G P S   1 5 0 X L

GARMIN GPS 150XL

KCOU
123.1 n
m
090° BRG
090° DTK

150 K
T

KMCI

090°
TRK

KMKC

63K 49:15

KOJC

±51 K KIXD

20 n
m

CLR ENT

CRSR

OFF

▽ △ ▷ NRST ▷ RTE ▷ WPT ▷ NAV ▷ MSG

P I L O T ' S   G U I D E   A N D   R E F E R E N C E

GARMIN®

Software Version 2.01 or above

March 1997 190-00067-80 Rev. A Printed in USA

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. Furthermore, 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.

Operation of this device 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 150XL 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 authority to operate this device under Part 15 regulations.

CAUTION

The Global Positioning 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 150XL is a precision electronic NAVigation AID (NAVAID), any NAVAID can be misused or misinterpreted and therefore become unsafe.

Use the GPS 150XL 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 150XL 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 150XL 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 150XL 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 150XL package.

Pilots using an out-of-date database do so entirely at their own risk.

Accessories & Packing List

Congratulations on choosing the finest, most advanced panel mount VFR GPS receiver available. The GPS 150XL 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 150XL Unit & NavData® Card
- GPS Antenna
- Installation Rack & Connectors
- Pilot's Guide & Quick Reference Guide
- Database Subscription Packet
- Warranty Registration Card

Optional Accessories:

- Remote Battery Pack
- AC Adapter
- PC Software/Interface Kit
- User Data Card
- 28 to 14 volt DC converter

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

To obtain warranty service, see your local dealer or call the GARMIN Customer Service department for a returned merchandise tracking number. The unit should be securely packaged with the tracking number clearly marked on the outside of the package, and sent freight prepaid and insured to a GARMIN authorized warranty service facility.

GARMIN is fully committed to your satisfaction as a customer. If you have any questions regarding the GPS 150XL, please contact our customer service department at:

> *GARMIN International, Inc.*
> *1200 East 151st Street*
> *Olathe, KS 66062-3426*
> *(913) 397-8200*
> *FAX (913) 397-8282*

Every GARMIN GPS is built to exacting standards to provide years of trouble-free service. GARMIN warrants this product to be free from defects in materials and workmanship for one year from the date of purchase.

GARMIN International, Inc. will at its sole option, repair or replace any components which fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor. The customer is, however, responsible for any transportation costs. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs. GARMIN International, Inc. assumes no responsibility for special, incidental, punitive or consequential damages, or loss of use.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE, AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY LIABILITY ARISING UNDER WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

PART ONE: INTRODUCTION

PART TWO: REFERENCE

To quickly and easily locate information on specific tasks, please refer to the Index on page 97.

Key and Knob Functions

The **power/intensity knob** controls unit power and display intensity.

The **zoom-in key** is used to zoom in to the next smaller scale setting when viewing the map page.

The **zoom-out key** allows you to zoom out to the next larger scale setting when viewing the map page.

The GPS 150XL 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 150XL. Experiment to find the most effective way to use the GPS 150XL to your advantage.

NRST

The **nearest key** is used to obtain information on the 9 nearest airports, VORs, NDBs, intersections, user waypoints and 2 nearest FSS/ARTCC points of communication. The nearest key also accesses any active SUA information. See Section 3 for more information on the nearest waypoints.

RTE

The **route key** enables you to create, edit, activate and invert routes. Search-and-rescue, parallel offset and closest point of approach functions are also performed using the route key. See Section 4 for more information.

WPT

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

NAV

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

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 150XL.

MSG   The **message key** is used to view system messages. This key is also used to access the GPS 150XL's unit settings. See Section 5 for more information on messages and unit settings.

-Đ►   The **direct-to key** performs an instant direct-to, allows you to enter a waypoint, and sets a direct course to the destination. See Section 4.

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

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.

CRSR   The **cursor key** is used to activate or deactivate the cursor on the GPS 150XL's display. Pressing once will activate the cursor (indicated by highlighted characters on a data field), which is used to highlight fields for data entry, changing information or cycling through available options. Press a second time to deactivate the cursor.

◯   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.

The GARMIN GPS 150XL is a powerful navigational tool that provides pilots with accurate navigational data and communication capability, along with a host of database information at your fingertips. The Takeoff Tour is designed to familiarize you with the operation of the GPS 150XL, including powering up the unit, entering data and performing a simple direct-to, and provide a limited introduction to the 'Nearest' functions. In addition, this section also briefly covers the position, NAV summary, map and frequency pages available from the NAV key. These pages will be used for most of your in-flight navigation.

The Takeoff Tour assumes that the receiver and antenna have been properly installed and you have not changed any of the GPS 150XL's default settings. If you have changed any of the factory default settings (position format, units of measure, selectable fields, etc.), the pictures shown here may not match your configuration. Prior to using your GPS 150XL for the first time, we recommend that you taxi to a location that is well away from buildings and other aircraft so the unit can collect satellite data without interruption.

Powering up the GPS 150XL

The GPS 150XL's power and display intensity are controlled using the ◉ knob at the bottom left of the unit. Rotating it clockwise will turn unit power on and increase the display intensity. After turning the unit on, a **welcome page** will be displayed while the unit performs a self test.

The **database page** will appear, showing the current database information on the NavData card, with the valid operating dates, cycle number and database type indicated. The database is updated every 28 days and is available for one-time or subscription purchase.

To acknowledge the database information:

1. Press the ENT key.

```
GPS 150XL  v 2.01
⊕1997 GARMIN Corp
Performing self test
```
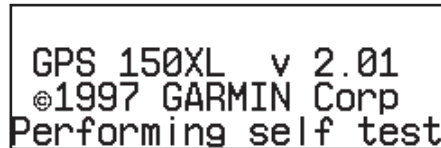
The welcome page appears when the GPS 150XL is turned on. During the time this screen is displayed, the GPS 150XL performs a self test to ensure proper operation.


```
WORLDWIDE VFR SUA
eff 27-feb-97 (9703)
exp 27-mar-97    ok?
```
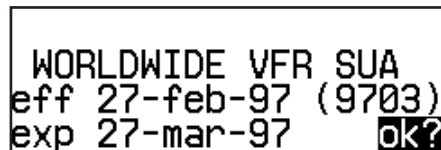
The database confirmation page shows the effective date of the Jeppesen database on the NavData Card.

```
No gps position
Acquiring    epe____ᶠᴛ
sat 1  3  5  6  9 13 17 19→
sgl  9  6  _  3  _  7  9  _
```

The satellite status page shows the ID numbers for the satellites and the relative signal strength of each satellite received. Turn the ◉ knob to view additional satellites.

```
No gps position
Search Sky  epe____ᶠᴛ
sat 1
sgl _
```

'Search Sky' indicates that satellite almanac data is not available or has expired (if the unit hasn't been used for six months or more). The data will be recollected from the first available satellite.

Once the database has been acknowledged, the **satellite status page** will appear, and the GPS 150XL will begin to collect satellite information. An 'Acquiring' status will be displayed on the satellite status page, and the signal values on the bottom line of the page will begin displaying numeric values. This is a good indication that you are receiving signals and satellite lock will occur. Following the first-time use of your GPS 150XL, the time required for a position fix will vary — usually from two to five minutes.

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

If the GPS 150XL has not been operated for a period of six months or more, it may have to 'Search the Sky' to collect new data. This means the unit is acquiring satellite data to establish almanac and satellite orbit information, which can take 5 to 10 minutes. The satellite status page will display a 'Search Sky' status, and the message annunciator (▸), next to the MSG key, will also flash to alert you of a system message — 'Searching the Sky'.

To view a system message:

1. Press MSG.

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

To return to the previous page after viewing a message:

1. Press MSG again.

After the GPS 150XL acquires satellites and computes a position, the **position page** will appear automatically, and you'll be informed with 'Ready for navigation' on the message page.

Altitude, MSA or ESA

```
No active waypoint
alt   1911ʰₜ
N38° 51.245′ W094° 55.473′
ʳapt KIXD    305°  2.11ⁿₘ
```

Position (lat/lon)

Reference Waypoint Field

The position page displays your present latitude and longitude, altitude and a reference waypoint field. The altitude and reference waypoint fields are also selectable (see Section 1 for more information) to allow you to configure the unit to your own preferences. The default settings are:

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

The position page is one of seven pages available under the GPS 150XI's NAV key:

- **NAV summary page**
- **NAVCOM page**
- **Satellite status page**
- **NAV menu 2**

- **Map page**
- **Position page**
- **NAV menu 1**

During most flights, the position, NAV summary, map and NAVCOM pages will be the primary pages used for navigation. The pages are accessible by pressing the NAV key and rotating the outer knob, or by pressing the NAV key repeatedly.

```
KICT      120ᴷₜ          1:10
139.6ⁿₘ KIXD      RUGBB
231° BRG   ·        ▲
231° DTK 231°ₜᵣₖ        12ⁿₘ
```
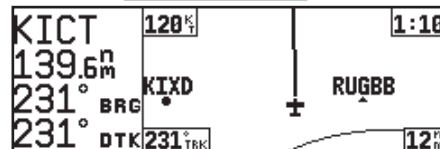
The map page combines a moving map display and navigation data for complete situational awareness.

```
No active waypoint
KIXD  uni 122.95
     gndᴾₜ124.30
   ↓twrᴾₜ118.30
```

The navigation communications (NAVCOM) page provides a complete list of airport frequencies at your departure and arrival airports.

The NAV summary page without a direct-to destination or active route appears blank, except for ground speed (GS) and track (TRK) figures, if displayed.

When a destination is selected the direct-to confirmation page appears to verify the destination you selected.

The GPS 150XL uses direct point-to-point navigation to guide you from takeoff to touchdown in the VFR environment. Once a destination is selected, the unit will provide speed, course and distance data based upon a direct course from your present position to your destination. A destination can be selected from any page using the ⬛➡ (**direct-to**) **key**.

To select a direct-to destination:

1. Press the ⬛➡ key. The NAV summary page will appear with the destination field highlighted.

2. Rotate the ⬤ knob to enter the first letter of the destination waypoint identifier. The destination waypoint may be an airport, VOR, NDB, intersection or user waypoint, as long as it is in the database or stored in memory as a user waypoint.

3. Rotate the ⭕ knob to the right to move the cursor to the next character position.

4. Repeat steps 2 and 3 to spell out the rest of the waypoint identifier.

5. Press ENT to confirm the identifier. The direct-to confirmation page will appear.

6. Press ENT to confirm the destination.

Once the direct-to destination is confirmed, the **NAV summary page** will appear with the destination indicated in the lower left hand corner of the screen. Your present speed and track over the ground, and the distance and estimated time enroute to your destination are also displayed. The graphical CDI (course deviation indicator), located at the top of the screen, displays your position relative to the desired course and provides turn anticipation and waypoint messages during route navigation.

In addition to the destination field and graphical CDI, the GPS 150XL NAV summary page features five selectable fields for various navigation data so that the page may be configured to your own preferences (see Section 1 for more information). The default settings for the NAV summary page are:

- **Distance (dis)—** The distance to your destination in nautical miles
- **Ground Speed (gs)—** Your present speed over the ground in knots
- **Bearing (brg)—** The direction from present position to your destination
- **Desired Track (dtk)—** The course between the 'from' and 'to' waypoints
- **Estimated Time Enroute (ete)—** The time to your destination (in hours and minutes) based upon your present speed and course

The next page available from the [NAV] key is the **map page**. The map page combines the primary navigation information from the NAV summary page – distance to waypoint, ground speed, bearing, desired track and ETE – with a moving map display. The moving map display shows your current position (using an airplane symbol or a diamond symbol) relative to nearby airports, VORs, NDBs, intersections, user waypoints and airspace boundaries. Notice that the graphical CDI does not appear on the map page; the graphical CDI does appear on all other GPS 150XL pages.

The map page can be divided into two main sections:
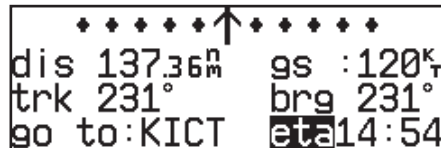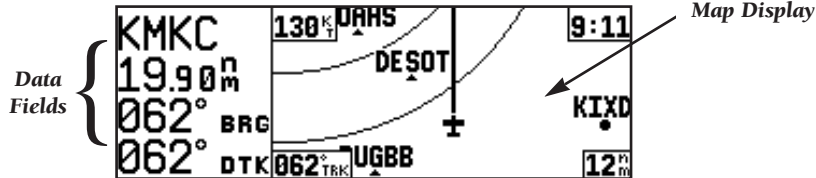
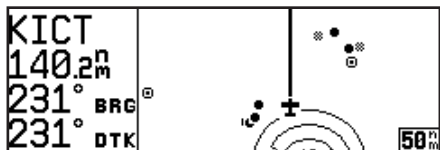*NAV summary page with 'trk', 'brg' and 'eta' displayed.*
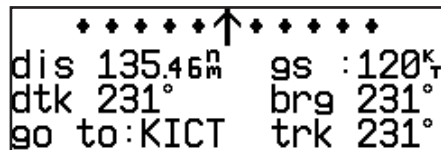
*NAV summary page with 'dtk', 'brg' and 'trk' displayed.*
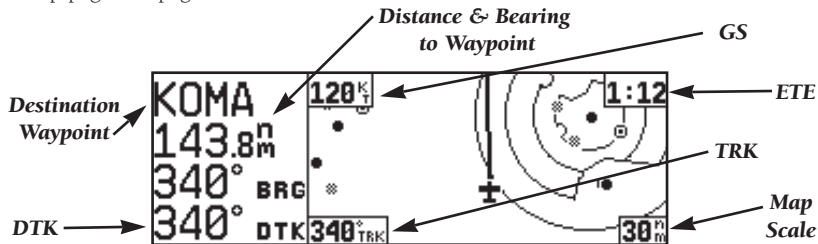
Data Fields {

Map Display

The map display may be oriented along your ground track (track up), course (desired track up) or fixed at north up. Desired track up or north up settings show your present position with a diamond symbol instead of the airplane symbol.

Distance and bearing to waypoint, destination waypoint name and desired track are shown on the left hand side of the map page. To remove the data fields that border the map display, press `CLR`.

Airspace Boundaries

Airport Waypoint
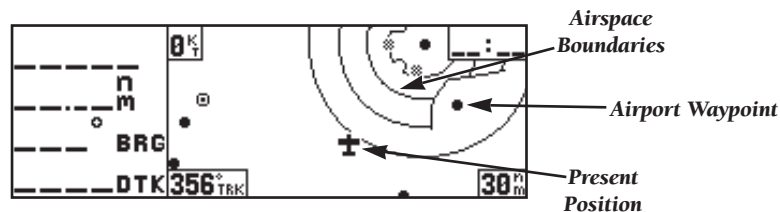
Present Position

The **map display** occupies the right side of the display. Your present position is indicated by a plane symbol (in track up mode) or a position diamond (in other orientation modes), with your route displayed as a solid line. Nearby airports, navaids and user waypoints may be depicted on the map; with unique identifying symbols for each waypoint type. Boundaries for special use and controlled airspaces can also appear on the map display. You may select which features are shown on the map using the map setup page (see page 70).

Distance & Bearing to Waypoint

GS

ETE

Destination Waypoint

TRK

DTK

Map Scale

The **data fields** on the map page indicate distance and bearing to destination waypoint, desired track, ground speed, time to waypoint and map scale. The destination waypoint name, bearing to waypoint, distance to waypoint and desired track appear on the left side of the page. The other data fields are located at the corners of the map display, as shown in the illustration above, and may be removed by pressing `CLR`.

The map display has 14 available scales from 0.5 to 300 (nautical miles, statute miles or kilometers) representing the vertical height of the map. The map scale is controlled by the   and   keys, with the current scale displayed in the lower right corner.

To select a map scale:

1. Press   to increase the map scale and show a larger area (or turn ⬤ to the right).

2. Press   to decrease the map scale and show a smaller area (or turn ⬤ to the left).

Another page available under the GPS 150XL's NAV key is the **navigation communications (NAVCOM) page**. It provides you with a complete list of airport frequencies at your departure and arrival airports, allowing convenient selection of frequencies you'll need along your flight path. If you do not have an active departure airport, the navigation communications page will display the frequencies for the airport nearest your departure position.

To view the NAVCOM page from the map page, rotate ◯ one stop to the right.

The NAVCOM page lists your departure and arrival airports on the left side of the page, with all the database frequencies listed in a column down the right side of the page. To scroll through the list of frequencies, simply rotate the inner knob (⬤) in the direction of the arrow prompts at the bottom left of the page.

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

To cancel a direct-to from the NAV summary page:

1. Press the CRSR key to activate the cursor in the destination field.

2. Press CLR .

3. Press ENT .
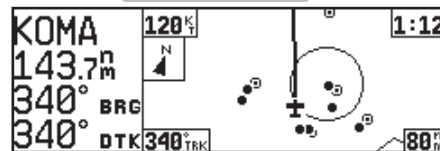
To change the map scale press   to increase the scale or   to decrease the scale.
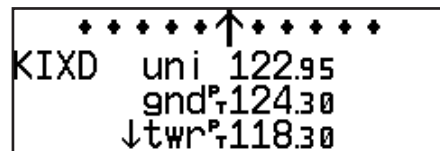
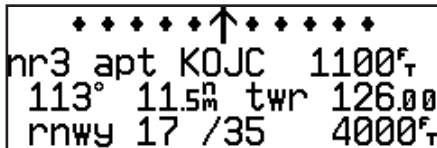*The NAVCOM page lists the frequencies for your departure (or nearest) and arrival airports.*

The nearest airport page shows up to nine nearest airports from your present position.

To view additional nearest airports, rotate the ● knob.

The GPS 150XL's **NRST key** provides the nine nearest airports, VORs, NDBs, intersections, user waypoints and any SUA (special use airspace) alerts, as well as the two closest FSS (Flight Service Station) and center (ARTCC) frequencies for your present position. The nearest waypoint feature is a handy safety feature that may be used to execute a quick direct-to in case of an in-flight emergency or to review the closest facilities to your present position. The nearest feature can also be used to quickly find the contact frequency of the nearest airport.

To view the nine nearest airports:

1. Press the NRST key. The nearest airport will be displayed, with the range and bearing from your present position, along with elevation, frequency and runway data.

2. To review the rest of the nearest airport list, rotate the ● knob to the right.

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

1. Rotate the ○ knob to the right, or press the NRST key repeatedly.

2. Rotate ● to scroll through the list.

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

To review the selected waypoint from the nearest waypoint list:

1. Press CRSR to activate the waypoint field.

2. Press ENT to display the waypoint identification page.

3. Rotate ○ to view any additional waypoint information available.

4. Press NRST to return to the nearest waypoint page.

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

      1. Press the [▶] key. The direct-to confirmation page for the selected waypoint will appear.

      2. Press [ENT] to confirm.

      Congratulations! You've now gone through the basic operation of the GPS 150XL. We encourage you to experiment with your new GPS receiver to get to know all the advanced navigation features it has to offer. If you'd like a little more practice, try using the built-in simulator described in Appendix C. An optional AC adapter will even let you plan and simulate flights in the comfort of your home or office.

