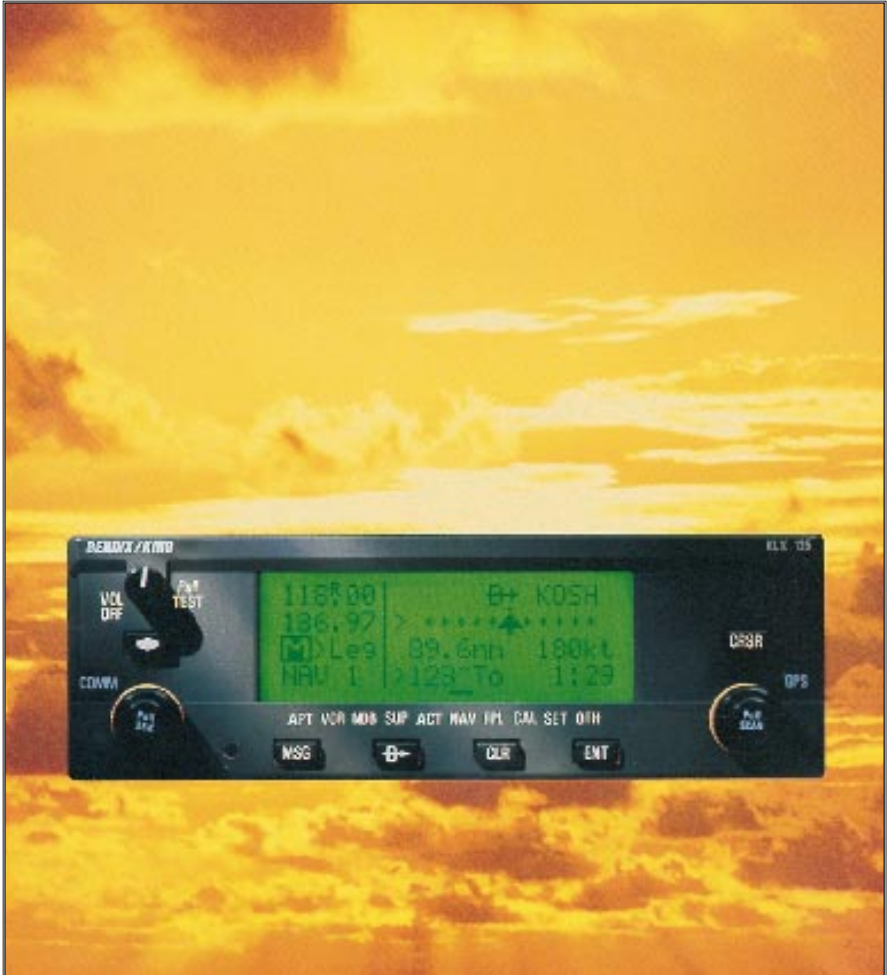


Bendix/King®
GPS/COMM



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INTRODUCTION

Welcome to the world of GPS flying! Your Bendix/King KLX 135 GPS/COMM is sure to make your flying more efficient and more fun. After all, isn't that why you got into flying in the first place? Now when you're flying VFR, you probably won't need to be constantly figuring or looking up VOR radials and distances.

The convenient QuickTune™ feature will allow you to easily look up the frequency for the appropriate airport, then transfer it to the KLX 135 COMM transceiver.

This Pilot's Guide should be of great help to you. It is written in plain, simple English and it assumes you are not an experienced user of GPS or other type of long range navigation equipment. If you are experienced, so much the better. This Pilot's Guide also includes hundreds of sample screen figures and other illustrations to make your learning easier. It is designed so that you can start at the front and progress in the order presented; however, you may want to skip around and learn things in your own order. Also, on page iv, there is an index of frequently used procedures which will help you find the page that describes how to do exactly what you want to do. There are also several appendices in the back of the manual that you may find useful from time to time.

Be sure to keep this Pilot's Guide handy with you in the airplane. It is designed to fit easily in the glove box, or in the seat pocket. The KLX 135 is very simple to operate, but the Pilot's Guide can sure be of help to you.

One last thing. Don't get so involved in learning to use the KLX 135 that you forget to fly the airplane. Be careful, and remember to keep a close eye out for other aircraft.

NOTE: A "whiskers" border is used around data on some of the figures in this Pilot's Guide to indicate that the data inside the border is flashing.

```


122.90 | ZBU
123.12 | BIMINI
ENT Le9 | N E
VOR 1  | W
    
```

KLX 135 SNEAK PREVIEW

If you absolutely can't wait to use your KLX 135 until you've read this Pilot's Guide, this section is for you. This page will teach you just enough to get going and then learn by doing. This operational preview assumes the KLX 135 has been properly installed, the unit was previously operational in the same general geographical location, and that no peripheral equipment interfaced with the KLX 135 (such as external HSIs, CDIs, autopilots, moving map display, etc.) is to be used at this time. If you are using this operational preview in flight, do so only in good VFR conditions and only with an alternate means of navigation (including pilotage) available to cross-check position.



1. Turn the unit on with the On/Off/Volume knob (the small knob in upper left hand corner). Adjust the COMM audio volume as desired by pulling this knob out, turning it to an appropriate level and pushing it back in.
2. For a few seconds, the Turn On Page is displayed while the unit runs a self-test. Afterwards, the Self-test Page is displayed. If the KLX 135 is receiving an altitude from an encoding altimeter, the present pressure altitude will be displayed on line 3. The bottom line should display **Self-test Pass** and a flashing **Ok?**. Press the **ENT** button to approve the Self-test Page.
3. The Initialization Page will now be displayed. If the date and time are incorrect by more than 10 minutes, refer to section 4.2 of this Pilot's Guide. The right side of the screen should show the identifier of the nearest airport to the initial position, along with a radial and distance from that airport waypoint. Press **ENT** with the cursor flashing over **Ok?** to approve the Initialization Page.
4. The VFR page will now be displayed to notify you that the GPS is for VFR use only. Press **ENT** to approve this page.
5. A Data Base Page is now displayed showing the date the data base expires or the date it expired. Press **ENT** to acknowledge the information displayed on this page.

6. The next page displayed will probably be a page showing the VHF communication frequencies for the airport you are at. For now, use the right outer knob to turn to the NAV page type (watch the lower left corner of the screen and the small bar at the bottom to know when you are there). Then use the right inner knob to select the NAV 2 page if not already there. The NAV 2 page shows your present position relative to a nearby VOR. Verify that this position is correct before proceeding.

7. Press the  button. A page with the words **DIRECT TO** is now displayed on the screen.

In step 8 you will enter the ICAO identifier of the airport. The identifier will have a "K" prefix for a Continental U.S. airport, a "C" prefix for a Canadian airport, or a "P" prefix (in some cases) for an Alaskan airport if the identifier is all letters. For example, LAX becomes KLAX. For these countries if the identifier contains any numbers, there is no prefix. For example, TX04 is entered TX04. For other areas of the world the airport identifier should be entered identically to how it is charted.

8. Rotate the right inner knob until the first character of the airport identifier is displayed. Turn the right outer knob one step clockwise to move the flashing segment to the second character position. Rotate the right inner knob to select the second character of the identifier. Use this procedure to enter the complete airport identifier.

9. Press . The display will change to a page showing the identifier, name, city, and state/country of the airport just entered. Confirm that the correct airport is displayed. Press  a second time to approve the airport data.

10. A Navigation page is now on the screen. It displays the distance, groundspeed, bearing, and ETE to the destination airport. In addition, it displays a course deviation indicator (CDI).

See--wasn't that easy?

HOW-TO INDEX

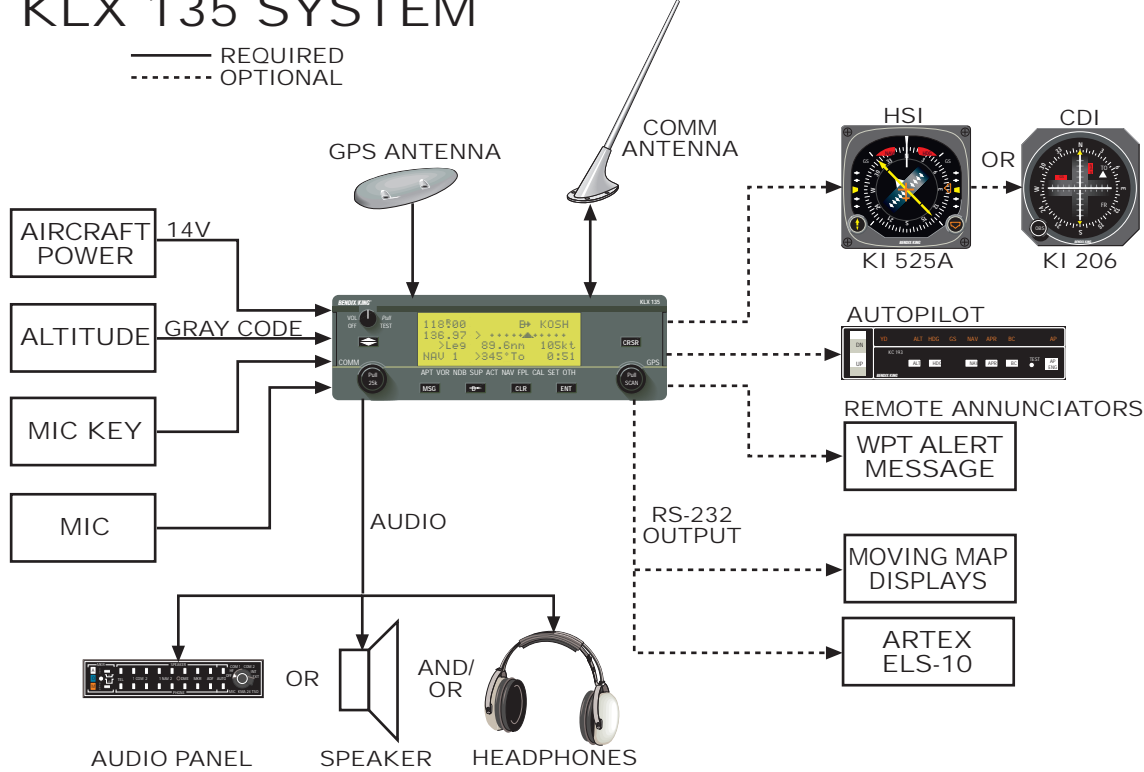
This index will help you quickly find important procedures at a glance. The list is alphabetized by action words.

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KLX 135 SYSTEM

———— REQUIRED
- - - - - OPTIONAL



1. KLX 135 SYSTEM COMPONENTS

A basic KLX 135 system consists of a panel mounted KLX 135 GPS/COMM and a GPS antenna. An altitude input is required to obtain full navigation and operational capabilities. Additional system components may be added or interfaced to the KLX 135 which increase its features and capabilities. Some of these optional components include an external course deviation indicator (CDI) or horizontal situation indicator (HSI), ARTEX ELS-10 emergency locator transmitter (ELT), autopilot, and external annunciators.

The KLX 135 panel mounted unit contains the GPS sensor, the navigation computer, a COMM transceiver, a liquid crystal display (LCD), and all controls required to operate the unit.

Installation of an appropriate VHF communication antenna (capable of receiving 118.000 to 136.975 MHz) is required. However, the VHF COMM antenna is not included as part of the KLX 135 system.

The GPS "patch" antenna is available for use with the KLX 135. It is designed to always be mounted on the top of the aircraft.

The KLX 135 has analog outputs to drive the left-right deviation bar of most mechanical CDIs and HSIs. In addition, the NAV mode of the Bendix/King KFC 150, KAP 150, KAP 150H, KAP 100, KFC 200, KAP 200, KFC 250, KFC 275, KFC 300, and KFC 325 flight control systems may be coupled to the KLX 135. Many other autopilots may also be coupled to the KLX 135. Actual autopilot performance and capability when coupled to the KLX 135 may vary significantly from one autopilot model to another.

Altitude may be provided to the KLX 135 from an encoding altimeter or blind encoder. Altitude is used as an aid in position determination when not enough satellites are in view.

Some installations may require remote annunciators to be mounted in the aircraft panel in order to indicate the status of certain KLX 135 functions, namely waypoint alert and message.

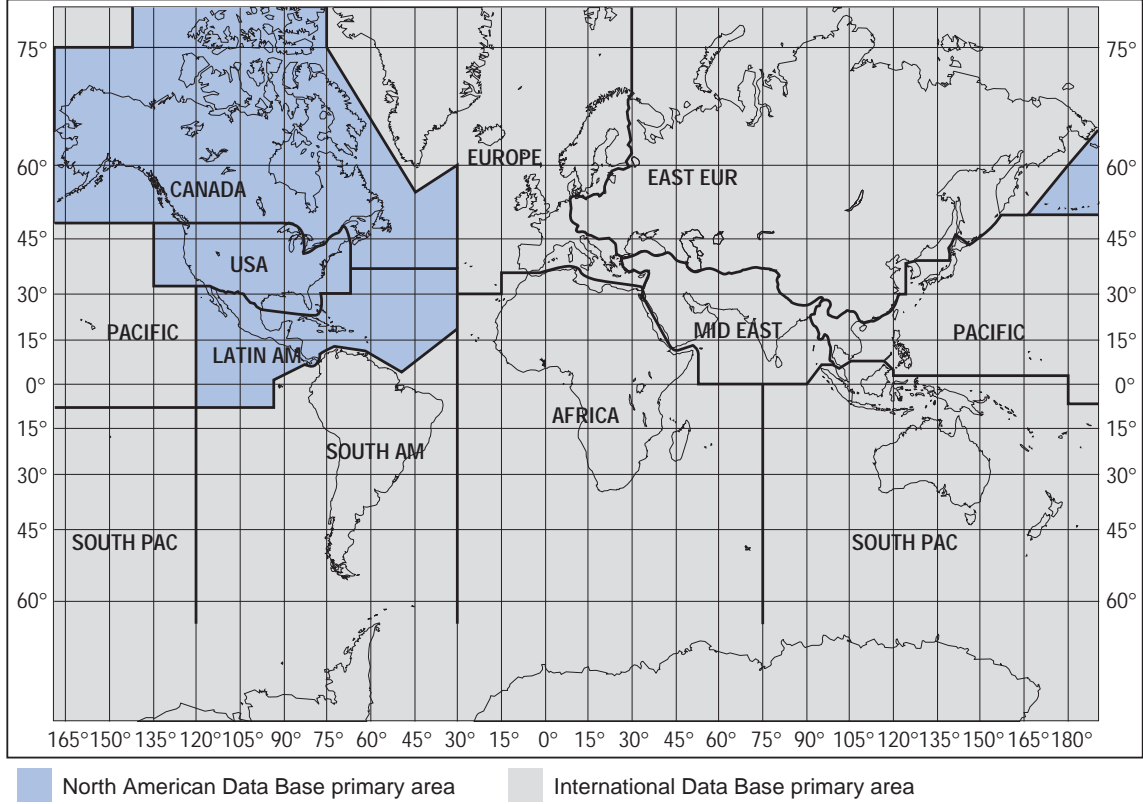


Figure 2-1 KLX 135 Data Base Geographical Region

2. DATA BASE

2.1. DATA BASICS

The data base provides two primary functions. First, it makes pilot interface with the GPS sensor much easier. Rather than having to manually look up and then enter the latitude and longitude for a specific waypoint, it allows you to merely enter a simple waypoint identifier. The data base automatically looks up and displays the latitude and longitude associated with the identifier. It should be obvious that the data base saves a lot of tedious latitude/longitude entry and also greatly reduces the potential for data input mistakes.

The second function of the data base is that it serves as a very convenient means to store and easily access aeronautical information. Want to know the name of the airport, the nearest city, or the airport altitude? Just unleash the power of the KLX 135 and display the information right on the screen.

2.2. DATA BASE CONTENTS AND COVERAGE AREAS

There are two data base coverage areas available for the KLX 135. One is referred to as the "North American" data base and the other is referred to as the "International" data base.

The International Civil Aviation Organization (ICAO) and Aeronautical Radio, Inc. (ARINC) break the world into the ten geographic regions shown in [figure 2-1](#). The KLX 135 North American data base contains aeronautical information for the group of ICAO regions consisting of Canada, USA, and Latin America. Likewise, the International data base also provides information for the group of ICAO regions consisting of Europe, East Europe, Africa, Mid East, Pacific, South Pacific, and South America.

Both data bases contain complete information for all VORs and NDBs in their respective coverage area. The data base also contains public use and military airports which have any runway at least 1000 feet in length.

Data Base

The following is a listing of the KLX 135 North American and International data base contents:

AIRPORTS

Identifier

Name

City, State or Country

Use type (if military)

Latitude and Longitude

Elevation

Communication frequencies

VORs

Identifier

Name

Frequency

Latitude and Longitude

Magnetic variation

NDBs

Identifier

Name

Frequency

Latitude and Longitude

(Note - Outer Compass Locators are not included in the data base)

250 USER DEFINED WAYPOINTS

Identifier

Latitude and Longitude

2.3. ICAO IDENTIFIERS

Waypoints are stored in the KLX 135 database almost exclusively by their ICAO identifiers. ICAO (International Civil Aviation Organization) is an internationally accepted reference for the data. In almost all cases the proper ICAO identifiers may be taken directly from Jeppesen Sanderson or government aeronautical charts.

Airport identifiers in the contiguous United States, Alaska, and Canada are special cases in the ICAO system. Many airport identifiers for these areas have four letters beginning with a prefix letter that corresponds to the geographic area in which it is located. The prefix letter for the contiguous U.S. is "K". Thus, the identifier for Dallas/Fort Worth International Airport is KDFW, not DFW (which would be identical to the VOR identifier). Likewise, the identifier for Orlando Executive Airport is KORL while the VOR identifier is ORL. The prefix letter for Canada is "C" and for Alaska is "P".

NOTE: *There are several exceptions in Alaska. In many cases, airports with three letter identifiers receive the prefix "P", but there are many that don't. The most reliable method of determining an Alaska airport identifier is to look it up from the airport name or city. See section 4.7.4, "Selecting Waypoints by Name or City".*

Incidentally, you can program the KLX 135 to default to a certain letter (such as "K") when you are entering a waypoint identifier. See [section 4.4.2](#), "Data Entry" to learn about this handy feature.

Not all airport identifiers receive the prefix letter. Airport identifiers which are combinations of letters and numbers do not apply to the prefix rule. Examples of airport identifiers not using the prefix are 3C2, 7TX6, and M33.

So remember, if you are entering or looking for an airport identifier that is all letters (no numbers) then it will begin with a "K" prefix in the contiguous U.S., a "P" in Alaska (in some cases), or a "C" in Canada. If there are numbers in the identifier then a prefix is not used. For other areas of the world the airport identifier stored in the KLX 135 data base is identical to how it is charted.

2.4. UPDATING THE DATA BASE

The information stored in the data base would eventually become obsolete if there wasn't some means to update it. For example, new airports open, nav aids can move or change frequency, communication frequencies can change, and on and on.

The data base is updated by means of a 3.5-inch diskette supplied by AlliedSignal and an IBM-compatible personal computer. This method does not have to involve removing the KLX 135 from the aircraft's instrument panel. A jack, usually mounted in the aircraft's instrument panel, provides a means of interfacing the KLX 135 with the computer via an interface cable. The diskettes are not returned to AlliedSignal.

Every 28 days, AlliedSignal receives new NavData information from Jeppesen Sanderson. This information is processed and downloaded onto diskettes. AlliedSignal makes the update service available to you in a choice of several subscription or random update programs. See [section 2.6](#) for details on these programs.

NOTE: *AlliedSignal sends the update so that it arrives prior to the next effective date. The new update may be installed any time prior to the effective date and the KLX 135 will use the previous data up to the effective date and automatically begin using the new data on the effective date.*

In order to use the update program you must have access to a computer having a disk drive capable utilizing 3.5-inch 1.44 megabyte high density diskettes. If you wish to perform updates in the cockpit, an optional PC Interface kit must be used. Included in the kit is an interface cable that plugs into both the computer and into the data loader jack. The data loader jack is included with the KLX 135 installation kit and is typically installed in the aircraft's instrument panel.

CAUTION: **The data base must be updated only while the aircraft is on the ground. The KLX 135 does not perform any navigation function while the data base is being updated. Since a data base update takes approximately 10 minutes it is a good idea to turn off all electrical equipment on the aircraft except for the KLX 135 to avoid running down the aircraft battery.**

NOTE: *The diskettes sent to you can only be used to update one KLX 135, although they can update that specific unit numerous times. The first time the diskettes are used in an update operation, a unique identification code from the KLX 135 being used is uploaded to the diskettes. These diskettes may be used in this specific KLX 135 an unlimited number of times which could be required if you switch back and forth between the North American and International data bases during one update cycle. These diskettes may not, however, be used to update other KLX 135s. This update protection ensures that Jeppesen Sanderson is properly compensated for the use of their NavData.*

To update the KLX 135 data base:

1. Plug the 9 pin female connector end of the interface cable into a COM serial port of the computer. If the computer has COM 1 and COM 2 serial ports, either may be used. Some computers use a 9 pin COM serial port connector while other computers use a 25 pin connector. If the computer being used has a 9 pin connector, the interface cable connector will plug directly into the computer's 9 pin connector. If the computer's COM serial port uses a 25 pin connector, use the 25 pin to 9 pin adapter included in the PC interface kit to adapt the interface cable's connector to the computer's connector.
2. If you are using the PC interface kit in the cockpit, plug the other end of the interface cable (4 conductor male connector) into the data loader jack that is mounted in the aircraft panel.
3. Insert the diskette into the computer's disk drive. Turn on the computer being used for the data base update. The program on the disk will automatically "boot" (load) and the computer screen will display "Ready" when the computer is ready to continue with the data base update operation.

4. Turn on the KLX 135. Press **[ENT]** as required to approve the Self Test, Initialization, VFR, and Data Base pages. Use the right outer knob to select the Setup (SET) type pages and the right inner knob to select the SET 3 page (figure 2-2).

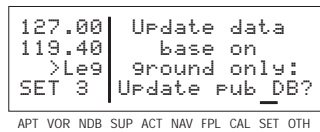


Figure 2-2

5. Press **[CRSR]**. **Update Pub DB?** will now be inverse video as in figure 2-3.

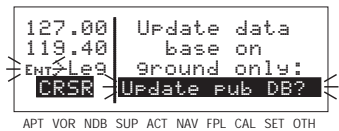


Figure 2-3

6. Press **[ENT]**. The estimated load time in minutes is now displayed (figure 2-4).

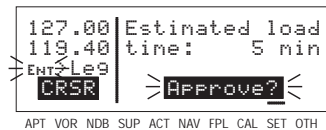


Figure 2-4

NOTE: In step 6, repeated pressing **[CLR]** will terminate the update process and bring the display back to the original SET 3 page shown in figure 2-2.

7. Press **[ENT]** to acknowledge the estimated load time and begin the erasing of the existing data base. The unit will now display

Erasing data base. After the data base has been erased, the loading of the new data automatically begins. As the new data is being loaded, the percentage of transfer is displayed (figure 2-5).

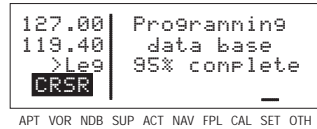


Figure 2-5

8. The KLX 135 will indicate when the data base update is complete as shown in figure 2-6. You may either turn the KLX 135 off at this point or press **ENT** to restart the KLX 135.

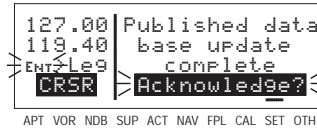


Figure 2-6

9. Remove the interface cable. Remove the disk from the computer. Turn off the computer.

The chances are small of having difficulty updating the data base but—

If you have a problem:

- First check that the interface cable is properly connected and that the computer is turned on. If there is a problem with the connection or the computer the KLX 135 will display **Data Loader Not Ready**. When the problem is corrected this prompt is removed and the update operation can continue from where it left off.
- If an internal test fails after the data has been loaded, the KLX 135 will display **Checksum Error, Data Base Invalid**. Press **ENT** to acknowledge. The KLX 135 will then display **Data Base Update Failed, Retry?** Use the right outer knob to position the cursor over the desired choice and press **ENT**.
- There are other error messages that may be displayed. If you have a problem that you can't resolve, write down any error messages to aid your AlliedSignal Service Center in identifying the problem.

2.5. USER DEFINED DATA BASE

In addition to the published data base of airports, VORs, and NDBs stored in the Jeppesen data base, you may create up to 250 other user-defined waypoints. [Section 5.2.1](#), "Creating User-defined waypoints" describes this further.

The KLX 135 contains an internal lithium battery that is used to “keep-alive” the user-defined data base as well as flight plans. This battery has a typical life of three to five years. *It is highly recommended that the battery be replaced every three years at an authorized AlliedSignal Service Center.*

2.6. DATA BASE UPDATE SERVICE OPTIONS

The following tear-out page can be used for ordering the North American and International data base update services from AlliedSignal. The forms may be mailed or FAXed for your convenience.

This page intentionally left blank

KLX 135 Data Base Diskette Update Service Options

AlliedSignal GAA offers several update service options to suit your requirements. Please select the service desired, then fill out and mail the attached order form below. Credit card orders may be faxed.

North American Data Base
or

International Data Base

Complete Update Service. **Price:**
Provides 13 updates—one **\$395***
every 28 days for one year.

Six-time Update Service. **Price:**
Provides six updates—one **\$260***
every 56 days for one year.

Four-time Update Service. **Price:**
Provides four updates—one **\$195***
during each quarter for one year.

