This Reference Manual is authorized for use with baseline software program revision 01.19, and subsequent revisions, which are approved for VFR and IFR operations of the M3 Navigator.
Current Product Line is now being maintained by

CMC Electronics Inc.
600 Dr. Frederik Philips Boulevard
Ville Saint-Laurent, Quebec, Canada
H4M 2S9
Tel : 1-888-827-2881 or 514-748-3050

All Manual references to Northstar should read CMC Electronics Inc.
LIMITED WARRANTY POLICY

Northstar M3 GPS Navigator

Northstar Technologies, a division of CMC Electronics, Inc., warrantees the Northstar M3 Navigator to be free from defects in materials and workmanship for a period of three (3) 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, etc.) 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 the Northstar M3’s database 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 utilized 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 you study this manual completely before flying with your Northstar M3. But if you just can’t wait, here’s a simple and effective way to navigate with the unit:

1. Read and understand the safety considerations contained in Section 10. Then familiarize yourself with the M3’s warning messages (see Appendix B). Also, because the M3 might want to let you know about controlled airspace areas, it’s a good idea to be aware of its Airalert feature (see Section 6).

2. Now you’re ready to operate the M3. Turn it on by pushing in the center control labelled PUSH ON, and wait for the unit’s automatic self-test and signal acquisition sequence to finish, as shown by the message:

   NAVIGATOR READY/USE ANY SWITCH

indicating that the unit is locked on to GPS signals and is ready to navigate.

3. Turn the large primary (left-hand) knob to illuminate the units’s APT (Airport) annunciator. Then turn the small primary knob, and you’ll see a list of airports displayed. (Refer to Section 3.4 to learn how to find an airport quickly.)

4. Twist the small knob until you see the airport you want to fly to. If you pass by it on the display, simply twist 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. And if you stray off course, the unit will automatically show you the new course to follow. 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 normal operation. If the message is one of a continuing nature, the button will remain lit and you can press it at any time to re-read the message.

Many other useful information displays and navigation functions are available with your Northstar Navigator. They are all described in the pages that follow.

But now, before you begin to fly with your Northstar, we suggest that you turn to the HINTS Section of the manual and read the first three paragraphs of Section 9.3—Approaching your destination.

And when you’re parked and finished using the unit, just turn it off.
HOW TO USE THIS MANUAL

It’s natural to want to use your Northstar M3 as soon as you get it, and because its operation is so simple and straightforward, this is easy to do. But, a good set of instructions is necessary if you are to take full advantage of all the unit’s advanced features. That’s what this manual provides.

The manual is organized into ten main sections, followed by several reference sections (appendices) at the back. The Table of Contents lists the names of all these sections and the information in them. The index at the end of this manual makes it easy to find particular topics.

The best way to use this manual is to sit down with it and your Northstar and read the main sections in order. You might want to do this one step at a time. When you’re done, you’ll be well on your way to being 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 to answer questions that might arise. In particular, note the Glossary, where many technical terms are defined. If you encounter a word or a term you don’t understand, look there for its meaning.

Information in the Installation Manual will be of interest mainly to the technician who installs your unit. You may wish to read it to learn the requirements for a good installation.

The separate Pilot’s Guide supplies a brief summary of the information contained in this book, for quick reference while flying.
As we showed you earlier, you don’t have to be an expert with all of the features of the Northstar Navigator before you fly with it and begin to enjoy its many benefits.

As soon as you feel comfortable accessing waypoints in the database, and reading your distance and bearing to them, you are ready. Start with these, and gradually try out other features as you have need for them. You will 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 your flying with the Northstar, and have fun!
Section 1 - INTRODUCTION

This section provides general information about the Northstar M3, basic considerations for its use, and factory policies. Please read this section carefully before using the unit so that you will be familiar with all of the above.

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1.1 THE NORTHSTAR NAVIGATOR FAMILY

Congratulations on your purchase of a Northstar M3 GPS Navigator! We believe you’ll find it to be among the easiest-to-use pieces of air navigation equipment available anywhere, as well as the most reliable, accurate and versatile. With proper approval, the M3 is suitable for use under either Visual Flight Rules (VFR), or Instrument Flight Rules (IFR) for en route and terminal navigation.

If you’re using the GPS system for the first time, you’ll enjoy its world-wide signal coverage, accuracy and responsiveness.

The M3 is Northstar’s top-of-the-line VFR & IFR GPS navigator, FAA-certified to TSO-C129, Class A2, for en route and terminal area navigation. Its 12-channel GPS sensor module includes fully automatic Receiver Autonomous Integrity Monitoring (RAIM) which constantly checks the validity of the received signals.

Other Northstar GPS Navigators include the GPS-60 (a low cost VFR-only navigator), and the GPS-600, a VFR unit which can be upgraded to become an M3 with its approval eligibility.

The Northstar family also contains two loran-based navigator units, the M2 and the M2V. The M2 loran is certified to TSO-C60b and (with companion Model 8100A Airborne GPS Sensor) to TSO-C115a, for multisensor navigation. It is suitable for approval for use under IFR. 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 have mastered any one of the Northstar family of Navigators, you should find that operating any other Northstar unit is very similar.

1.2 NORTHSTAR M3 FEATURES

The Northstar M3 is a highly sophisticated navigator with a built-in 12-channel GPS receiver. It builds on the highly successful Northstar M1, M2, GPS-60 and GPS-600, retaining easy-to-use operation while adding important new navigational capabilities.
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, VORs, NDBs, intersections, Class B, Class C, and Special Use Airspace, with room to accept up to 250 user-defined waypoints. The database is contained in a user-replaceable FliteCard. The M3 includes either a North American FliteCard, or an International FliteCard containing information supplied by Jeppesen Sanderson, Inc.
- High-brightness, dual LED readouts to present navigation information to the pilot. The brightness level is automatically maintained under varying light conditions.
- Ultra-simple operation by means of dual, concentric selector switches and illuminated pushbuttons.

1.3 NORTHSTAR M3 LIMITATIONS

The Northstar M3 Navigator may be approved for supplemental VFR-only use, or for supplemental VFR and IFR use in en route and terminal areas, within the National Airspace System (NAS). The procedures for obtaining installation, as well as operational approval, are described within Advisory Circular 20-138 (Draft) and other FAA policy guidance, as applicable. Approval of the installation may be accomplished by Type Certification, Supplemental Type Certification or by the FAA Form 337 “Field Approval” method. Installation approval under this “follow-on” procedure may require ground and flight testing to substantiate satisfactory performance. Responsibility for conducting such tests rests with the installer and/or the operator.

It is the responsibility of the installer and the operator to ensure that appropriate airworthiness and operational considerations are followed for the installation and operation of the M3 Navigator. If an FAA or other agency-approved aircraft Flight Manual Supplement (FMS) or supplemental flight manual was created to describe operational characteristics specific to your aircraft, the FMS or supplemental flight manual takes precedence over other operational guidance contained within this Reference Manual.
The following statement applies specifically to the TSO'd Northstar M3 GPS Navigator as required to satisfy the elements of the TSO:

"The conditions and tests required for TSO approval of this article are minimum performance standards. It is the responsibility of those desiring to install this article on or within a specific type or class of aircraft to determine that the aircraft installation conditions are within the TSO standards. If not within the TSO standards, the article may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the FAA or other certifying agency."

Federal Aviation Administration Advisory Circulars 90-45A and 20-138, and Technical Standard Order (TSO) C129, require that the maximum cross-track or along-track distance error not exceed +3.8 nautical miles for off-airway and +2.8 nautical miles for on-airway area navigation (RNAV) operations.

These limitations are imposed to ensure proper airspace protection when operating under Instrument Flight Rules (IFR) on great circle navigation routes.

The Northstar M3 Navigator computes great circle navigation using a spherical earth model which influences desired track, or course, along such routes. When you are hundreds of miles from the next waypoint, the Northstar M3 Navigator can exhibit cross-track or along-track distance errors that may exceed the maximum allowable limits, compared with tracks calculated using other models of the earth's shape.

For this reason, the distances between successive waypoints must not exceed 500 miles when using the Northstar M3 Navigator under IFR.

1.4 NAVIGATING WITH THE NORTHSSTAR M3

With the Northstar M3, you can easily perform many useful navigation functions, including:

Pre-Flight Planning - even when it is 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 can also 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, the M3 always knows where it is and can tell you your bearing and distance from an airport, a VOR, or any other point in its database.

**Direct navigation** - simply designate a destination and the M3 will guide you directly there, from whatever your present position happens to be.

**Route navigation** - enter up to twenty of your own personal routes, using waypoints from the unit’s database, and automatically follow them. Or, call up a Victor airway or Jet route from the M3’s database and follow it.

**Controlled Airspace Alert** - if your current track or your future track will take you near Class B, Class C, or Special Use Airspace, the unit’s Airalert feature advises you and helps you avoid it, or enter it legally.

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

### 1.5 THE GPS SYSTEM

The GPS system provides worldwide coverage with excellent accuracy. As of early 1994, the entire constellation of GPS satellites is in orbit and continuous, highly accurate position data is available to all users.

An altitude encoder may be wired directly to the M3 or interfaced by means of the Northstar 2006 altitude serializer. Pressure altitude is used by the M3 to aid in providing accurate position information, and may be used for future VNAV applications of the M3. Use of encoded altitude is desirable for all applications and is required for IFR-approved installations.
1.6 YOUR REGISTRATION CARD

Be sure your owner's registration card is promptly filled out and returned 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 (see Section 8.3), and any future information about the unit.

1.7 DATABASE UPDATES

The database in your Northstar M3 is valid for a 28-day period. For IFR use, the pilot is required to be sure that every item of navigational data he will use is current and correct. This is most easily accomplished by updating the database every 28 days. A subscription service is available from Northstar Avionics. In an IFR installation, a warning message is displayed when a unit with an expired database is turned on. The pilot must acknowledge this message before using the unit.

If the Northstar M3 Navigator database has expired, IFR navigation is prohibited unless the flight crew verifies the accuracy of each selected waypoint and/or route selected for use, by reference to current approved data or published navigation charts or reference manuals.

For VFR use, the database should 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 is not updated every 28 days, the user should expect to have some data in the unit which is no longer current.

The unit's database is contained in a small, convenient card called a FliteCard™. You can easily install an updated FliteCard yourself, or if your prefer, your Northstar dealer can quickly do it for you. Section 3.9 contains instructions for replacing a FliteCard. Each new FliteCard also contains the latest program revision, providing you with any new operating features that may have been made available.
1.8 IFR USE OF THE NORTHBALL M3

The installation of a Northstar M3 in your aircraft must be individually approved for IFR use. The M3 may not be used for IFR navigation until it has been demonstrated to meet the requirements of appropriate Advisory Circulars or other FAA policy guidelines for en route and terminal operation under Instrument Flight Rules.

If your Northstar M3 has been approved for IFR operations, there are several factors you should be aware of.

IFR operation is permitted only when the external panel-mounted VFR annunciator is extinguished. For an IFR-approved installation, the VFR annunciator will be extinguished whenever the GPS receiver’s Receiver Autonomous Integrity Monitoring (RAIM) function indicates that the information from the receiver can be relied on.

**The M3 must not be used for IFR navigation whenever the VFR annunciator is illuminated.**

When the VFR annunciator is illuminated, the M3 may be used as a supplemental navigation source in addition to equipment required for operation under Instrument Flight Rules.

If your installation has been IFR-approved, the M3 will display the following message every time it is turned on:

```
NORTHBALL M3 APPROVED FOR IFR
```

If your installation has not been IFR-approved, the M3 will display instead:

```
NORTHBALL M3 FOR VFR USE ONLY
```
1.9 SERVICE AND REPAIRS

In case of an operating problem with your Northstar M3, you may contact your dealer or return the unit to the Northstar factory for diagnosis and repair. Try to be as complete and accurate as possible when you describe an operating problem. Feel free to call Northstar Service at (508) 897-7251 if you need assistance.

The unit is covered by a three-year limited warranty which, in summary, states that if the M3 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, provided that the unit has been properly installed and has not 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 the factory for turnaround time and freight costs before shipping your Northstar.

Refer to the Warranty at the beginning of this manual and to Section 3 of your M3 Installation Manual for further details on the warranty, service and update policies and procedures.

1.10 BE CAREFUL!

Although Northstar Avionics has done its best to make the M3 as accurate and reliable as possible, please be sure to remember the following precautions:

1. Navigation data is constantly changing. As always, double-check any navigation information before you rely on it.

2. Observe all limitations for use of your M3 under VFR or IFR.
3. The record of reliability for the GPS system is very impressive, yet there is always the possibility of occasional position errors for any of a number of reasons. Double-check your position often.

4. The unit contains so much information and so many features that you may find yourself spending too much time looking at it and not watching for other aircraft. See and be seen is still an important rule for VFR flight. As with all other aircraft instruments, you should develop the technique of using 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 wish to use. Don’t let the novelty of the M3 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 M3 (see also Demo Mode in Section 8.10), a description of the uses and purposes of all of the unit’s controls, and the initial SETUP functions you may need to use before flying with the unit.

To aid in understanding the design and operation of the unit, be sure to read Section 2.3, General Operating Procedures. 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 M3

To learn about your Northstar M3, the first step is to make sure that it is operating properly. Your dealer will handle installation and initial check-out of the unit in your aircraft using the Installation Manual as a guide. You may wish to read that manual, but everything you need to know about operating your unit is presented here.

Although your aircraft may be the best place to learn to use your M3, 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 Section 8.10). With this mode (which is a built-in simulation program), you’ll be able to learn all the unit’s features and practice using them in realistic navigation conditions.

To use the M3 while it’s out of your aircraft, you’ll have to connect it to a 12- or 24-volt battery, or to a 12- to 24-volt DC power supply. Doing this requires an extra power cable and fan that you can order from your Northstar dealer.

