an airport to show that airport's weather report on the display. Only the identifiers with a caret symbol (< or >) at the outside edge of the display have a report to view. Lack of a caret symbol does not mean that there is no weather to report, only that weather was received for those airports that do have a caret symbol. When viewing a weather report, push the NEXT or PREV key as necessary to page through a multi-page report. The page numbers in the upper right corner of the display show the current and total page numbers.

TERMINAL WX REQUEST PAGE



Requesting

To make a request for terminal weather information, enter the airport's identifier into one of the six location lines on the **TERMINAL WX** page using the scratchpad entry method, then push the **XMIT REQ** line select key. The transmitted request is for all of the airports listed on the **TERMINAL WX** page.

When you enter or change an airport identifier, the identifiers show in large font characters before a request for data is transmitted. After a request is transmitted, the identifiers change to small font characters. When the weather data is received, the caret symbol (< or >) shows next to the identifiers that have viewable weather data. Lack of a caret symbol does not mean that there is no weather to report, only that weather was received for those airports that do have a caret symbol.

When you enter a new airport identifier on a line that previously contained an airport identifier with viewable data, the viewable data may be recovered by deleting the last entry on that line using the **DEL** key function. Only data contained in the last terminal weather transmission is recoverable with the **DEL** key function.

When a request for terminal weather is made, the message "**REQ PENDING**" shows above the **XMIT REQ** label until the new data arrives.

Requested terminal weather is available for viewing when it is received. Newly received terminal weather will overwrite any existing weather data. However, if you are viewing the terminal weather pages when new data arrives, the old data is not overwritten until you exit the **TERM WX** pages. Whenever a new terminal weather report is available, the terminal weather list is updated to correspond to the new report. The message "**REPORT**" shows at the bottom of the page when new data is available for viewing.

You can also read terminal weather from a diskette placed into the DBU. Push the **READ DISK WX** line select key on the **TERMINAL WX** page with the diskette inserted into the DBU. The terminal weather data on the diskette is then read into the AFIS system, overwriting any previous weather data. While the disk is being accessed, the "**REQ PENDING**" message show above the **READ DISK WX** label. If there is no diskette in the DBU, the message "**DISK DRIVE NOT READY**" shows in the scratchpad. If there is no terminal weather data on the diskette, the message "**FILE NOT FOUND**" shows in the scratchpad.

If either **DISK READ WX** or **XMIT REQ** is selected and the request cannot be honored, the message "**REQ FAIL**" shows in green above the appropriate line select key label until another request for the data is made, the terminal identifier lines are edited, or power is cycled on the AFIS DBU.

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WINDS

Winds aloft reports for up to six locations may be stored and available for display at any one time. After selecting WINDS on the AFIS menu page, a list of locations is shown.

Viewing

Push the WINDS line select key on the AFIS MENU page to show the WINDS ALOFT LIST page. On this page, you select the airports for which you want to view the winds aloft reports. You can also transmit a request for winds aloft reports or read them from a diskette.

On the WINDS page, push the line select key of an airport to show that airport's winds aloft report on the display. Only the identifiers with a caret symbol (< or >) next to them have a report to view. Lack of a caret symbol does not mean that there are no winds aloft reports, only that winds aloft data was received for those airports that do have a caret symbol.

WINDS ALOFT LIST

WINDS ALOFT LIST

ICT

STL

SLN

BUM

-----REPORT-----

<READ DISK WIND

REQ PENDING

<XMIT REQ

AFIS MENU>

[

]

Requesting

To make a request for winds aloft information, enter the airport's identifier into one of the six location lines on the WINDS ALOFT LIST page using the scratchpad entry method, then push the XMIT REQ line select key. The transmitted request is for all of the airports listed on the page.

When you enter or change an airport identifier, the identifiers show in large font characters before a request for data is transmitted. After a request is transmitted, the identifiers change to small font characters. When the winds aloft data is received, the caret symbol (< or >) shows next to the identifiers that have viewable data. Lack of a caret symbol does not mean that there are no winds aloft reports, only that winds aloft data was received for those airport that do have a caret symbol.

When you enter a new airport identifier on a line that previously contained a airport identifier with viewable data, the viewable data may be recovered by deleting the last entry on that line using the DEL key function. Only data contained in the last winds aloft transmission is recoverable with the DEL key function.

When a request for winds aloft data is made, the message "REQ PENDING" shows above the XMIT REQ label until the new data arrives.

Requested winds aloft data is available for viewing when it is received. Newly received winds aloft data overwrites any existing winds data. However, if you are viewing the WINDS pages when new data arrives, the old data is not overwritten until you exit the WINDS pages. Whenever a new winds aloft report is available, the airport list is updated to correspond to the new report. The message "REPORT" shows at the bottom of the page when new data is available for viewing.

You can also read winds aloft data from a diskette placed into the DBU. Push the READ DISK WIND line select key on the WINDS ALOFT LIST page with the diskette inserted into the DBU. The winds aloft data on the diskette is then read into the AFIS system, overwriting any previous wind data. While the disk is being accessed, the "REQ PENDING" message shows above the READ DISK WIND label. If there is no diskette in the DBU, the message "DISK DRIVE NOT READY" shows in the scratchpad. If there is no wind data on the diskette, the message "FILE NOT FOUND" shows in the scratchpad.

If either DISK READ WIND or XMIT REQ is selected and the request cannot be honored, the message "REQ FAIL" shows in green above the appropriate line select key label until another request for the data is made, the airport identifier lines are edited, or power is cycled on the AFIS DBU.

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MODES

AFIS communication modes are controlled from the MODES page. You can control:

- Automatic position reporting
- Automatic weather updating
- Use of VHF communications
- Use of satellite communications.

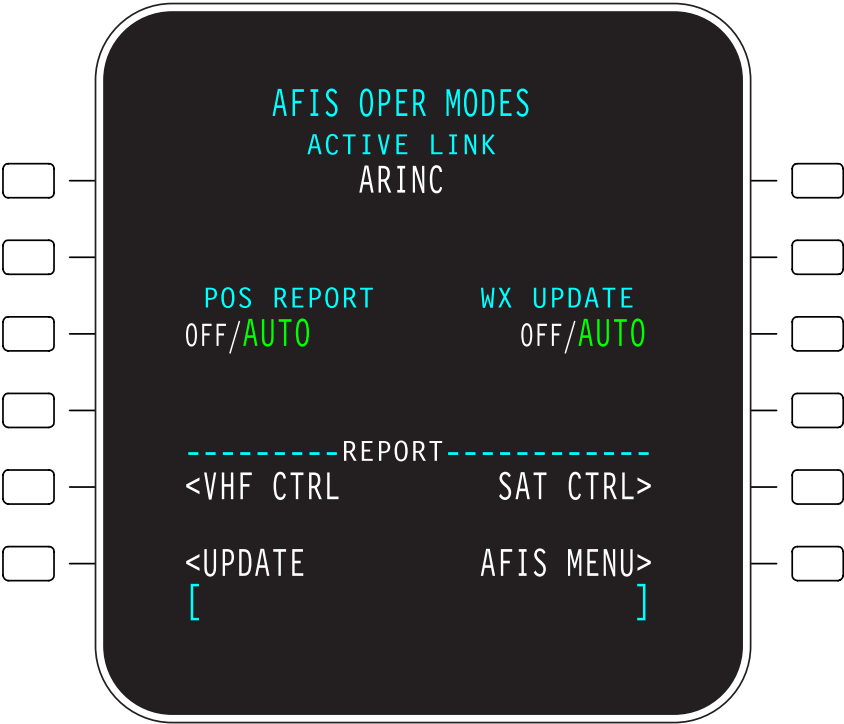
Push the MODES line select key on the AFIS MENU page to show the AFIS OPER MODES page.

On the AFIS OPER MODES page, push the OFF/AUTO line select keys for the POS REPORT and WX UPDATE functions to alternately turn the automatic update of position reports and weather information on (AUTO) and OFF.

The selected mode shows in large font green characters, and the unselected mode shows in small font white letters. When a change is made, the new selection shows in large font yellow characters, and the UPDATE line select key label shows in the lower left corner of the display. After a change is made, you must push the UPDATE line select key to activate the changed mode. If the UPDATE line select key is not pushed, the change is not made. When the update is complete, the UPDATE label is removed, and the selected modes show in green.

The default settings for POS REPORT and WX UPDATE, as well as the time between the automatic position reports, are set during the installation of the AFIS system.

AFIS OPERATING MODES PAGE



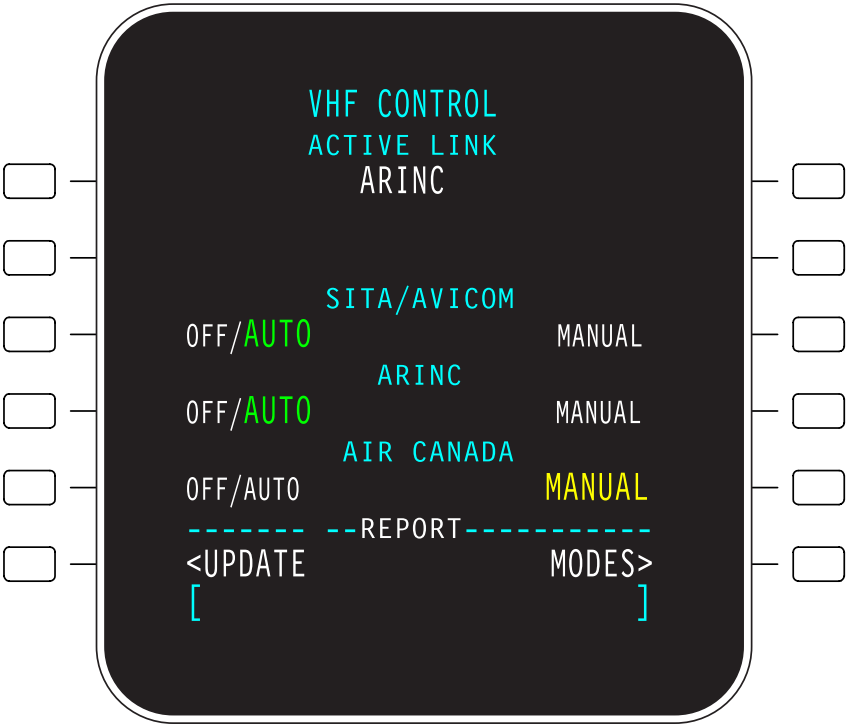
VHF Communications

For control of the VHF communications link, push the VHF CTRL line select key on the AFIS OPER MODES page to show the VHF CONTROL page. On this page, you can select the ground networks to be used by the AFIS system: SITA, ARINC, and/or AIR CANADA.

On the VHF CONTROL page, push a line select key to set or select the associated mode for each of the ground network stations. You can independently set each of the three VHF data links to OFF or AUTO. However, if any one of the links is set to MANUAL, the other two links are forced to OFF. For the ground network stations set to AUTO, the FMS automatically selects the appropriate data link service.

Selected modes show in large font green characters and unselected modes show in small font white characters. When a change is made, the new selection shows in large font yellow characters and the UPDATE label shows in the bottom left corner of the display. After a change is made, you must push the UPDATE line select key to activate the change. If the UPDATE line select key is not pushed, the change is not made. When the update is made, the UPDATE label is removed and the selected modes show in large font green characters.

VHF CONTROL PAGE



Satellite Communications

For control of the Satellite communications link, push the SAT CTRL line select key on the AFIS OPER MODES page to show the SATELLITE CONTROL page. On this page, you can select the satellite networks to be used by the AFIS system.

On the SATELLITE CONTROL page, push a satellite network line select key to select an individual satellite network, push the ALL line select key to enable the use of all the satellite networks, or push the OFF line select key to disable use of all the satellite networks.

Selected modes show in large font green characters and unselected modes show in small font white characters. When a change is made, the new selection shows in large font yellow characters and the UPDATE label shows in the bottom left corner of the display. After a change is made, you must push the UPDATE line select key to activate the change. If the UPDATE line select key is not pushed, the change is not made. When the update is made, the UPDATE label is removed and the selected modes show in large font green characters.

SATELLITE CONTROL PAGE

SATELLITE CONTROL

ACTIVE LINK

ARINC

WEST
ATLANTIC

PACIFIC

ALL

EAST
ATLANTIC

INDIAN

OFF

-----REPORT-----

<UPDATE

MODES>

[

]

2nd Edition
15 Dec 99

12-29

STATUS

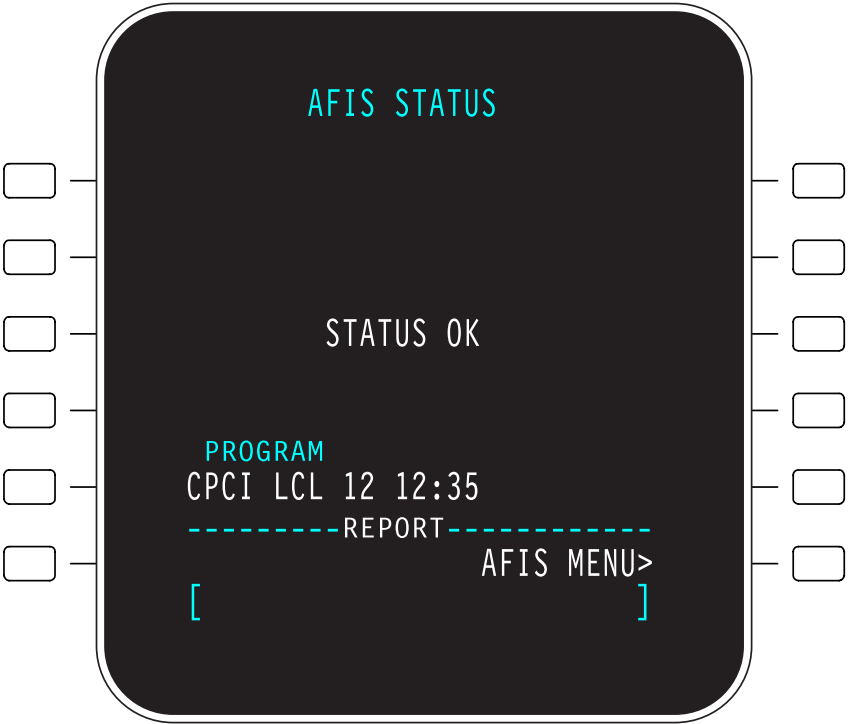
The operating status of the AFIS system shows on the AFIS STATUS page. Push the STATUS line select key on the AFIS MENU page to show the AFIS STATUS page.

If no AFIS faults exist, "STATUS OK" shows in the center of the page. If a fault is detected, one or more of the following messages may be shown:

- NO VHF COMM
- NO SAT COMM
- VHF DISABLE
- SAT DISABLE
- DMU FAULT
- MODEM FAIL
- CONFIG FAIL
- UP LINK FAIL
- DN LINK FAIL.

These messages show only when the corresponding condition exists. The "UP LINK FAIL" and "DN LINK FAIL" messages show for transient communications failures. They show for a minimum of 10 seconds for each failure occurrence.

AFIS STATUS PAGE



AFIS Configuration

AFIS configuration control pages may be accessed from the AFIS MENU page, but only when the maintenance plug is installed in the DMU. The AFIS configuration may be edited from these pages. The DMU will only update the configuration after a DMU power cycle. Current configuration data shows in small white font. Manual entries show in large green font. Current configuration setting may be restored by deleting manual entries. Configuration changes are not transmitted to the DMU until the UPDATE command on AFIS CONFIG page 3/3 is pressed. You must make at least one change on any of the three pages for the UPDATE prompt to be displayed on AFIS CONFIG page 3/3. Pressing the AFIS MENU line select key before pressing the UPDATE line select key will discard all changes. Once the UPDATE key is pressed, all communications between the DMU and CDU may cease for up to 45 seconds, and all CDUs will be locked until the update is completed.

If the DMU is unable to accept the configuration change, the message "DMU CONFIG FAIL" appears in yellow.

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RADIO TUNING

The RADIO TUNING page controls and displays the COMM, NAV, ADF, and ATC transponder radios. It also has controls for selecting the automatic tuning mode in which the FMS automatically tunes the paired VOR and DME channel 1 frequencies of the NAV receivers. MAN is the default mode. However, AUTO is the recommended operating mode for the NAV receivers. The FMS does not control ADF BFO, ADF antennas, DME holds, or the transponder operating modes. You must use the airplane's Radio Tuning Units (RTUs) to control these functions.

You can tune radios in several different ways. COMM radios can be tuned directly or from a preset frequency. NAV and ADF receivers can be tuned using either the station's frequency or its identifier. NAV receivers can also be set to be automatically tuned by the FMS as described above.

In most systems the colors used on the RADIO TUNING pages correspond with the colors used on the airplane's RTUs as follows:

- RADIO TUNING title line shows in cyan
- Radio names show in white
- Active Frequencies show in green
- Active modes and the STBY annunciation show in cyan.

Some installations may use colors other than as specified above. For these installations, refer to your aircraft flight manuals for a description of the use of color on the RADIO TUNING pages.

Manual Tuning (All Radios)

To directly tune a radio, set a transponder code or enter preset (PRE) COMM frequency:

1. Push the RADIO key to show the RADIO TUNING page.
2. Enter a COMM, NAV or ADF station frequency, a NAV station identifier, or an ATC squawk code into the scratchpad with a keypad entry or with a line select key transfer of a frequency or code shown on the display (example: enter 1187 into the scratchpad).

NOTE

You cannot copy a PRE or RCL COMM frequency into the scratchpad.
--

3. Push the line select key of the desired radio to transfer the scratchpad entry to that radio (example: PRE 1 line select key).

MANUAL TUNING FREQUENCY
SET IN SCRATCHPAD

RADIO TUNING

COM 1

133.95

PRE 1

123.25

NAV 1

114.10

NAV 1 -- MODE --

AUTO/MAN

ADF 1

326.0

ATC 1

6562

[129.95

COM 2

118.75

PRE 2

119.75

NAV 2

116.20

NAV 2

AUTO/MAN

ADF 2

338.0

ATC 2

]

8.33 KHz Tuning

In installations with compatible COMM radios and RTUs, the FMS supports 8.33 MHz frequency separation in the VHF frequency range of 117.975 to 136.975 MHz. This separation coexists with the current 25 kHz separation. Navaid frequencies, ADF frequencies and transponder codes are not affected by the 8.33 kHz separation. In the 8.33 kHz configuration, COM frequencies in the 117.975 to 136.975 range will use 8.33 kHz separation, and the remaining frequencies in the 137.00 to 151.975 range will use the traditional 25 kHz separation.

In the 8.33 kHz tuning configuration, the TUNE page will show 6 digits for COM channel names (frequencies). The naming convention for frequencies is shown in the table below. The actual tuning frequency will not be entered in the scratchpad in the 8.33 kHz mode. If you attempt to enter an invalid channel name into any of the COM channels, the message "INVALID ENTRY" will show in the scratchpad. Trailing zeros and decimal points are not required to be entered as part of the channel name, but will be displayed once the channel name has been entered.

FREQUENCY (MHZ)	CHANNEL SPACING (KHZ)	CHANNEL NAME
118.0000	25	118.000
118.0000	8.33	118.005
118.0833	8.33	118.010
118.0167	8.33	118.015
118.0250	25	118.025
118.0250	8.33	118.030
118.0333	8.33	118.035
118.0417	8.33	118.040
118.0500	25	118.050
118.0500	8.33	118.055
118.0583	8.33	118.060
118.0667	8.33	118.065
118.0750	25	118.075
118.0750	8.33	118.080
ETC	ETC	ETC

This page intentionally left blank.

NAV Tuning

NAV radios may be tuned either by entering the frequency manually, or by entering only the three letter identifier for the station. When a station identifier is entered into one of the active channels, the FMS automatically sets the station frequency using information stored in its database.

To tune by identifier:

1. On the RADIO TUNING page, enter the three letter station identifier into the scratchpad.
2. Press the line select key for the appropriate NAV radio to transfer the identifier.

NOTE

If a NAV radio is set to AUTO tune mode and it is manually tuned, either by entering the frequency or station identifier, the tune mode changes to MAN and remains in MAN until AUTO is reselected.

NOTE

When a NAV radio is manually tuned by station identifier, the three letter station identifier is displayed next to station frequency to indicate tuning by identifier.