Single Update. Provides one **Price:**
update upon receipt of order. **\$95***

Note: Updates are current for 28 days after effective date on diskette. If you select any service other than the complete 13-time service, your KLX 135 will begin alerting you after 28 days that your data base is out of date.

Please set up the service under:

My name. My Company's name.

Name: _____

Company: _____

Address: _____

City: _____

State: _____ Zip Code: _____

Telephone: (____) _____

FAX: (____) _____

Aircraft Make: _____

Aircraft Model: _____

Method of Payment

Check/Money order enclosed

Wire Transfer:
Chase Manhattan Bank, NY
Acct #910-2-538734

MasterCard VISA

Number _____

Expires _____

Signature _____

***Please include tax if you are subscribing from the following states: CA, FL, KS, MO, MN, NM, TX.**

Send to:

AlliedSignal GAA

Data Base Update Service

Mail Drop #45

400 N. Rogers Road

Olathe KS 66062-1212

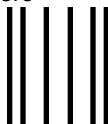
Telephone: (913) 768-3020

FAX: (913) 791-1335

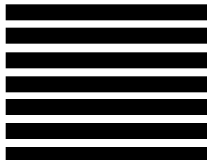


Tape here

Fold here



NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES



BUSINESS REPLY MAIL
FIRST-CLASS MAIL PERMIT NO. 121 OLATHE, KANSAS

POSTAGE WILL BE PAID BY ADDRESSEE

ALLIEDSIGNAL GENERAL AVIATION AVIONICS
M D 45
400 NORTH ROGERS ROAD
OLATHE KS 66062-9987



3. COMM OPERATION

This section describes the use of the VHF Communication Transceiver portion of the KLX 135. If you are not yet familiar with the procedure of turning on and initializing the KLX 135, see [section 4.2](#), "Turn-on and Self Test".

3.1. ENTERING FREQUENCIES

3.1.1. FREQUENCY SELECTION

The KLX 135 is capable of tuning VHF communication frequencies from 118.000 MHz (megahertz) to 136.975 MHz.

To tune a COMM frequency:

1. Use the left outer knob to select the desired number of megahertz between 118 and 136. In figure 3-1, the frequency 122.90 MHz is desired.

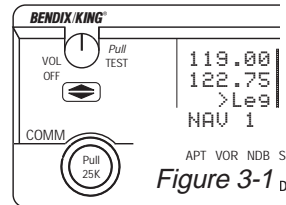


Figure 3-1

2. Make sure the left inner knob is pushed in, and use it to complete the desired frequency. In this case, the left inner knob changes the frequency in increments of 0.05 MHz (50 kHz) (figure 3-2). Note that the left inner knob must be rotated three clicks clockwise to go from 122.75 MHz to 122.90 MHz.

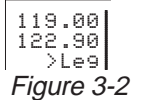



Figure 3-2

3.1.2. STANDBY FREQUENCY ENTRY

The default frequency entry mode is standby frequency entry. In the standby frequency entry mode, both the active and standby communication frequencies are displayed, and any frequency tuning is performed on the standby frequency.

To tune a COMM frequency using the standby frequency entry mode:

1. Use the left knobs to tune the standby COMM frequency, such as 122.90 MHz (figure 3-2 above).
2. To exchange the active and standby frequencies, press the  (flip-flop) button (figure 3-3).

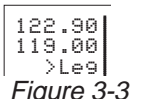





Figure 3-3

3.1.3. ACTIVE FREQUENCY ENTRY

You can also tune the KLX 135 active frequency directly.

To tune a COMM frequency using the active frequency entry mode:

1. Press and hold the  button for approximately 2 seconds. The standby frequency will disappear and the active frequency will be the same as before you pressed the  button (figure 3-4).
2. You can now use the left knobs to tune the active COMM frequency.
3. To change back to standby frequency entry mode, press the  button momentarily.

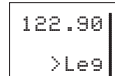


Figure 3-4

3.1.4. 25 KILOHERTZ CHANNEL SPACING OPERATION

Some communication frequencies are multiples of 25 kilohertz (for example 125.975 MHz). KLX 135 allows you to easily tune these frequencies.

To tune a 25 kHz COMM frequency:

1. Pull the left inner knob out.
2. Use the left knobs to tune the frequency. Notice that the KLX 135 only displays two digits after the decimal point, so it has to cut off the last digit. For example, in figure 3-5 the standby frequency is 123.125 MHz and the KLX 135 displays 123.12.
3. When you're ready to go back to 50 kHz tuning, push the left inner knob back in. This will allow you to select frequencies with fewer turns of the knob.

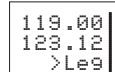


Figure 3-5

3.1.5. USING QuickTune™ FREQUENCY SELECTION

The KLX 135 gives you the ability to look up an airport VHF communication frequency from the navigation data base and load it directly into to COMM transceiver. That way, you don't have the risk of getting the wrong frequency or making a tuning error. The QuickTune™ function is accessible on the Airport 4 (APT 4) page. You may also use the Active 4 (ACT 4) page, if the active waypoint is an airport (see section 4.10.3).

To tune a COMM frequency from the data base:

1. Use the right outer and inner knobs to locate the APT 4 (or ACT 4, if the active waypoint is an airport) page for the facility you desire to communicate with (figure 3-6). The APT 4 page displays the frequency type (TWR = Tower Frequency, GRND = Ground Control, PCL = Pilot-controlled Lighting, etc.) and frequency.

119.00	KCOU		
121.60	ATIS*	128.45	
>Le9	GRND*	121.60	
APT+4	TWR *	119.30	

APT VOR NDB SUP ACT NAV FPL CAL SET OTH
2. Press the **CRSR** button to turn the cursor on and use the right outer knob to scan through all the airport's frequencies (figure 3-7). There may be more frequencies than can be displayed at one time.

119.00	KCOU		
121.60	CTR *	118.40	
ENT>Le9	CTAF*	119.30	
CRSR	PCL *	119.30	

APT VOR NDB SUP ACT NAV FPL CAL SET OTH
3. When you have the cursor over the desired frequency, press **ENT** and that frequency will become the standby frequency in the COMM transceiver (figure 3-8). The cursor turns off automatically.

119.00	KCOU		
119.30	CTR *	118.40	
>Le9	CTAF*	119.30	
APT+4	PCL *	119.30	

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 3-6

Figure 3-7

Figure 3-8

3.2. RECEIVE/TRANSMIT ANNUNCIATION

The KLX 135 display tells you when it is receiving and transmitting! When you key the mic and the KLX 135 COMM transmits, a small “T” is displayed above the active frequency (figure 3-9).

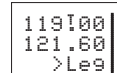


Figure 3-9

One instance where this is nice is if you have multiple COMM transmitters in the aircraft, it tells you when you are transmitting on the KLX 135. Whenever the KLX 135’s receiver breaks the squelch, an “R” is displayed in the same spot (figure 3-10). If the volume happens to be turned down low on the KLX 135, your audio panel, or your headphones, you may not hear the audio, but you **will see** the “R” annunciation. Note that you can’t receive and transmit at the same time.

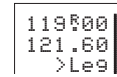


Figure 3-10

3.3. VOLUME ADJUSTMENT AND AUTOMATIC SQUELCH OVERRIDE

The small knob in the upper left corner of the KLX 135 is not only the ON/OFF switch, it is used to adjust the COMM audio volume. By pulling this knob out you can override the automatic squelch, either to receive a distant, weak signal or to give you a noise reference to adjust the volume by.

3.4. STUCK MICROPHONE PROTECTION

Occasionally, a microphone switch can get stuck in the “on” position. When this happens, you can jam the frequency. To prevent this, the KLX 135 automatically shuts down the transmitter whenever it is keyed for more than 35 seconds at a time. When this happens, the COMM frequency display area is replaced with a flashing **Stuck Mic** message (figure 3-11) until the microphone key is turned off.

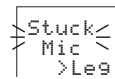



Figure 3-11

When this is the case, tuning the COMM with the left knobs or pressing the flip-flop button will cause the words **Stuck Mic** to be removed, allowing you to see what you are tuning. This is helpful if you desire to listen to a different frequency than you were when the microphone got stuck. Five seconds after you stop adjusting the frequency in any way, the **Stuck Mic** message will reappear.

If you are intentionally making a lengthy transmission and **Stuck Mic** is displayed, simply release the microphone key for an instant and then resume your transmission.

3.5 BLIND TUNING FEATURE

Turning the unit on while holding the flip-flop () button will bring the KLX 135 up in the active frequency entry mode, loading 120.00 MHz into the active COMM frequency (figure 3-12). This allows the pilot to “blind-tune” the radio in the event of a display failure.

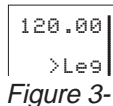




Figure 3-12

The COMM standby frequency will also be 120.00 MHz, although it is not displayed during active entry.

To accurately tune the active frequency on the COMM, count up 1 MHz for each clockwise click of the left outer knob, and down 1 MHz for each counterclockwise click of the knob. Similarly, count up or down 50 kHz or 25 kHz per click of the left inner knob, depending on whether it is pushed in or pulled out.

IMPORTANT NOTE: *In order to have the ability to change the COMM frequency, the pages of the turn-on sequence (Self-Test, Initialization, VFR, and Data Base) must be approved. Hold the  button down for about two seconds after applying power to the KLX 135. Then, wait about 20 seconds and press the  button four times to approve these pages.*

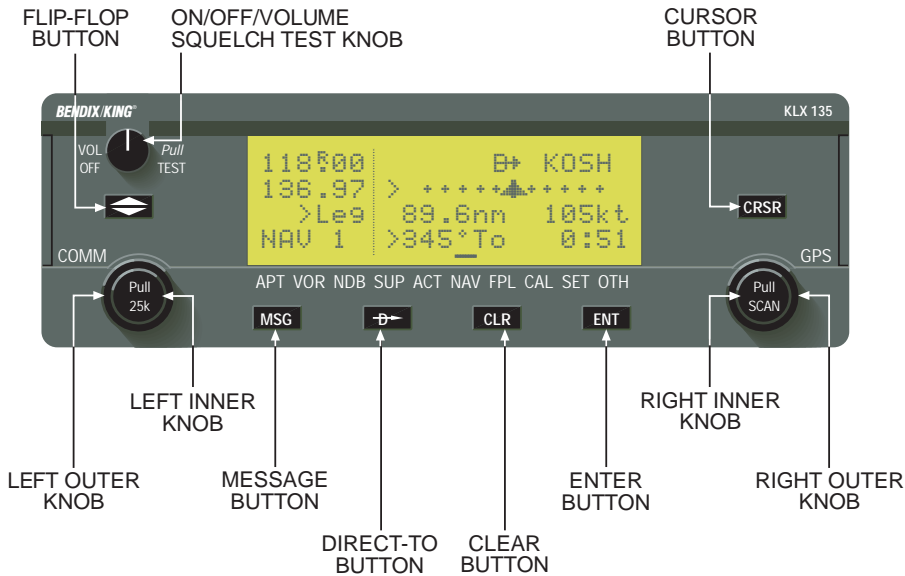


Figure 4-1 KLX 135 Controls

4. BASIC GPS OPERATION

4.1. COVERAGE AREA

The KLX 135 was designed to provide worldwide navigation coverage from North 74° latitude to South 60° Latitude (figure 4-2). Outside this area, magnetic variation must be manually entered as discussed in section 5.4, "Operation Outside the Primary Coverage Area". See section 2.2 for the data base geographical regions.

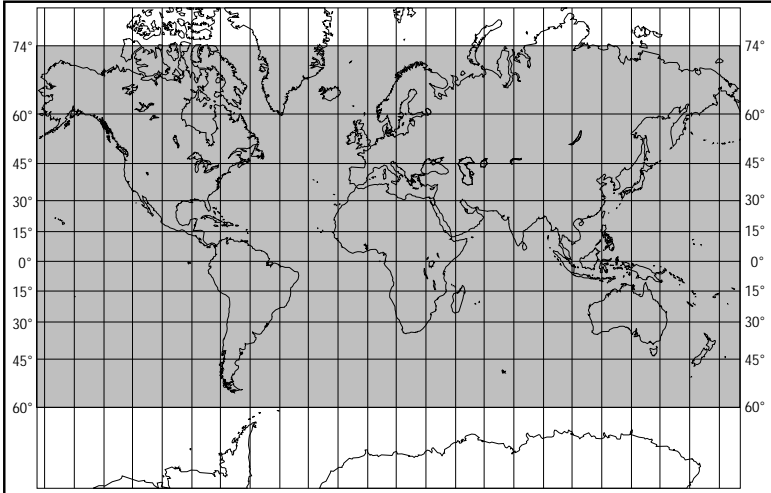


Figure 4-2 KLX 135 Navigation Coverage Area

4.2. TURN-ON AND SELF TEST

Well, it's time to get down to business and actually use the KLX 135! Figure 4-1 can be folded out and used as a reference during the following procedures. This is especially handy if you're learning while away from your GPS. The steps below take a lot of words to explain, but before you know it, you will be "flying" through them.

NOTE: When power is applied to the KLX 135 it always "wakes up" in the En route-Leg mode. Only the En route-Leg mode is described in this chapter. In this mode the KLX 135 performs great circle navigation (the shortest distance between two points located on the earth's surface). The course deviation output displayed on the unit's internal course deviation indicator (CDI) and provided to an external horizontal situation indicator (HSI) or CDI is five nautical miles (full scale sensitivity) left and right. The other mode is En route-OBS and is described in section 5.3.3.

To turn on and initialize the KLX 135:

1. Turn on the KLX 135 by turning the small power/volume knob clockwise. Be conscious of how far you turn it, for you are also adjusting the COMM volume.

The Turn-On page (figure 4-3) will be displayed for a few seconds. During this time, the KLX 135 performs an extensive internal test. The operational revision status (ORS) level number in the upper right corner of the display should match the ORS level indicated on the cover of this Pilot's Guide .

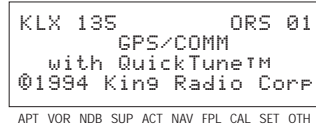


Figure 4-3

When the internal test is complete, the Turn-On page will automatically be replaced by the Self Test page (figure 4-4).

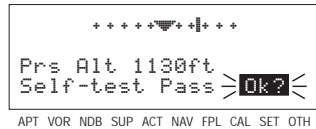


Figure 4-4

NOTE: If the KLX 135 is operating in the Take-Home Mode, the Take-Home Warning Page (figure 4-5) is displayed first and must be acknowledged by pressing **[ENT]**. See [section 5.5](#) for more information on the Take-Home mode.

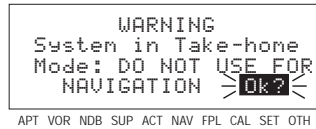


Figure 4-5

2. Verify that the data displayed on the Self Test page is the same as is being displayed on the appropriate indicator (if any) in the aircraft which is interfaced to the KLX 135. If the KLX 135 is not connected to any other equipment in the aircraft, you may skip to step 3.

If the KLX 135 is interfaced with a NAV indicator such as an HSI or a course deviation indicator (CDI), the deviation bar (D-bar) should be indicating a half scale deviation to the right. The TO/FROM indicator should be showing FROM.

If any of the above checks fail, do not use the associated indicator with the KLX 135.

3. If the KLX 135 has passed the internal self test, the bottom left side of the Self Test page will display **Self-test Pass** and all external annunciators should be illuminated. If instead, **Self-test**

Fail is displayed, recycle power to the KLX 135. If the Self Test page still displays **Self-test Fail**, the KLX 135 requires repair and should not be used for navigation.

- When you are ready to approve the Self-test page, press the **ENT** button while the **Ok?** is flashing. If it happens not to be flashing, press the **CRSR** button and use the right outer knob to move the cursor there.

- The next page displayed will be the Initialization page (figure 4-6). Verify that the date displayed in the top left corner of the Initialization page is correct. The KLX 135 has an internal battery powered calendar/clock, so the date and time normally don't require setting. The battery has a life of approximately 3 years. In addition, the KLX 135's system date and time are automatically updated very precisely when at least one satellite is being received. However, if for some reason the date or time are incorrect, it is necessary to enter the correct date or time so that the KLX 135 can reach the navigation mode. The date must be correct and the time must be correct within ten minutes so that the KLX 135 will start looking for the correct satellites.

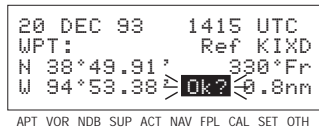


Figure 4-6

If the date is incorrect, rotate the right outer knob counterclockwise until the cursor is over the entire date field (figure 4-7). Rotate the right inner knob until the correct day of the month is displayed (figure 4-8). Then, move the cursor to the month field by rotating the outer knob one click clockwise and change the month as necessary. Use the same methods to select the correct year (figure 4-9). When the date is correct, press **ENT**.

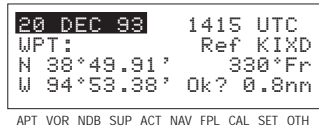


Figure 4-7

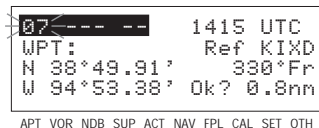


Figure 4-8

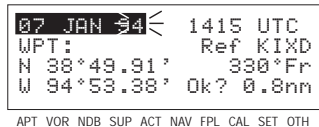


Figure 4-9

- Verify that the time displayed in the upper right corner of the Initialization page is correct to

within ten minutes of the actual time. Remember, once the KLX 135 receives the first satellite, it will automatically be very accurately updated by the satellite to the correct time. However, you are responsible for assuring the desired time zone is selected on the KLX 135. If it is necessary to reset the time, position the cursor over the time zone field (figure 4-10) and select the desired time zone (figure 4-11).

```
07 JAN 94    1415 UTC
WPT:         Ref KIXD
N 38°49.91'  330°Fr
W 94°53.38'  0k? 0.8nm
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 4-10

```
07 JAN 94    0615 EST
WPT:         Ref KIXD
N 38°49.91'  330°Fr
W 94°53.38'  0k? 0.8nm
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 4-11

The following are the time zones which the KLX 135 is capable of displaying:

- UTC** Coordinated Universal Time (Zulu)
- GST** Greenland Standard Time (UTC - 3)
- GDT** Greenland Daylight Time (UTC - 2)
- ATS** Atlantic Standard Time (UTC - 4)
- ATD** Atlantic Daylight Time (UTC - 3)
- EST** Eastern Standard Time (UTC - 5)
- EDT** Eastern Daylight Time (UTC - 4)
- CST** Central Standard Time (UTC - 6)
- CDT** Central Daylight Time (UTC - 5)
- MST** Mountain Standard Time (UTC - 7)
- MDT** Mountain Daylight Time (UTC - 6)
- PST** Pacific Standard Time (UTC - 8)
- PDT** Pacific Daylight Time (UTC - 7)
- AKS** Alaska Standard Time (UTC - 9)
- AKD** Alaska Daylight Time (UTC - 8)
- HAS** Hawaii Standard Time (UTC - 10)
- HAD** Hawaii Daylight Time (UTC - 9)
- SST** Samoa Standard Time (UTC - 11)
- SDT** Samoa Daylight Time (UTC - 10)

You will be able to change the time zone any time you desire on several other pages, so don't worry if you're not sure which time zone to choose. UTC—Coordinated Universal Time (also called "Zulu") is always a safe choice.

Once you have selected the desired time zone, position the cursor over the entire time field and select the correct hour with the right inner knob (figure 4-12). Since 24 hour time is used, be sure to add 12 if the time is after 1:00 P.M. (2:30 P.M. becomes 1430). Now move the cursor to the tens of minutes position and select the desired value, and repeat this process for the last digit of the time field. When the correct time has been entered (figure 4-13), press **ENT** to start the clock running. Don't worry that you can't update the seconds. The KLX 135 system time will automatically be corrected very precisely once a satellite is received.

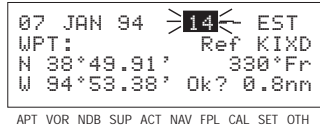


Figure 4-12

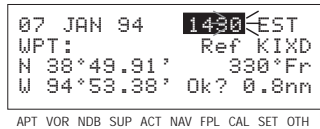


Figure 4-13

- To aid the GPS receiver in acquiring your position, it is vital that it have a reasonable idea of where you are, and the Initialization page is where you have the chance to set this initial position. Check to see if the displayed initial position is where you actually are. This latitude/longitude is the last known position before the power was shut down the last time. Unless the unit has been moved since its last use, this position should be correct. On the right side of the screen will be the identifier of the nearest airport in the database, with a radial and distance from that airport. If you need to change the initial position to—let's say—John F. Kennedy International (KJFK), move the cursor to the **WPT:** field and use the right inner knob to select a K as the first character of the identifier (figure 4-14). Move the cursor to the right one character and select a J and then right again to select an F. The final K should be filled in by the data base (figure 4-15). When you press **ENT**, the latitude and longitude fields will change to those of KJFK (figure 4-16). If necessary, the latitude and longitude may be entered manually.

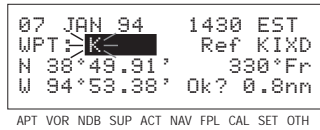


Figure 4-14

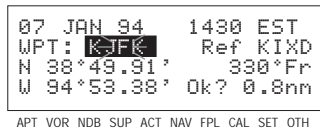


Figure 4-15

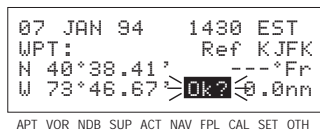


Figure 4-16

8. When all information on the Initialization page is correct, move the cursor to **Ok?** and press **ENT** to move on.
9. The VFR page will be displayed to notify you that the GPS is for VFR use only.
10. The Data Base page will now be displayed with the cursor over **Acknowledge?**. Line 1 indicates whether a North American or

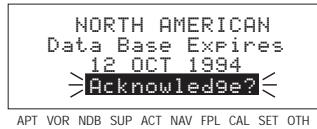


Figure 4-17

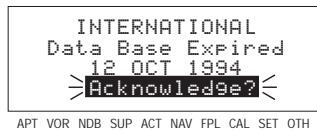


Figure 4-18

International data base is being used. If the data base is current, line 3 will show the date when the data base expires (figure 4-17). If, on the other hand, the data base is out of date, line 3 shows the date that it expired (figure 4-18). The KLX 135 will still function with an out of date data base; however, you must exercise extreme caution and always verify that the data base information is correct before using information from an out-of-date data base. Press **ENT** to acknowledge the information on the Data Base page.

WARNING: The accuracy of the data base information is assured only if the data base is current. Operators using an out-of-date data base do so entirely at their own risk.

A waypoint page for the waypoint which was active when the KLX 135 was last turned off will be displayed on the screen. If the last active waypoint was an airport, the APT 4 page showing the airport's communications frequencies will be displayed (figure 4-19). We thought you'd like that! Almost always, the waypoint which was active when you last turned the KLX 135 off is the airport where you landed. Therefore, when you get ready to depart, the airport communication frequencies for that airport will automatically be displayed for you! If you wish to select one or two of the airport frequencies to QuickTune™ the COMM, see [section 3.1.5](#), "Using QuickTune™ Frequency Selection".

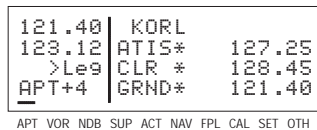


Figure 4-19

After you get your COMM frequencies ready to go, you'll probably want to check the NAV 2 page to see your present position. Use the right outer knob to select the NAV page type and then the right inner knob, if necessary, to select the NAV 2 page. It is quite likely that the present position will be dashed at first (figure 4-20). It takes the KLX 135 several minutes to acquire the GPS satellites and to make its initial calculation of your position. When the KLX 135 reaches a NAV ready status and is able to navigate, the NAV 2 page will display your present position relative to the nearest VOR (figure 4-21). Verify that the present position shown on the NAV 2 page is correct.

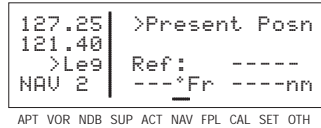


Figure 4-20

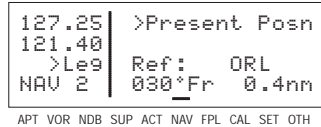


Figure 4-21

NOTE: In order to reach a Nav ready status, the aircraft must be away from obstructions blocking the GPS antenna's view of required satellites. If the KLX 135 fails to reach a Nav ready status within five minutes refer to [section 4.6](#), "Initialization And Time To First Fix".

4.3. DISPLAY FORMAT

The KLX 135 uses a Liquid Crystal Display (LCD). In normal operation, the display screen is divided into two segments by a vertical line, called the page divider. In some cases, such as the display of system messages or the turn-on and self test sequence, the page divider disappears and you have a "full-screen" page.

Aeronautical information (or *data*) is presented on the screen in the form of "pages". A page is a presentation of specific data in an organized format. Various page "types" are used to display related kinds of data. For example, one page type is NAV (navigation). NAV pages show information such as distance, groundspeed, bearing, course, and other data relating to navigation. Another page type is APT (airport). APT pages contain information pertinent to a specific airport such as name, city, State, elevation, and direction and distance relative to the aircraft's present position.

In normal operation, the aeronautical data is displayed on the right side of the screen. The active and standby COMM frequencies appear in the upper left corner of the display. The active frequency is

Basic GPS Operation

always on the top line. The bottom line on the left side of the page divider indicates the page type that is being displayed on the right side of the page divider. In figure 4-22, the **APT 1** (airport 1) page is being displayed.

