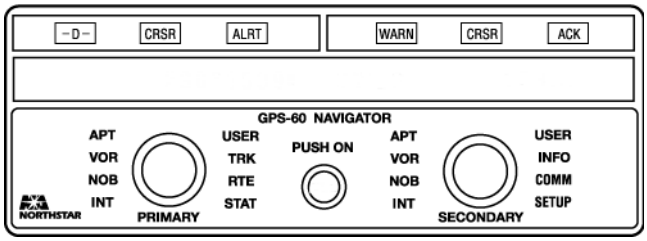
GPS-60/GPS-600
M2/M2V
NAVIGATORS

REFERENCE MANUAL



NORTHSTAR AVIONICS
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This Reference Manual is authorized for use with baseline software program revision 02.25, and subsequent revisions, which are approved for VFR operations of the GPS-60 Navigator, in accordance with Supplemental Type Certificate No. SA995NE, as amended.

 P/N GM453 Rev. 02.25

LIMITED WARRANTY POLICY
Northstar Avionics Navigators

Northstar Technologies, a division of CMC Electronics, Inc., warrants its avionics navigators to be free from defects in materials and workmanship for a period of two (2) years. This warranty applies to the original purchaser and to any subsequent owner during the warranty period, which begins on the date of shipment of the unit, F.O.B. Acton, Massachusetts, to an authorized Northstar dealer.

During the unit's warranty period, Northstar will repair or replace, at its option, any part of the unit it finds to be defective due to faulty material(s) or workmanship. All such repairs and/or replacements will be promptly performed by Northstar free-of-charge to the owner, excluding freight costs incurred in shipping to the factory. Return shipments from Northstar to points within the United States are made via ground transportation, freight prepaid. Special shipping charges (overnight, two-day, and so on) are the responsibility of the owner.

To be covered by this warranty, the Northstar equipment must have been in normal use. The warranty does not apply to units with defects caused by improper installation, physical damage, abuse, tampering, lightning or other abnormal electrical discharge, or to units with defaced or altered serial numbers, or to units repaired by unauthorized persons or repaired in a manner that violates Northstar's recommended service procedures.

All repairs and/or replacements made under this warranty must be performed at Northstar's facilities in Acton, Massachusetts. Performance of warranty work elsewhere will not be authorized, and Northstar will not pay for any charges for such work. Northstar will not be responsible for payment of any charges imposed by a Northstar dealer or other party for services requested by and/or performed for a unit's owner in connection with this warranty. Such services might include removal of the unit from an aircraft, inspection, packaging, handling, reinstallation, and the like.

Northstar Technologies assumes no responsibility for any consequential losses of any nature with respect to any of its products or services sold, rendered, or delivered. The foregoing is the only warranty expressed or implied. No other warranty exists.

CAUTION

Information contained in Northstar's avionics databases is obtained from reliable sources. While we have made every effort to assure the accuracy of the database information, it is important to remember that any source of navigational data is subject to possible error, which could impair accuracy of navigation. The pilot must not use the unit in a manner whereby an error would endanger the safety of the flight. Northstar Avionics cannot be responsible for any consequential damages resulting from the use of the unit.

A single navigation aid should never be relied upon by the pilot to the extent that the safety of the aircraft, passengers or crew is put in jeopardy.

A navigation aid is just that, an aid, and it must be used as such. Information from it should be analyzed and cross-checked against other sources to determine the reliability of navigational information.

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FOR THOSE WHO JUST CAN'T WAIT

For best results, we recommend that you read this manual completely before flying with your Northstar. If you just can't wait, however, here's a simple and effective way to navigate with the unit:

1. Read and understand the safety considerations contained in Section 9. Then familiarize yourself with the unit's warning messages (see Appendix B). Also, because the unit might want to let you know about controlled airspace areas, it's a good idea to be aware of its **Airalert**™ feature, which alerts you when you're likely to enter a Class B, Class C, or a Special Use Airspace (see Section 6 for more information).

2. Now you're ready to operate the unit. Turn it on using the control in the center of the unit, then wait for the unit's automatic self-test and signal acquisition sequence to finish. The readout below indicates that the unit is locked onto GPS signals and is ready to navigate:

3. Turn the *large primary* (left-hand) knob to illuminate the unit's **APT** (Airport) annunciator. Then turn the *small primary* knob, and you'll see a list of airports displayed. See "Selecting waypoints" beginning on page 40 to learn how to find an airport quickly.

4. Turn the *small* knob until you see the airport you want to fly to. If you pass it on the readout, simply turn the knob in the opposite direction, one click at a time, if necessary.

5. When the airport is displayed, press the **–D→** (Direct) button, then press the button marked **ACK** (Acknowledge).

And that's it. You've told the unit where you want to fly, and it now shows you the bearing and distance to your destination. In flight, you'll see the displayed distance decrease as you approach your destination. If you stray off course, the unit will automatically show you how to get back on course (using cross-track error). If a button flashes at any time, simply press it to read the waiting message. Press the button again to delete the message and return to your previous display. If the message is one of a continuing nature, the button will remain illuminated and you can press it at any time to read the message again. Many other useful informa-

tion readouts and navigation functions are available with your Northstar navigator; they're all described in the pages that follow.

HOW TO USE THIS MANUAL

It's natural to want to use your Northstar navigator as soon as you get it. Because its operation is so simple and straightforward, this is easy to do. If you are to take full advantage of all the unit's advanced features, however, a good set of instructions is necessary. That's what this manual provides. The manual is organized into nine main sections, followed by several reference sections (appendices) at the back. The Table of Contents lists the names of these sections and the information contained in them.

The bulk of this manual describes the GPS-60, although most of this information also applies to Northstar's GPS-600, M2, and M2V navigators. In places where the different units vary, the differences are clearly defined. M2V is a VFR-only M2, so when the manual refers to the M2, it's including the M2V, unless otherwise specified.

This manual doesn't provide information about loran, so M2 owners should retain their original Version 1.0 manuals for information about loran operation, IFR, and crosscheck, while using this updated manual for information about Version 02.25 software's new navigation features.

You can't use an encoding altimeter with the GPS-60, but you can use it with the M2 and the GPS-600. Extra lines appear in the **SETUP** function, which allow you to set the barometric altimeter and display the raw altimeter. These receivers occasionally use altimeter readings for GPS aiding.

The illustration on page 16 and on the front cover depicts the front face of the GPS-60. In the M2 and the GPS-600, the **STAT** knob is labelled **APCH**. Further, the GPS-60 displays GPS information and magnetic variation in its **STAT** function, whereas the M2 and GPS-600 display this information in their **SETUP** function.

The best way to use this manual is to sit down with your unit and read in order the main sections of the manual. You may want to do this one step at a time. When you're done, you'll be well on your way to becoming an expert in the unit's operation. After that, the manual becomes a reference guide, just in case you forget something. As you read the manual, keep the appendices in mind, since they may help answer questions that might arise. In particular, note the glossary, which defines many technical terms. If you

encounter a word or term you don't understand, look there for its meaning.

The conventions listed below are used throughout the manual to provide a consistent reference to specific information, as follows:

- BLOCK is the typeface used for text originating from a readout, but is only discussing that readout. Example: "The LOCAL waypoint group consists of up to 20 waypoints nearest your present position."
- **LEGEND** is the typeface used for text that refers to the pushbuttons, readout functions, and external annunciators.
- LEDCHAR is the typeface used for text-only information (i.e. text that isn't boxed) from either complete or partial readouts. Example: "As you approach a closer airport, the display will flash NEAREST AIRPORT."
- **NOTE** is the typeface used for notes that contain additional information.
-  is the universal **CAUTION** symbol used for information that either ensures flight safety or prevents damage to the unit.
- *Italic* is the typeface style used whenever text refers to the unit's *small* and *large primary*/*secondary* knobs.
- When the manual instructs you to "press" a button, this means push and release that button.

Information in the *Northstar Avionics GPS-60 Navigator Installation Manual* (Part No. GM454) will be of interest mainly to the technician who installs your unit. You may want to read it to learn the requirements for a good installation.

As we showed you earlier, you don't have to be an expert in using a Northstar navigator before you fly with it and enjoy its many benefits.

As soon as you feel comfortable accessing waypoints in the database and reading your distance and bearing to them, you're ready. Start with these features, and gradually try out other ones as you need them. You'll soon reach the point where you can develop your own favorite ways of using the unit—ways that meet your particular flying requirements. But, above all, enjoy flying with the Northstar, and have fun!

Section 1 – INTRODUCTION

This section provides general information about the Northstar navigator, considerations for basic usage, and factory policies. Please read this section carefully before using the unit, so you'll be familiar with all of the above.

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1.1 THE NORTHSTAR NAVIGATOR FAMILY

Congratulations on your purchase of a Northstar navigator! With proper approval, the unit is suitable for use under either Visual Flight Rules (VFR), or Instrument Flight Rules (IFR—in M2 only) for en route and terminal navigation.

The GPS-60 is Northstar's VFR-only navigator with a North American FliteCard™ covering public and private airports, Victor Airways, navaids, intersections, and Special Use Airspace in the United States (excluding Alaska) and Canada. Also available as options are the Alaskan FliteCard, the International FliteCard, and the Helicopter FliteCard.

The Northstar GPS-600 is a VFR unit that can be upgraded to become an M3 with its approval eligibility. The M3 is Northstar's top-of-the-line VFR and IFR GPS Navigator, FAA-certified to TSO-C129, Class A1 for en route, terminal area, and non-precision approach navigation. Its 12-channel GPS sensor module includes fully automatic Receiver Autonomous Integrity Monitoring (RAIM), which constantly checks the validity of the received signals.

The Northstar family also contains a loran-based navigator unit, the M2. The M2 loran is certified to TSO-C60b and—with companion Model 8100A Airborne GPS Sensor—TSO-C115a, for multisensor navigation. It's suitable for approval for use under terminal and en route IFR.

Historically, the Northstar family has consisted of two other loran-based navigator units: the M1 and the M2V. Northstar no longer sells the M1 or the M2V; however, many Northstar customers may still own an M1 or an M2V. The M1 loran is a VFR-only unit. The M2V is an upgrade applied to an existing Northstar M1 loran and is VFR-only. All models are nearly identical operationally to the M3, and their features and capabilities are very similar.

After you've mastered any one of the Northstar navigators, you'll probably find that operating any other Northstar unit is very similar.

1.2 NORTHSTAR NAVIGATOR FEATURES

The Northstar GPS-60 is a highly sophisticated navigator with a built-in 12-channel GPS receiver. It builds on the highly successful Northstar M1, M2, and GPS-600 units, retaining easy-to-use operation while adding important new navigational capabilities.

Software versions 02.25 and later contain new features and refinements now made available to GPS-60, GPS-600, and M2 owners, as a result of the development of the Northstar M3. Although the unit uses only two vertical inches of panel space, it contains:

- An extremely sensitive, state-of-the-art GPS receiver.
- An extensive database containing airports; Very-High-Frequency Omni-directional Ranges (VORs); Non-Directional Beacons (NDBs); intersections; Class B, Class C, and Special Use Airspace (SUA); and Victor and Jet airways. In addition, up to 250 user-entered waypoints and 100 user routes can be stored. The database is contained in a user-replaceable FliteCard. The unit is supplied with a FliteCard covering the United States and Canada (the North American FlightCard), but Northstar's optional Alaskan FliteCard, International FliteCard, or Helicopter FliteCards may be used as well. All of these FliteCards contain information supplied by Jeppesen Sanderson, Inc.

  NOTE: SUAs aren't available in the International FliteCard, and routes aren't available in the International or Helicopter FliteCards.

- High-brightness, dual (left and right sides) LED readouts that display navigation information to the pilot. The brightness level automatically adjusts under varying light conditions.
- Dual, concentric selector switches with rotary knobs, and illuminated pushbuttons, both of which make operation ultra-simple.

1.3 NORTHSTAR NAVIGATOR LIMITATIONS

The Northstar GPS-60, GPS-600, and M2V navigators are limited to use under VFR. With the proper installation and appropriate

FAA approval, the M2 may be used as a supplemental means of navigation for IFR enroute and terminal operations.

1.4 NAVIGATING WITH THE NORTHSTAR

With the Northstar, you can easily perform many useful navigation functions, including:

- Pre-flight planning—even when it's on the ground (or removed from your aircraft), the unit can tell you the distance and bearing to your destination, the distance and bearing of any leg of your flight plan, or the total distance of a complicated flight plan involving many stops. It also can tell you if any portion of your flight plan will pass through Class B, Class C, or Special Use Airspace.
- Position finding—when operating in flight, and receiving valid navigation signals, the unit always knows where it is and can tell you your bearing and distance to or from an airport, a VOR, or any other waypoint in its database.
- Direct navigation—simply designate a destination and the unit will guide you directly there, from whatever your present position happens to be. You may queue an additional waypoint.
- Route navigation—using waypoints from the unit's database, or your own waypoints, enter up to 100 of your own personal routes and automatically follow them. Or call up and follow a Victor airway or Jet route from the unit's database (not available with the International or Helicopter FliteCards).
- Controlled Airspace Alert—if your current track or future track will take you near Class B, Class C, or Special Use Airspace (SUAs not available with the International FliteCard), the unit's **Airalert** feature advises you and helps you either avoid it or enter it legally.

To help you stay on course, the unit has a built-in, electronic Course Deviation Indicator (CDI) to tell you how far you are to the left or right of your course line. The unit also can be interfaced to drive a standard CDI, and many HSIs (Horizontal Situation Indicator), flight directors, and autopilot. In addition, it may be interfaced to several models of fuel-management systems and moving map displays.

1.5 YOUR REGISTRATION CARD

Make sure you promptly fill out your owner's registration card and return it to Northstar Avionics. We must have your complete mailing address (not just a company name), so that we can send you your Starguard access code and any future information about the unit. (See "Starguard™ theft-protection system" on page 111.)

1.6 DATABASE UPDATES

It is recommended that the database in your unit be updated at appropriate intervals—at least once or twice a year—to keep it reasonably current with navigational and other changes to airports, navaids, and controlled airspace. If the database isn't updated every 28 days, you'll probably have some data in the unit that isn't current. The unit's database is contained in a small, convenient card called a FliteCard. North American, Alaskan, International, and Helicopter FliteCard updates (revisions) can be ordered from Jeppesen Sanderson, Inc. Call 800-621-JEPP for information on FliteCard subscriptions.

In IFR installations—M2s only—the pilot is required to ensure that every item of navigational data to be used is current and correct; a unit with an expired database flashes the **WARN** light when the unit is turned on. Until the pilot pushes **WARN** to display a warning, use of the knobs is disabled.

You can easily install an updated FliteCard yourself, or if you prefer, your Northstar dealer can quickly do it for you. For complete instructions on replacing a FliteCard, see "Changing your FliteCard™" on page 55.

1.7 SERVICE AND REPAIRS

In case of an operating problem with your Northstar navigator, contact your dealer, or return the unit to the Northstar factory for diagnosis and repair. Feel free to call Northstar Service at (978) 897-6600 if you need assistance; be as complete and accurate as possible when you describe an operating problem. Before returning a unit to Northstar for repair, contact your dealer for instructions and a Returned Materials Authorization

(RMA) number. Shipments without a proper RMA number won't be accepted.

The unit is covered by a two-year limited warranty, which, in summary, states that if the unit is returned to the factory by the owner or dealer during the warranty period, Northstar will repair or replace, free-of-charge, any part found to be defective due to faulty materials or workmanship, if the unit has been properly installed and hasn't been abused. The only cost to the owner will be the one-way shipping charges and any associated charges that might be imposed by the dealer.

Shipments to Northstar Avionics should be made to the following address:

Northstar Avionics
30 Sudbury Road
Acton, MA 01720

If you have special overnight or second-day shipping requirements (UPS or Federal Express), please call Northstar for turnaround time and freight costs before shipping the unit.

Refer to the Limited Warranty Policy at the beginning of this manual and to Section 3 of your *Northstar Avionics GPS-60 Installation Manual* for further details on the warranty, service, and update policies and procedures.

1.8 BE CAREFUL!

Although Northstar Avionics has done its best to make the unit as accurate and reliable as possible, please be sure to remember the following precautions:

- Navigation data is constantly changing. As always, double-check any navigation information before you rely on it.
- Observe all limitations for use of your unit.
- The reliability record of the GPS system is very impressive, yet there's always the possibility of occasional position errors for any number of reasons. Double-check your position often.
- The unit contains so much information and so many features that you may find yourself spending too much time looking at it and not enough time watching for other aircraft. "See and be seen" is still an important rule both for VFR flight and

for IFR flights in visual conditions. As with all other aircraft instruments, you should learn to take quick glances at the unit. Learn the number of knob clicks to go from one function to another, and become thoroughly familiar with the operation of each feature you want to use. Don't let the novelty of a new navigator take your attention away from what's happening around you. Remember: Fly the aircraft!

Section 2 - GETTING STARTED

This section covers initial training for using the Northstar (see also "Demo mode" on page 117), a description of the uses and purposes of all of the unit's controls, and the initial **SETUP** functions you may want to use before flying with the unit.

To help you understand the design and operation of the unit, be sure to read "General operating procedures" on page 15. You'll find it a big help in learning to use the unit intuitively, without having to refer back to this manual.

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2.1 TRAINING WITH THE NORTHSTAR NAVIGATOR

To learn about your Northstar navigator, the first step is to make sure that it's operating properly. Your dealer will handle installation and initial checkout of the unit in your aircraft using the *Northstar GPS-60 Installation Manual* as a guide. You may want to read that manual, but everything you need to know about operating your unit is presented in this manual (except for M2 information on loran, IFR, and crosscheck—see the Version 1.0 manual).

Although your aircraft may be the best place to learn to use your unit, it isn't your only choice. You can remove the unit from its mounting tray, take it home, and operate it using demo mode (see page 117). With this mode (which is a built-in simulation program), you'll be able to learn all of the unit's features and practice using them in realistic navigation conditions. Of course, the unit won't receive GPS signals unless it's connected to a Northstar GPS antenna; however, many of its functions, such as access to waypoint information, remain fully operable.

To use the navigator while it's out of your aircraft, you'll have to connect it either to a 12- or 24-volt battery or to a 12- to 24-volt DC power supply. Doing this requires an extra power cable that you can order from your Northstar dealer.

CAUTION: Make sure that the correct polarities are observed when connecting the unit to a battery or power supply. An incorrect connection may damage the unit.

With the unit removed from your aircraft, you also have the option of receiving GPS signals and observing the unit acquiring them. You must order a separate antenna and cable from your dealer for this purpose.

Here's a summary of your training options.

In aircraft:

- with GPS signals
- without GPS signals (as in hangar)
- overriding any GPS signals via demo mode

Out of aircraft (requires battery or DC power supply):

- with GPS signals (requires separate cable and antenna)
- without GPS signals
- demo mode

Whatever option you use in learning to operate the unit, the initial startup procedure is always the same:

With the unit installed in your aircraft or connected to an appropriate power source, turn the unit on using the center knob. The unit will display in the readout a series of self-test messages, followed by messages showing that it's searching for GPS signals and getting ready to navigate. (If you're new to Northstar navigators, this is a good time to visually acquaint yourself with the unit's controls and readouts.) When the unit locks onto GPS signals and is ready to operate, it will notify you with the message:

```
NAVIGATOR READY  -USE ANY SWITCH-
```

If you don't have an antenna connected, you'll probably want to use demo mode to provide simulated position data. (See "Demo mode" on page 117 for full details.)

To quickly enter demo mode:

1. Depress and hold the button marked **–D→** for a couple of seconds while turning the unit on.
2. Turn the *large secondary* (right hand) rotary knob to highlight **SETUP**.
3. Turn the *small primary* rotary knob to display:

```
DEMO MODE?:        YES        ACK?
```

4. Press **ACK** twice.

When you're finished using the unit, turn it off unit by pulling out the center knob labelled **PUSH ON**. This can be done at any time; no special precautions or procedures are needed. When you turn on the unit again, it will automatically perform its startup sequence and notify you when it's ready to operate. As you may have noticed, this takes about a minute, but it can be longer, up to several minutes, if signal conditions are poor.

If the unit's self-test detects a problem with the equipment or the received signals, it will flash the **WARN** button. You must press this button to read the displayed warning message before any of the other controls become operational.

2.2 BEFORE YOU START

Here are six important points you should know at this time:

- **Safety precautions** — Before navigating with the Northstar, read (and follow) the safety considerations contained in Section *9* of this manual. Also, be familiar with the warning messages listed in Appendix B.
- **Airspace alerts** — If you operate the unit near Class B, Class C, or Special Use Airspace, or if your future track will penetrate such an area, the unit's **Airalert** feature will automatically alert you. You may want to briefly familiarize yourself with this feature, which is described in Section *6*.
- **Bearings** — All bearings displayed by the unit are magnetic, corrected for local area magnetic variation. The only exception is winds aloft, which are reported as true.
- **Using the rotary knobs** — In this manual, the instruction "turn the knob to the right" means turn it clockwise, and "turn the knob to the left" means counterclockwise. To turn a knob "all the way" to the left or "all the way" to the right means to turn it until the readout stops changing and further turning has no effect. (The knobs have no mechanical end stop, but the effect is similar.)

  The *primary* knobs are the knobs on the left-hand side of the unit, and the *secondary* knobs are on the right-hand side. The unit's *large* knobs select a display function. Most display functions use just half of the 32-character readout—the 16 characters above the knob. Three display functions—**RTE**,

STAT, and **SETUP**—take over the entire readout when they're selected (in the GPS-600 and the M2, the **STAT** knob is labelled **APCH**). The unit's *small* knobs select and display information for the chosen display function. They can be turned one or more clicks in either direction to select information, or they can be turned rapidly to scan quickly through long lists of data.

- **The rest of this manual** – Beginning on the next page, you'll find a summary of basic procedures that are used repeatedly in operating the unit. These procedures are described in detail later in the manual, and after some practice, you'll be performing them automatically.

  After the summary of procedures, you'll find detailed information about the unit's controls and readouts beginning on page 16. We suggest that you read through this information to become familiar with it. Then turn the knobs and push the buttons to get the feel of them and see what happens. After that, we hope you'll enjoy working with the rest of the manual. If you're uncertain about the operation of any of the controls or readouts, just refer back to that section.
- **In general** – Don't feel that you have to be an expert with all of the unit's features before you fly with it and begin to enjoy its many benefits. In fact, as soon as you feel comfortable accessing waypoints in the database, and reading your bearing and distance to them, you're ready. Start there, and then gradually try out other features as you need them or want to practice with them. Develop your own favorite ways of using the navigator—ways that meet your own particular flying requirements.

Now it's time for you to get into the left-hand seat! Use the rest of this manual to learn about the unit's details and operation. But before you do, you may want to go back to the page entitled "For Those Who Just Can't Wait" following the Table of Contents. Turn your unit on and follow steps 2 through 5 of the procedure described there. Repeat it a few times. You'll be impressed with how easy the unit is to use, and you'll be well on your way toward mastering its operation. And learning what's in the rest of the manual will be much easier, too. Happy flying!

