Apollo
SL50 and SL60
GPS Receiver and
VHF Communications
Transceiver

User's Guide

II MORROW
VISIONARY THINKING TODAY

Welcome ...

Welcome to a new era of aviation navigation communication. Once again, II Morrow Inc. has set new standards in features and ease of use for the general aviation public. The Apollo SL50 and SL60 are unequaled in providing the features, level of performance, and reliability that aviation users require. The Apollo slim line series of avionics sets a precedent that will be the standard that all other avionics will be compared to. The Apollo SL50 is a full-featured slim line GPS receiver. The Apollo SL60 combines the capabilities of our outstanding GPS receiver with a state-of-the-art VHF communications transceiver in the same small package. You can be confident in knowing that you are the owner of the state-of-the-art in aviation navigation and communication. Our products are built to last and to satisfy your navigation needs.

History of Revisions

March 1997   Original Release
April 1997   Rev -01

Ordering Information

To receive additional copies of the Apollo SL50/60 manuals order the following part numbers:

User's Guide	560-0955-xx
User's Guide Binder (3/4")	560-9002-xx
Installation Manual	560-0957-xx
SL50 Quick Reference	561-0235-xx
SL60 Quick Reference	561-0239-xx

Important Notice

The Global Positioning System (GPS) is operated by the United States Department of Defense which is solely responsible for the accuracy, daily operation, and maintenance of the satellite constellation. System accuracy is affected by the Department of Defense's Selective Availability (SA) and the Dilution of Precision (DOP) attributed to poor satellite geometry.

Due to implementation of Selective Availability by the United States Department of Defense (DoD), all GPS receivers may suffer degradation of position accuracy. The DoD has stated that 95% of the time horizontal accuracy will not be degraded more than 100 m and 99.9% of the time accuracy will not be degraded more than 300 m.

Installations of TSO C-129 authorized Apollo SL50/60's may be approved for supplemental navigation only. The Apollo SL50/60 may be used as the primary navigation data display, however, other means of navigation appropriate to the intended route of flight must be installed and operational. It is not required that these other systems be monitored.

FCC Notice

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference during residential use. Operation is subject to the following two 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. 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 radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

• Reorient or relocate the receiving antenna.

• Increase the separation between the equipment and receiver.

• Connect the equipment into an outlet on a circuit different from the one the receiver is connected.

• Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications to this equipment not expressly approved by II Morrow Inc. could void the user's authority to operate this equipment.

DOC Notice

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of the Canadian Department of Communications.

APOLLO

TABLE OF CONTENTS

Introduction

This guide describes the operation of the Apollo SL50 GPS Receiver and the Apollo SL60 GPS Receiver and VHF Communication Transceiver.

SL50 The Apollo SL50 is a high performance GPS receiver with a high intensity LED display packed into a 1.3 inch high by 6.25 inch wide package that conserves panel space. The SL50 uses the same 8-channel GPS engine that is used in II Morrow's high end TSO C129 terminal and enroute certified products. The 32 character alphanumeric LED display uses an automatic intensity control to keep it easily readable in all conditions from direct sunlight to the dark of night.

The Apollo SL50 has a wealth of easy to use
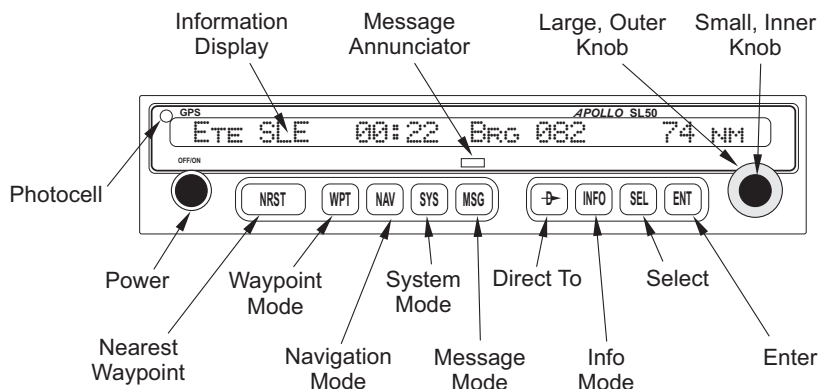
Apollo SL50 Front Panel Description

features that every pilot needs. The large waypoint database has information about airports, VORs, NDBs, intersections, and special use airspaces that makes the Apollo SL50 an encyclopedia of aviation. The database can be updated by connecting the SL50 serial port to a computer with II Morrow's innovative Waypoint Manager software. The database can also include 200 custom

waypoints created by the user. Ten flight plans can be saved with up to twenty legs for setting up custom tailored routes. The detailed Navigation information displays are also customizable and can be set to automatically scroll through the desired information. The Emergency Search feature, invented by II Morrow, when used with the Direct-To feature makes it easy to quickly select an airport as a new destination whether because of a change in plans, or to react to an emergency.

SL60

The Apollo SL60 combines all of the features of the SL50 with a state-of-the-art VHF communications transceiver in the same compact package. The VHF comm radio covers all 760 channels with 8+ watts (10 W typical for most frequencies) without any external cooling devices required. A built-in intercom capability works either with or replaces an audio panel. The features and packaging of the SL60 keeps your power requirements and installation costs low. You can easily switch between active and standby frequencies, select a weather channel, activate the emergency channel, or choose from one of ten customized frequencies or one of the last ten used.

Display
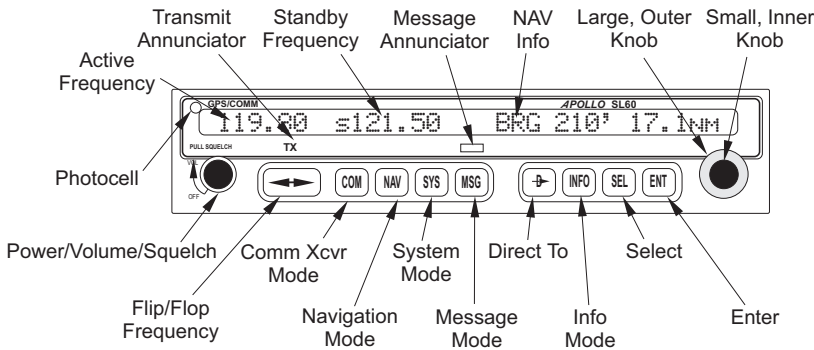
Apollo SL60 Front Panel Description

The display is a 1-line by 32-character 5x7 dot matrix alphanumeric display. A photocell is located in the top left corner of the front panel display. The photocell automatically controls the light intensity of the display LEDs from low brightness at night to high brightness during daylight operation.

Annun-ciators

Several annunciators are used to help indicate the operating modes of your SL60. The TX (Transmit) annunciator is lighted whenever you are transmitting. If the avionics bus drops below 9 VDC, the SL60 will not transmit. An LED will be lighted above the WPT/COM, NAV, SYS, or MSG keys when they are pressed. An "s" normally appears to the left of the Standby frequency. An "I" appears to the left of the Standby frequency when the Intercom function is active. An "m" will appear to the left of the Standby frequency when you are using the Monitor function.

TX - Transmit (SL60)
s - Standby Frequency (SL60)
m - Monitor Mode (SL60)
I - Intercom (SL60)

Relative Bearing Indicator
The Relative Bearing Indicator indicates an approximate bearing to a waypoint or airspace relative to the aircraft's current Track when your current ground speed is more than 5 knots. The following illustration describes the bearing range for each arrow.

🡥	🡢	🡦	🡣	🡧	🡠	🡤	🡡
23º to 67º	68º to 112º	113º to 157º	158º to 202º	203º to 247º	248º to 292º	293º to 337º	338º to 22º

Controls **Power/Volume/Squelch Knob(SL60)**
The knob on the left side of the SL60 controls power on/off, volume, and squelch test. Rotate the knob clockwise (CW) past the detent to turn the power on. Continue rotating the knob to the right to increase speaker and headphone amplifier volume level. Rotate the knob to the left to reduce the volume level. Pull the knob out to disable automatic squelch.

Power Knob (SL50)
The knob on the left side of the SL50 controls power on/off. Rotate the knob clockwise (CW) past the detent to turn the power on. Rotate the knob fully counterclockwise to turn the power off.

Small and Large Knobs
The dual concentric knobs on the right side of the front panel are used to select pages, edit characters and values, or other options.

Keys Nine backlighted keys allow you access the functions in your Apollo SL50/60.

Flip/Flop (Arrows) - SL60
Press the **Flip/Flop** key to switch between the active (left-most) and standby (right-most) frequency while in the Nav or Com functions. You may use an optional external Flip/Flop key for the same operation as the front panel control. Switching between frequencies is disabled while you are transmitting or editing in any function.

NRST (Nearest Waypoint) - SL50
The Nearest Waypoint (Emergency) mode displays the closest waypoints to your position.

COM (Communications Radio Mode) - SL60
Press the **COM** key to operate the Communications radio functions.

WPT (Waypoint) - SL50

The Waypoint key allows access to the waypoint database. (SL60 accesses the database from within the System function - see page 39.)

NAV (Navigation)

Press the **NAV** key to reach the navigation functions.

SYS (System Mode)

Press the **SYS** key to reach the System mode functions. System mode is used to make system level adjustments, setup flight plans, access the database, and modify Nav function displays.

MSG (Message)

Press the **MSG** key to reach the Message functions. The MSG annunciator will flash when a new message is provided. In the SL60, pressing **MSG** twice will start the Nearest Waypoint mode just as pressing **NRST** will on the SL50.

DIRECT-TO

The **DIRECT-TO** key is used to define a direct course from your present position to a waypoint.

INFO (Information)

The Info function accesses supplementary information about a waypoint.

SEL (Select)

The **SELECT** key activates editing or the selection of options. Editing is active on the items that flash on the display.

In the SL60 when the COM function is active, pressing the **SEL** key will recall stored frequencies.

ENT (Enter)

The **ENT** key enters and saves the information flashing on the display. If the **ENT** key is not pressed after editing, any changes made are not saved.

In the SL60 when the COM function is active, pressing the **ENT** key will save the standby frequency into the Auto Stack list.

Apollo SL50/60 Features

SL50/60 GPS Navigation Features

10 Reversible Flight Plans with 20 Legs

Automatic Waypoint Sequencing

200 User-Defined Waypoints

Nav Displays

Lat/Lon

Bearing and Distance

Ground Speed and Track Angle

Desired Track and Distance

Internal CDI Display

32-Character High-Intensity Alphanumeric LED Display

Automatic Display Intensity Control

User-Selectable Nav Displays

User-Defineable Distance and Speed Settings:

nm, km (distance)

knots, kph (speed)

Clock and Countdown Timer

Auto/Manual Magnetic Variation Settings

Direct-To Nav Function

Parallel Track

Nearest Waypoint Search

Internal Database of Airports, VORs, NDBs, Intersections, Frequencies, and Airport Info

Update the database through the serial port

SL50/60 GPS Receiver Performance Specifications

8-Channel Parallel GPS Receiver

Certified TSO C129 Class A2 for En Route and Terminal Operation

SL60 Comm Radio Features

760 Communication Channels

Frequency Range: 118 to 136.975 MHz

Weather Channels: Receive only

Active and Standby Flip/Flop Frequencies

Volume Control

32-Character High-Intensity Alphanumeric LED Display

Transmit Status Indicator

Backlit Keypad Controls

Automatic Display Intensity Control

2x10 Frequency Memory and Recall

Stores/Recalls Ten User-Defined Frequencies

Stores/Recalls Previous Ten Frequencies

Frequency Monitor Function (listens to standby while monitoring the active)

Squelch Test Function

Stuck Mic Time-Out - 35 seconds

SL60 Comm Radio Performance

Transmit Power: 8 watts Carrier Power (35 watts Input Power)

Input Voltage Range: 10 to 40 VDC

Operating Temperature Range: -20° to +55° C

Certified TSO C37d (transmitting)

Certified TSO C38d (receiving)

Certified TSO C128 (microphone)

Physical Specifications

Height: 1.3 inches
Width: 6.25 inches
Depth: 11.45 inches

Weight:

SL50: 2.3 pounds
SL60: 2.8 pounds

Interfaces

External:

CDI Left/Right

TO/FROM Flag

Nav Valid Flag

Nav Superflag

Three External Annunciators

RS-232 Bi-Directional Serial Ports

Optional External:

Flip/Flop Switch

OBS/Hold

Notes

Getting Started the First Time

This section explains how to get started using your Apollo SL50/60. Information in this section explains how to startup the unit, check signals from the GPS satellites, enter a seed position, and GOTO a destination waypoint.

It is necessary to enter a seed position and the current time the first time you turn the unit on.

- Power on
- Enter a seed position (your dealer may have already completed this step for you), if necessary
- Enter the current time
- Check satellite signal strength
- Enter a "GOTO" waypoint
- Begin navigating

Power Up
Turn the Power knob clockwise to switch the unit on. The startup screen, testing, position, and database information shows on the display for several seconds and then will go into the Navigation function.

Seed Position
Each time the Apollo SL50/60 is switched on, it must locate satellites in the sky to acquire signals before determining a position fix in a complex process involving lengthy mathematical operations. Without a seed position and the current UTC time and date, this process can take 10 minutes or more to complete. Enter a Seed Position to allow the receiver to quickly locate and track available satellites.

Note

The seed position and current time only need to be entered the first time the receiver is switched on. This information is stored in memory and need not be entered again. If you move about three hundred miles without the Apollo SL50/60 turned on and tracking its position, reenter the seed position.

APOLLO

Entering a Seed Position

After the start up tests, you will always have the choice of entering a Seed Position. The Seed Position is a starting reference point so the GPS receiver knows what satellites it is looking for. If a Seed Position has been previously entered, you do not need to select a new Present Position or a Reference Waypoint. If you do not make any selections, the Apollo SL50/60 will automatically progress into the Navigation function.

1. The previous Seed Position will display with the choice of SEL/ENT for a few seconds. If you don't do anything, the Apollo SL50/60 will continue normally. You can also press **ENT** to accept the current position, though this is not required.

```
0.3ɴᴍ 277° To SLE    SEL/ENT
```

SEL

2. Press **SEL** to change the Seed Position.

3. The current Reference Position will be displayed and the Chg? prompt will flash.

```
44°54.46N 122°59.69W  Rᴇꜰ: Cʜɢ?
```

ENT

Press **ENT** to change the Reference Waypoint or turn the **Large** knob to change to Lat/Lon Reference Position. Use the appropriate following description: Change Reference Waypoint or Change Lat/Lon Reference Position.

Change Reference Waypoint

ENT

1. After pressing **ENT**, the first character of the Reference Waypoint name will flash. You can change the waypoint type by turning the **Large** knob ccw one click and the turning the **Small** knob.

```
ᴀPDX   ᴄ PORTLAND       OR USA
```

2. Turn the **Large** knob to each character of the waypoint name. Change the character with the **Small** knob.

```
aSLE   c SALEM      OR USA
```

3. Note that you can change the character just before the airport name to either a "c" or an "f." The "c" indicates a "city" and the "f" indicates a "facility."

Waypoint Type   "c" = City   City or Facility   State
(Airport shown here)   "f" = Facility   Name

```
aSLE   c SALEM        OR USA
```

Waypoint   Underline indicates
Indentifier   flashing character   Country
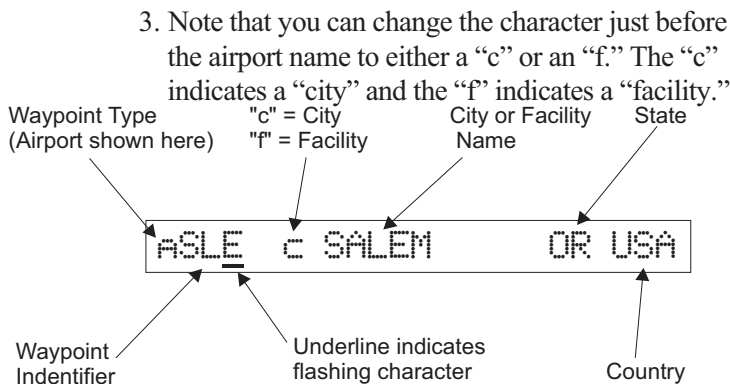
4. When you have entered the waypoint name, press **ENT**.