126.50		KISM		
129.12		KISSIMMEE MUN		
>Leg		ORLANDO		
APT 1		FL		
<small>APT VOR NDB SUP ACT NAV FPL CAL SET OTH</small>				

Figure 4-22

You might think of the page types as the chapters in a book and the page numbers as the pages within a chapter. Just as a chapter in a book may have from one to many pages, a KLX 135 page type may have from two to 10 pages associated with it. There are, for example, 10 flight plan pages (FPL 0, FPL 1, FPL 2, ..., FPL 9) in the flight plan page type and four airport pages (APT 1, APT 2, APT 3, APT 4) in the airport page type.

Figure 4-23 shows an example of an APT 4 page. Notice the “+” sign in the page identification. Whenever a “+” sign is part of a page identifier there will be two or more pages, all having the same page number, used to present all of the required information. That is, all of the information associated with a particular page number doesn’t fit on the page being viewed. In this case the “+” sign indicates that there are two or more APT 4 pages. Figure 4-24 shows the second APT 4 page for KICT (Wichita Mid-Continent Airport).

125.15		KICT		
125.70		ATIS	125.15	
>Leg		CLR	125.70	
APT+4		GND	121.90	
<small>APT VOR NDB SUP ACT NAV FPL CAL SET OTH</small>				

Figure 4-23

125.15		KICT		
125.70		TWR	118.20	
>Leg		UNIC	122.95	
APT+4		CL C	126.70	
<small>APT VOR NDB SUP ACT NAV FPL CAL SET OTH</small>				

Figure 4-24

The third line of the left side has three purposes: (1) If the KLX 135 is ready for you to approve something, such as a selected waypoint, the “Ent” prompt will flash (figure 4-25), indicating you should press the **ENT** button to continue. (2) If the KLX 135 has a new message for you which must be viewed on a message page, a large “M” will flash in the same area (figure 4-26) telling you to press the **MSG** button and view the new message. (3) Immediately to the right of the “message/enter” display area, the navigation mode (see [section 5.3.1](#) for details) is displayed. If the KLX 135 is in the En route-Leg mode (the normal mode of operation), “Leg” will be displayed here.

122.90		ZBU	116.70	
123.12		BIMINI		
>ENT Leg		N 25°42.10'		
VOR 1		W 79°17.10'		
<small>APT VOR NDB SUP ACT NAV FPL CAL SET OTH</small>				

Figure 4-25

118.00		B+ KSEA		
124.62		> ++++++ +++++		
>MSG Leg		62.1nm 112kt		
NAV 1		>262° To 0:33		
<small>APT VOR NDB SUP ACT NAV FPL CAL SET OTH</small>				

Figure 4-26

The lower left corner of the display, where the page type and number are usually displayed, can also display short operational messages to the user called "scratchpad messages". These messages are displayed for approximately five seconds, then this area returns to the page type and number. Figure 4-27 shows an example of a scratchpad message indicating a duplicate identifier. A complete listing of scratchpad messages is available in [Appendix C](#) of this Pilot's Guide.

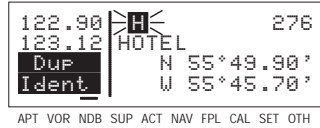


Figure 4-27

4.4. BASIC OPERATION OF PANEL CONTROLS

The KLX 135 controls are very easy to use. Most of the page selection and data entry is done with the knobs on the right side of the front panel and the cursor (CRSR) button immediately above them. The knobs on the left side and the flip-flop (⇄) button above them control the communication transceiver. There are four buttons across the bottom: MSG (Message), → (Direct To), CLR (Clear), and ENT (Enter). The operation of these four buttons will be described on the next few pages.

The cursor is an area of inverse video (light characters on a dark background) on the screen. Many pages allow you to add, delete, or change data on the screen by first pressing the CRSR button to turn the cursor function on and bring the cursor on the screen. The right knobs are then used to enter or change data. When the cursor is on the screen, the lower left corner of the screen will show **CRSR** in inverse video rather than the page name for that particular page (figure 4-28). The cursor is over **Present Posn**.

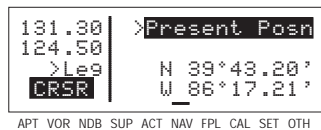


Figure 4-28

There are times when the cursor is flashing. Figure 4-29 shows an example of how "whiskers" are used in this Pilot's Guide to depict a flashing cursor (over **ATIS 125.15**) in addition, it shows an example of how "whiskers" around normal text is used to depict normal (non-inverse) characters flashing. The letters **Ent** are flashing but are not in inverse video.

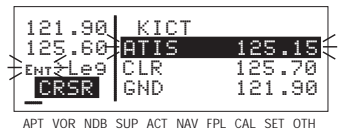


Figure 4-29

4.4.1. PAGE SELECTION

It is now time to learn to select a desired page.

NOTE: The cursor function is not used in selecting pages and the **CRSR** button should not be pressed at this time. If **CRSR** is annunciating in the lower left corner of the display, press the **CRSR** button to turn the cursor function off.

The right outer knob is rotated to select one of ten page types for the display. These ten page types are the following:

Chapter Name/ Page # Range	Page Type	Page Functions
APT 1-4	Airport	Directory of published airports
VOR 1-2	VOR	Directory of published VOR stations
NDB 1-2	NDB	Directory of published non-directional beacons (NDB)
SUP 0-3	Supplemental Wpt	Directory of user-defined waypoints
ACT 1-3	Active Waypoint	Information about the active waypoint
NAV 1-4	Navigation	Navigation data
FPL 0-9	Flight Plan	Active and stored flight plans
CAL 1-2	Calculator	Distance, bearing, time and fuel calculator
SET 1-5	Setup	Setting initial position and date/time, updating the data base, and selecting certain features
OTH 1-5	Other	Status reports, and deleting user wpts and remarks

Remember that the page type is displayed at the lower left corner of the screen. The first three letters of the page type are always used for annunciation on the screen, for example, **CAL** represents Calculator page. The page type is also annunciated by means of a bar on the display, which moves as you turn the right outer knob. All the page types are listed across the front panel directly under the display, and the bar will always be over one of them. For example, let's say you were on a NAV page

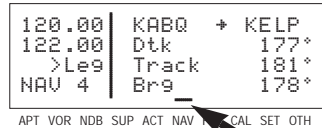


Figure 4-30

(figure 4-30) and you wanted to turn to a SET page. You would look at the list and see that the SET pages are three places to the right of the NAV pages. Therefore, turning the right outer knob three clicks clockwise will get you to the SET pages (figure 4-31). The annunciator bar and the page labels work kind of like a map to get you from one page type to another. The page type selection wraps around from Other (OTH) to Airport (APT); that is, the knob has no mechanical stops.

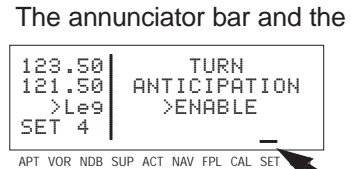


Figure 4-31

Once you have selected the desired page type using the right outer knob, you may select the page number by rotating the right inner knob. Let's use an example to make sure you understand. You are presently viewing the APT 2 page and you wish to view the NAV 3 page. Rotating the right outer knob 5 (five) clicks clockwise will display the NAV page that you last viewed—we'll say the NAV 2 page. Turning the right inner knob one click clockwise or three clicks counterclockwise will bring you to the NAV 3 page. Got it?

NOTE: *In this Pilot's Guide the right smaller knob is assumed to be in the "in" position unless it specifically states that he knob should be in the "out" position. Therefore, the words "rotate the right inner knob" mean to turn the right inner knob while the knob is in the "in" position.*

4.4.2. DATA ENTRY

Now that you've learned how to select the desired page, you're ready to learn the means of entering data. It is necessary to enter data, for example, in order to specify a waypoint of your choice to go Direct To. The general procedure for entering a waypoint identifier is described below and is shown in figures 4-32 through 4-40 for entering a waypoint (in this case, First Flight airport in North Carolina, identifier KFFA) on the Calculator (CAL) 1 page.

To enter a waypoint identifier:

1. If the cursor is not on the screen (figure 4-32), press **CRSR** to turn on the cursor function (figure 4-33).

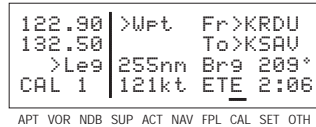


Figure 4-32

2. If required, rotate the right outer knob to position the cursor (figure 4-34).

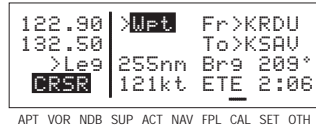


Figure 4-33

3. Rotate the right inner knob to select the first character of the waypoint identifier (figure 4-35).

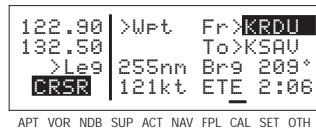


Figure 4-34

4. Turn the right outer knob one click clockwise to move the cursor to the second character position (figure 4-36).

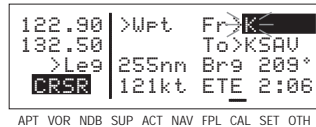


Figure 4-35

5. Rotate the right inner knob to select the second character (figure 4-37).

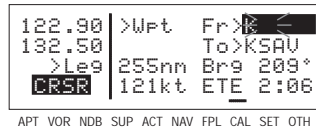


Figure 4-36

6. Use the right outer and inner knobs in this manner until the complete waypoint identifier is displayed (figure 4-38). Note that you may not have to enter the last characters of the identifier because each time you enter a character, the KLX 135 offers you the first identifier in the data base beginning with the characters you have entered.

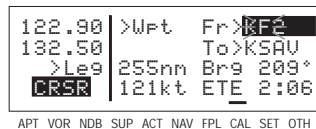


Figure 4-37

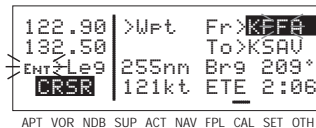


Figure 4-38

- If **Ent** is flashing on the left side of the screen, then press **ENT**. This will prompt the KLX 135 to display a waypoint page for the waypoint identifier you just entered (figure 4-39).



Figure 4-39

- Verify the waypoint information displayed, and then press **ENT** again to approve the waypoint page. The display will return to the page previously displayed (figure 4-40).

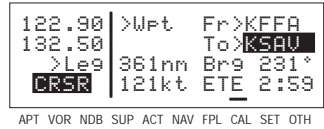


Figure 4-40

Often, you will find yourself entering airports that begin with the same character over and over again. In [section 2.3](#), you learned how the KLX 135 uses ICAO identifiers, which means that many U.S. airport identifiers begin with the letter K. Also, many airport identifiers in Europe begin with the letter E or the letter L. Especially when flying VFR, you will mostly want to enter airports as Direct To or Flight Plan waypoints. The KLX 135 has a great feature that will save you turns of the knob when you know that the first character will probably be a K, E, L, or other letter that is commonly used in your part of the world. You can set the default first waypoint identifier character on the SET 5 page.

To change the default first waypoint identifier character:

- Select the SET 5 page (figure 4-41) and turn on the cursor (**CRSR**) (figure 4-42).

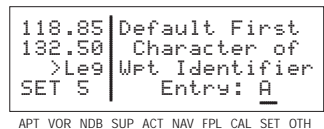


Figure 4-41

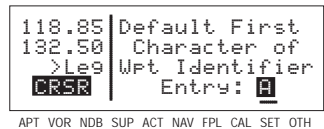


Figure 4-42

- Use the right inner knob to select the desired character (figure 4-43), such as a K in the U.S., a C in Canada, a P in Alaska, an E or an L in Europe, etc.

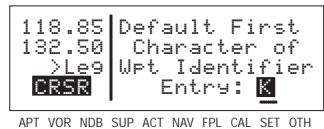


Figure 4-43

- Turn off the cursor. To try it out, proceed to the SET 1 page (initial position). Turn the cursor (CRSR) on (it will come on over the waypoint field). Try turning the right inner knob clockwise (figure 4-44). There's the character you just selected on the SET 5 page!

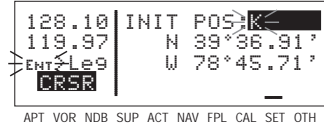


Figure 4-44

4.4.3. THE DUPLICATE WAYPOINT PAGE

There are some waypoints in the data base whose identifiers are not unique. That is, more than one waypoint has the same identifier. When a waypoint identifier has been entered which is not unique to a single waypoint, a Duplicate Waypoint page appears on the screen. The Duplicate Waypoint page is used to select which of the waypoints having the same identifier is actually desired. The waypoint identifier is displayed on the top left of the page. To the right of the identifier is the number of waypoints in the data base having the identifier. Below the identifier is a list of the waypoint types (APT, VOR, NDB, USR) and the associated countries which use the identifier.

To see an example of a Duplicate Waypoint page, try entering the identifier "D" as a Direct To waypoint or a Flight Plan Waypoint:

- Press **→**.
- Select the letter "D" as the waypoint identifier (figure 4-45). **D** is the full identifier of several waypoints in the KLX 135 data base.

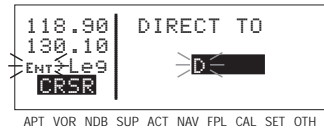


Figure 4-45

- Press **ENT**. The Duplicate Waypoint page will be displayed on the screen (figure 4-46). At the time of this writing, there were three waypoints in the North American data base having the identifier **D**. If there are more than four waypoints having the same identifier, only the first three are initially shown. The list includes an NDB in Canada, an NDB in Cuba, and an NDB in the U.S. The cursor will be over the first waypoint listed. They are listed with the waypoint closest to the aircraft's present position displayed first and the waypoint farthest

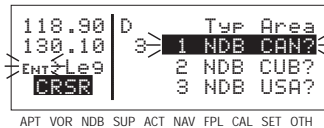


Figure 4-46

from the aircraft displayed last. To view the rest of the choices, rotate the right outer knob clockwise. Doing so will move the flashing cursor over waypoints two, three and then will cause the waypoint list to "scroll" so that the other waypoints in the list may be seen.

4. To select the desired waypoint, move the cursor over the appropriate choice (figure 4-47).
5. Press **ENT** and the display will change to the waypoint page for the selected waypoint (figure 4-48).
6. Press **ENT** again to approve the waypoint page.

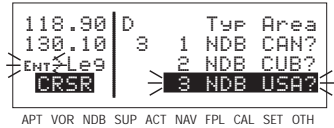


Figure 4-47

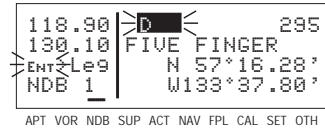


Figure 4-48

4.4.4. CYCLIC FIELDS

On many of the KLX 135 pages, there are *cyclic fields*, which are preceded by a carat (>). A cyclic field is one that you as the pilot can select from two or more options. For example, in figure 4-49, the field **>135°To** (magnetic bearing to Austin VOR) is a cyclic field. In this case, the second option is the magnetic radial from Austin VOR to present position.

To change a cyclic field:

1. Turn on the cursor by pressing the **CRSR** button (figure 4-50).
2. Using the right outer knob, move the cursor over the cyclic field you wish to change (figure 4-51).
3. Press the **CLR** button to change the cyclic field (figure 4-52). Notice that repeated **CLR** presses "cycle" you through the choices. In this case there are only two, so **CLR** works like a toggle switch.

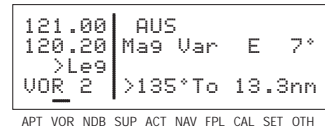


Figure 4-49

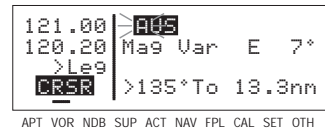


Figure 4-50



Figure 4-51



Figure 4-52

NOTE: The cyclic field which always appears on the left side of the display is the navigation mode selector/annunciator. In most cases, it will display **>Leg** indicating en route-leg mode (figure 4-52). The other choice is the en route-OBS mode, in which the magnetic selected course is displayed here (figure 4-53). You can move the cursor to this cyclic field by turning the cursor all the way counterclockwise. See section 5.3 for more details on navigation modes.

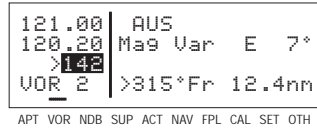


Figure 4-53

4.5. MESSAGE PAGE

Whenever the KLX 135 wants to get your attention, the message prompt (a large “M” on the left side of the screen, just below the COMM frequencies) begins flashing (figure 4-54). If you have a remote message annunciator in your aircraft, it will also begin flashing at that time. You should view the message at your earliest opportunity because the unit may be alerting you to some situation of immediate concern to its condition or to your flight. A description of each possible message is included in Appendix B of this Pilot’s Guide.



Figure 4-54

To view a message:

1. Press the **MSG** button. The MSG page will appear and show the new message (figure 4-55).

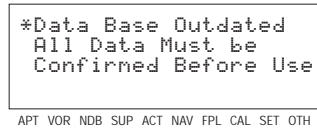


Figure 4-55

NOTE: Appendix B of this Pilot’s Guide contains a list of all the Message page messages and their meanings. It is possible that several messages are displayed at one time on the Message page. The newest message appears first and the rest in reverse chronological order.

2. After reading the message, press **MSG** again to return to the page previously in view. If all of the messages cannot be displayed on one Message page, repeated presses of **MSG** will show the other messages before returning to normal operation. If a message condition exists which requires a specific action by you, the message prompt will remain on but will not flash.

4.6. INITIALIZATION AND TIME TO FIRST FIX

Since the KLX 135 stores its position and other required parameters in memory when power to the unit is removed, it is seldom necessary to aid the unit in reaching a NAV ready condition. The time required from power on until the KLX 135 determines its present position and is therefore ready to navigate is called "time to first fix." The time to first fix is normally a few minutes or less. In order for the KLX 135 to reach a NAV ready condition, it is necessary to meet the following conditions:

1. The KLX 135's "almanac" data must be current. Almanac data is orbital information for all the satellites and is used for initial acquisition when the KLX 135 is first turned on. This data is stored in the KLX 135's non-volatile memory and is considered current for up to six months. Each satellite sends almanac data for all satellites. Since the KLX 135 routinely updates the almanac data during normal operation, the almanac data will become out of date only if the KLX 135 hasn't been used for the previous six months or longer. Collecting new almanac data takes place automatically if the data is more than six months old. The process of acquiring new almanac data is called a "Search The Sky" start-up. The Search The Sky process requires that the KLX 135 be turned on for a period of from 12.5 to 20 minutes and that at least one satellite be in view. The Self Test, Initialization, and Data Base pages should be approved. Almanac data is being collected as long as the Other 1 (OTH 1) page displays **SRCH** in the upper right corner. In addition, the message alert will flash indicating there is a message to be viewed. If you press the **MSG** button the message page will display a message stating:

***Search the Sky
Acquisition Started**

Press **MSG** again to return to the previous page. The message will remain active while the almanac data is being collected.

2. The aircraft must be located such that the GPS antenna has an unobstructed view of the sky so that required satellite signals are not being blocked. If possible, position the aircraft away from hangars or other obstructions.
3. The date and time displayed on the Initialization page or SET 2 page should be within 10 minutes of actual time. Date and time are seldom a practical concern because the KLX 135 contains a battery backed up calendar/clock. In addition, once a satellite is

being tracked, the KLX 135's system time is automatically updated to UTC (Zulu) time. However, if the time displayed on the Self Test page or the SET 2 page is in error by more than 10 minutes it is necessary to enter a correct time. See [section 4.2](#), "Turn-On And Self Test."

4. The aircraft's position should be within 60 nm of where the KLX 135 last had a valid position. If the distance is greater than 60 nm the KLX 135's position should be "initialized" on either the Initialization Page ([section 4.2](#)), or the SET 1 page. Since the KLX 135 stores its position when power is removed, it is usually not necessary to initialize the position when power is later reapplied. However, initialization may be required, for example, if the KLX 135 was not turned on for a flight or if it stopped navigating somewhere along the last flight due to a lack of adequate satellite coverage. If there is any doubt about whether or not to initialize, go ahead and do it! It's no big deal and it takes just a moment.

To initialize the position from the SET 1 page:

1. If the cursor is not on the screen (figure 4-56), press the **CRSR** button to bring it on the page over the **INIT POS** field (figure 4-57).

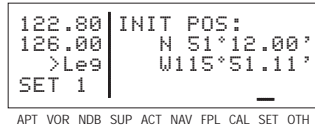


Figure 4-56

2. Using the right inner and outer knobs, enter the identifier for the airport where you are presently located or the identifier of a navaid or other airport which is close to your present position (figure 4-58). Any waypoint in the data base which is within 60 miles is acceptable, but the closer the better. Remember, if you are entering an airport identifier that is all letters (no numbers), then it will begin with a "K" prefix in the contiguous U.S., a "P" in Alaska (in some cases; in others, the prefix is not added), or a "C" in Canada. If there are numbers in the identifier then a prefix is not used. Outside the contiguous U.S., Alaska, and Canada, use the airport identifiers as they are charted.

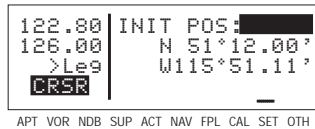


Figure 4-57

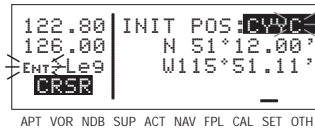


Figure 4-58

- Once you have entered the complete identifier, press **ENT**. The display will change to the waypoint page for the waypoint you entered (figure 4-59).



Figure 4-59

- If this is the waypoint you intended to enter, press **ENT** again. The display will change back to the SET 1 page.

NOTE: As an alternative, you can also enter the approximate latitude and longitude of your present position directly on the SET 1 page instead of entering a waypoint.

- With the right inner knob, position the cursor over **Ok?**, if it is not already there (figure 4-60).

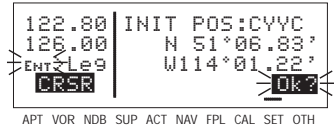


Figure 4-60

- Press **ENT** to approve the initial position. The cursor will automatically be removed from the screen.

NOTE: If the KLX 135 is in the Take-Home mode, you are allowed to enter the groundspeed (kt) and heading (°) fields in order to simulate flight (figure 4-61). They are not used for actual initialization in an aircraft. However, entering a ground speed will allow the KLX 135 to “fly” along the active flight plan (or to a direct to waypoint) starting from the initialization waypoint. A heading may be entered in the initial heading field while in the Take-Home mode if the one offered is not desired. See [section 5.5](#) for more details on the Take-Home mode.

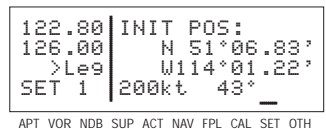


Figure 4-61

- Select the NAV 2 page. When the KLX 135 reaches the NAV ready status and is therefore able to navigate, the NAV 2 page will display the present position. Verify that the latitude and longitude or the waypoint, radial, and distance display of present position are correct.

4.7. SELECTING AND SCANNING WAYPOINTS

There are four types of waypoints: airports, VORs, NDBs, and user waypoints. Waypoints in the published data base fall into one of the first three types. You can create up to 250 user waypoints to supplement the waypoints in the database (see [section 5.2.1](#) to create a user waypoint).

There are three methods you may use to select a specific waypoint for viewing. You may enter the waypoint's identifier directly, you may scan through the waypoint identifiers in alphabetical order, or you may enter the waypoint's name. If the waypoint is an airport, you may also select it by entering the city where the airport is located.

4.7.1. SELECTING WAYPOINTS BY IDENTIFIER

The most direct way of selecting a specific waypoint is to simply enter the waypoint's identifier directly on the appropriate waypoint page type (APT, for example). Let's use Chicago O'Hare International Airport whose identifier is KORD as an example.

To select a waypoint by identifier from a waypoint page:

1. Use the right outer and inner knobs to select the Airport 1 (APT 1) page (figure 4-62). (Actually, the airport identifier can be entered on any of the three Airport pages but we'll use the APT 1 since it displays the airport name and city).



Figure 4-62

2. Turn on the cursor (CRSR) and make sure the right inner knob is pushed in. The cursor will appear over the first character of the airport identifier (figure 4-63).



Figure 4-63

3. Turn the right inner knob to select a "K" as the first character (figure 4-64). You may turn the knob either clockwise or counterclockwise, and the letters and numbers wrap around with a blank character separating the "9" and the "A".

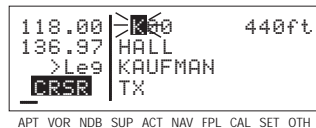


Figure 4-64

Notice that as you turn through letters, the KLX 135 automatically fills in the identifier of the first waypoint in alphanumeric order in the database which matches what you've entered so far (in this case, Hall Airport in Kaufman, Texas). Go ahead and experiment a little bit.

4. Use the right outer knob to move the cursor to the second character and select an "O" (figure 4-65).
5. Use the same process to select an "R" and then a "D" (figure 4-66). You are now viewing the APT 1 page for **KORD**.



Figure 4-65



Figure 4-66

The KLX 135 feature of filling in characters of the identifier can be a time saver! For a second example, let's select Bloomington VOR whose identifier is **BMI**.

More selecting a waypoint by identifier:

1. Make sure you have turned the cursor off from the previous example. With the right knobs, select the VOR 1 page (figure 4-67).
2. Turn the cursor (**CRSR**) on.
3. Change the first character to a "B" (figure 4-68).
4. Move the cursor to the second character and select "M" (figure 4-69). Eureka! When you entered the "M", the KLX 135 searched its data base for the first VOR identifier beginning with the letters "BM" and found **BMI**. Many times you will only have to enter two or three characters of the waypoint identifier and the KLX 135 will furnish the rest.
5. Turn off the cursor (**CRSR**).