To turn the GPS 150XL off:

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

```
 * * * * * ↑ * * * *
apt:KIXD   N CEN USA
OLATHE            KS
JOHNSON CO INDL
```

To review a nearest waypoint, highlight the identifier and press [ENT].

```
 * * * * * ↑ * * * * *
go to apt:KIXD
 N38° 49.90' W094° 53.39'
 auto  crs 152°    ok?
```

To select a nearest waypoint as your direct-to destination, press [▶] *and* [ENT].

```
 No active waypoint
3D Nav        dop  2.0
sat 1 3 5 6 9 13 17 19→
sgl  9 6 _ 3 _ 7 9 _
```

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

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

Section 1
Navigation Key

The GPS 150XL features seven navigation pages to provide various position, course, speed, status and planning information. The pages may be viewed by pressing the NAV key and rotating the outer knob, or by pressing the NAV key repeatedly.

NAV Summary Page

```
 • • • • •↑• • • • •
dis 143.04ᴹ  gs :130ᴷₜ
dtk 339°     brg 339°
go to:KOMA   trk 339°
```

Map Page

```
KOMA    120ᴷ    1:12
143.8ᴹ
340° ʙʀɢ
340° ᴅᴛᴋ 340ᵀᴿᴷ    30ᴹ
```

NAVCOM Page

```
 • • • • •↑• • • • •
KIXD  uni 122.95
       gndᴿₜ124.30
      ↓twrᴿₜ118.30
```

NAV Menu 2

```
 • • • • •↑• • • • •
Appr Time? Clock?
Trip Time? RAIM Prd?
Scheduler? Sunrise?
```

Position Page

```
 • • • • •↑• • • • •
alt  1081ᶠ
N39° 02.676′ W095° 01.000′
ᵣapt KIXD  331°14.08ᴹ
```

```
 • • • • •↑• • • • •
Trip Plan? Dalt/tas?
Fuel Plan? Winds?
Vnav Plan? Chklist?
```
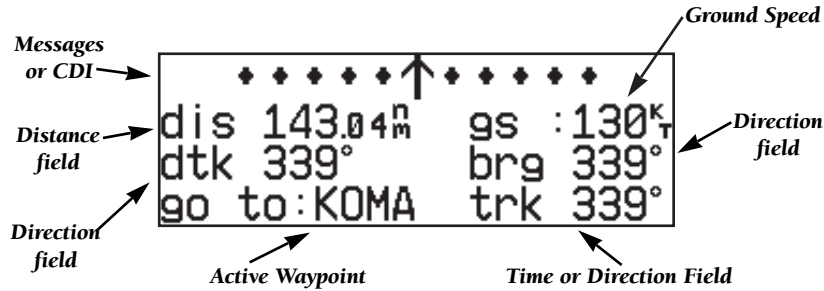
NAV Menu 1

```
 • • • • •↑• • • • •
3D Nav       dop  2.0
sat 1 3 5 6 9 13 17 19
sgl  9 6 _ 3 _ 7 9 _
```

Satellite Status Page

The **NAV summary**, **map, NAVCOM** and **position** pages are the primary pages used during in-flight navigation, while the nav menu and status pages offer access to planning, calculation and status functions. Note that rotating the outer knob clockwise will continuously cycle through all the nav pages, whereas turning the knob counterclockwise will stop the page selection sequence at the NAV summary page.

Whenever the NAV key pages are in use, the indicator light (▐) next to the NAV key will illuminate. If the GPS 150XL requires you to enter data on a navigation page, a message prompt with specific instructions will appear and the indicator will flash. If you leave the NAV page sequence for another set of pages, the last NAV page displayed will reappear when you return to the nav sequence.

The GPS 150XL's **NAV summary page** provides you with the important information needed to navigate directly to your destination. The destination field, located at the bottom left of the page, displays the current destination waypoint or active route leg being navigated. If no direct-to destination or route is being navigated, the destination field will remain blank.

```
        * * * * * ↑ * * * * *          ← Messages or CDI
dis 143.04ⁿₘ     gs :130ᴷₜ            ← Ground Speed / Direction field
dtk 339°         brg 339°
go to:KOMA       trk 339°
```

Messages or CDI → / Distance field → / Direction field →

Active Waypoint · *Time or Direction Field*

The **graphical CDI** (course deviation indicator) at the top of the page shows your position relative to the desired course (the moving D-bar) to the destination waypoint. The **TO/FROM arrow** in the center of the scale indicates whether you are heading to (an up arrow) the waypoint or if you have passed the waypoint (a down arrow). The default setting of the CDI scale is 5.0 nm. If you are not navigating to a destination, the CDI field will display a 'no active waypoint' message, and only speed and track data will be available. The CDI field is also used to display the GPS 150XL's turn anticipation and waypoint alert data during route operations (see Section 4).

In addition to displaying your active destination and the course deviation scale, the NAV summary page features five selectable fields for various distance, direction, speed and time options. This allows you to configure the NAV summary page to your preferences. The default settings displayed are distance, ground speed, bearing, desired track and estimated time enroute.

```
    * * * * * ↓ * * * * *
dis    1.16ⁿₘ    gs :120ᴷₜ
dtk 153°         brg 333°
go to:KIXD       trk 153°
```
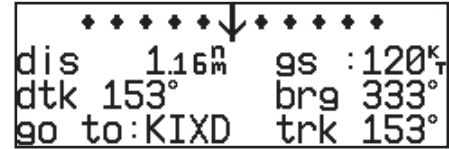
The TO/FROM arrow indicates whether you are heading to (an up arrow) the waypoint or if you've passed the waypoint (a down arrow).

```
No active waypoint
dis _____ⁿₘ      gs :110ᴷₜ
dtk    ___°      brg ___°
_____→_____      ete__:__
```
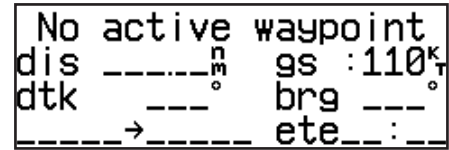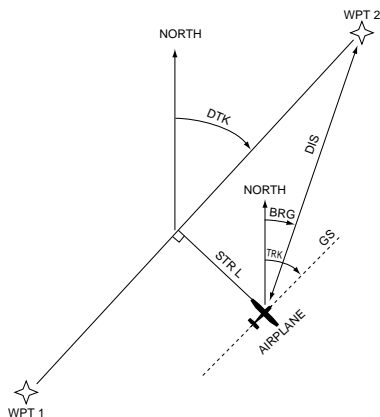
'No Active Waypoint' appears on the CDI field if there is no destination waypoint selected using the ▤ *key and no active route.*

The following functions may be displayed in the distance field:

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

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

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

The following steering functions may be displayed in the direction fields:

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

The following information can be displayed in the time 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, this field indicates either the elapsed time before the VNAV maneuver is to begin or the VNAV altitude (the suggested altitude you should be flying in order to complete the maneuver).

To change any of the selectable fields on the NAV summary page:

1. Press **CRSR** to activate the cursor.

2. Rotate ◯ to highlight the field you would like to change.

3. Rotate ⬤ to change the field to display the desired information.

4. Rotate ◯ to highlight another field, or **CRSR** to finish.
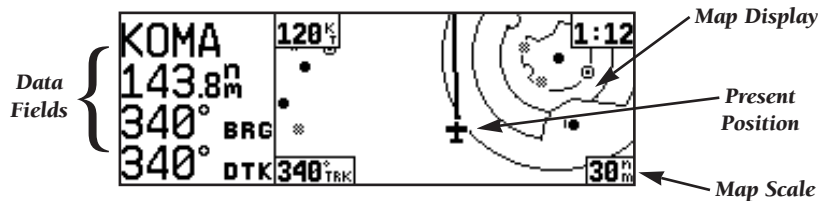
The next page available from the GPS 150XL's **NAV** key is the **map page**. The map page displays your present position, using an airplane symbol (in track up mode) or a position diamond (in other orientation modes), along with nearby airports, VORs, NDBs, intersections, user waypoints and airspace boundaries. **Note**: If the GPS 150XL is unable to determine a GPS position the present position symbol will not appear on the map page.

The map display occupies the right side of the display and shows your position relative to nearby airports, navaids, user waypoints and airspaces. Different symbols are used to distinguish between waypoint types. The identifiers for any on-screen waypoints can also be displayed. Special-use and controlled airspace boundaries appear on the map, showing the individual sectors in the case of Class B or Class C airspace. The map display can be configured to display airports, navaids, user waypoints, airspaces only at certain scales or these items may be disabled entirely (see page 70). This allows you to de-clutter the map display at larger scale settings.
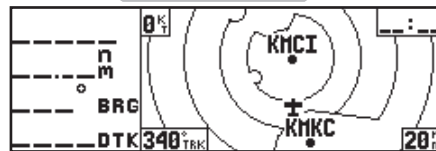
The map page, showing only airports and airspaces on the map display.
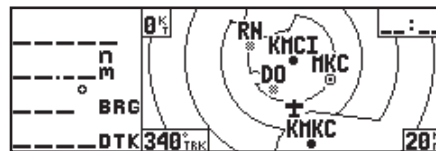
The map page, showing airports, airspaces, VORs and NDBs on the map display.
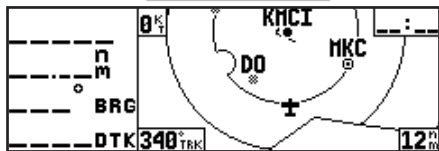
To change the map scale press the   key to increase the scale or   to decrease the scale.

The map display can be set to 14 different scale settings from 0.5 to 300 (nautical miles, statute miles or kilometers). The scale represents the top-to-bottom distance covered by the map display.

To select a map scale:

1. Press   to increase the map scale and show a larger area (or turn ⬤ to the right).

2. Press   to decrease the map scale and show a smaller area (or turn ⬤ to the left).

An autozoom feature is available which will automatically adjust from an en route scale of 300 through each lower scale, stopping at a scale of 1 as you approach your destination waypoint. The autozoom feature is turned on/off from the map setup page described on page 70.

The orientation of the map may be fixed at 'north up', or set to 'desired track up' (dtk up) or 'track up' (trk up). The 'north up' setting will keep the top of the map display fixed on north. 'Track up' will cause the map to rotate so the top of the map is the direction you are heading. 'Desired track up' keeps the map display fixed along your desired course. Map orientation is changed on the map setup page described on page 70.

Navigation data is also provided on the map page to guide you during your flight. The destination waypoint name, distance & bearing to waypoint, and desired track (dtk) appear on the left side of the page. Four additional data fields are located at the corners of the map display, as follows:

|	
Ground speed (gs)	- upper left corner
Ground track (trk)	- lower left corner
Estimated time en route (ETE)	- upper right corner
Map scale	- lower right corner
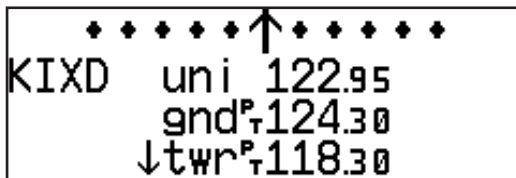
```
  * * * * * ↑ * * * * *
KIXD  uni 122.95
      gnd⁰ᵣ124.30
     ↓twr⁰ᵣ118.30
```

The next page available from the GPS 150XL's NAV key is the **navigation communications (NAVCOM) page**. The NAVCOM page provides a list of the airport frequencies at your departure and arrival airports, allowing convenient selection of frequencies you'll need along your flight path. To scroll through the list of frequencies, rotate the inner knob (⬤) in the direction of the arrow prompts at the bottom left of the page.

The frequencies displayed for the departure and arrival airports are listed in the order you are most likely to use them (see right), with the available frequencies displayed to the right of the airport identifier. If you do not have an active route with a departure airport, the NAVCOM page will display the frequencies for the airport nearest your departure position.

If a frequency has sector or altitude restrictions, the frequency will be followed by a 'brg?' indication.

To view restrictions on a frequency:

1. Press CRSR to activate the cursor.

2. Rotate ◯ to highlight the 'brg?' next to the frequency you wish to view.

3. Press ENT to begin viewing restrictions.

```
  * * * * * ↑ * * * * *
KACY  ats 108.60ᵣ×
      apr 124.60 brg?
     ↕apr 134.25 brg?
```
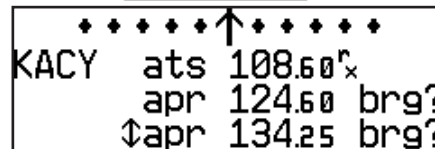
The NAVCOM page lists the frequencies for your departure (or nearest) and arrival airports in the following order:

Departure	*Arrival*
• *Unicom*	• *ATIS*
• *ATIS*	• *Approach*
• *Clearance Delivery*	• *Arrival*
• *Clearance Pretaxi*	• *TCA*
• *Ground*	• *TMA*
• *Tower*	• *CTA*
• *Multicom*	• *ARSA*
• *Other*	• *TRSA*
• *Departure*	• *Tower*
• *TCA*	• *Multicom*
• *TMA*	• *Other*
• *CTA*	• *Ground*
• *ARSA*	• *Unicom*
• *TRSA*	

NAVCOM page with receive only (rx) frequency and frequencies with restrictions (brg).

Frequency restrictions on 124.60, showing range of applicable radials from 130º through 309º.

Once you begin viewing restrictions, you can view any additional frequencies for the selected airport by rotating ●. (Note: An arrow prompt displayed next to the airport identifier indicates additional frequencies are available.) You can also view the other airport information pages by rotating ○. Information contained on these pages is covered in Section 2. To return to the NAVCOM page, press NAV.

Some frequencies in the NAVCOM page have tags which designate their usage:

'tx' – transmit only   'rx' – receive only
'pt' – part time frequency

The GPS 150XL **position page** displays the graphical CDI along with your present latitude and longitude, altitude and a reference waypoint field. The altitude and reference waypoint fields are selectable to configure the page to your own preferences and current navigation needs.

Altitude, MSA or ESA

Position (lat/lon)

Reference Waypoint Field

The altitude field can display either the present altitude, minimum safe altitude (MSA) or 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. MSA and ESA altitudes are calculated from information contained in the database and generally include mountains, buildings and other permanent features (see following page).

To change the altitude field:

    1. Press CRSR to obtain a cursor.

    2. Rotate ◯ until the 'alt/ESA/MSA' field is highlighted.

    3. Rotate ● to display the desired data. Press CRSR to return to normal navigation.

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

    • Range, bearing and identifier from the nearest airport (default), VOR, NDB, intersection, or user waypoint
    • Range, bearing, and identifier from a user specified waypoint

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

    1. Press CRSR to activate the cursor.

    2. Rotate ◯ to highlight the category field after the ^{f}r.

    3. Use ● to choose which waypoint type you would like displayed. (Choose 'wpt' if you would like range and bearing from a specific waypoint to be displayed.)

    4. Press CRSR to remove the cursor, or:

If you have selected 'wpt':

    5. Rotate ◯ to advance the cursor to highlight the identifier field.

    6. Use the ● and ◯ knobs to enter the identifier name. (This waypoint identifier can be an airport, VOR, NDB, intersection, or user waypoint.) Press ENT.

    7. Press CRSR to confirm the selection.

    This allows the distance and bearing from any waypoint to be displayed continuously, which may be useful when trying to locate your position on a sectional chart.

The position page displaying MSA. MSA and ESA are 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. Consult current charts and NOTAMS.

Position page displaying the 'TOP' VOR as the reference waypoint. This configuration can be used to help monitor your distance and radial from a waypoint of your choice. (Note: the waypoint category is listed as 'wpt' rather than 'VOR' because the GPS 150XL is not using the nearest VOR.)

Satellite status page with 'EPE' displayed. Estimated Position Error (EPE) gives an overall measure of your position accuracy in feet or meters.

Satellite status page with 'DOP' displayed. Dilution of Precision (DOP) measures relative accuracy from 1 to 10.

18

The GPS 150XI's **satellite status page** provides satellite information to monitor GPS coverage and receiver performance. This is helpful when you may be experiencing low signal levels due to poor coverage or installation problems.

To view the satellite status page:

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

CDI

Receiver Status

EPE/DOP value

Satellites in view

Signal strength of satellite being tracked (1-9)

Satellite in view but not receiving signal
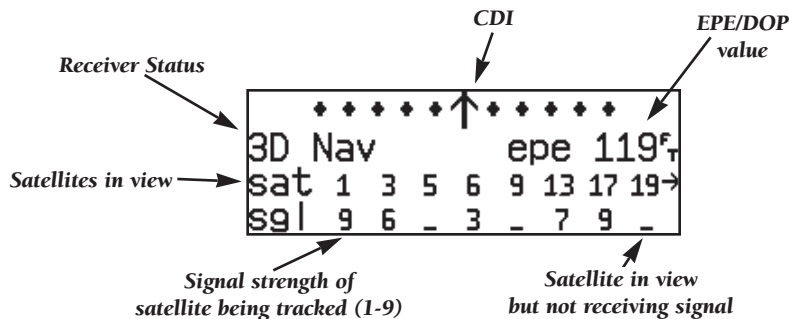
The top lines of the status page display a graphical CDI, followed by the receiver status and the current position accuracy in DOP or EPE. The default setting is DOP.

The following functions may be displayed in the DOP/EPE field:

- **dop**— Dilution of Precision, a measure of the satellite geometry quality and relative accuracy of your position, with 1 indicating good geometry and 10 meaning poor.

- **epe**— Estimated Position Error, an overall measure of your positional accuracy in feet or meters using signal and data quality, receiver tracking status and DOP.

To change the DOP/EPE field:

1. Press NAV and rotate ◯ to display the satellite status page.

2. If the desired field (EPE or DOP) is not displayed, press CRSR.

3. Use ◉ to change between 'epe' and 'dop'. Press CRSR to finish.

The **receiver status field**, located on the second line (left side) of the page, will display the following messages under the appropriate conditions:

Search Sky - The GPS 150XL is searching the sky for visible satellites. You will be informed with the message 'Searching the Sky'.

Acquiring - The GPS 150XL is acquiring satellites for navigation.

2D Nav - The GPS 150XL is in 2D navigation mode. If your installation does not include an altitude serializer, you must enter the altitude manually (see page 2). '2D Dif Nav' will appear when you are receiving DGPS corrections in 2D mode.

3D Nav - The GPS 150XL is in 3D navigation mode and will compute altitude. '3D Dif Nav' will appear when you are receiving DGPS corrections in 3D mode.

Simulator - The GPS 150XL is in simulator mode, which should only be used for practice and trip planning. **Never** use simulator mode for actual navigation.

Poor Cvrg - The GPS 150XL cannot acquire sufficient satellites for navigation.

Need Alt - The GPS 150XL needs altitude in order to start/continue navigation. Press NAV to display the position page and enter altitude.