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

**Important:** The M3 MUST be supplied with forced air cooling air whenever it is operated, to avoid damage due to overheating.

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

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

With the M3 installed in your aircraft, or connected to an appropriate power source, turn the unit on by pushing in the center knob labelled **PUSH ON**. The unit will display a series of self-test messages, followed by messages showing that it is 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 on to GPS signals and is ready to operate, it will notify you with the message:

**NAVIGATOR READY / USE ANY SWITCH**

You can now proceed to set up the unit to navigate with or learn its operation.

If you don’t have an antenna connected, you will probably want to use Demo Mode to provide simulated position data.

To quickly enter Demo Mode: (See Section 8.10 for full details.)

1. Depress and hold the button marked **D** for a few seconds while turning the unit on.
2. Turn the **large secondary** (right hand) knob to **SETUP**.
3. Turn the **small secondary** knob to display

**DEMO MODE?: NO**

4. Turn the **small primary** knob to display

**DEMO MODE?: YES ACK?**

5. Press **ACK** twice.

When you’re finished using the M3, simply turn the unit off 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 the unit on again, it will automatically perform its startup sequence and notify you when it is ready to operate. As you’ve 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 has detected a problem with the equipment or the received signals, it will flash the red **WARN** button. You must press this button and read the displayed warning message before any of the other controls become operational.
2.2 BEFORE YOU START

Here are a few important things that you should know at this time:

1. **Safety precautions.** Before navigating with the M3, read (and then follow) the Safety Considerations contained in Section 10 of this manual. Also, be familiar with the warning messages: they’re listed in Appendix B.

2. **Airspace alerts.** If you operate the unit near a Class B, 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 wish to briefly familiarize yourself with this feature, which is described in Section 6.

3. **About bearings.** All bearings displayed by the M3 are magnetic. The only exception is winds aloft, which are reported as true.

4. **Using the rotary knobs.** In the manual, the instruction “turn the knob to the right” means turn it clockwise and “turn the knob to the left” means counter-clockwise. To turn a knob “all the way” to the left or 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.

The unit’s small knobs are generally used to select and display information. They can be turned one or more clicks in either direction to select information, or they can be turned rapidly to greatly speed-up the selection process (see Section 3.4.1).

5. **About 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 in...
Section 2.4. We suggest that you read through this information for an initial familiarization. Then twist knobs and push buttons to get the feel of them and to see what happens. After that, we hope you’ll enjoy working with the rest of the manual. And, if you’re uncertain about the operation of any of the controls or readouts, just refer back to that Section.

6. In General. Don’t feel that you have to be an expert with all of the features of the M3 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 are 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 M3—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 details of the unit and its operation. But before you do, you may wish to go back to the page entitled “For Those Who Just Can’t Wait” following the Table of Contents. Turn your M3 on and follow steps 4, 5 and 6 of the procedure described there. Repeat it a few times. You’ll be impressed with how easy it is to use the unit, 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 a few general considerations to keep in mind while operating the Northstar M3:

1. Use the large, outer knobs to select the function you want the unit to perform. Use the small, inner knobs to select specific data or operating options to be displayed by the selected function.
2. The sequence is always the same whenever you specify or change a waypoint you want to fly to, or a heading you wish to fly, or whenever you want to follow a route. First, display your choice in the primary (left-hand) readout, and then press –D→ and ACK.

3. Whenever the ACK button flashes while you are entering data, it is requesting confirmation. Press the ACK button when the data is correctly entered and ready to be locked in.

4. Whenever the ALRT, WARN or ACK button flashes of its own accord, a message is waiting to be displayed. Press the flashing button, read the message, and press the button again to stop the flashing and return to normal operation.

5. 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 advance the flashing cursor ahead or back to the next character position. Finally, when all characters have been correctly entered, press CRSR again to turn the cursor off.

2.4 CONTROLS AND READOUTS

Below is a diagram of the M3, showing all of its controls and readouts, followed by an explanation of each. As you learn the controls, don’t be afraid to experiment—there is no 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 have entered). Factory-programmed waypoints cannot be erased or modified except by installing a new FliteCard.
2.4.1 Pushbuttons

There are six buttons across the top of the Northstar M3. Their basic functions are listed below:

**Button Description**

**-D-** (Direct) Press the **-D-** button to define a flight path direct from your present position to the waypoint, or along the route that is displayed in the *primary* readout. The **ACK** button will automatically flash. Press it to confirm the new path. The unit then automatically calculates Off-Course Distance, ETE, ETA, etc. for this flight path. Several other navigation functions can also 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 method for displaying the nearest airport's identifier, bearing, distance and longest runway. (See Section 8.1)

**CRSR** (Cursor) Press to turn on the readout's flashing cursor, allowing you to use the rotary knobs to enter or change data shown on the readout. Press **CRSR** again to turn the cursor off after data has been entered. (The **CRSR** button illuminates while the cursor is activated.) 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.

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

The ALRT button remains illuminated for as long as the alert condition exists. It will turn off when the aircraft is no longer within about four miles of the indicated area.

The Airalert system may be partially or fully deactivated as described in Section 6.6.

You may press ALRT anytime the button is not illuminated to display whether the Airalert system is currently activated.

**WARN** This button flashes when a warning condition occurs, indicating that the unit's navigation guidance is uncertain and should not be relied on. Press WARN to stop the flashing and display a message explaining the warning condition. Press WARN again to clear the message. The button remains illuminated for as long as the warning condition exists. If a new warning condition arises, the button flashes again. When all warning conditions stop, the light goes off. Appendix B lists all the warning messages and their meanings.

Whenever the WARN button is not illuminated, you may press and hold it to display the unit's estimate of its own accuracy under the current operating conditions.
ACK  (Acknowledge)

First function—Confirmation of Defined Flight Path

Press after the -D+ button to confirm a flight path to a waypoint or along a route leg displayed on the primary readout.

Second function—Data Entry

During certain data entry procedures, such as setting the time, the ACK button will flash. Press ACK after the data is correctly entered to indicate that it should be used by the M3.

Third Function—Reading Advisory Message

When an advisory message is waiting to be displayed, the button will flash. Press ACK to display the message, and press it again to clear the message.

Fourth Function—Saving your Present Position

Whenever the ACK button is not illuminated or flashing, you may press it to instantly save your present position for later use. Press ACK again to clear the displayed message. To use this saved position, you must follow the procedure described in Section 3.7.3, to convert this saved position into a user waypoint.

Note: There is no specific button for “NEGATIVE ACKNOWLEDGE.” To indicate that you do not wish to take the displayed action, just turn either large knob one click, turning off the flashing ACK light and removing the request from the readout. (There are some situations where the secondary knob controls data display and only the primary knobs will remove the request.)
2.4.2 Rotary Switches

The M3 has two separate readouts, each with its own controls and cursor button. The readout on the left-hand side is called the primary readout and it is controlled by the left-hand dual rotary knob (the primary knob). The right-hand readout is called the secondary readout and is controlled by the right-hand dual rotary knob (the secondary knob).

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 select among the airports stored in the unit’s database.

Here are the functions that can be selected by turning the large knobs:

APT, VOR, NDB, INT, and USER allow you to look at all the waypoints stored in the unit’s memory. Use the small knob to select from the waypoints in the chosen category. The readout shows the waypoint’s identifier, and also 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 Locater 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.
TRK (Track) displays information about the current desired track (which you defined by pressing the buttons marked “-D-” and “ACK”). Use the small primary knob to select the navigation data you wish to display, such as off-course distance or your ETE to the waypoint. (See Section 4.9.)

RTE (Routes) allows you to access, enter, review and follow routes. The route function uses 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 of GPS signals) Use the small primary knob to display the status of signal reception.

INFO displays additional information about a waypoint or track 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 on the secondary side.

COMM (Communications)
Displays local communications frequencies.

SETUP allows you to enter or review certain kinds of 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, and the normal operation of the primary knobs is suppressed.

2.4.3 Self-Guided Tour of Controls and Readouts
If you are new to the M3, and have just read about its controls and readouts, we suggest that you spend a few moments experimenting with them if you haven’t already done so. (Remember, no setting or combination of settings that you use can harm the unit.)

Here’s a brief demonstration you can try. Do part of it or all of it; takes only a couple of minutes. You’ll learn a lot about operating the unit, and the sequence is similar to one you might actually use in navigating with it.
1. Turn the unit on by pushing in the center knob labelled PUSH ON, and wait for the ready message. If a button flashes, press it and read the waiting message (for instance, the unit might want to let you know you’re in a controlled airspace area). Press the button again. If it remains lit, ignore it (unless the message was about something that would prevent you from operating the unit). Proceed as follows:

2. If the unit is not installed with a GPS antenna, select Demo Mode with the following procedure:
   a. Turn the unit off. Depress and hold the → button for a few seconds while turning the unit on.
   b. Turn the large secondary (right hand) knob to SETUP.
   c. Turn the small secondary knob to display

   DEMO MODE?: NO

   d. Turn the small primary knob to display

   DEMO MODE?: YES ACK?

   e. Press ACK twice.

3. Turn the large primary (left-hand) knob to the APT position. The primary display shows an airport identifier and the distance and bearing to it.

4. While watching the primary display, twist the small primary knob. Notice that each click displays an airport. (If you find that you are in the LOCAL listing, and you should display the LOCAL=ALL “signpost,” pause briefly and twist 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 is near your present position or that you are familiar with.
7. Turn the large secondary (right-hand) knob to the INFO position.

8. Watching the secondary display, turn the small secondary knob in either direction to display additional information about the airport shown on the primary display.

9. To define a flight path direct from your present position to the waypoint displayed on the primary readout, press the -D- (direct) button and the flashing ACK button.

10. Notice that the primary display has switched automatically to the TRK (track) function. Watch the primary display and turn the small primary knob in either direction to read the track information.

11. 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.

12. If you are receiving GPS signals, press and hold the WARN button to display the unit’s calculation of its estimated accuracy.

13. Simultaneously press the -D- (direct) button and the left-hand CRSR button to display the airport nearest your present position. Turn the small primary knob to show other nearby waypoints.

14. Turn the large secondary knob to SETUP.

15. 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.

16. Turn the large primary knob to the TRK position to switch the primary display back to the track function for your original waypoint. Turn the small primary knob to display various track functions for the waypoint.

That’s it. If you want to repeat the exercise (starting with Step 4), 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 Northstar M3's important **SETUP** functions are described later in this section. Others, which you won't need to use right away, are described in Section 8. There is generally no need to repeat these setup functions each time you turn the unit on.

### 2.5 EXTERNAL ANNUNCIATORS AND INTERFACES

Several types of remote panel-mounted annunciators and other devices may be connected to the Northstar M3 to aid in navigation.

**WARN** annunciator—A red annunciator which automatically illuminates in the same manner as the unit’s **WARN** light.

**RAIM** annunciator—An amber annunciator which indicates that Receiver Autonomous Integrity Monitoring (RAIM) is not available to verify the accuracy of GPS signals.

**WAYPOINT ALERT** annunciator—An amber annunciator which illuminates whenever you are within two minutes flying time of the waypoint the unit is currently navigating to. It may be abbreviated **WPT** or **WP ALRT**.

**PARALLEL OFFSET** annunciator—An amber, white or green annunciator which illuminates whenever a parallel offset has been activated. The annunciator may also be abbreviated **OFFSET**, or **PTK** for parallel track. (See Section 8.6.)

**VFR** annunciator—An amber, white or green annunciator intended primarily for use in IFR-approved installations. In a VFR installation, this annunciator, if installed, will be continuously illuminated.

**CDI/HSI/FLIGHT DIRECTOR/AUTOPilot** interface—The M3 may be interfaced to many types of indicators and systems.

**ALTITUDE ENCODER**—The M3 can be interfaced to an altitude encoder or altitude serializer to improve GPS performance (required for IFR installations).
The unit may also be interfaced with devices such as fuel management systems and/or moving map displays, and with the optional Northstar C1 VHF Communications transceiver module.

2.6 USING THE CURSOR TO ENTER DATA

In later sections of this manual, you will see data entered in two different ways. In some cases, you will turn the small knob to select among a number of choices, then press ACK to lock in the proper choice. To set the time (Section 2.9), you will activate the cursor and then enter the correct value character-by-character. You should practice both methods to be comfortable with each: they will be used frequently for various types of data entry.

2.7 USING GPS

2.7.1. GPS Accuracy

The Northstar M3 calculates GPS position based on the WGS-84 spheroid. Whenever four or more satellites are available, GPS accuracy should be excellent—around 100 meters or better most of the time.

The Northstar M3 can use pressure altitude from your altitude encoder to enhance the performance of the GPS receiver. In the event of a failure of the altitude encoder, or if your installation does not include interface to an encoder, you should enter pressure altitude manually into the M3 as described in Section 2.

2.7.2. GPS altitude requirements

Your altitude encoder supplies pressure altitude to the M3. Future M3 features may require a manually entered altimeter setting, so that the M3 can convert pressure altitude to actual altitude. The altimeter setting function described below is not required for current operation of the M3, but is included for future reference.

If you choose not to enter the current altimeter setting, the M3 will assume a setting of 29.92 inches. The M3 uses this default
setting every time it is turned on, and this setting remains in use unless it is changed as described below.