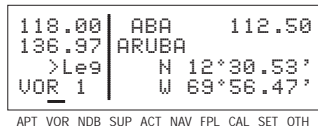


Figure 4-67

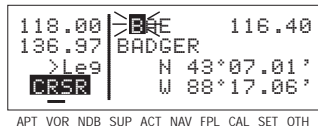


Figure 4-68

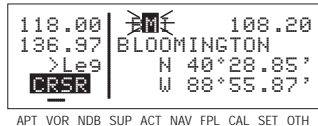


Figure 4-69

4.7.2. SELECTING WAYPOINTS BY SCANNING

You may also select waypoints by scanning through them. This may be done with the cursor either on or off.

To select a waypoint by scanning with the cursor off:

1. Select the page type for the waypoint you are looking for (APT, VOR, NDB, or SUP).
2. Pull the right inner knob to the “out” position.
3. Turn the right inner knob clockwise to scan through the waypoints in alphabetical order, or counterclockwise to scan in reverse alphabetical order. Remember that numbers are considered lower in order than letters. Thus, the airport identifier **KA2** comes before **KA AF**.

NOTE: The faster you turn the knob while scanning, the larger the step through the waypoints. This variable rate scanning allows you to get from one end of the list to the other very quickly. When the knob is turned slowly, you will go through the waypoints one at a time.

You may also want to scan waypoints with the cursor on. This is especially useful if you remember the first part of the identifier, or if you wanted to scan all airports that start with a **KL**, for example. Let's give it a try.

To select a waypoint by scanning with the cursor on:

1. Select the page type for the waypoint you are looking for (APT, VOR, NDB, or SUP). In this case, we want the APT 1 page.
2. Turn on the cursor (**CRSR**). It will appear over the first character of the waypoint identifier. Select a **K** with the right inner knob.
3. Move the cursor one place to the right and select an **L** (figure 4-70).
4. Move the cursor one place to the right and pull the right inner knob out. The last two characters of the waypoint identifier will be in reverse video (figure 4-71).
5. Use the right inner knob to leaf through all the data base airports whose identifiers begin with **KL**.

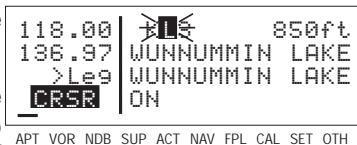


Figure 4-70

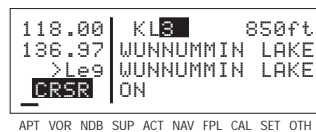


Figure 4-71

You will see **KL6**, Little Bear Lake Airport in Saskatchewan (figure 4-72), and **KLAS**, McCarran International in Las Vegas, Nevada among others.



Figure 4-72

4.7.3. “NEAREST” AND “COMPLETE” WAYPOINT SCAN LISTS

There are actually two waypoint scan lists for airports, VORs, and NDBs. These two lists are the “complete” list and the “nearest” list. The complete list contains all of the waypoints in the data base for a waypoint type (all the airports, for example). The nearest list consists of the nine nearest waypoints (of that type) to your present position. Therefore, if you are in the nearest airport list, it will contain the nine nearest airports relative to your location. There is no “nearest” list for supplemental waypoints (SUP).

The nearest list is positioned in front of the complete list. That is, you must scan backwards (turn the knob counterclockwise) through the complete list to reach the nearest list. You will know when you have reached the nearest list because the top middle portion of the waypoint page will flash the relative position of the waypoint to your position. “1” indicates nearest (figure 4-73) while “9” indicates the ninth nearest (figure 4-74). As you scan clockwise with the right inner knob “1, 2, 3, ..., 9”, the next scan position is the beginning of the complete list. The nearest list can only be reached by scanning backwards. It does not wrap around after the last waypoint in the complete list.

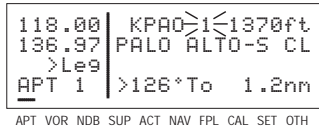


Figure 4-73

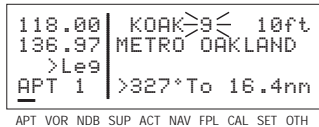


Figure 4-74

Waypoint pages displayed in the nearest list do not contain a latitude and longitude position as they do in the complete list. Instead, the bearing and distance to the waypoint (or the radial and distance from the waypoint) are displayed.

Once the nearest waypoint is being displayed, the other waypoint pages (for example, APT 2 and APT 3) for that airport are available for display by making sure the right inner knob is pushed in and then turning it to select the desired airport page.

4.7.3.1. Nearest Airports in an Emergency

In the event of an emergency, a special feature is provided to very quickly display the nearest airport to your present position and the rest of the nearest airport list.

To display the nearest airports in an emergency:

1. Press **MSG**, then press **ENT**.
2. The waypoint page for the nearest airport is now displayed on the screen. The right inner knob (in the “out” position), may now be used in the normal manner to scan the other nearest airports. With the right inner knob in the “in” position, you may view all three airport pages for a specific airport. **Figures 4-73 and 4-74** show examples of nearest APT 1 pages.

4.7.3.2. Continuous Display of Nearest Airport

When the nearest airport page is initially displayed, “1” is displayed in the upper right hand corner of the page to designate this airport as the nearest airport. However, if you continue to fly along your flight plan with this page selected, the same airport will be displayed and its position in the nearest airport list will change from **1** to **2, 3, 4 ... 9** until finally it won't be in the nearest airport list at all. The reason for this is that in the event of an actual emergency once you have determined which airport you are heading for, you don't want the nearest airport list to update while you are maneuvering or looking up data on the other airport pages for that airport.

There may be times, however, when you're flying over “unfriendly” terrain when you wish to always have the nearest airport displayed on the screen.

To display the nearest airport continuously:

1. Display the nearest airport page by pressing **MSG** followed by pressing **ENT**.
2. Turn on the cursor (**CRSR**).
3. Rotate the right outer knob clockwise to position the cursor over “1” (figure 4-75). As long as the cursor is left in this position, this page will update so that the nearest airport is always shown as the flight progresses.

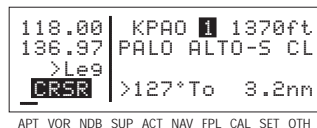


Figure 4-75

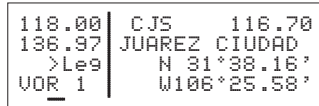
4.7.4. SELECTING WAYPOINTS BY NAME OR CITY

When you know the identifier of the desired waypoint you will use one of the two methods just described to select it. However, what if you know the name but you don't know the identifier of your desired waypoint? You're in luck because the KLX 135 will allow you to enter the first few characters of the name to help you find it in the data base. We will use a couple of examples to illustrate how this is done. For VORs and NDBs, you may use the navaid name. For airports, you may use the airport name or the city name (where the airport is located).

In this first example we want to view the information in the KLX 135 data base for Napoleon VOR (located just east of Kansas City) but we don't remember the identifier for it.

To select a VOR or NDB by navaid name:

1. With the cursor off, use the right knob to select the VOR 1 page (figure 4-76). The VOR waypoint in view is not important.
2. Press **CRSR** and then make sure the right inner knob is pushed to the "in" position.
3. With the right outer knob, move the cursor over the first character in the VOR name which is being displayed (figure 4-77).
4. Change this first character to an "N" in this case (figure 4-78).
5. Move the cursor one space to the right and select the second character, "A" (figure 4-79).
6. Select the third character, "P" (figure 4-80). Up pops Napoleon and its identifier, ANX!
7. Turn off the cursor (**CRSR**) so you can view other pages.



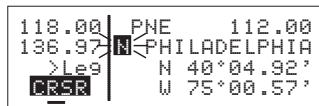
APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-76



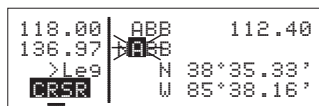
APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-77



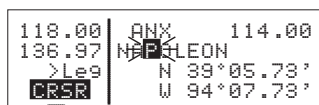
APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-78



APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-79



APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-80

Basic GPS Operation

We will now use another example to show how we may enter a few characters and then scan through all the waypoints in the data base beginning with those characters. Let's use this method to find La Guardia Airport in New York City.

To select an airport by scanning the airport name:

1. With the cursor off and the right inner knob in the "in" position, select the APT (Airport) 1 page. The airport displayed at this time is not important.
2. Turn on the cursor (**CRSR**).
3. Move the cursor over the first character in the airport name (figure 4-81).
4. Change the first character to an "L".
5. Move the cursor one place to the right, and select an "A" (figure 4-82).
6. Now, move the cursor one place to the right and pull the right inner knob out. The rest of the airport name field will appear in inverse video (figure 4-83).
7. Turn the right inner knob clockwise, scanning through La Crosse Municipal, La Grande/Union airport, and several others. Eventually, you will arrive at "LA GUARDIA" (figure 4-84). By pushing the right inner knob in and turning it, you can leaf through the remainder of the pages for La Guardia.

```
118.00 | KPAE 610ft
136.97 | SKOHOMISH CO
>Leg  EVERETT
CRSR  | WA
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 4-81

```
118.00 | MGGT 4950ft
136.97 | LA AURORA INTL
>Leg  GUATEMALA CITY
CRSR  | GTM
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 4-82

```
118.00 | MGGT 4950ft
136.97 | LA AURORA INTL
>Leg  GUATEMALA CITY
CRSR  | GTM
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 4-83

```
118.00 | KLGA 20ft
136.97 | LA GUARDIA
>Leg  NEW YORK
CRSR  | NY
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```



Figure 4-84

NOTE: This same method may be used with the name of the city where the airport is located.

There are a few changes made to names in order to accommodate the KLX 135 display and to make the names easier to find.

1. Names which are too long to fit on the display are abbreviated. The first six characters are usually exactly correct, but the following are exceptions:
 - North, Northern, East, Eastern, etc.—uses N, E
 - Southeast, Northwest, etc.—uses SE, NW
 - Point—uses PT
 - Port—uses PT
 - Fort—uses FT
 - Saint—uses ST
 - General—Deleted, or uses GEN
 - Person's name—uses initials for other than last name unless very well known (Will Rogers World airport)
 - Delete "City of" (City of Colorado Springs Municipal)
 - Delete "Greater" (Greater Buffalo Int'l)
 - Delete "The" (The Hartsfield Atlanta Int'l)
2. Unless the first word is greater than eight characters, it is usually not abbreviated.
3. Delete most punctuation such as periods and apostrophes.
4. Abbreviations for International are INTL, INT, and IN.
5. Abbreviations for Regional are REGL and REG.

4.8. DIRECT TO OPERATION

The  button is used to initiate Direct To operation (navigation from your present position direct to your destination). When  is pressed, the Direct To page will be displayed with a flashing cursor over a waypoint identifier (figure 4-85). The waypoint identifier which appears on the Direct To page is chosen by the KLX 135 according to the following rules:

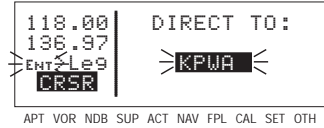





Figure 4-85

1. If the Flight Plan 0 (FPL 0) page is displayed on the screen and the cursor is over one of the waypoint identifiers in FPL 0 when  is pressed, then that waypoint identifier will appear on the DIR page. You will appreciate this feature when you learn to use flight plans in [section 4.10](#).

OR . . .

2. If there is any waypoint page (APT, VOR, NDB, SUP, or ACT page) in view when  is pressed, then the DIR page will contain the identifier for the waypoint just viewed.

If neither condition above is occurring, then:

3. When  is pressed, the waypoint identifier for the current active waypoint will be displayed on the DIR page.

If there is no active waypoint when  is pressed, then:

4. The Direct To page displays blanks in the waypoint identifier field. In order for there not to be an active waypoint, there is no Direct To waypoint and there are no waypoints in Flight Plan 0.

Now that you know the ground rules, let's go ahead and try some practical examples. First, let's say we wanted to fly directly to Wexford County Airport in Cadillac, Michigan. Its ICAO identifier is KCAD.

4.8.1. INITIATING A DIRECT TO

To fly Direct To a waypoint (procedure 1):


1. Press . The Direct To page is displayed (figure 4-86). The cursor will already be on. A



Figure 4-86

waypoint identifier may or may not be displayed, it doesn't matter at this point.

2. Rotate the right inner knob to select the first character of the desired waypoint's identifier, in this case, a "K" (figure 4-87). Remember to enter the "K", "C", or "P" prefix for certain airports in North America, if required (see [section 2.3](#), "ICAO Identifiers").

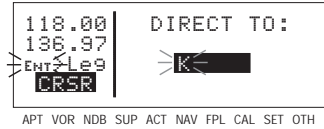


Figure 4-87

3. Turn the right outer knob one click clockwise to move the flashing portion of the cursor over the second character position (figure 4-88).

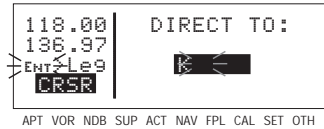


Figure 4-88

4. Rotate the right inner knob to select the second character of the identifier (figure 4-89).

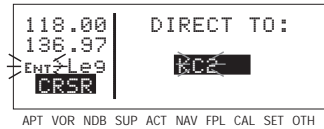


Figure 4-89

5. Use right outer and inner knobs as in the previous steps until the desired identifier is completely displayed (figure 4-90).

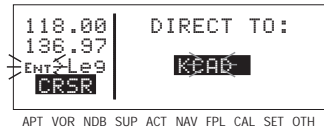


Figure 4-90

6. Press **ENT** to display the waypoint page for the selected waypoint (figure 4-91).

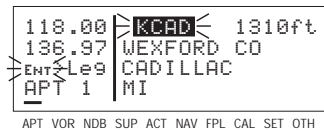


Figure 4-91

7. Press **ENT** again to approve the displayed waypoint page. The screen will change to the NAV 1 page, and the selected waypoint will now be the active Direct To waypoint (figure 4-92).

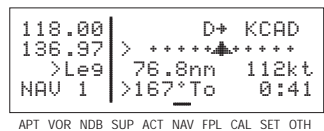


Figure 4-92

To fly Direct To a waypoint (procedure 2):

1. Select the desired waypoint page (APT, VOR, NDB, or SUP) on the screen (figure 4-93) using one of the three procedures explained in [section 4.8](#).

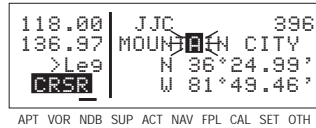


Figure 4-93

2. Press **[▶]**. The Direct To page is displayed and it contains the desired waypoint identifier (figure 4-94).
3. Press **[ENT]**. The display will revert to the NAV 1 page with the selected waypoint as the Direct To waypoint.

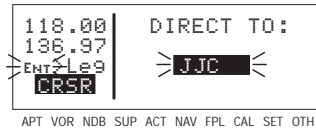


Figure 4-94

If you get off course and wish to recenter the left/right deviation bar (D-Bar) to proceed to the same waypoint, use the following procedure:

To recenter the D-Bar by going direct to the active waypoint:

1. Select a non-waypoint page (**NAV**, **FPL**, **CAL**, **SET**, or **OTH**) on the screen.
2. Press **[▶]**. The Direct To page is displayed on the left, containing the active waypoint identifier.
3. Press **[ENT]**.

4.8.2. CANCELING A DIRECT TO

To cancel Direct To operation:

The primary reason for wanting to cancel Direct To operation is to return to flight plan operation which is described later in [section 4.10.4](#) "Combining Direct To and Flight Plan Operation".

1. Press **[▶]**.
2. Press **[CLR]** to blank out the waypoint identifier field (figure 4-95).
3. Press **[ENT]**.

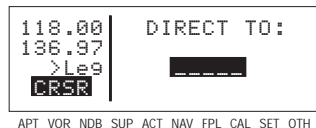


Figure 4-95

4.8.3. WAYPOINT ALERTING FOR DIRECT TO OPERATION

Approximately 36 seconds prior to reaching a Direct To waypoint, the arrow preceding the waypoint identifier on the waypoint page for the active waypoint will begin flashing. This arrow will also be flashing on any NAV or FPL page displaying the active waypoint identifier. This is called "waypoint alerting". If an external waypoint alert annunciator is mounted in the aircraft, this annunciator will begin flashing at the same time.

4.9. CREATING AND MODIFYING FLIGHT PLANS

The following rules and considerations apply to KLX 135 flight plans:

- The KLX 135 is capable of storing in its memory nine flight plans plus an active flight plan.
- Each of the flight plans may contain up to 20 waypoints. The waypoints may consist of any combination of published waypoints from the data base or user created waypoints.
- The flight plans are numbered 0 through 9 (FPL 0, FPL 1, FPL 2, . . . , FPL 9).
- The active flight plan is **always** FPL 0. The standard procedure is to create a flight plan in one of the flight plans numbered as FPL 1, FPL 2, etc. When one of these numbered flight plans is activated, it becomes FPL 0, the active flight plan. This Pilot's guide will refer to FPL 0 as the "active flight plan" and FPL 1 through FPL 9 as the "numbered flight plans." If desired, a flight plan can be created directly in the active flight plan. This avoids creating the flight plan in a numbered flight plan and then having to activate it. The disadvantage is that if a numbered flight plan is subsequently made active, the one programmed directly into FPL 0 will be lost.
- Modifications may be made to FPL 0 without affecting the way it is stored as a numbered flight plan.
- Unless Direct To operation is being used, the active flight plan (FPL 0) must contain at least two waypoints. Otherwise, the KLX 135 navigation system will be flagged.

4.9.1. CREATING A FLIGHT PLAN

A flight plan for a flight from Lakefront airport in New Orleans, LA. to St. Petersburg/Clearwater, FL. International airport will be used as an example of how to create a flight plan. The waypoints making up the flight plan are: **KNEW** (Lakefront airport), **GPT** (Gulfport VOR), **SJI** (Semmes VOR), **CEW** (Crestview VOR), **MAI** (Marianna VOR), **TLH** (Tallahassee VOR), **CTY** (Cross City VOR), and **KPIE** (St. Petersburg/Clearwater International airport).

To create a flight plan:

1. Select the flight plan (FPL) pages with the right outer knob.

2. Select a flight plan page (preferably other than FPL 0) which does not contain a flight plan (figure 4-96). If all of the flight plan pages contain flight plans, refer to [section 4.9.6](#), "Deleting Flight Plans".

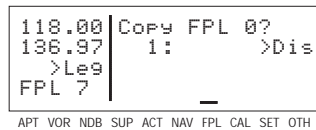


Figure 4-96

3. Turn on the cursor (**CRSR**).

NOTE: The KLX 135 flight plan operation is designed so that the first waypoint in the flight plan should always be the departure point. Remember to enter the **K**, **P**, or **C** prefix for certain airports in the United States, Alaska (some, but not all cases), or Canada, respectively. See [section 2.3](#), "ICAO Identifiers".

4. Use the right inner knob to select the first character of the departure waypoint identifier (figure 4-97). If you have set the default first waypoint character to **K** on the SET 5 page, you will just need one turn clockwise (see [section 4.4.2](#), "Data Entry")

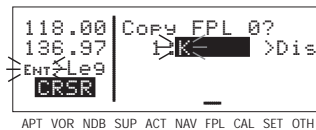


Figure 4-97

5. Turn the right outer knob to move the flashing part of the cursor over the second character, then select the desired character.

6. Use the above procedure to select the entire identifier for the first waypoint (figure 4-98).



Figure 4-98

- Press **[ENT]**. A waypoint page for the identifier just entered will be displayed on the screen (figure 4-99). If a mistake was made and the wrong waypoint identifier was entered, press **[CLR]** and begin again. If no mistake was made but the waypoint identifier just entered isn't in the data base, a page allowing creation of a user defined waypoint will appear on the screen. Refer to [section 5.2.1](#) for instructions on how to create a user-defined waypoint.

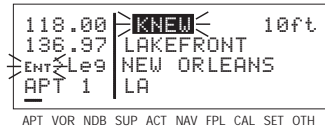


Figure 4-99

- Press **[ENT]** again to approve the waypoint page being displayed. The cursor will move automatically to the second waypoint position (figure 4-100).

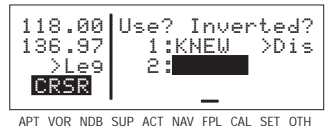


Figure 4-100

- Use the same procedure to enter the rest of the waypoints in the flight plan (figure 4-101). If the flight plan consists of three or more waypoints, the waypoints will automatically scroll as necessary to allow entry of the next waypoint.

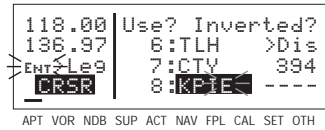


Figure 4-101

- When all of the waypoints have been entered in the flight plan, the right outer knob may be rotated to move the cursor up and down and manually "scroll" through the waypoints making up this flight plan. This is useful if the flight plan contains four or more waypoints since not all of the waypoints can be displayed at one time. When the right outer knob is rotated counterclockwise, the cursor may be positioned over **Use?**. If there are more than three waypoints in the flight plan, the first two waypoints will then be displayed followed by the last waypoint in the flight plan. Rotate the right outer knob to move the cursor and manually scroll to see the missing intermediate waypoints.
- Turn off the cursor (**[CRSR]**). Additional flight plans may now be created in the same manner.

4.9.2. VIEWING DISTANCE AND DESIRED TRACK BETWEEN STORED FLIGHT PLAN WAYPOINTS

The stored flight plan (FPL 1-9) pages have a field to the right of each waypoint in the flight plan. This field may be used to display the cumulative distance (**Dis**) to each waypoint or the magnetic desired track (**Dtk**) from the previous waypoint.

If you have more than three waypoints in the stored flight plan, you may wish to view flight data for waypoints which are not displayed on the screen. If this is the case, turn on the cursor (**CRSR**) and use the right outer knob to scroll down the flight plan until the waypoint of interest is on the screen.

This display will default to the distance presentation at power-on. The area in the upper right hand corner of the screen is a cyclic field.

To cycle between distance and desired track display on a numbered flight plan page:

1. Turn on the cursor (**CRSR**); it will come up over the cyclic field, which in this case is displaying distance (**Dis**) in nautical miles (figure 4-102).
2. Press **CLR**. The cyclic field will change to magnetic desired track (**Dtk**) (figure 4-103). An additional **CLR** press cycles back to **Dis**.

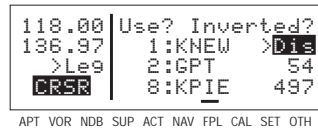


Figure 4-102

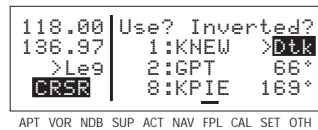


Figure 4-103

4.9.3. ACTIVATING A NUMBERED FLIGHT PLAN

To activate one of the previously created numbered flight plans:

1. Use the right outer and inner knobs to select the desired flight plan page (figure 4-104).
2. Press **CRSR** to turn on the cursor. It will appear over **Use?** (figure 4-105). If you haven't left the numbered flight plan since creating this flight plan, rotate the outer knob counterclockwise to position the cursor over **Use?**

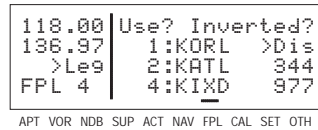


Figure 4-104

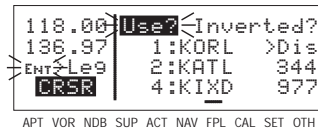


Figure 4-105

- Press **ENT** to activate the flight plan in the order shown (figure 4-106). To activate the flight plan in inverse order (first waypoint becomes last and last waypoint becomes first), rotate the outer knob one step clockwise to position the cursor over **Use? Inverted?** before pressing **ENT** (figure 4-107).

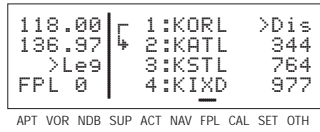


Figure 4-106

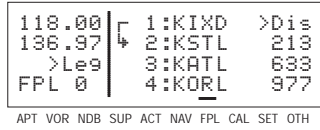


Figure 4-107

- The selected flight plan is now displayed as FPL 0, the active flight plan. Any changes made to FPL 0 will not affect how this flight plan is stored as the numbered flight plan.

4.9.4. ADDING A WAYPOINT TO A FLIGHT PLAN

A waypoint may be added to any flight plan containing fewer than 20 waypoints

To add a waypoint to a flight plan:

- Turn on the cursor with the **CRSR** button.
- With the outer knob, position the cursor over the waypoint identifier which you desire to follow the waypoint being added. Another way to think of this is to position the cursor over the location in the flight plan you wish the new waypoint to be added. For example, if **SJI** is presently the second waypoint in the flight plan and you wish to insert **GPT** in the number 2 position in front of **SJI**, move the cursor over **SJI** (figure 4-108).

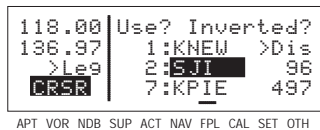


Figure 4-108

- Use the inner knob to enter the first character of the waypoint being inserted. As you begin to turn the knob, the existing waypoint in this position automatically jumps down to the next position. In this case, **SJI** automatically moves to waypoint 3 and **KPIE** changes to waypoint 8 (figure 4-109).

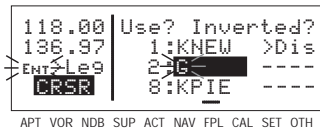


Figure 4-109

- Complete the waypoint entry operation (figure 4-110).

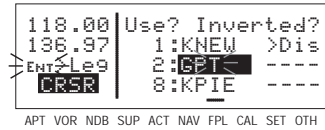


Figure 4-110

- Press **ENT** to display the waypoint page on the right side for the identifier just entered (figure 4-111).