Not Usable - The GPS 150XL is unusable due to incorrect initialization or abnormal satellite conditions. Turn the unit off and on again.

Autolocate - The GPS 150XL is looking for any satellite whose almanac has been collected. This process can take up to five minutes.
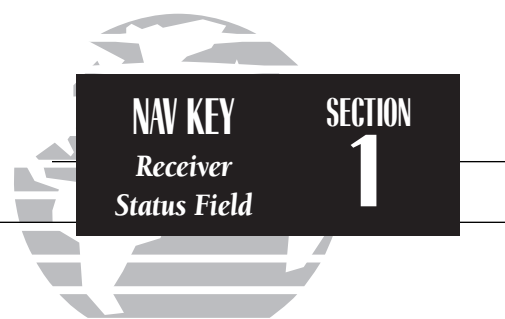
```
 No gps position
Acquiring    epe____ᶠᴛ
sat 1 3 5 6 9 13 17 19→
sgl  9 6 _ 3 _ 7 9 _
```

'Acquiring' satellites for navigation. In this case, the satellites are being received, but the data is still being collected before a position can be determined.

```
 No gps position
Search Sky  epe____ᶠᴛ
sat 1
sgl _
```

'Searching the Sky' for satellites. No satellite almanac data exists in the GPS 150XL. It must be recollected from the first available satellite.

```
 No gps position
Satellite  5
 elev 03°↓   ura  26ᶠₜ
 azm 018°    sgl   _
```

Viewing individual satellite information.

The third and fourth lines of the satellite status page provide the satellite number and signal strength of each satellite in view. The satellite status page shows signal strength for up to eight satellites at a time. If additional satellites are being received an arrow on the 'sat' line will indicate additional data is available.

To view additional satellites:

1. Rotate ⬤ to view more satellites.

Additional information regarding each satellite's azimuth, elevation and other data is also available.

To view individual satellite information:

1. Press NAV and use ◯ to display the satellite status page.

2. Press CRSR to activate the cursor.

3. Use ◯ to highlight the satellite number you wish to view and press ENT .

This will display the satellite data page, showing the selected satellite's number, elevation angle, rise or fall indication, User Range Accuracy (URA, or the range measurement accuracy as determined by the satellite), azimuth and signal strength.

To view other satellites:

4. Rotate ⬤ to view information for the next satellite.

5. Rotate ◯ and press CRSR on the satellite status page when you are finished.

In addition to the five other navigation pages, the GPS 150XL features two menu pages to perform a host of planning and navigation functions. **NAV Menu 1** provides access to the following functions:

- **Trip Planning**
- **Fuel Planning**
- **VNAV Planning**
- **Density altitude/true airspeed 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 and allows the pilot to view distance, ESA, bearing and estimated time enroute (ETE) between any two waypoints, and for programmed route legs. 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 waypoint mode or desired route number and press ENT .

    4. For direct-to navigation, use ● and ◯ to enter the 'to' and 'from' waypoints. Press ENT to accept the waypoints. To use your present position as a waypoint, leave the waypoint field blank.

    5. For route calculations, choose either 'cum' for cumulative data (from beginning to end) or the leg desired by rotating ●.

    6. Use ● and ◯ to enter the ground speed. Press ENT to calculate the values and CRSR to finish.
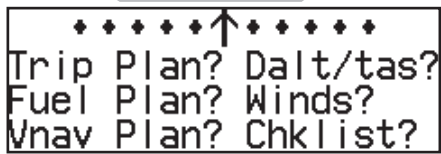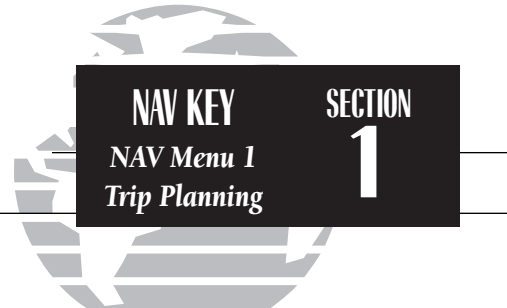
NAV Menu 1
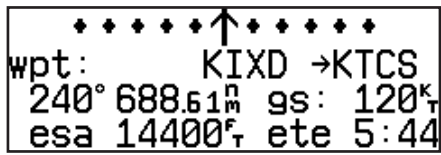
Trip planning with values calculated between two waypoints.
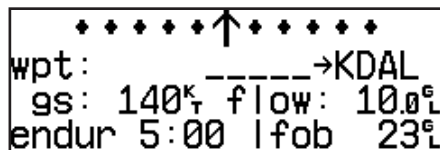
```
 * * * * *↑* * * * *
ialt: 1300°ₜ  cas:110ᴷₜ
pres: 29.95ⁱⁿₕ  tat: 68°ₜ
dalt  2000°ₜ  tas 113ᴷₜ
```

Density altitude/true airspeed page


```
 * * * * *↑* * * * *
wpt: _____→KDAL
 gs: 140ᴷₜ flow: 10.0ᵍₕ
endur 5:00 lfob  23ᵍ
```

Fuel planning page showing calculation from present position to 'KDAL'.

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

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 'Dalt/tas?'.

3. Press ENT to access the density altitude page.

4. Use ● and ◯ to enter the indicated altitude ('ialt') and press ENT.

5. Use ● and ◯ to enter the calibrated airspeed ('cas'). Press ENT.

6. Use ● and ◯ to enter the air pressure ('pres') and press ENT.

7. Use ● and ◯ to enter the total air temperature ('tat').

8. Press ENT and the density altitude and true airspeed will be calculated and displayed.

9. Press CRSR to remove the cursor.

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

The **fuel planning** page will display fuel requirements for both direct-to-navigation and programmed routes. The fuel planning function requires the pilot to enter the initial amount of fuel on board and the flow rate. You may also enter different ground speeds to view various information based on different travel times. If your installation is interfaced to a fuel flow sensor, the flow rate and other information will be supplied by the fuel flow sensor.

To perform fuel planning operations:

    1. Press <kbd>NAV</kbd> and rotate ⭘ until NAV Menu 1 is displayed.

    2. Press <kbd>CRSR</kbd> and rotate ⭘ until 'Fuel Plan?' is highlighted. Press <kbd>ENT</kbd>.

    3. Rotate ⬤ to select either 'wpt' for direct navigation or the desired route number. Press <kbd>ENT</kbd>.

    4. For waypoint-waypoint navigation, use ⬤ and ⭘ to enter the 'to' and 'from' waypoints. Press <kbd>ENT</kbd> to accept the waypoints. To use the present 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 <kbd>ENT</kbd>.

    8. Rotate ⭘ back two positions to highlight the 'fob:' or 'gs:' field again.

    9. Rotate ⬤ to display the other information. Press <kbd>ENT</kbd>.

    10. Use ⬤ and ⭘ to enter the remaining data. Press <kbd>ENT</kbd>.

    11. Use ⬤ and ⭘ to enter the flow rate, in units per hour, if needed. Press <kbd>ENT</kbd>.

The GPS 150XL will calculate the range and endurance (i.e., how long the fuel will last) of your aircraft. These are found in the first field on the bottom row of the page. The amount of fuel left on board (lfob) and reserve time after the selected direct-to, leg or route is flown are displayed in the second field on the bottom row.
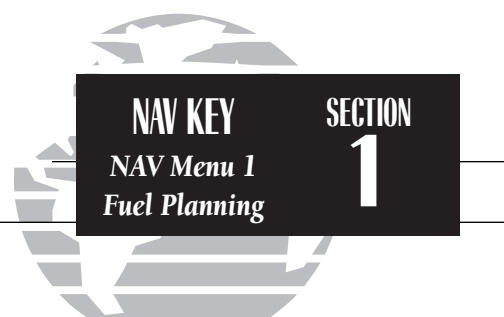
Fuel planning page showing calculations between two waypoints.
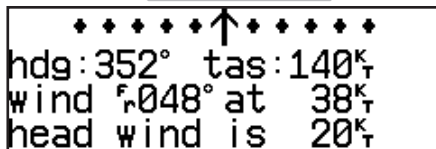
Fuel planning page with other information indicating 'endurance' and 'reserve' times.
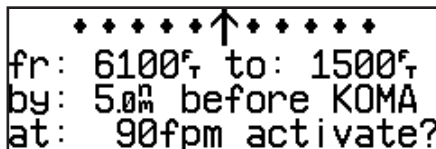
Winds aloft page

Vertical navigation page

The GPS 150XL's **winds aloft function** is used to calculate the true direction and speed of the any winds, and indicates whether you are flying with a head wind or tail wind, and the wind 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 airspeed (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 head/tail wind will be displayed.

The **VNAV function** calculates vertical speed requirements to reach a desired altitude before or after a specified distance from a waypoint. This is helpful when you'd like to descend to a certain altitude near an airport or climb to an altitude before reaching a route or direct-to waypoint.

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 current 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.

7. Use ● and ○ to select the waypoint identifier (it must be a waypoint in the active route or a direct-to waypoint). Press ENT.

You will now notice that the vertical speed has been calculated, based on your present speed. If you desire a more rapid climb or descent rate:

8. Use ● and ○ to enter the new desired vertical speed, or press ENT to accept the calculated value.

9. Press ENT to activate the vertical navigation function.

If you enter a value greater than the value computed by the GPS 150XL, the time remaining before the maneuver is to begin will be displayed. When the countdown reaches 15 seconds, you will be informed with the message 'Start altitude chng'. The VNAV function will automatically be cancelled if the active direct-to or route is changed in any way, and you will be informed with a 'VNAV cancelled' message.
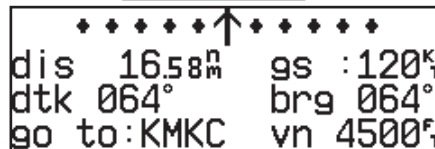
The GPS 150XL will allow you to create up to nine **checklists** with 30 items each to remind you of repetitive tasks (that can be called up at any time for review). The checklist feature is useful for creating pre-flight checklists, landing checklists, emergency procedures, etc. Each name or function can have up to 16 characters each.

To create a checklist:

1. Press NAV and rotate ○ until NAV Menu 1 is displayed.

2. Press CRSR and rotate ○ until 'Chklist?' is highlighted. Press ENT.

3. Press CRSR and use ○ to highlight the checklist you would like to create or edit. Press ENT.

4. Use ● and ○ 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'.

5. Use ● and ○ to enter the checklist item. Press ENT.

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

```
* * * * * ↑ * * * * *
dis  16.58ᴹ     gs :120ᴷₜ
dtk 064°        brg 064°
go to:KMKC      vn 4500ᶠₜ
```

VNAV displayed on NAV summary page. The VNAV altitude should be compared with the reading on the aircraft altimeter to ensure you are on the proper climb/descent angle.


```
* * * * * ↑ * * * * *
Select check list
  :PRE TAXI
↓ :EMERGENCY
```
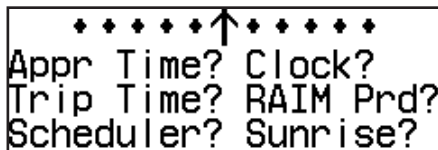
Checklist catalog page.

Executing a checklist.

NAV Menu 2

To execute a checklist:

1. Press NAV and rotate ◯ until NAV Menu 1 is displayed.

2. Press CRSR and rotate ◯ until 'Chklist?' is highlighted. Press ENT.

3. Use ◯ to highlight the checklist you would like to see. Press ENT.

4. Press ENT to check off list items.

To delete a checklist item or an entire checklist:

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

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

The GPS 150XI's **NAV Menu 2** provides access to various timer and planning functions, including:

- **Approach timer**   • **Clock (Date and time)**
- **Trip Timer**   • **RAIM Prediction**
- **Scheduler messages**   • **Sunrise and sunset calculations**

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

To activate/change/view the approach timer:

1. Press NAV and rotate ◯ until NAV Menu 2 is displayed.

2. Press CRSR and rotate ◯ until 'Appr Time?' is highlighted. Press ENT.

3. Rotate ⬤ to select either 'Count up' or 'Count down'. Press ENT.

4. Use ⬤ and ◯ to set the time to begin counting from. Press ENT.

5. Rotate ◯ to select the desired function: 'Start', 'Stop', or 'Reset'. Press ENT to execute.

When the countdown timer reaches zero, you will be informed with a 'Timer expired' message. The timer will then begin to count up, displaying the time since it expired. The timer runs, if not altered, whenever the GPS 150XL is turned on.

The GPS 150XL **clock function** keeps track of both UTC time (Greenwich Mean Time or Zulu Time calculated from the satellites) and local time, and allows you to designate which format to use in all time displays. The local time and date can be set without displaying local time on other GPS 150XL pages.

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 150XL's **trip timer** will automatically keep track of the duration of your current trip and can be configured to run when the GPS 150XL is on, or only when your ground speed exceeds a specified value (see Section 5).

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. The current time of day, departure time and time enroute will be displayed.

3. To reset the timer, press ENT. To skip resetting the timer, press CRSR.
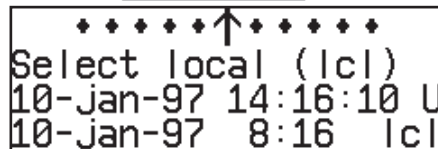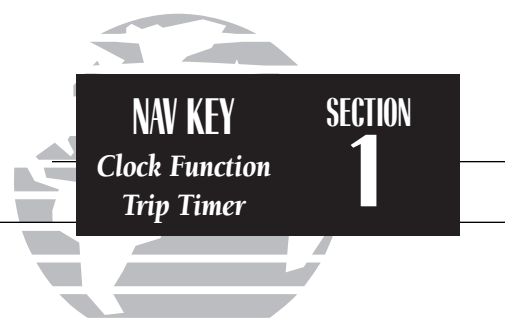
Clock function set to display local time in the time fields of all other GPS 150XL pages.
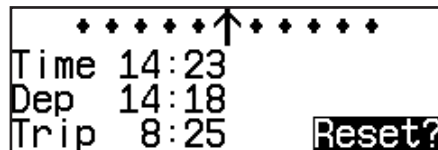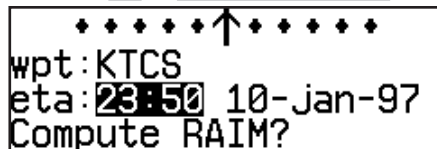
To reset the trip timer, highlight 'Reset?' and press ENT.
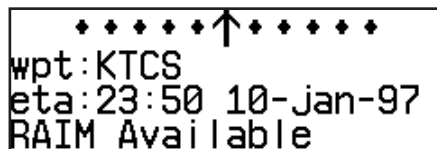
Enter the time and date for RAIM prediction.

RAIM available for the entered time, date and waypoint location.

The **RAIM Prediction function** allows you to confirm that GPS coverage is available for your current location or at a specified waypoint any day of the year. **R**eceiver **A**utonomous **I**ntegrity **M**onitoring performs checks to ensure that the GPS 150XL will have adequate satellite geometry to work with during your flight. RAIM availability will be near 100% in Oceanic, En route and Terminal phases of flight.

To predict RAIM availability:

1. Press NAV and rotate ◯ until NAV Menu 2 is displayed.

2. Press CRSR and rotate ◯ to highlight 'RAIM Prd?'. Press ENT.

3. Rotate ◯ to highlight the field which you would like to change.

4. Use ⬤ and ◯ to enter the waypoint name, or leave it blank to use your current position. Press ENT to accept.

5. Use ⬤ and ◯ to enter the ETA in hours and minutes (in local or UTC time, whichever you have selected from the clock display), and the day, month and year. The current date will be displayed automatically. Press ENT to accept.

6. Rotate ◯ to highlight 'Compute RAIM?'.

7. Press ENT to compute information.

When the computations are complete, the GPS 150XL will display whether or not RAIM is available for the specified waypoint at the specified date and time. Refer to the table on page 72 for specific RAIM protection limits as they relate to CDI scale figures.

The **scheduler function** will display reminder messages (such as 'Change oil', 'Switch fuel tanks', 'Overhaul', etc) after a specified time has elapsed. For example, if you enter 'Change oil' to be displayed in 30 hours, the message 'Change oil' will be displayed after the GPS 150XL has been running in Normal mode for 30 hours. After appearing, the message will be displayed each time the GPS 150XL 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.

3. Press ENT.

4. Rotate ◯ to highlight the message you would like to edit. To delete, press CLR, then ENT.

5. Use ⬤ and ◯ to enter the message. Press ENT.

6. Use ⬤ and ◯ to set the time to elapse before the message is displayed, in hours and minutes, up to 99 hours and 59 minutes (this time is cumulative and counts whenever the GPS 150XL is on in normal operating mode).

7. Press ENT.

You may edit another scheduled message by repeating steps 4, 5, 6 and 7 or if you are finished, press CRSR.

+ + + + + ↑ + + + + +
Scheduled messages
:CHANGE OIL   10:00
↓:ANNUAL   57:00
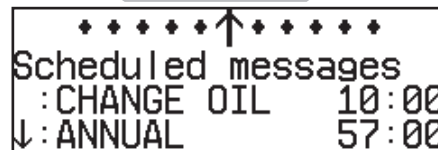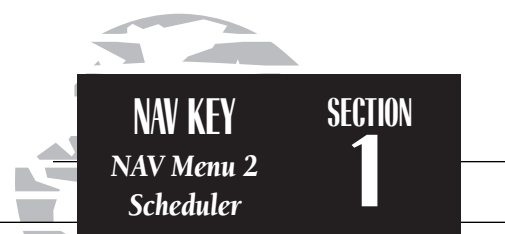
The scrolling arrow prompt indicates which direction to scroll to view additional listings.

No gps position
CHANGE OIL
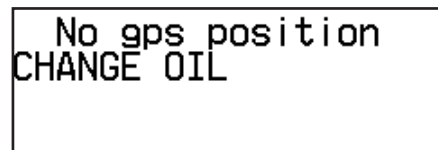
The scheduled message will appear after the timer expires and reappear every time the GPS 150XL is powered on until the message is changed.

```
 No active waypoint
Sunrise/sunset
wpt:KROG    10-Jan-97
Rise 13:28 Set 23:19
```

Sunrise/sunset planning page showing UTC (Zulu) sunrise and sunset times for 'KROG'.

The GPS 150XI's **sunrise/sunset planning function** allows you to calculate the time of sunrise or sunset at any waypoint or your present position for a specified date.

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 GPS 150XL uses a Jeppesen NavData® card to provide position and facility information for thousands of airports, VORs, NDBs and intersections. Each facility in the database is stored as a waypoint with its own latitude/longitude, identifier (up to five letters and/or numbers), and other pertinent information. Up to 1,000 user waypoints may also be created and stored in the GPS 150XL's internal memory.