NAV RADIO #1
TUNED BY IDENT

RADIO TUNING

COM 1

123.25

RCL 1

133.95

NAV 1

113.80/ICT

NAV 1 -- MODE --

AUTO/MAN

ADF 1

326.0

ATC 1

6562

[

COM 2

118.75

PRE 2

119.75

NAV 2

116.20

NAV 2

AUTO/MAN

ADF 2

338.0

ATC 2

]

Recall (RCL)

Pushing the RCL line select key on the TUNE page causes the active COM frequency (indicated in green text) to swap with the RECALL frequency (the preceding frequency). This allows you to return to the previous frequency without having to manually reenter the frequency. Each push of the RCL line select key switches the active and recall frequencies.

RECALL FREQ
AVAILABLE IN COM 1

RADIO TUNING

COM 1

123.25

RCL 1

133.95

NAV 1

114.10

NAV 1 -- MODE --

AUTO/MAN

ADF 1

326.0

ATC 1

6562

[

COM 2

118.75

PRE 2

119.75

NAV 2

116.20

NAV 2

AUTO/MAN

ADF 2

338.0

ATC 2

]

Automatic NAV Tuning

The FMS-4200 determines its present position using all available sensors. For the NAV receiver portion of the position determination, the FMS can automatically tune NAV receivers to use DME and radial information from various NAV stations to greatly improve its position determination. Setting the AUTO/MAN function on the RADIO TUNING page to AUTO enables the automatic tuning function. However, there are several things that can prevent automatic tuning from functioning, causing the FMS to automatically change back to MANual tuning mode. These are:

- Selecting DME HOLD
- Manually tuning the NAV receiver from the FMS
- Manually tuning the NAV receiver from the RTU
- Changing the selected NAV source to other than FMS
- A NAV receiver failure.

To turn the AUTO/MAN tuning mode on or off:

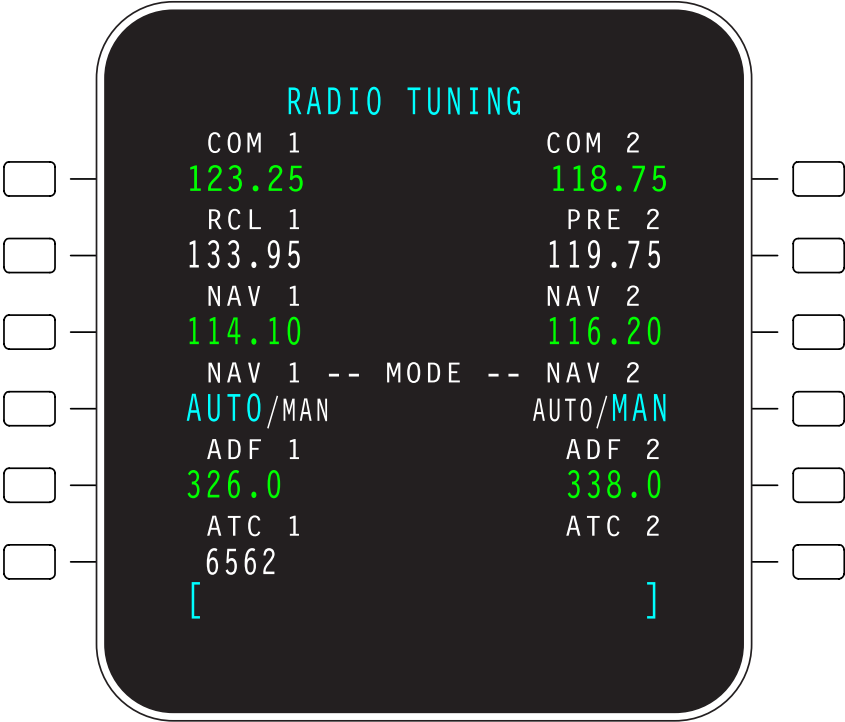
1. Push the RADIO key to show the RADIO TUNING page.
2. Push the AUTO/MAN line select key (example: set NAV 1 to AUTO).

NOTE

The normal and recommended operating mode is AUTO when using FMS as the NAV source.

NAV 1 IN AUTO TUNE MODE

NAV 2 IN MANUAL TUNE MODE



Reversion Modes

Switches in the cockpit select the reversion mode operations for tuning the radios from the FMS. Refer to the appropriate airplane flight manuals for specific information for your airplane.

Failure Indications

Dashes show in place of the frequency, channel number or transponder code for a radio that is not matching the frequency, channel number or transponder code set by the FMS. Try retuning the affected radio using the RTU or try turning it off and then back on.

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Load A Database.....	14-2
Copy Routes/Waypoints To Disk.....	14-4

**ADDENDUM 3
TO
COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert this addendum sheet facing page 14-1

The following NOTE is added after the second NOTE on the page.

NOTE

The PCD-3000 data loader may be used instead of the DBU to initiate a database read or write. Refer to the Rockwell Collins PCD-3000 Data Loader user's guide (CPN 523-0780041) for instructions on how to upload and download data to the FMS.
--

DATABASE LOADING/COPYING

The Collins FMS-4200 Navigation Database Service provides the navigation data for the FMS-4200 Flight Management System. This service allows you to select a navigation database which matches the operational requirements of your flight operations. Contact Collins Business and Regional Systems Customer Service by phone at 1-319-295-2512 for information on database subscriptions, as well as any other questions you may have about databases for your FMS-4200.

Push the DB DISK OPS line select key on the INDEX page to show the DATA BASE DISK OPS page. From the DATA BASE DISK OPS page, you can load a database into the FMS with the READ DISK function and you can copy any custom PILOT ROUTES and PILOT WPTs you may have entered into the FMS to a disk with the WRITE RTES and WRITE WPTS functions.

NOTE

Database operations can be performed only when the airplane is on the ground.

NOTE

The ability to store PILOT ROUTES and WRITE RTES/WPTS is optional and may not be available on all installations. In those installations without the WRITE RTES/WPTS or store PILOT ROUTES function, only the READ DISK function is available.

Load A Database

To load a database:

1. Push the INDEX key to show the INDEX page.

NOTE

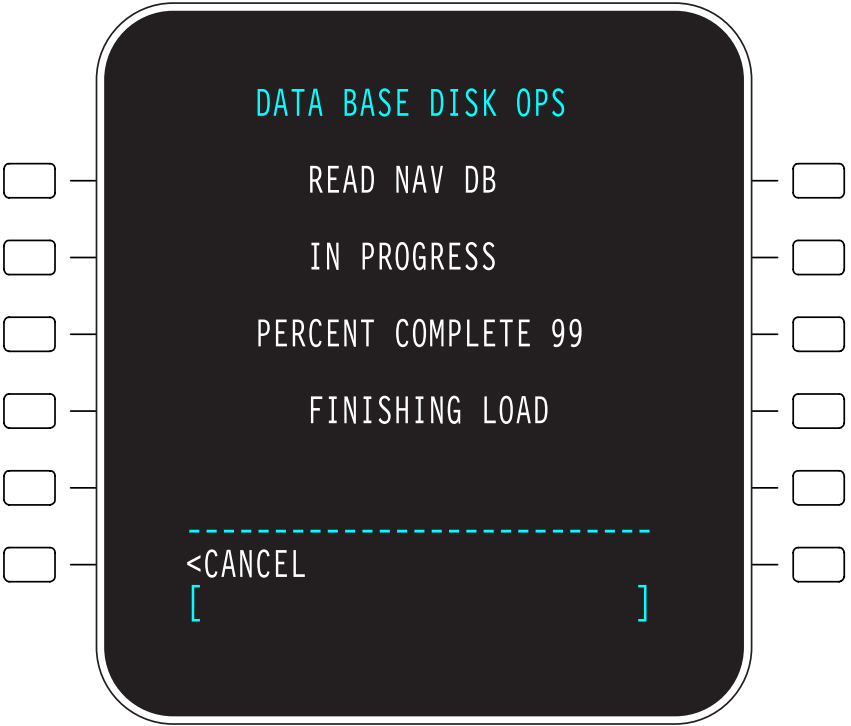
Depending on the equipment and options installed in the airplane, for step 2 below you may need to push the PREV PAGE or NEXT PAGE key to show the DB DISK OPS line select key on the INDEX page.

2. Push the DB DISK OPS line select key to show the DATA BASE DISK OPS page.
3. Insert the database diskette into the DBU.
4. Push the READ DISK line select key.
5. Follow the instructions on the display to insert any additional diskettes if required. The display shows information on the progress of each step of loading a database, indicates when the loading is completed, and then shows the STATUS page.

NOTE

Database loads cannot be cross-talked by the FMSs. All database loads must be individually performed on each FMC.

LOADING DATA BASE
TYPICAL PROGRESS PAGE



Copy Routes/Waypoints To Disk

NOTE

WRITE RTES/WPTS is an option and may not be available in all installations. If the option has not been installed, WRITE RTES and WRITE WPTS will not appear on the DATA BASE DISK OPS page.

To copy PILOT RTES and/or PILOT WPTS to a disk:

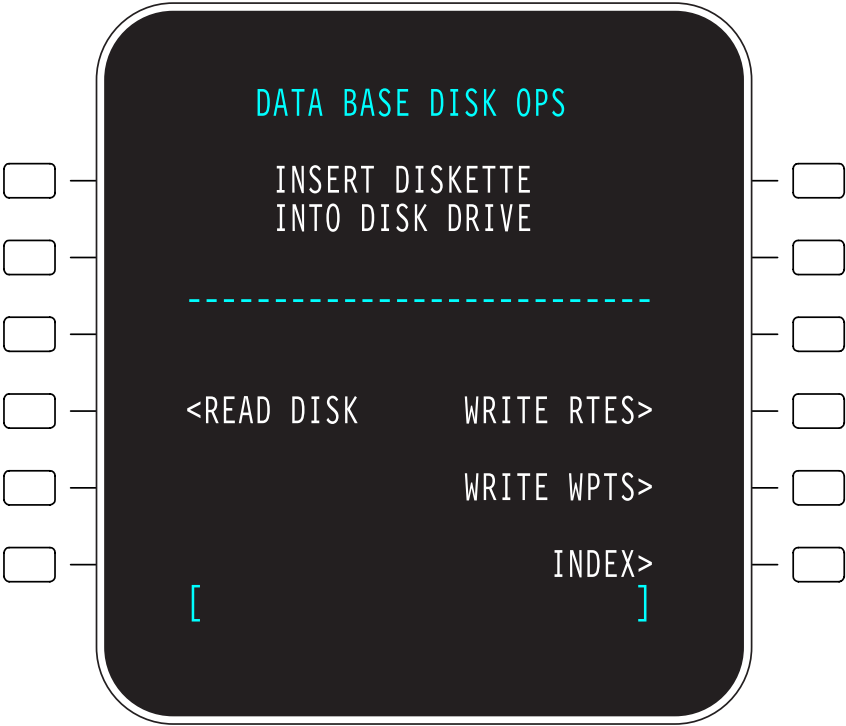
1. Push the INDEX key to show the INDEX page.

NOTE

Depending on the equipment and options installed in the airplane, for step 2 below you may need to push the PREV PAGE or NEXT PAGE key to show the DB DISK OPS line select key on the INDEX page.

2. Push the DB DISK OPS line select key to show the DATA BASE DISK OPS page.
3. Insert a diskette into the DBU (write protection must be disabled).
4. Push the WRITE RTES or WRITE WPTS line select key. Follow any instructions on the display to insert any additional diskettes if required. The display indicates when copying is complete.

DATA BASE DISK OPS PAGE



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**ADDENDUM 8
TO
FMS-4200 Flight Management System
PILOT'S GUIDE**

Part Number 523-0778363-02117, 2nd Edition Dated 15 Dec 99

Notice

INFORMATION SUBJECT TO EXPORT LAWS

The technical data in this document (or file) is controlled for export under the Export Administration Regulations (EAR), 15 CFR Parts 730-774. Violations of these laws may be subject to fines and penalties under the Export Administration Act.

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Remove Addendum 6, dated 6 Feb 07 and insert this addendum prior to page 15-1

The following information is provided for aircrew awareness and should be accessible to pilots on the flight deck. A choice between two Navigational Databases Vendors is available for Rockwell Collins Flight Management Systems requiring a *Type 4* or *Type 6* navigation database. Two choices exist for Navigation database for the RCI FMS and they are named: **Standard** (Lufthansa Systems Inc.) and **Optional** (Jeppesen Sanderson Inc.).

The status of the FAA AC 20 -153 Type-1 Navigation Database Vendor Letter of Acceptance (LOA) and Rockwell Collins FAA AC 20 -153 Type-2 LOA that ensure compliance of the aeronautical data to the State data sources can be found at the following link. <http://www.rockwellcollins.com/fms/naalerts.asp>

The CDU Status Page delineates which vendor's navigational data is loaded into the FMC by the respective prefix letter "L" (LSY) or "J" (Jeppesen) preceding the identified Nav Data.

Regulatory guidance for preflight planning requires crew members to verify their Flight Plan (route verification check) and accomplish a legs verification check for the complete flight plan route and note or resolve any discrepancies, these observations are offered for consideration by customers electing to change database vendors. These observations are neither totally inclusive nor exclusive and are subject to change with each AIRAC cycle (28 day update cycle). The following LSY observations are general in nature, were noted during one AIRAC cycle and therefore will not be updated

1. When lifting off the runway on takeoff or on a missed approach, an initial altitude constraint not defined by the procedure can be referenced in the navigational database.
 - o LSY usually references 500' AGL

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2. *“Expected Altitude”* constraints published in Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs) are often included in the LSY database.
3. Waypoint fixes exist that are not defined as part of a procedural design.
 - o The name and location of aeronautical data representing an undefined fix is at the discretion of the vendor. An example would be the waypoints used to define a turn to final from an arcing approach.
4. STAR/SID Name and Transition:
 - o Waypoints listed as referenced to the PROCEDURAL named fix may not be dependent on runway selection in the LSY database. The BYP5 STAR into Dallas/Ft Worth is an example.
 - a. The LSY database lists the waypoints past BYP prior to runway selection (i.e. all the way to STONZ).
 - o The LSY database lists only the RNAV procedure if more than published procedure exists.
 - a. STAR example at Cairo (HECA): The BALTIM 1A RNAV arrival into Cairo for RWY 05R is listed as BLT1A, not RBLT1A.
5. Approach Transition Name: A database vendor has discretion in approach transition naming. Washington Reagan (KDCA) can be referenced to illustrate.
 - o The GRNV04 approach with the Transition of GTN in the LSY database represents the Georgetown Transition.
6. The LSY database provides Airport Communication Frequency coverage at most Large Volume Airports.

If you have any questions regarding this FMS Pilot's/Operator's Guide Addendum, please contact your local Rockwell Collins Customer Support Engineer or call FMS & Database Support at 319.295.5000.

PRINCIPLES OF FMS NAVIGATION

FMS-4200 navigation is based on using all the airplane's available navigation sensors to fly from waypoint to waypoint along a flight plan route. The waypoints are based on the information contained in the FMS-4200 Navigation Database and any pilot-defined waypoints. A flight plan route is selected from a route list, or created from the database waypoint information and/or pilot-defined waypoints. With the navigation and other sensor data available to it, the FMS determines its present position relative to the flight plan route and computes steering commands for use by the flight control system to fly the airplane along the route.

FMS Database

The FMS-4200 typically contains two databases, the ACTIVE DATA BASE and the SEC DATA BASE. Only the ACTIVE DATA BASE is used for flight planning and navigation purposes. The secondary database allows a new database to be loaded before its effective date so the new database is ready for use when it becomes valid.

A database may include, but is not limited to, information on the following facilities:

- Airports and Runways
- Navaids - VOR, VOR/DME, VORTAC, and TACAN
- GPS
- NDB (All NDB identifiers are suffixed with NB i.e., IOWNB, DBNB, etc.)
- Airways
- Intersections
- Pilot-defined waypoints
- SIDs and STARs
- Approaches and Missed Approach procedures(optional).

A new, updated database must be installed every 28 days to ensure it contains the latest available information for the facilities described above. Updates are accomplished by loading new data into the airplane's Flight Management Computer (FMC).

Navigation database information is used for many purposes. Pilots use the information to create and modify flight plans. The FMS uses the information to:

- Select the VOR/DME navaids to use in determining its position
- Display information about the various navigation facilities on the CDU, MFD data pages and MAP displays
- Automatically insert into a flight plan the waypoints that make up a selected airway, SID, STAR, or approach.

Dual FMS Coordination

Dual FMS installations can operate in a synchronized (SYNC) or independent (INDEP) mode. In some installations, the mode is selected by the pilot from the CDU on the FMS CONTROL page. In others, it is configured with the airplane wiring to operate only in SYNC mode or only in INDEP mode.

SYNC

In the SYNC mode, the following items are automatically synchronized between both FMSs:

- FMS position initialization (optional)
- Database selection
- Disabled VOR/DME nav aids
- Disabled navigation sensors (except for GPS)
- All mode selections
- FIX INFO entries
- Flight plan entries or changes (only after the flight plan is executed for active flight plans)
- Second flight plan entries or changes.

In the SYNC mode, changes made to an active flight plan on one FMS are synchronized with the other FMS when the EXEC key is pushed to execute the flight plan. Changes made to the second flight plan on one FMS are synchronized immediately with the other FMS.

Only one FMS can change an active flight plan at any time. If one FMS already has a MOD FPLN in progress, any attempt to edit or change the active flight plan from the other FMS shows the "XSIDE EDIT IN PROGRESS" message on the CDU scratchpad line. The same is true if you attempt to activate a flight plan from the other FMS.

When both FMSs are selected as navigation sources, flight plan leg sequencing is controlled by the FMS that is selected as the active NAV steering source. When only one FMS is selected as the navigation source, it controls the flight plan leg sequencing.

INDEP

In the INDEP mode, none of the mode selections or flight planning data from one FMS are shared with the other FMS. However, flight plans can still be copied in whole from one FMS to the other via the FPLN TRANSFER line key function on the last page of the ACT FPLN and SEC FPLN pages. However, if a flight plan transfer is attempted when a flight plan is being edited (MOD FPLN page showing), the flight plan will be transferred without the new information. If a transfer is attempted when no flight plan exists on the other FMS, the message "NO XSIDE FPLN" shows on the scratchpad line. If the database is not the same on both FMSs when a flight plan transfer is attempted, the message "CHK SELECTED DATA BASE" shows on the scratchpad line. The database must be the same on both FMSs to copy a flight plan from one to the other.

NOTE

Due to slight variations in each FMS in determining its position, sequencing from one leg of a flight plan to the next may not occur simultaneously on both systems while they are operating in the INDEP mode.
--

Position Initialization

Preflight

After power is applied to the FMS, a position initialization process is required for it to accurately determine its present position. This is done by selecting or entering a known position, such as the airport, gate, runway threshold, or navaid, into the FMS through the POS INIT page on the CDU. This allows the FMS to use the sensors available to it to accurately determine and track its present position, direction, and speed. The most accurate way to initialize the FMS position is to enter on the POS INIT page the coordinates, if known, for the location where the airplane is currently parked.

Runway Updates

To further increase the accuracy of the initial position before takeoff, the ACT LEGS page provides the capability for a update the position to the runway threshold. As the airplane moves into position on the runway, the FMS can be updated to that initial position. It is important that the airplane be at the threshold before this update is accomplished. In airplanes with GPS sensors available for use by the FMS, it is not necessary to do position updates at the runway threshold.

Inflight Position Updates

In-flight FMS position updates are accomplished using position data from a GPS sensor, a navaid, or the FMS itself (depending on the equipment installed in the airplane). However, GPS sensors cannot be position updated from the FMS while the airplane is airborne.

Flight Plan

Each FMS-4200 may hold two flight plans. One flight plan is called the active flight plan and the other is called the second flight plan. Active flight plan data shows on the ACT FPLN, MOD FPLN, LEGS, ACT LEGS, and MOD LEGS display pages. Second flight plan data shows on the SEC FPLN and SEC LEGS display pages. Only the active flight plan is used for navigation and it is used only when FMS is selected as the NAV source.

