OWNER'S MANUAL
& REFERENCE

GPS 165*TSO*
Pilot's Guide

GARMIN®

This manual is written for software versions 3.06 or above, and is not suitable for earlier software versions.

9875 Widmer Road, Lenexa, KS 66215, USA

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NOTE: This device complies with Part 15 of the FCC limits for Class B digital devices. This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to other equipment, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by relocating the equipment or connecting the equipment to a different circuit than the affected equipment. Consult an authorized dealer or other qualified avionics service technician for additional help if these remedies do not correct the problem. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The GARMIN GPS 165 does not contain any user-serviceable parts. Repairs should only be made by an authorized GARMIN service center. Unauthorized repairs or modifications could void your warranty and your authority to operate this device under Part 15 regulations.

CAUTION

The GPS system is operated by the United States government, which is solely responsible for its accuracy and maintenance. The system is subject to changes which could affect the accuracy and performance of all GPS equipment. Although the GARMIN GPS 165 is a precision electronic NAVigation AID (NAVAID), any NAVAID can be misused or misinterpreted, and therefore become unsafe.

Use the GPS 165 at your own risk. To reduce the risk of unsafe operation, carefully review and understand all aspects of this Owner's Manual and Flight Manual Supplement, and thoroughly practice using the simulator mode prior to actual use. When in actual use, carefully compare indications from the GPS 165 to all available navigation sources, including the information from other NAVAIDS, visual sightings, charts, etc. For safety, always resolve any discrepancies before continuing navigation.

The altitude calculated by the GPS 165 is geometric height above mean sea level and could vary significantly from altitude displayed by pressure altimeters in aircraft. **NEVER** use GPS altitude for vertical navigation.

The Jeppesen database incorporated in the GPS 165 must be updated regularly in order to ensure that its information is current. Updates are released every 28 days. Contact Jeppesen for more information on GPS 165 database updates.

Pilots using an out-of-date database do so entirely at their own risk.

CAUTION! The GARMIN GPS 165 has no user serviceable parts. Should you ever encounter a problem with the unit, please take it to an authorized GARMIN dealer for repairs.

Accessories & Packing List

Congratulations on choosing the first GPS certified to meet the requirements of TSO C-129 Category A1 for non-precision IFR approach procedures. The GPS 165 represents GARMIN's commitment to provide an accurate, easy-to-use GPS for all of your aviation needs.

Before installing and getting started with your unit, please check to see that your package includes the following items. If any parts are missing or damaged, please see your GARMIN dealer immediately.

Standard Package:

- GPS 165 unit and NavData® Card
- Aviation Installation and Antenna Kit
- Remote backup battery
- Pilot's Guide & Quick Reference Guide
- Sample Airplane Flight Manual Supplement
- Database Subscription Packet

Optional Accessories:

- AC Adapter
- User Data Card

Designed for accurate performance, and intuitive operation, the GPS 165 is a powerful navigation device that allows you to navigate IFR en route and approach procedures for added convenience and safety.

Precision Performance

- MultiTrac8™ receiver tracks and uses up to 8 satellites for fast, accurate positioning and speed data, with continuous 1 second updates
- Jeppesen database lists airports, VORs, NDBs, FSSs, intersections, comm frequencies, runway info, minimum safe altitude, SUA information and more
- Vacuum fluorescent display to provide easy viewing, even in direct sunlight
- Remote battery pack provides up to 90 minutes of power in the event of electrical power failure

Advanced Navigation

- Non-Precision approaches for over 5,000 U. S. airports
- Standard Instrument Departures (SIDs) and Standard Terminal Arrival Routes (STARs)
- Full-featured fuel and trip planning and E6-B capabilities
- User checklists, schedulers and timers for keeping track of maintenance requirements, procedures and flight times

PART ONE: INTRODUCTION

PART TWO: REFERENCE

To quickly and easily locate information on specific tasks, please refer to the Index on page 117.

Key and Knob Functions

The power/brightness knob controls unit power and screen brightness

The direct-to key performs an instant GOTO and allows you to enter a waypoint and sets a direct course to the destination.

NRST The nearest key is used to obtain information on the 9 nearest airports, VORs, NDBs, intersections, user waypoints and 2 nearest FSSs. The nearest key also accesses any active SUA information. (See Section 2 for more information on the nearest waypoints.)

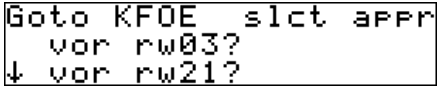
SET The set key allows you to customize the settings on your unit to your preferences, and view GPS coverage and receiver status. (See Section 5 for more information on unit settings.)

RTE The route key enables you to create, edit, activate and invert routes, and access approaches, SIDs and STARs. Search-and-rescue, parallel offset and closest point of approach are also performed using the route key. (See Section 3 for more information on routes.)

WPT The waypoint key is used to view information such as runways, frequencies, position, and comments on airports, VORs, NDBs, intersections and user waypoints. (See Section 2 for more information on the database and waypoints.)

NAV The nav key is used to view navigation and position information. Planning operations are also performed using the **NAV** key. (See Section 1 for more information on navigation and planning operations.)

The GPS 165 is designed to minimize keystrokes to perform operations. There are typically several ways to perform the same operation. In general, using the knobs will decrease keystrokes and time spent using the GPS 165. Experiment to find the most effective way to use the GPS 165 to your advantage.



Scrolling Arrow Prompts

Whenever the GPS 165 is displaying a list of information that is too long for the display screen, the scrolling arrow prompt will indicate which direction to scroll to view additional listings.

To scroll through a list with the flashing cursor inactive, simply rotate the inner knob. If the scrolling cursor is active, use the outer knob to view additional information.

CRSR The cursor key is used to activate/deactivate the cursor. The cursor is indicated by flashing characters on the screen and is used for data entry, changing fields or cycling through available information.

CLR The clear key is used to erase information or cancel an entry.

MSG The message key is used to view receiver messages and to alert you to important warnings and requirements.

ENT The enter key is used to approve an operation or complete data entry. It is also used to confirm information, such as during power on.

The outer knob is used to advance through pages, advance the cursor or move through data fields.

The inner knob is used to change data or scroll through information that cannot fit on the screen all at once.

This manual will describe how to enter data using the concentric knobs; ◉ for the inner knob and ◯ for the outer knob. Experiment with the concentric knobs. This will greatly reduce the amount of time required to navigate with the GPS 165.

GARMIN is fully committed to your satisfaction as a customer. If you have any questions regarding the GPS 165, please contact our customer service department at:

GARMIN International, Inc.
9875 Widmer Rd.
Lenexa, KS 66215-1239
(913) 599-1515 (913) 599-2103 (FAX)

The GARMIN GPS 165 is a powerful navigational tool that provides pilots with accurate navigational information and non-precision approaches, SIDs and STARs. The Flying Start section is designed to get you familiar with the operation of the GPS 165. This will include powering up the unit and acquiring satellites, entering data and activating a simple direct-to. This section also briefly covers the Position and CDI navigation pages, which you'll use for most of your in-flight navigation.

The Flying Start assumes that the GPS and antenna have been correctly installed and that you have not changed any of the factory default settings for the unit. If you have changed any settings (position formats, units of measure, etc.), the descriptions and pictures used may not match your configuration. Prior to using your GPS 165 for the first time, we recommend that you taxi to location that is well away from buildings and other aircraft so the unit can collect satellite data without interruption.

Powering up the GPS 165 for first time use

The GPS 165's power and screen brightness are controlled using the knob at the bottom left of the unit. Rotating it clockwise will turn the unit on and progressively brighten the display. This knob also locks the NavData® card (included with your unit) in place, so that it may not be removed during operation. After turning the unit on, a welcome page will be displayed while the unit performs a self test.

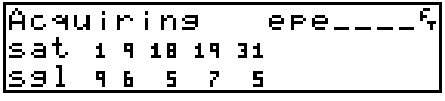
The Database page will appear, showing the current database information on the NavData® card, with the valid operating dates, cycle number and database type indicated. Databases are updated every 28 days, and must be current for approved approach and IFR operations. Information on database subscriptions is available inside your GPS 165 package.

To acknowledge the database information:

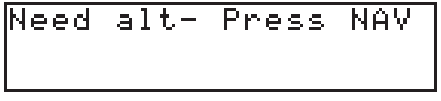
1. Press the ENT key.

Welcome Page.

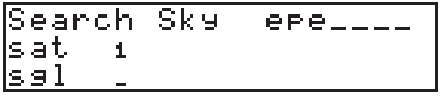
Database Confirmation Page.



Acquiring satellite data.



Enter the altitude manually if necessary.



Searching the Sky Message.

Once the database has been acknowledged, the Satellite Status page will appear, and the GPS 165 will begin to collect satellite information. An 'Acquiring' status will be displayed on the Satellite Status page, and the signal values on the bottom line of the page will begin displaying numeric values. This is a good indication that you are receiving signals, and satellite lock will occur. Following the first time use of your GPS 165, the time required for a position fix will vary, usually from 2 to 5 minutes.

If the unit can only obtain enough satellites for 2D navigation (no altitude), the unit will use the altitude provided by your altitude encoder, if one is connected and working. If not, you will be prompted to enter the altitude with a 'Need alt- Press NAV' message. If this message occurs, press the NAV key and use the ◉ and ◯ knobs to enter the altitude shown on your altimeter. Press ENT when finished.

If the GPS 165 has not been operated for a period of six months, or has moved over 300 miles without actively tracking satellites, it may have to 'Search the Sky' to collect new data. This means the unit is acquiring satellite data to establish almanac and satellite orbit information, which can take 7 1/2 to 30 minutes. The Status page will display a 'Searching the Sky' status, and the external message annunciator will also flash to alert you of a system message.

To view a system message:

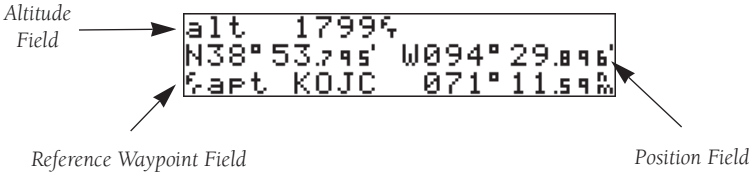
1. Press MSG.

The message page will appear and display the status or warning information applicable to the receiver's current operating condition.

To return to the previous page after viewing a message:

1. Press MSG.

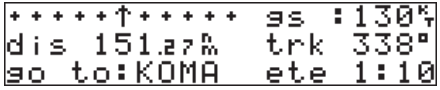
After the GPS 165 acquires satellites and computes a position, the Position page will appear automatically, and you'll be informed with a 'Ready for navigation' message on the message page.



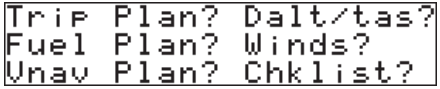
The Position page displays your present latitude and longitude, altitude and a reference waypoint field, and is also used to enter barometric pressure during approach operations. The altitude and reference waypoint fields are also selectable (see Section 1 for more information) to allow you to configure the unit to your own preferences. The default settings are:

- **Altitude—** Your present GPS altitude
- **Present Position—** Latitude and longitude displayed in degrees/minutes
- **Reference Waypoint—** The bearing and distance to the nearest airport

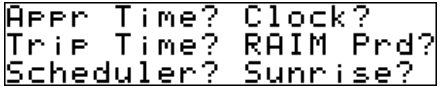
The Position page is one of four pages available under the GPS 165's NAV key: The Position page, CDI page, NAV Menu 1 and NAV Menu 2. During most flights, the Position page and the CDI (course deviation indicator) page will be the primary pages used for navigation. The pages available under each key are accessible by pressing the desired key and rotating the outer knob, or by pressing the NAV key repeatedly.



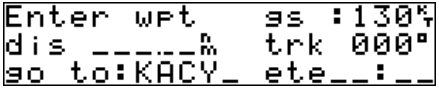
CDI page.



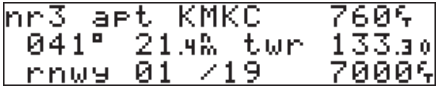
NAV Menu 1.



NAV Menu 2.



Entering a direct-to destination.

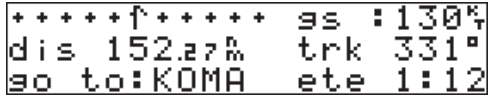


A direct-to may also be performed from any page that displays a single waypoint identifier (the nearest airport page in this example) by simply pressing the D▸ *key, followed by ENTER.*

The GPS 165 uses direct point-to-point navigation to guide you from takeoff to touchdown in the IFR environment. Once a destination is selected, the unit will provide speed, course and distance data based upon a direct course from your present position to your destination. A destination can be selected from any page with the DIRECT-TO (D▸) key.

To select a direct-to destination:

1. Press the D▸ key. The CDI page will appear with the destination field flashing.
2. Rotate the ◉ knob to enter the first letter of the destination waypoint identifier. The destination waypoint may be an airport, VOR, NDB, intersection or user waypoint, as long as it is in the database or stored in memory as a user waypoint.
3. Rotate the ◯ knob to the right to move the cursor to the next character position.
4. Repeat steps 2 and 3 to spell out the rest of the waypoint identifier.
5. Press ENT to confirm the identifier. The waypoint confirmation page will appear.
6. Press ENT to confirm the destination.



Once the direct-to destination is confirmed, the CDI page will appear with the destination indicated in the lower left hand corner of the screen. As well as displaying the current destination waypoint, the CDI page displays your present speed and track over the ground, and the distance and estimated time enroute to your destination. The graphical CDI, located at the top left of the screen, displays your position relative to the desired course and provides turn anticipation and waypoint messages during route and approach navigation.

In addition to the destination field and graphical CDI, the GPS 165 CDI page features four selectable fields for various navigation data so the page may be configured to your own preferences. The default settings for the CDI page are:

- **Ground Speed (gs)—** Your present speed over the ground in knots
- **Distance (dis)—** The distance to your destination in nautical miles
- **Track (trk)—** Your present course over the ground
- **Estimated Time Enroute (ete)—** The time to your destination based upon your present speed and course in hours and minutes

Once a direct-to is activated, the CDI page will provide navigation to the destination until the direct-to is cancelled or another direct-to destination is activated.

To cancel a direct-to from the CDI page:

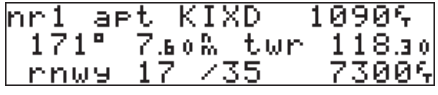
1. Press the CRSR key to activate the destination field.
2. Press CLR.
3. Press ENT.

The GPS 165's NRST key provides the nine nearest airports, VORs, NDBs, intersections and user waypoints, as well as the two closest FSSs (Flight Service Stations) and any SUA (special use airspace) alerts for your present position. The nearest waypoint feature is a handy safety feature that may be used to execute a quick direct-to in case of an in-flight emergency or to review the closest facilities to your present position.

To view the nine nearest airports:

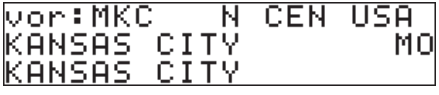
1. Press the NRST key. The nearest airport will be displayed, with position, frequency and runway data.
2. To review the rest of the nearest airport list, rotate the ◉ knob to the right.

CDI page with an active destination.

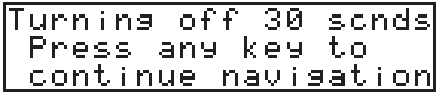


Nearest Airport Page.

The Nearest VOR Page.



To review a nearest waypoint, simply highlight the identifier and press ENTER.



The GPS 165 will operate on an internal battery if external power is lost.

To view the nine nearest list for other waypoint categories (VOR, NDB, etc.):

1. Rotate the ◯ knob to the right, or press the NRST key repeatedly.
2. Rotate ◉ to scroll through the list.

Once the nearest airport (or any other nearest waypoint) page is displayed, the selected waypoint can be quickly reviewed or selected as a direct-to destination.

To review the selected waypoint from the nearest waypoint list:

1. Press CRSR to activate the waypoint field.
2. Press ENT to display the waypoint identification page.
3. Rotate ◯ to view any additional waypoint information available.
4. Press NRST to return to the nearest waypoint page.

To select a nearest waypoint as a direct-to destination:

1. Press the D► key. The waypoint position page for the selected waypoint will appear.
2. Press ENT to confirm the destination.

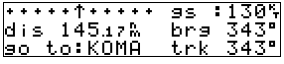
The GPS 165 is normally connected to power through the avionics master switch. When the master switch is turned off while the unit is operating, the GPS 165 will display a power down warning page. The power down page features a timer which will count down from 30 seconds when the unit senses that power is off. After 30 seconds, the GPS 165 will shut off. If you want to continue navigation, press any key during the countdown, and the unit will continue using the remote backup battery.

To turn the GPS 165 off:

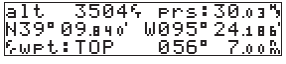
1. Turn the ◉ knob to the left until the unit shuts off.

Section 1
Navigation Key

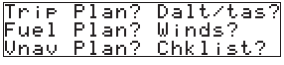
The GPS 165 features four navigation pages to provide various position, course, speed and planning information. The navigation pages may viewed by pressing the NAV key and rotating the outer knob, or pressing the NAV key repeatedly.



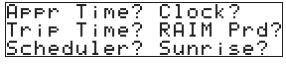
CDI Page



Position Page



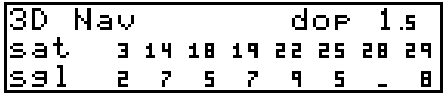
NAV Menu 1



NAV Menu 2

The CDI and Position pages are the primary pages used during in-flight navigation, while the two nav menu pages offer access to planning and calculation functions. Note that rotating the outer knob clockwise will continuously cycle through all the nav pages, while turning the knob counterclockwise stops the page selection sequence at the CDI page.

Whenever the NAV key pages are in use, the indicator light next to the NAV key will illuminate. If the GPS 165 requires you to enter data on the Position page, the message indicator will flash and a message prompt with specific instructions will appear. If you leave the NAV page sequence for another set of pages, the last NAV page displayed will appear when you return to the nav sequence.

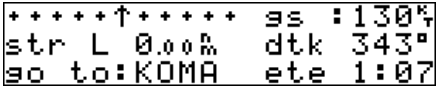


Remember! *The NAV pages will only display information AFTER the position and navigational information has been calculated from the satellites. If you are on the Position page before the unit has calculated a position, you will be able to enter an approximate position and altitude. This is helpful in speeding satellite acquisition if the unit has moved a great distance with the power off.*

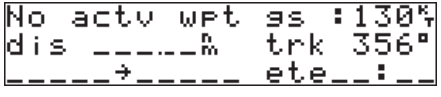
If you are not sure whether the GPS is actively calculating a position, check the receiver status field for '2D NAV' or '3D NAV' by pressing the SET key and rotating the outer knob to the left. The current receiver status is displayed at the top left of the page.

NAV KEY

CDI Page

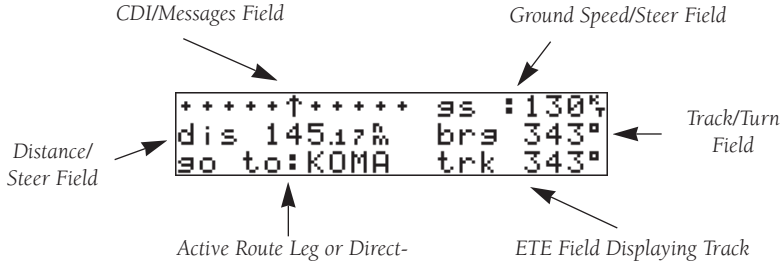


The CDI page with desired track and estimated time enroute displayed.



If the GPS 165 is not currently navigating to a waypoint, 'No actv wpt' will be displayed in the CDI field.

The GPS 165's **CDI page** provides you with the important information needed to navigate directly to your destination. The destination field, located at the bottom left of the page, displays the current destination waypoint or active route leg being navigated. If no direct-to destination, route or approach is being navigated, the destination field will display a dashed leg (____➔_____).



The **graphical CDI** at the top left of the page shows your position relative to the desired course (the moving D-bar) to the destination waypoint. The **TO/FROM arrow** in the center of the scale indicates whether you are heading to (an up arrow) the waypoint or from the waypoint (a down arrow). Note that the GPS 165 always navigates TO a waypoint unless the GPS SEQ switch is set to the HOLD position or you have passed the last waypoint in a route. The default setting of the CDI scale is 5.0 nm. The CDI field is also used to display the GPS 165's turn anticipation and waypoint alert data during route and approach operations (See sections 3 and 4). In addition to displaying your active destination and the course deviation indicator, the CDI page features four selectable fields for various distance, direction and time options. This allows you to configure the CDI page to your preferences. The default settings displayed are ground speed, distance, track and estimated time enroute.

The following functions may be displayed in the ground speed field:

- **gs --** Your present speed over the ground.
- **str --**Steer direction and distance, or digital crosstrack error. An 'L' or 'R' indicates which direction to steer, while the distance value indicates how far you are off course.

The following functions may be displayed in the distance field:

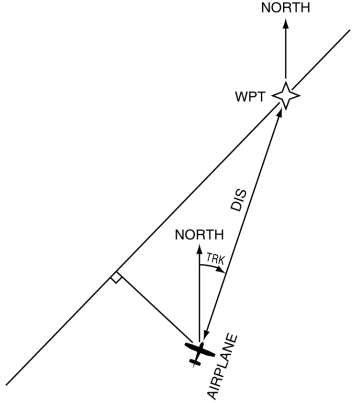
- **dis --** Distance from present position to the 'active to' waypoint.
- **str --** Steer direction and distance, or digital crosstrack error. An 'L' or 'R' indicates which direction to steer to return to your original course, while the distance value indicates how far you are off course.

The following steering functions may be displayed in the track field:

- **trk --** Track, the direction of movement relative to the ground.
- **brg --** Bearing, the direction from your present position to the waypoint.
- **cts --** Course to steer to reduce cross track error and stay on course.
- **dtk --** Desired track, the course between the active from and to waypoints.
- **trn --** Turn, the direction and degrees to turn to get back on the most direct course to the destination waypoint.

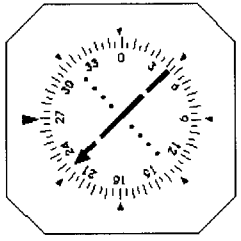
The following information can be displayed in the ete field:

- **eta --** Estimated Time of Arrival (at the active to waypoint)
- **ete --** Estimated Time Enroute (to the active to waypoint)
- **trk --** Track, or the direction of movement relative to the ground
- **vn --** Vertical Navigation, or VNAV. If VNAV has been activated (See page 16-17), this field indicates either the elapsed time before the VNAV maneuver is to begin or the VNAV altitude (the suggested altitude you should be flying in order to complete the maneuver).



NAV KEY

CDI Page/Course Select

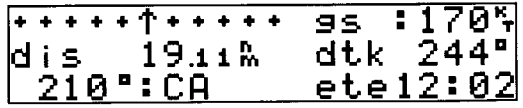


GPS SEQ
HOLD

The GPS 165's course select feature uses the external GPS SEQ switch to allow you to dial in the desired course to or from your destination from your HSI.

To change any of the selectable fields on the CDI page:

1. Press CRSR to obtain a cursor.
2. Rotate ◯ to highlight the field you would like to change.
3. Rotate ◉ to change the field to display the desired information.
4. Rotate ◯ to highlight another field, or CRSR to finish.



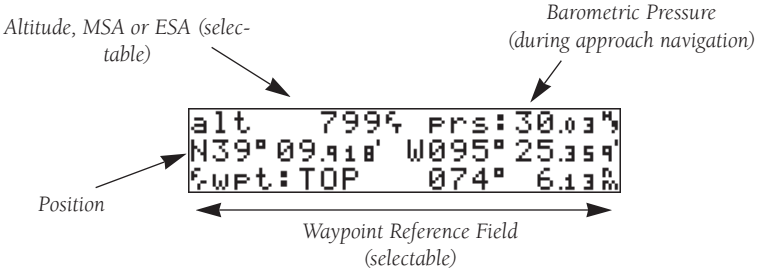
CDI page displaying selected course

The GPS 165's **course select feature** allows the pilot to define the inbound course to or outbound course from the 'active' waypoint using the external HSI. Once the course select function is activated, the selected course will be displayed next to the destination waypoint identifier and the CDI will provide guidance relative to the desired course. The course select feature is only available during route, approach or direct-to navigation. For more information on the course select feature and the GPS SEQ switch, see Section 4.

To set a desired inbound course:

1. Dial the desired course on the HSI.
2. Set the external GPS SEQ switch to the HOLD position.
3. To stop the course select function, set the GPS SEQ switch back to the AUTO position.

The GPS 165 **position page** displays your present latitude and longitude, altitude and a reference waypoint field; and is also used to enter barometric pressure during approach operations. The altitude and reference waypoint fields are selectable to configure the page to your own preferences and current navigation needs.



