3 USING LABMON

The Conexant Zodiac™ Development Kit is designed to facilitate evaluation of Conexant's Jupiter Global Positioning System (GPS) receiver engine based on the Zodiac chip set. The receiver can be used in both static and mobile operations for evaluation purposes.

This Section explains the use of the GPS monitor and controller software, referred to as LABMON, provided with the Development Kit (Refer to Section 2 of this Designer's Guide for details on how to set up and configure the Development Kit). LABMON runs on a PC and allows the user to control the receiver and to display the receiver outputs. Externally supplied Radio Technical Commission for Maritime Services (RTCM SC-104) data can also be logged using a second PC serial port. ASCII files containing the LABMON source code, included on the same diskette as the executable, provide a reference for similar Original Equipment Manufacturer (OEM) code implementations.

3.1 Introduction

The Development Kit implements the receiver control operation and input/output (I/O) functions of the GPS receiver using an IBM-AT compatible PC, a serial port, external antenna, and power supply. The GPS receiver is contained in a housing with I/O connectors, status LEDs, and configuration DIP switches.

3.1.1 LABMON Compatibility With Conexant Receivers. There are two series of Conexant commercial GPS receivers to date. The first was the NavCore series and the latest is the Zodiac family. The NavCore series consists of the NavCore V, MicroTracker, MicroTracker LP, NavCard, and NavCard LP receivers. The Zodiac family currently consists of the Jupiter board level product and the Zodiac chip set product.

LABMON v5.4 is designed primarily to support the Zodiac family of receivers. Since it is also backwardly compatible with the NavCore series of receivers, this version of LABMON may be used to monitor and control them as well.

3.1.1.1 Serial Communication Protocols. The receivers may use either a binary or NMEA-0183 type of serial interface protocol for communication. The Zodiac and NavCore receivers share a similar Conexant binary message format, but the messages themselves have different IDs and content. To differentiate between these binary types in this document, they are referred to as Zodiac binary and NavCore binary.

The NMEA-0183 protocol consists of a number of standard messages, and also allows manufacturer specific or proprietary messages for more complete control or monitoring of receivers.

While the Zodiac and NavCore receiver NMEA-0183 protocols share a number of standard messages, the number and type of Conexant proprietary messages differ. To differentiate between these NMEA types in this document, they are referred to as Zodiac NMEA and NavCore NMEA.

The Zodiac receiver series comes standard with both Zodiac binary and Zodiac NMEA. The type used is selected either by software command or by controlling the voltage applied to an external pin on the receiver.

The NavCore series is available with Conexant NavCore binary and NavCore NMEA protocols depending on the model and software options. The type used is selected by controlling the voltage applied to an external pin on the receiver.

The NavCard supports only NavCore binary. The NavCard LP is available with either Conexant NavCore binary or NavCore NMEA-0183 protocols.

To communicate with a receiver, the message protocol used by LABMON is changed to match the current message type in use by that receiver.

It is important to select the correct protocol for LABMON to operate properly. The two binary protocols are not compatible. The NMEA-0183 protocols are similar enough that standard messages can be displayed or received properly, but not all Conexant proprietary NMEA messages will be output or accepted.

3.2 Installing LABMON

3.2.1 Operating Environment. LABMON was designed to run using an MS-DOS/PC-DOS or compatible DOS operating system. It is also possible to run LABMON from the DOS prompt under Windows 3.x.

NOTE: Sometimes, both Windows and DOS will attempt to use the same interrupt for the serial ports and a conflict may occur. If problems are encountered running LABMON under Windows, exit to DOS to run LABMON.

If a mouse driver is installed on a serial port used by LABMON, serial data may be prevented from reaching LABMON. The mouse driver should be removed if LABMON does not function properly.

While LABMON can be run from the 3.5-inch diskette, copying the program and associated files to a hard disk and retaining the diskette as a backup is recommended.

The current version of LABMON can be used to operate the Zodiac family of receivers and is also compatible with the MicroTracker/MicroTracker LP, NavCore V, and PCMCIA NavCard/NavCard LP receivers. However, some of the keys and commands used to enable certain features of the current hardware configuration may not be supported by these receivers.

3.2.2 DOS Installation. To install LABMON for use with DOS, do the following:

1. Create a directory on the PC's hard drive and copy all the LABMON disk files to it.
2. Edit your AUTOEXEC.BAT file to include this directory as part of the path.
3. Remove the LABMON disk and save it as a backup.
4. Reboot the PC to update the path.