A flight plan is made up of waypoints created from a combination of elements that include some or all of the following:

- Airports (origin, destination and alternate)
- Departure runway
- SID and transition
- Direct-to routes
- Airways
- Pilot-defined waypoints
- Holds
- STAR and transition
- Approach procedure, or arrival runway extension, and arrival runway
- Missed approach procedure
- Route to the alternate airport.

A waypoint is any point that is used as a reference for a navigation fix. Waypoints may be either predefined or pilot-defined. Predefined waypoints are stored in the FMS navigation database with the identifiers that are shown on aeronautical charts. These waypoints may be airports, navaids, or other charted navigation fixes and uncharted fixes used in SIDs, STARs, and approaches. Pilot-defined waypoints are stored within a flight plan and in the Pilot-defined waypoint list, but not in the FMS navigation database.

In dual FMS installations set to the SYNC operating mode, flight plan data is shared between both systems. In the INDEP operating mode, each FMS has its own flight plans. However, the flight plans can be copied, in whole, from one FMS to the other.

In SYNC mode, as the airplane progresses along the flight plan route, both FMSs are simultaneously sequenced from one waypoint to the next by the FMS that is selected for use by the autopilot. In the INDEP mode, when both FMS1 and FMS2 are selected as NAV sources, each FMS independently sequences through the flight plan as the airplane progresses along the route.

Navigation Sensors

To navigate, the FMS-4200 uses sensor data from GPS, VOR/DME nav aids, AHS, and air data systems along with the active flight plan and its own database information. The sensor data is used by the FMS to determine its present position, direction, and speed.

To determine its present position, the FMS uses all of the installed and enabled navigation sensors available to it. The FMS uses data from each sensor to determine position, as long as the data is valid or the sensor has not been specifically disabled. By default, all navigation sensors are enabled for use by the FMS at startup. Disabling sensors may degrade the accuracy of the position. Since the FMS weighs each sensor's accuracy and validity as part of determining its position, all sensors should be enabled at all times. Disabling a known invalid or failed sensor, or up to eight specific nav aids that are out of service, would be the only exception to this. By leaving all sensors enabled, the FMS can properly select the most accurate sensors for use in calculating its position.

VOR and DME

For VOR and DME navigation, the FMS scans approximately every 3 minutes for the best combination of DME stations, according to its database and present position. It takes into account the service volume of the nav aids, the airplane's altitude and distance from them, and the geometric relationship required to give accurate positioning data. To ensure that the DME stations received have valid signals and are the stations it expected to receive, the FMS verifies the actual station identifiers it receives with its database information for the expected station and rejects any DME stations with invalid identifiers.

The default FMS operating mode for use of VOR/DME nav aids is DME/DME navigation. In this mode, the FMS automatically tunes DME channels 2 and 3, using the distance data as part of its calculations to determine position. It does this with both NAV receivers, unless they are specifically disabled for use by the FMS on the VOR CONTROL page. When the NAV receiver tuning mode for the FMS is set to AUTO on the RADIO TUNING page, the FMS automatically tunes the paired VOR and DME channel 1 frequencies in addition to DME channels 2 and 3. For airplanes with dual DME installations, this gives the FMS up to six DME stations to use in determining its position with a high degree of accuracy.

The FMS uses the database to select and tune DME stations, first looking for stations with a geometry that will give the most accurate position information. If one or more of those stations cannot be received or the signal is invalid, it scans for another station. It continues to do this until it finds valid stations within the required geometric limits for determining its position. As the search expands and the geometric positioning of the stations degrades, the accuracy of the DME position data decreases. However, the FMS takes this into account as it

calculates its present position. After the DME scan is complete, any DME channels that did not receive a valid signal are tuned to the nav aids closest to the airplane's present position. They remain tuned to those nav aids until the next scan.

NOTE

When the airplane is on the ground, the FMS tunes the NAV receivers to the closest nav aids so they will be available as soon as possible after takeoff.

When at least two properly positioned DME stations are received and valid, the airplane's present position can be calculated using the distance data from each of those stations. If more valid stations are received, and they are within the required geometric limits, they are also used as part of determining the position and will improve its accuracy. For this reason, the FMS NAV tuning mode should always be set to AUTO to make the additional VOR/DME channels available to the FMS for DME/DME navigation. If the geometry of the received and valid DME stations will not result in an acceptably accurate position determination, the FMS removes the DME/DME navigation data from its calculations to determine position.

When less than two properly positioned and valid DME stations are available, the FMS may still use VOR radial and DME distance (referred to as VOR/DME navigation) from a co-located VOR/DME pair as part of the calculations to determine position. As with DME/DME, the FMS supplements VOR/DME data with data from the other navigation sensors available to it, as previously described, to increase the accuracy of the position solution. When the airplane is within the cone of confusion of a VOR/DME nav aid that is currently in use for VOR/DME navigation, the FMS removes that VOR/DME's navigation data from its position calculations. The FMS considers the airplane to be within the cone of confusion when the elevation angle from the nav aid to the airplane is greater than 45 degrees.

GPS

For GPS sensors, the FMS uses, by default, the on-side sensor data as it is provided by the sensor.

GPS may be used for primary means of navigation in oceanic and remote areas, provided a qualified GPS sensor is installed in the airplane. Qualified GPS sensors include a ground-based prediction program that verifies GPS navigation availability over the planned route. Pre-departure verification of GPS availability is required for GPS as primary means of navigation before each flight.

Status and integrity of the GPS position solution shows on the MFD LRN STATUS page. GPS Receiver Autonomous Integrity Monitoring (RAIM) is used to assure that the GPS solution meets the required accuracy:

- 4 NM oceanic/remote
- 2 NM en route
- 1 NM terminal
- .0.3 NM final approach with 99.9% confidence

The current RAIM accuracy limit is displayed on the MFD page. The oceanic/remote threshold is used in the North Atlantic region; other remote areas used the en route threshold.

The measured accuracy limit shown on the MFD page indicates the maximum estimated error based on measurement inconsistency. Unless an error is detected by RAIM, this value is always less than the RAIM accuracy limit.

When an error is detected, it is annunciated on the MFD page. If the detected error cannot be predicted to be less than the required integrity threshold, GPS is removed from the navigation solution. If no other navigation sensors are available, the FMS navigates by dead reckoning. If no error is detected by RAIM, the probable GPS error is shown. This is a statistical number based on normal satellite error characteristics.

Dead Reckoning (DR)

When no navigation sensor data is available for the FMS to use, it begins navigating in the DR mode. In this mode, it estimates its position based only on the last known position, heading, and airspeed. To identify this mode, "FMS DR" is annunciated on the MFD, and on the PFD if the NAV SOURCE is FMS; it also shows on the CDU message line and MESSAGES page.

Reversion Mode

Normally, the FMS uses on-side data from the installed GPS, AHS, and air data sensors. However, if an on-side sensor fails or its data is invalid, the FMS automatically changes to the off-side sensor as long as that sensor's data is valid and it has not been manually disabled on the sensor's control page. Only one of each sensor type is used by the FMS in its calculations to determine position.

If the FMS is using an offside sensor while the airplane is on the ground, it will automatically change back to the on-side sensor if that sensor's data becomes valid before the airplane is airborne. When the airplane is airborne, if the FMS changes to, or is already using, an off-side sensor, it will not change back to the on-side sensor even if the sensor returns to a valid state. However, if the offside sensor becomes invalid while the on-side sensor is valid, it will change

back to the on-side sensor. Also, at any time, a sensor that has been manually disabled can be manually reenabled on the sensor's control page on the CDU.

Sensor Monitoring

The FMS continuously monitors the navigation sensors to ensure they provide valid position data to the FMS. If position data from a specific sensor varies significantly from the FMS position, the "CHK POS" message is annunciated on the PFD and MFD. It also shows on the CDU message line and MESSAGES page, where it is followed by a message that identifies the suspect sensor (GPS-FMS DISAGREE, FMS-FMS DISAGREE, or DME-FMS DISAGREE). The monitors for each sensor type have different thresholds, based on the phase of flight (en route or terminal), for annunciating a sensor disagreement.

Required Navigation Performance (RNP)

RNP is a statement of the navigation accuracy necessary for operation within a defined airspace. The RNP value may be specified by the pilot and entered on the PROGRESS page through the CDU. The FMS also computes its expected position accuracy based upon the navigation sensors it is using. The expected position accuracy also shows on the PROGRESS page. When flying in RNP airspace, the error in the location of the airplane is required to be less than the RNP value 95% of the time. FMS position error should be less than the expected position accuracy 95% of the time. Therefore, when the expected position accuracy is greater than the RNP value, the message "LOW POSITION ACCURACY" shows on the CDU message line.

Flight Plan Tracking

The FMS accomplishes flight plan tracking by determining its present position, direction, and speed, and then computing steering commands for use by the flight control system to steer the airplane along a flight plan route. Flight plan routes are typically made up of great circle legs from waypoint to waypoint.

Waypoints

In addition to identifying a specific navigation facility, a waypoint can have one or more other unique properties. Some of these properties are: TO waypoints, flyover waypoints, and conditional waypoints.

A TO waypoint is the waypoint to which the FMS is currently tracking on the active leg of the flight plan. The CDU and MFD show the TO waypoint information in magenta and its identifier is annunciated in white on the PFD under the NAV source annunciation.

A flyover waypoint is a waypoint that must be flown over or abeam before the FMS sequences to the next waypoint of the flight plan. Leg terminating waypoints, such as a waypoint before a discontinuity, a holding fix waypoint, some waypoints in SIDs and STARs, the missed approach (MAP) waypoint, and the last waypoint at the end of a flight plan, are flyover waypoints.

Conditional waypoints are waypoints that are part of a SID, STAR, or approach and are not located at a geographically fixed position. They are shown enclosed in parenthesis. Two examples of conditional waypoints are: a turn point located at a specified altitude, and the point where a heading leg intersects with a leg defined by a VOR radial. A conditional waypoint cannot be manually entered into a flight plan. They are entered as part of a SID or STAR.

Leg Sequencing

Flight plan legs are typically defined by the waypoint at each end of the leg. As the airplane approaches the TO waypoint, the FMS gives a waypoint alert by flashing the waypoint identifier on the PFD, and the waypoint identifier and symbol on the MFD maps. Approximately five seconds after the waypoint alert, the FMS sequences to the next leg of the flight plan and generates steering commands to steer the airplane toward the new TO waypoint.

When the FMS sequences to a discontinuity in the flight plan, or when the last waypoint in the flight plan is passed, it begins computing steering commands to fly wings level.

MAG VAR Effects On Displayed Desired Course

On an HSI, the numeric course and the position of the course pointer arrow for a waypoint or navaid facility often differ slightly from the course value shown by the FMS. The difference is compounded as the distance from that fix increases. The difference exists for the following reasons:

- As the airplane travels along the flight path, the FMS constantly calculates the current value of the desired true track, which reflects the changing direction of the curved geodesic route abeam the airplane's present position.
- The FMS corrects the current desired true track to a magnetic reference using the calculated value for magnetic variation at the airplane's present position. This value may be somewhat different from the value used to define an arrival or departure course as described above because:
- The actual magnetic variation varies from place to place as the airplane travels, and
- The magnetic model used by the FMS to calculate local variation may not exactly match the declination or magnetic variation published in the navigation database for the nav aids and airports.

Another effect caused by the differences in MAG VAR as described above appears when editing a flight plan: the course value shown on the CDU may change when you execute the flight plan. Before executing a flight plan, the course shown to a waypoint is based on the facility's MAG VAR. After executing the flight plan, the course is based on the MAG VAR at the airplane's present position. The resulting course over the ground is exactly as specified by the pilot using the declination or magnetic variation contained in the database.

Discontinuities

Discontinuities are inserted automatically during certain edits of a flight plan. Their purpose is to segregate portions of the flight plan that are not naturally connected, such as an approach procedure not connected by an IAF to the last en route or arrival waypoint.

A waypoint before a discontinuity is treated as a flyover waypoint. As such, the FMS sequences a flight plan to a discontinuity only as the airplane passes abeam the waypoint. At that point, the FMS steers the airplane to wings-level mode. The airplane will continue to fly wings-level until FMS is deselected as the navigation source or the discontinuity is removed. Two minutes before reaching a waypoint that is followed by a discontinuity, the message "FPLN DISCONTINUITY" shows on the CDU message line and page. The waypoint alert feature flashes the waypoint and its identifier on the CDU and MFD for five seconds. The waypoint alert will flash the waypoint and its identifier again five seconds before sequencing to the discontinuity.

While the FMS is steering to wings-level flight, no data shows on the displays for time-to-go, distance-to-go, bearing to waypoint, course, cross track deviation, course arrow, and course digital readout. Also, the LNAV mode annunciation shows in yellow.

A discontinuity can be deleted from a flight plan at any time by replacing it with the next waypoint in the flight plan (referred to as a close-up edit). Some discontinuities may also be deleted directly by entering DELETE into the scratchpad with the DEL key and transferring it to the discontinuity. Either method results in the FMS connecting the last waypoint before the discontinuity with the next waypoint following the discontinuity. Deleting a discontinuity when it is the active leg (the TO waypoint) results in a direct-to course to the next waypoint, unless you enter a specific course in the INTC CRS data line and activate it by pushing the INTC CRS line key.

Another way to sequence beyond a discontinuity is to reselect AUTO sequencing with the AUTO/INHIBIT line select key. When the FMS sequences to a discontinuity, the sequencing mode is automatically changed to INHIBIT. Push the AUTO/INHIBIT line key to select AUTO, and the FMS will sequence to the next waypoint in the flight plan.

Turns

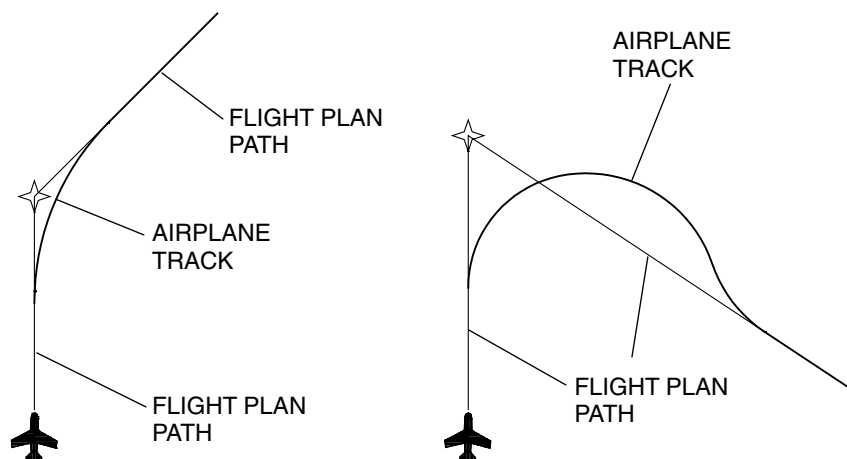
The FMS computes a turn to be accomplished using a nearly constant bank angle. For small turns, the amount of bank angle is small. The larger the turn, the greater the bank angle. It also computes when to start a turn based on the type of waypoint, the number of degrees of turn, the airplane's true airspeed, the current heading relative to the new heading, and the wind conditions. During a turn, the FMS continuously computes the bank angle to compensate for changes in wind conditions, true airspeed, and the airplane's heading relative to the new course.

Bank Angle and Roll Rate

Bank angle and roll rate for a turn are continuously computed by the FMS with consideration for the flight control system's bank angle limits. With the flight control system set to the normal operation mode (no bank limit selected), the bank angle is limited to approximately 25 degrees. With the flight control system set to the HALF-BANK mode, the bank angle is limited to approximately 12.5 degrees. Roll rate is set at three degrees per second for all turns.

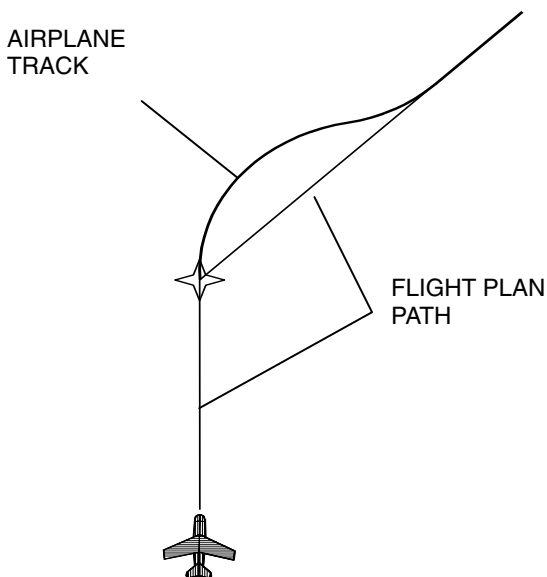
Anticipation

As the airplane approaches a turn at a waypoint, in addition to computing the bank angle for the turn, the FMS computes the point at which the turn is to be initiated. This is called turn anticipation. Its purpose is to prevent the airplane from unnecessarily overshooting the new course during the turn. Essentially, the FMS cuts the corner of the turn to make a smooth transition to the new course. For flight plan leg turns at true airspeeds less than 350 knots, the turn initiation point is not further than seven nautical miles from the waypoint. At true airspeeds of 350 knots or greater, the turn initiation limit is no further than 12 nautical miles from the waypoint. A waypoint alert flashes the active waypoint identifier on the PFD display, and the active waypoint symbol and identifier on the MFD map appear approximately five seconds before the FMS initiates the turn to the new course. While turn anticipation prevents most overshoots, very large course changes may still result in some overshoot.



Flyover Waypoints

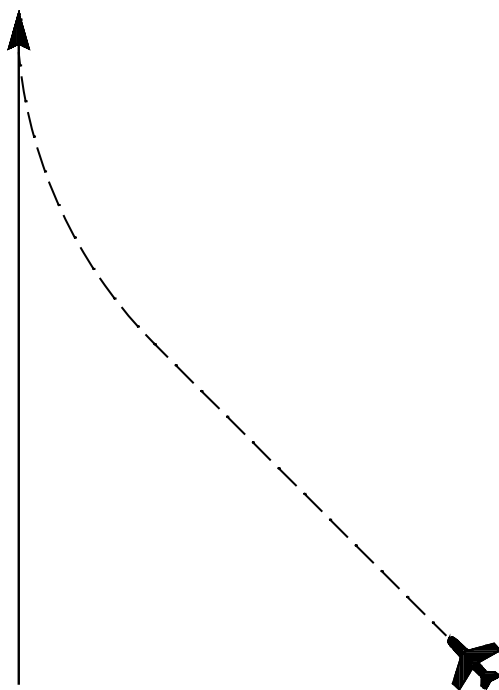
Selective waypoints designated as flyover waypoints require the airplane to fly over the waypoint before a turn is initiated. Examples include leg terminating waypoints such as a waypoint before a discontinuity, holding fix waypoints, and the last waypoint at the end of a flight plan.



TYPICAL COURSE CHANGE AT A FLYOVER WAYPOINT

Intercepting a Track

The FMS can intercept an active course track at any converging angle. Whenever possible, the intercept is such that the airplane turns onto the active course without overshoot. However, if the intercept angle is great and the distance to the course is short, an overshoot will occur. If the intercept path is such that the intercept may not occur before the active waypoint, the message "NOT ON INTERCEPT TRK" shows on the CDU message page.



TYPICAL COURSE INTERCEPT

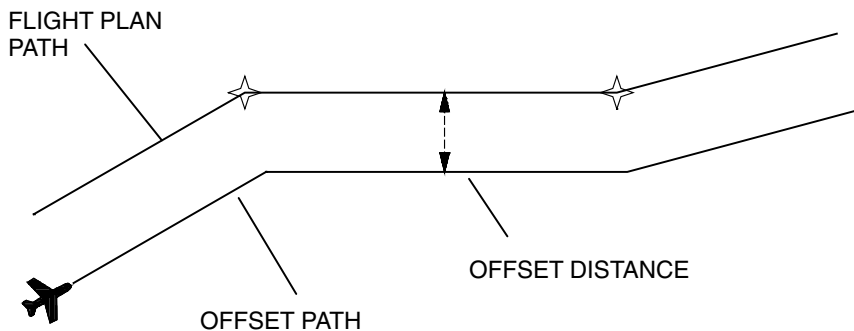
Parallel Offset Course Tracking

FMS can track a parallel offset path to a flight plan route. While tracking an offset path, course heading and deviation are referenced to the offset path. Also, distance and time-to-go data for the active leg are referenced to the offset path intersections, effectively treating these intersections as actual waypoints. Turn anticipation and waypoint alerts are also referenced from the offset intersections.