To enter the altimeter setting:

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

```
29.92: ALTIMETER SETTING
```

3. Turn the small primary knob to enter the current setting for your area.
4. Press ACK.

A SETUP function displays the altitude obtained from the encoder:

```
RAW ENCODER ALTITUDE: 5300
```

A GPS Status function displays the altitude calculated by the GPS sensor when it is operating in 3D mode. The quantity labelled HDOP is a measure of the expected accuracy of the GPS system under the current operating conditions. An HDOP of 1 to 3 implies excellent accuracy, while an HDOP of 5 or greater implies lesser but still acceptable accuracy. Turn the large primary knob to STAT and the small primary knob to display:

```
GPS ALT: 10000   GPS HDOP: 15
```

At the present time, GPS altitude should never be used for navigation. GPS-derived altitude is not sufficiently accurate for use in determining vertical separation. In addition, the nation's airspace is operated using altitude information from a barometric altimeter along with the appropriate altimeter correction. It is vitally important that all pilots use the same reference system for altitude.
2.7.3. Manual altitude entry

If your unit is not interfaced to an altimeter encoder, or if your encoder has failed, you may enter your altitude manually into the unit. It is important to re-enter your altitude every time it changes, to maintain GPS accuracy. When you are using manually-entered altitude, the unit flashes its ACK indicator approximately every half-hour, to remind you to do this. Press the ACK button to read the message

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

Press ACK again to remove the message.

Use the following procedure to verify or enter your current altitude:

1. Turn the large secondary knob to SETUP, and turn the small secondary knob to display:

```
5000 IS MANUAL ALTITUDE ACK?
```

2. Turn the small primary knob to enter your current altitude, as determined from your altimeter.

3. Press ACK.

Even if the altitude is correct when it is first displayed, be sure to press ACK in step 3 so that the unit will stop asking you to check it.

When four or more satellites are available, and GPS is operating in 3D mode, the altitude entry message appears as

```
GPS IN 3-D
```

This message indicates you do not need to, and in fact can not, enter altitude manually, because the GPS sensor is able to calculate it automatically.

You also do not need to enter your altitude if your M3 is interfaced to an altimeter encoder.
2.8 AIRALERT™ CONTROL

Airalert is a useful feature of the M3 that tells you if your future track penetrates Class B, Class C, or Special Use Airspace, or if you are about to enter (or are already in) one of these areas. See Section 6 for details. While you are learning to use the unit, you may prefer to turn off the airspace messages given by Airalert until you are 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:

\[\text{ALL CLASS B \& C AIRALERT ON}\]

3. Turn the small primary knob to display:

\[\text{ALL CLASS B \& C NO AIRALERT ACK?}\]

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:

\[\text{SU A ALERT ON}\]

3. Turn the small primary knob to display:

\[\text{SU A ALERT OFF ACK?}\]

4. Press ACK, and Airalert will be disabled for SUAs except for Prohibited areas, for which alerts remain always active.
2.9 TIME OF DAY

The Northstar M3 contains a battery-powered clock which enables it to constantly keep the precise time and date, even when the unit is turned off. The battery has a design lifetime of approximately 5 to 10 years.

The Northstar M3 automatically sets its internal clock to the time obtained from the GPS system as soon as the time is available, after power has been turned on and the satellites have been acquired. The time may be adjusted to read a value other than GPS time, if desired, after GPS acquisition has occurred.

The time and date are normally set at the factory as part of final inspection. Time is set at the factory according to ZULU time. You may leave the time zone set to ZULU, or set the time zone to local time, if desired. Designating the time zone will automatically adjust the displayed time to the correct offset from ZULU time. Do not change to local time by setting the time directly.

To adjust the current time and 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.

```
EASTERN  STD TIME IS 10:24:32
```

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

4. To change the time, press the right-hand *CRSR* button. The leftmost digit of the time display will flash. Turn the *small secondary* knob to set it to the proper value. (The time is always set and displayed in 24-hour mode.)

5. Turn the *large primary* knob to the right and the second digit will flash. Use the *small* knob to set it to the proper value.

6. Continue until all digits are correct.
7. Press **ACK** to enter the corrected time and/or time zone.

Whenever you wish, you may change to a different time zone (the time of day will automatically adjust to the new time zone). 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 Section 4.9.10.

You’re now familiar with the M3’s **SETUP** functions and are ready to do something even more interesting. The next step is to learn about the unit’s database of waypoints.
Section 3
USING THE DATABASE OF WAYPOINTS

This section introduces the Northstar M3's database. It tells how to determine your position as distance and bearing to a nearby airport or VOR, like a conventional nav receiver. Next, it describes several ways of accessing waypoints from the database, and how to enter your own waypoints. Section 3.9 explains how to replace database with a current release to maintain the accuracy of the data.

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3.1 THE NORTHSTAR M3’s DATABASE

A database is a collection of useful information in a computer’s memory. The Northstar M3 has a very useful database indeed—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:** The M3 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, 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 P (Pr) to the right of their identifier.

**VORs:** Coordinates of all civil-use VORs. Of course, the M3 does not receive signals from VORs or NDBs—it simply uses the location of these navaids as familiar and useful reference points.

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

**INTERSECTIONS:** 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 Section 3.7.

An International Database is also available containing data covering the entire world.
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 have already entered some of your own waypoints) USER. Section 3.4 describes numerous ways to quickly find the specific waypoint you want. However, for now just turn the small 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 shown on the display.

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

Section 8.1 describes a shortcut for quickly displaying your position relative to the nearest airport. Press -D- and the left cursor button simultaneously to activate this function.

If you wish to display your position as latitude/longitude coordinates, turn the large secondary knob to SETUP, and turn the small secondary knob to display the lat/lon of your position.

3.3 ADDITIONAL WAYPOINT INFORMATION

To display more information about a waypoint shown in the primary readout, set the large secondary knob to the INFO position. 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 are not descriptive. The next two pages list the additional information typically displayed for each category of waypoint.
For AIRPORTS:

| BOSTON MA | City and State or Country |
| LOGAN INTL | Name of Airport |
| ATIS: 135.0 | ATIS frequency |
| APCH: 120.625 | Approach Control |
| TOWER: 119.1 | Tower frequency |
| GROUND: 121.9 | Ground frequency |
| CLNC DEL: 121.65 | Clearance Delivery frequency |
| UNICOM: 122.95 | Unicom frequency |
| CTAF: 119.1 | Common Traffic Advisory Freq |
| ELEVATION 20 | Field Elevation |
| 15-33 10100 HARD | Runway designation, length and surface (for up to five runways) |
| NE-SW 5100 GRAY | |
| 18-36 4000 TURF | |
| 11-29 3500 DIRT | |
| IFR APCH, LGTD | Approach* and Lighting† |
| APT. LAT 42°21.9N | Airport latitude |
| APT. LON 72°46.3W | Airport longitude |

*Approach Categories

| IFR | APCH | instrument approach available |
| NO | APCH | no approach |
| ??? | ??? | data not available |

†Lighting Categories

| LGTD | Lighted |
| UNLGTD | Unlighted |
| LGTD:T | Telephone rqst |
| LGT:?? | data not available |
For VORs:

<table>
<thead>
<tr>
<th>City and State or Country</th>
<th>VOR Name</th>
<th>VOR Frequency</th>
<th>VOR latitude</th>
<th>VOR longitude</th>
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<tbody>
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For NDBs:

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<th>NDB longitude</th>
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For Intersections:

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</thead>
<tbody>
<tr>
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<td>INT. LON 71°30.5W</td>
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For the User Category:

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<th>User waypoint longitude</th>
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</thead>
<tbody>
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<td>USER LON 71°30.5W</td>
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</tbody>
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| ACK to erase user waypoint |
|-----------------------------|-------------------------|
| ERASE XXXXX ACK?            |                         |
State and Province Codes for the USA and Canada

When the unit's INFO function is used, one of the following two-letter codes is displayed to identify the state or Canadian province of airport, VOR and NDB waypoints in the database:

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<th>State/Province</th>
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### Country Codes for countries other than the USA and Canada

The following three-letter codes identify the country of waypoints located outside of the United States and Canada. This table is current as of 1992, and is subject to additions and deletions.

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</tr>
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</table>

030194 REV 01.19
3.4 SELECTING WAYPOINTS

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

1. you may scan through the list of waypoints
2. you may enter the identifier of the waypoint
3. you may enter the waypoint’s name or city

A word of caution: When using the 3- or 4-letter airport identifiers, be careful to distinguish between the number zero and the letter O. The M3 always displays the number zero with a slash through it (0), and the letter O 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 O, 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 M006. (You may even be in the habit of thinking of your local airport as “0Y5” when in fact its correct identifier is “@Y5”.) In a few directories, it is difficult to distinguish between the letter L and the number 1. The M3 will not recognize an identifier that is entered incorrectly. You must always use 0 and L for the letters and 0 and 1 for the numbers. When scanning through the database, the waypoints beginning with letters appear first, followed by the digits 0–9, and then the special characters, if any.

In the North American database, the ICAO “K” prefix for major US 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 (“C” for Canada and “M” for Latin America).

For 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 M3 database can be accomplished quickly and easily.

Within each waypoint category (APT, for instance) the M3 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 twenty waypoints nearest your present position. These are the waypoints that will most often be of interest, 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 will pass some waypoints and approach others. The unit automatically updates and rearranges the group of LOCAL waypoints continuously. 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 are using the INFO function to display the airport's city and state, the new city will also be automatically displayed.

**SHORTCUT TO DISPLAY NEAREST AIRPORT:** Press -D- and the left CRSR button simultaneously 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 use a waypoint not in the LOCAL group, turn the small knob to the right to access the group of ALL waypoints. (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 to have to rotate the small knob for thousands of clicks to select the desired waypoint.

This is not necessary. The M3 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, such as LAX or DCA (or your local field). Turn the small knob rapidly to arrive at 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 display. 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 "identifier" is 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.
3 - USING THE DATABASE

If you discover that you have 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. The completes the selection procedure.

3.4.3 Selecting waypoints by name or city

If you do not know the identifier of an airport, a VOR, or an NDB, you can ask the M3 to search for the waypoint’s facility name or city to find it in the database. To do this, enter the first few characters of the waypoint name or city as described below. Then, turning the *small* primary knob will 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 wish to search for. (The waypoint that is displayed at this point 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 cursor off!

5. If the desired waypoint doesn’t appear in step 4, turn the *small primary* knob to scan through those waypoints which 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. Also, there are common city names, such as Springfield and Columbus, that 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 which 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:

1. All periods have been removed. Any apostrophes and hyphens are retained.

2. 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.

3. FORT has been abbreviated to FT.

4. SAINT has been abbreviated to ST.

5. When NORTH, SOUTH, EAST and WEST are parts of long names, they are usually abbreviated as N, S, E and W

6. 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 where 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 single digit, 1-9. 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 will see “CL #1” displayed as a reminder that there is more than one waypoint designated by that identifier. You can easily determine and select the NDB waypoint you want, in this instance “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 inherently contains many duplicate identifiers. (For example, there are fifteen intersections named DELTA, and many NDB identifiers are used for 10 or more different locations.) Because of the large number of duplicate identifiers, it becomes vitally important to be sure you are using the desired waypoint. You can do this in any of the following ways:

1. check the waypoint’s city and state or country, or its name
2. check the waypoint’s lat/lon coordinates
3. check the waypoint’s distance and bearing from your present position
4. (when forming a route) check the waypoint’s distance and bearing from the previous waypoint in the route
5. 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 3000 miles northeast to BR NDB located 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 M3 is different for each waypoint. The same numbers are used in the North American
FliteCard as are needed for the International FliteCard, to maintain consistency. This means that the North American FliteCard might contain an identifier such as 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 is not room on the readout to display more than the 5-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 on the previous page (except the first). Whenever you display an intersection identifier which has duplicates, a flashing number sign is automatically displayed following the identifier. This serves as a reminder that there are a number of duplicate identifiers from which you must choose.

3.6 TO/FROM INDICATOR

When the waypoint’s bearing is displayed, an indicator appears showing whether the bearing is TO or FROM the desired waypoint. Unless changed by the user, the bearing displayed by the M3 is the bearing TO the waypoint. Exception: A VOR waypoint displayed on the secondary readout will normally be displayed with a FROM bearing.

You may change the TO/FROM indicator in either readout to obtain a bearing which 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

\[
\begin{array}{c}
\text{BOS}\ 010^\circ\ 45.6^n
\end{array}
\]

"From” bearing

\[
\begin{array}{c}
\text{BOS}\ 190^\circ\ 45.6^n
\end{array}
\]
If you change the TO/FROM indicator for a waypoint, that new indicator will be shown until you change it or you 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 M3 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 M3 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 M3’s memory. They may be entered 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 not be added to the APT, VOR, NDB or INT waypoint categories.

3.7.1 Defining a User Waypoint

You may store user waypoints in the M3’s memory using any of four methods to specify the waypoint’s coordinates. Each method is described in detail in step 4 on the next page. The four methods are:

1. aircraft’s present position
2. latitude/longitude coordinates
3. distance and bearing from an existing waypoint
4. a previously “saved” position
The first step in adding a user-entered waypoint is to choose and enter the identifier of the new waypoint. User-entered waypoint identifiers can be from 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 is displaying a waypoint, not a LOCAL-ALL message—turn the small knob if necessary to change it. If there are no waypoints already entered, you must turn the 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: in doing this you will not affect the waypoint displayed.) When you’re finished, press CRSR again.

3. The unit will display

   XXXXX UNKNOWN: STORE IT. ACK?

   Press ACK.

   If a user waypoint with the same identifier is already stored in the database, you will 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 is no longer needed, as described in Section 3.7.2.

Next, enter 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 choose one of the following four entry methods:
Method 1 — enter present position:

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

  **Note:** Be sure the M3 is receiving or GPS signals with no warning flag present.

  **Note:** An estimate of the accuracy of this waypoint may be obtained when the waypoint is defined by pressing **WARN** and reading the repeatability estimate displayed.

Method 2 — enter lat/lon coordinates:

- Press **ACK**. Then, using **small** and **large** knobs:
  
  - Enter latitude and press **ACK**.
  
  - Enter longitude and press **ACK**.
Method 3 — enter distance and bearing from an existing waypoint:

> D/B FR. WPT. ACK?