Change Lat/Lon Reference Position

1. Set the latitude and longitude coordinates near to your current position. After turning the **Large** knob, the first character of the Reference Position Lat/Lon will flash.

```
44°54.46N 122°59.69W  Ref: Chg?
```

2. Change the character with the **Small** knob. Turn the **Large** knob to move to each character of the Lat/Lon position and change it with the **Small** knob.

```
45°54.46N 122°59.69W
```

3. When you have entered the Lat/Lon position, press **ENT**.

4. After entering the Seed Position, you will be prompted next to clear the active flight plan. Choose Yes or No with the **Small** knob. Press **ENT** to now continue normal operations.

```
Clear Active Flight Plan YES?
```

Checking GPS Signal Strength

The unit shows the GPS signal strength screen in the GPS Sensor function. Make it a habit to check this screen to make sure that the unit is properly tracking visible satellites before you fly. The Apollo SL50/60 requires signals from at least four satellites to calculate a 3D position fix (Lat/Lon and GPS altitude). More details are available in the GPS Sensor part of the System section of this manual, see page 79.

1. Press **SYS** and turn the **Large** knob to display the GPS Sensor function. Press **ENT**.

```
GPS Sensor:          Press ENT
```

2. The GPS Health page is shown if GPS information is received. The GPS number and dimension (2D, 3D, or no position), number of healthy, and number of visible satellites are shown.

```
GPS 3D Pos Healthy: 25  Vis: 8 ✦
```

3. Turn the **Small** knob to view the GPS Satellites Used for Position fixes page.

```
GPS SVs: 31,27,26,19,07,02
```

4. Turn the **Small** knob again to view the GPS Satellite Status, Elevation, SNR, and Azimuth page. Turn the **Small** knob to view information about each available satellite.

```
SV31 DATA el:21° sig:055 az:043°
```

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Note

The GPS antenna must be able to "see" each satellite it is tracking. If a satellite is "shaded" by the wing or fuselage during a turn, it may temporarily lose track of that satellite. If this happens, or if the geometry of the satellites available is poor, the unit may temporarily calculate a "2D Fix" and Nav information will not be available. A NAV INVALID FLAG will be generated and all Nav information will be dashed.

Entering a Destination Waypoint

With a seed position and the current UTC time and date set, the Apollo SL50/60 is ready to begin navigating a trip. Prepare for trip navigation by entering a destination waypoint.

Using the Nearest Waypoint Function

1. Press the **NRST** key in the SL50 or press **MSG** twice in the SL60. The GOTO Nearest Waypoint function is displayed with the distance and bearing from your present position to the indicated waypoint. See page 41 in the Waypoint section for a more complete description of using the Nearest Waypoint function.

```
ARPT  1 SLE     BRG 352°    5.4NM
```

2. Turn the **Large** knob to view the different waypoint types.

```
VOR   1 UBG     BRG 344°   26.6NM
```

3. Turn the **Small** knob to view the 20 nearest waypoints.

```
VOR   2 CVO     BRG 189°   27.5NM
```

Using the Direct-To Function

1. Press the **Direct-To** key. Change the waypoint type by moving to the character to the left of the waypoint name with the **Large** knob.

```
vUBG    f NEWBERG      OR USA
```

2. Change the type of destination waypoint by turning the Small knob to select: airport (a), NDB (n), VOR (v), INT (i), or USER (u). For instance, with ARPT (a) indicated as the type of destination waypoint, only airports show on the display as you select identifier characters.

```
aSLE    c Salem        OR USA
```

3. Turn the **Large** knob to each character of the waypoint identifier. Change the character with the **Small** knob.

```
aPAE    c EVERETT      WA USA
```

4. Turn the **Large** knob to the "c" or "f" character before the waypoint city (c) or facility (f) name. Change the character with the **Small** knob. A plus (+) will appear when the same name is available for multiple waypoints.

```
aPDX   +c PORTLAND     OR USA
```

5. You can also then turn the **Large** knob to each character of the city/facility name. Change the character with the **Small** knob.

```
aPDX   +c PORTLAND     OR USA
```

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SEL

6. Press **SEL** again to select the entire city name.

    ʌPDX +c PORTLAND   OR USA

7. Turn the **Small** knob to view each airport with the current city name. The city name can be a maximum of 16 characters. Longer names will be truncated.

    ʌHIO +c PORTLAND   OR USA

ENT

8. When you have entered the waypoint name, press **ENT**. Your Apollo SL50/60 will now switch to the Navigation function and show information based on your present position to the Direct-To destination waypoint.

    ETE HIO   00:13 BRG 345 36.6NM

Navigation Basics

This section explores the navigation function and describes the powerful features it contains. When you become comfortable operating the unit, you may wish to "fly" the Apollo SL50/60 using the built-in simulator. Follow the instructions in the Simulator section for using the simulator.

About the Navigation Function

The navigation function is always active. When you use other functions, the navigation function continues to run "in the background" calculating your present position, navigating your programmed route (if active), and alerting you to events or conditions important to navigation. When you finish using other functions and return to the navigation function, the last navigation display used is shown.

About the Navigation Function Displays

While you navigate, the Apollo SL50/60 gives you information in the Navigation function displays. The navigation information displays and sequencing speed are user-programmable. See the Nav info section of the System Functions chapter (see page 65). The **Large** knob will select the higher level Nav functions: Nav pages, Emergency Search, Parallel Track Offset, GPS Position, Countdown Timer, and the From/To/Next Waypoints. The **Small** knob will look at the pages available for each function; a diamond will be shown on the right side of the display if more pages are available.

Nav Home Page

The Nav Home Page is a default page that is the first page available in the Navigation function. The Nav Home Page is not customizable. The information in the Home Page shows the Destination Waypoint identifier, Estimated Time Enroute, Bearing, and Range (distance) to the destination waypoint.

```
Ete EUG   00:22 Brg 082    74nm ◆
```

APOLLO

Turn the **Small** knob to view the other available Navigation displays.

North

TAE = Difference between Track and Desired Track

Bearing = Direction to waypoint

Course = Desired Track between specific waypoints

Desired Track = Course direction

Track = Direction the aircraft is going

Heading = Direction the aircraft is pointed

TO WPT

Course

TRK

BRG

DTK

DTK

Heading

Track Angle Error (Tae)

Distance Off Track or Cross Track Deviation

FROM WPT

Present Position

Navigation Terms and Abbreviations

Autonav   The Autonav feature lets you select certain Nav display choices and have them rotate in sequence displaying each one from one to nine seconds. The selection of displays and sequencing time is performed in the Nav Info part of the System Functions (see page 67).

ENT

1. Start Autonav by pressing **ENT** while displaying the Nav Home Page, or one of its sub-pages.

Eᴛᴇ EUG   00:22 Bʀɢ 082   74ɴᴍ ✦
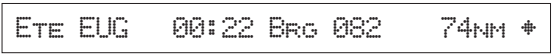
2. Stop Autonav rotation by pressing any key or turning either knob.

Nav Pages

Nav Display Choices
Estimated Time Enroute (Ete)

ETE is to the current TO (destination) waypoint from your present position based on the current ground speed. The units shown are in hours and minutes, 00:00 to 99:59. If the ground speed is less than or equal to 5 knots, the GPS receiver does not have a valid position, or there is no TO waypoint, the ETE value will be shown as dashes. If there is no TO waypoint, the TO identifier location will be replaced by dashes.

Estimated Time Enroute Label   Estimated Time Enroute Value   Bearing Label   Range to Destination Waypoint from your Present Position

```
ETE EUG   00:16 Brg 173   45.5nm ◆
```

Waypoint Indentifier

Bearing Value

"Diamond" indicates more pages can be selected with the **Small** knob.
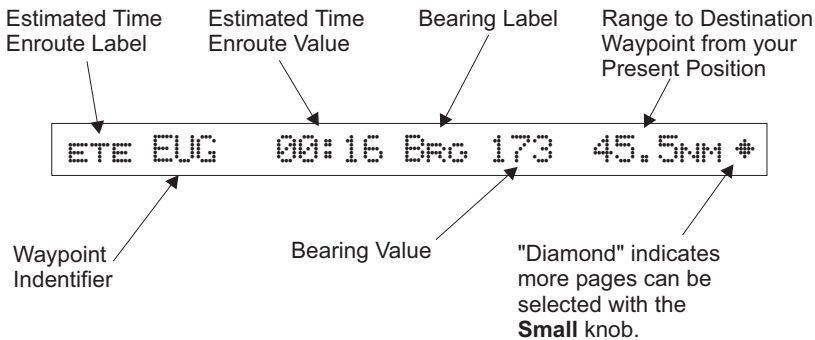
Bearing (Brg)

Bearing is the angle from your present position to the TO waypoint. Bearing is shown from 0 to 359 degrees in one degree increments. Bearing is computed using the magnetic variation at the Present Position. The Bearing value will be dashed if the FROM or TO waypoints are blank or the GPS receiver does not have a valid position.

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Range (Rge)

The distance from your present position to the TO waypoint. Units can be set as either nautical miles or kilometers in the Nav Info section of the System functions (see page 71). Nautical mile units are 0.00 to 9.00 nm in 0.01 nm increments, 10.0 to 99.9 nm in 0.1 nm increments, and 100 to 9999 nm in 1 nm increments. Kilometer units are 0.00 to 99.99 km in 0.01 km increments, 100.0 to 999.9 km in 0.1 km increments, and 1000 to 9999 km in 1 km increments. The Range value will be dashed if the FROM or TO waypoints are blank or the GPS receiver does not have a valid position.

Course Deviation Indicator (CDI) and Distance Off Track

The airplane symbol (⚓) referenced to a bar graph shows your position relative to being on-course. When the airplane is to the right of the center bar, you must fly left to return on-course; the bar graph indicates you are off-course to the right. Fly the aircraft in the direction of the bar graph to return on-course.

⊦⊦⊦⊦⊦⊦ ⚓	Brg 173 42.4nm

CDI Sensitivity = 0.3 nm	CDI Sensitivity = 1.0 nm	CDI Sensitivity = 5.0 nm
each ` = 0.01 nm	each ' = 0.05 nm	each ! = 0.24 nm
each ⋯! = 0.04 nm	each ⋯! = 0.14 nm	each !!! = 0.71 nm
⚓ ⋯⊦⋯⊦⋯⊦⋯⊦	⚓ ⊦⊦⊦⊦⊦⊦⊦⊦⊦⊦	⚓ ⊦⊦⊦⊦⊦⊦⊦⊦⊦⊦
(full scale) = 0.3 nm	(full scale) = 1.0 nm	(full scale) = 5.0 nm

A single dot thickness bar indicates that CDI sensitivity is set to 0.3 nm full scale per side. The two dot bar indicates a sensitivity of 1.0 nm full scale per side. The three dot bar indicates a sensitivity of 5.0 nm full scale per side. The manual sensitivity of the CDI may be set to 0.3, 1.0, or 5.0

nm full scale per side. The airplane symbol is also used as a To-From indicator. When the airplane is facing up, you are on the "To" side of the destination waypoint. When the airplane is facing upside down, you are on the "From" side of the destination waypoint.
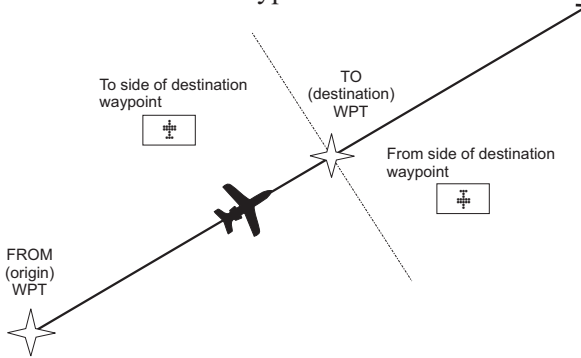
The number shown on the edge of the display opposite from the airplane symbol shows the distance off track. The range is 0.000 to 0.999 nm at 0.001 nm resolution, 1.0 to 9.99 nm at 0.01 nm resolution, and 10.0 to 99.9 nm at 0.1 nm resolution.

If the GPS sensor is not sending a valid position, or the current TO waypoint is blank, the CDI will display "—Nav Flagged—".

APOLLO
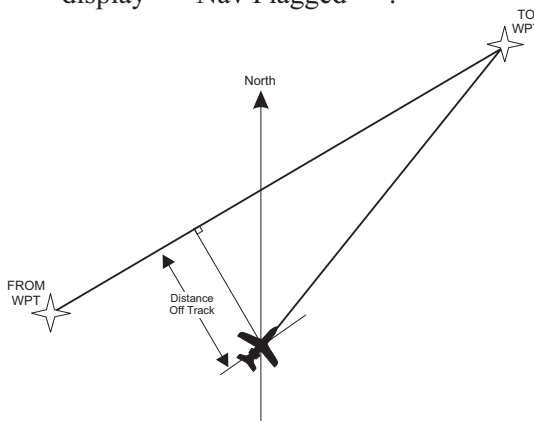
Desired Track (Dtk)

Desired Track is the course angle between the FROM and TO waypoints referenced to the magnetic variation at the current FROM waypoint. Desired Track is shown from 0 to 359 degrees in one degree increments.

```
Dᴛᴋ 173  48.0ɴᴍ Tʀᴋ 173 TAE 000
```

Desired Track Label

Desired Track Distance from Origin to Destination

Track Angle Label

Track Angle Error Label

```
Dᴛᴋ 173  48.0ɴᴍ Tʀᴋ 174 TᴀE 001
```

Desired Track Angle from Origin to Destination

Track Angle Value

Track Angle Error Value
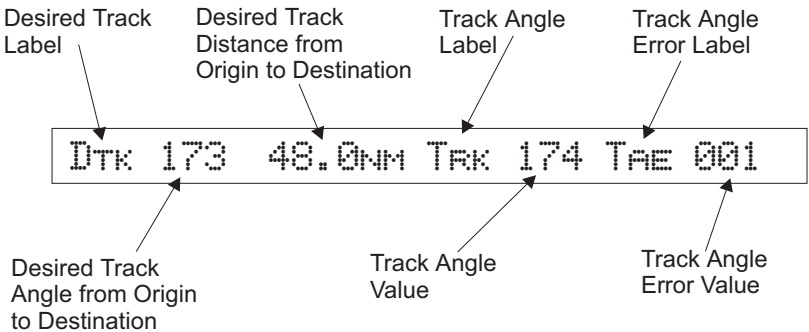
From-To Distance

The distance from the departure (origin) waypoint to the destination waypoint is shown as a value, but does not show any label. The nautical mile units are 0.00 to 9.99 nm at 0.01 nm resolution, 10.0 to 99.9 nm at 0.1 nm resolution, and 100 to 9999 nm at one nm resolution. Kilometer units are 0.00 to 99.99 km at 0.01 km resolution, 100.0 to 999.9 km at 0.1 km resolution, and 1000 to 9999 km at 1 km resolution. See page 71 for details on changing units of measurement.

Track (Trk) Angle

Track Angle is the angle of your actual direction of travel. Track is shown from 0 to 359 degrees in one degree increments. Track is computed using the magnetic variation at the Present Position. The Track value will be dashed if the FROM or TO waypoints are blank, if the GPS receiver does not have a valid position, or if ground speed is less than 5 knots.

Track Angle Error (Tae)

Track Angle Error is the difference between the Desired Track and Track Angle (Dtk - Trk). Track Angle Error is shown from 0 to 359 degrees in one degree increments. Track Angle Error is computed using the magnetic variation at the Present Position. The Track Angle Error value will be dashed if the FROM or TO waypoints are blank, if the GPS receiver does not have a valid position, or if ground speed is less than 5 knots.

Ground Speed (GS)

Ground Speed is the measure of your progress over the ground, not airspeed. Ground Speed units are from 0 to 999 knots in 1 knot increments. The Ground Speed value will be replaced with dashes if the speed is less than 5 knots, there is no valid GPS position, or the TO waypoint is blank. See page 71 for details on changing units of measurement.

```
Trk 173 173 Ground Sp 170 kts
```

Minimum Safe Altitude (MSA)

The elevation of the highest obstruction near the aircraft plus a 1,000 or 2,000 foot buffer added for safety. In non-mountainous terrain, a 1,000 foot buffer is added. In mountainous terrain, a 2,000 foot buffer is added. The result is rounded to the nearest 100 feet. The value will be replaced with dashes if there is no valid GPS position, the TO waypoint is blank, or the current position is outside of the database coverage area.

```
MinSafeA  5700    EnrtSafeA  5700
```

Minimum Enroute Safe Altitude (MESA)

Minimum Enroute Safe Altitude is the highest MSA for every point between the aircraft present position and the "TO" waypoint with a 5 nm buffer around the course. The value will be replaced with dashes if there is no valid GPS position, the TO waypoint is blank, or the current position is outside of the database coverage area.