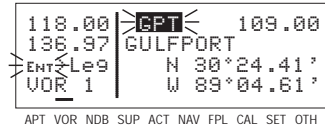


Figure 4-111

- Press **ENT** again to approve the waypoint page (figure 4-112).

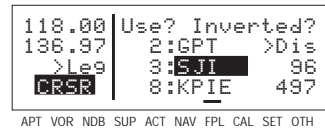


Figure 4-112

- Turn off the cursor (**CRSR**).

4.9.5. DELETING A WAYPOINT FROM A FLIGHT PLAN

To delete a waypoint from a flight plan:

- Press **CRSR** to enable the cursor if it is not on already.
- Move the cursor over the waypoint you wish to delete (figure 4-113).

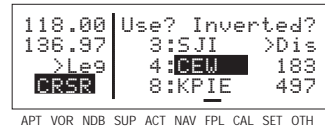


Figure 4-113

- Press **CLR**. The letters **Del** (delete) will appear to the left of the identifier and a question mark will appear to the right of the identifier (figure 4-114). If a mistake was made and you do not wish to delete this waypoint, press **CLR**.

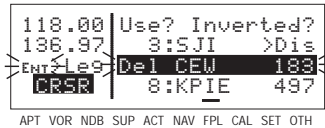


Figure 4-114

- Press **ENT** and the waypoint will be deleted from the flight plan. The other waypoints in the flight plan will be correctly repositioned (figure 4-115).

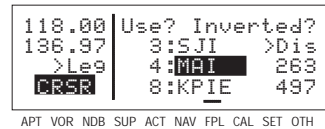


Figure 4-115

- Turn off the cursor (**CRSR**).

4.9.6. DELETING FLIGHT PLANS

To delete a flight plan which is no longer required:

1. Display the flight plan (FPL 0, FPL 1, . . . , or FPL 9) which is to be cleared (figure 4-116).
2. Make sure that the cursor is turned off, and use the **CRSR** button if it is not.
3. Press **CLR**. The words **Delete FPL?** will appear at the top of the page (figure 4-117). If a mistake was made and you do not wish to clear this flight plan, press **CLR** again.
4. Press **ENT** to clear the flight plan (figure 4-118).

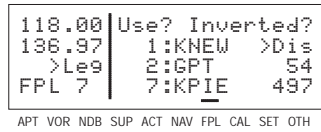


Figure 4-116

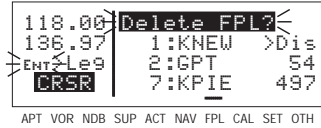


Figure 4-117

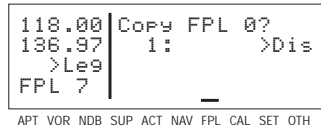


Figure 4-118

4.9.7. STORING FPL 0 AS A NUMBERED FLIGHT PLAN

The active flight plan may be loaded into a numbered flight plan so that it can be recalled for later use. This may be desirable, for example, if the active flight plan was originally created on the FPL 0 page and not as a numbered flight plan.

To store the active flight plan as a numbered flight plan:

1. Select a numbered flight plan page which does not contain any waypoints (figure 4-118). If none exist, use the procedure described in section 4.9.6, "Deleting Flight Plans," to clear a flight plan which is no longer required.
2. Turn on the cursor (**CRSR**). It will appear over the blank first waypoint position (figure 4-119).
3. Rotate the right outer knob counterclockwise to position the cursor over **Copy FPL 0?** (figure 4-120).

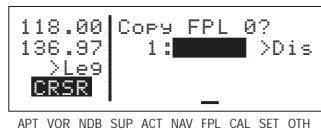


Figure 4-119

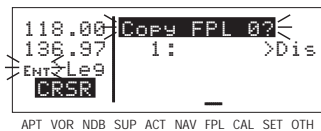


Figure 4-120

- Press **ENT** to load the active flight plan into this numbered flight plan (figure 4-121).

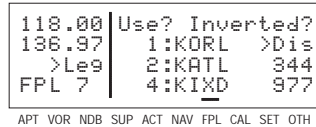


Figure 4-121

4.10. OPERATING FROM THE ACTIVE FLIGHT PLAN

4.10.1. GENERAL PROCEDURES

Everything you have learned in this Pilot's Guide thus far is applicable to using the KLX 135 for flight plan operation. The following rules and considerations apply for flight plan operation while the KLX 135 is in the En route-Leg mode:

- Always verify that you are viewing the active flight plan page (FPL 0) and not one of the other numbered flight plan pages.
- The active leg of the flight plan is designated with a **↵** symbol. A leg is defined as the course line between a pair of waypoint (a "from" waypoint and a "to" waypoint). The head of the arrow is positioned to the left of and points to the active "to" waypoint. In figure 4-122, SLC (Salt Lake City VOR) is the "to" waypoint. The tail of the **↵** symbol is positioned to the left of the "from" waypoint. KPVV (Provo Municipal) is the "from" waypoint in figure 4-122. The **↵** symbol is not displayed unless the KLX 135 is actually receiving GPS signals suitable for navigation. (**Note:** If the unit is in the take-home mode, it has been "tricked" into thinking it is receiving signals and therefore the **↵** symbol can be displayed).

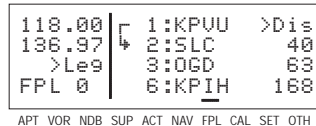


Figure 4-122

Also, the **↵** symbol will not be displayed if Direct To navigation is occurring and the Direct To waypoint is not in FPL 0. If in doubt as to whether or not Direct To operation is occurring, view the NAV 1 or NAV 4 page. If the top line shows the **D→** symbol (figure 4-123) instead of a "from" waypoint (figure 4-124), then Direct To navigation is

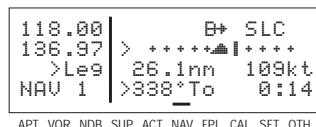


Figure 4-123

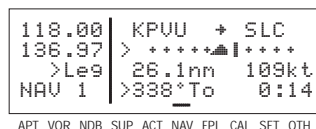


Figure 4-124

occurring. If it is desired to cancel the Direct To operation and operate from the active flight plan, press **ENT**, **CLR**, and then **ENT**.

- As flight plan waypoints are reached, the active leg symbol automatically shifts to the next leg.
- If the flight plan contains more waypoints than can be displayed on the screen at one time, the page will automatically scroll as progress is made along the flight plan so that the active leg is always displayed (figure 4-125).

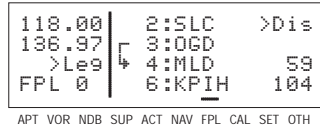


Figure 4-125

- The last waypoint in the flight plan is always displayed at the bottom of the FPL 0 page, even if all of the waypoints in the flight plan can't be displayed on the page at one time. To view intermediate waypoints, turn the cursor on and use the right outer knob to manually scroll through all of the waypoints, as desired. If scrolling is performed all the way to the end of the flight plan, a blank waypoint position will exist so that a waypoint may be added to the end of the flight plan (figure 4-126).

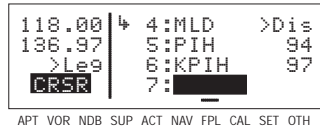


Figure 4-126

4.10.2. TURN ANTICIPATION AND WAYPOINT ALERTING

Prior to reaching a waypoint in the active flight plan, the KLX 135 will provide navigation along a curved path segment to ensure a smooth transition between two adjacent legs in the flight plan. That is, the CDI or HSI left/right deviation will be referenced to the dashed line in figure 4-127. This feature is called turn anticipation. The transition course is based upon the aircraft's actual groundspeed and the amount of course angle change between the two legs. The KLX 135 automatically sequences to the next leg after passing the midpoint in the transition segment.

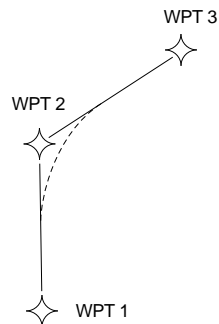


Figure 4-127

Approximately 20 seconds prior to the beginning of turn anticipation, the arrow preceding the active waypoint identifier will begin flashing on the FPL 0 page and on any Navigation page or waypoint page displaying the active waypoint identifier (figures 4-128 and 4-129). This is called “waypoint alerting”. If an external waypoint alert annunciator is mounted in the aircraft, this annunciator will begin flashing at the same time.

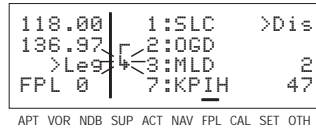


Figure 4-128

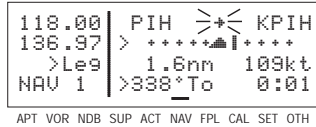


Figure 4-129

To utilize the turn anticipation feature, start the turn transition to the next leg in the flight plan at the very beginning of turn anticipation. This occurs when the external waypoint alert annunciator stops flashing and goes on steady. At this time, the KLX 135 will notify you with a message on the Message page of the new desired track to select on your HSI or CDI.

Adj Nav Ind Crs to 123°

A message will not be given if the change in desired track (course change) is less than 5°.

The desired track (**Dtk**) displayed on the NAV 4 page also changes to the value for the next leg at the beginning of turn anticipation. Turn anticipation becomes inactive when transition to the next leg has been made.

If desired, turn anticipation may be disabled (or enabled) on the Setup (**SET**) 4 page by pressing the **CRSR** button and then the **CLR** button to toggle back and forth between **ENABLE** (figure 4-130) and **DISABLE** (figure 4-131). If turn anticipation is disabled, navigation is provided all the way to the waypoint, and waypoint alerting occurs approximately 36 seconds prior to actually reaching the waypoint.

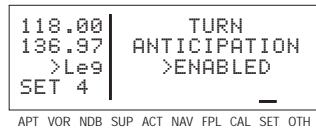


Figure 4-130

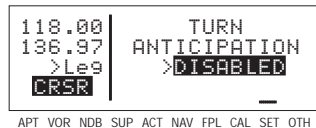


Figure 4-131

4.10.3. VIEWING THE WAYPOINT PAGES FOR THE ACTIVE FLIGHT PLAN WAYPOINTS

The waypoint pages for each of the waypoints in the active flight plan may be easily displayed by selecting the Active (ACT) Waypoint page type. When the ACT page type is first selected, the waypoint page for the active waypoint will be displayed (figure 4-132). The location of the waypoint in the flight plan (waypoint 1, waypoint 2, etc.) is annunciated with a number to the left of the identifier. In addition, an arrow to the left of the waypoint number designates the active waypoint. If there is a letter to the far right of the identifier, it designates the type of waypoint: **A** = airport, **U** = user-defined waypoint. If the waypoint is a VOR or an NDB, the navaid frequency is displayed in this area (figure 4-133).

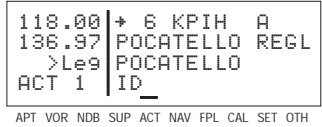


Figure 4-132

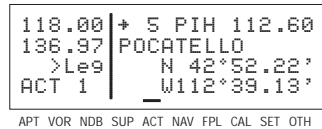


Figure 4-133

To view the waypoints in the flight plan that are not the active waypoint:

1. Pull the right inner knob to the “out” position and turn it to view each of the waypoints in the order they are contained in the flight plan (figure 4-134).
2. Once the desired waypoint is found, the right inner knob may be pushed back to the “in” position and rotated to display any of the other waypoint pages (figure 4-135).
3. Pulling the knob back out will allow further scanning of the waypoint pages in the active flight plan.

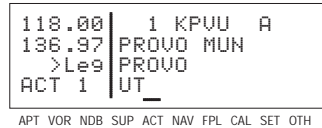


Figure 4-134

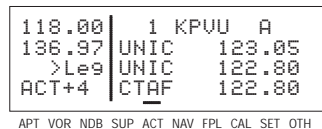


Figure 4-135

4.10.4. COMBINING DIRECT TO AND FLIGHT PLAN OPERATION

It is very common when using flight plan operation to use the Direct To function to proceed directly to a waypoint which exists in the active flight plan. For example, after takeoff on an IFR flight plan, it is

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common to receive vectors in the terminal area and then be given a clearance direct to the first point in the flight plan that was filed. The KLX 135, as an advisory navigation source, makes this kind of operation very easy to accomplish. Whenever you do a Direct To operation to a waypoint which is in the active flight plan (FPL 0), the system will provide navigation to the waypoint and then automatically resume navigation along the flight plan when the Direct To waypoint is reached. Waypoints which exist prior to the Direct To waypoint in the active flight plan are bypassed. Of course, the active flight plan will never be resumed if the Direct To operation is to a waypoint which is not in the active flight plan.

Any of the several methods previously described for initiating Direct To operation may be used, although the one below is the easiest for this application.

To fly direct to a waypoint in the active flight plan (FPL 0):

1. Select the FPL 0 page.
2. Turn on the cursor (**CRSR**) and use the left outer knob to position the cursor over the desired waypoint (figure 4-136).
3. Press **▶**. The display will change to the Direct To Page (figure 4-137), with the identifier of the selected waypoint.
4. Press **ENT** to approve the Direct To. The NAV 1 page will be displayed (figure 4-138) reflecting the new active waypoint.
5. If you now turn back to the FPL 0 page, you will see that the active waypoint is now preceded by an arrow only, instead of the ∇ symbol (figure 4-139). This is because there is no "from" waypoint in the flight plan.

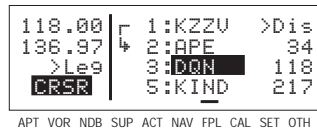


Figure 4-136



Figure 4-137

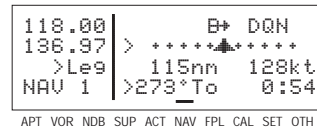


Figure 4-138

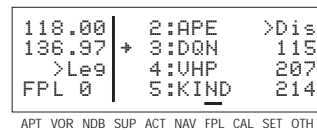


Figure 4-139

If it is desired to cancel the Direct To operation prior to reaching the Direct To waypoint in order to proceed along the flight plan leg, press **▶**, then press **CLR**, then **ENT**.

4.10.5. VIEWING DISTANCE, ETE, ETA, OR DESIRED TRACK TO FLIGHT PLAN WAYPOINTS

The active flight plan (FPL 0) page has a data field to the right of each waypoint in the flight plan. This field may be used to display the cumulative distance (**Dis**) from the present position to each waypoint, the estimated time en route (**ETE**), the estimated time of arrival (ETA, for which the time zone abbreviation is displayed), or the magnetic desired track (**Dtk**) between each waypoint.

If you have more than four waypoints in FPL 0, you may wish to view flight data for waypoints which are not displayed on the screen. If this is the case, turn on the cursor (**CRSR**) and use the right outer knob to scroll down the flight plan until the waypoint of interest is on the screen.

This display will default to the distance presentation at power-on (figure 4-139). The area in the upper right hand corner of the screen is a cyclic field, which means that . . .

To cycle between distance, ETE, ETA, and desired track on the FPL 0 page:

1. Turn on the cursor (**CRSR**); it will come up over the cyclic field, which in this case is displaying distance (**Dis**) in nautical miles (figure 4-140).

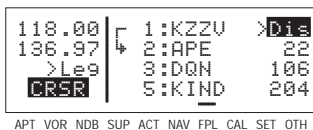


Figure 4-140

2. Press **CLR**. Subsequent presses of the **CLR** button will cycle through **ETE** in hours:minutes (figure 4-141), **ETA** in terms of the system time zone (figure 4-142), magnetic **Dtk** (figure 4-143), then back to **Dis**.

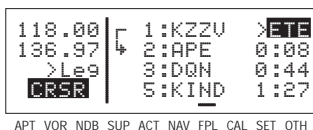


Figure 4-141

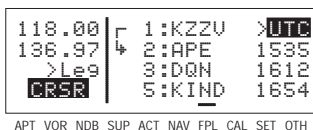


Figure 4-142

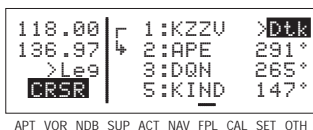


Figure 4-143

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NOTE: When the cursor is over the cyclic field and it is displaying the ETA time zone, turning the right inner knob changes the system time zone (figure 4-144).

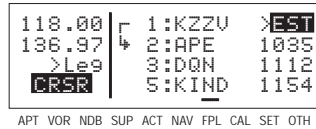


Figure 4-144

NOTE: When the KLX 135 is in OBS mode, the FPL 0 page will present OBS selected course (OBS) as an option instead of magnetic desired track (Dtk). The selected course will be displayed to the right of the active waypoint, and the OBS fields for all other waypoints will be dashed (figure 4-145).

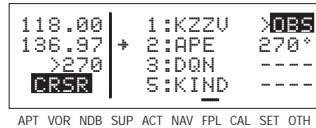


Figure 4-145

4.11. NAVIGATION PAGES

As you would expect, the NAV (navigation) pages contain information relating specifically to the KLX 135's navigation capabilities. The KLX 135 has four NAV pages. The procedure for selecting specific pages, including the NAV pages, was described in section 4.4.1, "Page Selection".

4.11.1. THE NAVIGATION 1 (NAV 1) PAGE

The NAV 1 page is the primary navigation display, and is shown in figure 4-146. In normal flight, you will probably want to view this page more often than any other. A NAV 1 page displays the following information:

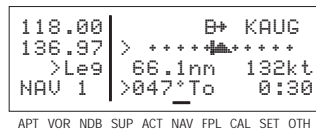


Figure 4-146

Line 1: The active navigation leg. For Direct To operation this consists of the Direct To symbol, **D→**, followed by the active Direct To waypoint identifier (figure 4-146). For the leg of a flight plan this consists of the "from" waypoint identifier and the active "to" waypoint identifier (figure 4-147). An arrow **→** precedes the active waypoint identifier.

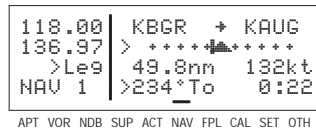


Figure 4-147

Line 2: A cyclic field which can either be (1) a course deviation indicator (CDI) that graphically displays left and right deviation from desired track (figure 4-147), or (2) The direction to fly to intercept the

desired track and the crosstrack distance (figure 4-148). In either case, the same information is displayed. This is a cyclic field, so you can change back and forth from the two options by turning on the cursor (CRSR) over the second line and pressing the CLR button.

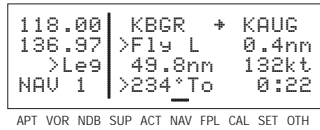


Figure 4-148

The CDI's vertical bar operates like a navigation deviation needle on a conventional CDI or HSI using VOR/Localizer navigation. An on-course indication is displayed when the vertical deviation bar is centered on the triangle in the middle of the CDI. In both modes (en route and OBS, see section 5.3), each dot represents one nautical mile deviation from the desired track. Therefore, the CDI shows course deviation five nautical miles left and right of course. A vertical deviation bar positioned two dots to the right of the center triangle indicates the aircraft is two nautical miles to the left of course (figure 4-149). The center triangle also serves as the CDI's

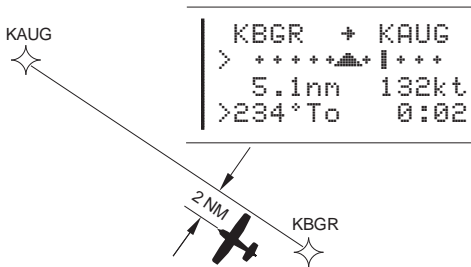


Figure 4-149

TO/FROM indicator and operates in the same manner as a conventional CDI TO/FROM indicator; a triangle pointing up indicates "to" the active waypoint while a "down" triangle (figure 4-150) indicates "from" the active waypoint. The word **FLAG** is displayed over the CDI when the KLX 135 is not usable for navigation (figure 4-151).

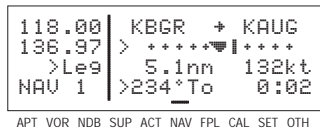


Figure 4-150

The numerical crosstrack distance display is especially handy when more than five nautical miles off of course (naturally, you yourself would never deviate more than five nm off course, but not everyone is as good a pilot as you are!) If your crosstrack

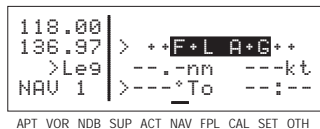


Figure 4-151

Basic GPS Operation

distance was 13.1 nautical miles left of course, the graphic CDI needle will be pegged on the right side (which doesn't tell you much). But this presentation will show you exactly how far off course you are (figure 4-152). When the KLX 135 is not usable for navigation, the crosstrack distance will be dashed out (figure 4-153).

118.00	KBGR + KAUG
136.97	>Fly R 13.1nm
>Leg	49.8nm 132kt
NAV 1	>234°To 0:22

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-152

118.00	
136.97	>Fly - -.nm
>Leg	-.nm -.kt
NAV 1	>---°To ---:

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-153

Line 3: Distance from present position to the active waypoint and the calculated groundspeed.

Line 4: A cyclic field which can display either bearing to the active waypoint (**To**) or radial from the active waypoint (**Fr**) relative to the present position. By placing the cursor over this field and pressing the **CLR** button, you may toggle between the two options.

NOTE: Due to “great circle” courses and magnetic variation differences between present position and the active waypoint, the To bearing and From radial may not be exactly 180° different from each other when the system is in the Leg mode. This condition is most likely to occur when long distances are involved, and/or you are operating in very northerly or southerly latitudes. See figure 4-154 for an example depicting a case like this. The aircraft is somewhere over Georgia, and the active waypoint is KPHX. The bearing to steer is 269°, and radial is 72°. Generally, you will want to use bearing (not radial) when long distances are involved.

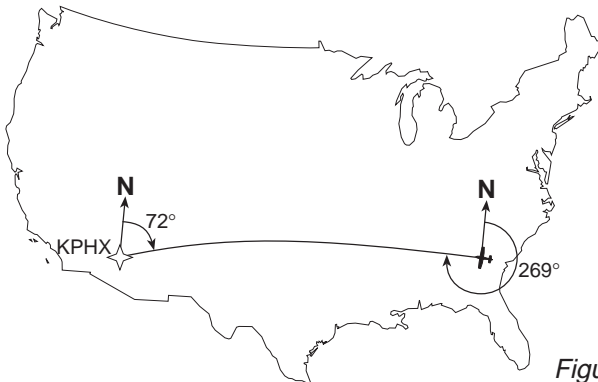


Figure 4-154

Line 4 also displays the estimated time en route (ETE) from present position to active waypoint.

4.11.2. THE NAVIGATION 2 (NAV 2) PAGE

The NAV 2 pages in figures 4-155 and 4-156 display the aircraft's present position in one of two formats. The first line is a cyclic field which allows you to toggle between formats. When the KLX 135 is first powered up, it defaults to present position in terms of the radial and distance from a nearby VOR. You can change the reference waypoint from the nearby VOR to any waypoint.

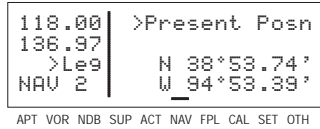


Figure 4-155

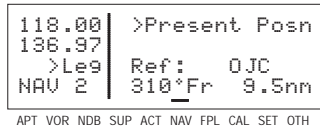


Figure 4-156

To change the NAV 2 page present position reference waypoint:

1. With the NAV 2 page on the radial and distance from a reference waypoint format, turn on the cursor (CRSR) and move it to the Ref: field (figure 4-157).
2. Use the right inner and outer knobs to enter the waypoint you wish to use as a reference.
3. Press ENT. The waypoint page for the identifier just entered will be displayed.
4. If this is the waypoint you intended, press ENT again. The display will return to the NAV 2 page (figure 4-158).

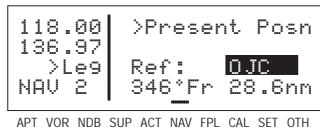


Figure 4-157

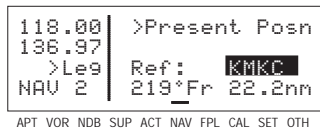


Figure 4-158

NOTE: If you change the reference waypoint, change to a page other than the NAV 2 page, then turn back to the NAV 2 page, the reference waypoint will revert back to a nearby VOR.

By turning on the cursor (CRSR) over the first line and pressing CLR, you can change to the latitude and longitude format.

4.11.3. THE NAVIGATION 3 (NAV 3) PAGE

The Navigation (NAV) 3 page shows you several important times pertaining to your flight (figure 4-159).

118.00	Time	CDT	1805
136.97	Depart		1343
>Leg	ETA	KIXD	1710
NAV 3	Flight		2:22

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-159

Line 1: The current system time zone and time. The time zone may be changed by turning the cursor (**CRSR**) on over it and turning the right inner knob. All times shown on the NAV 3 page are in terms of the system time zone (except for the flight time, which is an elapsed time).

Line 2: The time of departure. This is the time when a valid ground-speed was first greater than 30 knots (typically during takeoff).

Line 3: Estimated time of arrival at your destination. If the active waypoint is not part of the active flight plan, the active waypoint will be the destination. Otherwise, the last waypoint in your active flight plan will be the destination.

Line 4: The elapsed flight time, which will be the hours and minutes since the departure time.

4.11.4. THE NAVIGATION 4 (NAV 4) PAGE

The NAV 4 page (figure 4-160) shows some supplemental navigation data.

118.00	KICT	→	KMCI
136.97	Dtk		051°
>Leg	Track		046°
NAV 4	Br9		050°

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-160

Line 1: The active waypoint or leg, just like the NAV 1 page.

Line 2: The present desired track (**Dtk**). This is the great circle course between two waypoints. Any CDI or HSI driven by the KLX 135, including the CDI displayed on the NAV 1 page, is referenced to this desired track. You may wish to look at the navigation terminology diagram in [Appendix A](#) at this time if you are unfamiliar with terms like desired track and actual track.