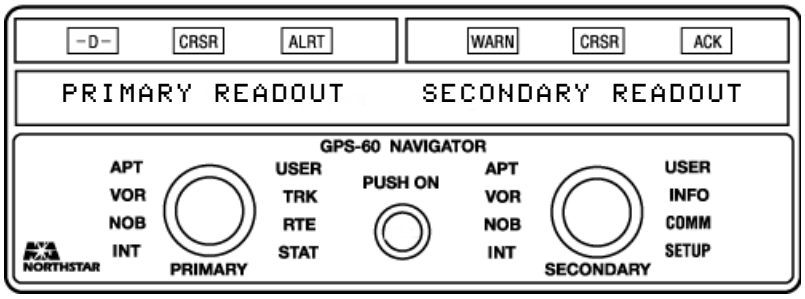
2.3 GENERAL OPERATING PROCEDURES

Here are several general considerations to keep in mind while operating the Northstar navigator:

- Use the *large*, outer knobs to select the function you want the unit to perform.
- The yellow annunciator next to each knob illuminates to show which function is active. Most functions use only one-half of the full readout, leaving the other knob and its readout available for other functions. The functions **RTE**, **STAT**, and **SETUP** use the entire readout and both the *primary* and *secondary* knobs (in the GPS-600 and the M2, the **STAT** knob is labelled **APCH**). When one of these functions is being used, the annunciator for the other knob is turned off to show that side's function is being controlled by the first knob.
- Use the *small*, inner knobs to select specific data or operating options to be displayed by the function selected by the *large* knob.
- The sequence is always the same whenever you specify or change a waypoint or heading you want to fly to, or whenever you want to follow a route. First, display your choice in the *primary* (left-hand) readout, then press **–D→** and **ACK**.
- Whenever the **ACK** button flashes and the readout displays ACK? (for example, while you're entering data), it's requesting confirmation. Press the **ACK** button when the data is correctly entered and ready to be locked in.
- Whenever the **ALRT**, **WARN**, or **ACK** buttons flash of their own accord, a message is waiting to be displayed. Press the flashing button, read the message, and then press the button again to stop the flashing and return to normal operation.
- When using the flashing cursor to enter data, remember the sequence: Press **CRSR** to turn the cursor on, use the *small* knob to scan through the alphabet, numbers, or symbols, and use the *large* knob to move the flashing cursor ahead or back to the next character position. Finally, when you've correctly entered all characters, press **CRSR** again to turn the cursor off.

2.4 CONTROLS AND READOUTS

Below is a drawing of the Northstar GPS-60, showing all of its controls and readouts, followed by an explanation of each one. As you learn the controls, don't be afraid to experiment—there isn't any combination of button and switch settings that can cause any damage to the unit, although if you're not paying attention to what you're doing, you might accidentally erase waypoints or routes that you've entered. Factory-programmed waypoints can't be erased or modified, except by installing a new FliteCard.



2.4.1 Pushbuttons

There are six buttons across the top of the Northstar. Their basic functions are listed below:

> **NOTE: You may press the ALRT, WARN, or ACK (ACK's third function) buttons at any time to read an advisory, without disrupting the turning of the knobs or other activities. Just keep pressing the button until your original readout returns.**

Button Description

–D→ (Direct) Press the **–D→** button to define a flight path direct from your present position to the waypoint that's displayed on the *primary* readout, or along a route. The **ACK** button will automatically flash; press it to confirm the new path. The unit then automatically calculates Off-Course Distance, Estimated Time Enroute (ETE), Estimated Time of Arrival (ETA), etc., for this flight path. Or, to cancel this change, don't press **ACK**, but

press **–D→** again once or twice to return to the original readout. Several other navigation functions also can be performed using the **–D→** and **ACK** buttons (see Sections 4 and 5).

NOTE: Simultaneously pressing –D→ and the left-hand CRSR button provides a shortcut for displaying the nearest airport's identifier, bearing, distance, and longest runway. See "Quick nearest-airport display" on page 111.

CRSR (Cursor) There are two **CRSR** buttons, one to control data entry on the *primary* (left-hand) side of the unit and one for the same purpose on the *secondary* (right-hand) side. Press either **CRSR** to turn on a readout's flashing cursor, allowing you to use the rotary knobs to enter or change data shown on the readout. The **CRSR** button illuminates while the cursor is activated. Press **CRSR** again to turn the cursor off after data has been entered.

ALRT (Alert) This button flashes when any type of airspace alert (or **Airalert**) occurs. **Airalert** messages occur when the aircraft is about to penetrate Class B, Class C, or Special Use Airspace stored in the database, or when a flight path you've specified will pass through one of these areas. Press **ALRT** to read the alert message. (See Section 6 for details.) Press **ALRT** again to return to your previous readout.

The **ALRT** button remains illuminated for as long as the alert condition exists. Press it again to display current data. **ALRT** will turn off when the aircraft is about four miles outside of the indicated area.

The **Airalert** system may be partially or fully deactivated as described in "Disabling the Airalerts" beginning on page 105.

NOTE: To display whether or not the Airalert system is currently activated, hold in (press without releasing) the ALRT button anytime the button isn't illuminated.

WARN (Warning) This button flashes if any new system messages are waiting to be seen by the pilot. Press **WARN** again to clear the message, display any additional messages, or finally, display GPS accuracy

estimate — ACCY USING GPS: 0.05M — if you hold in the **WARN** button. In this readout, the GPS accuracy estimate means there's a 95 percent probability that your true position is within the number of nautical miles (nm) displayed on the readout.

NOTE: You can display GPS accuracy estimate even when the WARN button isn't illuminated.

For most messages, the button remains illuminated for as long as the condition exists; you may press **WARN** again to re-read it. Other messages will disappear after you've read them once. Appendix B lists all the messages and their meanings.

ACK (Acknowledge) The **ACK** button is used to acknowledge an action as described in the four examples below, including to confirm a defined flight path, enter data, read an advisory, and save your present position.

- Confirmation of Defined Flight Path

  Press **ACK** after the **–D→** button (when prompted ACK? in the readout, accompanied by the flashing **ACK** light) to confirm a flight path to a waypoint or along a leg displayed in the primary readout. If you don't want to take the proposed action, press **–D→** again.

  NOTE: There isn't a specific button for "NEGATIVE ACKNOWLEDGE." To indicate that you don't want to take the displayed action, just turn a knob to obtain a different display. You may need to turn the cursor off first.

- Data Entry

  During certain data entry procedures, such as choosing a parallel offset, the **ACK** button will flash and the readout will prompt ACK?. Press **ACK** after the data is correctly entered to indicate that it should be used by the unit.

- Reading an Advisory

  When an advisory is waiting to be displayed, the **ACK** button will flash. Press **ACK** to display the advisory, and press it again to clear the advisory and return to your previous readout.

- Saving your Present Position

  Whenever the **ACK** button isn't illuminated or flashing, you may press it to save your present position for later use. An advisory immediately informs you of the temporary name assigned to the position. Press **ACK** again to clear the displayed advisory. To use this saved position, you must follow the procedure in "Saving your present position" beginning on page 50 to convert this saved position into a user waypoint.

2.4.2 Rotary switches

Each rotary switch has two knobs: a large, outer one and a smaller, inner one. The *large* knobs select the function (**VOR**, **APT**, **USER**, etc.) whose information is to appear in the readout. The *small* knobs select the specific data to be displayed for the chosen function.

For example, if you turn either *large* knob to **APT**, you'll see airport information displayed. You may then turn the *small* knob to display the various airports stored in the unit's database.

The unit has two separate readouts, each one with its own controls and cursor button. The left-hand dual rotary knob (the *primary* knob) controls the readout on the left-hand side *(*the *primary* readout). The right-hand dual rotary knob (the *secondary* knob) controls the right-hand readout (the *secondary* readout).

The following functions can be selected by turning either of the *large* knobs:

APT, VOR, NDB, INT, and **USER** allow you to look at waypoints stored in the unit's memory. Use the *small* knobs to select from the waypoints in the chosen category. The readout shows the waypoint's identifier as well as the bearing and distance from your present position to that waypoint. The waypoint categories are:

APT – Airports

VOR – VOR transmitters

NDB – Non-Directional Beacons including Locator Outer Markers (LOMs)

INT – Intersections, including terminal area airspace fixes

USER – User-entered waypoints

These waypoint functions are available for both the *primary* and *secondary* readouts. You can display the bearing and distance of two different waypoints simultaneously, one on each readout.

The following functions can be selected by turning the *large primary* knob:

TRK (Track) displays information about the current desired track, which you determined by pressing the buttons marked **–D→** and **ACK**). Use the *small primary* knob to select the navigation data you want to display, such as off-course distance or your ETE to the waypoint.

RTE (Routes) allows you to access, enter, review, and follow routes. The route function encompasses both the *primary* and *secondary* readouts. When **RTE** is selected, the *secondary* knobs are used exclusively for route entry and editing, covered in detail in Section 5.

STAT (Status) provides a detailed status of current GPS data. Use the *small primary* knob to display the status of signal reception. **STAT** uses both readouts and disables the secondary knobs. (In the M2 or GPS-600, this data is under **SETUP** instead.)

The following functions can be selected by turning the *large secondary* knob:

INFO (Information) displays additional information about a waypoint or track that's shown in the *primary* readout. Use the *small secondary* knob to select the type of additional information shown, by category:

INFO for **APT**	City and State Name Communications Frequencies Elevation Runways Approaches and Lighting Latitude and Longitude
INFO for **VOR**	City and State

	Name Frequency Latitude and Longitude
INFO for **NDB**	City and State or Country Name Frequency Latitude and Longitude
INFO for **INT**	Latitude and Longitude
INFO for **USER**	Latitude and Longitude
INFO for **TRK**	Shows additional navigation data about your current track. For example, you might choose to display the CDI on the *primary* side and your ground speed and track angle error on the *secondary* side.

COMM (Communications) displays local communications frequencies.

SETUP (Setup) allows you to enter or review standard data in the unit's memory, and also to perform setup functions to activate special modes and features. All **SETUP** functions use both the *primary* and *secondary* readouts.

NOTE: SETUP can't be selected when RTE or STAT is active; conversely, RTE and STAT can't be selected when SETUP is active.

2.4.3 Self-guided tour of controls and readouts

If you're new to the unit, and have just read about its controls and readouts, we suggest that you spend a few minutes experimenting with them if you haven't already done so. (Remember: There isn't any combination of button and switch settings that can damage the unit.)

Here's a brief demonstration you can try. Do part of it or all of it; it takes only a couple of minutes. You'll learn a lot about oper-

ating the unit, and the sequence is similar to one you may actually use in navigating with it.

If GPS signals are available, and you don't care to simulate motion, perform the following procedure:

1. Turn the unit on by using the center knob and wait for the ready message. If a button flashes, press it and read the waiting message (for example, the unit might want to let you know you're in a controlled airspace area). Press the button again until it stops flashing. If it remains illuminated, ignore it (unless the message refers to something that will prevent you from operating the unit). Proceed as follows:
2. Turn the *large primary* (left-hand) knob to the **APT** position. The *primary* readout displays an airport identifier and the distance and bearing to it.
3. Turn the *large secondary* (right-hand) knob to the **INFO** position.
4. While watching the *primary* readout, turn the *small primary* knob. Notice that each click displays an airport. (If you find that you are in the **LOCAL** listing, and you happen to display the LOCAL–ALL "signpost," pause briefly, then turn the knob to the right in the direction of the ALL listing.)
5. Using different speeds to turn the *small primary* knob—from fast to slow and then click-by-click—display several different waypoints in the ALL database listing. In each instance, the airport identifier, and the bearing and distance from your present position to it, will be displayed.
6. Use the *small primary* knob to display an airport that's near your present position or that you're familiar with.
7. Watching the *secondary* readout, turn the *small secondary* knob in either direction to display additional information about the airport shown on the *primary* readout.
8. To define a flight path direct from your present position to the waypoint displayed on the *primary* readout, press the **–D→** button, and then the flashing **ACK** button.

9. Notice that the *primary* readout has switched automatically to the **TRK** (track) function. Watch the *primary* readout and turn the *small primary* knob in either direction to read the track information.
10. Turn the *large secondary* knob to the **APT** position. Turn the *small secondary* knob in either direction to display the distance and bearing to various waypoints from your present position.
11. Press and hold the **WARN** button to display the unit's calculation of its estimated accuracy.
12. Simultaneously press the **–D→** button and the left-hand **CRSR** button to display the airport nearest your present position. Turn the *small primary* knob to show other nearby airports.
13. Turn the *large secondary* knob to **SETUP**.
14. Turn the *small secondary* knob to display various **SETUP** functions. Do not press **ACK** at this time. When finished, turn the *large secondary* knob to a position other than **SETUP** to stop using the setup function and return to normal readouts.
15. Turn the *large primary* knob to the **TRK** position to switch the *primary* readout back to the track function for your original waypoint. Turn the *small primary* knob to display various track functions for the waypoint.

If GPS signals aren't available (for example, in a hangar), or if you want to simulate motion, select demo mode with the following procedure:

1. While turning the unit on, press and hold the **–D→** button for a few seconds until the readout rolls up.
2. Turn the *large secondary* (right-hand) knob to **SETUP**; the readout displays:

```
DEMO MODE?: NO
```

3. Turn the *small primary* knob one click to the right to display:

```
DEMO MODE?: YES              ACK?
```

Press **ACK** twice; the readouts automatically switch to **APT INFO**, displaying your simulated position.

4. While watching the *primary* readout, turn the *small primary* knob. Notice that each click displays an airport. (If you find that you're in the **LOCAL** listing, and you happen to display the LOCAL–ALL "signpost," pause briefly, then turn the knob to the right in the direction of the ALL listing.)
5. Using different speeds to turn the *small primary* knob—from fast to slow and then click-by-click—display several different waypoints in the ALL database listing. In each instance, the airport identifier, and the bearing and distance from your present position to it, will be displayed.
6. Use the *small primary* knob to display an airport that's near your simulated present position or that you're familiar with.
7. Watching the *secondary* readout, turn the *small secondary* knob in either direction to display additional information about the airport shown on the *primary* readout.
8. To define a flight path direct from your present position to the waypoint displayed on the *primary* readout, press the **–D→** button, and then the flashing **ACK** button. The unit's simulated position will "fly" toward the waypoint.
9. Notice that the *primary* readout has switched automatically to the **TRK** (track) function. Watch the *primary* readout and turn the *small primary* knob in either direction to read the track information.
10. Turn the *large secondary* knob to the **APT** position. Turn the *small secondary* knob in either direction to display the changing distance and bearing to various waypoints from your present position.
11. Simultaneously press the **–D→** button and the left-hand **CRSR** button to display the airport nearest your present position. Turn the *small primary* knob to show other nearby airports.

12. Turn the *large secondary* knob to **SETUP**; the readout displays current speed and course. (In Section 7.8, you'll learn how to modify these while in demo mode.)
13. Turn the *small secondary* knob to display various **SETUP** functions. Do not press **ACK** at this time. When finished, turn the *large secondary* knob to a position other than **SETUP** to stop using the setup function and return to normal operations.

That's it. If you want to repeat the exercise or experiment by changing the steps, go right ahead. Among other things, there are more than 25,000 waypoints you can choose to practice with!

Several of the unit's important **SETUP** functions are described later in this section; others that you won't need to use right away are described in Section 7. There's no need to repeat these **SETUP** functions every time you turn on the unit.

2.5 USING THE CURSOR TO ENTER DATA

In later sections of this manual, you'll see how data can be entered in two different ways. In some cases, you'll turn the small knob to select among a number of choices, and then press **ACK** to lock in the proper choice. In other cases (for example, to select a waypoint by entering the identifier as described in "Selecting waypoints" on page 40), you'll first activate the cursor, and then enter the letters character by character. You should practice both methods to be comfortable with each one; they'll be used frequently for various types of data entry.

2.6 USING GPS

2.6.1 GPS accuracy

The Northstar calculates GPS position based on the WGS-84 spheroid. If the antenna isn't blocked, GPS accuracy should be excellent—around 100 meters (.05 nm) or better, most of the time.

2.6.2 GPS altitude requirements

In the rare case when only three satellites are being tracked, the unit must be given your altitude above sea level before it can calculate your position. The accuracy of its position calculations will depend on the accuracy with which it knows your altitude.

In units with no altimeter, use the procedure below to enter altitude.

When you first begin to use GPS with only three satellites, and approximately every half-hour thereafter, the unit flashes its **ACK** button to remind you to enter altitude. Press **ACK** to read the message:

```
  VERIFY ALTITUDE IN SETUP,PLS.
```

Press **ACK** again to remove the message.

Altitude is entered when in 2-D mode using the **SETUP** function shown below:

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob (if necessary) to display:

```
  10000 IS MANUAL ALTITUDE   ACK?
```

3. Use either *primary* knob to enter your current altitude.

When the unit is in 3-D mode, altitude can't be entered, and the **SETUP** function simply displays:

```
 GPS IN 3-D
```

2.6.3 GPS altitude and HDOP readout

The **STAT** function displays the altitude calculated by the GPS sensor when it's operating in 3-D mode. On the same line, the quantity labelled Horizontal Dilution Of Precision (HDOP) is a measure of how good the satellite pattern is in the sky for fix-taking purposes. HDOP is dependent on how many operational satellites are in view and where they're currently located. HDOP doesn't consider atmospheric conditions, Selective Availability, and signal interference, which all affect accuracy. An HDOP

lower than 1.5 implies excellent performance. Turn the *large secondary* knob to **STAT** and the *small secondary* knob to display:

```
GPS ALT: 5400'   GPS HDOP: 1.5
```

CAUTION: GPS altitude should never be used for navigation. GPS-derived altitude isn't sufficiently accurate for use in determining vertical separation. In addition, the nation's airspace usage is based on altitude information from a barometric altimeter using the appropriate altimeter correction. It is vitally important that all pilots use the same reference system for altitude.

2.7 AIRALERT™ CONTROL

The useful **Airalert**™ feature tells you if your future track penetrates Class B, Class C, or Special Use Airspace, or if you're about to enter (or are already in) one of these areas. See Section 6 for details. While you're learning to use the unit, you may prefer to turn off the airspace messages given by **Airalert** until you're ready to deal with these extra functions.

To disable **Airalert** for Class B and C airspace:

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display:

```
ALL CLASS B & C AIRALERT ON
```

3. Turn the *small primary* knob to display:

```
ALL CLASS B & C NO AIRALERT ACK?
```

4. Press **ACK**, and **Airalert** will be disabled for Class B and Class C airspace.

To disable **Airalert** for Special Use Airspace (abbreviated SUA, and including Prohibited, Restricted, Warning, Alert, and Military Operations Areas):

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display:

```
SUA ALERT      ON
```

3. Turn the *small primary* knob to display:

4. Press **ACK**, and **Airalert** will be disabled for SUAs, except for Prohibited Areas, for which alerts always remain active.

2.8 SETTING THE TIME ZONE AND TIME OF DAY

The unit adjusts its internal clock to the time obtained from the GPS system after power has been turned on and the satellites have been acquired.

The time zone is set at the factory to ZULU time. You may leave the time zone set to ZULU, or set the time zone to local time. Designating the time zone will automatically adjust the displayed time to the correct offset from ZULU time.

To adjust the current time zone:

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display the time of day and the time zone:

3. Turn the *small primary* knob to select either Coordinated Universal Time (**ZULU**), or your local time zone. North American time zones include settings for both standard time (**STD**) and daylight savings time (**DST**):

4. Press **ACK**.

You may change to a different time zone (the time of day will automatically adjust to the new time zone) whenever you want. Just display the time, turn the *small primary* knob to choose the new zone, and then press **ACK**. For a listing of time zone abbreviations and their meanings, see “Estimated time of arrival” on page 70.

The time of day is normally obtained automatically from the GPS satellites. If satellites are not being tracked, you can manually set the time as follows:

1. Press the right-hand **CRSR** button, and the left-most digit of the time display will flash.
2. Turn the *small secondary* knob to set it to the proper value (the time is always set and displayed in 24-hour mode).
3. Turn the *large secondary* knob to the right and the second digit will flash.
4. Use the *small secondary* knob to set it to the proper value. Continue until all digits are correct.
5. Press **ACK**.

2.9 EXTERNAL ANNUNCIATORS AND INTERFACES

To aid in navigation, several types of remote panel-mounted annunciators and other devices may be connected to the unit.

WARN annunciator—An annunciator that automatically illuminates in the same manner as the unit's **WARN** light.

WAYPOINT ALERT annunciator—An amber annunciator that illuminates whenever you are within 15 seconds flying time of the waypoint the unit is currently navigating to, or of the place to start a turn to the next leg. It may be abbreviated **WPT** or **WP ALRT**.

PARALLEL OFFSET annunciator—An amber, white, or green annunciator that illuminates whenever a parallel offset has been activated. The annunciator may be abbreviated **OFFSET** or **PTK** for parallel track. (See "Parallel offset" on page 114.)

VFR annunciator—an amber, white, or green annunciator intended for use only in M2 IFR-approved installations. In an IFR-approved M2 installation, the annunciator will extinguish when using loran, provided the estimated accuracy based on the current conditions is better than 1.7 nm. When using GPS in an IFR-approved installation,

the annunciator will extinguish when the requirements of the GPS/loran crosscheck function are satisfied. If the **VFR** annunciator is illuminated, the M2 must not be used for IFR navigation.

CDI/HSI/FLIGHT DIRECTOR/AUTOPILOT interface—The unit may be interfaced to many types of indicators and systems.

Now you're familiar with some of the unit's **SETUP** functions and are ready to do something even more interesting: learning about the unit's database of waypoints.

Section 3 - USING THE WAYPOINT DATABASE

This section introduces the Northstar's waypoint database. It tells how to determine your position as distance and bearing to a nearby airport or VOR, like a conventional navigational receiver does. Next, it describes several ways of accessing waypoints from the database, and how to enter your own waypoints. Finally, "Changing your FliteCard™" on page 55 explains how to replace your database with a current release to maintain accuracy of the data.

CONTENTS

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3.1 THE NAVIGATOR'S DATABASE

A database is a collection of useful information. The Northstar contains a very useful database indeed—it includes all the important airports, navaids, and intersections in the coverage area.

Database waypoints are grouped into five categories: Airports, VORs, NDBs, Intersections, and User. All waypoints in each category are listed in alphabetical (A-Z) and numerical (0-9) sequence, according to the first character of the waypoint identifier. Alphabetical listings always precede numerical listings. The North American database contains the following information for the U.S., Canada, Mexico, and the Caribbean:

AIRPORTS (APT): The North American FliteCard is programmed with over 14,000 airports, including all "public use" and military airports and most U.S. privately-owned airports. Military airports are included in the database for use in emergencies and as visual reference points, and for those authorized to land. These airports are designated by the letter m to the right of their identifier. Privately-owned airports (often restricted or requiring prior permission to land) are designated by the small letters Pr (Pr) to the right of their identifier.

VORs: Coordinates of all civil-use VORs. Of course, the unit doesn't receive signals from VORs or NDBs—it uses the location of these navaids as familiar and useful reference points.

NDBs: Coordinates of civil-use NDBs (excluding marine radiobeacons, but including Locator Outer Markers).

INTERSECTIONS (INT): Coordinates of all low-altitude and high-altitude intersections and terminal-area airspace fixes.

USER: There are no factory-programmed waypoints in the user category. You may enter up to 250 additional user waypoints as described in "Adding your own waypoints to the database" beginning on page 46.

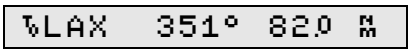
In addition, the database contains RCO (Remote Communication Outlets) frequencies, SUAs (Special Use Airspace), and Victor Airways and Jet Routes.

NOTE: SUAs aren't available in the International FliteCard, and routes aren't available in the International or Helicopter FliteCards.

Also available is an International FliteCard that contains data covering the entire world, an Alaskan FliteCard that includes all of Alaska, and a Helicopter FliteCard.

3.2 DISPLAYING YOUR POSITION

You can instantly display your position in terms of bearing and distance to any of the thousands of waypoints in the unit's database. To do this, use the *large primary* or *secondary* knob to select the waypoint category: **APT, VOR, INT, NDB,** or—if you've already entered some of your own waypoints—**USER**. The section "Selecting waypoints" beginning on page 40 describes numerous ways to quickly find the specific waypoint you want, but for now, just turn the *small primary* knob to select a waypoint of interest. The identifier of the waypoint (such as LAX for Los Angeles International) and its bearing and distance will be displayed on the *primary* readout:



In keeping with standard aviation practice, the bearing displayed is magnetic (referenced to magnetic north).

A shortcut for quickly displaying your position relative to the nearest airport is described in detail in "Quick nearest-airport display" on page 111. Press **–D→** and the left-hand **CRSR** button simultaneously to activate this function.