Flight Time

Flight Time shows the elapsed time in hours and minutes (00:00 to 99:59) from departure. If the Flight Timer is not started the value will be replaced with dashes. The Flight Timer options are set in the System Functions (see page 72).

```
Flt Time 00:07   Time 13:15 UTC
```

Time UTC

Time is displayed using the 24 hour clock based on Universal Coordinated Time. Units are hours and minutes (00:00 to 23:59).

Estimated Time of Arrival (ETA)

The first ETA is to the current TO waypoint at the current Ground Speed from the present position. The second ETA uses the total flight plan distance remaining to the last waypoint in the flight plan based on the current Ground Speed. The destination waypoint is displayed. Units are hours and minutes (00:00 to 23:59) based on the UTC 24 hour clock. The values will be replaced with dashes if the speed is less than 5 knots, there is no valid GPS position, or the TO and destination waypoints are blank.

```
ETA EUG    00:11
```

Emergency Search

An important safety feature of the SL50/60 is its ability to locate waypoints closest to your position. Should you have to land quickly, you can use this feature to locate a nearby waypoint, assign it as a destination, and quickly navigate to it. Besides the nearest waypoints to your present position, you can also select a reference waypoint from the database and search for waypoints near to it. You can set up the Emergency Search function to filter for certain airport types you select, such as: runway length, lighting, and surface type.

Starting Emergency Search

1. In the SL50, press the **NRST** key. In the SL60, press the **MSG** key twice. Turn the **Large** knob to display the waypoint type and options: Airport (ARPT), VOR, NDB, Intersection (INT), User (USER), Choose Reference Waypoint, Runway Limits, and Special Use Airspace.

NRST

MSG   MSG

ENT

```
ARPT  1 SLE    BRG 075°  ↑ 17.3NM
```

2. Turn the **Small** knob to display the nearest 20 waypoints. The waypoints must be within 600

miles of your present position. The Bearing and Distance to the displayed waypoint is shown on the right side of the display. Press **ENT** to set the displayed waypoint as the new destination (TO) waypoint.

Searching Around a Reference Waypoint

Use this function to search for the 20 nearest waypoints within 600 miles of a reference waypoint selected from the database.

1. While in the Emergency Search function, turn the **Large** knob to view "Choose Reference Waypoint" and press **ENT**.

```
Choose Reference Wpt:  Press ENT
```

2. The first character of the airport identifier will flash. You can also press **SEL** a second time to make the entire field flash. Turn the **Small** knob to change characters. Turn the **Large** knob to select another field to change.

```
aSLE   c SALEM        OR USA
```

3. Turn the **Large** knob to cause the waypoint type to flash. Turn the **Small** knob to choose Airport (a), VOR (v), NDB (n), or User (u) waypoint type.

```
aBOI   c BOISE        ID USA
```

4. Press **ENT** to accept the displayed waypoint as the reference waypoint.

```
ARPT  1 BOI    Brg 344°   0.0nm
```

5. Turn the **Small** knob to view the nearest 20 waypoints.

Setting Runway Limits
Narrow the type of airports that you will accept by choosing the runway length, lighting, and surface type.

1. While in the Emergency Search function, turn the **Large** knob to view the "Runway Limits" display.

```
Rwy Limits:H/S/W Ft:0      Lit:No
```

2. Press **SEL**. The runway length value will flash. Turn the **Small** knob to select the minimum runway length you want considered. Choosing a length of 0 feet means you will accept any runway length.

```
Rwy Limits:H/S/W Ft:3500  Lit:No
```

3. Turn the **Large** knob to move to the next selection. With the "Lit" value flashing, turn the **Small** knob to choose "Yes" or "No" for the runway lighting requirement.

```
Rwy Limits:H/S/W Ft:3500     Lit:Yes
```

4. Turn the **Large** knob to cause the runway surface type to flash. Turn the **Small** knob to choose from the Hard (H), Soft (S), or Water (W) surface types. Soft refers to grass, dirt, or gravel runways.

```
Rwy Limits:H/S Ft:3500     Lit:Yes
```

5. Press **ENT** to save your choices.

Special Use Airspace

When searching around your present position, the first ten airspaces within 100 miles are displayed. If you are using the Simulator, the first 20 airspaces within 100 miles are displayed. While searching for airspaces, the keys and knobs are disabled and the following display will appear.

```
Searching for Airspaces...
```

The information for airspaces includes: name, position in the list (1-10), type, and proximity. Proximity is indicated as either: Soon, Outside, Inside, or Close. Criteria for airspace searches is set in the System functions (see pages 66 and 98).

```
KANSAS CITY    1 Class B OUTSIDE
```

INFO

1. Press the **INFO** key to view information about the airspace. Bearing and Distance values are towards the closest point on the airspace boundary, whether you are inside or outside the airspace.

```
KANSAS CITY    1 Brg 210°+17.1nm
```

2. Turn the **Small** knob to view more information about the airspace. "MSL" stands for feet above Mean Sea Level. "AGL" stands for feet Above Ground Level.

```
KANSAS CITY    1 Ceil: 8000 msl
```

Values for ceiling and floor may be any number of positive feet less than 100,000. Values may also be Unlimited, Ground, FL (Flight Level, followed by a number such as 050), Unknown, or NOTAM.

```
KANSAS CITY    1 Floor:UNLIMITED
```

The Nearest Airspace list is updated periodically as your aircraft moves and the following display will appear.

```
Re-Organizing Airspaces...
```

Parallel Track Offset

This function allows you to create a parallel course offset to the left or right from your current FROM-TO course from 0.1 to 20.0 nm. You must have FROM and TO waypoints defined. Parallel Track cannot be activated if you set a course using Direct-To. Transitions between flight plan legs cannot be greater than 120 degrees. Parallel tracks that would force backtracking are not allowed. You select Parallel Track to be "In Use" or on "Standby," choose Left or Right of the current course, and the offset distance. The PTK annunciator (if installed) will turn on when Parallel Track is enabled.

1. In the Nav function, turn the **Large** knob to display Parallel Track.

```
PTK Offset RIGHT 12.4nm  Standby
```

2. Press **SEL**. The activation field will flash. Two states are available: In Use or Standby. If Parallel Track is in use, "Standby" will flash. If Parallel Track is on Standby, "In Use?" will flash. Turn the **Large** knob to choose In Use or Standby. Press **ENT** to activate the Parallel Track settings when you are finished.

```
PTK Offset RIGHT 12.4nm  Use?
```
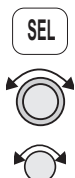
3. Press **SEL** and then turn the **Large** knob to the direction field. Turn the **Small** knob to choose Left or Right.

```
PTK Offset LEFT 12.4nm  In Use
```
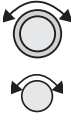
4. Turn the **Large** knob to the distance field. Turn the **Small** knob to select the offset distance.

```
PTK Offset LEFT   2.5nm  In Use
```

5. After making your choices, press ENT. A "p" will replace the waypoint type to indicate that Parallel Track is in use. The MSG annunciator will flash and a message will state that Parallel Track is in use. Using Direct-To will cancel Parallel Track.

GPS Position

The GPS Position page shows the calculated Latitude and Longitude, as well as its Position Dilution of Precision (PDOP). Lower PDOP values are better than higher values. *See the Glossary for more details.*

In the Navigation function, turn the **Large** knob to display the GPS Position page.

```
44°10.11N 123°15.84W  PDOP  0.0
```

Countdown Timer

The Countdown Timer allows you to set a timer that will alert you when it expires with a flashing MSG annunciator. The maximum time is 99:59:59 (hours, minutes, seconds). The default time on power up is the previous time that was entered. The factory default time is 00:03:00 (3 minutes). Pressing **SEL** will reset the Countdown Timer to your last selected value.

1. While in the Navigation function, turn the **Large** knob to view the Countdown Timer page.

2. Press **SEL** to start editing. The minutes value will flash.

```
Countdown Timer         00:03:00
```

3. Turn the **Large** knob to move between the time value fields.

```
Countdown Timer        00:05:00
```

4. Turn the **Small** knob to edit the hours, minutes, or seconds value.

```
Countdown Timer        01:05:00
```

5. Press **ENT** to start the timer at the selected time value.

6. After the Countdown Timer value expires, press the **MSG** key to note the time out message.

From/To/-Next Waypoint

The From/To/Next Waypoint page allows you to create a three waypoint mini-flightplan while within the Nav function. These waypoints are like a three waypoint window into your Active Flight Plan. Changes to this page or to the Active Flight Plan changes the other one. Select waypoints from the database including the following types: airport (a), VOR (v), NDB (n), Intersection (i), and User-defined (u). You can search for waypoints by facility identifier, waypoint type, or by facility name.


```
aSLE    TO  vUBG    NEXT aPDX
```
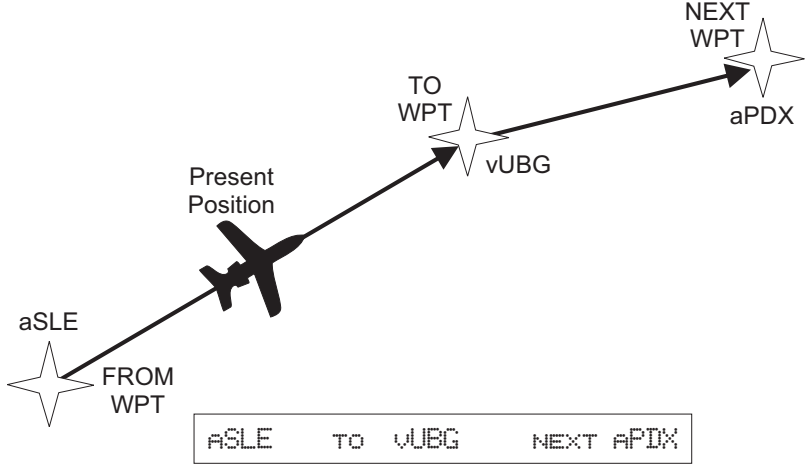
Creating From/To/Next Waypoints
From Waypoint

1. While in the Navigation function, turn the **Large** knob to view the From/To/Next page.

```
------    TO  ------    NEXT ------
```

2. Press **SEL** to start editing. Turn the **Large** knob to select the From (first) waypoint position. Turn the **Small** knob so the flashing selection shows Ins? (Insert). Press **ENT**.

```
Ins?    TO  ------    NEXT ------
```

3. Turn the **Large** knob ccw one position to the waypoint type. Choose Airport (a), VOR (v), NDB (n), Intersection (i), or User-defined (u) with the **Small** knob.

```
vABA   F ARUBA           ANTILL
```

4. Turn the **Large** knob clockwise one click to move to the first character of the waypoint name. The first character of the waypoint name will flash. Turn the **Small** knob to select the desired character.

```
a6S4   c GATES           OR USA
```

5. Turn the **Large** knob clockwise one click to move to the next character. Turn the **Small** knob to select the desired character. Continue to select additional characters.

```
aEUF   c EUFAULA         AL USA
```

6. Turn the **Large** knob clockwise one click to move to the next character. Turn the **Small** knob to select the desired character. Continue to select the needed characters.

```
aEUG   c EUGENE          AL USA
```

8. Press **ENT** when you have selected the desired departure waypoint.

```
aEUG   TO   ------   NEXT ------
```

APOLLO

To Waypoint

SEL

1. Press **SEL** and move to the To waypoint with the **Large** knob.

```
aEUG   TO   Ins?    NEXT   _____
```

ENT

2. The insert (Ins?) choice will flash. Press **ENT** and then select the To waypoint as you did for the From waypoint.

ENT

3. After selecting a To waypoint, press **ENT**.

```
aEUG   TO   aSLE    NEXT   _____
```

Next Waypoint

SEL

1. Press **SEL** and move to the Next waypoint with the **Large** knob.

```
aEUG   TO   aSLE    NEXT   Ins?
```

ENT

2. The insert (Ins?) choice will flash. Press **ENT** and then select the Next waypoint as you did for the From waypoint.

ENT

3. After selecting a Next waypoint, press **ENT**.

```
aEUG   TO   aSLE    NEXT   HIO
```

Editing

1. While in the Navigation function, turn the **Large** knob to view the From/To/Next page.

2. Press **SEL** to start editing.

3. Turn the **Large** knob to select the From, To, or Next waypoint field to edit.

4. The flashing selection will ask you to choose between Ins (Insert), Chg (Change), or Del (Delete). The TO waypoint can also be placed on Hold or To (active). When a waypoint is deleted, its position will be replaced by dashes.

Placing the To Waypoint on Hold

1. Press **SEL** and move to the To designation with the **Large** knob. You can also place the To waypoint on hold by pressing the external **WPT SEQ** button, when it is installed. The HOLD annunciator will light when it is installed.

```
aEUG   TO   aSLE   NEXT  HIO
```

2. Turn the **Small** knob to choose Hold? Placing the To waypoint on Hold suspends waypoint sequencing.

```
aEUG   HOLD?   aSLE   NEXT  HIO
```

3. Press **ENT**.

Reverse the operation to return to normal sequencing.

Using Direct-To

Pressing the **Direct-To** key sets the From location as your present position. When using the Direct-To function, the From waypoint identifier is overwritten with the word "Direct." If you remove the Direct-To position with the Del? option, the old From waypoint is returned to that position. If you edit the From position, Direct-To navigation will be replaced by the new entered waypoint. Activating Direct-To will disable Parallel Track.
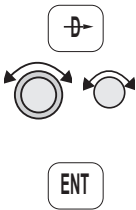
1. Press the **Direct-To** key.

2. Select the waypoint using the **Small** and **Large** knobs.

3. Press **ENT**.

Direct-To OBS

Pressing the **Direct-To** key twice starts the OBS desired track editor. This feature is useful for defining the inbound course for holding patterns. OBS Desired Track allows entry of a desired track to the current To waypoint. The current desired track in the navigation pages will be replaced by the OBS Desired Track value entered. Waypoint sequencing at the To waypoint is automatically inhibited; placed on Hold.

1. Press **Direct-To** twice. The first character of the Desired Track value will flash. Turn the **Small** knob to change the value. This value defaults to the current inbound course for the active waypoint.

```
OBS DTK: 329°   To SLE
```

2. Turn the **Large** knob to move to the next character. Turn the **Small** knob to change the value.

```
OBS DTK: 279°   To SLE
```

3. Press **ENT** when the desired track value is complete.

Waypoint Functions

Waypoint Information

The Apollo SL50/60 provides an extensive built-in database of waypoint information to aid the navigator. Waypoints in the database are divided into 5 categories. This structure allows you to easily select a waypoint as a destination, search for waypoint information, search for nearest waypoints, or insert waypoints into a flight plan.

The waypoint types are:
- Airports (ARPTs)
- Very high frequency omniranges (VORs)
- Non-directional beacons (NDBs)
- Enroute intersections (INTs)
- User created (USERs)

Available Waypoint Information

The following information is available for each waypoint type. Use the waypoint INFO function to get this information as the Introduction describes in "Waypoint Information."

ARPT Waypoint Information
- Bearing and distance from present position
- Airport type
- Airport elevation
- Fuel availability by type
- Runway length(s) and surface type
- Radio communication frequencies (an asterisk at the frequency indicates part-time availability)
- Lat/Lon coordinates
- Identifier
- City/Facility name
- Waypoint comments

VOR Waypoint Information
- Identifier
- Name
- Radial and distance from the VOR
- Bearing and distance from present position
- Operating frequency
- Lat/Lon coordinates

NDB Waypoint Information
- Bearing and distance from present position
- Operating frequency
- Lat/Lon coordinates
- Identifier
- Name

INT Waypoint Information
- Country
- Bearing and distance from present position
- Identifier
- Lat/Lon coordinates

USER Waypoint Information
- Bearing and distance from present position
- Distance from present position
- Lat/Lon coordinates
- Runway Length
- Identifier
- Waypoint comments

Getting Information about a Waypoint

You can access the Waypoint database by either looking directly or by using a feature that draws information from the database, such as using Emergency Search or creating a Flightplan. This section will describe going directly into the database, the other methods of using the waypoint database will be covered in the sections about the specific features.

1. In the SL50, press the **WPT** key. In the SL60, press the **SYS** key, turn the **Large** knob to view the "Access Database" page, and then press **ENT**.

```
a͟AAF    c APALACHICOLA    FL USA
```

2. Select the waypoint type. Turn the **Large** knob one click ccw. Choose Airport (a), VOR (v), NDB (n), Intersection (i), or User-defined (u) with the **Small** knob.

```
a͟AAF    c APALACHICOLA    FL USA
```

3. Turn the **Large** knob clockwise one click to move to the first character of the waypoint name. Turn the **Small** knob to select the desired character.

```
aP͟AE    c EVERETT        WS USA
```

4. Turn the **Large** knob clockwise one click to move to the next character. Turn the **Small** knob to select the desired character. Continue to select the needed characters.

```
aPD͟X    c PORTLAND        OR USA
```

5. You can also select the waypoint by the facility name. As you turn the **Large** knob to the "c", a "+" may appear.

```
aPDX  +c PORTLAND        OR USA
```

Multiple facilities or cities with the same name will have a "+" beside the name.