NOTE: If the KLX 135 is in the OBS mode, the selected course (**Obs**) is displayed instead of the desired track on the NAV 4 page (figure 4-161).

118.00	KICT	→	KMCI
136.97	Obs		045°
>045	Track		046°
NAV 4	Br9		050°

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-161

Line 3: Actual track (**Track**) — the aircraft's present track over the ground. If you are trying to establish a heading on a new leg of your flight, it is very helpful to look at the difference between the actual track and the desired track, and adjust your heading accordingly to allow for crosswind.

Line 4: Bearing (**Brg**) — the magnetic bearing from present position to the active waypoint.

4.12. WAYPOINT PAGES

NOTE: Each of the waypoint page types includes a cyclic field which displays present magnetic bearing to or magnetic heading from the waypoint. Due to "great circle" courses and magnetic variation differences between present position and the active waypoint, the To bearing and From radial may not be exactly 180° different from each other. This condition is most likely to occur when long distances are involved, and/or you are operating in very northerly or southerly latitudes. See [section 4.11.1](#) and [figure 4-154](#) for more details.

4.12.1. AIRPORT PAGES

4.12.1.1. The Airport 1 (APT 1) Page

See figure 4-162A.

Line 1: The ICAO identifier (see [section 2.3](#)) of the airport; an arrow precedes the identifier if it is the active waypoint. The airport elevation above MSL in feet, which is rounded to the nearest 10 feet.

118.00	KLIT	260ft
136.97	ADAMS	
>Leg	LITTLE ROCK	
APT 1	AR	

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-162A

Line 2: The name of the airport.

Line 3: The city where the airport is located.

Line 4: The State if the airport is located in the US., the Province if located in Canada, or the country if outside the US. and Canada. A listing of the abbreviations used for States, Provinces, and countries is contained in [Appendix D](#). The right side of line 4 will read **MILITARY** if it is a military airport (Figure 4-162B).

118.00	KSZL	870ft
136.97	WHITEMAN AFB	
>Leg	KNOB NOSTER	
APT 1	MO	MILITARY

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-162B

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If the airport is being viewed as part of the *nearest airports list* (see [section 4.7.3](#), “Nearest and Complete Waypoint Scan Lists”), the APT 1 page format will differ as follows (see figure 4-163):

```
118.00 | KLIT>3< 280ft
136.97 | ADAMS
>Le9
APT 1 | >103°To 14.5nm
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 4-163

Line 1: After the airport identifier, the number designating the airport’s position in the nearest airport list is displayed. In figure 4-163, KSZL is the third nearest airport.

Line 2: Same as a normal APT 1 page.

Line 3: Blank

Line 4: The magnetic bearing to or the magnetic radial from the airport and the distance in nautical miles. Placing the cursor over the radial/bearing field and pressing toggles between radial from and bearing to the airport.

4.12.1.2. THE AIRPORT 2 (APT 2) PAGE

See figure 4-164.

Line 1: The ICAO identifier (see [section 2.3](#)) of the airport; an arrow precedes the identifier if it is the active waypoint.

```
118.00 | KLIT
136.97 | N 34°43.74'
>Le9 | W 92°13.47'
APT 2 | >103°To 14.5nm
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 4-164

Lines 2-3: The latitude and longitude of the airport reference point (the “official” location of the airport).

Line 4: The magnetic bearing to or the magnetic radial from the airport and the distance in nautical miles. Placing the cursor over the radial/bearing field and pressing toggles between radial from and bearing to the airport.

If the airport is being viewed as part of the *nearest airports list* (see [section 4.7.4](#), “‘Nearest’ and ‘Complete’ Waypoint Scan Lists”), the APT 2 page format will differ as follows (see figure 4-165):

```
118.00 | KLIT>3<
136.97 | LITTLE ROCK
>Le9 | AR
APT 2 | >103°To 14.5nm
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 4-165

Line 1: After the airport identifier, the number designating the airport’s position in the nearest airport list is displayed.

Line 2: The city where the airport is located.

Line 3: The State if the airport is located in the US., the Province if located in Canada, or the country if outside the US. and Canada. A listing of the abbreviations used for States, Provinces, and countries is contained in [Appendix D](#). The right side of line 4 displays **MILITARY** if it is a military airport.

Line 4: The magnetic bearing to or the magnetic radial from the airport and the distance in nautical miles. Placing the cursor over the radial/bearing field and pressing **[CLR]** toggles between radial from and bearing to the airport.

4.12.1.3. THE AIRPORT 3 (APT 3) PAGE

See figure 4-166.

Line 1: The ICAO identifier (see [section 2.3](#)) of the airport; an arrow precedes the identifier if it is the active waypoint.

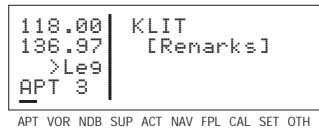


Figure 4-166

Lines 2-4: The pilot-entered remarks for the airport. Three lines of 14 characters each are available for the remarks. These remarks might include information on lodging, dining, airport services, etc. Up to 100 waypoints may include remarks. Letters, numbers, hyphens, and spaces may be used in the remark. If no remarks have been entered for the airport, line 2 will display “[Remarks]”.

To enter an airport remark on the APT 3 page:

1. Turn on the cursor and move it until the cursor fills line 2 of the screen (figure 4-167).
2. With the right inner knob, select the desired character, if any, and move the cursor to the next character on the line (figure 4-168).
3. Repeat step 2 as necessary.
4. Press **[ENT]** to approve each line of remarks. The cursor will automatically move to the next line (see figure 4-169).
5. Turn the cursor off when you are

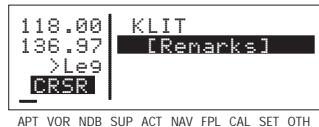


Figure 4-167

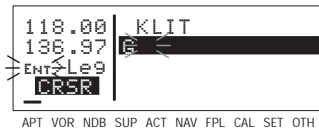


Figure 4-168

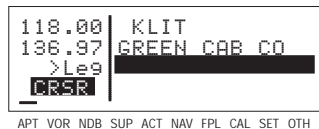


Figure 4-169

finished creating the remark (figure 4-170).

118.00	KLIT	
136.97	GREEN CAB CO	
>Le9	555-9999	
<u>APT 3</u>		

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-170

The Other 4 (OTH 4) page is a list of waypoints with associated remarks. Sometimes these are deleted if there are more than 100 waypoints with remarks, or if the remarks are no longer relevant. If you wish to delete a waypoint remark for an airport, see [section 4.14.2](#).

4.12.1.4. THE AIRPORT 4 (APT 4) PAGE

See figure 4-171.

Line 1: The ICAO identifier (see [section 2.3](#)) of the airport; an arrow precedes the identifier if it is the active waypoint.

118.00	KLIT	
136.97	ATIS	125.60
>Le9	PTX	118.95
<u>APT+4</u>	TWR *	121.90

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-171

Lines 2-4: The VHF communication frequencies associated with the airport. The type and frequency is listed. The abbreviations are:

- AAS** aeronautical advisory service
- AFIS** aerodrome flight information service
- ARVL** arrival
- APR** approach
- ATF** aerodrome traffic frequency
- AWOS** automatic weather observing station
- ATIS** automatic terminal information service
- CL B** class B airspace (formerly terminal control area)(VFR frequency)
- CL C** class C airspace (formerly airport radar service area) (VFR frequency)
- CLR** clearance delivery
- CTA** control area (VFR frequency used outside the U.S.)
- CTAF** common traffic advisory frequency
- CTR** center (when center is used for approach/departure control)
- DEP** departure
- DIR** director (approach control/radar)
- GRND** ground control
- MCOM** multicom
- MF** mandatory frequency
- PCL** pilot-controlled lighting
- PTAX** pre-taxi clearance
- RAMP** ramp/taxi control
- RDR** radar-only frequency
- TMA** terminal area (VFR frequency used outside the U.S.)
- TWR** control tower
- UNIC** unicom

Part-time operation, such as for a control tower, is indicated with an asterisk (*) to the right of an airport frequency.

The frequencies associated with class B or C airspace, CTA or TMA are VFR frequencies. Airports which have one of these categories of frequencies also have APR and DEP which are IFR frequencies.

If there are more than three frequencies of the same frequency type for a given airport, only three will be listed. An example might be for approach (APR) frequencies. There can be several approach frequencies for different sectors and altitudes around the airport.

4.12.2. VOR PAGES

Two pages of information may be displayed for each VOR in the KLX 135. Sample VOR pages are shown in figures 4-172 through 4-174.

4.12.2.1. The VOR 1 Page

See figure 4-172.

Line 1: The VOR identifier, preceded by an arrow if it is the active waypoint. To the right of the identifier is the frequency of the VOR in megahertz.

118.00	MEX	117.00
136.97	MEXICO CITY	
>Le9	N 19°26.22'	
VOR 1	W 99°04.17'	

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-172

Line 2: The name of the VOR.

Lines 3-4: The latitude and longitude of the VOR

If the VOR is being viewed as part of the *nearest VORs list* (see [section 4.7.3](#)), the VOR 1 page format will differ as follows (see figure 4-173):

Line 1: After the VOR identifier, the number designating the VOR's position in the nearest VOR list is displayed. In figure 4-173, MEX is the second nearest VOR.

118.00	MEX	>2<	117.00
136.97	MEXICO CITY		
>Le9			
VOR 1	>359°To	97.7nm	

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-173

Lines 3-4: In place of the latitude/longitude, line 3 is blank and line 4 displays the magnetic bearing to or the magnetic radial from the VOR and the distance in nautical miles. Placing the cursor over the radial/bearing field and pressing **[CLR]** toggles between radial from and bearing to station.

4.12.2.2. The VOR 2 Page

See figure 4-174.

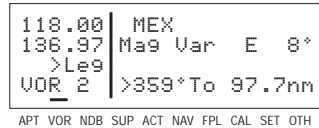


Figure 4-174

Line 1: The VOR identifier, preceded by an arrow if it is the active waypoint.

Line 2: The published magnetic station declination of the VOR. Magnetic station declination is another way to say the published magnetic variation for the VOR.

Line 4: The magnetic bearing to or the magnetic radial from the VOR and the distance in nautical miles. Placing the cursor over the radial/bearing field and pressing **[CLR]** toggles between radial from and bearing to station.

4.12.3. NDB PAGES

Two pages of information may be displayed for each NDB in the KLX 135. Sample NDB pages are shown in figures 4-175 through 4-177.

4.12.3.1. The NDB 1 Page

See figure 4-175.

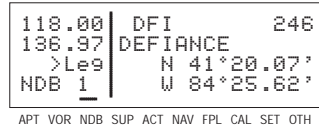


Figure 4-175

Line 1: The NDB identifier, preceded by an arrow if it is the active waypoint. To the right of the identifier is the frequency of the NDB in kilohertz.

Line 2: The name of the NDB.

Lines 3-4: The latitude and longitude of the NDB

If the NDB is being viewed as part of the *nearest NDBs list* (see [section 4.7.3](#)), the NDB 1 page format will differ as follows (see figure 4-176):

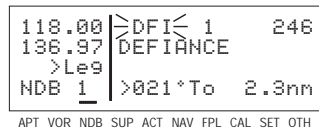


Figure 4-176

Line 1: After the NDB identifier, the number designating the NDB's position in the nearest NDB list is displayed. In figure 4-176, DFI is the nearest NDB.

Lines 3-4: In place of the latitude/longitude, line 3 is blank and line 4 displays the magnetic bearing to or the magnetic radial from the NDB and the distance in nautical miles. Placing the cursor over the radial/bearing field and pressing **[CLR]** toggles between radial from and bearing to station.

4.12.3.2. The NDB 2 Page

See figure 4-177.

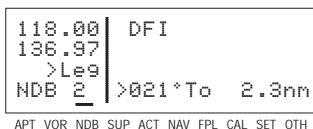


Figure 4-177

Line 1: The NDB identifier, preceded by an arrow if it is the active waypoint.

Line 4: The magnetic bearing to or the magnetic radial from the NDB and the distance in nautical miles. Placing the cursor over the radial/bearing field and pressing **[CLR]** toggles between radial from and bearing to station.

4.12.4. SUPPLEMENTAL WAYPOINT PAGES

The Supplemental waypoint pages (SUP 0, SUP 1, SUP 2, and SUP 3) allow you to create “custom” waypoints for use in navigation. A crop sprayer might want to create a waypoint on a field that is sprayed regularly, for instance. Another candidate might be a small airport which is not included in the KLX 135 database. To learn how to create a user-defined waypoint, see [section 5.2.1](#).

4.12.4.1. The Supplemental 0 (SUP 0) Page

See figure 4-178.

NOTE: The SUP 0 page is only displayed for waypoint identifiers that do not have a previously defined position.

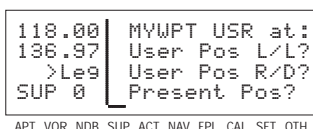


Figure 4-178

Line 1: The identifier for the as-yet-undefined waypoint.

Lines 2-4: Cursor fields for the three possible user-defined waypoint creation methods. For information on creating user-defined waypoints, see [section 5.2.1](#).

4.12.4.2. The Supplemental 1 (SUP 1) Page

See figure 4-179.

Line 1: The user-defined waypoint identifier, preceded by an arrow if it is the active waypoint. To the right of the identifier are the letters “USR” to signify that this is a user-defined waypoint.

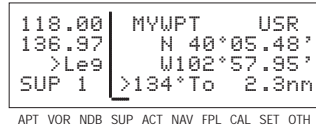


Figure 4-179

Lines 2-3: The latitude and longitude of the user-defined waypoint.

Line 4: The magnetic bearing to or the magnetic radial from the user-defined waypoint and the distance in nautical miles. Placing the cursor over the radial/bearing field and pressing **[CLR]** toggles between radial from and bearing to station.

4.12.4.3. The Supplemental 2 (SUP 2) Page

See figure 4-180.

Line 1: The user-defined waypoint identifier, preceded by an arrow if it is the active waypoint. To the right of the identifier are the letters “USR” to signify that this is a user-defined waypoint.

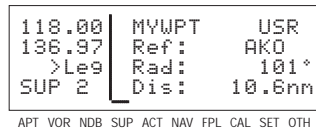


Figure 4-180

Line 2: The identifier of the user-defined waypoint’s reference waypoint. When this page is first viewed, the reference waypoint is the nearest VOR to the user waypoint. The reference waypoint may be changed by the pilot. However, once you leave this page and come back, the reference waypoint reverts back to a nearby VOR.

Line 3: The magnetic radial from the reference waypoint to the user waypoint.

Line 4: The distance in nautical miles from the reference waypoint to the user waypoint.

4.12.4.4. The Supplemental 3 (SUP 3) Page

See figure 4-181.

Line 1: The identifier of the user-defined waypoint; an arrow precedes the identifier if it is the active waypoint.

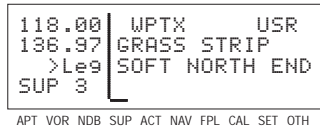


Figure 4-181

Lines 2-4: The pilot-entered remarks for the user waypoint. Three lines of 14 characters each are available for the remarks. Up to 100 waypoints may include remarks. Letters, numbers, hyphens, and spaces may be used in the remark. If no remarks have been entered for the user-defined waypoint, line 2 will display [Remarks].

To enter a user-defined waypoint remark on the SUP 3 page:

1. Turn on the cursor and move it until the cursor fills line 2 of the screen (figure 4-182).
2. Select the desired character, if any, and move the cursor to the next character on the line (figure 4-183).
3. Repeat step 2 as necessary.
4. Press **ENT** to approve each line of remarks. The cursor will automatically move to the next line (see figure 4-184).
5. Turn the cursor off when you are finished creating the remark.

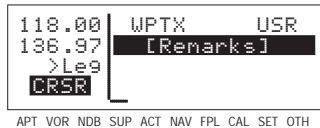


Figure 4-182

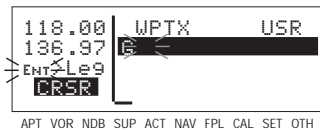


Figure 4-183

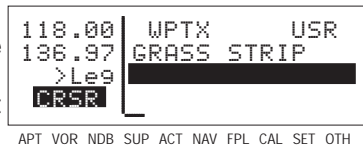


Figure 4-184

The Other 4 (OTH 4) page is a list of waypoints with associated remarks. Sometimes these are deleted if there are more than 100 waypoints with remarks, or if the remarks are no longer relevant. If you wish to delete a waypoint remark for a user-defined waypoint, see [section 4.14.2](#).

4.13. VIEWING AND SETTING THE DATE AND TIME

The KLX 135 system time and date should seldom, if ever, require updating because they are automatically updated when at least one satellite is received. In addition, the KLX 135 contains an internal battery powered calendar/clock to keep system time and date when the unit is not being used. You will normally check to make sure the KLX 135 is set to the correct time and date shortly after you turn the unit on while you verify the Self Test Page. You can, however, also check the time and date on the Setup (SET) 2 page anytime you desire. There are several pages as well as some internal functions of the KLX 135, such as magnetic variation and proper use of data base information, that depend on having the proper time and date.

NOTE: You will not be able to update the time or date if the KLX 135 is receiving a time and date from a satellite.

To set the date on the SET 2 page:

1. Select the SET 2 page (figure 4-185).
2. Turn on the cursor. The cursor will be over the entire date field (figure 4-186).
3. Select the correct day of the month with the right inner knob.
4. Move the flashing part of the cursor to the month field (middle three dashes) with the right outer knob, and select the proper month (figure 4-187).
5. Move the flashing part of the cursor to the tens digit of the year field, and select the proper number (figure 4-188).
6. Repeat step 5 for the ones digit of the year field.
7. Press **ENT** to start the KLX 135 using the newly entered date (figure 4-189).

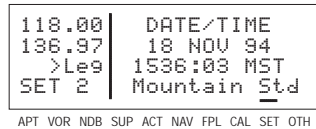


Figure 4-185

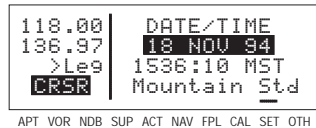


Figure 4-186

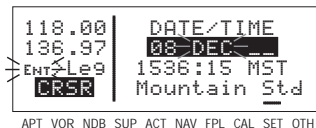


Figure 4-187

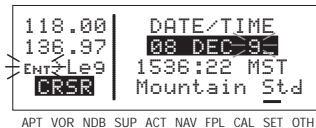


Figure 4-188

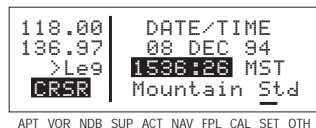


Figure 4-189

To set the time on the SET 2 page:

1. Select the SET 2 page if it is not already selected.

2. Turn on the cursor and move it to the time zone field (figure 4-190).

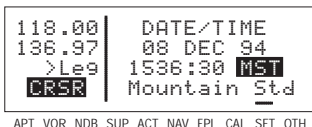


Figure 4-190

3. Change the time zone with the right inner knob, if desired (figure 4-191). A listing of the time zones and their abbreviations is contained in section 4.2, "Turn-on and Self Test".

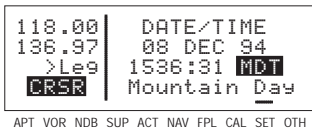


Figure 4-191

4. Move the cursor to the time field. The hours and minutes will appear in inverse video.

5. Select the correct hour (figure 4-192). Remember, the KLX 135 uses 24 hour time. If it is 1:00 P.M. or later, add 12 hours (for example, 2:30 P.M. becomes 14:30).

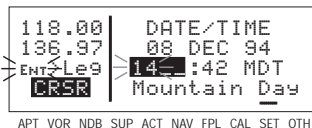


Figure 4-192

6. Move the flashing part of the cursor to the tens of minutes, select the proper number (figure 4-193), then move on to the last digit and set it.

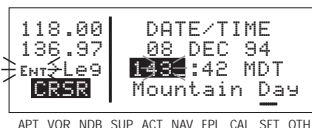


Figure 4-193

7. Press **ENT** to start the clock running (figure 4-194). Note that the seconds will reset to zero when you do this.

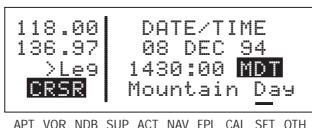


Figure 4-194

4.14. THE OTHER (OTH) PAGES

4.14.1. DETERMINING THE STATUS OF THE GPS SIGNALS

The Other (OTH) 1 and OTH 2 pages may be viewed at any time to determine the status of the GPS receiver and the GPS satellites being received. This includes which satellites are being tracked, the satellites' health, the signal-to-noise ratio for each of these satellites, the elevation of each satellite above the horizon, and the estimated position error.

The GPS receiver in the KLX 135 is capable of using signals from up to eight satellites to determine its position. A valid position may be determined using as few as four satellites alone or three satellites with a valid altitude input. However, four satellites alone or three satellites with an altitude input do not necessarily ensure that navigation can take place. The satellites must be positioned relative to your location such that sufficient "geometry" exists to determine an accurate position. The satellite constellation geometry is continually changing as each satellite, "rises", travels across the sky, and eventually "sets" relative to your position. The GPS satellites are not in geosynchronous orbits positioned over the same spot on earth at all times like some television communication satellites with which you may be familiar. Rather, the GPS satellites are in orbits that allow them to circle the earth about two times each day.

A representative OTH 1 page is shown in figure 4-195. The OTH 1 page displays the GPS receiver state and the system's estimate of the position error expressed in nautical miles.

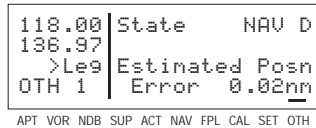


Figure 4-195

The GPS state is indicated on line 1. The possibilities are:

- INIT** initialization
- SRCH** search the sky
- ACQ** acquisition
- TRAN** transition
- NAV** navigation
- NAV A** navigation with altitude aiding
- NAV D** navigation with data collection
- DEGRD** navigation with position degradation
- FAILR** receiver failure

In the initialization state the GPS receiver is in the process of initializing itself, collecting information such as the date, time, and last present position. Next, the receiver collects data from its own memory to determine which satellites should be visible. After completing the initialization process the receiver begins the acquisition process. During this time, the visible satellites are being acquired and data is obtained from them.

If the KLX 135 is not used for a period of six months or more, the satellite orbital data stored in the GPS receiver's memory is too old to use. When this occurs, the receiver will enter the search the sky state to acquire the required data. This data, called almanac data, can be acquired by receiving just one satellite. A search the sky operation takes 20 minutes to complete.

The transition state indicates an adequate number of satellites for navigation has been acquired and is being tracked but no position data can yet be produced.

Normal navigation is indicated by a **NAV**, **NAV A**, or **NAV D** GPS state. **NAV A** indicates that the altitude input is being used in the position solution. **NAV D** indicates that besides calculation position, the receiver is collecting and storing in its memory additional data from the satellites (called ephemeris and almanac data).

Lines 3 and 4 of the OTH 1 page display the KLX 135's estimated position error. The KLX 135's position error depends upon such factors as the number of satellites being received, the strength of the GPS signals, and the geometry of the satellites presently being used for navigation.

Figures 4-196, 4-197 and 4-198 show a representative example of a set of OTH 2 pages. There will be three OTH 2 pages if more than six satellites are being received as in this example. The following information is displayed for each satellite on the OTH 2 pages:

- The specific GPS satellites or "space vehicles" (**SV**) being received are displayed in the left column. Each satellite has its own identification number. A * symbol to the left of the satellite

122.90	SV	H1t	SNR	E1e
123.12	02	Good	41	43°
>Le9	11	Good	32	07°
OTH+2	16*	Weak	31	76°

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-196

122.90	SV	H1t	SNR	E1e
123.12	18	Good	39	21°
>Le9	20	Good	47	88°
OTH+2	23*	Good	34	09°

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-197

122.90	SV	H1t	SNR	E1e
123.12	25	Good	41	52°
>Le9				
OTH+2				

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-198

number indicates this particular satellite is not presently being used in the navigation position solution.

- The satellite's "health" (**Hit**) is indicated to the right of the satellite number. This health information is transmitted by the satellites.
- The signal-to-noise ratio (**SNR** in decibels) for each satellite is displayed in the middle column and indicates the signal strength for each satellite. The higher the SNR value the stronger the signal. Values usable for navigation will be in the mid 30s to mid 50s; however, typical values are in the middle of this range.
- The elevation (**Ele**) above the horizon for each satellite is provided in the right column and will range from 5° to 90°.

4.14.2. VIEWING AND DELETING USER WAYPOINTS AND WAYPOINT REMARKS

The OTH 3 and OTH 4 pages list the user-defined waypoints and waypoint remarks, respectively, which are currently stored in the KLX 135's memory.

4.14.2.1. The OTH 3 Page

An example of an OTH 3 page is shown in figure 4-199. All currently stored user-defined waypoints are listed in alphanumeric order. If the user-defined waypoint is the active waypoint, an arrow (+) follows the identifier. If the waypoint is used in one or more flight plans, then the number of the first flight plan in which it is used is displayed on the right side. If there are more than three user waypoints in storage, you can see the rest of the list by turning on the cursor (**CRSR**) and turning the right outer knob to scroll through the list.

118.00	User Waypoints
136.97	LAKE
>Le9	MYRWY 0
OTH+3	WPTX 5
APT VOR NDB SUP ACT NAV FPL CAL SET OTH	

Figure 4-199

To delete a user-defined waypoint from the OTH 3 page:

1. Turn on the cursor and position it over the desired waypoint (figure 4-200). If there are more than three user-defined waypoint, you will have to scroll the cursor down the list.

118.00	User Waypoints
136.97	LAKE
>Le9	MYRWY 0
CRSR	WPTX 5
APT VOR NDB SUP ACT NAV FPL CAL SET OTH	

Figure 4-200

2. Press **[CLR]**. The KLX 135 will ask if you wish to delete that user-waypoint (figure 4-201). If the waypoint is active or used in a flight plan, the deletion will not be allowed and you will receive a scratchpad message telling you this (figure 4-202).
3. Press **[ENT]** to approve the deletion (figure 4-203).

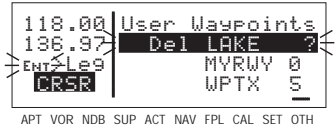


Figure 4-201

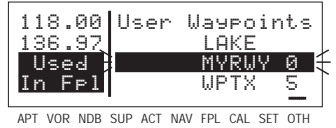


Figure 4-202

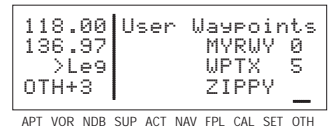


Figure 4-203

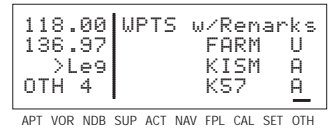


Figure 4-204

4.14.2.2. The OTH 4 Page

An example of an OTH 4 page is shown in figure 4-204. All waypoints with remarks are listed in alphanumeric order. Remarks can be stored for airports (on the APT 3 page) or user-defined waypoints (on the SUP 3 page). If the waypoint is an airport, then an “A” is displayed on the right side; likewise, a “U” represents a user-defined waypoint. If there are more than three waypoints, you can see the rest of the list by turning on the cursor (**[CRSR]**) and turning the right outer knob to scroll through the list.

and turning the right outer knob to scroll through the list.

To delete a waypoint remark from the OTH 4 page:

1. Turn on the cursor and position it over the desired waypoint (figure 4-205). If there are more than three airports with remarks, you will have to scroll the cursor down the list.
2. Press **[CLR]**. The KLX 135 will ask if you wish to delete that remark (figure 4-206).
3. Press **[ENT]** to approve the deletion.



Figure 4-205



Figure 4-206

4.14.3. VIEWING THE KLX 135 SOFTWARE STATUS AND TIME OF OPERATION

The OTH 5 page (figure 4-207) shows the software revision status of the KLX 135 host computer (line 1) and of the GPS receiver (line 2). Line 3 displays the total number of hours of operation and line 4 displays the number of times the unit has been turned on. These values are reset to zero if the KLX 135's non-volatile memory is cleared.

118.00	Host SW	01
136.97	Rcvr SW	01
>Le9	Tot Hours	115
OTH 5	Pwr Cycls	67

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 4-207

4.15. REMOTE MOUNTED ANNUNCIATORS

The KLX 135 has outputs capable of driving two remote annunciator lights: waypoint alert and message. Although these annunciators are optional, it is desirable to have them mounted in the pilot's normal scan area so that these annunciators are easily seen. A typical annunciator is shown in figure 4-208; however, actual annunciation abbreviations and configurations may be different.

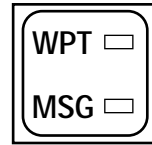


Figure 4-208

The remote waypoint alert annunciator is on whenever waypoint alerting is occurring. See [sections 4.8.3](#), "Waypoint Alerting for Direct To Operation" and [4.10.2](#), "Turn Anticipation and Waypoint Alerting".

The remote message annunciator is on whenever the message prompt is on. See [section 4.5](#).

5. ADVANCED GPS OPERATION

5.1. CALCULATOR PAGES

The Calculator (CAL) pages are used for trip planning. They are convenient both on the ground before you begin your flight, and in the air. The CAL 1 page performs distance, bearing, and time calculations, and the CAL 2 page is for advisory fuel planning.

Data entered on any of the Calculator pages has no effect on navigation data provided on any Navigation (NAV) or Flight Plan (FPL) pages. You may perform trip calculations without disturbing ongoing navigation.

NOTE: The Calculator pages rely on pilot enterable inputs for groundspeed, fuel flow, and fuel reserve requirements. These pages do not utilize inputs from fuel flow or air data sensors.

5.1.1. THE CALCULATOR (CAL) 1 PAGE

The CAL 1 page allows you to do distance, bearing, and time calculations that you might otherwise need a chart, ruler, and pocket calculator for. The KLX 135 will perform these calculations either from waypoint to waypoint (for in-flight calculations, your present position can be one of the waypoints), or for one of your flight plans (active or stored).

To calculate distance, bearing, and time from waypoint to waypoint:

1. From the CAL 1 page (figure 5-1), turn on the cursor (**CRSR**). It will appear over a cyclic field that either displays **Wpt** (waypoint to waypoint) or **Fpl** (flight plan).
2. For this type of calculation, the cyclic field should display **Wpt**. Press **CLR** to toggle if this is not the case (figure 5-2).
3. Turn the right outer knob clockwise to move the cursor to the "from" waypoint in the upper right corner of the screen (figure 5-3).

