

Owner's
Manual
&
Reference



GPS 90 Personal Navigator™

 **GARMIN®**

GPS 90 Personal Navigator™ OWNER'S MANUAL

Introduction

Foreword

Software version 2.0 or above.

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CAUTION

The GPS system is operated by the United States Government, which is solely responsible for its accuracy and maintenance. The system is subject to changes which could affect the accuracy and performance of all GPS equipment. Although the GPS 90 is a precision device, any NAVAID can be misused or misinterpreted, and therefore become unsafe.

Use the GPS 90 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 operation using the simulator mode prior to actual use. When in actual use, carefully compare indications from the GPS 90 to all available navigation sources, including other NAVAIDs, visual sightings, sectional charts, etc. Always resolve any discrepancies before continuing navigation.

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

The GARMIN GPS 90 does not contain any user-serviceable parts. Repairs should only be made by an authorized GARMIN service center. Unauthorized repairs or modifications could void your warranty and your authority to operate this device under Part 15 regulations.

Preface

Welcome to the smallest, easiest-to-use GPS navigator in the skies! The GARMIN GPS 90 represents GARMIN's continuing commitment to provide aviators with quality navigation information in a versatile, accurate and user-friendly design you'll enjoy for years to come.

To get the most out of your new GPS, it's important that you take the time to read through the owner's manual to understand the operating features of the GPS 90. The manual is organized into two sections for your convenience:

The GPS 90 **Takeoff Tour** is designed to familiarize you with the basic operation of the unit through a simulated flight, where you'll learn how to turn the unit on and off, use the airport and waypoint database, select and navigate to a destination, and use the moving map page in flight. The tour is the fastest way to get the feel of your new GPS.

The **Reference Section** provides detailed information and instructions to the advanced features of the GPS 90 in a topical format. This allows you to concentrate on a specific topic quickly, without reading through entire sections of text that you may not need.

Thanks for choosing the GARMIN GPS 90. We hope it will help you get the most out of your aviation adventures. If you have any questions or comments concerning the operation of the GPS 90, please contact our Product Support staff at 913-599-1515 or 913-599-2103 (FAX).

GPS 90 Capabilities

Designed for easy operation, the GARMIN GPS 90 offers powerful features that help make aviation navigation come alive in the palm of your hand.

Precision Performance

- MultiTrac-8™ receiver tracks and uses up to 8 satellites simultaneously for fast, accurate positioning
- Differential-Ready for accuracy to 5 meters with optional beacon receiver
- Waterproof, dry nitrogen filled case and backlit LCD display
- Up to 20 hours of battery life on 4 AA batteries in battery saver mode

Advanced Navigating and Plotting

- Large, moving map display with Auto Zoom and SUA boundaries
- Internal Jeppesen® database includes detailed airport information, including runway length, surface and lighting, airport position and elevation, communication frequencies and fuel services. Valuable information about VORs, NDBs and Intersections is also available. See page 17 for basic database coverage.
- 250 user waypoints with alphanumeric names up to six characters long
- 20 routes with up to 29 legs each
- One-touch GOTO navigation
- List of nine nearest airports, SUAs, VORs, NDBs, INTs or user waypoints

Before getting started with your new GPS, check to see that your GPS 90 package includes the following items. If you are missing any parts, please see your dealer immediately.

Standard Package:

- GPS 90 Receiver
- Carrying Case and Wrist Strap
- Universal Yoke Mount Bracket
- Suction Cup Antenna Mount & Cable
- DC Power Cable
- 4 AA Batteries
- GPS 90 Owner's Manual
- Quick Reference Card
- Warranty Card
- Country Airport Prefix Chart

Optional Accessories:

- PC Kit
- Serial Data Cable
- Cigarette Lighter Adapter

See your local dealer for optional accessories.

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What is GPS?

GPS (Global Positioning System) is a satellite-based navigation system developed by the U. S. Department of Defense to provide a consistent, accurate method of simplifying navigation. Originally designed for military applications, it also provides commercial and recreational users with 24-hour, worldwide navigation coverage with accuracy to 15 meters (49 feet).

How Does GPS Work?

GPS navigation uses satellite ranging to determine your position in relation to a set of satellites orbiting the earth. The GPS constellation is made up of 24 satellites, which continuously send radio signals containing precise position and time information for each satellite back to earth.

By knowing the position of any 3 or 4 of these satellites and calculating various time differences between the transmitted signals, your GPS receiver can determine its present position anywhere on earth. And once you're under way, your GPS continuously updates your position and provides speed and track information.

What are the Advantages of GPS Navigation?

The GPS system provides pilots with a highly efficient, reliable system for point-to-point navigation without total reliance on traditional ground-based navigation aids. GPS takes navigation to a higher level by providing accurate position and course information, anywhere in the world, regardless of the weather or your proximity to traditional nav aids. The accuracy and coverage of GPS navigation can help make your flying safer, smarter and more efficient wherever you may travel.



The GPS 90 is a powerful navigation tool that can guide you anywhere in the world. To better understand its operation and capabilities, it may be helpful to review the basic terms and concepts briefly explained below.

Navigation is the process of traveling from one place to another and knowing where you are in relation to your desired course.

Position is an exact, unique location based on a geographic coordinate system. Most aviation navigation is based on the latitude/longitude coordinate system.

Meridians of longitude are a set of imaginary circles around the earth that pass through the north and south poles. Longitude describes position in terms of how many degrees it is east or west of the Prime Meridian (0° longitude).

Parallels of latitude are another set of imaginary circles that are perpendicular to the earth's polar axis. Latitude describes position in terms of how many degrees it is north or south of the equator (0° latitude).

A **waypoint** marks an exact position fix so it can be recalled for future use. The GPS 90 lets you mark waypoints electronically, without physical landmarks.

Bearing is a compass direction to a particular destination (waypoint) from your present position.

Track is a compass direction representing your course over ground.

Getting Started

Keypad Usage



The GPS 90's two-speed thumbkey allows convenient, one-handed entry of information. Press on a particular arrow key once to scroll through data options slowly, press and hold an arrow key for faster scrolling.



- Use the up and down arrow keys to select alphanumerical characters and menu choices and to move the field highlight from field to field.



- Use the left and right arrow keys to move the selected character field and to move the field highlight from field to field.



The GOTO/NRST key quickly sets a direct course to a selected destination. Pressing GOTO twice activates the NRST mode.



The POWER key turns the unit on and off and activates screen backlighting. To turn the unit off, press and hold the POWER key for 3 seconds.



The QUIT key returns you to a previous page, or clears data entry, restoring a data field's previous value.



The PAGE key scrolls through main data pages in sequence and returns the display from a submenu page to the previous page viewed. It also displays the message screen when a message alert appears.



The WPT key provides access to the GPS 90's internal database of airports, VORs and other waypoints and the AutoStore function.



The ENTER key confirms data entry and on-screen responses. The ENTER key also activates highlighted fields to allow data entry.

The GARMIN GPS 90 is a powerful navigation tool that offers pilots a host of advanced features that help make flying safer and more efficient. The Takeoff Tour is designed to quickly guide you through basic features and functions of the GPS 90 using a simulated trip.

Once you've completed the tour and become familiar with the main pages and features of the unit, refer to the reference section for complete instructions on installation, initialization and performing specific tasks and functions.

The takeoff tour assumes you have not changed any of the default settings for the unit. If you have changed any settings, the descriptions and pictures used may not match your configuration (see the troubleshooting section in Appendix D to reset your unit to default settings).

You're now ready to power up and take off with GARMIN GPS!

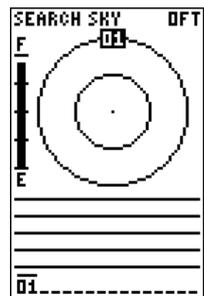
1. Press and hold the  key until the Welcome page appears.
2. After the unit performs a self-test, the Database Information page will appear, listing the issue date of the internal aviation database.

After a few seconds, the Database Information page will be replaced with the Satellite Status page. The Status page provides a visual reference of satellite acquisition and status, with signal strength bars and a satellite sky view in the center of the screen. The battery level gauge provides an indication of how much battery life you have left in the internal batteries, and will only appear when you are not connected to external power.

By now, you should also have an on-screen message box flashing on the screen. To view the message:

1. Press the  key.

The 'Searching the Sky' message informs you that the GPS 90 has not yet been initialized to a GPS position. Since our tour will use the simulator mode, we don't need to worry about acquiring satellites just yet.



Status Page

IMPORTANT!

If you're already familiar with GPS navigation and would like to skip the Takeoff Tour, please refer to page 63 for instructions and tips on initializing your unit for first time use. Once the unit has been properly initialized, you should acquire satellites and obtain a position within a few minutes each time you power the unit up.

Takeoff Tour

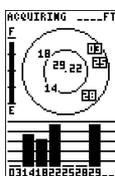
Page Sequence & Simulator

To exit the Message page and return to the previous page:

1. Press the **PAGE** key.

The GPS 90 features five main pages in a continuous loop: Satellite Status, Position, Map, Navigation and Main Menu. Try scrolling through the pages by pressing the **PAGE** key. You can also scroll the opposite direction (or return to a previous page) by pressing the **QUIT** key.

Status Page



Position Page

```

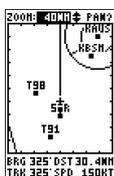
*****
000 HW 330 345
TRACK SPEED
325° 150%

POSITION
N 29°51.496'
W 097°40.620'

ALTITUDE
1053' ± 74f

TIME
07:35:42
    
```

Map Page



Nav Page

```

BRG DST
326° 34.4%
326° 150%
TRK SPD

3R9
1.25 1.25
* * * * *
ETE HTR
13:46 0.00%
07:35 -----
TIME UNAV
    
```

Main Menu

```

MAIN MENU
Setup Menu
Map Config
Alarms/CDI
EG-B Menu
User Wpt List
Routes
Messages
    
```

Use the Page and Quit keys to continuously scroll through the main pages in either direction.

To continue the Takeoff Tour, you'll need to put the GPS 90 in simulator mode:

1. Press **PAGE** repeatedly until the Main Menu page appears.
2. Use **▲** or **▼** arrow key to move the field highlight to the 'Setup Menu' option.
3. Press the **ENTER** key.
4. The setup menu will appear, with the 'Operation Mode' option highlighted. Press the **ENTER** key.
5. Once the Operation Mode page appears, use the **▼** key to highlight the 'Current Mode' field.
6. Press **ENTER** to begin selection of the operating mode.
7. Use the **▲** and **▼** keys to toggle through and select the 'Simulator' option.
8. Press **ENTER** to confirm the simulator selection.

```

OPERATION MODE

Current Mode:
Simulator

Initial Position
Ref: -----
Brq: 000°
Dis: 0.0%
    
```

Select the 'Simulator' option from the current mode field.

The field highlight will move to the Initial Position field, where we can now enter the starting position of our flight, Lockhart Municipal Airport (50R, the ICAO identifier), in Lockhart, Texas:

1. Press **ENTER** to begin initial position entry.
2. Use the **▼** key to scroll through and select '5', the first number of the identifier.
3. Press the **▶** key to move the field highlight to the next character position.
4. Repeat steps 2 and 3 until you have spelled out '50R' in the waypoint identifier field.
5. Press **ENTER** to confirm your selection.

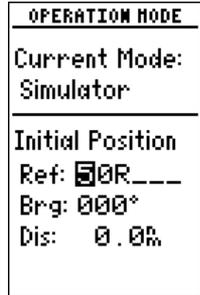
Since we'll be taking off from the airport, keep the position and bearing values at zero to keep our position right on the airport. To return to the Main Menu Page:

1. Press the **QUIT** key twice.

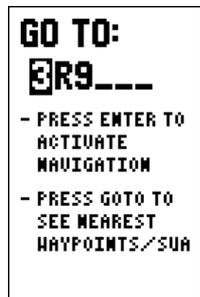
Once you have entered the starting position of your flight, the next step is to select our GOTO destination, Lakeway Airport (3R9) in Austin, Texas:

1. Press the **GOTO NEXT** key.
2. The GOTO Page will appear with the waypoint identifier field ready to accept changes.
3. Use the **▲** and **▼** keypad to enter the identifier of the destination waypoint (3R9).
4. Press the **ENTER** key to confirm your destination.

Once a GOTO is activated, the Navigation Page will display the bearing (BRG) and distance (DST) to the destination, along with your present speed (SPD) and track over ground (TRK). The GOTO destination is listed above the course deviation indicator, with your estimated time enroute (ETE), cross track error (XTK) and time displayed at the bottom of the page. A relative bearing pointer, located above the CDI scale, points to the direction of your destination.



Entering an initial position from the operation mode setup page.



Confirm the GOTO destination by pressing the ENTER key.

Takeoff Tour

Navigation & Position Pages

BRG	DST
326°	34.4%
326°	150%
TRK	SPD
3R9	
1.25	1.25
.....↑.....	
ETE	XTK
13:46	0.00%
07:35	---
TIME	UNAU

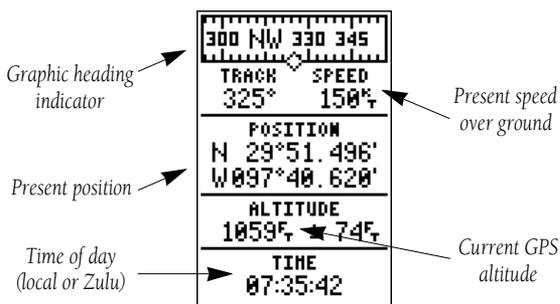
The Navigation page displays your present speed and course over the ground, along with the distance and bearing to your destination. The CDI scale and relative bearing indicator help keep you on course, while your ETE and cross track error are shown at the bottom of the Nav page.

Now we'll need to enter a speed for the aircraft:

1. Use the arrow keypad to highlight to the 'SPD' field.
2. Press the **ENTER** key to begin ground speed entry.
3. Use the arrow keypad to enter a speed of 150 knots.
4. Press **ENTER** to confirm the speed entry.

Once a speed has been entered, the Nav page will continuously update as we make our way to the destination airport. We now need to enter the cruising altitude of our flight, which can be entered from the Position page:

1. Press the **PAGE** key until the Position page appears.
2. Press the **▲** key to move the field highlight to the altitude field and press **ENTER**.
3. Use the arrow keypad to enter an altitude of 2,500 feet (leave the first altitude digit at zero, or you'll be at 25,000 feet).
4. Press **ENTER** to confirm the altitude.



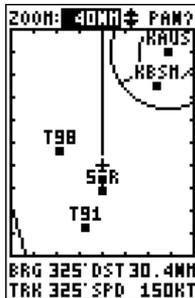
The GPS 90 Position page displays your present latitude, longitude and altitude, along with your current track and speed over the ground. The top of the page also features a graphic heading indicator, which displays your cardinal heading as you're moving. The time of day, displayed in UTC or local time, is indicated at the bottom of the page. To enter a local time offset, see page 46.

Most of your in-flight navigation with the GPS 90 will center around the Navigation and Moving Map pages. Now that we're on our way, let's move on to the Map page:

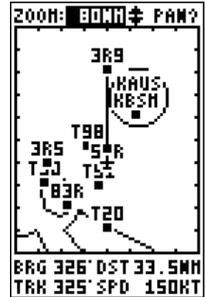
1. Press the **PAGE** key.

The GPS 90's Moving Map page provides extensive capabilities and information on your present position, nearby facilities and waypoints, special use airspace and your active route. Before we go through a few of the basic features, let's zoom in for a closer look at our progress:

1. Verify that the map scale field, located at the top of the page, is highlighted. If it isn't highlighted, press the **▲** key repeatedly until it is highlighted.
2. Press the **ENTER** key.
3. Press the **▼** key once to change the scale to the 40nm setting, and **ENTER** to return the cursor to the default position.



Once you've zoomed in to the 40 nm scale, you'll be able to see a clear presentation of your plane, nearby airports and the special use airspace around Mueller Municipal Airport (KAUS). The line between 50R and 3R9 represents the track-up route from our starting point to the destination airport, with your present position indicated by the plane icon. Notice that the plane icon remains centered on the map, while nearby airports and airspace move by relative to your present speed and track.

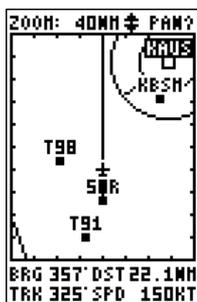


The Map page shows your present position as a plane icon in track up mode, with nearby airports and special use airspace boundaries indicated right on the map.

To reduce map clutter at higher scales, you can turn off the waypoint identifiers (and other features) from the map configuration setup described on page 51.

Takeoff Tour

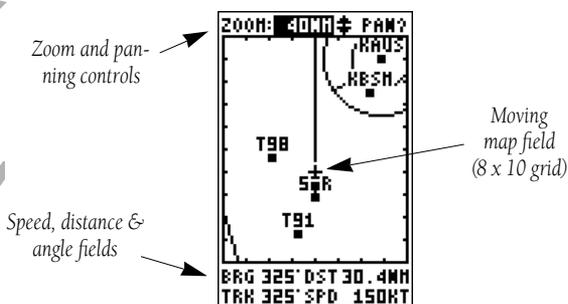
Moving Map Basics



Selecting an on-screen waypoint.

WAYPOINT	
APT: KAUS	
MUELLER MUN	
AUSTIN TX	
ELEV 630ft	
N 30°17.915'	
W 097°42.095'	
FUEL AV JET	
RWY? COM? DOWN	

Review any highlighted waypoint by pressing the ENTER key.