6. Press **SEL** so the whole name flashes.

```
aPDX   +c PORTLAND        OR USA
```

7. Turn the **Small** knob to view the waypoints with the same city or facility name.

```
aHIO   +c PORTLAND        OR USA
```

8. Press **INFO** to view information about the selected waypoint.

```
aHIO   +F PORTLAND-HILLSBORO OR USA
```

9. Press **ENT** or **INFO** to leave the function.

Database Update

The SL50/60 can have its waypoint database updated to allow you to keep your information current. Connect your SL50/60 to the serial port of a PC with the appropriate cable. Use II Morrow's Waypoint Manager software to perform the update.

1. In the Waypoint Database, turn the **Large** knob to the Database Update page. Press **ENT** to start the updating. No controls may be used until the update is complete.

```
Database UPDATE:      Press ENT
```

2. The SL50/60 will provide a series of displays showing your progress during the update process. Follow the directions in the Waypoint Manager documentation.

Nearest (Emergency Search) Waypoint

An important safety feature of the SL50/60 is its ability to locate waypoints closest to your position. Should you have to land quickly, you can use this feature to locate a nearby waypoint, assign it as a destination, and quickly navigate to it. Besides the nearest waypoints to your present position, you can also select a reference waypoint from the database and search for waypoints near to it. You can set up the Emergency Search function to filter for certain airport types you select, such as: runway length, lighting, and surface type. See page 25 in the Navigation Basics section for more details on using Emergency Search.

Starting Emergency Search

NRST

MSG MSG

1. In the SL50, press the **NRST** key. In the SL60, press the **MSG** key twice.

2. Turn the **Large** knob to display the waypoint type and options: Airport, VOR, NDB, Intersection (INT), User waypoints, Choose Reference Waypoint, Runway Limits, and Special Use Airspace.

-D-

ENT

3. Turn the **Small** knob to display the nearest 20 waypoints. The waypoints must be within 600 miles of your present position. The Bearing and Distance to the displayed waypoint is shown on the right side of the display. Press **Direct-To** and then **ENT** to set the displayed waypoint as the new destination (TO) waypoint.

Create User Waypoint by Lat/Lon

The Apollo SL50/60 allows you to create up to 200 of your own waypoints to the waypoint database. You can create a waypoint based on a Lat/Lon or using a radial and distance from another waypoint. You can also add the runway length.

1. In the SL50, press the **WPT** key. In the SL60, press the **SYS** key, turn the **Large** knob to view the "Waypoint Database" page, and then press **ENT**.

2. Turn the **Large** knob to view the "Create User Wpt By Lat/Lon" page.

```
Create User Wpt By Lat/Lon:   ENT
```

3. Press **ENT**.

```
#000   USER   44°24.29N 122°51.52W
```

4. Turn the **Small** knob to select the desired character.

```
H000   USER   44°24.29N 122°51.52W
```

5. Turn the **Large** knob clockwise one click to move to the next character. Turn the **Small** knob to select the desired character. Continue to select the needed characters for the Waypoint Name, Latitude, Longitude, and Runway Length.

```
HOME   USER   44°24.29N 122°51.52W
```

5. Runway Length is not shown on the first page of the waypoint. Turn the **Large** knob cw past the last Lat/Lon value or ccw before the first character of the waypoint name to view the Runway Length.

```
HOME  USER Rwy Length:  0000 ft
```

6. A Runway Length digit will flash. Turn the **Small** knob to change the value. Turn the **Large** knob to move to another character.

```
HOME  USER Rwy Length:  3500 ft
```

7. Press **ENT** when you have finished entering the waypoint information.

Create User Waypoint by Radial/-Distance

1. In the SL50, press the **WPT** key. In the SL60, press the **SYS** key, turn the **Large** knob to view the "Waypoint Database" page, and then press **ENT**.

ENT

2. Turn the **Large** knob to view the "Create User Wpt By Rad/Dis" page. Press **ENT**. The first character of the radial will flash.

    REF WPT: AAF   000.0°   000.0NM

ENT

3. Select the Reference Waypoint. Turn the **Large** knob ccw one click to select the waypoint identifier which will be replaced by the change prompt (Chg?). Press **ENT** to change the waypoint identifier.

    REF WPT: CHG?   000.0°   000.0NM

ENT

4. Turn the **Small** knob to select the desired character. Turn the **Large** knob clockwise one click to move to the next character. Turn the **Small** knob to select the next desired character. After the reference waypoint name is chosen, press **ENT**.

    REF WPT: SLE   000.0°   000.0NM

5. Now select the needed characters for the Radial and Distance. Turn the **Small** knob to change characters. Turn the **Large** knob to move to the next character.

    REF WPT: SLE   040.0°   012.0NM

6. Press **ENT** when you have finished entering the waypoint information. You will be prompted to create a name for the waypoint.

```
#000  USER  44°10.96N 121°43.35W
```

7. Now, use the **Large** and **Small** knobs to enter the waypoint name. You can also adjust Lat/Lon and add the Runway Length. Press **ENT** when you are finished.

```
CABIN  USER  44°10.96N 121°43.35W
```

Note

You should never create a Radial/Distance User waypoint from another Radial/Distance User waypoint. "Chaining" this type of waypoint in a string may cause additive errors in the waypoint position.

Delete User Waypoint

1. In the SL50, press the **WPT** key. In the SL60, press the **SYS** key, turn the **Large** knob to view the "Waypoint" page, and then press **ENT**.

2. Turn the **Large** knob to view the "Delete User Waypoint" page.

```
Delete User Wpt:      Press ENT
```

3. Press **ENT**. Turn the **Small** knob to view the User waypoints.

```
WPT to Delete: CABIN   Press ENT
```

4. When the waypoint to delete is displayed, press **ENT**.

Modify User Waypoint

1. In the SL50, press the **WPT** key. In the SL60, press the **SYS** key, turn the **Large** knob to view the "Waypoint Database" page, and then press **ENT**.

2. Turn the **Large** knob to view the "Modify User Waypoint" page. Press **ENT**.

ENT

```
Modify User Wpt:      Press ENT
```

3. Turn the **Small** knob to view the User waypoints.

```
WPT to Modify: CABIN    Press ENT
```

ENT

4. When the waypoint to modify is displayed, press **ENT**.

5. Turn the **Small** knob to select the desired character.

6. Turn the **Large** knob clockwise one click to move to the next character. Turn the **Small** knob to select the desired character. After the correct characters are chosen, press **ENT**.

ENT

Waypoint Comments

You may add comments to up to 200 waypoints. The comments are added while viewing the Info for a waypoint.

INFO

1. While viewing the desired waypoint, press **INFO**. Turn the **Small** knob to the Waypoint Comment page and press **SEL**.

SEL

```
Waypoint Comment:      Press SEL
```

2. Turn the **Large** and **Small** knobs to edit the comment. Press **ENT** to save the comment.

```
900FT TOWER 14NM NW OF AIRPORT
```

ENT

Flight Plan Functions

Flight plans are specific routes between waypoints you may store in the Apollo SL50/60's memory. This information is used to calculate useful flight statistics. The Flight Plan function allows you to have up to 10 stored flight plans. Each flight plan may have up to 20 legs. The Active flight plan is always used for the current flight. Inactive flight plans may be activated in the Flight Plan function to be copied into the Active flight plan. The From-To-Next waypoint page in the Nav function is a two-leg window of the Active Flight Plan showing the current and next leg.

Flight Plan Leg pages show the leg number and *From* and *To* waypoint identifiers on the display, along with the bearing and distance between the *From* and *To* waypoints. One asterisk (*) next to the leg number means that the displayed leg is in the Active flight plan. Two asterisks (**) mean that the displayed leg shows the current *From* and *To* waypoints which are being used for navigation.

Flight Plan Pages

The first page of each flight plan is the Name Page. The Name Page displays the flight plan name, total distance, and the destination waypoint. Distance is displayed as 0.0 to 99.9 nm at 0.1 nm resolution and 100 to 99999 nm at 1 nm resolution. A diamond ✢ at the right side of the display indicates that more pages can be viewed by turning the **Small** knob.

Reaching the Flight Plan Function

1. Press **SYS** to reach the System function and then press **SYS** a second time, or turn the **Large** knob, to reach the Flight Plan access display.

```
Flight Plans:        Press ENT
```

2. Press **ENT** to enter into the Flight Plan function.

Active Flight Plan

The first plan in the Flight Plan function is the Active plan and is noted by the name *Active* with asterisks. This name cannot be changed in the Active page.

```
*Active*   259nm   Dest: PDT   *
```

Creating a Flight Plan

The basic steps for creating a flight plan include: entering the plan name and inserting waypoints. You may then view flight plan information, activate the plan, and use the other options.

WPT5

Leg 4   WPT4

Leg 3

Present Position

WPT2   Leg 2   WPT3

Leg 1

WPT1 (Departure WPT)
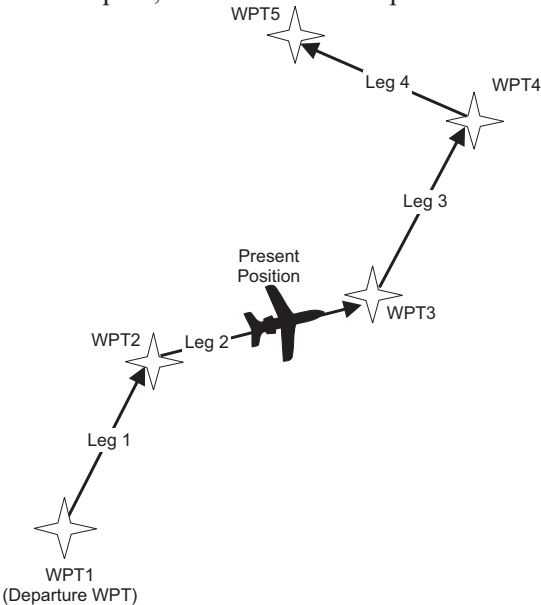
1. In the Flight Plan function, turn the Large knob to view the "Create a New Flightplan: SEL" page.

SYS

```
Create a New Flightplan:      SEL
```

2. Press **SEL**.

SEL

```
_____    Enter a New Plan Name
```

3. Turn the **Small** knob to select the first flight plan name character.

```
R_____      Enter a New Plan Name
```

4. Turn the **Large** knob clockwise one click to move to the next character position. Turn the **Small** knob to select the next name character. You can have up to eight characters in the flight plan name.

```
ROUTE 2    Enter a New Plan Name
```

5. Press **ENT** when the name is complete. A message will display telling you to turn the **Small** knob to insert waypoints or to press **SEL** for options. Options can be selected later.

```
Sml Knob: Ins Wpts  SEL: Options
```

6. After turning the **Small** knob, the Ins? Prompt will flash in the From waypoint position. Press **ENT** to insert a From waypoint.

```
1   Ins?  ÷ _____    Press SEL
```

7. Turn the **Small** knob to select the first character.

```
1   aE___  ÷ _____    000°  0.0nm
```

8. Turn the **Large** knob clockwise one click to move to the next character position. Turn the **Small** knob to select the next name character. After selecting the waypoint name, press **ENT**.

```
1   aEU__  ÷ _____    000°  0.0nm
```

ENT

9. The Ins? Prompt will flash in the To waypoint position. Press **ENT**.

```
1   ⌐EUG   �División ΞNΞ?   000°  0.0ΝΜ
```

10. Repeat steps 7-9 for the remaining waypoints in your flight plan.

SEL

11. Press **SEL** when your flight plan is complete.

Flight Plan Leg Information

Two types of information are available within flight plan legs. Pressing **INFO** will provide information about the destination waypoint. Information about the ETA, ETE, Ground Speed, and Fuel is also available for each leg by selecting which option you like to view in the leg display.

SEL

1. While viewing a flight plan leg, press **SEL**. The From waypoint field will flash.

```
1**   CHG?  ⇒ ⌐SLE   353°  48.0ΝΜ
```

2. Turn the **Large** knob ccw one click to choose the Bearing and Distance field for selection.

```
1**   CHG?  ⇒ ⌐SLE   353°  48.0ΝΜ
```

3. Turn the **Small** knob to choose from the list of available leg information options.

```
1**   CHG?  ⇒ ⌐SLE   LEGETE 00:28
```

ENT

4. Press **ENT** to keep your choice displayed or press **SEL** to cancel viewing and return to the Bearing and Distance information.

ETA

Estimated Time of Arrival is for the displayed To waypoint. It is available only in the Active flight plan and requires an actual ground speed of more than 5 knots. If there is no valid ETA for the leg, dashes will replace the value.

```
1 ** ⌐EUG    ÷ ⌐SLE    ETA 00:26
```

ETA?

ETA? is the same as ETA, except the Estimated Ground Speed is used for the calculation.

```
1 ** ⌐EUG    ÷ ⌐SLE    ETA? 00:27
```

Leg ETE

The Estimated Time Enroute between the displayed From and To waypoints. Leg ETE requires an actual ground speed of more than 5 knots. If there is no valid ETA for the leg, dashes will replace the value.

```
1 ** ⌐EUG    ÷ ⌐SLE  LegETE 00:28
```

Leg ETE?

Leg ETE? is the same as ETE, except the Estimated Ground Speed is used for the calculation.

```
1 ** ⌐EUG    ÷ ⌐SLE  LegETE?00:30
```

ETE

Estimated Time Enroute in the Active flight plan is from your present position. In an inactive flight plan, ETE uses the From waypoint. ETE requires an actual ground speed of more than 5 knots. If there is no valid ETE for the leg, dashes will replace the value.

```
1 ** ⌐EUG    ÷ ⌐SLE    ETE 00:24
```

ETE?

ETE? is the same as ETE, except the Estimated Ground Speed is used for the calculation.

```
1 ** ₐEUG    ÷  ₐSLE    ETE? 00:24
```

Fuel?

Fuel? shows the amount of fuel required to get from the From waypoint to the To waypoint for an inactive plan or from the present position to the To waypoint for the Active flight plan. Legs previous to the current one are dashed.

```
1 ** ₐEUG    ÷  ₐSLE  Fuel?--5usg
```

In the Active flight plan, the Fuel? calculation uses the Estimated Fuel Usage value and the actual ground speed. The Estimated Fuel Usage value must be greater than zero, and the actual ground speed must be greater than 5 knots. If there is no valid Fuel? for the leg, dashes will replace the value. *See Estimated Fuel Flow on page* 57.

In an inactive flight plan, the Fuel? calculation uses the Estimated Fuel Usage value and the estimated ground speed. The Estimated Fuel Usage value must be greater than zero, and the actual ground speed must be greater than 5 knots. If there is no valid Fuel? for the leg, dashes will replace the value. *See Estimated Ground Speed on page* 57.

Direct-To

If the leg page displayed is the currently active leg of the Active flight plan, and a Direct-To waypoint has been entered, the From waypoint will say "Direct." The leg just prior to the currently active leg displays the leg as if the "direct" waypoint did not exist. After sequencing, the "Direct" disappears, and the currently active leg once again displays the waypoint identifier. See page 36 for more details on using the Direct-To function.

```
1** Direct → A6S4    034° 39.3nm
```

Manual Leg Activation

While viewing a leg page of the Active flight plan, pressing **ENT** will provide the option for making the displayed leg the active leg.

```
3*    Press ENT to Activate leg
```

Flight Plan Editing

You can alter any of the information you entered into the flight plans. The editing options include: Chg?, Ins?, and Del?

• Chg? - An existing waypoint can be changed.

• Ins? - A waypoint can be inserted before an existing waypoint. Inserting a new waypoint into the Active flight plan before or after the current leg does not affect the currently active leg. Inserting a new waypoint before the active leg's To waypoint will immediately change navigation to the new To waypoint.

• Del? - An existing waypoint can be deleted if it is not one of only two waypoints in the Active flight plan. A Direct-To waypoint can always be deleted. When the "Direct" indicator is deleted, the waypoint that was overwritten by "Direct" will return as the original From waypoint. If you delete the current To waypoint, the Next waypoint, if available, becomes the current To waypoint. If the last To waypoint is deleted, the previous From waypoint becomes the current To waypoint and the

active leg number will be reduced (i.e. from leg 7 to leg 6).