```

118.00 |>Fp1: 0  KJFK
136.97 |      To KORD
>Le9  | 643nm
CAL 1  |138kt ETE 4:40
    
```

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 5-1

```

118.00 |>Wpt Fr>KJFK
136.97 |      To>KSAV
>Le9  | 624nm Br9 217°
CRSR  |138kt ETE 4:31
    
```

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 5-2

```

118.00 |>Wpt Fr>KJFK
136.97 |      To>KSAV
>Le9  | 624nm Br9 217°
CRSR  |138kt ETE 4:31
    
```

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 5-3

Advanced GPS Operation

- Enter the desired identifier for the "from" waypoint and press **ENT**. You will be shown the waypoint page for the waypoint you entered. Press **ENT** again to approve.

NOTE: On either of the two waypoint fields on this page, you can select your present position. To do this, press **CLR** while the cursor is on the desired waypoint field. The results will only be displayed when your KLX 135 is receiving a valid position, or if you happen to be in the Take Home mode (see [section 5.5](#)).

- With the cursor over the "to" waypoint, enter the desired identifier (figure 5-4) and press **ENT** twice. The distance in nautical miles and the bearing will be displayed on line 3.

```
118.00 >Wpt Fr>KLGA
136.97 To>KCLE
>Leg 628nm Br9 217°
CRSR 138kt ETE 4:38
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 5-4

- Use the right outer knob to move the cursor over the groundspeed field on line 4.
- Select your estimated groundspeed for the trip. As you change it, the estimated time en route (ETE) calculation will be updated (figure 5-5).

```
118.00 >Wpt Fr>KLGA
136.97 To>KCLE
>Leg 364nm Br9 279°
CRSR 122kt ETE 2:59
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 5-5

To calculate distance and time for a flight plan:

- From the CAL 1 page, turn on the cursor (**CRSR**). It will appear over a cyclic field that either displays **Wpt** (waypoint to waypoint) or **Fpl** (flight plan).
- For this type of calculation, the cyclic field should display **Fpl**. Press **CLR** to toggle if this is not the case.
- Turn the right outer knob clockwise to place the cursor over the flight plan number. As you cycle through the flight plans, the first and last waypoints of each flight plan will be displayed, along with the total distance in nautical miles (figure 5-6).

```
118.00 >Fp1: 2 KDPA
136.97 To KSUS
>Leg 224nm
CRSR 152kt ETE 1:28
APT VOR NDB SUP ACT NAV FPL CAL SET OTH
```

Figure 5-6

- Once you have selected the desired flight plan, move the cursor to the groundspeed field on line 4.

5. Select your estimated ground-speed for the trip. As you change it, the estimated time en route (ETE) calculation will be updated (figure 5-7).

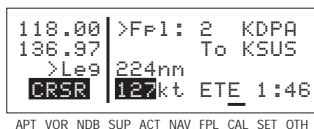


Figure 5-7

5.1.2. THE CALCULATOR (CAL) 2 PAGE

The CAL 2 page is for calculating fuel requirements for a trip. To use these pages, you need to have a good idea what the typical fuel flow rate for your aircraft is. This information can often be found for given cruise power settings in a "performance" section of the operational handbook for the aircraft. The units for fuel are not specified on this page, but the units of time are always hours. This means that you can use gallons per hour, pounds per hour, kilograms per hour, etc. Like with the CAL 1 page, the fuel calculations can be done from waypoint to waypoint (including present position), or for one of your flight plans.

To calculate fuel requirements from waypoint to waypoint:

1. From the CAL 2 page, turn on the cursor (CRSR). It will appear over a cyclic field that either displays **Wpt** (waypoint to waypoint) or **Fpl** (flight plan).
2. For this type of calculation, the cyclic field should display **Wpt**. Press CLR to toggle if this is not the case.

3. Turn the right outer knob clockwise to move the cursor to the "from" waypoint in the upper right corner of the screen (figure 5-8).

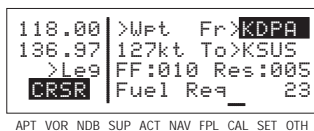


Figure 5-8

4. Enter the desired identifier for the "from" waypoint and press ENT. The waypoint page for the identifier you just entered will be displayed. If it is the correct one, press ENT again.

NOTE: On either of the two waypoint fields on this page, you can select your present position. To do this, press CLR while the cursor is on the desired waypoint field (figure 5-9). The results will only be displayed when your KLX 135 is receiving a valid position, or if you happen to be in the Take Home mode (see section 5.5, "Using the Take-home Mode").

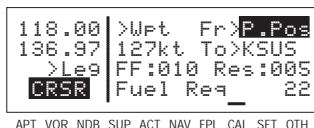


Figure 5-9

Advanced GPS Operation

5. Move the cursor to the groundspeed field on line 2.

```
118.00 | >Wpt Fr>P.Pos
136.97 | 105kt To>KSPJ
        | >Leg FF:010 Res:005
        | CRSR Fuel Req _ 26
```

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 5-10

6. Select your estimated groundspeed for the trip (figure 5-10).

7. With the cursor over the "to" waypoint, enter the desired identifier (figure 5-11) and press **ENT**.

```
118.00 | >Wpt Fr>P.Pos
136.97 | 105kt To>KSPI
        | >Leg FF:010 Res:005
        | CRSR Fuel Req _ 26
```

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 5-11

8. Move the cursor to the fuel flow rate field and use the right inner knob to select the desired value (figure 5-12). Remember that this can be in any units you desire (as long as it's per hour), but the same fuel units must carry through the calculations.

```
118.00 | >Wpt Fr>P.Pos
136.97 | 105kt To>KSPI
        | >Leg FF:007 Res:005
        | CRSR Fuel Req _ 14
```

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 5-12

9. Move the cursor to the fuel reserve requirement field and enter the desired value. As you do, watch the calculation of fuel required on line 4 change (figure 5-13).

```
118.00 | >Wpt Fr>P.Pos
136.97 | 105kt To>KSPI
        | >Leg FF:007 Res:008
        | CRSR Fuel Req _ 17
```

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 5-13

To calculate fuel requirements for a flight plan:

1. From the CAL 2 page, turn on the cursor (**CRSR**). It will appear over a cyclic field that either displays **Wpt** (waypoint to waypoint) or **Fpl** (flight plan).
2. For this type of calculation, the cyclic field should display **Fpl**. Press **CLR** to toggle if this is not the case.

3. Turn the right outer knob clockwise to place the cursor over the flight plan number. As you cycle through the flight plans, the first and last waypoints of each flight plan will be displayed (figure 5-14).

