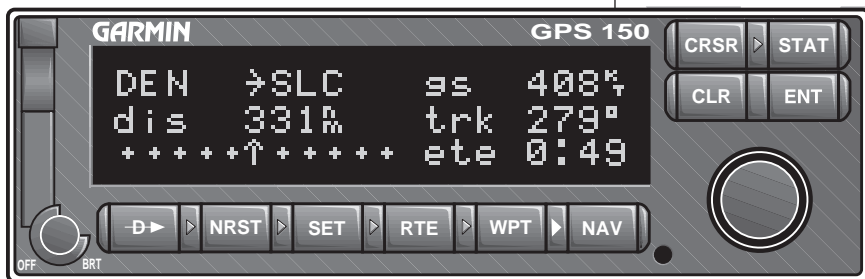


OWNER'S MANUAL
& REFERENCE



GPS 150 Pilot's Guide





Software Version 3.00 or above

© 1997 GARMIN Corporation
1200 E. 151st Street, Olathe, KS USA 66062

GARMIN (Europe) LTD
Unit 5, The Quadrangle, Abbey Park Industrial Estate, Romsey, U.K. SO51 9AQ

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INTRODUCTION

Cautions

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, the user is encouraged to try to 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 technician for additional help if these remedies do not correct the problem.

This device complies with part 15 of the FCC rules. 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 150 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 150 is a precision electronic NAVigation AID (NAVAID), any NAVAID can be misused or misinterpreted, and therefore become unsafe.

Use the GPS 150 at your own risk. To reduce the risk of unsafe operation, carefully review and understand all aspects of this Owner's Manual and thoroughly practice using the simulator mode prior to actual use. When in actual use, carefully compare indications from the GPS 150 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 150 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 150 must be updated regularly in order to ensure that its information is current. Updates are released every 28 days. A database information packet is included in your GPS 150 package.

Pilots using an out-of-date database do so entirely at their own risk.

CAUTION! The GARMIN GPS 150 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 finest, most full-featured panel-mount VFR GPS available. The GPS 150 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 150 unit w/ Rechargeable Battery Pack and NavData® Card
- Aviation Installation and Antenna Kit
- Pilot's Guide & Quick Reference Guide
- Database Subscription Packet

Optional Accessories

- AC Adaptor
- PC 150 Interface Kit
- User Data Card

*To obtain accessories for your GPS 150,
please contact your nearest GARMIN dealer.*

INTRODUCTION

Capabilities

Designed for accurate performance and intuitive operation, the GPS 150 is a powerful navigation device that allows you to navigate easily, no matter where your destination may take you.

Precision Performance

- MultiTrac8™ receiver tracks and uses up to 8 satellites for fast, accurate positioning and speed, 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
- Battery backup of up to 4 hours for powering the GPS 150 in case of aircraft electrical power failure

Advanced Navigation

- Stores 1,000 user waypoints and 20 reversible flight plans of up to 31 waypoints each
- Stores user comments on up to 250 items (airports, VORs, etc.)
- Interfaces with existing autopilot, moving maps, CDI, HSI and other equipment

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INTRODUCTION

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To quickly and easily locate information on specific tasks, please refer to the Index on page 83.

INTRODUCTION

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Key and Knob Functions



The power/brightness knob controls unit power and screen brightness.



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



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 4 for more information on the nearest waypoints).



The set key allows you to customize the settings on your unit to your preference. (See Section 5 for more information on unit settings).



The route key enables you to create, edit, activate and invert routes. 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).



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).

The GPS 150 is designed to minimize keystrokes when performing 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 150. Experiment to find the most effective way to use the GPS 150 to your advantage.

INTRODUCTION

Key and Knob Functions

NAV

The navigation 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).

CRSR

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

CLR

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

STAT

The status key is used to view receiver and satellite status, as well as system messages (See Section 5 for more information on receiver status).

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 entering data using the  and  knobs. Experiment with them and become efficient in entering data with the concentric knobs. This will greatly reduce the amount of time required to navigate with the GPS 150.



The GARMIN GPS 150 is a powerful navigational tool that provides pilots with accurate navigational data and provides a host of database information at their fingertips. The next few pages are designed to familiarize you with the operation of the GPS 150, including powering up the unit, entering data and doing a simple direct-to. This section also briefly covers the Position and CDI navigation pages, which will be used for most of your in-flight navigation.

Once you're familiar with what the keys and knobs do, consult the reference section of the manual for instructions on specific tasks, and an overview of what the GPS 150 can do for you. This introduction uses the GPS 150's simulator mode, so it can be performed at home or at the office using the optional AC adaptor. If you have changed any of the factory default settings (position format, units of measure, selectable fields, etc.), the pictures used may not match your configuration.

Powering up the GPS 150

Turn the GPS 150 on by rotating  (the power/ brightness knob) clockwise. Notice that rotating it clockwise will also brighten the display. This knob locks the NavData[®] card in place, so it may not be removed while the unit is on. After you turn the unit on, the Welcome page will be displayed while the unit performs a self-test. When the self-test is complete, you will be prompted to select which operating mode you would like, either Simulator or Normal.

Simulator mode will enable all of the functions of the GPS 150, but will not acquire satellites and use calculated position information or navigational guides. Simulator mode will allow you to mark, create, edit and store waypoints and routes.

The operating mode screen will NOT be displayed when using aircraft power. Although you may use the GPS 150 inside the cockpit if main power is off, it is not recommended to keep you from accidentally navigating the aircraft using Simulator mode. If aircraft power is lost during flight, the GPS 150 will automatically switch to its internal battery to provide safe navigation information for up to four hours.

Pictures in the left and right columns are actual screens taken from the GPS 150. Some screens may vary slightly if you have changed any of the unit settings.

```
GPS 150 Ver 3.00
©1993-95 GARMIN Corp
Performing self test
```

Welcome page

```
Select operating mode
Normal
ok?
```

Operating Mode page

Getting Started

Simulator Mode

```
Select operating mode
Simulator
ok?
```

Operating Mode page

```
AMERICAS VFR SUA
eff 05-jan-95 (9501)
exp 02-feb-95 ok?
```

Database page

```
Init posn ref:L45__
N35° 19.44' W118° 59.75'
ok?
```

*Initial Position Reference page with
airport identifier and position.*

To enter Simulator mode from the Operating Mode page:

1. Rotate the outer knob (○) one stop to the left or right to highlight the operating mode.
2. Rotate the inner knob (●) to display 'Simulator?'.
3. Rotate ○ to highlight 'ok?'.
4. Press **ENT** to accept.

This will display the Database page, which states the current database information contained on the NavData® card. On this page, information including valid operating dates, cycle number and database type is shown. Databases are updated every 28 days. Information on subscribing to the database is available inside your GPS 150 package.

1. Press **ENT** to acknowledge the database information.

The Initial Position Reference page will now appear. Since simulator mode does not acquire satellites and obtain a GPS position, it needs a reference point to begin your trip. Let's enter an airport in Bakersfield, CA (identifier L45) as our initial reference point.

1. Rotate ○ to highlight the blank identifier field.
2. Rotate ● to display 'L'.
3. Rotate ○ to advance the cursor position.
4. Rotate ● to display '4'.
5. Rotate ○ to advance the cursor position.
6. Rotate ● to display '5'.
7. Press **ENT** to accept the entry. (If you make a mistake, use ○ to highlight the character again and change it using ●, or press **CLR** to clear the present entry).

Getting Started

Position and CDI pages

This will display the Waypoint Confirmation page which, for an airport, contains identifier, altitude, fuel services available, position, approach information and radar services.

1. Press **ENT** to confirm the waypoint information.
2. Press **ENT** again to accept the waypoint as the initial starting point.

The Position page will now be displayed. Information on this page includes altitude, minimum safe altitude, position and nearest airport. Notice that the annunciator (**▶**) next to the **STAT** key is flashing.

To view any system message:

1. Press **STAT**

The 'Do not use for nav' message will appear to warn you that the information being displayed is only valid for simulation, and is not your actual position, speed or altitude.

1. Press **STAT** again or **NAV** to return to the Position page.

Now that the Position page is displayed, let's view the other main navigational page, the CDI page.

To view the CDI page from the Position page (while the cursor is not flashing):

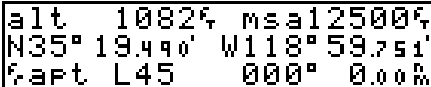
1. Rotate **◉** left one position.

The CDI page is the main page used while navigating to a destination. It contains information including the active waypoint, ground speed, track, course deviation indicator (CDI), distance and estimated time enroute (ETE). These fields will typically only contain information if you have selected a destination (performed a direct-to or activated a route) and a speed. In our simulated trip, we will begin at Bakersfield Municipal Airport and go to Delano Municipal Airport.




```
L45      380% av gas
N35° 19.44' W118° 59.75'
MP-APR radar   ok?
```

Waypoint Confirmation page



```
alt 1082% msa12500%
N35° 19.440' W118° 59.751'
%apt L45      000° 0.00%
```

Position page



```
----->-----  gs: 0%
dis -----% trk ---°
No actv wpt ete ---:--
```

CDI page

Getting Started

Going to the Destination

```
so to:KDLO_  ss: 0%  
dis  -----m  trk  ---°  
Enter wpt    ete_:_:--
```

Entering the direct-to waypoint identifier.

```
so to:KDLO  ss: 0%  
dis  27.82m  trk  ---°  
++++↑++++  ete_:_:--
```

The CDI page after the waypoint has been confirmed.

```
so to:KDLO  ss: 140%  
dis  27.82m  trk  321°  
++++↑++++  ete11:54
```

The CDI page after a ground speed has been set.

To perform a direct-to at any time:

1. Press **→**. (For our simulated trip we will go to KDLO, Delano Municipal).
2. Rotate **⦿** until 'K' is displayed.
3. Rotate **○** one position to advance the cursor.
4. Repeat steps 2 and 3 until 'KDLO' is displayed.
5. Press **ENT** to accept the entry.

This will bring up the Waypoint Confirmation page again, but this time, it will contain the Delano Municipal Airport information.

1. Press **ENT** to confirm the direct-to.

This brings you back to the CDI page, which will allow you to enter a ground speed toward the destination. The waypoint you have selected as your destination will now be referred to as the 'active to' waypoint.

To set a ground speed from the CDI page:

1. Press **CRSR** to obtain a cursor.
2. Rotate **○** to highlight the ground speed ('gs') field.
3. Using **⦿** to change the data, and **○** to move the cursor, enter a ground speed of 140 knots.
4. Press **ENT** when finished.

This will calculate and display the ETE and distance as you approach the destination. The CDI page also displays the course deviation indicator in the lower left part of the display. The CDI slides horizontally to show the direction and distance you are off course (in simulator mode, it will always be on course). The default is for the CDI to deflect full scale at 5 distance units (mi, km, etc.) of crosstrack error. Crosstrack error is the distance you have deviated from the course set when you activated the destination waypoint.



The CDI page contains three fields which may be configured to display other information.

The 'dis' field can be configured to display any of the following:


- **dis** – Distance to destination waypoint
- **str** – Steer direction and distance away from established course


The 'trk' field can be configured to display any of the following:

- **trk** – Track angle
- **brg** – Bearing to waypoint
- **cts** – Course to steer (to get back on course most efficiently)
- **dtk** – Desired track
- **obs** – Omni-directional Bearing Select (Inbound Course Select)
- **trn** – Turn angle

The 'ete' field can be configured to display any of the following:



- **eta** – Estimated time of arrival
- **ete** – Estimated time enroute
- **trk** – Track angle
- **vn** – Vertical navigation

You can change these fields by highlighting them with the cursor and rotating  until the desired data is displayed. This is covered completely in Section 1, page 13.


Any time you would like to set a direct course for a destination, simply highlight the waypoint identifier and press . This can be done from any page. It will cancel any active routes, vertical navigation, or offset navigation that may be in effect. This is especially useful when locating the nearest airport, and setting a direct course for it.

To display the nearest airport, press . After the nearest airport is displayed, you may perform a direct-to and begin navigating towards that destination.

To go directly to the nearest airport:

1. Press  to highlight the identifier.
2. Press  to perform a direct-to.

This will display the Waypoint Confirmation page for the selected airport.

3. Press  to accept and begin navigating toward the nearest airport.

```
so to:KDLO  as: 140°  
dis 23.82%  trn R00°  
++++↑++++  trk 321°
```

The CDI page with 'trn' and 'trk' displayed.

```
so to:KDLO  as: 140°  
dis 23.82%  brg 321°  
++++↑++++  trk 321°
```

The CDI page with 'brg' and 'trk' displayed.

You are now ready to begin navigating using your GPS 150. Please be sure you understand all features of the unit before actual flight.

Review operation of the unit in Section 1 and become familiar with the GPS 150's capabilities so that in an emergency, it can provide safe and reliable navigation.

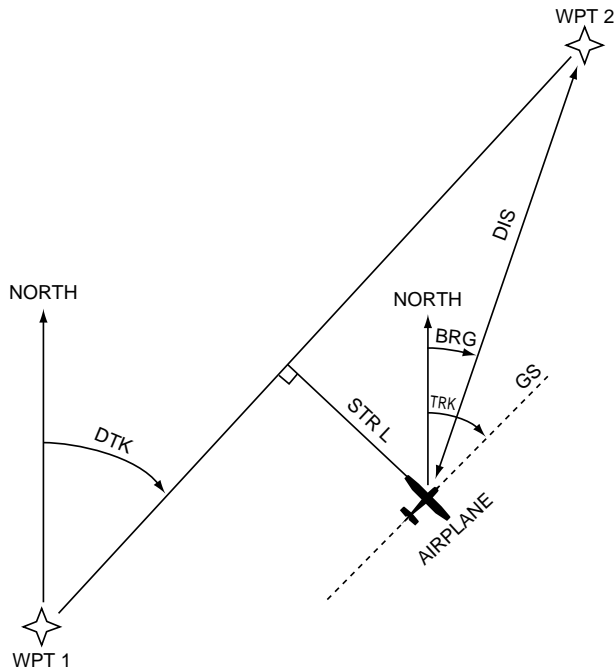
REFERENCE

Navigation Diagram

The abbreviations used in the diagram on the right are:

- BRG:** bearing
- DIS:** distance
- DTK:** desired track
- GS:** ground speed
- STR:** steer direction & distance
- TRK:** track angle
- WPT:** waypoint


The GPS 150 is a precision navigational device that provides speed, course and track information to the pilot at the touch of a button. The diagram below shows the basic navigational features and fields used in the GPS 150. The abbreviations used are listed on the left hand side of this page.



Section 1

Navigating with the GPS 150



Prior to using your GPS 150 for the first time in flight, we recommend that you taxi to a location that is well away from buildings and other aircraft. The first time you use the GPS 150 it will automatically collect satellite data, and should not be interrupted.

1. Turn on your GPS 150 by rotating  clockwise.
2. Press **ENT** to acknowledge database dates and cycle.

This will display the Receiver Status page, which, for the first use of your GPS 150, will be 'Searching the Sky'. This means the unit is acquiring data to establish almanac and satellite orbit information, which can take 7 1/2 to 30 minutes. A message will inform you that the unit is 'Searching the sky'.

When the GPS 150 has located at least one satellite, and is beginning to collect information on all satellites, a 'Collecting data' message will be displayed. This is a good indication that you are receiving satellite signals, and that satellite lock and position fix will occur.

Following the first use of your GPS 150, the amount of time required for a position fix will vary, usually from 2 to 5 minutes. If the GPS 150 has not been operated for a period of six months, or it has moved over 300 miles without being on, it may be required to Search the Sky to collect new data. This will be done automatically.