If you want to display your position as latitude/longitude coordinates, turn the *large primary* knob to **STAT**, and turn the *small primary* knob all the way to the left to find the line that displays the lat/lon of your position.

In units without **STAT**, this information is viewable in **SETUP**.

3.3 ADDITIONAL WAYPOINT INFORMATION

To display more information about a waypoint shown in the *primary* readout, turn the *large secondary* knob to the **INFO** posi-

tion, then turn the *small secondary* knob to scan through the available information. For example, you can display the city and state of airports, VORs, and NDBs. This information can be useful when selecting waypoints, since in many cases waypoint identifiers themselves aren't sufficiently descriptive.

The next two pages list typical information displayed for each waypoint category.

For AIRPORTS:

BOSTON MA	City and State or Country
LOGAN INTL	Name of Airport
ATIS: 135.0	ATIS Frequency
APPROACH:120.625	Approach Control
TOWER: 119.1	Tower Frequency
FSS: 122.4	Flight Service Station
GROUND: 121.9	Ground Frequency
LIGHTS: 122.8	Pilot-Controlled Lighting
CLNC DEL:121.65	Clearance Delivery Frequency
UNICOM: 122.95	Unicom Frequency
CTAF: 119.1	Common Traffic Advisory Frequency
ELEVATION 20'	Field Elevation
15-33 10100'HARD	Runway Designation, Length, and Surface (for up to five runways)
NE-SW 5100'GRAV	
18-36 4000'TURF	
11-29 3500'DIRT	
IFR APCH, LGTD	Approach* and Lighting**
LAT. 42°21.92N	Airport Latitude
LON. 72°46.35W	Airport Longitude

***Approach Categories**

IFR APCH	Instrument Approach Available
NO APCH	No Approach
???? APCH	Data Not Available

****Lighting Categories**

LGTD	Lighted
UNLGTD	Unlighted
LGTD:T	Telephone Request
LGT:??	Data Not Available

For VORs:

GARDNER MA	City and State or Country
GARDNER	VOR Name
VOR FREQ: 110.6	VOR Frequency
LAT. 42°32.81N	VOR Latitude
LON. 72°03.54W	VOR Longitude

For NDBs:

PROVINCETOWN MA	City and State or Country
PROVINCETOWN	NDB Name
NDB FREQ: 389	NDB Frequency
LAT. 42°04.13N	NDB Latitude
LON. 70°13.42W	NDB Longitude

For Intersections:

LAT. 42°15.54N	Intersection Latitude
LON. 71°30.58W	Intersection Longitude

For the User Category:

LAT. 42°15.54N	User Waypoint Latitude
LON. 71°30.58W	User Waypoint Longitude
ERASE XXXXX ACK?	**ACK** to Erase User Waypoint

State and Province Codes for the U.S. and Canada

When a waypoint's city and state or province is displayed, one of the following two-letter codes identifies the state or Canadian province of **APT**, **VOR**, and **NDB** waypoints:

AB	Alberta
AK	Alaska
AL	Alabama
AR	Arkansas
AZ	Arizona
BC	British Columbia
CA	California
CO	Colorado
CT	Connecticut
DC	District of Columbia
DE	Delaware
FL	Florida
GA	Georgia
HI	Hawaii
IA	Iowa
ID	Idaho
IL	Illinois
IN	Indiana
KS	Kansas
KY	Kentucky
LA	Louisiana
MA	Massachusetts
MB	Manitoba
MD	Maryland
ME	Maine
MI	Michigan
MN	Minnesota
MO	Missouri
MS	Mississippi
MT	Montana
NB	New Brunswick
NC	North Carolina
ND	North Dakota
NE	Nebraska
NF	Newfoundland
NH	New Hampshire
NJ	New Jersey
NM	New Mexico
NS	Nova Scotia
NW	Northwest Territories
NV	Nevada
NY	New York
OH	Ohio
OK	Oklahoma
ON	Ontario
OR	Oregon
PA	Pennsylvania
PE	Prince Edward Island
PQ	Province of Quebec
PR	Puerto Rico
RI	Rhode Island
SC	South Carolina
SD	South Dakota
SK	Saskatchewan
TN	Tennessee
TX	Texas
UT	Utah
VA	Virginia
VT	Vermont

Country Codes for countries other than the U.S. and Canada. The following three-letter codes identify the country of waypoints located outside of the U. S. and Canada. This table is current as of *1996* and is subject to additions and deletions.

AFG	Afghanistan
AGO	Angola
AIA	Anguilla
ALB	Albania
ANT	Netherland Antilles & Aruba
ARE	United Arab Emirates
ARG	Argentina
ARM	Armenia
ASM	American Samoa
ATG	Antigua
AUS	Australia
AUT	Austria
AZE	Azerbaijan
BDI	Burundi
BEL	Belgium
BEN	Benin
BFA	Burkima Faso
BGD	Bangladesh
BGR	Bulgaria
BHR	Bahrain
BHS	Bahamas
BIH	Bosnia-Herzegovina
BLR	Belarus
BLZ	Belize
BMU	Bermuda
BOL	Bolivia
BRA	Brazil
BRB	Barbados
BRN	Brunei
BTN	Bhutan
BWA	Botswana
CAF	Central African Republic
CAN	Canada
CHE	Switzerland
CHL	Chile & Easter Is
CHN	PR of China
CIV	Ivory Coast
CMR	Cameroon
COG	Congo
COK	Cook Is
COL	Colombia & San Andres
COM	Comoros
CPV	Cape Verde
CRI	Costa Rica
CUB	Cuba
CYM	Cayman Is
CYP	Cyprus
CZE	Czechoslovakia
DEU	Germany
DJI	Djibouti
DMA	Dominica
DNK	Denmark
DOM	Dominican Republic
DZA	Algeria
ECU	Ecuador
EGY	Egypt
ERI	Eritrea
ESP	Spain & Canary Is & Melilla
EST	Estonia
ETH	Ethiopia
FIN	Finland
FJI	Fiji Is
FLK	Falkland Is
FRA	France
FRO	Faroe Is
FSM	Micronesia
GAB	Gabon
GBR	Great Britain
GEO	Georgia
GHA	Ghana
GIB	Gibraltar
GIN	Guinea Rep
GLP	Guadeloupe
GMB	Gambia
GNB	Guinea-Bissau
GNQ	Equatorial Guinea
GRC	Greece
GRD	Grenada
GRL	Greenland
GTM	Guatemala
GUF	French Guiana
GUM	Guam
GUY	Guyana
HKG	Hong Kong
HND	Honduras
HRV	Croatia
HTI	Haiti
HUN	Hungary
IDN	Indonesia
IND	India
IOT	British Indian Ocean Trust & Chagos Archipelago
IRL	Ireland
IRN	Iran
IRQ	Iraq
ISL	Iceland
ISR	Israel & Jerusalem
ITA	Italy
JAM	Jamaica
JOR	Jordan
JPN	Japan
JTN	Johnston Atoll
KAZ	Kazakhstan
KEN	Kenya
KGZ	Kyrgyzstan
KHM	Cambodia
KIR	Kiribati
KNA	St. Kitts & Nevis Island
KOR	Korea
KWT	Kuwait
LAO	Laos
LBN	Lebanon
LBR	Liberia
LBY	Libya
LCA	St. Lucia
LKA	Sri Lanka
LSO	Lesotho
LTU	Lithuania
LUX	Luxembourg
LVA	Latvia
MAC	Macau
MAR	Morocco
MDA	Moldavia
MDG	Madagascar
MDV	Maldives
MEX	Mexico
MHL	Marshall Is
MID	Midway Is
MKD	Macedonia, FYR
MLI	Mali
MLT	Malta
MMR	Myanmar
MNG	Mongolia
MNP	Mariana Is & N Mariana Is
MOZ	Mozambique
MRT	Mauritania
MSR	Montserrat Is
MTQ	Martinique
MUS	Mauritius
MWI	Malawi
MYS	Malaysia
MYT	Mayotte
NAM	Namibia
NCL	New Caledonia
NER	Niger
NGA	Nigeria
NIC	Nicaragua
NIU	Niue
NLD	Netherlands
NOR	Norway
NPL	Nepal
NRU	Nauru
NZL	New Zealand
OMN	Oman
PAK	Pakistan
PAN	Panama
PCI	Caroline Is
PER	Peru
PHL	Philippines
PLW	Palau
PNG	Papua New Guinea
POL	Poland
PRI	Puerto Rico
PRK	DPR of Korea
PRT	Portugal and Azores and Madeira Island
PRY	Paraguay
PYF	French Pacific Overseas Terr. & Society Is & Tuamotu Is
QAT	Qatar
REU	Reunion
ROM	Romania
RUS	Russia
RWA	Rwanda
SAU	Saudi Arabia
SDN	Sudan
SEN	Senegal
SGP	Singapore
SHN	St. Helena and Ascension Is
SLB	Solomon Is
SLE	Sierra Leone
SLV	El Salvador
SOM	Somalia
SPM	St. Pierre & Miquelon
STP	Sao Tome & Principe
SUR	Suriname
SVK	Slovakia
SVN	Slovenia
SWE	Sweden
SWZ	Swaziland
SYC	Seychelles
SYR	Syria
TCA	Turks Is & Caic Is
TCD	Chad
TGO	Togo
THA	Thailand
TJK	Tajikistan
TKM	Turkmenistan
TON	Tonga
TTO	Trinidad & Tobago Is
TUN	Tunisia
TUR	Turkey
TUV	Tuvalu
TWN	Taiwan
TZA	Tanzania
UGA	Uganda
UKR	Ukraine
URY	Uruguay
USA	USA
UZB	Uzbekistan
VCT	St. Vincent
VEN	Venezuela
VGB	British Virgin Is
VIR	Virgin Is
VNM	Vietnam
VUT	Vanuatu
WLF	Futuna Is & Wallace Is
WSM	Western Samo
XJW	Wake Is
YEM	Yemen
YUG	Yugoslavia
ZAF	S African Republic
ZAR	Zaire
ZMB	Zambia
ZWE	Zimbabwe

3.4 SELECTING WAYPOINTS

To select a specific waypoint within a database category, you have a choice of three methods:

- you may scan through the list of waypoints
- you may enter the identifier of the waypoint
- you may enter the waypoint's name or city

A word of caution: When using the three- or four-letter airport identifiers, be careful to distinguish between the number zero and the letter "oh." The unit always displays the number zero with a slash through it (Ø), and the letter "oh" without the slash (O). Some airport directories show the number zero with a slash through it; other directories do not and they must be looked at carefully—the wider character is the letter "oh" and the narrower character is the number zero. For example, the identifier of Heart Airport in Kansas City is MO06, and must be entered as MOØ6. (You may even be in the habit of thinking of your local airport as OY5 when, in fact, its correct identifier is ØY5.) In a few directories, it's difficult to distinguish between the letter "el" and the number one. The unit won't recognize an identifier that's entered incorrectly. You must always use O and L for the letters and Ø and 1 for the numbers. When scanning through the database, the waypoints beginning with letters appear first, followed by the digits Ø–9, and then the special characters, if any.

In the North American database, the ICAO "K" prefixes for major U.S. airports have been deleted from the identifier. For example, Los Angeles International is shown as LAX, not KLAX. Canadian, Mexican, and Latin American airports are shown with their appropriate ICAO prefix (C for Canada and M for Latin America).

In the International database, the K prefix is included for U.S. airports, where appropriate, to conform to international usage, and Alaskan airports are displayed with their ICAO prefix of PA.

3.4.1 Selecting waypoints by scanning

Scanning and selecting from among the thousands of waypoints stored in the unit's database can be accomplished quickly and easily. Within each waypoint category (**APT**, for example), the unit divides waypoints into two groups: LOCAL and ALL. To

access the LOCAL group, turn the *small* knob all the way to the left. To access the group of ALL waypoints, turn the *small* knob to the right.

The Local Group

The LOCAL waypoint group consists of up to 20 waypoints nearest your present position. These are the waypoints that will be of interest most often, and scanning through them is accomplished quickly. Local airports and VORs are listed in order of distance from your position. NDBs, intersections, and user waypoints are listed alphabetically.

In flight, you'll pass some waypoints and approach others. The unit automatically and continuously updates and rearranges the group of LOCAL waypoints. You can observe this when you display the leftmost (nearest) airport in the local group. As you approach a closer airport, the display will flash `NEAREST AIRPORT`, then automatically display the identifier, bearing, and distance to that airport. If you're using the **INFO** function to display the airport's city and state, the new city will also be automatically displayed.

> **NOTE: Here's a shortcut to display the nearest airport. Simultaneously press −D→ and the left CRSR button to instantly display the nearest airport's identifier, bearing, distance, and longest runway on the primary and secondary readouts.**

The beginning (left end) of the LOCAL group is designated by the display `LOCAL−−→`, and the division between the groups is designated by `←−−LOCAL ALL−−→`. These arrowed displays show the direction to turn the *small* knob to move between the two waypoint groups (LOCAL and ALL).

The All Group

To access the group of ALL waypoints, turn the *small* knob to the right. (You must pause briefly at the `←−−LOCAL ALL−−→` message before you can access the larger group.) Here, you'll find all the waypoints in the waypoint category you selected, listed in alphabetical and numerical order.

In the airport category alone, many thousands of waypoints are listed. It would be time-consuming and unnecessary to have to rotate the *small* knob for thousands of clicks to select the desired

waypoint. The unit steps through the waypoints at a rate proportional to the speed you turn the *small* knob. If you turn the knob slowly, the waypoints appear one at a time, in sequence. Turn the knob quickly, and the waypoints jump by rapidly.

You should practice this procedure to get the feel of it. Search for well-known airports like LAX or DCA (or your local field). Turn the *small* knob rapidly to get to the correct starting letter or number, then turn slowly as you get near the correct waypoint. You'll soon learn how fast to turn the *small* knob to produce the right amount of "jump" in the readout. With a little practice, you should be able to select any waypoint you want in just a few seconds.

3.4.2 Selecting waypoints by identifier

Instead of scanning through waypoints as described above, you can select a waypoint directly by entering the characters of its identifier, the standard one- to five-character code assigned to the waypoint. To do this, proceed as follows:

1. Press **CRSR**, and the leftmost character displayed will flash. Use the *small* knob to select the first letter of the waypoint's identifier. Then use the *large* knob to move the flashing cursor to the second letter and use the *small* knob to select the second character of the identifier. Repeat for each character of the waypoint's identifier until all characters are correct; meanwhile, the unit always tries to guess a matching waypoint identifier.

   NOTE: If you discover that you've entered an incorrect character or characters, simply turn the *large* knob to locate the cursor over each incorrect character and make the correction.

2. When the identifier is completely entered, press **CRSR** again to turn the cursor off. This action completes the selection procedure.

3.4.3 Selecting waypoints by name or city

If you don't know the identifier of an airport, VOR, or NDB, you can ask the unit to search the database for the waypoint's facility name or city. To do this, enter the first few characters of the waypoint name or city as described below. Then, by turning the

small primary knob, you'll scan through only those waypoints whose name or city begins with the characters you specified. Proceed as follows:

1. Turn the *large primary* knob to **APT**, **VOR**, or **NDB** to select the waypoint category.
2. Turn the *large secondary* knob to **INFO**.
3. Turn the *small secondary* knob to display either any waypoint name or any city, depending on which you want to search for. (The waypoint that's displayed at this time is of no consequence.)
4. Press the right-hand **CRSR** button to turn the cursor on, and then use the *secondary* knobs to enter the first few characters of the desired name or city. Do not turn the **CRSR** off!
5. If the desired waypoint doesn't appear in step 4, turn the *small primary* knob to scan through those waypoints that begin with the characters you entered.
6. When you find the desired waypoint, press **CRSR** again to turn the cursor off.

In many cases, the unit will find several waypoints listed for the same city. For example, there are many airports listed under Houston, as well as common city names like Springfield and Columbus, which are found in several different states. Check the state code to the right of the city and the identifier code on the far left to help determine which one you want. Entering the waypoint name, instead of the city, may be a better approach in such cases.

As you turn the *small primary* knob, the unit will display only those cities or names that precisely match the letters you entered. In general, the first five characters of the waypoint's city and name in the database exactly match the listings in airport directories; however, the following changes have been made in the database to make cities and names easier to find:

- All periods have been removed. Any apostrophes and hyphens have been retained.

- Any blank space found between a prefix "MC" and the remainder of the name has been deleted. For example, the name MC BRIAN will appear as MCBRIAN.
- FORT has been abbreviated to FT (no period).
- SAINT has been abbreviated to ST (no period).
- When NORTH, SOUTH, EAST, and WEST are parts of long names, they're usually abbreviated as N, S, E, and W.
- For an airport named for a person, the initials or first names are often deleted, unless the person is especially well-known (such as WILL ROGERS AIRPORT).

3.5 DUPLICATE WAYPOINT IDENTIFIERS

There are many cases in which the FAA or other agencies have assigned the same identifier code for two or more waypoints within the same database category. For example, an NDB co-located with an outer marker may use the same identifier as another NDB located in a different part of the country. In these cases, Northstar adds a suffix to the identifiers to distinguish between them. The suffix is a number sign (#) followed by a one- or two-digit number. For example, two NDBs having the same identifier "CL" would be shown as CL #1 and CL #2. When you enter the identifier CL, you'll see CL #1 displayed as a reminder that there's more than one waypoint designated by that identifier. You can easily determine and select the NDB waypoint you want—in this case CL #1 or CL #2—by checking the displayed bearing and distance, or by using the **INFO** function to display the facility name, or city and state.

The International FliteCard contains many duplicate identifiers. For example, there are 15 intersections named DELTA. An NDB identifier may be used for 10 or more different locations. Because of the large number of duplicate identifiers, it is vitally important to make sure you're using the desired waypoint, which you can do in any of the following ways:

- check the waypoint's city and state or country, or its name
- check the waypoint's lat/lon coordinates
- check the waypoint's distance and bearing from your present position

- when forming a route, check the waypoint's distance and bearing from the previous waypoint in the route
- use the LOCAL list of waypoints to select from the waypoints that are near your present position

In addition, when using the unit to fly to a waypoint, always verify that the displayed distance and bearing to the waypoint are the values you expect. You don't want to start flying north 15 miles to BR NDB in Iowa, when the unit is actually navigating 3,000 miles northeast to BR NDB in Egilsstadir, Iceland!

For airports, VORs, and NDBs, duplicate identifiers are handled by the method described above. A number sign and a one- or two-digit number are added to the official identifier so that the resulting identifier displayed by the unit is different for each waypoint. To maintain consistency, the same numbers are used in the North American FliteCard as the International FliteCard. This means that the North American FliteCard might contain an identifier like BR#2, but no other BRs. Although this might appear to be an error, the "missing" BRs are contained in the International FliteCard, and the "#2" suffix is retained in the North American card, so that a pilot who uses both cards may refer to the same identifier in each.

For intersections, there's no room on the readout to display more than the five-character identifier. All duplicates of a given intersection identifier look the same on the readouts. To choose the correct intersection, use any of the methods outlined in the list above—except the first. Whenever you first select an intersection identifier that has duplicates, a flashing number sign is automatically displayed following the identifier, serving as a reminder that there are several duplicate identifiers from which you must choose. These duplicate identifiers are adjacent in the database, and you may use the *small primary* or *small secondary* knobs, depending on which readout you're using, to scan through them.

3.6 TO/FROM INDICATOR

When the waypoint's bearing is displayed, an indicator appears that shows whether the bearing is TO or FROM the desired waypoint. Unless changed by the user, the unit displays the bearing TO the waypoint. Exception: A VOR waypoint displayed

on the *secondary* readout will normally be displayed with a FROM bearing.

You can change the TO/FROM indicator in either readout to obtain a bearing that is the reciprocal of the one being displayed. To do this, press **CRSR** and turn the *large* knob to the left so that the flashing cursor is positioned on the TO/FROM indicator. Turn the *small* knob to select TO or FROM, then press **CRSR** again to turn the flashing cursor off.

TO bearing:

FROM bearing:

If you change the TO/FROM indicator for a waypoint, that new indicator will be shown until you change it or display another waypoint. The indicator will then automatically return to its normal status.

CAUTION: Always check the TO/FROM indicator to be sure you know which type of bearing the unit is displaying!

NOTE: The reciprocal of a distant waypoint may differ by an amount other than 180° because of differences in magnetic variation at that waypoint, and because the path calculated by the unit is a great circle.

3.7 ADDING YOUR OWN WAYPOINTS TO THE DATABASE

You can add up to 250 of your own waypoints to the **USER** category of the unit's database, using either the *primary* or *secondary* readout. Each waypoint is automatically inserted in alphabetical and numerical order.

You may enter the waypoint's identifier and its coordinates.

User waypoints can't be added to the **APT**, **VOR**, **NDB,** or **INT** waypoint categories.

3.7.1 Entering a user waypoint

To store user waypoints in the database, use any of the following four methods to specify the waypoint's coordinates. Each method is described in detail in step 4 beginning on the next page:

- aircraft's present position
- latitude/longitude coordinates
- distance and bearing from an existing waypoint
- a previously saved position

The first step in adding a user-entered waypoint is choosing and entering the identifier of the new waypoint. User-entered waypoint identifiers can be one to five characters in length and can consist of any combination of letters (A-Z), numbers (0-*9*), or special characters (#, /, *, or a blank space).

1. Turn the *large primary* or *secondary* knob to **USER**.

   NOTE: Be sure the readout displays a waypoint, not the LOCAL–ALL message. Turn the *small* knob, if necessary, to change it. If there are no waypoints already entered, you must turn that *small* knob to display the identifier *** before proceeding.**

2. Press **CRSR** and use the *small* and *large* knobs to enter the identifier of the new waypoint. (Don't be concerned; you won't affect the waypoint previously displayed.) When you're finished, press **CRSR** again. The unit will display:

   ```
   XXXXX UNKNOWN:  STORE IT?  ACK?
   ```

3. Press **ACK**.

   NOTE: If a user waypoint with the same identifier is already stored in the database, you'll see your distance and bearing to the existing waypoint displayed, instead of the above message. In this case, you may choose a different identifier or erase the old waypoint, if it's no longer needed, as described in "Erasing a user-entered waypoint" on page 49.

The next step is entering the coordinates of the new waypoint.

4. The unit now asks how you want to specify the position of the waypoint. Turn the *small secondary* knob to the right to choose one of the following four entry methods:

Method 1–Enter present position:

```
THIS POS'N.  ACK?
```

a. Press **ACK** to store the aircraft's position at the instant **ACK** is pressed.

NOTE: The coordinates saved may be meaningless if the message NO POSITION FROM GPS is active.

NOTE: At this time, you may obtain an estimate of the accuracy of this waypoint by pressing and holding WARN and reading the displayed GPS accuracy estimate.

Method 2–Enter lat/lon coordinates:

```
LAT/LON.    ACK?
```

a. Press **ACK**. Then, using *small* and *large secondary* knobs:

b. Enter latitude and press **ACK**.

c. Enter longitude and press **ACK**.

Method 3–Enter distance and bearing from an existing reference waypoint:

```
 D/B FR. WPT. ACK?
```

a. Press **ACK**. Then, using the *small* and *large secondary* knobs:

b. Enter distance from existing reference waypoint, and then press **ACK**.

c. Enter bearing from existing reference waypoint, and then press **ACK**.

d. Select the reference waypoint category and identifier, and then press **ACK**.

NOTE: To select a reference waypoint identifier, you may scan through the database or use the cursor to enter each character. You may also preselect that waypoint (on the *primary* readout) before beginning this procedure, so that the waypoint will be waiting for you in its category when you get to this step. This is particularly advisable for waypoints that have duplicate identifiers—it's much easier to distinguish duplicate waypoints on the *primary* readout.