The altitude field can display either the present altitude, minimum safe altitude (MSA) or the enroute safe altitude (ESA). MSA is the recommended minimum altitude within approximately ten miles of your present position. ESA is the recommended minimum altitude within ten miles of your course on an active route or direct-to. MSA and ESA altitudes are calculated from information contained in the database and generally includes mountains, buildings and other permanent features (see right).

To change the altitude field to display other information:

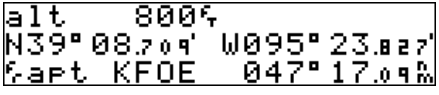
1. Press CRSR to obtain a flashing cursor.
2. Use ◉ to change the field to display the desired data.
3. Press CRSR to return to normal navigation.

Position page displaying MSA.

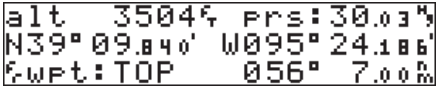
The same Position page displaying ESA. If you are on a route from New York City to Los Angeles, the MSA would be 2700 ft. at KJFK to account for objects in the area. However, the ESA would be 16,700 feet to account for the course flying through the Rocky Mountains.

NAV KEY

Position Page/Reference Wpt



Position page displaying KFOE airport as the reference waypoint.



Position page displaying the TOP VOR as the reference waypoint. This configuration is used to monitor your distance and radial to the reference waypoint during DME ARC approaches. See Section 4 for more information on approach operation.

The Position page also features a **reference waypoint field**, located at the bottom of the page, to indicate your radial and distance from a selected waypoint. The reference waypoint field can display the following:

- Range, radial and identifier of the nearest airport, VOR, NDB, intersection or user waypoint
- Range, radial and identifier from a user specified waypoint

The default setting is to display the nearest airport. During DME arc approach operations, the reference waypoint field will automatically display the DME reference as long as the active to waypoint is part of the DME arc.

To change the reference waypoint field to display the nearest airport, VOR, NDB, intersection, user waypoint or the range and radial from a user selected waypoint:

1. Press CRSR to obtain a cursor.
2. Rotate ◯ to highlight the proximity field after the fr.
3. Use ● to choose which waypoint type you would like displayed. (Choose 'wpt' if you would like a specific waypoint range and bearing to be displayed.)
4. Press CRSR to remove the cursor, or:

If you have selected 'wpt':

5. Rotate ◯ to advance the cursor to highlight the identifier field.
6. Use the ● and ◯ knobs to enter the identifier name. (This waypoint identifier can be an airport, VOR, NDB, intersection or user waypoint.) Press ENT.
7. Press CRSR to confirm the selection.

This allows any waypoint's distance and radial to be listed on the Position page continuously. This is especially useful when trying to locate your position on a sectional or when an approach reference is not the closest navaid.

NAV KEY

NAV Menu 1/Trip Planning

The GPS 165 features two nav menu pages for a host of valuable planning and calculating functions. **NAV Menu 1** provides access to the following functions:

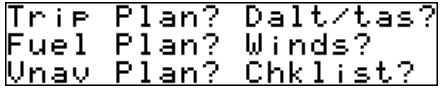
- **Trip Planning**
- **Fuel Planning**
- **VNAV Planning**
- **Density altitude/true air speed calc.**
- **Winds aloft calculations**
- **Checklist**

Trip Plan is the first function listed on NAV Menu 1 and allows you to view information regarding distance, ESA, bearing and estimated time enroute between any two waypoints and programmed route legs. The ground speed can also be varied manually to calculate several possible ETEs.

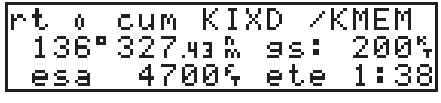
To use the trip planning function:

1. Press NAV and rotate ◯ to display NAV Menu 1.
2. Press CRSR, then ENT to access trip planning.
3. Rotate ◉ to select waypoint mode or the desired route number and press ENT.
4. For direct-to navigation, use ◉ and ◯ enter the 'to' and 'from' waypoints. Press ENT to accept the waypoints (to use your present position as a waypoint, leave the corresponding waypoint field blank).
5. For route calculations, choose either 'cum' for cumulative data (from beginning to end) or the leg desired by rotating ◉.
6. Use ◉ and ◯ to enter the ground speed. Press ENT to calculate the values.
7. Press CRSR to complete.

The trip direction, distance, ESA and ETE will be displayed on the bottom two lines of the planning page.



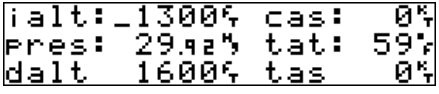
NAV Menu 1.



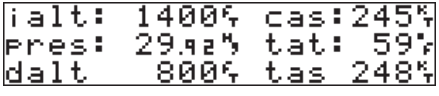
Using the trip planning function.

NAV KEY

NAV Menu 1/Density Altitude



Entering an indicated altitude.



Density altitude & true air speed calculated.

The **density altitude/true air speed** function is also accessed from NAV Menu 1. Density altitude is the altitude at which your aircraft will perform depending on several environmental conditions including air pressure and total air temperature (the temperature including the effect of speed), read on a standard outside temperature gauge on most aircraft). True air speed considers the same factors.

To calculate the density altitude and true air speed:

1. Press CRSR and rotate ◯ to highlight 'Dalt/tas?'.
2. Press ENT to access the density altitude page.
3. Using ◉ and ◯, enter the indicated altitude (ialt) according to the aircraft instruments. Press ENT.
4. Use ◉ and ◯ to enter the calibrated air speed (cas) according to the aircraft instruments. Press ENT.
5. Use ◉ and ◯ to enter the barometric pressure (pres) obtained from ATC. Press ENT.
6. Use ◉ and ◯ to enter the total air temperature (tat) according to aircraft instruments.
7. Press ENT and the density altitude and true air speed will be calculated and displayed.
8. Press CRSR to remove the cursor.

The **fuel planning** page will display fuel requirements for both direct-to navigation and programmed routes. The planning function requires the pilot to know the initial amount of fuel on board and the flow rate. You may also enter different ground speeds to view various information based on different travel times, etc. If your installation has interfaced a fuel flow sensor to the GPS 165, the flow rate and other information will be used from the sensor, and do not need to be entered manually.

To perform fuel planning operations:

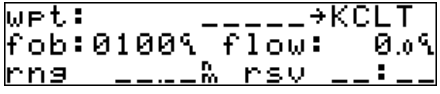
1. Press CRSR and use ◯ to highlight 'Fuel Plan?'. Press ENT.
2. Use ● to select either 'wpt' for direct navigation or the route number you would like to use.
3. For direct-to navigation, use ● and ◯ enter the 'to' and 'from' waypoints. Press ENT to accept the waypoints (to use your present position as a waypoint, leave the corresponding waypoint field blank).
4. For route calculations, choose either 'cum' for cumulative route fuel requirements (from beginning to end) or the leg desired by rotating ●.

If leg is selected, it displays the amount of fuel required to fly until that leg is complete.

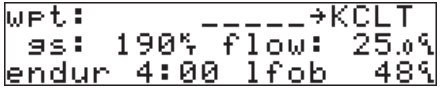
For example: The fuel required to complete leg 2 is leg 1 + leg 2.
Fuel required to complete leg 4 is leg 1 + leg 2 + leg 3 + leg 4.

5. Rotate ◯ to advance the cursor to 'fob:' or 'gs:' (depending on which is displayed).
6. Use ● and ◯ to enter the fuel on board or the ground speed. Press ENT.
7. Rotate ◯ back two positions to highlight the 'fob:' or 'gs:' field again.
9. Rotate ● to display the other information. Press ENT.
10. Use ● and ◯ to enter the remaining data. Press ENT.
11. Use ● and ◯ to enter the flow rate, in units per hour, if needed. Press ENT.

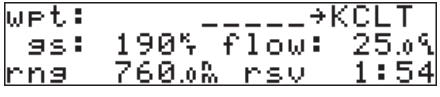
The GPS 165 will calculate the range (distance) and endurance (how long the fuel will last) of your aircraft. These are found in the first field on the bottom row of the page. The fuel left on board (lfob) and reserve after the selected direct-to, leg or route will also be displayed in the second field on the bottom row.



Enter initial fuel on board before takeoff.



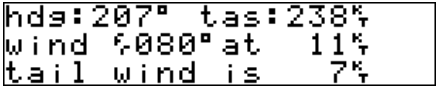
Fuel planning with endurance and leftover fuel on board displayed.



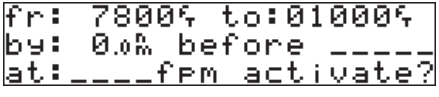
Fuel planning with range and reserve displayed.

NAV KEY

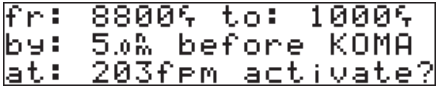
NAV Menu 1/Winds Aloft/VNAV



Calculating winds aloft.



Entering initial and final altitude.



The recommended VNAV descent will be displayed in the 'at' field.

The GPS 165 will also perform **winds aloft calculations** to inform you of the direction (true) and speed of the wind. This will also inform you whether you are flying with a headwind or tailwind, and its speed.

To calculate winds aloft:

1. Press CRSR and use ◯ to highlight 'Winds?'. Press ENT.
2. Use ◉ and ◯ to enter your present heading in the 'hdg:' field. Press ENT.
3. Use ◉ and ◯ to enter your true air speed (TAS) in the 'tas:' field. If you have calculated it using the GPS 165, it will be displayed as the default. Press ENT.

The direction, speed and magnitude of the winds aloft will now be displayed. If the GPS 165 is interfaced to a compatible Air/Data Sensor, these values will be calculated automatically.

The **VNAV function** calculates vertical speed requirements to obtain a desired altitude before or after a certain distance to a waypoint. This is helpful when you would like to descend to a certain altitude near an airport, or climb to a certain altitude before reaching a certain waypoint or NAVAID.

To calculate vertical navigation parameters:

1. Press CRSR and use ◯ to highlight 'Vnav Plan?'. Press ENT.
2. Use ◉ and ◯ to enter the initial (from) altitude (your present GPS altitude will appear as the default altitude). Press ENT.
3. Use ◉ and ◯ to enter the desired final (to) altitude. Press ENT.
4. Use ◉ and ◯ to enter the distance from the waypoint. Press ENT.
5. Rotate ◉ to select 'before 'or 'after' the waypoint. Press ENT.
6. Use ◉ and ◯ to enter the waypoint identifier from the active route. If you are on a route, or a direct-to, the active 'to' identifier will be displayed as default. Press ENT.

You will now notice that the vertical speed field has been calculated. If you desire a faster climb or descent, you may enter that value now.

7. Use ◉ and ◯ to enter the new desired vertical speed, or press ENT to accept the calculated value.

If you enter a greater value, the GPS 165 will display the elapsed time before the maneuver is to begin. When the countdown reaches 15 seconds, you will be informed with the message 'Start altitude chng'. The VNAV function will automatically be cancelled if the active route is changed in any way. In this case, you will be informed with a 'VNAV cancelled' message.

The GPS 165 will allow you to create up to nine **checklists** with 30 items each to remind you of repetitive tasks that can be called up at any time for review. The checklist feature is useful for creating pre-flight checklists, landing checklists, emergency procedures, etc. Each name or function can have up to 16 characters.

To create or edit a checklist:

1. Press CRSR and rotate ◯ to highlight 'Chklist?'. Press ENT.

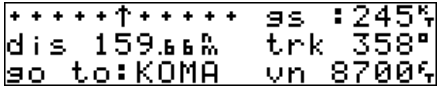
2. Use ◯ to highlight the checklist number you would like to create or edit. If there are no checklists, you must select the first checklist field. Press ENT.

3. Use ◉ and ◯ to enter the title of the checklist. Press ENT.

The checklist page will appear, where you may now enter each individual item, such as 'Check Fuel', etc.

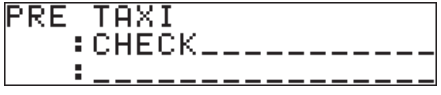
4. Use ◉ and ◯ to enter the checklist item. Press ENT.

5. You may repeat step 4 to enter additional items, or press CRSR to finish.



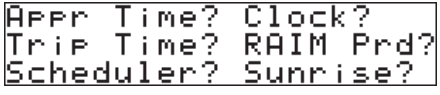
VNAV displayed on the CDI page.

The scrolling cursor prompt indicates the direction to scroll to view additional checklists.

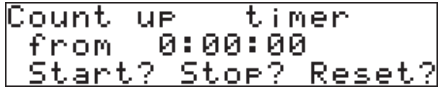


Entering Pre-Taxi checklist items.

To execute a checklist, highlight the desired item and press ENTER.



NAV Menu 2.



Approach Timer.

To execute a checklist:

1. Press CRSR and highlight 'Chklist?'. Press ENT.
2. Rotate ◯ to highlight the checklist you would like to see and press ENT.
3. Use ◯ to view checklist items, and press ENT to check off a highlighted item.

To delete a checklist item or an entire checklist:

1. To delete a checklist item, highlight the desired item and press CLR, followed by ENT.
2. To delete an entire checklist, highlight the desired list and press CLR, followed by ENT.

The GPS 165's **NAV Menu 2** provides access to various timer and planning functions, including:

- **Approach timer**
- **Trip timer**
- **Scheduler**
- **Clock (Date and time)**
- **RAIM prediction**
- **Sunrise and sunset calculations**

The **approach timer** serves as either a count up or a count down timer that can be set or reset at any time.

To activate/change/view the approach timer:

1. Press NAV and rotate ◯ to display NAV Menu 2.
2. Press CRSR, followed by ENT.
3. Rotate ◉ to select either 'Count up' or 'Count down'. Press ENT to accept.
4. Use ◉ and ◯ to set the time to count from, if you are using count down, or the time to begin counting, if you are using count up. Press ENT.
5. Rotate ◯ to select desired function, 'Start?', 'Stop?', or 'Reset?'. Press ENT to execute.

When the count down timer reaches zero, you will be informed with a 'Timer expired' message. The timer will then begin to count up, keeping track of how long it has been since it expired. The count up timer will not display a message. The timers run, if not altered, any time the GPS 165 is on.

The GPS 165 **clock function** keeps track of both UTC time (Greenwich Mean Time, or Zulu Time calculated from the satellites) and local time, and allows you to designate which time format is used for ETA calculations. The local time and date can be set without doing a UTC to local time conversion manually.

To set the local date/time:

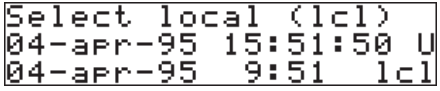
1. Press CRSR and use ◯ to highlight 'Clock?'. Press ENT.
2. Use ◉ to select either UTC or local time to be displayed in the ETA fields. Press ENT.
3. Use ◉ and ◯ to set the local date. Press ENT.
4. Use ◉ and ◯ to set the local time. Press ENT.
5. Press CRSR to complete.

The GPS 165's **trip timer** keeps track of the duration of your current trip, and can help you maintain accurate records and logs. The timer will count whenever the GPS 165 is on, or when your ground speed exceeds a specified setting (see page 90).

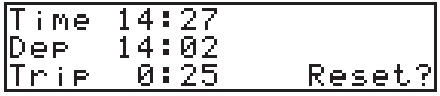
To view or reset the trip timer:

1. Press CRSR and use ◯ to highlight 'Trip Time?'. Press ENT. The current time of day, departure time and time enroute will be displayed.
2. To reset the timer, press ENT. To skip resetting the timer, press CRSR.

Timer expired message.



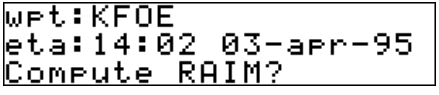
Entering a local time.



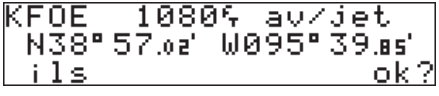
Resetting the trip timer.

NAV KEY

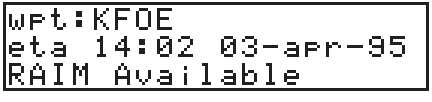
NAV Menu 2/RAIM Prediction



Enter the time and date for RAIM prediction.



Confirm the selected waypoint.



RAIM available for the entered date & time.

The **RAIM Prediction** function allows you to confirm that GPS coverage is available for a specific location or waypoint, any day of the year. **R**eceiver **A**utonomous **I**ntegrity **M**onitoring performs checks to ensure that the GPS 165 will have adequate satellite geometry to work with during your flight. RAIM availability will be near 100% in Oceanic, En route, and Terminal phases of flight. Because the FAA's TSO requirements for non-precision approaches specify significantly better satellite coverage than other flight phases, RAIM may not to be available when flying some approaches. The GPS 165 will automatically monitor RAIM during approach operations and warn you if RAIM is not available. RAIM prediction will help you plan for a pending flight to confirm that the GPS 165 can be used for an approach, and should be calculated the night before or the day of the desired flight.

To predict RAIM availability:

1. Press CRSR and rotate ◯ to highlight 'RAIM Prd?'. Press ENT. The cursor highlight will appear on the 'Compute RAIM?' prompt, ready to compute RAIM for your present position and time. To compute RAIM, press ENT. If you want to see if RAIM is available at another date or time, or at any waypoint in the database, perform steps 2 through 6.
2. Rotate ◯ to highlight the field which you would like to change.
3. Use ● and ◯ to enter the waypoint name, or leave it blank to use your current position. Press ENT to accept. *or*.
4. Use ● and ◯ to enter the day/month/year and the estimated time of arrival in hours and minutes (in local or UTC time, whichever you have selected from the clock display). The current date will be displayed automatically. Press ENT to accept.
5. Rotate ◯ to highlight 'Compute RAIM?' and press ENT.

When the computations are complete, the GPS 165 will display whether or not RAIM is available for the specified date and time, +/- 15 minutes of your ETA.

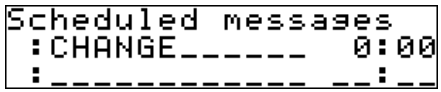
The **scheduler** function can be used to display reminder messages after a selected elapsed time such as Change Oil, Switch fuel tanks, etc. The scheduled message will be displayed after the timer runs out, and each time the GPS 165 is powered up, until the time is changed or the message is deleted.

To enter a scheduled message:

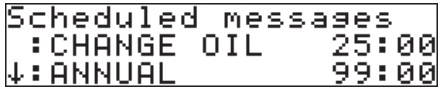
1. Press CRSR and rotate ◯ to highlight 'Scheduler?'. Press ENT.
2. Rotate ◯ to highlight the message you would like to edit (if none exist, you must edit message 1).
3. Use ◉ and ◯ to enter the message. Press ENT.
4. Use ◉ and ◯ to set the elapsed time until the message is displayed, in hours and minutes, up to 99 hours and 59 minutes. (This time is cumulative and counts whenever the GPS 165 is on in Normal mode.)
5. Press ENT to accept. To edit another scheduled message, repeat steps 4, 5 and 6, or press CRSR to finish.

To delete a scheduled message:

1. Press CRSR and rotate ◯ to highlight 'Scheduler?'. Press ENT.
2. Rotate ◯ to highlight the message you would like to delete.
3. Press CLR, followed by ENT.

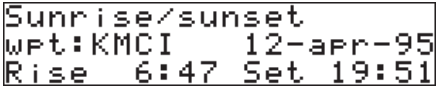


Entering a scheduled message.

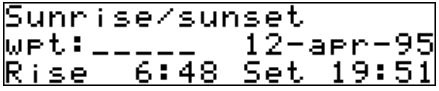


The scrolling arrow prompt indicates which direction to scroll to view additional listings.

The scheduled message will appear after the timer expires and after the GPS 165 is powered up until it is changed.



Sunrise and sunset calculated for the selected waypoint on the specified date.



Sunrise/Sunset Page

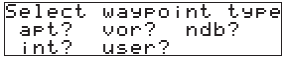
The last function available from the GPS 165's NAV Menu 2 is the **sunrise/sunset calculation**, which will give you the sunrise and sunset times for any user or database waypoint, or your present position.

To calculate sunrise and sunset at a waypoint or your present position:

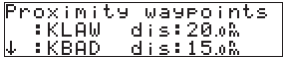
1. Press CRSR and rotate ◯ to highlight 'Sunrise?'. Press ENT.
2. Use ● and ◯ to enter the waypoint identifier, or leave blank to use your current position. Press ENT.
3. Press ENT to accept the waypoint confirmation page, if necessary.
4. Use ● and ◯ to enter the desired date.
5. Press ENT and the sunrise and sunset times will be calculated and displayed. The times will be displayed in your local time or UTC time, whichever is specified from the clock function on NAV Menu 2.

Section 2
Waypoint and Database Information

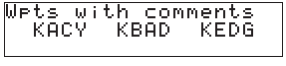
The GPS 165 uses a Jeppesen NavData® card to provide position and facility information for thousands of airports, VORs, NDBs and intersections. Each facility in the database is stored as a waypoint, with its own latitude/longitude, identifier (up to five letters and/or numbers) and other pertinent information. Up to 1,000 user waypoints may also be created and stored in the GPS 165's internal memory.



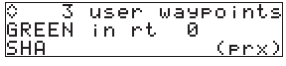
Waypoint Menu Page



Proximity Waypoints Page

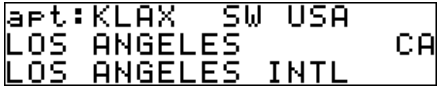


Waypoint Comments List



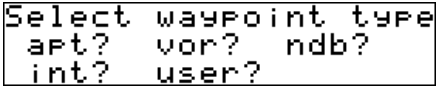
User Waypoint List

Waypoint information is available through four primary waypoint pages accessible from the GPS 165's WPT key. The waypoint pages may be scrolled through by pressing the WPT key and rotating the outer knob until the desired page is displayed, or by pressing the WPT key repeatedly.

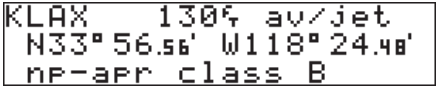


Please note *that your GPS 165 uses ICAO identifiers for all airport names. All continental U.S. airport identifiers which contain only letters use the prefix 'K'. For example, Los Angeles International is KLAX under the ICAO standard. Other airports, such as Otten Memorial (3VS), that contain numbers in the identifier, do not require the 'K' prefix. Many foreign countries use 2 letter prefixes. For more information on ICAO identifiers, contact:*

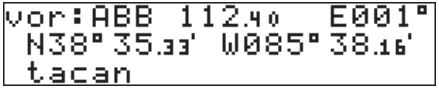
Document Sales Unit
International Civil Aviation Organization
1000 Sherbrooke, Suite 400
Montreal, Quebec
Canada H3A 2R2



Waypoint Menu Page.



Airport Position Page.



VOR Position Page.

The GPS 165 organizes waypoints into one of five waypoint categories for your convenience. Each waypoint category provides different types of detailed information for a selected facility:

- **Airports -** Identifier, city/state, country, facility name, position (lat/lon), elevation, fuel services, control and approach information, IFR procedures, runways and communications frequencies.
- **VORs -** Identifier, city/state, country, facility name, position (lat/lon), frequency, magnetic variation, co-located DME or TACAN and weather broadcast indication.
- **NDBs -** Identifier, city/state, country, facility name, position (lat/lon), frequency and weather broadcast indication.
- **Intersections -** Identifier, country, position (lat/lon), nearest VOR.
- **User -** Identifier (name), position (lat/lon), reference waypoint.

To view the waypoint information for a desired waypoint, select the waypoint category from the waypoint menu page.

To choose a waypoint category (for viewing information):

1. Press WPT and rotate ◯ to display the waypoint menu page.
2. Press CRSR and rotate ◯ to highlight the desired waypoint category.
3. Press ENT to accept the waypoint category. The waypoint identification or position page for the selected category will appear, with the waypoint identifier field ready for entry.

After a waypoint category is selected, information for a waypoint may be viewed by entering the identifier or name of the desired waypoint. Airports, VORs and NDBs may be entered by either the identifier, name or the location (city) of the facility. Intersections and user waypoints must be entered by the identifier.

To enter a waypoint identifier:

1. With the flashing cursor over the waypoint field, use ◉ and ◯ to enter the waypoint identifier.

As the identifier is entered, the GPS 165's Spell'N'Find feature will scroll through the available database, displaying any waypoints with the same identifier letters you have entered to that point. When the desired waypoint is displayed, press CRSR to remove the cursor.

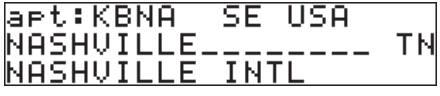
To obtain waypoint information by entering the facility name of the airport, the name of the VOR or NDB or its location:

1. Press WPT and rotate ◯ to display the waypoint menu page.
2. Rotate ◯ to highlight the desired waypoint category.
3. Press ENT to accept waypoint category.
4. Rotate ◯ to highlight the middle field to enter location (city) OR:

   Rotate ◯ to highlight the bottom field to enter facility name, or VOR/NDB name.
5. Use ◉ and ◯ to enter the location or the name and press CRSR to finish.