If only enough satellites can be acquired for 2D navigation (no altitude), the unit will use the altitude provided by your altitude serializer, if installed. If not, you will be prompted to enter the altitude with a 'Need alt - press NAV' message. If this message occurs, press **NAV** and use  and  to enter the altitude shown on your altimeter. Press **ENT** when you are finished.



```
GPS 150 Ver 3.00
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Performing self test
```

Welcome page

```
AMERICAS VFR SUA
eff 05-jan-95 (9501)
exp 02-feb-95 ok?
```

Database page

```
Acquiring epe----f
sat 1 9 10 19 31
s91 96 5 7 5
```

Receiver Status page

REFERENCE

Satellite Acquisition

Section 1

1

```
Acquiring  epe_---4  
sat  1 9 18 19 31  
ssl  9 6 5 7 5
```

Receiver Status page

```
3D Nav      dop 1.5  
sat   3 14 18 19 22 25 28 29  
ssl   2 7 5 7 9 5 - 8
```

Receiver Status page during navigation.

The Position page will be displayed when the GPS 150 has locked on to satellites and is ready for navigation. Note that if you begin using the GPS 150 in any way before it has obtained a fix, it will not automatically display the Position page, but will inform you when the GPS 150 is displaying current navigation information with the 'Ready for navigation' message.

Typically, if you turn on the GPS 150 when you leave the hangar, it will have acquired satellites and be ready for navigation before you are ready to take off. Satellite acquisition times can be as little as 15 seconds, or as long as 5 minutes. If the antenna has a clear view of the sky, it should not take over 5 minutes, unless the unit is acquiring new satellite data. This condition will be accompanied by a 'Searching the sky' message.

If you are having trouble acquiring satellites on a routine basis, check the antenna installation and cabling to the GPS 150 rack. If the installation appears to be in good order, this may signal that there is a problem with the unit. If you feel there may be a problem with your GPS 150, please contact your local avionics dealer.

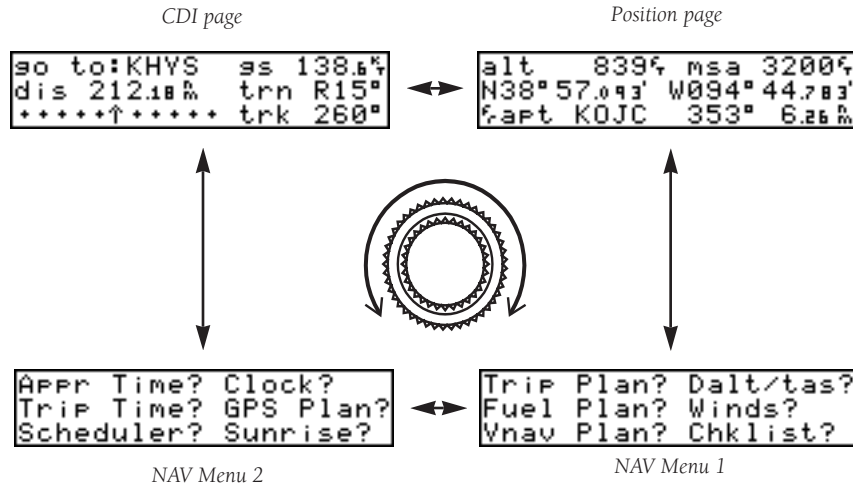
The GPS 150 displays all navigation data on pages accessed using the **NAV** key. The GPS 150 contains four NAV pages:

The **Position page** displays current position and altitude information and also provides reference waypoint information.

The **CDI page** indicates the speed, steering and distance information.

NAV Menus 1 and 2 contain prompts to perform various planning functions and in-flight calculations. The entire list of functions the NAV menus perform appears later in this section.

The NAV pages may be accessed by pressing **NAV** and rotating the outer knob (⊙).



When using the GPS 150, you may rotate the outer knob either direction to display other information or pages.

The pages are accessed in a cyclic manner, and can be displayed in different ways.

For example, instead of rotating the outer knob to display subsequent pages, you may repeatedly press **NAV**. This will also display the other three NAV pages.

REFERENCE

Position Page

Section 1

```
alt 839f msa 3200f
N38° 57.0q3' W094° 44.7q3'
fact KOJC 353° 6.26 M
```

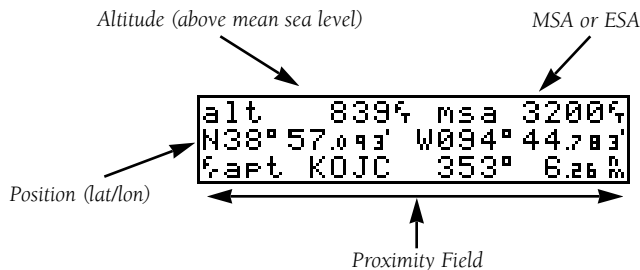
Position page with MSA displayed.

```
alt 2839f esa 4400f
N38° 57.0q3' W094° 44.7q3'
fact KOJC 353° 6.26 M
```

Position page with ESA displayed.

MSA and ESA are computed based on data stored in the NavData card. This information cannot be solely relied upon as an absolute measure of safe altitude in your area, particularly if the data card is out of date. Consult current charts and NOTAMS for more complete information.

The Position page contains the following information:



The MSA/ESA field can display either the minimum safe altitude (MSA) or the enroute safe altitude (ESA). MSA is the recommended minimum altitude within a ten mile radius of your present position. ESA is the recommended minimum altitude within a ten mile radius of your course on an active route or direct-to. This information is determined using the database and generally includes mountains, buildings and other permanent features.

For example, if you are on a route from New York City to Los Angeles, the MSA at JFK would be 2700 ft. to account for objects in the area. However, the ESA would be 16,700 feet to account for the course through the Rocky Mountains.

To change the ESA/MSA field on the Position page:






1. Press **CRSR**, if necessary, to obtain a flashing cursor.
2. Rotate **○** until the 'ESA/MSA' field is highlighted.
3. Rotate **●** to display the desired data.
4. Press **CRSR** to return to normal navigation.

The Proximity field can display the following:


- Range, bearing and identifier of the nearest airport, VOR, NDB, intersection, or user waypoint, or;
- Range and bearing from a user entered waypoint.

This will display ANY waypoint's distance and bearing on the bottom of the Position page. This is especially useful when trying to locate your position on a sectional. The default setting is to display the nearest airport.

To change the proximity field:

1. Press **CRSR**.
2. Rotate  to highlight the proximity field after the 'r'.
3. Rotate  until the type of waypoint you would like is displayed. (Choose 'apt', 'vor', 'ndb', 'int', 'usr', or choose 'wpt' if you would like a specific waypoint's range and bearing to be displayed.)
4. Press **CRSR** to remove the cursor, or, if you have selected 'wpt':
5. Rotate  to highlight the identifier field.
6. Use  and  to enter the identifier name. (This waypoint identifier can be an airport, VOR, NDB, intersection, or user waypoint). Press **ENT**.
7. Press **CRSR** to complete.

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 GPS position, you will be able to enter an approximate position and altitude. This is helpful in speeding satellite acquisition only if the unit has moved without tracking satellites.



```
alt 2839f esa 4400f
N38°57.093' W094°44.783'
rapt KOJC 353° 6.26 A
```

Position page with nearest airport displayed.

```
alt 2839f esa 4400f
N38°57.093' W094°44.783'
rvor OJC 350° 6.67 A
```

Position page with nearest VOR displayed.

```
alt 2839f esa 4400f
N38°57.093' W094°44.783'
rwpt:KDFW 011° 379.6 A
```

Position page with user entered waypoint displayed.

REFERENCE

CDI Page

Section 1

1

```
so to:KHYS  ss 138.6°  
dis 212.18M  trn R15°  
++++↑+++++ trk 260°
```

CDI page with TRN and TRK displayed.

```
so to:KHYS  ss 138.6°  
dis 212.18M  cts 266°  
++++↑+++++ eta 8:21
```

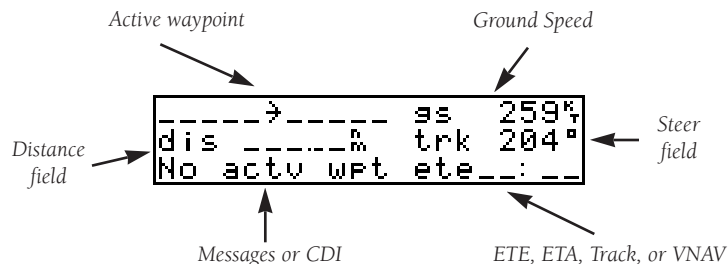
CDI page with CTS and ETA displayed.

The CDI page will display the CDI in the lower left hand corner of the screen if the unit has obtained a GPS position AND there is an active waypoint. If the unit has not obtained a position, but you have already performed a direct-to, it will display 'No gps posn'. If a position has been calculated, but there is not an active waypoint, the unit will display 'No actv wpt'. The CDI itself may be configured to your preference. The default is for the CDI to deflect full scale at 5.0 nm (or mi, km) of cross track error. See page 54 to set the CDI sensitivity.

The CDI page is the primary NAV page used for enroute navigation. It displays information such as the active waypoint, ground speed, course deviation indicator (CDI), steering information, distance, etc.

To display the CDI page:

1. Press **NAV** and rotate  until the CDI page is displayed:



The following distance functions may be displayed in the distance field:

- **dis** – Distance from present position to the 'active to' waypoint.
- **str** – Steer direction and distance. 'L' or 'R' to indicate which direction to steer, and the distance to indicate how far you are off course.

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




- **trk** – Track, or the direction of movement relative to the ground.
- **brg** – Bearing, or the direction to the destination waypoint.
- **cts** – Course to steer to reduce cross track error and stay on course.
- **dtk** – Desired track, or the course between the 'active from' and the 'active to' waypoint.
- **obs** – OBS, or course select mode allows the pilot to set the inbound course to the 'active to' waypoint. (See page 13 to set the OBS.)
- **trn** – Off course error. 'L' or 'R' to indicate which direction to turn, and the degrees indicate the angle you are off course.

Changing Fields
on the CDI Page

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 17), this field indicates either the elapsed time before the VNAV maneuver is to begin, or the VNAV altitude if a maneuver is in progress. The VNAV altitude displayed is the suggested altitude you should be flying in order to complete the maneuver.

To change any of the fields on the CDI page to display other information:

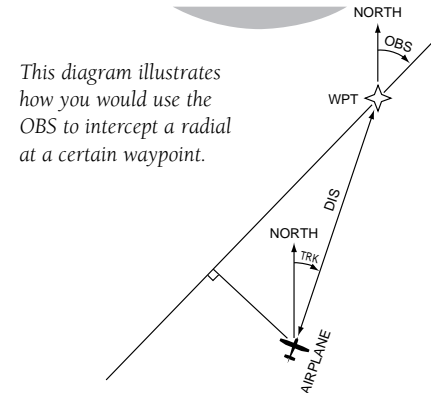
1. Press **CRSR** if necessary, to activate the cursor.
2. Rotate  until the field you would like to change is highlighted.
3. Rotate  until the field displays the desired information.
4. Use  to highlight another field, or **CRSR** to complete.

When navigating towards a destination, it is sometimes desirable to intercept that waypoint on a certain radial. The OBS (Omni-directional Bearing Select, or inbound course select) allows the pilot to set the desired inbound course to the destination waypoint. This is similar to selecting the desired course on a VOR indicator.

To set the OBS (You must have an ‘active to’ waypoint):

1. Highlight the steer field and select ‘obs’ as shown above.
2. Rotate  until the number field to the right of ‘obs:’ is highlighted.
3. Use  and  to enter the OBS course (0-359°).
4. Press **ENT** to accept.

The CDI will guide you to intercept the desired radial upon reaching the waypoint.



This diagram illustrates how you would use the OBS to intercept a radial at a certain waypoint.

```
obs :KICT  35 138.6°
dis 212.10%  obs:145°
++++↑++++ eta17:21
```

Examples of CDI pages with different data types selected.

REFERENCE

NAV Menu 1 & Trip Planning

Section 1

1

```
Trip Plan? Dalt/tas?  
Fuel Plan? Winds?  
Vnav Plan? Chklist?
```

NAV Menu 1

```
Wpt: ----->-----  
000° 0.00% gs: 0%  
esa 3200% ete_:_:_
```

Trip Planning page

```
Wpt: ----->KDAL  
192° 379.02% gs: 140%  
esa 3800% ete 2:42
```

Trip Planning page with values calculated.

In addition to the Position and CDI pages, the **NAV** key features two menu pages to perform many planning and navigation functions. **NAV Menu 1** contains options to perform the following functions:

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

To display NAV Menu 1:

1. Press **NAV**.
2. Rotate **○** until NAV Menu 1 is displayed.

Trip Plan is the first function listed on NAV Menu 1. Trip planning allows the pilot to view distance, ESA, bearing and estimated time enroute (ETE) between any two waypoints, and for programmed route. The ground speed can be varied manually to calculate several possible ETEs.



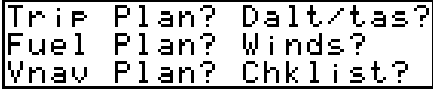









To use the trip planning function:

1. Press **NAV** and rotate **○** until NAV Menu 1 is displayed.
2. Press **CRSR** then **ENT** to access trip planning.
3. Rotate **●** to select 'wpt' for waypoint-to-waypoint planning, or select the route you would like to use. Press **ENT**.
4. If you have selected a route, use **●** to select either 'cum' for cumulative or the leg of the trip you wish to plan for. Press **ENT**.
5. If using waypoint-waypoint, then use **●** and **○** to enter the 'to' and 'from' waypoints. (To use the current position as a waypoint, leave the corresponding waypoint field blank). Press **ENT** after each identifier, then press **ENT** on the waypoint confirmation pages to accept.
6. Use **●** and **○** to enter the ground speed. Press **ENT** to calculate the values and **CRSR** to complete.

This will display the trip direction, distance, ESA and ETE.

The **density altitude/true air speed** function is also accessed from NAV Menu 1.

To calculate the density altitude and true air speed:

1. Press **NAV** and rotate  until NAV Menu 1 is displayed.
2. Press **CRSR** and rotate  to highlight the 'Dalt/tas?'.

3. Press **ENT** to access the density altitude page.
4. Use  and  to enter the indicated altitude (ialt) according to the altimeter.
Press **ENT**.
5. Use  and  to enter the calibrated air speed (cas). Press **ENT**.
6. Use  and  to enter the air pressure ('pres') obtained from local weather stations or from the altimeter (assuming the altimeter is calibrated). Press **ENT**.
7. Use  and  to enter the total air temperature according to aircraft instruments.
8. Press **ENT** and the density altitude and true air speed will be calculated and displayed.

9. Press **CRSR** to remove the cursor.

NAV Menu 1

Density Altitude/True Air Speed page

If your installation includes components to provide any of the information required on the density altitude page, they will be displayed as the defaults.

The **Fuel Planning** page will display fuel requirements for both direct-to navigation, and for programmed routes. The fuel planning function requires the pilot to know the initial amount of fuel on board and the flow rate of fuel in the aircraft. The fuel planning feature allows you to enter different ground speeds to view various information based on different travel times. If your installation has interfaced a fuel flow sensor to the GPS 150, the flow rate and other information will be used from the fuel flow sensor, and do not need to be entered manually.

```

Trip Plan? Dalt/tas?
Fuel Plan? Winds?
Vnav Plan? Chklist?
  
```

NAV Menu 1

```

Wpt:  ----->KHYS
gs:  140% flow: 10.0%
endur 5:00 lfob  35%
  
```

Fuel Planning page

```

Wpt:  ----->KHYS
fob:   50% flow: 10.0%
rng  700.0% rsv  3:29
  
```

Fuel Planning page with other information.

To perform fuel planning operations:

1. Press **NAV** and rotate **○** until NAV Menu 1 is displayed.
2. Press **CRSR** and rotate **○** until 'Fuel Plan?' is highlighted. Press **ENT**.
3. Rotate **●** to select either 'wpt' for direct navigation or the desired route number. Press **ENT**.
4. For waypoint-waypoint navigation, use **●** and **○** to enter the 'to' and 'from' waypoints. Press **ENT** to accept the waypoints. (To use the current position as a waypoint, leave the corresponding waypoint field blank).
5. 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.