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

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

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

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

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

Method 4 — use one of ten previously-saved positions:
(see also Section 3.7.3)

> SAVED POSN. ACK?

a. Press **ACK**.

b. Each saved position is temporarily identified by a phonetic alphabet word (ALFA, BRAVO, etc.) as follows:
You will see the most-recently-saved position displayed first. If you wish instead to select an earlier position, turn the *small* knob to the left until it is displayed.

c. Press ACK.

Note: The advisory indicator $^\dagger$ will flash if the warning indicator was on when the position was originally saved. This indicates the coordinates may be incorrect.

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 you no longer need a user-entered waypoint, or you may have entered one incorrectly and wish to erase it. To erase either:

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 shows:

   ![ERASE XXXXX ACK?]

3. Press ACK to erase the waypoint.

As you might expect, you may erase only those waypoints that you have entered and defined—factory-programmed waypoints cannot be erased.
3.7.3 Saving Your Present Position

You may instantly save your present position and at a later time convert it to a database waypoint.

This is a two-step process:

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

   Note: Up to ten positions can be saved. 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 Section 3.7.1) and store as a database waypoint so that it can be used.

In detail, saving your position works as follows. Whenever the ACK button is not 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 M3 to temporarily identify the last ten 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 location 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 of Section 3.7.1, under the heading SAVED POS N. These saved positions cannot be accessed until they have 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 the name of the new 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 of Section 3.7.1 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 the name of the new waypoint.

3. Press **CRSR** to turn the flashing cursor off.

4. Press **ACK**, wait until you are directly over the waypoint, and press **ACK** again.

Whichever method you choose, be sure that the **WARN** light is extinguished when you save your position, to assure its accuracy.

### 3.8 FLITECARD UPDATES

As is the case with all navigational data, the waypoint information in the M3’s database is subject to occasional changes. Many changes are relatively insignificant. Others can be critical, such as airports which have been abandoned, or VORs that have been moved or whose identifiers have been changed, etc.

The expiration date for your database is displayed during self-test after power is applied, and as a **SETUP** function. In an IFR-
approved installation, if the data in your FliteCard has expired, you will need to respond to a warning message advising of this fact every time the unit is turned on. For VFR use, it is recommended that your FliteCard be updated at least once or twice a year.

Accuracy and completeness of the database is intended only for the twenty-eight (28) day cycle for which it is provided. Users are encouraged to keep data current by purchasing an Update Subscription.

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

At the present time, FliteCards for the M3 are available in two versions: North American and International. The North American database is appropriate for use in Canada, the U.S., Mexico, and the Caribbean. It contains far fewer duplicate identifiers, and the international "K" prefix for larger U.S. airports is deleted. The International database is intended primarily for use outside of North America.
Northstar FliteCard: North American

Area covered: Canada, U.S. (including Hawaii), Mexico and Caribbean

FliteCard Contents as of February 1994:

14713 airports (all public airports and all U.S. private airports registered with the FAA)
1297 VORs
2366 NDBs
14090 intersections
1325 Victor and Jet airways
U.S. Class B and C airspace
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: International

Area covered: worldwide

FliteCard Contents as of February 1994:

12815 airports (all airports that are available from Jeppesen database)
3153 VORs
7524 NDBs
21769 Intersections
U.S. Class B and C airspace

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

Accuracy and completeness of the database is warranted only for the twenty-eight (28) day cycle for which the data is effective. Users are encouraged to keep data current by purchasing an Update Subscription.
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, JEPPESSEN 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.

Northstar Avionics will replace any FliteCard containing data which it improperly compiled, reproduced, or processed, but makes no warranty, express or implied, as to the accuracy of the source material, including warranties or merchantability or of fitness for a particular purpose.

3.9 CHANGING YOUR FLITECARD

The M3’s database and operational software is contained in a user-replacable card called a FliteCard™. The FliteCard may be changed to a new, current version with the following procedure.

Tool required: a 1/8" flat blade screwdriver

1. Turn the unit on while it is still installed in the aircraft and allow it to acquire GPS signals, shown by the message

   NAVIGATOR READY/USE ANY SWITCH

Press -D- and the left cursor button simultaneously to display the distance and bearing to the nearest airport. Verify that the distance is approximately correct (usually less than a mile), and write down the identifier, distance and bearing displayed.
2. Turn off the unit, and 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, and then slide the unit out of the tray.

3. 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.

4. Insert the new FliteCard by pressing it firmly into the slot as shown on the unit’s top cover.

5. Be sure 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 one-half inch from being fully seated. Turn the retaining screw to draw the unit the remaining distance into the panel. Do not overtighten.

6. Replace the old FliteCard in the supplied postage-paid mailer, and be sure to return it to Northstar so that you will not be charged for it.

7. Turn the unit on and wait for it to acquire GPS signals, without turning any switches or pressing any buttons on the unit. The unit will automatically perform a complete self-check and report any problems as warning messages. When the unit finishes acquiring signals, and displays the message NAVIGATOR READY, press -D- and the left cursor button simultaneously. Compare the identifier, distance and bearing of the nearest airport with the values you recorded earlier. If the values match, and no warning message is displayed, the system is performing correctly and is ready to use.
With the M3 Navigator, you can instantly access information about any one of thousands of waypoints, and you have the ability to 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.
Section 4 - NAVIGATING TO WAYPOINTS

This section explains how to fly single-segment flight paths with the M3, such as flying direct to a waypoint, or flying a constant heading. An entire flight plan may be easily flown with the procedures described in this section.

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4.1 FLYING DIRECT TO A WAYPOINT

The simplest way to navigate with the M3 is to fly directly from your present position to a waypoint. To do this:

1. Pick your waypoint and display it in the primary (left-hand) readout. (Section 3.4 explains how to do this.)
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 have just defined and confirmed a flight path direct from your present position to the waypoint, and the unit is navigating to it.

4. The primary readout will automatically switch to the TRK function, and the TRK annunciator will light. Turn the small primary knob to select any of the following track functions (the displays shown are typical and are further described in Section 4.9):

   a. The lat/long of your starting point:

      \[ 41°26'2\text{n} 93°25'8\text{w} \]

   b. The lat/long of the waypoint:

      \[ 39°13'4\text{n} 89°52'1\text{w} \]
c. The track you are following:

\[ \text{VASE a DIRECT} \]

d. The bearing and distance to the waypoint:

\[ \text{VASE a 097° 193NM} \]

e. Course Deviation Indicator:

\[ [\ldots\ldots\Phi\ldots\ldots] \]

f. Your estimated time enroute:

\[ \text{ETE 1:35} \]

g. Your ground speed and track angle:

\[ \text{GS 145° TRK 096°} \]

h. Your cross-track distance:

\[ \text{FLY RIGHT 12M} \]

i. Your estimated time of arrival:

\[ \text{ETA 2:44 Z} \]

You can turn the \textit{large secondary} knob to \textsc{INFO} to display additional track data on the secondary readout.

While enroute, you can select any of the displays at any time to review waypoint information, check your current bearing and distance, navigate with the CDI, etc. 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 nearly all of your basic navigation requirements. It is the only one you really need to know how to use. However, there are many variations of this function available in the M3, and these are detailed in the following sections.
4.2 QUEUING A SECOND WAYPOINT

The M3's waypoint queuing function allows you to specify the next waypoint to fly to before you reach the current waypoint. (If you're not familiar with the term queue, it means to put in line, as when 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.

The waypoint queuing gives you the following advantages:

1. Queuing reduces your workload at each waypoint, because you don't have to locate and specify the next waypoint while crossing the current waypoint.

2. The unit will display the desired track of the next leg while you are still flying the current leg, so you can prepare for the turn.

3. The unit will show you when you should start the turn, shortly before the current waypoint, as specified in FAR 91.181 and section 5-35 of the Airman's Information Manual, helping you to remain within the boundaries of the airway.

4. The next leg will extend precisely from the current waypoint to the queued waypoint, rather than from the point at which the next leg was activated.
To queue the next waypoint:

1. Display the next waypoint in the primary readout.
2. Press the $\downarrow$ button two times. The readouts will display:

   ![FLY $082^\circ$ TO BJC AFTER ASE ACK?](image)

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

When you are about two minutes from the current waypoint, the ACK button will flash, asking you to press it to read a message. When you press it, the readout will display a message such as

   ![FLY $082^\circ$ IN 0:56](image)

This indicates you should begin a standard-rate turn to $082^\circ$ in 56 seconds in order to merge with the next leg without overshooting it (neglecting any effects of winds). The “seconds” displayed will count down to zero. Press ACK again to remove the message.

The method used by the M3 for automatically changing from one waypoint to the next is the same as when flying a route, described in Section 5.4.3.

The same TRK displays are available as when flying to a waypoint, as described in Section 4.1.

If you queue a waypoint while flying a route, the remainder of the route is canceled and replaced by the queued waypoint.

You may queue just one waypoint at a time. To change the queued waypoint, just repeat the above procedure. The newly-specified queued waypoint will replace the old one.

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

   ![NEXT LEG: \&BJC](image)
4.3 FLYING A COURSE

Another basic form of navigation you can perform with the M3 is to fly a particular course without specifying a waypoint as a destination. To do this:

1. Turn the **large primary** knob to TRK.
2. Press the button marked −D→. (Don’t press ACK yet.)

```
FLY 123° DIRECT TO ASE ACK?
```

3. Turn the **small primary** knob to select the course you wish to fly. When it is correct, press ACK. The M3 is now ready to navigate with the designated course line.

```
FLY 280° ACK?
```

4. Turn the **small primary** knob to see the following typical displays:
   a. The lat/long of your starting point:
      ```
      42°26′ N 105°25′ W
      ```
   b. The course you chose to fly:
      ```
      FLYING 280°
      ```
   c. Course Deviation Indicator:
      ```
      [ ][ ][ ][ ][ ][ ][ ]
      ```
d. Your cross-track distance:

\[
\text{FLY RIGHT 0.25m}
\]

e. Your ground speed and track angle:

\[
\text{GS 145° TRK 284°}
\]

As is the case with flying to a waypoint, you can select any of the above displays at any time to review flight information or to navigate using the unit's electronic CDI.

4.4 (RESERVED FOR FUTURE USE)

4.5 (RESERVED FOR FUTURE USE)

4.6 CENTERING THE CDI

This section describes how to fly directly from your present position to the current waypoint without returning to the established desired track. Generally you might use this function when flying VFR and you had strayed off the course (perhaps to avoid a restricted area, for example), and you wish to simply fly straight to the current waypoint.

Caution: Remember that this function changes the location of the desired track line or course.
To center the CDI and establish a new desired track or course:

1. Turn the **large primary** knob to **TRK**.
2. Press → 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.

### 4.7 TRACK FUNCTIONS AND DISPLAYS

You probably have noticed that the unit automatically switched to the track display when you set it up to navigate to a waypoint. You may also manually switch the primary display to the **TRK** function at any time in order to access the track functions. The functions that can be displayed will depend on how you have set up the M3 to navigate. For instance, if you are simply flying a course line, ETE and ETA will not be displayed.

To access the M3’s track functions and their display:

1. Set the **large primary** knob to **TRK**.
2. Turn the **small primary** knob to select any of the following functions (typical displays are shown):

#### 4.7.1 The next leg: if designated by the waypoint queuing function (Section 4.2)

![NEXT LEG: ηBJC](image)

#### 4.7.2 The lat/long of your starting point:
4.7.3 The lat/long of the waypoint:

\textbf{N 39° 13'40" W 106° 52'1 W}

4.7.4 The course or route you are following: (a display such as one of the following will appear, depending on how you specified the track).

(flying to a waypoint) \textbf{BASE A DIRECT}

(flying a course) \textbf{FLYING 280°}

(following a route) \textbf{BASE A \#BUC A}

4.7.5 The bearing and distance to the waypoint:

\textbf{BASE 083° 193 M}

4.7.6 Course Deviation Indicator:

This display for the M3's built-in electronic CDI simulates the needle of a mechanical CDI. The vertical line represents your desired track. When it moves to the right of center, your course line lies to your right. Fly to the needle as in conventional VOR navigation to stay on course.
4.7.7  Your ground speed and track angle:

\[ \text{GS 145\,\degree} \, \text{TRK 096\,\degree} \]

4.7.8  Your ground speed and ETE:

\[ \text{GS 145\,\degree} \, \text{ETE 1:35} \]

The unit calculates the distance to the next waypoint, divides it 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. If you are more than 4 miles off your defined desired course, the ETE display will automatically flash, as the unit senses that you do not appear to be flying to the designated waypoint.

If you are following a route and are near the next waypoint, the estimated time remaining before your next turn, and the course of the next leg of the route are displayed.

\[ \text{FLY 058\,\degree} \, \text{IN 1:38} \]

4.7.9  Cross-track distance (distance off-course):

\[ \text{FLY LEFT 22\,\text{m}} \]

This display means that the course line from your starting position to your destination is 2.2 nautical miles to your left. You should turn to the left to get back on course.

4.7.10 Your estimated time of arrival:

\[ \text{ETA 2:44 2} \]

ETA is calculated based on the time-of-day you have set in the \textit{SETUP} function, described in Section 2. The ETA flashes if you are more than 4 miles off your course line. As shipped from the factory, the unit displays ETA as ZULU time. To
change to your local time zone, press **CRSR** and use the **small primary** knob to select the local standard or daylight time zone. Press **CRSR** again after you have set the desired time zone. (Note: changing the ETA's time zone does not change the time zone displayed in the **TIME IS** setup function.)

The time zone abbreviations and their meanings are shown below.