Method 4–Use one of 10 previously saved positions:

(See "Saving your present position" on page 50.)

a. Press **ACK**.

b. Each saved position is temporarily identified by a phonetic alphabet word (ALFA, BRAVO, and so on) as follows:

NOTE: The advisory indicator ↳ (lat/lon) will flash, indicating that the coordinates may be incorrect, if any of the following occurred when the position was originally saved: 1) the unit was in demo mode; 2) the message NO POSITION FROM GPS was active; or 3) the message POOR OR DEGRADED ACCURACY was active. If the indicator isn't displayed, the saved coordinates should be reliable.

You'll see the most recently saved position displayed first. If you want to select an earlier position instead, turn the *small* knob to the left until it's displayed.

c. Press **ACK**.

Now you've finished adding and defining the new waypoint. The unit will display the waypoint's identifier, and the bearing and distance to it. You may view the waypoint's lat/lon coordinates with the **USER INFO** function.

The new waypoint is now stored in the **USER** category of the database.

3.7.2 Erasing a user-entered waypoint

You may find that you no longer need a user-entered waypoint. Or you may have entered a waypoint incorrectly and want to erase it. To erase a waypoint:

1. Display the waypoint on the *primary* readout.

2. Turn the *large secondary* knob to **INFO**. Then turn the *small secondary* knob until the *secondary* readout displays:

3. Press **ACK** to erase the waypoint. As you might expect, you may erase only those waypoints that you've entered and defined; factory-programmed waypoints can't be erased. Also, any waypoints in use for navigation or in a user-entered route can't be erased.

3.7.3 Saving your present position

You may instantly save your present position with a temporary name, and at a later time, convert it to a database waypoint. This process has two steps:

1. When flying directly over the desired waypoint, press **ACK** to save your position immediately.

   NOTE: You can save up to 10 positions with temporary names. When this number is exceeded, the unit automatically deletes the earliest entry.

2. Later, when time and workload permit, give the saved position a permanent identifier (see "Entering a user waypoint" on page 47), and store it as a database waypoint so it can be used.

In detail, saving your position works as follows: Whenever the **ACK** button isn't illuminated or flashing, you may press it to save your position at that instant. After you press **ACK** to save your position, the readouts will display a message, such as ✱SAVED✱ ALFA. The phonetic alphabet words ALFA, BRAVO, etc., are automatically assigned by the unit to temporarily identify the last 10 of these saved positions. Press **ACK** a second time to clear the message. (It's a good idea to write down the temporary identifier and the significance of saved positions you intend to use later, so you can easily identify them correctly.)

Then, when your workload permits, transfer the new position to the database by renaming it as a database waypoint as described in Method 4 on page 49. These saved positions can't be accessed until they've been transferred to the database.

In summary, a previously saved waypoint is transferred to the database with the following procedure:

1. Turn either *large* knob to **USER**.
2. Press the **CRSR** button and enter a new name for the waypoint.
3. Press **CRSR** to turn the flashing cursor off.
4. Press **ACK**.
5. Turn the *large secondary* knob three clicks to the right.
6. Press **ACK** twice.

Note that Method 1 on page 48 describes another method of storing your present position as a waypoint. This method is described under the heading `THIS POS'N`. Using this alternate method, the waypoint is stored in a single operation, but it requires the preparatory work of entering the waypoint identifier before the instant of saving your present position.

In summary, your present position may be stored directly as a database waypoint with the following procedure:

1. Turn either *large* knob to **USER**.
2. Press the **CRSR** button and enter an unused name for the new waypoint.
3. Press **CRSR** to turn the flashing cursor off.
4. Press **ACK**, wait until you're directly over the waypoint, and press **ACK** again.

Whichever method you choose, when you save your position, push the **WARN** button to check your position's accuracy.

3.8 FLITECARD™ UPDATES

As with all navigational data, the waypoint information in the unit's database is subject to occasional changes. Many changes are relatively insignificant. Other changes can be critical, however, such as airports that have been abandoned or VORs that have been moved or whose identifiers have been changed.

Your database's expiration date is displayed during self-test after power is applied, and as a **SETUP** function. For VFR use, it's recommended that your FliteCard be updated at least once or twice a year. In an IFR-approved installation (for M2s only), if the data in your FliteCard has expired, you'll have to respond every time the unit is turned on to a message that warns about the expiration.

Accuracy and completeness of the database is intended only for the cycle for which it's provided. Users are encouraged to keep data current by contacting Jeppesen at 800-621-JEPP.

You can install the FliteCard yourself following the instructions given below, or if you want, it can be installed quickly either by your dealer or at the Northstar factory. Contact your dealer for information on pricing and availability.

At the present time, FliteCards for the unit are available in four versions (see details below): North American, Alaskan, International, and Helicopter. The North American FliteCard is appropriate for use in the U.S. (including Hawaii and Alaska, but excluding Hawaiian and Alaskan intersections), Canada, Mexico, and the Caribbean. It contains far fewer duplicate identifiers than the International card, and the international "K" prefix for larger U.S. airports is deleted. The Alaskan FliteCard contains all of Alaska and Canada and most of the U.S. The International FliteCard is intended primarily for use outside of North America. The Helicopter FliteCard is appropriate for use in the U.S., Canada, Mexico, and the Caribbean, and includes all public and private airports as well as public and private heliports registered with the FAA.

- Northstar FliteCard: North American

  Area covered: U.S. (including Hawaii and Alaska, but excluding Hawaiian and Alaskan intersections); Canada; Mexico; and the Caribbean.

  FliteCard contents as of May 1998 (these amounts are only approximate and are subject to change without notice):

  13,260 airports (all public airports, and most U.S. private airports, registered with the FAA, with the exception of non-hard-surface runways shorter than 1,800 feet)

  1,300 VORs

2,500 NDBs

16,950 Intersections

3,600 Remote Communications Outlets (RCOs)

1,100 Victor and Jet airways

150 U.S. Class B and Class C airspaces (TCAs and ARSAs)

960 U.S. MOAs, and Restricted, Prohibited, Alert, and Warning Areas

Data Source: Data for the North American FliteCard is obtained from Jeppesen Sanderson, Inc. Data for U.S. private airports is obtained from the FAA National Flight Data Center.

- Northstar FliteCard: Alaskan

  Area covered: All of Alaska and Canada, and all of the U.S. down to 30.0 N latitude.

  FliteCard Contents as of January 1999 (these amounts are only approximate and are subject to change without notice):

  13,350 airports (all public airports, and most U.S. private airports registered with the FAA)

  1,100 VORs

  2220 NDBs

  16,730 Intersections

  3,625 RCOs

  1,120 Victor and Jet Airways

  150 U.S. Class B and Class C airspaces (TCAs, ARSAs)

  970 U.S. MOAs, and Restricted, Prohibited, Alert, and Warning Areas

  Data source: Data for the Alaskan FliteCard is obtained from Jeppesen Sanderson, Inc. Data for U.S. private airports is obtained from the FAA National Flight Data Center.

- Northstar FliteCard: International

  Area covered: Worldwide.

  FliteCard Contents as of May 1998 (these amounts are only approximate and are subject to change without notice):

12,230 airports (all airports that are available from the Jeppesen database)

3,300 VORs

7,830 NDBs

24,620 Intersections

1,170 RCOs

Data source: Data for the International FliteCard is obtained from Jeppesen Sanderson, Inc.

- Northstar FliteCard: Helicopter

  Area covered: U.S. (including Hawaii and Alaska, but excluding Hawaiian and Alaskan intersections); Canada; Mexico; and the Caribbean.

  FliteCard Contents as of January 1999 (these amounts are only approximate and are subject to change without notice):

  17,240 airports (all public airports/heliports and most private airports/heliports registered with the FAA)

  1,020 VORs

  1,730 NDBs

  14,250 Intersections

  3,630 RCOs

  0 Victor and Jet Airways

  150 U.S. Class B and Class C airspaces (TCAs and ARSAs)

  970 U.S. MOAs, and Restricted, Prohibited, Alert, and Warning Areas

  Data source: Data for the Helicopter FliteCard is obtained from Jeppesen Sanderson, Inc. Data for U.S. private airports is obtained from the FAA National Flight Data Center.

Accuracy and completeness of the database is warranted only for the 28-day cycle for which the data is effective. Users are encouraged to keep data current by contacting Jeppesen at 800-621-JEPP for subscription information.

3.9 FLITECARD™ WARRANTY

Jeppesen Sanderson, Inc. warrants that it will accurately compile, reproduce, and process the flight navigation source material on which the navigation data is based. HOWEVER, JEPPESEN MAKES NO WARRANTY, WHETHER EXPRESS OR IMPLIED, AS TO THE ACCURACY OF THE SOURCE MATERIAL ITSELF, INCLUDING WARRANTIES OR MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE.

3.10 CHANGING YOUR FLITECARD™

The FliteCard may be changed to a current version with the following procedure.

Tool required: One 1/8-inch flat-blade screwdriver

1. With the unit turned off, remove it from the instrument panel by inserting a flat-blade screwdriver into the hole in the front on the unit, and engaging the slot in the retaining screw. Turn it counterclockwise six revolutions or more until the unit is released from the mounting tray, then slide the unit out of the tray.
2. Holding the unit so that the right-hand side is visible, release the FliteCard by pressing the small rectangular button on the right side of the unit as indicated by the arrow on the unit's top cover. Remove the FliteCard.
3. Insert the new FliteCard by pressing it firmly into the slot as shown on the unit's top cover.
4. Be sure the aircraft battery power is off. Install the unit in the instrument panel by gently sliding it into the mounting tray until the retaining screw contacts its threads when the unit is still about inch from being fully seated. Turn the retaining screw to draw the unit the remaining distance into the panel. Do not overtighten!

With the Northstar navigator, you can instantly access information about one of thousands of waypoints, and you can enter many of your own. But the primary purpose of waypoints is to help you to navigate. How to do that is the subject of the following sections.

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Section 4 – NAVIGATING WITH WAYPOINTS

This section explains how to fly single-segment flight paths with the navigator, such as flying direct to a waypoint or flying a constant heading. Queuing of a second segment is also explained. An entire flight plan may be easily flown with the procedures described in this section.

CONTENTS

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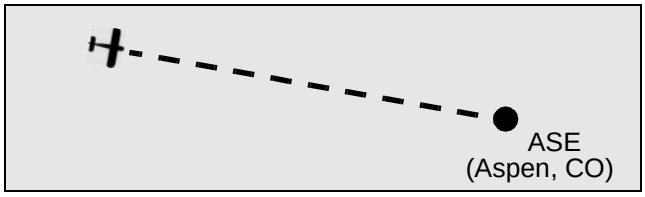
4.1 FLYING DIRECT TO A WAYPOINT



The simplest way to navigate with the unit is to fly direct from your present position to a waypoint:

1. Pick your waypoint and display it in the *primary* (left-hand) readout. (See "Selecting waypoints" on page 40.)
2. Press the button marked **–D→** (direct). The **ACK** button will flash, and the unit displays:

```
FLY 123° DIRECT TO ASE        ACK?
```

3. Press the **ACK** button.

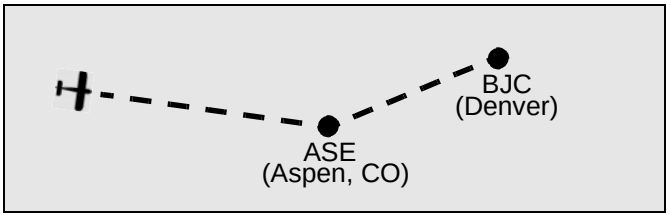
   You've just defined and confirmed a flight path direct from your present position to the waypoint, and the unit is navigating to it.

   NOTE: The *primary* readout will automatically switch to the TRK function, and the TRK annunciator will illuminate. Turn the *small primary* knob to select a variety of informational readouts that guide you to the waypoint. See "Track functions and readouts" on page 66.

The unit will continue to update and display track information no matter what heading you fly or how far you stray from your original course line. Using this feature, you can navigate along a whole series of waypoints, specifying the next waypoint just as you cross the current waypoint.

This one function may satisfy almost all of your basic navigation requirements. It's the only one you really need to know how to use, but the unit offers many variations of this function. These are detailed in the following sections.

4.2 QUEUING A SECOND WAYPOINT



The unit's waypoint queuing function lets you specify the next waypoint to fly to before you reach the current waypoint. (If you're unfamiliar with the term *queue*, it means to put in line, as when several people are waiting for service at a ticket window). Using this feature, you can navigate along a series of waypoints, specifying the next waypoint at any time before you pass the current waypoint. Waypoint queuing provides many of the advantages of following an entire route automatically (see Section 5), while providing the flexibility of easily handling last-minute changes to your flight plan:

- Queuing reduces your workload at each waypoint, since you don't have to locate and specify the next waypoint while crossing the current waypoint.
- The unit displays the desired track of the next leg while you're still flying the current leg, so you can prepare for the turn.
- The unit shows you when you should start the turn, shortly *before* the current waypoint, as specified in Section 5-3-5 of the *Airman's Information Manual*, helping you to remain within the airway boundaries.
- The next leg extends precisely from the current waypoint to the queued waypoint, rather than from the point at which you activated the next leg.

To queue the next waypoint:

1. Display the next waypoint in the *primary* readout.
2. Press the **–D→** button twice. The readouts will display:

```
FLY 052°TO BJC  AFTER ASE   ACK?
```

If you've already passed the current waypoint, FROM replaces AFTER.

3. Press **ACK**. The unit will continue navigating to ASE, and then automatically switch to BJC.

> **NOTE: As it does when flying direct to a waypoint, the *primary* readout will automatically switch to the TRK function, and the TRK annunciator will illuminate. Turn the *small primary* knob to select a variety of informational readouts that guide you to the waypoint. See "Track functions and readouts" on page 66.**

When you're about 15 seconds before the start of the turn, the waypoint annunciator will begin flashing. If you're already viewing **TRK INFO**, the turn readouts below will be automatically displayed. Otherwise, the **ACK** button will flash, prompting you to press it to read an advisory. When you press it, the **ACK** button will stay illuminated and the readout will display the advisory, such as:

```
TURN TO 052°: 02M
```

This readout indicates you should begin a standard-rate turn to 052° in 0.2 nm, to merge with the next leg without overshooting it (neglecting any effects of winds). When the displayed distance to the turn reaches zero, the advisory changes to:

```
TURNING NOW → 052°
```

During the turn, all guidance is relative to the turning arc. After a few seconds, the readout returns to your previous readout with the **ACK** light off. You can remove the advisory early by pressing the **ACK** button. If the unit had already sequenced to the next leg by the time you pushed the flashing **ACK** button, a different advisory would have been displayed:

```
NOW ON NEXT LEG
```

If the queued leg is within 2° of the direction of the first leg, no advisories are given.

The turn information is also continuously available in **TRK INFO** when the *small secondary* knob is all the way to the left.

If you queue a leg while the unit is flying a route, the remainder of the route is cancelled and replaced by the queued leg.

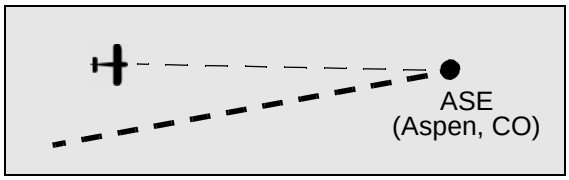
You can only queue one waypoint at a time. To change the queued waypoint, just repeat the above procedure, and the newly-specified queued waypoint replaces the old one.

The identifier of the queued waypoint may be displayed by turning the *large primary* knob to **TRK** and the *small primary* knob all the way to the left:

```
NEXT LEG: %BJC
```

Information about that waypoint can be displayed in **TRK INFO** by turning the *small secondary* knob.

4.3 CENTERING THE CDI



Use this procedure to fly direct from your present position to the current waypoint without returning to the established desired track. You might use this function when flying VFR, if you had strayed off the course (for example, to avoid a restricted area) and you simply wanted to fly straight to the current waypoint.

NOTE: Remember that this function changes the location of the desired track line or course.

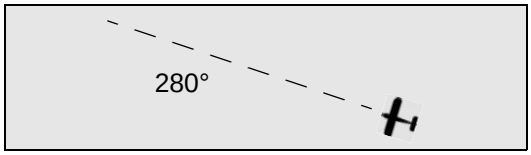
To center the CDI and establish a new track or course:

1. Turn the *large primary* knob to **TRK**.
2. Press **–D→** and **ACK**.

The unit will resume normal operation, and when you return to the CDI display, you'll see that the course line has been moved to run from your present position direct to the waypoint.

If you center the CDI while flying a route, guidance will continue normally after that leg.

4.4 FLYING A COURSE



You can perform another basic form of navigation with the unit—flying a particular course from your present position without specifying a waypoint as a destination:

1. Turn the *large primary* knob to **TRK**.
2. Press the button marked **–D→** (don't press **ACK** yet). You'll see a bearing and current destination, if any.

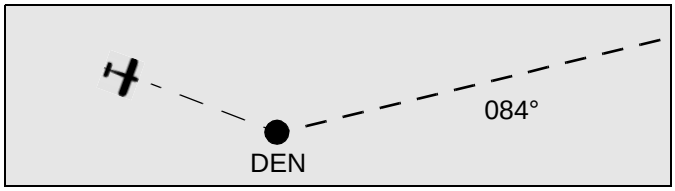
```
FLY 270° DIRECT TO ASE      ACK?
```

3. Turn the *small primary* knob to select the course you want to fly. When it's correct, press **ACK**. The unit is now navigating along the designated course line.

```
FLY 280°                    ACK?
```

The unit will switch automatically to the **TRK** function and display guidance along the course line.

4.5 QUEUING A RADIAL FROM THE CURRENT WAYPOINT



You can fly a course from your present position as described in the previous section, or you can fly a course line (a radial) from the upcoming waypoint, as described here.

To queue a radial to fly away from the current waypoint:

1. Turn the *large primary* knob to **TRK**.

2. Press **–D→** twice:

```
FLY 115°  AFTER DEN          ACK?
```

3. Turn the *small primary* knob to select the radial along which you want to leave the waypoint:

```
FLY 084°     ACK?
```

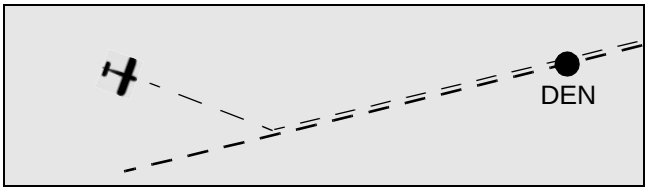
4. Press **ACK**. The unit will continue navigating to the current waypoint, and then navigate along the specified radial from the waypoint.

> **NOTE: Turn the *small primary* knob to select a variety of navigational TRK function readouts. See "Track functions and readouts" on page 66.**

If you've already passed the waypoint, the unit will sequence immediately to the radial.

Queuing a radial while flying a route pauses the route so that it can easily be rejoined.

4.6 FLYING A BEARING TO/FROM A WAYPOINT



You can use the unit to intercept and fly along a specified bearing to or from any waypoint.

> **NOTE: ATC often talks of intercepting specific radials when the navaid is a VOR, and of bearings when referring to an NDB. For example, if you're west of the DEN VOR, and ATC instructs you to intercept the 253° radial to DEN, this is the equivalent of flying the 73° bearing to DEN.**

1. Display the waypoint on the *primary* readout.
2. Press **–D→** to display the following readout:

```
FLY 90° DIRECT TO DEN        ACK?
```

3. Use the *small primary* knob as a course-set function to select the direction you want to fly to or from the waypoint:

NOTE: Always specify the direction you want to fly. In this example, 73° is inbound to the waypoint. To fly outbound on the same radial, dial in 253°; the readout will display FROM **instead of** TO**.**

4. Press **ACK**.

NOTE: The *primary* readout will automatically switch to the TRK function, and the TRK annunciator will illuminate. Turn the *small primary* knob to select a variety of navigational TRK function readouts. See "Track functions and readouts" on page 66.

The CDI immediately shows the off-course distance, just like the needle of a VOR receiver. Always fly TO the needle, regardless of whether you're flying to or from the waypoint.

With VOR receivers, set the OBS to 73° (the flag shows a TO), and you're set up to intercept the 73° bearing. If ATC instructs you to intercept and fly the 253° *radial* outbound, this means fly the 253° bearing. Just remember to tell the unit the direction you want to fly. With NDBs, ATC refers to *bearings*, not radials. The unit's course-select function is always specified as a bearing that you'll fly, whether the navaid is a VOR or NDB. Use this function to navigate to/from airports, intersections, or user waypoints.

4.7 HOLDING ON THE NEXT WAYPOINT

You can set the unit to hold on the next waypoint. Specify the outbound direction to fly from the waypoint, and the unit will automatically sequence through the outbound and inbound legs of the hold.

To fly a holding pattern on the next waypoint:

1. Turn the *large primary* knob to **TRK** and the *large secondary* knob to **INFO**.
2. Turn the *small secondary* knob to the right to display:

3. Press **ACK**. The unit displays:

```
HOLD OUT 252°, IN 072° @NBE ACK?
```

4. Turn the *small primary* knob to select the outbound direction to fly, then press **ACK**.

The unit will guide you around the holding pattern, automatically sequencing the outbound and inbound legs as you make the turns. You must take the initiative, however, in turning the aircraft to the inbound leg. The unit will sequence when it's sure that you've changed direction.

You can leave the hold by choosing many other forms of navigation, including:

- flying direct to a waypoint
- queuing a waypoint to fly to after you pass the hold point one more time
- flying a route

If you queue another leg while receiving inbound guidance in the hold, the unit will sequence at the holding point. If you queue while outbound, however, the unit sequences immediately to the queued leg.

4.8 TRACK FUNCTIONS AND READOUTS

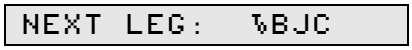
The unit automatically switches to the **TRK** readout when you set it up to navigate by pressing **–D→** and **ACK**. The functions displayed will depend on what you've told the unit to do. For example, if you're flying a course line, ETA won't be displayed.

To access the unit's **TRK** functions and their readouts:

1. Set the *large primary* knob to **TRK**.
2. Turn the *small primary* knob to select any of the following functions; typical readouts are shown. (Also, when you're in the **INFO** function, the *primary* readouts shown below in Sections 4.8.1 through 4.8.4 display further information in the *secondary* readout. See "Information displays" on page 71.)

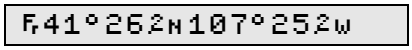
4.8.1 The next leg

If designated by the waypoint queuing function. (See "Queuing a second waypoint" on page 60):

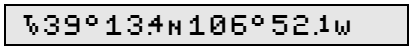


If the queued leg is a radial (See "Queuing a radial from the current waypoint" on page 63):

4.8.2 The lat/lon of the FROM waypoint (if any)



4.8.3 The lat/lon of the TO waypoint (if any)



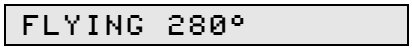
4.8.4 The leg you're currently following

One of the following typical readouts will appear, depending on how you specified the track:

Flying direct to a waypoint:

Flying a from-to leg:

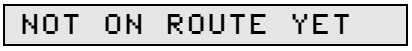
Flying a course:



Flying a radial:

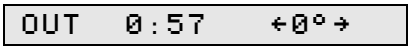
The following additional message appears when you're flying direct to the first waypoint of a route or if you've re-centered the CDI while on a route.

Direct to a route waypoint:

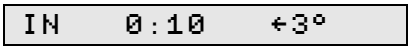


4.8.5 Ground speed and track angle error (TAE)

If outbound on a hold:



If inbound on a hold:

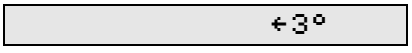


On a hold, GS is replaced by the length of time you've been flying the leg. As happens in the ETE readout (see 4.8.8 below), the times will flash if you're more than four miles off your defined desired course, when the unit senses that you don't seem to be flying to the designated waypoint.

TAE is the difference between your intended track angle and your actual course over ground. It's the correction that should be applied to your track angle to make it parallel to the desired track line. The goal is to fly on the leg, with zero TAE.