6. Rotate **○** to advance the cursor to 'fob:' or 'gs:' (Depending on which is displayed).
7. Use **●** and **○** to enter the fuel on board or the ground speed. Press **ENT**.
8. 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 150 will calculate the range and endurance (how long the fuel will last) of your aircraft. These are found in the first field on the bottom row. It will also calculate leftover fuel on board (lfob) and reserve after the selected direct-to, leg, or route is completed. These are found in the second field on the bottom row. These may be changed by highlighting the field with the cursor, and using **●** to change the data.

The GPS 150 will also perform **winds aloft** calculations to inform you of the true direction and speed of the wind. The GPS 150 will also display whether you are flying with a headwind or tailwind, and its speed.

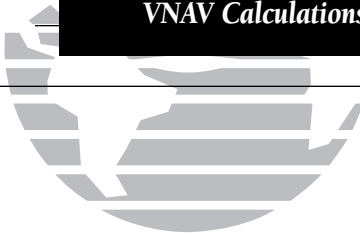
To calculate winds aloft:

1. Press **NAV** and rotate **○** until NAV Menu 1 is displayed.
2. Press **CRSR** and rotate **○** until 'Winds?' is highlighted. Press **ENT**.
3. Use **○** and **○** to enter your present heading in the 'hdg:' field. If your installation includes a fuel/air data computer, this will be displayed automatically. Press **ENT**.
4. Use **○** and **○** to enter your true air speed (TAS) in the 'tas:' field. If you have previously calculated it using the density altitude/true air speed function it will be displayed as the default. Press **ENT**. The wind direction and speed and the value of the head/tail wind will be displayed.

The GPS 150 will calculate **vertical navigation** requirements to achieve a certain altitude before or after 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 waypoint or NAVAIID.

To calculate vertical navigation parameters:

1. Press **NAV** and rotate **○** until NAV Menu 1 is displayed.
2. Press **CRSR** and rotate **○** until 'Vnav Plan?' is highlighted. Press **ENT**.
3. Use **○** and **○** to enter the initial (from) altitude. Your GPS altitude will be displayed as the default. Press **ENT**.
4. Use **○** and **○** to enter the desired final (to) altitude. Press **ENT**.
5. Use **○** and **○** to enter the distance from the waypoint. Press **ENT**.
6. Use **○** to select 'before' or 'after' the waypoint. Press **ENT**.



```
Trip Plan? Dalt/tas?
Fuel Plan? Winds?
Vnav Plan? Chklist?
```

NAV Menu 1

```
hdg: 225° tas: 259%
wind @ 253° at 38%
head wind is 34%
```

Winds Aloft page

```
fr: 6000% to: 1000%
by: 5.0% before KHYS
at: 50fpm activate?
```

Vertical Navigation page

```
fr: 6000% to: 1000%
by: 5.0% before KHYS
at: 250fpm in 38:21
```

Vertical Navigation after a greater descent rate has been manually entered.

```
Trip Plan? Dalt/tas?
Fuel Plan? Winds?
Vnav Plan? Chklist?
```

NAV Menu 1

```
Select check list
1:PRE TAXI
2:EMERGENCY
```

Checklist Catalog page

- Use **ENT** and **ENT** to enter the waypoint identifier. If you are on a route or a direct-to, the 'active to' identifier will be displayed automatically. This may be changed to another waypoint, but it must be contained in the active route. Press **ENT**.

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

- Use **ENT** and **ENT** to enter the new desired vertical speed, or press **ENT** to accept the calculated value.
- Press **ENT** to 'activate' the vertical navigation.

If you enter a more rapid climb or descent, the GPS 150 will display the elapsed time before the maneuver is to begin. At 15 seconds, you will be informed with the message 'Start altitude chng'. The VNAV altitude may be displayed on the CDI page in the ETE field. The VNAV altitude displayed is the suggested altitude you should fly in order to complete the maneuver as programmed. The VNAV function will automatically be cancelled if the active route is changed, and you will be informed with a 'VNAV cancelled' message.

The GPS 150 will also allow you to create **checklists** to remind you of repetitive tasks that can be called up at any time for review. Examples include pre-flight checklists, landing checklists, emergencies, etc. You can program up to nine checklists with thirty items in each list. Each name or checklist item can have up to 16 characters each.

To create a checklist:

- Press **NAV** and rotate **ENT** until NAV Menu 1 is displayed.
- Press **CRSR** and rotate **ENT** until 'Chklist?' is highlighted. Press **ENT**.
- Press **CRSR** and use **ENT** to highlight the checklist number you would like to create or edit. (If there are no checklists, you must select checklist number 1). Press **ENT**.
- Use **ENT** and **ENT** to enter the title of the checklist. Press **ENT**.

This will display the checklist items page. On this page, you can enter each task, such as 'Check Fuel', etc.

- Use and to enter the checklist item. Press .
- You may repeat step 5 to enter more items, or press when you are finished.

To execute a checklist:

- Press and rotate until NAV Menu 1 is displayed.
- Press and rotate until 'Chklist?' is highlighted. Press .
- Scroll through available checklists using .
- Press and use to highlight the checklist you would like to see. Press .
- Press to check off list items.

The final NAV page is **NAV Menu 2**. NAV Menu 2 contains the following functions:

- **Approach timer**
- **Clock (Date and time)**
- **Trip Timer**
- **GPS Planning**
- **Scheduler**
- **Sunrise and sunset calculations**

The **approach timer** acts as either a count up or a count down timer.

To activate/change/view the approach timer:

- Press and rotate until NAV Menu 2 is displayed.
- Press and rotate until 'Appr Time?' is highlighted. Press .
- Rotate to select either 'Count up' or 'Count down'. Press .
- Use and to set the time to begin counting from. Press .
- Rotate to select the function you would like to perform, 'Start', 'Stop', or 'Reset'. Press . Reset returns the timer to the original count up/count down time.

When the count down timer reaches zero, you will be informed with a 'Timer expired' message. It will then begin to count up, to indicate how long it has been since it expired.



```
EMERG IN FLT ENG FIR
√2:THROTTLE CLOSED
3:MX_CTRL_IDL_CUTOF
```

Executing a checklist.

```
Appr Time? Clock?
Trip Time? GPS Plan?
Scheduler? Sunrise?
```

NAV Menu 2

```
Count down timer
from 0:25:00
Start? Stop? Reset?
```

Approach timer

```

APPR Time? Clock?
Trip Time? GPS Plan?
Scheduler? Sunrise?
  
```

NAV Menu 2

```

Select local (lcl)
16-jan-95 14:46:42 U
16-jan-95 08:46 lcl
  
```

Local date/time








```

Time 8:47
Dep 8:26
Trip 11:03 Reset?
  
```

Trip timer



The GPS 150 keeps track of both UTC time (Greenwich Mean Time, or Zulu Time, calculated from the satellites) and local time. The GPS 150 will allow you to set the local time and date for your reference so you do not have to do a UTC to local time conversion manually. The times displayed elsewhere on the unit can be either local time or UTC.

To set the local date/time:

1. Press **NAV** and rotate  until NAV Menu 2 is displayed.
2. Press **CRSR** and rotate  until 'Clock?' is highlighted. Press **ENT**.
3. Use  to select either 'UTC' or 'local' time to be displayed in the time fields. Press **ENT**.
4. Use  and  to set the local date. Press **ENT**.
5. Use  and  to set the local time. Press **ENT**.
6. Press **CRSR** to complete.

The GPS 150's **trip timer** will automatically keep track of the length of the current trip. This can help you maintain accurate records and logs.

To view or reset the trip timer:








1. Press **NAV** and rotate  until NAV Menu 2 is displayed.
2. Press **CRSR** and rotate  until 'Trip time?' is highlighted. Press **ENT**.


This will display the current time, departure time, and time enroute. To reset, press **ENT**. If you don't want to reset the timer, press **CRSR**. The timer can be configured to run when the GPS 150 is on, or when your ground speed exceeds a value you enter. Setting this feature is covered in Section 5, page 57.


The **GPS planning** function allows you to make sure there are no GPS coverage outages for any location or waypoint, any day of the year. Now that the GPS constellation is complete and has been declared operational by the U.S. Department of Defense, it is unlikely that instances of poor coverage will occur.

However, if satellites are damaged or are no longer functioning before new ones can be deployed, the GPS 150 cannot use data from those satellites in calculating position, speed, or course information. The GPS 150 will obtain information about the condition of the constellation from other operational satellites and then determine which 'healthy' satellites will be in view at any point on the earth.

To check GPS coverage:

1. Press **NAV** and rotate  until NAV Menu 2 is displayed.
2. Press **CRSR** and rotate  until 'GPS Plan?' is highlighted. Press **ENT**.
3. Use  and  to enter the waypoint at which you would like to check coverage, or leave it blank to use your current position. Press **ENT**.
4. Use  and  to enter the day, month and year of the information desired. Current date will be displayed automatically. Press **ENT**.
5. Rotate  to select which fix you require, either a 2D or 3D position. (A 2D position will not contain altitude). Press **ENT**.
6. The 'Compute?' field will be highlighted automatically. Press **ENT** to compute information.

When the computations are complete, the GPS 150 will display the times (of 15 minutes or greater) of poor GPS coverage. They will be displayed on line three and, if more than two exist, may be viewed by rotating . If no 15 minute periods of poor coverage are found, the GPS 150 will display '24 hour coverage'.



```

APPR Time? Clock?
Trip Time? GPS Plan?
Scheduler? Sunrise?
  
```

NAV Menu 2

```

wpt:KTUP 09-Jan-95
fix 3D Compute?
  
```

GPS Planning (checking GPS coverage)

```

wpt:KTUP 09-Jan-95
fix 3D
24 hour coverage
  
```

GPS Planning (with 24 hour coverage)

REFERENCE

Scheduler, Sunrise & Sunset

Section 1

```
APPR Time? Clock?  
Trip Time? GPS Plan?  
Scheduler? Sunrise?
```

NAV Menu 2

```
Scheduled messages  
1:CHANGE OIL 30:00  
2:-----:--:--
```

Scheduled messages

```
Sunrise/sunset  
wpt:KMEM 16-jun-95  
Rise 4:44 Set 19:14
```

Calculating sunrise/sunset.

The **scheduler** function will display reminder messages after a certain elapsed time such as Change oil, Switch fuel tanks, Overhaul, etc. For example, if you enter 'Change Oil' to be displayed in 30 hours, the message 'Change Oil' will be displayed after the GPS 150 has been on in Normal operating mode for 30 hours. After appearing, the message will be displayed each time the GPS 150 is turned on until it is changed or deleted.

To enter a scheduled message:

1. Press **NAV** and rotate **○** to display NAV Menu 2.
2. Press **CRSR** and rotate **○** until 'Scheduler?' is highlighted. Press **ENT**.
3. Rotate **○** to display the message you would like to edit. Press **CRSR** and rotate **○** to highlight the message you would like to edit. (To delete, press **CLR**, then **ENT**).
4. Use **○** and **○** to enter the message. Press **ENT**.
5. 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 150 is on in Normal operating mode). Press **ENT**.

You may edit another by repeating steps 3, 4 and 5, or if you are finished, press **CRSR**.

To calculate sunrise and sunset times at a waypoint, or at your present location:


1. Press **NAV** and rotate **○** until NAV Menu 2 is displayed.
2. Press **CRSR** and rotate **○** to highlight 'Sunrise?'. Press **ENT**.
3. Use **○** and **○** to enter the waypoint identifier, or leave blank to use current position. Press **ENT**.
4. Press **ENT** to accept the waypoint information.
5. Use **○** and **○** to enter the date desired.
6. Press **ENT** and the sunrise and sunset times will be calculated and displayed.

Section 2

Waypoint and Database Information

The database in your GPS 150 is contained on a NavData® card providing information for either the Americas, International or Worldwide coverage. The Americas database covers North, Central and South America. The International database covers Europe, Asia and Africa. The Worldwide database contains both Americas and International. The following information is contained on your NavData card:

- **Airports** - Identifier, city/state, country, facility name, position (lat/lon), elevation, fuel services, control and approach information, runways and communications frequencies.
- **Runways** - Runway designation, length, surface, lighting, ILS/localizer identifier and frequency and pilot controlled lighting frequency.
- **Communication - Approach, arrival, control area, departure, class B, Frequencies** TMA, class C, and TRSA with sector, altitude and text usage. In addition: ATIS, clearance delivery, tower, ground, unicom, pre-taxi and other frequencies are also included.
- **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.



```
AMERICAS VFR SUA
eff 05-jan-95 (9501)
exp 02-feb-95   ok?
```

Database page

Please note that your GPS 150 uses ICAO identifiers for all airport names. All 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

Phone: (514) 285-8022
FAX: (514) 288-4772

- **Intersections** - Identifier, country, position (lat/lon), nearest VOR.
- **FSS** - Identifier, reference VOR, frequency and usage.
- **Minimum Safe Altitude (MSA)** - Minimum altitude you can fly and remain above obstructions in the region. Enroute Safe Altitude (ESA) is the minimum safe altitude along a route or direct-to.
- **Controlled and Special Use Airspace** - Type, name, controlling agency, boundaries, floor and ceiling altitudes and controlling airport identifier.

Updates for the GPS 150 database may be purchased from Jeppesen on a one-time basis or by subscription. A packet supplied with your GPS 150 details the subscription cycles and prices.

The GPS 150 database information is accessed using the **WPT** key. The GPS 150 contains four pages under the **WPT** key. These pages are:

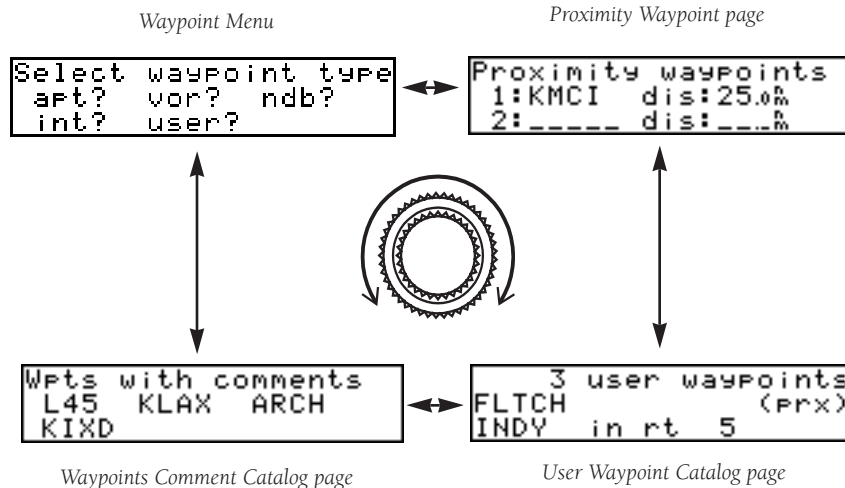
The **Waypoint Menu** page lets the user select the type of waypoint they would like to see information regarding. After selecting the waypoint type, the user may enter the identifier, location, or facility name to access the data contained on the NavData card.

The **Proximity Waypoint** page lists all of the proximity waypoints the user has entered. Proximity waypoints notify the pilot if the aircraft comes within a user entered range of the waypoint's position.

The **User Waypoint Catalog** page lists all of the user entered waypoints in alphabetical order.

The **Waypoints Comment Catalog** page lists all of the waypoints which have user entered comments.

The waypoint pages may be accessed by pressing **WPT** and rotating the outer knob (⊙).



Note: Any time you would like information on a waypoint, highlight the identifier with the cursor and press **ENT**. This will display the Waypoint Identification or Position page, and allow you to view the information in the same manner as listed in this section.

If the waypoint identifier is not contained in the database, you will be able to create a user waypoint as described on pages 34 & 35.