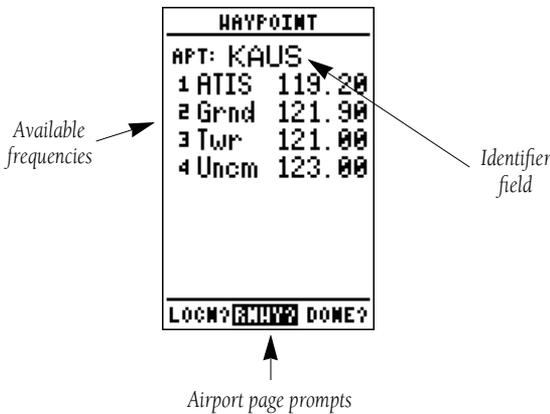


The Moving Map page can be broken down into three parts: the zoom and pan fields, located at the top of the page; the moving map field; and speed distance and angle fields, located at the bottom of the page. The zoom and pan fields provide access to the map scale and scrolling cursor functions, while the map field lets you highlight on-screen airports and waypoints for immediate review. The speed, distance and angle fields are display fields only, and do not provide access to other functions.

The default placement of the cursor highlight is on the zoom field. To move the cursor to the pan field or through the on-screen waypoints, simply use the arrow keypad to move in the desired direction, and press **ENTER** to activate the function or review the selected waypoint. Try selecting KAUS, located just to the right of your current route, to practice:

1. With the field cursor on the zoom field, press the **▼** key repeatedly until the KAUS identifier is highlighted.
2. Press the **ENTER** key to review the waypoint page for KAUS.

The waypoint location page for KAUS will appear, providing you with the facility's name and location (city/state/region), with the elevation, latitude and longitude of the field indicated on the bottom half of the page. The fuel available (AV, jet or MOGAS) at the facility is also displayed.



In addition to the location page, each airport in the GPS 90's database feature separate communication and runway pages, which are accessible from the prompts located in the bottom field of any airport page.

To view the Airport Communication page:

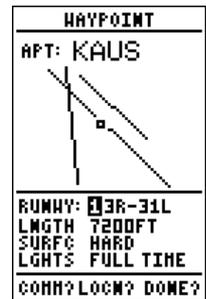
1. Press **←** to move the field highlight to the 'COMM' prompt.
2. Press **ENTER**.

All of the available frequencies for the selected airport will be displayed, with the designation indicated at the left of each frequency. If there are more than 8 frequencies for a selected airport, use the down arrow key to view additional frequencies.

Once you have moved from the initial page of an airport review, the prompt highlight will automatically move forward to the next available prompt. This allows you to continuously scroll through airport information pages by simply pressing the **ENTER** key repeatedly.

To view the runway information page:

1. Press **ENTER**.

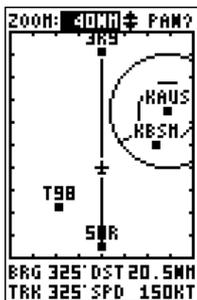


The airport runway page shows a North-Up display of all available runways, with the designation, length, surface and lighting conditions available for each runway.

To view additional runways, highlight the 'RUNWY' field and press **ENTER**, then use the arrow keypad to toggle between the various runways.

Takeoff Tour

Special Use Airspace



The GPS 90's sectorized SUA boundaries let you watch your proximity right on the moving map.



The nearest SUA page provides information about special use airspaces you are being alerted to.

The runway information page features a diagram of available runways, along with runway length, surface type and lighting for each runway. To return to the Moving Map page:

1. Move the field highlight to the 'DONE?' prompt.
2. Press **ENTER**.

Once you're back on the Moving Map Page, you'll notice that our plane is getting close to the special use airspace surrounding KAUS. Whenever you are within 2 nm of an SUA, projected to enter an SUA or inside an SUA, the GPS 90 will notify you with a message and supply detailed information on each SUA you are being alerted to. By looking closely at the map display, you'll notice that we will come very close to the KAUS SUA, but not actually enter it. Once our flight takes us within 2 nm of the SUA, we'll be alerted with a 'Near SUA < 2nm' message (you may have to wait a minute or so to get the message, depending on how fast you've made your way through the Takeoff Tour).

To view the SUA message:

1. Press the **PAGE** key.
2. To return to the Map page, press **PAGE** again.

Additional information, including the name, class, controlling agency and altitudes, is available from the **GOTO NRST** key. To view additional SUA information:

1. Press the **GOTO NRST** key twice. The nearest SUA alarm page will appear, listing up to 9 SUA warnings you are being alerted to. Each listing will display the type of warning and your ETE to intrusion, if applicable.
2. To view specific information on any listed SUA, highlight the desired SUA name and press **ENTER**. The SUA page will appear, providing additional information on floor and ceiling altitudes for the selected SUA.
3. To return to the Nearest SUA list, press the **ENTER** key.
4. To return to the Map Page from the SUA list, press **QUIT**.

SUA alert messages for class B, class C, MOAs, restricted and other areas may be turned off to avoid nuisance alerts, and may also be removed from the map to avoid excess clutter at higher map scales. For complete information and definitions on SUAs, see page 52.

The GPS 90's nearest function will also provide you with a list of the nine nearest airports, VORs, NDBs, intersections and user waypoints to your present position. The internal Jeppesen database used in the GPS 90 contains information about thousands of waypoints, which are divided into specific categories for your convenience. For more on waypoint categories and the internal database, please see page 17-27 after completing the takeoff tour.

To view the nearest waypoints of a particular category (airports, VORs, NDBs, intersections or user waypoints), you need to select the desired category from the category field at the top of the nearest page. Let's practice by viewing the nearest airports to our present position:

1. Press the **PROG** key twice to display the nearest page.
2. Press **ENTER** to begin selection of the desired category.
3. Press the **▼** key repeatedly to scroll through the waypoint categories until 'APT' appears in the category field.
4. Press **ENTER** to confirm the category. The field highlight will move to the first facility on the list.

Once you've selected and confirmed a category, the GPS 90 will display the nine nearest facilities and provide the distance and bearing to each waypoint in the list. To scroll and review the nearest waypoints list:

1. Press the **▼** key to highlight to the desired waypoint.
2. Press **ENTER** to review the waypoint page(s).
3. Press **ENTER** again to return to the nearest list. The field highlight will sequence to the next waypoint on the list.
4. Press **QUIT** to exit the nearest function and return to the previously viewed page.

NEAREST APT		
WAYPNT	BRG	DIS
KESH	079°	10.6
KAUS	046°	11.7
3R9	325°	12.3
T9B	171°	17.1
50R	145°	22.5
T91	151°	29.4
3R5	190°	29.8
T90	184°	35.8
83R	167°	39.3

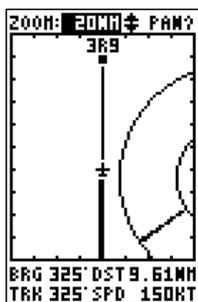
The GPS 90 displays the nine nearest airports, VORs, NDBs, intersections or user waypoints to your present position.

NEAREST APT		
WAYPNT	BRG	DIS
KESH	081°	10.8
KAUS	049°	11.7
E83	325°	11.8
T9B	171°	17.6
50R	145°	23.0
T91	151°	29.9
3R5	190°	30.2
T90	183°	36.2
83R	167°	39.8

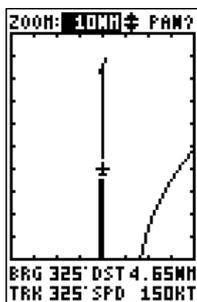
To review a nearest waypoint, highlight the identifier and press ENTER.

Takeoff Tour

AutoZoom



AutoZoom at 20 nm
map scale.



AutoZoom at 10 nm
map scale.

Now let's return to the Map page to finish the tour. If you're not already on the Map page:

1. Press **PAGE** repeatedly until the Map page appears.

You may have noticed that as we make our way towards the destination airport, the map scale has automatically zoomed in to provide a closer look of the airport. What you're actually seeing is the GPS 90's AutoZoom feature. Whenever you select a GOTO destination, the Map Page will default to the 80 nm setting, and gradually zoom down the map scale to the 1 nm setting.

The map scale will zoom to the next lowest setting (i.e., from 80 nm to 40 nm) whenever the map can fit both your present position and your destination on the screen. If you manually zoom in the map scale before this point, the AutoZoom feature will resume once it catches up to the map scale you have selected (down to 2 nm). If the map is manually zoomed out beyond the AutoZoom scale, the Autozoom will be cancelled, and the GPS 90 will assume you want to stay at the scale you have manually selected. For more information on the AutoZoom feature, please see page 41.

By now, our plane should be approaching 3R9, the destination airport. As the map zooms in to the 10 nm range, you'll be able to see the runway appear right on the screen. Let's move back to the Navigation page and finish up our tour:

1. Press the **PAGE** key to display the Navigation Page.

As we fly past the airport, notice that the GPS 90 continues to provide navigation to 3R9, with the relative bearing pointer and ETE fields indicating we are past our destination. The GOTO destination may be cancelled by activating another GOTO or cancelling the current GOTO destination. To cancel the current GOTO:

1. Press the **GOTO NEXT** key.
2. Press **◀** once to clear the destination field (pressing **◀** clears a selected field)
3. Press **ENTER** to confirm the cancellation.

Congratulations! You've now mastered some of the basic features of the GPS 90, and are ready to take to the skies with a powerful tool that can help make all your flights a little smoother and a lot more efficient. Be sure to carefully review the sections on initialization, installation and the internal database so you can get the most out of your new GPS. The rest of the manual is organized as a topical reference, so you may quickly find instructions and explanations on the GPS 90's powerful features.

To turn the GPS 90 off:

1. Press and hold the  key for 3 seconds.

Thank you for choosing the GARMIN GPS 90. We hope that it will be a valuable navigation tool for you, wherever your course may take you.



The power off count-down helps prevent the GPS 90 from being powered down accidentally.

The GPS 90 uses an internal Jeppesen® database 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 six letters and/or numbers) and other pertinent information. Up to 250 user waypoints may also be created and stored in memory.

Waypoint information is available through the GPS 90's WPT key. Waypoints are divided into five categories for your convenience. Each category provides different types of detailed information for a selected facility:

- **Airports**— Identifier, city/state, country, facility name, position (lat/lon), elevation, fuel services, runways, and communications frequencies.
- **VORs**— Identifier, city/state, country, facility name, position (lat/lon), frequency and co-located DME or TACAN availability.
- **NDBs**— Identifier, city/state, country, facility name, position (lat/lon) and frequency.
- **Intersections**— Identifier, region/country, position (lat/lon) and range/bearing to nearest VOR.
- **User**— Identifier (name), position (lat/lon), user comments and reference waypoint.

To view the waypoint information for a desired waypoint, select the waypoint category from the category field, located at the top left of the waypoint page, next to the identifier field.

To choose a waypoint category:

1. Press **WPT** to display the waypoint page.
2. Use the arrow keypad to highlight the category field.
3. Press **ENTER** to begin selection of the waypoint category.
4. Use the **▲** or **▼** keys to select the desired category.
5. Press **ENTER** to confirm the category selection.



The GPS 90's internal Jeppesen database is available with an Americas (North, Central & S. America) or International database (Europe, Africa, Asia, Australia & Greenland). Hawaii is included in both database versions.

The database cycle is displayed on the Database Information page. Information on updating the database is included with your GPS 90 package.

Waypoints & Database

Viewing Waypoint Data

After a waypoint category is selected, information for a waypoint can 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. Use the arrow keypad to highlight the identifier field.
2. Press **ENTER**.
3. Use the **▲** and **▼** keys to spell out the desired identifier, using the **▶** key to move to the next character position.

As the identifier is entered, the GPS 90's Spell'N Find feature will scroll through the available database, displaying any waypoints with the same identifier letters you have entered to that point. When the desired waypoint is displayed, press **ENTER**.

Once you've selected a waypoint category, waypoint information can also be retrieved by entering the facility name of the airport, the name of the VOR or NDB, or their city name (intersections and user waypoints cannot be retrieved by facility or city name).

To select a waypoint by facility or city name:

1. Select the desired waypoint category (APT, VOR or NDB).
2. Use the arrow keypad to highlight the facility name or city name field.
3. Press **ENTER** to begin entry of the facility or city name.
4. Enter the name of the facility or city with the arrow keypad.
5. The GPS 90's Spell'N Find feature will scroll through the available database, displaying any waypoints with the same letters you have entered to that point.
6. When the desired waypoint appears, press **ENTER**.

WAYPOINT	
APT: 50	---
LOCKHART MUN	
LOCKHART TX	
ELEV	530'
N	29°51.043'
W	097°40.334'
FUEL AV	
RWY? COHH? DOME?	

Entering a waypoint
identifier.

WAYPOINT	
APT: KCOS	
CITY OF COLORADO	
SPRINGS MUN	
COLORADO SPRINGS	
CO	
ELEV	6180'
N	38°48.357'
W	104°42.055'
FUEL AV JET	
RWY? COHH? DOME?	

Entering a waypoint
by facility name.

Once a waypoint category and identifier have been selected, the GPS 90 will provide extensive information through various waypoint review pages. The following waypoint information is available:

AIRPORT INFORMATION

WAYPOINT	
APT: KAUS	
MUELLER MUN	
AUSTIN TX	
ELEV 630ft	
N 30°17.915'	
W 097°42.095'	
FUEL AV JET	
RMWY? COMN? 00130	

WAYPOINT	
APT: KAUS	
1 ATIS 119.20	
2 Grnd 121.00	
3 Trn 121.00	
4 Unclm 123.00	
LOCK? 00130 DONE?	

WAYPOINT	
APT: KAUS	
RUNWY: 33R-34L	
LNTH 7200ft	
SURF: HARD	
LGHTS: FULL TIME	
COMN? LOCK? DONE?	

WAYPOINT	
APT: KLAX	
LOS ANGELES INTL	
LOS ANGELES CA	
ELEV 130ft	
N 33.94442°	
W 118.40659°	
FUEL AV JET	
RMWY? COMN? 00130	

The GPS 90 features three airport pages:

- **Airport location**— allows entry of desired airport by identifier, facility name or city and displays latitude, longitude and elevation; and fuel availability.
- **Airport communication**— allows entry of desired airport by identifier and displays radio frequencies/usage.
- **Airport runway**— allows entry of desired airport by identifier, displays runway designations, length, surface and lighting information; and/or pilot controlled lighting frequencies.

To scroll through the airport pages:

1. Select the airport category and enter the desired airport identifier. The airport page initially displayed will be the same as the last airport page viewed.
2. Use the ◀ key to move the field highlight to the desired page prompt and press **ENTER**.

Once you have moved from the initial airport page displayed, the page prompt will automatically move forward to the next available prompt. This allows you to continuously cycle through the airport pages by simply pressing the **ENTER** key repeatedly.

To exit the airport pages and return to the previously viewed page:

1. Press the **QUIT** key.

The internal database uses ICAO identifiers for all airport names. All U. S. airports 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 countries outside the U. S. use two letter prefixes. For more information, contact the International Civil Aviation Organization.

Waypoints & Database

Location & Comm Pages

WAYPOINT	
APT: KIXD	
1 Grnd	124.30
2 Twr	118.30
3 Uncom	122.95
LOGN? RMHY? DOME?	

In some instances, all available frequencies for a selected airport may not fit on the communication page. To view additional frequencies, use the DOWN ARROW key to scroll through and view any additional frequencies.

Facility Name
(selectable)

City/State
(selectable)

WAYPOINT	
APT: KIXD	
JOHNSON CO INDL	
OLATHE KS	
ELEV 1090F	
N 38.83347°	
W 094.88793°	
FUEL AV JET	
RMHY? COMM? DOME?	

Identifier field
(selectable)

Location field

Available fuel types

The GPS 90's airport location page displays the latitude, longitude and elevation of the selected airport, as well as fuel availability. From the airport location page, you can enter a desired airport by identifier, facility name or city as described on page 18. The following descriptions and abbreviations are used on the airport position page:

Elev— Elevation in feet or meters.

Position— In the position format you have currently selected from the setup page.

Fuel— Lists the types of fuel available on the airport:

- AV gas— 80-87 octane, 100 LL, 100-130 octane
- JET— Jet A, Jet A-1 or Jet A+
- MOGAS— 87 octane unleaded

The airport communication page (shown in the left margin) displays radio frequencies and their usage for the selected airport, and allows entry of a desired airport by identifier only (see page 18). The following frequencies are displayed if available:

- ATIS— Automatic terminal information service
- Grnd— Ground
- Twr— Tower
- Uncom— Unicom/Multicom

The last airport page is the runway page, which features a diagram of available runways, along with designations, length, surface and lighting information for the selected airport.

WAYPOINT	
AFT: KAUS	Identifier field (selectable)
Runway Diagrams	
RUNWY: 13R-31L	Runway Data
LGTH 7200FT	
SURFC HARD	
LGHTS FULL TIME	
CONN? LOC? DONE?	

Designator Field (selectable)

The runway diagram provides a north-up graphic of available runways, with length, surface and lighting data listed below the runway designation. The 'SURFC' field will display one of the following surface types: hard, turf, sealed, gravel, dirt, soft, unknown or water. The 'LGHTS' field will indicate one of five lighting schemes: part time, full time, pilot controlled (with frequency), no lighting or unknown.

If a selected airport has more than one runway, additional runways can be viewed by selecting another runway from the designation field.

To view additional runways:

1. Highlight the runway designation field.
2. Press the **ENTER** key.
3. Use the arrow keypad to toggle through and select the desired runway.
4. Press **ENTER** to return the cursor to the 'DONE?' prompt.

WAYPOINT	
AFT: KAUS	Identifier field (selectable)
Runway Diagrams	
RUNWY: 07-35	Runway Data
LGTH 5000FT	
SURFC HARD	
LGHTS FULL TIME	
CONN? LOC? DONE?	

Additional runways are accessed through the runway designator field

WAYPOINT	
AFT: KTCS	Identifier field (selectable)
Runway Diagrams	
RUNWY: 03-31	Runway Data
LGTH 5500FT	
SURFC HARD	
LGHTS 122.80MHz	
CONN? LOC? DONE?	