As the information is entered, the GPS 165 will display any entries in its database which match the letters you have entered so far. If duplicate entries exist for the entered identifier, name or location, additional entries may be viewed by rotating ◉ until the desired waypoint is displayed. As soon as the desired waypoint is displayed, press CRSR to continue.

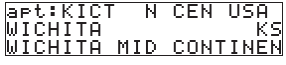
Entering a waypoint by facility name.



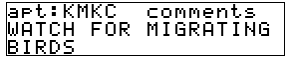
Entering a waypoint by city. ***NOTE:*** *Punctuation marks are not used when entering locations or names. Use spaces, where appropriate, to identify these marks. For example, St. Louis would be entered as "ST LOUIS" without a period.*

Once a waypoint category and identifier have been selected, the GPS 165 will provide extensive information through a set of waypoint pages for the selected category. We'll now go through the pages available for each waypoint category in the order they appear on the waypoint menu page: airports, VORs, NDBs, intersections and user waypoints.

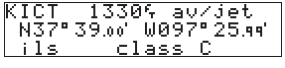
Airport Information



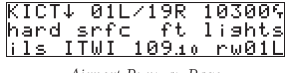
Airport Identification Page



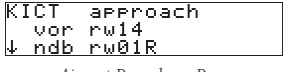
Airport Comments Page



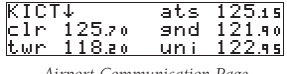
Airport Position Page



Airport Runway Page



Airport Procedures Page



Airport Communication Page

To scroll through the airport pages:

1. Make sure the cursor is not flashing. If it is, press CRSR.
2. Rotate ◯ in either direction to scroll through the available pages.

The GPS 165 features six airport pages:

airport identification— allows entry of desired airport by identifier, facility name or city; displays region and/or country of facility.

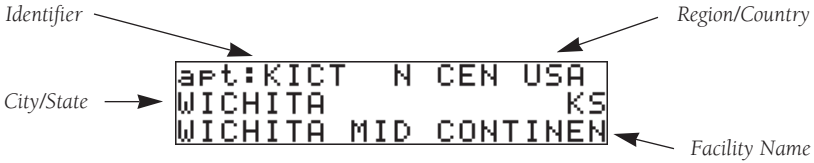
airport position— allows entry of desired airport by identifier; displays latitude, longitude and elevation; usage or fuel availability, available approaches and airport control/radar capability.

airport procedures— allows entry of desired airport by identifier; displays all available approaches, SIDs and STARs at the selected facility.

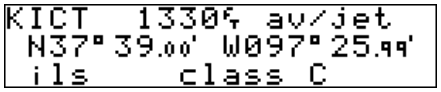
airport communication— allows entry of desired airport by identifier; displays radio frequencies/usage, and sector and altitude restrictions.

airport runway— allows entry of desired airport by identifier; displays runway designations, length, surface and lighting information; ILS/localizer and/or pilot controlled lighting frequencies.

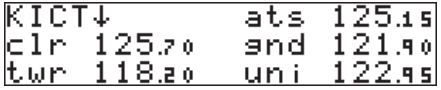
airport comments— allows entry of desired airport by identifier; displays user comments for the selected airport.



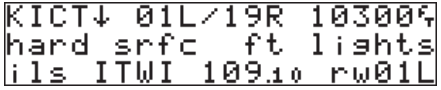
The **airport identification page** displays a selected airport's identifier, region and country, city/state and facility name. The identification page is always the first airport page available, allowing you to quickly review an airport facility or select another facility by entering the identifier, facility name or city of the desired airport.



Airport Position Page.



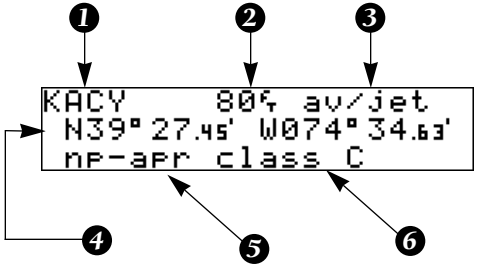
Airport Communication Page.



Airport Runway Page.

WAYPOINTS & DATABASE

Airport Position Page



Airport Position Page

1. Identifier (selectable)
2. Elevation
3. Fuel Availability
4. Airport Position
5. Approach Information
6. Controlled Airspace/Radar Capability

The **airport position page** displays the latitude, longitude and elevation of the selected airport, as well as usage or fuel availability, available approaches and airport control/radar capability. The following descriptions and abbreviations are used on the airport position page:

Elevation— In feet or meters.

Usage/Fuel— If the airport is for military use, it will display 'military'. If it is private, the GPS 165 will display 'private'. If it is a public airport, it will display the fuel type(s) available:

- **av gas—** 80-87 octane, 100 LL, 100-130 octane or mogas is available
- **jet—** Jet A, Jet A-1 or Jet A+ fuel is available
- **av/jet—** Both av gas and jet fuel are available

Position— In degrees/minutes or degrees/minutes/seconds of latitude and longitude.

Approach Information - displays the airport approaches available

- **no apr—** No approach is available
- **np-apr—** Non-precision approach is available
- **loc—** Localizer approach is available
- **ils—** ILS approach is available

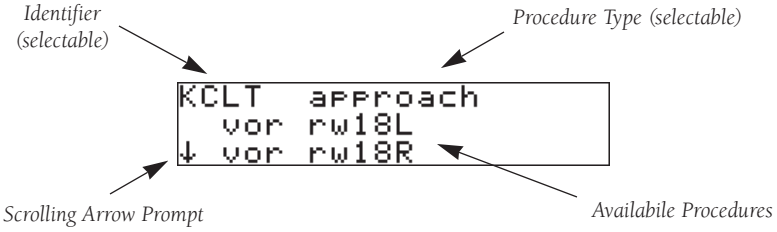
Controlled Airspace Information— displays controlled airspace type

- **class B**
- **class C**
- **cta**
- **tma**

Radar— displays approach/departure radar capability

- **radar—** indicates radar is present

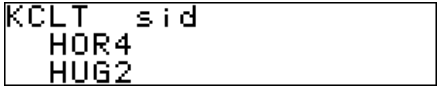
The **airport procedures page** displays all the available approaches, SIDs and STARs at any selected airport in the database, without placing a specific approach, SID or STAR in the active route. This allows the pilot to quickly scan the procedures of any nearby airport in case of an emergency or help plan future flights. You may view the available non-precision approaches, SIDs or STARs by selecting the desired list from the procedure type field.



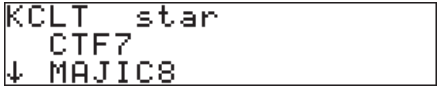
To view the available procedures for a selected airport:

1. Press WPT and rotate ◯ to display the procedures page.
2. Press CRSR and rotate ◯ to highlight the procedure field.
3. Rotate ◉ to select the approach, SID or STAR list.
4. Press CRSR to remove the flashing cursor.

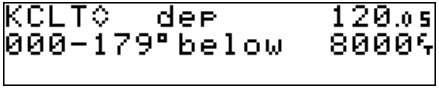
Whenever there are more than two available procedures for a selected category, the GPS 165 will display a scrolling arrow prompt on the left side of the list. To view additional procedures, simply rotate ◉ with the cursor removed. As you scroll through the list, the arrow prompt will point 'down' to indicate additional listings below the displayed procedures, or 'up' to indicate additional listings above. If you're in the middle of a list, a double arrow will be displayed to indicate the list may be scrolled up or down.



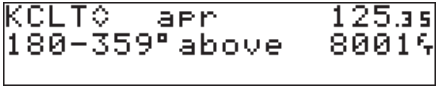
SIDs Procedures Page.



STARs Procedures Page.



Airport Communication Page.



Approach frequency with restrictions.

The **airport communication page** displays the radio frequencies and usage for the selected airport, as well as sector and altitude restrictions.

To view the communication page from any of the airport information pages:

1. Rotate ◯ with the flashing cursor removed to display the communication page.
2. Rotate ◉ in the direction of the arrow prompt to view additional frequencies.

The following descriptions and abbreviations are used on the communication page:

Frequencies without restriction information:

- **ats -** Automatic terminal information service (ATIS)
- **ptx -** Pre-taxi
- **clr -** Clearance delivery
- **gnd -** Ground
- **twr -** Tower
- **uni -** Unicom
- **mul -** Multicom
- **atf -** Aerodrome traffic frequency
- **ctf -** Common traffic advisory frequency (CTAF)
- **mf -** Mandatory frequency
- **oth -** Other frequencies

Frequencies with restriction information:

- **dep -** Departure
- **arv -** Arrival
- **cta -** ICAO control area
- **class C**
- **apr -** Approach
- **class B**
- **tma -** ICAO terminal control area
- **trsa -** Terminal radar service area

'Receive only' frequencies will display an 'rx' indicator, while 'transmit only' frequencies will display a 'tx'. If a frequency has sector and/or altitude restrictions, they will also be displayed. Sector restrictions define a range of radials from the facility, while altitude restrictions may describe an area above, below or between altitudes. Additional frequency usage instructions, if available, will be displayed on the bottom line.

The **airport runway page** displays runway designations, length, surface and lighting for the selected airport, as well as ILS/localizer and/or pilot controlled lighting frequencies.

To view the runway page from any of the airport information pages:

1. Rotate ◯ with the flashing cursor removed to display the runway page.
2. To view additional runway information, rotate ◉ with the flashing cursor removed. The scrolling arrow prompt, located beside the identifier field, indicates which direction to scroll for additional runway information.

If a localizer and ILS are used on the same runway, rotating ◉ will display both sets of information.

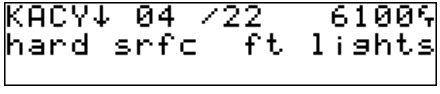
The following descriptions and abbreviations are used on the airport runway page:

Runway surfaces:

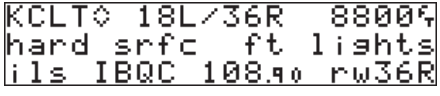
- **hard -** Hard (concrete, asphalt, etc.)
- **seal -** Sealed surface
- **dirt -** Dirt surface
- **unkn -** Unknown surface
- **turf -** Turf (grass)
- **grav -** Gravel surface
- **soft -** Unknown soft surface
- **watr -** Water landing site

Runway lighting:

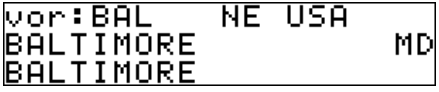
- **pt lights -** Part time lights
- **ft lights -** Full time lights
- **pc -** Pilot controlled (with frequency)
- **no lights -** No runway lighting



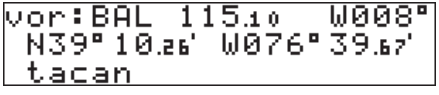
Airport Runway Page.



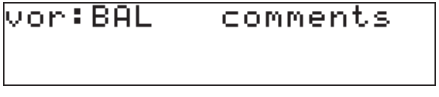
To view additional runways, rotate the inner knob in the direction of the arrow prompt.



VOR Identification Page.



VOR Position Page.



VOR Comments Page.

VOR Information

The GPS 165 features three VOR waypoint pages:

VOR identification— allows entry of desired VOR by identifier, facility name or city; displays region and/or country of facility.

VOR position— allows entry of desired VOR by identifier; displays latitude, longitude and frequency, magnetic variation, weather broadcasts and DME/TACAN information.

VOR comments— allows entry of desired VOR by identifier; displays user comments for the selected facility.

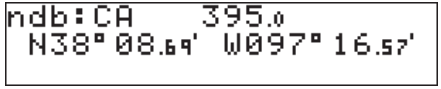
VOR information is accessed by entering the desired facility by identifier, city or facility name (see page 25) on any VOR waypoint page. The VOR identification and comments pages are identical in form and function to their airport page counterparts.

To scroll through the VOR pages:

1. Make sure the cursor is not flashing. If it is, press CRSR.
2. Rotate ◯ in either direction to scroll through the available pages.

In addition to displaying the VOR frequency, magnetic variation and position, the VOR position page indicates if a DME or TACAN is co-located at the facility The 'wx bdcst' field indicates that the VOR also transmits weather information.

NDB Information



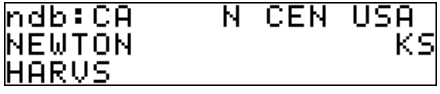
NDB Position Page

The GPS 165 also uses identification, position and comments pages for NDB information. The NDB waypoint pages are used in the same manner as VOR pages: NDB information is accessed by entering the desired facility's identifier, city or name (see page 25) on the NDB identification page.

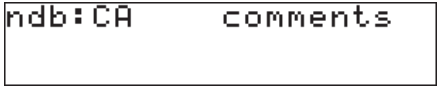
To scroll through the NDB pages:

1. Make sure the cursor is not flashing. If it is, press CRSR.
2. Rotate ◯ in either direction to scroll through the available pages.

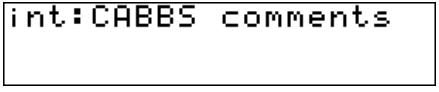
The NDB position page (see above) displays the selected facility's identifier, frequency and position, as well as any weather broadcasts available. The NDB comment page will display any user comments for the selected NDB. See page 41 for instructions on entering user comments.



NDB Identification Page.

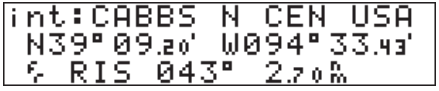


NDB Comments Page.



Intersection Comments Page.

Intersection Information



Intersection Position Page

The last database waypoint category available is intersections. Two intersection pages are available: intersection position and intersection comments. Intersections may be entered by identifier only (not city or name) on either intersection page.

To scroll through the Intersection pages:

1. Make sure the cursor is not flashing. If it is, press CRSR.
2. Rotate ◯ to toggle between the available pages.

The intersection position page displays the selected facility's identifier; region and/or country, latitude and longitude and the identifier, distance and bearing to the nearest VOR (not necessarily the VOR used to define the intersection). The intersection comment page will display any user comments for the selected intersection (see page 41).

User Waypoint Information

In addition to the airport, VOR, NDB and intersection waypoints contained in your NavData® card, the GPS 165 allows you to store up to 1,000 user-defined waypoints. Once a user waypoint is created, two user waypoint pages will display the following information:

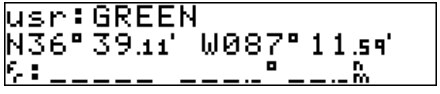
- Waypoint identifier
- Position in latitude and longitude
- Identifier, range and bearing from a reference waypoint
- User comments

To scroll between the user waypoint position page and the user comments page, rotate ◯. User waypoints may be created or modified using the WPT key. After selecting the waypoint identifier, as shown on page 25, you will be prompted to enter information if the waypoint is new. There are three ways to create a user waypoint's position from the WPT key:

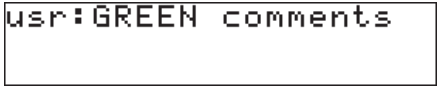
1. Enter the exact position of the new waypoint.
2. Reference a known waypoint.
3. Enter a range and bearing from your current position.

To create or edit a user waypoint:

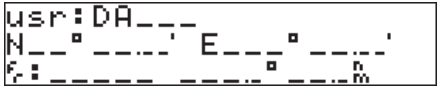
1. Press WPT.
2. Use ◯ to highlight the 'user?' field. Press ENT.
3. Use ● and ◯ to enter the waypoint identifier. Press ENT.



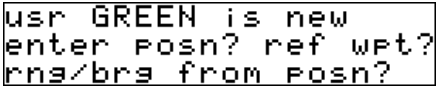
User Waypoint Position Page.



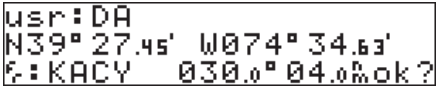
User Waypoint Comments Page.



Entering a user waypoint name.



Select a waypoint entry method.



User waypoints may be created by referencing another waypoint in the database. The GPS 165 will automatically calculate the new waypoint's coordinates after a bearing and distance have been entered.

If the waypoint identifier entered does not exist in the database, you will be prompted to select the method to enter the new waypoint's position into the database. If the waypoint exists (you're just reviewing or editing a user waypoint), skip step 4 and move on to the next set of instructions.

4. Select the desired waypoint entry method using ◯ and press ENT.

You will automatically be placed on the latitude and longitude field (if you selected 'enter posn?'), or the 'from' field (if you select 'ref wpt?'), or the 'bearing' field (if you select 'rng/brg from posn?').

To enter/edit the position of the user waypoint:

1. Use ◉ and ◯ to enter the latitude. You may select either north or south and enter a latitude up to (but not including) 90°.
2. Press ENT.
3. Use ◉ and ◯ to enter the longitude. You may select either east or west and enter a longitude up to (but not including) 180°.
4. Press ENT.

Once the latitude and longitude have been entered, the flashing cursor will move to the reference waypoint field, where you may enter a reference waypoint to calculate a bearing and distance to the new waypoint position. If you are not entering a reference waypoint:

5. Press ENT to advance the flashing cursor to the 'ok?' prompt and press ENT to save the new waypoint in internal memory.

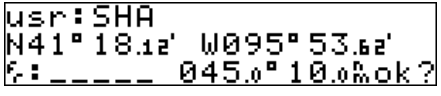
To enter/edit a user waypoint position from a reference waypoint:

1. Use ◉ and ◯ to enter the reference waypoint's identifier.
2. Press ENT.
3. Use ◉ and ◯ to enter the bearing from the reference waypoint.
4. Press ENT.
5. Use ◉ and ◯ to enter the distance from the reference waypoint.
6. Press ENT. The latitude and longitude will be calculated for the waypoint.
7. Press ENT to confirm the 'ok?' prompt and save the waypoint position.

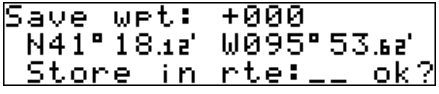
If you have chosen to create a waypoint at a certain bearing and distance from your current position, your current position will be displayed and you will enter the bearing and distance you would like the new waypoint to be located.

To create a user waypoint offset from your present position:

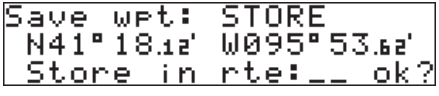
1. Use ◉ and ◯ to enter the bearing from your position.
2. Press ENT.
3. Use ◉ and ◯ to enter the distance from your position.
4. Press ENT. The latitude and longitude will be calculated for the new waypoint.
5. Press ENT to confirm the 'ok?' prompt and save the waypoint position.



To create a user waypoint from your present position, leave the reference waypoint field blank and enter a bearing and distance from your present position. The GPS 165 will calculate the new waypoint's coordinates automatically.



AutoStore waypoint with default name.



The default waypoint name may be changed before saving the waypoint.

The GPS 165's **AutoStore™ function** provides another method of creating user waypoints. AutoStore is used to instantly capture your present position as a user waypoint with a touch of a button, and add the new waypoint to the end of a specified route if desired.

To perform an AutoStore:

1. Press NAV and rotate ◯ to display the Position page.
2. Press ENT to mark your position.

This will display the 'Save' waypoint screen which will allow you to rename the waypoint if you would like and choose the route to which it should be added. The GPS 165 will assign the next available three digit number as the default waypoint name, preceded by a '+' sign (this will help you differentiate AutoStore waypoints from other user waypoints).

To change the name or the route of an AutoStore waypoint:

1. Rotate ◯ to select the name or route number field.
2. Use ● and ◯ to enter the name or route number.
3. Press ENT to accept.
4. Press ENT to confirm the 'ok?' prompt.

If the waypoint name is already used for another waypoint, you will be informed with the message 'WPT exists _____'. The default waypoint number will be redisplayed, and you may enter a different name The new waypoint will only be added to a route if the desired route number is manually entered in the route field.

The second page available from the GPS 165's WPT key is the **proximity waypoints page**. This page allows you to define an alarm circle around a selected waypoint, and is useful in defining alarm circles around towers or obstructions. Up to 9 proximity waypoints can be entered, with an alarm radius up to 99.9 units (nm, mi,).

To create or edit a proximity waypoint:

1. Press WPT and use ◯ to display the 'Proximity waypoints' page.
2. Press CRSR and use ◯ to highlight the first available field.
4. Use ● and ◯ to enter the identifier. It may be an airport, VOR, NDB, INT or user waypoint. Press ENT.
5. Use ● and ◯ to enter the radius of the alarm circle Press ENT.

If two proximity waypoints, whose alert regions overlap, are entered, you will be informed with the message 'Proximity overlap'. This message will be displayed each time you turn on the GPS 165 as long as the overlap remains. **WARNING:** If you enter the overlap area you will only be informed of the *nearest* proximity waypoint.

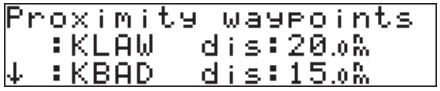
To remove a waypoint from the proximity waypoints page:

1. Press CRSR, if necessary, to obtain a cursor.
2. Press CLR to erase the name and then ENT to delete.

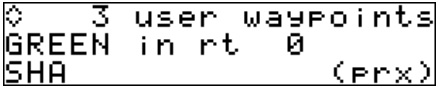
To scroll through the proximity waypoints list:

1. Rotate ● with the flashing cursor inactive, (or use ◯ with the flashing cursor active) to scroll through the available proximity waypoints. The scrolling arrow prompt will indicate the direction to scroll to view additional waypoints, if available.

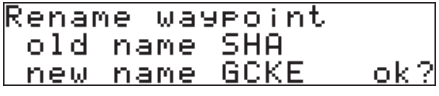
Creating a proximity waypoint.



Proximity Waypoint List.



User Waypoint List.



Renaming a user waypoint.

The third page available from the GPS 165's WPT key is the **user waypoint list**, which can be used to quickly scan, review, rename or delete user waypoints.

To display the user waypoint list:

1. Press WPT and use ◯ to display the user waypoint list.
2. To scroll through the list, rotate ◉.

The total number of user waypoints is displayed at the top of the page, with user waypoints listed two at a time in alphabetical order. The scrolling arrow prompt, located at the top left of the page, will indicate which direction to scroll to view additional waypoints. The status of each waypoint, if applicable, will be displayed to the right of the identifier. A status will appear when it is the active to waypoint, part of an active or stored route or a proximity waypoint. To edit, rename or delete waypoints, the cursor must highlight the desired waypoint.

To highlight a waypoint:

1. Press CRSR and use ◯ to highlight the desired waypoint.

To edit a highlighted waypoint:

1. Press ENT to obtain the waypoint position page. Edit the waypoint as described on page 37.

To delete a waypoint from the list:

1. Highlight the desired waypoint and press CLR. Press ENT to confirm the deletion.

To rename a waypoint from the list:

1. Highlight the desired waypoint. Use ◉ and ◯ to enter a new identifier for the waypoint.
2. Press ENT on the confirmation page to change the name, or press CLR to cancel.

The last page available through the GPS 165's WPT key is the **waypoint comments page**, which lists all waypoints that have a user comment. User comments may be added to 250 waypoints stored in the user or NavData® database, and are helpful to note two lines of special information concerning a particular waypoint.

To enter user comments:

1. Enter the waypoint identifier from any waypoint page (see page 25), and press CRSR to remove the flashing cursor.
2. Rotate ◯ to display the 'comments' page.
3. Press CRSR and use ◯ to highlight either the second or third line.
4. Use ● and ◯ to enter the comment.
5. Press ENT to accept, and repeat, if necessary, to enter information on another line.
6. Press CRSR to remove the cursor.

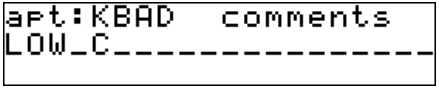
To view the waypoints with comments list:

1. Press WPT and use ◯ to display the 'Wpts with comments' page.
2. Use ● to scroll through the list.

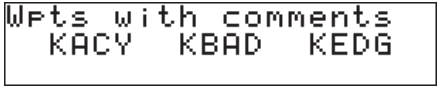
The GPS 165 will display the waypoints with comments in alphabetical order, up to six waypoints at a time. The scrolling arrow prompt will indicate which direction to scroll to view additional waypoints. These waypoints may be highlighted, reviewed, changed, etc. just as they would if they were accessed from the waypoint menu page.

To view comments for a selected waypoint:

1. Highlight the desired waypoint and press ENT.
2. Rotate ◯ to display any other available pages for the selected waypoint.



Entering waypoint comments.



Waypoints with Comments List.