REFERENCE

Obtaining Waypoint Information

Section 2

```
Select waypoint type
apt? vor? ndb?
int? user?
```

Waypoint Menu page

```
apt:KUBE GR LKS USA
CUMBERLAND WI
CUMBERLAND MUN
```

Entering an airport by identifier.

```
apt:KJAC NW USA
JACKSON----- WY
JACKSON HOLE
```

Entering an airport by city.

To choose a waypoint type (for viewing information):

1. Press **WPT** and, if necessary, rotate until the Waypoint Menu page is displayed.
2. Press **CRSR** and rotate until the desired waypoint type is highlighted. Press **ENT**.

Airports, VORs and NDBs may be entered by either the identifier, the facility name, or the city and state in which it is located. Intersections and user waypoints must be entered by identifier.

To enter waypoints by identifier:

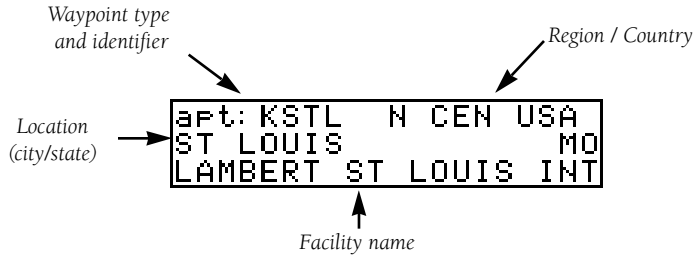
1. Use and to enter the waypoint identifier in the first field on the page.

As the identifier is entered, the GPS 150 will display any waypoint with the same identifier you have entered so far. When the desired waypoint is displayed, press **CRSR** to remove the cursor.

To obtain waypoint information by entering the facility name of an airport, VOR or NDB, or the city in which an airport, NDB or VOR is located:

1. Press **WPT** and rotate until the Waypoint Menu is displayed.
2. Press **CRSR** and rotate to highlight the type of waypoint you wish to view.
3. Press **ENT** to accept the waypoint type.
4. Use to highlight the middle field to enter the city, or:
5. Use to highlight the bottom field to enter facility name, or VOR/NDB name.
6. Use and to enter the location or the name (do not use punctuation).
7. Press **CRSR** to remove the cursor when the desired waypoint is displayed.

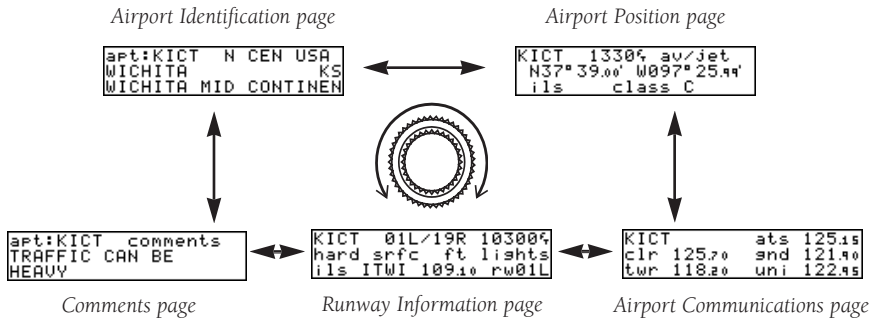
As soon as the desired identifier or location is displayed, press **CRSR**. This will leave the following Waypoint Identification page displayed:



If the city and/or facility name is too long to fit on the displayed line, it will scroll to show more information when the cursor is removed.

Airport Information

When an airport is entered, the Waypoint Identification page above will be displayed. The airport also contains a Position page, a Communications page, a Runway Information page and a Comments page.



REFERENCE

Airport Position Page

```
KMEM 3304 av/jet
N35° 02.56' W089° 58.44'
ils class B
```

Airport Position page for KMEM.

```
KIXD 10904 av/jet
N38° 49.71' W094° 53.65'
ils radar
```

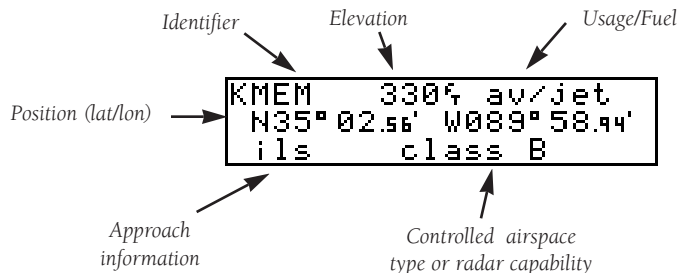
Airport Position page for KIXD.

```
3VS 10304 av gas
N38° 25.47' W092° 52.77'
no apr
```

Airport Position page for 3VS.

To display the Airport Position page:

1. Rotate  until the Airport Position page is displayed (with the cursor not flashing).



The fields on the Airport Position page display the following information:

Elevation - In feet or meters.

Usage/Fuel - If the airport is for military use, it will display **'military'**. If it is private, the GPS 150 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
- **jet** - Jet A, Jet A-1, or Jet A+
- **av/jet** - Both av gas and jet are available

Approach Info - 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 - displays controlled airspace type and if radar is available.
or Radar Information

- **class B**
- **class C**
- **cta** - ICAO control area
- **tma** - ICAO terminal control area
- **radar** - indicates radar is present

The GPS 150 database also contains most communication frequencies used at the facility.

To view the Airport Communications page from any of the airport information pages:

1. Rotate  while the cursor is not flashing to display the Communication page.
2. Rotate  to scroll through more communication frequencies (if available) and sector or altitude restrictions.

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

REFERENCE

Airport Communications Page



KLAX	apr	124.50
255-044°		

Frequency with sector restriction.

KMEM	ats	127.75
Ptx	125.20	gnd 121.65
gnd	121.90	twr 118.30

Airport Communications page for KMEM.

3VS	uni	122.80
-----	-----	--------

Airport Communications page for 3VS.

Section
2

REFERENCE

Runway Information

Section 2

```
IAN 06 /24 3400g
grav srfc Pc 122.40
```

Runway information for IAN.

```
KLAX 06L/24R 8900g
hard srfc ft lights
ils IUWU 108.50 rw06L
```

Runway information for KLAX.

```
3VS 07 /25 2800g
hard srfc ft lights
```

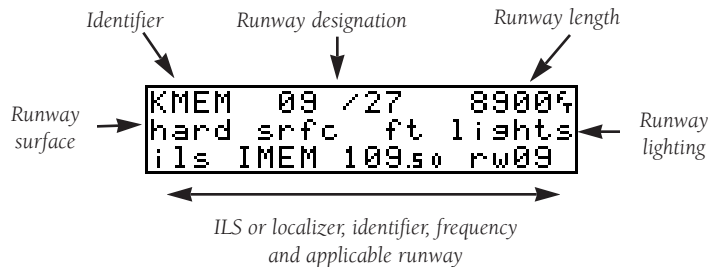
Runway information for 3VS.

If the frequency is receive only, the frequency type will be followed by 'x'. If the frequency is transmit only, it will be followed by 'x'. If the displayed frequency has sector and/or altitude restrictions, they will also be displayed. Sector restrictions define a range of radials from the applicable facility. Altitude restrictions may describe an area above, below, or between altitudes. In some instances, narrative restrictions that will not fit on the displayed line will scroll to display more information.

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

1. Make sure that the cursor is not flashing. If it is, press **CRSR**.
2. Rotate **⊖** until the Runway Information page is displayed.

The Runway Information page displays the following information:



To access more runway information while the cursor is not flashing, rotate **⊖**. If a localizer and ILS are used on the same runway, rotating **⊖** will display both sets of information.

The following runway information can be displayed on the Runway Information page:

Runway surfaces:

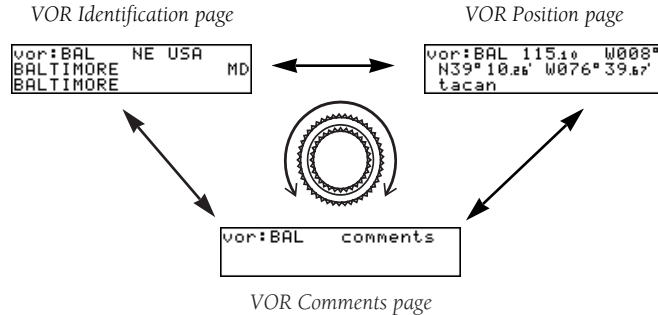
- hard** - Hard (concrete, asphalt, etc.)
- turf** - Turf (grass)
- seal** - Sealed surface
- grav** - Gravel surface
- dirt** - Dirt surface
- soft** - Unknown soft surface
- unkn** - Unknown surface
- watr** - Water landing site

Runway lighting:

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

VOR Information

After entering a VOR identifier, location, or name (as described on page 26), the VOR Identification page will be displayed. The GPS 150 contains three pages for each VOR: the VOR Identification page, the VOR Position page, and the Comments page.



REFERENCE


VOR Position Page

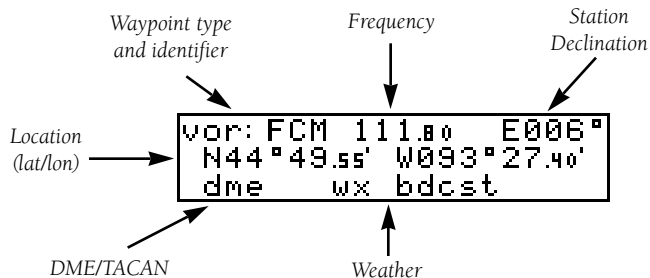
Section 2

```
VOR:MA 117.50 E006°  
S20°39.97' E139°29.00'  
dme
```

VOR Position page

To view the VOR Position page:

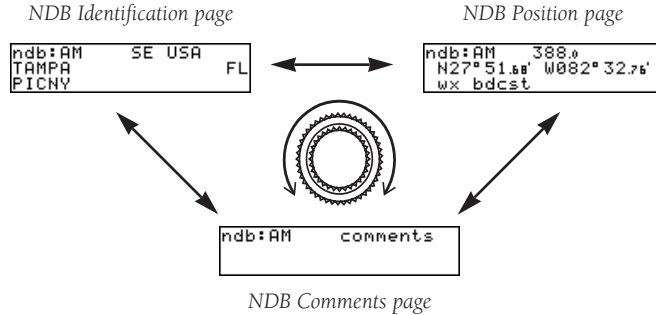
1. Make sure the cursor is not flashing. If it is, press **CRSR**.
2. Rotate  until the VOR Position page is displayed.



'**dme**' or '**tacan**' is displayed on the bottom line of the VOR Position page if there is a DME or TACAN facility also located with the VOR. The '**wx bdcst**' indicates that the VOR also transmits weather information. The station declination displayed on the top right is the magnetic orientation to which the VOR is set.

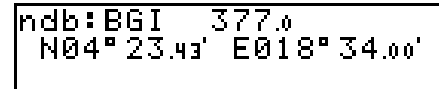
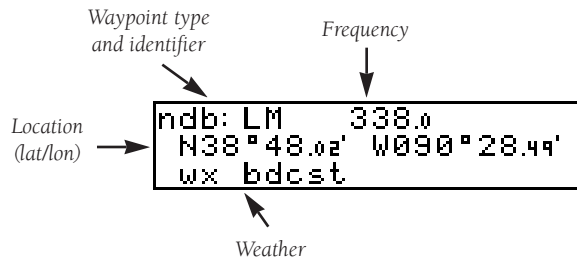
NDB Information

After entering the NDB identifier, city, or name, the NDB Identification page will be displayed. Like VORs, the GPS 150 displays NDB information on three pages: the NDB Identification page, the NDB Position page, and the Comments page.



To view the NDB Position page:

1. Make sure the cursor is not flashing. If it is, press **CRSR**.
2. Rotate **○** until the Position page is displayed.



NDB Position page

REFERENCE

Intersections & User Waypoints

```
int:RAZOR SE USA
N36°28.84' W079°22.41'
% DAN 203° 5.37%
```

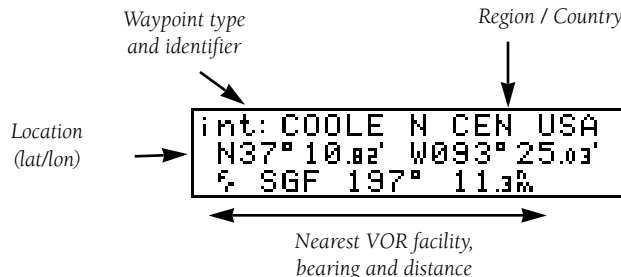
Intersection page

```
Select waypoint type
apt? vor? ndb?
int? user?
```

Waypoint Menu

Intersection Information

When an intersection identifier is entered, the following information will be displayed:



Note: The VOR displayed is the calculated nearest VOR, not necessarily the VOR used to define the intersection.

User Waypoint Information

User waypoints are created or modified using the **WPT** key. Selecting 'usr' as shown on page 26 will allow you to enter the waypoint identifier and modify the user waypoint. Note that this can also be done **ANY** time you are entering an identifier. If the identifier chosen is not contained in the database, the GPS 150 will assume you would like to create a new waypoint. There are three ways to create a user waypoint's position:

1. Enter the exact position of the new waypoint.
2. Reference a known waypoint (range and bearing from an airport, VOR, etc.)
3. Enter a range and bearing from your current position.

To create, edit or view a user waypoint:

1. Press **WPT** and rotate **⊙** until the Waypoint Menu is displayed.
2. Press **CRSR** and rotate **⊙** until the 'user?' field is highlighted. Press **ENT**.
3. Use **⊙** and **⊙** to enter the waypoint identifier. Press **ENT**.

If the waypoint is new, you will be prompted to select the method to enter the waypoint into the database. If the waypoint exists, skip the next step.

4. Select the method to enter the waypoint using and press **ENT**.

You will automatically be placed on either the latitude and longitude (if you selected 'enter posn?'), or on the 'from' field (if you selected 'ref wpt?'), or on the 'brg' field (if you selected 'rng/brg from posn?') (see User Waypoint page at right).

To enter 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°. Press **ENT**.
2. Use and to enter the longitude. You may select either east or west and enter a longitude up to (but not including) 180°. Press **ENT**.

You may also enter a reference waypoint to calculate a bearing and distance.

To enter the reference waypoint, bearing and distance:

1. Use and to enter the reference waypoint's identifier. Press **ENT**.

This will display the latitude and longitude of the identifier, if you have not entered the user waypoint's position. If you have, it will remain unchanged, and the unit will calculate the bearing and distance to the identifier. If you would like to change this information, or did not enter the waypoint position, enter them now using and and **ENT** to accept. All of these functions may be used together to pinpoint the location of the new user waypoint.

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 from present position at which you would like the new waypoint to be located. This will calculate the latitude and longitude of the new waypoint. Press **ENT** to accept.



```
usr INDY is new
enter posn? ref wpt?
rng/brg from posn?
```

Selecting a method to enter a new user waypoint.

```
usr: _____
N ___ ° ___ ' E ___ ° ___ '
brg: _____ ° _____
```

User Waypoint page

```
usr: INDY
N31° 35.02' W052° 49.10'
brg: _____ ° _____ ok?
```

Entering the user waypoint's exact position.

```
Save wpt: +000
N38°56.02' W095°40.11'
Store in rte: __ ok?
```

AutoStore page

```
Save wpt: MONTE
N38°56.02' W095°40.11'
Store in rte: 8 ok?
```

Changing the waypoint name and route number.

```
wpt:KLAX  comments
WATCH FOR HEAVY
REGIONAL TRAFFIC
```

User comments on KLAX.




User waypoints may also be created using AutoStore™. This will save your current position as a user waypoint and can instantly be added to any route.

To AutoStore your current position as a waypoint:

1. Press **NAV** and rotate  until the Position page is displayed. Press **ENT**.

This will display the AutoStore page which will allow you to rename the waypoint if you would like and also to choose the route to which it will be added.