Pilot controlled lighting with frequency listed.

INTERSECTION INFORMATION

The GPS 90's intersection waypoint page allows entry of a desired intersection by identifier and displays position and nearest VOR data for a selected intersection.

To view waypoint information on an intersection:

1. Select the intersection category from any waypoint field.
2. Enter the identifier of the desired intersection and press the **ENTER** key.

The GPS 90 will display the intersection's latitude and longitude below the identifier field, and calculate the bearing and distance to the nearest VOR facility. Note that the VOR displayed may not necessarily be the facility used to define the intersection. The region and country of the intersection will also be displayed at the bottom of the page to help you confirm the location in the event of duplicate identifiers.

WAYPOINT	
INT: BATYE	
N 38.86845°	
W092.25446°	
REF:BLM	
BEARING	DISTANCE
070°	111%
N GEN USA	
ENTER	

GPS 90 intersection
waypoint page.

NDB INFORMATION

The next waypoint category in the GPS 90's internal database is NDB facilities. The NDB waypoint page allows you to select a desired NDB by entering the identifier, facility name or city (see page 18). In addition to displaying the identifier, facility name and city/state of the NDB, the NDB page will show the latitude and longitude of the facility, the region/country, & the transmitting frequency.

To view waypoint information on a NDB:

1. Select the NDB category from any waypoint category field.
2. Enter the identifier, facility name (on the second line) or city (on the third line) of the desired NDB.
3. Press the **ENTER** key.

WAYPOINT	
NDB: MA	
FARLY	
HIGHLAND TX	
326.0KHz	
N 31°59.284'	
W102°19.507'	
S GEN USA	
ENTER	

NDB waypoint page.

VOR INFORMATION

The GPS 90's VOR waypoint page allows you to enter a desired VOR by identifier, facility name, or city name and displays the selected facility's position, frequency and other information.

To view waypoint information for a VOR:

1. Select the VOR category from any waypoint category field.
2. Enter the identifier, facility name or city of the desired VOR.
3. Press the  key.

The VOR page lists the identifier, facility name and city/state of at the top of the page, with the transmitting frequency of the facility listed below. If DME or TACAN equipment is co-located at the site, it will be indicated next to the transmitting frequency of the VOR. The latitude and longitude is also displayed, with the region and country indicated at the bottom of the page.

WAYPOINT	
VOR: BUM	
BUTLER	
BUTLER MO	
115.90MHz DME	
N 38.27382°	
W094.48642°	
W GEN USA	

VOR waypoint page.

USER WAYPOINT INFORMATION

The last waypoint category available from the GPS 90's WPT key is user waypoints. The user waypoint page allows entry of a desired waypoint by name/identifier and displays the waypoint's position, user comments and a reference waypoint field to calculate the distance and bearing to any other waypoint in the database. The user waypoint page can also be used to create up to 250 waypoints by manually entering a position or defining a range and bearing from an existing waypoint.

To view waypoint information for a user waypoint:

1. Select the USR category from any waypoint category field.
2. Enter the identifier/name of the desired user waypoint.
3. Press the  key.

WAYPOINT	
USR: GARMIN	
N 38°57.066'	
W094°44.829'	

REF:KIXD	
BEARING DISTANCE	
039° 9.80%	
RENAME?	
DELETE?	

User Waypoint page.

Waypoints & Database

Creating User Waypoints

The user waypoint page allows you to create new waypoints three ways:

- Enter the exact position of the new waypoint
- Reference a waypoint already in the database
- Enter a range and bearing from your present position

To first step in creating a new waypoint (regardless of what method you're using) is to assign a name/identifier for the new waypoint.

To create a new waypoint from the user waypoint page:

1. Select the 'USR' category from any waypoint category field and press **ENTER**. The highlight will advance to the name field.
2. Press the **ENTER** key to begin entry of your waypoint name.
3. Use the arrow keypad to enter the waypoint name.
4. Press **ENTER** to accept the waypoint name.

Once the name has been accepted, the field highlight will move to the position field, where you can manually enter the position of the new waypoint:

1. Press **ENTER** to begin entry of the waypoint position.
2. Use the arrow keypad to enter the lat/lon. The **◀** and **▶** keys will advance the cursor to the desired character position.
3. After the latitude and longitude entry is complete, press **ENTER** to save the new waypoint.

If you are defining the new waypoint position by referencing (entering a distance and bearing from) a known waypoint or your present position:

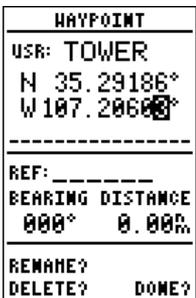
1. Use the **▼** key to highlight the 'REF' field.
2. If you are referencing a waypoint, press **ENTER** and use the arrow keypad to enter the identifier of the reference waypoint (If you want to reference your present position, leave the 'REF' field blank).
3. Press the **ENTER** key.

(continued on page 25)



```
WAYPOINT
USR: TOWER
-----
REF:
BEARING DISTANCE
-----
RENAME?
DELETE?  DONE?
```

Entering a new user
waypoint's name.



```
WAYPOINT
USR: TOWER
N 35.29186°
W 107.20600°
-----
REF:
BEARING DISTANCE
000° 0.00%
-----
RENAME?
DELETE?  DONE?
```

Entering a new user
waypoint's position.

The field highlight will automatically advance to the bearing field. To enter a bearing and range from the reference position:

1. Press **ENTER** to begin entry of the compass bearing.
2. Use the arrow keypad to enter the bearing of the new waypoint from the reference position.
3. Press **ENTER** to confirm the bearing. The field highlight will automatically move to the distance field.
4. Press **ENTER** to begin entry of the distance.
5. Use the arrow keypad to enter the distance of the new waypoint from the reference position.
6. Press **ENTER** to confirm the distance. The GPS 90 will calculate the coordinates of the waypoint and store it in memory.

Once a new user waypoint is saved, the GPS 90 will assign a default user comment (the date and time of creation) to the new waypoint. You can change the default comment to a custom comment at any time, right from the user waypoint page.

To enter a user comment:

1. Use the arrow keypad to highlight the comment field.
2. Press the **ENTER** key.
3. To clear the default comment, press the **◀** key.
4. Use the arrow keypad to enter the comment. Press **ENTER**.

The delete and rename prompts, located at the bottom of the user waypoint page, allow you to quickly remove a waypoint from memory or change the name of an existing waypoint.

To delete a user waypoint:

1. Use the **◀** key to move the field highlight from the 'DONE' prompt to the 'DELETE' prompt and press **ENTER**.
2. Use the **◀** key to highlight the 'Yes' prompt and press **ENTER**.

WAYPOINT	
USR: CASTLE	
N 07.09174°	
E 006.36595°	
31-MAR-95 07:46	
REF:KENIL	
BEARING	DISTANCE
082°	11. 0.0
RENAME?	
DELETE?	DONE?

Entering a range and bearing from a reference waypoint.

WAYPOINT	
USR: GARMIN	
N 38°57.066'	
W 094°44.829'	

REF:KIXD	
BEARING	DISTANCE
039°	9.800
RENAME?	
DELETE?	DONE?

Deleting a User Waypoint

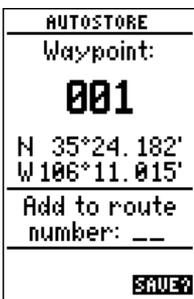
Waypoints & Database

User Waypoints & AutoStore



```
RENAME WAYPOINT
From
CASTLE
To:
EAGLE
Are you sure
Yes? or No?
```

*Renaming a user
waypoint.*



```
AUTOSTORE
Waypoint:
001
N 35°24.182'
W 106°11.015'
Add to route
number: --
SAVE?
```

*Marking an
AutoStore position.*

The user waypoint page also allows you to rename any user waypoint in memory.

To rename a user waypoint:

1. Use the arrow keypad to highlight the 'RENAME' prompt.
2. Press the **ENTER** key. The rename waypoint page will appear.
3. Use the arrow keypad to enter the new waypoint name.
4. Press **ENTER**. The highlight will advance to the 'Yes' prompt.
5. Press **ENTER** to accept the new name, or **QUIT** to cancel.

The WPT key is also used to save new waypoints using the GPS 90's AutoStore™ function. AutoStore allows you to quickly store your present position and add the new waypoint to a selected route if desired.

To save your present position using AutoStore:

1. Press the **WPT** key twice to capture your position (if you're already on a waypoint page, you'll only need to press the **WPT** key once).

The AutoStore page will appear, showing the captured position and a default 3-digit waypoint name. To change the default position name :

1. Use the arrow keypad to highlight to the name field.
2. Press **ENTER** to begin entry of your waypoint name.
3. Use the arrow keypad to enter the name.
4. Press **ENTER**. The field highlight will move to the 'route' field.

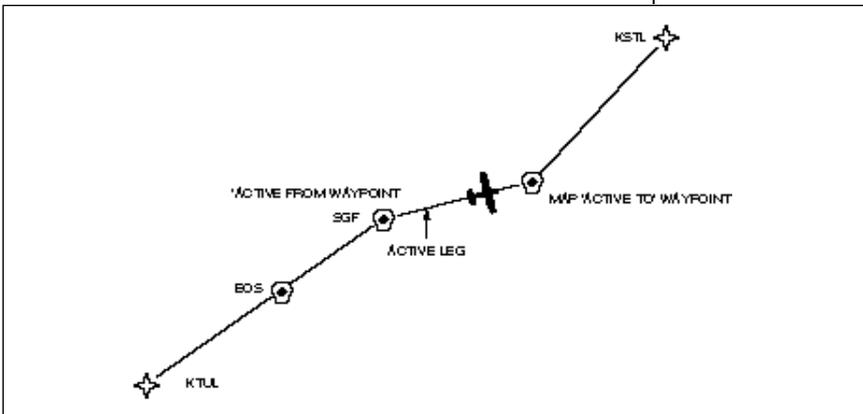
If you'd like to add the waypoint to a route:

1. Press the **ENTER** key.
2. Enter the desired route number and press **ENTER**.
3. Press the **ENTER** key to confirm the route number.

To save the AutoStore waypoint:

1. Highlight the 'save' field and press **ENTER**.

One of the many benefits of GPS navigation is the ability to fly directly to a waypoint or fly a chain of waypoints without relying totally on ground based navigation aids. To take advantage of the convenience and efficiency of point-to-point GPS navigation, the GPS 90 provides two methods of selecting a destination for your flight: **GOTO and route navigation**. The GOTO function provides a fast way to set a course to a destination from your present position, while the route function allows you to create a chain of waypoints to fly in sequence towards a selected destination.



Whether you're flying a GOTO course or a route, there are a few basic concepts and terms that apply to all point-to-point GPS navigation. Routes are broken down and navigated in smaller segments called '**legs**'. The diagram above shows a basic route consisting of five waypoints and four legs. The waypoint you are going to in a leg is called the '**active to**' waypoint (MAP), and the waypoint immediately behind you is called the '**active from**' waypoint (SGF). The line between the 'active to' and the 'active from' waypoint is called the '**active leg**'.

When you activate a route with the GPS 90, it will automatically select the route leg closest to your position as the active leg, and provide navigation guidance directly to the 'active to' waypoint of that leg. As you pass a waypoint in your route, the unit will select the next waypoint as the 'active to' waypoint.

GOTO function

The GPS 90's GOTO function lets you choose any stored waypoint as a destination and quickly set a course from your present position. Once a GOTO has been activated, the Navigation Page will provide you with steering guidance to your destination.

To activate the GOTO function:

1. Press the **GOTO NRST** key.
2. The GOTO Page will appear with the waypoint field ready to select a destination. Enter your destination waypoint.
3. Press the **ENTER** key to confirm the waypoint.

You can also quickly activate the GOTO function from any other page by simply highlighting a waypoint, pressing the **GOTO NRST** key and confirming the GOTO page.

Another time-saving feature of the GPS 90 that you may have noticed when entering waypoint names is the Spell'N'Find feature. As you enter waypoint characters, the screen will automatically display the first numerical or alphabetical match of the character you have entered.

To use the Spell'N Find feature:

1. Press the **◀** key to clear the name field.
2. Use the **▲** and **▼** keys to scroll through waypoints.
3. If you have more than one waypoint that begins with the same letter or number, use the **▶** key to move to the next character positions as needed. Only the first character match is listed for each character set.
4. Once you've found the desired waypoint, press **ENTER**.

Once a GOTO is activated, the GPS 90 will provide navigation guidance to the selected waypoint until the GOTO is cancelled. To cancel a GOTO:

1. Press the **GOTO NRST** key.
2. Press the **◀** key to clear the destination field.
3. Press **ENTER** to complete the cancellation.

```

GO TO:
KAX__
- PRESS ENTER TO
  ACTIVATE
  NAVIGATION
- PRESS GOTO TO
  SEE NEAREST
  WAYPOINTS/SUA
    
```

Selecting a GOTO destination.

```

GO TO:
_-----
- PRESS ENTER TO
  ACTIVATE
  NAVIGATION
- PRESS GOTO TO
  SEE NEAREST
  WAYPOINTS/SUA
    
```

Use the **LEFT ARROW** key to clear the GOTO field and cancel navigation.

The GPS 90 lets you create and store up to 20 routes of 30 waypoints each. Routes are created, copied and edited through the route definition page, which is accessed through the Main Menu Page.

To select the route definition page:

1. Press **PAGE** until the Main Menu page appears.
2. Use the arrow keypad to highlight the 'routes' option.
3. Press the **ENTER** key to display the routes page.
4. To return to the Main Menu page, press **QUIT**.

Comments field

Route number field

Route waypoint field

Desired track & distance fields

Route copy prompts

ROUTE: 1			
KIXD TO KCOS			
NO	WAYPNT	DTR	DIS
1.	KIXD	250° 891	
2.	KPHX	033° 479	
3.	KCOS		
4.	-----	-----	-----
5.	-----	-----	-----
6.	-----	-----	-----
7.	-----	-----	-----
COPY TO ROUTE: --			
CLR? INU? ACT?			

ROUTE: 1			
ATHOOD_TO_			
NO	WAYPNT	DTR	DIS
1.	KADT	100° 293	
2.	KIXD	341° 145	
3.	KOFF		
4.	-----	-----	-----
5.	-----	-----	-----
6.	-----	-----	-----
7.	-----	-----	-----
COPY TO ROUTE: --			
CLR? INU? ACT?			

Each route can be given a 16 character custom comment.

The route number field is displayed at the top of the page, with a 16 character comment below. If no user comment is entered, the field will display the first and last waypoint in the route. The waypoint list accepts up to 30 waypoints for each route, with fields for desired track and distance between legs (if the leg distance exceeds 999 nm, the field will remain blank).

Below the waypoint list are the route page function fields which let you copy, clear, invert or activate the displayed route. Routes 1-19 are used as storage routes, with route 0 always serving as the active route you are navigating. If you want to save a route currently in route 0, be sure to copy it to another open route, as it will be overwritten by the next route activation.

ROUTE: 1			
KIXD TO KCOS			
NO	WAYPNT	DTR	DIS
1.	KIXD	250° 891	
2.	KPHX	033° 479	
3.	KCOS		
4.	-----	-----	-----
5.	-----	-----	-----
6.	-----	-----	-----
7.	-----	-----	-----
COPY TO ROUTE: --			
CLR? INU? ACT?			

Highlight the 'CLR' prompt and press **ENTER** to clear the active route.

Routes

Creating & Copying Routes

ROUTE: 2			
LA TO BARRSFIELD			
NO	WAYPNT	DTK	DIS
1.	KLAX	346	90
2.	LSI	---	---
3.	---	---	---
4.	---	---	---
5.	---	---	---
6.	---	---	---
7.	---	---	---
COPY TO ROUTE: --			
CLR? IMU? ACT?			

Creating a route.

ROUTE: 2			
LA TO BARRSFIELD			
NO	WAYPNT	DTK	DIS
1.	KLAX	346	90
2.	LSI	---	---
3.	---	---	---
4.	---	---	---
5.	---	---	---
6.	---	---	---
7.	---	---	---
COPY TO ROUTE: 5?			
CLR? IMU? ACT?			

Highlight the 'COPY' prompt and press ENTER to copy a route to another storage position.

To create a route in the GPS 90:

1. Press **ENTER** to begin route number selection.
2. Use the **▲** or **▼** key to enter a route number.
3. Press the **ENTER** key to confirm the route number.
4. Press **ENTER** to begin entry of a route comment.
(Note that the default (first and last waypoint) comment will only appear if the comment field is blank).
5. Enter your comment and press the **ENTER** key.
6. Highlight the No. 1 waypoint field and press **ENTER**.
7. Enter the name of the first route waypoint and press **ENTER**.
8. Continue entering the rest of your waypoints in order, using the **ENTER** key to start and confirm each field entry. The list will scroll down as needed to enter up to 30 waypoints.
9. After you have finished entering all your waypoints, press **PAGE** to return to the Menu page.

The route definition page is also used to copy a route to another route number. This feature is useful when you make changes to the active route (route 0) and want to save the new route and the original route.

To copy a route:

1. Press **ENTER** to begin route number selection.
2. Enter the route number to be copied and press **ENTER**.
3. Move the field highlight to the 'COPY TO ROUTE' field and press the **ENTER** key.
4. Use the arrow keypad to scroll through the available routes and select a destination route number. Only open routes will be available as choices.
5. Press the **ENTER** key to copy the route.
6. Press the **PAGE** key to return to the Menu page.

The route action fields, located at the bottom of the route definition page, allow you to clear, invert and activate the routes stored in the GPS 90.

To clear a route:

1. Press **ENTER** to begin entry of the route number.
2. Enter the route number and press **ENTER**.
3. Select the 'CLR' field and press **ENTER**.

A warning page will appear, asking you to confirm that you want to remove all waypoints from the route.