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Time Zone Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Z</td>
<td>Coordinated Universal Time</td>
</tr>
<tr>
<td>SST</td>
<td>Samoa Standard Time</td>
</tr>
<tr>
<td>HAS</td>
<td>Hawaii-Aleutian Standard Time</td>
</tr>
<tr>
<td>AKS</td>
<td>Alaska Standard Time</td>
</tr>
<tr>
<td>PST</td>
<td>Pacific Standard Time</td>
</tr>
<tr>
<td>MST</td>
<td>Mountain Standard Time</td>
</tr>
<tr>
<td>CST</td>
<td>Central Standard Time</td>
</tr>
<tr>
<td>EST</td>
<td>Eastern Standard Time</td>
</tr>
<tr>
<td>ATS</td>
<td>Atlantic Standard Time</td>
</tr>
<tr>
<td>GST</td>
<td>Greenland Standard Time</td>
</tr>
<tr>
<td>SDT</td>
<td>Samoa Daylight Time</td>
</tr>
<tr>
<td>HAD</td>
<td>Hawaii-Aleutian Daylight Time</td>
</tr>
<tr>
<td>AKD</td>
<td>Alaska Daylight Time</td>
</tr>
<tr>
<td>PDT</td>
<td>Pacific Daylight Time</td>
</tr>
<tr>
<td>MDT</td>
<td>Mountain Daylight Time</td>
</tr>
<tr>
<td>CDT</td>
<td>Central Daylight Time</td>
</tr>
<tr>
<td>EDT</td>
<td>Eastern Daylight Time</td>
</tr>
<tr>
<td>ATD</td>
<td>Atlantic Daylight Time</td>
</tr>
<tr>
<td>GDT</td>
<td>Greenland Daylight Time</td>
</tr>
</tbody>
</table>

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

### 4.7.11 Waypoint category indicators

When the M3's **TRACK** function is used, the small letter following the waypoint identifier in the display indicates the waypoint category according to the following table:
A  Public Airport
M  Military Airport
P  Private Airport
H  Heliport
S  Seaplane base
V  VOR
N  NDB
I  Intersection
U  User-entered waypoint

(Waypoints using codes H and S are available only in optional databases for specialized applications.)

4.8 INFO DISPLAYS

When the primary readout is displaying TRACK data, you may set the large secondary knob to the INFO position and turn the small secondary knob to select another TRACK function to be shown on the secondary readout (including in some cases additional information about any waypoint displayed on the primary readout).

4.9 OFF-COURSE ALARM

If you deviate from the calculated flight path by more than 4 miles, the unit informs you by flashing the ACK button. When this happens, press the ACK button and the message OFF-COURSE ALARM will appear in the display. Press the ACK button again to clear the message.
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Section 5 - USING ROUTES

A route is a pre-defined sequence of waypoints which may be stored in the M3's memory. A flight plan is a sequence of waypoints you expect to follow on a particular trip. A flight plan may be flown by specifying waypoints one at a time as you fly, as described in the previous section. It may also be flown by following a stored route or a portion of a route, as described in this section.

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 will also learn about the various in-flight advisory messages that the unit will give you, how to revise a user-entered route before or during flight, how to divert from it, and more.

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5.1 GENERAL INFORMATION

In this manual, the term route is used to designate one of the airways or other sequences of waypoints stored in the Northstar M3'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 form the database.

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

Routes are stored in the database category labelled RTE. A route is accessed by scanning through the identifiers with the small primary knob, or by using the flashing cursor to enter the identifier character by character.

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

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.) The unit will immediately start navigating along the chosen leg. The TRK function displays information about navigating along that leg.

Before using the M3 to follow a flight plan, you should take into account the possible changes you might be required to make to the flight plan while enroute. 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 (Section 4.2) provides many of the advantages of route-following while retaining total flexibility for easy in-flight changes.

When few changes are expected, 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.

![Route Diagram]

A typical route is shown above. 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 M3 can automatically guide you to BJC, COS, and finally to DBQ.

This sequence of waypoints is used to illustrate the remainder of this section, using the hypothetical Victor airway name V999, and also as a user-entered route named ASPEN-DUBUQUE.

### 5.2 ROUTE FUNCTIONS

This section summarizes the M3’s route functions. Each function is described in detail in later sections. Turn the large secondary knob to select functions which apply to the route as a whole. The functions LEG EDIT and LEG INFO are displayed briefly, and then roll up off the screen to show specific editing functions or data for the displayed leg.

The time and the distance to the end of the route, and the option to cancel flying the route are displayed only if the route is currently being flown.
The following are displayed for user-entered routes:

<table>
<thead>
<tr>
<th>Route Name</th>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASPEN-DUBUQUE</td>
<td>FASE</td>
<td>%BJC</td>
</tr>
<tr>
<td>ASPEN-DUBUQUE</td>
<td>LEG INFO</td>
<td></td>
</tr>
<tr>
<td>ASPEN-DUBUQUE</td>
<td>LEG EDIT</td>
<td></td>
</tr>
<tr>
<td>ASPEN-DUBUQUE</td>
<td>LENGTH</td>
<td>32.6M</td>
</tr>
<tr>
<td>ASPEN-DUBUQUE</td>
<td>TO END</td>
<td>17.5M</td>
</tr>
<tr>
<td>ASPEN-DUBUQUE</td>
<td>ETE 0:25 AT 110%</td>
<td></td>
</tr>
<tr>
<td>ASPEN-DUBUQUE</td>
<td>CANCEL RTE. ACK?</td>
<td></td>
</tr>
<tr>
<td>ASPEN-DUBUQUE</td>
<td>ERASE ROUTE ACK?</td>
<td></td>
</tr>
<tr>
<td>ASPEN-DUBUQUE</td>
<td>CHANGE NAME ACK?</td>
<td></td>
</tr>
</tbody>
</table>

The North American FliteCard's database routes (Victor airways) cannot be modified. For these, the 3rd, 8th and 9th functions are displayed as shown:

<table>
<thead>
<tr>
<th>Route Name</th>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>V999 (US)</td>
<td>FASE</td>
<td>%BJC</td>
</tr>
<tr>
<td>V999 (US)</td>
<td>LEG INFO</td>
<td></td>
</tr>
<tr>
<td>V999 (US)</td>
<td>NO LEG EDIT</td>
<td></td>
</tr>
<tr>
<td>V999 (US)</td>
<td>LENGTH</td>
<td>123.6M</td>
</tr>
<tr>
<td>V999 (US)</td>
<td>TO END</td>
<td>992M</td>
</tr>
<tr>
<td>V999 (US)</td>
<td>ETE 0:25 AT 110%</td>
<td></td>
</tr>
<tr>
<td>V999 (US)</td>
<td>CANCEL RTE. ACK?</td>
<td></td>
</tr>
<tr>
<td>V999 (US)</td>
<td>AIRWAY, NO ERASE</td>
<td></td>
</tr>
<tr>
<td>V999 (US)</td>
<td>CANNOT RENAME</td>
<td></td>
</tr>
</tbody>
</table>

**A. Display route name and a selected leg**

<table>
<thead>
<tr>
<th>Route Name</th>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>V999 (US)</td>
<td>FASE</td>
<td>%BJC</td>
</tr>
</tbody>
</table>

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 route to find a nearby leg. Turn the **small secondary** knob to select a leg of the route.
B. Display information about a route leg

This message rolls up off the screen to display data such as:

Information about any leg of a route is displayed. The small secondary knob scans through the route legs, which are displayed on the secondary readout. The small primary knob scans through the available information for each leg: leg number, Class B, Class C and Special Use Airspace penetrations, bearing and length of the leg, distance and time to the end of this leg, and database "INFO" information for the "to" waypoint of the leg.

C. Edit a user-entered route leg

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

These functions allow a user-entered route to be edited. The small secondary knob scans through the route legs, which are displayed on the secondary readout. The small primary knob scans through the editing functions: add-to-end, insert waypoint, change waypoint and delete waypoint. Only user-entered routes may be edited. A route cannot be edited if it is being followed, except that waypoints may be added to the end of the route.
D. Total length of route

**V999 (US)**  
**LENGTH:** 831.6\%  

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 are not defined in the current database.

E. Distance to the end of the route

**V999 (US)**  
**TO END:** 753.6\%  

If you are flying this route, the distance along the route from your present position to the end of the route is displayed.

F. Estimated time to the end of the route (in hours and minutes) and ground speed

**V999 (US)**  
**ETE 6:50 AT 110\%**  

If you are 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, etc.

G. Erase a user-entered route

**ASPEN–DUBUQUE ERASE ROUTE ACK?**

Press ACK twice to erase the route. This function is available only if the displayed route is user-entered and is not 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.

I. Stop following a route

Press ACK to stop the route-following calculations and displays.

The unit “remembers” the last leg edit or leg info function which you used. This allows your most-used edit function or information function to be instantly displayable.

Waypoints in user-entered routes are identified as to whether they are airports, VORs, etc., by a small letter following the waypoint identifier. The two letter ᵇ's in the example below indicate that both these waypoints are airports.

The available waypoint categories are as follows:

- ᵇ Airport
- ᵇ VOR
- ᵇ NDB
- ᵇ Intersection
- ᵇ User-entered waypoint
5.3 ACCESSING ROUTES

Routes are stored in the unit's database in alphabetical order by their identifiers. For example, Victor airways are stored with identifiers such as V123, and Jet Routes with identifiers such as J34. User-entered routes may be assigned identifiers of up to 16 characters. When you store a user-entered route, it is strongly recommended that you use a character other than a letter for the first character of the route's name. Then, all user-entered routes will appear in the same area of the database, rather than being mixed in with airways. Several special characters such as #, $ and % are listed after the letters and digits when the small primary knob is turned to enter characters.

5.3.1 Route Identifiers

Because any given route identifier may be used in more than one area of the world, the geographical area of the route is added to the route identifier when it is displayed. For example, airway V431 located in the USA is shown as “V431 (US)” to distinguish it from V431 in Canada. The area identifiers 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 routes in the database have breaks in the middle, where a leg may have been deleted by the FAA. 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 is a break in the route between Boston and Manchester. Since there is 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 would be 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 characters of the route name.

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

Since 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 primary 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 and then press \(-D\rightarrow\) and ACK. 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 wish to start on a leg other than the one displayed, turn the **small secondary** knob to display the desired leg.

4. Press \(-D\rightarrow\). The unit will display the two waypoints of the leg and the bearing of the leg:

   ![FLY LEG RASE BJC 052° ACK?](image)

5. If you wish to fly the route in the reverse direction, press \(-D\rightarrow\) a second time. The unit will display the same two waypoints in reversed order, and the new reciprocal bearing:

   ![FLY LEG RBJC RASE 234° ACK?](image)

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 which are not in the database, the unit displays the message:

![CANNOT FLY INTO UNKNOWN LEG(S)](image)

See Section 5.9 for more information.
Note: If you have already passed the route leg you chose to start on, the unit will automatically scan through the route legs to find the leg you are currently on. When it finds that leg, it will then begin navigating along it.

During this scanning of the route, you can see the “To” waypoint displayed by the TRK function stepping through the waypoints of the route. The CDI needle may also 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 the 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:

```
V999 (US) DIRECT TO ASE
```

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

```
V999 (US) DBQ <END>
```

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

```
FLY 282° DIRECT TO ASE ACK?
```

and then press ACK.
5.4.3 Changing waypoints

The Figure below shows how the Northstar M3 guides you from one leg to the next as you approach a waypoint. It calculates the point at which you should start a two-minute turn in order to end up on the next leg with the same cross-track error you had going into the turn. Two minutes before you reach this point, the unit flashes the ACK button (asking you to press it). When you press ACK, the heading of the next leg and the time remaining before you should start the turn are displayed. Start a two-minute turn to this new heading when the displayed time counts down to zero, and you should end up on the new leg. (The unit does not take account of winds, which might change the time at which you should start the turn.) The CDI will automatically change waypoints halfway through the turn.

![Flight Plan A to B to C](image)

If you are off-course coming into the turn by more than four miles, the unit will not attempt to guide you around the turn but will simply tell you when it has switched to the next leg.

As you might expect, if you are far off-course and not really attempting to follow the flight plan, the unit may appear to act strangely as it attempts to give you instructions to get you back on the flight plan. Don’t be alarmed. You may CANCEL the flight plan if you no longer wish to follow it, or you may tell the unit to fly direct to another waypoint or route, thus cancelling the old flight plan.
5.4.4 Advisory messages

Several messages are activated automatically by the Northstar M3 to inform you of your progress along the flight plan. When the ACK button flashes, a message is waiting to be displayed. Press ACK to display the message. Press ACK again to clear the message.

**OFF-COURSE ALARM**

If you deviate from the calculated flight path by more than 4 miles, the unit informs you with the above message.

**FLY 347° IN 0:55**

If you are on-course when you approach within two minutes of a waypoint, the unit displays the heading of the next leg, along with the time remaining before you should start the turn.

**NOW ON LEG 3**

If you approach a waypoint while more than four miles off-course, the unit assumes you have some good reason for being off course and it does not attempt to tell you when to make the turn. It does, however, inform you with this message when it automatically switches to the next leg.

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 VFR or when cleared direct to the waypoint.

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5.5 CREATING YOUR OWN ROUTES

You can enter up to twenty routes into the unit’s database. These routes are made up of waypoints stored in the unit’s memory. To create a new route, first choose and enter an identifier for the route (up to 16 characters), and then specify the waypoints as shown below.

Note: You may wish to use a special character (such as *) as the first character of all user-entered routes so they will all appear in the same area of the database, rather than being mixed in with airways.

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 identifier you have chosen for the new route. When the name is entered, press CRSR once more to turn it off.

3. Unless this identifier has already been used, or the database already contains that maximum of twenty user routes, the unit will display

ASPEN DUBUQUE NEW ROUTE? ACK?

4. Press ACK to begin storing the new route.

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

ADD TO END ACK? DIRECT < END>

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

CHOOSE 1ST WAYPT ADD ASE ACK?

6. Use the secondary knobs to specify the first
waypoint's category (such as AIRPORTS) and the waypoint's identifier (such as ASE). You may use either the cursor method or the scanning method described in Section 3.4. After displaying the waypoint's identifier, press ACK to store it.