Waypoint Menu Page

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

Proximity Waypoints Page

```
• • • • • ↑ • • • • •
Proximity waypoints
:KACY  dis:15.0m
:_____ dis:___m
```

```
• • • • • ↑ • • • • •
Wpts with comments
 KACY  KIXD  KLAX
KSUSM
```

Waypoints With Comments List

```
• • • • • ↑ • • • • •
↕   3 user waypoints
HOME
KSUSM in rt  2
```

User Waypoint List

Waypoint information is available through four primary waypoint pages accessible from the GPS 150XL's WPT key. The waypoint pages may be scrolled through by pressing the WPT key and rotating the outer knob until the desired page is displayed, or by pressing the WPT key repeatedly.
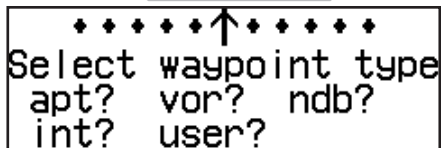
Please note that your GPS 150XL uses ICAO identifiers for all airports. All U.S. airport identifiers which contain only letters use the prefix 'K'. For example, Los Angeles International is KLAX under the ICAO standard. Other airports, such as Otten Memorial (3VS), that contain numbers in the identifier do not require the 'K' prefix. Many foreign countries use two letter prefixes. For more information on ICAO identifiers, contact:

Document Sales Unit
International Civil Aviation Organization
999 University Street
Montreal, Quebec
Canada H3C 5H7

The waypoint menu page allows you to select the desired waypoint type (or category).

The airport position page shows the position, field elevation and available fuel types for the selected airport.

The GPS 150XL organizes waypoints into one of five waypoint categories for your convenience. Each waypoint category provides different types of detailed information for a selected facility:

- **Airports -** Identifier, city/state, country, facility name, position (lat/lon), elevation, runways, fuel services and communication frequencies.

- **VORs -** Identifier, city/state, country, facility name, position (lat/lon), frequency, magnetic variation, co-located DME or TACAN and weather broadcast indication.

- **NDBs -** Identifier, city/state, country, facility name, position (lat/lon), frequency and weather broadcast indication.

- **Intersections -** Identifier, country, position (lat/lon) and nearest VOR.

- **User -** Identifier (name), position (lat/lon) and reference waypoint.

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

To choose a waypoint category (for viewing information):

1. Press WPT and rotate ◯ to display the waypoint menu page. (If pressing WPT once does not display the waypoint menu page, press WPT a second time.)

2. Press CRSR and rotate ◯ to highlight the desired waypoint category.

3. Press ENT to accept the waypoint category. The waypoint identification or position page for the selected category will appear with the waypoint identifier field ready for entry.

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

To enter a waypoint identifier:

1. With the cursor over the waypoint field, use ● and ○ to enter the waypoint identifier.

As the identifier is entered, the GPS 150XL's Spell'N'Find™ feature will scroll through the available database, displaying those waypoints matching the identifier letters you have entered to that point. When the desired waypoint is displayed, press CRSR to remove the cursor.

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

1. Press WPT and rotate ○ to display the waypoint menu page.

2. Press CRSR and rotate ○ to highlight the desired waypoint category.

3. Press ENT to accept the waypoint category.

4. Rotate ○ to highlight the middle field to enter location (city) **OR:**

   Rotate ○ to highlight the bottom field to enter facility name or VOR/NDB name.

5. Use ● and ○ to enter the location or the name, and press CRSR to finish.

As the information is entered, the GPS 150XL will display any entries in its database that match the letters you have entered. If duplicate entries exist for the entered identifier, name or location, additional entries may be viewed by rotating ●. Once the desired waypoint is displayed, press CRSR to continue.

Entering a waypoint by identifier.

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

If the city or facility name information is too long to fit the screen, the name will scroll across the page every few seconds so the complete name can be read.

The airport position page shows the position, field elevation and available fuel types for the selected airport.

Once a waypoint category and identifier have been selected, the GPS 150XL will provide extensive information through a set of waypoint pages for the selected category. The pages available for each waypoint category are presented here in the order they appear on the waypoint menu page: airports, VORs, NDBs, intersections and user waypoints.

Airport Information

Airport Identification Page

Airport Comments Page

Airport Position Page

Airport Runway Page

Airport Communication Page

To scroll through the airport pages:

1. Make sure the cursor is not present. If it is, press CRSR.

2. Rotate ◯ in either direction to scroll through the available pages.

The GPS 150XL features five airport pages:

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

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

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

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

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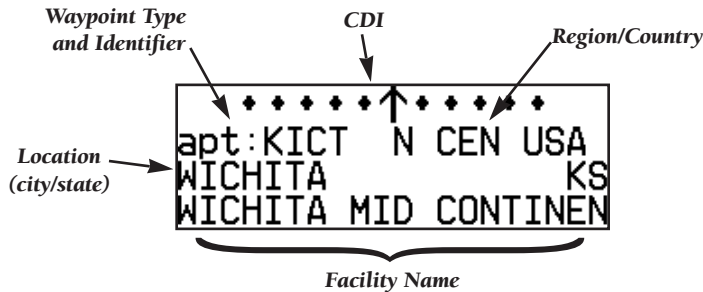
The **airport identification page** displays a selected airport's identifier, region and country, city/state and facility name. The identification page is always the first airport page available, allowing you to quickly review an airport facility or select another facility by entering the identifier,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

Airport communication page. The down arrow next to the identifier indicates additional frequencies may be displayed by rotating the ⬤ knob.
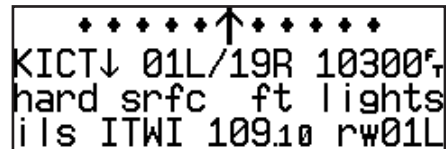
Airport runway page. The down arrow next to the identifier indicates additional runways may be displayed by rotating the ⬤ knob.

35
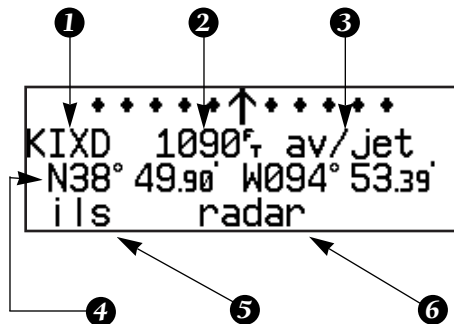
Airport Position Page

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

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

Elevation— In feet or meters

Usage/Fuel— If the airport is for military use, it will display 'military'. If it is private, the GPS 150XL will display 'private'. If it is a public airport, it will display the fuel type(s) available:
- **av gas—** 80-87 octane, 100 LL, 100-130 octane, or mogas is available
- **jet—** Jet A, Jet A-1 or Jet A+ fuel is available
- **av/jet—** Both av gas and jet fuel are available

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

Approach Information— displays the airport approaches available
- **no apr—** No approach is available
- **np-apr—** Non-precision approach is available
- **loc—** Localizer approach is available
- **ils—** ILS approach is available

Controlled Airspace Information— displays controlled airspace type
- **class B**
- **class C**
- **cta**
- **tma**

Radar— displays approach/departure radar capability
- **radar—** indicates radar is present

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

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

1. Rotate ◯ with the cursor removed to display the communication page.

2. Rotate ⬤ in the direction of the arrow prompt to view additional frequencies. You may also view additional frequencies with the cursor on the page by rotating the ◯ knob.

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

Frequencies without restriction information:

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

Frequencies with restriction information:

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

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

```
* * * * * ↑ * * * *
KCLT↓          atsⁿ×121.15
atsⁿ×132.10   clr 127.15
gnd 121.80    gnd 121.90
```

Airport communications page for KCLT.


```
* * * * * ↑ * * * * *
KLAX↕  dep       124.30
045-224°
```
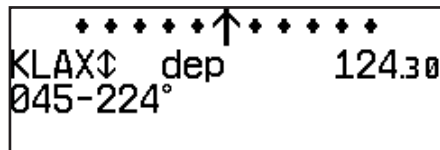
Frequency page with sector restrictions.

Airport runway page for KICT.

To view additional runways, rotate the ◉ knob in the direction of the arrow prompts.

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

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

1. Rotate ◯ with the cursor removed to display the runway page.

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

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

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

Runway surfaces:

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

Runway lighting:

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

## VOR Information

The GPS 150XL features three VOR waypoint pages:

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

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

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

VOR information is accessed by entering the desired facility by identifier, city or facility name (see page 33) on a VOR waypoint page. The VOR identification and comments pages are identical in form and function to their airport page counterparts.

To scroll through the VOR pages:

1. Make sure the cursor is not present. If it is, press CRSR.

2. Rotate ◯ in either direction to scroll through the available pages.

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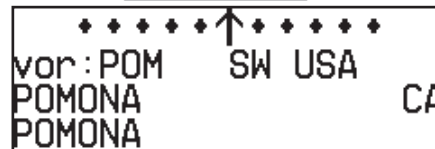
VOR identification page
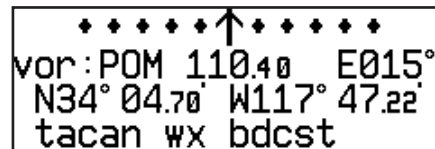
VOR position page showing co-located TACAN facility and weather broadcast.

NDB identification page

NDB comments page

NDB Information

NDB Position Page

The GPS 150XL also uses identification, position and comments pages for NDB information. The NDB waypoint pages are used in the same manner as VOR pages: NDB information is accessed by entering the desired facility's identifier, city or name (see page 33) on the NDB identification page.

To scroll through the NDB pages:

      1. Make sure the cursor is not present. If it is, press **CRSR**.

      2. Rotate ⬭ in either direction to scroll through the available pages.

The NDB position page (see above) displays the selected facility's identifier, frequency and position, as well as any weather broadcasts available. The NDB comment page will display any user comments for the selected NDB (see page 48 for instructions on entering user comments).

Intersection Information

Intersection Position Page

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

To scroll through the intersection pages:

1. Make sure the cursor is not present. If it is, press CRSR.

2. Rotate ◯ to toggle between the available pages.

The intersection position page displays the selected facility's identifier, region and/or country, latitude and longitude, and the identifier, distance and bearing to the nearest VOR (not necessarily the VOR used to define the intersection). The intersection comment page will display any user comments for the selected intersection (see page 48).

Intersection comments page

User waypoint page

User waypoint comments page

User Waypoint Information

In addition to the airport, VOR, NDB and intersection waypoints contained in your NavData® card, the GPS 150XL allows you to store up to 1,000 user-defined waypoints. Once a user waypoint is created, two user waypoint pages will display the following information:

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

To scroll between the user waypoint position page and the user comments page, rotate ◯. User waypoints may be created or modified using the WPT key. After selecting the waypoint identifier, as shown on page 33, you will be prompted to enter information if the waypoint is new. There are three ways to create a user waypoint's position from the WPT key:

1. Enter the exact position of the new waypoint.

2. Reference a known waypoint by range and bearing.

3. Enter a range and bearing from your current position.

To create or edit a user waypoint:

1. Press WPT.

2. Press CRSR and use ◯ to highlight the 'user?' field. Press ENT.

3. Use ⬤ and ◯ to enter the waypoint identifier. Press ENT.

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

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

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

To enter/edit the position of the user waypoint:

1. Use ● and ○ to enter the latitude. You may select either north or south and enter a latitude up to (but not including) 90°.

2. Press ENT.

3. Use ● and ○ to enter the longitude. You may select either east or west and enter a longitude up to (but not including) 180°.

4. Press ENT.

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

5. Press ENT to advance the cursor to the 'ok?' prompt and press ENT to save the new waypoint in internal memory.
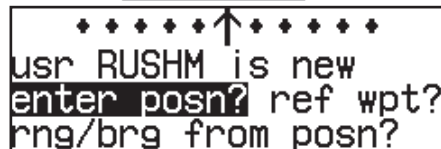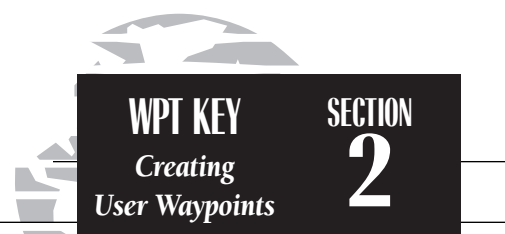
Selecting a method to enter a new user waypoint.
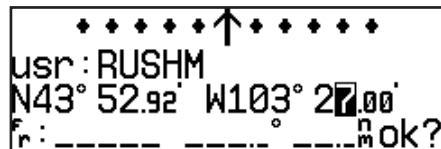
Entering the user waypoint's exact position.

Creating a user waypoint by referencing another waypoint.

To create a user waypoint from your present position, leave the reference waypoint field blank and enter a bearing and distance from your present position. The GPS 150XL will calculate the new waypoint's coordinates automatically.

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

1. Use ● and ○ to enter the reference waypoint's identifier.

2. Press ENT. The waypoint's position will appear.

3. Use ● and ○ to enter the bearing from the reference waypoint.

4. Press ENT.

5. Use ● and ○ to enter the distance from the reference waypoint.

6. Press ENT. The latitude and longitude will be calculated for the waypoint.

7. Press ENT to confirm the 'ok?' prompt and save the waypoint position.

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

To create a user waypoint offset from your present position:

1. Use ● and ○ to enter the bearing from your position.

2. Press ENT.

3. Use ● and ○ to enter the distance from your position.

4. Press ENT. The latitude and longitude will be calculated for the new waypoint.

5. Press ENT to confirm the 'ok?' prompt and save the waypoint position.

The GPS 150XL's **AutoStore™ function** provides another method of creating user waypoints. AutoStore is used to instantly capture your present position as a user waypoint with a touch of a button and add the new waypoint to the end of a specified route if desired.

To perform an AutoStore:

 1. Press NAV and rotate ◯ to display the position page or map page.

 2. Press ENT.

This will display the 'Save waypoint' screen, which will allow you to rename the waypoint and choose the route to which it should be added. The GPS 150XL will assign the next available three-digit number as the default waypoint name, preceded by a '+' sign. This will help you differentiate AutoStore waypoints from other user waypoints.

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

 1. Rotate ◯ to select the name or route number field.

 2. Use ⬤ and ◯ to enter the name or route number. If you do not want to add the waypoint to a route, be sure to keep the route field blank.

 3. Press ENT to accept.

 4. Press ENT to confirm the 'ok?' prompt.

If the waypoint name you entered is already assigned to another waypoint, you will be informed with the message 'WPT exists _____'. The default waypoint name will be redisplayed, and you may enter a different name.

```
  * * * * * ↑ * * * * *
Save wpt: +000
 N39° 03.25'  W094° 28.65'
 Store in rte:__ ok?
```
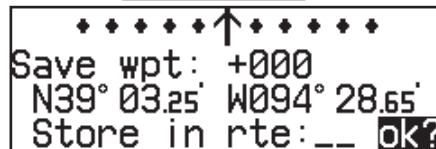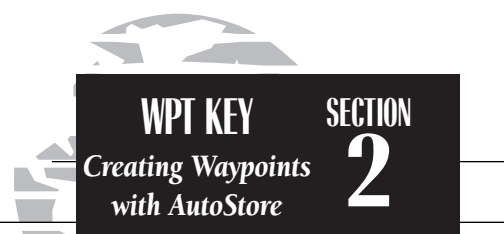
AutoStore waypoint with default name.

```
  * * * * * ↑ * * * * *
Save wpt: ROYA▮
 N39° 03.25'  W094° 28.65'
 Store in rte:__ ok?
```
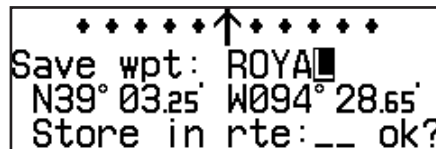
The default waypoint name may be changed before saving the waypoint.

Proximity waypoints page

Proximity alarm message. Pressing NAV *will display the position page with the bearing and distance from the proximity waypoint indicated on the bottom line.*

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The second page available from the GPS 150XL's WPT key is the **proximity waypoints page**. This page allows you to define an alarm circle around a selected waypoint and is useful in defining alarm circles around towers or obstructions. Up to nine proximity waypoints can be entered, each with an alarm radius of up to 99.9 nm.

To create or edit a proximity waypoint:

1. Press WPT and use ◯ to display the 'Proximity waypoints' page.

2. Press CRSR and use ◯ to highlight the first available field.

3. Use ⬤ and ◯ to enter the identifier. It may be an airport, VOR, NDB, intersection or user waypoint. Press ENT .

4. Use ⬤ and ◯ to enter the radius of the alarm circle. Press ENT .

If two proximity waypoints are entered and their regions overlap, you will be informed with the message 'Proximity overlap'. This message will be displayed each time you turn on the GPS 150XL for as long as the overlap remains. **Warning:** If you enter the overlap area you will only be informed of the *nearest* proximity waypoint.

To remove a waypoint from the proximity waypoints page:

1. Press CRSR , if necessary, to obtain a cursor.

2. Press CLR to erase the name, and then ENT to delete.

To scroll through the proximity waypoints list:

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

The third page available from the GPS 150XL's ᵂᴾᵀ key is the **user waypoint list**, which can be used to quickly scan, review, rename or delete user waypoints.

To display the user waypoint list:

1. Press ᵂᴾᵀ and use ◯ to display the user waypoint list.

2. To scroll through the list, rotate ⬤.

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

To highlight a waypoint:

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

To edit a highlighted waypoint's position:

1. Press ᴱᴺᵀ to obtain the waypoint position page. Edit the waypoint position as described on page 43. (**Note**: The active-to waypoint cannot be edited.)

To delete a waypoint from the list:

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

To rename a waypoint from the list:

1. Highlight the desired waypoint. Use ⬤ and ◯ to enter a new identifier for the waypoint.

2. Press ᴱᴺᵀ on the confirmation page to change the name, or press ᶜᴸᴿ to cancel.

User waypoint list showing the current active-to waypoint and a proximity waypoint.

Renaming a user waypoint.

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Entering waypoint comments

Waypoints with comments page

The last page available through the GPS 150XL's [WPT] key is the **waypoints with comments page**, which lists all waypoints that have a user comment. User comments may be added to 250 waypoints stored in the user or NavData® database, and allow you to note two lines of special information concerning a particular waypoint.

To enter user comments:

>   1. Enter the waypoint identifier from any waypoint page (see page 33), and press [CRSR] to remove the cursor.

>   2. Rotate ◯ to display the 'comments' page.

>   3. Press [CRSR] and use ◯ to highlight either the second or third line.

>   4. Use ⬤ and ◯ to enter the comment.

>   5. Press [ENT] to accept, and repeat steps 4 and 5, if necessary, to enter information on the other line.

>   6. Press [CRSR] to remove the cursor.

To view the 'waypoints with comments' list:

>   1. Press [WPT] and use ◯ to display the 'Wpts with comments' page.

>   2. Use ⬤ to scroll through the list.

The GPS 150XL will display the waypoints with comments in alphabetical order, with up to six waypoints at a time. The scrolling arrow prompt will indicate which direction to scroll to view additional waypoints.

To view comments for a selected waypoint:

>   1. Highlight the desired waypoint and press [ENT] (or press [CLR] and [ENT] to delete).