1. Highlight the 'Yes' field with the **◀** key and press **ENTER**.
2. Press **PAGE** to return to the Menu page.

After a route has been entered in the GPS 90, it can be activated in its defined sequence or inverted (in reverse order). The process of activating or inverting a stored route takes a storage route (routes 1-19) and copies it into the active route (route 0) for navigation. The storage route is now no longer needed and will be retained in its original format under its existing route number.

This system allows you to have an active route that you may edit during navigation and save as an entirely new route from the original. You will have to copy the active route to an unused storage route to save it, since new route activation overwrites route 0.

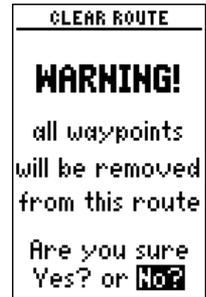
To activate a route:

1. Select the route definition page and press the **ENTER** key to activate the route number field.
2. Enter the route number to be activated and press **ENTER**.
3. Highlight the 'ACT' field and press **ENTER**.

Inverting a route allows you to navigate route legs in reverse order, without editing the original route.

To activate a route in inverted order:

1. Follow the same steps as above, but select the 'inv' command field and press the **ENTER** key.



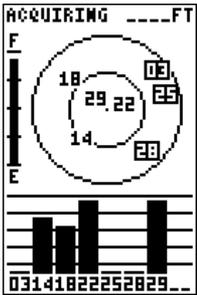
Clearing a route will delete all waypoints from a route.

ROUTE: 1			
ATWOOD TO ONAHA			
NO	WAYPNT	DTR	DIS
1.	KADT	100	293
2.	KIXD	341	145
3.	KOFF	---	---
4.	---	---	---
5.	---	---	---
6.	---	---	---
7.	---	---	---
COPY TO ROUTE: --			
CLR? INV? ACT?			

To activate a route, highlight the 'ACT' prompt and press the ENTER key

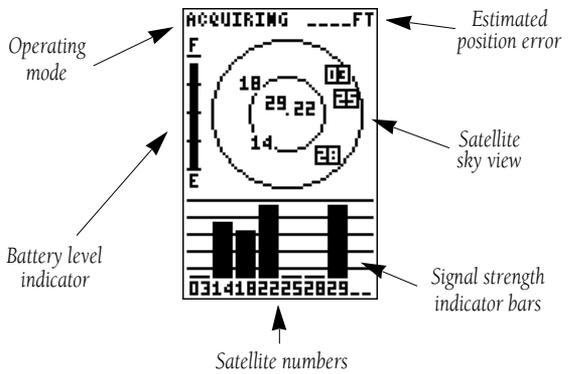
Status Page

Overview



The satellite sky view shows a bird's eye view of the position of each satellite relative to the receiver's last known position.

The outer circle represents the horizon (north up); the inner circle 45° above the horizon; and the center point a position directly over your head. Use the sky view to help determine if there are obstructions shading your reception of satellite signals.



The GPS 90 Status page displays the status of various receiver functions. The status information will help you understand what the GPS is doing at any given time.

The sky view and signal strength bars give you an indication of what satellites are visible to the receiver, whether or not they are being tracked, and the signal quality. When a satellite is visible but not being tracked, the signal strength bar will remain blank and the sky view indicator will remain highlighted in reverse video.



If you are losing coverage or having trouble acquiring a position, use the sky view and signal strength bars to verify proper antenna and receiver installation. If you have lost coverage and the unit has trouble reacquiring satellites, try shutting the unit off momentarily to reset the unit. For more information on installation, acquiring satellites and using the GPS 90 in other applications (hunting, fishing, hiking, etc.), please see Appendix A & D.

Receiver status is indicated at the top left of the screen, with the current horizontal accuracy (in feet or meters) at the top right. The status will show one of the following conditions:

Acquiring— the first status you'll see in normal operation. The GPS 90 is looking for satellites to track based on its last known position.

2D NAV— at least 3 satellites with good geometry have been locked onto and a 2 dimensional position fix (lat. & lon.) is being calculated. '2D DIFF' will appear when DGPS corrections are being received.

3D NAV— at least four satellites with good geometry have been locked onto and your position is being calculated in latitude, longitude and altitude. '3D DIFF' will appear when DGPS corrections are being received.

NEED ALT— the receiver needs altitude to start and/or continue 2D navigation. Enter your altitude on the Position page (see page 36).

SEARCH SKY— the GPS 90 is collecting new almanac data or AutoLocate™ mode has been selected. This process can take 7.5-15 minutes.

POOR CVRG— the unit is no longer tracking enough satellites to provide a 2D/3D position.

NOT USABLE— the receiver is unusable, possibly due to incorrect initialization or abnormal satellite conditions. Turn the unit off and back on.

SIMULATOR— the unit is in simulator mode.

Below the receiver status field and to the left of the satellite sky view is the battery level indicator, which will display the battery life level whenever the GPS 90 is operating on internal batteries. If you're operating off external power, the battery indicator will not appear.

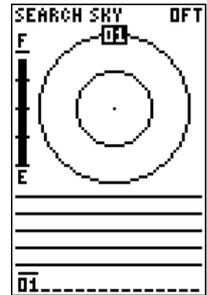


The battery level indicator is calibrated for alkaline batteries. Ni-Cad and lithium batteries will not show battery level at full scale due to voltage differences. No other functions are affected by using Ni-Cad or lithium batteries.

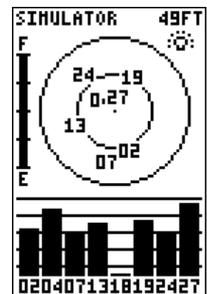
On the right side of the screen, just below the horizontal accuracy field is the screen backlighting indicator.

To turn the screen backlighting on or off:

1. Press the  key.
2. To adjust the duration of screen backlighting, refer to the operation setup section (page 46).



Searching the Sky status indicates the GPS 90 is collecting new satellite data before calculating a GPS position.



The bulb icon indicates that screen backlighting is on.

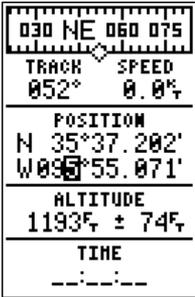
Position Page

Entering Position & Altitude

The GPS 90 Position page displays your current position's latitude, longitude, altitude and time numerically. It also displays your track (compass direction) and speed whenever you're moving.

The Position page also lets you enter a position's latitude and longitude manually. During satellite acquisition, the position displayed is the last computed position stored in memory. If the receiver's position has moved several hundred miles with the power off or memory has been lost due to battery failure, the unit may take 7 1/2 to 15 minutes to acquire satellite data.

To speed up the acquisition process, you can enter a more accurate initial position or reference airport (see page 44). Be sure to accurately enter the latitude and longitude to the nearest degree. An incorrect lat/lon may prevent the receiver from tracking the correct set of satellites for your position.



Entering a position manually.

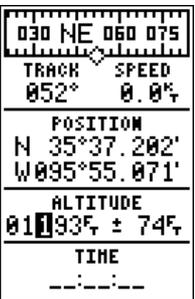
To manually enter a position:

1. Press the ▼ key until the position field is highlighted.
2. Press **ENTER** to begin entry of your position.
3. Use the arrow keypad to enter the new position.
4. Press the **ENTER** key to confirm your changes.

When the GPS 90 is acquiring satellites or navigating in the 2D mode, the last known altitude will be used to compute your position. You may also manually enter an altitude. Keep in mind that GPS altitudes may vary significantly from pressure altimeters. Never use GPS altitude for vertical navigation.

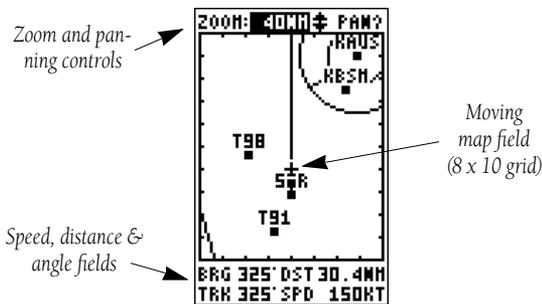
To enter an altitude manually:

1. Press the ▼ key until the altitude field is highlighted.
2. Press **ENTER** to begin entry of your altitude.
3. Use the arrow keypad to enter the altitude.
4. Press the **ENTER** key to confirm the altitude.



Entering an altitude manually.

The GPS 90 features a powerful moving map display that can do much more than just plot your course and route. The Map page also provides you with a moving map cursor that will let you pan ahead and review nearby waypoints, determine the distance and bearing to any map position and mark new waypoints.

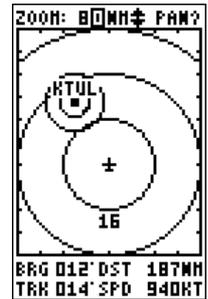


The Map page can be broken down into three main sections:

The **zoom function and panning control fields** are located at the top of the screen. There are 12 selectable zoom ranges from 0.2 to 320 miles or 0.5 to 600 km, measured vertically.

The **map portion** of the page is bordered by an 8 x 10 grid to help you estimate distances based on the map scale you are using. Your present position is indicated by a plane icon (in track up mode), or a position diamond (in other modes), with your track and/or route displayed as a solid line. Nearby waypoints are represented as squares, with the waypoint name also listed. You may select which of these features are shown through the map setup submenu page (see page 51 for more information).

The **speed, distance and angle fields**, located directly below the map show your bearing and distance to one of three selectable destinations: an active destination waypoint; a highlighted on-screen waypoint; or to the panning target crosshair. Your current track and speed are displayed just below the bearing and distance fields.



The GPS 90 has on-screen range rings to help you estimate distances relative to your present position. The value of each ring is determined by the current zoom scale.

The distance value of each ring is equal to 1/5th of the current zoom range, with the interval of each ring noted below the first range ring.

To turn the range ring display on or off (the default setting is off), see the map setup instructions on page 51.

Map Page

Zooming & Panning

There are three main functions you can perform from the Map page— zooming, pointing and panning. Each of these functions has its own ‘field’, which may be selected and activated for use.

Whenever the Map Page first appears, the zoom field (at the top left) is always selected. The Map Page has 12 map scales which are selected through the zoom function field.

To select a zoom scale:

1. Press ◀ or ▶ to highlight the zoom field.
2. Press the **ENTER** key to begin range selection.
3. Use the ▲ or ▼ keys to scroll through and find the desired range scale.
4. Press **ENTER** to confirm your selection.

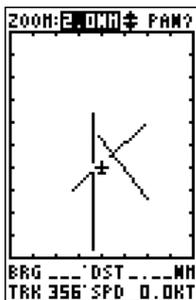
The second function field on the Map page is the pan field, located at the top right of the screen. The pan function allows you to move the map with the four arrow keys to view areas outside the current map

To activate the pan function:

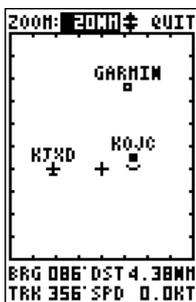
1. From the zoom field, use the ▶ key to highlight the pan field.
2. Press the **ENTER** key to activate the pan function.
3. Use the arrow keys to move the map in any direction.

As you begin to move the map, a crosshair will appear. This crosshair will now serve as a target marker for the moving map. The distance and bearing to destination (at the bottom of the page) will now be replaced by the distance and bearing from your present position to the target crosshair.

As you pan around the moving map display, you'll notice that the target crosshair will ‘snap’ to on-screen waypoints and highlight the waypoint name. Once a waypoint name is highlighted, you can review its waypoint definition page or execute a GOTO function right from the Map page.



The GPS 90 has 12 map scales from 0.2 to 320 nm.



Whenever the pan function is active, a target crosshair will appear. To stop panning, press QUIT.

To review the definition page for a waypoint highlighted in the map field:

1. Press the **ENTER** key.
2. To return to the Map Page, press **ENTER**.

To GOTO a waypoint highlighted in the map field:

1. Press the **GOTO** key.
2. Press the **ENTER** key to confirm the destination.
3. To return to the Map Page, press the **QUIT** key.

To stop the panning function and return to your present position:

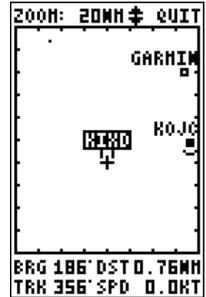
1. Press the **QUIT** key.

The last field on the Map page is the map itself. From the zoom or pan fields, the cursor highlight may be moved into the map display by pressing the down arrow key. The arrow keys will now move the highlight through the map and 'point' at on-screen waypoints.

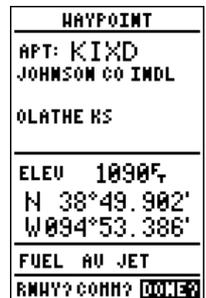
To point at a displayed waypoint:

1. Use the arrow keys to move the cursor highlight from the zoom field into the map field.
2. Once you are in the map field, use the four arrow keys to scroll through on-screen waypoints. The arrow key you use will determine the direction of your scroll.
3. When you have scrolled through all the on-screen waypoints, the cursor will move back to the zoom or pan function field.
4. To return the field highlight to the zoom field, press **QUIT**.

Once a waypoint has been selected in the map field, its distance and bearing from your present position will be displayed in the destination field. You can also review its waypoint definition page or select it as a GOTO destination by following the same steps outlined above for waypoints highlighted on the map field.



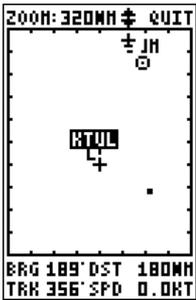
Whenever an on-screen waypoint is selected, it will be highlighted in reverse video.



Once the waypoint is highlighted, it can be quickly reviewed by pressing **ENTER**.

Map Page

Advanced Zooming & Panning



Zooming out to a higher map scale lets you pan and review large areas quickly.



Creating a new waypoint as a GOTO destination with the target crosshair.

One of the benefits of a moving map display is being able to pan to different map areas and see what's out there. To get the most out of panning, you'll need to be able to zoom in and out while you're panning. This lets you move the map at a faster speed and zoom in for waypoint details. Once the pan function is activated, the cursor highlight moves back to the zoom field.

To adjust the zoom range while panning:

1. Press the **ENTER** key to begin range selection.
2. Use the **▲** and **▼** keys to select the desired zoom range.
3. Press **ENTER** to return to normal panning mode.

During panning, the crosshair represents a target position on the map, with the range and bearing to the target displayed at the bottom of the screen. You can also use the target crosshair to mark a new waypoint position or as a GOTO destination right from the map field.

To mark the target crosshair position as a new waypoint:

1. Press the **WPT** key to capture the position.
2. Enter a new name and route number if you wish.
3. Press the **ENTER** key to return to the Map Page.

You can also use the target crosshair as an instant GOTO destination. This function will AutoStore the position and set a course for a new waypoint called 'MAP'.

To GOTO the target crosshair:

1. Press the **GOTO NRST** key to capture the position.
2. Press the **ENTER** key to confirm the MAP GOTO.
3. Press **QUIT** to return to the Map Page.

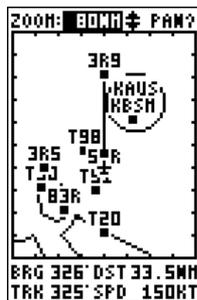
If you want to save the MAP waypoint, be sure to rename it, as it will be overwritten the next time a map GOTO is executed.

The GPS 90's Map page also features an AutoZoom mode that automatically changes the map scale to keep your present position and destination on the display at all times. Whenever a GOTO or route is activated, AutoZoom will default to the largest map scale that will fit your present position and 'active to' waypoint on the map display (up to 80 nm). As you head towards the destination, the scale will change to the next lower scale when your present position and the destination can be displayed on that particular scale. The AutoZoom feature will stop when the scale has reached the 1nm setting.

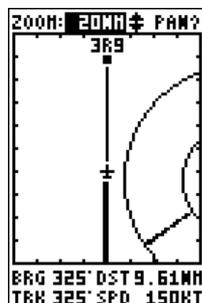
The AutoZoom feature is designed to allow you to manually change the map scale without turning the automatic map scaling off. AutoZoom will determine whether or not to change the scale based upon the current status of the map page:

- If the map scale is manually zoomed in before an AutoZoom takes place, the automatic scaling will resume once it reaches the scale you have selected.
- If the map scale is manually changed to a setting higher than the current AutoZoom setting, automatic map scaling will be cancelled unless the map scale is manually returned to the current or smaller AutoZoom setting.
- If you leave the Map page and miss an automatic scale adjustment, AutoZoom will assume you want to keep the last selected map scale and cancel automatic map scaling.
- If the zoom field is active (it has been highlighted and the **ENTER** key has been pressed) when the map is ready to scale down to the next level, the AutoZoom feature will be cancelled.

The AutoZoom feature is designed to be most effective when you are continuously navigating a GOTO or a route from the Map page, and can be turned off through the map configuration setup described on page 51.

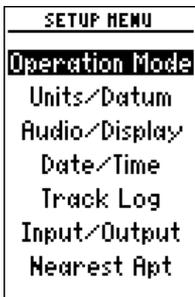
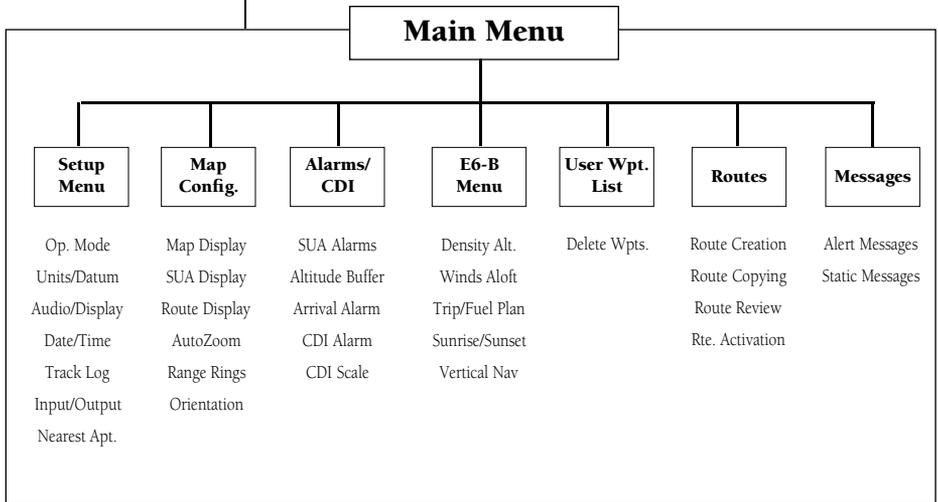


AutoZoom at the 80 nm map scale.