7. The unit displays

```
ADD TO END  ACK?  FASE  (END)
```

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

```
LEG: 123°  123′ ADD BJC  ACK?
```

8. To enter all of the remaining legs of the route, respond to each ADD TO END ACK? message by pressing the ACK button, and choose each waypoint as described above.

Note: A special feature makes it easy to jump back and forth from using the primary side to search for waypoints by city or by name, to using the secondary side to enter waypoints into your route. If you display any waypoint on the primary side, that waypoint is automatically the first waypoint displayed on the secondary side in that category when you jump back to enter the next route leg.
There are many cases of duplicate waypoint identifiers in the database, especially when using the International FliteCard. Duplicates are indicated by a number sign (#) following the identifier. Be sure to verify that you are choosing the correct waypoint by preselecting the waypoint as described in the preceding paragraph, and/or by verifying that the displayed distance and bearing of the leg matches what you expect for each leg.

5.6 ROUTE LEG INFORMATION

This section gives detailed information about using the leg info function.

The primary readout gives additional information about the route leg displayed in the secondary readout. The information displayed depends on whether or not you are following the route.

1. Turn the large primary knob to RTE, and turn the small primary knob 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.

4. Select the desired information by turning the small primary knob.

The following information may be displayed on the primary readout.
The number of the leg shown on the other readout.

The bearing and length of this leg.

The distance from your present position to the indicated waypoint. (Displayed only if you are following this route).

Your ETE to the ‘to’ waypoint of this leg if the current Ground Speed is maintained. (Displayed only if you are following this route).

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

Names of any Class B, Class C or Special Use Airspace which the leg passes through.
Additional database information about the “To” waypoint currently displayed on the secondary readout. Continue turning to display the complete list of information.

5.7 EDITING USER-ENTERED ROUTES

This section gives detailed information about using the leg edit function.

You may edit (make changes to) a user-entered route stored in the unit’s database. If you are following the route, the only change you can make is to add waypoints to the end, unless you cancel it first.

To edit a route:

1. Turn the large primary knob to RTE.

2. Turn the small primary knob 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 a specific edit operation.
4. If necessary, turn the *small secondary* knob to display the leg to be edited.

5. If necessary, turn the *small primary* knob to select the edit function (insert, delete, etc.) from those listed below, and make the desired change.

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

The route-editing functions available by turning the *small primary* knob are as follows:

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

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

**ACK** to change the “to” waypoint of the displayed leg.

**ACK** to delete from the route the “to” waypoint of the displayed leg.
5.8 CHANGING A FLIGHT PLAN IN-FLIGHT

It's rare (at least in busy areas) to be able to follow a flight plan without having to make changes to it as you fly. Here are the different ways you can modify it as you go:

Option 1:

You may immediately divert from the route to any database waypoint: (Section 4.1)

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 function described in Section 4.2. Queuing a waypoint cancels the route; you may return to any leg of the route using Option 4 below.

Option 3:

You may divert from the route by flying any course (track angle) you choose:

1. Turn the large primary knob to TRK. Press -D-.

2. Turn the small primary knob to select the course to fly.

3. Press ACK.

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

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 Section 5.4. Choose the leg which you wish to rejoin, and fly to the leg using the CDI as a guide.

Option 5:

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

Option 6:

You may add one or more waypoints to the end of the route at any time by using the same ADD WAYPOINT function you used earlier when entering the route in Section 5.5.

Option 7:

You may edit the route by using the DROP, INSERT and CHANGE functions described above in Section 5.7. Note: if you're following the route, you will be required to CANCEL (not ERASE) the route before editing it. (Section 5.2, paragraph I)

Option 8:

You may proceed direct from your present position to the "To" waypoint of the current leg by pressing -D- and ACK. This recenters the CDI but does not cancel the route.
5.9 ROUTES AND DATABASE UPDATES

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

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

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

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 providing all the waypoints involved are defined.

The following are other potential problem areas to be aware of when changing between the North American and International FliteCard:

**Airports:**

In the North American database, the ICAO “K” prefix for major US 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.

For 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. These are indicated by a flashing number sign (#) following the identifier.

**Route Names:**
In the event that a user-entered route name is later used by an FAA airway in a new database update, a problem arises. The M3 automatically solves this problem by adding an otherwise unused initial character in front of each duplicated user-entered route name. When the unit is first turned on after a database update which causes a route name conflict, a warning message is displayed which shows the new initial character of the user route. Be sure to remember this initial character. Even if you forget the character, you can easily find any such routes by placing the flashing cursor on the initial character and scanning counterclockwise from the end of the list of routes. As mentioned earlier, it is strongly recommended that all user routes be named with a special character as the first character of the name, both to avoid this potential problem, and to group all user routes together at the end of the list.
Section 6 - AIRSPACE ALERTS

This section describes how the M3 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 which you know well, and you do not want to be alerted to its presence, you may turn off its alerts as described in Section 6.6. When flying IFR, you may wish to turn all of the alerts off as described in the same section.

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6.1 AIRALERT™ AIRSPACE USAGE ALERT

The US Airspace system presently contains Controlled Airspace including Class B airspace (formerly called Terminal Control Areas or TCAs) and 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, Airalert™ provides information needed either to avoid the area, or to comply with the regulations for entry.

You may shut off the alerts for any one Class B or Class C area, or for all areas, if you wish. (See Section 6.6.)

Airalert is programmed with precise descriptions of the outer boundaries of all Class B and 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, turn the large secondary knob to SETUP and turn the small secondary knob all the way to the left. 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 will see the name of each area, and the bearing and distance to its center from your present position.

| BOSTON Class B | 087° | 57.1M |

As new controlled and special use areas are added to the nation’s airspace, they will be included in future database updates.
6.2 WHAT GENERATES AN AIRALERT MESSAGE:

The Airalert feature of the Northstar M3 alerts you when you are likely to enter a Class B or C area or an SUA, requiring radio communication and control. Specifically, a continuous alert is given when any of the following conditions exists:

1. You are inside a Airalert area, or
2. You are passing within approximately 4 miles of an Airalert area, or
3. You are 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:

1. use -D- and ACK to fly direct to a waypoint,
2. use -D- and ACK to fly a heading,
3. change a parallel offset, or
4. activate a new flight plan leg

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 100nm ahead of your present position. In other situations, a great circle track is checked as far as the waypoint, or 1000nm, whichever comes first.

This Airalert message appears as

```
BOSTON CLASS B IN FUTURE TRACK
```
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 a message describing the situation. Press ALRT again to return to the normal navigation display. The ALRT button remains illuminated while you are in or near Airalert areas. You may press ALRT any time it is illuminated to check the time to the outermost boundary or the distance to the center.

When avoiding Class B and 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 time to penetration and the distance to the boundary for an accurate measure of how far you are away.

6.4 AIRALERT INFORMATION

When you press ALRT in response to an Airalert message, 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 track will penetrate boundary within ten minutes)

3.3M Distance to boundary (if within four miles but track will not penetrate 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 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 messages alternating on the readout:

| SARASOTA CLASS C 237°72M INSIDE |
| TAMPA APP 120.55 237°72M INSIDE |

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

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

| BOSTON CLASS B 161° 345M 9:55 |
| APPRAOCH: 120.6 161° 345M 9:55 |

The time indicates just under ten minutes from the boundary. The center of the area is 34.5nm at 161°. The radio call is BOSTON APPROACH, so no separate call name is shown.
Example 3: If you were flying by the edge of restricted area R-1234, and were 2.6 miles from its boundary, you would see the following:

<table>
<thead>
<tr>
<th>R-1234</th>
<th>180°</th>
<th>15 nm</th>
<th>≤ 2.6 nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESTRICTED AREA</td>
<td>180°</td>
<td>15 nm</td>
<td>≤ 2.6 nm</td>
</tr>
</tbody>
</table>

The distance and bearing near the center of the readout are to the approximate center of the area and indicate its general direction. The distance on the right end of the readout is the distance to its boundary.

The **bearing and distance** 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 C airspace. For example, if the boundary at your altitude is a 10-mile ring, and the unit displays 12 nm, you are 2 nm from that boundary.

The **time** displayed on the right-hand end of the readout is the estimated time remaining before you will penetrate the **outermost boundary** of the area, based on your present track angle and ground speed as calculated by the M3. The time to penetration is always displayed if the unit calculates penetration of the outer boundary will happen within about ten minutes.

If you are within about four miles from an area boundary, but your projected track indicates you will not penetrate it, the symbol ≥ (meaning close) is displayed, along with the distance to the boundary.
The word INSIDE on the right-hand end means you are now inside the area.

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

The letter I on the right end of the readout is a reminder that you are INSIDE an area while the unit is showing information about another area you may come close to or penetrate.

The word CLEAR on the right-hand end means you have left the area and no penetration warning, or "close" warning, is needed.

For Class B and C airspace, the displayed frequency corresponds to the particular sector from which you are approaching the area. The radio call name and frequency alternate with the area name.
Note: 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 allows the M3 to display your distance to the airport whose sector you are entering so you can monitor your distance to the 20- or 15-mile boundary of that sector.

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

6.5 AIRALERT LIMITATIONS

1. The M3 assumes you are flying at the altitude corresponding to the largest perimeter of the controlled area. That is, if you are flying at a relatively low altitude, the unit may alert when you are about to fly under the edge of a controlled area. Once you are under the edge of a controlled area, you must monitor your distance to the boundary that corresponds to your particular altitude.

2. When you are 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 are near irregularly shaped areas, use the time-to-penetration to determine how far you are from the boundary.

3. If you take off near or inside a controlled area, you will naturally get less than a ten-minute warning of penetration.

4. It is possible for the unit to simultaneously indicate that you are near one controlled area (Є is displayed) and will soon penetrate another area. (The time to penetration displayed may refer to a different area than the Є symbol refers to.) When you unexpectedly see the Є symbol, it's best to check your chart unless you know the area well.
5. If you are just beginning to learn to use the M3 for the first time, you may wish 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 take one step at a time in learning the unit's various operations.

6. The Airalert feature is designed to be used as a backup to the pilot's normal navigation procedures. It is the pilot's responsibility to know where he is and where he is going at all times. A chart depicting the controlled area should always be used with the M3. Airalert is intended to be a reminder or verification of what the pilot should already know. The database information has been carefully checked, but it is 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 does not encourage pilots to lose their navigation skills by becoming overly-reliant on any one system.

6.6 DISABLING THE AIRALERT MESSAGES

If you regularly fly in or near an area whose boundaries you know well, you may not want the M3 to alert you every time you approach the area. Also, when you are flying IFR, you may not want to be given any airspace alerts at all. The Northstar M3 allows you to disable alerts for one particular controlled area, or for all areas.

When the Airalert system is disabled, an alert message appears each time the unit is turned on, reminding you that the feature is not fully operational. The ALRT button will flash. Press it to read the message and press it again to turn off the message.

AIRALERT IS OFF: CLASS B/C OR SUA

No warning is shown if the Airalert feature is active for all areas.
This same status message may be displayed by pressing the ALRT button any time that it is not already illuminated.

### 6.6.1 Disabling Class B and C alerts

1. Turn the *large secondary* knob to SETUP.

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

<table>
<thead>
<tr>
<th>ALL CLASS B &amp; C</th>
<th>AIRALERT ON</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALL CLASS B &amp; C</td>
<td>NO AIRALERT</td>
</tr>
<tr>
<td>ATLANTA Class B</td>
<td>NO AIRALERT</td>
</tr>
<tr>
<td>BOSTON Class B</td>
<td>NO AIRALERT</td>
</tr>
</tbody>
</table>

3. Turn the *small primary* knob to select the desired new status, choosing between three options: Airalert ON, Airalert OFF, or disabling the warnings for just a single designated area. For the third option, continue turning the 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 which are split into sections (New York, Washington and Houston), only one section may be disabled at a time.

4. Press ACK to confirm your new selection.

### 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:
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 flying within a thirty-mile radius of the primary airport in a Class B area. The Northstar M3 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 ten 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 end of the readout, alternating with either **SQUAWK**, **SOON** or **NEAR**.

- **SQUAWK** means you are inside a Mode-C area.
- **SOON** means you will soon penetrate a Mode C area.
- **NEAR** means you are close to a Mode C area but are not expected to penetrate it.

A **SETUP** function separately disables this alert function when Class B alerts are turned on.
Turn the *large secondary knob* to SETUP. Turn the *small secondary knob* to display the above function. Turn the *small primary knob* to display YES or NO as desired, and then press ACK.

In addition, disabling any Class B alert will also disable MODE C alerts for that area.

Please remember that this feature is intended as an advisory only, and that responsibility for compliance with federal aviation regulations always rests entirely with the pilot.
Section 7 - RESERVED FOR FUTURE USE
Section 8 — MISCELLANEOUS FUNCTIONS

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

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8.1 QUICK NEAREST-AIRPORT DISPLAY

To instantly display the identifier of the nearest airport in the unit's database, along with the distance and bearing to it, and the length, surface and identifier of the longest runway, press D+ and the left-hand CRSR button simultaneously. The unit will switch automatically to the APT and INFO functions, and the nearest airport display will remain on the readouts until another function is selected.

<table>
<thead>
<tr>
<th>NEAREST AIRPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>VMA03 247 325 11-29 2200</td>
</tr>
</tbody>
</table>

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

8.2 STARGUARD™ THEFT-PROTECTION SYSTEM

Northstar Navigators are fast becoming the navigation aid for increasing numbers of pilots. Unfortunately, a few cases have been reported where somebody apparently didn't want to go the normal route of purchasing his own Northstar and, instead, just removed one from an aircraft parked on the ramp. Northstar Avionics offers Starguard as a standard feature on all M3s to help alleviate this problem. Starguard gives you the option of using two levels of security protection, if you wish.

You may simply leave Starguard inactive if you do not wish to use it. It will not impede your operation of the unit whatsoever.