Adding, changing, or deleting an offset to a flight plan path causes the FMS to immediately steer to the new offset, or the original flight plan path if the offset is deleted. For large changes in the offset path, the FMS can steer an intercept of up to 45 degrees to the new path.

Cancel offset tracking manually by entering a zero offset, or by deleting the offset with the DEL key function. Offset flight plan tracking is canceled automatically when:

- A Direct-To or other type course change is made to the flight plan
- The flight plan sequences to a leg that does not support an offset path (holding leg, vectors leg, etc.)
- The flight plan sequences to a discontinuity
- The flight plan sequences to a leg that requires a course change of greater than 100 degrees.



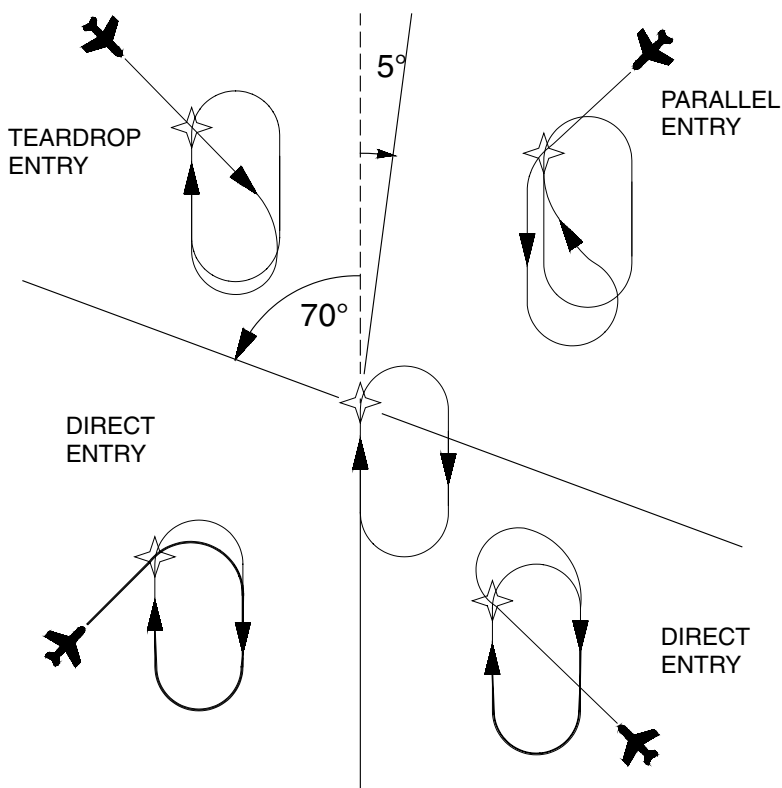
PARALLEL OFFSET COURSE TRACKING

Holding Patterns

Entry

As the airplane approaches a holding fix, the FMS calculates the initial size of the holding pattern based on the current wind conditions, the airplane's true airspeed or the MAX HOLD speed, whichever is lower, and either the leg time or the leg distance of the hold. In addition, it determines the best entry method based on the direction of approach to the holding fix, and the direction and type (standard or nonstandard) of holding pattern. The entry method is selected in accordance with the rules depicted in the following figure.

For parallel entries into a hold, the FMS steers the outbound entry leg to an extended fixed distance. This is done to ensure the protected airspace of the holding pattern is not violated when flown in excessive wind conditions. If your ground speed is slow, the parallel entry leg may extend well beyond the normal inbound leg turn (as shown below). However, even with the extended entry leg, the FMS maintains the airplane well within the protected airspace for a holding pattern.



Flying the Pattern

The FMS provides holding pattern steering data to the flight control system, and is calculated to steer the airplane in the smallest symmetrical racetrack pattern within the flight control's selected bank angle limit. Twenty-five degrees is the normal bank angle limit and 12.5 degrees is the HALF-BANK limit. Holding patterns should be flown in normal bank mode unless weight and/or altitude prohibit and ATC approves the use of HALF-BANK.

NOTE

The message "HALF-BANK SELECTED" shows on the CDU message line when the airplane is within one minute of arriving at the holding pattern fix and HALF-BANK is selected on the flight control system.

Just before crossing the holding fix, the FMS calculates the size of the holding pattern based on the wind conditions, the airplane's true airspeed or the MAX HOLD speed, whichever is lower, and either the leg time or the leg distance of the hold. The size of the holding pattern is set (unless edited on the CDU HOLD page) until the next passage of the fix. Just before each subsequent pass of the fix, the FMS recalculates the holding pattern. This ensures that each circuit of the holding pattern is the proper size for the existing wind conditions and true airspeed.

WARNING

DEPENDING ON THE SIZE OF THE HOLDING PATTERN AND THE AIRSPEED OF THE AIRPLANE, IT MAY BE IMPOSSIBLE FOR THE FMS TO MAINTAIN THE AIRPLANE WITHIN THE PROTECTED AIRSPACE OF A HOLDING PATTERN IN STRONG WIND CONDITIONS WHEN THE FLIGHT CONTROL SYSTEM IS SET TO THE HALF BANK MODE.

The FMS steers the airplane around the holding pattern using a nearly constant bank angle in the turns. The airplane's track in the turns of a holding pattern in strong wind conditions may not be a true semicircular path, as shown in the following figure. Also, the radius of the turns for the holding pattern are size-limited to the MAX KIAS speed for the hold. If your speed is greater than the MAX KIAS for the hold, the FMS may not be able to maintain the airplane within the boundaries of the protected airspace of the holding pattern.

When flying a hold, approximately five seconds before reaching the holding fix on each circuit around the holding pattern, the waypoint alert feature flashes the holding fix waypoint to alert you of the crossing.

ADDENDUM 2
To
Collins FMS-4200
Flight Management System Pilot's Guide

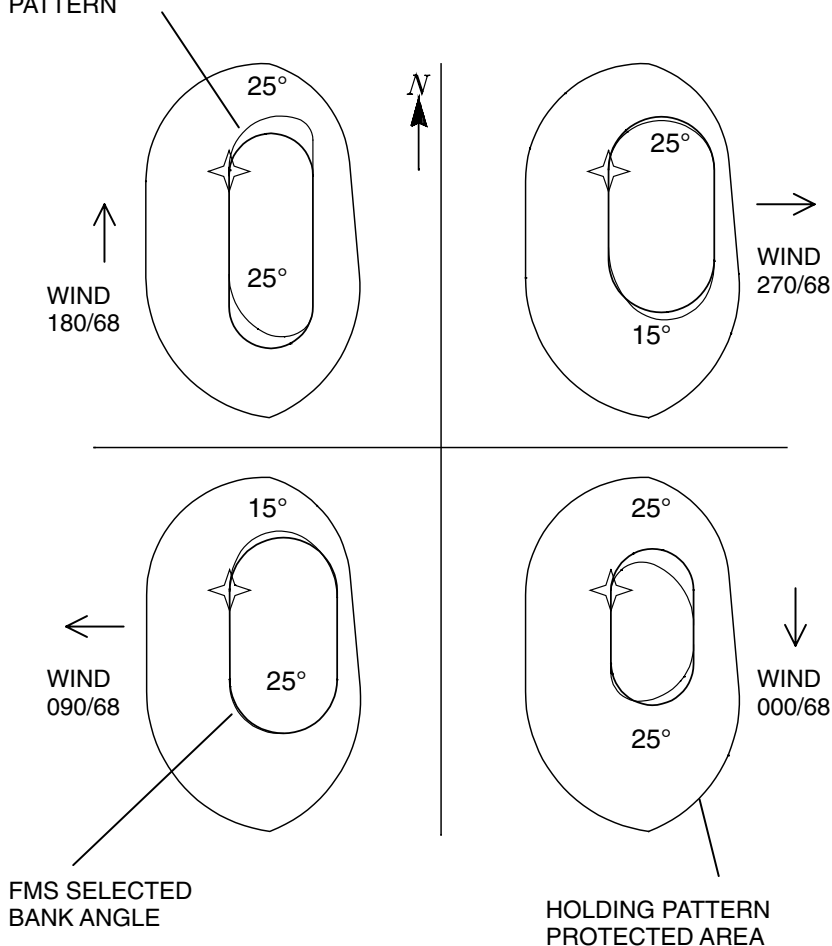
Part Number 523-0778363-002117, 2nd Edition
Dated 15 December 1999

Insert this addendum sheet facing page 15-19.

The paragraph under **Speeds** heading is revised and replaced with the paragraph shown below. Changes are shown in **bold text**.

Both FAA and ICAO recommended maximum holding speeds are programmed into the FMS. They are shown on the HOLD page on the CDU, and also on the LEGS page as the default speed for a hold. The FMS uses the LEGS page speed limits to generate a "CHECK SPEED" message, on the message line of the CDU, **when the appropriate conditions are met. See Section 17, Messages and Annunciations, for specific message logic.**

TURN VARIATION
FROM RACETRACK
PATTERN



Speeds

Both FAA and ICAO recommended maximum holding speeds are programmed into the FMS. They are shown on the HOLD page on the CDU, and also on the LEGS page as the default speed for a hold. The FMS uses the LEGS page speed limits to generate a "CHECK SPEED" message, on the message line of the CDU, when the airplane is within two minutes of its initial arrival at the holding fix, and the current indicated airspeed is 10 knots or greater than the recommended maximum holding speed.

Distance and Time

To help you visualize your current position relative to the fix, distance and time to the holding fix show on the PFD, and are based on the direct distance from the aircraft's present position to the holding fix. The distance and time to the holding fix that show on MFD displays and on the CDU are based on the distance around the holding pattern to the fix, giving you an exact ETA to the holding fix.

Changes

Changing the hold direction, leg time, leg length, or inbound course on the CDU HOLD page, causes the FMS to immediately recalculate the holding pattern. If a change to a holding pattern results in the airplane being off the holding track, the FMS steers the airplane onto the new holding pattern track using the smallest course change required.

NOTE

The direction and inbound course of a hold cannot be changed once the hold is the active leg of the flight plan.

Exit

Holds may be exited in one of two ways depending on whether or not the hold is part of a course reversal for an approach procedure.

Course Reversals

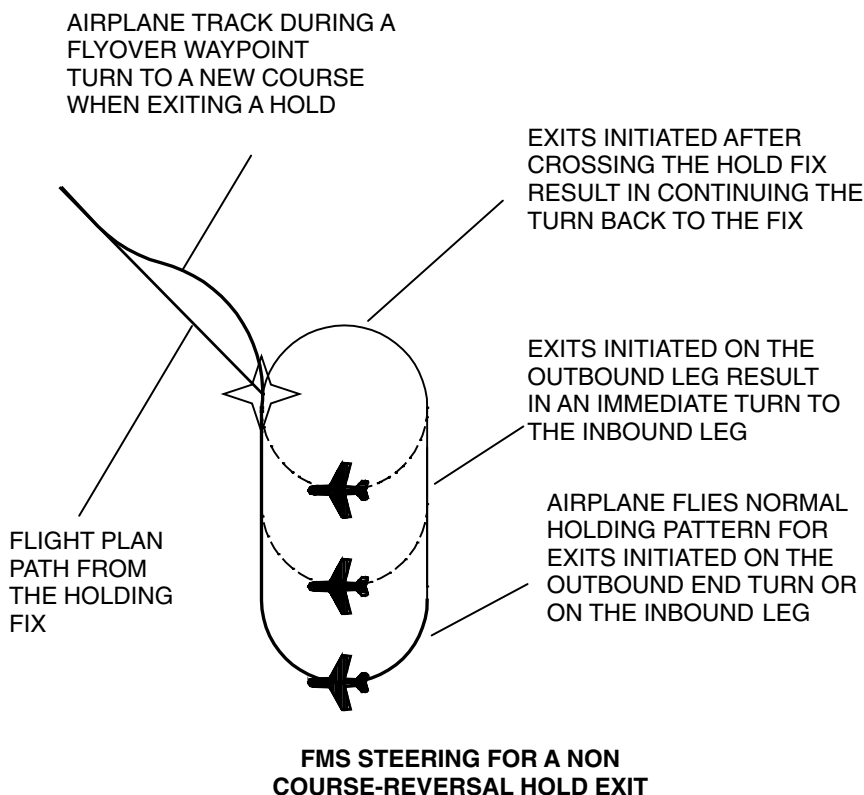
When you make a direct or teardrop entry into a course reversal hold of an approach, EXIT HOLD is automatically selected as soon as you enter the hold. When you make a parallel entry into a course reversal hold, EXIT HOLD is selected after you complete the entry. You may manually select or cancel EXIT HOLD at any time. You will automatically exit a course reversal hold when you are established on the inbound course at the "(INTC)" waypoint (as shown on the MFD and the LEGS page of the CDU), rather than at the FIX waypoint.

Other Holds

When EXIT HOLD is selected and executed, "EXIT ARMED" is annunciated on the CDU LEGS page, and the FMS steers the airplane to exit the holding pattern onto the next leg of the flight plan. If the airplane is on the outbound turn or leg of the holding pattern when EXIT HOLD is selected and executed, the FMS immediately begins to steer the aircraft back to the inbound leg to the fix. If the airplane is on the inbound turn or leg when EXIT HOLD is selected, the airplane continues around the holding pattern to the fix in the normal manner. In both cases, the FMS steers the airplane to fly over the holding fix waypoint and capture the course for the next leg of the flight plan.

Cancel Exit

An EXIT HOLD can be canceled at any time. However, if CANCEL EXIT is selected and executed after the FMS has initiated a turn to the inbound leg to exit the hold, it will continue the turn to the inbound leg and return to the fix. After crossing the fix, the FMS will follow the complete holding pattern in the normal way. If the airplane is on the inbound turn or leg before crossing the fix when CANCEL EXIT is selected and executed, the FMS will steer the aircraft around the holding pattern as if EXIT HOLD had not been selected and executed.



Flight Plan Termination

Two minutes before reaching the last waypoint of a flight plan, the CDU message "LAST WAYPOINT" shows, and the waypoint alert flashes the waypoint for five seconds. One exception to this when the last waypoint of the flight plan is the runway of a visual approach, in which case the "LAST WAYPOINT" message will not show. When the airplane is within five seconds of passing abeam the last waypoint, the waypoint alert again flashes the waypoint. As the airplane passes abeam the last waypoint, the FMS begins steering to maintain wings-level flight. The FMS will continue to steer wings-level until it is deselected as the navigation source, or until a new waypoint is entered into the flight plan; the LEGS page will show the last waypoint until a new one is entered.

While the FMS is steering to wings-level flight, no data shows on the displays for time-to-go, distance-to-go, bearing to waypoint, course, cross track deviation, course arrow, and course digital readout. Also, the LNAV mode annunciation shows in yellow.

Heading Legs

For departure and arrival procedures that include legs that must be flown to a specified heading rather than a course, the FMS steers the aircraft to maintain the FMS flight plan heading.

Approaches

The FMS-4200 is designed and authorized to automatically execute non-precision GPS, GPS overlay, multi-sensor RNAV, and VOR approaches. Both lateral and vertical approach guidance are provided, whether using course deviation, flight director guidance, or coupled autopilot. The database includes missed approach procedures for all approaches, and procedures are defined to accommodate ATC RADAR vectors which may be issued before or during an approach. The FMS can track all leg types found in the approach database.

The FMS may also be used to fly ILS, localizer, localizer back course, LDA (localizer directional aid) and SDF (simplified directional facility) approaches. Missed approach procedures for these approaches are also included.

IGS (instrument guidance system), non-GPS NDB, and LORAN approaches are included in the database. These are used to generate an FMS MAP for orientation on the MFD, even though the approaches themselves are to be executed using the authorized (non-FMS) guidance.

Visual approaches are also supported. The FMS MAP mode on the MFD shows runway threshold and runway extension waypoints.

The FAA has identified certain approaches as "Phase Three GPS Approaches." These approaches are identified on the approach charts as "or GPS" (e.g., "VOR or GPS Rwy 28"). The Phase Three approaches are identified on the CDU approach selection list by prefixing the base name with a "G" (such as GVOR28), unless the Phase Three approach is not a GPS-only approach (which is identified as GPS28). ATC will give clearance to a Phase Three GPS approach using the GPS name (GPS 28) while also giving clearance to the same approach without GPS using the base name (VOR 28). Example: "Cleared GPS approach, VOR 28, report runway in sight."

Visual

WARNING

A VISUAL APPROACH MUST NOT BE USED IN IMC AS A SUBSTITUTE FOR AN IFR APPROACH.

As discussed here, a visual approach for the FMS is not the same as an instrument flight rules (IFR) visual approach clearance issued by Air Traffic Control. You must not use an FMS visual approach in instrument meteorological conditions (IMC). They should only be used in visual flight rules (VFR) conditions.

For visual approaches, the FMS generates lateral and vertical flight paths for an ILS-like approach to a runway. It also gives lateral steering commands to the

flight control system to capture and advisory vertical steering commands to follow the generated flight paths of the approach. Lateral and vertical guidance are shown on the PFD by the lateral deviation bar and scale on the HSI, and the vertical deviation scale and pointer. Lateral deviation sensitivity is ± 1.25 NM for RNAV or ± 1 NM for GPS. When the airplane is within 30 NM of the runway threshold, the message "TERM" or "GPS TERM", as appropriate, shows on the PFD. Also, if the terminal navigation accuracy requirements for VNAV are not met, VNAV is flagged invalid.

To set up the FMS for a visual approach, simply select an arrival runway for the DEST airport on the ARRIVAL page. When you select the arrival runway, the FMS automatically adds a five mile runway extension waypoint to the selected arrival runway. You can change the runway extension if you want something other than the default extension, or you can delete the extension. The FMS also creates a discontinuity from the last en route or STAR waypoint to the runway extension waypoint for the visual approach. You may delete the discontinuity or initiate a Direct-To the runway extension at the appropriate time. If no other altitude constraints exist at prior waypoints, the VNAV function computes the top of descent (TOD) and en route descent profile to the selected altitude at the visual approach's runway extension waypoint. You can set the altitude constraints and/or VPA on the LEGS page.

You can enter a runway extension of 25.0 NM or less into the RWY EXT on the ARRIVAL page; the default is 5 NM. When a RWY EXT is entered, an unnamed pilot-defined waypoint is created along an extension of the runway centerline at the specified distance from the runway threshold. The fix is entered into the flight plan with a name consisting of the runway identifier prefixed with RX (example: RX27R).

Changing the selected runway removes the previously selected runway, along with any associated runway extension fix, from the flight plan. The new runway replaces the old runway, unless the old runway is the active waypoint. In that case, the new runway is inserted after the active waypoint (old runway). Additionally, if a STAR had been chosen that is not associated with the newly selected runway, the STAR will also be removed from the flight plan.

Changing a runway extension fix removes any previously selected runway extension fix from the flight plan, unless the old runway extension fix is the active waypoint. In that case, the new runway extension fix is inserted after the active waypoint.

ADDENDUM 1
To
Collins FMS-4200
Flight Management System Pilot's Guide

Part Number 523-0778363-002117, 2nd Edition
Dated 15 December 1999

Insert this addendum sheet facing page 15-24.

The partial paragraph at the top of the page is changed to read as follows:

“flight control system to capture and advisory vertical steering commands to follow the generated flight paths of the approach. Lateral and vertical guidance are shown on the PFD by the lateral deviation bar and scale on the HSI, and the vertical deviation scale and pointer. Lateral deviation sensitivity is ± 1 NM for terminal operation. When the airplane is within 30 NM of the runway threshold, the message "TERM" shows on the PFD. Also, if the terminal navigation accuracy requirements for VNAV are not met, VNAV is flagged invalid.”

Instrument

Select an instrument approach and any related elements for that approach on the ARRIVAL page. The ARRIVAL page is selected with the DEP/ARR key or with a line key selection on the DEP/ARR INDEX page.

The FMS provides lateral steering commands to the flight control system and advisory vertical steering commands to fly non-precision approaches. All FMS database instrument approaches are either localizer-based or FMS-based. Localizer-based approaches include:

- ILS
- Localizer Only (LOC)
- Simplified Directional Facility (SDF)
- Localizer Directional Aid (LDA)
- Localizer Back Course (B/C).