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



1. Rotate  until the name field or the route number field is highlighted.
2. Enter the new name or route number by using  to change the character and  to advance the cursor. Press **ENT** to accept.

If the waypoint name is already used, you will be informed with the message 'WPT exists ____'. The default waypoint number will be redisplayed. The waypoint will be added to the end of the route you select, or none, if the field is left blank. If the route you choose already contains 31 waypoints, you will be informed with a 'Route is full' message. If this occurs, select another route to add waypoints.

User Comments on Waypoints

All of the waypoint types contain pages for the user to enter up to two lines of comments for later reference. You may add comments on up to 250 waypoints, which are saved even when the unit is off.

To enter user comments from any of the waypoint pages:

1. Rotate  while the cursor is not flashing until the 'Comments' page is displayed.
2. Press **CRSR** and rotate  to highlight the comment you would like to edit, or the blank field to enter a new one.

- Use and to enter the comment.
- Press to accept, and repeat, if desired, to enter information on another line.
- Press to complete.

Proximity Waypoints

The GPS 150 will allow you to enter up to 9 proximity waypoints, which will display an alert message when you come within a user entered distance of them.

To create or edit a proximity waypoint:

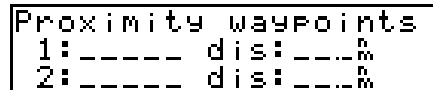
- Press and rotate until the Proximity Waypoint page is displayed.
- Press and rotate to highlight the first available field to create a new one, or the desired proximity waypoint.
- Use and to enter the identifier. It may be an airport, VOR, NDB, intersection, or user waypoint. Press .

This will display the Waypoint Confirmation page. Press to confirm the waypoint.

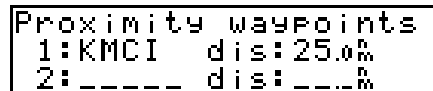
- Use and to enter the distance away from the waypoint that you wish to be alerted. Press .

If you enter two proximity waypoints whose alert regions overlap, you will be informed with the message 'Proximity overlap'. This message will be displayed each time you turn on the GPS 150 as long as the overlap remains.

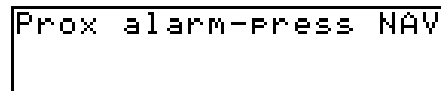
WARNING: If you enter the overlap area you will only be informed of the **nearest** proximity waypoint.



Proximity Waypoint page



Proximity Waypoint page



Proximity alarm

REFERENCE

Proximity Waypoints & User Waypoint Catalog

Section 2

```
3 user waypoints  
FLTCH (PRX)  
INDY in rt 5
```

User Waypoint Catalog

To delete a waypoint from the Proximity Waypoints page:

1. Rotate **○** to display the waypoint you would like to remove.
2. Press **CRSR**, if necessary, to obtain a cursor.
3. Rotate **○** to highlight the waypoint you would like to remove.
4. Press **CLR** to erase the name and then **ENT** to delete.

If you enter the proximity region, a 'Prox alarm - press NAV' message will be displayed. Pressing NAV will display the Position page, and the proximity waypoint's identifier, range and bearing will be listed in the proximity field at the bottom of the page.

User Waypoint Catalog

The User Waypoint Catalog is available to quickly scan, edit, activate, rename, or delete user waypoints.

To display the User Waypoint Catalog:

1. Press **WPT** and rotate **○** until the User Waypoint Catalog is displayed.
2. Rotate **○** to scroll through all of the available user waypoints.

When the User Waypoint Catalog is displayed, notice that any waypoint which is contained in a route or acts as a proximity waypoint is designated. To edit, activate, rename, or delete waypoints, the desired waypoint must be highlighted.

To highlight a waypoint that is displayed on the User Waypoint Catalog:

1. Press **CRSR** and rotate **○** until the desired waypoint is highlighted.

To edit a waypoint:

1. Press **ENT** while the waypoint is highlighted to obtain the Waypoint Position page. Edit the waypoint as described on pages 34 & 35.

To activate a user waypoint (perform a direct-to) from the list:

1. Press **→** while the waypoint is highlighted.

To delete a waypoint from the list (cannot be contained in a route or be a proximity waypoint):

1. Press **CLR** while the waypoint is highlighted. Press **ENT** to delete.

To rename a waypoint from the list:

1. Press **CLR** while the waypoint is highlighted to clear the name. Use **⦿** and **○** to enter a new identifier for the waypoint.
2. Press **ENT** on the Rename Waypoint Confirmation page to change the name, or press **CLR** to cancel.

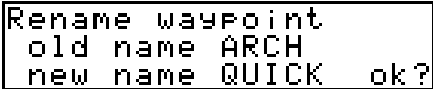
Waypoint Comment Catalog

The Waypoint Comment Catalog lists all waypoints which have user comments.

To review the waypoints with comments:

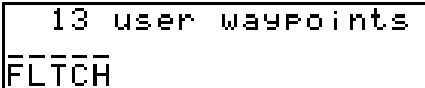
1. Press **WPT** and use **○** to display the Waypoint Comment Catalog page.
2. Rotate **⦿** to scroll through the list.

These waypoints may be highlighted, reviewed, changed, etc. just as they would if they were accessed from the Waypoint Menu. The waypoint comments appear first, and other pages can be viewed by rotating **⦿**.



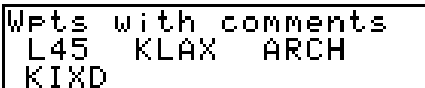
```
Rename waypoint
old name ARCH
new name QUICK ok?
```

Renaming a user waypoint.



```
13 user waypoints
FLTCH
```

Deleting a user waypoint.



```
Wpts with comments
L45 KLAX ARCH
KIXD
```

Waypoint Comment Catalog

REFERENCE

Duplicate & Locked Waypoints

```
2 duplicate MA
1 ndb S CEN USA?
2 ndb CANADA?
```

*Duplicate Waypoint page
(for the Americas Database)*



```
Proximity wpt locked
Route wpt locked
Wpt comment locked
```

Alarms possible for locked waypoints.

Duplicate identifiers for waypoints sometimes exist when identifier names have been used in more than one location. For example, the identifier MA is used in nineteen different locations throughout the world (fewer are contained on the Americas or International databases).


When you enter an identifier (as listed throughout the manual) that is a duplicate, you will be prompted to select which waypoint you desire with a Duplicate Waypoint page **BEFORE** the Waypoint Confirmation page appears (as shown on the left). The Duplicate Waypoint page will display the number of duplicate waypoints, the identifier, and the region or country in which each waypoint is located. This list is sorted with the nearest waypoint listed first.

To select the desired waypoint on the Duplicate Waypoint page:

1. Rotate  to select the desired waypoint and press  to choose the highlighted waypoint as the desired location.

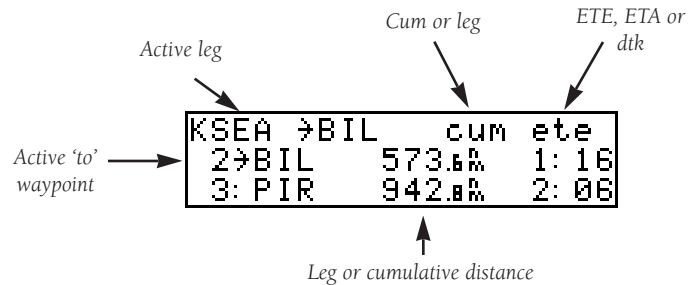
This displays the Waypoint Confirmation page, and you may continue normal operation.

Locked waypoints exist when a waypoint contained in a route or used as a proximity waypoint is not contained on the NavData Card, or no card is inserted. When this occurs, you will be informed with either a 'Proximity wpt locked' or a 'Route wpt locked' when the unit is powered up. Additionally, if a waypoint that contains a user comment is locked, you will be informed with a 'Wpt comment locked' message on startup.

In these cases, you will not be able to obtain information on or navigate to these waypoints. You may display the identifier of each locked waypoint by highlighting the 'lockd' with the cursor and pressing . Anywhere these waypoints' identifiers are to be displayed will be replaced with a 'lockd' message. You may delete these waypoints from routes, the User Comment Catalog, or the Proximity Waypoint page, but you cannot activate them for navigation.

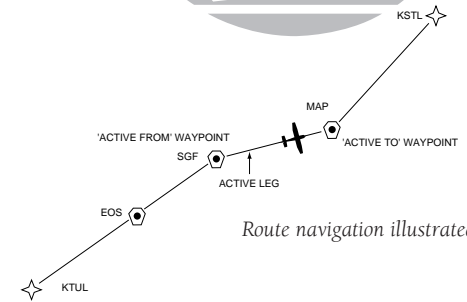
Section 3 Routes

All routes are created, edited, activated and copied using the **RTE** key. Routes are a series of waypoints flown in order to arrive at the desired destination. The GPS 150 contains two route pages, the Active Route page and the Route Catalog page. Pressing **RTE** will display one of the route pages, and rotating **⊙** will display the other. The Active Route page contains the following information:



The active leg field displays the beginning and ending waypoint identifiers of the leg you are currently navigating. The first waypoint identifier is the 'active from' waypoint. The second waypoint is the 'active to' waypoint. The line connecting these waypoints is known as the 'active leg' (see diagram at right).

The 'cum or leg' field can be selected to display 'cum' for cumulative distance and etc, or 'leg' to display each leg's distance and etc. If cumulative is selected, the first leg's distance will be displayed, and the second leg's distance will be the first plus the second, and so on. This also applies to the etc field. If leg is selected, each leg's distance and etc/eta will be displayed. If dtk or eta is displayed in the etc/eta field, it will be unaffected by the cum/leg selection - it will always display the desired track of the leg or the time it will be complete.



ACTIVE FROM WAYPOINT	ACTIVE TO WAYPOINT	ACTIVE LEG
SGF → MAP	cum	dtk
3 → MAP	9.0%	081°
4: KSTL	163.9%	054°

Active Route page with cumulative distance and desired track displayed.

ACTIVE FROM WAYPOINT	ACTIVE TO WAYPOINT	ACTIVE LEG	ETE
SGF → MAP	leg	ete	
3 → MAP	8.33%	0:03	
4: KSTL	154.0%	1:05	

Active Route page with leg distance and ETE displayed.

REFERENCE

Route Information

You can create routes by either adding new waypoints to the active route (if it is empty) as shown on the right, or by editing any of the other 19 routes as described on page 44.

```
KTOP →EMP  leg dtk
2→EMP  76.40 %  204°
3:M_____ %  ___
```

Adding a waypoint to the active route.

```
rte 0 activate?
KTOP /KOKC  241.03 %
Parallel trk: L 0.0%
```

Route Catalog page

To add waypoints to the active route (while on the Active Route page):

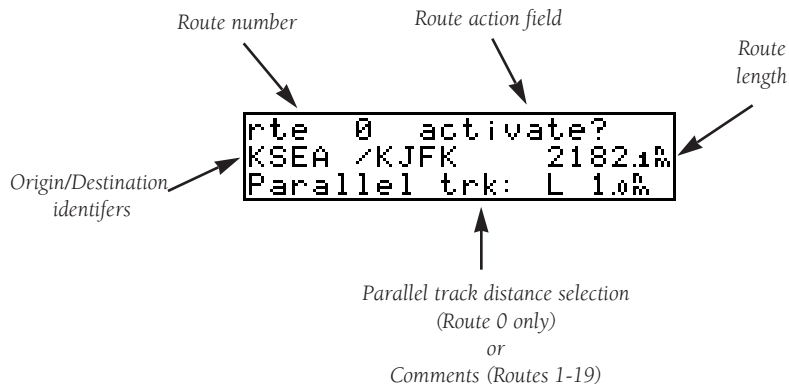
1. Make sure the cursor is not flashing. If it is, press **CRSR**.
2. Rotate **⬇** to display the waypoint you would like to insert the new waypoint BEFORE.
3. Press **CRSR**.
4. Rotate **⬆** to highlight the waypoint you would like to insert the new waypoint BEFORE.
5. Use **⬇** and **⬆** to enter the new waypoint identifier. Press **ENT**.


You will be prompted to accept the new waypoint with the Waypoint Confirmation page. If you make a mistake entering the waypoint, or do not wish to add the waypoint, press **CLR**; or press **ENT** to add the new waypoint.

To display the Route Catalog page:

1. Press **RTE** and rotate **⬆**, if necessary.




The Route Catalog page displays the following information:



Rotate  to scroll through the available routes. You may perform the following functions on any of the routes in the route action field:




- **Activate** - activate the route for navigation
- **Reverse** - activate a route in reverse order
- **Edit** - create a new route, or edit existing routes
- **Delete** - delete a route
- **Copy** - copy a route to an empty route
- **CPA** - (Closest Point of Approach) calculate the closest point a route passes a waypoint
- **Search** - Perform search and rescue ladder operations

To activate a route:

1. Press **RTE** and rotate , if necessary, to display the Route Catalog page.
2. Rotate  until the route you would like to activate is displayed.
3. Press **CRSR** and rotate  until 'activate?' is displayed. Press **ENT**.

If the route is empty, you will be informed with a 'Route is empty' message. When any route is activated, it is automatically copied to route 0. Route 0 is **always** the active route. Before you create a new route 0, or edit route 0, be sure to copy it to another route, or it will be deleted. After traveling a route, or creating one using AutoStore™ (see page 36), you can activate the route in reverse order to return to the starting point quickly and easily.

To activate a route in reverse order:

1. Press **RTE** and rotate , if necessary, to display the Route Catalog page.
2. Rotate  until the route you would like to reverse is displayed.
3. Press **CRSR** and rotate  until 'reverse?' is displayed. Press **ENT**.

This will copy the route in reversed order to route 0 and display the Active Route page.



```

rte 0 activate?
KTOP /KOKC 241.03 %
Parallel trk: L 0.0%
  
```

Route Catalog page

```

rte 0 reverse?
KTOP /KOKC 241.03 %
Parallel trk: L 0.0%
  
```

Route Catalog page performing reverse function.

```

PER →EMP 1es dtk
3→EMP 72.48 % 022°
4:KTOP 52.52 % 021°
  
```

Route reversed while in flight.

REFERENCE

Editing Routes

```
rte 1 edit?  
KTOP /KOKC 241.03 M  
Parallel trk: L 0.0 M
```

Editing route 1.

```
1:KTOP 2:KFO_ rt  
3:EMP 4:PER 1  
5:KOKC 6:-----
```

Inserting a waypoint in route 1.

```
rte 0 delete?  
KTOP /KOKC 241.03 M  
Parallel trk: L 0.0 M
```

Deleting route 0.

To edit a route (add or delete waypoints):

1. Press **RTE** and rotate **○**, if necessary, to display the Route Catalog page.
2. Rotate **○** until the route you would like to edit is displayed.
3. Press **CRSR** then **ENT** when 'edit?' is highlighted.

This will display the Route Review page.

To add a waypoint:

1. Rotate **○** until the waypoint you would like to insert the new waypoint BEFORE is displayed.
2. Press **CRSR** and use **○** to highlight the above waypoint.
3. Use **○** and **○** to enter the new waypoint identifier. Press **ENT**.

The GPS 150 will display the Waypoint Confirmation page, or allow you to modify the waypoint, if it is a new user waypoint. (See pages 34 & 35 for user waypoint editing.)

3. Press **ENT** to accept.

You may repeat to enter more waypoints, or press **CRSR** to finish.

To delete a waypoint:





1. Press **CRSR** and rotate **○** until the waypoint you would like to delete is highlighted.
2. Press **CLR** to clear the name, then press **ENT** to delete.

You may repeat to delete more, or press **CRSR** to finish.

To delete an entire route:






1. Press **RTE** and rotate **○**, if necessary, to display the Route Catalog page.
2. Rotate **○** until the route you would like to delete is displayed.
3. Press **CRSR** and rotate **○** to display 'delete?'. Press **ENT** to delete, or **CLR** to cancel.