When you're flying parallel to or exactly on the leg, with zero TAE, the unit displays:

If your track angle is 3° greater than the desired track, the unit displays:

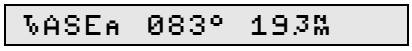


Arrows show the direction you must turn the aircraft to bring the TAE to zero (to fly parallel to the desired course line):

- The left arrow (←) indicates you must come left (3° in the example above) to fly parallel to the desired track.

- A right arrow (→) means you must come right to become parallel.

4.8.6 Bearing and distance to waypoint



4.8.7 Course deviation indicator

This readout for the unit's built-in electronic CDI simulates the needle of a mechanical CDI. The vertical line represents your desired track. When it moves to the left of center, your course line lies to your left. To stay on course, fly to the needle as in conventional **VOR** navigation. Any parallel offset will be noted on the left.

4.8.8 Ground speed and ETE

The unit divides the distance to the waypoint by your ground speed, and shows this as your ETE. In other words, the displayed ETE is the time it would take you to get to the waypoint if you flew directly there from your present position at your present speed. As mentioned above in 4.8.5, if you're more than four miles off your defined desired course, the ETE will automatically flash, when the unit senses that you don't seem to be flying to the designated waypoint.

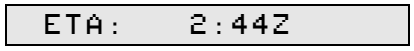
4.8.9 Ground speed and track angle

4.8.10 Cross-track distance (distance off-course)

This readout means that the course line from your starting position to your destination is 2.2 nm to your left; turn to the left to get back on course. Any parallel offset will be noted on the

right. Distances less than 1 nm are displayed in hundredths of a mile.

4.8.11 Estimated time of arrival



(Not always shown if you're flying a course or a radial)

ETA is calculated based on the time zone selected in the **SETUP** function, described in Section 2. The ETA flashes if you're more than four miles off your course line. As shipped from the factory, the unit displays ETA as ZULU time.

To change the ETA readout to a different time zone, press **CRSR** and use the *small primary* knob to select the desired standard or daylight time zone. Press **CRSR** again after you've set the desired time zone.

NOTE: Changing the ETA's time zone doesn't change the time zone displayed in the TIME IS SETUP function.

Time zone abbreviations and their meanings are shown below:

Z	Coordinated Universal Time
SST	Samoa Standard Time
HAS	Hawaii-Aleutian Standard Time
AKS	Alaska Standard Time
PST	Pacific Standard Time
MST	Mountain Standard Time
CST	Central Standard Time
EST	Eastern Standard Time
ATS	Atlantic Standard Time
GST	Greenland Standard Time
SDT	Samoa Daylight Time
HAD	Hawaii-Aleutian Daylight Time
AKD	Pacific Daylight Time
MDT	Mountain Daylight Time
CDT	Central Daylight Time
EDT	Eastern Daylight Time
ATD	Atlantic Daylight Time
GDT	Greenland Daylight Time

Other time zones throughout the world are identified by their standard single-letter designator.

4.8.12 Waypoint category indicators

When the unit's **TRK** function is used, the small letter following the waypoint identifier in the readout indicates the waypoint category:

- A Public Airport
- M Military Airport
- F Private Airport
- H Heliport
- V VOR
- N NDB
- I Intersection
- U User-entered Waypoint

4.9 INFORMATION DISPLAYS

When the *primary* readout displays **TRK** data, you can set the *large secondary* knob to the **INFO** position, and turn the *small secondary* knob to select another **TRK** function (as described in Sections 4.8.5 to 4.8.11) to be shown on the *secondary* readout. If the **TRK** function is displaying a waypoint on the primary readout, the **INFO** function can be used to display database information for that waypoint.

An additional function may be displayed on the *secondary* readout by turning the *small secondary* knob all the way to the left:

```
DESIRED TRK 167°
```

This function shows your current desired track, followed by information about any upcoming turns, possible manual sequences required by the pilot, and so on.

4.10 OFF-COURSE ALARM

If you deviate from the calculated flight path by more than four miles, the unit informs you by flashing the **ACK** button. When this happens, press the **ACK** button and the advisory `OFF-`

COURSE ALARM will appear in the readout. Press the **ACK** button again to clear the advisory. In addition, the ETA, ETE, and IN and OUT time values will flash for as long as you are off-course.

Section 5 - USING ROUTES

This section describes how to access the routes stored in the database, how to specify your own routes, and how the unit can guide you through a route automatically. You'll also learn about the various in-flight advisories that the unit will give you, how to revise a user-entered route before or during flight, how to divert from that route, and more.

A *route* is a predefined sequence of waypoints that may be stored in the unit's database. A *flight plan* is a sequence of waypoints you expect to follow on a particular trip. You can fly a flight plan by specifying waypoints one at a time as you fly, as described in "Section 4 – NAVIGATING WITH WAYPOINTS" beginning on page 57, or by following a stored route or a portion of a route, as described in this section.

CONTENTS

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5.1 GENERAL INFORMATION

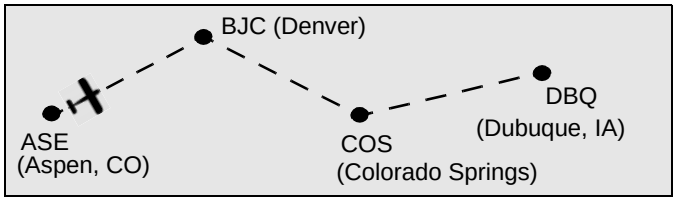
5.1.1 Terminology

In this manual, the term *route* is used to designate one of the airways or other sequences of waypoints stored in the Northstar's database. The term *flight plan*, on the other hand, is used to designate the sequence of waypoints you intend to follow on any particular trip. A typical flight plan might follow a database route, or might consist of a series of individually chosen waypoints from the database.

The unit follows a route automatically, guiding you to each waypoint and indicating exactly when to start the turn to the next waypoint.

To help you fly your flight plan, the North American database contains Victor airways and Jet routes. In addition, you may enter up to 100 of your own personal routes into the database.

A typical route is shown below. It consists of a *starting point* (ASE) and a *destination* (DBQ), and a series of *legs* connecting the waypoints. In this example, after you take off from ASE, the unit can automatically guide you to BJC, COS, and finally, to DBQ.



This sequence of waypoints, which comprises the route ASPEN-DUBUQUE, is used throughout this section to illustrate and discuss user-entered route functions.

The actual Victor airway V99 is used to illustrate and discuss route functions.

5.1.2 Flying a route

Routes are stored in the database category labelled **RTE**. A route is accessed by scanning through the route identifiers with the

small primary knob, or by using the flashing cursor to enter the route name character by character.

To follow a route, display its identifier, and then simply press **–D→** and **ACK**. (To start on a leg other than the one displayed, turn the *small secondary* knob to display the desired leg before pressing **–D→** and **ACK**. To fly in the opposite direction along the route, press **–D→** twice and **ACK**.) The unit will immediately start navigating along the chosen leg. The **TRK** function displays information about navigating along that leg.

5.1.3 Should I use routes or waypoint queuing?

Before using the unit to follow a flight plan, you should consider the possible changes you might be required to make to the flight plan while en route. If you expect many changes, you may find it easier to use the techniques described in Section 4, and simply navigate from point to point. In particular, the unit's waypoint queuing feature provides many of the advantages of route following, while retaining total flexibility for easy in-flight changes. (See "Queuing a second waypoint" on page 60.)

If you're following a Victor airway, or if you expect few changes to a user-entered route, the unit's route-following function can reduce pilot workload and increase safety. When following airways, communications and VOR navigation are almost always available, and the Minimum Enroute Altitude defined for each leg is often lower and less restrictive than the Maximum Elevation Figure available for the general area. Storing user-entered routes gives you the flexibility of adding any additional routes that you expect to fly repetitively.

5.2 ROUTE FUNCTIONS

This section summarizes the unit's route functions. Remember: For illustration and discussion, this section uses both a hypothetical route (ASPEN-DUBUQUE) and the actual Victor airway name V99. Each function is described in detail in later sections. With the *large primary* knob set to **RTE**, turn the *large secondary* knob to choose one of the following functions:

The following typical information would be displayed for any user-entered routes:

```
ASPEN-DUBUQUE  FRASE    %BJC
ASPEN-DUBUQUE     LEG INFO...
ASPEN-DUBUQUE     LEG EDIT...
ASPEN-DUBUQUE  LENGTH:   326M
ASPEN-DUBUQUE  TO END:   176M
ASPEN-DUBUQUE  ETE 0:25 AT 110%
ASPEN-DUBUQUE  ERASE ROUTE ACK?
ASPEN-DUBUQUE  CHANGE NAME ACK?
```

The North American and Alaskan FliteCard's database routes (Victor airways) can't be modified. For these, the third, seventh, and eighth functions shown below are displayed differently from user-entered routes:

```
V99 (US)       FRLGA    %OUTTEI
V99 (US)          LEG INFO...
V99 (US)        AIRWAY, NO EDIT
V99 (US)        LENGTH:    116.0M
V99 (US)        TO END:     89.3M
V99 (US)        ETE 0:41 AT 140%
V99 (US)        AIRWAY, NO ERASE
V99 (US)        CANNOT RENAME
```

NOTE: For airway V99, your actual readouts may vary, depending upon your location; furthermore, the fifth and sixth readouts will not appear unless you're actually flying a route.

The functions `LEG EDIT` (seen as such only for user-entered routes) and `LEG INFO` are displayed briefly, and then roll up

off the readout to display specific editing functions or relevant data for the displayed leg.)

The unit remembers the last LEG EDIT or LEG INFO function that you used, allowing your most-used edit function or information function to be instantly displayed when you turn the *large secondary* knob.

The time and the distance to the end of the route are displayed only if the route is currently being flown.

Each of the functions shown above is described in detail below; turn the *large secondary* knob to select any of them.

A. Display route name and a selected leg

This is always the first function shown when the *large primary* knob is turned to **RTE** from any other function. Turn the *small primary* knob to select the desired route name. The unit automatically searches the entire route to find a leg that's near your present position, and displays that leg on the *secondary* readout. Turn the *small secondary* knob to display the other legs of the route.

B. Display information about any route leg

The above message rolls up off the readout to display such data as (you may have to turn the *small primary* knob to access this readout):

Information about any leg of a route is displayed. The unit displays a route leg on the *secondary* readout, and information about that leg on the *primary* readout. Turn the *small secondary* knob to display different route legs. Turn the *small primary* knob to show information about the displayed leg:

- leg number
- bearing and length of the leg

- distance from your present position along the route to the end of this leg (if flying the route)
- distance above divided by speed (if flying route) equals the estimated time en route
- Class B, Class C, and Special Use Airspace penetrations on this leg
- database **INFO** for the TO waypoint of the leg

Further details about the LEG INFO function are provided in "Route leg information" beginning on page 89.

C. Edit any user-entered route leg

This message rolls up off the readout to display a leg edit function, such as:

The unit displays a route leg on the *secondary* readout, and a leg editing function on the *primary* readout. Turn the *small secondary* knob to display different route legs. Turn the *small primary* knob to display the editing functions:

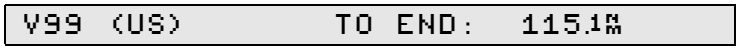
- add-to-end
- insert waypoint
- change waypoint
- drop (delete) waypoint

Only user-entered routes may be edited. Details on editing routes are given in "Editing user-entered routes" beginning on page 91.

D. Total length of route

The total length of the route from beginning to end is displayed. The word UNKNOWN is displayed in place of the length if one or more waypoints aren't defined in the current database.

E. Distance to the end of the route



If you're flying this route, the distance along the route from your present position to the end of the route is displayed. Distance to intermediate waypoints can be seen in LEG INFO.

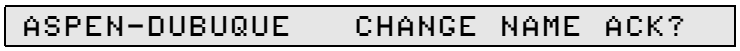
F. Estimated time to the end of the route

ETE is shown in hours and minutes, and is displayed along with your ground speed. If you're flying this route, the estimated time along the route from your present position to the end of the route is displayed. This time is based on your current ground speed, and may change due to variable winds and so on. ETE to intermediate waypoints may be seen in LEG INFO.

G. Erase a user-entered route

Press **ACK** twice to erase the route. This function is available only if the displayed route is user-entered and isn't currently being followed.

H. Change the name of a user-entered route



Press **ACK**, and use the *primary* **CRSR** button and knobs to change the name of the route. This function is available only if the displayed route is user-entered.

Each waypoint in a route is identified, whether it's an airport, VOR, and so on, by a small letter following the waypoint identifier. The two letter A s in the example below indicate that each one of these waypoints is an airport.

The available waypoint categories are as follows:

- A Airport
- V VOR
- N NDB
- I Intersection
- U User-entered waypoint

5.3 ACCESSING ROUTES

Routes are stored alphabetically in the unit's database by their identifiers. Victor airways are stored with identifiers like V123 (US) ; Jet Routes are stored with identifiers like J34 (US) . User-entered routes may be assigned identifiers of up to 16 characters.

5.3.1 Route identifiers

Because a Victor airway or Jet Route identifier may be used in more than one area of the world, Northstar adds a geographic region code to all Victor airway and Jet Route identifiers. This code helps distinguish between routes that are located within different jurisdictions, but that have the same identifier. For example, V431 identifies one route in the U.S. and a different route in Canada. The region code differentiates between the routes—in this example, V431 (US) and V431 (CA) .

The region identifiers added by the unit are as follows:

- (AF) Africa
- (AK) Alaska
- (CA) Canada
- (EE) Eastern Europe, Russia, China
- (EU) Europe
- (LA) Latin America and northern South America
- (ME) Mesopotamia, India
- (PA) Pacific Ocean
- (SA) South America (except those countries included in the Latin American area)

(SP) South Pacific
(US) United States

Several FAA routes have breaks in the middle where the FAA has deleted an obsolete leg. For example, V141 starts in Nantucket, Massachusetts and goes as far as Boston. V141 then starts again in Manchester, New Hampshire and continues to Burlington, Vermont and beyond. There's a break in the route between Boston and Manchester. Since there's no provision for airway navigation along the break in such a route, the route is treated as two separate routes, labelled V141 (US) #1 and V141 (US) #2.

Route identifiers are listed strictly in alphabetical order, not numerical order. This means, for example, that route V141 is listed between V1 and V2, along with all other route identifiers beginning with V1.

5.3.2 Accessing a route

Accessing a route is similar to accessing a waypoint in the unit's database:

1. Turn the *large primary* knob to **RTE**.
2. Turn the *small primary* knob to scan through the available routes. Or press the *primary* **CRSR** button and use the knobs to enter the first few characters of the route name; press **CRSR** again when finished.

   NOTE: If you use the CRSR button to enter the name of the route character by character, and you incorrectly entered an identifier that you expected to be in the database, the unit may ask if you want to store this as a new route. Do not press ACK; instead, turn the *large primary* knob away from the RTE position, then try again.

Because some Victor airways are quite long (over 100 waypoints), the unit helps you find a nearby leg by automatically searching the route for the waypoint closest to your present position. It then displays the leg for which this waypoint is the FROM waypoint. You may need to turn the *small secondary* knob one click to the left or right to display the leg you want to start on.

5.4 FOLLOWING ROUTES

5.4.1 Activating a route

To follow a route, display its identifier as described above, then press **–D→** and **ACK**; first, here's how to do it in detail:

1. Turn the *large primary* knob to **RTE**.
2. Turn the *small primary* knob to display the name of the route. (Or use the *primary* **CRSR** button and knobs to spell out the characters of the route name.)
3. The unit displays a leg near your present position. If you want to start on a leg other than the one displayed, turn the *small secondary* knob to display the desired leg.
4. Press **–D→**. The unit will display the two waypoints and the bearing of the leg:

```
FLY LEG  KLGA   %OUTTE   055° ACK?
```

5. If you want to fly the route in the reverse direction, press **–D→** again. The unit will display the same two waypoints in reverse order, and the new reciprocal bearing:

```
FLY LEG  KOUTTE  %LGA    237° ACK?
```

   (To cancel this option and return to the **RTE** readout, press **–D→** a third time.)

6. Press **ACK**. The unit automatically starts following the route and switches the readouts to the **TRK** function. The CDI displays the distance to the track line.

The unit will sequence automatically from one leg to the next as you fly.

NOTE: If the route contains waypoints that aren't in the database, the unit displays the message:

```
CANNOT FLY INTO UNKNOWN LEG(S)
```

See "Routes and database updates" beginning on page 94.

If you've already passed the route leg you chose to start on, the unit will automatically sequence through the route legs to find the leg you're currently on. When it finds that leg, it will begin navigating along it.

During this quick waypoint sequencing, you can see the TO waypoint, displayed by the **TRK** function, stepping through the waypoints of the route. The CDI needle may fluctuate rather vigorously as new legs are briefly selected, and the autopilot (if coupled) may react as it tries to keep up with the rapid changes. This normally occurs for only a few seconds.

5.4.2 The first and last waypoints

When a route leg is displayed, the *small secondary* knob can be turned one click beyond the first or last leg of the route. This feature allows two functions to be performed: inserting a waypoint at the beginning or end of the route, and joining the route by flying direct to the first or last waypoint of the route.

Turning the knob one click counterclockwise beyond the first leg displays the following:

```
 V99 (US)        DIRECT TO LGA
```

Turning the knob one click clockwise beyond the last leg displays the following:

```
V99 (US)        GRAYMI        (END)
```

To fly direct to the displayed waypoint, press **–D→** once (or twice, if at the end) to display:

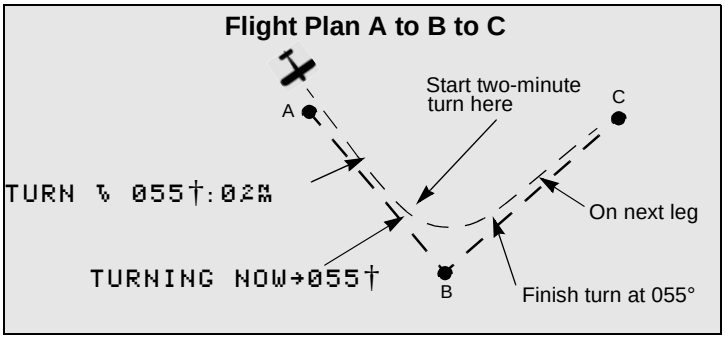
```
FLY 245° DIRECT TO LGA      ACK?
```

and then press **ACK**, or press **–D→** again to cancel.

5.4.3 Changing waypoints

The figure below shows how the unit guides you from one leg to the next as you approach a waypoint. The unit calculates the point at which you should start a two-minute turn.

Approximately 15 seconds before you reach this point, the unit informs you of the distance remaining. Start a two-minute turn to the new heading when the displayed distance to the turn reaches zero, and you should end up on the new leg. The unit will automatically change waypoints about halfway through the turn.



The unit calculates the exact curve of an ideal two-minute turn from one leg to the next. If you keep the CDI centered during the turn, you'll follow this curve precisely, even if winds are present. The unit will preserve any parallel offset you may have chosen. (See "Parallel offset" on page 114.)

If you've queued a leg that involves a turn of 150° or more, the unit won't try to set up a standard two-minute turn. If you make the turn before reaching the waypoint, the unit sequences to the next waypoint. If you pass the waypoint, the unit flashes the **ACK** button to give an advisory, such as `TURN BACK ↻ 055†`.

5.4.4 Advisories

To inform you of your progress along the flight plan, the unit automatically activates several advisories. When the **ACK** button flashes, an advisory is waiting to be displayed. Press **ACK** to display the advisory, and press **ACK** again to clear the advisory.

- If you deviate from the calculated flight path by more than four miles, the unit informs you with the following advisory:

`OFF-COURSE ALARM`

- If you're on course (within four miles) when you approach within 15 seconds of a waypoint, the unit displays the heading of the next leg, as well as the distance remaining before you should start the turn:

  NOTE: If you're already in TRK INFO, you won't have to press the ACK button—this readout appears automatically.

  ```
  TURN ↻ 055°:0.1M
  ```

- When the distance reaches zero, the advisory changes to:

  ```
  TURNING NOW →055°
  ```

  NOTE: The turn advisories are omitted if the desired track is changing less than 2°.

- If you finish the turn without viewing either of the above advisories, the advisory will read:

  ```
  NOW ON NEXT LEG
  ```

  or, if on a route:

  ```
  NOW ON LEG 3
  ```

While using the **TRK** function, you can re-center the CDI at any time by pressing **–D→** and **ACK**, as described in detail in Section 4. Be aware that re-centering the CDI while following an airway may move your desired track line outside of the limits of the airway. You should use this function only when under VFR or when cleared direct to the waypoint.

5.5 CREATING YOUR OWN ROUTES

You can enter up to 100 routes into the unit's database. These routes are made up of permanent waypoints and/or user waypoints previously stored in the unit's memory. Each route can have up to 50 waypoints. To create a new route, first choose and enter a name for the route (up to 16 characters), and then specify the sequence of waypoints. Remember: You may fly the route in either direction.

NOTE: When you store a user-entered route, it's strongly recommended that you use a character other than J(et) or V(ictor) for the first character of the route's name. In this way, all user-entered routes will be grouped together alphabetically, rather than mixed in with airways. You can devise your own indexing scheme: For example, you could start all your routes for the southwestern states with the letters "SW" so they would be adjacent in the route list. Several special characters, such as #, $, and %, are available after the letters and digits when the *small primary* knob is turned to enter characters.

To create a route:

1. Turn the *large primary* knob to **RTE**.
2. Press the left **CRSR** button, and use the *small* and *large primary* knobs to enter the name you've chosen for the new route. When you've entered the name, press the **CRSR** button again to turn it off.

   Unless this name has already been used, or the database already contains the maximum of 100 user routes, the unit will display:

```
ASPEN-DUBUQUE    NEW ROUTE? ACK?
```

3. Press **ACK** to begin storing the new route.

   The unit now asks you to begin adding waypoints to the route:

```
ADD TO END  ACK? DIRECT ↘  (END)
```

4. Press **ACK** to prepare to add the first waypoint to the route.

```
CHOOSE 1ST WAYPT ADD  ASE   ACK?
```

5. Use the *large secondary* knob to select the first waypoint's category (such as airport–APT) and the *small secondary* knob to display the waypoint's identifier (such as ASE). You may use either the cursor method or the scanning method described in "Selecting waypoints by scanning" beginning on page 40. After displaying the waypoint's identifier, press **ACK** to store it.

The unit responds briefly with the confirmation:

Then, the unit displays:

6. Press **ACK**, and choose the next waypoint of the route as described in Step 5. The unit displays the distance and bearing from the previous waypoint to the currently selected waypoint to help ensure that the correct waypoint has been chosen.

7. To enter the remaining legs of the route, respond to each `ADD TO END ACK?` message by pressing the **ACK** button, and enter each waypoint as described above.
8. When you're finished adding to the end, you may turn the *small primary* knob to select a different edit function, or you may turn the *large secondary* knob to leave `LEG EDIT`. Turning the *large primary* knob removes you entirely from the **RTE** function.

> **NOTE: A special feature makes it easy to move back and forth between the *primary readout* to search for waypoints by city or name, to using the *secondary readout* to enter waypoints into your route.**
>
> **If you leave RTE and display any waypoint on the *primary readout*, that waypoint is automatically the first waypoint displayed on the *secondary readout* in that category, when you move back into RTE, `LEG EDIT` to enter the next route leg.**

There are many duplicate waypoint identifiers in the database, especially with the International FliteCard. Duplicates are indicated by a number sign (#) following the identifier. Be sure to verify that you're displaying the correct waypoint by preselecting the waypoint as described in the preceding paragraph, and/or by verifying that the displayed length and bearing of the leg is what you expect.

5.6 ROUTE LEG INFORMATION

This section provides detailed information about the LEG INFO function. The *primary* readout displays additional information about the route leg displayed in the *secondary* readout. The precise information displayed depends on whether or not you are following the route.