All other approaches are FMS-based.

Transitions

Many instrument approaches use transitions to go from the en route or STAR environment to the approach environment. Transitions available for any given approach may include specific charted and named transitions, vectored transitions, or a combination of both. Instrument approach transitions, along with the desired approach, are selected on the ARRIVAL page. When you select an approach, the list of transitions available for that approach shows under the annunciation "TRANS". The default transition for all approaches is VECTORS. If you want a transition other than VECTORS, you must select one from the list of available transitions.

When you select an approach on the ARRIVAL page and execute the flight plan change, a discontinuity is automatically inserted into the flight plan to separate the en route or STAR segment from the approach segment, unless the en route or STAR terminates on the initial approach waypoint. When the FMS sequences to that discontinuity, it automatically changes from the AUTO SEQUENCE mode to the INHIBIT SEQUENCE mode.

An easy method to transition to an approach with a named transition (other than VECTORS) is to close the discontinuity before the FMS sequences it into the TO waypoint position. It should be closed with an appropriate waypoint from the approach segment of the flight plan.

For VECTORS transitions, one of the two following procedures may be used:

When vectors to final are expected, select the VECTORS transition when selecting the approach. This transition consists of a course-to-fix leg in the flight plan leading to the final approach course toward the FAF (or toward the FACF

fix if present). With this course-to-fix leg established, you can follow RADAR vectors manually with the autopilot, or with the flight director. When the aircraft is properly positioned and cleared for the approach, intercept the course-to-fix leg leading to final approach, either manually or using the flight control system.

A second method for flying a VECTORS approach is to set the flight control system to the heading mode so that you can comply with ATC vectors, then change the flight plan in the FMS to set up for the approach. To do this, on the LEGS page, select an appropriate waypoint from the approach segment of the flight plan and make it the TO waypoint. Before you execute the flight plan change, push the INTC CRS line key to set the appropriate course to intercept for the approach.

NOTE

When you manually sequence to an approach by inserting an approach segment waypoint into the TO waypoint position, the FMS automatically enters an inbound course to that waypoint on the INTC CRS data line. Also, the FMS automatically inserts the appropriate INTC CRS into the flight plan when you select AUTO sequence to an approach waypoint from a discontinuity.

To prevent the FAF from sequencing prematurely, regardless of aircraft position, special waypoint passage criteria applies to the FAF. At 2.0 NM radial distance from FAF, the aircraft must have:

- Less than 1.6 NM cross track deviation
- The magnitude of intercept (track angle minus outbound course from FAF) must be less than 90 degrees
- The airplane altitude must be less than 3000 feet above the FAF altitude constraint
- The FAF must be the TO waypoint or next waypoint after the TO waypoint.

Localizer-Based (ILS, LOC, SDF, LDA, and B/C)

The FMS-4200 supports a class of localizer-based approaches which include LOC, B/C, LDA, SDF and full ILS approaches. Although the FMS does not execute the final approach phase of these approaches, it does support initial approach phases leading to lateral navaid capture. Vector transitions to the approach are also accommodated. Missed approach procedures are included and are flown by re-selecting FMS as the NAV source following a missed approach.

Localizer-based approaches always include, as a minimum, an approach entry point called a Final Approach Course Fix (FACF), a Final Approach Fix (FAF), a runway threshold, and a missed approach procedure. One characteristic of the FACF is that localizer signal reception is assured on the leg from FACF to FAF.

The FAF fix may or may not be named and printed on the published approach chart. However, the FAF is always named in the database. If the database default name applies to an FAF, the first letter "C" designates the FAF waypoint type, and the second letter refers to the approach type, e.g., "I" for ILS, "L" for localizer, "B" for back course localizer, "X" for LDA, and "Z" for SDF. For circling approaches, the standard second letter identifier is "F".

The FAF and the portions of the approach that follow localizer interception are included in the approach flight plan. They are shown on the MFD FMS MAP strictly as a visual reference aid depicting the overall navigation situation.

Localizer-based approaches and transitions are selected on the ARRIVAL page. The ARRIVAL page is selected with the DEP ARR key or with the ARR line select key on the DEP/ARR INDEX page.

For airports with STARS, an available approach may be selected with or without an accompanying STAR.

When a localizer-based approach is selected, as the airplane flies to within 30 miles of the destination airport, the FMS allows the pilot to manually tune the ILS navigation frequency to initiate a NAV-ILS Preview on the PFD. The NAV-ILS Preview mode shows a second NAV SOURCE annunciation, course arrow, lateral deviation bar, and glideslope scale and pointer on the PFD. After the pilot has selected LOC as the active NAV SOURCE, and valid glideslope data is available, the PFD displays lateral deviation for the localizer and vertical deviation from the glideslope on the vertical deviation scale on the PFD. This removes the ILS PREVIEW display from the PFD. The pilot may then select NAV or APPR mode to initiate localizer capture.

Selecting approach (APR) mode on the flight control system arms the flight director for localizer or ILS capture, regardless of the current active flight plan leg. You must use discretion in choosing the proper time to arm for the approach, since RADAR vectors or published approach routes may prematurely approach or cross the localizer.

When the airplane is in a position to capture the localizer, **and you are cleared for the approach**, select the approach mode on the flight control system to arm the flight director to capture the approach.

WARNING

FOR ALL TYPES OF LOCALIZER-BASED APPROACHES YOU MUST MANUALLY SET THE DH OR MDA ALERTERS. IT IS THE PILOT'S RESPONSIBILITY TO RECOGNIZE WHEN THE AIRPLANE REACHES THE DH OR MDA, AND TO MAKE A DECISION ON WHETHER OR NOT TO CONTINUE THE APPROACH.

To activate the missed approach you can do either of the following:

- Push the TOGA button
- If the TO waypoint is the MAP, select AUTO SEQUENCE.

FMS-Based

FMS-based approaches and transitions are selected on the ARRIVAL page. The ARRIVAL page is selected with the DEP ARR key or with the ARR line select key on the DEP/ARR INDEX page.

All FMS-based approaches are non-precision approaches. This includes VISUAL, GPS, RNAV, VOR/DME, VOR, (as a GPS overlay), and NDB. The FMS is certified to do both stand-alone GPS and multi-sensor non-precision approaches. GPS sensor data is used predominantly for all FMS-based approaches. However, other available navigation sensors are used by the FMS as a part of the process of determining position. The FMS also monitors RAIM to ensure the required GPS accuracy is maintained for an approach. Visual, RNAV, VOR/DME, and VOR approaches can also be executed by the FMS without GPS.

Lateral and vertical guidance is available throughout all FMS-based approaches. On the PFD, the lateral deviation bar and scale on the HSI give the lateral guidance, and the vertical deviation pointer and scale give the vertical guidance. The intent is to fly non-precision FMS-based approaches in a manner similar to that of an ILS. The FMS provides steering commands to fly the airplane along the flight plan route to a position where it captures an FMS-generated lateral flight path for the approach. As with all approaches, pilots must maintain vigilance and verify the aircraft is maintaining the correct lateral course and vertical profile.

FMS approach logic is automatically enabled at 30 NM from the destination airport's reference point (ARP) and remains active until after the missed approach point (MAP). You can disable the approach logic at any time. The approach must be disabled in order to transition to a missed approach procedure.

To disable an approach you can do any one of the following:

- Push the TOGA button
- Make a lateral change to the flight plan between the FAF and MAP
- Manually sequence through the flight plan past the MAP waypoint
- Delete the FAF or MAP waypoint
- Push the APPR ENABLED line key on the ARRIVAL page to select NO
- If the TO waypoint is the MAP, select AUTO SEQUENCE.

WARNING

FOR ALL TYPES OF FMS-BASED AND/OR NON-PRECISION APPROACHES YOU MUST MANUALLY SET THE MDA ALERTERS.

There are two different types of non-precision FMS-based approaches: RWY and V-MDA. RWY approaches are those that terminate at a MAP generally located at the runway threshold. The annunciation "RWY" shows on the CDU LEGS page in the altitude restriction data line of the runway waypoint to identify this type of non-precision approach. V-MDA approaches are those that terminate at a MAP generally located somewhere other than the runway threshold. The annunciation "V-MDA" shows on the CDU LEGS page in the vertical speed data line of the runway waypoint to identify this type of non-precision approach. The primary difference between the two types is in how the FMS creates the vertical flight path.

RWY

WARNING

IT IS THE PILOT'S RESPONSIBILITY TO RECOGNIZE WHEN THE AIRPLANE REACHES THE MDA, AND TO MAKE A DECISION ON HOW TO CONTINUE THE APPROACH..

RWY type FMS-based approaches terminate at a MAP which is located approximately at the runway threshold. The vertical path angle (VPA) used by the FMS for this type of approach terminates at approximately 50 feet above the runway threshold at the MAP. The VPA is specific for a given approach and provides obstacle clearance down to the MDA. Ensuring obstacle clearance below MDA is the pilot's responsibility. The runway waypoint's VPA, shown on the LEGS page, cannot be changed or deleted. For this type of approach, the FMS steers the airplane along a lateral and vertical flight path very similar to that of an ILS. Vertical flight path tracking is based on the airplane's corrected barometric altimeter.

V-MDA

WARNING

PILOTS MUST REVIEW THE APPROPRIATE TERMINAL PROCEDURES FOR AN APPROACH AND ADJUST THE MDA WHEN APPROPRIATE IN ACCORDANCE WITH THE AIRPLANE'S APPROACH CATEGORY REQUIREMENTS. IT IS THE PILOT'S RESPONSIBILITY TO RECOGNIZE WHEN THE AIRPLANE REACHES THE MDA, AND TO MAKE A DECISION ON HOW TO CONTINUE THE APPROACH.

WARNING

THE FMS DOES NOT RECOGNIZE STEP-DOWN FIXES BETWEEN THE FAF AND THE MAP, AND WILL NOT TRY TO COMPLY WITH THEM. IT IS POSSIBLE, ON SOME V-MDA APPROACHES, FOR A SELECTED VPA TO RESULT IN A VERTICAL FLIGHT PATH THAT WOULD GO BELOW A STEP-DOWN FIX ALTITUDE RESTRICTION. IF A GIVEN APPROACH HAS ANY STEP-DOWN FIXES BETWEEN THE FAF AND ARRIVAL AT MDA, VNAV SHOULD NOT BE USED FOR THIS PORTION OF THE APPROACH.

For V-MDA type approaches, you must verify and set, as necessary, the VPA for the approach. You must also verify and set the MDA of the MAP waypoint in accordance with the airplane's approach category for the approach being flown, or to your personal MDA for the approach.

NOTE

Depending on the approach, if you change the altitude of a MAP waypoint, you may also have to change the altitude of the final approach fix (FAF) and any intermediate waypoints, as well as the altitude of the initial waypoint of the missed approach procedure. You may also have to calculate the proper temperature compensation as part of determining these altitudes when operating in extremely cold temperatures.

VPA design for a V-MDA type approach is significantly different from that of a RWY approach. It originates at the final approach fix (FAF) and goes down to the MDA, typically with a default angle of three degrees. Examples of V-MDA type approaches are circling approaches or approaches where the MAP is a navaid located on the field.

DME ARC Approaches

To intercept a DME arc at a published entry point, no special procedures are required. The FMS will fly to the entry point, turn to intercept the published arc, and fly the approach. Radar-vector DME arc approaches, however, require the pilot to maintain situational awareness to intercept the arc somewhere between the published entry and exit points of the arc.

GPS

To fly a GPS approach, or an RNAV, VOR/DME, VOR, or NDB approach as a GPS-overlay approach using the FMS, the approach must be selected and inserted into the flight plan. When the approach is enabled, cross track deviation display sensitivity, enforcement of approach navigation accuracy and integrity, and the display of vertical deviation information during the final approach are activated. If flight director vertical steering guidance is desired,

ADDENDUM 1
To
Collins FMS-4200
Flight Management System Pilot's Guide

Part Number 523-0778363-002117, 2nd Edition
Dated 15 December 1999

Insert this addendum sheet facing page 15-31.

The third bullet down from the top of the page is changed to read as follows:

Shows the "TERM" message on the PFD.

the preselector altitude must remain set below airplane altitude past the leg into FAF.

NOTE

GPS and NDB approaches cannot be flown with the FMS if the GPS navigation sensor is not available.

When the FMS sequences from the en route segment to the approach segment, the following events occur.

At 30 NM great circle distance from the airport reference point (ARP), the system automatically:

- Transitions to terminal deviation sensitivity (± 1.0 NM)
- Begins monitoring for terminal navigation accuracy (RAIM)
- Shows the "GPS TERM" message on the PFD.

Between 2 NM from FAF up to FAF, if the approach is enabled and FAF waypoint sequencing conditions are met, the system automatically:

- Shows the "DEV CHG" message on the PFD
- Smoothly transitions to approach deviation sensitivity (± 0.3 NM)
- Begins monitoring for approach navigation accuracy (RAIM).

Between FAF and the MAP, the system automatically:

- Shows the "GPS APPR" message on the PFD
- Maintains the deviation sensitivity at ± 0.3 NM
- Continues monitoring of approach navigation accuracy (RAIM).

The integrity of the GPS position solution is monitored by using more than the minimum number of satellite measurements to determine the position, and by verifying that the redundant measurements do not produce inconsistent position solutions. This is known as Redundant Autonomous Integrity Monitoring (RAIM). If the number of receivable satellites or the geometry of the satellites cannot support RAIM to the required accuracy level for the phase of flight (4 NM oceanic/remote, 2 NM en route, 1 NM terminal, and 0.3 NM approach), RAIM is not available and the message "NO GPS RAIM" shows on the CDU. This does not mean that the GPS position is inaccurate, but that the accuracy of the GPS position cannot be guaranteed. In any case, the pilot is responsible for proper monitoring of backup navigation means in the cockpit in accordance with any provisional airworthiness conditions imposed upon GPS approaches.

RAIM status may be examined on the MFD LRN STATUS page. RAIM is available if the RAIM ACCURACY LIMIT value is less than that required for the current phase of flight (4 NM oceanic/remote, 2 NM en route, 1 NM terminal, and 0.3 NM approach). The LRN STATUS page also shows a MEASUREMENT ACCURACY LIMIT based on the current GPS measurements plus the most probable GPS error. If the satellite signals sufficiently disagree and the source of the disagreement cannot be isolated to one satellite, then "RAIM DETECTED ERROR" shows on the MFD LRN STATUS page. GPS is not used by the FMS in its calculations to determine position if there is a "RAIM DETECTED ERROR" message and the MEASUREMENT ACCURACY LIMIT is greater than what the current phase of flight requires, or the PROBABLE ERROR is too large.

There may be short periods when the required approach accuracy is unavailable. By predicting future satellite positions, GPS is capable of estimating the availability of approach accuracy at a future time. This feature is called predictive RAIM. The GPS CONTROL page on the CDU gives you access to the GPS predictive RAIM capability any time the FMS and GPS systems are operational. Normally, the active flight plan contains the required data (destination and ETA) and the estimates are made automatically. When approach RAIM is unavailable, the message "NO APPR GPS RAIM" shows on the CDU. This message can show only when the airplane is within the arrival terminal area and a GPS approach is selected. However, you can view the current RAIM status at any time on the GPS CONTROL page as described below.

Flight plan DEST and ETA are automatically inserted on the GPS CONTROL page. However, before departure you can change them to investigate alternate destinations and arrival times. Pilot entries show in large font characters and automatic entries from a flight plan show in small font characters.

GPS RAIM status annunciations for the specified DEST and ETA that show on the GPS CONTROL page are:

- AVAILABLE – GPS approach RAIM is available
- UNAVAILABLE – GPS approach RAIM is not available
- REQ PENDING – RAIM status is being evaluated
- INIT GPS – RAIM cannot be evaluated, GPS is not initialized.

Predicted approach RAIM availability at a destination is based on the ETA predicted by the airplane performance function. If performance predictions are not available because the required data was not entered, ETA for predicted approach RAIM is measured ground speed when the airplane is in the destination terminal area.

The GPS CONTROL page also gives you the ability to manually deselect up to 8 satellites that are scheduled to be out of service as identified in NOTAMS. Deselected satellites are not included in the predicted RAIM computations.

**ADDENDUM 4
TO
ROCKWELL COLLINS FMS-4200 FLIGHT MANAGEMENT SYSTEM
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Insert facing page 15-33.

The information in the fifth bullet is incorrect. The corrected information is shown below. (The words "NO APPR GPS RAIM" have been deleted from the original text.)

- "GPS NOT AVAILABLE", "NO GPS RAIM", or "FMS DR" message is annunciated after 20 seconds while in final approach.

Satellite numbers may be entered one at a time. All deselected satellites are deleted simultaneously using the DELETE key function, or you can delete individual satellites from the deselected list by reentering the satellite number.

If approach is enabled and any of the following conditions are true, then "NO APPR" is annunciated in yellow on the PFD.

- Approach RAIM is not available at any time while the airplane is between 2 NM inbound to FAF and FAF
- Approach RAIM is available while the airplane is between 2 NM inbound to FAF and FAF, MAP is more than 5 min from FAF, and approach RAIM is predicted to be unavailable within 5 min of predicted arrival time at MAP
- Approach RAIM is not available at 2 NM inbound to FAF and approach RAIM is predicted to be unavailable within 5 min of predicted arrival time at FAF or MAP
- Approach RAIM is not available for 5 minutes during final approach
- "GPS NOT AVAILABLE," "NO APPR GPS RAIM," "NO GPS RAIM," or "FMS DR" message is annunciated after 20 seconds while in final approach.

RNAV

To fly an RNAV, VOR/DME, or VOR approach as an RNAV approach with FMS, but without the GPS sensor, the approach must be selected and inserted into the flight plan. When the approach is enabled, cross track deviation display sensitivity, enforcement of approach navigation accuracy and integrity, and the display of vertical deviation information during the final approach are activated. If flight director vertical steering guidance is desired, the preselector altitude must remain set below airplane altitude past FAF.

When the FMS sequences from the en route segment to the approach segment, the following events occur.

At 30 NM great circle distance from the airport reference point (ARP), the system automatically:

- Transitions to terminal deviation sensitivity (± 1.00 NM)
- Begins monitoring for terminal navigation accuracy
- Shows the "TERM" message on the PFD.

Between 2 NM from FAF up to FAF, if the approach is enabled and FAF waypoint sequencing conditions are met, the system automatically:

- Shows the "APPR" message on the PFD
- Maintains deviation sensitivity of ± 1.00 NM
- Begins monitoring for approach navigation accuracy.

Between FAF and the MAP, the system automatically:

- Shows the "APPR" message on the PFD
- Maintains deviation sensitivity of ± 1.00 NM
- Continues monitoring approach navigation accuracy.

Selecting an RNAV approach is the same as selecting any other approach on the ARRIVAL page. RNAV approaches include a Final Approach Fix (example: FF31), a Missed Approach Point (MAP), and a missed approach procedure. RNAV approaches also include transitions that constitute entry routes for the approach.

Although pilot-entered waypoints defining an approach can be included in the flight plan, the FMS does not support important aspects of approach operation for these waypoints. Some of the aspects not supported for pilot-entered approach waypoints include approach deviation scaling, approach accuracy checking, certain leg types commonly used in approaches, and approach mode VNAV operation. Because of these limitations, using pilot-entered approaches with the FMS is approved for pilot reference only. An independent primary source of navigation must be used to conduct the approach.

Course Reversal Holds In Approach Transitions

When an approach includes a course reversal hold and the FMS sequences to that hold's waypoint, the hold is automatically armed for exit. The airplane will fly the holding pattern, then complete the approach procedure in a seamless process, unless a parallel entry is required. On a parallel entry, the hold will be automatically armed for exit after the entry maneuver has been completed. However, you may select exit at any time. If your clearance requires you to continue to hold, all you need to do is push the CANCEL EXIT line select key on the LEGS page to cancel the hold exit and continue flying the hold. When you are cleared to exit the hold, push the EXIT HOLD line select key on the LEGS page to arm the FMS to exit the hold and continue the approach.

Course reversal holds in an approach transition have a waypoint labeled (INTC) at the point where the holding pattern intercepts the final approach course. Altitude constraints that apply until you are established on the final approach course are applied to the (INTC) waypoint.