AutoZoom at the 20 nm map scale.

The GPS 90 Main Menu page provides access to submenus and functions that are used to select and customize operation and navigation setup. The listings are divided into categories by function. The route management features are discussed on pages 27-33. We'll now address the rest of the listings in the order they appear on the Main Menu page.



Selecting a Main Menu option.

To select a submenu from the Main Menu page:

1. Highlight the submenu/function you want to select.
2. Press the **ENTER** key to display the submenu/function page.
3. To return to the Main Menu page, press the **QUIT** key.

The first listing on the Main Menu page is the setup menu option, which provides access to the setup submenu, where you can select operating modes, display and other settings to meet your specific preferences. To select a submenu from the setup menu, simply highlight the desired listing and press the **ENTER** key.

The first setup page is the operation mode page, which is used to select the operating mode and set an initial position reference for initialization or simulator use.

The GPS 90 has four available operating modes:

Normal Mode operates the unit at maximum performance, and should provide a battery life of 15 hours on alkaline batteries.

Battery Saver Mode is suitable for most applications, and extends battery life to up to 20 hours on alkaline batteries by reducing the unit's update rate when navigational conditions permit (e.g., you're travelling a steady course without constant speed or heading variations).

Simulator Mode allows you to operate the unit without acquiring satellites, and is ideal for practicing or entering waypoints and routes while at home.

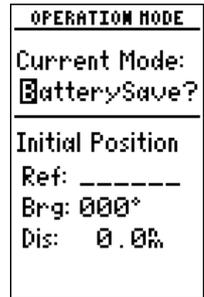
AutoLocate™ Mode forces the receiver to 'find itself', or search for a new set of satellites in situations where you have moved more than 300 miles from the unit's last known position.

To select an operating mode:

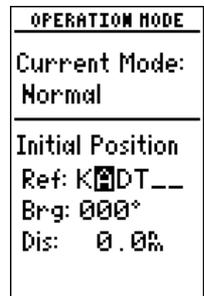
1. Move the field highlight to the 'mode' field and press .
2. Use the arrow keypad to choose a mode and press .

The initial position field allows you to define a starting point for simulated trips or name an initial position to speed up the acquisition process if the unit has moved more than several hundred miles with the power off. When the GPS 90 is in simulator mode, you may select a known waypoint as your starting position, or define a distance and bearing from a known waypoint to calculate your starting latitude and longitude.

When the unit is in not in simulator mode, the bearing and distance fields will not be available. Keep in mind that while entering an initial position may speed up acquisition, entering an incorrect initial position will have an adverse effect on the receiver's ability to find the necessary satellites to calculate an accurate position.



Selecting an operating mode.



Entering an initial position reference.

Setup Menu

Reference Waypoints & Position Format

OPERATION MODE
Current Mode: Simulator
Initial Position Ref: KADT Brg: 075° Dis: 10.0%

*Entering a bearing
and distance from a
reference waypoint.*

UNITS/DATUM
Posn Format: ddd°mm'ss.s"
Nav Units: Nautical
Heading: User Mag: E000
Map Datum: WGS 84

*Selecting a position
format.*

To enter an initial position reference:

1. Move the field highlight to the 'Ref' field and press **ENTER**.
2. Use the arrow keypad to enter the identifier of the reference position waypoint and press **ENTER**.

If the GPS 90 is in simulator mode, the field highlight will advance to the 'Brg' field, where you may define your position in reference to the selected waypoint (the GPS 90 will calculate the position coordinates for you).

To enter a bearing:

1. With the field highlight on the 'Brg' field, press **ENTER**.
2. Use the arrow keypad to enter the bearing and press **ENTER**.

To enter a distance from the reference waypoint:

1. With the field highlight on the "Dis" field, press **ENTER**.
2. Use the arrow keypad to enter the distance and press **ENTER**.

The next setup menu listing is the **Units/Datum submenu**, where you can select preferences for position format, nav units, heading calculations and map datum. The default position setting is latitude and longitude in degrees and minutes (hddd°mm.mmm'). You may also select degrees, minutes and seconds (hddd°mm'ss.s"); degrees only (hddd.dddd°); UTM/UPS coordinates; or British, Irish, German, Swedish or Swiss Grid formats.

To select a format:

1. Highlight to the 'position format' field and press **ENTER**.
2. Use the arrow keypad to select a format and press **ENTER**.

The GPS 90 lets you select nautical (default), statute or metric units of measure for all speed and distance fields.

To change the unit of measure:

1. Highlight the 'units' field and press the **ENTER** key.
2. Use the arrow keypad to select the desired unit of measure.
3. Press the **ENTER** key to confirm the selection.

The GPS 90's **heading information** can be displayed referencing magnetic north (automatic or user-defined), true north or calculated grid headings. The default setting is automatic magnetic north, which is suitable for most applications.

To select a heading preference:

1. Highlight the heading field and press **ENTER**.
2. Use the arrow keypad to select a heading preference.
3. Press the **ENTER** key to confirm the selection.

To enter a magnetic heading:

1. Select the 'user mag' heading and press **ENTER**.
2. Enter the degrees of magnetic variation.
3. Press the **ENTER** key to confirm the magnetic variation value.

The **map datum field** is located just below the position format field, and comes with a WGS 84 default setting. Although 104 total map datums are available for use (see the map datum listing on page 78-79), you should only change the datum if you are using charts that specify a different datum than WGS 84.

To select a map datum:

1. Move the field highlight to the 'datum' field and press **ENTER**.
2. Use the arrow keypad to toggle through and select the desired setting. Confirm the setting by pressing **ENTER**.

The next listing available from the setup menu is the **Audio/Display submenu**, which provides access to screen contrast, backlighting and tone settings. The GPS 90 features adjustable screen contrast for optimum viewing in any condition. The screen contrast is set by using an on-screen bar scale.

To set the screen contrast:

1. Highlight the 'Contrast' field and press the **ENTER** key.
2. Use the ◀ and ▶ keys to adjust the bar scale for the desired contrast and press the **ENTER** key.

UNITS/DATUM
Posn Format: hddd°mm'ss.s"
Nav Units: Nautical
Heading: User Mag: E000
Map Datum: WGS 84

The GPS 90 comes with the latitude and longitude position format and WGS 84 map datum as the default settings.

Only change the map datum if the charts you are using specify a different map datum in the legend.

WARNING!

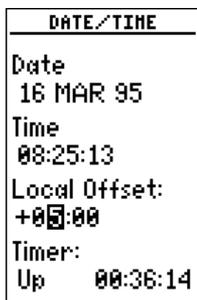
Using the wrong datum can seriously effect the accuracy of your GPS. Always set the GPS to the same datum indicated on the charts you are currently using.

Setup Menu

Backlighting, Tones & Time Offset



Selecting a tones setting.



Entering a time offset.

The screen **backlight timer** is adjustable for 0, 15, 30, 60, 120 and 240 seconds. The '0' setting will keep the screen backlighting on as long as the unit is on. Whenever screen backlighting is on, a bulb icon will appear on the Status Page.

To set the backlight timer:

1. Highlight the 'Backlight time' field and press **ENTER**.
2. Use the arrow keypad to toggle through and select the desired setting. Confirm the setting by pressing **ENTER**.
3. To turn backlighting on and off, press **☺**.

The last field on the Audio/Display page is the **tones field**. This field lets you specify an audible tone for message alerts and keystroke confirmation. The tone may be set to sound for messages only, messages and keystrokes (default) or no sound at all.

To select a tone setting:

1. Highlight the 'Tones' field and press the **ENTER** key.
2. Use the arrow keypads to select the desired setting. Confirm the setting by pressing the **ENTER** key.

The **Date/Time menu** provides access to the local time offset and timer functions. The date and time field is located at the top half of the Date/Time page. The date and time are calculated from satellites and cannot be edited. Because the time shown is UTC time, you will need to enter a time offset to display the correct local time for your area. To determine the time offset for your area, refer to the chart on page 77.

To enter the time offset:

1. Move the field highlight to the 'offset' field and press **ENTER**.
2. Enter the time offset for your longitude and press **ENTER**. Remember to select a positive or negative indicator for your offset (you'll have to move the field highlight to the left of the offset to enter a + or - for the offset).
3. Press the **ENTER** key to confirm the offset.

The GPS 90 **timer function** will count down from an entered interval and alert you with a message or keep a running timer that will count up to 99:59:59 while the unit is on.

To set the countdown timer:

1. Highlight the up/down field and press the **ENTER** key.
2. Use the arrow keypad to select the 'Down' setting. The field highlight will advance to the time field. Press the **ENTER** key.
3. Enter the countdown time (hours, minutes & seconds).
4. Press **ENTER** to confirm the setting and begin the countdown.

When the timer has elapsed, you will be informed with a message, and the timer will automatically transition to the count up mode, and display the time elapsed since the timer expired. The count up timer will keep a running clock until it is manually reset.

To reset the count up timer or enter a starting time:

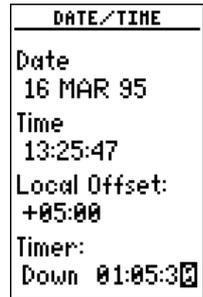
1. With the timer field in the count 'Up' setting, highlight the time field and press **ENTER**.
2. Press the **◀** key to reset the field, or use the arrow keypad to enter a starting time for the timer. Press **ENTER** to finish and restart the timer.

The fifth listing on the Main Menu page is the **Track Log submenu**, which lets you manage and erase the GPS 90's tracking data. From the Track Log page, you can select whether or not to record a track and define how it is recorded.

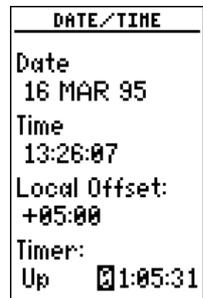
To turn the track log on or off:

1. Highlight the 'record track' field and press **ENTER**.
2. Select 'yes' or 'no' and press **ENTER**.

The stored track criteria determines how often positions are stored in the track log. The default setting is automatic, which stores track based on resolution. This setting gives you the most efficient use of track memory. A time interval setting is also available to record the track log at a user-specified interval.



Setting the countdown timer.



To reset the count up timer, press the LEFT ARROW key.

Setup Menu

Track Log & I/O Formats



Confirm the 'Yes?' prompt to clear the track log.



Selecting an Input/Output format.

To change the track criteria to the time interval setting:

1. Highlight the 'criteria' field and press **ENTER**.
2. Use the **▲** or **▼** key to select 'Time Interval' and press **ENTER**.
3. Press **ENTER** to begin entry of the interval.
4. Enter a value in hours, minutes and seconds in the field and press the **ENTER** key.

The rest of the track log setup page displays the percentage of available memory currently used to store track log data and a function field to clear the track log memory. Stored track logs may also be downloaded to a PC with the GPS 90's optional PC Kit, available from your local dealer or directly from GARMIN.

To clear the track log:

1. Highlight 'clear track log?' and press **ENTER**.
2. A warning page will appear, asking you to confirm clearing the track log. Use the **◀** key to move the field highlight to the 'yes' field.
3. Press **ENTER** to clear the track log.

The next listing available from the setup menu is the **Input/Output setup page**, where you can specify the interfacing formats for connecting external devices. Five I/O options available: GRMN/GRMN, None/None, None/NMEA, RTCM/None, & RTCM/NMEA. Each format lists the input format first, followed by the output format.

To select I/O format:

1. Highlight the I/O field and press **ENTER**.
2. Use the **▲** and **▼** keys to toggle through and select the desired setting and press **ENTER**.

The GRMN/GRMN setting is a proprietary format that lets you exchange user data between two GPS 90s or a PC with an optional GARMIN PC kit. During data transfer, the number of packets being exchanged will be displayed on screen.

To select a transfer option:

1. Highlight the 'host' field and press **ENTER**.
2. Use **▲** and **▼** to select the desired setting and press **ENTER**.

To disable all GPS 90 interfacing capabilities, select the None/None setting. If you want to output NMEA data to compatible external devices without any differential input capability, select the None/NMEA setting. Once a NMEA output setting has been selected (with or without RTCM input), the NMEA field will become highlighted. NMEA formats 0180, 0182 or 0183 (version 1.5 or 2.0) are available.

To select an NMEA format:

1. Press **ENTER** to begin a NMEA selection.
2. Use the **▲** and **▼** keys to select the desired setting.
3. Press the **ENTER** key.
4. The baud rate will be selected automatically.

The last two format settings allow the GPS 90 to accept DGPS corrections in RTCM 104 version 2.0 format. The RTCM/NONE format will allow connection to any manually tuned beacon receiver with the proper interface, with the baud rate selectable from the GPS 90. The RTCM/NMEA selection controls the GARMIN GBR-21 beacon receiver. Once a RTCM setting has been selected, the GPS 90 will automatically try to tune the last frequency and bit rate you selected or will switch to the default frequency of 304.0 kHz with a bit rate of 100 bps if no previous beacon has been tuned. You may also enter your own frequency and bit rate if desired.

To enter a DGPS beacon frequency:

1. Highlight the 'freq' field and press **ENTER**.
2. Enter the desired frequency and press **ENTER**.
3. Highlight the 'rate' field and press **ENTER**.
4. Use **▲** and **▼** to select the rate and press **ENTER**.

```

INPUT/OUTPUT
NONE/NMEA
NMEA 0183 2.0
4800 baud
  
```

Selecting an NMEA format.

```

I/O SETUP
RTCM/NMEA
NMEA 0183 2.0
4800 baud
BEACON RECEIVER
FREQ: 304.0KHz
RATE: 25bps
DIST 35.8m
SNR 30dB
Receiving
  
```

Receiving DGPS corrections.

Setup Menu

DGPS & Nearest Airport Setup

NEAREST AIRPORT
Runway Surface: Hard Only
Minimum Length: 3000ft

Selecting a nearest airport surface type.

NEAREST AIRPORT
Runway Surface: Hard Only
Minimum Length: 0000ft

Entering a minimum runway length.

When the GPS 90 is receiving DGPS corrections, the 'beacon receiver' section of the I/O setup page will display the frequency and signal strength, as well as the distance from the transmitter to the beacon receiver. A status message will constantly keep you informed of DGPS activity:

- A 'tuning' message will be displayed while a beacon signal is being tuned.
- Once the beacon signal has been tuned, the status message will display a 'receiving' message.
- If a signal is tuned and no corrections are being received, a 'no data' message will be displayed.
- If a beacon signal cannot be tuned, a 'no status' message will be displayed.

The last listing on the GPS 90's setup menu is the **nearest airport function**, which allows you to define the type and minimum length of runway used to calculate the nearest airports. The options for runway surfaces are:

- **Any:** (Default setting) any runway, regardless of surface type, including water landing facilities.
- **Hard Only:** Only runways with a concrete, asphalt or similar sealed surface.
- **Hard or Soft:** All runways except water landing.
- **Water Only:** Only water landing facilities.

To select a runway surface:

1. Use the arrow keypad to highlight the runway surface field.
2. Press the **ENTER** key.
3. Use the arrow keypad to select the surface and press **ENTER**.

The bottom of the nearest airport page allows you to designate a minimum runway length used to determine the nine nearest airports. The default setting is 0 feet.

To enter a minimum runway length:

1. Highlight the 'Minimum Length' field and press **ENTER**.
2. Enter the desired runway length and press the **ENTER** key.

The second option available from the Main Menu is the **Map Configuration submenu**, which lets you select what features are displayed on the map, choose a map orientation and control other map features.

To change the default configuration of the map:

1. Use the arrow keypad to highlight the desired map feature.
2. Press the **ENTER** key.
3. Use **▲** and **▼** to select the 'On' or 'Off' and press **ENTER**.

The top section of the page lists the five waypoint categories and an 'ID' field, which lets you designate what types of waypoints will appear on the map and whether or not the identifiers for a waypoint category are displayed.

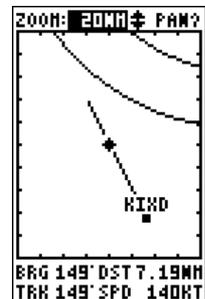
The next section of the configuration page lets you define what special use airspace boundaries are displayed on the map. The 'Other' airspace category includes alert, caution, danger, training and warning areas. Prohibited airspaces are not selectable, and are always displayed. Turning off an airspace simply removes it from the map display, and DOES NOT turn off the alert messages for an airspace category. For more on SUAs, see pages 52-53.

The third section of the configuration page controls the map's route and track log features. The 'ROUTES' field lets you select whether or not the GPS 90 will display the straight leg lines between the waypoints of an active route and display all route waypoint names. The 'TRACK LOG' sets the number of points the unit will attempt to plot. The maximum number of points that can be displayed is 999, with 2048 maximum points recorded.

The last section of the configuration page lets you turn the GPS 90's AutoZoom (see page 41) and range ring (see right) features on or off and define a map orientation. The 'DISPLAY' field lets you set the map to a north up, track up (the direction of current travel) or a desired track up (the direction of an active route leg) orientation.