WAYPOINTS & DATABASE

Waypoint Confirmation

Waypoint Scanning

To simplify waypoint entry, the GPS 165 provides a waypoint scanning feature that allows you to scan airports, VORs, NDBs & intersections by identifier, facility name or city. To enter a waypoint by scanning:

- *With the flashing cursor over a blank identifier field, press the* WPT *key.*
- *Use* ◯ *to highlight the waypoint category you wish to scan.*
- *Press* ENT *to activate the scanning mode.*
- *Place the flashing cursor over the field you want to scan (identifier, city or facility name).*
- *Enter the letters of the identifier, city or facility name. The GPS 165 will scan the database and fill in the first identifier, city or facility that matches your entry.*
- *Press* ENT *to accept the waypoint, and* ENT *again to enter the waypoint for the function being used.*

The GPS 165's extensive waypoint database makes it possible for several waypoints to share the same identifier. To ensure that you are selecting the waypoint desired, the GPS 165 will always offer the **waypoint confirmation page** (that shows the waypoint's position) when an identifier is entered for a particular function.

To accept the waypoint position:

1. Place the cursor over the 'ok?' prompt and press ENT.

To reject the waypoint position:

1. Place the cursor over the 'ok?' prompt and press CLR.

Once a waypoint has been accepted or rejected, the previous page will be displayed. If there is more than one waypoint available for a selected identifier, the GPS 165 will display the duplicate waypoint page for you to choose the desired waypoint. The waypoint identifier and number of duplicates will be shown at the top of the page, with the waypoint type and region of each duplicate indicated below. The waypoints listed are sorted by the distance from your present position.

To scroll through additional duplicate waypoints:

1. Rotate ◯ with the flashing cursor active, or ● with the flashing cursor inactive.

To select the desired waypoint from the duplicates list:

1. Activate the flashing cursor and rotate ◯ to highlight the desired waypoint.
2. Press ENT. The waypoint confirmation page will appear.
3. Press ENT over the 'ok?' prompt to accept the waypoint or CLR to reject the waypoint and return to the duplicate waypoints list.

The GPS 165's **NRST key** provides detailed information including range and bearing from present position on the nine nearest airports, VORs, NDBs, intersections and user waypoints within 200 nm of your current position. In addition, it will also display the two nearest Flight Service Station (FSS) points of communication, and alert you to any Special Use Airspace (SUA) you may be in or near. The NRST key can be used in conjunction with the GPS 165's direct-to function to quickly set a course to a nearby facility in case of an in-flight emergency.

To view the nearest waypoint information:

1. Press NRST.

This will display the nearest airport to your present position, subject to the runway surface type and minimum runway length selected (see page 89).

To scroll through the next eight nearest airports, rotate ◉.

From the nearest airport page, you can easily examine both the communication frequencies and the runway information.

To view more comm/runway information:

1. Press CRSR and rotate ◯ to highlight the comm field or the runway field.
2. Rotate ◉ to scroll through more information, if available.

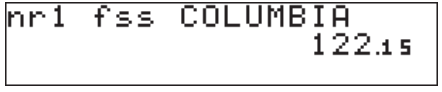
To perform a direct-to from any of the nearest waypoint pages:

1. Press ⇢. The waypoint confirmation page will appear.
2. Press ENT to accept the waypoint or CLR to cancel.

The nearest waypoints for other categories (VORs, NDBs, etc.) may be viewed by rotating ◯. Rotating ◯ continuously to the left will stop page selection on the nearest airport category.

Nearest Airport Page.

Nearest VOR Page.



Nearest FSS page. To view additional frequencies for the displayed FSS, highlight the frequency and rotate the inner knob.

SUA Near & Ahead Message.

SUA Alert Page.

The next page available under the GPS 165's NRST key is the **SUA alert page**. The SUA alert page will alert you with up to nine controlled or restricted airspaces near or in your flight path, according to the following conditions:

- If your projected course will take you inside an SUA within the next 10 minutes, the message '**SUA ahead < 10 min**' will be displayed.
- If you are within two nautical miles of an SUA and your current course will take you inside, the message '**SUA near & ahead**' will be displayed.
- If you are within two nautical miles of an SUA and your current course will **not** take you inside, the message '**Near SUA < 2nm**' will be displayed.
- If you have entered an SUA, the message '**Inside SUA**' will be displayed.

Note that the GPS 165's SUA alerts are based on three-dimensional data (latitude, longitude and altitude) to avoid nuisance alerts. The alert boundaries for controlled airspace are also sectorized to provide complete information on those airspaces. Once you have met one of the described conditions, the external message annunciator will flash, alerting you of an SUA message.

To view an SUA message:

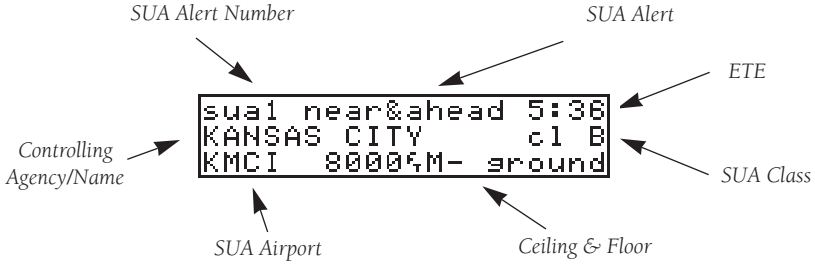
1. Press the MSG key.
2. Press MSG again to return to the previous page.

Once you are notified of a SUA alert, detailed information concerning the specific SUA is provided by the NRST key.

To view the SUA alert page:

1. Press the NRST key.
2. Rotate ◯ one stop to the right to view the SUA alert page.

The SUA alert page contains the following information:



The 'SUA number' field displays which SUA you are viewing (you may be alerted with up to 9 SUAs). SUAs are listed as 'sua1' being the highest priority, and 'sua9' being the lowest priority from your current position. The 'SUA alert' field displays the corresponding alert message for this SUA, such as near, near and ahead, etc. (see the previous page for a complete list of SUA alerts). The ETE (estimated time enroute until entering the SUA), located at the top right of the page, will only be displayed if you are projected to enter the airspace.

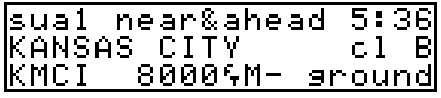
The second line of the SUA alert page displays the name or controlling agency of the SUA, along with the SUA type to which you are being alerted.

To toggle between the SUA name and controlling agency display:

1. Rotate ◉ one stop in either direction.

If the SUA name or controlling agency is too long to fit on the display, the GPS 165 will automatically scroll to display the rest of the information.

To toggle between the SUA name and controlling agency display, rotate the inner knob one stop in either direction.



SUA Alert Page.

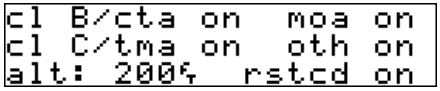
The airport communication page for the displayed alert may be viewed by highlighting the controlling agency's identifier and pressing ENTER.

The following SUA types can appear in the SUA type field:

Message	Airspace Type
alrt	- Alert
caut	- Caution
cl B	- Class B
cl C	- Class C
cta	- ICAO Control Area
dngr	- Danger
moa	- Military Operations Area
proh	- Prohibited
rstc	- Restricted
tma	- ICAO Terminal Control Area
trng	- Training
trsa	- Terminal Radar Service Area
unsp	- Unspecified
warn	- Warning

The last line on the SUA alert page displays the SUA's controlling airport identifier and the ceiling and floor altitudes for the SUA alert. Controlling agency frequencies may be viewed by highlighting the controlling airport identifier with the cursor and pressing ENT. The following are examples of what can appear in the altitude fields:

Message	Meaning
8000ftM	- 8000 feet mean sea level (MSL)
3000ftA	- 3000 feet above ground level (AGL)
ground	- ground level
msl	- mean sea level
notam	- See Notice to Airmen (NOTAM) for altitude restrictions
not sp	- Altitude is not specified
unlmtd	- Altitude is unlimited



SUA Settings Page

All SUA alert messages except for prohibited areas may be turned on or off through the GPS 165's SET key (described page 92). The GPS 165 will also automatically turn off SUA alert messages during approach operations (see page 73). Alerts for prohibited areas will always be displayed, regardless of unit settings or operating mode. SUA alerts may be turned off so the pilot can avoid continuous alerts in areas with extensive special use airspace.

Important: Turning off the SUA alerts only stops the display of SUA messages. Any applicable SUA alert pages will still be available from the NRST key.

The GPS 165 also features an altitude buffer which may be set to provide a greater level of protection from penetrating an SUA. By increasing the altitude buffer, you can effectively stretch an SUA's altitude boundaries in both directions. This allows the pilot to add an extra margin of prevention around controlled or restricted airspace. For instructions on setting the altitude buffer, see page 92.

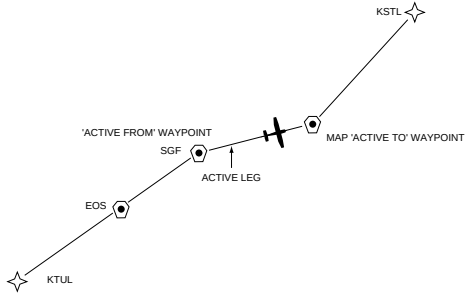
ROUTE TERMINOLOGY

The diagram at the right shows a basic route consisting of five waypoints and four legs.

The waypoint you are travelling to is called the ***'active to'*** *waypoint, and the waypoint immediately behind you is called the* ***'active from'*** *waypoint. The course line between the active from and the active to waypoint is called the* ***'active leg'***.

Section 3
Direct-to & Route Navigation

One of the many benefits of GPS navigation is the ability to fly directly to a waypoint or fly a chain of waypoints without using ground-based navigation aids. To take advantage of the convenience and efficiency provided by point-to-point GPS navigation, the GPS 165 provides two basic methods of selecting a destination for your flight: **direct-to** and **route navigation**. The direct-to function provides a fast way to set a course to a destination waypoint from your present position. The route function allows the pilot to create a chain of waypoints to fly in sequence and provides access to the GPS 165's approach, SID and STAR capabilities.



As you pass each waypoint in the route, the GPS 165's automatic leg sequencing and turn anticipation features will automatically select the next waypoint as the 'active to' waypoint and provide smooth steering guidance around the turn. If you are not currently navigating a particular route leg (e.g., your starting position is not a route waypoint), the automatic leg selection feature will select the leg closest to your present position as the active leg.

The GPS 165's **direct-to function** provides a quick method of setting a course to a destination waypoint. Once a direct-to destination is activated, the GPS 165 will establish a point to point route line along the great circle from your present position to the destination, and provide steering guidance and navigation data to the waypoint until it is cancelled. If you are navigating to a waypoint and get off course, the direct-to function may also be used to re-center the d-bar to proceed to the same waypoint.

To select a direct-to destination:

1. Press the D▸ key. The CDI page will appear with the destination field flashing.
2. Use ◉ and ◯ to enter the identifier of the desired waypoint.
3. Press ENT to confirm the identifier, and ENT to accept the waypoint confirmation page.

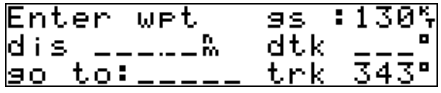
To recenter the d-bar to the same active to waypoint:

1. Press the D▸ key, followed by ENT twice. **NOTE:** If you're navigating an active approach with the MAP as the active waypoint, the approach will be cancelled.

A direct-to may also be quickly activated from many pages that display a single waypoint identifier (e.g. the nearest airport page) by simply pressing D▸ and ENT. For pages that display a list of waypoints (e.g. the user waypoint list page), you must highlight the desired waypoint with the flashing cursor before pressing the D▸ key. Once a direct-to is activated, the GPS 165 will provide navigation guidance until the direct-to is cancelled or the unit is turned off.

To cancel a direct-to destination:

1. Place the flashing cursor over the destination field on the CDI page.
2. Press CLR. The destination field will go blank.
3. Press ENT. The GPS 165 will resume navigating Route 0 (the active route) if available.



To select a direct-to destination, press the D▸ key and enter the waypoint identifier.

To quickly select a direct-to from any page that displays a single waypoint identifier, press D▸, followed by ENTER.

```
Turning off 30 scnds
 Press any key to
 continue navigation
```

REMEMBER!

If you want to save the active route, be sure to copy it to an open storage route before turning the GPS 165 off or activating a new route or direct-to destination. See page 54 for instructions on copying routes.

The GPS 165 lets you create up to 20 routes (numbered 0 through 19), with up to 31 waypoints each. Routes are created, copied and edited through the RTE key, which features five route pages selectable from the GPS 165's outer knob.

```
KIXD →KFOE  leg ete
  →KFOE   35.5nm  0:11
◇ :KICT   114.3nm  0:47
```

Active Route Page

```
rte  0  activate?
KHHR /L88      153.6?%
Parallel trk: L 0.0nm
```

Route Catalog Page

```
Rt 0 KFOE *actv appr
 *vor rw21.d094s
◇ ndb rw13?
```

Approach Select Page

```
Rt 0 KCLT *actv sid
 *ALL.HOR4.GREAT
  HUG2?
```

SID Select Page

```
Rt 0 KCLT *actv star
 *LYH.MAJIC8.ALL
◇ SHINE5?
```

STAR Select Page

The five route pages can be divided into two types: **active route pages** and a **route catalog** page. Active route pages provide information and editing functions for Route 0, which always serves as the route you are currently navigating. The route review page serves as the main page for creating, editing, activating, deleting and copying all routes. Routes 1-19 are used as storage routes, which are stored in the GPS 165's internal memory. Once a storage route is 'activated', a copy is placed into Route 0 for navigation until it is cancelled, overwritten by activating another route or erased when the GPS is turned off. If you want to save a route currently in Route 0, be sure to copy it to an open storage route (routes 1-19) before it is cancelled, overwritten or erased.

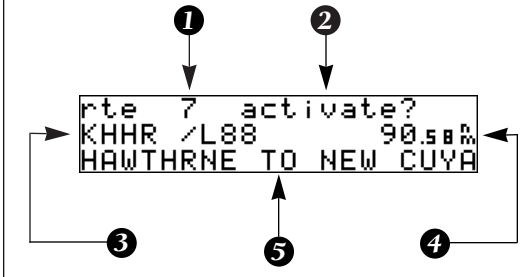
The GPS 165's **route catalog page** is used to create, edit, delete or copy routes, and serves as the main page for a host of functions, including route activation, determining the closest point of approach and search and rescue operations. It also displays a summary of routes currently stored in memory, with the departure and arrival route waypoints and total distance for the selected route number. To scroll through the available routes, rotate ◉. A one line user comment may be added to any storage route, which will be displayed on the route catalog page.

To add user comments to any route (except route 0):

1. Rotate ◉ to display the route you would like to add comments.
2. Press CRSR and use ◯ to highlight the bottom row.
3. Use ◉ and ◯ to enter the comments, and press ENT. To erase, press CLR, then ENT.

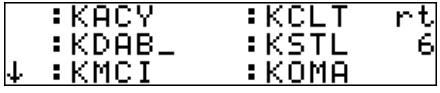
The **route action field**, located at the top right of the page, is used to select the desired route operation. The following functions are available:

- **Activate -** activate the route for navigation
- **Reverse -** activate a route in reverse order
- **Edit -** create a new route, or edit an existing route
- **Approach -** select an approach for the route (see Section 4)
- **Star -** select a STAR for the route (see Section 4)
- **Sid -** select a SID for the route (see Section 4)
- **Delete -** delete a route
- **Copy -** copy the current route to an empty route
- **CPA -** calculate the closest point of approach
- **Search -** Perform search and rescue ladder operations



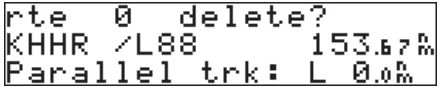
Route Catalog Page

1. Route selection field
2. Route action field
3. Departure/Arrival waypoints
4. Cumulative distance of route
5. Comments/Parallel track offset field



Adding a new route waypoint.

Deleting a route waypoint.



Deleting the active route.

The **route editing function** allows you to create new routes and edit existing routes. Creating routes before takeoff can help make approach, SID and STAR operations faster and easier during your flight.

To create or edit a route:

1. Use ◉ to display the route number you would like to edit.
2. Press CRSR and use ◯ to highlight the route action field.
3. Use ◉ to select 'edit?'. Press ENT. The route review page will appear.

To add a waypoint:

4. Rotate ◯ to highlight the first blank waypoint field (it will already be flashing if you're creating a new route) or at the point where you want to enter the new waypoint.
5. Use ◉ and ◯ to enter the waypoint's identifier. Press ENT.
6. Press ENT to confirm the 'ok?' prompt on the waypoint confirmation page.
7. Repeat steps 4 through 6 to add the next waypoint, or press CRSR to finish.

To delete a waypoint:

1. Rotate ◯ to highlight the waypoint you wish to delete.
2. Press CLR to remove the name, then press ENT to delete.
3. Repeat steps 1 and 2 to delete additional waypoints, or press CRSR to finish.

To delete an entire route:

1. Use ◉ to display the route number you would like to delete (route 0 for the active route).
2. Press CRSR and use ◯ to highlight the action field.
3. Use ◉ to select 'delete?'. Press ENT to delete.

Once a route is defined through the route catalog page, it may be activated or inverted (to navigate the route waypoints in reverse order) from the route catalog page. Activating or inverting a route copies the selected route into route 0 and overwrites the existing active route.

To activate a route:

1. Press RTE and use ◯ to display the route catalog page.
2. Rotate ◉ to display the route you would like to activate.
3. Press CRSR and use ◉ to display 'activate?'. Press ENT.

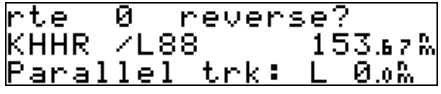
After travelling a route or creating a route with the GPS 165's AutoStore™ feature, the route activation field may be used to activate the route in reverse order.

To activate a route in reverse order:

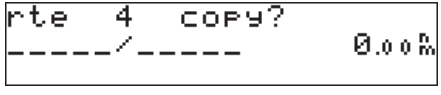
1. Use ◉ to display the route number you would like to reverse.
2. Press CRSR and use ◉ to display 'reverse?'. Press ENT.

This will copy the reversed route to route 0 and display the active route page. The original route will remain intact in its original storage position.

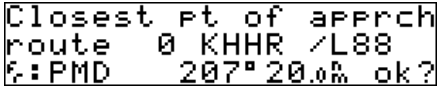
The route action field also features a **copy function** that permits you to copy any route to another empty storage route. The copy function can be used to save the contents of the active route (Route 0) to a storage route before activating another route or turning the GPS 165 off.



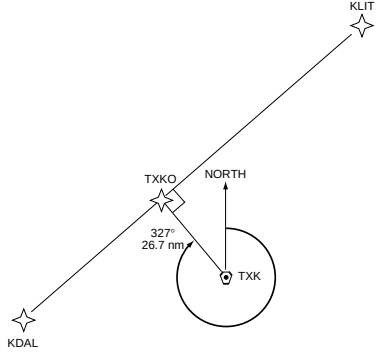
To invert the active route, select 'reverse?' from the route action field.



Copying a route.



Calculating closest point of approach.



Closest Point of Approach.

To copy a route:

1. Use ◉ to display the route you would like to copy TO (the route must be empty).
2. Press CRSR and use ◯ to highlight the action field.
3. Use ◉ to select 'copy?'. Press ENT.
4. Use ◉ to enter the route you would like to copy. The departure/arrival identifiers will be displayed for your reference. Press ENT to copy the route.

The **CPA function** calculates the closest distance that a route will pass a reference waypoint, and is helpful when creating new route waypoints referenced to a NAVAID.

To calculate the closest point of approach (CPA) for any route:

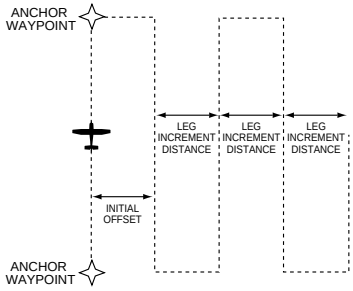
1. Use ◉ to display the route you would like to use for the CPA function. The route must consist of at least two waypoints, and the reference facility must fall between the waypoints of a route leg.
2. Press CRSR and use ◯ to highlight the action field.
3. Use ◉ to select 'cpa?'. Press ENT.
4. Use ◉ and ◯ to enter the identifier of the reference waypoint.
5. Press ENT. The bearing and distance of the closest point on the route will be displayed.
6. Press ENT to add the cpa waypoint to the route, or CLR to finish. If you do add the cpa waypoint to the route, it will be named based on the reference waypoint plus a number (0...9) added to the end (e.g. KMCI3, etc.). If the waypoint does not fall between waypoints on the route, the reference waypoint does not exist, or a unique name cannot be assigned to the CPA waypoint, you'll be informed with a 'Invald CPA wpt ____' message.

The GPS 165's **search and rescue** function provides navigation guidance for search and rescue operations, navigating in a ladder pattern to maximize coverage and efficiency. This is done in reference to two waypoints, called anchor waypoints. The first leg will be a specified distance from the line connecting the anchor waypoints, called the offset distance. The increment distance is the distance between each subsequent leg. The ladder can be created on either side of the waypoints.

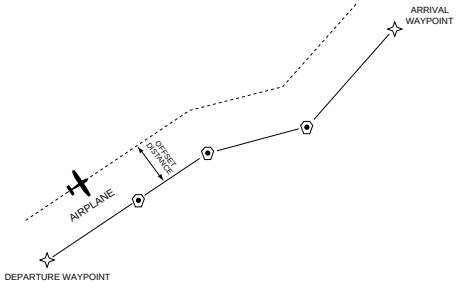
To perform a search and rescue operation:

1. Create a route of ONLY two waypoints.
2. Press RTE and use ◯ to display the route catalog page.
3. Use ● to select the 2-waypoint route to use as anchor waypoints.
4. Press CRSR and use ● to display 'search?'. Press ENT.
5. Use ● and ◯ to enter the leg increment value, and R or L. Press ENT.
6. Rotate ◯ to highlight the initial offset, and use ● and ◯ to enter the initial offset value, and R or L.
7. Press ENT three times to accept the operation values and begin navigation.

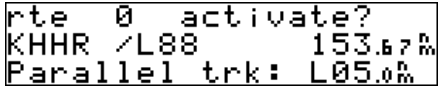
After activating a search and rescue, you will be informed with an 'Offset nav in effect' message. If a search and rescue is interrupted, note the parallel track direction (R or L) and distance on the activation page for route 0. When you resume search and rescue operations, use this as the initial offset.



Performing a search and rescue operation.



Parallel Track



Enter parallel track value after route activation.

During route navigation, it is sometimes desirable to navigate a specified distance away from the 'active leg' to help avoid certain airspaces or regions. The GPS 165's **parallel track feature** will automatically guide you along a selected offset from the active leg.

To use offset navigation, or parallel track:

1. Press RTE and use ◯ to display the route catalog page.
2. Use ● to display route 0 (parallel track can only be used on the active route).
3. Press CRSR and use ◯ to highlight the parallel track value field.
4. Use ● and ◯ to enter the desired distance and direction (R or L), from the leg.
5. Press ENT to accept.

It is important to note that offset navigation is only available on route navigation, not direct-to navigation. Offset navigation is ***NOT*** valid for IFR approach procedures. When offset navigation is activated, an 'Offset nav in effect' message will be displayed, with the distance and direction noted on the route activation page for route 0. If you enter an offset which causes a leg to be reversed, you'll be informed with the message 'Ofst too big for rte'. If you change the active route in any way, perform a direct-to, or re-activate the route, you'll be informed with an'Offset nav cancelled' message.

Flying and Modifying the Active Route

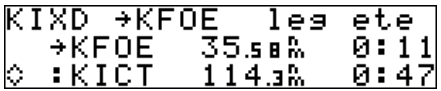
Once a route has been created and activated, the GPS 165 will provide navigation to each route waypoint through the active route and CDI pages. From the active route pages, you may create and modify the active route, and insert an approach, SID or STAR for your flight. The CDI page will display detailed navigation data on your progress to each route waypoint, and provide turn anticipation, waypoint arrival and next desired track information. By understanding the relationship between the active route and CDI pages and the role of the GPS SEQ switch, you'll be able to get the most out of the GPS 165's advanced route and approach features.

Whenever the GPS 165 is navigating a direct-to, route or approach, the **active route page** will provide a list of the route waypoints in sequence, along with distance, time and course information. You may also create and edit a route directly from the active route page. If you want to save a route created from the active route page (Route 0), you must copy it to an open storage route (see page 54) before turning the unit off or activating another route. The active route page may be displayed by pressing the RTE key and rotating ◯ left continuously. It will also appear automatically whenever a route, approach, SID or STAR is activated.