3.2.3 Windows 3.x Installation. To install LABMON for use with Windows 3.x, do the following:

1. Perform steps 1 through 4 as for DOS installation above.
2. Start Windows, select the Program Manager, and select New under the File menu.
3. Click on the Program Item within the dialog box which appears and click on OK to exit the dialog box.
4. Enter "LABMON" for the Description.
5. Enter "LABMON" for the Command Line.
6. Enter the full path to the LABMON directory or use Browse to set the Working Directory (i.e., C:\LABMON).
7. To select the program icon, click on Change Icon. Then, enter the full path or use Browse to select the LABMON.ICO file located in the LABMON installation directory and click on OK twice to exit the dialog boxes.

3.2.4 Windows 95 Installation. To install LABMON for use with Windows 95, do the following:

1. Create a directory on the PC's hard drive and copy all the LABMON disk files to it.
2. Remove the LABMON disk and save it as a backup.
3. Create a "shortcut" to the LABMON executable (see the Win95 manual or use the Win95 on-line Help feature).

3.3 Configuring LABMON

3.3.1 The LABMON.CFG File. Using function keys or certain <Alt>/function key combinations, LABMON can be configured for the message protocol mode (binary or NMEA), display datum, the UTC time offset, speed units, display colors, reference position, and filtering parameters. This is the easiest way to change the configuration settings.

These parameters can also be changed by editing the LABMON.CFG file. If difficulties are encountered processing the settings, the LABMON.CFG file should be examined to see if extraneous or incorrect information has corrupted it. This file may be deleted since the program will automatically reconstruct it with defaults which can then be modified.

LABMON checks for the presence of the LABMON.CFG file when the program is invoked and reads parameters from the file if it is present. If the LABMON.CFG file is not present, default configuration parameters are used, and a LABMON.CFG file containing the following lines is created in the local directory:

```
DATA TYPE  4
DATUM NUMBER  0
UTC OFFSET  7
SPD UNITS  0
COLORS  10  15  0  14  15  10
LAT  33.661446  LON  - 117.861252
ALT - 8.716304
FILTERS  STATMASK  FFFF  FOM  5
QUALITY  1  SATS  3  PDOP  6.000000
HDOP  6.000000  VDOP  6.000000
```

NOTE: Although the latitude, longitude, altitude, and filter parameters are shown on more than one line above, they must all appear on the same line in the configuration file.

3.3.1.1 DATA TYPE Parameter. This parameter determines the desired message protocol mode, binary or NMEA. Use 1 for Conexant NavCore binary, 2 for NavCore NMEA-0183, 4 for Conexant Zodiac binary, and 8 for Zodiac NMEA-0183. This is done using the <Alt>F2 keys.

3.3.1.2 DATUM NUMBER Parameter. The datum number for display of position output is no longer set from within the configuration file when using the Zodiac family of GPS receivers. Instead, use the Ctrl-<F6> keys to enter any of the datum numbers shown in Appendix E of this Designer's Guide.

The Zodiac family supports many datums internally while the NavCore series of receivers supported only WGS-84 with the desired transformation being performed by LABMON. LABMON v5.4 ignores the datum number contained in the LABMON.CFG file when processing Zodiac data. The inclusion of the datum number in the configuration file is for backward compatibility of LABMON with Conexant NavCore GPS receivers.

When using LABMON v5.4 with one of these earlier receivers, the datum number may either be changed in the configuration file (using an appropriate text editor) or by using the Ctrl<F6> keys to enter any of the datums shown in Appendix E.

3.3.1.3 UTC OFFSET Parameter. The UTC time offset between local time and UTC should be set to UTC minus local time. The time zones in the United States, for example, have positive time offsets. This time is added to the PC time and used as the default for receiver initialization. It is important to verify and correct, if necessary, the PC time for correct initialization when using the defaults provided by LABMON. This is done using the F1 key.

3.3.1.4 SPD UNITS Parameter. This parameter configures the speed units displayed in the SPD field on the LABMON display. Unless modified in the LABMON.CFG file (since there are no keys or key combinations that will do this), the speed units will default to meters per second (m/s). The setting for speed units in the LABMON.CFG file should be set to 0 for m/s, 1 for miles per hour (mph), or 2 for kilometers per hour (kph).

3.3.1.5 COLORS Parameters. Screen colors are changed using the <Alt>-Function key combinations shown on the screen menu.

3.3.1.6 LAT, LON, ALT Parameters. The receiver's reference position can be changed using the <Alt>F3 keys. When this position is changed, the LAT, LON, and ALT parameters in the LABMON.CFG file are changed. The new location becomes the default reference position (the start-up location).