Route Copying and
Closest Pt of Approach (CPA)**To copy a route:**

1. Press **RTE** and rotate , if necessary, to display the Route Catalog page.
2. Rotate  until the route you would like to copy TO is displayed. (The route must be empty.)
3. Press **CRSR** and rotate  to display 'copy?'. Press **ENT**.
4. Use  to select the route you would like to copy from. The origin/destination identifiers will be displayed for your reference. Press **ENT** to copy the route.

The GPS 150 will also calculate the closest distance that a route will pass a waypoint. This is helpful when creating a new waypoint on your route referenced to a NAVAID. See page 46 for a diagram of the CPA function.

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

1. Press **RTE** and rotate , if necessary, to display the Route Catalog page.
2. Rotate  until the desired route is displayed.
3. Press **CRSR** and rotate  to display 'cpa?'. Press **ENT**.
4. Use  and  to enter the identifier of the waypoint from which the distance will be calculated.
5. Press **ENT** and the bearing and distance of the waypoint to the closest point on the route will be displayed. Press **ENT** to accept and insert into the route.

If the waypoint does not fall between the waypoints on the route, you will be informed with a 'Invalid CPA wpt ____' message. If the waypoint cannot be added to memory, you will be informed with a 'Wpt memory full' message. If you attempt to insert the CPA waypoint in a route that already contains 31 waypoints, you will be informed with the message 'Route is full'. The CPA waypoint will still be stored in the database.



```
Copy to route 5
from route 0?
KTOP /KOKC
```

Copying route 0 to route 5.

```
rte 0 cpa?
KTOP /KOKC 241.03 M
Parallel trk: L 0.0 M
```

Calculating CPA for route 0.

```
Closest Pt of approach
route 5 KTOP /KOKC
W:-----^-----M
```

Entering the CPA waypoint identifier.

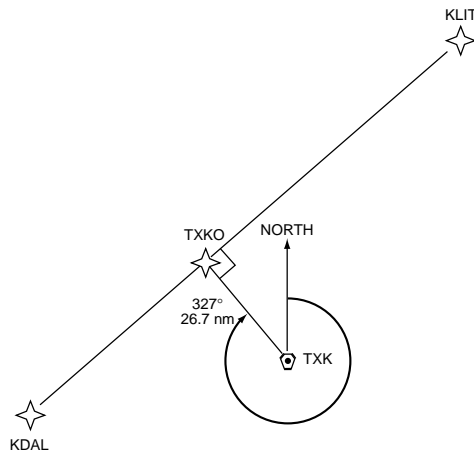
REFERENCE

CPA Diagram

```
Closest Pt of apprch  
route 6 KDAL /KLIT  
P:TXK 327°26.7% ok?
```

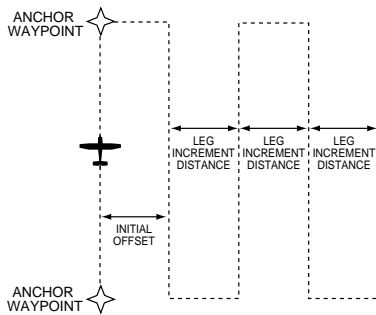
CPA page

The following diagram displays how the CPA function works. The route is from KDAL to KLIT, and the user desires to create a waypoint on the route in reference to TXK. The GPS 150 calculates the closest point the route comes to TXK, which the unit calls TXKO. The unit will display TXKO's range and bearing from TXK.



Closest Point of Approach (CPA)

The GPS 150 will attempt to match the NAVAIDs identifier to create a new identifier for the CPA waypoint. The GPS 150 will always add a numeral as the last character in the new identifier.



Search and rescue operations

The GPS 150 will also guide you on search and rescue operations, navigating in a ladder pattern to maximize coverage and minimize navigational planning. This is done in reference to two waypoints, called the anchor waypoints. The first leg of the route will be a line connecting the anchor waypoints. 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 as described on page 42 or 44.
2. Press **RTE** and rotate **○**, if necessary, to display the Route Catalog page.
3. Rotate **●** until the 2-waypoint route to use as anchor waypoints is displayed.
4. Press **CRSR** and rotate **●** until 'search?' is displayed. Press **ENT**.
5. Use **●** and **○** to enter the leg increment value, and R(right) or L(left). Press **ENT**.
6. If you are restarting a search, rotate **○** to highlight the initial offset field, and use **●** and **○** to enter the initial offset value, and R or L.
7. Press **ENT** three times to accept the Search and Rescue operation values, and begin navigation.

After activating the search and rescue, you will be informed with an 'Offset nav in effect' message each time you traverse the route offset from the anchor waypoints. Upon arrival at the destination waypoint, the leg increment will be added to your present offset, and the route will automatically be reversed.

```
rte 0 search?
KLWC /KTOP 19.20%
Parallel trk: L 0.0%
```

Using search and rescue operations.

```
Route 0 KLWC /KTOP
initial offst:R___%
increment:L02.0% ok?
```

Entering initial offset and leg increment.

If search and rescue operations are interrupted, note the parallel track direction (R or L) and distance on the Route Listing page for route 0. When you resume search and rescue operations, use this as the initial offset.

REFERENCE

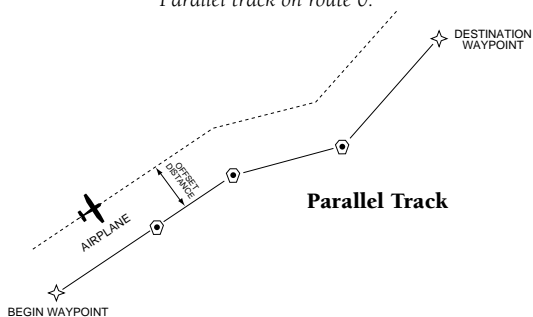
User Comments & Parallel Track

```
rte 2 activate?  
KTOP /KOKC 241.03 M  
TOPEKA_TO_OKLA_CITY_
```

User comments on the route.

```
rte 0 activate?  
KTOP /KOKC 241.03 M  
Parallel trk: L08.0%
```






Parallel track on route 0.



Parallel Track






The GPS 150 will also allow you to add one line of comments to each route, which will be displayed on the Route Catalog page. This excludes route 0, which will display the offset navigation field.

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

1. Press **RTE** and rotate , if necessary, to display the Route Catalog page.
2. Rotate  until the route you would like to add comments to is displayed.
3. Press **CRSR** and rotate  to highlight the bottom row.
4. Use  and  to enter the comments, and press **ENT**.
To erase, press **CLR** followed by **ENT**.

During en route navigation, it is sometimes desirable to navigate a certain distance away from the 'active leg'. This can help avoid certain airspace or regions. The GPS 150 will automatically guide you along a parallel track of a route.

To use offset navigation, or parallel track:

1. Press **RTE** and rotate , if necessary, to display the Route Catalog page.
2. Rotate  until route 0 is displayed. (Parallel track can only be used on the active route).
3. Press **CRSR** and use  to highlight the parallel track distance field.
4. Use  and  to enter the distance from the actual route you would like to navigate, and either R(ight) or L(eft). Press **ENT**.

Offset navigation is only available on route navigation, not direct-to. When offset navigation is activated, an 'Offset nav in effect' message will be displayed. If you enter too large an offset, you will be informed with the message 'Ofst too big for rte'. If you change the active route in any way, or perform a direct-to, offset navigation will be stopped, and you will be informed with the message 'Offset nav cancelled'. See the diagram on the left for offset navigation reference.



Section 4

Nearest Waypoints



The GPS 150 will locate and display the nine nearest airports, VORs, NDBs, intersections and user waypoints within 200 nautical miles of your current position. In addition, it will also display the two nearest Flight Service Station (FSS) points of communication, and any Special Use Airspace alert information and messages that could affect your flight. SUAs are either controlled or restricted airspace.

To begin viewing the nearest waypoint information:

1. Press **NRST**.

This will display the nearest airport. The airport shown is subject to the runway surface type and minimum runway length you may have selected. (See Section 5, page 56). **To scroll through the next eight nearest waypoints, rotate** . The other nearest waypoints of each type may be viewed by rotating . For any of the nearest airports, you may examine both the communication frequencies and the runway information directly from the Nearest Airport page.

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 **CRSR**, if necessary, and highlight the identifier by rotating .
2. Press **→**.

This will display the Waypoint Confirmation page. To accept, press **ENT**. To cancel the operation, press **CLR**.

REFERENCE

Nearest Waypoints



```
nr1 apt KEGT 1270%  
193° 5.47% uni 122.80  
rnwy 17 /35 3500%
```

Nearest airport

```
nr1 apt KEGT 1270%  
193° 5.47% apr 134.80  
rnwy 17 /35 3500%
```

Nearest airport with other frequency information.

```
nr8 apt KICT 1330%  
339° 15.0% twr 118.20  
rnwy 01L/19R 10300%
```

Eighth nearest airport.

REFERENCE

Special Use Airspace

```
sua1 near&ahead 1:31  
KANSAS CITY c1 B  
KMCI 8000%M- ground
```

Nearest SUA

```
sua1 near < 2nm  
FAA KANSAS CITY ARTC  
29000%M- ground
```

Nearest SUA with controlling agency displayed.

NOTE: The GPS 150 will flash the **A** next to the **STAT** key to inform you of SUA alerts. You do not have to repeatedly check the Nearest Waypoint page for SUA information. It is provided to supply more information on the SUA and its boundaries. The GPS 150 will not flash an alert, however, if they have been turned off, or your altitude is such that you will not enter the buffered airspace. Turning off SUA alerts and setting the altitude buffer is covered in Section 5, page 59. **ANY** SUA that meets the above conditions will be displayed on the nearest pages.

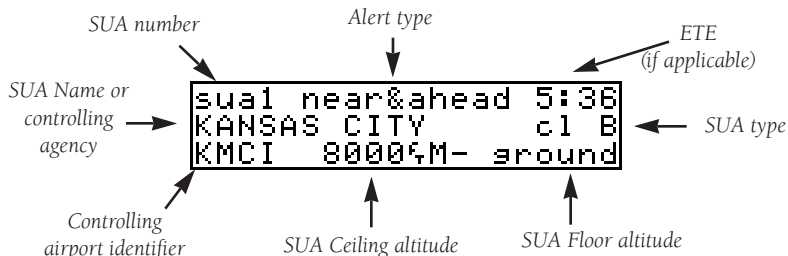
The SUA Alert page will inform you if any restricted or controlled airspace is near or in your flight path, according to the following conditions:

- 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.

To view the SUA alerts (if present):

1. Press **NRST** and rotate **⊖** to display the SUA Alert page.
2. Rotate **⊖** to scroll through more information, or more SUAs.


The SUA Alert page contains the following information:




The 'SUA number' field displays which SUA you are viewing. SUAs are listed with 'sua1' being the highest priority, and 'sua9' being the lowest priority from your current position. The 'Alert type' field displays the corresponding alert message for this SUA, such as near, near and ahead, etc. The ETE (estimated time enroute) will be displayed only if you are projected to enter the airspace. The 'SUA type' field displays the controlled airspace type.

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 SUA name is displayed on the center line initially and the controlling agency can be viewed by rotating . You may also view SUA controlling agency communication frequencies by highlighting the controlling airport identifier with the cursor and pressing

 The following are examples of what can appear in the altitude fields:

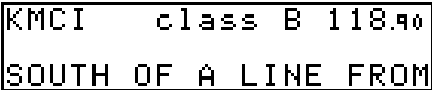
Message	Meaning
8000 ^f M	- 8000 feet mean sea level (MSL)
3000 ^f A	- 3000 feet above ground level (AGL)
ground	- ground level
msl	- mean sea level
notam	- See Notice to Airmen (NOTAM) for altitude restrictions
not sp	- Altitude is not specified
unlmt	- Altitude is unlimited



```

sua1 near&ahead 1:31
KANSAS CITY      cl B
KMC  8000fM-  ground
  
```

SUA Alert page



```

KMC  class B 118.90
SOUTH OF A LINE FROM
  
```

Frequency information for SUA.

REFERENCE

SUAs and other Nearest Waypoints

```
nr1 vor RIS 111.40  
151° 4.97 M dme  
RIVERSIDE
```

Nearest VOR

```
Nearest intersectns  
1 JAMES 077° 3.83 M  
2 KENZY 063° 3.96 M
```

Nearest intersections

```
nr1 fss COLUMBIA  
122.15
```

Nearest FSS

All SUA alerts (except for prohibited areas) may be turned on or off to avoid unnecessary alerts. Alerts for prohibited areas will always be displayed. An altitude buffer also may be set to extend the vertical profile of your aircraft to provide earlier warnings when climbing or descending.

For example, if you are 1500 feet above an SUA, and the altitude buffer is set to 1000 feet, you will not be notified with an alert message. Turning the SUA alerts on and off and setting the altitude buffer is covered in Section 5, page 59. The SUA information **will** still be displayed on the SUA Alert page using the **NRST** key.

To view any of the other nearest waypoints (VORs, NDBs, intersections, user waypoints and FSSs):

1. Press **NRST**.
2. Rotate **○** to display the nearest waypoint of each type.
3. When the desired waypoint type is displayed, rotate **●** to scroll through the next eight nearest waypoints of the same type (FSSs will have only two entries).

To perform a direct-to at any time, simply highlight the identifier with the cursor and press **→**. To view more information on the waypoint, highlight the identifier and press **ENT**. This will take you to the waypoint pages as described in Section 3.

The FSS page displays information on the two nearest FSS points of communication.

To view additional frequency information regarding FSSs:


1. Press **CRSR** and rotate **●** to view additional FSS frequencies.

The FSS page will display ^Tf and the VOR the FSS transmits through, if applicable. Frequencies which are transmit or receive only are designated with a ^Tx or ^Rx, respectively.

Section 5

Unit Settings and Satellite Status

The GPS 150 will allow you to customize many settings to your preferences. Also, it will provide information on the satellites it is currently tracking, which is helpful in alerting you to possible problems with antenna installation, or receiver problems.

All of the GPS 150's settings are accessed using the **SET** key. After pressing **SET**, the following pages can be accessed by rotating  when the cursor is not flashing.

- **CDI Scale/Arrival Alarm settings**
- **Route settings (Auto leg sequencing and auto leg selection)**
- **Magnetic variation setting**
- **Nearest airport search (Runway length and surface type)**
- **Battery saver (Timeout delay)**
- **Trip timer setting**
- **Navigation units (Distance, speed, position, etc.)**
- **SUA settings (On or off and altitude buffer)**
- **Map datums**
- **I/O Channels 1 & 2 settings**
- **Arinc 429 Output configuration**
- **Data transfer**



CDI Scale, Arrival Alarm & Route Settings

```

CDI/Arrival
 cdi scale : 5.00
 arrival: 10.0%
  
```

CDI Scale/Arrival Alarm page

```

Route settings
 auto leg seq on
 auto leg slct on
  
```

Route Settings page

The course deviance indicator (CDI) may be set to deflect full scale at either 5 distance units (mi, nm, km) or 1.25 distance units. This setting will cause the CDI to deflect appropriately when you have cross track error. This page also contains the arrival alarm settings. The arrival alarm can be set to alert the pilot a specified distance from the destination waypoint. When this distance is reached, the message 'Arrival at ____' will be displayed.

To change the CDI sensitivity scale and arrival alarm:

1. Press **SET** and rotate until the CDI Scale/Arrival Alarm page is displayed.
2. Press **CRSR** and use to select either 5 units or 1.25 units. Press **ENT**.
3. Use and to enter the arrival alarm distance. Enter zero to turn the alarm off.
4. Rotate to highlight 'ok?'. Press **ENT** to confirm settings.




The GPS 150 automatically sequences the active leg of the current route to the next leg when you pass the 'active to' waypoint. This is known as automatic leg sequencing. It will also select the leg of a route nearest your current position when a route is activated. This is known as automatic leg selection. Both automatic leg sequencing and automatic leg selection may be turned off.