Not all approaches have a hold in the approach transition. However, many do have a hold in the missed approach procedure. In an approach with these conditions, to enter a hold at the FAF as part of a non-published approach procedure, you must add a new hold at the FAF. When you select the hold page, it initially shows the ACT HOLD LIST with the missed approach hold clearly labeled on the list. You must push the NEW HOLD line select key and add a new hold at the FAF waypoint. This will result in what appears to be two holds at the same waypoint. One of the holds is at the FAF and the other is part of the missed approach procedure.

Missed Approach

Missed approach procedures are included in the flight plan as part of an approach. The MAP waypoint shows on the LEGS page as the waypoint just before the MISSED APPR label. It is also identified on the ACT/MOD FPLN page as MISSED APPROACH. The first waypoint after the "MISSED APPR" annunciation is usually the initial altitude constraint waypoint for the missed approach. It shows in parentheses, which indicates it cannot be copied to the scratchpad; however, it can be deleted. It also shows on the MFD, in parentheses, as the first waypoint of the missed approach.

NOTE

Missed approach procedures do not show on the MFD display until the missed approach is active, or the MISS APR map display option is selected on the MFD MENU page.

For the FMS to sequence beyond the MAP to the missed approach procedure, you must disable the approach, or fly to the MAP waypoint with AUTO SEQUENCE selected.

There are several ways to disable an approach. You can:

- Push the TOGA button
- Make a lateral change to the flight plan between the FAF and MAP
- Manually sequence through the flight plan past the MAP waypoint
- Delete the FAF or MAP waypoint
- Push the APPR ENABLED line key on the ARRIVAL page to select NO
- Select AUTO sequencing when you reach the MAP.

NOTE

The APPR ENABLED line key selection, on the ARRIVAL page, is available only for non-precision approaches.

While on the missed approach, you can edit the flight plan to select a new approach (refer to the APPROACH section of this book), or sequence the FMS to a waypoint on the route to your alternate airport.

Some missed approach procedures may require flying a segment of a SID as part of the procedure. To do this, you select the DEP option for the destination airport on the DEP/ARR INDEX page. Once you have selected the desired SID, the FMS will insert it into the flight plan, preceded by a discontinuity.

The following two simplified checklists, one for each type of approach (localizer-based and FMS-based), should aid in the transition to a missed approach.

To transition to a missed approach procedure from a localizer-based approach:

1. Select Go Around (GA).
2. Set power and configuration as required.
3. Verify AUTO sequence selected (LEGS PAGE).
4. Verify the TO waypoint is the first waypoint of the missed approach.
5. Set FMS as NAV SOURCE.
6. Set the appropriate lateral and vertical flight director modes.
7. Engage autopilot (if desired).

To transition to a missed approach procedure from an FMS-based approach:

1. Select Go Around (GA).
2. Set power and configuration as required.
3. Verify auto-sequence is selected (LEGS PAGE).
4. Verify the TO waypoint is the first waypoint of the missed approach.
5. Set the desired lateral and vertical flight director modes.
6. Engage autopilot (if desired).

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PRINCIPLES OF VNAV

The FMS-4200 provides multiple waypoint advisory vertical navigation (VNAV) for each phase of flight (climb, cruise and descent). VNAV aids the pilot in complying with altitude and speed constraints at waypoints, and speed limits at altitudes; it also aids in ensuring the vertical flight profile entered into the active flight plan is followed.

During the various phases of flight, advisory VNAV follows the script of the flight plan. It levels the airplane once the preselect altitude is captured and prompts a descent at a planned location. Step climbs may be initiated by the preselect altitude and selecting the desired climb mode. During the descent mode, VNAV computes a geographical path to each waypoint and gives guidance relative to that path, ensuring the descent altitude constraints are honored. As the approach and its corresponding procedure environments are entered, vertical navigation is fully automated, providing smooth transitions and easing pilot workload. In addition to following a planned vertical profile that is entered into the FMS flight plan, the vertical Direct-To feature allows you to execute a direct-to vertical path to an altitude at a waypoint.

VNAV information shows on the PFD when advisory VNAV is enabled. The information shown includes:

- The next altitude constraint
- Vertical deviation from the planned descent path
- Vertical speed required to fly direct-to the next altitude constraint.

VNAV PLAN speed is displayed on the PERF MENU page. Advisory VNAV is enabled and disabled on the PERF MENU page as well.

Setup

A vertical guidance profile is defined by the active flight plan and the settings on the VNAV setup pages. The flight plan defines the altitude and speed constraints on the LEGS page. VNAV setup pages define the cruise altitude, speed targets, altitude dependent speed limits, and vertical path angle (VPA) for descents. VNAV data is also used in the performance calculations.

There are default values for all VNAV parameters except cruise altitude. When you select SID, STAR, and approach procedures, the appropriate speed and altitude constraints at waypoints are automatically loaded into the flight plan. You can set up the VNAV default parameters so each flight is automatically initialized in accordance with the way you normally fly the airplane. When nonstandard flight conditions arise, the VNAV parameters may be modified for that flight without changing the default values for subsequent flights. No data entry is required on the VNAV setup pages to activate VNAV, unless you want to modify the defaults or add an additional speed or altitude constraint.

To select the VNAV setup pages, push the VNAV key on the CDU. (Alternately, you can push the VNAV line select key on the PERF MENU and PERF INIT pages.) If VNAV is in use, the page associated with the current flight phase (climb, cruise, or descent) shows when you push the VNAV SETUP line select key. Push the NEXT or PREV key as necessary to show the other pages.

ADDENDUM 1
To
Collins FMS-4200
Flight Management System Pilot's Guide

Part Number 523-0778363-002117, 2nd Edition
Dated 15 December 1999

Insert this addendum sheet facing page 16-3.

The Flight Plan Target Altitude paragraph is changed to read as follows:

Flight Plan Target Altitude

VNAV has a flight plan target altitude derived from the altitude constraints in the active flight plan. The flight plan target altitude shows on the PFD near the preselector altitude when advisory VNAV is selected. Generally, it is the next altitude constraint in the flight plan consistent with the current phase of flight. Therefore, a distant descent altitude constraint is not shown when the airplane is climbing to cruise altitude, for example. In those cases where the flight plan contains a VNAV altitude constraint in a downleg waypoint which is below aircraft present altitude, the VNAV target altitude for the descent will not be posted on the PFD until the altitude preselector is set down by the crew (beneath aircraft present baro altitude) as an indication of the intent to descend. The target altitude is the next altitude constraint in the flight plan that will be honored by VNAV.

Add the following note at the bottom of the page:

NOTE

The FMS vertical speed advisory pointer displayed on the PFD vertical speed scale is available to provide the flight crew with awareness of the climb/descent rate that will be needed for the aircraft to achieve the next altitude constraint. It should be noted that the display of the vertical speed advisory pointer on the PFD vertical speed scale may be allowed in cases where FMS performance calculations indicate that the requirements to achieve flight plan altitude constraints fall outside the boundaries of expected aircraft operation. The vertical speed advisory pointer position on the VSI scale is a reflection of the FMS calculation of required climb/descent rates associated with the flight plan, and does not infer that the aircraft is capable of meeting the required rate of climb/descent.

PFD Annunciations and Displays

Flight Plan Target Altitude

VNAV has a flight plan target altitude derived from the altitude constraints in the active flight plan. The flight plan target altitude shows on the PFD near the preselector altitude when advisory VNAV is selected. Generally, it is the next altitude constraint in the flight plan consistent with the current phase of flight. Therefore, a distant descent altitude constraint is not shown when the airplane is climbing to cruise altitude, for example. The target altitude is the next altitude constraint in the flight plan that will be honored by VNAV. For step descents, where the airplane levels at an intermediate constraint altitude, the intermediate altitude remains showing after passing the constraint waypoint so that the autopilot can continue to hold that altitude.

A flight plan target altitude sequences to the next target 60 seconds before arriving at the switch point, provided the current target altitude has been captured.

Deviation Scale and Pointers

A unique FMS deviation pointer shows the vertical deviation from the descent path on the same scale as the glideslope deviation (when close to the planned descent path). If advisory VNAV is selected, the vertical deviation scale and pointer are shown when the vertical deviation from a descent path is less than 1000 feet.

Vertical Speed

An FMS vertical speed advisory pointer showing on the vertical speed display indicates:

- The minimum average vertical speed required to climb from present position to the next climb constraint if the rate is at least 100 fpm. Vertical speed required to AT OR BELOW constraints is not shown because there is no minimum value.
- The initial vertical speed required if a descent were initiated at the present position to the next descent altitude constraint. This is an advisory pointer to assist you in determining when it may be appropriate to initiate a descent. The vertical speed pointer shows only if the required descent rate is at least 500 fpm, and top of descent at current altitude is within 50 NM, or vertical deviation is displayed. The pointer shows in all VNAV modes. The vertical speed required for descent shows in the VNAV MFD window as a number. Vertical speed required to AT OR ABOVE constraints is not shown because there is no minimum value.

The vertical speed advisory pointer shows whenever advisory VNAV is selected and the above display conditions are met.

Operation

Climb

For the climb phase, VNAV provides speed and altitude targets consistent with the climb constraints and speed limits.

Cruise

Cruise altitude on the PERF INIT page is not a required entry. All VNAV features are available without a cruise altitude entry with two exceptions: TOD from the cruise altitude is not shown and performance predictions are not available.

If a cruise altitude is entered, and you end up flying at a higher altitude after capturing the planned cruise altitude, VNAV automatically adjusts the cruise altitude to match the actual flight altitude, provided the airplane initially reaches the cruise altitude that was entered. If the airplane is climbing from the planned cruise altitude to the preselector setting, then the planned cruise altitude is set to the preselector setting until you reach the planned descent path.

If the airplane never reaches the planned cruise altitude, the climb phase VNAV operation will not readjust the planned cruise altitude downward. However, when the airplane is close to the next descent path, the planned top of descent point is readjusted to correspond to the actual airplane altitude.

The cruise phase begins when the cruise altitude is captured. Cruise speed command is the Mach or IAS speed target that shows on the cruise VNAV SETUP page. If the cruise altitude is so low that a climb altitude dependent speed limit is applicable, then the cruise speed command is limited to that altitude dependent speed limit.

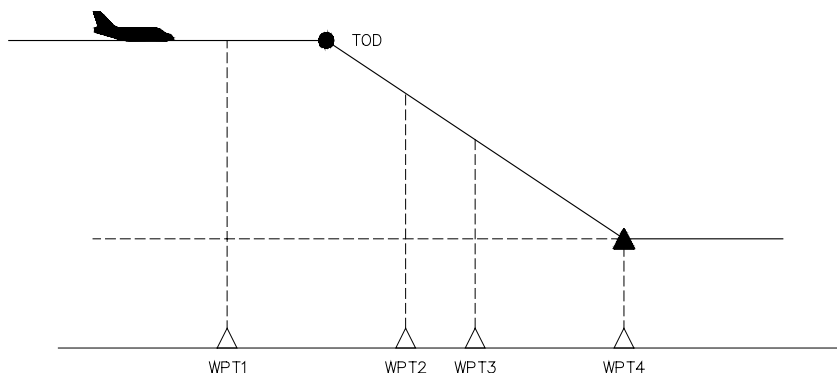
To execute a step climb, raise the preselect altitude to the desired step climb altitude and select a climb mode. The FMS automatically raises the cruise altitude shown on the VNAV page to the preselect altitude and the step climb will begin. Climb speed targets are used for planned reference speed during a step climb.

Descent

The descent phase is entered when you set the preselect altitude below the airplane's current altitude and an altitude change mode (flight level change, vertical speed or pitch) is selected on the flight control panel. The descent phase may also include altitude hold segments. VNAV provides speed and altitude targets consistent with the descent constraints and speed limits.

VPA

The descent path is defined by the vertical path angle (VPA). A default VPA (set on the CDU DEFAULTS page) is initially shown on the VNAV DESCENT page and it is applied to a flight plan when one is created. You can overwrite the default setting on the VNAV DESCENT page to apply it to the entire descent portion of a flight plan, or you can overwrite it on the LEGS pages for specific descent segments of a flight plan.



VPATH DESCENT PATH

Path Smoothing

When there are two or more altitude constraints in a descent path, the FMS calculates and flies a smooth descent path without intermediate altitude hold segments, as long as each of the descent segments has a VPA greater than the airplane's minimum allowable VPA (typically 1 degree). When two altitude constraints are so far apart that a straight-line path connecting the two constraints is shallower than the minimum allowable VPA, or you have specified a VPA for that segment, an altitude hold is inserted before the descent.

VPAs on the second and subsequent descent segments are modified to provide the path continuity. The computed VPA is shown on the LEGS page. A descent path is always computed to the last descent altitude constraint in a flight plan or before a discontinuity, regardless of the altitude type (AT, AT OR ABOVE, AT OR BELOW or BETWEEN). If the last descent altitude is BETWEEN, the path defaults to the upper altitude constraint. The descent path is computed through, versus to, AT OR ABOVE, AT OR BELOW, or BETWEEN descent constraints that are not last in the flight plan or before a discontinuity. This allows the FMS to both maintain the selected VPA and perform path smoothing whenever possible to create a continuous descent path through these constraints. AT OR ABOVE, AT OR BELOW, and BETWEEN constraints are always honored but they do not unduly restrict the path. In the approach phase of flight, VNAV computes a descent path that flies to the first altitude

constraint in the approach transition even if it is specified as AT OR ABOVE in the flight plan.

For a smooth descent path, the FMS cannot select a vertical path angle greater than the airplane's maximum allowable VPA (typically 6 degrees). If adjacent altitude constraints require a steeper path than the airplane's limit, the lower altitude constraint shows in yellow on the LEGS page, and the message "CHECK FPLN ALT" shows on the message line to alert you that you may need to resolve the vertical path ambiguity.

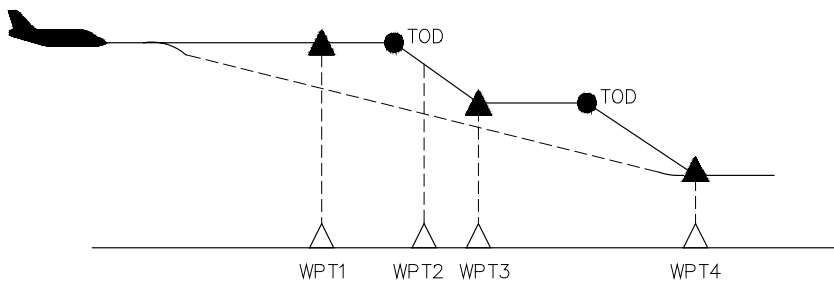
Vertical Direct-To

You can specify a descent path from the aircraft's current position direct-to a selected altitude at a waypoint, which includes:

- The next altitude constraint waypoint in the flight plan
- Any future altitude constraint waypoint in the flight plan
- Any other waypoint in the flight plan, provided a new altitude constraint is specified for the waypoint.

All altitude constraints between the current airplane altitude and the specified direct-to target altitude are cleared when a vertical direct-to is initiated.

The vertical Direct-To path is computed as long as the required VPA is less than the airplane's maximum allowable VPA. A descent path may be very shallow, but it may not be a climb.



VERTICAL DIRECT-TO

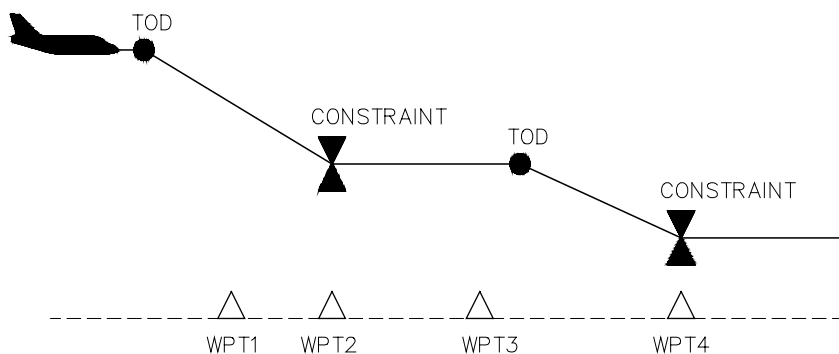
Altitude Constraints

When one or more descent altitude constraints are specified in the flight plan, the FMS plans the VNAV path so the airplane descends to each constraint altitude and holds that altitude until reaching the planned top of descent to the next altitude constraint. This is true unless the descent path allows the path smoothing feature to create one continuous descent. When smoothing is used to create the descent path, the path is designed to keep the airplane as high as possible as long as possible without violating any altitude constraints.

Top of Descent

The predicted top of descent (TOD) location shows on both the present position and north up MFD maps to help you anticipate an upcoming descent. TOD also shows on the MFD ACT FPLN PROGRESS data page so that you can see the relationship of the TOD location relative to other flight plan waypoints.

The FMS continuously calculates the TOD location. When the airplane reaches the capture point, the descent path becomes fixed and VNAV begins to track the path. The initial location of the TOD is at the intersection of the planned cruise altitude and the planned descent path. If there is a subsequent planned altitude hold segment following an altitude constraint waypoint, TOD also shows at the top of the second descent segment as shown in the following figure. If the airplane is close to and approaching the descent path, and is not at a planned altitude intercepting the path, the FMS recalculates the TOD location based on the intersection of the current altitude and the descent path. The airplane is considered to be "close" to the descent path when it is 50 NM or 20% of the origin to destination distance whichever is smaller (but not less than 20 NM).



FLIGHT PLAN WITH TWO DESCENT SEGMENTS

Approaches

ILS Approaches

NAV-ILS PREVIEW

The FMS-4200 provides a NAV-ILS PREVIEW to support ILS approaches. FMS must be selected as the active NAV SOURCE on the PFD for the NAV-ILS PREVIEW display mode to be enabled. After arriving at the terminal area for the destination airport with a localizer-based approach selected in the flight plan, the pilot must manually tune the ILS frequency for the localizer-based approach.

In a dual FMS installation, for the NAV-ILS PREVIEW display to show on PFD1, FMS1 must be selected as the active NAV SOURCE on PFD1, and NAV1 must be manually tuned to the ILS frequency for the localizer-based approach selected in the flight plan. To show the NAV-ILS PREVIEW on PFD2, FMS2 must be selected as the active NAV SOURCE on PFD2, and NAV2 must be tuned to the ILS frequency for the approach.

In a single FMS installation to show the NAV-ILS PREVIEW on PFD1, the FMS must be selected as the active NAV SOURCE on PFD1, and NAV1 must be manually tuned to the ILS frequency for the localizer-based approach selected in the flight plan. To show NAV-ILS PREVIEW on PFD2, the FMS must be selected as the NAV SOURCE on PFD2, and NAV2 must be manually tuned to the ILS frequency for the approach.

After the pilot has tuned the ILS frequency of the localizer-based approach selected in the flight plan, a NAV-ILS PREVIEW will be displayed on the PFD consisting of:

- A second NAV SOURCE annunciation (LOC1 or LOC2)
- A second NAV Course Arrow (showing the inbound track to the ILS approach)
- A second NAV Lateral Deviation Bar (showing the localizer deviation of the selected ILS station)
- A second NAV Glideslope Scale and Pointer.

While FMS remains selected as the active NAV SOURCE on the PFD, both the FMS lateral navigation and Advisory VNAV will remain available for display (provided Advisory VNAV is enabled).

When the pilot determines it is appropriate to attempt localizer capture, the normal procedure requires the pilot to SYNC to aircraft Selected Heading Bug, and select HDG mode on the Flight Control Panel (FCP). While in HDG mode, the pilot should change the NAV SOURCE on the Display Control Panel (DCP) from FMS to the on-side VOR/LOC. Once LOC is selected as the active NAV

SOURCE on the PFD, the PFD will show localizer deviation for active lateral deviation, and glideslope deviation on the vertical deviation scale when valid GS data becomes available. The ILS PREVIEW display will be removed from the PFD as the system removes the second NAV SOURCE annunciation, second NAV Course Arrow, second NAV Lateral Deviation Bar, and the second NAV Glideslope Pointer. Having selected LOC as the active NAV SOURCE, the pilot then has the option of selecting either NAV or APPR mode on the FCP to initiate localizer capture.