3.3.1.7 FILTERS Parameters. The data filtering parameters STATMASK, FOM, QUALITY, SATS, PDOP, HDOP, and VDOP should be set to the desired criteria for solution evaluation using the <F> key. The parameters used depend on the message protocol in use.

When the criteria are not all met, the FILTER ON indicator is shown on the display screen and if data is being extracted into a text file for post processing, the data is not written to the file. When the criteria are all met, the indicator is not displayed and the data is extracted and written to the file. This allows filtering or screening of outputs that are computed under conditions which do not meet the user's criteria for solution quality.

NOTE: The filter does not prevent any data from being written to the log file when recording data.

The STATMASK parameter is a 16-bit bitmask that is used to mask out any desired invalid bits returned in Message 1000. These invalid bits report the reasons for not being in navigation, and the STATMASK parameter masks out any of these reasons. The format of this bitmask is shown in Figure 3-1.

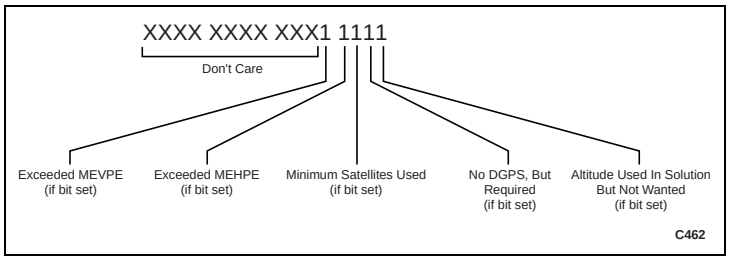

Figure 3-1. STATMASK Filter Parameter Format (0xFFFF Mask)

3.3.2 The LABMON.INI File. LABMON can also be configured to select the COM ports it uses for serial I/O either by choosing settings from within the program or by editing the initialization file, LABMON.INI, before starting the program.

LABMON checks for the presence of the LABMON.INI file when it is invoked and reads parameters from the file if it is present. If this file is not present, default parameters are used for the GPS and RTCM ports, and a LABMON.INI file is created in the local directory. The I/O addresses and interrupts used are shown at the bottom of the screen when LABMON is first started.

The LABMON.INI file contains one line of parameters each for the GPS and for the RTCM ports. These are used to define the port number, interrupt level, baud rate, parity scheme, number of data bits, and stop bits for each. The I/O address used is the default for the port number selected.

3.3.2.1 Default Settings. The default settings for the Zodiac receiver are COM1, IRQ4, 9600 baud, no parity, 8 data bits, and 1 stop bit (if this version of LABMON is used with earlier Conexant GPS receivers, these same settings should be used except that parity should be set to "odd").

The default parameters provided for the RTCM port are COM0 (which disables the port), IRQ3, 9600 baud, no parity, 8 data bits, and 1 stop bit. However, the user should consult the RTCM receiver hardware documentation or contact the provider of the RTCM data to determine the proper settings for the RTCM port.

The easiest way to change the GPS and RTCM port default settings is to start the program and use the <Alt>F1 keys to check or modify the port settings. Alternately, the user may edit the LABMON.INI file. If difficulties are encountered setting the ports, the user should examine the LABMON.INI file to see if extraneous or incorrect information has corrupted it (this file may be deleted since the program will automatically reconstruct it).

The LABMON.INI file initially contains the following lines which provide default values for the GPS port and the RTCM port:

```
GPS   COM1 IRQ4 9600  n  8 1
RTCM  COM0 IRQ3 9600  n  8 1
```

The port parameters may be changed using either lower or uppercase letters, separated by spaces. The syntax for the configuration commands is as follows:

```
[Port][COMn][IRQm][Baud][Parity]
[DataBits][StopBits]
```

NOTE: Although these configuration commands are shown on two lines above, they must all appear on the same line in the initialization file.

Only the following configuration values are currently allowed:

Port	GPS for the GPS port RTCM for the RTCM port
COMn	n = 1, 2, 3, or 4 (to open the port) n = 0 (to ignore the port)
IRQm	m = 0 to 15 (note that the use of IRQ values must be verified by the user when writing this file. The <ALT><F2> keys will configure default values for each port. The <ALT><I> keys are used to configure any allowable IRQ available.
Baud	300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, or 115200
Parity	n, o, e (None, Odd, or Even)
DataBits	6, 7, or 8
StopBits	1 or 2

The modified settings are saved in the LABMON.INI file.