To display route leg information:

1. Turn the *large primary* knob to **RTE**, and turn the *small primary* knob (or use the **CRSR** button) to display the name of the desired route.
2. Turn the *large secondary* knob to display `LEG INFO` on the *secondary* readout. After one second, this message will roll up to display information about the leg shown on the *secondary* readout.
3. Select the desired route leg by turning the *small secondary* knob at any time.
4. Select the desired information by turning the *small primary* knob at any time.
5. To exit the `LEG INFO` readout, turn the *large secondary* knob. To leave the **RTE** function, turn the *large primary* knob.

The following information can be displayed on the *primary readout*:

- The number of the leg shown on the *secondary* readout.

```
1ST LEG
2ND LEG
3RD LEG
```

or, if flying this route,

```
PRESENT LEG
NEXT LEG AHEAD
2ND LEG AHEAD
```

- The bearing and length of this leg.

```
LEG: 052° 90.6M
```

- The distance from your present position to the indicated waypoint, displayed only if you're following this route. (Turn the *small secondary* knob to see distance accumulate from one leg to the next.)

```
%BJC  17.6M
```

- Your ETE to the TO waypoint of this leg assuming you're maintaining your current Ground Speed, displayed only if you're following this route. Turn the *small secondary* knob to see cumulative time to each future waypoint

NOTE: Remember—varying winds and changes in heading may affect your ability to maintain the current Ground Speed.

```
ETE  0:11 AT 157%
```

- Names of any Class B, Class C, or SUA that the leg passes through.

```
DENVER CLASS B
COL SPGS Class C
A-260
```

- Additional database information about the TO waypoint currently displayed on the *secondary* readout. SmartComm frequencies are included. Continue turning to display the complete list of information.

```
DENVER          CO
JEFFCO
ATIS:      126.25
APPROACH: 126.1
TOWER:     118.6
```

5.7 EDITING USER-ENTERED ROUTES

You may change a user-entered route stored in the unit's database by using the LEG EDIT function.

To edit a route:

1. Turn the *large primary* knob to **RTE**:

2. Turn the *small primary* knob or use the left **CRSR** button to display the name of the route to be edited.

3. Turn the *large secondary* knob to display the message LEG EDIT:

   The route name and LEG EDIT message roll up to display the previously used edit operation, such as CHNGE:

4. If necessary, turn the *small primary* knob to select the edit function (ADD, INSRT, CHNGE, or DROP) like the one listed below:

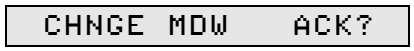
5. If necessary, turn the *small secondary* knob to display the leg to be edited:

NOTE: Steps 4 and 5 above can be performed in either order.

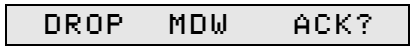
Here are the four possible route-editing functions:

Press **ACK** to add a waypoint to the end of the route.

Press **ACK** to insert a new waypoint within the displayed leg.



Press **ACK** to change the TO waypoint of the displayed leg.



Press **ACK** to delete from the route the TO waypoint of the displayed leg.

For ADD, INSRT, and CHNGE, you select the desired new waypoint category and ID using the *secondary* knobs and/or right **CRSR** button, then press **ACK** again.

After you complete each edit, a confirmation is briefly displayed. Then you'll be given the option to repeat the same type of edit. You may repeat Steps 4 and Step 5 above as often as you want. Then turn the *large secondary* knob to leave LEG EDIT.

The add-to-end function can be used at any time. To INSRT, CHNGE, or DROP a waypoint while you're currently flying the route, you'll be asked to PAUSE the route by pressing **ACK**:

The unit will now continue providing guidance along the route's current leg and its next leg, if any. You are now free to edit any part of the route without affecting this guidance. To rejoin the route after editing it, simply display the desired leg and press **–D→** and **ACK** in normal fashion.

5.8 CHANGING A FLIGHT PLAN IN-FLIGHT

Rarely will you be able (at least in busy areas) to follow a flight plan without having to make changes to it as you fly. Here are some of the different ways you can modify it as you fly:

Option 1:

You may immediately divert from the route to any database waypoint (see "Flying direct to a waypoint" on page 59):

1. Display that waypoint on the *primary* readout.
2. Press **–D→** and **ACK**.

Diverting from the route cancels the route. You may return to any leg of the route using Option 4 below.

Option 2:

You may specify a waypoint to fly to after passing the current waypoint by using the waypoint queuing functions described in "Queuing a second waypoint" beginning on page 60. Queuing a waypoint cancels the route. You may return to any leg of the route using Option 6 below.

Option 3:

You may specify a radial to fly after passing the current waypoint by using the queuing functions described in "Queuing a radial from the current waypoint" on page 63. This operation cancels the route. You may return to any leg of the route using Option 6 below.

Option 4:

You may hold at the next waypoint by using the waypoint holding functions described in "Holding on the next waypoint" on page 65. This operation cancels the route. You may return to any leg of the route using Option 6 below.

Option 5:

You may fly a selected bearing inbound to or outbound from any waypoint using the procedure described in "Flying a bearing to/ from a waypoint" on page 64. This operation cancels the route.

Option 6:

You may fly to any leg of the route. Use the same procedure as when you first started to follow the route as described in "Following routes" beginning on page 83. Choose the leg that you want to rejoin, and fly to the leg using the CDI as a guide.

Option 7:

You may start flying any other route (airway or user-entered) using the same method you used to fly the current route.

Option 8:

You may add one or more waypoints to the end of a user-entered route at any time by using the ADD TO END function described above.

Option 9:

You may edit a user-entered route by using the DROP, INSRT, and CHNGE functions described above.

If you're following the route, you'll be asked to PAUSE the route before editing it (see "Editing user-entered routes" beginning on page 91).

The PAUSE operation disengages the unit from the route so you may freely edit it. The unit does continue guidance, however, along the current leg and the next leg of the original route. To rejoin the edited route, display the desired leg and press **–D→** and **ACK** as described in "Following routes" beginning on page 83. Unless you select some form of guidance, one minute after you stop editing, you'll be reminded with the message:

```
ROUTE PAUSED, SELECT GUIDANCE!
```

Option 10:

You may proceed direct from your present position to the TO waypoint of the current leg by pressing **–D→** and **ACK** when you're displaying the **TRK** function. This re-centers the CDI, but doesn't cancel the route.

5.9 ROUTES AND DATABASE UPDATES

User-entered routes are composed primarily of waypoints from the factory-programmed database. When this database is updated, or when a particular FliteCard is swapped for a different one, some waypoints used in routes may no longer be found in the new database. This leaves some routes with legs having unknown waypoints.

Trying to fly a route section containing an unknown leg displays the message:

```
CANNOT FLY INTO UNKNOWN LEGS
```

A route containing an unknown leg may need to be edited before it can be used. You can fly the latter part of the route or the reverse direction provided that all the waypoints involved are defined.

The following list contains other potential problem areas to be aware of when changing between the North American or Alaskan FliteCard, and the International FliteCard:

- *Airports*: In the North American database, the ICAO "K" prefix for major U.S. airports has been deleted from the identifier. For example, Los Angeles International is shown as LAX, not as KLAX. Canadian, Mexican, and Latin American airports are shown with their appropriate ICAO prefix.

  In the International database, the "K" prefix is included for many U.S. airports to conform to international usage (Los Angeles International is shown as KLAX). Also, major Alaskan airports are shown with their ICAO identifiers, which begin with PA. A few duplicate identifiers exist, primarily between smaller U.S. airports and similarly named airports in the South Pacific.
- *VORs*: A few duplicate identifiers exist.
- *NDBs*: Many duplicate identifiers exist.
- *Intersections*: Many duplicate identifiers exist internationally, indicated by a flashing number sign (#) following the identifier.
- *Route Names*: If a user-entered route name is later used by an FAA airway in a new database update, a conflict arises. The unit automatically solves this problem by adding an otherwise unused initial character in front of any duplicated user-entered route names. When the unit is first turned on after a database update that caused a route-name conflict, the unit displays a warning message that shows the new initial character of the user route. Try to remember this initial character, but even if you forget the character, you can easily find any such routes by placing the flashing cursor on the initial character of any route identifier and scanning

counterclockwise from the end of the route list. As mentioned earlier, it's strongly recommended that all user routes be named with a special character as the first character of the name, to avoid this potential problem and to group all user routes away from the FAA airways.

Section 6 – AIRSPACE ALERTS

This section describes how the unit alerts you to possible penetration of Controlled Airspace (Class B and Class C) and Special Use Airspace (Prohibited, Restricted, Warning, and Military Operations Areas).

If you often fly near one of these areas that you know well, and you don't want to be alerted to its presence, you may turn off its alerts as described in "Disabling the Airalerts" beginning on page 105. (When flying IFR, you may want to turn all of the alerts off, as described in the same section.)

CONTENTS

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6.1 AIRALERT™ AIRSPACE USAGE ALERT

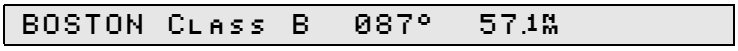
The U.S. Airspace system contains Controlled Airspace, including Class B airspace (formerly called Terminal Control Areas or TCAs), Class C airspace (formerly called Airport Radar Service Areas or ARSAs), and Special Use Airspace (SUA), including Prohibited, Restricted, Warning, and Military Operations Areas. Within this manual, these areas are called **Airalert** areas. Pilots are required to follow special rules for these areas, such as establishing radio contact before entering them or, in some cases, avoiding them completely. When the aircraft is near or likely to penetrate controlled airspace, the unit's **Airalert** function provides information you can use to either avoid the area or comply with the regulations for entry.

You can turn off the alerts for any one Class B or Class C Area, or for all areas, if you want. (See "Disabling the Airalerts" on page 105.)

Airalert is programmed with precise descriptions of the outer boundaries of all Class B and Class C Areas. No separate warning is given for the inner, lower altitude boundaries.

To display the names of all the **Airalert** areas in the database:

1. Turn the *large secondary* knob to **SETUP** and turn the *small secondary* knob all the way to the left.
2. Turn the *small primary* knob to scan through all the controlled areas stored in the database. The areas are divided into LOCAL and ALL groups in the same manner as waypoints. You'll see the name of each area, and the bearing and distance to its center from your present position:



6.2 WHAT GENERATES AN AIRALERT

The **Airalert** feature of the unit alerts you when you're likely to enter a Class B or Class C area or an SUA that requires radio communication and control. Specifically, a continuous alert is given when any of the following conditions exists:

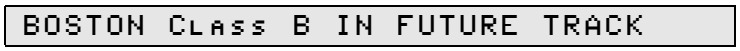
- You're inside a **Airalert** area, or
- You're passing within approximately four miles of an **Airalert** area, or
- You're approximately 10 minutes from penetrating an **Airalert** area

In addition, a one-time alert will be given shortly after you specify a new flight path, if that flight path passes through an **Airalert** area. The flight path is tested when:

- you select a new leg to fly by any of the methods in Section 4 or 5, including queuing
- you set or change a parallel offset
- the unit sequences to a queued leg or route leg. Exception: sequencing to the inbound leg of a hold.

The unit checks your future track for **Airalert** area penetration and displays the names of up to five areas that the track will penetrate. Flying a heading, your track is checked up to 100 nm ahead of your present position. In other situations, a great circle track is checked as far as the waypoint, or 1000 nm, whichever comes first.

This **Airalert** appears as:



6.3 HOW TO USE AIRALERT

When the unit detects any of the conditions described above, the **ALRT** button will flash. Press it to display an alert describing the situation. Press **ALRT** again to return to the normal navigation display; while you hold the button in, another alert will appear that tells you if you've inhibited any particular alerts.

The **ALRT** button stays illuminated while you're in or near **Airalert** areas; you may press **ALRT** any time it's illuminated to check the time to the outermost boundary or the distance to the center.

When avoiding Class B and Class C Areas, use the displayed distance and bearing to the center of the area, especially when flying near one of the inner, lower altitude boundaries. The time

or distance to the boundary displayed on the far right of the readout refers only to the outermost boundary of the area.

For irregularly-shaped areas, such as Restricted Areas, the bearing and distance to the center are useful only in indicating the general location of the area. Use the displayed time-to-penetration and the distance to the boundary for an accurate measure of how far away you are.

6.4 AIRALERT INFORMATION

When you press **ALRT** in response to an **Airalert**, the following information is displayed (and continuously updated as you fly):

- name of the area
- bearing and distance to the center of the area
- status relative to the outermost boundary of the area (one of more of the following):

9:35	Time-to-penetration (if your track will penetrate boundary within 10 minutes)
33M	Distance to the boundary (if within four miles, but your track won't penetrate the boundary)
INSIDE	(if inside the displayed area)
IN TWO	(if inside two or more areas)
I	(if inside an area, and time or distance to another area is displayed)
CLEAR	

- For Class B and Class C Areas:

  Radio call name and frequency for entering the area

- For SUAs:

  Type of area (restricted, prohibited, etc.)

Example 1: If you were inside the Sarasota Class C area, you would see the following two alerts alternating on the readout:

```
SARASOTA Class C 237° 7.2M INSIDE
TAMPA APP 120.55 237° 7.2M INSIDE
```

The center of the area is 7.2 nm away at 237°. The radio call for this area is TAMPA APPROACH, on 120.55 MHz.

Example 2: If you had just passed the 10-minute mark from penetrating the outer boundary of the Boston Class B area, you'd see the following:

```
BOSTON Class B  161° 34.5M  9:55
APPROACH: 120.6 161° 34.5M  9:55
```

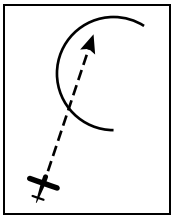
The time indicates just under 10 minutes from the boundary. The center of the area is 34.5 nm at 161°. The radio call is BOSTON APPROACH, so no separate call name is shown.

Example 3: If you were flying by close to the edge of restricted area `R-1234`, and were 2.6 miles from its boundary, you'd see the following:

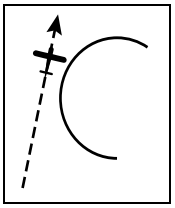
```
R-1234          180° 15M @ 2.6M
RESTRICTED AREA 180° 15M @ 2.6M
```

The distance, if any, on the right-hand end of the readout is the distance to the area's boundary. The bearing and distance near the middle of the readout shown above always refer to the center of the controlled area, and are useful for monitoring your distance from inner, lower altitude boundaries of Class B or Class C airspace. For example, if the boundary at your altitude is a 10-mile ring and the unit displays 12 nm, you're 2 nm from that boundary.

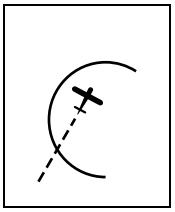
The time, if any, displayed on the right-hand end of the readout is the estimated time remaining before you'll penetrate the *outermost boundary* of the area, based on your present track angle and ground speed. The time-to-penetration is displayed if the unit calculates you'll penetrate the outer boundary within about 10 minutes.



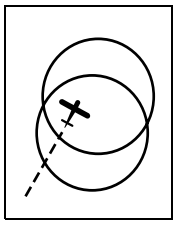
If you're within about four miles from an area boundary, but your projected track indicates you won't penetrate it, the symbol C (meaning *close*) is displayed, along with the distance to the boundary.



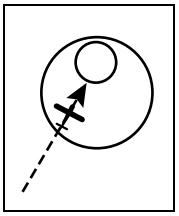
The word INSIDE on the right-hand end means you're now inside the area.



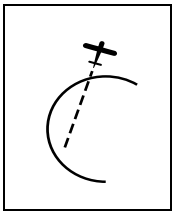
The words IN TWO mean you're inside two or more defined areas.



The letter I on the right-hand end of the readout is a reminder that you're inside an area while the unit's showing information about another area you may come close to or penetrate.



The word CLEAR on the right-hand end means you've left the area and neither penetration warning nor "close" alert is needed.



The multi-lobed New York Class B area is split into three separate sections (for JFK, EWR, and LGA airports); the Washington area is split into four sections (for DCA, BWI, IAD, and ADW airports); and the Houston area is split into two sections (for HOU and IAH airports). This sectioning allows the unit to display your distance to the airport whose sector you're entering, so you can monitor your distance to the 20- or 15-mile boundary of that sector.

It's normal for the time-to-penetration to show substantial jitter—this calculation is quite complex and is intended as an approximation.

For Class B and Class C airspace, the displayed frequency corresponds to the particular sector from which you're approaching the area. The radio call name and frequency alternate with the area name.

6.5 AIRALERT LIMITATIONS

- The unit provides alerts only for the largest perimeter of Class B and Class C airspace. That is, if you're flying at a relatively low altitude, the unit will alert you when you're about to fly under the edge of a controlled area. Once you're under the edge of a controlled area, the unit doesn't display any further alerts for inner, lower altitude boundaries.
- When you're near controlled areas having circular boundaries, use the distance and bearing to the center to determine your distance from inner, lower altitude boundaries. When you're near irregularly shaped areas, use the time-to-penetration to determine how far you are from the boundary.
- It's possible for the unit to simultaneously indicate that you're near one controlled area (is displayed) and that you soon will penetrate another area. The time-to-penetration

displayed may refer to a different area than the ⊑ symbol refers to. When you unexpectedly see the ⊑ symbol, it's best to check your chart unless you know the area well.

- If you're just learning to use the unit, you may want to disable the **Airalert** feature (as described on the next page) until you feel comfortable using the unit's many other features. Although **Airalert** is very useful, you may prefer to learn the unit's various operations one step at a time.
- The **Airalert** feature is designed as a backup to a pilot's normal navigation procedures. It is your responsibility as a pilot to know where you are and where you are going at all times. **Airalert** is intended to be a reminder or verification of what you should already know. A chart that depicts the controlled area should always be used with the unit. The database information has been carefully checked, but it's always possible that errors exist, and new **Airalert** areas are constantly being added to the national airspace. Area boundaries and frequencies may be changed at any time. Northstar Avionics doesn't encourage pilots to lose their navigation skills by becoming overly reliant on any one system.

6.6 DISABLING THE AIRALERTS

If you regularly fly in or near an area whose boundaries you know well, you may not want the unit to alert you every time you approach the area. (Furthermore, when you're flying IFR, you may not want to be given any airspace alerts at all.) The unit lets you disable alerts for one particular controlled area or for all areas.

When the Airalert system is disabled, an alert appears every time the unit is turned on, reminding you that the feature isn't fully operational. The **ALRT** button will flash; press it to read the alert, and press it again to turn off the alert:

No alert status is shown if the **Airalert** feature is active for all areas.

This same status alert may be displayed either by pressing and holding in the **ALRT** button any time that it isn't already illuminated or after viewing other alerts.

6.6.1 Disabling Class B and Class C alerts

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display a line, such as one of the following, indicating the present status of the **Airalert** system:

ALL CLASS B & C	AIRALERT ON
ALL CLASS B & C	NO AIRALERT
ATLANTA Class B	NO AIRALERT
BOSTON Class B	NO AIRALERT

3. Turn the *small primary* knob to select the desired new status, choosing between two options: AIRALAERT ON ACK? or NO AIRALERT ACK?.
4. To disable an alert for just one designated area, the readout must first display AIRALERT ON ACK?. Then turn the *small primary* knob to display NO AIRALERT ACK? (to disable all alerts), or continue turning the *small primary* knob to the right to scan through all the area names in the database. Select and display the one particular area you want to disable.

   NOTE: For those areas that are split into sections (New York, Washington, and Houston), only one section may be disabled at a time.

5. Press **ACK** to confirm your new selection. Whether or not all alerts are disabled or only one alert is disabled, in either case, you must turn all the alerts back on again before you can disable another area.

6.6.2 Disabling Special Use Airspace (SUA) alerts

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display the current SUA status:

```
SUA ALERTS          ON
```

3. Turn the *small primary* knob to select the desired new status.
4. Press **ACK**.

6.7 MODE C VEIL ALERT

Federal aviation regulations require pilots to operate, or "squawk," Mode C altitude encoding equipment whenever they're flying within a 30-mile radius of the primary airport in a Class B area. The unit provides an alert to the pilot whenever the aircraft is within or near such a radius, or when the projected track indicates that the aircraft will penetrate this radius within approximately 10 minutes. The display format for Mode C alerts is similar to that of Class B alerts, except that the unit displays the text `MODE C` on the right-hand end of the readout, alternating with either `SQUAWK`, `SOON`, or `NEAR`. Or, `MODE C` will alternate with one of the higher priority displays described in "Airalert information" beginning on page 101.

`SQUAWK`	Means you're inside a Mode C area.
`SOON`	Means you'll soon penetrate a Mode C area.
`NEAR`	Means you're close to a Mode C area, but aren't expected to penetrate it.

```
BOSTON Class B  351° 24²ᴺᴹ MODE C
```

A **SETUP** function separately disables this alert function when Class B alerts are turned on:

```
MODE C ALERTS    YES        ACK?
MODE C ALERTS    NO         ACK?
```

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display the above function.
3. Turn the *small primary* knob to display `YES` or `NO` as desired, and then press **ACK**.

In addition, disabling any Class B alert disables MODE C alerts for that area.

Please remember that this feature is intended only as an advisory. The pilot is entirely responsible for complying with federal aviation regulations.

Section 7 – MISCELLANEOUS FUNCTIONS

This section describes a number of miscellaneous and setup functions, most of which are only used occasionally.

CONTENTS

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7.1 QUICK NEAREST-AIRPORT DISPLAY

If you press **–D→** and the left-hand **CRSR** button simultaneously, you'll immediately be shown the identifier of the nearest airport in the unit's database, along with the distance and bearing to that airport, and the length, surface, and identifier of the longest runway. The unit does this by switching automatically to the **APT** and **INFO** functions, and the nearest airport display will remain on the readouts until another function is selected.

```
NEAREST AIRPORT
%MA03 247° 32M 11-29  2200' TURF
```

To display other nearby airports in the order of distance from you, turn the *small primary* knob to the right.

7.2 STARGUARD™ THEFT-PROTECTION SYSTEM

Northstar navigators are well-known for being *the* navigation aid for large numbers of pilots. Unfortunately, there have been a few reported cases in which certain people apparently didn't want to buy their own Northstar navigator; instead, they just removed one from an aircraft parked on the ramp. To help alleviate this problem, Northstar Avionics offers *Starguard* as a standard feature on its avionics navigators. *Starguard* gives you the option of using two levels of security protection, if you want to. (You may leave *Starguard* inactive if you don't want to use it. It won't impede your operation of the unit whatsoever.)

- To activate the first level of protection, your personal access code is used once to enter a personal greeting that's subsequently displayed every time the unit is turned on, identifying you as the owner.
- Activating the *Starguard* full protection prohibits the unit from functioning at all until your access code has been entered.

A window decal is provided reminding any potential thief that the unit won't function if it's removed from the aircraft.

7.2.1 Your personal access code

A plastic card printed with your access code will be mailed directly to the address shown on your owner's registration card. Under no circumstances will this code be given out over the telephone. *Be sure you fill out and mail with a complete address your registration card, so that we may send you this access card and any other update information!*

You can always use this code to access *Starguard*. If you want to add an alternate, or second, access code, you may do so as described below. Either code may then be used.

To add a second access code that's easier to remember (you may choose a new access code up to six characters long, containing the characters A-Z, 0-*9*, and blank):

1. Turn the *large secondary* knob to **SETUP**. Turn the *small secondary* knob to display the following, and press **ACK**.

```
ADD ALT.CODE?                ACK?
```

2. The unit will first ask you to enter your existing code. Use the *small* and *large secondary* knobs to carefully enter those characters, then press **ACK**. If you fail to enter a correct code three consecutive times, the unit won't let you try again for five minutes.
3. The unit will ask you to enter your new code. Use the *small* and *large secondary* knobs to enter the new characters, then press **ACK**.
4. The unit will ask you to enter your new code a second time to verify it. Use the *secondary* knobs, then press **ACK**.