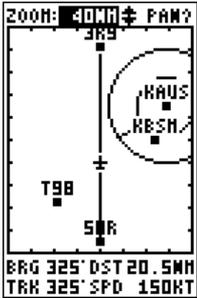
MAP CONFIG	
AFT: YES	UOR: YES
IMT: NO	USR: YES
MDB: NO	ID: YES
CLASS B/CTA: YES	
CLASS C/TRA: YES	
MOA: YES	
RESTRICTED: YES	
OTHER: YES	
ROUTES: YES	
TRACK LOG: 250	
AUTO ZOOM: YES	
RINGS: NO	
DISPLAY: TRACK UP	

The map configuration page, with all settings in the default position. Turning off unwanted features will help declutter the map presentation.



When the display is not in track up mode, the present position will be indicated by a diamond icon.

The third option available on the GPS 90's Main Menu page is the **Alarms/CDI submenu**, which is used to control SUA alarms, set arrival and CDI alarms and define the course deviation indicator scale.

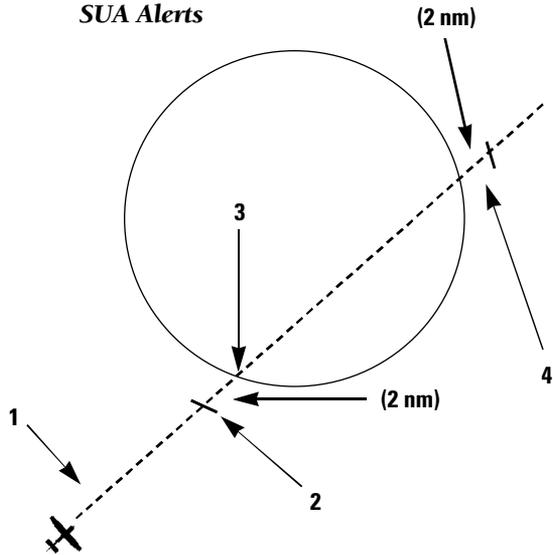


You can see your position relative to nearby SUAs right on the map page.

Information on SUAs is only available from the GOTO/NRST key when you are actually being warned with one of the four SUA conditions (see right).

Keep in mind that SUA warnings are based on your current GPS altitude, track and speed.

SUA Alerts



The GPS 90's special use airspace feature will inform you if any restricted or controlled airspace is near or in your flight path, according to the following conditions:

1. If your projected course will take you inside an SUA within the next 10 minutes, a **'SUA ahead < 10 min'** message will be displayed.
 2. If you are within 2 nm of an SUA and your current course will take you inside, a **'SUA near & ahead'** message will be displayed.
 3. If you have entered an SUA, a **'Inside SUA'** message will be displayed.
 4. If you are within 2 nm of an SUA and your current course will not take you inside the airspace, a **'Near SUA < 2nm'** will be displayed.
- All SUA alerts are based on your present GPS altitude.

Alarms/CDI Menu

Turning Off SUA Alarms

The GPS 90's SUA alarms for the following airspace types may be turned on or off from the alarms/CDI page:

- Class B/CTA- ICAO control area
- Class C/TMA- ICAO Terminal Control Area
- MOA- Military Operations Area
- Restricted- Restricted areas
- Other- Other airspaces, including alert, caution, danger and warning areas

Alarm warnings for prohibited areas may not be turned off. Keep in mind that turning a warning 'off' from the alarms/CDI page will only prevent the you from receiving a message alert for an airspace. SUA information will still be displayed on the map page unless that category is turned off from the map configuration page.

To turn an SUA category on or off:

1. Use the arrow keypad to highlight the desired SUA category.
2. Press the **ENTER** key.
3. Use the arrow keypad to select the 'on' or 'off' position.
4. Press the **ENTER** key.

The '**ALT BUF**' field, located directly below the SUA alarm settings, is an altitude buffer that allows you to set a specific altitude range for triggering SUA alerts. This helps add an extra margin of safety to your estimated altitude error to ensure you receive SUA messages in time to avoid unwanted SUA intrusions. The default altitude buffer is 200 feet.

The value of the altitude buffer is added to an estimated altitude error calculated by the GPS 90. This value is then added or subtracted from your present GPS altitude. If the final adjusted altitude falls within an SUA, you'll receive a message. If the adjusted altitude does not place you in an SUA, you won't receive the message.

ALARMS/CDI	
CLASS B/CTA:	ON
CLASS C/TMA:	ON
MOA:	OFF
RESTRICTED:	ON
OTHER:	ON
ALT BUF:	200'
ARRIVAL:	OFF
	0.0%
CDI ALARM:	OFF
	0.0%
SCALE:	±0.25

*Turning an SUA
alarms category off.*

ALARMS/CDI	
CLASS B/CTA:	ON
CLASS C/TMA:	ON
MOA:	OFF
RESTRICTED:	OFF
OTHER:	ON
ALT BUF:	0500'
ARRIVAL:	OFF
	0.0%
CDI ALARM:	OFF
	0.0%
SCALE:	±0.25

*Setting an altitude
buffer.*

Alarms/CDI Menu

Arrival & CDI Alarms

ALARMS/CDI	
CLASS B/C/A:	ON
CLASS C/T/A:	ON
NOA:	OFF
RESTRICTED:	OFF
OTHER:	ON
ALT BUF:	500 _F
ARRIVAL:	ON
	10.0%
CDI ALARM:	OFF
	0.0%
SCALE:	±0.25

Setting the arrival alarm.

ALARMS/CDI	
CLASS B/C/A:	ON
CLASS C/T/A:	ON
NOA:	OFF
RESTRICTED:	OFF
OTHER:	ON
ALT BUF:	500 _F
ARRIVAL:	ON
	10.0%
CDI ALARM:	ON
	01.0%
SCALE:	±0.25

Setting the CDI alarm.

To enter an altitude buffer:

1. Highlight the 'ALT BUF' field and press **ENTER**.
2. Use the arrow keypad to enter a buffer value and press **ENTER**.

The next function available from the alarms/CDI page is the **waypoint arrival alarm**, which will activate an alarm message once you've come within a set distance to a destination waypoint.

To set the arrival alarm:

1. Highlight the arrival field and press **ENTER**.
2. Use the arrow keypad to select the 'ON' setting.
3. Press **ENTER** to begin entry of the alarm distance.
4. Use the arrow keypad to enter a distance (to 99.9 nm).
5. Press the **ENTER** key.

The last section of the alarms/CDI page allows you to set a **CDI/crosstrack alarm** and define the course deviation indicator scale. The CDI alarm will provide a message when your crosstrack error exceeds a specified distance.

To set the CDI alarm:

1. Highlight the 'CDI ALARM' field and press **ENTER**.
2. Use the arrow keypad to select the 'ON' setting.
3. Press **ENTER** to begin entry of the alarm distance.
4. Use the arrow keypad to enter a distance (to 99.9 nm).
5. Press the **ENTER** key.

The **CDI scale** field lets you select the +/- range of the CDI bar scale that appears on the Nav Page. Three scales are available: +/- 0.25, 1.25 and 5.0 miles or kilometers, with 1.25 being the default setting.

To select a CDI scale:

1. Highlight the 'SCALE' field and press **ENTER**.
2. Use the arrow keypad to select a scale and press **ENTER**.

The Main Menu page also provides access to the GPS 90's **E6-B functions**, which can be used to calculate density altitude, winds aloft, fuel usage, sunrise & sunset and vertical navigation profiles.

To calculate density altitude and true air speed:

1. Highlight the indicated altitude field (IAIt) and press **ENTER**.
2. Enter the altitude from your altimeter and press **ENTER**.
3. Press **ENTER** to begin entry of your calibrated airspeed (CAS).
4. Enter the calibrated airspeed and press **ENTER**.
5. Press **ENTER** to begin entry of your current altimeter setting.
6. Enter the altimeter pressure and press **ENTER**.
7. Press **ENTER** to begin entry of the total air temperature (TAT).
8. Enter the TAT (standard outside air temperature gauge on most piston aircraft) and press the **ENTER** key.

The calculated density altitude and true airspeed will be displayed at the bottom of the page.

The GPS 90 **winds aloft function** will calculate the wind direction, speed and head/tail wind conditions for you from by entering your true air speed and current heading.

To calculate winds aloft:

1. Highlight the true airspeed field (TAS) and press **ENTER**.
2. Enter the TAS (use the density altitude function if you do not know TAS) and press **ENTER**.
3. Press **ENTER** to begin entry of your current heading (Hdg).
4. Enter your heading and press **ENTER**.

The wind direction, speed and the head/tail wind conditions will be displayed at the bottom of the winds aloft page.

DENSITY ALTITUDE	
IAIt:	5000'
CAS:	125'
Prs:	29.92Hg
TAT:	59°F
<hr/>	
DAIt	5869'
TAS	136'

Calculating density altitude and true air speed.

WINDS ALOFT	
TAS:	136'
Hdg:	262°
<hr/>	
Head Wnd	16'
Wind from	222°
at	23'

Calculating winds aloft.

The GPS 90's **trip and fuel planning function** will calculate the desired track, distance, estimated time enroute and fuel requirements between any two waypoints or for any programmed route. The first field (at the top left of the planning page) allows you to select between waypoint or route planning.

To perform a waypoint to waypoint and fuel plan:

1. Highlight the Waypoint/Rte field and press **ENTER**.
2. Use the arrow keypad to select the 'Waypoint' option and press **ENTER**. The field highlight will move to the 'From' field.
3. Press **ENTER** to begin selection of the 'From' waypoint.
4. Enter the starting waypoint for the trip, or leave the field blank to start from your present position and press **ENTER**. The field highlight will advance to the 'To' field.
5. Press **ENTER** to begin selection of the 'To' waypoint.
6. Enter the destination waypoint and press **ENTER**.
7. Press **ENTER** to begin entry of the trip speed.
8. Enter the trip speed and press **ENTER**. The field highlight will advance to the 'Flow' field.
9. Press **ENTER** to begin entry of the fuel flow.
10. Enter the fuel flow for the trip and press **ENTER**.

The desired track (DTK), distance (DIS), fuel requirement (REQ) and estimated time enroute (ETE) of the trip will be displayed at the bottom of the planning page.

The GPS 90's **route planning function** will calculate the same trip information for any programmed route and provide data on both the entire route and each individual route leg.

To perform a route trip and fuel plan:

1. Highlight the Waypoint/Rte field and press **ENTER**.
2. Use the arrow keypad to select the 'Rte' option and press **ENTER**. The field highlight will move to the route number field.

TRIP & FUEL PLAN	
Waypoint	
From:	KLAX
To:	L91
Speed:	140%
Flow:	10
DTK	346°
DIS	90.4%
REQ	6
ETE	38:45

Waypoint to waypoint trip and fuel planning.

TRIP & FUEL PLAN	
Rte	1 Leg All
From:	KIXD
To:	KCOS
Speed:	0%
Flow:	0
DTK	---°
DIS	1370%
REQ	---
ETE	--:--

Selecting a route for trip and fuel planning.

Once the route option has been selected, you'll need to select the route number you want to perform the trip planning for.

3. Press **ENTER** to begin selection of the desired route.
4. Enter the route number and press **ENTER**. The field highlight will advance to the 'Leg' field, where you can select to either 'All' or a specific route leg (Leg 1, etc.) to calculate.
5. Press the **ENTER** key.
6. Press **ENTER** to begin entry of the route or leg speed.
7. Enter the trip speed and press **ENTER**. The field highlight will advance to the 'Flow' field.
8. Press **ENTER** to begin entry of the hourly fuel flow.
9. Enter the fuel flow for the route or leg and press **ENTER**.

The GPS 90 will display the distance, fuel requirement and the estimated time enroute for the route or route leg, and provide the desired track for each leg.

The next E6-B function available is the **sunrise/sunset calculator**, which will allow you to calculate the sunrise and sunset for any known waypoint or your present position for a specific date.

To calculate sunrise/sunset information:

1. Highlight the waypoint field and press **ENTER**.
2. Use the arrow keypad to enter the desired waypoint, or leave the waypoint field blank to calculate the sunrise/sunset for your present position and press **ENTER**. The field highlight will automatically advance to the date field.
3. Press **ENTER** to begin entry of the date. The default date will be the current date as calculated by the GPS satellites.
4. Use the arrow keypad to enter the desired date, month and year (the last two digits).
5. Press **ENTER**. The sunrise and sunset for the entered date will be displayed at the bottom of the page.

TRIP & FUEL PLAN	
Rte 1 Leg	2
From:	KIXD
To:	KOFF
Speed:	140%
Flow:	10
DTK	341°
DIS	145%
REQ	10
ETE	01:02

Selecting the leg/all mode for route planning calculations.

SUNRISE/SUNSET
Waypoint:
KCOS
Date:
16 SEP 96
Rise 18:10:18
Set 06:05:19

Entering a date for sunrise/sunset planning.

E6-B Menu

VNAV

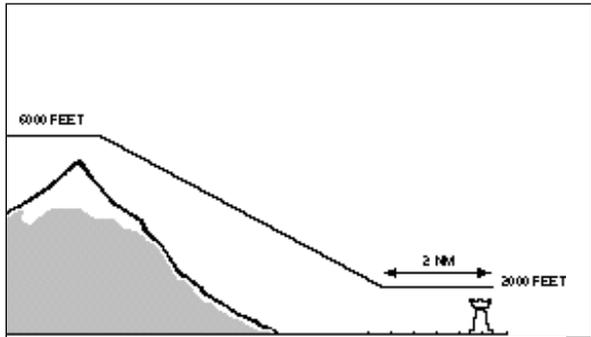
The last option featured on the GPS 90's E6-B menu is the **vertical navigation (VNAV) function**, which lets you create a rate of descent profile from your present position and altitude to a final altitude at a specified location. To use the VNAV feature, your aircraft ground speed must be greater than 35 knots, and you must be navigating an active GOTO or route.

VERTICAL NAV
From: 07500 ^{ft}
To: 1000 ^{ft}
By: 10.0%
After
Wpt: KTUL
At: 811 ^{ft} pm
Vnav: Off
Enter Profile

Entering initial altitude for the VNAV function.

VERTICAL NAV
From: 7500 ^{ft}
To: 1000 ^{ft}
By: 10.0%
After
Wpt: KTUL
At: 853 ^{ft} pm
Vnav: Off
Enter Profile

Selecting a VNAV waypoint reference.



To perform a VNAV calculation:

1. Highlight the 'From' field and press **ENTER**.
2. Enter the initial altitude and press **ENTER**.
3. Press **ENTER** to begin entry of the final (To) altitude.
4. Enter the desired final altitude and press **ENTER**.
5. Press **ENTER** to begin entry of the offset (the distance from the waypoint you'll be referencing for your final altitude).
6. Press **ENTER** and use the arrow keypad to select the 'Before' or 'After' option for the distance offset.
7. Press **ENTER** to confirm.
8. Press **ENTER** and use the arrow keypad to enter the waypoint you want to use as a reference for your final altitude. If you are navigating an active route, the waypoint field will offer the route waypoints for the reference waypoint.
9. Press **ENTER** to confirm the waypoint. The vertical speed for the descent will appear in the 'At' field.

To activate the VNAV function:

1. Review the calculated vertical speed. If the calculated speed does not fit within the performance guidelines of your aircraft, manually enter the appropriate speed in the 'At' field and press **ENTER**.
2. Highlight the 'Vnav' field.
3. Press the **ENTER** key.
4. Use the arrow keypad to select the 'On' setting.
5. Press **ENTER**.

The VNAV status at the bottom of the page will change from 'Enter Profile' to 'Begin In ____', indicating the time remaining to begin the descent. Once you are less than 15 seconds from the starting point of the descent, you'll be informed with a 'Start Altitude Change' message. If the maneuver has already started, the status field will display a 'Navigating' status.

While the VNAV function is active, the vertical navigation page will provide a continuous display of the recommended altitude you should be at (the 'From' field) and vertical speed required (the 'At' field) to complete the maneuver.

When the recommended altitude is within 1,000 feet of the final altitude, you'll be informed with a 'Final Altitude Alert' message. The recommended altitude during any active VNAV maneuver is also displayed at the bottom right of the Navigation Page.

The VNAV function will be cancelled automatically if the active route or GOTO is changed in any way (e.g., performing an on-route GOTO or adding a waypoint to a route). Whenever this happens, you'll be informed with a 'VNAV Cancelled' message. If your current speed does not exceed 35 knots, or a route waypoint that has already been past is selected, the status line will display 'Invalid Profile'. If there is no active GOTO or route, the status field will display 'No Active Waypoint'.

VERTICAL NAV	
From:	5000ft
To:	2500ft
By:	1.0%
Before	
Wpt:	TOP
At:	350fpm
Vnav:	On
Begin In 10:24	

The 'Begin In' field indicates the time remaining before you should begin your descent.

MESSAGES
Vertical Nav Cancelled
PRESS PAGE

Whenever the active route is modified in any way, the VNAV will automatically be cancelled.

Main Menu Page

Waypoint List & Messages



User waypoint list.



To delete all user waypoints, highlight the 'Yes' prompt and press ENTER.

The last three options available from the GPS 90's Main Menu Page are the **user waypoint list**, **route management function** and **messages page**. The route management features are described in detail on pages 27-33. The **user waypoint list** provides you with a complete list of all user waypoints stored in the GPS 90. The total number of used and free waypoints is indicated at the top of the page. From the user waypoint list, you can quickly GOTO a selected waypoint, review a selected waypoint's waypoint page or delete all user waypoints.

To select a waypoint as a GOTO destination:

1. Highlight the desired waypoint and press **GOTO WPT?**.
2. Press **ENTER** to activate the GOTO.

To review the waypoint page of a listed waypoint:

1. Highlight the desired waypoint and press the **ENTER** key.
2. To return to the waypoint list, press **ENTER** again.

To delete all user waypoints:

1. Use the arrow keypad to highlight the 'DELETE ALL WPTS?' prompt and press **ENTER**.
2. Use the **◀** key to move the field highlight to the 'Yes?' prompt on the delete waypoints confirmation page.
3. Press the **ENTER** key.