To activate the first level of protection, your personal access code is used once to enter a special message that is subsequently displayed each time the unit is turned on, identifying you as the owner.

Activating the full Starguard protection prohibits the unit from functioning at all until your access code has been entered.
A window decal is provided reminding any would-be thief that the unit will not function if removed from the aircraft.

8.2.1 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 your registration card is filled out and mailed with a complete address, so that we may send this access card (and any other update information) to you!*

You may always use this code to access Starguard. If you wish 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 is 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 enter the characters, then press ACK.

3. The unit will ask you to enter your new code. Use the *small* and *large secondary* knobs to enter the 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.
8.2.2 STARGUARD LEVEL 1: Entering your own personal message to be displayed when the unit is turned on.

Letters, numbers and several punctuation characters are available for your message.

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

   CHANGE YOUR MSG

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 message: ACK? LEFT MSG: Use the small and large secondary knobs to enter the characters. Press ACK when done.

5. The unit will ask you to enter the right-most 16 characters of your message: ACK? RIGHT MSG: Use the small and large secondary knobs to enter the characters. Press ACK when done.

8.2.3 STARGUARD LEVEL 2: Activating Starguard full protection:

Since the fully-activated Starguard requires you to enter your access code every time you turn the unit on, you may wish 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 have 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 is 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.

### 8.3 TRACK ANGLE AND GROUND SPEED

The M3 calculates and displays the current TRACK ANGLE and GROUND SPEED of your aircraft. Turn the *large primary* knob to TRK, and turn the *small primary* knob to display

```
GS 142° TRK 270°
```

### 8.4 WINDS ALOFT

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

```
HDG: 334° TAS: 128° WIND: 221° T
```

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...
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.

8.5 PARALLEL OFFSET

You may specify a parallel offset to your track. This allows 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 nautical miles up to a maximum of twenty 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 offset currently in use.
3. Turn the small primary knob to select the desired new offset. Press ACK.

Any parallel offset is canceled when the unit is turned off and back on again, and also whenever the -D- function is used to specify a new flight path.

When you are within two minutes of a waypoint the unit is navigating to, you cannot remove any parallel offset you might have entered earlier.
8.6 CDI SENSITIVITY

The en route sensitivity of the M3's internal CDI display, as well as the electrical output to CDIs, HSIs and flight directors or autopilots is adjustable. Normally, it is set to one mile per dot, giving plus or minus 5 miles full scale. You may change the sensitivity to 1/2, 1/4, 1/8, 1/16, or 1/32 mile per dot for precision flying. (At 1/32 mile per dot, the minimum visible cross-track distance on the M3's electronic CDI is just 37.5 feet!)

To change the sensitivity:

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

   CDI SENSITIVITY 1 DOT = 1M

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

This function controls the sensitivity of both the unit's electronic CDI and also any external CDI or autopilot which 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 but the recommended setting of 1 dot = 1/4 mile.

8.7 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). In order to display proper magnetic bearings and courses, the Northstar M3 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 clock and normally needs no attention after once being set correctly during installation or service.

8.8 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:

a. NO. OF USER POSITIONS 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 which are no longer needed.)

b. DATABASE REVISION DATE. The date at which the database currently installed in the Northstar M3 was revised and issued.

c. SERIAL NUMBER and SOFTWARE. The serial number and current software revision level of your particular unit.

d. GPS SOFTWARE and GPS PART NUMBER. The first item refers to the current revision level of the GPS software and the second refers to the hardware revision level of the GPS sensor.

8.9 DEMO MODE

Demo Mode enables the user to simulate a flight and practice using the Northstar M3 in realistic navigating situations when the unit is removed from the aircraft. All navigation features including Cross-Track Error, ETE, nearest airport display, etc., function properly. For safety reasons, Demo Mode is intended for use only when the unit is not installed in the aircraft. Specifically, the GPS receiver must not be receiving any satellite data in order to use Demo Mode.

A function in the SETUP category allows the user to activate Demo Mode. The user then specifies any database waypoint as the
starting point of the simulated flight, and a waypoint to fly to. The unit will behave exactly as if it were actually flying along the specified track or flight plan, including advising of waypoint arrival and warning of Class B and Class C airspace penetrations.

Reminder: Remember that when the M3 is removed from the aircraft, forced air cooling is required.

8.9.1 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.

2. To activate Demo mode, the M3 must be removed from the aircraft. Turn the large secondary knob to SETUP, and 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 Northstar M3 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 controls to display the identifier of the waypoint from which you wish 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 have displayed the desired identifier, press ACK.
6. To simulate motion, you must specify where you want to fly to. Step 6A 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.

6a. You may “fly” to the waypoint shown on the primary readout by pressing -D+ and ACK, or you may follow a route and fly it as described in Section 5 of this manual. If the simulated ground speed was previously zero knots, the flight will start with a default speed of 140 knots.

-or-

6b. If you wish, you may specify a simulated track angle and/or ground speed. Turn the large secondary knob to SETUP and the small secondary knob to display Course and Ground Speed. 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.

8.9.2 How the unit behaves in Demo Mode

In Demo Mode, the unit follows the specified track as if it were actually using GPS signals. Essentially all navigation functions will work normally.

8.9.3 Special Notes

1. Pressing -D+ and CRSR simultaneously to activate the emergency nearest-airport search will show airports near to the simulated position.

2. Demo Mode will not attempt 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 were following a constant heading without occasionally
correcting his heading. This feature allows the pilot to become familiar with the procedure for adjusting the desired track line to move to his present position. (See Section 4.6.)

3. The 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.

4. When automatically following a route, Demo Mode will not simulate a two-minute turn at each waypoint. It will simply fly up to the waypoint, make a sudden sharp turn, and continue along the new leg.

5. To enter a new starting position, turn Demo Mode off and then on again.

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

8.9.4 Canceling Demo Mode

Demo Mode is canceled either by turning the unit off, or by 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.

8.10 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.
NOTE: The unit must be receiving satellite signals to use Look-Ahead Mode.

8.10.1 Activating Look-Ahead Mode

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](image)

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?](image)

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

4. Use the primary controls to display the identifier of the waypoint whose nearby airports you wish 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 have displayed the desired identifier, press ACK.

8.10.2 How the unit behaves in Look-Ahead Mode

In Look-Ahead Mode, distances and bearings to waypoints will now be displayed relative to the simulated position, not your present position. For example, you may use the LOCAL feature to show the twenty airports, VORs, etc. that are nearest to the simulated position.
8.10.3 Special Notes

1. The emergency airport search activated by simultaneously pressing –D– and CRSR 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.

2. While the unit is in Look-Ahead Mode, the WARN light will illuminate (but not flash). Pressing the WARN button will display the warning 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.

3. To enter a new simulated position, you must turn Look-Ahead Mode off and then on again.

8.10.4 Canceling Look-Ahead Mode

Look-Ahead Mode is canceled by any one of the following actions:

1. Press –D– and CRSR simultaneously to activate the emergency nearest-airport search. (This is the easiest way.) The unit resumes normal navigation.

2. Or, use the SETUP function as described above in step 1. Change the word YES to NO and press ACK. The unit resumes normal navigation.

3. Or, turn the unit off. The unit will resume normal operation when turned back on.

8.11 LATITUDE AND LONGITUDE

To display the latitude and longitude of your present position, turn the large secondary knob to SETUP. Turn the small secondary knob to display the latitude/longitude coordinates obtained from the GPS receiver.
8.12 GPS SIGNAL MONITORING
8.12.1 SIGNAL MONITORING

To monitor GPS signal status, turn the large primary knob to STAT, and turn the small primary knob to display the following functions:

1. Latitude and longitude obtained from the GPS receiver, or GPS status, if position is not available:

   42°251N 72°272W

2. Satellite PRN identification numbers, azimuth angle and elevation angle for each satellite that is being received.

   #12: AZ. 237° EL 45°

3. The PRN identification numbers and the signal-to-noise ratios for each satellite that is being received.

   SAT PRN: #12 #14 #16 #18 #19 #--

   SAT SNR: 59 37 62 85 79 --

8.13 CDI CALIBRATION AND ANNUNCIATOR TEST

Note: This procedure cannot be accomplished if an M3 is designated as IFR-approved.

The M3’s electrical output, which drives an external CDI, flight director and/or autopilot, may be calibrated at any time. This procedure is normally performed only during installation of the
unit, but it is given here in case the user wishes to check or recalibrate the signal. Panel annunciators may also 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 CHECK CDI & ANNUN. function. 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 5.0 nm left deflection. When the needle indicates 5.0 nm left deflection, press ACK. The CDI should now be properly calibrated.

5. The final step checks the full range of the CDI needle, and also tests any external annunciators which may be wired to the loran. 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 and the external nav flag and To/From pointer as described in the unit’s readouts. When finished with the test, press ACK to store the new calibration values.

If your unit is interfaced to a flight director and/or an autopilot, but not to an external CDI, you can only calibrate the output 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 1 – 3 above to produce zero volts output. Press ACK two additional times to complete the procedure and store the new calibration values.

—or—

B. While flying with the GPS providing guidance to the autopilot, use only steps 1 – 3 above to produce straight and level flight. Press ACK two additional times to complete the procedure and store the new calibration values.
8.14 COMMUNICATIONS FREQUENCIES

The Northstar M3 continuously searches its database for nearby communications frequencies as you fly. 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. Remember that this information is taken from the Jeppesen database; if your FliteCard has not recently been updated, some frequencies displayed by your M3 may not be current.

The M3 automatically scans its Jeppesen database to find and compile the local frequencies you are likely to use. They are then presented in two ways:

1. A list of up to eight priority frequencies

   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 at which you are located—ATIS, AWOS, GROUND, CLEARANCE DELIVERY, TOWER, UNICOM and CTAF.

2. Available local frequencies, grouped by their functions

   Each list contains one type of frequency (APPROACH, GROUND, TOWER, etc.), and lists are shown in alphabetical order, i.e., APPROACH list first. Up to ten frequencies of each type are displayed, in order of distance from you, with the nearest first.

   ![118.5 TOWER]

   ![118.5 HANSCOM]

To display the nearby communications frequencies:
1. Turn the large secondary knob to COMM. The closest priority frequency is displayed, along with the local function for that frequency.

2. Turn the small secondary knob to the right to display additional priority frequencies and the function of each.

3. To see other frequencies, turn the small secondary knob further to the right to display the type of frequency you want, press ACK, and continue turning to select the specific frequency.

Each frequency is displayed with its function in your area, and the radio call of the facility alternates with the frequency on the display.

(If you have just turned the system on, and it has not yet determined your position, it will use its last calculated position to determine local area frequencies.)

Manual frequency display

1. Turn the large secondary knob to COMM.

2. Whenever a frequency is displayed on the readouts, you must 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 137 MHz.

4. Turn the small secondary knob to select the kilohertz frequency in 25 kHz steps.

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
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).

**Priority frequency selection**

The navigator automatically scans its database to find the local frequencies you are most likely to use, based on your location and whether you are airborne. Up to eleven 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 at which you are 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 current 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 the priority frequencies, and the type and call sign of each.
If the frequency you want is not 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.

**Local frequency lists**

The navigator 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 CTAQ. Up to ten 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.

*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.
Database INFO selection

The navigator'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.

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 this value. Use the SETUP function described below to set this speed threshold to a different value, if necessary. If you wish to defeat this function and display all frequencies at all times, set the function one click to the left of 0 knots, to the position labelled (OFF).

To change the ground speed value:

1. Turn the large secondary knob to SETUP.
2. Turn the small secondary knob to display the function shown as MAX. TAXI SPEED:
3. Turn the small primary knob to select the desired speed, or OFF.

MAX. TAXI SPEED: 20%

MAX. TAXI SPEED: 5%

MAX. TAXI SPEED: (OFF)

See Appendix F for additional functions available if the Northstar C1 Communications module has been installed.
Section 9
HINTS FOR BETTER NAVIGATION

This section contains a number of suggestions for better ways to navigate with the Northstar M3.

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9.1 WAYS TO USE THE M3

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

INFO on the secondary readout. The city or name of the airport you are 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; CDI on the secondary readout. Use the TRACK and INFO functions to show complete information about the waypoint you are navigating to.

9.2 PRESELECTING WAYPOINTS

Since the unit “remembers” which waypoints were last being used for each category on each readout, you may preselect several waypoints which you will 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.

9.3 APPROACHING YOUR DESTINATION

If you haven’t flown with GPS guidance before, you’re sure to be amazed by the accuracy of the Northstar M3. There are obviously many advantages to this system, but you must still use caution when navigating with GPS.
One instance may arise when it comes 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 is still several miles ahead. If you wait until your unit says you have arrived, you’re probably right over the field, and will have to overfly it as you descend for a landing.

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

This 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.

9.4 AIRPORT REFERENCE POINT

The airport locations contained in the M3’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.
9.5 GREAT CIRCLE ROUTES

If you are planning a flight of over 100 miles, and you take the trouble 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 M3.

The reason is that the unit always calculates the shortest possible route between two waypoints, a “Great Circle” route. A flat chart is not an accurate model of a spherical earth; consequently, the route you obtain from a chart will not necessarily be the shortest one possible.

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

You should be aware that with Northstar guidance your course will usually be slightly different from the one you would draw on a chart. This difference is usually an advantage—you'll get there quicker because you're flying the shortest possible distance. However, your Great Circle route might take you where you do not wish to go—such as through a Class B area or a Restricted Area. (But don't forget, the Airlert™ feature will search your future track for Class B and C penetrations.)

9.6 PIREPS

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

Pireps are a good idea, when they are current. But, it seems that not many pilots make these reports, so there is often little or no useful information available.

With your trusty M3 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 would
certainly appreciate an accurate, up-to-the-minute report. And so
would other pilots who plan to fly in your area and don’t have the
Northstar’s accurate guidance.