>   2. Rotate ◯ to display any other available pages for the selected waypoint.

The GPS 150XL's extensive waypoint database makes it possible for several waypoints to share the same identifier. To ensure that you are selecting the waypoint desired, the GPS 150XL will always offer the **waypoint confirmation page** (which shows the waypoint's position) when an identifier is entered for a particular function.

To accept the waypoint position:

1. Press ENT with the cursor over the 'ok?' prompt.

To reject the waypoint position:

1. Press CLR with the cursor over the 'ok?' prompt.

Once a waypoint has been accepted or rejected, the previous page will be displayed. If there is more than one waypoint available for a selected identifier, the GPS 150XL will display a duplicate waypoint page for you to choose the desired waypoint. The waypoint identifier and number of duplicates will be shown at the top of the page, with the waypoint type and region of each duplicate indicated below. The waypoints listed are sorted by the distance from your present position.

To scroll through additional duplicate waypoints:

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

To select the desired waypoint from the duplicate list:

1. Activate the cursor and rotate ◯ to highlight the desired waypoint.

2. Press ENT. The waypoint confirmation page will appear.

3. Press ENT over the 'ok?' prompt to accept the waypoint or CLR to reject the waypoint and return to the duplicate waypoints list.

* * * * * ↑ * * * *
go to apt:KACY
N39° 27.45' W074° 34.63'
auto   crs 107°   ok?

Waypoint confirmation page

* * * * * ↑ * * * *
9 duplicate MA
ndb S CEN USA?
↓ ndb CANADA?

Duplicate waypoints page

Possible messages for locked waypoints.

To blank a waypoint field, highlight the field and press the CLR *key.*

Because the GPS 150XL relies on a NavData card for most waypoint information, there may be instances when waypoint information is not available for use. **Locked waypoints** exist when a waypoint contained in a route, used as a proximity waypoint or with a comment, is not contained on the NavData card, or no card is inserted in the unit. If this condition exists, you'll be alerted with a 'Proximity wpt locked', 'Route wpt locked' or 'Wpt comment locked' message when the unit is powered up. The identifier of a locked waypoint will be replaced with a 'lockd' message, which indicates you cannot obtain waypoint information or navigate to the waypoint. The identifier of a locked waypoint may be displayed by highlighting 'lockd' and pressing ENT. Locked waypoints may be deleted from routes, the proximity waypoints list or waypoints with comments page by following the instructions in the appropriate section of this manual.

The **waypoint scanning feature** provides a fast way to scan through airports, VORs, NDBs and intersections in the database by identifier, facility name or city. Waypoint scanning may be used from any blank waypoint identifier field.

To enter a waypoint by scanning the identifier, facility name or city:

1. With the cursor over a blank identifier field, press WPT. If the identifier field is not blank, highlight the field with the cursor and press CLR before pressing WPT.

2. Use ◯ to highlight the waypoint category you wish to scan.

3. Press ENT to activate the scanning mode.

4. Rotate ◯ to place the cursor over the field you want to scan (identifier, facility or city name).

5. Use ⬤ and ◯ to enter the letters of the identifier, city or facility name. The GPS 150XL will scan the database and display the first waypoint that matches your entry.

6. Press ENT to accept the waypoint, and ENT again to confirm the waypoint for the function being used.

Section 3
Nearest Waypoints

The GPS 150XI's NRST **key** provides detailed information on the nine nearest airports, VORs, NDBs, intersections and user waypoints within 200 nm of your current position. In addition, it will display the two nearest Flight Service Station (FSS) and center (ARTCC/FIR) points of communication, plus alert you to any Special Use Airspace (SUA) you may be in or near. The NRST key can be used in conjunction with the GPS 150XI's direct-to function to quickly set a course to a nearby facility in case of an in-flight emergency.

To view the nearest waypoint information:

1. Press NRST.

This will display the airport nearest to your present position, subject to the runway surface type and minimum runway length selected (see page 73).

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

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 on any of the nearest waypoint pages:

1. Press ⫎. The waypoint confirmation page will appear.

2. Press ENT to accept the waypoint or CLR to cancel.

Nearest airport with other frequency information. If an airport has multiple frequencies available, they may be quickly viewed without activating the cursor by pressing the CLR key repeatedly.

Nearest FSS page. To view additional frequencies (if available), highlight the frequency and rotate the ◯ knob.

Nearest SUA

Nearest SUA with controlling agency displayed.

NOTE: *The GPS 150XL will flash the ◖ next to the* **MSG** *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 150XL will not flash alerts, however, if it has been turned off or if your altitude is such that you will not enter the buffered airspace. Turning off SUA alerts and setting the altitude buffer is described on page 78.*

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

The next page available under the GPS 150XL's **NRST** key is the **SUA (special-use airspace) alert page**. The SUA alert page will alert you to as many as nine controlled or restricted airspaces near or in your flight path, according to the following conditions:

- If your projected course will take you inside an SUA within the next 10 minutes, the message '**SUA ahead < 10 min**' will be displayed.

- If you are within two nautical miles of an SUA and your current course will take you inside, the message '**SUA Near & Ahead**' will be displayed.

- If you are within two nautical miles of an SUA and your current course will **not** take you inside, the message '**Near SUA < 2nm**' will be displayed.

- If you have entered an SUA, the message '**Inside SUA**' will be displayed.

Note that the GPS 150XL's SUA alerts are based on three-dimensional data (latitude, longitude and altitude) to avoid nuisance alerts. The alert boundaries for controlled airspace are also sectorized to provide complete information on any nearby airspace. Once you have met one of the described conditions, the message annunciator will flash, alerting you of an SUA message.

To view an SUA message:

1. Press the **MSG** key.

2. Press **MSG** again to return to the previous page.

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

To view the SUA alert page:

1. Press the NRST key.

2. Rotate ◯ one stop to the right to view the SUA alert page.

The SUA alert page contains the following information:

SUA number   *Alert type*

                                                                    *ETE
                                                                    (if applicable)*

*SUA Name or
controlling
agency*

```
 * * * * * ↑ * * ╱ * *
sua1 near&ahead 1:24
KANSAS CITY      cl B
KMCI  8000ᶠₜM- 4000ᶠₜM
```

SUA type

*Controlling
airport identifier*

SUA Ceiling altitude   *SUA Floor altitude*
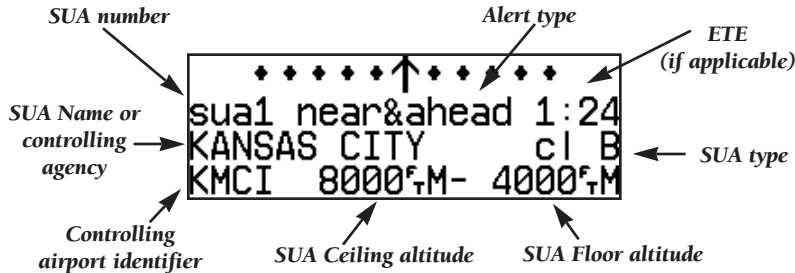
The 'SUA number' field displays which SUA you are viewing (you may be alerted to up to nine SUAs). SUAs are ranked with 'sua1' being the highest priority, and 'sua9' being the lowest priority from your current position. The 'SUA alert' field displays the corresponding alert message for this SUA, such as 'near', 'near & ahead', etc. (see page 52). The ETE (estimated time enroute), located at the top right of the page, will only be displayed if you are projected to enter the airspace.

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

To toggle between the SUA name and controlling agency display:

1. Rotate ⬤ one stop in either direction.

If the SUA name or controlling agency is too long to fit on the display, the GPS 150XL will automatically scroll to display the rest of the information.

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

SUA alert page

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

Message	Meaning
$8000^{ft}M$	- 8000 feet mean sea level (MSL)
$3000^{ft}A$	- 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
unlmtd	- Altitude is unlimited

Frequency information for SUA. If the information is too long to fit on the display, the GPS 150XL will automatically scroll to display the rest of the information.

```
 ♦ ♦ ♦ ♦ ♦↑♦ ♦ ♦ ♦ ♦
cl B/cta on   moa on
cl C/tma on   oth on
alt: 200ₜᶠ rstcd on
```

SUA Settings Page

All SUA alert messages except for prohibited areas may be turned on or off through the GPS 150XL's unit settings options, found under the [MSG] key (see page 78). Alerts for prohibited areas will always be displayed, regardless of unit settings or operating mode. SUA alerts may be turned off so the pilot can avoid continuous alerts in areas with extensive special use airspace.

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

The GPS 150XL also features an altitude buffer which may be set to provide a greater level of protection from penetrating an SUA. By specifying an altitude in the buffer, you can effectively stretch an SUA's altitude boundaries in both directions. This allows the pilot to add an extra margin of prevention around controlled or restricted airspace. For instructions on setting the altitude buffer, see page 78.

```
 ♦ ♦ ♦ ♦ ♦↑♦ ♦ ♦ ♦ ♦
cl B/cta on   moa on
cl C/tma on   oth on
alt: 500ₜᶠ rstcd on
```

Altitude buffer set at 500 feet. This provides an added 500 foot margin beyond the floor and ceiling limits for an airspace.

Section 4
Direct-to & Route Navigation

One of the many benefits of GPS navigation is the ability to fly directly to a waypoint or fly a chain of waypoints without using ground-based navigation aids. To take advantage of the convenience and efficiency provided by point-to-point GPS navigation, the GPS 150XL provides two basic methods of selecting a destination for your flight: **direct-to** and **route navigation**. The direct-to function provides a fast way to set a course to a destination waypoint from your present position. The route function allows the pilot to create a chain of waypoints to fly in sequence.
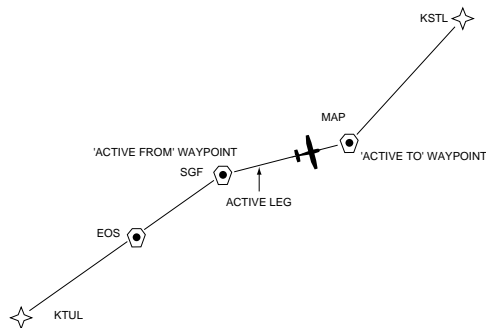
As you pass each waypoint in the route, the GPS 150XL's automatic leg sequencing and turn anticipation features will automatically select the next waypoint as the 'active to' waypoint and provide smooth steering guidance around the turn. If you are not currently navigating a particular route leg (e.g., your starting position is not a route waypoint), the unit will select the appropriate leg as the active route segment.

The GPS 150XL's **direct-to function** provides a quick method of setting a course to a destination waypoint. Once a direct-to destination is activated, the GPS 150XL will establish a point-to-point route line along the great circle from your present position to the destination and provide steering guidance and navigation data to the waypoint until it is cancelled. If you are navigating to a waypoint and get off course, the direct-to function may also be used to re-center the d-bar to proceed to the same waypoint.

To select a direct-to destination:

1. Press the [⊕] key. The NAV summary page appears with the destination field highlighted.

2. Use ⬤ and ◯ to enter the identifier of the desired waypoint.

3. Press [ENT] to confirm the identifier, and [ENT] to accept the direct-to confirmation page.

To re-center the d-bar to the same active-to waypoint:

1. Press the [⊕] key, followed by [ENT] twice.

A direct-to may also be quickly activated from many pages that display a single waypoint identifier (e.g., the nearest airport page) by simply pressing [⊕] and [ENT]. For pages that display a list of waypoints (e.g., the user waypoint list page), you must highlight the desired waypoint with the cursor before pressing the [⊕] key. Once a direct-to is activated, the GPS 150XL will provide navigation guidance until the direct-to is cancelled or the unit is turned off.

To cancel a direct-to destination:

1. Place the cursor over the destination field on the NAV summary page.

2. Press [CLR]. The destination field will go blank.

3. Press [ENT]. The GPS 150XL will resume navigating Route 0 (the active route) if available.
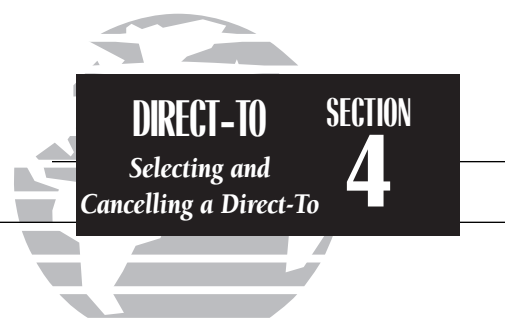
```
No active waypoint
dis ____.__ⁿₘ  gs : 0ᴷₜ
dtk ___°      brg ___°
go to:KCOS_   trk 356°
```

To select a direct-to destination, press the [⊕] key and enter the waypoint identifier using ⬤ and ◯.

```
  ♦ ♦ ♦ ♦ ♦ ↑ ♦ ♦ ♦ ♦ ♦
nr1 apt KIXD   1090ᶠₜ
 154°  5.50ⁿₘ twr 118.30
rnwy 17 /35    7300ᶠₜ
```

To quickly select a direct-to from any page that displays a single waypoint identifier (e.g., the nearest airport page), press [⊕], followed by [ENT].
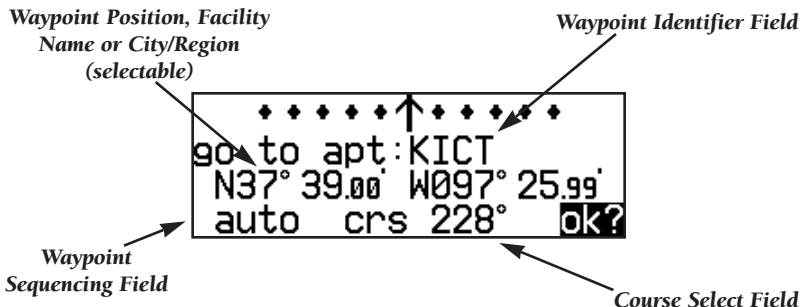
```
  • • • • • ↑ • • • • •
go to apt:KICT
 N37° 39.00' W097° 25.99'
hold   crs 228°    ok?
```

The waypoint sequencing field, located at the bottom left of the direct-to confirmation page, allows you to 'hold' on a selected route waypoint and prevent the GPS 150XL from sequencing to the next route waypoint.

If you have selected the 'hold' setting from the waypoint sequencing field, your selected course will appear at the bottom left of the NAV summary or map pages. You may change your selected course right from this field by highlighting the course field and rotating the inner knob. Press ENT to confirm the course.

Whenever you perform a direct-to, the GPS 150XL will set a point-to-point great circle course to your destination. You can also manually define the course to your destination with the GPS 150XL's **course select** feature. The course select feature is available from the bottom line of the **direct-to confirmation page** and works like selecting an OBS course on a VOR indicator.

*Waypoint Position, Facility
Name or City/Region
(selectable)*

Waypoint Identifier Field

```
  • • • • • ↑ • • • • •
go to apt:KICT
 N37° 39.00' W097° 25.99'
auto   crs 228°    ok?
```

*Waypoint
Sequencing Field*

Course Select Field

To manually set a course:

1. Press the [⟿] key. The direct-to confirmation page will appear.

2. Rotate ◯ to place the cursor on the course select field.

3. Use ⬤ to begin entry of the selected course (the ◯ and ⬤ knobs may be used once you have started editing the course select field).

4. Press ENT to accept the course, and ENT again to acknowledge the 'ok?' prompt.

The GPS 150XL will now use the selected course for your CDI and DTK steering guidance. To reset the course to a GPS-calculated course from your present position, simply press [⟿], followed by ENT.

The GPS 150XL lets you create up to 20 routes (numbered 0 through 19), with up to 31 waypoints each. Routes are created, copied and edited through the [RTE] key, which features two route pages selectable from the GPS 150XL's outer knob: the **active route page** and the **route catalog page**. The active route page provides information and editing functions for route 0, which always serves as the route you are currently navigating. The route catalog page serves as the main page for creating, editing, activating, deleting and copying all routes.

Routes 1-19 are used as storage routes, which are stored in the GPS 150XL's internal memory. Once a storage route is 'activated', it is placed into route 0 for navigation until it is cancelled, overwritten by activating another route or erased when the GPS is turned off. If you want to save a route currently in route 0, be sure to copy it to an open storage route (routes 1-19) before it is cancelled, overwritten or erased.

The GPS 150XL's **route catalog page** is used to create, edit, delete or copy routes, and serves as the main page for a host of functions. These include route activation, determining the closest point of approach and search and rescue operations. It also displays a summary of routes currently stored in memory, with the departure and arrival route waypoints and total distance for the selected route number. To scroll through the available routes, rotate ⬤. A one-line user comment may be added to any storage route, which will be displayed on the route catalog page.

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

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

Route Catalog Page

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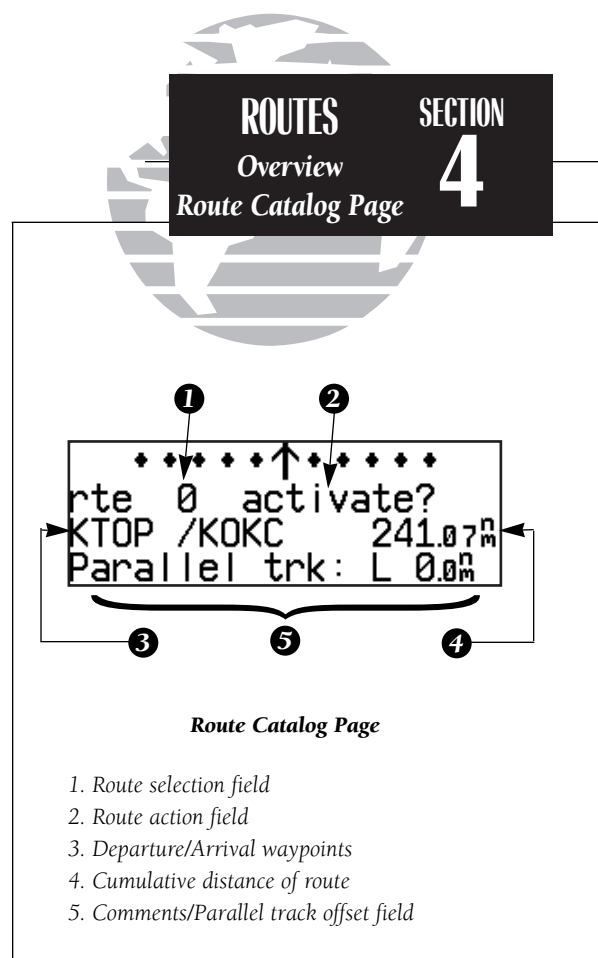
Selecting the route edit function.

Adding a waypoint to route 1.

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

- **Activate -** activate the route for navigation
- **Reverse -** activate a route in reverse order
- **Edit -** create a new route, or edit an existing route
- **Delete -** delete a route
- **Copy -** copy the current route to an empty route
- **CPA -** calculate the closest point of approach
- **Search -** perform search and rescue ladder operations

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

To create or edit a route from the route catalog page:

1. Use ⬤ to display the route number you would like to edit.

2. Press CRSR.

3. Use ⬤ to select 'edit?'. Press ENT. The route review page will appear.

To add a waypoint:

4. Rotate ◯ to highlight the first blank waypoint field or the point where you want to enter the new waypoint. The first waypoint field will already be highlighted if you're creating a new route.