The **message page** displays all current messages in the GPS 90. There are two types of messages: temporary alerts (eg. approaching a waypoint) and condition alerts (eg. battery power is low). All messages are initially indicated by a flashing on-screen indicator. After a temporary alert has been viewed, it is cleared from the message page. Condition alerts are displayed on the messages page until the condition has been resolved. For a complete list of messages, see Appendix F.

To view the messages page:

1. Move the field highlight to the "Messages" field and press **ENTER**. To return to the Main Menu Page, press **ENTER**.

The GPS 90's **simulator mode** lets you practice all aspects of its operation without active satellite acquisition. You can also plan and practice trips, enter new waypoints and routes and save them for use during normal operation. The simulator mode is activated from the Menu page, with aircraft speed and heading controlled from the Position or Navigation pages.

To activate the simulator mode:

1. Press **PAGE** repeatedly until the Main Menu page appears.
2. Use **▲** or **▼** key highlight to the 'Setup Menu' option.
3. Press the **ENTER** key.
4. The setup menu will appear, with the 'Operation Mode' option highlighted. Press the **ENTER** key.
5. Once the Operation Mode page appears, use the **▼** key to highlight the 'Current Mode' field.
6. Press **ENTER** to begin selection of the operating mode.
7. Use the **▲** and **▼** keys to toggle through and select the 'Simulator' option.
8. Press **ENTER** to confirm the simulator selection.

The initial position function may be used to define the starting position for any simulated trip.

To enter an initial position:

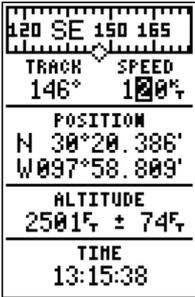
1. Highlight the 'Ref' and press **ENTER**.
2. Use the arrow keypad to enter the desired identifier of the starting position.
3. Press **ENTER** to confirm your selection.
4. To define the starting position as a bearing and distance from the reference waypoint:
 - Highlight the 'Brg' or 'Dis' field and press **ENTER**.
 - Enter the desired bearing or distance.
 - Press the **ENTER** key to finish.

OPERATION MODE
Current Mode: Simulator
Initial Position Ref: KTUL Brg: 181° Dis: 595%

Selecting simulator mode.

OPERATION MODE
Current Mode: Simulator
Initial Position Ref: KSAN Brg: 100° Dis: 00.0%

Entering an initial position.



120 SE 150 165	
TRACK	SPEED
146°	120%
POSITION	
N 30°20.386'	
W097°58.809'	
ALTITUDE	
2501ft ± 74ft	
TIME	
13:15:38	

Entering track and speed from the Position page.

Once the simulator mode has been activated, use the Position or Navigation Page to set your speed and track. You may also enter a new position if you desire (only from the Position Page).

To enter track, speed and position:

1. Highlight the 'track' field and press the **ENTER** key.
2. Enter a track heading and press **ENTER**.
3. Highlight the 'speed' field and press **ENTER**.
4. Enter a speed and press **ENTER**.
5. Highlight the 'position' field and press **ENTER**.
6. Enter a position and press the **ENTER** key.



The GPS 90 does not track satellites in simulator mode. Although you can create and save waypoints and routes while using the simulator mode, never attempt to use the simulator mode for actual navigation. The GPS 90 will always power up in the last selected satellite mode.

The first time you power up your new GPS 90 is an important step in getting the best possible GPS performance. **The receiver must be given an opportunity to collect satellite almanac data and establish its present position.** This initialization process can take 7 1/2 to 15 minutes and is only necessary for first time operation or after memory loss. Once your GPS 90 has been properly initialized, you should acquire satellites and obtain a position within a few minutes each time you power up.

Your GPS 90 is shipped in AutoLocate mode, which is designed to let the receiver 'find itself' without using its last known position (you don't need to worry about what lat/lon is currently displayed on the Position Page, as the unit is not using that information to calculate your present position). AutoLocate works best when:

- The unit's portable antenna is in the proper orientation (see page 65) and has a clear view of the sky from horizon to horizon in all directions. Stay away from all buildings, heavy tree cover and other structures that may block satellite signals.
- The unit is not moving during initialization. Let the receiver find an initial position before you take off.
- You wait for an initial position to be computed. If you turn the unit off before acquiring a position, it may increase the time to first fix the next time you power the unit up.

If you want to speed up the initialization process, you can manually enter your present position through the initial position reference (see page 44) or on the Position Page (see page 36). Keep in mind that manually entering a latitude and longitude or position reference will take the unit out of AutoLocate mode, and rely on your entry to look for the proper set of satellites (make sure you enter the coordinates accurately).

If you experience trouble acquiring satellites or obtaining a position fix, refer to the troubleshooting section in Appendix D.

Initializing Your GPS 90

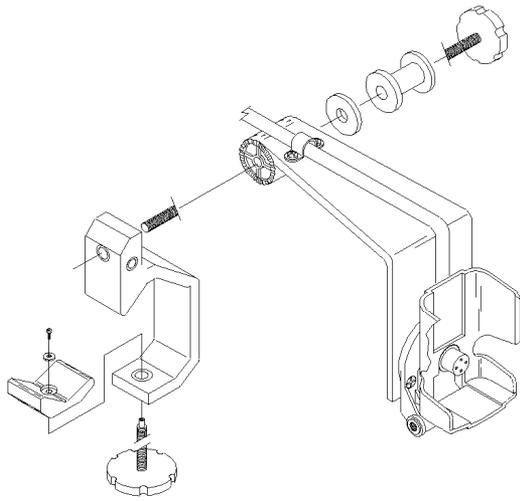
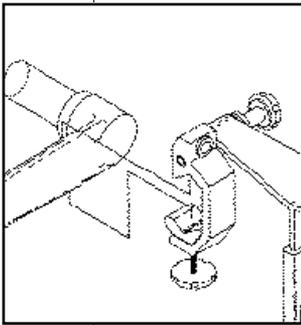
To initialize your unit for first time use:

- Rotate the portable antenna so it is perpendicular to the ground (see page 64). If you're using the suction cup mount, position the antenna so has the best possible view of the sky, as perpendicular to the ground as your windscreen will allow (see page 65).
- Press and hold the red power key for two seconds.
- Remain in the same location until the GPS 90 has calculated a position (the Status page will be replaced by the Position page if no other buttons have been pressed during acquisition).

Appendix B

Installation

The GPS 90 includes an adjustable yoke mounting bracket that may be attached to the control yoke for easy access without blocking the view of the instrument panel. The standard yoke clamp is designed to fit 90% of general aviation aircraft. The mount will have to be reconfigured to fit Bonanza, Baron and some other Beech models with center column control.



For Bonanza, Baron & other Beech center column controls, reconfigure the yoke mount clamp by removing the upper knob and reattaching the clamp from the right side using the hole provided.

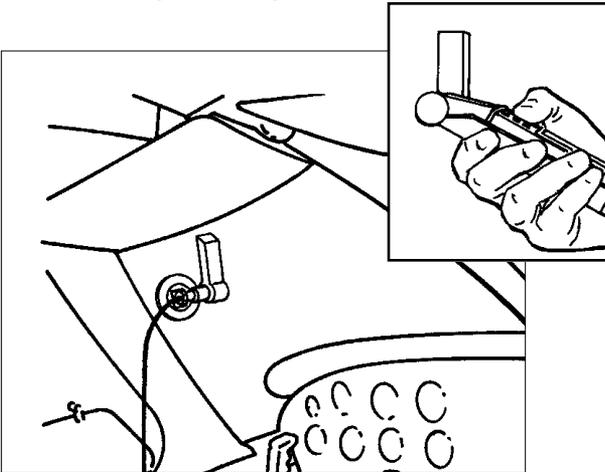
To attach the yoke mount to the control yoke on most aircraft:

1. Loosen the lower mounting knob.
2. Slide the clamp over the yoke shaft just behind the control wheel and tighten the lower knob securely.
3. Make sure the clamp is as close as possible to the wheel and check to ensure that yoke travel is not limited or hindered in any way by the yoke mount.

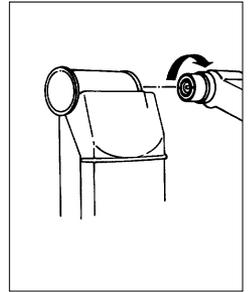
For Bonanza, Baron and other aircraft with Beech center column control:

1. Unscrew and remove the upper mounting knob.
2. Reposition the C-clamp as shown in the inset on page 64 and reattach the bracket using the upper knob assembly.
3. Open the clamp as wide as possible by unscrewing the lower mounting knob.
4. Slide the clamp over the horizontal member of the control yoke, keeping the clamp as far towards the center column as possible.
5. Tighten the lower mounting knob securely.
6. Check to make sure that yoke travel is not limited or hindered in any way by the yoke mount.

ANTENNA INSTALLATION



The GPS 90's portable antenna should be used with the suction cup adapter and extension cable and mounted to the inside of your windscreen. Remember to attach the antenna and cable where it does not block your vision of primary instruments and does not interfere with yoke control in any way. Try to orient the antenna so it has the best possible view of the sky, as perpendicular to the ground as the windshield slope allows.

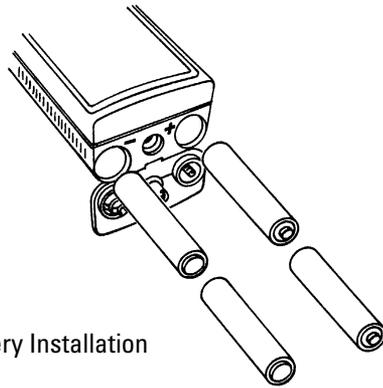


Antenna Removal

The GPS 90's antenna may be removed to attach to the aircraft windscreen with the suction cup mount adapter. To remove the antenna:

- Rotate the knurled knob (located at the bottom left of the antenna) toward the front of the unit one-quarter turn.
- Pull the antenna gently away from the unit.
- To install the suction cup cable leads, mate the BNC connector notches with the mounting posts and turn the knurled knob one-quarter turn clockwise.

The GPS 90 may be powered by four AA batteries, wired directly to 8-40 volt DC power, or by an optional cigarette lighter plug adapter. The internal AA batteries provide up to 15 hours of operation in normal mode and up to 20 hours of operation in battery saver mode on 4 AA alkaline batteries. Rechargeable Ni-Cad or lithium batteries may also be used. Note that the battery level indicator is calibrated for alkaline batteries, and Ni-Cad and lithium batteries will only show battery life at partial scale. No other functions will be affected.



Battery Installation

To install batteries:

1. Remove the battery cover by turning the thumb loop 1/4 turn counter-clockwise.
2. Insert batteries into position. The battery pole you can still see should match the symbol marked on the case
3. Replace the battery cover by turning the thumb loop 1/4 turn clockwise.

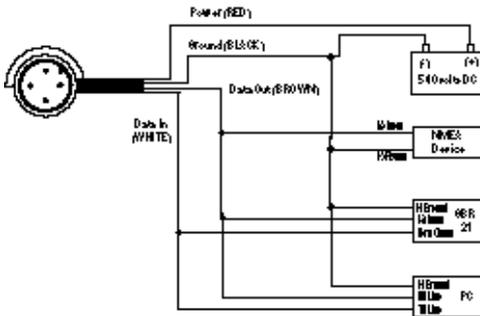


Never store your GPS 90 without batteries. A built-in rechargeable lithium battery will save almanac and way-point data while you are changing the batteries, but will only save data for a few months. If you're storing the unit for the season, put in a fresh set of alkaline batteries to help prevent loss of stored data.

The GPS 90 Power/Data Cable allows you run the unit off 8-40 volts DC power and connect to external devices. Always use the power cable with a 2 amp fuse (included).

To connect the power/data cable:

1. Connect the red lead to the positive side of a 8-40 VDC source.
2. Connect the black lead to the negative side of the power source.
3. Connect the white lead to the output port of a connected device.
4. Connect the brown lead to the input port of a connected device.



The following interface formats are supported by the GPS 90 for driving three NMEA devices:

- NMEA 0180
- NMEA 0182

- NMEA 0183 version 1.5

Approved sentences:

GPBWC, GPGLL, GPRMB, GPRMC, GPXTE, GPVTG, GPWPL

Proprietary sentences:

PGRMM (map datum), PGRMZ (altitude), PSLIB (beacon rec. control)

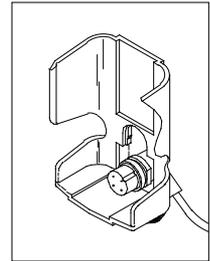
- NMEA 0183 version 2.0

Approved sentences:

GPGGA, GPGLL, GPGSA, GPGSV, GPRMB, GPRMC, GPRTE, GPWPL

Proprietary sentences:

PGRME (estimated error), PGRMM (map datum), PGRMZ (altitude), PSLIB (beacon receiver control)



If you are using the power/data cable, make sure the power/data connector is properly installed in the mounting bracket before inserting the unit in the bracket.

To connect to external power, open the rubber plug on the back of the unit and snap the GPS 90 firmly into the mounting bracket. Once the unit is properly connected, the GPS 90 will run off external power, and the battery level indicator will no longer appear on the Satellite Status page.



The GPS 90 features a dry nitrogen-filled case and quality construction to provide reliable navigation without user maintenance. These design benefits, coupled with advanced self-test and AutoLocate modes, help the GPS 90 maintain the best possible performance over time. If you're experiencing difficulty using your unit, read the following Q & A section for solutions to common problems and suggestions for getting the most from your GPS 90.

Why won't my GPS 90 power up?

Make sure a fresh set of AA batteries are correctly installed (see page 66). If you're using external power, check the cable connection at the back of the unit, the DC wiring and the fuse for the circuit you're using. Last but not least, make sure you're holding the red power key down for two seconds to turn the unit on. See pages 5, 66 and 67 for more information.

Why does my GPS 90 come on in Searching the Sky mode with an 'All Stored Data Lost' message?

When a GPS 90 loses all waypoint and satellite data, a 'Searching the Sky' and 'Stored Data Lost' message will appear on the message page shortly after the unit is turned on the first time after data loss. There are three ways this can happen:

- The unit has been stored without batteries
- The POWER and MARK keys have been pressed simultaneously to turn the unit on
- The GPS has failed internally

If all satellite and waypoint data has been lost, a master reset should be performed to ensure that any possible data corruption is cleared (see page 71). Once the reset is performed, it may take 7 1/2 to 30 minutes to obtain a position fix, as satellite data needs to be collected for each satellite being used. See the Battery & Antenna Installation sections for more information.



It's important to note that unless your GPS fails internally, you should never experience complete loss of data. To avoid losing data by battery failure or an inadvertent keystrokes, take the following precautions:

- *Always store your unit with a fresh set of alkaline batteries installed to preserve waypoint & satellite data. A rechargeable lithium battery will retain memory while batteries are being changed for a few months.*
- *Always store your GPS 90 in a position where it's not possible for multiple keys to be pressed simultaneously by accident.*

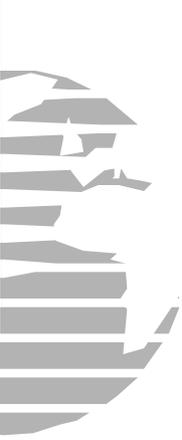
My GPS 90 comes on in AutoLocate mode (Searching the Sky without losing data). What does this mean?

The GPS 90's AutoLocate mode is an advanced software feature that allows the GPS to find itself anywhere in the world, without knowing its present position or time. Even though the GPS may not know position or time, the satellite data stored in memory can help the unit obtain a position fix without going through the satellite constellation sequentially.

Your unit is shipped in AutoLocate mode to help provide you with the fastest initialization possible without entering your present position. Once you've obtained an initial position, AutoLocate mode will only be necessary when you've moved several hundred miles from the receiver's last known position. Because AutoLocate mode is a manual selection in the GPS 90, you should only encounter it under the following conditions:

- When you've selected it from the operation setup page
- First time use initialization
- The POWER and PAGE keys have been pressed simultaneously
- After a master reset has been performed

If your unit has powered up in AutoLocate mode, you can cancel the mode by manually entering your lat/lon (see page 36) or changing the mode from the setup page (see page 43).



Why does my GPS 90 take so long to acquire a position?

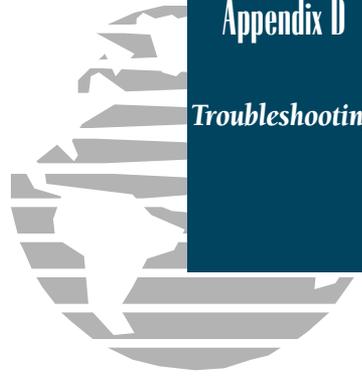
There are several variables that can effect how long the GPS 90 takes to calculate a position fix. These variables can be placed into 3 categories:

- Current view of the sky
- Incorrect operating mode
- Antenna connections/internal failure

The **current view of the sky** determines what satellites are 'visible' to the GPS antenna. Because GPS signals are relatively low power, they do not travel through buildings or other significant structures (usually not a concern when using your unit for flying). That means you need to give your GPS a clear view of the sky in all directions. This is especially true when the unit is calculating an initial fix. If you're using the suction cup antenna, make sure the antenna has the best view of the sky as possible. For portable use, make sure the antenna is oriented in the correct position, and there are no buildings or other significant structures to block the satellite signals. Once the GPS has determined your position, it can usually provide accurate updates in less than ideal conditions.