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

1. Press **SET** and rotate until the Route Settings page is displayed.
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 you turn automatic leg sequencing off, you must manually advance the route you are navigating to the next waypoint.



To manually sequence the active route legs:

1. Press **RTE** and rotate  until the Active Route page is displayed.
2. Rotate  until the next desired destination waypoint is displayed.
3. Press **CRSR** and rotate  to highlight the next destination waypoint.
4. Press **→**. Press **ENT** to confirm the waypoint.

This will change the leg of the active route, making the selected waypoint the 'active to' waypoint.

Similarly, if you turn automatic leg selection off, you must manually select the starting leg.

To manually select the active (starting leg):

1. Activate the desired route as described in Section 3, page 43.
2. Rotate  until the beginning waypoint of the desired leg is displayed.
3. Press **CRSR** and rotate  until the beginning waypoint of the desired leg is highlighted.
4. Press **→**. Press **ENT** to confirm the waypoint.

An on-route direct-to will provide course guidance to the selected waypoint and then provide guidance to navigate the remaining legs of the route (providing automatic leg sequencing is on).



PER	→EMP	1es	dtk
3	→EMP	72.48 %	022°
4	:KTOP	52.52 %	021°

Active Route page

Magnetic Variation & Runway Settings

```
Magnetic variation
auto mag E004°
```

Magnetic variation with auto mag selected.

```
Magnetic variation
user mag: E011°
```

User magnetic variation set to E011°.

```
Nearest apt search
min rnwy len: 2000ft
hard only srfc ok?
```

Nearest Airport Search page

The next Settings page contains the magnetic variation options. The GPS 150 offers three magnetic variation settings. True, automatic, or user defined magnetic corrections will be applied to all track, course and heading information.

To set the magnetic variation:

1. Press **SET** and rotate until the Magnetic Variation page is displayed.
2. Press **CRSR** and rotate to select 'auto mag', 'true hdg' or 'user mag'.
3. If 'user mag' is selected, use to highlight the magnetic variation value field and and to enter the value, and E or W. Press **ENT** to accept.
4. Press **CRSR** to complete.

If 'auto mag' is selected, all heading information will be corrected with the automatic magnetic variation computed by the GPS 150, depending on your position. If you select 'true hdg', all heading information will be referenced to true north. If 'user mag' is selected, all heading information will be corrected by the value you enter.

When using the nearest function to locate the nine nearest airports, it will display the nine closest airports according to the parameters you may choose. A surface type and minimum runway distance may be selected to prevent airports with small runways, or runways that are not of appropriate surface from being displayed.



To set the minimum runway length and runway surface:

1. Press **SET** and rotate until the Nearest Airport Search page is displayed.
2. Press **CRSR** and use and to enter the minimum runway length required for your aircraft to land (up to 9999 units). Press **ENT**.
3. Rotate to display the surface selection you desire. Choices include:
 - any surface
 - hard only surface
 - soft/hard surface
 - water only surface
4. Rotate to select 'ok?' and press **ENT** to confirm. Press **CRSR** to complete.

Display Timeout &
Trip Timer Settings






In the event of power failure, the GPS 150 can automatically turn off the display while using battery power, if desired. This will greatly increase the GPS 150's battery life while navigating without aircraft power. During the time the display is off, the GPS 150 will continue to navigate and track satellites, but not display information until a key is pressed, or a knob is turned.

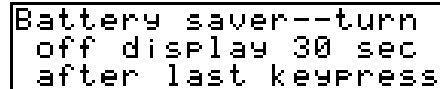
To set the display timeout:

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

The trip timer (described in Section 1, page 20) can be configured to run when the power is on, or when your ground speed exceeds a specified minimum.

To change the trip timer settings:

1. Press **SET** and rotate  until the Trip Timer Settings page is displayed.
2. Press **CRSR** and rotate  to display either 'pwr is on' or 'gs exceeds'.
3. If you choose 'pwr is on', press **CRSR** to complete.
4. If you choose 'gs exceeds', rotate  to highlight the speed field.
5. Use  and  to enter the ground speed to be used as the minimum.
6. Press **ENT** to accept, and **CRSR** to complete.



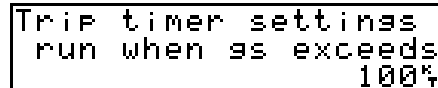
Battery saver--turn
off display 30 sec
after last keypress

*Battery Saver page set to
30 second display timeout.*



Trip timer settings
run when pwr is on

Trip Timer Settings page



Trip timer settings
run when gs exceeds
100k

Trip Timer Settings page set to 100 knots.

The GPS 150 will allow you turn the SUA alert messages on or off. This will not affect the airspace being listed on the SUA Alert page, it will simply turn off the alert messages when you are approaching or near an SUA. You can turn off alerts for the following airspaces:






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

Other areas include alert, caution, danger, training, unspecified, unknown and warning airspaces.

The 'alt' field is an altitude buffer which may be set so that SUA alerts do not appear if you are a given vertical distance above or below an SUA.

For example, if the buffer is set at 500 feet, and you are at least 500 vertical feet away from an SUA and NOT projected to enter it, then you will not be notified with an SUA alert message.

To set the warnings or change the altitude buffer:

1. Press **SET** and rotate  until the SUA Settings page is displayed.
2. Press **CRSR** and rotate  to highlight the field you would like to change.
3. Rotate  to change to 'on' or 'off'.
4. To change the altitude buffer, highlight the buffer value, and use  and  to change the data. Press **ENT** to accept.
5. Press **CRSR** to complete.



```
cl B/cta on moa on
cl C/tma on oth on
alt: 200% rstcd on
```

SUA Settings page

```
cl B/cta off moa on
cl C/tma off oth on
alt: 100% rstcd on
```

SUA Settings page

REFERENCE

Map Datums

```
Map datum
WGS 84
Define user datum?
```

Map Datum page

```
dx: 300% dy: -200%
dz: 140% da: 50%
df: -1.00000000e-4 ok?
```

User Datum page



```
Map datum
USER
Define user datum?
```

Map Datum page with 'User' selected.






The GPS 150 contains over 100 map datums for you to use when navigating with the GPS 150. By default, your GPS 150 calculates positions using the WGS-84 map datum. If you are using charts based on another datum, you must set the GPS 150 to use that datum if you are using the coordinates provided on that chart. Using the WGS-84 datum on the GPS 150 while using a different datum for maps or other navigation devices could result in significant differences in position information.

If you are using maps for reference only, the GPS 150 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 rotate  until the Map Datum page is displayed.
2. Press **CRSR** to highlight the current map datum.
3. Rotate  to change the datum.
4. Press **CRSR** to complete.

To create a user datum:

1. Press **SET** and rotate  until the Map Datum page is displayed.
2. Press **CRSR** and rotate  to highlight 'Define user datum?'. Press **ENT**.
3. Enter the 5 parameters of the map datum using  and . Press **ENT** to accept a field. The sign of each value (+/-) should follow the convention: WGS84-local geodetic system.
4. Rotate  to highlight 'ok?' and press **ENT**.
5. To activate the user datum, select 'USER' on the map datum page as described above.

The GPS 150 features two RS-232 data ports which can be configured to accept input from altitude serializers, fuel flow systems, fuel/air data computers or output aviation data to moving maps, fuel flow sensors, or the GARMIN PC 150 software kit.

Channel 1 **input** selections correspond to the following:

- Icarus Model 3000 Mode C serializer (**icarus-alt**)
- Shadin serial altitude (**shadin-alt**)
 - 8800T Series Encoder System
 - 9000T Serializer System
 - 9200T Series Serializer System
- Shadin fuel information (**shadin-fuel**)
 - Shadin 91204XT Digital Fuel Management System
 - Shadin 91053XT Digital Fuel Management System
- Fuel information (**arnav/ei-fuel**)
 - Arnav Model FC-10 Fuel Computer
 - Arnav Model FT-10 Fuel Totalizer
 - Electronics International Model FP-5L Fuel Flow Computer
- Shadin Model 962801 Fuel/Air Data Computer (**shadin-fac**)

Channel 1 **output** selection corresponds to the following:

- Serial position, velocity, and navigation data (**aviation**)
 - Argus Model 3000 Moving Map
 - Argus Model 5000 Moving Map
 - Argus Model 7000 Moving Map
 - Stormscope, Series II with Navaid, Moving Map
 - Shadin 91204X[T] Digital Fuel Management System
 - Shadin 91053X[T] Digital Fuel Management System
 - Shadin Model 962801 Fuel/Air Data Computer
 - Electronics International Model FP-5L Fuel Flow Computer



I/O Channel Settings & ARINC 429 Output

```
I/O Channel 1
in  off
out off
```

I/O Channel 1 page





```
I/O Channel 1
in  arnav/ei-fuel
out aviation
```

I/O Channel 1 page

```
ARINC 429 Output
with GAMA labels
```

ARINC 429 Output page

To change the Input/Output settings (channel 1 or channel 2):



1. Press **SET** and rotate  until the I/O Channel 1 (or 2) page is displayed.
2. Press **CRSR** and rotate  to select the field you would like to change.
3. Rotate  to select the proper setting.
4. Rotate  to highlight another, or **CRSR** to complete.
5. To use the PC 150 interface kit, the GPS 150 channel 2 settings must be: in: off, out: plotting. Set the baud rate to 9600. Press **CRSR** to complete.

```
I/O Channel 2
in  off
out plotting 9600
```

Channel 2 Setup for use with the PC 150 interface kit.



The GPS 150 can also output data to EFIS and other ARINC 429 devices used for navigation. The unit may be configured to output the data with or without GAMA labels. GAMA labels are required if the device uses route specific information such as identifiers, location, etc., or to use the nearest waypoint information.

To set the ARINC 429 output:


1. Press **SET** and rotate  until the ARINC 429 Output page is displayed.
2. Press **CRSR** and rotate  to change to 'off', 'with GAMA labels', or 'w/o GAMA labels'.
3. Press **CRSR** to complete.

The GPS 150 can also interface to another GPS 150 to transfer user waypoints, settings and other user information between units. These operations are performed from the Data Transfer page.

To receive user data from another GPS 150:



1. Press **SET** and rotate  until the Data Transfer page is displayed.
2. Press **CRSR** and rotate  to highlight 'Receive?'. Press **ENT**.

You may choose to 'Update user data?' or 'Replace user data?'. Updating user data will update ONLY the data received from the other GPS 150, and other data will not be affected. Replacing user data will erase the user data contained in the GPS 150 and replace it with data received from the other GPS 150. This only applies to data which can be updated by the user, such as user waypoints and routes.


3. Use  to select either 'Replace user data?' or 'Update user data?'. Press **ENT**.

The GPS 150 will now begin receiving data from the other GPS 150. Press **ENT** to stop.

To download user data to another GPS 150:

1. Press **SET** and rotate  until the Data Transfer page is displayed.
2. Press **CRSR** and rotate  to highlight 'Download?'. Press **ENT**.

The GPS 150 will now begin transmitting data to the other GPS 150. Press **ENT** to stop.



```
Data transfer
Receive? Download?
```

Data Transfer page

```
Receive
Update user data?
Replace user data?
```

Choosing to update or replace user data.

```
Download data
Stop?
```

Getting ready to download data.

REFERENCE

Receiver Status & Satellite Signal Level

```
3D Nav          epe 131%  
sat   3 14 18 19 22 25 28 29  
s91   2 7 5 7 9 5 - 8
```

Receiver Status page with EPE displayed.

```
3D Nav          dop 1.5  
sat   3 14 18 19 22 25 28 29  
s91   2 7 5 7 9 5 - 8
```

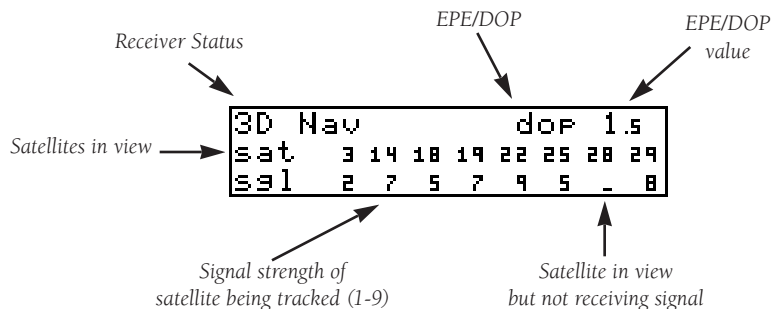
Receiver Status page with DOP displayed.

The GPS 150 is designed to allow the user to obtain satellite information at any time to monitor signal strengths and relative accuracy of the position information the receiver is calculating. This is especially helpful when you might be experiencing a problem with low signal levels due to poor coverage or installation problems.

To obtain receiver status and satellite signal levels:

1. Press **STAT** (while the **▶** is NOT flashing).

This will display the Receiver Status page:



Dilution of precision (DOP) is a measure of the satellite geometry quality and therefore, the 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 using signal and data quality, receiver tracking status and DOP as factors in computing the value displayed.

To view or change the EPE/DOP field:

1. Press **STAT**.
2. If the desired field (EPE or DOP) is not displayed, press **CRSR**.
3. Rotate **◉** to change between 'epe' and 'dop'. Press **CRSR** to complete.

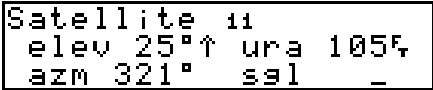


The Receiver Status field can display the following messages:

- Search Sky** - The GPS 150 is searching the sky for visible satellites. You will be informed with the message 'Searching the sky'.
- Acquiring** - The GPS 150 is acquiring satellites for navigation.
- 2D Nav** - The GPS 150 is in 2D navigation mode. If your installation does not include an altitude serializer, you must enter the altitude manually.
- 3D Nav** - The GPS 150 is in 3D navigation mode and will compute altitude.
- Simulator** - The GPS 150 is in simulator mode, which should only be used for practice and trip planning. **NEVER** use simulator mode for actual navigation.
- Poor Cvrge** - The GPS 150 cannot acquire sufficient satellites for navigation.
- Need Alt** - The GPS 150 needs altitude in order to start/continue navigation. Select the Position page and enter the altitude. (See Section 1 for more information.)
- Not Usable** - The GPS 150 is unusable due to incorrect initialization or abnormal satellite conditions. Turn the unit off and back on again. If this does not help, contact an authorized GARMIN dealer for service.

REFERENCE

Satellite Information



```
Satellite 11
elev 25°↑ ura 105%
azm 321° sbl -
```

Satellite Detail page

The GPS 150 will also display information regarding each satellite in view.

To view individual satellite information:

1. Press **STAT** (while the **▶** is NOT flashing).
2. Press **CRSR** to obtain a cursor.
3. Rotate **○** to highlight the satellite you wish to view.
4. Press **ENT**.

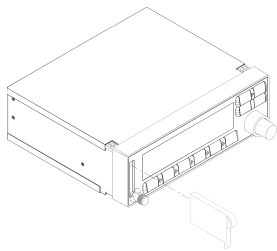
The Satellite Detail page will display the satellite number, elevation angle, rising/setting indication, user range accuracy (URA), azimuth and signal strength. Other satellites may also be viewed:

5. Rotate **○** to view information on the next satellite.
6. Rotate **○** and press **CRSR** on the Receiver Status page when you are finished.

Appendix A

NavData® and User Data Installation and Operation





The NavData card supplied with your GPS 150 can be installed or removed **ONLY** when the GPS 150 is turned off.




Insert the card with the thumb tab at the top, and the beveled corner on the bottom right.

The User Data 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 150.

To save the user data to the User Data card:

1. Install the UserData card while the unit is off.
2. Turn the GPS 150 on by rotating  clockwise.
3. Rotate  to highlight 'Save user data?'.