RNAV and GPS

As long as advisory VNAV remains enabled, the FMS displays the altitude constraints of RNAV and GPS procedures, up to and including the FAF and MAP or runway threshold. Full scale deviation equals 1 NM at 2 NM from FAF, to 0.3 NM at FAF and beyond. Vertical deviation guidance to the descent altitude constraint at the MAP is also available if approach is enabled in the FMS and the required navigation accuracy is available.

If advisory VNAV is still enabled when the FMS sequences to the MAP, VNAV will give climb guidance to the altitude constraints in the missed approach procedure.

Visual and Other Approaches not Qualified for FMS

VNAV guidance is available for visual approaches to a runway, and for any other approach that is not qualified to be executed as an FMS approach. Vertical deviation to the runway threshold or MAP constraint altitude is provided if the required approach navigation accuracy is available. If the preselect altitude remains below airplane altitude past the FAF, vertical deviation guidance to the runway threshold or MAP is available.

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MESSAGES AND ANNUNCIATIONS

The FMS-4200 Flight Management System shows various messages and annunciations on the CDU, PFD, and MFD displays. This chapter gives a brief description of each message/annunciation and where applicable the action that may be taken when it shows on the display.

CDU

There are two display lines on the CDU that show messages. One is the bottom display line called the message line; the other is the scratchpad entry line. Messages that show on the scratchpad entry line are generally data entry error messages and are shown on the display for approximately one second, then disappear. Messages that show on the message line are generally related to the system operation. For many of these messages, the FMS shows an annunciation on the PFD and/or MFD at the same time to alert you to the message. (Refer to the PFD and MFD annunciations later in this chapter.)

On the message line, a new message overwrites any existing message except for the EXEC message. When multiple messages occur, they are prioritized and the most important or most recent message is the one that shows. The MESSAGES page stores all the currently active messages that were generated for the message line.

MESSAGE Page

To review all messages, both new and old, stored on the MESSAGES page:

1. Push the MSG key to show the MESSAGES page on the CDU display

NOTE

The MESSAGES page may require more than one page to show all messages. Push the NEXT PAGE or PREV PAGE key as necessary to review all messages.

2. Push the MSG key a second time to return to the display page shown before selecting the MESSAGES page, or push any other function key to show that function's display page. (Example: LEGS key)

MESSAGES PAGE
WITH TYPICAL MESSAGES



Messages

The messages in the following table show on the CDU message line and on the MESSAGES page. Not every message will show in every aircraft installation.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
AFIS	MSG	White	Indicates new AFIS information is available. (Will not show on CDU message page)
AFIS FPLN LOADED	MSG	White	This message indicates loading of AFIS flight plans is complete. Review the new flight plans.
AFIS FPLN UPDATED	MSG	White	This message indicates the flight plan update you requested is complete. Review the new flight plans.
APPR FOR REF ONLY	MSG	White	This message shows when the airplane is within 30 nautical miles of the FAF for the selected approach and that approach is not qualified for use by the FMS as primary approach guidance.
CHECK ALT SEL	MSG	White	VNAV is active and either: (Climb) The preselect altitude is not higher than the aircraft's current barometric altitude and the aircraft is within 45 seconds of a bottom of climb, or (Descent) The preselect altitude is not lower than the aircraft's current barometric altitude and the aircraft is within 45 of a top of descent and approach condition is not active.
CHECK FPLN ALT	MSG	White	This message indicates either: (1) There is an error in an altitude constraint because it results in a reversal of a climb or descent altitude, or (2) The airplane has exceeded a down-track altitude constraint.

ADDENDUM 1
To
Collins FMS-4200
Flight Management System Pilot's Guide

Part Number 523-0778363-002117, 2nd Edition
Dated 15 December 1999

Insert this addendum sheet facing page 17-4.

The Messages table will be expanded to include the following items. The added items will appear in alphabetical order at the next revision to the pilot's guide.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
ADC TEMP DISAGREE	MSG	Yellow	SAT temperature values for the air data computers are in disagreement.
CHECK TAKEOFF PERF	None shown	Yellow	Verify that performance database with takeoff N1 thrust tables is loaded.
FMS-EFD N1 DISAGREE	MSG	Yellow	N1 thrust comparator indicates mismatch between FMS and EFD values.
FMS-FMS N1 DISAGREE	MSG	Yellow	N1 thrust comparator indicates mismatch between FMS LRUs.
LOW POS ACCURACY	MSG	Yellow	Position accuracy is below the RNP required value.
PERF OUT OF RANGE	MSG	White	Performance parameter values are exceeded.
UNABLE VHF NAV TUNE	MSG	Yellow	VHF navigation receiver tuning is unavailable.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
CHECK LOC TUNING	MSG	White	The airplane is at or within 30 nautical miles of the destination airport, a localizer based approach is selected and the NAV frequency does not match the tuned value of the FMS. You may have to manually tune the correct localizer frequency before making the approach.
CHECK NAV SOURCE	MSG	White	VNAV is selected and the NAV source is not FMS or LOC after the FMS initiated ILS capture. Set the NAV source to FMS or LOC.
CHECK NAV TUNING	MSG	White	The airplane is at or within 30 nautical miles of the destination airport, approach mode is selected, an RNAV approach is selected, and the FMS could not tune the referenced navaid. Select the correct VOR/DME for the approach, or select the AUTO tuning mode when able. If the correct VOR/DME is not available, the approach is not authorized.
CHECK SPEED	SPD	Yellow	(1) The current airspeed is 20 knots or .03 Mach greater than a VNAV speed restriction and VNAV is selected. (2) You are within two minutes of a hold and the current indicated airspeed is 20 knots or 0.03 MACH greater than the maximum recommended holding airspeed.
CHK DATA BASE DATES	None Shown	White	To operate dual FMS installations in the coordinated mode, the active databases on both systems must have the same effective date . This message indicates they are not the same. To correct this, go to the STATUS page and select the appropriate database on each CDU.
CHK POS	CHK POS	Yellow	The FMS has determined that a navigation sensor is not meeting the accuracy requirements for the current phase of flight. This message is usually followed by another message indicating the affected sensor. (Example: FMS-FMS DISAGREE, GPS-FMS DISAGREE, VOR/DME DIST>75NM, etc.). A position update may correct this problem. If the problem is caused by a failed sensor, then disabling that sensor may also correct the problem.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
CRS REVERSL IN FPLN	MSG	Yellow	This indicates the flight plan route contains a course reversal of more than 160 degrees at the TO waypoint. Its purpose is to identify a possible error in a flight plan. Ignore the message if the flight plan course reversal is intentional.
DECELERATE	MSG	White	The current airspeed is faster than the planned decelerating reference speed computed by VNAV when VNAV is selected.
DME-FMS DISAGREE	MSG	Yellow	This indicates one or more DMEs are inconsistent with the current FMS position estimate. This message is annunciated when the difference is: 2.0 NM in the en route environment, 1.0 NM in the terminal environment, and 0.5 NM in the approach environment. Determine if: (1) An FMS position update is required. (2) Any of the NAV sensors is in error. (3) A DME station is in error and should be disabled.
EXCESS IRS MOTION	MSG	White	The IRS has detected excessive motion during alignment. This message occurs usually because the airplane is taxied or towed during alignment. Ensure the airplane is not in motion and restart IRS alignment.
EXEC	None Shown	White	This message shows at the right side of the message line anytime that an active flight plan is modified or when a new flight plan is activated. Verify the flight plan change, then push the EXEC key to execute the flight plan. (Will not show on the MESSAGES page)
EXEC FPLN MOD	MSG	Yellow	This message shows for a modified flight plan that has not been updated or executed for more than one minute (approximately). Continue the modification, or verify the current change and push the EXEC key to execute the flight plan, or push the CANCEL MOD line select key to cancel the modification in progress.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
FMS DR	FMS DR	White	The airplane is on the ground or has been airborne for less than one minute and the FMS has been in dead reckoning mode for between 10 to 30 seconds. Determine if: (1) VOR/DME, IRS, and GPS sensors are enabled. Enable them if they are not. (2) AUTO tuning mode is selected (3) Any VOR/DME stations are being received. If airborne, climb higher to receive more stations. Another reason for this message may be that the FMS position may not have been properly initialized. Go to the POS INIT page and position update the FMS with data from a known good sensor.
FMS DR	FMS DR	Yellow	This message shows when the FMS has been in DR mode for at least: 60 seconds in an oceanic or remote environment, 30 seconds in the en route or terminal environment, or 10 seconds in the approach environment. Determine if: (1) An FMS position update is required. (2) Navigation sensors are appropriately enabled. Another reason for this message may be that the FMS position may not have been properly initialized. Go to the POS INIT page and position update the FMS with data from a known good sensor.
FMS DR FOR 5 MIN	FMS DR	Yellow	The FMS has been in DR mode for more than five minutes while the airplane is airborne. Determine if: (1) An FMS position update is required. (2) Navigation sensors are appropriately enabled.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
FMS-FMS DISAGREE	MSG	Yellow	Cross-side FMS position data is significantly different from that of the on-side FMS. Review the sensor position summary page on both sides to determine the best FMS position. Try a position update for the suspected incorrect side, or change to INDEP operation and use the known good FMS.
FMS INDEPENDENT OP	DISCON MSG	White	In a dual FMS installation, a communications failure between the FMSs has occurred, the selected databases are different, or the software programs in the FMS are different and the FMS cannot operate in the SYNC mode. If the communications failure was temporary due to a power transient, resync the FMSs. If "CHK DATA BASE DATES" is also displayed, correct the dates to allow SYNC operation.
FMS NAV INVALID	MSG	Yellow	The FMS does not have a valid source for sensor and heading data while airborne. Check the NAV sensors to be sure they are enabled and check for a heading sensor failure.
FMS NAV INVALID	MSG	White	The FMS does not have a valid source for sensor and heading data while on the ground. Check the NAV sensors to be sure they are enabled and check for a heading sensor failure.
FPLN DISCONTINUITY	MSG	Yellow	The flight plan has sequenced past, or is within two minutes of sequencing past, the last waypoint before a flight plan discontinuity. Modify the flight plan as required.
FUEL FLOW NOT AVAIL	MSG	White	Fuel flow data has been invalid for at least two minutes.
GPS DISABLED	None Shown	White	GPS sensors are disabled for use by the FMS on the GPS CONTROL page. This may degrade FMS navigation performance. If the GPS sensors are valid, enable the GPS sensors on the GPS CONTROL page.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
GPS-FMS DISAGREE	MSG	Yellow	The GPS position estimate is different from that of the FMS. This message shows when the difference is: 2.0 NM or greater in the oceanic, remote or en route environment, 1.0 NM or greater in the terminal environment, or 0.3 NM or greater in the approach environment. Determine if a position update can correct the problem, or if the GPS sensor should be disabled.
GPS NOT AVAILABLE	MSG	White	This message indicates the FMS is not using GPS position data as part of its calculations to determine position. This message shows when GPS has been unavailable for: at least five minutes in the oceanic, remote or en route environment.
GPS NOT AVAILABLE	MSG	Yellow	This message indicates the FMS is not using GPS position data as part of its calculations to determine position. This message shows when GPS has been unavailable for: at least two minutes in the terminal environment, or at least 30 seconds in the approach environment.
GPS ONLY	GPS ONLY	White	The FMS is using position data from only the GPS sensor. This message only shows if all of the other sensors are disabled, invalid or failed. This message may be inhibited in some aircraft installations.
GPS REVERTED	MSG	White	This message indicates the FMS is using the cross-side GPS sensor, instead of the on-side sensor, while the on-side sensor is enabled. This could be the result of invalid data from the on-side GPS sensor or a failed on-side sensor.
HALF-BANK SELECTED	MSG	Yellow	The airplane is within one minute or less of arriving at holding fix or procedure turn fix, or the active leg is an approach leg, and HALF-BANK mode is selected on the flight control panel. In these situations, an overshoot of the desired path may occur when HALF-BANK is selected.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
HOLD EFC EXPIRED	MSG	White	This message shows when the Expect Further Clearance (EFC) time has expired and you have not exited the hold.
INITIALIZE POSITION	MSG	Yellow	The IRS sensors and FMS have not been initialized. Initialize the FMS and IRS from the POS INIT page on the CDU.
INVALID PERF DB	MSG	Yellow	PREDICTED performance mode is selected and the FMS performance database version does not match the airplane type.
IRS DISABLED	None Shown	White	IRS navigation sensors are disabled for use by the FMS on the IRS CONTROL page. This may degrade FMS navigation capability. To correct this, unless there is a problem with the sensors, reenable the IRS sensors.
IRS-FMS DISAGREE	MSG	Yellow	The IRS position solution is different from that of the FMS. This message shows when the difference is: 2.5 NM or greater within the first hour after alignment. After the first hour this message shows if the IRS drift rate exceeds 2.5 NM per hour. However, if the FMS position has not been initialized, or if the IRS was initialized in the air, it is annunciated only if the FMS and IRS positions differ by more than 30.0 NM. Determine if a position update can correct the problem or if the IRS sensor should be disabled.

**ADDENDUM 7
TO
COLLINS FMS-4200 Flight Management System
PILOT'S GUIDE**

Part Number 523-0778363-002117, 2nd Edition Dated 15 Dec 99

Notice

INFORMATION SUBJECT TO EXPORT LAWS

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Insert this addendum sheet facing page 17-10

Insert after the first sentence in the IRS-FMS DISAGREE description.

When the FMC-4200 (CPN 822-0783-011 with SCID 832-4119-012) is installed on the aircraft the, following is true.

The message shows when the difference is 2.5 NM or greater for the first hour of flight. After the first hour, this message shows if the drift rate for the IRS exceeds 2.5 NM per hour.

When the FMC-4200 (CPN 822-0783-015 with SCID 832-4119-016) is installed, the message shows whenever the difference is 5 NM or greater, regardless of flight time.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
IRS ONLY	IRS ONLY	White	IRS is the only sensor being used by the FMS and: (1) In the en route environment, it has been more than 20 minutes since a position update was available from a GPS or other navaid, and it has been more than two hours since IRS alignment and takeoff (2) In the terminal environment, it has been more than 10 minutes since a position update was available from a GPS or other navaid, and it has been more than 1 hour since IRS alignment and takeoff (3) In the North Atlantic region, it has been more than 20 minutes since a position update was available from a GPS or other navaid, and it has been more than 6 hours since IRS alignment and takeoff.
IRS REVERTED	MSG	White	This message shows if two or more IRSs are enabled, and one or more is not being used because its data is invalid, which prevented unreverted IRS operation. Normal unreverted usage is: (1) Blended with three IRS enabled. (2) Highest priority single IRS with two IRSs enabled. The priority of usage is: on-side, center and cross-side. The most common cause of reversion is IRS position errors exceeding 2.5 NM/hr over the duration of flight, or 2.5 NM over the first hour of flight.
LAST WAYPOINT	MSG	Yellow	The airplane has passed, or is within two minutes of passing, the last waypoint in the flight plan.
LOC WILL BE TUNED	MSG	White	The FMS is within 30 seconds of automatically tuning the localizer and the radio tuning mode is set to MANUAL.
MAX VPA EXCEEDED	MSG	White	A descent angle specified in the selected approach exceeds the maximum VPA for the aircraft.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
MSG	MSG	White or Yellow	This message shows when the CDU message page contains a new or old message. This message also shows on the PFD for each new message. Push the MSG key to acknowledge the message and remove the "MSG" annunciation from the PFD. The "MSG" annunciation shows on the CDU as long as there is a message on the MESSAGES page. (Will not show on the MESSAGES page)
NO APPR GPS RAIM	MSG	White	A GPS or GPS-only approach is specified in the flight plan and RAIM is predicted to be unavailable to the GPS sensor for the approach.
NO APPR REVERSION	MSG	White	This message shows when either DCP is in reversion mode while the airplane is within 30 NM of the airport, a localizer-based approach is in the active flight plan, and FMS-to-localizer (NAV-to-NAV) capture is enabled. NAV-to-NAV capture will not occur with the DCP in reversion.
NO FLIGHT PLAN	NO FLIGHT PLAN	White	The FMS does not have an active flight plan. Create, activate, and execute a flight plan, or activate and execute an existing flight plan.
NO GPS RAIM	MSG	White	The FMS is using GPS in its calculations to determine position in the en-route, terminal or approach phase of flight, and RAIM at the required accuracy is not available to the GPS sensor.
NO NAV DATA BASE	MSG	White	The FMS has no navigation database. A database must be loaded into the FMS system.
NO PERF DATA BASE	MSG	White	The performance database has not been loaded into the FMS. Load the performance database.
NO TXT WHEN PFD MAP	NO TXT WHEN PFD MAP	White	Aircraft configuration supports FMS map display on the PFD, the PFD is currently showing a present position map, and the MFD DATA key was pushed. This message will clear itself.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
NO VPATH CONDITION	MSG	White	When this message shows, VPATH mode automatically reverts to VPITCH mode. This occurs because either the airplane crossed a vertical discontinuity in the descent path, or a flight plan edit occurred that caused the active descent path to move. Changing the autopilot to a mode other than VPITCH or passing the last altitude constraint on the descent path clears this message.
NO VPATH- DISCON	MSG	White	VPATH arm is invalid because there is a discontinuity down track. Clear the discontinuity to clear this message.
NO VPATH- PILOT CMD	MSG	White	You have selected a vertical autopilot mode while flying VPATH. VPATH will automatically recapture only after: (1) Vertical deviation exceeds 1 dot, and (2) The airplane is maneuvered back to the VNAV path. Another way to clear this message is to cycle VNAV off and on.
NO VPATH THIS LEG	MSG	White	This message occurs when the flight plan sequences to a new leg that is a holding pattern. When this occurs, VPATH automatically changes to VPITCH. Changing the autopilot to a mode other than VPITCH, or changing to a leg that is not a holding pattern, clears this message.
NO VPATH-TAE	MSG	White	VPATH mode has automatically reverted to VPITCH mode because the track angle error has exceeded the specified limits. This message will clear when the airplane is turned to fly along the FMS course line or when you select an autopilot mode other than VPITCH.
NO VPATH- VECTORS	MSG	White	VPATH mode has automatically reverted to VPITCH mode because there is a heading leg in the FMS flight plan. This message will clear after passing the heading leg, or when you set the autopilot to a mode other than VPITCH.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
NO VPATH -XTD	MSG	White	VPATH mode has automatically reverted to VPITCH mode because the cross track deviation has exceeded the specified limits. To clear this message, reduce the cross track distance to within the specified limit, or set the autopilot mode to other than VPITCH.
NOT ON INTERCPT TRK	MSG	Yellow	The FMS is steering the airplane back to the active leg, or it is armed for capture, but the current flight path will not intercept the active flight plan leg. If the FMS is steering the airplane, this condition will be corrected automatically. You must assess any potential airspace violations during the maneuver.
OFFSET	OFST	White	This message shows when a parallel offset is in use. The message clears when the offset is terminated. (Will not show on the MESSAGES page)
OFFSET TERMINATED	OFST	White	This message shows when you have reached the end of a parallel offset leg of the flight plan.
OFFSET WILL END	None Shown	White	The FMS shows this message when you are within two minutes of the end of an offset track.
PROGRAM DIFFER	MSG	White	The two FMS software programs are incompatible. This message shows when an incorrect FMC or CDU is installed in the aircraft. See a maintenance technician to correct this problem.
RE-ENTER SET POS	MSG	Yellow	This message shows when an IRS (or other LRN) may not have properly received a position update or requires reconfirmation of the update.
RESET INITIAL POS	MSG	Yellow	The position entered during position initialization is greater than 40 NM from the FMS's last known position. Because of this, it is requesting the initial position be re-entered for verification. Reinitialize the FMS position on the POS INIT page on the CDU.
SET IRS HDG	MSG	Yellow	The IRS requires a heading value to continue to supply heading in the attitude mode.

ADDENDUM 1
To
Collins FMS-4200
Flight Management System Pilot's Guide

Part Number 523-0778363-002117, 2nd Edition
Dated 15 December 1999

Insert this addendum sheet facing page 17-15.

Delete the following text in the Messages Table on page 17-15. This change will be effective in the next revision to the pilot's guide.