Changing Existing Flight Plan Legs
1. In the Flight Plan function, turn the **Large** knob to a flight plan and then use the **Small** knob to display the leg of the plan that you want to edit.

```
2*  ⌐SLE  →  ⌐HIO   345°  37.9ɴᴍ
```

2. Press **SEL**. The From waypoint will flash with the Chg? prompt. Turn the **Large** knob to the desired waypoint.

```
2*  C̲ʜ̲ɢ̲?̲  →  ⌐HIO  345°  37.9ɴᴍ
```

3. Press **ENT**. This takes you into the waypoint database. Use the **Large** and **Small** knobs to select the desired waypoint and then press **ENT**.

```
⌐6S4̲   c GATES        OR USA
```

Inserting a New Waypoint
1. In the Flight Plan function, display the leg of the plan that you want to edit.

```
3*  ⌐6S4  →  ⌐PDT   050°   162ɴᴍ
```

2. Press **SEL**. The From waypoint will flash with the Ins? prompt. Turn the **Large** knob if necessary to the waypoint you want changed.

```
3*  ⌐6S4  →  I̲ɴ̲s̲?̲   050°   162ɴᴍ
```

3. If another option was last used, turn the **Small** knob to choose Ins?.

```
3*  a6S4   →  Ins?   050°  162nm
```

5. Press **ENT**. Use the **Large** and **Small** knobs to select the desired waypoint.

```
a5J0    c JOHN DAY       OR USA
```

6. After selecting the waypoint name, press **ENT**.

```
3*  a6S4   → a5J0   079°  149nm
```

Deleting a Waypoint
1. In the Flight Plan function, display the leg of the plan that you want to edit.

```
3*  a6S4   → a5J0   079°  149nm
```

2. Press **SEL**. The From waypoint will flash with the Chg? prompt. Turn the **Large** knob to the waypoint you want changed.

```
3*  a6S4   →  Del?  079°  149nm
```

3. Turn the **Small** knob to choose Del?. Press **ENT**. The waypoint will be deleted. Each flight plan leg will shift back to replace the deleted leg, i.e. after deleting leg 3, leg 4 will then become leg 3.

```
3*  a6S4  →  aPDT   050°  162nm
```

Flight Plan Options

In the Flight Plan function you may make changes to the active flight plan.

1. In the Flight Plan function turn the **Large** knob to the active flight plan.

2. Press **SEL** and then turn the **Small** knob to view the available functions.

3. Press **ENT** to activate the option.

Activate
Pressing **ENT** when the "Activate" option is displayed copies the selected inactive flight plan to the active plan and activates the plan starting at Leg 1. If you have gone past a given leg, the next appropriate leg will be activated. In the Flight Plan function, turn the **Large** knob to view the available flight plans.

```
Route 2    259nm      Activate?
```

Rev Activate
Pressing **ENT** when the "Rev Activate" option is displayed copies the selected flight plan to the active plan in reverse waypoint order and starts it at leg 1.

```
Route 2    259nm   Rev Activate?
```

Reactivate
Pressing **ENT** when the "Reactivate" option is displayed resets the active leg to leg 1 and allows waypoint sequencing.

```
Route 2    259nm      Reactivate?
```

Rename
Pressing **ENT** when the "Rename Plan" option is displayed lets you rename the flight plan. Duplicate names are not allowed.

```
Route 2    259nm   Rename Plan?
```

Copy Plan

Pressing **ENT** when the "Copy Plan" option is displayed allows you to copy any existing plan into the current plan, overwriting all of the current plan's waypoints.

```
Route 2    259nm    Copy Plan?
```

Estimate Ground Speed

Pressing **ENT** when the "Est Gr Speed" option is displayed allows you to enter an estimated ground speed value to be used in estimating some leg info options, such as estimated fuel flow.

```
Route 2    259nm    Est Gr Speed?
```

The estimated ground speed can be entered from 000 to 999 knots.

Clear Waypoints

Pressing **ENT** will delete all waypoints in the selected flight plan. The plan name will remain.

```
Route 2    259nm    Clear Wpts?
```

Reverse Flight Plan

Pressing **ENT** when the "Reverse" option is displayed reverses all the waypoints in the current flight plan. This option is available only on inactive flight plans with two or more waypoints.

```
Route 2    259nm    Reverse?
```

Estimated Fuel Flow

Pressing **ENT** when the "Est Fuel Flow" option is displayed allows you to enter an estimated fuel usage value to be used in estimating one of the leg info options.

```
Route 2    259nm    Est Fuel Flow?
```

The estimated fuel flow can be selected from 0000 to 9999 units per hour. The units may be set in the System function (see page 71). Pressing **ENT** saves the entered value if the value entered is less than or equal to 999 US gallons per hour, after any necessary conversions are performed. If the value is too large when **ENT** is pressed, it is truncated to the largest possible value for the units selected, and remains flashing for editing.

After entering the Estimated Fuel Flow, a four second help screen indicates either "Fuel To Uses Actual Gr Speed" or "Fuel To Uses Est Gr Speed," depending on whether the current flight plan is active or not.

Delete Plan
Pressing **ENT** when the "Delete Plan" option is displayed deletes the current flight plan. The display returns to the previous flight plan's name (or first) page. The *Active* flight plan cannot be deleted, in which case this option is not displayed.

```
Route 2    259nm    Delete Plan?
```

Hold
The Hold option is available for the Active flight plan when the flight plan status is Active (waypoint sequencing allowed). This function is used while viewing the Name Page.

1. In the Flight Plan function, turn the **Large** knob to display the Name Page.

```
*Active*    259nm    Dest: PDT    *
```

2. Press **SEL**. The "Hold?" option will flash.

```
*Active*    259nm          Hold?
```

ENT

3. Press **ENT** to place the active flight plan on hold. Waypoint sequencing will be inhibited. Waypoint sequencing remains inhibited until it is reenabled, even if you change waypoints or legs manually.

```
*Active*   Holding  Dest: PDT   *
```

Continue

The Continue option is available for the Active flight plan when the flight plan status is Holding (waypoint sequencing is not allowed). Pressing **ENT** when this option is displayed renews waypoint sequencing.

1. In the Flight Plan function, turn the **Large** knob to display the Name Page.

```
*Active*   Holding  Dest: PDT   *
```

SEL

2. Press **SEL**. The "Continue?" option will flash.

```
*Active*   259nm       Continue?
```

ENT

3. Press **ENT** to continue on the previously active flight plan. Waypoint sequencing will be enabled.

```
*Active*   259nm   Dest: PDT   *
```

Destination Waypoint Information

INFO

Normal waypoint information about the destination waypoint can be viewed by pressing **INFO** when the Plan Name Page is displayed. This is the same as pressing **INFO** to view information about a To waypoint, except that the Plan Comment page is available by turning the **Large** knob.

Flight Plan Comments

A flight plan comment page can be viewed and edited for each flight plan by pressing **INFO** when the Plan Name Page is displayed and the turning the **Large** knob.

If no plan comment has been entered, press **SEL** to create one.

INFO

1. While viewing the desired flight plan, press **INFO**.

SEL

2. Turn the **Large** knob to choose the Comment page and press **SEL**.

3. Turn the **Small** knob to select the first character.

4. Turn the **Large** knob clockwise one click to move to the next character position. Turn the **Small** knob to select the next name character.

ENT

5. After selecting the waypoint name, press **ENT**.

Copying the Active Flight Plan

You may copy the Active flight plan into an existing or new flight plan. This feature is useful if you have made changes en route that you want to keep.

1. Create a new flight plan or turn to an existing one to copy over.

SEL

2. Press **SEL**. Turn the **Small** knob to reach the "Copy Plan?" option.

```
New Wpt     0.0nm     Copy Plan?
```

ENT

3. Press **ENT**. The name "*Active*" will flash.

```
New Wpt     0.0nm     *Active*
```

ENT

4. Press **ENT** accept the copy.

System Functions

Pressing the **SYS** key allows you to access the System functions. After pressing the **SYS** key, turn the **Large** knob to view the available functions. Press **ENT** when viewing the desired System function.

Flight Plans Press **ENT** to reach the Flight Plan functions. The available pages include: the Active flight plan, inactive flight plans, and the page to create new flight plans. Complete details on using the Flight Plan function are available in the Flight Plan section.

```
Flight Plans:        Press ENT
```

Waypoint Database The Waypoint Database page allows you to view all of the waypoint information in the database. In the Apollo SL50, pressing the **WPT** key will take you into the Waypoint database. In the SL60, press **SYS**, turn the **Large** knob to the Waypoint Database page, and then press **ENT**.

```
Access Database:      Press ENT
```

1. The first character of the waypoint name flashes. Turn the **Large** knob ccw one click to select the waypoint type character. Turn the **Small** knob to select the Waypoint type.

```
aPDT   c PENDLETON      OR USA
```

2. Turn the **Large** knob clockwise to move to the first character of the waypoint name.

```
aPDT   c PENDLETON      OR USA
```

4. Turn the **Small** knob to select the first character.

```
aSAA   c SARATOGA       WY USA
```

5. Turn the **Large** knob clockwise one click to move to the next character position. Turn the **Small** knob to select the next name character.

```
aS20   c GOLDENDALE     WA USA
```

6. After selecting the waypoint name, press **ENT**.

7. Press **INFO** to view information about the waypoint.

```
aS21   c SUNRIVER       OR USA
```

See the section on the Waypoint Functions for complete details (page 37).

Com Radio Information (SL60 Only)
The Com Radio information page provides system level details about the operation of the Comm radio function. Information includes: software version, rf signal strength, audio noise level, side tone adjustment, intercom squelch, and headphone level.

1. Press **SYS** and then turn the **Large** knob to reach the Com Radio Information page.

```
COM Radio Info:       Press ENT
```

2. Press **ENT**.

```
COM Radio SW Version:    X.X
```

3. Turn the **Large** knob to view the available pages.

Software Version

1. Press **SYS** and then turn the **Large** knob to reach the Com Radio Information page. Press **ENT**.

```
COM Radio SW Version:        X.X
```

2. Software Version information is displayed.

RF Signal Strength
The RF Signal Level function shows the relative signal strength of the frequency you are listening to. The range displayed is between 0 and 255. The value will constantly change while you are viewing it as signal conditions change.

```
119.10  RF Signal Level:    087
```

Audio Noise Level
The Noise Level function shows the relative received noise level of the frequency you are listening to. The range displayed is between 0 and 255. The value will constantly change as you are viewing it as signal conditions change. A higher number indicates more noise.

```
119.10  Audio Noise Level:   087
```

Intercom Squelch Level Adjustment
The Intercom Squelch Level Adjustment page is used to display and adjust the Intercom Squelch level to match the sensitivity for your system and personal needs. The typical useful range is from approximately 230 to 250, with the higher number being more sensitive.

APOLLO

1. In the Com Radio Information function, turn the **Large** knob to the Intercom Squelch Level page.

```
Intercom Squelch:              187
```

2. Turn the **Small** knob to adjust the level.

```
Intercom Squelch:              197
```

3. The desired level will be activated as selected. You do not need to press **ENT**.

Sidetone Level Adjustment
The Sidetone Level Adjustment page is used to display and adjust the headphone sidetone level.

1. In the Com Radio Information function, turn the **Large** knob to view the Sidetone Level Adjustment page.

```
Sidetone Level:                187
```

2. Turn the **Small** knob to adjust the level.

```
Sidetone Level:                197
```

3. The desired level will be activated as selected. You do not need to press **ENT**.

Navigation Information

The Navigation Information function allows to make adjustments on the way information is shown in the Navigation function. The pages available include: Airspace Setup, Autonav Time, Nav Mode Display Programming, Magnetic Variation, Flight Timer Trigger, Direct-To Entry Option, and CDI Scaling.

1. Press the **SYS** key.

2. Turn the **Large** knob to reach the Navigation Information page and then press **ENT**.

```
Navigation Info:       Press ENT
```

Airspace Setup

The Airspace Setup selections allows you to turn Airspace notification On or Off, select the distance and time buffers, and to choose the Airspace types that will be used.

1. Press the **SYS** key. Turn the **Large** knob to reach the Navigation Information page and then press **ENT**.

2. Turn the **Small** knob to view the pages for Airspace Setup.

```
Airspace Setup  Alerts: ON     ✦
```

Airspace Buffers

Three values may be adjusted for Airspace Buffers for determining CLOSE information: distance, elevation, and time. CLOSE distance may be from 0 to 99 nm at one nm intervals. Time values are from 0 to 20 minutes in one minute intervals.

APOLLO

SEL

1. While viewing the Airspace Buffer page, press **SEL**.

```
Airspc Buffers:    2nm   10min
```

2. Turn the **Large** knob to select the desired value to change. Turn the **Small** knob to change the value.

```
Airspc Buffers:    3nm   10min
```

ENT

3. Press **ENT** when the desired values have been selected.

Airspace Selections
Thirteen Airspaces are available for selection: Class B, B Outer, Class C, C Outer, MOA, Training, Unknown, Alert, Caution, Danger, Restricted, Prohibited, and Warning. When Class B or C are "On", the airspace warning will be activated when your aircraft crosses the boundary of each airspace. Altitude is not used as a factor. When the Outer choice is selected, the airspace warning will be activated when your aircraft crosses the outside boundary of the airspace (see page 98).

1. Turn the **Small** knob to view the desired Airspace selection page.

```
CLASS B  : OFF  B OUTER  : ON
```

SEL

2. Press **SEL** to activate selection.

```
CLASS B  : OFF  B OUTER  : ON
```

3. Turn the **Large** knob to choose the Airspace type. Turn the **Small** knob to select ON or OFF.

```
CLASS B  : OFF  B OUTER  : OFF
```

ENT

🔄

4. Press **ENT** after selecting ON or OFF for each Airspace type. Turn the **Small** knob to view the other Airspace pages.

Autonav Time
Autonav Time is the delay time that each Navigation page will be displayed before rotating to the next page. Time may be selected from one to nine seconds.

SEL

1. While viewing the Autonav Time page, press **SEL**.

```
Autonav Time:     4 Seconds/Page
```

🔄

2. Turn the **Small** knob to select the delay time.

```
Autonav Time:     7 Seconds/Page
```

ENT

3. Press **ENT** when finished.

NAV

ENT

4. Press **NAV**. While viewing the Nav functions, Press **ENT** to start Autonav scrolling. Press **ENT** again to stop Autonav scrolling.

Navigation Mode Programmable Pages and Autonav Pages
This function allows you to customize both the look of the programmable basic navigation pages and the selection of pages used in the Autonav function. All basic Nav pages are programmable except the first (home) page.

Customizing Navigation Pages

SYS

🔄

ENT

1. Press the **SYS** key. Turn the **Large** knob to reach the Navigation Information page and then press **ENT**.

2. Turn the **Large** knob to reach Nav Mode Display Pages.

```
Nav Mode Display Pages        ✦
```

3. Turn the **Small** knob cw to view the second (first editable) Nav page.

```
     ☦ 0.002 Brg 128  77.5nm
```

4. Press **SEL** to activate editing. The first Nav field will flash.

```
     ☦ 0.002 Brg 128  77.5nm
```

5. Turn the **Small** knob to select the desired Nav information to be displayed in that field.

```
GroundSp 100kts Brg 128  77.5nm
```

6. Turn the **Large** knob to move to the next field to edit. Turn the **Small** knob to select the Nav information.

```
GroundSp 100kts ete 8S3   00:44
```

7. When you are finished selecting Nav page information, press **ENT**. You will be prompted to decide if you want to include this page in the Autonav scrolling.

```
Nav Page 2 in Autonav Pages?  Yes
```

9. Turn the **Small** knob to choose between Yes and No. Press **ENT**.

10. Turn the **Small** knob to view another Nav page and repeat steps 4-9.

Selecting Autonav Pages

1. While you are viewing a Nav page information page, press **SEL** and then **ENT**.

2. You will be prompted to decide if you want to include this page in the Autonav scrolling. Turn the **Small** knob to choose between Yes and No.

```
Nav Page 4 in Autonav Pages?  Yes
```

3. Press **ENT**.

Creating a New Custom Nav Page
Besides being able to customize most of the Nav pages, you can also create an entirely new one. You can select information for up to four fields on the display.