To scroll through the active route waypoints:

1. Rotate ◉ with the flashing cursor inactive (or ◯ with the cursor active).

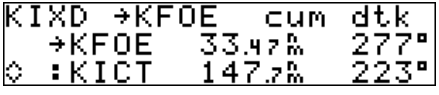
The active leg identifiers field, located at the top left of the page, displays the waypoint identifiers of the route leg you are currently navigating. The first waypoint identifier displayed is the **'active from'** waypoint. The second waypoint is the **'active to'** waypoint. The line connecting these waypoints is known as the **'active leg'**. If you are navigating a direct-to, the field will display the destination only.



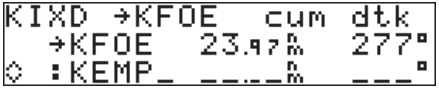
USING THE ACTIVE ROUTE PAGE

The GPS 165's active route page provides a working list of the route you are navigating, allowing you to view all route waypoints, along with distance, and timing or desired track information. The scrolling arrow prompt to the left of the route waypoint list indicates which way to scroll to view additional route waypoints.

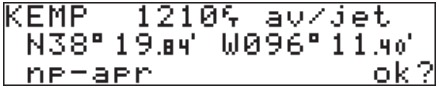
The active route page can also be used to manually select your next 'active to' destination, which allows you to fly the route out of sequence without modifying it. The GPS 165 will resume navigation of the remainder of the route in sequence once you arrive at the selected waypoint.



Active route page with desired track displayed.



Adding a waypoint to the active route.



Confirming the new route waypoint.

The 'cum or leg' field can be selected to display cumulative distance and ete/eta or the distance and ete/eta for each individual route leg. If cumulative is selected, the first leg's distance will be displayed, while the second leg will represent the first leg's distance plus the second leg, and so on. This also applies to the ete/eta field, which may also be configured to display the desired track (dtk) for each leg, regardless of the cumulative or leg selection.

To change the leg and ete/eta fields:

1. With the flashing cursor active, rotate ◯ to highlight the field you want to change.
2. Rotate ◉ to select the desired setting and press CRSR.

The active route page may also be used to create a new route or edit the route you are currently navigating (approach, SID or STAR waypoints cannot be edited), and provides a fast method of selecting any route waypoint as your next destination waypoint without modifying the active route. If you are editing the active route and want to save it in its original form, copy it to an open storage route before editing.

To add waypoints to the active route:

1. Press CRSR, if necessary, to activate the cursor.
2. Use ◯ to highlight the first blank waypoint field ***or*** highlight the waypoint you would like to add the new waypoint BEFORE.
3. Use ◉ and ◯ to enter the new waypoint identifier. Press ENT.
4. Press ENT to accept or CLR to cancel. The cursor will automatically move to the next waypoint field, and the remaining route waypoints (if any are present) will move down the list accordingly.

To delete a waypoint from the active route:

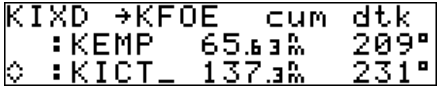
1. Press CRSR, if necessary, to activate the cursor.
2. Use ◯ to highlight the waypoint you would like to delete from the active route.
3. Press CLR, followed by ENT. The next route waypoint (if available) will move up to take the position of the deleted waypoint.

The active route page also allows you to select your next destination waypoint manually from the active route waypoint list and resume the remainder of the route in sequence. This procedure, referred to as an **'on-route' direct-to**, allows the pilot to fly the active route in a different sequence without editing the active route, approach, SID or STAR itself. For example, if you are flying a route with an armed approach, the GPS 165 will automatically provide the initial approach fix (IAF) for the selected approach as your 'active to' waypoint. If you have been vectored directly to the final approach fix (bypassing the IAF), you can manually 'skip ahead' to the final approach fix as your next active to waypoint.

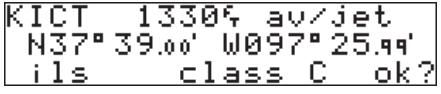
To perform an on-route direct-to from the active route page:

1. Press CRSR and rotate ◯ to highlight the desired waypoint.
2. Press -D▸, followed by ENT to confirm the 'ok?' prompt on the waypoint confirmation page.

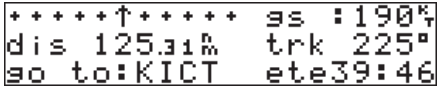
The GPS 165 will now provide guidance to the direct-to waypoint with the CDI page, and resume navigating the remainder of the active route in sequence once you arrive at the direct-to destination. See Section 4 for more on approach navigation.



Manually selecting the next active route waypoint.

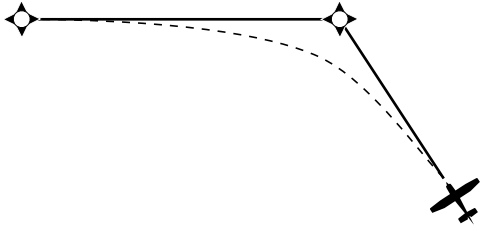


Confirming the on-route direct-to.



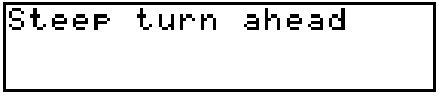
CDI page with new destination waypoint.

While the active route page offers the necessary functions for creating, monitoring and modifying the active route, the GPS 165's CDI page is used to provide turn anticipation, next desired track and waypoint arrival information to the pilot.



During route navigation, the GPS 165's **turn anticipation feature** will smooth out the transition between adjacent route legs by providing navigation along a curved path segment. This leg transition is based on the aircraft's actual ground speed and the difference between the course angle of the two legs. The GPS 165 will automatically sequence to the next leg when you are abeam the 'active to' waypoint and on the curved transition segment (the to/from indicator on the CDI will flip momentarily). During the transition, the CDI display will be referenced to the dotted line illustrated above. Turn anticipation will not be provided in the following scenarios:

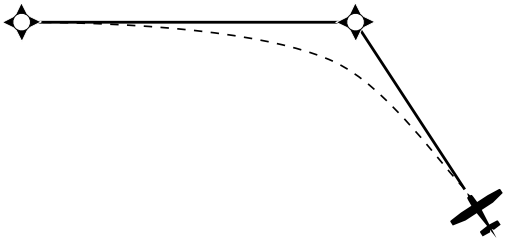
- Waypoint/fix crossing is a requirement of the approach, SID or STAR you're navigating.
- The GPS SEQ switch is in the HOLD position.
- Automatic leg sequencing is disabled.
- Your current ground speed and the course angle between the two legs would require a bank angle greater than 25º (see left).



The GPS 165's turn anticipation feature smooths out the transitions between adjacent legs based on a nominal bank angle of 15º, with the ability to roll up to 25º. If the turn angle and your present speed will require a bank angle that exceeds 25º, you'll be notified with a 'Steep turn ahead' message approximately 90 seconds before arrival at the active to waypoint.

If the leg transition is too short for a smooth transition, a 'Leg not smoothed' message will appear, and the pilot should expect a rapid change in the CDI deflection.

As you approach a route waypoint, the GPS 165's external waypoint annunciator will flash 15 seconds before the turn anticipation point, and the GPS CDI will be replaced by a flashing 'Next dtk xxx°' prompt (see right).

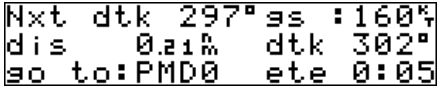


To use the turn anticipation feature, note the 'Nxt dtk' heading when the external waypoint annunciator begins to flash, and start the turn when the annunciator glows steadily (approximately 2 seconds before the turn anticipation point). Once you've reached the turn anticipation point, the desired track (dtk) field on the CDI page will change to display the course value for the next leg. If you have not adjusted your HSI course selector before the turn, the 'Next dtk' will continue to flash until you have reached the midpoint of the turn. Please refer to your aircraft flight manual supplement for specific turn anticipation instructions.

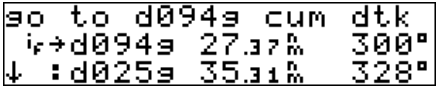
In addition to the active route page, the GPS 165 features three other pages that correspond to the route you are currently navigating: the **approach select**, **STAR select and SID select pages**. These pages display the approach, SID or STAR currently selected, and list all other available procedures for the departure or arrival airports. Because they are relevant to approach operations, these pages and their functions are described in Section 4.

GPS WPT

The waypoint annunciator will glow steadily 2 seconds before the turn anticipation point.



The desired track for the next leg will appear flashing in the CDI field 15 seconds before the turn anticipation point.



Once an approach is selected, the GPS 165 will replace the destination airport with the appropriate approach waypoints. The initial approach fix, final approach fix and missed approach point waypoints are indicated by an 'if', 'ff' and 'mp' designator to the immediate left of the waypoint.

In many instances, there may be approach waypoints in the GPS approach that are not shown on the approach plate. These waypoints are usually intermediate fixes designed to help the GPS provide smooth navigation along the approach path.

Section 4
Approaches, SIDs and STARs

The GPS 165's approach navigation mode allows you to fly non-precision approaches to airports with GPS and overlay procedures using information contained on your Jeppesen NavData® card. GPS approaches are similar to existing IFR approach procedures, but provide additional course and distance information for a higher level of accuracy, efficiency and safety. The non-precision approaches available in the GPS 165 are executed using the GPS route features covered in Section 3, so it's important to understand routes before attempting approach navigation.

A **GPS approach** is a sequence of waypoints linked together into a subroute which replaces your destination airport waypoint when selected. They may be based on an existing RNAV, VOR or NDB approach procedure, or be an entirely new approach created specifically for GPS. Regardless of what type of approach a GPS procedure is based on, the procedure is flown as a sequence of route legs in the active route. Once a GPS approach is selected, the GPS 165 will provide guidance to each waypoint in the approach in sequence, starting with the initial approach fix (IAF).

Flying a GPS approach with the GPS 165 can be broken down into three phases: **approach selection**, **approach arming** and the **active approach:** 1) Approach selection is simply the step of choosing the desired approach for the destination airport. 2) Arming the approach makes sure the unit is ready to begin the automatic sequencing and CDI adjustment required for approach navigation. 3) The active approach tightens the accuracy requirements and CDI sensitivity one step further to meet TSO standards for the non-precision approach.

The GPS 165 works in conjunction with a set of external switches and your HSI to fly GPS approaches. The external switches are used to control GPS functions, and contain illuminated annunciators to indicate when functions are active. Your installation must also have annunciators for waypoint arrival and GPS messages.

The **GPS APPR switch** is used to arm the GPS 165 for approach navigation.mode after a desired approach has been selected. Once armed, the GPS 165 will begin automatic CDI scaling and ensure that receiver autonomous integrity monitoring (RAIM) is available to provide the required level of accuracy and satellite coverage during the approach. The GPS APPR switch is used to deactivate an approach and return the CDI scale to the 1 nm setting in the event of a missed approach between the FAF and the MAP waypoints. You may also choose to keep the switch set to the 'ARM' position at all times to simplify the approach procedure. Remember, arming a GPS approach only prepares the GPS to transition to the active approach mode.

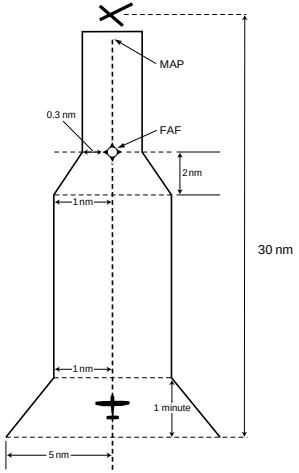
If you have selected an approach, the GPS 165 will prompt you to arm the approach mode 30 nm from your destination airport, and again 3 nm before the final approach fix if the approach has not been already armed. Once the GPS mode is armed (you have selected an approach and set the GPS APPR switch to the 'ARM' position), the ARM annunciator will illuminate, and automatic CDI scaling will begin. The GPS 165 will also automatically set the CDI scaling and automatic leg sequencing features to their default settings ('auto' CDI scaling & auto leg sequencing 'on').

Arm Approach Mode

The external GPS APPR switch should be set to the ARM position 30 nm from the destination airport. Once the approach is armed, the unit will provide a smooth transition from the 5.0 to 1.0 nautical mile CDI scale, and down to 0.3 nm within 2 nm inbound to the FAF.

APPROACH NAVIGATION

GPS SEQ Switch



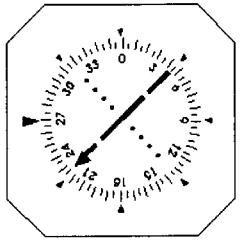
CDI Scale ramping during approach.

When the aircraft is within 2 nm of the FAF along the inbound course to the final approach (see left), the ACTV annunciator will illuminate on the GPS APPR switch, and the GPS 165 will enter the active approach phase. The CDI will now scale down to the 0.3 nm sensitivity. If you wish to deactivate the approach during the active phase, simply release the GPS APPR switch from the 'ARM' position. This will return the CDI scale to 1 nm setting and provide less sensitive CDI deflection in missed approach conditions.

The **GPS SEQ switch** is used to select manual or automatic waypoint sequencing of waypoints. Setting the GPS SEQ switch to the HOLD position holds your current 'active to' waypoint as your navigation reference and prevents the GPS from sequencing to the next waypoint.

When the GPS SEQ switch is set to the AUTO position, automatic waypoint sequencing is selected. Whenever the GPS SEQ switch is engaged, the HOLD annunciator will illuminate and the GPS will continue navigating to the waypoint regardless of your position relative to other waypoints.

The GPS SEQ switch must be set to the HOLD position any time you are deviating from the flight sequence of an approach (e.g., when you are flying radar vectors) or when you must cross the same waypoint twice in succession (e.g., IAF and FAF at the same waypoint). Whenever the GPS SEQ switch is set to the HOLD position, the GPS 165 allows you to select the desired course to/from a waypoint using the HSI, much like a VOR



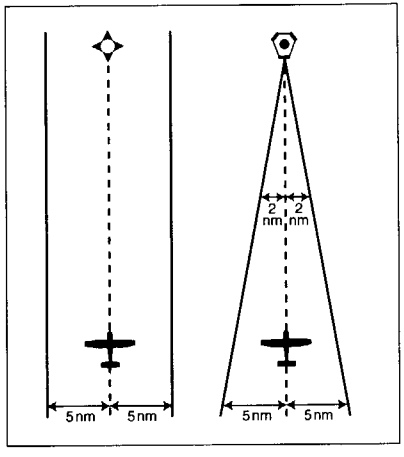
Set desired course

Set GPS SEQ switch to AUTO

Whenever the GPS SEQ switch is released from the HOLD position, the GPS 165 will 'capture' the present HSI setting as your desired course. Always dial in your next desired course before returning the GPS SEQ switch to the AUTO position. The GPS SEQ switch may be released from the HOLD position 2 seconds after the inbound course has been set. The GPS 165 will continue navigation on the last selected course through the 'active to' waypoint and then automatically sequence to the next waypoint.

NOTE: When performing an approach, the GPS SEQ switch must be set to the AUTO position with the FAF as the active to waypoint for the approach to go active. If the switch has not been set to the AUTO position 2 nm before the FAF, the CDI scale transition will be compressed, making the CDI change more abrupt.

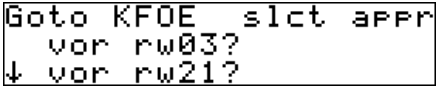
During a GPS approach, keep in mind that your external HSI will display the same CDI needle deflection and scale as the CDI on the GPS 165, which will transition from 5.0 to 0.3 nm through the approach. It's also important to note that unlike a VOR CDI, the GPS CDI scale is based on the *cross-track distance* to the desired course (the distance to the reference waypoint does not have an effect on the CDI scale).



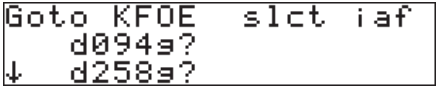
Unlike a VOR, GPS CDI deflection is based on the cross-track distance to the desired course, regardless of how far away you are from the destination.

APPROACH NAVIGATION

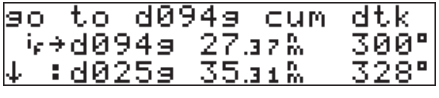
Selecting an Approach



Select the approach.



Select the Initial Approach Fix.



Once the approach is loaded, the active route page will appear.

When an arrival airport is selected with the direct-to key (or created and activated in a route to the arrival airport), the approaches for your arrival airport become available through the Approach Select page, which can be viewed by pressing RTE and rotating the outer knob. Remember that an airport must be the last waypoint in a route to select an approach.

To select an approach:

1. Select the destination airport using the D→ key, or create and activate a route to the destination airport (see Section 3).
2. Press RTE and rotate ◯ to display the approach select page.
3. Rotate ◉ (or ◯ with the cursor active) to display the desired approach procedure.
4. Press CRSR (if necessary) and rotate ◯ until the desired approach flashes.
5. Press ENT to select the approach.

If an approach procedure has more than one Initial Approach Fix (IAF), you'll need to select the desired IAF identifier for your approach.

To select an IAF:

1. Rotate ◯ until the desired IAF flashes.
2. Press ENT.

Once the IAF is selected, the approach waypoints will be inserted into Route 0, replacing the destination airport, and the Active Route page will be displayed. To review the active route, rotate the ◉ knob. The scrolling arrow prompt will indicate which direction to scroll to view additional waypoints, while the 'if', 'ff' and 'mp' designators will indicate the IAF, FAF and MAP respectively.

When the aircraft is within 30 nautical miles of the destination airport, the GPS 165 will display the 'Arm approach mode' (if the GPS APPR switch is not set to the ARM position) and 'Need pres- press NAV' messages.

To fly the GPS approach (without radar vectors):

1. Arm the GPS approach by setting/confirming the GPS APPR switch is in the ARM position. The CDI scale will begin a steady transition from the 5.0 nm to the 1.0 nm scale as you make your way to the FAF. The approach may be armed at any time after an approach has been selected. If the approach has not been armed and the aircraft is within 3 nm of the FAF, the GPS 165 will prompt you to arm the approach again.

2. Enter the barometric pressure at the destination airport on the Position page when the 'Need pres- press NAV' message appears.

3. The GPS 165 will automatically sequence to each waypoint in the approach, with CDI, course and timing guidance to each waypoint. For each waypoint in the approach, the GPS 165's turn anticipation and waypoint alerting features will provide three pilot cues:
   a. The waypoint annunciator will flash approximately 15 seconds before reaching the turning point for each approach waypoint, and glow steadily approximately 2 seconds prior to the turn anticipation point.
   b. The 'Next dtk' prompt will flash in the CDI field. Set the HSI course select to the next dtk value when the waypoint annunciator starts flashing. Start the turn when the annunciator glows steadily.
   c. The To/From indicator flag on the GPS CDI will flip momentarily to indicate you have transitioned to the next approach leg.

   For more information on turn anticipation and waypoint alerting, please refer to Section 3.

4. If a procedure turn is required:
   a. 2 miles prior to crossing the waypoint outbound, set the GPS SEQ switch to HOLD.
   b. At the waypoint, set the outbound course on the HSI.

(continued on next page)

NEED PRES - PRESS NAV

The altimeter setting of the destination airport needs to be entered on the Position page.

IMPORTANT! *Entering an incorrect altimeter setting will directly affect the GPS 165's ability to provide accurate navigation guidance.*

Enter the altimeter setting on the Position page.

After crossing the MAP, press the ⇾ *key to display the missed approach holding point.*

If you have clearance directly to the holding point, press ENTER. You must fly all published missed approach procedures before navigating to the holding point.

c. Fly the procedure turn. After the procedure turn outbound, set the inbound course on the HSI.
d. On the inbound intercept to the final course, fly to center the CDI.
e. Set the GPS SEQ switch to the AUTO position. The GPS 165 will resume automatic waypoint sequencing for the remaining approach waypoints.

6. Once the aircraft is within 2 nm of the FAF (and the approach has been armed), the 'ACTV' annunciator will illuminate and the CDI scale will ramp down to 0.3 nm.

   NOTE: If the ACTV annunciator does not illuminate, do not descend after crossing the FAF and fly all published missed approach procedures.

7. Upon reaching the FAF, the GPS 165 will automatically sequence to the MAP waypoint.

To fly a missed approach procedure:

If an approach is terminated, the GPS 165 may be used to navigate to the missed approach holding point using one of the following procedures.

NOTE: To comply with TSO specifications, the GPS 165 will not automatically sequence to the missed approach holding point. The first waypoint of the missed approach will be displayed as the next ⇾ waypoint. After crossing the MAP, the pilot may activate the waypoint when authorized. You must fly all published missed approach procedures before selecting the missed approach holding point on the GPS.

If the approach procedure permits navigation direct from the MAP to the missed approach holding point:

1. Release the GPS SEQ switch from the ARM position to return the CDI scale to the 1 nm sensitivity. After the MAP has been crossed, press the ⇾ key. The GPS 165 will automatically display the first waypoint of the missed approach as the next approach waypoint.

2. Press ENT to confirm the destination. The GPS 165 will provide a direct navigation course to the waypoint.

If you're not authorized to fly direct-to the missed approach holding point:

1. Release the GPS SEQ switch from the ARM position to return the CDI scale to the 1 nm sensitivity. After the MAP has been crossed, press the [-D▸] key. The GPS 165 will automatically display the first waypoint of the missed approach as the next approach waypoint.

2. Press [ENT] to confirm the destination.

3. Stop automatic waypoint sequencing by setting the GPS SEQ switch to the HOLD position.

4. Fly the published missed approach procedure. Select the intercept to the missed approach holding point on the HSI.

5. Leave the GPS SEQ switch in the HOLD position to accomodate holding at the missed approach holding point.

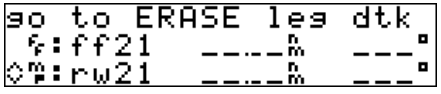
After a missed approach, the GPS 165 will allow you to repeat the same approach procedure and select whatever approach waypoint you have been cleared to as the next active to waypoint. Before reactivating the approach, make sure you fly all published missed approach procedures. If you disarmed the approach during the course of the previous attempt, be sure to set the GPS APPR switch to the ARM position.

To reactivate the same approach for another attempt:

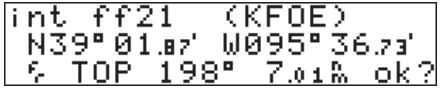
1. Press the [RTE] key and rotate ◯ to select the active route page.

2. Press [CRSR] and rotate ◯ to place the flashing cursor over the identifier of the approach waypoint you have been given direct clearance to.

3. Press the [-D▸] key, followed by [ENT]. The GPS 165 will provide navigation for the repeat approach, starting with the approach waypoint you have selected.



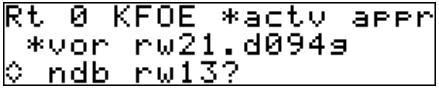
Select the waypoint you have clearance to from the active route page and press [-D▸].



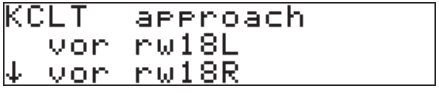
Confirm the starting waypoint for the next attempt by pressing ENTER.

APPROACH NAVIGATION

Approach Select Page



Approach Select Page.



Approach Procedures Page.

The GPS 165's **approach select page** allows you to review the available approach procedures at the destination airport. From the procedures list, you may select and activate a new procedure on the fly. The active approach is indicated by an on-screen asterisk, and the scrolling arrow prompt indicates which direction to scroll to view additional procedures.

To select or replace a procedure from the approach select page:

1. Press the RTE key and rotate ◯ until the approach select page appears.
2. To review all available procedures, rotate ◉.
3. To select a procedure, press CRSR and rotate ◯ to highlight the desired procedure.
4. Press ENT. If there are multiple IAFs for the selected approach, rotate ◯ to select the desired IAF and press ENT.

You may also replace or delete the active approach for any route from the route catalog page.

To replace or delete an approach from the route catalog page:

1. Press the RTE key and rotate ◯ until the route catalog page appears.
2. Press CRSR and rotate ◉ until the 'approach?' prompt appears. Press ENT.
3. To replace the active approach procedure, rotate ◯ to highlight the desired procedure and press ENT. If there are multiple IAFs for the selected approach, rotate ◯ to select the desired IAF and press ENT.
4. To delete the active approach (denoted by an asterisk), highlight the approach and press CLR, followed by ENT.

UNDERSTANDING GPS APPROACHES

The GPS 165 is the first GPS certified to meet the requirements of TSO C-129 Category A1. When using the GPS 165 for non-precision approaches, you'll encounter two types of approaches: overlay approaches (based on existing procedures) and GPS approaches (new approaches designed specifically for GPS). The FAA has approved a large number of overlay approaches, with plans to add as many GPS approaches as possible to take advantage of the safety and convenience of GPS.

Flying a GPS approach is not difficult, and varies from conventional approaches only in the operation of the equipment being used. Although you'll often be following the same flight path used in conventional approaches, the equipment operation procedures will be different from typical NDB or VOR approaches.

The following definitions, guidelines and examples will help you understand the basic rules of GPS approaches, and offer four examples to guide you through some typical approaches. Think through the approach examples— this will assist you in getting the greatest benefit from the GPS 165.