```
118.00 | >Fpl: 4 KIXD
136.97 | 105kt To KDAL
        | >Leg FF:007 Res:005
        | CRSR Fuel Req _ 32
```

APT VOR NDB SUP ACT NAV FPL CAL SET OTH

Figure 5-14

4. Once you have selected the desired flight plan, move the cursor to the groundspeed field on line 2.

5. Select your estimated groundspeed for the trip.
6. Move the cursor to the fuel flow rate field and use the right inner knob to select the desired value. Remember that this can be in any units you desire (as long as it's per hour), but the same fuel units must carry through the calculations.
7. Move the cursor to the fuel reserve requirement field and enter the desired value. As you do, watch the calculation of fuel required on line 4 change (figure 5-15).

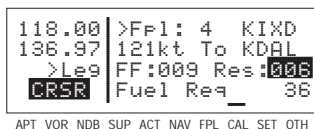


Figure 5-15

5.2. CREATING USER-DEFINED WAYPOINTS

You may create and store up to 250 user-defined (also known as supplemental) waypoints. These waypoints will be very helpful to you. One major application is private airstrips, which are not included in the Jeppesen data base. They are also handy for points which you fly over frequently, and wish to navigate to. For example, a crop sprayer would want to store the locations of the fields he or she dusts often.

There are three ways to create a user-defined waypoint. If you happen to know the latitude and longitude of the point, that is one option. The waypoint can also be defined as a radial and distance from another waypoint. A third choice is just to store your present position under the identifier you have chosen.

NOTE: Whenever you are in a waypoint entry situation, such as a Direct To waypoint or flight plan, and you enter an identifier which is not in the data base, the KLX 135 will automatically start the user-defined waypoint creation process.

To delete a user-defined waypoint that is no longer needed, see [section 4.14.2](#), "Viewing and Deleting User Waypoints and Waypoint Remarks".

5.2.1. CREATING A WAYPOINT AT YOUR PRESENT POSITION

Creating a waypoint at your present position is the simplest possible way to create a user-defined waypoint. This is nice for "remembering" a spot you are at. Let's suppose you're at a private strip that you want to name "VALLY"

To create a user-defined waypoint at your present position:

1. From any supplemental waypoint (SUP) page, turn on the cursor (CRSR). It will flash over the first character in the waypoint identifier field (figure 5-16).

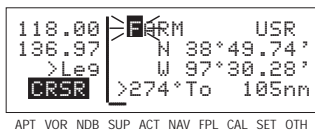


Figure 5-16

2. Use the right inner knob to select the first character of the identifier (figure 5-17). Remember that when the cursor is on, the right inner knob changes the character and the right outer knob moves the cursor around.

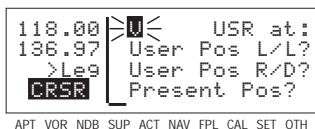


Figure 5-17

3. Spell out the rest of the identifier using the right inner and outer knobs (figure 5-18).

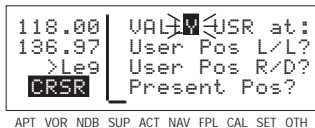


Figure 5-18

4. Move the cursor down to the fourth line, over **Present Pos?** (figure 5-19).

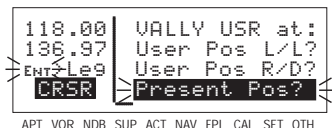


Figure 5-19

5. Press **ENT**. The SUP 1 page for your new waypoint will be displayed with its latitude and longitude (figure 5-20). The cursor is turned off automatically.

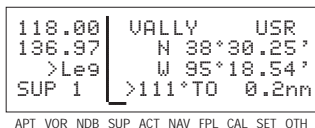


Figure 5-20

5.2.2. CREATING A WAYPOINT AT A CERTAIN LATITUDE/LONGITUDE

It is also possible to create a user-defined waypoint by manually entering a latitude and longitude. Let's say you wanted to create a user waypoint over your farm at N 42°56.32', W 76°29.95'

To create a user-defined waypoint with latitude/longitude:

1. From any supplemental waypoint (SUP) page, turn on the cursor

- (**CRSR**). It will flash over the first character in the waypoint identifier field (figure 5-21).
2. Use the right inner knob to select the first character of the identifier (figure 5-22). Remember that when the cursor is on, the right inner knob changes the character and the right outer knob moves the cursor around.
3. Spell out the rest of the identifier using the right inner and outer knobs (figure 5-23).
4. Move the cursor down to the second line, over **User Pos L/L?** (figure 5-24).
5. Press (**ENT**). The display will change to a format like figure 5-25.
6. Use the right inner knob to select N for north or S for south (figure 5-26).
7. Use the right outer knob to move the cursor, and the right inner knob to select the proper numbers to complete the latitude (figure 5-27).
8. Press (**ENT**). The cursor will move to the longitude field.

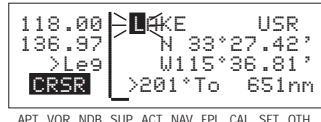


Figure 5-21

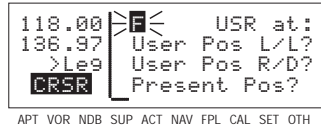


Figure 5-22

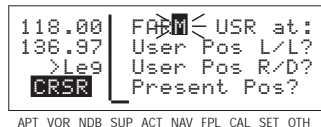


Figure 5-23

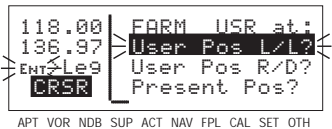


Figure 5-24

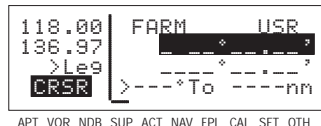


Figure 5-25

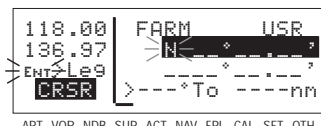


Figure 5-26

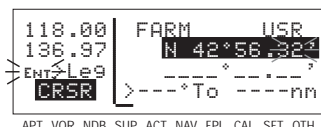


Figure 5-27

- Enter the longitude in the same manner as the latitude (figure 5-28).

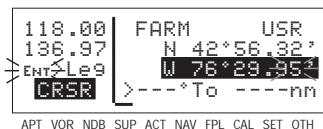


Figure 5-28

- Press **ENT** to approve this position. The cursor will automatically turn off (figure 5-29).

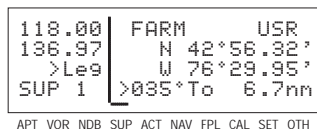


Figure 5-29

5.2.3. CREATING A WAYPOINT REFERENCED FROM ANOTHER WAYPOINT

The third method of creating a user-defined waypoint is as a radial and distance from a known waypoint.

To create a user-defined waypoint using the radial/distance method:

- From any supplemental waypoint (SUP) page, turn on the cursor (**CRSR**). It will flash over the first character in the waypoint identifier field.
- Use the right inner knob to select the first character of the identifier. Remember that when the cursor is on, the right inner knob changes the character and the right outer knob moves the cursor around.
- Spell out the rest of the identifier using the right inner and outer knobs (figure 5-30).

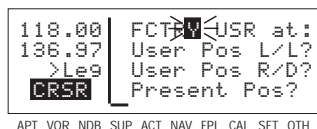


Figure 5-30

- Move the cursor down to the third line, over **User Pos R/D?** (figure 5-31).

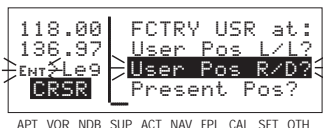


Figure 5-31

- Press **ENT**. The display will change to a format like figure 5-32 with the cursor over the reference waypoint field.

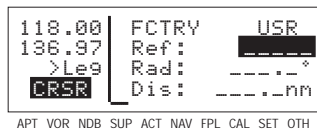


Figure 5-32

6. Use the right inner and outer knobs to select the identifier of the desired reference waypoint (figure 5-33).

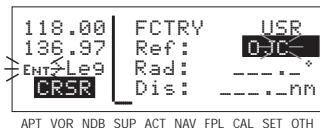


Figure 5-33

7. Press **ENT**. The waypoint page for the waypoint you just entered will be displayed (figure 5-34).

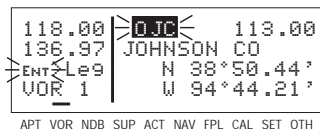


Figure 5-34

8. Press **ENT** again to approve the waypoint. You will be returned to the waypoint creation page.

9. Use the right inner and outer knobs to select the desired radial. Notice that you may enter the angle down to the tenth of a degree (figure 5-35).

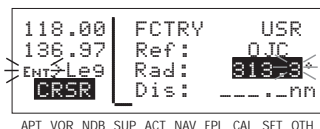


Figure 5-35

10. Press **ENT** to approve the radial. The cursor will move to line 4.

11. Use the right inner and outer knobs to select the desired distance from the reference waypoint (figure 5-36).

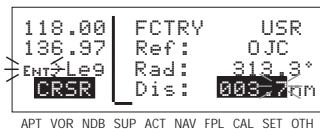


Figure 5-36

12. Press **ENT** to approve the distance. The cursor will automatically be removed from the screen.

5.3. NAVIGATION MODES

The KLX 135 has two modes of operation: En Route-Leg and En Route-OBS. When the KLX 135 is turned on, it always "wakes up" in the En route-Leg mode. The En Route-Leg mode is the normal mode for en route flying. One can think of the OBS mode as similar to VOR navigation, except it allows you to use any waypoint in the same manner as VORs.

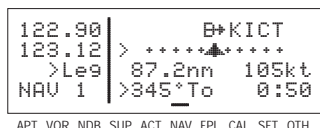


Figure 5-37

The mode is annunciated on the left side of the screen, line 3. When in the En Route-Leg mode, it displays **Leg** (figure 5-37), and when in the En Route-OBS mode, it displays the selected magnetic course (figure 5-38).

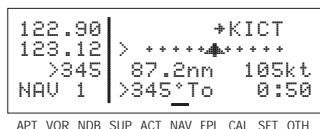


Figure 5-38

5.3.1. SELECTING THE LEG MODE OR THE OBS MODE

To change navigation modes:

1. From any page (except a message page), turn on the cursor (**CRSR**).

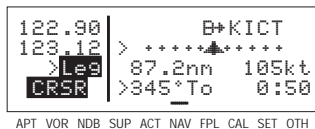


Figure 5-39

2. Turn the right inner knob counter clockwise until the cursor is over the navigation mode. In this case, the current mode is **Leg** (figure 5-39).

3. Press **CLR**. The mode will toggle between Leg and OBS. In the case of OBS mode, the selected course angle will be displayed (figure 5-40).

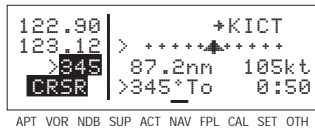


Figure 5-40

4. If you desire to change the selected course while in OBS mode, turn the right inner knob while the cursor is over the mode annunciation (figure 5-41).

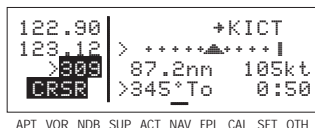


Figure 5-41

5. Turn off the cursor (**CRSR**).

5.3.2. THE EN ROUTE-LEG MODE

The following are the characteristics of the En route-Leg Mode:

1. The course deviation indicator (CDI) sensitivity is plus and minus five nautical miles, full scale. This applies to the CDI on the NAV 1 page as well as any external CDIs or HSI's interfaced to the KLX 135. If the CDI or HSI has five dots left and right of the center position, then each dot represents one nautical mile of deviation.
2. Navigation is provided along the great circle path between two waypoints. As you probably know, great circle navigation is the shortest distance between two points located on the earth's surface. In the case of Direct To operation, the "from" waypoint is not displayed but it is the point where Direct To operation was initiated. The course to fly while in this mode is referred to as the desired track (Dtk). The desired track is displayed on the NAV 4 page. To fly a great circle course between two points, the desired track may be constantly changing. A good way to

illustrate this concept is with a world globe and a piece of string. You can determine the great circle path between Denver, Colorado and Manila, Philippines by stretching the string over the globe between these two points. Notice that you would start the flight with a northwesterly desired track, which gradually becomes due westerly, and finally southwesterly by the time you reach Manila. Of course, your trips with the KLX 135 will be substantially shorter and the desired track will probably change only a few degrees.

3. Automatic waypoint sequencing is provided during flight plan operation. As you reach a waypoint in your flight plan, the next leg of the flight plan automatically becomes active.
4. Turn anticipation may be utilized in flight plan operation as described in [section 4.10.2](#).

5.3.3. THE EN ROUTE-OBS MODE

The following are characteristics of the En Route-OBS mode.

1. (Same as item 1 for En Route-Leg mode) The course deviation indicator (CDI) sensitivity is plus and minus five nautical miles, full scale. This applies to the CDI on the NAV 1 page as well as any external CDIs or HSI's interfaced to the KLX 135. If the CDI or HSI has five dots left and right of the center position, then each dot represents one nautical mile of deviation.
2. The course is defined by the active waypoint and the selected magnetic course. A course "to" or "from" the active waypoint may be selected.
3. There is no automatic leg sequencing or turn anticipation.
4. When the active waypoint is a VOR, the published magnetic variation for the VOR is utilized rather than the calculated magnetic variation.

5.3.4. EFFECTS OF SWITCHING FROM EN ROUTE-OBS MODE TO EN ROUTE-LEG MODE

The following mode transition occurs if the KLX 135 is in the En Route-OBS mode with a TO indication and the mode is switched to the En Route-Leg mode:

1. The waypoint that was active while in the OBS mode remains the active waypoint when the En route-Leg mode is activated. The

system does not attempt to orient itself on a leg of the active flight plan.

2. The selected course (**Obs**) that was active in the OBS mode prior to switching to Leg mode becomes the desired track (**Dtk**) in the Leg mode.
3. With the exception of #2 above, the characteristics of normal Direct To operation apply.
4. If the active waypoint was part of the active flight plan (FPL 0), the system will revert to normal flight plan operation once the active waypoint is reached.

If, on the other hand, the KLX 135 is showing a FROM indication when the mode is switched from En Route-OBS to En Route-Leg mode, the system will immediately orient itself on the nearest leg of the flight plan.

5.3.5. ACTIVATING A WAYPOINT WHILE IN THE EN ROUTE-OBS MODE

While in the En route-OBS mode, you may activate another waypoint by using the normal Direct To method or by using a second method. This second method activates another waypoint without changing the selected course (OBS). In other words, when the new waypoint is activated, the D-Bar is not necessarily recentered. In figure 5-42 the KLX 135 is in the En Route-OBS mode and the selected course is 149°. You have just crossed ARG and desire to activate the next waypoint in the flight plan, GQE, without recentering the D-Bar.

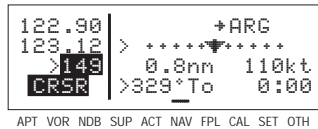


Figure 5-42

To activate a waypoint in OBS mode without changing the selected course:


1. Press  (figure 5-43). The rules described in section 4.8, "Direct To Operation", dictate which waypoint identifier will be initially displayed on the Direct To page.



Figure 5-43

- Press **[▶]** a second time. The annunciation **DIRECT TO** changes to **ACTIVATE** (figure 5-44). Repeated presses of **[▶]** cause the annunciation to alternate between **DIRECT TO** and **ACTIVATE**. Make sure **ACTIVATE** is displayed.

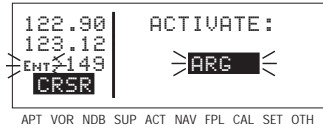


Figure 5-44

- If the desired waypoint is not the one that was suggested by the KLX 135, enter the desired identifier. Press **[ENT]**.
- Press **[ENT]** to approve the waypoint page and activate the waypoint (figure 5-45). The selected course does not change, therefore this method does not center the D-Bar like a Direct To operation does.

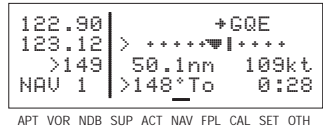


Figure 5-45

5.4. OPERATION OUTSIDE THE PRIMARY COVERAGE AREA

The KLX 135's primary coverage area is from N 74° to S 60° as was shown in figure 4-1. Navigation outside this area is automatically referenced to true North unless a manual input of magnetic variation is made on the SET 2 page. The same is true anytime the KLX 135 is in the OBS mode and the active waypoint is outside the primary coverage area. Under both of these conditions, the following message will be displayed on the Message page:

***Magnetic Var Invalid
All Data Referenced
To True North**

When navigation is within the primary coverage area, the SET 2 page does not display magnetic variation (figure 5-46). However, under the conditions stated above, a user magnetic variation may be entered on line 4 of the SET 2 page.

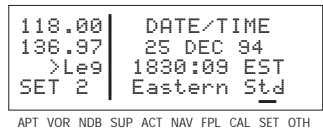


Figure 5-46

To enter the local magnetic variation manually on the SET 2 page:

1. Turn on the cursor (**CRSR**).
2. Move the cursor over the numerical field on line 4 (figure 5-47).

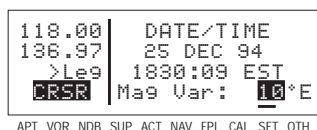


Figure 5-47

3. Use the right knobs to select the magnetic variation, from 0 to 99 degrees.

4. Move the flashing part of the cursor to the E/W (east/west) field and select whether the magnetic variation is easterly or westerly (figure 5-48).

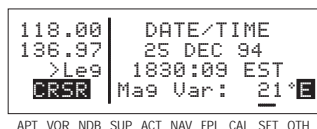


Figure 5-48

5. Press **ENT** to approve and turn the cursor (**CRSR**) off.

5.5. USING THE TAKE-HOME MODE

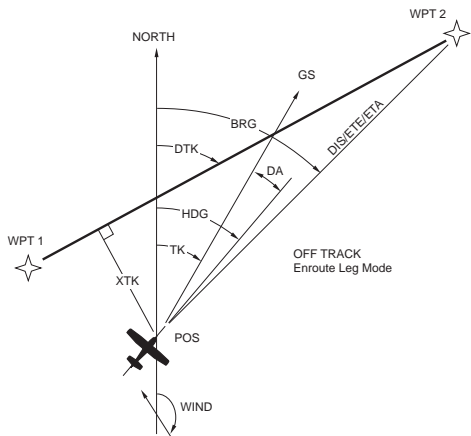
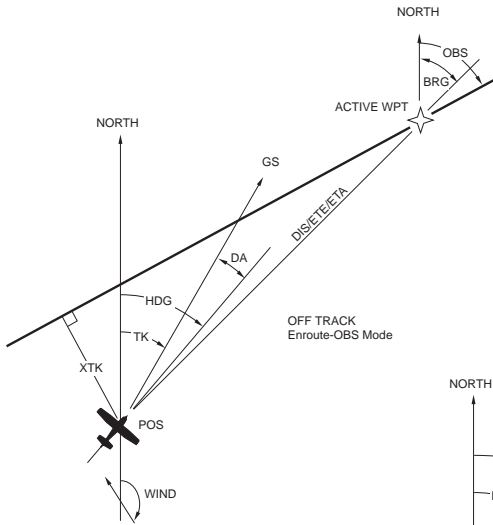
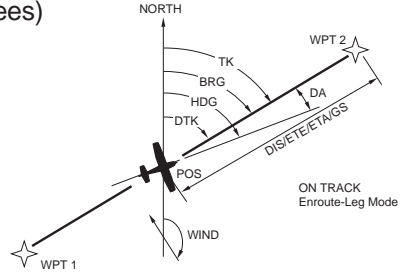
It is very likely that the KLX 135 will become your "best friend" in the cockpit, especially in VFR flight. As with any good friend, you may need some time to get well-acquainted. This will allow you to utilize it to the maximum extent. A great way to get to know the KLX 135 is to use it outside the airplane, using what we call the "take-home mode".

There are products available which allow you to use the KLX 135 at your home, office, or hotel to have get-acquainted time in the take-home mode, for instance the Commander 2000 from Lone Star Aviation. It is also helpful to do flight planning and perform data base updates outside the airplane, perhaps with a home personal computer.

When the KLX 135 is in the take-home mode, it performs as if it is receiving adequate satellite signals to determine its position. It displays the latitude and longitude of its last known position or of whatever position it is initialized to on the Setup 1 (SET 1) page (see [section 4.6](#), "Initialization and Time to First Fix"). In addition, a ground speed and heading may be entered on the SET 1 page and the KLX 135 will track a flight plan or a direct to waypoint just as if it was actually functioning in an aircraft. Distances count down, waypoints sequence, and the deviation bar follows the progress of the simulated flight. Using the take-home mode is an excellent way to learn the operation of the KLX 135 without worrying about the engine running, other traffic, or even terrain (fortunately, these phenomena are not simulated in the take-home mode!)

APPENDIX A - NAVIGATION TERMS

- BRG - Bearing to waypoint (degrees)
- DA - Drift Angle (degrees)
- DIS - Distance to waypoint (nm)
- DTK - Desired Track (degrees)
- OBS - Selected Course
- GS - Groundspeed (nm/hr)
- HDG - Heading (degrees)
- POS - Present position
- TK - Actual Track (degrees)
- WPT - Waypoint
- XTK - Cross Track Error Correction (nm)
displayed as "FLY L 2.3 nm"
- ETE - Estimated Time Enroute (hrs:min)
- ETA - Estimated Time of Arrival



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APPENDIX B - MESSAGE PAGE MESSAGES

Adj Nav Crs to 234° — (Adjust navigation indicator course to 234°) When this message appears, you should select the suggested course on the HSI or CDI. When the KLX 135 is in the En Route-Leg mode, this message occurs at the beginning of turn anticipation (prior to reaching the active waypoint) if the upcoming course change is greater than 5°. See section 4.10.2.

All Wpt Remarks Used, Delete on OTH 4 Page — This message will be displayed if you attempt to enter a waypoint remark and the user database already contains 100 waypoint remarks.

Altitude Fail — This message will be displayed if the altitude input becomes invalid during operation.

Battery Low: Service Required to Prevent Loss of User Data — This message will be displayed when the KLX 135's internal battery is low and needs replacing at an authorized AlliedSignal service center. The battery should be replaced within a week to prevent the loss of all user-defined data including waypoints, airport remarks, flight plans, etc. Typical battery life is approximately three to five years.

COMM System Failed, Service Required — This message appears if the communication transceiver is unable to function. Service from an authorized AlliedSignal service center is required.

Data Base Error: Publ Data Not Useable, Service Required — This message appears if the data base fails an internal test when the KLX 135 is turned on.

Data Base Outdated, All Data Must be Confirmed Before Use — This message appears when the data base is out of date as a result of a date and time entered on the SET 2 page or Self-Test page or as a result of a pilot-entered date being overridden by a date from the GPS receiver.

Magnetic Var Invalid All Data Referenced To True North — This message appears when the magnetic variation is invalid due to operation outside of the data base magnetic variation area without having a pilot-entered magnetic variation. See section 5.4.

No GPS Receiver Data — This message appears when the KLX 135 fails a specific internal test for the GPS receiver. This failure will prevent the unit from providing any navigation capability.

OBS Waypoint > 200nm — (OBS mode waypoint greater than 200 nm away) This message is displayed when the KLX 135 is in the OBS mode and the distance to the active waypoint is more than 200 nautical miles.

Other WPTs Deleted — (Other waypoints deleted) This message is displayed whenever more than 10 waypoints used in a flight plan (including the active waypoint) have been deleted.

Position of _____ has Changed -- This message appears when either the latitude or the longitude of a waypoint used in a flight plan or the active waypoint has changed by more than .33 minutes as a result of updating the data base.

Positions of Other WPTs Have Changed -- This message appears when the above message “ Position of _____ has Changed” would be effective for more than ten waypoints..

RCVR HW Error: ____ -- (Receiver Hardware Error) This message appears when the KLX 135 fails a specific internal test for the GPS receiver. The blank will contain a numerical value which may provide assistance to maintenance personnel.

Recycle Power to Use Valid Data Base Data -- This message appears when the date entered on the Initialization page is before the data base effective date and the date entered later on the SET 2 page is after the data base effective date, or vice versa. Turn the KLX 135 off and back on so that the correct data base data is utilized.

Satellite Coverage Inadequate for NAV -- This message appears when the received GPS signals are not adequate for navigation. Occasions when this message will be displayed include when there are an insufficient number of satellites (including altitude input) or when the satellite geometry is inadequate for accurately determining position within 3.8 nautical miles.

Search the Sky Acquisition Started -- This message appears when the GPS receiver is unable to locate satellites in the normal start-up mode and reverts to a search the sky acquisition. See section 4.6.

System Time Updated To GPS Time -- This message appears when the KLX 135 system time is automatically updated to GPS time by more than 10 minutes.

User Data Lost -- This message appears when the unit determines that the internal memory backup battery is dead or that some other internal failure has occurred which has caused all user-entered data including waypoints, flight plans, airport remarks, etc., to be lost.

WPT _____ Deleted -- This message appears when a waypoint used in a flight plan, or the active waypoint, no longer exists as a result of updating the data base. The blank space is filled in with the waypoint identifier. The waypoint is deleted from flight plans in which it was used.

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APPENDIX C - SCRATCHPAD MESSAGES

Scratchpad messages are temporarily displayed in reverse video in the bottom left corner of the screen. The following are scratchpad messages that may appear:

Active Wpt — (Active Waypoint) Appears when you attempt to delete a user-defined waypoint on the OTH 3 page if the waypoint is the active waypoint (the waypoint you are navigating to). Another waypoint must be made the active waypoint before this waypoint can be deleted from the user-defined waypoint list.

Dup Ident — (Duplicate Identifier) Appears when you select a waypoint identifier on one of the waypoint type pages if there is more than one waypoint of that waypoint type having the same identifier.

Invalid Ent — (Invalid Entry) Appears when you attempt to enter data which is not a valid entry. For example, trying to enter a date of 30 FEB 95.

Invalid Freq — (Invalid Frequency) Appears when you attempt to transfer a frequency outside the VHF communication band from an APT 4 page to the standby COMM frequency. For example, some ATIS frequencies are in the VHF NAV band (108.00 to 117.90 MHz), and can not be received on KLX 135.

No Act Wpt — (No Active Waypoint) Appears when you attempt to activate the OBS mode if there is no active waypoint. To have an active waypoint, a flight plan must be activated of a Direct To must be initiated.

NoSuch Wpt — (No Such Waypoint) Appears when there is no waypoint in the data base corresponding to the entered identifier on the Supplemental Waypoint page.

Remrks Full — (Remarks Full) Appears when you attempt to create a user-entered Airport or Supplemental Waypoint remark on the APT 3 or SUP 3 page if 100 user-entered remarks already exist. In order to create additional airport remarks, some existing remarks must be deleted on the OTH 4 page.

Used In Fpl — (Used in Flight Plan) Appears when you attempt to delete a user-defined waypoint on the OTH 3 page if the waypoint is used in a flight plan. Either this waypoint must be deleted from the flight plan or the entire flight plan must be deleted before this waypoint can be deleted from the user-defined waypoint list.

Appendix

USR DB Full — (User Data Base Full) Appears when you attempt to create a user-defined waypoint if the user data base already contains 250 waypoints. In order to create additional user-defined waypoints, it will first be necessary to delete existing user-defined waypoints on the OTH 3 page.

APPENDIX D - ABBREVIATIONS**STATE ABBREVIATIONS**

<u>ABBREVIATION</u>	<u>STATE</u>
AK	Alaska
AL	Alabama
AR	Arkansas
AZ	Arizona
CA	California
CO	Colorado
CT	Connecticut
DC	District of Columbia
DE	Delaware
FL	Florida
GA	Georgia
IA	Iowa
ID	Idaho
IL	Illinois
IN	Indiana
KS	Kansas
KY	Kentucky
LA	Louisiana
MA	Massachusetts
MD	Maryland
ME	Maine
MI	Michigan
MN	Minnesota
MO	Missouri
MS	Mississippi
MT	Montana
NC	North Carolina
ND	North Dakota
NE	Nebraska
NH	New Hampshire
NJ	New Jersey
NM	New Mexico
NV	Nevada
NY	New York
OH	Ohio
OK	Oklahoma

Appendix

STATE ABBREVIATIONS (Cont'd)

OR	Oregon
PA	Pennsylvania
RI	Rhode Island
SC	South Carolina
SD	South Dakota
TN	Tennessee
TX	Texas
UT	Utah
VA	Virginia
VT	Vermont
WA	Washington
WI	Wisconsin
WV	West Virginia
WY	Wyoming

CANADIAN PROVINCE ABBREVIATIONS

<u>ABBREVIATION</u>	<u>PROVINCE</u>
AB	Alberta
BC	British Columbia
MB	Manitoba
NB	New Brunswick
NF	Newfoundland
NS	Nova Scotia
NW	Northwest Territory
ON	Ontario
PE	Prince Edward Island
PQ	Quebec
SK	Saskatchewan
YK	Yukon

COUNTRY ABBREVIATIONS

<u>ABBREVIATION</u>	<u>COUNTRY</u>
AFG	Afghanistan
AGO	Angola
AIA	Anguilla Isl.
ALB	Albania
ANT	Antarctica/Netherlands Antilles/Aruba

COUNTRY ABBREVIATIONS (Cont'd)

ARE	United Arab Emirates
ARG	Argentina
ASM	American/Western Samoa
ATG	Antigua/Barbuda
AUS	Australia
AUT	Austria
BDI	Burundi
BEL	Belgium
BEN	Benin
BFA	Burkina Faso
BGD	Bangladesh
BGR	Bulgaria
BHR	Bahrain
BHS	Bahamas
BHU	Bhutan
BLZ	Belize
BMU	Bermuda
BOL	Bolivia
BRA	Brazil
BRB	Barbados
BRN	Brunei
BWA	Botswana
CAF	Central African Republic
CHE	Switzerland
CHL	Chile/Easter Isl.
CHN	China
CIV	Ivory Coast
CMR	Cameroon
CNR	Canary Islands
COG	Congo
COK	Cook Islands
COL	Colombia/San Andres
CRI	Costa Rica
CSK	Czechoslovakia
CUB	Cuba
CYM	Cayman Islands
CYP	Cypress
DEU	Germany
DJI	Djibouti
DMA	Dominica

COUNTRY ABBREVIATIONS (Cont'd)

DNK	Denmark
DOM	Dominican Republic
DZA	Algeria
ECU	Ecuador
EGY	Egypt
ERI	Eritrea
ESP	Spain
ETH	Ethiopia
FIN	Finland
FJI	Fiji/Tonga
FLK	Falkland Islands
FRA	France
GAB	Gabon
GBR	United Kingdom
GHA	Ghana
GIB	Gibraltar
GIN	Guinea
GLP	Guadeloupe/Martinique
GMB	Gambia
GNB	Guinea-Bissau
GNQ	Equatorial Guinea
GPV	Cape Verde
GRC	Greece
GRD	Grenada
GRL	Greenland
GTM	Guatemala
GUF	French Guiana
GUY	Guyana
HKG	Hong Kong
HND	Honduras
HTI	Haiti
HUN	Hungary
IDN	Indonesia
IND	India
IOT	British Indian Ocean Territory
IRL	Ireland
IRN	Iran
IRQ	Iraq
ISL	Iceland
ISR	Israel

COUNTRY ABBREVIATIONS (Cont'd)

ITA	Italy
JAM	Jamaica
JOR	Jordan
JPN	Japan/Okinawa
JTN	Johnston Island
KEN	Kenya
KHM	Cambodia/Kampuchea
KIR	Kiribati/Tuvalu/Phoenix I./Line I.
KNA	St. Kitts/Nevis
KOR	Korea
KWT	Kuwait
LAO	Laos
LBN	Lebanon
LBR	Liberia
LBY	Libya/SPA Jamahiriya
LCA	St. Lucia
LKA	Sri Lanka
LSO	Lesotho
LUX	Luxembourg
MAC	Macau
MAR	Morocco
MDG	Madagascar/Comoros/Mayotte I./Reunion
MDV	Maldives
MEL	Melilla
MEX	Mexico
MHL	Marshall Island
MID	Midway Island
MLI	Mali
MLT	Malta
MNP	Mariana Islands
MOZ	Mozambique
MRT	Mauritania
MSR	Montserrat Isl.
MUS	Mauritius
MWI	Malawi
MYR	Myanmar
MYS	Malaysia
NCL	New Caledonia
NER	Niger
NGA	Nigeria

COUNTRY ABBREVIATIONS (Cont'd)

NIC	Nicaragua
NIU	Niue Island
NLD	Netherlands
NOR	Norway
NPL	Nepal
NRU	Naura
NZL	New Zealand
OMN	Oman
PAC	Oakland OTCA (PACIFIC)
PAK	Pakistan
PAN	Panama
PCI	Caroline Island/Micronesia
PER	Peru
PHL	Philippines
PNG	Papua New Guinea
POL	Poland
PRI	Puerto Rico
PRK	Korea (Dem. Peoples Republic)
PRT	Portugal/Azores/Madeira Isl.
PRY	Paraguay
PYF	French Polynesia/Society Isl./Tuamotu
QAT	Qatar
ROM	Romania
RWA	Rwanda
SAU	Saudi Arabia
SDN	Sudan
SEN	Senegal
SGP	Singapore
SHN	Ascension Island/St. Helena
SLB	Solomon Islands
SLE	Sierra Leone
SLV	El Salvador
SOM	Somalia
SPM	St. Pierre/Miquelon
STP	Sao Tome/Principe
SUR	Suriname
SVK	Slovakia
SWE	Sweden
SWZ	Swaziland
SYC	Seychelles

COUNTRY ABBREVIATIONS (Cont'd)

SYR	Syria
TCA	Turks and Caicos Islands
TCD	Chad
TGO	Togo
THA	Thailand
TTO	Trinidad/Tobago (SP?)
TUN	Tunisia
TUR	Turkey
TWN	Taiwan
TZA	Tanzania
UGA	Uganda
URY	Uruguay
USA	Baker Islands
VCT	St. Vincent
VEN	Venezuela
VGB	Virgin Islands (U.K.)
VIR	Virgin Islands (U.S.)
VNM	Vietnam
VUT	Vanautu
WAK	Wake Island
WLF	Wallis/Futuna Islands
XJ1	Kazakhstan/Kyrgyzstan
XJ2	Armenia/Georgia
XJ3	Ukraine/Moldova
XJ4	Estonia/Russia
XJ5	Belarus/Latvia/Lithuania/Russia
XJ6	Kazakhstan/Russia
XJ7	Kazakhstan/Tajikistan/Turkmenistan/ Uzbekistan
XJJ	Azerbaijan
XJR	Russia
YEM	Yemen (Arab Republic)
YUG	Yugoslavia
ZAF	South Africa
ZAM	Zambia
ZAR	Zaire
ZWE	Zimbabwe

OTHER ABBREVIATIONS USED ON KLX 135 PAGES

A	Airport waypoint
ACQ	Acquisition
ACT	Active flight plan waypoints
ADJ	Adjust
AKD	Alaska Daylight Time
AKS	Alaska Standard Time
ALT	Altitude
APT	Airport
ATD	Atlantic Daylight Time
ATS	Atlantic Standard Time
BRG	Bearing
CAL	Calculator
CDT	Central Daylight Time
CHAR	Character
CRS	Course
CRSR	Cursor
CST	Central Standard Time
DB	Data base
DEGRD	Degraded navigation
DIS	Distance
DTK	Desired track
DUP	Duplicate
E	East
EDT	Eastern Daylight Time
ELE	Elevation
ENT	Enter
EST	Eastern Standard Time
ETA	Estimated time of arrival
ETE	Estimated time en route
FAILR	Failure of receiver
FPL	Flight plan
FR	From
GDT	Greenland Daylight Time
GS	Groundspeed
GST	Greenland Standard Time
HAD	Hawaii Daylight Time
HAS	Hawaii Standard Time
HLT	Health of space vehicle signal
IDENT	Identifier

OTHER ABBREVIATIONS (Cont'd)

INIT	Initialization
KT	Knots
L	Left
MAG VAR	Magnetic variation
MDT	Mountain Daylight Time
MSG	Message
MST	Mountain Standard Time
N	NDB waypoint
N	North
NAV	Navigation
NAV A	Navigation with altitude aiding
NAV D	Navigation with data collection
NM	Nautical miles
OBS	Omni bearing selection
ORS	Operational Revision Status
OTH	Other
P.POS	Present position
PDT	Pacific Daylight Time
POS	Position
POSN	Position
PRES	Present
PRS	Pressure
PST	Pacific Standard Time
PUB	Published
PWR	Power
RAD	Radial
RCVR	Receiver
REF	Reference
REQ	Required
RES	Reserve fuel
S	South
S	Supplemental waypoint
SDT	Samoa Daylight Time
SET	Setup
SNR	Signal-to-noise ratio
SRCH	Search the sky
SST	Samoa Standard Time
SUP	Supplemental
SV	Space vehicle
SW	Software

OTHER ABBREVIATIONS (Cont'd)

TK	Actual track
TOT	Total
U	User-defined waypoint
USR	User-defined waypoint
UTC	Coordinated Universal Time (Zulu)
V	VOR waypoint
W	West
WPT	Waypoint
Z	Zulu time

APPENDIX E - LAT/LON CONVERSIONS

The KLX 135 utilizes latitude and longitude expressed in degrees, minutes, and hundredths of a minute. You may occasionally see a document expressing latitude and longitude in degrees, minutes, and seconds. This table may be used to convert seconds to hundredths of a minute.

<u><i>SECONDS (")</i></u>	<u><i>HUNDREDTHS OF A MINUTE (')</i></u>
00	.00
01	.02
02	.03
03	.05
04	.07
05	.08
06	.10
07	.12
08	.13
09	.15
10	.17
11	.18
12	.20
13	.22
14	.23
15	.25
16	.27
17	.28
18	.30
19	.32
20	.33
21	.35
22	.37
23	.38
24	.40
25	.42
26	.43
27	.45
28	.47
29	.48
30	.50
31	.52
32	.53

Appendix

LAT/LON CONVERSIONS (Cont'd)

<u>SECONDS (")</u>	<u>HUNDREDTHS OF A MINUTE (')</u>
33	.55
34	.57
35	.58
36	.60
37	.62
38	.63
39	.65
40	.67
41	.68
42	.70
43	.72
44	.73
45	.75
46	.77
47	.78
48	.80
49	.82
50	.83
51	.85
52	.87
53	.88
54	.90
55	.92
56	.93
57	.95
58	.97
59	.98

For example:

35° 46' 24" is the same as 35° 46.40'

32° 15' 58" is the same as 32° 15.97'

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5-11	Rev 1	6/95
5-12	Rev 1	6/95
5-13	Rev 1	6/95
5-14	Rev 1	6/95
A-1	Rev 0	3/94
A-2	Rev 0	3/94
B-1	Rev 0	3/94
B-2	Rev 0	3/94
B-3	Rev 0	3/94
B-4	Rev 0	3/94
C-1	Rev 0	3/94
C-2	Rev 0	3/94
D-1	Rev 0	3/94
D-2	Rev 0	3/94
D-3	Rev 0	3/94
D-4	Rev 0	3/94
D-5	Rev 0	3/94
D-6	Rev 0	3/94
D-7	Rev 0	3/94
D-8	Rev 0	3/94
D-9	Rev 0	3/94
D-10	Rev 0	3/94
E-1	Rev 0	3/94
E-2	Rev 0	3/94
I-1	Rev 0	3/94
I-2	Rev 0	3/94
I-3	Rev 0	3/94
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I-6	Rev 0	3/94
I-7	Rev 0	3/94
I-8	Rev 0	3/94

Record of Revisions

REV. NO.	REVISION DATE	DATE INSERTED	BY
			Complete Through Rev No. 0
1	6/1/95		Complete Through Rev No. 1