1. Press **SYS**. Turn the **Large** knob to Nav Info and press **ENT**. Turn the **Large** knob to the Nav Mode Display Pages.

```
Nav Mode Display Pages          ✦
```

2. Turn the **Small** knob to reach the new Nav Page display.

```
<Blank Nav Page>                ✦
```

2. Press **SEL** to start editing. The first field will flash showing a series of dashes.

```
------ ------ ------ ------ ------
```

3. Turn the **Small** knob to select the desired Nav information to be displayed in that field.

```
100kts
```

4. Turn the **Large** knob to move to the next field.

```
100kts _____
```

5. Turn the **Small** knob to select the desired Nav information to be displayed in the field.

```
100kts Brg 353
```

6. Use the **Large** and **Small** knobs to select information for the next field, if desired.

```
100kts Brg 353 ete SLE    00:22
```

7. Press **ENT** when you have finished selecting information for your custom Nav display. Choose Yes or No with the **Small** knob and then press **ENT**.

```
NavPage 8 in Autonav Pages?  Yes
```

Restoring Default Nav Pages

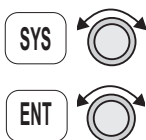1. While viewing the Nav Mode Display Pages, turn the **Small** knob to reach the Restoring Default Nav Pages display.

```
Restore Default Nav Pages:  ENT
```

2. Press **ENT** to delete any changes you have made in the Nav display pages and revert to the original (default) pages.

Setting Units

Nav displays that show distance may be selected to show either nautical miles or kilometers.

1. Press **SYS**. Turn the **Large** knob to Nav Info and press **ENT**. Turn the **Large** knob to the Nav Mode Display Pages.

```
Nav Mode Display Pages            ✦
```

2. Turn the **Small** knob to reach a programmable Nav page.

```
Dtk 353  48.0nm Trk 353 tae 000
```

3. Press **SEL** to start field selection. Turn the **Large** knob to the desired field.

```
Dtk 353  48.0nm Trk 353 tae 000
```

4. Turn the **Small** knob to select the field with different units. Press **SEL** to stop editing.

```
Dtk 353 89.10km Trk 353 tae 000
```

Magnetic Variation

Automatic or Manual Magnetic Variation can be set in this page. Automatic is the default setting on power-up, unless the database is invalid.

1. Press the **SYS** key. Turn the **Large** knob to reach the Magnetic Variation page and then press **SEL**.

```
Mag Variation:  Auto      18°E
```

3. Turn the **Small** knob to select Auto or Manual Magnetic Variation and then press **ENT**.

```
Mag Variation:   Manual      18°E
```

4. If you selected Manual Magnetic Variation, turn the Large knob to move to the variation value field.

```
Mag Variation:   Manual      18
```

5. Select the variation value with the **Small** knob.

```
Mag Variation:   Manual      19°E
```

6. Turn the **Large** knob to move to the E or W direction field. Turn the **Small** knob to select E or W and then press **ENT**. The MSG annunciator will flash and a message will note that you have selected manual magnetic variation.

```
Mag Variation:   Manual      19°E
```

Flight Timer Trigger

The following procedure is used to edit the flight timer trigger speed. The flight timer may be set to start at power-up, or when the ground speed exceeds from 10 to 500 knots. The default (factory) setting is 60 knots. The feature may also be turned off.

1. Press the **SYS** key.

```
Flt Timer Trigger:  At   60kts
```

2. Turn the **Large** knob to reach the Flight Timer Trigger page and then press **SEL**.

```
Flt Timer Trigger:   At   60kts
```

3. Turn the **Small** knob to select the speed value, "At Power On," or "OFF" and then press **ENT**.

Direct-To Entry Options

When you use Direct-To, the Active flight plan (and the From, To, Next information) is automatically updated.

If you use Direct-To to center the CDI needle for the current "To" waypoint, or skip past the To waypoint to another waypoint already in the Active flight plan, the current leg number of the Active flight plan will be updated, if needed, so that the Direct-To waypoint matches the current "To" waypoint. In these cases, the Direct-To Entry Option is not a factor.

The Direct-To Entry Option becomes a factor if you go Direct-To a waypoint which is *not* in the Active flight plan.

With the **May Clear** Direct-To Entry Option, the Direct-To waypoint will be inserted in the Active flight plan, *and all of the other waypoints will be deleted from the Active flight plan.*

With the **Never Clears** Direct-To option, the Direct-To waypoint is *inserted before the current To waypoint.*

The **May Clear** option is useful for the pilot who uses the Direct-To function for the majority of flight planning, and doesn't want to be bothered with a steadily increasing number of waypoints in the Active flight plan. The **Never Clears** option is useful when you need to vector off from the Active flight plan's path temporarily, resuming the previously entered flight plan at a later time, such as for a "cleared direct to the xyz VOR, rest of route unchanged" type of clearance.

The default setting for the Direct-To Entry is **Never Clears**. The Apollo SL50/60 retains the last

Direct-To Entry Option setting when it is powered up.

SYS

SEL

1. Press the **SYS** key. Turn the **Large** knob to reach the Direct-To page and then press **SEL**.

```
Direct-To Never Clears Active
```

2. Turn the **Small** knob to select "May Clear" or "Never Clears" and then press **ENT**.

ENT

```
Direct-To  May Clear   Active
```

CDI Scaling
The CDI Scaling option allows you to select manual or automatic full scale deflection of the internal CDI. Manual full scale deflection options include: 0.30 nm, 1.00 nm, and 5.00 nm. Automatic scaling will use 5.00 nm as the setting.

SYS

SEL

1. Press the **SYS** key. Turn the **Large** knob to reach the CDI Scaling page and then press **SEL**.

```
CDI Scaling: Auto    |·|·|·|·|·|·| 5.00nm
```

2. Turn the **Small** knob to select Automatic or Manual.

```
CDI Scaling: Manual |·|·|·|·|·|·| 5.00nm
```

3. If you chose manual, turn the **Large** knob to move to the distance value.

```
CDI Scaling: Manual |·|·|·|·|·|·| 5.00nm
```

4. Turn the **Small** knob to select the distance value and then press **ENT**.

```
CDI Scaling: Manual |⊦⊦⊣⊣⊦⊦| 1.00nm
```

System Information

The System Information area provides the following pages: Date and Time, Software and Database Version, Display test, and Owner Info.

Date and Time
1. Press the SYS key. Turn the Large knob to reach the System Information function and press ENT. You cannot change the values in Simulator mode. This information is provided by the satellites and you will not usually need to change it.

```
System Info:          Press ENT
```

2. Press **SEL** to reset the date and time. The Day value will flash.

```
12 MAY 97  23:24 UTC
```

4. Turn the **Small** knob to choose the day.

```
15 MAY 97  23:24 UTC
```

5. Turn the **Large** knob to move to the Month value. Turn the **Small** knob to choose the month.

```
15 JUN 97  23:24 UTC
```

6. Turn the **Large** knob to move to the Year value. Turn the **Small** knob to choose the year.

```
15 JUN 97  23:24 UTC
```

7. Turn the **Large** knob to move to the Time-Hours value. Turn the **Small** knob to choose the hours.

```
15 JUN 97  20:24 UTC
```

8. Turn the **Large** knob to move to the Time-Minutes value. Turn the **Small** knob to choose the minutes.

```
15 JUN 97  20:24 UTC
```

9. After completing your entries, press **ENT**.

```
15 JUN 97  20:24 UTC
```

Software Version
The Software Version function provides version information about the Apollo software, serial number, database, GPS sensor, display software, and Com Radio software for the Apollo SL60.

1. In the System Information function turn the **Large** knob to reach Software Version page.

```
Apollo SL50/60  SW Vers  X.X    ◆
```

2. Turn the **Small** knob cw one click to view the Serial Number page.

```
Serial Number:       XXXXXXX
```

3. Turn the **Small** knob cw one click to view the Database Version page.

```
Americas DB      Exp: xx/xx/xx
```

4. Turn the **Small** knob cw one click to view the GPS Software Version page.

```
GPS Sensor SW: x.x   PN:123456789
```

5. Turn the **Small** knob cw one click to view the Display Software Version page.

```
Display SW Version:          X.X
```

6. Turn the **Small** knob cw one click to view the Com Radio Software Version page (SL60 only).

```
COMM Software Version:       X.X
```

Fuel Measure Units

Fuel Measure Units for the appropriate displays can be selected as: US Gallons (usg), Imperial Gallons (img), Liters (ltr), Pounds AvGas (lbs), Pounds Jet Fuel A (lbs), Pounds JP4 (lbs), Kilograms AvGas (kgs), Kilos JetFuelA (kgs), or Kilos JP4 (kgs).

1. In the System function, turn the **Large** knob to reach the Fuel Measure Units page. Press **SEL**.

2. Turn the **Small** knob to change and press **ENT**.

Test Display

The Test Display page allows you to initiate a test of the display segments. In the System function, turn the **Large** knob to reach the Test Display page. Press **ENT** to start the test. Pressing any key or turning any knob will cancel the test.

```
Test Display:        Press ENT
```

Owner Information

The Owner Information function allows the user to enter their Name, Address, City, Phone, and Aircraft. As a security feature, the user must enter a password to enable editing of the Owner Information.

APOLLO

1. In the System function, turn the **Large** knob to reach the Owner Information page.

```
Owner: WILBUR WRIGHT          ✦
```

2. Turn the **Small** knob to view the Owner Information.

```
Address: 2345 TURNER RD SE
```

3. Start editing by pressing **SEL**.

```
User Must First Enter Password..
```

4. The password entry page is then ready. Select the characters with the **Small** knob and move to the next character to the right by turning the **Large** knob cw. When you turn the **Large** knob, the last character is erased to enforce secrecy of your password.

```
Enter Password: _____
```

5. Press **ENT** when you finish entering the password. If the entered password does not match the true password, you will be given another chance. You can cancel by pressing **SEL**. If the entered password matches, the screen flashes a message for about two seconds followed by the last displayed owner info page. Once the correct password is entered, editing is allowed until your Apollo SL50/60 is turned off.

```
Password OK    Editing Enabled
```

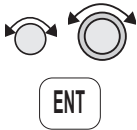6. Press **SEL** to start editing.

7. Select the characters with the **Small** knob and move to the next character to the right by turning the **Large** knob cw. Press **ENT** to save the information.

8. Turn the **Small** knob to go to the next Owner Information page you want to edit.

9. Press **SEL** to start editing.

10. Select the characters with the **Small** knob and move to the next character to the right by turning the **Large** knob cw. Press **ENT** to save the information.

GPS Sensor   The GPS Sensor selection provides information about GPS satellite health, the GPS satellites available, information on each satellite, GPS Time, and GPS Reset. See the Introduction to GPS section on page 89.

1. In the System function, turn the **Large** knob to reach the GPS Sensor page. Press **ENT**.

```
GPS Sensors:          Press ENT
```

2. The GPS Health page is shown if GPS information is received. The GPS number and dimension (2D, 3D, or no position), number of healthy, and number of visible satellites are shown.

```
GPS 3D Pos Healthy: 25  Vis: 8 ✦
```

3. Turn the **Small** knob to view the GPS Satellites Used for Position fixes page. SV means space vehicle, which is the same as a GPS satellite in this case.

```
GPS SVs: 31,27,26,19,07,02
```

4. Turn the **Small** knob again to view the GPS Satellite Status, Elevation, SNR, and Azimuth page. Turn the **Small** knob to view information about each available satellite.

```
SV31 DATA el:21° sig:055 az:043°
```

Satellite Search Status

- SRCH
  Receiver is searching for the satellite

- ACQR
  receiver is acquiring the signal

- TRCK
  receiver has locked to the satellite's data sequence

- DATA
  receiver is locked and downloading data from the satellite

  Until data is received by the receiver, a display may look like the following:

```
Third Sat        Not Available
```

GPS Date and Time Page

In the GPS Sensor Information function, turn the **Small** knob to view the GPS Date and Time page.

```
GPS Time(UTC) 13 May 96 17:54:27
```

GPS Normal Reset Page

Resetting the GPS receiver deletes all GPS information and forces a new search of the satellites. Use this function when it appears that the GPS receiver is locked up or seems to be taking far longer than it should to lock onto the signals.

1. In the GPS Sensor Information function, turn the **Small** knob to view the GPS Normal Reset page.

```
Press ENT to do Normal GPS Reset
```

2. Press **ENT** to reset the GPS receiver.

Comm Radio Operation

This section introduces the basic operating details of the VHF Communications Transceiver portion of the Apollo SL60.

Power On/Off

Turn the **Power/Volume** control clockwise past the OFF detent.

Volume

Turn the **Power/Volume** control clockwise to increase the volume level and counterclockwise to decrease volume.

Small and Large Knobs
The dual concentric knobs on the right side of the SL60 are used to select frequencies or other options. The **Large** outer knob is used to change the MHz value in 1 MHz steps.
The **Small** inner knob changes the kHz values in 25 kHz steps.

In both the SL50 and SL60, the **Large** and **Small** knobs are used to view different functions and for editing. Other functions will be described in the affected section.

Selecting Frequencies

New frequencies are first selected as a Standby frequency and then toggled to the Active side when desired. While viewing the frequency display, use the **Large** and **Small** knobs on the right side of the SL60 to select the desired frequency.

1. Press **COM** to reach the Comm radio function.

```
119.80 s121.30  Brg 353  46.3nm
```

2. Turn the **Large** knob to change the values in one MHz increments. The MHz selection range is between 118 and 136 in one MHz steps.

```
119.80 s121.30  Brg 353  46.3nm
```

APOLLO

2. Turn the **Small** knob to change the values in 25 kHz increments. The kHz selection range is between 000 and 975 kHz in 25 kHz steps. Note that only two digits are displayed to the right of the decimal point.

```
119.80 ⌐122.30  Brg 353  46.3nm
```

Turn the **Large** and **Small** knobs clockwise to increase and counterclockwise to decrease the frequency values. Standby frequency selection is not inhibited during transmit.

```
119.80 ⌐122.40  Brg 353  46.3nm
```

Press the **Flip/Flop** key to toggle the Standby or recalled frequency to the Active frequency.

```
122.40 ⌐119.80  Brg 353  46.3nm
```

Frequency Monitoring

The Frequency Monitoring function allows you to listen to the Standby frequency, while monitoring the Active frequency for activity.

Press the **COM** key in the COM function to listen to the standby frequency. A small "m" is displayed in front of the Standby frequency.

```
119.10 m123.85  Brg 353  46.3nm✦
```

When the Active frequency receives a signal, the unit will switch automatically to the Active frequency. The volume and sound quality will be slightly less for the Standby frequency. The Active frequency quality is not affected. The Frequency Monitor function is inhibited while you are transmitting.

Recalling a Frequency

The SL60 can access several areas of stored frequencies. The SL60 can access airport frequencies from its database of: TO, FROM, INFO, automatically stored active, User stored, weather, and emergency frequencies.
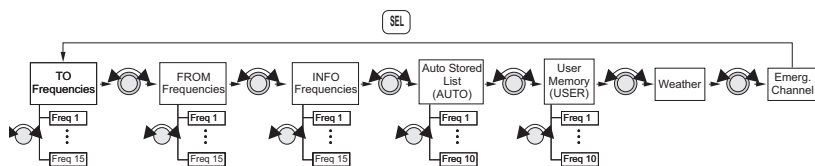
1. Press **SEL** to recall frequencies in the COM function.

2. Turn the **Large** knob view the frequency types.

3. Turn the **Small** knob to view the frequencies available for each type.

4. Press **ENT** to load the displayed frequency into the Standby position.

or

5. Press the **Flip/Flop** key to load the displayed frequency into the Active position.

TO, FROM, and INFO Frequency Database
You can access up to 15 airport frequencies referenced to your TO and FROM waypoints, as well as the last 15 frequencies viewed by pressing **INFO**.