Subsequently, this readout in **SETUP** displays:

```
CHANGE ALT.CODE?             ACK?
```

7.2.2 Starguard level 1

Entering your own personal greeting to be displayed when the unit is turned on.

Letters, numbers, and several punctuation characters are available for your greeting. Plan your greeting to accommodate a visible space between the primary and secondary readout.

1. Turn the *large secondary* knob to **SETUP**. Turn the *small secondary* knob to display the following, and press **ACK**.

```
CHANGE YOUR MSG                ACK?
```

2. The unit will ask for your access code:

```
YOUR CODE, PLEASE              ACK?
```

3. Use the *small* and *large secondary* knobs to enter the characters of your access code, then press **ACK**.
4. The unit will ask you to enter the left-most 16 characters of your greeting: `ACK? LEFT MSG:` Use the *small* and *large secondary* knobs to enter the characters. When finished, press **ACK**.
5. The unit will ask you to enter the right-most 16 characters of your greeting: `ACK? RIGHT MSG:` Use the *small* and *large secondary* knobs to enter the characters. When finished, press **ACK**.

7.2.3 Starguard level 2

Activating Starguard full protection

Since the fully-activated Starguard requires that you enter your access code every time you turn the unit on, you may want to activate this feature only when the aircraft will be left unattended for a long period of time. You may activate or deactivate it at any time.

1. Turn the *large secondary* knob to **SETUP**. Turn the *small secondary* knob to display:

```
STARGUARD:          OFF
```

2. Turn the *small primary* knob to change the word OFF to ON, and press **ACK**.
3. The unit will ask you to enter your access code as described above.
4. After you've entered the access code correctly, the unit will display OK, THANK YOU and activate Starguard. The unit will now require entry of the correct code every time it's turned on, until you decide to deactivate Starguard.

To deactivate, display the STARGUARD message as described above and turn the *small primary* knob to OFF. Then press **ACK**.

7.3 WINDS ALOFT

Turn the *large secondary* knob to **SETUP** and turn the *small secondary* knob to display the winds function:

Turn the *large primary* knob to the left to flash the heading or to the right to flash the true air speed. Turn the *small primary* knob to enter the correct value of the flashing number. The unit immediately calculates and displays the direction and speed of the winds aloft, using the current track angle and ground speed. In keeping with normal conventions, you must enter your heading as magnetic, but the displayed wind is shown as true.

7.4 PARALLEL OFFSET

You may specify a parallel offset to your track, allowing you to fly parallel to a defined course, offset by a fixed distance. The Cross-Track Distance display, the external CDI, and the autopilot signal will refer to the parallel course. The amount of offset may be specified as NONE, or in nm up to a maximum of 20 miles left or right of your original course. When an offset is in use, an indicator such as 4L (designating four miles to the left of the original course) is shown to the left of the Off-Course Distance and CDI displays. Also, an optional external annunciator illuminates (if installed).

To enter a parallel offset:

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to select the function PARALLEL OFFSET. The *secondary* readout will show the offset currently in use.
3. Turn the *small primary* knob to select the desired new offset. Press **ACK**.

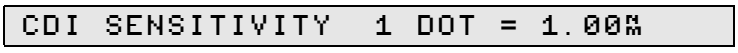
Any parallel offset is cancelled when the unit is turned off and then turned back on again, and whenever the **–D→** function is used to change the current flight path. If the unit isn't turned off, the unit informs you with a message when it cancels a current offset. Queuing a leg doesn't affect parallel offset, and sequencing to a new leg also preserves parallel offset, except in holds.

7.5 CDI SENSITIVITY

The sensitivity of the unit's internal CDI display, as well as the electrical output to CDIs, HSIs and flight directors or autopilots, is adjustable. Normally, it's set to one mile per dot, giving ± 5 miles full scale. For precision flying, you may change the sensitivity to .50, .25, .20, .12, .06, or .03 miles per dot. (At .03 miles per dot, the minimum visible cross-track distance on the unit's electronic CDI is just 36.5 feet!)

To change the sensitivity:

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display the current value:



3. Turn the *small primary* knob to select the new sensitivity.
4. Press **ACK**.

This function controls the sensitivity of the unit's electronic CDI and any external CDI or autopilot that may be connected.

Be careful! Many flight directors or autopilots may not function correctly when the CDI is set to a highly sensitive position. Test

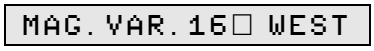
their operation carefully before using at any setting except the recommended one of 1 dot = ¼ mile.

7.6 MAGNETIC VARIATION

Magnetic variation is the difference between magnetic north and true north. In the continental U.S., it varies from more than 20° west (in Maine) to more than 20° east (in Washington state). To display proper magnetic bearings and courses, the unit has an internal map of magnetic variation. The unit displays all bearings as magnetic, except for the direction of WINDS ALOFT, which is displayed as true. Magnetic variation changes slowly from year to year. The current year is taken from the unit's internal, battery-operated clock, which normally needs no attention after being set once correctly during installation or service.

To see the local magnetic variation:

1. Turn the *large primary* knob to **STAT**.
2. Turn the *small primary* knob all the way to the left to display on the *secondary* readout:



NOTE: In the M2 and GPS-600, this data is under SETUP.

7.7 MISCELLANEOUS DISPLAYS

Additional information may be displayed using the **SETUP** function. Turn the large *secondary* knob to **SETUP**, and the *small secondary* knob to display the following:

- USER POS'NS. STILL AVAILABLE. The number of unused slots for user-entered waypoints at the present time (how many more waypoints you may enter before filling the memory and having to erase points that are no longer needed).
- SERIAL # and SOFTWARE. The serial number and current software revision level of your particular unit.
- GPS #. This line has the GPS sensor 9-digit hardware part number on the left and the GPS sensor 9-digit firmware part

number on the right. Older M2s and GPS-600 units will show GPS SFT. REV.xxxx GPS FRM. REV.xxx.

7.8 DEMO MODE

Demo mode enables the user to simulate a flight and practice using the Northstar navigator in realistic navigating situations, even when the unit is removed from the aircraft. All navigation features, including Cross-Track Error, ETE, nearest airport display, and so on, function properly. For safety reasons, demo mode is intended for use only when the aircraft is not in flight.

A function in the **SETUP** category allows you to activate demo mode. You then specify any database waypoint as the starting point of the simulated flight, and a course or a waypoint to fly to. The unit will behave exactly as if it was actually flying along the specified track or flight plan, including advising of waypoint arrival and warning of Class B and Class C airspace penetrations.

7.8.1 Activating demo mode

1. To enable demo mode, hold the **–D→** button in while turning the unit on. It will now be possible to activate demo mode for as long as the unit is turned on. (Look-ahead mode won't be allowed.)
2. To activate demo mode, turn the *large secondary* knob to **SETUP**, and, if necessary, turn the *small secondary* knob to display

```
DEMO MODE          NO
```

3. Next, turn the *small primary* knob one click to change the word NO to YES. Press **ACK**.
4. The unit will display:

```
LAX   IS DEMO POSITION      ACK?
```

   where LAX is the identifier of a database waypoint. (The waypoint actually shown will be the last waypoint displayed on the primary readout.)

5. Use the *primary* knobs to display the identifier of the waypoint from which you want to start your simulated flight. (Use the *large primary* knob to select the waypoint category, and either turn the *small primary* knob to select the identifier, or press **CRSR** and use the *small* and *large primary* knobs to spell out the identifier.)

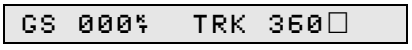
   When you've displayed the desired identifier, press **ACK**.

6. To simulate motion, you must specify where you want to fly to. Step #6a below describes how to specify a database waypoint to fly to, or a flight plan to follow. Step #6b describes how to enter a track angle and ground speed. You may use either method at any time to change the flight path or ground speed.

   a. You may "fly" to any waypoint selected on the *primary* readout by pressing **–D→** and **ACK**, or you may follow a route as described in Section 5. You may queue a waypoint or set a desired track direction, all as in normal operation. In all cases, simulated motion will start in the direction of the chosen course. If the simulated ground speed previously was zero knots, the flight will start with a default speed of 140 knots. Sequencing to a new leg overrides any simulated course you might select in Step #6b.

   -or-

   b. If you want, you may specify a simulated course and ground speed. Any demo flight plan previously selected will remain active as guidance; in this way, you can simulate cross-track error and perform simulated holds. Turn the *large secondary* knob to **SETUP** and the *small secondary* knob, if necessary, to display Ground Speed and Course:

      Press the *secondary* **CRSR** button, and enter the desired values one character at a time, using the *small secondary* knob to select each character and the *large secondary* knob to move the flashing

cursor to the next character position. When this is done, press **ACK**.

7.8.2 How the unit behaves in demo mode

In demo mode, the simulated flight path follows the most recently specified course and speed as if it were actually using GPS signals. At the same time, the unit shows your cross-track error, etc., relative to the last guidance you selected in Step #6a. All navigation functions will work normally, but the nav flag will be shown at all times.

7.8.3 Special notes

- Pressing **–D→** and **CRSR** simultaneously to activate the emergency nearest-airport search will display airports near the simulated position.
- Demo mode won't try to fly precisely to a specified waypoint. It will start flying along the indicated heading, but may very slowly drift away from that track, just as if the pilot was following a constant heading without occasionally correcting the heading. This feature allows you to become familiar with the procedure for adjusting the desired track line to move to your present position. (See "Centering the CDI" on page 62.)
- Any track angle you enter is, of course, magnetic, and the unit will attempt to fly a constant magnetic heading. This means the true heading will vary slowly as you "fly" through areas of different variation.
- The demo-mode flight path won't simulate a two-minute turn at each waypoint. It will simply fly until the unit sequences, then make a sudden sharp turn, and continue in the direction of the new leg. TAE will change gradually as the unit's guidance follows a two-minute turn.
- To sequence to the inbound leg of a simulated hold, simply "fly" in the inbound direction using the speed and course line in **SETUP** (see "Activating demo mode" beginning on page 117). The unit will recognize your change of direction just as it does in actual flight.
- To enter a new starting position, turn demo mode off and then on again in **SETUP**.

- When travelling at simulated supersonic speeds, the unit may not supply a full 10-minute warning of Class B or Class C airspace penetration, and some other functions may not work exactly as expected.

7.8.4 Cancelling demo mode

Demo mode is cancelled either by turning the unit off or by using the following procedure:

1. Turn the *large secondary* knob to **SETUP**, and the *small secondary* knob to display `DEMO MODE YES`.
2. Turn the *small primary* knob one click in either direction to change the word `YES` to `NO`. Press **ACK**.

7.9 LOOK-AHEAD MODE

Look-ahead mode allows the pilot to temporarily use the unit while in flight to check for waypoints near any given location. For example, you might simulate being at the destination of a trip in order to find suitable alternate airports before you actually arrive there.

7.9.1 Activating look-ahead mode

NOTE: Look-ahead mode is unavailable if demo mode is enabled.

1. To activate look-ahead mode, turn the *large secondary* knob to **SETUP**, and turn the *small secondary* knob to display:

```
LOOK-AHEAD MODE      NO
```

2. Next, turn the *small primary* knob one click to change the word `NO` to `YES`. Press **ACK**.
3. The unit will display:

```
LAX    IS REMOTE LOCATION   ACK?
```

where LAX represents the identifier of a waypoint in the database.

4. Use the *primary* knobs to display the identifier of the waypoint whose nearby airports you want to locate. (Use the *large primary* knob to select the waypoint category, and either turn the *small primary* knob to select the identifier, or press **CRSR** and use the *small* and *large primary* knobs to spell out the identifier.)

   When you've displayed the desired identifier, press **ACK**.

7.9.2 How the unit behaves in look-ahead mode

In look-ahead mode, distances and bearings to waypoints are displayed relative to the simulated position, not your present position. For example, you may use the LOCAL feature to show the 20 airports, VORs, SmartComm frequencies, and so on, which are nearest to the simulated position.

For safety reasons, alerts and the list of local SUAs remain centered on your true position.

7.9.3 Notes

The emergency airport search, activated by simultaneously pressing **–D→** and the left-hand **CRSR** button, will immediately cancel look-ahead mode and display the airport nearest your present (actual) position. To see the list of airports nearest your *simulated* position, turn the *large primary* knob to **APT** instead.

While the unit is in look-ahead mode, the **WARN** light will illuminate (but not flash). Pressing the **WARN** button will display the message:

```
LOOK-AHEAD MODE D/B NOT VALID!!!
```

This message means that distances and bearings displayed in the **APT**, **VOR**, **NDB**, **INT**, and **USER** functions refer to the simulated position, not to your present position.

To enter a new simulated position, you must turn look-ahead mode off and then on again.

7.9.4 Cancelling look-ahead mode

Look-ahead mode is cancelled by any one of the following actions:

- Press **–D→** and **CRSR** simultaneously to activate the emergency nearest-airport search (this is the easiest way). The unit resumes normal navigation.
- Or, use the **SETUP** function as described in step one of "Activating look-ahead mode" on page 120, but change the word YES to NO and press **ACK**. The unit resumes normal navigation.
- Or, turn the unit off. The unit will resume normal operation when turned back on.

7.10 LATITUDE AND LONGITUDE

To display the latitude and longitude of your present position, turn the *large primary* knob to **STAT**. Turn the *small primary* knob to display on the *primary* readout the latitude/longitude coordinates obtained from the GPS receiver.

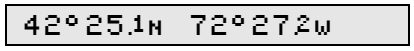
The M2 and GPS-600 have this data under **SETUP.**

7.11 GPS SIGNAL MONITORING

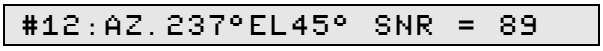
7.11.1 Signal monitoring

To monitor GPS signal status, turn the *large secondary* knob to **STAT**, and turn the *small secondary* knob to display the following functions. For the M2 and GPS-600, use **SETUP.**

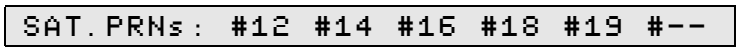
- Latitude and longitude obtained from the GPS receiver, or GPS status, if position isn't available:

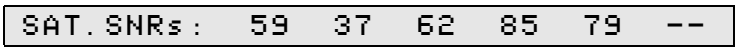


- Satellite PRN identification numbers, azimuth angle, and elevation angle for each satellite that's being received:

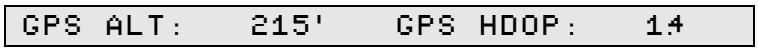


- The signal-to-noise ratios and PRN identification numbers for each satellite that's being received:





- The altitude reported by GPS (Caution—not barometric altitude) and HDOP:



  HDOP is a measure of how good the satellite pattern is in the sky for fix-taking purposes; HDOP lower than 1.5 is very good. Press and hold the **WARN** button to view GPS accuracy estimate in nautical miles.

7.12 CDI CALIBRATION AND ANNUNCIATOR TEST

Note: The calibration portion of this procedure can't be performed if the unit is an M2 that has been designated as IFR-approved.

The unit's electrical output, which drives an external CDI, flight director, and/or autopilot, may be calibrated. This procedure is usually performed only during installation of the unit, but is given here in case you want to check or re-calibrate the signal. Also, panel annunciators may be checked with this test. Since many CDI needles tend to be somewhat "sticky," this procedure is best performed with the engine running, to supply enough vibration to jiggle the needle and allow it to move to its proper position.

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to the function:

   and press **ACK**.
3. The CDI needle should move to the center position. Rotate the *small secondary* knob, if necessary, to precisely center the needle. When the needle is centered, press **ACK**.
4. The CDI should move to the left. Rotate the *small secondary* knob to cause the CDI to indicate 5 dots left deflection. When the needle indicates this deflection (5L), press **ACK**. The CDI should now be properly calibrated.

5. The next step checks the 5L to 5R range of the CDI needle, and also tests any external annunciators that may be wired to the unit. Turn the *small secondary* knob to scan through the CDI's entire range to check its linearity and calibration accuracy. This step also sequentially energizes the external annunciators, the external nav flag, and the TO/FROM pointer as described in the unit's readouts. When finished with the tests, press **ACK**.

6. The final two steps check the extreme left and right outputs to the CDI. When finished with each test, press **ACK**:

```
CDI OUTPUT FULL SCALE LEFT  ACK?
```

```
CDI OUTPUT FULL SCALE RIGHT ACK?
```

7. After you've completed all steps, the unit returns to the first readout of this procedure.

If your unit is interfaced to a flight director and/or an autopilot, but not to an external CDI, you can calibrate the output only by using either of the following two methods:

a. Have your installer connect a voltmeter to the unit's output signal, and use only steps one through three above to produce zero volts output. Press **ACK** two more times to complete the procedure and store the new calibration values.

-or-

b. While flying with the autopilot connected to the unit, use only steps one through three above to produce straight and level flight. Press **ACK** two more times to complete the procedure and store the new calibration values.

7.13 COMMUNICATIONS FREQUENCIES

This section describes the use of the unit's SmartComm system for installations that don't include the Northstar C1 communications transceiver.

If your installation includes the C1 transceiver, see Appendix E, instead of this section, for operation of your SmartComm system.

As you fly, the unit continuously searches its database for nearby communications frequencies. This function provides a reference guide for many of the communications frequencies you may use, including Approach, ATIS, AWOS, Center, Clearance Delivery, Ground, Pilot-Controlled Lighting, Tower, Unicom, and CTAF. This information is taken from the Jeppesen database, so remember, if your FliteCard hasn't recently been updated, some frequencies may not be current. The unit automatically scans its database to find the local frequencies you're likely to use. These frequencies are presented in two ways:

- A list of up to 11 *priority* frequencies:

  While flying, the priority frequencies are the local en route frequencies—Approach, Center, FSS, Tower, and ATIS.

  Immediately after landing, Ground and Tower will appear first in the list.

  While on the ground, the priority frequencies are those for the airport where you're located—ATIS, AWOS, Clearance Delivery, Ground, Tower, Unicom, and CTAF.

  You can merge the above two frequency lists by setting the MAXIMUM TAXI SPEED **SETUP** function to (OFF).

- Available local frequencies grouped by their functions:

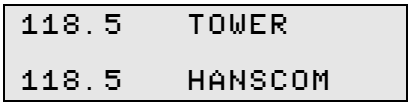
  Frequencies are grouped as Approach, ATIS, AWOS, Center, Clearance Delivery, FSS, Ground, Pilot-Controlled Lighting, Tower, Unicom, and CTAF. Up to 10 of each type are displayed, in order of distance.

You can use the following steps to become familiar with Smart-Comm's operation, before you move on to the details in the sections that follow. Turn the *large secondary* knob to **COMM**. Turn the *small secondary* knob once to the left to see the heading:

```
PRIORITY LIST    →
```

Then turn the *small* knob right to see the first priority frequency (under some circumstances, there may not be any available). In

this example, the words TOWER and HANSCOM alternate on the readout:



Continue turning the *small primary* knob to the right to display all the priority frequencies. After all frequencies in the priority list have been displayed, you'll see a header for each of the local frequency lists:

If a frequency list is empty, the header says:

and **ACK** won't flash.

To see the available frequencies within a displayed type, press the flashing **ACK** button. After you press **ACK**, the frequencies will be shown one by one as you turn the *small* knob. To leave on a local frequency list, turn the *small secondary* knob all the way to either end and press **ACK.** Then you can look through the other local lists or return to the priority list.

(If you've just turned the unit on, and it hasn't yet determined your position, it will use its last calculated position to determine local area frequencies.)

7.13.1 Manual frequency lookup

1. Turn the *large secondary* knob to **COMM**.
2. Whenever a frequency is displayed on the readouts, you may press the *secondary* **CRSR** button to enable manual input.
3. The *large secondary* knob now changes the megahertz frequency. Turn it to select from 118 to 136 MHz.
4. Turn the *small secondary* knob to select the kilohertz frequency in 25-kHz steps.

If the selected frequency is recognized in the database as a locally used frequency, then the airport identifier (if any) and function for the frequency are also displayed, according to the following table:

Type	Abbreviation
Approach	APP
ATIS	ATS
AWOS	AWS
Center	CEN
Clearance Delivery	CLD
CTAF	CTA
Ground	GND
Flight Service Station	FSS
Pilot-Controlled Lighting	PCL
Tower	TWR
Unicom	UNI

5. (Optional) Press **CRSR** again to see the radio call (if known).

7.13.2 Priority frequency selection

The unit automatically scans its database to find the local frequencies you're most likely to use, based on your location and whether or not you're airborne. Up to 11 priority frequencies may be displayed.

While flying, the priority frequencies are the local en route frequencies—Approach, Center, FSS, Tower, and ATIS. Immediately after landing, the priority frequencies are Ground and Tower. While on the ground, the priority frequencies are those for the airport where you're located—ATIS, AWOS, Clearance Delivery, Ground, Tower, CTAF, and Unicom.

To view the available priority frequencies:

1. Turn the *large secondary* knob to **COMM**. The first local frequency is displayed, along with the call sign and type for that frequency.
2. Turn the *small secondary* knob to the right to display other priority frequencies, and the type and call sign of each one.

If the frequency you want isn't included in the priority list, press **CRSR** and enter the frequency manually as described above, or continue turning to the right to scan the local lists, as described below.

7.13.3 Local frequency lists

The unit automatically scans its database to find the frequencies for the facilities in your area. Local frequencies are grouped into the following lists: Approach, ATIS, AWOS, Center, Clearance Delivery, FSS, Ground, Pilot-Controlled Lighting, Tower, Unicom, and CTAF. Up to 10 nearest frequencies are displayed in each list, in order of distance from your position.

To select from the available local frequencies:

1. Turn the *large secondary* knob to **COMM**. The first priority frequency is displayed, along with the local type and call for that frequency.
2. Turn the *small secondary* knob to the right, past the priority frequencies, to display the type of frequency list you want. Press **ACK** to see the nearest frequency in the list.
3. Turn the *small secondary* knob to the right to view any frequency in the list.

NOTE: To return to the list headings, turn the *small* knob past either end of the list and press ACK.

NOTE: If a list is empty, the word NO will be displayed before the list title, and ACK will not be flashed.

Whenever you display frequencies from the ATIS or AWOS lists, the tower call name alternates on the readout with the distance and bearing to the facility. This function allows you to access weather information for locations chosen relative to your position. You can choose weather dead ahead, or off to the right or left of your track.

7.13.4 Database INFO selection

The unit's **APT INFO** and **TRK INFO** functions display an airport on the *primary* readout, and information about the airport,

including its comm frequencies, on the *secondary* readout. The RTE LEG INFO section also shows frequencies.

7.13.5 Maximum taxi speed

The aircraft's ground speed is used to determine whether the aircraft is taxiing or flying, in order to choose the type of priority frequencies displayed. As shipped from the factory, the unit displays ground-related frequencies if the speed is below 20 knots, and en route frequencies if the speed is above 20 knots. To set this speed threshold to a different value, if necessary, use the **SETUP** function described below.

To change the ground speed value:

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display the function:

```
MAX. TAXI SPEED:  20 KNOTS
```

3. Turn the *small primary* knob to select the desired speed:

```
MAX. TAXI SPEED:  5 KNOTS      ACK?
```

If you want to defeat this function and display all frequencies at all times, turn the *small primary* knob one click to the left of 0 knots, to the position labelled OFF:

```
MAX. TAXI SPEED: OFF           ACK?
```

See Appendix E for additional **SETUP** functions available for installations that include the Northstar C1 Communications module.

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Section 8 – HINTS FOR BETTER NAVIGATION

This section provides several suggestions for better ways to navigate with the Northstar.