Basic Rules of GPS Approaches

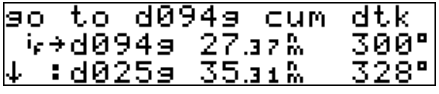
There are a few basic rules that apply to all GPS approaches. Remembering these rules will assist you in understanding the approach procedures and ensure the greatest margin of safety for your flight.

- The approach to be flown must be in the aviation database, and the database must be current.
- You may select the desired approach and arm the approach mode at any time after the destination airport is selected. If the GPS APPR switch is not set to ARM within 2 nm inbound to the final approach fix, the approach will not become active, which precludes descent at the FAF.

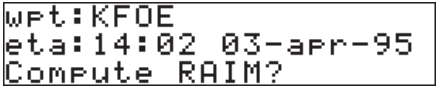
GPS approaches must be in the current aviation database to be approved.

TSO C-129 requires that satellite coverage and navigational accuracy provided by the GPS system meets minimum standards.

A 'No RAIM from FAF to MAP' message will appear if RAIM is predicted to be unavailable for an approach. Do not plan on using a GPS approach. For a complete list of RAIM messages, see Appendix C and page 111 for more information on RAIM during approach operations.



Cumulative distance displayed on the active route page.



RAIM may be predicted from NAV Menu 2.

Basic Rules of GPS Approaches (continued)

- If you cross the same waypoint twice in succession during an approach, you must set the GPS SEQ switch to the HOLD position PRIOR to crossing the bisector of the course line at the fix the first time (no matter what the cross-track distance from the waypoint) to prevent the GPS from sequencing to the next waypoint.
- The HSI course select should always be set 2 seconds BEFORE changing the GPS SEQ from HOLD to AUTO to ensure the desired course to the next waypoint is settled prior to use by the GPS and give the autopilot sufficient time to react to the heading change.
- GPS always displays distance to the currently active waypoint. When determining distance along the approach, use caution to determine the correct distance from the approach chart.
- For the approach to become active:
  - The GPS APPR switch must be set to the ARM position.
  - The GPS SEQ switch must be set to AUTO (verify that the GPS APPR ACTV light is illuminated before descending beyond the FAF).
  - You must cross within 2 nm of the FAF along the inbound course to the final approach fix (keep in mind that the CDI scale will be at 0.3 nm).
  - RAIM must be available (the GPS 165 automatically monitors RAIM, and will display a message if it is not available) from the FAF to the MAP. If RAIM is not available or becomes unavailable during this leg, the HSI NAV flag will appear, and you must fly the missed approach procedure.
- When executing a missed approach, you must fly all published procedures before proceeding to the missed approach holding point on the GPS.

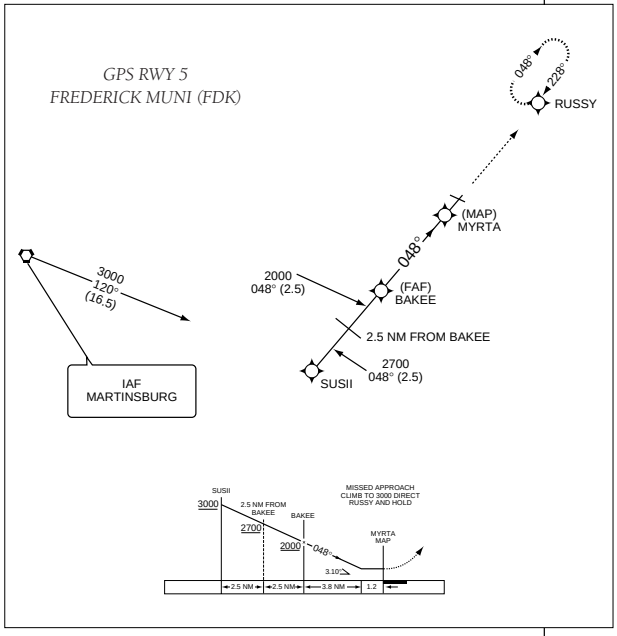
Basic Rules of GPS Approaches (continued)

- If you are off course to the MAP waypoint and use a direct-to to re-center the d-bar, the active approach mode will be cancelled.
- SUA alerts are disabled when an approach is selected and armed, and the aircraft is less than 30 nm from the destination airport. SUA information is still available from the NRST key at all times.

GPS APPROACH EXAMPLES

In the examples that follow, the GPS waypoints are shown along the approach path. In some cases, intermediate database waypoints have been added to some approaches. These waypoints are named using lower case letters using the following convention (the most common database waypoints are defined below). Note that these waypoints are not charted on NOS approach plates. They do appear on current Jeppesen approach charts.

- **dyyyj—** DME arc waypoint where yyy is the radial from the reference facility (VOR)
- **cfxx or cfxxx—** course fix for runway xx or radial xxx
- **ffxx or ffxxx—** final approach fix for runway xx or radial xxx
- **rwxx—** runway xx threshold
- **nxxhp—** NDB approach runway xx intermediate holding pattern waypoint
- **maxx or maxxx—** missed approach point for runway xx or radial xxx
- **vxxhp—** VOR approach runway xx intermediate holding pattern waypoint



DO NOT USE FOR NAVIGATION

EXAMPLE 1— NEW GPS APPROACH

Example 1 uses the GPS approach into Frederick Municipal Airport (KFDK) and illustrates the basic sequence of selecting and flying a GPS approach, and flying directly to a missed approach holding point. Please refer to the previous sections of this chapter for expanded keystroke instructions.

1. Select the destination airport (KFDK) using the D▸ key, or create and activate a route to the destination airport.

2. Select the desired approach (gps rw05) from the Approach Select page. The GPS 165 will automatically select MRB as the IAF since it is the only IAF available.

3. 30 nm from the destination, set/confirm the GPS APPR switch to the ARM position. The CDI will automatically begin a smooth transition from the 5.0 nm to the 1.0 nm scale.

4. Enter the current altimeter setting of KFDK on the Position page when prompted with the 'Need pres- press NAV' message.

5. Fly the approach. The GPS will provide navigation to each approach waypoint in sequence:
   - MRB (Initial Approach Fix)
   - SUSII
   - BAKEE (Final Approach Fix)
   - MYRTA (Missed Approach Point)
   - RUSSY (Missed Approach Holding Point)

6. Set the HSI course to DTK at each waypoint. The CDI will automatically transition from the 1.0 to 0.3 nm scale when you are within 2.0 nm of the FAF, and the unit will warn you if RAIM is not available for your approach.

7. To fly the missed approach procedure, cross the MAP and climb to 3000 feet. For direct navigation guidance to the missed approach holding point, press D▸ followed by ENT after crossing the MAP.

EXAMPLE 2— VOR/GPS OVERLAY

Example 2 uses the VOR/GPS RWY 19 approach into Kansas City Downtown Airport (KMKC) from the south and illustrates an approach with a procedure turn, which requires the pilot to set the GPS SEQ switch to the HOLD position prior to crossing the IAF the first time. This example also illustrates the procedures required when direct navigation to the missed approach holding point is not available.

1. Select and arm the VOR/GPS RW19 approach. Enter the current altimeter setting of KMKC when the 'Need pres- press NAV' message appears.

2. Fly towards the IAF of the approach (the JAMES intersection).

3. Two nm BEFORE crossing the IAF, set the GPS SEQ switch to the HOLD position. This prevents the GPS 165 from automatically sequencing to the missed approach point before the required procedure turn is completed.

4. After crossing the IAF, set the 013º outbound course on the HSI.

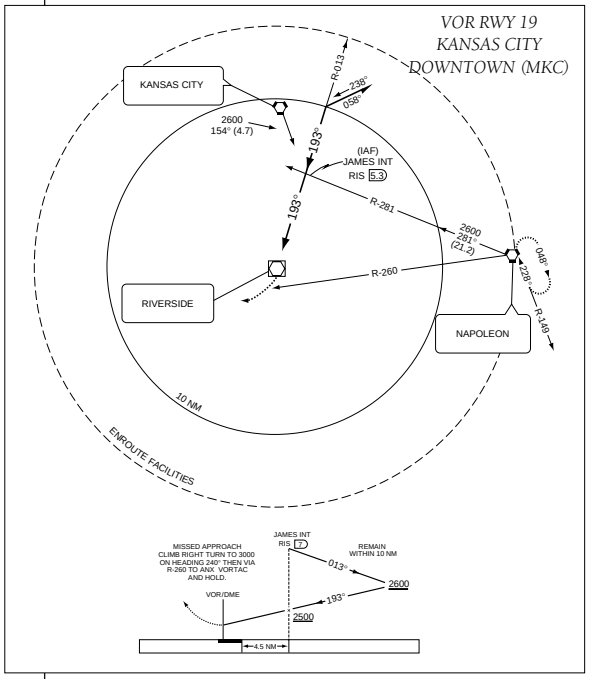
5. Initiate the procedure turn and set the 193º inbound course on the HSI. As you turn to the inbound intercept heading, set the GPS SEQ switch to the AUTO position. The GPS SEQ switch must be set to the AUTO position for the approach to go active.

6. Complete the approach by landing, or follow the missed approach procedure.

7. To fly the missed approach procedure, cross the MAP and climb to 3000 feet via heading 240º and press ⊕▸, followed by ENT. This will select the missed approach holding point as your active to waypoint.

8. Since direct navigation to the holding waypoint is not authorized, set the GPS SEQ switch to the HOLD position to prevent automatic waypoint sequencing.

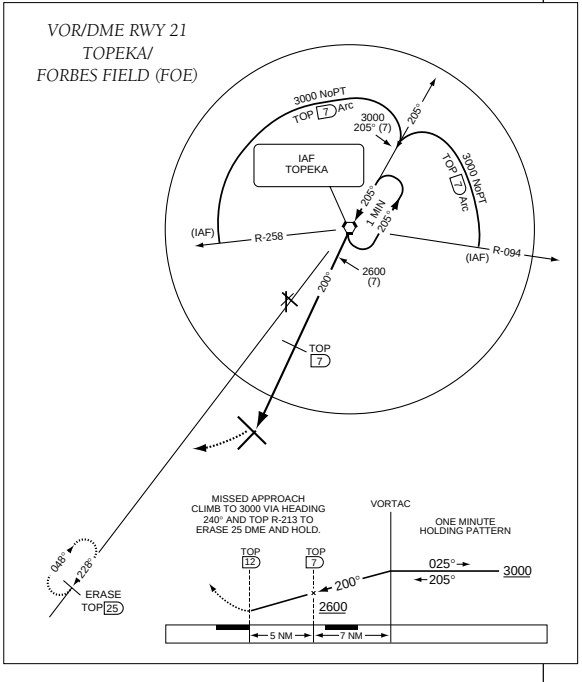
9. Set the HSI to the 080º heading and intercept the inbound course to the holding point.



DO NOT USE FOR NAVIGATION

APPROACH NAVIGATION

VOR/DME ARC Example



DO NOT USE FOR NAVIGATION

EXAMPLE 3— VOR/DME ARC OVERLAY

Example 3 uses the VOR/DME RWY 21 approach into Topeka/Forbes Field Airport (KFOE) and illustrates an approach based on a DME arc. Although DME arc approaches are not based on a direct course, the GPS 165 will still provide approach navigation guidance through the arc by constantly displaying your distance and bearing from the DME reference navaid on the Position page. To fly the arc, monitor the distance displayed on the Position page and manually adjust your heading to maintain the course along the arc. When flying a DME arc, the GPS SEQ switch must be set to the HOLD position to ensure proper CDI operation.

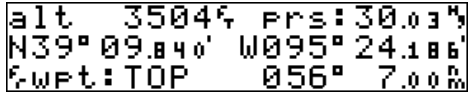
1. Select and arm the VOR RW21 approach and select the D094G initial approach fix to fly the left hand arc from the 094° radial. Enter the current altimeter setting of KFOE when the 'Need pres- press NAV' message appears.

2. Fly to the IAF of the DME arc (D094G). The GPS WPT annunciator will flash 15 seconds before you reach the waypoint.

3. After crossing the IAF, set the GPS SEQ switch to the HOLD position.

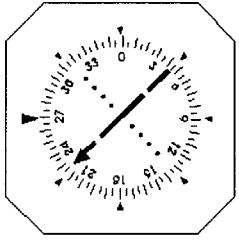
4. Set the desired inbound course (205°) on the CDI/HSI.

5. Press NAV and rotate ◯ to display the Position page. The Position page will display the DME navaid as the reference waypoint (on the bottom line) as long as your active to waypoint is part of the DME arc you are flying.



6. Monitor your distance and bearing from the DME navaid along the arc.

7. The external CDI needle will begin to center as you approach the inbound course.



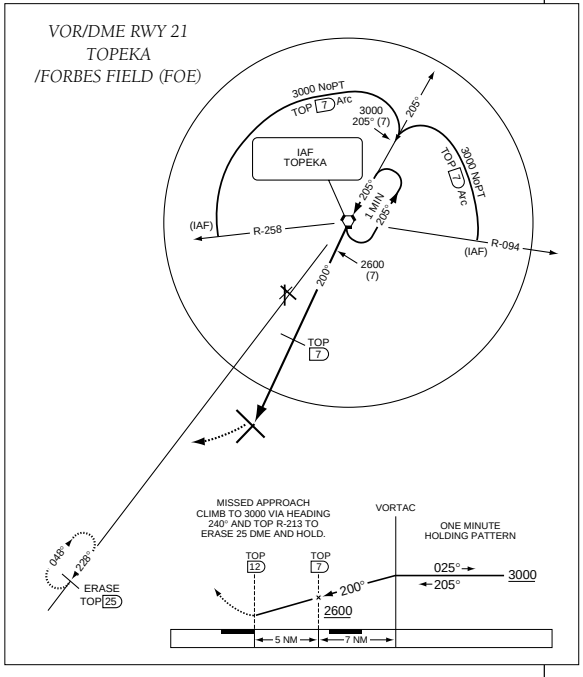
8. Set the GPS SEQ switch to the AUTO position. Automatic waypoint sequencing will resume for the rest of the approach. Locate the step down fix by monitoring the distance to the MAP as shown on the profile view of the approach plate.

9. To fly the missed approach procedure, cross the MAP and climb to 3000 feet via heading 240°.

10. Press [D▸], followed by [ENT]. This will select the missed approach holding point (the ERASE intersection) as your active to waypoint.

11. Stop automatic waypoint sequencing by setting the GPS SEQ switch to the HOLD position.

12. Set the HSI to the 213° course and fly until the CDI is centered, and enter the holding pattern.



DO NOT USE FOR NAVIGATION

EXAMPLE 4— RADAR VECTORS TO FINAL APPROACH COURSE

Example 4 uses the same VOR/DME RWY 21 approach into Topeka/Forbes Field Airport (KFOE) used in example 3 and illustrates an approach using radar vectors to a point 3 miles out from the final approach fix. To fly a radar vector approach, you must still select a desired approach and IAF from the database and set the GPS SEQ switch to HOLD while you fly the vectors to the active approach waypoint. To accommodate radar vectors, the GPS 165 allows manual selection of any approach waypoint as the destination waypoint.

1. Select and arm the desired approach and initial approach fix. Enter the current altimeter setting of the destination airport when the 'Need pres- press NAV' message appears.

2. When you are advised by the controller that you will be receiving radar vectors to the final approach course:

   - Activate the final approach fix waypoint from the Active Route page:

     a. Press the RTE key and rotate ◯ until the Active Route page appears.
     b. Press CRSR to activate the flashing cursor.
     c. Rotate ◯ until the 'ff' (FAF) waypoint flashes.
     d. Press -D→, followed by ENT.

   - Set the GPS SEQ switch to the HOLD position.

3. Set the 200º inbound course on the HSI. As the CDI needle begins to center to the final approach course, set the GPS SEQ switch to the AUTO position to resume automatic waypoint sequencing.

4. Complete the approach by landing or perform the missed approach procedure.

The Jeppesen database used in the GPS 165 features Standard Terminal Arrival Routes (STARs) and Standard Instrument Departures (SIDs) that may be placed into any active or stored route.

Available SIDs may be selected at any time for the active route as long as the departure airport is the first route waypoint and the route contains more than one waypoint. Activating a SID or STAR will modify the waypoint sequence of Route 0. If you'd like to save the contents of Route 0, be sure to copy it to an empty route first.

To select and activate a SID:

1. Press RTE and rotate ◯ until the SID Select page appears.
2. Press CRSR and rotate ◯ until the SID name flashes.
3. Press ENT. The SID waypoints will be inserted in the route.

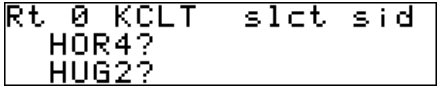
If a SID has more than one runway or transition, the SID Select page will display the available runway designations and/or transitions.

To select a transition:

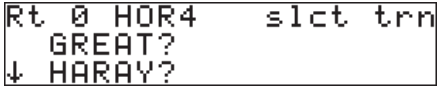
1. Rotate ◯ until the transition name flashes and press ENT.

To select a runway:

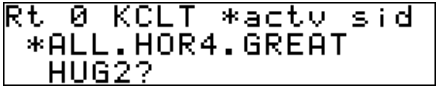
1. Rotate ◯ until the runway designation name flashes and press ENT.



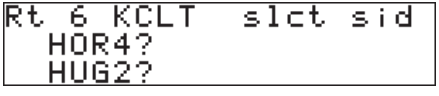
Selecting a SID.



Selecting a SID transition.



The SID select page allows you to select a new SID on the fly.



SIDs may be saved with any stored route.

The SID select page also allows you to review all the available SIDs for the departure airport and select, delete or change the active SID.

To replace the active SID with another SID:

1. Press RTE and rotate ◯ until the SID Select page appears.
2. Press CRSR and rotate ◯ to select the desired new SID. Press ENT.

To delete the active SID:

1. Press RTE and rotate ◯ until the SID Select page appears.
2. Press CRSR. The active SID (denoted by an asterisk) will flash.
3. Press CLR, followed by ENT. The SID waypoints will be removed from the active route.

SIDs can also be selected and deleted from storage routes through the Route Catalog page.

To select a SID from the Route Catalog page:

1. Display the desired route on the Route Catalog page.
2. Select 'sid?' in the route action field and press ENT.
3. Select the desired SID and transitions.
4. The SID waypoints will be inserted into the route and the Route Review page will be displayed.

To replace a SID from the Route Catalog page:

1. Display the desired route on the Route Catalog page.
2. Select 'sid?' in the route action field and press ENT.
3. Select the desired new SID and transitions.
4. The SID waypoints will be inserted into the route and the Route Review page will be displayed.

To delete a SID from the Route Catalog page...

1. Display the desired route on the Route Catalog page.
2. Select 'sid?' in the route action field and press ENT.
3. Rotate ◯ to highlight the active SID (denoted by an asterisk). Press CLR, then ENT.

Standard Terminal Arrival Routes (STARs) used in the GPS 165 are selected and activated with the same procedures as SIDs. Available STARs may be selected at any time for the active route as long as the arrival airport is the last active route waypoint or direct-to waypoint. Activating a STAR will modify the sequence of waypoints in Route 0. If you'd like to save the contents of Route 0, be sure to copy it to an empty route first.

To select and activate a STAR:

1. Press RTE and rotate ◯ until the STAR select page appears.
3. Press CRSR and rotate ◯ until the desired STAR flashes.
4. Press ENT. The STAR waypoints will be inserted in the route.

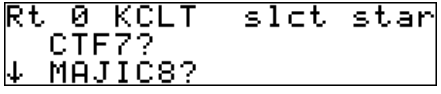
If a STAR has more than one transition or runway, the STAR select page will display the transitions and/or runway designations available.

To select a transition:

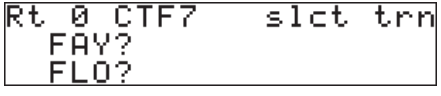
1. Rotate ◯ until the desired transition flashes and press ENT.

To select a runway:

1. Rotate ◯ until the runway designation flashes and press ENT.



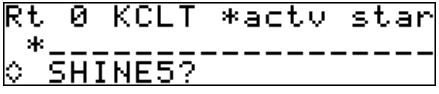
Selecting a STAR.



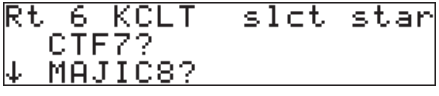
Selecting a STAR transition.

APPROACH NAVIGATION

Selecting & Deleting STARs



Deleting the active STAR.



STARs may be saved in any storage route.

The STAR select page also allows you to review all available STARs for the destination airport and select, delete or replace the active STAR.

To replace the active STAR:

1. Press RTE and rotate ◯ until the STAR select page appears.
2. Press CRSR and use ◯ to select a new STAR. Press ENT.

To delete a STAR:

1. Press RTE and rotate ◯ until the STAR select page appears.
2. Press CRSR. The active STAR name (denoted by an asterisk) will flash.
3. Press CLR, followed by ENT. The STAR waypoints will be removed from Route 0.

STARs can also be selected and deleted from storage routes through the Route Catalog page.

To select or replace a STAR from the Route Catalog page:

1. Display the desired route on the Route Catalog page.
2. Select 'star?' in the route operations field and press ENT.
3. Select the desired STAR and transitions. The STAR waypoints will be inserted into the route and the Route Review page will be displayed.

To delete a STAR from the Route Catalog page:

1. Display the desired route on the Route Catalog page.
2. Select 'star?' in the route action field and press ENT.
3. Rotate ◯ to highlight the active STAR (denoted by an asterisk). Press CLR followed by ENT. The STAR waypoints will be deleted from the route.

Section 5
Unit Settings

Many of the GPS 165's navigation features can be customized to your own preferences, allowing the pilot to choose how and when the unit displays certain information. The GPS 165 also provides extensive information on satellite tracking and signal strength to aid in monitoring performance and alerting you to problems with antenna installation or receiver problems.

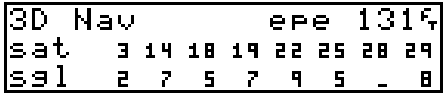
All of the GPS 165's settings are accessed by pressing the SET key. Once the SET key is pressed, the last settings page viewed will be displayed. The following pages of satellite status and user-defined settings are available:

- **Satellite status**
- **Route settings**
- **Nearest airport search**
- **Trip timer settings**
- **SUA alert settings**
- **CDI Settings**
- **Magnetic variation/Arrival alarm**
- **Battery saver**
- **Navigation units**
- **Map Datums**

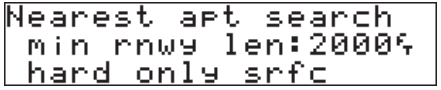
To view any settings page:

1. Press SET. The last page viewed from the SET key will be displayed.

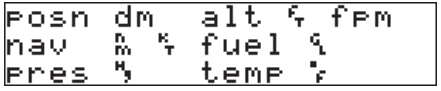
2. Rotate ◯ with the flashing cursor inactive until the desired page is displayed. Page selection will cycle through all available pages as the outer knob is rotated to the right, and page selection will stop at the Satellite status page when the outer knob is rotated to the left continuously.



Satellite Status Page.



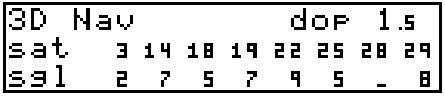
Nearest Airport Search Page.



Navigation Units Page.

UNIT SETTINGS

Satellite Status Page

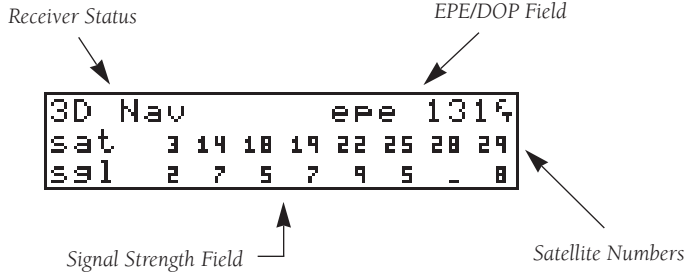


Satellite status page displaying DOP.

The GPS 165's **satellite status page** provides satellite information to monitor GPS coverage and receiver performance. This can be helpful when you may be experiencing a problem with low signal levels due to poor coverage or installation problems.

To view the satellite status page:

1. Press SET and rotate ◯ until the satellite status page appears



The top line of the status page displays the receiver status and the current DOP or EPE. Dilution of precision (DOP) is a measure of the satellite geometry quality and relative accuracy of your position, with 1 meaning good geometry and 10 meaning poor. Estimated position error (EPE) is an overall measure of your positional accuracy in feet or meters using signal and data quality, receiver tracking status and DOP.

To view information on DOP/EPE:

1. Press SET and rotate ◯ to display the satellite status page.
2. If the desired field (EPE or DOP) is not displayed, press CRSR.
3. Use ◉ to change between 'epe' and 'dop', press CRSR to finish.