So 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 on
your Sectional or call Flight Watch on 122.0) and let them know.

9.7 ATIS SCAN:

If you wish to find the closest ATIS transmitter to check on
weather conditions or other local information, turn the large
primary knob to APT, the small primary knob all the way left
to show the NEAREST AIRPORT, the large secondary knob to
INFO, and the small secondary knob to display ATIS
frequencies. Now scan through LOCAL airports with the small
primary knob to see which nearby airports have ATIS and what
their frequencies are.
Section 10 - SAFETY CONSIDERATIONS

These important safety points should always be kept in mind!

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 display 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 M3 may give you excellent performance 99 times in a row, don’t be lulled into feeling that it is a magic box that you can blindly trust with your life. The unit performs extensive cross-checking of itself and signal conditions, but you should always double-check your navigation with other means.

Whenever the VFR annunciator is illuminated, signal conditions are such that reliance on the M3 is allowed in Visual Meteorological Conditions only. When flying IFR you may find it very comforting to be able to verify your exact position with the unit, but actual navigation must be based only on other navigation equipment required for flight.
APPENDICES

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Appendix A — FEATURES AND SPECIFICATIONS

Features:

Starguard™ Theft-protection system
  Power-up customized identification message
  Optional system disable
Airalert™ Controlled Airspace alerts
  Class B and 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 waypoints
Fly direct to any waypoint
Queuing of next waypoint
Fly Victor airways and Jet routes
Store up to 20 user routes
Flight planning with automatic turn anticipation
Off-course distance
Estimated Time En-route
Estimated Time of Arrival
Time of day
Track Angle and Ground Speed
Winds Aloft
Present Latitude/Longitude
Automatic magnetic variation
North American FliteCard (U.S., Canada, Mexico, Caribbean):
  Public-use, private and military airports, with:
    city and state
    name
    communications frequencies
    field elevation
    runways
    latitude/longitude
Appendix A — Features and Specifications

VORs and NDBs:
  city and state
  name
  frequency
All civil-use intersections
Class B and C airspace, Prohibited, Restricted, Warning,
       Alert and Military Operating Areas
Room for up to 250 user-defined waypoints

International FliteCard (Worldwide):
Public-use and military airports
VORs and NDBs
All civil-use intersections
U.S. Class B and C airspace

Specifications:

Dimensions:  
  Height:  2"
  Width:  6.25"
  Depth:  11.75" (from rear of front bezel to rear of mounting tray)

Weight:  4.2 lbs

Power Requirements:  10-35 VDC, 25 W nominal

Output Interfaces:  
  CDI and its nav flag
  Superflag
  To/from pointer
  Warn annunciator
  Alert annunciator
  Parallel Offset annunciator
  VFR Annunciator
  RAIM Annunciator
  RS-422 serial channel for moving map displays and/or fuel management systems
Appendix B — WARNING CONDITIONS

The following is a list of warning messages which the Northstar M3 may display if its self-diagnostic system detects a problem. When the WARN light flashes, press it to read the warning message, and press again to clear the message. Warning messages may indicate either poor signal conditions or equipment malfunction (either transmitter or receiver equipment).

B – 1 INDICATIONS OF SIGNAL PROBLEMS

The following messages could indicate a receiver problem, but more often are related to signal or geometry problems.

**NO POSITION FROM GPS**

This means that the M3 has not yet acquired at least three usable satellites (the minimum required for navigation). You will see this warning if you try to use the unit before it is ready, or if satellites are not currently available, or there is a failure within the GPS receiver.

**POOR OR DEGRADED ACCURACY**

This means the unit’s estimate of its accuracy presently exceeds 1.7 miles. You may choose to continue using the unit, but at reduced accuracy. If GPS satellites are available at this time, this message may be an indication that something is wrong with the receiver.

If the error estimate improves beyond the specified accuracy, the indicator turns off.
Appendix B — Warning Conditions

B – 2 AIRALERT WARNING

When the Airalert system is disabled, a warning message appears each time the unit is turned on—before it can be used—reminding you that the feature is not fully operational. The ALRT button will flash. Press it to read the message and press it again to turn off the message.

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

One of several failures on the internal computer board has been detected. Unit must be repaired.

FAILURE: SOFTWARE REPLACE FLT. CRD
A problem has been detected with the unit's FliteCard. Obtain a new FliteCard and replace the defective Card.

**NY MEMORY FAILED USER DATA GONE**

The Northstar M3 contains a "non-volatile" memory chip with a design lifetime of 5 to 10 years. This warning indicates that this memory has failed, and any user-entered waypoints will have been lost. The time zone selection (Section 2.9), the calendar year (for magnetic variation calculations), and the CDI calibration will also have been lost. You may continue to use the unit until it can be repaired. Entering the calendar year is described in the M3 Installation Manual.

**B – 4 DATABASE EXPIRATION**

**DATABASE EXPIRED 07JAN93**

The database contained in the unit's FliteCard is no longer current. This warning message is displayed only for installations which are IFR-approved.

An updated FliteCard may be obtained directly from Northstar.

**B – 5 PARALLEL OFFSET WARNING**

**PARALLEL OFFSET IS CANCELLED**

A parallel offset previously in effect has been automatically canceled because of changing to a new waypoint.
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Appendix C — GLOSSARY

Airalert™: The Northstar M3's controlled-airspace alert system that advises when you approach Class B or Class C airspace and helps you avoid the area, or enter it legally.

almanac: Data describing the precise orbits of GPS satellites, 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 is 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: The display panel indicator that shows which character is ready to be changed or acknowledged by the user. It is activated and positioned by the user when required.

database: A collection of information about waypoints stored in the unit's memory.

ETA: Estimated Time of Arrival at the next waypoint as calculated by the M3 according to your present speed.
Appendix C — Glossary

ETE: Estimated Time En route to the next waypoint as calculated by the M3 according to your present speed.

flight plan: A sequence of flight legs comprising one trip.

GPS: Global Positioning System. A navigation system using signals from earth-orbiting satellites. The system is capable of providing high accuracy under all weather conditions.

great circle: Shortest possible path between two points on the surface of a sphere.

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.

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).

magnetic variation: The difference between magnetic North and true North. Since the difference varies according to geographic location, the Northstar M3 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, so the unit allows the user to enter the current calendar year.
Mode C: Altitude encoding system utilized by ATC. The Northstar M3 will warn pilots to operate, or "squawk," their Mode C altitude-encoding equipment whenever flying within a thirty 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 at a time as you fly.

readout: The panel of alphanumeric characters used by the unit to display navigation data.

SNR: Signal to Noise Ratio. Guide number for determining the relative quality of GPS signals as compared to background radio "noise."

Starguard™: The Northstar M3’s theft-protection system.

TCA: Terminal Control Area. (Now called Class B airspace.) Controlled airspace surrounding the largest airports in the US, 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.
APPENDIX D
DIFFERENCES BETWEEN
THE M3 AND THE M1

This section contains a listing of the major differences between the Northstar M3 and the older M1 loran navigator, for those who are upgrading to the new unit or who use both instruments on a regular basis.

Changes from the M1
The M1's flight plan feature is called routes in the M3, and contains the following changes:
  Up to 20 user-entered routes may be stored
  U.S. Victor Airways and Jet Routes are included in the database
  The one-minute alert before changing waypoints has been changed to two minutes
  The M1's automatic leg interception feature has been changed. Activating a route now places you on the selected leg.
  If you are located somewhere along the middle of the route when you first start following it, the M3 automatically sequences up to the current leg.
Track angle and ground speed (previously called course and ground speed) are now displayed in the TRK function.
The SETUP function is now accessed from the right-hand side.
The local VOR list is displayed in order of distance from your position, not alphabetically.
The power switch is of the push-to-turn-on, pull-to-turn-off type.
Appendix D — Differences between the M3 and the M1

New functions:
GPS capability
Worldwide operation
To/From pointer output has been added
Waypoint queuing
Local communications frequencies
With TRK selected on the primary readout and INFO on the secondary, the small secondary knob selects specific data.

Database changes:
The database is now contained in a user-changeable FliteCard
North American and International FliteCards are available
Clearance Delivery frequency has been added to airport information
Restricted, Prohibited, Military, Alert and Warning areas have been added.
APPENDIX E
M3 SETUP FUNCTIONS

Typical data for each of the M3's SETUP functions is shown here. Actual data will depend on your present situation.

ABELINE Class C 271 1467M
RAW ENCODER ALTITUDE: 5300
29.92: ALTIMETER SETTING ACK?
000 IS MANUAL ALTITUDE ACK?
PARALLEL OFFSET: NONE ACK?
CDI SENSITIVITY: 1 DOT=1/4 M
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 M WIND: 035 T 35 M
SERIAL NO. W12345 SOFTWARE: v01.00
GPS #613850.000K PART #601650.001
CHANGE YOUR MSG? ACK?
ADD ALT.CODE? ACK?
STARGUARD: OFF
REVISED 3FEB94 COPR 1994 CMCE
COMM SQUELCH: AUTOMATIC
MAX. TAXI SPEED: 20%
FRONT PANEL TEST ACK?

END OF FUNCTIONS
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APPENDIX F
NORTHSTAR SMARTCOMM SYSTEMS

The full Northstar SmartComm system consists of a Northstar M2, M2V, M3, GPS-60 or GPS-600 navigator combined with a Northstar C1 or C2 communications transceiver module. The C1 comm module is remote-mounted and can be operated entirely through the navigator unit. The C2 comm module is panel-mounted and can be operated either by the navigator or by its own built-in controls.

SmartComm uses the Jeppesen database to help you find your next frequency, and it displays the function and radio call sign for local frequencies in the database.

118.5 TOWER

118.5 HANSCOM

If you have just turned the system on, and it has not yet determined your position, it will use its last calculated position to determine local area frequencies. The last-used frequency is automatically tuned.

The following frequencies are displayed by the SmartComm system: Approach, ATIS, AWOS, Center, Clearance Delivery, CTAF, Flight Service Stations, Ground, Pilot Controlled Lighting, Tower, and Unicom.

Even if you do not have a comm module connected to the navigator in your installation, the SmartComm system can still be used as a source of useful information. Many of the functions described below are available. Frequencies of nearby facilities and their radio call signs are displayed as described.

Communications frequencies may be selected in any of the following ways:
1. Enter the frequency manually, as with a traditional comm unit.
2. Select from a list of “priority” frequencies.
   
   Priority frequencies are automatically compiled by the SmartComm feature.
   
   While flying, the priority frequencies are the local en-route frequencies.
   
   While on the ground, the priority frequencies are those for the airport at which you are located.
3. Select from lists of all area frequencies prepared by the “SmartComm” feature.
   
   Each list contains one type of frequency (Tower, Ground, etc.), and lists are shown in alphabetical order, i.e., APPROACH list first. Within each list, the frequencies are in order of distance, with the nearest first.
4. Select from a list of frequencies which you have recently used.
5. Select a frequency which is currently displayed by the navigator’s APT INFO or TRK INFO function.

The comm (if installed) is automatically tuned to the selected frequency.

**Manual frequency entry**

1. Turn the **large secondary** knob to **COMM**.
2. Whenever a frequency is displayed on the readouts, you must 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 137 MHz.
4. Turn the **small secondary** knob to select the kilohertz frequency in 25 kHz steps.
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:

<table>
<thead>
<tr>
<th>Type</th>
<th>Abbreviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach</td>
<td>APP</td>
</tr>
<tr>
<td>ATIS</td>
<td>ATS</td>
</tr>
<tr>
<td>AWOS</td>
<td>AWS</td>
</tr>
<tr>
<td>Center</td>
<td>CEN</td>
</tr>
<tr>
<td>Clearance Delivery</td>
<td>CLD</td>
</tr>
<tr>
<td>CTAF</td>
<td>CTA</td>
</tr>
<tr>
<td>Ground</td>
<td>GND</td>
</tr>
<tr>
<td>Flight Service Station</td>
<td>FSS</td>
</tr>
<tr>
<td>Pilot Controlled Lighting</td>
<td>PCL</td>
</tr>
<tr>
<td>Tower</td>
<td>TWR</td>
</tr>
<tr>
<td>Unicom</td>
<td>UNI</td>
</tr>
</tbody>
</table>

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 the frequency was selected, 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, which flashes during transmission.

**Priority frequency selection**

The navigator automatically scans its database to find the local frequencies you are most likely to use, based on your location and whether you are airborne. Up to eleven 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 at which you are 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.

3. When the desired frequency is displayed, press **ACK**. The comm transceiver tunes to the designated frequency.

If the frequency you want is not 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.

### Local frequency lists

The navigator 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 ten 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.

Last-used frequencies
The Northstar SmartComm system also keeps a list of the last four or five frequencies which you have 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 which were used earlier.
3. When the desired frequency is displayed, press ACK. The comm module tunes to the designated frequency.

Database INFO selection
The navigator’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 is to confirm the use of the new frequency.

Volume control
If your communications transceiver is remote-mounted, use the navigator 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 communications transceiver is panel-mounted, use its volume control knob to set the audio output level.

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 this value. Use the SETUP function described below to set this speed threshold to a different value, if necessary. If you wish to defeat this function and display all frequencies at all times, set the function one click to the left of 0 knots, to the position labelled (OFF).

1. Turn the large secondary knob to SETUP.
2. Turn the small secondary knob to display the function shown as MAX. TAXI SPEED:
3. Turn the small primary knob to select the desired speed, or OFF.

MAX. TAXI SPEED: 20°

MAX. TAXI SPEED: 5°

MAX. TAXI SPEED: (OFF)

Squelch defeat
The C1 comm’s squelch setting is normally controlled automatically. If you wish to defeat the squelch 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](image)

![COMM SQUELCH: OPEN](image)

Note that simply turning the volume control up or down a bit 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 wish to change it, 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](image)