1. In the COM function, press **SEL** to view the Frequency Database. The diamond on the right side of the display indicates that more frequencies are available. If there are no other frequencies, the diamond will not appear.

```
119.80 s121.30  SLE Twr   119.10♦
```

2. Turn the **Large** knob to select the frequency type. Turn the **Small** knob to display the available frequencies. The waypoint identifier, type, and frequency are displayed.

```
119.80 s121.30  SLE ATIS 124.55
```

3. Press **ENT** to move the database frequency into the Standby frequency position.

```
119.80 s124.55  SLE ATIS 124.55
```

or

Press the **Flip/Flop** key to move it into the Active position.

```
124.55 s121.30  SLE ATIS 124.55
```

Frequency Abbreviations

TWR - Tower frequency (* indicates part time)
GRND - Ground frequency
ATIS - ATIS frequency
ATF - Air Traffic Frequency
APPR - Approach
ARR - Arrival
AWOS - Automatic Weather Station
CLR - Clearance/Delivery
CTAF - Common Traffic Advisory Frequency
DEP - Departure frequency
FSS - Flight Service Station
RFSS - Remote Flight Service Station
**UNIC** - Unicom frequency
MF - Mandatory Frequency
UNKN - Unknown
UNDF - Undefined

Auto Stored Frequencies (Auto)

The SL60 keeps track of the last ten Active frequencies and stores them in a stack. When a new frequency is used, it becomes number one on the stack and the old number ten frequency is removed. Each time a new Active frequency is used, the last (tenth) frequency is automatically dropped off the list. Duplicate frequencies are not stored; one instance of the selected frequency does become Freq 1 on the list.
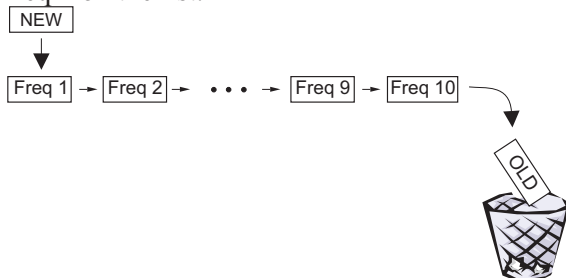
1. In the Comm function, press **ENT** and then turn the **Large** knob to display the Auto Stack List (Auto).

```
119.80 s121.30  Auto 1   123.85
```

2. Turn the **Small** knob to view the stored frequencies. The last used frequency is shown at the top of the list.

User Stored Frequencies

When you press the **ENT** key the Standby frequency is stored in User memory. The SL60 stores the last ten frequencies selected by the user. The next time a new User frequency is stored, the last (tenth) frequency is automatically dropped off the list. Duplicate frequencies are not stored.

ENT

1. Press **ENT** to prepare to store the Standby frequency.

```
119.80 s121.30  Store 121.300?
```

ENT

3. Press **ENT** again to store the displayed frequency.

```
119.80 s121.30  121.300 Stored
```

SEL

4. Press **SEL** and then turn the **Large** knob to view the last stored User frequency.

```
119.80 s121.30  user 1   130.85*
```

5. Turn the **Small** knob to view the other User stored frequencies.

Weather Channels

The standard weather channels are stored in the memory of the SL60. You cannot transmit on a weather channel frequency.

1. Press **ENT** and then turn the **Large** knob to display the Weather channel memory.

```
119.80 s121.30  WEATHER  162.40◆
```

2. Then, turn the **Small** knob to view the available weather channels.

Weather Frequencies

162.400 MHz
162.425 MHz
162.450 MHz
162.475 MHz
162.500 MHz
162.525 MHz
162.550 MHz

Emergency Channel

The standard emergency channel (121.50 MHz) is stored in the memory of the SL60.

1. In the COM function, press **SEL** and then turn the **Large** knob to display the Emergency channel memory.

```
119.80 s121.30  EMG CHAN 121.50
```

2. Press the **Flip/Flop** key to load the Emergency Channel into the Active frequency.

```
121.50 s121.30  EMG CHAN 121.50
```

Intercom Function
When two headphone and microphone jacks are connected to the SL60, these headsets can be used as a voice-activated intercom.

When you select the Intercom function with the installed selector switch, the intercom function is enabled. The Volume control will control the headphone listening level. The receive function will automatically become active when a signal is detected. Frequency monitoring will be disabled when the intercom is selected. An "I" is displayed in front of the Standby frequency to indicate the Intercom function is selected.

```
119.10 ɪ122.85  Bʀɢ 210°  17.1ɴᴍ
```

The Intercom Squelch Sensitivity can be set in the System Functions.

Stuck Mic
The SL60 helps protect you from a situation where the microphone may get stuck in the ON or Transmit position. If the microphone is keyed for longer than 35 seconds, the SL60 will return to the receive mode on the selected frequency.

A flashing "Stuc Mic" message will display until the transmit key is released.

```
119.10 STUC MIC  Bʀɢ 210°  17.1ɴᴍ
```

Introduction to GPS Navigation

GPS Overview

The Global Positioning System (GPS) is a constellation of 24 satellites in six orbit lanes 10,898 nautical miles above the earth at an inclination angle of about 55 degrees from the equator. Each satellite orbits the earth twice in 24 hours.

The GPS was developed and the satellites launched by the U.S. Department of Defense with the original intent of supplying highly accurate position fix information for military applications. In recent years, commercial applications for the information provided by this system have steadily increased in the civilian sector. Some of the more popular civilian uses of the system include surveying and position fix data recording for civil engineering applications, and a broad range of marine, aviation, and terrestrial navigation applications.

While orbiting the earth, each GPS satellite transmits complex streams of data containing the operational status and orbital location of all the satellites in the system. The Apollo SL50/60
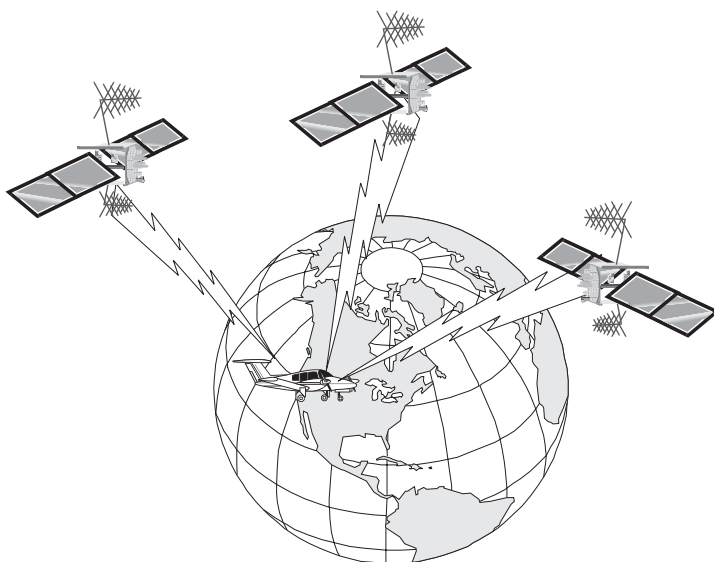
receives this data stream and processes the information to determine which satellites are "visible" to the receiver's antenna. With this determination made, the receiver chooses satellites to calculate a position fix. Using information transmitted from three or more satellites, the unit can calculate latitude and longitude (usually abbreviated Lat/Lon); with four or more satellites, GPS altitude can also be calculated.

GPS System Accuracy

The GPS allows a high degree of position fix accuracy. The system can produce a position fix accurate to within less than one meter. Due to concern for national security, the U.S. Department of Defense introduces constant errors to the transmitted satellite data to degrade the accuracy of the system. Called *Selective Availability*, this practice limits GPS position fix accuracy to about 100 meters, although the relative position of the satellites to one another, their elevation above the horizon, and other factors can also affect accuracy of the position fix. Under optimal conditions, accuracy can improve to within 10 meters. GPS position fix accuracy is not affected by atmospheric conditions.

GPS altitude is based on a mathematical model of the sphere of the earth. Including intentional degradation, GPS altitude may differ from barometric altitude by several hundred feet.

Summary

Unlike navigation aids providing a position fix with data from land-based sources, the Apollo GPS can provide an accurate position fix over land or sea anywhere in the world. The unit includes an extensive database of useful waypoint information and allows you to create up to 200 "customized" waypoints of your own. With the power of this navigation device in the cockpit, you can easily navigate with unsurpassed accuracy.

Start Up Displays

The Start Up Sequence runs each time the unit is powered on. Until the Start Up Sequence is completed, no other editing or mode selections work. The Start Up Sequence varies between units due to installation differences. The initial start up message is displayed for about three seconds.

```
┌─────────────────────────────────────┐
│  Apollo SL60     By II Morrow        │
└─────────────────────────────────────┘
```

Owner Message

If the owner name has been previously entered (in System Mode), this page with your name is displayed for three seconds. *No owner info screen is displayed if the user has not entered the owner data.*

```
┌─────────────────────────────────────┐
│ Owner: II Morrow Inc                 │
└─────────────────────────────────────┘
```

Memory Tests

Memory tests are preceded by the following two second display.

```
┌─────────────────────────────────────┐
│    Starting Memory Tests             │
└─────────────────────────────────────┘
```

While the Starting Memory Tests message is displayed, you may press **ENT** to bypass most of the normal tests and go directly to normal operation.

Note
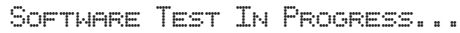
☞ *Bypassing the complete series of tests should only be done in the case of an emergency. Use of your Apollo SL50/60 for IFR flight requires that all of the tests be performed and passed.*

Software Memory Test

This is a checksum test of the code memory region. The following screen is displayed for the duration of this test.

```
Software Test In Progress...
```

If the checksum passes, the next screen is displayed for two seconds.

```
Software Test Passed
```

Failure to pass the software checksum test indicates that the software memory is corrupted. **The GPS board will not continue operation when the following screen is displayed.**

```
Nav SW Failed: Contact II Morrow
```

If the Nav software checksum test fails, the COM board will function properly, but the GPS board will not operate. The display will only show the active and standby frequencies.

Non-Volatile RAM Tests

The non-volatile RAM validation code does the following checks every time the unit is powered up. Any tests which detect a failure reset the failed values. Generally, the non-volatile RAM test pages are not displayed, since in most cases the tests pass.

User Database Memory Failure

User waypoint checksums exist for each User waypoint. If the checksums do not match, the User waypoint is deleted. If this occurs, any flight plan which references this user waypoint is also deleted.

In addition, User comment checksums exist for each user-defined waypoint comment. The comment is deleted if the calculated checksum does not match the saved checksum.

```
User DB Test Failed:   Press ENT
```

If the User DB checksum test fails, both the COM board and the GPS board continue to function.

```
Flight Plan Memory Failure
```

Flight plan checksums exist for all flight plan information. If a particular flight plan checksum does not match the calculated checksum, the flight plan is deleted, or in the case of the Active Flight Plan, the plan is reinitialized. The following message is then displayed until you press **ENT**.

```
Flight Plan Memory Failed:   ENT
```

If the flight plan memory checksum test fails, both the COM board and the GPS board continue to function.

Miscellaneous NVRAM Memory Failure

All other user input values which are held in non-volatile RAM are checked for validity, producing the following message if any of the values needed to be reset.

```
Memory Test Failed:    Press ENT
```

If the memory checksum test fails, both the COM board and the GPS board continue to function.

Database Test

This checksum test compares the stored database checksum with the calculated database checksum. Since this test may take several seconds to complete, the following screen is displayed until the test is completed.

```
  Database Test In Progress...
```

If the checksum test passes, the next screen is displayed for two seconds.

```
  Database Test Passed
```

Failure to pass the database checksum test indicates that memory in the database is corrupted, and the following message is displayed until you press **ENT**.

```
Database Failed:       Press ENT
```

If the database checksum test fails, both the COM board and the GPS board continue to function.

Special Use Airspace Displays

This display indicates whether Airspace Alerts have been selected.

```
Airspace Alrts OFF: SEL to Reset
```

Database Message

This page shows the database name and expiration date. If the database has expired, the message "Press ENT" will flash. Press **ENT** to continue operation.

```
Americas DB              MM/DD/YY
```

IFR Output Tests

A series of tests covering connections for IFR flight are tested if your Apollo SL50/60 has been installed for IFR flight.

```
     Starting IFR Output Tests
```

After the completion of all tests the Apollo SL50/60 will start normal navigation operation.

APOLLO

Notes

Message Function

Message function is responsible for warning the user of changing conditions which require immediate attention.

When a new message exists, the MSG annunciator flashes on and off approximately twice per second, until either the user views the new message, or the condition causing the message goes away. If multiple messages exist, the annunciator continues to flash until all new messages have been viewed.

Most new messages continue to be relevant following viewing of the new message, and are put into the old message list, where they remain until the condition causing the message goes away. Other messages are cleared from the message list as soon as they are viewed (they don't become old messages). The decision whether a new message becomes an old message after viewing is described for each individual case below in the List of Messages section. The formats of all messages are the same if they are in the new or old message list.

While any old message exists, the MSG annunciator remains steadily on at all times unless new messages arrive or all old message conditions go away.

The home page in message mode is the first new message, if one exists, or the New Message Summary page if no new messages exist.

New Messages

The New Message page shows how many new messages are stored.

MSG

1. Press **MSG**. Turn the Large knob to switch between Old and New messages.

2. Turn the **Small** knob to view each message.

Old Messages

The Old Message page shows how many old messages are stored.

MSG

1. Press **MSG**. Turn the Large knob to switch between Old and New messages.

2. Turn the **Small** knob to view each message.

Messages

The following is a summary of the conditions that cause a message warning, and examples of the messages generated for each condition.

Special Use Airspace Messages
Following is a list of the types of airspace messages which can be generated. All of the airspace messages become old messages after they are viewed. The Airspace Messages are unique in Message Mode in that they are the only messages which the **INFO** key is used to find out more information concerning the message.

Soon
This condition occurs when penetration of the airspace is within 10 minutes (or user-selected limit in System Mode)

WITHIN 10 MIN   GABBS CENTRAL

Close

This condition occurs when the airspace is less than 2 nm (or user-selected limit in System Mode, see page 65).

```
Within 2 nm       SUNDANCE
```

Inside

This condition occurs when the plane penetrates the airspace.

```
Inside            NORTON AFB
```

Empty To Waypoint: Cannot Compute Nav

Anytime the current To waypoint is empty, this message is generated. It becomes an old message after viewing.

```
Empty To Waypoint: Cannot Compute Nav
```

GPS Communications Failure

When the GPS sensor stops communicating (after it has established communications), this message is generated. It becomes an old message after viewing.

```
GPS Communications Failure
```

GPS Command Failure

When data is being received from the GPS sensor but responses to commands sent to the GPS sensor are not being received, this message is generated. This problem indicates that the GPS is not receiving transmissions and cannot be used for IFR flight. It becomes an old message after viewing and remains an old message even if the condition does not persist.

```
Tx to GPS Failed:    Not for IFR
```

GPS Self Test Failure

If the GPS self-test fails, a message displays indicating the cause of the failure in four hex digits. It becomes an old message after viewing.

```
GPS Self Test Failure: 1FFF
```

GPS Sensor Lat/Lon Failure

When the GPS sensor cannot compute the latitude and longitude, the following message displays. It becomes an old message after viewing.

```
GPS Cannot Compute Lat/Lon
```

GPS RAIM Not Available

When RAIM detection is not available for the GPS sensor, a warning is generated. The current flight phase is displayed first (either Terminal or Enroute). It becomes an old message after viewing.

```
Enroute GPS RAIM Not Available
```

GPS RAIM Position Error

When RAIM detection is available for the GPS sensor and it detects a RAIM alarm, a warning is generated. The current flight phase is displayed first (either Terminal or Enroute). It becomes an old message after viewing.

```
Terminal GPS RAIM Position Error
```

GPS HDOP Position Error

When the HDOP for the GPS sensor exceeds current flight phase HDOP requirements, a warning is generated. The current flight phase is displayed first (either Terminal or Enroute). It becomes an old message after viewing.

```
Terminal GPS HDOP Position Error
```

Arrival At the To Waypoint

The arrival message is generated when within 36 seconds of arrival at the current To waypoint. It is cleared after viewing it; it does not become an old message after viewing. The arrival condition will also go away without viewing the message after crossing the angle bisector.

```
Not Holding at the To Waypoint
```

This form of the Arrival Alert is provided when not holding at the current To waypoint. In addition to the arrival waypoint identifier, the next leg's desired track is shown, when available; otherwise, it is dashed.

```
Arrival: SLE    Next Dtk: 321
```

Holding at the To Waypoint

This form of the Arrival Alert is provided when holding at the current To waypoint.

```
Arrival: SLE      — Holding —
```

To Waypoint Sequence

When a waypoint sequence occurs and the user has not viewed the arrival alert, the following alert is provided if you are traveling faster than 5 knots (this reduces the chance of nuisance alerts). The new waypoint, bearing and desired track are provided. This message does not become an old message after viewing.

```
New Wpt: SLE    Brg 073  Dtk 069
```

Auto OBS Crossing Holding Waypoint

When a waypoint on hold is crossed to the From side the first time, the following message is provided. If you press **ENT**, the OBS Desired Track screen is displayed. This message does not become an old message after viewing.

```
   Push ENT to set OBS Course
```

User Database Memory Loss

This message indicates that one or more user waypoints or user-defined comments had a checksum error. This message is cleared after the message is viewed.

```
User DB Memory Loss:    2 Deleted
```

Comm Radio Failure (SL60 only)

This message indicates that the Comm Radio module has failed. Call factory service.

```
Comm radio failure! : Service Now
```

Flight Plan Memory Loss
This message indicates that one or more flight plans had a checksum error. This message is cleared after the message is viewed.

```
Flt Plan Memory Loss:  1 Deleted
```

User Memory Failure
This message indicates that one or more user settings were not within valid limits at power-up and needed to be reset. This message is cleared after the message is viewed.

```
Memory Failure: Setups Reset
```

Database Expired
This message indicates that the internal waypoint database's expiration date is before the current UTC date. This message is cleared after the message is viewed.

```
Americas DB        Exp: 03/30/97
```

Database Invalid
This message indicates that the internal waypoint database's memory has been corrupted. It becomes an old message after being viewed. Contact your dealer or the factory for service.

```
Database Invalid:  Mem Corrupted
```

Manual Magnetic Variation

This message indicates that magnetic variation is on a manual setting. This occurs when the database is not valid, or when the user selects manual magnetic variation in System Mode. It becomes an old message after being viewed.

```
Using Manual Mag Var:        130 E
```

Low Internal Battery Voltage

This message is generated when low internal battery voltage is detected. It becomes an old message after being viewed. Battery voltage is checked every 15 seconds. This battery backs up the memory for information added by the user.

```
Low Battery Voltage: Service Now
```

High Battery Voltage

This message is generated when high battery voltage is detected. It becomes an old message after being viewed. Battery voltage is checked every 15 seconds.

```
Battery Failure:   Turn Off Unit!
```

Countdown Timer Expired

This message is generated when the Countdown Timer (which must have been counting down) goes to 0. The message is cleared when the user views the message or reactivates the Countdown Timer.

```
    Countdown Timer Expired
```

Flight Simulator

Your Apollo SL50/60 is provided with a Flight Simulation program that allows you to "fly" your unit by simulating your ground speed. This section describes the procedures used to run the Flight Simulator, and re-install the unit.