The **receiver status field**, located at the top left of the page, can display the following messages under various conditions:

Search sky - The GPS 165 is searching the sky for visible satellites. You will be informed with the message 'Searching the sky'.

Acquiring - The GPS 165 is acquiring satellites for navigation.

2D Nav - The GPS 165 is in 2D navigation mode. If your installation does not include an altitude serializer, you must enter the altitude manually (see page 2.)

3D Nav - The GPS 165 is in 3D navigation mode and will compute altitude.

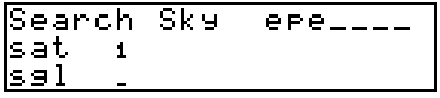
Simulator - The GPS 165 is in simulator mode, which should only be used for practice and trip planning. **NEVER** use simulator for actual navigation.

Poor cvrg - The GPS 165 cannot acquire sufficient satellites for navigation.

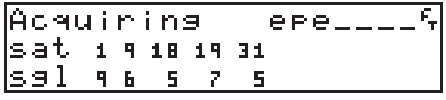
Need alt - The GPS 165 needs altitude in order to start/continue navigation. Go to the position page and enter the altitude.

Need pres - The GPS 165 needs the current altimeter (barometric pressure) setting at the approach airport. Enter the altimeter setting on the Position page.

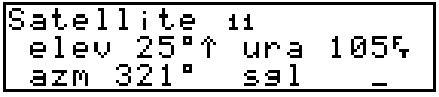
Not usable - The GPS 165 is unusable due to incorrect initialization or abnormal satellite conditions. Turn the unit off and back on again. If this does not help, return the unit to an authorized GARMIN dealer for service.



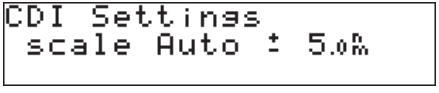
Searching the Sky.



Acquiring satellite data.



Viewing individual satellite information.



The CDI setting will be reset to the AUTO position whenever a GPS approach is armed, selected or the unit is powered down. The AUTO setting allows the CDI to smoothly transition from the 5.0 nm to the 0.3 nm scale during an approach.

The second and third lines of the satellite status page provide the satellite number and signal strength of each satellite in view. Additional information regarding each satellite's azimuth, elevation and other data is also available.

To view individual satellite information:

1. Press SET and use ◯ to display the satellite status page.
2. Press CRSR to obtain a cursor.
3. Use ◯ to highlight the satellite number you wish to view and press ENT.

This will display the satellite data page, showing the selected satellite's number, elevation angle, rise or fall indication, user range accuracy (URA, or the range measurement accuracy as determined by the satellite), azimuth and signal strength. To view other satellites:

4. Rotate ◉ to view information on the next satellite.
5. Rotate ◯ and press CRSR on the satellite status page when you are finished.

The next available page under the SET key is the **CDI settings page**, which allows you to define the scale of the GPS 165's course deviation indicator.

To change the CDI scale:

1. Press SET and rotate ◯ to select the 'CDI Settings' page.
2. Press CRSR and rotate ◉ to select either 'Auto', '5.0 nm', '1.0 nm', or '0.3 nm'.
3. Rotate ◯ to highlight 'ok?' and press ENT to approve.

The scale values represent full scale deflection of the CDI to either side.
NOTE: The selected CDI scale will not take effect until approved.

The **route settings page** allows you to select between automatic and manual route sequencing and turn the automatic leg select feature on and off. **Automatic route sequencing** changes the active leg of a route when the current leg is complete (you have reached the 'active to' waypoint). **Automatic leg selection** chooses the route leg closest to your present position as the active leg. Whenever a GPS approach is armed, selected or the unit is powered down, the auto leg sequencing option will be reset to the automatic setting.

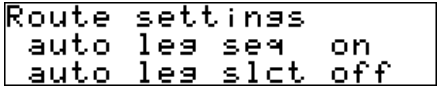
To change route settings (auto leg sequencing and auto leg selection):

1. Press SET and rotate ◯ to highlight the 'Route settings' page.
2. Press CRSR and use ◉ to turn the auto leg sequencing on or off.
3. Rotate ◯ to advance the cursor and use ◉ to turn auto leg selection on or off.
4. Press CRSR when finished.

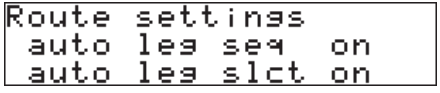
If manual leg sequencing is selected, you must manually advance the active route to the next waypoint after completing each route leg. Manual leg sequencing can also be used with the GPS SEQ switch to dial in the desired inbound course to the next route waypoint from your HSI.

To manually sequence the active route legs:

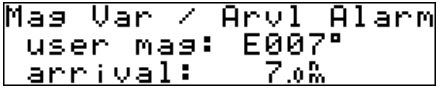
1. Press RTE and use ◯ to display the active route page.
2. Press CRSR and rotate ◯ to highlight the waypoint.
3. Press -D►. Press ENT to confirm the waypoint.
4. The GPS 165 will change the leg of the active route, making the selected waypoint the 'active to' waypoint.



Route settings with automatic leg selection off.



Whenever a GPS approach is armed, selected or the unit is powered off, the automatic waypoint sequencing option will be reset to the on position.



User magnetic variation.

Auto magnetic variation.

Automatic leg selection chooses the route leg closest to your present position as the active leg. If you have selected the manual leg selection option, you can manually select any route leg as the active route leg by performing an 'on-route' direct-to. An on-route direct-to will provide direct course navigation to the selected waypoint and begin navigation of the remainder of the route in sequence, provided the auto leg sequencing option is selected.

To manually select the active (starting leg):

1. Press CRSR and use ◯ to highlight the beginning waypoint of the desired leg from the active route page.
2. Press D►. Press ENT to confirm the waypoint.

The GPS 165 offers three **magnetic variation options:** true, auto or user defined.

To set the magnetic variation:

1. Press SET and use ◯ to display the 'Mag Var/Arvl Alarm' page.
2. Press CRSR and use ◉ to select auto, true or user.
3. If user is selected, use ◯ to highlight the magnetic variation value and use ◉ and ◯ to enter the value, and E or W.
4. Press CRSR.

If 'auto' is selected, all track, course and heading information will be corrected with the magnetic variation computed by the GPS 165. The 'true' setting will reference all information to true north, while the 'user' setting will correct information to the value you enter.

The GPS 165's **arrival alarm** can be set to notify the pilot with a message when you have reached a user defined distance to a destination waypoint. Once you have reached the set distance (up to 99.9 units), an 'Arrival at _____' message will be displayed.

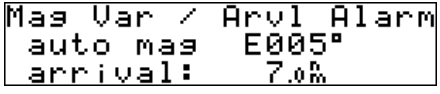
To set the arrival alarm distance:

1. Press SET and use ◯ to display the 'Mag Var/Arvl Alarm' page.
2. Press CRSR and use ◯ to select the arrival distance field.
3. Use ● and ◯ to enter the desired distance. Press ENT to accept the distance.
4. Press CRSR to finish.

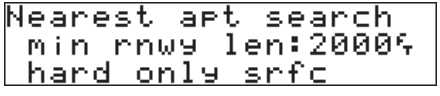
The **nearest airport search** settings allow you to define the runway length and surface type used in determining the nine nearest airports that are displayed. A minimum runway distance and surface may be entered to prevent airports with small runways, or runways that are not of appropriate surface, from being displayed. The default settings are '0 ft/mt' for runway length and 'any' for runway surface.

To set the minimum runway length and runway surface:

1. Press SET and use ◯ to display the 'Nearest apt search' page.
2. Press CRSR and use ● and ◯ to enter the minimum runway length upon which your aircraft can land (up to 9999 units). Press ENT to accept the distance.
3. Rotate ● to display the surface selection you desire. Choices include:
   - any surface
   - hard only surface
   - soft/hard surface
   - water only surface
4. Use ◯ to select 'ok?' and press ENT to confirm.



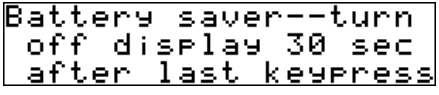
Arrival alarm set to 7.0 nm.



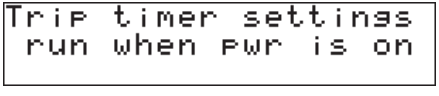
Nearest Airport Search Page.

UNIT SETTINGS

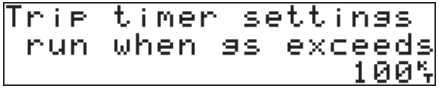
Battery Saver/Trip Timer



Battery Saver Page.



Trip timer set to run when power is on.



Trip timer set to run when speed exceeds 100 knots.

The GPS 165 **battery saver** feature can be programmed to automatically turn off the display when using battery power. This will increase the GPS 165's remote battery life in event of power failure. During this time, the GPS 165 will continue to navigate, track satellites and drive the external CDI/HSI, but not display information on the unit's display until a key is pressed or a knob is turned.

To set the display timeout:

1. Press SET and rotate ◯ to display the 'Battery saver' page.
2. Press CRSR to activate the cursor.
3. Rotate ● until the desired value is displayed (0, 30, 60 or 90 seconds). Entering 0 will leave the display on at all times. Press CRSR to complete.

The **trip timer** provides a running clock on NAV Menu 2 (see page 19), and can be configured to run when power is on, or when your ground speed exceeds a user-defined minimum.

To change the trip timer settings:

1. Press SET and use ◯ to display the 'Trip timer settings' page.
2. Press CRSR to activate the cursor.
3. Use ● to select either 'pwr is on' or 'gs exceeds'.
4. If you choose 'pwr is on', press CRSR to complete.
5. If you choose 'gs exceeds', use ◯ to highlight the speed field.
6. Enter the speed using ● and ◯.
7. Press ENT to accept, and CRSR to complete.

The GPS 165 can be configured to display data in standard or metric **units of measure**. These apply to: distance, position, speed, altitude, fuel, pressure and temperature.

To change the units of measure:

1. Press SET and rotate ◯ to display the nav units page.
2. Press CRSR and rotate ◯ to highlight the field you would like to change.
3. Use ● to change the unit of measure.
4. Rotate ◯ to advance to the next field, or press CRSR when finished.

The available units are:

position :
- degrees, minutes and seconds (dms) [hddd° mm' ss.s"]
- degrees and minutes (dm) [hddd° mm.mmm']

altitude :
- feet (ft)
- meters (mt)

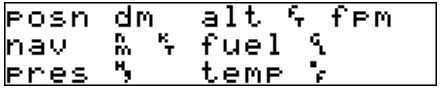
vertical speed :
- feet per minute (fpm)
- meters per minute (mpm)
- meters per second (mps)

nav units :
- nautical miles and knots (nm, kt)
- statute miles and miles per hour (mi and mh)
- kilometers and kilometers per hour (km and kh)

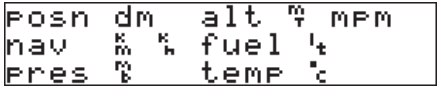
fuel :
- gallons (gl)
- imperial gallons (ig)
- kilograms (kg)
- pounds (lb)
- liters (lt)

pressure :
- inches of mercury (hg)
- millibars (mb)

temperature :
- degrees Fahrenheit (°f)
- degrees Celsius (°c)



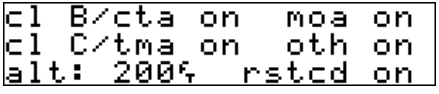
Units of measure displayed in standard format.



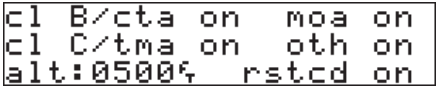
Units of measure in metric format.

UNIT SETTINGS

SUA Settings



SUA Settings Page.



Altitude buffer set at 500 feet.

The **Special Use Airspace settings** page will allow you turn the controlled/ restricted airspace message alerts on or off. This will not affect the alerts being listed on the nearest page. It will simply turn off the warning when you are approaching or near an SUA. Warnings can be turned off for the following airspaces:

class B / cta : ICAO control area
class C / tma : ICAO Terminal Control Area
rstcd : Restricted areas
moa : Military operations area
other : Other areas

SUA warnings for prohibited airspace can not be turned off. The 'alt' field, located at the bottom of the SUA settings page, is an altitude buffer which 'expands' the vertical range of the SUA, so you will be notified if you are within a certain range of an SUA. For example, if the buffer is set at 500 feet, and you are 500 feet above or below an SUA, you will not be notified with an alert message; if you are less than 500 feet above or below an SUA and projected to enter it, you will be notified with an alert message. The default setting for the altitude buffer is 200 feet.

To set the warnings or change the altitude buffer:

1. Press SET and use ◯ to display the SUA settings page.
2. Press CRSR.
3. Rotate ◯ to highlight the field you would like to change.
4. Use ● to change to 'on' or 'off'.
5. To change the altitude buffer, highlight the buffer value, and use ● and ◯ to change the data. Press ENT to accept.
6. Press CRSR to complete.

The GPS 165 contains over 100 map datums for you to use when navigating. By default, your unit calculates positions using the WGS-84 map datum. If you are using charts based on another datum, you must set the GPS 165 to use the same datum. Using a map datum that does not match the sectionals you are using can result in significant differences in position information. If you are using maps for reference only, the GPS 165 will provide correct navigation guidance to the waypoints contained in the database regardless of the datum selected.

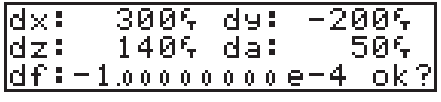
To change the map datum to one listed in Appendix E:

1. Press SET and use ◯ to display the 'Map datum' page.
2. Press CRSR.
3. Use ◯ to highlight the current map datum.
4. Use ● to change the datum.
5. Press CRSR to complete.

To create a user datum:

1. Press SET and use ◯ to display the 'Map datum' page.
2. Press CRSR.
3. Use ◯ to highlight 'Define user datum?'. Press ENT.
4. Enter the 5 parameters of the map datum using ● and ◯. Press ENT to accept a field. The signs of each value (+/-) should follow the convention: WGS84-local geodetic system.
5. Use ◯ to highlight 'ok?' and press ENT.
6. To activate the user datum, select 'USER' on the map datum page as described above.

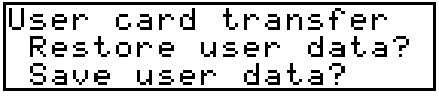
Map Datum Page.



Defining user map datum.

APPENDIX A

NavData Card Operation



UserData Transfer Page.

Appendix A
NavData and UserData Installation and Operation

NavData® and UserData Card installation and operation

The NavData® card supplied with your GPS 165 can be installed or removed **ONLY** when the GPS 165 is turned off. Insert the card with the thumb tab at the top, and the beveled corner on the bottom right.

The UserData card can be used to make a backup of user waypoints, routes, checklists, proximity alarms, etc. for later reference and use. The UserData card can also be used to transfer the same information to another GPS 165.

To save the user data to the UserData card:

1. Install the UserData card.
2. Turn the GPS 165 on using ◉.
3. Use ◯ to highlight 'Save user data?'.
4. Press ENT.

The message 'Saving to card' is displayed while the GPS 165 transfers all user data to the UserData card. It may take several minutes to complete the transfer. When all user data is transferred, the GPS 165 will instruct you to turn the unit off, remove the user card and insert the Jeppesen NavData® card. After this is complete, the GPS 165 is ready for normal operation.

To restore user data from a UserData card to the GPS 165:

1. Install the UserData card.
2. Turn the GPS 165 on using ◉.
3. Use ◯ to highlight 'Restore user data?' and press ENT.

The GPS 165 will ask you which type of data to replace. You may choose checklists, scheduler messages, user waypoints, proximity waypoints, routes, waypoint comments or all data.

4. Use ◉ to select the type of data to replace.

You may either replace or update the information in the database. Replacing the data will replace **ALL** user data with the data from the card. Updating the data will not delete unrelated material, it will only change what is necessary to use the data received from the UserData card.

5. Use ◯ to select either 'Replace?' or 'Update?'.
6. Press ENT to begin transferring data to the GPS 165. The GPS 165 will now transfer all of the data requested. This may take several minutes.
7. To perform additional data transfer types, repeat steps 4- 6. Otherwise, press ENT.
8. Turn the GPS 165 off and replace the UserData card with a NavData® card. The GPS 165 is now ready for normal operation.

Restoring data from a user data card.

The GPS 165 must be turned off to remove and install the NavData card.

APPENDIX B

GPS 165 Installation/Removal

The GPS 165 may be powered from an optional AC adapter when used away from the aircraft, allowing you to use the GPS 165 at your home or office for flight planning.

Appendix B
Maintenance of the GPS 165

The GPS 165 is built to exacting standards and does not require user maintenance. Should the faceplate and lens require cleaning, use a soft cloth and non-abrasive cleaner. The user data is maintained by an internal battery with a projected life of 3 to 5 years. If the GPS 165 detects a low memory battery, you will be informed with the message 'Memory battery low'. You should return your unit to an authorized GARMIN service center as soon as possible. Failure to do so may result in loss of data each time you turn your unit off. This will GREATLY increase satellite acquisition time and no user data will be saved. This condition will be accompanied by the message 'Stored data lost'.

The GPS 165 contains a crystal oscillator, which may drift after many years of operation. If the unit detects excessive oscillator drift, you will be informed with the message 'Osc needs adjustment'. When this occurs, contact an authorized GARMIN service center for service. Failure to do so may result in severely degraded acquisition performance.

Appendix C
GPS 165 Messages and Abbreviations

The GPS 165 uses the Message Page to communicate important information to you. Some messages are advisory in nature, others are warnings that may require your intervention. This appendix provides a complete list of GPS 165 messages and their meanings.

Altitude input fail - The altitude serializer input is no longer available to the GPS 165. Check the I/O settings and/or the serializer installation. If enough satellites are available for a 3D fix, no pilot action is required, provided no RAIM warnings are present. If only a 2D fix is possible, the pilot should maintain the GPS altitude within 1,000 feet of the pressure altitude from the Position page.

Approach deleted - The selected approach was deleted from the route because not enough room existed to insert a SID or STAR.

Approach not active - The approach could not transition to the active phase because the GPS SEQ switch is set to the HOLD position, the GPS APPR switch has not been set to the ARM position, the automatic CDI scale is not selected, or the automatic leg sequencing option is disabled. Do not descend at the FAF.

Arm approach mode - Approach navigation is available. Set the GPS APPR switch to the ARM position.

Arrival at _____ - You have entered the arrival alarm circle for the indicated waypoint.

Arrvl at offst _____ - Your craft has entered the arrival alarm circle for the indicated waypoint offset by the parallel track distance.

Auto CDI slctd - The GPS 165 has reset the CDI scale preference to the AUTO setting to permit approach navigation.

APPENDIX C

Messages

Auto leg seq slctd - The GPS 165 has reset the automatic leg sequencing option to the ON setting to permit approach navigation.

Battery low - The remote battery pack is low on power. The battery pack should be recharged for continued operation by reverting to aviation power.

Battery rqrs service - A problem has been detected in the battery pack. The unit should be taken to an authorized GARMIN service center.

Cannot chng actv wpt - An attempt has been made to modify the position of the 'active to' or 'active from' waypoint. The GPS 165 will not allow the modifications.

Cannot chng wpt sqnc - An attempt has been made to modify an approach, SID or STAR. The waypoint sequence of approaches, SIDs and STARs may not be modified.

Cannot nav lockd rte - You have tried to activate a route containing a locked waypoint. The GPS 165 cannot navigate in this condition.

Cannot ofst goto rte - An attempt has been made to engage the offset navigation feature while the GPS 165 is navigating using a single waypoint route. The GPS 165 will not allow offset navigation in this situation.

Checklist is full - The selected checklist is full. No new items can be added until existing items are deleted.

Collecting data - The GPS 165 is collecting orbital data while searching the sky. The antenna should have a good view of the sky and the GPS 165 should be allowed to finish data collection before turning the unit off.

Comment memory full - The waypoint comment memory is full. You must delete existing waypoint comments before adding new ones.

Course input fail - The course input from RS-422 or ARINC 429 is not available to the GPS 165. Check the I/O settings and/or have the installation checked by a certified technician.

APPENDIX C

Messages

Data card failed - The GPS 165 has detected a problem with the data card. The data is not usable and the card should be returned to Jeppesen or an authorized GARMIN service center.

Data card write fail - The user data card failed to program. The card should be returned to an authorized GARMIN service center.

Degraded accuracy - The GPS 165 has detected poor satellite geometry while in approach mode while RAIM is unavailable. Additional cross checking should be performed by the user to verify the integrity of the GPS 165 position.

Do not use for nav - The GPS 165 is in the simulator mode and must not be used for actual navigation.

Final altitude alert - The suggested altitude is within 1000 feet of the final altitude entered on the VNAV Planning Page.

Fuel/Air input fail - The fuel and/or air data input is not available to the GPS 165. Check the I/O settings and/or fuel/air data system installation.

Inside SUA - You have entered a Special Use Airspace.

Invald CPA wpt ____ - The closest point of approach cannot be created from the waypoint entered on the CPA Page. This occurs when the computed point does not fall on one of the route legs, or when a unique waypoint name for the closest point of approach cannot be found.

Invalid copy route - A non-empty route was selected for a copy operation. A route must be empty before another route can be copied to it.

Invalid CPA route - The selected route contains less than two waypoints and cannot be used for CPA operations.

Invalid SAR route - The selected route does not contain exactly two waypoints and cannot be used for SAR operations.

Leg not smoothed - The upcoming leg is too short for smooth waypoint transitions. Expect a rapid change in the CDI.

Memory battery low - The battery that sustains user memory is low and should be replaced by an authorized GARMIN service center as soon as possible. Failure to do so may result in loss of stored data, including all user waypoints and routes.

APPENDIX C

Messages

Near SUA < 2 nm - Your position is within 2 nautical miles of a Special Use Airspace and your current course will NOT take you inside.

Need alt - press NAV - The GPS 165 needs altitude input in order to start and/or continue 2D navigation. Press the NAV key and enter your antenna altitude on the Position page. The altitude you enter should be as accurate as possible. An inaccurate altitude will directly translate into inaccurate position information.

Need pres - press NAV - The GPS 165 needs the pressure altitude for the destination airport to navigate an approach.

No altitude input - The GPS 165 has failed to receive altitude data from the parallel input. Check the I/O settings and/or the installation. If enough satellites are available for a 3D fix, no pilot action is required, provided no RAIM warnings are present. If only a 2D fix is possible, the pilot should maintain the GPS altitude within 1,000 feet of the pressure altitude from the Position page.

No course input - The GPS SEQ switch is set to the HOLD position and has no selected course input from the CDI/HSI. Check the state of configuration switches if installed, or check the CDI/HSI unit.

No RAIM FAF to MAP - RAIM may not be available from the final approach fix to the missed approach point. Continue to fly the approach, but be prepared to cross check GPS navigation with other navigation sources if RAIM is not available.

Offset nav cancelled - Offset navigation has been cancelled due to a direct-to operation or activation of a new route.

Offset nav in effect - Offset navigation mode is in effect.

Ofst too big for rte - The parallel track distance is too large for the active route.

Osc needs adjustment - The GPS 165 has detected excessive drift in its internal crystal oscillator which may result in longer acquisition time. The unit should be taken to an authorized GARMIN service center immediately.

APPENDIX C

Messages

Poor GPS coverage - The GPS 165 cannot acquire sufficient satellites necessary to provide navigation.

Prox alarm-press NAV - Your craft has penetrated the alarm circle of a proximity waypoint. Press NAV to see the bearing and distance to the proximity waypoint.

Proximity overlap - The circles defined by two proximity waypoints overlap. When entering the area of the overlap, the GPS 165 will alarm you of the closest proximity waypoint, but not both. You should be certain this condition is desirable.

Proximity wpt locked - At least one proximity waypoint is locked because the waypoint has been removed from the Jeppesen NavData®, the data card is missing, or the data card has failed.

Proximity wpt moved - One or more proximity waypoints were moved at least 0.33 arc minutes due to a database change.

Proximty wpt deleted - One or more proximity waypoints were deleted while receiving data.

Pwr down and re-init - The GPS 165 is unusable until power has been cycled and the unit re-initialized. Abnormal satellite conditions may exist.

RAIM not available - RAIM is unavailable for the phase of flight you are in (the HSI NAV flag should also appear). Revert to alternate navigation.

RAIM position warn - RAIM has detected position errors exceeding those allowed for a given phase of flight. Revert to an alternative source of navigation.

RAM failed - The GPS 165 has detected a failure in its internal memory. If the message persists, the GPS 165 is unusable and should be taken to an authorized GARMIN service center.

Ready for navigation - The GPS 165 is ready for navigation.

Received invalid wpt - A waypoint was received in an upload operation that has an invalid identifier or position.

APPENDIX C

Messages

Receiver failed - The GPS 165 has detected a failure in the receiver hardware. If the message persists, the GPS 165 is unusable and should be taken to an authorized GARMIN service center.