Selecting the wrong operating mode can make it impossible for your GPS to calculate a position. When the GPS 90 is powered up, it begins searching for a set of satellites based upon the receiver's last known position, the time of day, and satellite almanac data stored in memory. An incorrect operating mode, inaccurate latitude and longitude or incorrect internal clock can cause your GPS to look for satellites that may be on the other side of the earth. Generally speaking, the GPS 90 should be used in normal or battery saver mode unless:

- The GPS 90 is being initialized for first time use
- You've moved several hundred miles from the receiver's last known position with the unit off
- All satellite data has been lost due to battery failure



Antenna connections and internal failures may also result in long acquisition times, no position fix or intermittent reception:

- Check the GPS 90's portable antenna connection by rotating the black knob clockwise until it stops (see page 65 for instructions).
- Position the antenna so it's perpendicular to the ground

If you're using the suction cup antenna mount:

- Check the antenna connections at both ends
- Make sure the antenna has a clear view of the sky and as perpendicular to the ground as your windscreen allows.

Is there any way to completely reset my unit?

The GPS 90 is designed to provide years of reliable service without any routine maintenance or adjustments. If the unit has been stored without batteries, or you have encountered a problem that was not solved by the troubleshooting tips, you may find it necessary to perform a master reset on your unit. A master reset will clear any corrupt data (e.g., incorrect UTC time, etc.) and place the unit in AutoLocate mode for re-initialization.

NOTE: Performing a master reset will also clear all user data, including user waypoints, routes and track logs.

To perform a master reset:

1. Press the  and  keys simultaneously for 2 seconds.

Once the unit has been reset, allow the unit 15-30 minutes to acquire new satellite data and calculate a position (see page 63).



Almanac Data—Satellite constellation information (including location and health of satellites) that is transmitted to your receiver from every GPS satellite. Almanac data must be acquired before GPS navigation can begin.

Bearing—The compass direction from your position to a destination.

Course Made Good (CMG)—The bearing from the ‘active from’ position (your starting point) to your present position.

Crosstrack Error (XTE)—The distance you are off a desired course in either direction.

Desired Track (DTK)—The compass course between the ‘from’ and ‘to’ waypoints.

Differential GPS (DGPS)—An extension of the GPS system that uses land-based radio beacons to transmit position corrections to GPS receivers.

Estimated Time of Arrival (ETA)—The time of day of your arrival at a destination.

Estimated Time Enroute (ETE)—The time left to your destination at your present speed.

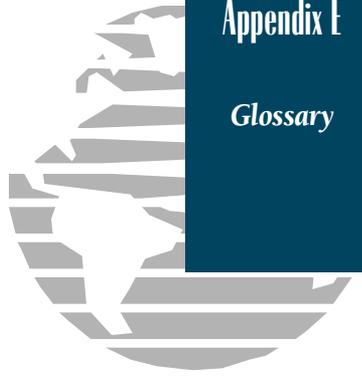
Grid—A coordinate system that projects the earth on a flat surface, using square zones for position measurements.

Ground Speed—The velocity you are travelling relative to a ground position.

Latitude—A north/south measurement of position perpendicular to the earth’s polar axis.

Longitude—An east/west measurement of position in relation to the Prime Meridian, an imaginary circle that passes through the north and south poles.

Position—An exact, unique location based on a geographic coordinate system.

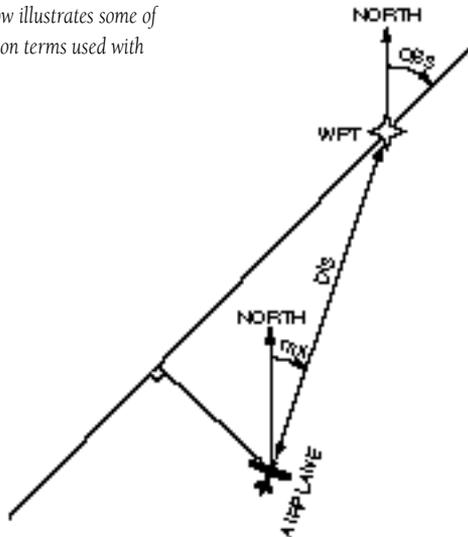


Track (TRK)—The direction of movement relative to a ground position.

Universal Transverse Mercator- (UTM)— A grid coordinate system that projects global sections onto a flat surface to measure position in specific zones.

Velocity Made Good (VMG)—The speed you are closing in on a destination along a desired course.

The diagram below illustrates some of the basic navigation terms used with the GPS 90.





The GPS 90 uses a flashing on-screen message to alert you to important information. Whenever the message indicator appears, press the **PAGE** key to view the message page. There are two types of messages: temporary alerts and condition alerts. Temporary alerts are cleared from the message page after viewing, while condition alerts remain on the message page until the condition has been resolved. Pay careful attention to all messages for your own safety.

Accuracy has been Degraded—The accuracy of the GPS 90 has been degraded beyond 500 meters due to poor satellite geometry or data quality. You should check other navigational sources to verify the position indicated.

Already Exists—The waypoint name you are entering already exists in the GPS 90's memory.

Approaching—You are less than one minute away from reaching a destination waypoint.

Arrival At—You are within the arrival alarm circle of the indicated waypoint.

Battery Power is Low—The AA batteries are low and should be replaced.

Cannot Navigate Locked Route—You have attempted to navigate a route with a locked waypoint. A waypoint can be 'locked' when the database is updated if the waypoint does not exist in the new database.

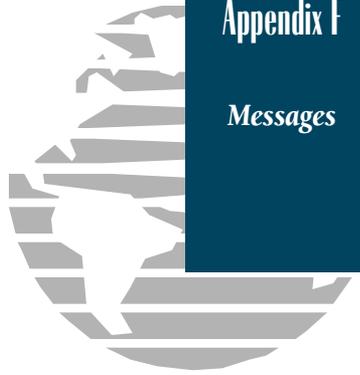
Can't change Active WPT—You have attempted to change the 'active to' or 'active from' waypoint. Clear the active route or GOTO before making your changes.

CDI Alarm—Your course deviation has exceeded the limit specified on the alarms setup page.

Final Altitude Alert—The current altitude is within 1000 feet of the final altitude entered on the VNAV page.

Inside SUA—Your aircraft has entered the boundaries of a special use or controlled airspace.

Leg Not Smoothed—The upcoming route leg is too short for smooth waypoint transitions.



Near SUA < 2nm—Your present position is within 2 nm of an SUA boundary, but you are not projected to enter it.

No Position—You have tried to save an AutoStore waypoint before a GPS position has been calculated.

No DGPS Position—Not enough data is being received to compute a DGPS position.

No RTCM Input—Beacon receiver is not properly connected or baud rates do not match.

Poor GPS Coverage—The GPS 90 cannot acquire the necessary number of satellites to compute a position.

Power Down and Re-init—The GPS 90 is not able to calculate a position due to abnormal satellite conditions. Turn the unit off and verify the last position shown by other means.

Read Only Mem has Failed—The permanent memory has failed and the unit is not operable. Take your unit to an authorized GARMIN dealer for repairs.

Received an Invalid WPT—A waypoint was received during upload transfer that has an invalid identifier.

Receiver has Failed—A failure in receiver hardware has been detected. If this message persists, do not use the unit and take it to an authorized dealer for repair.

Route is Full—You have attempted to add more than 30 waypoints to a route.

Route is not Empty—You have attempted to copy into a route already in use.

Route Waypoint Can't be Deleted—The waypoint you are trying to delete is part of a route. You must first delete the waypoint from the route before striking it from memory.



Route Waypoint was Deleted—A route waypoint entered does not exist in the database and has been deleted from the route.

RTCM Input has Failed—DGPS data being received has been lost. You are no longer receiving the beacon signal.

Searching the Sky—The GPS 90 is in searching the sky for almanac data or the unit is in AutoLocate™ mode.

Start Altitude Change—The altitude change entered on the VNAV page is about to begin.

Steep Turn Ahead—This message appears approximately one minute prior to a turn that requires a bank angle in excess of 25 degrees in order to stay on course.

Stored Data was Lost—All waypoints, routes and almanac data has been lost due to battery failure.

SUA Ahead < 10 min—Your projected course and current altitude will place you within an SUA within 10 minutes, based on your current ground track.

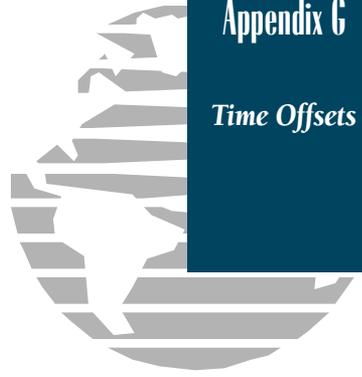
SUA Near & Ahead—Your present position is within 2 nm of an SUA and you are projected to enter the SUA based upon your current course & altitude.

Timer has Expired—The countdown timer has expired.

Transfer has been Completed—The receiver is finished uploading or downloading information to the connected device.

Vertical Nav Cancelled—The VNAV function has been cancelled due to a change in the active route.

WPT Memory is Full—You have used all 250 waypoints in the GPS 90. Delete unwanted waypoints to make room for new entries.



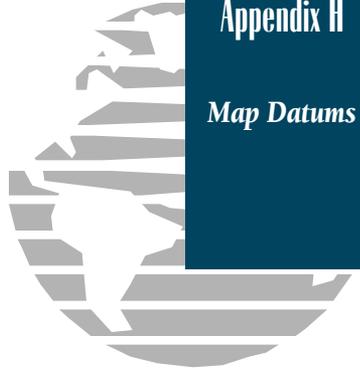
The chart below gives the UTC time offset for the various longitudinal zones. If you are in daylight savings time, add one hour to the offset.

Longitudinal Zone	Offset	Longitudinal Zone	Offset
W180.0° to W172.5°	-12	W007.5° to E007.5°	0
W172.5° to W157.5°	-11	E007.5° to E022.5°	1
W157.5° to W142.5°	-10	E022.5° to E037.5°	2
W142.5° to W127.5°	-9	E037.5° to E052.5°	3
W127.5° to W112.5°	-8	E052.5° to E067.5°	4
W112.5° to W097.5°	-7	E067.5° to E082.5°	5
W097.5° to W082.5°	-6	E082.5° to E097.5°	6
W082.5° to W067.5°	-5	E097.5° to E112.5°	7
W067.5° to W052.5°	-4	E112.5° to E127.5°	8
W052.5° to W037.5°	-3	E127.5° to E142.5°	9
W037.5° to W022.5°	-2	E142.5° to E157.5°	10
W022.5° to W007.5°	-1	E157.5° to E172.5°	11
		E172.5° to E180.0°	12

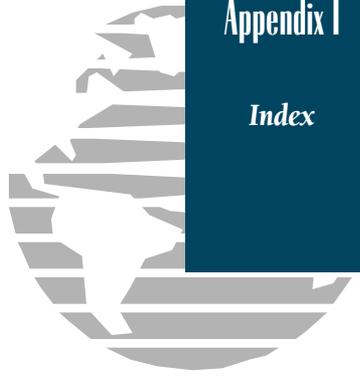


The following list shows the 104 map datums available for the GPS 90. Menu Page abbreviations are listed first, followed by the corresponding map datum name and area.

Adindan	Adindan- Ethiopia, Mali, Senegal, Sudan	Dos 1968	Dos 1968- Gizo Island (New Georgia Islands)
Afgooye	Afgooye- Somalia	Easter Isld 67	Easter Island 1967
AIN EL ABD '70	AIN ELANBD 1970- Bahrain Island, Saudi Arabia	European 1950	European 1950- Austria, Belgium, Denmark, Finland, France, Germany, Gibraltar, Greece, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland
Anna 1 Ast '65	Anna 1 Astro '65- Cocos Isl.	European 1979	European 1979- Austria, Finland, Netherlands, Norway, Spain, Sweden, Switzerland
ARC 1950	ARC 1950- Botswana, Lesotho, Malawi, Swaziland, Zaire, Zambia, Zimbabwe	Finland Hayfrd	Finland Hayford- Finland
ARC 1960	ARC 1960- Kenya, Tanzania	Gandajika Base	Gandajika Base- Republic of Maldives
Ascnsn Isld '58	Ascension Island '58- Ascension Island	Geod Datm '49	Geodetic Datum '49- New Zealand
Astro B4 Sorol	Astro B4 Sorol Atoll- Tern Island	Guam 1963	Guam 1963- Guam Island
Astro Bcn "E"	Astro Beacon "E"- Iwo Jima	Gux 1 Astro	Gux 1 Astro- Guadalcanal Island
Astro Dos 71/4	Astro Dos 71/4- St. Helena	Hjorsey 1955	Hjorsey 1955- Iceland
Astr Stn '52	Astronomic Stn '52- Marcus Island	Hong Kong '63	Hong Kong '63- Hong Kong
Astrln Geod '66	Australian Geod '66- Australia, Tasmania Island	Hu-Tzu-Shan	Taiwan
Astrln Geod '84	Australian Geod '84- Australia, Tasmania Island	Indian Bngldsh	Indian- Bangladesh, India, Nepal
Bellevue (IGN)	Efate and Erromango Islands	Indian Thailand	Indian- Thailand, Vietnam
Bermuda 1957	Bermuda 1957- Bermuda Islands	Indonesia '74	Indonesia
Bogata Obsrv	Bogata Obsrvatry- Colombia	Ireland 1965	Ireland 1965- Ireland
Campo Inchspe	Campo Inchauspe- Argentina	ISTS 073 Astro	ISTS 073 ASTRO '69- Diego Garcia
Canton Ast '66	Canton Astro 1966- Phoenix Islands	Johnston Island	Johnston Island Kandawala Kandawala- Sri Lanka
Cape	Cape- South Africa	Kerguelen Isld	Kerguelen Island
Cape Canavrl	Cape Canaveral- Florida, Bahama Islands	Kertau 1948	Kertau 1948- West Malaysia, Singapore
Carthage	Carthage- Tunisia	L. C. 5 Astro	Cayman Brac Island
CH-1903	CH 1903- Switzerland	Liberia 1964	Liberia 1964- Liberia
Chatham 1971	Chatham 1971- Chatham Island (New Zealand)	Luzon Mindanao	Luzon- Mindanao Island
Chua Astro	Chua Astro- Paraguay		
Corrego Alegre	Corrego Alegre- Brazil		
Djakarta	Djakarta (Batavia)- Sumatra Island (Indonesia)		



Luzon Philippine	Luzon- Philippines (excluding Mindanao Island)		
Mahe 1971	Mahe 1971- Mahe Island		
Marco Astro	Marco Astro- Salvage Island		
Massawa	Massawa- Eritrea (Ethiopia)		
Merchich	Merchich- Morocco		
Midway Ast '61	Midway Astro '61- Midway		
Minna	Minna- Nigeria		
NAD27 Alaska	North American 1927- Alaska		
NAD27 Bahamas	North American 1927- Bahamas (excluding San Salvador Island)		
NAD27 Canada	North American 1927- Canada and Newfoundland		
NAD27 Canal Zone	North Am. 1927- Canal Zone		
NAD27 Caribbn	North American 1927- Caribbean (Barbados, Caicos Islands, Cuba, Dom. Rep., Grand Cayman, Jamaica, Leeward and Turks Islands)	Prov S Chln '63	Prov So Chilean '63- S. Chile
NAD27 Central	North American 1927- Central America (Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua)	Puerto Rico	Puerto Rico & Virgin Islands
NAD27 CONUS	North Am. 1927- Mean Value (CONUS)	Qatar National	Qatar National- Qatar
NAD27 Cuba	North American 1927- Cuba	Qornoq	Qornoq- South Greenland
NAD27 Grnland	North American 1927- Greenland (Hayes Peninsula)	Reunion	Reunion- Mascarene Island
NAD27 Mexico	N. American 1927- Mexico	Rome 1940	Rome 1940- Sardinia Island
NAD27 San Sal	North American 1927- San Salvador Island	RT 90	Sweden
NAD83	North American 1983- Alaska, Canada, Central America, CONUS, Mexico	Santo (Dos)	Santo (Dos)- Espirito Santo Island
Nhrwn Masirah	Nahrwn- Masirah Island (Oman)	Sao Braz	Sao Braz- Sao Miguel, Santa Maria Islands (Azores)
Nhrwn Saudi A	Nahrwn- Saudi Arabia	Sapper Hill '43	Sapper Hill 1943- East Falkland Island
Nhrwn United A	Nahrwn- United Arab Emirates	Schwarzeck	Schwarzeck- Namibia
Naparima BWI	Naparima BWI- Trinidad and Tobago	Sth Amrcn '69	South American '69- Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Venezuela, Trinidad and Tobago
Obsrvtorio '66	Observatorio 1966- Corvo and Flores Islands (Azores)	South Asia	South Asia- Singapore
Old Egyptian	Old Egyptian- Egypt	SE Base	Southeast Base- Porto Santo and Madiera Islands
Old Hawaiian	Old Hawaiian- Mean Value	SW Base	Southwest Base- Faial, Graciosa, Pico, Sao Jorge and Terceira Islands (Azores)
Oman	Oman- Oman	Timbalai 1948	Timbalai 1948- Brunei and E. Malaysia (Sarawak and Sabah)
Ord Srvy GB	Old Survey Grt Britn- England, Isle of Man, Scotland, Shetland Isl., Wales	Tokyo	Tokyo- Japan, Korea, Okinawa
Pico De Las Nv	Canary Islands	Tristan Ast '68	Tristan Astro 1968- Tristan da Cunha
Ptcairn Ast '67	Pitcairn Astro '67- Pitcairn Isl.	Viti Levu 1916	Viti Levu 1916- Viti Levu/ Fiji Islands
Prov S Am '56	Prov So Amrcn '56- Bolivia, Chile, Colombia, Ecuador, Guyana, Peru, Venezuela	Wake-Eniwetok	Wake-Eniwetok- Marshall Isl.
		WGS 72	World Geodetic System 1972
		WGS 84	World Geodetic System 1984
		Zanderij	Zanderij- Surinam



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