5. Use ⬤ and ◯ to enter the waypoint's identifier. Press ENT.

6. Press ENT to confirm the 'ok?' prompt on the waypoint confirmation page.

7. Repeat steps 4 through 6 to add the next waypoint, or press CRSR to finish.

To delete a waypoint:

    1. Rotate ◯ to highlight the waypoint you wish to delete.

    2. Press `CLR` to remove the name, then press `ENT` to delete.

    3. Repeat steps 1 and 2 to delete additional waypoints, or press `CRSR` to finish.

To delete an entire route:

    1. Use ⬤ to display the route number you would like to delete (route 0 for the active route).

    2. Press `CRSR` and use ◯ to highlight the action field.

    3. Use ⬤ to select 'delete?'. Press `ENT` to delete.

Once a route is defined through the route catalog page, it may be activated from the route catalog page. Activating or reversing a route places the selected route into route 0 and overwrites the existing active route.

To activate a route:

    1. Press `RTE` and use ◯ to display the route catalog page.

    2. Rotate ⬤ to display the route you would like to activate.

    3. Press `CRSR` and use ⬤ to display 'activate?'. Press `ENT`.

After travelling a route or creating a route with the GPS 150XL's AutoStore feature, the route activation field may be used to activate the route in reverse order.

To activate a route in reverse order:

    1. Press `RTE` and use ◯ to display the route catalog page.

    2. Use ⬤ to display the route number you would like to reverse.

    3. Press `CRSR` and use ⬤ to display 'reverse?'. Press `ENT`.
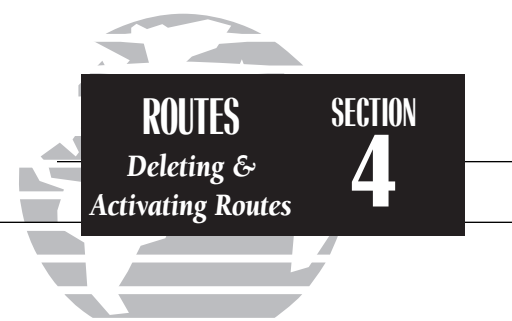
Deleting route 0.

Reversing route 0.

Calculating closest point of approach.
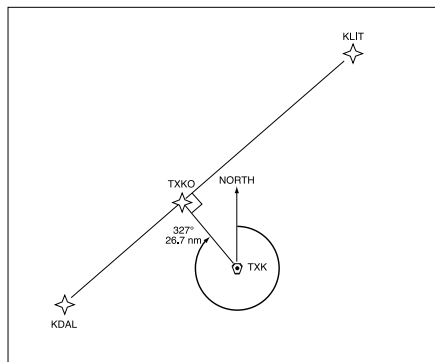
Closest point of approach to 'TXK'.

The route action field also features a **copy function** that permits you to copy any route to another open storage route. The copy function can be used to save the contents of the active route (route 0) to an open storage route.

To copy a route:

1. Press RTE and use ⬭ to display the route catalog page.

2. Use ⬤ to display the route to which you would like to copy. The route must be empty.

3. Press CRSR and rotate ⬤ to select 'copy?'. Press ENT.

4. Use ⬤ to enter the route you would like to copy. The departure/arrival identifiers will be displayed for your reference. Press ENT to copy the route.

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

To calculate the closest point of approach (CPA) from the route catalog page:

1. Use ⬤ to display the route you would like to use for the CPA function. The route must consist of at least two waypoints, and the reference facility must fall between the waypoints of a route leg.

2. Press CRSR and rotate ⬤ to select 'cpa?'. Press ENT.

3. Use ⬤ and ⬭ to enter the identifier of the reference waypoint.

4. Press ENT. The bearing and distance of the closest point on the route will be displayed.

5. Press ENT to add the cpa waypoint to the route, or CLR to finish. If you do add the cpa waypoint to the route, it will be named based on the reference waypoint plus a number (0-9) added to the end (e.g., KMCI3 for KMCI). If the waypoint does not fall between waypoints on the route, the reference waypoint does not exist or a unique name cannot be assigned to the CPA waypoint, you will be informed with the 'Invald CPA wpt ____' message.

The GPS 150XL's **search and rescue function** provides navigation guidance for search and rescue operations, navigating in a ladder pattern to maximize coverage and efficiency. This is done in reference to two waypoints called 'anchor waypoints'. The first leg will be a specified distance from the line connecting the anchor waypoints. This is called the 'offset distance'. The 'increment distance' is the distance between each subsequent leg. The ladder can be created on either side of the anchor waypoints.

To perform a search and rescue operation:

1. Create a route of **only** two waypoints.

2. Press RTE and use ◯ to display the route catalog page.

3. Use ● to select the 2-waypoint route.

4. Press CRSR and use ● to display 'search?'. Press ENT.

5. Use ● and ◯ to enter the leg increment value and R or L. Press ENT.

6. Rotate ◯ to highlight the initial offset, and use ● and ◯ to enter the initial offset value, and R or L.

7. Press ENT three times to accept the operation values and begin navigation.

After activating a search and rescue, you will be informed with an 'Offset nav in effect' message each time you traverse the route offset from the anchor waypoints and the NAV summary page will guide you along each leg of the ladder pattern. Note that bearing and distance information are referenced to the anchor waypoints. Once you've arrived at the destination waypoint, the leg increment will be added to your present offset, and the route will be automatically reversed. If a search and rescue is interrupted, note the parallel track direction (R or L) and distance on the catalog page for route 0. When you resume search and rescue operations, use this as the initial offset.
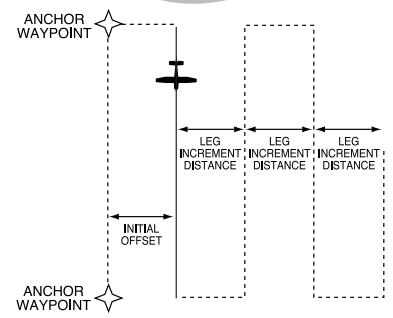
The map page will show the active leg of the search and rescue pattern as a solid line with the anchor waypoints joined together by a dashed line.


```
+ + + + + ^ + + + + →
Route  0 KTOP /KFOE
initial offst:L 0.0m
increment:R 0.5m ok?
```

Performing a search and rescue operation.
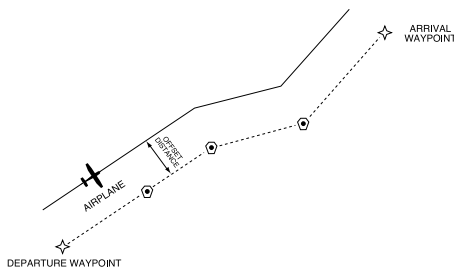
Enter parallel track value after route activation.

During route navigation, it is sometimes desirable to navigate a specified distance away from the 'active leg' to help avoid certain airspaces or regions. The GPS 150XI's **parallel track feature** will automatically guide you along a selected offset from the active leg. Bearing and distance information will be to the waypoints along the original course, with the CDI centered on the offset course.

To use offset navigation, or 'parallel track':

1. Press RTE and use ◯ to display the route catalog page.

2. Use ⬤ to display route 0 (parallel track can only be used on the active route).

3. Press CRSR and use ◯ to highlight the parallel track value field.

4. Use ⬤ and ◯ to enter the desired distance and direction (R or L) from the leg.

5. Press ENT to accept. The Map Page will display the offset route as a solid line and the original route as a dashed line.

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

Parallel Track

Flying and Modifying the Active Route

Once a route has been created and activated, the GPS 150XL will provide navigation to each route waypoint through the active route and NAV summary pages. From the active route page, you may also create and modify the active route. The NAV summary page will display detailed navigation data on your progress to each route waypoint and provide turn anticipation, waypoint arrival and next desired track information. By understanding the relationship between the active route and NAV summary pages and the role of the waypoint sequencing selector, you'll be able to get the most out of the GPS 150XL's advanced route features.

Whenever the GPS 150XL is navigating a route or an on-route direct-to, the **active route page** will provide a list of the route waypoints in sequence, along with distance, time and course information. You may also create and edit a route directly from the active route page. If you want to save a route created from the active route page (route 0), you must copy it to an open storage route (see page 62) before turning the unit off or activating another route. The active route page may be displayed by pressing the <kbd>RTE</kbd> key and rotating ◯ left continuously. It will also appear whenever a route is activated.

To scroll through the active route waypoints:

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

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

```
 + + + + + ^ + + | + + +
KTOP →KSLN   cum  ete
   →KSLN  100.4ᴹᴺ  0:51
↕ :KCOS  431.0ᴹᴺ  3:43
```

USING THE ACTIVE ROUTE PAGE

The GPS 150XL's active route page provides a working list for the route you are navigating, allowing you to view all route waypoints, along with distance, timing or desired track information. The scrolling arrow prompt to the left of the route waypoint list indicates which way to scroll to view additional route waypoints.

The active route page can also be used to manually select your next 'active-to' destination using <kbd>-D→</kbd>, which allows you to fly directly to any waypoint in the route without modifying the route itself. The GPS 150XL will resume navigation of the remainder of the route in sequence once you arrive at the selected waypoint.

Active route page with cumulative distance (cum) and desired track (dtk) displayed.

Active route page with leg distance and estimated time enroute displayed.

The leg field can be selected to display cumulative distance or the distance for each route leg. If cumulative is selected, the first leg's distance will be displayed. The second leg will represent the first leg's distance plus the second leg, and so on. The time field may be configured to display the estimated time enroute (ete), estimated time of arrival (eta) or desired track (dtk) for each leg.

To change the leg and time fields:

1. With the cursor active, rotate ○ to highlight the field you want to change.

2. Rotate ● to select the desired setting and press CRSR.

The active route page may also be used to create a new route or edit the route you are currently navigating, and provides a fast method of selecting any route waypoint as your next destination waypoint without modifying the active route. If you are editing the active route and want to save it in its original form, copy it to an open storage route before editing.

To add waypoints to the active route:

1. Press CRSR, if necessary, to activate the cursor.

2. Use ○ to highlight the first blank waypoint field, *or* highlight the waypoint before which you would like to add the new waypoint.

3. Use ● and ○ to enter the new waypoint identifier. Press ENT.

4. Press ENT to accept or CLR to cancel. The cursor will automatically move to the next waypoint field, and the remaining route waypoints (if any are present) will move down the list accordingly.

To delete a waypoint from the active route:

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

The active route page also allows you to select your next destination waypoint manually from the active route waypoint list and resume the remainder of the route in sequence. This procedure, referred to as an **'on-route' direct-to**, allows the pilot to fly directly to any waypoint in the active route without editing the active route itself.

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

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

The GPS 150XL will now provide guidance to the selected waypoint and resume navigating the remainder of the route in sequence once you arrive at the next destination waypoint. The **waypoint sequencing field**, located at the bottom left of the direct-to confirmation page, allows you to select manual or automatic waypoint sequencing of route waypoints. Setting the selector to the 'hold' setting holds your current 'active-to' waypoint as your navigation reference and prevents the GPS from sequencing to the next waypoint in the route. The waypoint sequencing selector may be used in conjunction with the course select feature (see page 58) to manually select the course to the 'hold' waypoint.

```
+ + + + + ↑ + + + +
go to usr:KSLN
 N38° 47.50' W097° 39.06'
hold  crs  261°   ok?
```
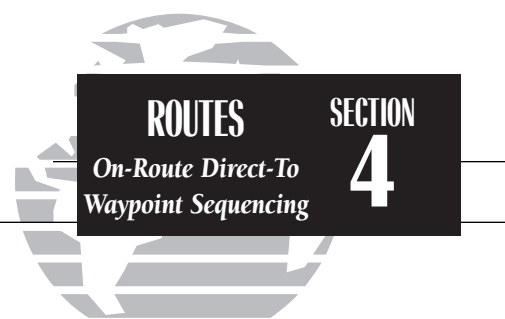
You can hold on a destination waypoint by setting the waypoint sequencing field to the 'hold' position. A user-defined course may also be entered in the course select field.

```
+ + + + + ^ + + + +
dis  85.32ⁿₘ   gs :160ᵏₜ
dtk 263°       brg 260°
:261°:KSLN     trk 218°
```
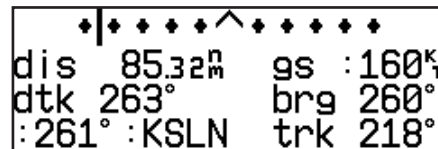
Whenever waypoint sequencing is set to 'hold', the desired course is displayed at the bottom left of the NAV summary page. See page 58 for more details.

```
        Next dtk 034°
dis    1.50ᴺᴹ    gs :160ᴷₜ
dtk 109°        brg  108°
KTOP →KIXD      trk  108°
```

As you approach a route waypoint, the graphical CDI will be replaced by a flashing 'Next dtk xxxº' prompt indicating the desired track of the next leg. When using the map page, the desired track readout will flash and indicate the dtk for the next leg.
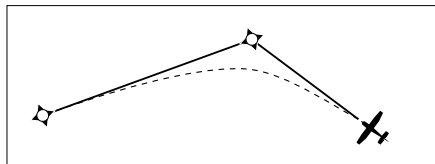
If the turn angle and your present speed will require a bank angle that exceeds 25º, you'll be notified with a 'Steep turn ahead' message approximately 90 seconds before arrival at the active to waypoint.

To 'hold' on the active-to waypoint:

1. Press [-D→] and [ENT]. The direct-to confirmation page will appear.

2. Rotate ◯ to highlight the waypoint sequencing field, and rotate ⬤ to select 'hold'.

3. Press [ENT]. The cursor will advance to the course select field where you may manually enter the desired course to the 'hold' waypoint. The default course is the GPS course calculated from your present position.

4. Press [ENT] to accept the course select field.

5. Press [ENT] to confirm the 'ok?' prompt. The Map Page will display the inbound course as a solid line and the outbound course as a dashed line.

During route operations, the NAV summary page is used to provide turn anticipation, next desired track and waypoint arrival information to the pilot. The GPS 150XL's **turn anticipation feature** will smooth out the transition between adjacent route legs by providing CDI guidance along a curved path segment. This leg transition is based on the aircraft's actual ground speed and the difference between the course angle of the two legs. The GPS 150XL will automatically sequence to the next leg when you are abeam the 'active to' waypoint on the curved transition segment, and the to/from indicator on the CDI will flip momentarily. During the transition, the CDI display will be referenced to the dotted line illustrated at the left of this page. As you approach a route waypoint, the graphical CDI will be replaced by a flashing 'Next dtk xxxº' prompt and the desired track readout on the map page will flash, both indicating the desired track of the next route leg.

Turn anticipation will not be provided if you have set the waypoint sequencing field to 'hold' or your current ground speed and the course angle between the two legs would require a bank angle greater than 25º. If the leg transition is too short for a smooth transition, a 'Leg not smoothed' message will appear, and the pilot should expect a rapid change in the CDI deflection.

Section 5
Messages and Unit Settings

The GPS 150XL's [MSG] key provides access to system messages and allows you to customize the unit to your own preferences through a settings submenu. Whenever the GPS 150XL needs to alert you to a navigation or system message, the annunciator light ([▸]) next to the [MSG] key will flash. Some messages are advisory in nature (e.g., the arrival and countdown alarms), while others may require your immediate attention (e.g., poor GPS coverage). For a complete list of GPS 150XL messages, please see Appendix D.

To view a message, press [MSG]. Press [MSG] again to return to the previous page.

The GPS 150XL's settings submenu is also accessed from the [MSG] key.

To view the settings submenu, press and hold [MSG] for more than 2 seconds.

Once the settings submenu has been accessed, the following setup pages are available by rotating ◯ with the cursor inactive:

- **Map page settings**
- **Nearest airport search**
- **Battery saver**
- **Backlighting settings**
- **Navigation units**
- **Map datums**

- **CDI scale settings**
- **Mag. var./arrival alarm settings**
- **Display screen settings**
- **Trip timer settings**
- **SUA settings**
- **I/O Settings (channel 2 only)**

✦ ✦ ✦ ✦ ✦ ✦ ↑ ✦ ✦ ✦ ✦ ✦ ✦
Prox alarm-press NAV

To view a message, press [MSG].

✦ ✦ ✦ ✦ ✦ ✦ ↑ ✦ ✦ ✦ ✦ ✦ ✦
CDI Settings
  scale Auto ± 5.0ᴹ

To access the settings submenu pages, press and hold the [MSG] key for two seconds. The GPS 150XL will return to the last submenu viewed the next time you access the unit settings.

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Map setup page

The map orientation may be set to north up, track up or desired track up. This determines what direction the top of the map display is oriented to.

The GPS 150XI's map page is designed to be a flexible tool that can be custom-tailored to your navigation needs. The **map setup page** provides access to many of the features and functions that will help you configure the map page to your own preferences. From the map setup page you can set the map orientation, automatic zoom, and specify which waypoints and airspace boundaries you wish to display.

The map orientation setting allows you to orient the top of the map display to your current ground track ('trk up'), fix the top of the map to north like a paper chart ('nrth up') or set the top of the map along your desired track ('dtk up').

To change the map orientation:

1. Press and hold MSG, then rotate ◯ to select the 'MAP Setup' page.

2. Press CRSR to highlight the orientation field.

3. Rotate ⬤ to select 'trk up', 'dtk up' or 'nrth up'.

The automatic zoom feature will automatically adjust the map display scale during your flight. Starting at an en route scale of 300 (nautical miles, statute miles or kilometers) the scale will adjust through each lower scale, stopping at a scale of 1 as you approach your destination waypoint.

To turn the automatic zoom feature on or off:

1. Press and hold MSG, then rotate ◯ to select the 'MAP Setup' page.

2. Press CRSR and rotate ◯ to highlight the 'auto zoom' field.

3. Rotate ⬤ to select 'on' or 'off'.

The map setup page also allows you to control whether or not the various waypoint types and the identifiers for these waypoints are displayed. Settings for each waypoint type allow you to select the maximum scale at which that feature should be displayed, or you may turn that waypoint type off for all scales. For example, by setting 'VOR' at 80, VOR waypoints will appear on the map display at all scales from 80 on down, but not at 120, 200 or 300.

To display airports, navaids and/or user waypoints:

1. Press and hold [MSG], then rotate ◯ to display the 'MAP Setup' page.

2. Press [CRSR] and rotate ◯ to highlight 'apt', 'vor', 'ndb', 'int' or 'user'.

3. Rotate ◉ to select the maximum map scale for that waypoint type, or select 'off' to disable the waypoint type entirely.

To display waypoint identifiers:

1. Press and hold [MSG], then rotate ◯ to display the 'MAP Setup' page.

2. Press [CRSR] and rotate ◯ to highlight 'apt ident', 'vor ident', 'ndb ident', 'int ident' or 'user ident'.

3. Rotate ◉ to select the maximum map scale for that waypoint category, or select 'off' to disable the waypoint identifiers.