About the Flight Simulator

The Flight Simulator is programmed into your Apollo SL50/60 at the factory. Your Apollo must be removed from the front panel of your aircraft and connected to a power supply with the appropriate power cable. The Flight Simulator is activated during start up.

The Apollo SL50/60 "asks" you to input a ground speed and altitude each time it is powered-up. This speed and altitude information will remain constant throughout the simulation. The Apollo SL50/60 uses a simulated GPS sensor to provide position, speed, and course information. As no external sensors are connected while the simulation is running, no information is displayed about external sensors. The simulated altitude does not change while the Flight Simulator is running.

The Apollo SL50/60 uses the position of the first From waypoint in the Active flight plan as the initial position and simulates flight along the desired track to each successive To waypoint. While "en route," the Apollo SL50/60 generates updated navigation information and alert messages consistent with the simulated flight path. When the Apollo SL50/60 "arrives" at the final waypoint of your flight plan, it stops waypoint sequencing. The Apollo SL50/60 continues to simulate flight past the waypoint and provides bearing and distance information to the last To waypoint.

Starting the Flight Simulation

The following procedure is used to start the flight simulation. It is recommended that you have a data card properly inserted into the data card slot so you can use the appropriate functions.

1. Remove the Apollo SL50/60 from the front panel of your aircraft. Use a 3/32" hex driver (p/n 998-0048 included with installation kit).

Mounting Screw
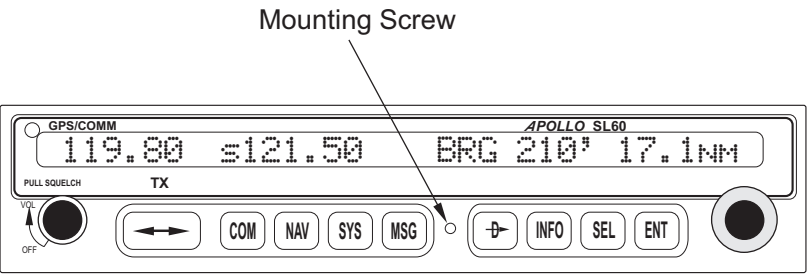
2. Connect the Power/PC Cable (p/n 500-4026-xx) to the connector on the back of your Apollo SL50/60.

3. Turn on the power for the power supply. Turn on the power for the Apollo SL50/60.

4. The Apollo SL50/60 will run its database and memory tests. The display will then shown that it is ready to start the Flight Simulator.

```
Simulator - NOT FOR FLIGHT  -  SEL
```
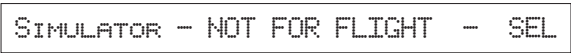
5. Press **SEL** to start the Flight Simulator. The default ground speed will be displayed. The ground speed value will flash. Turn the **Small** knob to display the desired ground speed. Speed values are changed in 10 kt increments.

```
Simulation Ground Speed   100kts
```

ENT
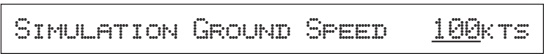
6. Press **ENT** to enter the displayed ground speed values and start the flight simulation.

```
Simulation Ground Speed    140kts
```

ENT

7. You will prompted to use or clear the previous Flight Plan. Turn the **Small** knob to choose Yes or No. Press **ENT**. If you do nothing, the Apollo SL50/60 will automatically retain the previous Flight Plan and switch to the Nav function. The Apollo SL50/60 will go to the Nav function and a simulated GPS sensor begins tracking your position from the first From waypoint in the Active flight plan.

```
Clear Active Flight Plan?   Yes
```

Flight Simulator Operations

Once you've started the flight simulator, you may practice the various operating procedures, such as activating flight plans, entering Direct-To courses, and inserting/deleting/changing waypoints in the Active flight plan. The simulator is also useful for planning purposes; you may create and edit flight plans in the comfort of your office or home. Changes made to flight plans and waypoints while the simulator is running are retained when the Apollo SL50/60 is reinstalled in the aircraft.

Notes

Troubleshooting

This section contains information to troubleshoot your Apollo GPS Receiver when improper operation is observed. The following table lists possible problems you could encounter while operating the unit. Examine the possible causes of the problem and take the action listed to correct the trouble. If you cannot correct the problem, contact your dealer. If your dealer is unavailable, contact the II Morrow factory at the address and phone number listed.

Contacting the Factory

If efforts to resolve the problem fail, contact your dealer or the factory weekdays from 8:00 A.M. until 5:00 P.M. Pacific time for technical assistance. The II Morrow technical service staff will gladly assist you.

Please have the following information ready:

- System configuration (products, antennas, mounting locations, etc.)
- Model No., part number, and serial number
- Software versions
- Description of the problem
- Efforts made to isolate/solve the problem
- Computed Lat/Lon position shown on your Apollo
- Local time, UTC time, and date

II Morrow Inc.
Technical Service Department
2345 Turner Road S.E.
Salem, OR 97302 U.S.A.

U.S.A. Toll Free 800-525-6726
Canada Toll Free 800-654-3415
FAX (503) 364-2138
International (503) 391-3411

Problem	Possible Cause	Action
Unit does not power on	Open in power supply circuit	Check circuit breaker - reset if necessary
	Faulty electrical wiring or connection	Contact your dealer to perform electrical system test
No GPS signal reception	Obstructed signal path	Move aircraft out of hangar or away from buildings to provide an unobstructed view of the sky for the antenna
	Incorrect seed position, time, or UTC differential entered	Check these settings, if necessary
	If using a wrong antenna: faulty external antenna, wiring, or connections	Contact your dealer to check the antenna and other wiring
Search for nearest waypoints reveals too few or wrong types of waypoints	Incorrect selection of waypoint types to show after search	Check "Airspace Setup" function and verify that the desired waypoint type to search is "ON"
Position fix seems inaccurate	Wrong seed position	Re-enter seed position
Waypoints sequencing is erratic	Direct-To entry option setting may not be correct	If you are flying Direct-To, the option should be set to "May Clear", see page 73
Wrong bearing and track values	Incorrect magnetic variation entered	Check Magnetic Var option - select "Automatic" or enter correct value
Can't change active frequency	Comm Radio not communicating	Contact dealer.

Glossary of Navigation Terms

A   **Altitude (GPS ALT):** Altitude, as calculated by the Apollo SL50/60, based upon a mathematical model of the earth's surface curvature. A substantial difference between this altitude value and altitude referenced to sea level may exist.

Almanac: Data transmitted by a GPS satellite including orbit information on all satellites, clock correction, and atmospheric delays.

Automatic Terminal Information Service (ATIS): Recorded information about weather and other conditions at an airport, periodically updated when conditions change.

Autonav: The function that allows you to set the SL50/60 to scroll automatically through selected navigation displays .

Azimuth: an arc, as measured clockwise from true or magnetic north.

B   **Bearing (BRG):** The direction to any point, usually measured in degrees relative to true or magnetic north.

C   **Circular Error Probable (CEP):** As applied to GPS position fix accuracy, the radius of a circle inside of which there exists a 50 percent chance of being located.

Constellation: A group of stars or objects, such as GPS satellites, in the heavens.

Coordinates: Values for latitude and longitude that describe a geographical point on the surface of the earth.

Course: The planned direction of travel between the departure and destination waypoints.

Course Deviation: A measurement of distance left or right from the desired course of travel.

Course Deviation Indicator (CDI): A graphic indicator of course deviation typically shown as a graduated horizontal bar with an icon indicating the deviation distance left or right of course.

Common Traffic Advisory Frequency (CTAF)

D   **Database:** A collection of data structured in such a way as to allow quick and convenient access to any particular record or records. The Apollo SL50/60 contains a built-in database of waypoints and waypoint information. Users may add waypoints to this database.

Degree: 1/360th of a circle.

Departure: The first waypoint in the active route.

Desired Track (DTK): The desired course of navigation between a point of origin and a destination waypoint.

Destination: The last waypoint in the active route.

Dilution of Precision (DOP): A merit value for the calculated position based on the geometrical configuration of the satellites used; 3 is considered good, greater than 7 is considered poor. Also called Position Dilution of Precision or PDOP.

Direct-To: The function or procedure that directs you from your present position to the designated TO, or destination, waypoint.

Distance: A measure of interval in space. Also referred to as range.

DME - Distance Measuring Equipment

Drift: Displacement from the intended course of travel.

E   **Elevation:** The angle of a GPS satellite above the horizon.

Emergency Search: The function that allows to immediately navigate to the nearest airport in the case of an emergency.

Ephemeris: A list of accurate positions or locations of a celestial object as function of time.

Estimated Time of Arrival (ETA) - The estimated time from your present position to the destination (TO) waypoint.

Estimated Time Enroute (ETE) - The estimated time from your starting (FROM) waypoint to the destination (TO) waypoint.

F   **Fix:** A geographical location determined by either visual reference or by electronic navigation aids.

Flight Time: Flight Time shows the elapsed time in hours and minutes (00:00 to 99:59) from departure. If the Flight Timer is not started the value will be replaced with dashes. The Flight Timer options are set in the System Functions (see page 72).

Flight Plan: A series of two or more waypoints.

G   **GDOP:** Geometric Dilution of Precision. The relationship between errors in receiver position and time and in satellite range.

Global Positioning System (GPS): Also known as NAVSTAR. A constellation of satellites launched by the U.S. Department of Defense into six orbit lanes (four satellites per plane) at an altitude of 10,898 nm above the earth.

Greenwich Mean Time (GMT): *See Universal Time Coordinate (UTC).*

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Ground (GRND): Ground communication frequency

Ground Speed (GS): Speed of travel across the ground. In aviation, the relation between ground speed and air speed is affected by the prevailing winds.

H **HDOP:** Horizontal Dilution of Precision. *See Dilution Of Precision.*

Heading: The direction that the aircraft is pointing.

I **Identifier:** A name, typically abbreviated, assigned to a waypoint. The identifier may consist of numbers and alpha characters, up to six in length. For example, the airport identifier for Los Angeles International Airport is LAX.

Instrument Flight Rules (IFR)

Intersection (INT): A point defined by any combination of courses, radials, or bearings of two or more navigational aids.

K **Knot (kt):** A unit of speed equal to one nautical mile per hour.

L **Latitude (Lat):** Any line circling the earth parallel to the equator, measured in degrees, minutes, and seconds north and south of the equator.

LFAC: Landing **FAC**ility.

Longitude (Lon): Any line from the north to the south pole, measured in degrees, minutes, and seconds of a circle, east or west of the Prime Meridian (Greenwich, England).

M **Magnetic North:** The region, some distance from the geographic north pole where the earth's

magnetic lines concentrate. A magnetic compass points to the magnetic north.

Magnetic Variation (Mag Var): The angle between the magnetic and true north. At various points on the earth it is different due to local magnetic disturbances. It is shown on charts as isogonic lines marked with degrees of variation, either east or west. These degrees must be added to or subtracted from the true course to get the magnetic course. (Easterly variations are deducted, and westerly variations are added.) The Apollo SL50/60 automatically sets magnetic variation to 0 degrees at positions above 70 degrees north or south latitude.

Map Datum: A mathematical model of the earth used for the purpose of creating navigation charts and maps. The Apollo SL50/60 uses the WGS84 map datum.

MESA: Minimum Enroute Safe Altitude is the highest MSA for every point between the aircraft present position and the "TO" waypoint with a 5 nm buffer around the course.

Meter (m): A metric distance measurement equal to 39.37 inches.

Minute: 1/60th of a degree.

MSA: Minimum Safe Altitude. The elevation of the highest obstruction near the aircraft plus a 1,000 or 2,000 foot buffer added for safety. In non-mountainous terrain, a 1,000 foot buffer is added. In mountainous terrain, a 2,000 foot buffer is added. The result is rounded to the nearest 100 feet.

N   **Nautical Mile (nm):** A distance measurement equal to 6,076 feet, or 1.15 statute mile. One nautical mile is also equal to one minute of latitude.

NAVSTAR: The name given to GPS satellites formed from the acronym for **NAV**igation **S**ystem with **T**ime And **R**anging.

Non-Directional Beacon (NDB): A low frequency/medium frequency navigation aid sending non-directional signals that can be used for navigation.

O   **OBS:** Omni-Bearing Selector.

P   **Parallel Track Offset:** A course that is parallel to the designated course, but offset to the right or left by a given distance.

PDOP: Position Dilution of Precision. *See Dilution of Precision.*

R   **Radial:** Any of the 360 magnetic courses from a VOR or similar navigational aid, beginning at the navigational aid and proceeding outward in a straight line.

RAIM: **R**eceiver **A**utonomous **I**ntegrity **M**onitoring. A method of predicting possible system accuracy errors that may be caused by bad satellite data. The RAIM algorithm requires that more satellites are available and usable than required for a normal GPS position fix.

Range (RNG): The distance from the present position to a destination waypoint.

S   **Second:** 1/60th of a minute of a degree.

Seed Position: A latitude and longitude position fix approximately equal to the current position that the Apollo SL50/60 uses to determine the location of available satellites from which signals may be received.

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Selective Availability (SA): The degradation of accuracy of GPS position fix data by the United States Department of Defense for civilian use.

Space Vehicle (SV): A GPS satellite.

Statute Mile: A distance measurement equal to 5,280 feet or 0.87 of a nautical mile.

T   **Three-dimensional (3D) Position Fix:** A position fix defined by latitude, longitude, and altitude.

Track (TRK): The imaginary line that the flight path of an airplane makes over the earth.

Track Angle: The angle of your actual direction of travel. Track angle is computed using the magnetic variation at the Present Position.

Track Angle Error (TAE): The difference between the Desired Track and the Track Angle (Dtk - Trk = Tae). Track angle is computed using the magnetic variation at the Present Position.

True North: Geographic north, at the earth's north pole.

Tower (TWR): Airport tower communication frequency

U   **UNICOM:** The radio frequencies assigned to aeronautical advisory stations for communication with aircraft. Unicoms may provide such airport information as active runway, wind direction and velocity and other conditions of importance to pilots.

Universal Time Coordinate (UTC): Greenwich Mean Time, or the time at the Prime Meridian in Greenwich, England. Also referred to as Zulu time.

UTC Differential: The difference in time between that at the present position and UTC.

Universal Transverse Mercator Map Projection System (UTM): Also known as Military Grid Coordinates, the UTM grid consists of 60 north-south/east-west zones, each six degrees wide in longitude.

V **Very High Frequency Omnirange (VOR):** A navigational aid that transmits signals such that a receiver can indicate its current radial or bearing from the transmitter.

VHF: Very High Frequency. The range of frequencies between 30 and 300 MHz.

W **Waypoint:** A navigation fix used in area navigation and defined by latitude and longitude coordinates.

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