4. Press 

The message 'Saving to card' is displayed while the GPS 150 transfers all user data to the User Data card. It may take a few minutes to complete the transfer. When all user data is transferred, the GPS 150 will instruct you to turn the unit off, remove the user card and insert the Jeppesen NavData card. After this is complete, the GPS 150 is ready for normal operation.



```
User card transfer
Restore user data?
Save user data?
```

User Data card transfers.

```
Turn off GPS 150
Remove user card
Insert Jeppesen card
```

Message following User Data card transfer.

*User Data cards are available from
your local GARMIN dealer.*

APPENDIX A

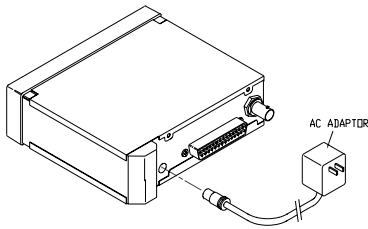
Data Transfer to other GPS 150s

```
User card transfer
Restore user data?
Save user data?
```



User Data card transfers.

```
Restore from card
all data
Replace? Update? ok?
```


Choosing to update or replace the user data.




To restore user data from a User Data card to the GPS 150:

1. Install the User Data card while the unit is off.
2. Turn the GPS 150 on by rotating  clockwise.
3. Rotate  to highlight 'Restore user data?' and press **ENT**.

The GPS 150 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. Rotate  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, but will only change what is necessary to use the data received from the User Data card.

5. Rotate  to select either 'Replace?' or 'Update?'.
6. Press **ENT** to begin transferring data to the GPS 150. The GPS 150 will now transfer all of the data requested. This may take a few minutes.
7. To continue with more data transfer types, repeat steps 4, 5 and 6; otherwise, press **ENT** when 'ok?' is highlighted.
8. Turn the GPS 150 off and replace the User Data card with a NavData® card. The GPS 150 is now ready for normal operation.

The GPS 150 may be powered from an optional AC adaptor when used away from the aircraft. The AC adaptor will both power the unit, and charge the NiCad battery. With the GPS 150 off, a full charge will occur in 12-14 hours. The GPS 150 should not remain connected to the AC adaptor for more than 24 hours continuously. Connect the AC adaptor as shown on the left.

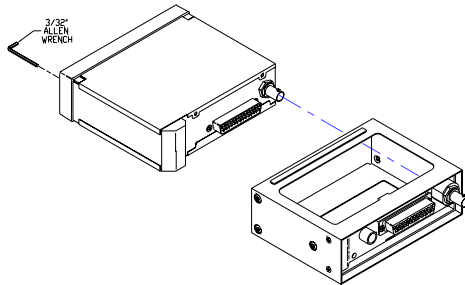
Appendix B

Installation, Removal and Maintenance of the GPS 150

The aviation rack is designed to allow easy removal of the GPS 150. This enables you to use the unit at home to create routes, interface to a PC, etc.

To install the GPS 150 into the aviation rack:

1. Insert a 3/32" allen wrench in the small hole adjacent to the dual knob.
2. Rotate the wrench counterclockwise until it stops to ensure the pawl latch is in the proper position.
3. Insert the GPS 150 into the aviation rack and rotate the wrench clockwise to secure the unit.
To ensure proper connector seating, gently press on the left side of the unit until tightened.



To remove the GPS 150 from the aviation rack:

1. Insert a 3/32" allen wrench into the small hole adjacent to the dual knob.
2. Rotate the wrench counterclockwise until the GPS 150 can be removed from the rack.



APPENDIX B

GPS 150 Maintenance

Maintenance

The GPS 150 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 150 detects a low memory battery, you will be informed with the message 'Memory battery low'. Failure to have the battery replaced 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 150 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 150 Messages and Abbreviations

The GPS 150 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 150 messages and their meanings.

- Altitude input fail** - The altitude serializer input is not available to the GPS 150. Check the I/O settings and/or the serializer installation.
- Apprchng offst _____** - You are less than one minute from reaching the indicated waypoint offset by the parallel track distance. You may use the CTS option on the CDI page to help set the autopilot heading if a course change is necessary.
- Approaching _____** - You are less than one minute from reaching the indicated waypoint. You may use the CTS option on the CDI page to help set the autopilot heading if a course change is necessary.
- Arrival at _____** - Your craft has 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.
- Battery low** - The battery pack is low on power. The battery pack should be recharged for continued operation.
- 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 150 will not allow the modifications.
- Cannot nav lockd rte** - An attempt has been made to activate a route containing a locked waypoint. The GPS 150 cannot perform navigation in this situation.
- Cannot ofst goto rte** - An attempt has been made to engage the offset navigation feature while the GPS 150 is navigating using a single waypoint route. The GPS 150 will not allow offset navigation in this situation.

APPENDIX C

GPS 150 Messages

- Checklist is full** - The selected checklist is full. No new items can be added until existing items are deleted.
- Collecting data** - The GPS 150 is collecting orbital data while searching the sky. The antenna should have a good view of the sky and the GPS 150 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.
- Data card failed** - The GPS 150 has detected a problem with the data card. The data is not usable and the card should be returned to an authorized GARMIN service center.
- Data card write fail** - The user data card failed to program.
- Degraded accuracy** - The accuracy of the GPS 150 position is degraded beyond 500 meters due to satellite geometry or data quality. Additional cross checking should be performed by the user to verify the integrity of the GPS 150 position.
- Do not use for nav** - The GPS 150 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 150. Check the I/O settings or fuel/air data system.
- Inside SUA** - The unit has entered a Special Use Airspace.
- Invalid 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.
- Near SUA < 2 nm** - Your position is within 2 nautical miles of an SUA and your current course will NOT take you inside.
- Need alt - press NAV** - The GPS 150 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.
- No altitude input** - The GPS 150 has failed to receive altitude data from the serializer.
- Offset nav cancelled** - Offset navigation has been cancelled due to a direct-to operation or modification of the active 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 150 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.
- Poor GPS coverage** - The GPS 150 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 150 will warn you of the closest proximity waypoint, but not both. You should be certain this condition is desirable.

APPENDIX C

GPS 150 Messages

- 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.
- Proximity wpt deleted** - One or more proximity waypoints were deleted while receiving data from the PC 150 Interface Kit.
- Pwr down and re-init** - The GPS 150 is unusable until power has been cycled and the unit re-initialized. Abnormal satellite conditions may exist.
- RAM failed** - The GPS 150 has detected a failure in its internal memory. If the message persists, the GPS 150 is unusable and should be taken to an authorized GARMIN service center.
- Ready for navigation** - The GPS 150 is ready for navigation.
- Received invalid wpt** - A waypoint was received in an upload operation that has an invalid identifier or position.
- Receiver failed** - The GPS 150 has detected a failure in the receiver hardware. If the message persists, the GPS 150 is unusable and should be taken to an authorized GARMIN service center.
- ROM failed** - The GPS 150 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 150 will not allow more than 31 waypoints per route.
- Route wpt deleted** - One or more route waypoints were deleted while receiving data from the optional PC150 Interface Kit.
- 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 wpt moved** - One or more route waypoints were moved at least 0.33 arc minutes due to a database change.
- Searching the sky** - The GPS 150 is in the search-the-sky mode. Allow the unit to complete data collection before turning it off.
- Start altitude chng** - The altitude change entered on the VNAV Planning page is about to begin.
- Steep turn ahead** - This message appears approximately one minute prior to a turn that requires a bank angle in excess of 25 degrees in order to stay on course.
- Stored data lost** - Stored user data, including waypoints, routes and satellite orbital data have been lost due to a low memory battery, or inadvertant master reset.
- SUA ahead < 10 min** - The projected course and current speed will take you inside an SUA within the next 10 minutes.
- SUA near & ahead** - Your position is within two nautical miles of an SUA and its 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.
- 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

GPS 150 Abbreviations

This section of Appendix C provides a complete list of GPS 150 abbreviations and their meanings.

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

APPENDIX C


GPS 150 Abbreviations



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

APPENDIX C

GPS 150 Abbreviations



RX-	Receive only	USR-	User Waypoint
SAR-	Search And Rescue	UTC-	Universal Time Coordinated (GMT/ Zulu)
SEC-	Seconds	VN-	VNAV or Vertical Navigation
SEQ-	Sequence	VNAV-	Vertical Navigation
SGL-	Signal	VOR-	VOR Waypoint
SLCT-	Select	WPT-	Waypoint
SRFC-	Surface	WX-	Weather
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-	Turn Angle		
TRSA-	Terminal Radar Service Area		
TWR-	Tower		
TX-	Transmit only		
U-	UTC time		
UNI-	Unicom		
URA-	User Range Accuracy		
USER-	User Waypoint		

Appendix C Specifications

PHYSICAL

Size:	6.25"W x 5.8"D x 2"H (159mm x 147mm x 51mm)
Weight:	34 ounces (0.96kg)
Rack Size:	6.32"W x 5.64"D x 2"H (161mm x 143mm x 51mm)
Rack Weight:	11 ounces (0.31kg)

POWER

Input:	Rechargeable battery pack (life of up to 4 hours) 10-33V DC with power cable (aircraft power) 115V or 230V AC w/adaptor
--------	---

ENVIRONMENTAL

Temperature:	5° F to 158° F (-15°C to 70°C) Operating -40°F to 158°F (-40°C to 70°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, PC 150 Interface,
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	DOS 1968	Gizo Island (New Georgia Islands)
AFGOOYE	Somalia	EASTER ISLAND 1967	Easter Island
AIN EL ABD 1970	Bahrain Island, Saudi Arabia	EUROPEAN 1950	Austria, Belgium, Denmark, Finland, France, Germany, Gibraltar, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland
ANNA 1 ASTRO 1965	Cocos Islands		Austria, Finland, Netherlands, Norway, Spain, Sweden, Switzerland
ARC 1950	Botswana, Lesotho, Malawi, Swaziland, Zaire, Zambia, Zimbabwe	EUROPEAN 1979	Finland
ARC 1960	Kenya, Tanzania		Borneo
ASCENSION IS 1958	Ascension Island	FINLAND HAYFORD 1910	Republic of Maldives
ASTRO B4 SOROL ATOLL	Teru Island	G. SEGARA	New Zealand
ASTRO BEACON "E"	Iwo Jima Island	GANDAJIKA BASE	Greece
ASTRO DOS 71/4	St. Helena Island	GEODETTIC DATUM 1949	Guam Island
ASTRONOMIC STN 1952	Marcus Island	GGRS 87	Guadalcanal Island
AUSTRALIAN GEOD 1966	Australia, Tasmania Island	GUAM 1963	Afghanistan
AUSTRALIAN GEOD 1984	Australia, Tasmania Island	GUX 1 ASTRO	Iceland
AUSTRIA NS	Austria	HERAT NORTH	Hong Kong
BELGIUM 1950	Belgium	HJORSEY 1955	Taiwan
BELLEVUE (IGN)	Efate and Erromango Islands	HONG KONG 1963	Bangladesh, India, Nepal
BERMUDA 1957	Bermuda Islands	HU-TZU-SHAN	India
BOGOTA OBSERVATORY	Colombia	INDIAN BNGLDSH NEPAL	Thailand, Vietnam
BUKIT RIMPAH	Indonesia	INDIAN MEAN VALUE	Ireland
CAMP AREA ASTRO	Antarctica	INDIAN THAILAND VIETN	Diego Garcia
CAMPO INCHAUSPE	Argentina	IRELAND 1965	Johnston Island
CANTON ASTRO 1966	Phoenix Islands	ISTS 073 ASTRO 1969	Sri Lanka
CAPE	South Africa	JOHNSTON ISLAND 1961	Kerguelen Island
CAPE CANAVERAL	Florida, Bahama Islands	KANDAWALA	West Malaysia, Singapore
CARTHAGE	Tunisia	KERGUELEN ISLAND	Cayman Brac Island
CH-1903	Switzerland	KERTAU 1948	Liberia
CHATHAM 1971	Chatham Island (New Zealand)	L.C. 5 ASTRO	Philippines
CHUA ASTRO	Paraguay	LIBERIA 1964	Mindanao Island
CORREGO ALEGRE	Brazil	LUZON MEAN VALUE	
DANISH GI 1934	Denmark	LUZON MINDANAO IS	
DJAKARTA (BATAVIA)	Sumatra Island (Indonesia)		

APPENDIX E

Map Datums (cont.)

LUZON PHILIPPINES	Philippines (excluding Mindanao Isl.)	OMAN	Oman
MAHE 1971	Mahe Island	ORD SRV GRT BRITAIN	England, Isle of Man, Scotland, Shetland Islands, Wales
MARCO ASTRO	Salvage Islands	PICO DE LAS NIEVES	Canary Islands
MASSAWA	Eritrea (Ethiopia)	PITCAIRN ASTRO 1967	Pitcairn Island
MERCHICH	Morocco	PORTUGUESE 1973	Portugal
MIDWAY ASTRO 1961	Midway Island	POTSDAM	Germany
MINNA	Nigeria	PROV SO AMERICAN '56	Bolivia, Chile, Colombia, Ecuador, Guyana, Peru, Venezuela
NAD27 ALASKA	North American 1927- Alaska	PROV SO CHILEAN 1963	South Chile
NAD27 BAHAMAS	Bahamas (excluding San Salvador Island)	PUERTO RICO	Puerto Rico & Virgin Isl.
NAD27 CANADA	Canada (including Newfoundland Island)	QATAR NATIONAL	Qatar
NAD27 CANAL ZONE	Canal Zone	QORNOQ	South Greenland
NAD27 CARIBBEAN	Caribbean (Barbados, Caicos Islands, Cuba, Dom. Rep., Grd. Cayman, Jamaica, Leeward and Turks Islands)	REUNION	Mascarene Island
NAD27 CENTR AMERICA	Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua)	ROME 1940	Sardinia Island
NAD27 CONUS	Mean Value (CONUS)	RT 90	Sweden
NAD27 CUBA	Cuba	SANTO (DOS)	Espirito Santo Island
NAD27 GREENLAND	Greenland (Hayes Peninsula)	SAO BRAZ	Sao Miguel, Santa Maria Islands (Azores)
NAD27 MEXICO	Mexico	SAPPER HILL 1943	East Falkland Island
NAD27 SAN SALVADR IS	San Salvador Island	SCHWARZECK	Namibia
NAD83	North American 1983- Alaska, Canada, Central America, CONUS, Mexico	SOUTH AMERICAN 1969	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Venezuela, Trinidad/Tobago
NAHRWAN MASIRAH IS	Masirah Island (Oman)	SOUTH ASIA	Singapore
NAHRWAN SAUDI ARABIA	Saudi Arabia	SOUTHEAST BASE	Porto Santo and Madeira Islands
NAHRWAN UNITD ARAB E	United Arab Emirates	SOUTHWEST BASE	Faial, Graciosa, Pico, Sao Jorge and Terceira Islands (Azores)
NAPARIMA BWI	Trinidad and Tobago	TANANARIVE OBSV 1925	Madagascar
NETHERLAND TRIAG '21	Netherlands	TIMBALAI 1948	Brunei and East Malaysia (Sarawak and Sabah)
NOU TRIAG FRANCE	France	TOKYO	Japan, Korea, Okinawa
NOU TRIAG LUXEMBOURG	Luxembourg	TRISTAN ASTRO 1968	Tristan da Cunha
OBSERVATORIO 1966	Corvo and Flores Islands (Azores)	USER	User datum
OLD EGYPTIAN	Egypt	VITI LEVU 1916	Viti Levu Island/Fiji Islands
OLD HAWAIIAN KAUAI	Kauai	WAKE-ENIWETOK 1960	Marshall Islands
OLD HAWAIIAN MAUI	Maui	WGS 72	World Geodetic System 1972
OLD HAWAIIAN MEAN	Mean Value	WGS 84	World Geodetic System 1984
OLD HAWAIIAN OAHU	Oahu	YACARE	Uruguay
		ZANDERIJ	Surinam

Appendix F

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