The boundaries for airspaces that appear on the map display may be enabled or disabled by airspace type. As described above for waypoints, you select the maximum scale at which the airspace should appear or turn the airspace type off entirely. Airspace categories for Class B/CTA, Class C/TMA, MOA, restricted and other SUAs are provided. 'Other sua' includes alert, caution, danger, training and warning areas.

The automatic zoom feature will automatically adjust the map display through progressively lower scale settings as you approach your destination waypoint.
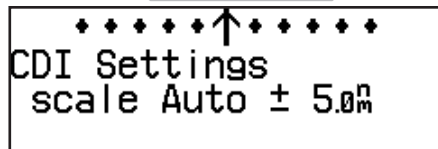
A scale setting of '200' for airports will display airport locations on the map display for all scales from '200' on down. Airports will not appear on the map display at a scale setting of '300'.
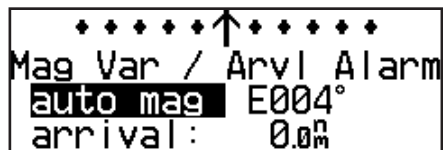
```
• • • • • ↑ • • • • •
CDI Settings
 scale Auto ± 5.0ⁿₘ
```

When the 'auto' CDI setting is selected, the GPS 150XL will automatically change the CDI scale when you are within 30 nm of a departure or arrival airport.


```
• • • • • ↑ • • • • •
Mag Var / Arvl Alarm
 auto mag   E004°
 arrival:    0.0ⁿₘ
```

The 'auto mag' setting will automatically calculate the magnetic variation based upon your current position.

To enable/disable airspace boundaries on the map:

1. Press and hold MSG , then rotate ◯ to select the 'MAP Setup' page.

2. Press CRSR and rotate ◯ to highlight 'class B/cta', 'class C/tma', 'moa', 'restricted' or 'other sua'.

3. Rotate ⬤ to select the maximum map scale for the designated airspace type, or select 'off' to never display.

The next page under the settings submenu is the **CDI settings page**, which allows you to define the scale of the GPS 150XL's course deviation indicator.

To change the CDI scale:

1. Press and hold MSG , and rotate ◯ to select the 'CDI Settings' page.

2. Press CRSR and rotate ⬤ to select 'Auto', '± 5.0 nm', '± 1.0 nm' or '± 0.3 nm'.

3. Rotate ◯ to highlight 'ok?' and press ENT to approve. (Note: The selected CDI scale will not take effect until approved.)

The scale values represent full scale deflection of the CDI to either side. The default setting is ± 5.0 nm. The 'Auto' setting will start the CDI scale at 5 nm (en route), and gradually ramp down the scale to the 1 nm range once you are within 30 nm of a departure or arrival airport (terminal area). For auto CDI scaling to occur, you must have an active direct-to or route with an airport as your final destination waypoint, or be within 30 nm of a departure airport. Note that the GPS 150XL uses **Receiver Autonomous Integrity Monitoring (RAIM)** to cross-check its position. The RAIM protection limits listed below follow the selected CDI scale, changing automatically with the 'Auto' setting:

CDI Scale	RAIM Protection
+/-5.0 nm or Auto (en route)	2.0 nm
+/- 1.0 nm or Auto (terminal)	1.0 nm
+/- 0.3 nm	0.3 nm

The GPS 150XL has three **magnetic variation options:** true, auto, or user-defined.

To set the magnetic variation:

1. Press and hold MSG, and use ○ to display the 'Mag Var/Arvl Alarm' page.

2. Press CRSR and use ● to select 'auto mag', 'true hdg' or 'user mag'.

3. If user is selected, use ○ to highlight the magnetic variation value, and use ● and ○ to enter the value and 'E' or 'W'. Press CRSR to finish.

If 'auto' mag var is selected, all track, course and heading information will be corrected to the magnetic variation computed by the GPS. The 'true' setting will reference all information to true north, and the 'user' setting will correct information to an entered value.

The GPS 150XL's **arrival alarm** can be set to notify the pilot with a message when you have reached a user-defined distance to a final destination waypoint (the direct-to way-point or the last waypoint in a route). Once you have reached the set distance (up to 99.9 units), an 'Arrival at ____' message will be displayed.

To set the arrival alarm distance:

1. Press and hold MSG, and use ○ to display the 'Mag Var/Arvl Alarm' page.

2. Press CRSR and use ○ to select the arrival distance field.

3. Use ● and ○ to enter the desired distance. Press CRSR to finish.

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

```
· · · · · ↑ · · · · ·
Mag Var / Arvl Alarm
  auto mag   E004°
  arrival:   10.0ⁿᵐ
```
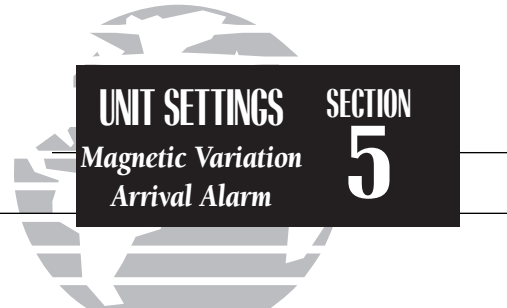
Setting the arrival alarm to 10 nautical miles.

```
· · · · · ↑ · · · · ·
Nearest apt search
 min rnwy len:2000ᶠₜ
 hard only srfc
```
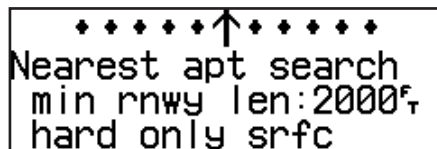
The runway length and surface type settings allow pilots of large, high-performance aircraft to direct the NRST key function to ignore those airports at which it would be difficult, if not impossible, to land their aircraft.

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Display timeout settings. As shown, the display backlight will turn off after 30 seconds to conserve power in the optional battery pack.

To set the minimum runway length and runway surface:

1. Press and hold **MSG** and use ○ to display the 'Nearest apt search' page.

2. Press **CRSR** and use ● and ○ to enter the minimum runway length upon which your aircraft can land (up to 9999 units). Press **ENT** to accept the distance.

3. Rotate ● to display the surface selection you desire. Choices include:

- any surface
- hard only surface
- soft/hard surface
- water only surface

4. Use ○ to select 'ok?' and press **ENT** to confirm.

The GPS 150XL's **battery saver feature** can be programmed to automatically turn off the backlighting when using the optional remote battery pack. This will increase the remote battery life in the event of power failure. During this time, the GPS 150XL will continue to navigate and track satellites, but will not backlight the display until a key is pressed or a knob is turned.

To set the display timeout:

1. Press and hold **MSG** and rotate ○ to display the 'Battery saver' page.

2. Press **CRSR** to activate the cursor.

3. Rotate ● until the desired value is displayed (0, 30, 60 or 90 seconds). Entering 0 will leave the display on at all times. Press **CRSR** to finish.

The GPS 150XL features automatic contrast and backlighting control to adjust the display for optimum viewing in any condition. This is done using a photocell at the top left corner of the display bezel. It is important that this photocell not be covered to ensure proper display adjustment. You may also select manual control of the display contrast and backlighting to tailor the GPS 150XL to your needs.
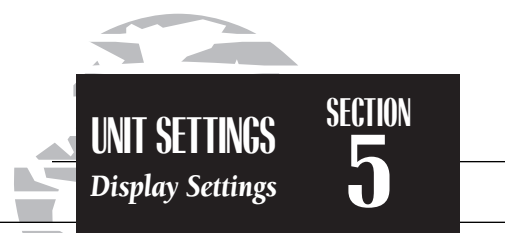
To change the display contrast settings:

1. Press and hold [MSG] and rotate ⃝ to show the 'Display' page.

2. Press [CRSR] and use ⬤ to select 'auto' or 'manual' control.

3. Press [ENT].

4. If 'manual' is selected, use ⬤ to set the display contrast level. (If 'auto' is selected you may also change the offset level to your preference.)

5. Press [CRSR] to complete.

The 'mode' selection allows you to display on-screen characters as black on a light green background (positive) or light green on a black background (negative). With the 'auto' setting the photocell selects the best mode for day or night viewing.

To change the display mode settings:

1. Press and hold [MSG], and rotate ⃝ to show the 'Display' settings page.

2. Press [CRSR] and use ⃝ to highlight the 'mode' field.

3. Rotate ⬤ to select 'pstv', 'ngtv' or 'auto'.

4. If 'auto' is selected, rotate ⃝ to highlight the threshold level, and use ⬤ to select the level where the display will switch from positive to negative for night time use. (Note: Some experimentation may be necessary to obtain the desired response level.)

The backlight intensity settings control the backlighting level and allow for automatic adjustment using the built-in photocell or manual adjustment.

```
+ + + + +↑+ + + + +
Display
contrast  auto   :50
mode      pstv
```

The display contrast may be set to automatically adjust to varying lighting conditions, using the built-in photocell.

```
+ + + + +↑+ + + + +
Display
contrast  auto   :50
mode      ngtv
```

Setting the display mode to 'negative' will display on-screen characters as light green on a black background. This setting is suitable for night operation.
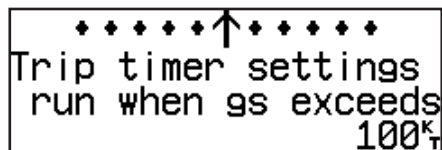
```
    * * * * * ↑ * * * * *
Backlight intensity
 mode    auto
 level     75%
```

The backlight intensity settings page is used to set/adjust the screen backlighting for day or night operation.

```
    * * * * * ↑ * * * * *
Trip timer settings
 run when gs exceeds
                 100ᵏ⊤
```

Trip timer settings, showing timer active when ground speed exceeds 100 knots.

To change the backlighting intensity:

1. Press and hold MSG, and rotate ◯ to display the 'Backlight intensity' page.

2. Press CRSR to highlight the 'mode' field.

3. Rotate ⬤ to select 'auto' or 'manual'.

4. If 'manual' is selected, rotate ⬤ to select the desired backlighting level.

The **trip timer** provides a running clock on NAV Menu 2 (see page 27) which can be configured to run either when power is on or when your ground speed exceeds a user-defined minimum.

To change the trip timer settings:

1. Press and hold MSG, and use ◯ to display the trip timer settings page.

2. Press CRSR to activate the cursor.

3. Use ⬤ to select either 'pwr is on' or 'gs exceeds'.

4. If you choose 'pwr is on', press CRSR to complete.

5. If you choose 'gs exceeds', use ◯ to highlight the speed field.

6. Enter the speed using ⬤ and ◯.

7. Press ENT to accept, and press CRSR to complete.

The GPS 150XL can be configured to display data in standard or metric **units of measure**. These apply to: distance, position, speed, altitude, fuel, pressure and temperature.

To change the units of measure:

1. Press and hold MSG and rotate ◯ to display the nav units page.

2. Press CRSR and rotate ◯ to highlight the field you would like to change.

3. Use ● to change the unit of measure.

4. Rotate ◯ to advance to the next field, or press CRSR when finished.

The available units of measure are:

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

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

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

nav units :
- nautical miles and knots (nm, kt)
- statute miles and miles per hour (mi, mh)
- kilometers and kilometers per hour (km, kh)
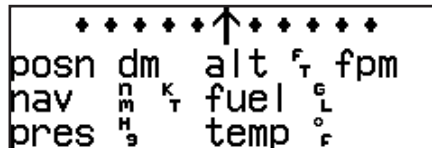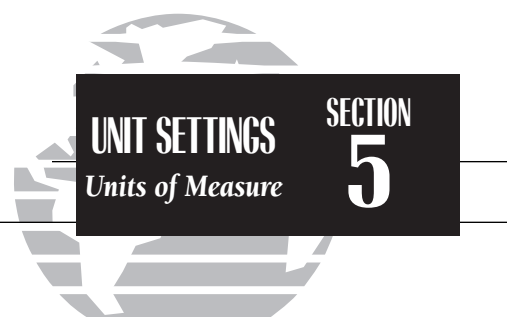
fuel :
- gallons (gl)
- imperial gallons (ig)
- kilograms (kg)
- pounds (lb)
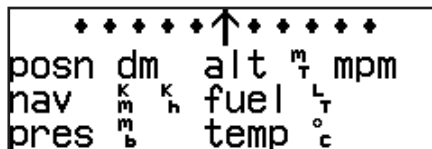- liters (lt)

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

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

Default units of measure settings.

Units of measure settings with all metric values displayed.

The SUA settings page with all airspace alerts enabled and the altitude buffer set to 100 meters.

The SUA settings page with 'other' airspaces disabled and the altitude buffer set to 500 feet.

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

class B/cta: ICAO control area
class C/tma: ICAO Terminal Control Area
rstcd: Restricted areas

moa: Military operations area
other: Other areas includes: alert, caution, danger, training, warning

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

To set the warnings or change the altitude buffer:

1. Press and hold **MSG**, and use ◯ to display the SUA settings page.

2. Press **CRSR**.

3. Rotate ◯ to highlight the field you would like to change.

4. Use ⬤ to change to 'on' or 'off'.

5. To change the altitude buffer, highlight the buffer value, and use ⬤ and ◯ to change the data. Press **ENT** to accept.

6. Press **CRSR** to complete.

The NavData card contains over 100 map datums for you to use when navigating. By default, your unit calculates positions using the WGS 84 map datum. If you are using charts based on another datum, you must set the GPS 150XL to use the same datum. Using a map datum that does not match the charts you are using can result in significant differences in position information. If you are using maps for reference only, the GPS 150XL 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 F:**

1. Press and hold MSG, and use ◯ to highlight the map datum page.

2. Press CRSR.

3. Use ◯ to highlight the current map datum.

4. Use ⬤ to change the datum.

5. Press CRSR to complete.

To create a user datum:

1. Press and hold MSG, and use ◯ to highlight the map datum page.

2. Press CRSR.

3. Use ◯ to highlight 'Define user datum?'. Press ENT.

4. Enter the five parameters of the map datum using ⬤ and ◯. Press ENT to accept a field. The signs of each value (+/-) should follow the convention: WGS84-local geodetic system.

5. Use ◯ to highlight 'ok?', and press ENT.

6. To activate the user datum, select 'USER' on the map datum page as described above.
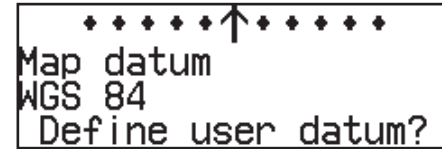
Map datum page showing the default WGS 84 datum. This setting should be used unless your paper chart specifies a different datum.
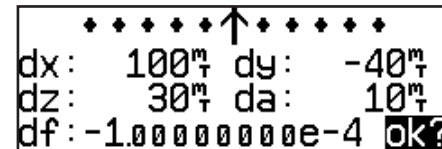
User datum page. To use this function you must enter the parameters as differences from the WGS 84 default.

I/O page settings

The last page available under the GPS 150XL's setup menu is the **I/O setup page**. The I/O setup page lets you configure the GPS 150XL to input RTCM SC-104 correction data, output to an RS-232 mapping device or a PC (with the optional GARMIN PC Kit or other mapping software) and select the appropriate baud rate. The I/O setup page only provides access to I/O channel 2 input/output. For information on using I/O channel 1, please see your GPS 150XL installation manual.

To change the output settings for I/O channel 2:

1. Press and hold MSG, and rotate ◯ until the I/O setup page is displayed.

2. Press CRSR, and rotate ⬤ to select 'off' or 'plotting' for output to an RS-232 device.

3. Rotate ◯ to advance the cursor to the baud rate field.

4. Use ⬤ to select the desired baud rate (300, 1200, 2400, 4800 or 9600).

5. Press CRSR to finish.

Appendix A
# NavData® and User Data Installation/Operation

The NavData card supplied with your GPS 150XL can be installed or removed when the GPS 150XL is on or off. Insert the card with the thumb tab at the top, and the beveled corner at the bottom. If the NavData card is not present when the unit is powered on, you will receive a 'No Jeppesen database' message on the database confirmation page, and you will only be able to use user waypoints for navigation. If the NavData card is removed during operation, a 'No data card present' warning will appear, asking you to reinsert the data card within 30 seconds. If the card is not replaced within 30 seconds, the GPS 150XL will automatically reinitialize. You may also reinitialize the unit manually by pressing ENT .

An optional **user data card** can be used to make a backup of user waypoints, routes, etc. and transfer information to another GPS 150XL.

To save user data to the user data card:

1. Install the user data card.

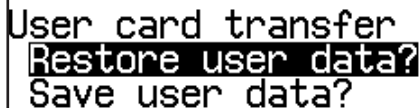2. Rotate ◯ to highlight 'Save user data?'. Press ENT to confirm.

The message 'Saving to card' is displayed while the GPS 150XL 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 150XL will instruct you to turn the unit off, remove the user card and insert the Jeppesen NavData card. After this is complete, the GPS 150XL is ready for normal operation.
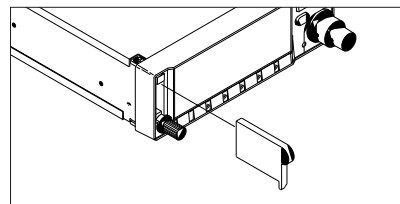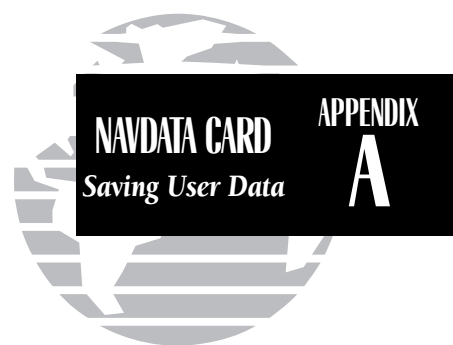
Insert the card with the thumb tab at the top, and the beveled corner on the bottom right.

No data card present
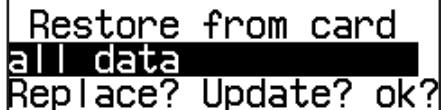Reinit in 29 seconds
or ENT to reinit

Data card warning

User card transfer
Restore user data?
Save user data?

Data transfer page

Restore from card
all data
Replace? Update? ok?

Restore data page

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

1. Install the user data card.

2. Rotate ◯ to highlight 'Restore user data?'.

3. Press ENT .

The GPS 150XL 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 150XL. The GPS 150XL 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 150XL off and replace the user data card with a NavData card. The GPS 150XL is now ready for normal operation.