ROM failed - The GPS 165 has detected a failure in its permanent memory. If this message occurs, the unit is unusable and should be taken to an authorized GARMIN service center.

Route is empty - An attempt has been made to activate an empty route.

Route is full - An attempt has been made to add more than 31 waypoints to a route. The GPS 165 will not allow more than 31 waypoints per route.

Route wpt deleted - One or more route waypoints were deleted.

Route wpt locked - At least one route waypoint is locked because the waypoint has been removed from the Jeppesen NavData®, the data card is missing, or the data card has failed.

Route truncated - The route was truncated because not enough room existed to insert a SID, STAR or approach.

Route wpt moved - One or more route waypoints were moved at least 0.33 arc minutes due to a database change.

SID deleted - The SID was deleted from the route because of insufficient space in the route.

STAR deleted - The STAR was deleted from the route because of insufficient space in the route.

Searching the sky - The GPS 165 is in the search-the-sky mode. Allow the unit to complete data collection before turning it off.

Select auto seq mode - The GPS SEQ switch should be set to the AUTO position to continue navigation..

Set course to ___° - The CDI/HSI should be set to the specified course.

Start altitude chng - The altitude change entered on the VNAV Planning page is about to begin.

APPENDIX C

Messages

Steep turn ahead - This message appears approximately 90 seconds prior to a turn that requires a bank angle in excess of 25 degrees in order to stay on course. Turn anticipation will not be provided by the GPS 165.

Stored data lost - Stored user data, including waypoints, routes and satellite orbital data have been lost due to a low memory battery, or inadvertent master reset.

SUA ahead < 10 min - Your projected course and current speed will take you inside a Special Use Airspace within the next 10 minutes.

SUA near & ahead - You are within two nautical miles of a Special Use Airspace and your current course will take you inside.

Timer expired - The approach timer has expired.

User data RX started - Data receive operations have started.

Usr data TX complete - Data transmit operations are complete.

VNAV cancelled - The VNAV function has been cancelled due to a change in the active route.

WGS 84 datum selectd - The system map datum was changed to WGS 84 because the selected map datum has been removed from the NavData® card, the data card is missing, or the data card has failed.

Wpt comment locked - At least one waypoint comment is locked because the waypoint has been removed from the Jeppesen NavData®, the data card is missing, or the data card has failed.

Wpt exists _____ - You have entered a waypoint name on the AutoStore™ Page or User Waypoint Catalog Page that already exists in memory. Enter a waypoint name that does not exist.

Wpt memory full - The waypoint memory is full. You should delete unused waypoints to make room for new waypoints.

APPENDIX C

Messages

The following section provides a complete list of GPS 165 abbreviations and their meanings.

ALT-	Altitude
APP-	Approach
APR-	Approach
APT-	Airport Waypoint
ARV-	Arrival
ATF-	Aerodrome Traffic Frequency
ATS-	Automatic Terminal Information Service (ATIS)
AVGS-	Aviation gas
AZM-	Azimuth (bearing)
BRG-	Bearing
CAS-	Calibrated Airspeed
CDI-	Course Deviation Indicator
CL B-	Class B
CL C-	Class C
CLR-	Clearance Delivery
CPA-	Closest Point of Approach
CTA-	ICAO Control Area
CTAF-	Common Traffic Advisory Frequency
CTF-	Common Traffic Advisory Frequency
CTS-	Course To Steer
CUM-	Cumulative
DALT-	Density Altitude
DEG-	Degrees
DEP-	Departure
DIS-	Distance To Waypoint
DME -	Distance Measuring Equipment
DOP-	Dilution of Precision
DTK-	Desired Track
ELEV-	Elevation
ENDUR-	Endurance
EPE-	Estimated Position Error
ESA-	Enroute Safe Altitude
ETA-	Estimated Time of Arrival
ETE-	Estimated Time Enroute
FLOW-	Fuel Flow Rate
FOB-	Fuel On Board
FPM-	Feet Per Minute
FR-	From
FSS-	Flight Service Station
FT-	Feet
FT-	Full time
GL-	Gallons
GND-	Ground
GPS-	Global Positioning System
GS-	Ground Speed
HDG-	Heading
HG-	Inches of Mercury
IALT-	Indicated Altitude
ILS-	Instrument Landing System
IG-	Imperial gallons
INT-	Intersection Waypoint

APPENDIX C

Abbreviations

JET A- Jet fuel - Type A
JET B- Jet fuel - Type B
KH- Kilometers Per Hour
KM- Kilometers
KT- Knots
LB- Pounds
LCL- Local
LEN- Length
LFOB- Leftover Fuel On Board
LFLOW- Left fuel flow
LOC- Localizer
LT- Liters
MAG VAR-Magnetic Variation
MB- Millibars Of Pressure
MF- Mandatory Frequency
MH- Statute Miles Per Hour
MI- Statute Miles
MIN- Minimum
MIN - Minutes
MOA- Military Operations Area
MPM- Meters Per Minute
MPS- Meters Per Second
MSA- Minimum Safe Altitude
MT- Meters
MUL- Multicom
NDB- NDB Waypoint
NM- Nautical Miles
NP- Non-precision
NR- Nearest
OBS- Omni-directional Bearing Select (Inbound Course Select)
OTH- Other
ºC- Degrees Celsius
ºF- Degrees Fahrenheit
PC- Pilot Controlled
POSN- Position
PRES- Barometric Pressure (Altimeter setting)
PROX- Proximity
PRX- Proximity
PT- Part Time
PTX- Pre-Taxi
PWR- Power
RDR- Radar
REQ- Required
RF- Reference
RFLOW- Right fuel flow
RNG- Range
RNWY- Runway
RSTCD- Restricted
RSV- Reserves
RTE- Route
RX- Receive only
SAR- Search And Rescue
SEC- Seconds
SEQ- Sequence

APPENDIX C

Abbreviations

SGL- Signal
SID- Standard Instrument Departure
SLCT- Select
SRFC- Surface
STAR- Standard Terminal Arrival Route
STR- Steer To
TACAN- TACtical Air Navigational aid
TAS- True Airspeed
TAT - Total Air Temperature
TEMP- Temperature
TMA- ICAO Terminal Control Area
TRK- Track Angle
TRN- Transition
TRN- Turn Angle
TRSA- Terminal Radar Service Area
TWR- Tower
TX- Transmit only
U- UTC time
UNI- Unicom
URA- User Range Accuracy
USER- User Waypoint
USR- User Waypoint
UTC- Universal Time Coordinated (GMT/ Zulu)
VN- VNAV or Vertical Navigation
VNAV- Vertical Navigation
VOR- VOR Waypoint
WPT- Waypoint
WX- Weather

Appendix D
Specifications

PHYSICAL

Size:	5.75"W x 5.25"D x 2.25"H (146mm x 133mm x 57mm)
Weight:	24 ounces (0.96kg)

POWER

Input:	10-33V DC (aircraft power) Rechargeable battery pack (up to 90 minutes) 115V or 230V AC w/ optional adapter

ENVIRONMENTAL

Temperature:	-4° F to 131° F (-20°C to 55°C) Operating -67°F to 185°F (-55°C to 85°C) Storage

PERFORMANCE

Receiver:	MultiTrac 8™
Acquisition Time:	2-2.5 minutes (typical) 15 seconds (warm start, with ephemeris)
Update Rate:	1 per second, continuously
Accuracy:	15 meters (49ft.) RMS**
Dynamics:	999 knots velocity, 3g acceleration

INTERFACES

ARINC 429, Plotting (NMEA 0183 V2.0), Aviation, Altitude Serializer, Fuel Sensor, Fuel/Air Data Computer

*** Subject to accuracy degradation to 100m 2DRMS under the US DOD-imposed Selective Availability Program.*

APPENDIX E

Map Datums

Appendix E
Map Datums

ADINDAN	Ethiopia, Mali, Senegal, Sudan
AFGOOYE	Somalia
AIN EL ABD 1970	Bahrain Island, Saudi Arabia
ANNA 1 ASTRO 1965	Cocos Island
ARC 1950	Botswana, Lesotho, Malawi, Swaziland, Zaire, Zambia, Zimbabwe
ARC 1960	Kenya, Tanzania
ASCENSION IS 1958	Ascension Island
ASTRO B4 SOROL ATOLL	Tern Island
ASTRO BEACON "E"	Iwo Jima
ASTRO DOS 71/4	St. Helena
ASTRONOMIC STN 1952	Marcus Island
AUSTRALIAN GEOD 1966	Australia, Tasmania Island
AUSTRALIAN GEOD 1984	Australia, Tasmania Island
AUSTRIA NS	Austria
BELGIUM 1950	Belgium
BELLEVUE (IGN)	Efate and Erromango Islands
BERMUDA 1957	Bermuda Islands
BOGOTA OBSERVATORY	Colombia
BUKIT RIMPAH	Indonesia
CAMP AREA ASTRO	Antarctica
CAMPO INCHAUSPE	Argentina
CANTON ASTRO 1966	Phoenix Islands
CAPE	South Africa
CAPE CANAVERAL	Florida, Bahama Islands
CARTHAGE	Tunisia
CH-1903	Switzerland
CHATHAM 1971	Chatham Island (New Zealand)
CHUA ASTRO	Paraguay
CORREGO ALEGRE	Brazil
DANISH GI 1934	Denmark
DJAKARTA (BATAVIA)	Sumatra Island (Indonesia)
DOS 1968	Gizo Island (New Georgia Islands)
EASTER ISLAND 1967	Easter Island
EUROPEAN 1950	Austria, Belgium, Denmark, Finland, France, Germany, Gibraltar, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland
EUROPEAN 1979	Austria, Finland, Netherlands, Norway, Spain, Sweden, Switzerland
FINLAND HAYFORD 1910	Finland
G. SEGARA	Borneo
GANDAJIKA BASE	Republic of Maldives
GEODETIC DATUM 1949	New Zealand
GGRS 87	Greece
GUAM 1963	Guam Island
GUX 1 ASTRO	Guadalcanal Island
HERAT NORTH	Afghanistan
HJORSEY 1955	Iceland
HONG KONG 1963	Hong Kong
HU-TZU-SHAN	Taiwan
INDIAN BNGLDSH NEPAL	Bangladesh, India, Nepal
INDIAN MEAN VALUE	India
INDIAN THAILND VIETN	Thailand, Vietnam
IRELAND 1965	Ireland
ISTS 073 ASTRO 1969	Diego Garcia
JOHNSTON ISLAND 1961	Johnston Island Kandawala Kandawala- Sri Lanka
KANDAWALA	Sri Lanka
KERGUELEN ISLAND	Kerguelen Island
KERTAU 1948	West Malaysia, Singapore
L.C. 5 ASTRO	Cayman Brac Island
LIBERIA 1964	Liberia
LUZON MEAN VALUE	Philippines
LUZON MINDANAO IS	Mindanao Island
LUZON PHILIPPINES	Philippines (excluding Mindanao Island)
MAHE 1971	Mahe Island

APPENDIX E

Map Datums

MARCO ASTRO	Salvage Island
MASSAWA	Eritrea (Ethiopia)
MERCHICH	Morocco
MIDWAY ASTRO 1961	Midway
MINNA	Nigeria
NAD27 ALASKA	North American 1927- Alaska
NAD27 BAHAMAS	North American 1927- Bahamas (excluding San Salvador Island)
NAD27 CANADA	North American 1927- Canada and Newfoundland
NAD27 CANAL ZONE	North Am. 1927- Canal Zone
NAD27 CARIBBEAN	North American 1927- Caribbean (Barbados, Caicos Islands, Cuba, Dom. Rep., Grd. Cayman, Jamaica, Leeward and Turks Islands)
NAD27 CENTRL AMERICA	North American 1927- Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua)
NAD27 CONUS	North Am. 1927- Mean Value (CONUS)
NAD27 CUBA	North American 1927- Cuba
NAD27 GREENLAND	North American 1927- Greenland (Hayes Peninsula)
NAD27 MEXICO	N. American 1927- Mexico
NAD27 SAN SALVADR IS	North American 1927- San Salvador Island
NAD83	North American 1983- Alaska, Canada, Central America, CONUS, Mexico
NAHRWAN MASIRAH IS	Masirah Island (Oman)
NAHRWAN SAUDI ARABIA	Saudi Arabia
NAHRWAN UNITD ARAB E	United Arab Emirates
NAPARIMA BWI	Trinidad and Tobago
NETHERLAND TRIAG '21	Netherlands
NOU TRIAG FRANCE	Nouvelle Triangulation De France- France
NOU TRIAG LUXEMBOURG	Nouvelle Triangulation De France- Luxembourg
OBSERVATORIO 1966	Corvo and Flores Islands (Azores)
OLD EGYPTIAN	Egypt
OLD HAWAIIAN KAUAI	Kauai
OLD HAWAIIAN MAUI	Maui
OLD HAWAIIAN MEAN	Mean Value
OLD HAWAIIAN OAHU	Oahu
OMAN	Oman
ORD SRV GRT BRITAIN	England, Isle of Man, Scotland, Shetland Isl., Wales
PICO DE LAS NIEVES	Canary Islands
PITCAIRN ASTRO 1967	Pitcairn
PORTUGUESE 1973	Portugal
POTSDAM	Germany
PROV SO AMERICAN '56	Bolivia, Chile,Colombia, Ecuador, Guyana, Peru, Venezuela
PROV SO CHILEAN 1963	S. Chile
PUERTO RICO	Puerto Rico & Virgin Isl.
QATAR NATIONAL	Qatar
QORNOQ	South Greenland
REUNION	Mascarene Island
ROME 1940	Sardinia Island
RT 90	Sweden
SANTO (DOS)	Espirito Santo
SAO BRAZ	Sao Miguel, Santa Maria Islands
SAPPER HILL 1943	East Falkland Island
SCHWARZECK	Namibia
SOUTH AMERICAN 1969	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Venezuela, Trin/Tobago
SOUTH ASIA	Singapore
SOUTHEAST BASE	Porto Santo and Madiera Islands
SOUTHWEST BASE	Faial, Graciosa, Pico, Sao Jorge and Terceira Islands
TANANARIVE OBSV 1925	Madagascar
TIMBALAI 1948	Brunei and E. Malaysia (Sarawak and Sabah)
TOKYO	Japan, Korea, Okinawa
TRISTAN ASTRO 1968	Tristan da Cunha
USER	User datum
VITI LEVU 1916	Viti Levu/ Fiji Islands
WAKE-ENIWETOK 1960	Wake-Eniwetok- Marshall
WGS 72	World Geodetic System 72
WGS 84	World Geodetic System 84
YACARE	Uruguay
ZANDERIJ	Surinam

Appendix F
Troubleshooting Q & A

The GPS 165 is a precision navigation instrument that offers a wide array of performance navigation features. The 'Q & A' section is designed to answer some of the common questions regarding the GPS 165's capabilities and operation. If you have a problem operating your unit, go through the troubleshooting section and refer to the reference section noted. If your problem is not listed in the Q & A section, use the index to find the appropriate reference in the manual. If you still encounter a problem, please see your authorized dealer or call or fax our customer support staff at 913-599-1515 or 913-599-2377 FAX. GARMIN is dedicated to supporting its products and customers.

What is RAIM, and how does it affect approach operations?

RAIM is an acronym for Receiver Autonomous Integrity Monitoring, a receiver function that performs a consistency check on all tracked satellites. RAIM ensures that the available satellite geometry will allow the receiver to calculate a position within a specified protection limit (2 nm for oceanic and en route, 1 nm for terminal and 0.3 nm for non-precision approaches).

During oceanic, enroute and terminal phases of flight, RAIM will be nearly 100%. Because of the tighter protection limit on approaches, there may be times when RAIM is not available. The GPS 165 automatically monitors RAIM and will warn you with an alert message (see Appendix C) when it is not available. If RAIM is not available when crossing the FAF, the ACTV annunciator will not illuminate and the pilot must fly the missed approach procedure. The GPS 165's RAIM prediction function (see page 20) will also allow you to see whether RAIM will be available for a specified date and time.

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Why aren't there any approaches available for my route?

Approaches are only available when the final route waypoint or direct-to destination is an airport (some VOR/VORTAC identifiers are similar to airport identifiers). If a destination airport does not have a GPS approach, the GPS 165 will display a 'no procedures in database' message. For more on selecting an approach, see page 66.

What happens when I select an approach? Can I store a route with an approach, SID or STAR?

Whenever you load an approach or STAR into the active route, the arrival airport is moved, and a set of approach or arrival waypoints is inserted. If a SID is loaded into the active route, the SID waypoints will be inserted following the departure airport in the active route. Note: these modifications only apply to the active route, and will not affect the corresponding stored route (if you have activated one). Routes can be stored with an approach, SID or STAR. Keep in mind that the active route is erased when the unit is turned off and overwritten when another route is activated.

When storing routes with an approach, SID or STAR, the GPS will use the waypoint information from the current database to define the waypoints. If the database is changed or updated, the GPS 165 will automatically update the information if the procedure name has not changed. If an approach, SID or STAR procedure is no longer available, the route will become locked until the procedure is deleted from the route or the correct database is installed. For information on loading an approach, SID or STAR, see pages 79-82. See page 54 for instructions on saving and copying routes.

Can I file slant Romeo '/R' using my GPS?

Yes, you may file your flight plan as /R if your GPS 165 is a certified A1 or A2 installation. If you are flying enroute, you may fly /R with an expired database **only** after you have verified all route waypoints. Non-precision approaches **may not** be flown with an expired database. See your approved Airplane Flight Manual Supplement for more information.

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What does the GPS APPR switch do? What is 'arming' an approach?

The GPS APPR switch must be set to the ARM position for an approach to enter the active phase. It may be left in the ARM position to simplify approach operation. Its main function is to provide the pilot with a quick method of deactivating the approach and returning the CDI scale to the 1 nm scale in the event of a missed approach. For more on the GPS APPR switch and arming approaches, see pages 63-64.

What does the GPS SEQ switch do and when do I use it?

The GPS SEQ switch is used to select manual or automatic waypoint sequencing of waypoints. Setting the GPS SEQ switch to the HOLD position holds your current 'active to' waypoint as your navigation reference and prevents the GPS from sequencing to the next waypoint. When the GPS SEQ switch is set to the AUTO position, automatic waypoint sequencing is selected, and the GPS will automatically select the next waypoint in the route once the aircraft has crossed the present active-to waypoint.

AUTO	**HOLD**
Automatic sequencing of waypoints	Manual sequencing- 'HOLDs' on selected waypoint
Change in HSI does not affect CDI deflection	Manually select course to next waypoint from HSI
Always navigates 'TO' the active waypoint	Will indicate 'TO' or 'FROM' from waypoint
Must be set to AUTO for approach to go active	Approach will not go active

The GPS SEQ switch must be set to the HOLD position any time you are deviating from the flight sequence of an approach (e.g., when you are flying radar vectors) or when you must cross the same waypoint twice in succession (e.g., a procedure turn or holding pattern). Whenever the GPS SEQ switch is set to the HOLD position, the GPS 165 allows you to select the desired course to/from a waypoint using the HSI, much like a VOR, and display a to/from flag for the active-to waypoint. In the AUTO position, the CDI will always display a 'TO' indication for the next waypoint once you've crossed the active waypoint. Refer to page 75 for an approach example using a HOLD.

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When should I switch from HOLD to AUTO, and what happens when I do?

Once you are ready to resume automatic waypoint sequencing, you must set the desired course on your HSI two seconds before changing the GPS SEQ switch to the AUTO position. This allows the the desired course to 'settle' prior to the GPS 165 using it. Once the GPS SEQ switch is set back to the AUTO position, the GPS 165 will use the HSI course until you have crossed the active-to waypoint and sequenced to the next route waypoint. See pages 64-65 for more on the GPS SEQ switch.

Why won't my unit automatically sequence to the next waypoint?

The GPS 165 will only sequence approach, SID or STAR waypoints when the GPS SEQ switch is in the AUTO position. For automatic sequencing to occur, you must also cross the bisector of the turn you are navigating. See pages 64-65 for more on automatic waypoint sequencing.

How do I skip a waypoint in an approach, SID or STAR?

The GPS 165 allows you to manually select any approach, STAR or SID waypoint as your next 'active to' destination. This procedure, called an on-route direct-to, is performed from the active route page by highlighting the desired waypoint and pressing  , then ENT to approve the selection. The GPS will then provide navigation directly to the selected waypoint, so be sure you have clearance directly to that position. See pages 59 & 69 for more information.

How do I fly the GPS with an autopilot and DG heading bug?

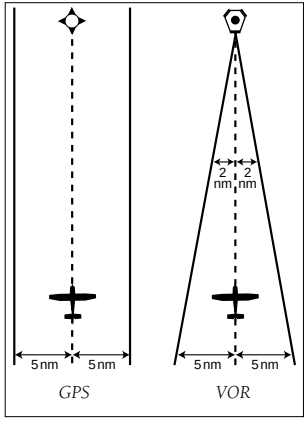
If you do not have an HSI, you should make your course selections on the OBS and the DG heading bug.

When does turn anticipation begin, and what bank angle is expected?

The GPS 165 will smooth adjacent leg transitions based upon a nominal 15º bank angle (with the ability to roll up to 25º) and provide three pilot cues for turn anticipation: 1) The waypoint annunciator will flash 15 seconds before the turn point and glow steadily 2 seconds prior to the turn anticipation point. Begin the turn when the annunciator goes steady. 2) A flashing 'next dtk' prompt will appear on the GPS 165's CDI field. Set the HSI to the next dtk value when the waypoint annunciator starts flashing. 3) The To/From indicator on the GPS CDI will flip momentarily to indicate that you have crossed the midpoint of the turn. For more on turn anticipation, see pages 60-61 & 67.

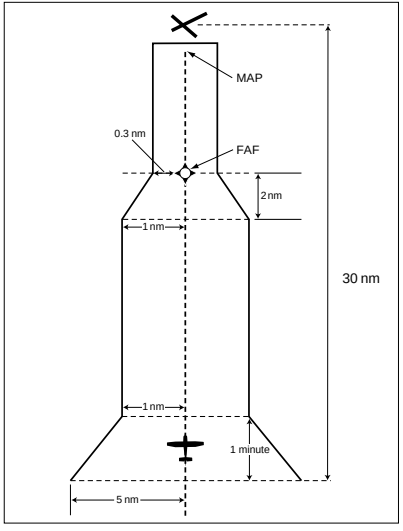
When does the CDI scale change, and what does it change to?

Whenever an approach is selected and armed, the GPS 165 will begin a smooth CDI scale transition from the 5.0 nm to the 0.3 nm scale 30 nm from the destination airport (see right). The CDI scale will remain at the 0.3 nm scale from the FAF to the MAP during the active approach. If you are in a missed approach situation, and would like to return the CDI to the 1 nm scale, you may deactivate the approach by releasing the GPS APPR switch from the ARM position.



Why does my CDI not respond like a VOR when the GPS SEQ switch is set to HOLD?

Unlike a VOR, the CDI scale used on GPS equipment is based on the cross-track distance to the desired course, not an angular relationship to the destination. Therefore, the CDI deflection on the GPS will be consistent regardless of the distance to the destination, and will not become less sensitive when you are further away from the destination. For more on the CDI scale, see pages 64-65.



CDI Scale Transition

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What is the correct missed approach procedure? How do I select the missed approach holding point?

To comply with TSO specifications, the GPS 165 will not automatically sequence to the missed approach holding point. The first waypoint in the missed approach procedure will be displayed as the next approach waypoint when the pilot performs a direct-to AFTER crossing the MAP, which the pilot may activate when authorized. All published missed approach procedures must be flown before activating navigation to the holding point. To begin the missed approach procedure prior to crossing the MAP, the GPS APPR switch must be released from the 'ARM' position to disarm the approach and begin transition of the CDI to the 1.0 nm scale.

To activate navigation to the first missed approach waypoint after crossing the MAP, press D▶, then ENT. The GPS 165 will provide direct navigation to the holding point. If you do not have direct clearance to the holding point, set the GPS SEQ switch to the HOLD position until you have intercepted the inbound course to the holding point. See page 68-69 for more on missed approaches.

How do I re-select the same approach or activate a new approach after a missed approach?

After flying all missed approach procedures, you may reactivate the same approach for another attempt from the active route page. Once you have been given clearance for another attempt, select the starting waypoint from the active route list by highlighting the waypoint identifier and pressing D▶, followed by ENT. The GPS 165 will provide direct navigation to the selected waypoint and rejoin the approach in sequence from that point on. If you have disarmed the previous approach, remember to set the GPS APPR switch to the 'ARM' position.

To activate a new approach, you must select the new procedure from the approach select page. To view the approach select page, press RTE and rotate ◎ until the approach select page appears. Press CRSR and rotate ◎ to highlight the new approach you want to fly. To activate the new approach, press ENT and select the IAF, if necessary. See page 69 for more on reactivating an approach.

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