CONTENTS

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8.1 WAYS TO USE THE NAVIGATOR

There are many combinations of readouts that you may find useful. You may decide to pick a standard combination that meets your particular needs for most purposes. Here are three suggestions:

- INFO on the *secondary* readout. The city or name of the airport you're using on the *primary* readout may be shown continuously on the *secondary* readout.
- NEAREST AIRPORT on the *secondary* readout. Wherever you fly, the distance and bearing to the nearest database airport will be shown.
- DISTANCE and BEARING to waypoint on the *primary* readout; GS and TAE on the *secondary* readout. Use the **TRK** and **INFO** functions to show complete information about the waypoint you're navigating to.

8.2 PRESELECTING WAYPOINTS

Since the unit remembers which waypoints were last used for each category on each readout, you may preselect several waypoints that you'll soon be using. You can preselect one airport, VOR, NDB, intersection, and user waypoint on each readout. Turning to this position then instantly shows the distance and bearing to the selected waypoint.

8.3 APPROACHING YOUR DESTINATION

If you haven't flown with GPS guidance before, you'll be amazed by the accuracy of the Northstar. There are many advantages to this system, but you still must use caution when navigating with GPS.

One instance may arise when it's time to land at your destination. Your unit says the airport is only a few tenths of a mile away, but you can't see it anywhere—where is it?

The answer is: directly beneath you. You should start looking for your destination while it's still several miles ahead. If you wait until your unit says you've arrived, you're probably right over the field, and will have to overfly it as you descend for a landing.

In fact, you may not want to fly to the airport itself, but to a point from which to approach the airport. This technique might be useful either at a busy airport where ATC requires you to be at a particular reporting point when calling for clearance to land, or at a mountain strip that you want to approach from a safe direction.

These situations would require an additional waypoint as part of your flight plan. Define the waypoint as part of the **USER** database. If you use the name of the airport as a prefix for the name of the new waypoint, any such waypoints for a given airport will appear together in the database and thus be easy to use.

For example, an approach waypoint for airport XYZ might be called XYZAP. Or, if you wanted different approach waypoints for different runways, you might call them XYZ14 (approach point for runway 14 at airport XYZ) and XYZ32 (for runway 32). Don't forget: All the FAA-identified five-letter fixes and reporting points are contained in the INTERSECTION waypoint category.

8.4 AIRPORT REFERENCE POINT (ARP)

The airport locations contained in the unit's database are known as Airport Reference Points (ARPs). These are the "official" airport latitude and longitude. At airports that have been surveyed, the ARP is usually at the "center of gravity" of the runway ends. At other airports, the ARP may not be so well-defined.

8.5 GREAT CIRCLE ROUTES

If you're planning a flight of over 100 miles, and you take the time to lay out your course on a Sectional or WAC chart, you'll notice that the course the charts suggest you fly is different from that recommended by your Northstar unit.

This difference is because the unit always calculates the shortest possible route between two waypoints, a "great circle" route. A flat chart isn't an accurate model of a spherical earth; consequently, the route you obtain from a chart won't necessarily be the shortest one possible.

The difference is small on a short flight, larger on a long one.

Be aware that with Northstar guidance your course usually will be slightly different from the one you'd draw on a chart. This dif-

ference is usually an advantage—you'll get there quicker because you're flying the shortest possible distance. Your great circle route, however, might take you where you don't want to go, such as through a Class B area or a restricted area. (Don't forget that the **Airalert** feature will search your future track for Class B and Class C penetrations.)

8.6 PILOT REPORTS (PIREPS)

Flight Service Stations have a system to pass along weather information from one pilot to another; the reports are called PIREPS (Pilot Reports). For example, if you encounter moderate turbulence at a certain altitude, you can tell the FSS about it, and they'll inform other pilots who plan to fly in the same area.

When they're current, PIREPS are a good idea. Since many pilots don't make these reports, however, there's often little or no useful information available.

With your trusty Northstar in your panel, you can help the PIREP situation in an important area—winds aloft. To be sure, the FSS has a prediction of winds aloft at various altitudes, but they'd certainly appreciate an accurate, up-to-the-minute report. So would other pilots who plan to fly in your area and don't have the Northstar's accurate guidance.

Get in the habit of checking winds aloft every hour or so. When you do, call up the nearest FSS (use the frequency that appears in your **COMM** display on your Sectional, or call Flight Watch on 122.0) and let them know.

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Section 9 – SAFETY CONSIDERATIONS

ALWAYS KEEP IN MIND THESE IMPORTANT SAFETY POINTS!

- Don't rely on a single navigation system.
- Don't be tempted to violate FARs concerning visibility requirements for VFR flight.
- Don't ignore the unit's warning messages.
- Don't fixate on the readout and fail to look outside the aircraft.
- Do get in the habit of checking estimated accuracy. Be careful when navigating in areas or times of poor signal coverage.

Just because the unit may give you excellent performance *99* consecutive times, don't think that it's a magic box with which you can blindly trust your life. The unit performs extensive cross-checking of itself and signal conditions, but you should always double-check your navigation with other means.

Reliance on the GPS-60 is only allowed in Visual Meteorological Conditions (VMC). When flying IFR, you may find it quite comforting to be able to vertify your exact position with the unit, but actual navigation must be based only on other navigation equipment required for flight.

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APPENDICES

CONTENTS

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Appendix A – Features and specifications

Features:

- Updatable database and software
- Waypoints in airport, VOR, NDB, and intersection categories
- 12-channel GPS satellite navigator with altitude aiding (older GPS-60s and GPS-600s, and M2s with an external GPS interface, have only six channels)
- **Airalert** Controlled Airspace alerts

  Class B and Class C Airspace, with Mode C Alert
- **Airalert** Special Use Airspace alerts

  Prohibited, Restricted, Warning, Alert, and Military Operating Area alerts
- Distance and bearing to all database and user waypoints
- Lists of local waypoints by category
- Lists of local communications frequencies, with optional SmartComm radio
- Fly direct to any waypoint
- Fly a radial to or from any waypoint
- Queue next leg
- Queue a hold
- Fly Victor airways and Jet routes (only with North American and Alaskan FliteCards)
- Store up to 100 user routes
- Room for up to 250 user-entered waypoints
- Track Angle and Ground Speed
- Desired track and advance notice of turns
- Automatic turning arc guidance
- Off-course distance and Track Angle Error
- Estimated Time Enroute
- Estimated Time of Arrival
- Time of day
- Winds aloft
- Present latitude/longitude

- Automatic magnetic variation
- North American FliteCards (U.S., Canada, Mexico, Caribbean):

  Public-use, private and military airports, with:

  - city and state
  - name
  - communications frequencies
  - field elevation
  - runways
  - latitude/longitude

  VORs and NDBs:

  - city and state
  - name
  - frequency

  Civil-use intersections (only for the continental U.S.)

  Class B and Class C airspace, Prohibited, Restricted, Warning, Alert, and Military Operating Areas

  RCO frequencies

- Alaskan FliteCard (Alaska, Canada, and the U.S. down to 30 degrees North latitude)

  Public-use and military airports, with:

  - city and state
  - name
  - communications frequencies
  - field elevation
  - runways
  - latitude/longitude

  VORs and NDBs:

  - city and state
  - name
  - frequency

  Civil-use intersections

U.S. Class B and Class C airspace

RCO frequencies

- International FliteCard (Worldwide)

  Public-use and military airports, with:

  - city and state
  - name
  - communications frequencies
  - field elevation
  - runways
  - latitude/longitude

  VORs and NDBs:

  - city and state
  - name
  - frequency

  Civil-use intersections

  U.S. Class B and Class C airspace

  RCO frequencies

- Helicopter FliteCard

  Public-use and private airports and heliports, with:

  - city and state
  - name
  - communications frequencies
  - field elevation
  - runways
  - latitude/longitude

  VORs and NDBs:

  - city and state
  - name
  - frequency

  Civil-use intersections (excluding Alaskan intersections)

Class B and Class C airspace, Prohibited, Restricted, Warning, Alert, and Military Operating Areas

RCO frequencies

- Starguard Theft-protection system

  Power-up customized identification message

  Optional system disable

Specifications:

- Dimensions

  Height—2 inches

  Width—6.25 inches

  Depth—11.75 inches (from rear of front bezel to rear of mounting tray)

- Weight

  4.2 pounds

- Power Requirements

  10 to 35 VDC, 18 watts nominal

- Output Interfaces

  CDI and its nav flag

  TO/FROM pointer

  WARN annunciator

  WPT annunciator

  VFR annunciator (useful only in M2 IFR-approved installations)

  Parallel Offset annunciator

  RS-422 serial channel for moving map displays and/or fuel management systems

- Input Interfaces

  RS-232 serial channel to accept altitude data from altitude serializer

  Certain M2s (not M2Vs) and GPS-600s, depending on

computer-board revision level, have the capability to interface directly with an altitude encoder without the use of a serializer

- Two-Way Interfaces

  SmartComm radio

  Service port for in-plant use

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Appendix B – Warning conditions

This section describes warning messages that the unit may display if its self-diagnostic system detects a problem. When the **WARN** or **ALRT** light flashes, press it to read the warning message, and press it again to clear the message. Warning messages may indicate either poor signal conditions or equipment malfunction (either transmitter or receiver equipment). Other messages are also listed in this section.

B - 1 Indications of signal problems

The following messages could indicate a receiver problem, but are more likely to relate to signal or satellite geometry problems. (These messages are suppressed during the power-up scrolling readout.)

```
NO POSITION FROM GPS
```

The unit isn't currently tracking enough usable satellites for navigation. You'll see this message if you try to use the unit before it's ready, if satellites are currently unavailable, or if there's a failure within the GPS receiver or antenna..

```
POOR OR DEGRADED ACCURACY
```

This message occurs only in the extreme case when your position error has more than a five percent probability of exceeding 1.7 nm. It is accompanied by the nav flag.

> **NOTE: The GPS accuracy estimate is displayed while the WARN button is held down, after you've viewed all other messages, if any.**

B - 2 Airalert warning

When the **Airalert** system is disabled, a warning alert appears every time the unit is turned on, reminding you that the feature isn't fully operational. The **ALRT** button will flash; press it to read the alert, then press it again to turn off the alert:

```
AIRALERT IS OFF: Class B/C OR SUA
```

No warning is shown if the **Airalert** feature is active for all areas.

B - 3 Indications of receiver problems

```
FAILURE:N.RAM   REPLACE COMP.BD.
```

The unit detects one of several failures on the internal computer board. Unit must be repaired.

```
FAILURE:SOFTWARE REPLACE FLT.CARD
```

The unit detects a problem with the FliteCard. Obtain a new FliteCard and replace the defective one.

```
NV MEMORY FAILED   USER DATA GONE
```

The Northstar navigator contains a nonvolatile memory chip with a design lifetime of 5 to 10 years. This warning indicates that this memory has failed, and any user-entered waypoints have been lost. The time zone selection ("Setting the time zone and time of day" on page 28), the date (for magnetic variation calculations), the CDI calibration, as well as a number of configuration flags, will also have been lost. You may continue to use the unit under VFR until it can be repaired. Entering the date is described in the *Northstar Avionics GPS-60 Installation Manual.*

B - 4 Other messages

```
DATABASE EXPIRED ON 07JAN98
```

The database contained in the unit's FliteCard is no longer current. You can obtain an updated FliteCard directly from Jeppesen. This warning message is displayed only for IFR-approved installations.

```
PARALLEL OFFSET IS CANCELLED
```

A parallel offset previously in effect has been automatically cancelled because of a change in flight plan.

```
LOOK-AHEAD MODE:D/B NOT VALID!!!
```

You're still in look-ahead mode.

```
NO RESPONSE FROM RADIO MODULE
```

SmartComm radio isn't working.

```
   ROUTE PAUSED, SELECT GUIDANCE!
```

Reminder to re-activate edited route or choose other guidance.

```
USER ROUTE NAME GIVEN "%" PREFIX
```

Your new database has a route with the same name as one of your user routes. To avoid conflict, your user route has been renamed.

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Appendix C – Glossary

airalert: The Northstar's Controlled Airspace alert system that advises you when you approach Class B or Class C airspace, and helps you either avoid the area or enter it legally.

almanac: Data used to speed up acquisition, describing the orbits of GPS satellites, and obtained automatically from satellite signals and stored in a GPS receiver. The receiver requires about 30 minutes to collect almanac data the first time it's turned on. Thereafter, it can usually use the almanac data collected previously.

ARSA: Airport Radar Service Area (now called Class C airspace). Controlled airspace surrounding many airports, requiring you to make radio contact before entering.

CDI: Course Deviation Indicator. Instrument used to display your position relative to an intended track line.

cursor: A flashing character on the readout that shows which character is ready to be changed or entered by the user. It is activated and positioned by the user when required.

database: A collection of information about waypoints, etc., stored in the unit's memory.

ETA: Estimated Time of Arrival at the next waypoint, calculated by the unit according to your present speed.

ETE: Estimated Time Enroute to the next waypoint, calculated by the unit according to your present speed.

flight plan: A sequence of flight legs comprising one trip.

GPS: Global Positioning System. Using signals from earth-orbiting satellites, this navigation system is capable of providing high accuracy under all weather conditions.

GPS accuracy estimate: There is a 95 percent probability of your true position being within the number of nautical miles displayed on the unit's readout.

great circle: Shortest possible path between two points on the surface of a sphere.

Horizontal Dilution Of Precision (HDOP): A measure of how good the satellite pattern is in the sky for fix-taking purposes. HDOP depends on how many operational satellites are in view and where they're currently located. HDOP doesn't consider atmospheric conditions, Selective Availability, and signal interference, which all affect accuracy.

latitude: Imaginary lines on the earth's surface running East/West and expressed in degrees (0-90) north or south of the Equator. Used in conjunction with the North/South lines of longitude to determine position.

leg: A segment of a route or flight plan.

longitude: Imaginary lines on the Earth's surface running North/South and expressed in degrees (0-180) east or west of the Prime Meridian (a line running from the North to South Pole, passing through Greenwich, England). Used in conjunction with East/West lines of latitude to determine position.

magnetic variation: The difference between magnetic North and true North. Since the difference varies according to geographic location, the Northstar navigator automatically calculates magnetic variation and uses it to display bearings as magnetic north. The variation at any location changes slowly over a period of years. The current year is taken from the unit's internal, battery-operated clock.

Mode C: Altitude encoding system utilized by ATC. The Northstar navigator will warn pilots to operate, or "squawk," their Mode C altitude-encoding equipment whenever they're flying within a 30-

mile radius of the primary airport in Class B Airspace.

NDB: Non-Directional Beacon.

parallel offset: A flight leg separate from, but parallel to, the original leg.

queuing waypoints: The process of specifying a flight plan one waypoint in advance as you're flying.

readout: The row of alphanumeric characters that the unit uses to display navigation data.

satellite geometry: The relative position and number of satellites in the sky. Poor satellite geometry results from either poor spacing or too few satellites.

SNR: Signal-to-Noise Ratio. Guide number for determining the relative quality of GPS signals as compared to background radio noise.

Starguard: The Northstar navigator's theft-protection system.

TCA: Terminal Control Area (now called Class B airspace). Controlled airspace surrounding the largest airports in the U.S., requiring the pilot to obtain specific permission before entering.

track: A desired line of travel.

VOR: Very-high-frequency Omni-directional Range.

waypoint: A particular location (defined for navigation purposes by its lat/lon), used as an intermediate or final destination.

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Appendix D – Setup functions

Typical data for each **SETUP** functions is shown here. Actual data depends on your present situation.

```
ABILENE Class C    271° 1467%
10000 IS MANUAL ALTITUDE    ACK?
PARALLEL OFFSET:  NONE      ACK?
CDI SENSITIVITY: 1 DOT= .25%
BOSTON Class B   NO AIRALERT
MODE C ALERT     ON
   SUA ALERT     ON
EASTERN      STD TIME IS 13:32:25
233 USER POS'NS. STILL AVAILABLE
     DEMO MODE?: NO
CALIBRATE CDI,CK FLAGs,ANNCs.ACK?
HDG:125°TAS:155% WIND: 035°T  35%
SERIAL # AL     SOFTWARE: v02.07
GPS #601650.002 PART #613850.007
MAX. TAXI SPEED:  20 KNOTS
CHANGE YOUR MSG?             ACK?
CHANGE ALT.CODE?             ACK?
      ST*RGUARD: OFF
REVISED 1AUG96   COPR 1996 CMCE
FRONT PANEL TEST             ACK?
                 END OF FUNCTIONS
```

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Appendix E – SmartComm operation

The full Northstar SmartComm system consists of a Northstar navigator combined with a Northstar C1 communications transceiver module. The C1 comm module is remote-mounted and can be operated entirely through the navigator unit. SmartComm uses the Jeppesen database to help you find your next frequency, and displays the function and radio call sign for local frequencies in the database.

If you've just turned the system on, and it hasn't yet determined your position, it will use its last calculated position to determine local area frequencies. The last-used frequency is automatically tuned.

The SmartComm system displays the following frequencies: Approach, ATIS, AWOS, Center, Clearance Delivery, CTAF, Flight Service Stations, Ground, Pilot-Controlled Lighting, Tower, and Unicom.

Even if your installation doesn't have a comm module connected to the navigator, the SmartComm system still can be used as a useful information source. Many of the functions described below are available. Frequencies of nearby facilities and their radio call signs are displayed as described.

You may select communications frequencies in any of the following ways:

- Enter the frequency manually like a traditional comm unit.
- Select from a list of priority frequencies.

  NOTE: Priority frequencies are automatically compiled by the SmartComm system. While flying, the priority frequencies are the local en route frequencies; while on the ground, the priority frequencies are those for the airport where you're located.

- Select from lists of all area frequencies prepared by the SmartComm system.

NOTE: Each list contains one type of frequency (Tower, Ground, etc.), and lists are shown in alphabetical order (e.g. APPROACH list first). Within each list, the frequencies are in order of distance, with the nearest first.

- Select from a list of frequencies that you've recently used.
- Select a frequency that's currently displayed by the unit's **APT INFO** or **TRK INFO** function.

The comm unit (if installed) is automatically tuned to the selected frequency.

The five sections below explain how to select the comm frequencies.

E - 1 Entering frequency manually

To enter frequencies manually:

1. Turn the *large secondary* knob to **COMM** and display any frequency.
2. Press the *secondary* **CRSR** button to enable manual input.
3. The *large secondary* knob now changes the megahertz frequency; turn it to select from 118 MHz to 137 MHz.
4. Turn the *small secondary* knob to select the kilohertz frequency in 25-kHz steps.

NOTE: If the selected frequency is recognized in the Jeppesen database as a locally used frequency, then the airport identifier (if any) and function for the frequency are also displayed according to the following table.

Type	Abbreviation
Approach	APP
ATIS	ATS
AWOS	AWS
Center	CEN
Clearance Delivery	CLD
TAF	CTA
Ground	GND
Flight Service Station	FSS
Pilot-Controlled Lighting	PCL
Tower	TWR
Unicom	UNI

5. (Optional) Press **CRSR** again to see the radio call (if known).
6. Press the flashing **ACK** button to tune the radio to the designated frequency.

NOTE: Regardless of how you select the frequency, the comm unit remains tuned to the selected frequency until you change to a different frequency. You can transmit or receive regardless of whether the navigator is set to display COMM or navigation information.

NOTE: The currently tuned comm frequency is marked on the display with a small arrow that flashes during transmission.

E - 2 Selecting a priority frequency

The unit automatically scans its database to find the local frequencies you're most likely to use, based on your location and whether or not you're airborne. Up to 11 priority frequencies may be displayed.

While flying, the priority frequencies are the local en route frequencies—Approach, Center, and FSS, and the nearest tower and ATIS.

While on the ground, the priority frequencies are those for the airport where you're located—ATIS, AWOS, Clearance Delivery, Ground, Tower, CTAF, and Unicom.

To select from the available priority frequencies:

1. Turn the *large secondary* knob to **COMM**. The current frequency is displayed, along with the call sign and type for that frequency.
2. Turn the *small secondary* knob to the right to display the priority frequencies, and the type and call sign of each one.
3. When the desired frequency is displayed, press **ACK**. The comm transceiver tunes to the designated frequency.

If the frequency you want isn't included in the priority list, press **CRSR** and enter the frequency manually as described above, or continue turning to the right to scan the local lists, as described below.

E - 3 Selecting a local frequency

The unit automatically scans its database to find the frequencies for the facilities in your area. Local frequencies are grouped into the following lists: Approach, ATIS, AWOS, Center, Clearance Delivery, FSS, Ground, Pilot-Controlled Lighting, Tower, Unicom, and CTAF. Up to 10 nearest frequencies are displayed in each list, in order of distance from your position.

To select from the available local frequencies:

1. Turn the *large secondary* knob to **COMM**. The current frequency is displayed, along with the local type and call for that frequency.
2. Turn the *small secondary* knob to the right, past the priority frequencies, to display the type of frequency list you want. Press **ACK** to see the nearest frequency in the list.
3. Turn the *small secondary* knob to the right to select any frequency in the list, and press **ACK**. The comm transceiver tunes to the designated frequency.

NOTE: To return to the list headings without selecting a frequency, turn the *small* knob past either end of the list and press ACK.

Whenever you display frequencies from the ATIS or AWOS lists, the tower call name alternates on the readout with the distance and bearing to the facility. This function allows you to access weather information for locations chosen relative to your position. You can choose weather dead ahead, or off to the right or left of your track.

E - 4 Last-used frequencies

The Northstar SmartComm system also keeps a list of the last four or five frequencies that you've used.

To return to a recently used frequency:

1. Turn the *large secondary* knob to **COMM**.
2. Turn the *small secondary* knob one click to the left to display the most recent of the last five frequencies used. Continue turning the knob to the left if you need to access frequencies that you used earlier.

3. When the desired frequency is displayed, press **ACK**. The comm module tunes to the designated frequency.

E - 5 Database INFO selection

The unit's **APT INFO** and **TRK INFO** functions display an airport on the *primary* readout, and information about the airport, including its comm frequencies, on the *secondary* readout. To tune the comm transceiver to the frequency displayed on the *secondary* readout, press the flashing **ACK** button twice.

NOTE: The second press of the ACK button confirms use of the new frequency.

E - 6 Volume control

If your comm transceiver is remote-mounted, use the unit's volume-control knob to set the audio output level. Whenever the level is changed, the comm receiver is unsquelched for one second to aid in setting the desired volume. If your comm transceiver is panel-mounted, use its volume control knob to set the audio output level.

E - 7 Setup functions

Maximum taxi speed

The aircraft's ground speed is used to determine whether the aircraft is taxiing or flying, in order to choose the type of priority frequencies displayed. As shipped from the factory, the unit displays ground-related frequencies if the speed is below 20 knots, and en route frequencies if the speed is above 20 knots. To set this speed threshold to a different value, if necessary, use the **SETUP** function described below.

To change the ground speed value:

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display the function:

```
MAX. TAXI SPEED:  20 KNOTS
```

3. Turn the *small primary* knob to select the desired speed:

```
MAX. TAXI SPEED:  5 KNOTS      ACK?
```

If you want to defeat this function and display all frequencies at all times, set the function one click to the left of zero knots, to the position labelled OFF:

```
MAX. TAXI SPEED: OFF          ACK?
```

Squelch defeat

The C1 comm's squelch setting is normally controlled automatically. If you want to defeat the squelch in order to test the radio, use the **SETUP** function described below to listen to the radio's audio output.

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display the function shown as COMM SQUELCH:
3. Turn the *small primary* knob to select AUTOMATIC or OPEN:

```
COMM SQUELCH:     AUTOMATIC
```

```
COMM SQUELCH:     OPEN
```

NOTE: Simply turning the volume control up or down slightly automatically unsquelches the radio for one second and provides an alternate means of testing the radio.

Squelch level setting

The squelch level normally needs no adjustment. If you want to change it, however, use the **SETUP** function described below:

1. Turn the *large secondary* knob to **SETUP**.
2. Turn the *small secondary* knob to display the function shown as SQUELCH LEVEL:
3. Turn the *small primary* knob to select a sensitivity level between 15 (least sensitive) and 5 (most sensitive):

```
SQUELCH LEVEL:     12
```