Appendix B
Installation, Removal and Maintenance of the GPS 150XL

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

To install the GPS 150XL 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 150XL 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.
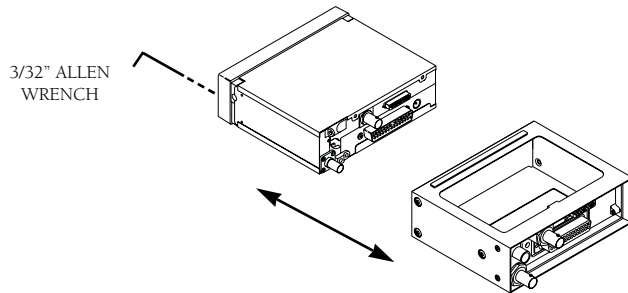
3/32" ALLEN
WRENCH

To remove the GPS 150XL from 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 the GPS 150XL can be removed from the rack.

The GPS 150XL is built to exacting standards and does not require user maintenance. If 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 150XL 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 150XL 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.

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Operating mode page

Selecting the simulator mode.

The GPS 150XL's simulator mode allows you to plan and practice flights in your home and office using an optional remote battery pack or AC adapter. **The simulator is not accessible when the GPS 150XL is running off the master avionics switch.** All waypoint and route planning done in simulator mode will be saved in the unit's internal memory.

To operate the GPS 150XL in simulator mode:

1. Turn the unit on by rotating the ⊙ knob clockwise. The welcome page will appear while the unit conducts a self test. Once the self test is complete, the welcome page will be replaced by the operating mode page.

2. Rotate ◯ to move the cursor over the operating mode field ('Normal') .

3. Rotate ⦿ to select 'Simulator' and press the ENT key. The cursor will advance to the 'ok?' prompt.

4. Press ENT to confirm.

Once the GPS 150XL has been placed in simulator mode, the database confirmation page will appear, showing the operating dates, cycle number and database type available.

To acknowledge the database information:

1. Press ENT .

After the database has been acknowledged, the initial position reference page will appear, where you may specify the starting position for your simulated trip. You can define the initial position by entering a waypoint identifier in the reference field, or by manually entering coordinates in the lat/lon field.

To enter an initial position reference by waypoint identifier:

    1. Rotate ⬤ to highlight the waypoint identifier field.

    2. Use ⬤ and ⬤ to spell out the identifier of the desired airport, navaid or user waypoint.

    3. Press ENT to confirm the identifier. The waypoint confirmation page will appear, displaying the waypoint's position.

    4. Press ENT to confirm the 'ok?' prompt.

The position page will now appear, and you may now use most of the GPS 150XL navigation features for practice and planning. You'll also receive a 'Do not use for nav' message to remind you that the simulator mode should never be used for actual navigation. During simulator operation, you will be able to enter a ground speed from the NAV summary page, and define a course to a destination from the direct-to confirmation page. Altitude may only be entered by using the VNAV function available from the NAV menu 1 page (see page 24).

To enter a ground speed from the NAV summary page:

    1. Press NAV and rotate ⬤ to display the NAV summary page.

    2. Press CRSR to activate the cursor.

    3. Rotate ⬤ to highlight the ground speed field.

    4. Use ⬤ and ⬤ to enter the desired speed. Press ENT to accept, and CRSR to finish.

To exit the simulator mode, the GPS 150XL must be turned off by rotating the ⬤ knob counterclockwise until the unit shuts down. All waypoints and routes created in simulator mode will be retained in the GPS 150XL's internal memory.

APPENDIX

C

SIMULATOR

```
WORLDWIDE VFR SUA
eff 27-feb-97 (9703)
exp 27-mar-97    ok?
```

Database confirmation page

```
No active waypoint
Init posn ref:KIXD_
 N38° 58.70' W094° 54.32'
                 ok?
```
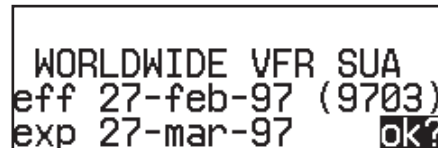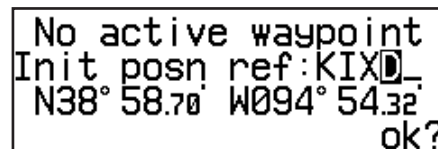
Entering an initial position reference.

Appendix D
GPS 150XL Messages and Abbreviations

The GPS 150XL 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 150XL messages and their meanings.

Altitude input fail - The altitude serializer input is not available for the GPS 150XL. Check the I/O settings and/or the serializer installation. If enough satellites are available for a 3D position fix, no pilot action is required, providing no RAIM warnings are present. If only a 2D fix is possible, the pilot should enter an altitude within 1,000 feet of the current indicated altitude.

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 optional remote battery pack is low on power and limited operating time remains. The battery should be recharged for continued operation.

Battery rqrs service - A problem has been detected in the optional remote battery pack. The battery should be serviced at 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 150XL will not allow the modifications.

Cannot nav lockd rte - An attempt has been made to activate a route containing a locked waypoint. The GPS 150XL cannot perform navigation in this situation.

Cannot ofst goto rte - An attempt has been made to engage the offset navigation feature while the GPS 150XL is navigating using a single waypoint route. The GPS 150XL will not allow offset navigation in this situation.

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

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

Configuration reset - The GPS 150XL has detected a failure in its installation configuration memory. Data from the user memory has been used to reset the configuration. Check the installation settings for correctness. If the message persists, the unit is not usable and should be taken to an authorized service center for repair.

Data card failed - The GPS 150XL has detected a problem with the data card. The data is not usable and the card should be returned to Jeppesen or an authorized GARMIN service center.

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

Degraded accuracy - The GPS 150XL has detected poor satellite geometry while RAIM is not available. Additional cross-checking with a secondary navigation source should be performed to verify the integrity of the GPS position.

Do not use for nav - The GPS 150XL is in the simulator mode and must not be used for actual navigation.

EEPROM write fail - The GPS 150XL has detected a failure while programming its installation configuration memory. The unit is not usable and should be taken to an authorized service center.

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 150XL. Check the I/O settings or fuel/air data system installation.

Inside SUA - You have entered a Special Use Airspace.

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

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

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

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

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

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

Near SUA < 2 nm - Your position is within 2 nautical miles of an SUA, and your current course will **not** take you inside.

No DGPS position - Not enough data is available to compute a differential GPS (DGPS) position.

No RTCM input - DGPS data, in an RTCM SC-104 format, is not available.

Need alt - press NAV - The GPS 150XL 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.

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 150XL has detected excessive drift in its internal crystal oscillator which may result in longer acquisition time. The unit should be taken to an authorized service center immediately.

Poor GPS coverage - The GPS 150XL 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 150XL will warn you of the closest proximity waypoint, but not both. You should be certain this condition is desirable.

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

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

Proximty wpt deleted - One or more proximity waypoints were deleted while receiving data from the PC Interface Kit.

Pwr down and re-init - The GPS 150XL is unusable until power has been cycled and the unit re-initialized. Abnormal satellite conditions may exist.

RAIM not available - The GPS 150XL is unable to cross-check its position using RAIM. You may continue to navigate using visual flight rules. Your position should be verified every 15 minutes using other navigation sources. If you have selected a CDI scale other than 'Auto', selecting a larger CDI scale may remove the conditions causing this message.

RAIM position warn - RAIM has detected position errors. If you have selected a CDI scale other than 'Auto', selecting a larger CDI scale may remove the conditions causing this message.

RAM failed - The GPS 150XL has detected a failure in its internal memory. If the message persists, the GPS 150XL is unusable and should be taken to an authorized GARMIN service center.

Rcvr needs service - The GPS 150XL has detected a condition requiring service in the receiver hardware. The GPS 150XL should be taken to an authorized GARMIN service center.

Ready for navigation - The GPS 150XL is ready for navigation.

Receiver failed - The GPS 150XL has detected a failure in the receiver hardware. If the message persists, the GPS 150XL is unusable and should be taken to an authorized GARMIN service center.

ROM failed - The GPS 150XL 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 150XL 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 PC 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.

RTCM input fail - The DGPS data signal was being received but has now been lost. Check wiring.

Searching the sky - The GPS 150XL 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 90 seconds prior to a turn that requires a bank angle in excess of 25 degrees in order to stay on course. Turn anticipation will not be provided for the turn.

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

SUA ahead < 10 min - 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 your current course will take you inside.

Timer expired - The approach timer has expired.

User data RX started - Data receive operations have started.

Usr data TX complete - Data transmit operations are complete.

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

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

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

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

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

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

ALT-	Altitude		DEG-	Degrees
APP-	Approach		DEP-	Departure
APR-	Approach		DIS-	Distance To Waypoint
APT-	Airport Waypoint		DME -	Distance Measuring Equipment
ARTCC-	Air Route Traffic Control Center		DOP-	Dilution of Precision
ARV-	Arrival		DTK-	Desired Track
ATF-	Aerodrome Traffic Frequency		ELEV-	Elevation
ATS-	Automatic Terminal Information Service (ATIS)		ENDUR-	Endurance
			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		FIR-	Flight Information Region
CDI-	Course Deviation Indicator		FLOW-	Fuel Flow Rate
CL B-	Class B		FOB-	Fuel On Board
CL C-	Class C		FPM-	Feet Per Minute
CLR-	Clearance Delivery		FR-	From
CPA-	Closest Point of Approach		FSS-	Flight Service Station
CTA-	ICAO Control Area		FT-	Feet
CTAF-	Common Traffic Advisory Frequency		FT-	Full Time
			GL-	Gallons
CTF-	Common Traffic Advisory Frequency		GND-	Ground
			GPS-	Global Positioning System
CTR-	Center (ARTCC)		GS-	Ground Speed
CTS-	Course To Steer		HDG-	Heading
CUM-	Cumulative		HG-	Inches of Mercury
DALT-	Density Altitude		IALT-	Indicated Altitude

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ILS-	Instrument Landing System	**MT-**	Meters
IG-	Imperial Gallons	**MUL-**	Multicom
INT-	Intersection Waypoint	**NDB-**	NDB Waypoint
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
KT-	Knots		(Inbound Course Select)
LB-	Pounds	**OTH-**	Other
LCL-	Local	**ºC-**	Degrees Celsius
LEN-	Length	**ºF-**	Degrees Fahrenheit
LFOB-	Leftover Fuel On Board	**PC-**	Pilot Controlled
LFLOW-	Left Fuel Flow	**POSN-**	Position
LOC-	Localizer	**PRES-**	Barometric Pressure
LT-	Liters		(Altimeter Setting)
MAG VAR-Magnetic Variation		**PROX-**	Proximity
MB-	Millibars Of Pressure	**PRX-**	Proximity
MF-	Mandatory Frequency	**PT-**	Part Time
MH-	Statute Miles Per Hour	**PTX-**	Pre-Taxi
MI-	Statute Miles	**PWR-**	Power
MIN-	Minimum	**RDR-**	Radar
MIN -	Minutes	**REQ-**	Required
MOA-	Military Operations Area	**RF-**	Reference
MPM-	Meters Per Minute	**RFLOW-**	Right Fuel Flow
MPS-	Meters Per Second	**RNG-**	Range
MSA-	Minimum Safe Altitude	**RNWY-**	Runway

RSTCD- Restricted
RSV- Reserves
RTE- Route
RX- Receive Only
SAR- Search And Rescue
SEC- Seconds
SEQ- Sequence
SGL- Signal
SLCT- Select
SRFC- Surface
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
USR- User Waypoint

UTC- Universal Time Coordinated
(GMT/ Zulu)
VN- VNAV or Vertical Navigation
VNAV- Vertical Navigation
VOR- VOR Waypoint
WPT- Waypoint
WX- Weather

Appendix E
Specifications

PHYSICAL

Size:	6.25"W x 5.8"D x 2"H (159mm x 147mm x 51mm)
Weight:	27.2 ounces (.77 kg)
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:	10-33V DC with power cable (aircraft power)
	Optional remote battery pack
	115V or 230V AC w/ optional adapter

ENVIRONMENTAL

Temperature:	-4° F to 158° F (-20°C to 70°C) Operating
	-67°F to 185°F (-55°C to 85°C) Storage

PERFORMANCE

Receiver:	12 channel PhaseTrac12™
Acquisition Time:	45 seconds (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 Interface, Altitude Serializer, Fuel Sensor, Fuel/Air Data Computer

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

```
Turning off 29 scnds
 Press any key to
 continue navigation
```

Whenever the GPS 150XL is connected to the optional remote battery pack and power from the master switch is lost, the unit will revert to battery power. To continue navigation, press any key when the power down page appears.

Appendix F
Map Datums

ADINDAN	Ethiopia, Mali, Senegal, Sudan
AFGOOYE	Somalia
AIN EL ABD 1970	Bahrain Island, Saudi Arabia
ANNA 1 ASTRO 1965	Cocos Islands
ARC 1950	Botswana, Lesotho, Malawi, Swaziland, Zaire, Zambia, Zimbabwe
ARC 1960	Kenya, Tanzania
ASCENSION IS 1958	Ascension Island
ASTRO B4 SOROL ATOLL	Tern Island
ASTRO BEACON "E"	Iwo Jima Island
ASTRO DOS 71/4	St. Helena Island
ASTRONOMIC STN 1952	Marcus Island
AUSTRALIAN GEOD 1966	Australia, Tasmania Island
AUSTRALIAN GEOD 1984	Australia, Tasmania Island
AUSTRIA NS	Austria
BELGIUM 1950	Belgium
BELLEVUE (IGN)	Efate and Erromango Islands
BERMUDA 1957	Bermuda Islands
BOGOTA OBSERVATORY	Colombia
BUKIT RIMPAH	Indonesia
CAMP AREA ASTRO	Antarctica
CAMPO INCHAUSPE	Argentina
CANTON ASTRO 1966	Phoenix Islands
CAPE	South Africa
CAPE CANAVERAL	Florida, Bahama Islands
CARTHAGE	Tunisia
CH-1903	Switzerland
CHATHAM 1971	Chatham Island (New Zealand)
CHUA ASTRO	Paraguay
CORREGO ALEGRE	Brazil
DANISH GI 1934	Denmark
DJAKARTA (BATAVIA)	Sumatra Island (Indonesia)
DOS 1968	Gizo Island (New Georgia Islands)
EASTER ISLAND 1967	Easter Island
EUROPEAN 1950	Austria, Belgium, Denmark, Finland, France, Germany, Gibraltar, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland
EUROPEAN 1979	Austria, Finland, Netherlands, Norway, Spain, Sweden, Switzerland
FINLAND HAYFORD 1910	Finland
G. SEGARA	Borneo
GANDAJIKA BASE	Republic of Maldives
GEODETIC DATUM 1949	New Zealand
GGRS 87	Greece
GUAM 1963	Guam Island
GUX 1 ASTRO	Guadalcanal Island
HERAT NORTH	Afghanistan
HJORSEY 1955	Iceland
HONG KONG 1963	Hong Kong
HU-TZU-SHAN	Taiwan
INDIAN BNGLDSH NEPAL	Bangladesh, India, Nepal
INDIAN MEAN VALUE	India
INDIAN THAILAND VIETN	Thailand, Vietnam
INDONESIA 74	Indonesia
IRELAND 1965	Ireland
ISTS 073 ASTRO 1969	Diego Garcia
JOHNSTON ISLAND 1961	Johnston Island
KANDAWALA	Sri Lanka
KERGUELEN ISLAND	Kerguelen Island
KERTAU 1948	West Malaysia, Singapore
L.C. 5 ASTRO	Cayman Brac Island
LIBERIA 1964	Liberia
LUZON MEAN VALUE	Philippines
LUZON MINDANAO IS	Mindanao Island

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LUZON PHILIPPINES	Philippines (excluding Mindanao Isl.)
MAHE 1971	Mahe Island
MARCO ASTRO	Salvage Islands
MASSAWA	Eritrea (Ethiopia)
MERCHICH	Morocco
MIDWAY ASTRO 1961	Midway Island
MINNA	Nigeria
NAD27 ALASKA	North American 1927- Alaska
NAD27 BAHAMAS	Bahamas (excluding San Salvador Island)
NAD27 CANADA	Canada (including Newfoundland Island)
NAD27 CANAL ZONE	Canal Zone
NAD27 CARIBBEAN	Caribbean (Barbados, Caicos Islands, Cuba, Dom. Rep., Grd. Cayman, Jamaica, Leeward and Turks Islands)
NAD27 CENTRL AMERICA	Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua)
NAD27 CONUS	Mean Value (CONUS)
NAD27 CUBA	Cuba
NAD27 GREENLAND	Greenland (Hayes Peninsula)
NAD27 MEXICO	Mexico
NAD27 SAN SALVADR IS	San Salvador Island
NAD83	North American 1983- Alaska, Canada, Central America, CONUS, Mexico
NAHRWAN MASIRAH IS	Masirah Island (Oman)
NAHRWAN SAUDI ARABIA	Saudi Arabia
NAHRWAN UNITD ARAB E	United Arab Emirates
NAPARIMA BWI	Trinidad and Tobago
NETHERLAND TRIAG '21	Netherlands
NOU TRIAG FRANCE	France
NOU TRIAG LUXEMBOURG	Luxembourg
OBSERVATORIO 1966	Corvo and Flores Islands (Azores)
OLD EGYPTIAN	Egypt
OLD HAWAIIAN KAUAI	Kauai
OLD HAWAIIAN MAUI	Maui
OLD HAWAIIAN MEAN	Mean Value
OLD HAWAIIAN OAHU	Oahu

OMAN	Oman
ORD SRV GRT BRITAIN	England, Isle of Man, Scotland, Shetland Islands, Wales
PICO DE LAS NIEVES	Canary Islands
PITCAIRN ASTRO 1967	Pitcairn Island
PORTUGUESE 1973	Portugal
POTSDAM	Germany
PROV SO AMERICAN '56	Bolivia, Chile, Colombia, Ecuador, Guyana, Peru, Venezuela
PROV SO CHILEAN 1963	South Chile
PUERTO RICO	Puerto Rico & Virgin Isl.
QATAR NATIONAL	Qatar
QORNOQ	South Greenland
REUNION	Mascarene Island
ROME 1940	Sardinia Island
RT 90	Sweden
SANTO (DOS)	Espirito Santo Island
SAO BRAZ	Sao Miguel, Santa Maria Islands (Azores)
SAPPER HILL 1943	East Falkland Island
SCHWARZECK	Namibia
SOUTH AMERICAN 1969	Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Venezuela, Trinidad/Tobago
SOUTH ASIA	Singapore
SOUTHEAST BASE	Porto Santo and Madeira Islands
SOUTHWEST BASE	Faial, Graciosa, Pico, Sao Jorge and Terceira Islands (Azores)
TANANARIVE OBSV 1925	Madagascar
TIMBALAI 1948	Brunei and East Malaysia (Sarawak and Sabah)
TOKYO	Japan, Korea, Okinawa
TRISTAN ASTRO 1968	Tristan da Cunha
USER	User datum
VITI LEVU 1916	Viti LevuIsland/Fiji Islands
WAKE-ENIWETOK 1960	Marshall Islands
WGS 72	World Geodetic System 1972
WGS 84	World Geodetic System 1984
YACARE	Uruguay
ZANDERIJ	Surinam

Appendix G
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APPENDIX G   INDEX

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