UNABLE NEXT ALT	ALT	Yellow	(1) At the present rate of climb or descent, you will not be able to clear the next altitude constraint in the flight plan. This message annunciates when the climb or descent is insufficient for at least one minute or more. Correct the flight plan altitude constraint or change the airplane's climb or descent rate to comply with the current constraint to clear this message. NOTE Annunciation of this message is disabled when you are in an altitude hold mode. (2) An automatic vertical direct-to has been attempted and it cannot be performed because the required descent path exceeds the maximum VPA for the aircraft.
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CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
UNABLE CRZ ALT	MSG	White	FMS performance predictions indicate the airplane cannot reach the cruise altitude because of climb or ceiling limitations, or the climb and descent profiles overlap. Correct the vertical profile to clear the message.
UNABLE FPLN ALT	MSG	Yellow	FMS performance predictions indicate an altitude constraint cannot be met at the specified waypoint. Correct the vertical profile of the climb or descent to clear this message.
UNABLE NEXT ALT	ALT	Yellow	(1) At the present rate of climb or descent, you will not be able to clear the next altitude constraint in the flight plan. This message annunciates when the climb or descent is insufficient for at least one minute or more. Correct the flight plan altitude constraint or change the airplane's climb or descent rate to comply with the current constraint to clear this message. NOTE Annunciation of this message is disabled when you are in an altitude hold mode. (2) An automatic vertical direct-to has been attempted and it cannot be performed because the required descent path exceeds the maximum VPA for the aircraft.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
UNABLE TO SEQ FPLN	None Shown	White	There are three situations that cause the FMS to show this message. (1) A SID, STAR, or approach specifies that the active leg be terminated at a specified distance from a DME station, and the airplane's current flight path does not intercept the specified DME station. (2) A SID, STAR, or approach specifies that the active leg is a heading leg, it is terminated when it either intercepts the next leg or terminates at a specified VOR radial, and the termination point is more than 50 NM from the airplane's present position. (3) An altitude-terminated procedure leg is active and the barometric altitude is invalid, or vertical speed has been negative for at least one minute. Change the flight plan to eliminate the above situations to clear this message.
VNAV SENSOR FAIL	MSG	White	Sensor data for VNAV functions is not available or is invalid. Determine the invalid or failed sensor and select a reversion mode to provide valid data to the FMS.
VNAV WARN-TAE	MSG	White	Aircraft track angle error is greater than: (1) 80% of the TAE threshold for oceanic/remote, enroute, or terminal, or (2) 50% of the TAE threshold for approach, and VNAV will be deactivated at threshold crossing. This message only appears if the aircraft is configured to drop VNAV in this situation.

CDU MESSAGE	PFD MESSAGE	COLOR	DESCRIPTION
VNAV WARN-XTD	MSG	White	Aircraft cross-track distance is greater than: (1) 80% of the XTD threshold for oceanic/remote, enroute, or terminal, or (2) 50% of the XTD threshold for approach, and VNAV will be deactivated at threshold crossing. This message only appears if the aircraft is configured to drop VNAV in this situation.
VOR/DME DISABLED	None Shown	White	VOR/DME navigation sensors are disabled for use by the FMS on the VOR CONTROL page. This may degrade FMS navigation capability. To correct this, enable the VOR/DME sensors on the VOR CONTROL page.
VOR/DME DISTANCE> 75 NM	MSG	Yellow	The FMS is navigating within a terminal area and is using a single collocated VOR/DME for determining position, and the navaid is greater than 75 NM from the airplane's present position.
VOR-FMS DISAGREE	MSG	Yellow	The VOR/DME position estimate is different from that of the FMS. To show this message, the difference must be greater than 10 NM in the en route environment, and greater than 5 NM in the terminal and approach environment. The pilot should determine whether the FMS position or the VOR signal is incorrect and determine the appropriate action, if any. Corrective actions include: (1) Updating the FMS position (2) Disabling individual VOR/DME navaids (3) Disabling the use of all VOR/DMEs.
XTALK FAIL	MSG	White	In a dual FMS installation, the two systems have had a communications failure and cannot operate in the SYNC mode.

Scratchpad Messages

Pilot Operations

The following messages show on the CDU scratchpad for data entry or selection problems. All scratchpad messages show in white for approximately one second, then the previous scratchpad entry returns for correction or deletion. The PFD and MFD do not show annunciations for scratchpad messages. Also, scratchpad messages do not show on the MESSAGES page.

MESSAGE	DESCRIPTION
ALONG TRK WPT N/A	An attempt to enter a place/along-track offset or place/along-track offset/name waypoint into the flight plan failed. Check for a possible scratchpad entry error. Also, be sure the entry you are trying to make complies with the entry rules for pilot-entered waypoints.
CHK SELECTED DATA BASE	In dual FMS installations, transferring a flight plan from the FMS on one side to the FMS on the other side requires the two FMSs have the same effective dates for the active database. Also, both FMSs must have the same active database to change from the INDEP operating mode to the SYNC mode. This message indicates they are not the same. Go to the STATUS page on each CDU and verify that the navigation database name and effective dates are the same. You may need to load a new database in one or both FMSs.
DATE ENTRY N/A	An attempt to enter a date value in the DATE location on the STATUS page failed because current conditions do not allow the clock to be reset. In many airplanes, the date and time shown on the FMS STATUS page are set by the airplane clocks and cannot be set from the FMS. Refer to the appropriate airplane flight manuals to set the DATE.
DISTANCE TOO LARGE	You tried to enter an along-track waypoint offset that is too large for the flight plan leg. Verify the correct reference waypoint and the correct distance were used.
DME IN HOLD	An attempt to set the NAV radio tuning mode to AUTO failed because the affected radio has a DME in the HOLD mode. Clear the HOLD mode, then set the NAV radio to the AUTO mode.
ENTER CRZ ALT	An AFIS request to update the flight plan has been made and cruise altitude has not been entered on the active flight plan.
FLT DIR MODE NOT HDG	An attempt to set the heading on the SIMULATION CONTROL page failed, because the flight director is not in heading mode.

MESSAGE	DESCRIPTION
FMS FAULT	The FMS has detected an internal fault which prevents storing the database. Report this problem to your maintenance personnel.
FPLN EDIT IN PROGRESS	You attempted to select the SYNC mode while one FMS has a flight plan edit in progress (MOD FPLN). Execute the modified flight plan on the cross-side FMS, then try again.
FPLN FULL	An attempt to add waypoints to a flight plan failed because the flight plan is full.
FUEL FLOW NOT AVAIL	This message indicates fuel flow data has been invalid for at least two minutes.
INBD CRS ENTRY N/A	You cannot edit the inbound course of an active hold.
INTERSECTION>400 NM	A waypoint specified by the intersection of radials from two nav aids is more than 400 nautical miles from either of the nav aids.
INVALID DELETE	You attempted to delete data that cannot be deleted with the DELETE function.
INVALID DIRECT-TO	The DIRECT-TO waypoint selected is not a geographical waypoint, a vertical direct-to was requested to an altitude that is above the airplane barometric altitude or requires a descent path that exceeds the maximum VPA, or there is a VECTORS leg or discontinuity between the current airplane position and the target waypoint. Modify the flight plan as necessary to correct any of the above problems.
INVALID ENTRY	The entered data is invalid for the attempted data entry field.
INVALID ROUTE	You attempted to store a route that does not have any waypoints. You must enter waypoints into a route before you can store it.
KEY NOT ACTIVE	This message shows when an inactive line select key or function key is pushed.
LIST FULL	You have 8 GPS satellites disabled on the GPS CONTROL page and you attempted to disable another one. You can only disable 8 satellites.
MAG N/A	An attempt to select the MAG display mode on the FMS CONTROL page failed, because you are operating in extreme latitudes: either north of 73 degrees North latitude or south of 60 degrees South latitude.

MESSAGE	DESCRIPTION
N/A IN POLAR REGION	You attempted to perform a disallowed edit in the polar regions of the flight plan. Any of the following located in the polar region may not be entered: a hold at a fix, a hold at PPOS, a reference fix (FIX INFO page), a reference fix for a place bearing/distance, place bearing/place bearing, or along-track fix, a course edit to fix, or a FROM waypoint.
NAVAID INHIBITED	An attempt to specify a navaid for position update on the POS INIT page failed because the navaid is inhibited on the VOR CONTROL page.
NAVAID NOT RECEIVED	An attempt to update position from a navaid on the POS INIT page failed because the navaid signal is invalid.
NO ENTRY ALLOWED	With data in the scratchpad, you pushed a line select key adjacent to a data field that does not allow entry of data. Select a valid entry field for the data in the scratchpad.
NO INTERSECTION	The waypoint specified by the intersection of radials from two navaids does not exist because the radials do not intersect, or the radial or distance does not intercept a flight plan leg. This message also shows when you try to enter an airway for which there is neither an entry nor an exit waypoint already in the flight plan.
NO XSIDE DATA	You attempted to transfer a cross-side waypoint list and there is no data in the cross-side FMS.
NO XSIDE FPLN	You attempted to transfer an empty flight plan from the cross-side FMS.
NOT A COLLOCATED NAVAID	You must use a collocated VOR/DME to initialize position or update from a navaid. Select another VOR/DME or another sensor type to initialize or update the position.
NOT A VOR/DME	The station identifier you entered corresponds to a navaid that is not a paired VOR/DME, which is unacceptable to initialize or update the position. Select another VOR/DME or another sensor type to initialize or update the position.
NOT IN DATA BASE	The identifier entered into the scratchpad is not in the navigation database.
NOT ON AIRWAY	An attempt to enter an exit waypoint for an airway failed because the waypoint is not part of the airway. Select a waypoint that is located on the airway and try again.

MESSAGE	DESCRIPTION
NOT ON GROUND	The FMS has determined the aircraft is not on the ground and the pilot has attempted to perform one of the following actions: (1) Select an active database (2) Load a database from disk (3) Transfer a pilot route (4) Specify an origin airport in the active flight plan. The above actions are not allowed while the airplane is airborne.
PILOT WPT LIST FULL	This message shows when you attempt to enter a pilot-defined waypoint into the flight plan and there are already 50 pilot-defined waypoints in the flight plan. This message also shows when you try to store a waypoint in the pilot waypoint database, and the total number of waypoints in the database is at the limit of 100 waypoints. To enter another pilot-defined waypoint, you must first delete one from the current flight plan or the pilot waypoint database.
QUAD/RADIAL ENTRY N/A	You cannot edit the QUAD/RADIAL of an active hold.
RADIO IS NAV SOURCE	You have attempted to set the navigation radio tuning mode to AUTO when the affected radio is the navigation source. Set the NAV source to FMS and try again.
ROUTE LIST FULL	One hundred routes have been stored in the FMS route database, or there is not enough memory to store this route. Delete a route to make room for this route and try again to store it.
SYNC N/A	An attempt to select the SYNC mode failed because the two software programs in the FMSs are different or a cross-talk communication between the two FMS is unavailable. On the STATUS page, verify the PROGRAM names in both FMSs are the same. If they are not the same, then the appropriate programs must be installed in the FMSs. If they are the same, then there must be a cross-talk communications failure between the FMSs.
SYSTEM NOT AVAILABLE	You attempted to select an MCDU function and the associated system is not available to the FMS.
TIME ENTRY N/A	An attempt to change the UTC time on the STATUS page failed because an external clock source is in use. In many airplanes, the date and time shown on the FMS STATUS page are set by the airplane clocks and cannot be set from the FMS. Refer to the appropriate airplane flight manuals to set the TIME for the airplane clock.

MESSAGE	DESCRIPTION
TOO MANY HOLDS	An attempt to enter a hold into a flight plan failed because the flight plan already has the maximum number of holds allowed. Only six holds are allowed in a flight plan (which includes the direct-to history). Delete a previous hold from the flight plan to make room to add a new one.
TUNING NOT AVAIL	In a triple FMS installation the FMS you are using is in stand-alone operating mode (reverted out) and you attempted to tune a radio from the RADIO TUNING page. Set the reversion modes so that this FMS is not in stand-alone mode and try again.
WPT NOT MATCHED	An attempt to enter a place/along-track offset waypoint at a location in the flight plan failed because the waypoint identifiers in the flight plan and scratchpad did not match. Verify and correct the scratchpad entry and try again.
XSIDE EDIT IN PROGRESS	An attempt to edit an active flight plan failed because the other CDU is already in the MOD mode. Only one CDU at a time is allowed to edit the active flight plan when either FMS is set to the SYNC mode. You must cancel or execute the modification on the other CDU to allow you to edit from this CDU.
XSIDE STORE FAIL	You attempted to store a waypoint on the on-side FMS while in the SYNC mode, and the cross-side FMS could not store the data. This can occur if the database on the cross-side FMS is full, but the on-side FMS database is not, or when the cross-side database contains a dublicately-named item that is not in the on-side database.
XTALK BUS FAILURE	The crosstalk bus is invalid and you attempted to change the cross-side NAV radio tuning mode from MANual to AUTOMATIC.

DBU and Maintenance Operations

The following messages show on the CDU scratchpad for data entry or selection problems related to use of the DBU and maintenance operations. The messages show in white for approximately one second, then the previous scratchpad entry returns for correction or deletion.

MESSAGE	DESCRIPTION
DBU NOT RESPONDING	The DBU is not responding to commands from the FMS.
DISK CHANGED DURING REQ	The disk was changed before the last command was completed. Cancel the operation or reinsert the previous disk.
DISK DRIVE COLD	The disk drive indicates it is too cold to operate. The drive must be above 0° F for it to operate.
DISK DRIVE NOT READY	No diskette is inserted in the disk drive. Insert the disk and try the procedure again.
DISK ERROR	The disk drive detected an error while reading or writing to the disk. Try the procedure again.
DISK UNFORMATTED	The disk inserted into the DBU is not formatted. Format the disk and try again.
DISK WRITE PROTECTED	You attempted to write data to the disk in the DBU and the write protection tab on the disk is set to the protect position. If you are sure that you want to write to this disk, set the tab on the disk to the unprotected position and try again.
FILE NOT DELETABLE	You attempted to delete a file that cannot be deleted.
FILE NOT FOUND	The disk in the DBU does not contain a file requested by the FMS. Cancel the operation or check to be sure you inserted the correct disk and try again.
FILE TRANSFER ERROR	An error occurred while transferring data between the FMS and the DBU. Cancel the operation or try again.
FMS LOAD ERROR	The FMS has detected an error in storing the disk data. Cancel the operation and try again.
FMS MEMORY FULL	The FMS does not have enough memory to load the requested data from the disk. Cancel the operation.
FMS NOT RESPONDING	The FMS is not responding to the DBU. Cancel the operation and try again.

MESSAGE	DESCRIPTION
INSUFFICIENT DISK SPACE	The memory available on the disk does not meet the amount needed to write the complete list of routes or waypoints to the disk. Try a new or larger capacity disk, or cancel the operation.
NO LOADABLE FILES	The diskette in the DBU does not contain any loadable files. The diskette is likely not the diskette intended to be loaded by the FMS. Insert the correct disk and try again.
NO SAVABLE FILES	You have requested the FMS to store data to the disk. However, there is no data available for storage.
OTHER LRU USING DBU	The DBU is in use by another device. Discontinue the other device's use of the DBU and try again.
POWER INTERRUPT DETECTED	A momentary loss of power has been detected during DBU operations. Cancel or continue the operation as necessary.
WRONG DISK	During the loading of a navigation database, a diskette which is different from the requested disk was inserted in the DBU. Insert the correct disk and continue the database load.

PFD

FMS annunciations on the PFD alert you to some specific operating conditions. The table below lists and describes the messages that show on the PFD on two display lines at the bottom of the NAV sensor annunciations. These messages stay on while the condition causing the message exists or for a minimum of five seconds.

NOTE

The "MSG" annunciation flashes for 10 seconds and then stays on. Push the MSG key on the CDU to show the MESSAGES page and turn off the "MSG" annunciation on the PFD.

TOP ANNUNCIATION LINE	BOTTOM ANNUNCIATION LINE	COLOR	DESCRIPTION
APPR		White	This annunciation indicates the lateral and vertical deviations shown on the PFD are set to the approach sensitivity level and RNAV approach is active.
CHK POS		Yellow	The calculated FMS position does not meet the accuracy requirements for the current phase of flight.
FMS DR		White	The FMS is in dead reckoning mode with the aircraft on the ground or airborne for less than two minutes.
FMS DR		Yellow	FMS is in dead reckoning mode with the aircraft airborne for more than two minutes.
GPS APPR		White	This annunciation indicates the lateral and vertical deviations are set to the approach sensitivity level and a GPS approach is active.
GPS ONLY		White	The FMS position is determined from GPS sensor data only.
IRS ONLY		White	The FMS position is determined from IRS sensor data only.
NO APPR		White	FMS guidance for the approach is not approved or the approach had been disabled. When this annunciation shows on the display, the lateral deviation scaling reverts to the terminal environment sensitivity level.
NO APPR		Yellow	This annunciation indicates, during final approach, you have lost the required navigation accuracy to complete the approach.

SEQ INHB		White	This annunciation shows when SEQUENCING is set to INHIBIT on the LEGS page and the airplane is on the FROM side of the active waypoint. Setting SEQUENCING to AUTO on the LEGS page removes this annunciation.
TERM		White	This annunciation indicates the lateral and vertical deviations are set to the terminal sensitivity levels.
	ALT	Yellow	This annunciation indicates the rate of climb or descent is less than required to make the next altitude constraint specified in the flight plan.
	BOC	White	This annunciation shows when the airplane is within one minute of a bottom of climb altitude change. When the airplane is within five seconds of the change, the annunciation begins to flash. The annunciation turns off after the airplane passes the BOC point.
	HOLD	White	Indicates a holding pattern is active.
	MSG	White	Indicates there is a white message on the CDU message page.
	MSG	Yellow	Indicates there is a yellow message on the CDU message page.
	OFST	White	indicates a flight plan parallel offset is in effect.
	SPD	Yellow	This annunciation shows when the current airplane speed is 20 knots or greater than the target speed and VNAV is selected. It also shows when the airplane is within two minutes of reaching a hold and the airplane's speed is 20 knots or greater than the recommended maximum holding speed.

	TOD	White	This annunciation shows when the airplane is within one minute of a top of descent altitude change. When the airplane is within five seconds of the change, the annunciation begins to flash. The annunciation turns off after the airplane passes the TOD point.
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In addition to the annunciation lines under the NAV sensor annunciations, two FMS related annunciations can also show in the middle of the HSI display. Below is a list of these annunciations and their description.

ANNUNCIATION	DESCRIPTION
DISCONTINUITY	This annunciation shows in the middle of the HSI displays when the active leg of the flight plan is a discontinuity. Sequencing past the discontinuity or deleting the discontinuity removes this annunciation.
NO FLIGHT PLAN	This annunciation shows in the middle of the HSI displays when FMS is selected as the navigation source and there is no flight plan entered into the FMS. Entering and executing a flight plan, or selecting another NAV source, removes this annunciation.

MFD

FMS annunciations on the MFD alert you to specific operating conditions. The following table lists the messages shown on the MFD annunciation line. The annunciations stay on while the condition causing them exists, or for a minimum of five seconds.

MESSAGE	COLOR	DESCRIPTION
CHK POS	Yellow	The FMS position estimate does not meet the accuracy required for the current phase of flight. Verify all sensors are enabled for use by the FMS; perform a position update if an accurate position can be determined by one of the navigation sensors.
FMS NAV INVALID	Yellow	The airplane is airborne and the FMS does not have a valid source for sensor and attitude data. Check the NAV sensors to be sure they are enabled and check for an attitude sensor failure.
FMS NAV INVALID	White	The airplane is on the ground and the FMS does not have a valid source for heading. Check the NAV sensors to be sure they are enabled and check for an attitude sensor failure.
FMS DR	White	FMS is in dead reckoning mode with the aircraft on the ground or airborne for less than two minutes.
FMS DR	Yellow	FMS is in dead reckoning mode and the aircraft has been airborne for more than two minutes.
FMS DR FOR 5 MIN	Yellow	This annunciation indicates that the FMS has been in DR mode for five minutes or longer.

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NOTES

If you have problems or questions with operation of the FMS-4200 Flight Management System, use the space below to make notes about the details. At your next stop, contact your Collins Regional Office to get the answers. If your question is about a problem with the FMS-4200 system, some of the details that are helpful in understanding the problem are: the nature of the problem, where it occurred (takeoff, en route, approach, etc.), the selected operating modes, and other flight conditions.

[illegible]

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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