3.4 Using Differential RTCM Data

3.4.1 Differential RTCM Data and Zodiac GPS Receivers. When using differential corrections with a Zodiac receiver, the data is directly input using the Zodiac's Auxiliary port. The baud rate, parity, and number of data and stop bits required by the source needs to be determined and the source protocol established using Message 1330 (Serial Port Communication Parameters).

The source is then connected using either a straight-through cable or a null-modem cable. The required cable type may be different than that recommended by the provider of the specific correction source.

To change the Auxiliary port parameters, the receiver must be using Zodiac binary protocol. The protocol may be changed to Zodiac NMEA after setting port parameters.

Normally, RTCM data is sent directly to the Auxiliary port of the receiver. In the event that RTCM data needs to be recorded for analysis, a cable with three connectors may be used to send data to both the receiver's Auxiliary port and a second PC serial port. The user must then set the parameters for the second port to match the RTCM SC-104 source protocol as described in Section 3.3. Refer to Section 2 of this Designer's Guide for additional details.

NOTE: An indirect DGPS data input capability is available with Zodiac GPS receivers for those applications that are limited to one serial port. Message 1351 is the Zodiac equivalent of the NavCore Message 210. Setup and operation of LABMON using this feature are identical to the NavCore indirect RTCM input method described in the next paragraph.

3.4.2 Differential RTCM Data and NavCore GPS Receivers. When using differential corrections with NavCore series receivers, the data may be directly input using the receiver's Auxiliary port or indirectly input with a Message 210 (Differential GPS RTCM SC-104 Data Message) using the Host port. The method used depends on the receiver type and the system configuration. The direct input method is recommended since it is the simplest.

When using direct input, the baud rate, parity, and number of data and stop bits required by the source must be established using Message 217 (Port Configuration Message) if in NavCore binary mode or using the ICOM message if in NavCore NMEA-0183 mode. The source is then connected using either a straight-through cable or a null-modem cable. The required cable type may be different than that recommended by the provider of the specific correction source.

When using indirect input of RTCM SC-104 data, the user connects the source to a second serial port on the PC. LABMON checks for the presence of RTCM SC-104 data on the second serial port and processes it when available.

The user needs to set the source protocol used by LABMON as described in Section 3.3. LABMON packages RTCM SC-104 data received from the second serial port into a series of 210 messages. When data is input directly to the receiver using the Auxiliary I/O port, the LABMON port settings are not used and do not affect RTCM receiver operation.

Note that LABMON does not send RTCM data using Message 210 until the required number of RTCM words are received. This number can be set by the user with the <Ctrl>F10 keys (see Section 3.8). By reducing the number of required RTCM words, the delay between reception of RTCM data by LABMON and the use of that data by the receiver can be minimized.

3.5 Starting LABMON

3.5.1 Command Line Parameters. LABMON software uses several command line options:

- -R Record GPS port data. This command must be followed by the log file name (ex: -RLogfile.log).
- -S Save DGPS port data. This command must be followed by the log file name (ex: -SLogfile.log).
- -C Default Configuration. This command must be followed by a sequence of two parameters. The first parameter is the desired COM port number (1, 2, 3, or 4) and the second parameter is the desired message protocol type (ZB, ZN, NB, or NN). For example, -C1ZB would be the command line for setting COM1 with Zodiac binary messages as the default.

Note: each command line option may be entered in upper or lower case and each must be preceeded by a dash. The message protocol

codes ZB, ZN, NB, and NN may also be entered in upper or lower case.

When running under DOS, the data filenames are selected on the command line. When running under Windows 3.x, either select the LABMON icon or use the Run command from the Program Manager and specify the files on the command line. When running under Windows 95, the 'Run' window under the 'Start' icon must be used so that the command line parameters can be included on the command line.

3.5.2 Starting LABMON From DOS. To run LABMON from DOS, do the following (the filenames used are examples only; others may be used):

1. Type "LABMON" for no data recording.

   Or type "LABMON -RGPS.DAT" to record all data to and from the Host port.

   Or type "LABMON -RGPS.DAT -SRTCM.RTC" to record both Host and Auxiliary port data.

3.5.3 Starting LABMON From The DOS Prompt In Windows 3.x or Windows 95. To run LABMON from Windows 3.x using the DOS prompt, do the following (the filenames used are examples only; others may be used):

1. Select the MS DOS prompt icon.

2. Type "LABMON" for no data recording.

   Or type "LABMON -RGPS.DAT" to record all data to and from the Host port.

   Or type "LABMON -RGPS.DAT -SRTCM.RTC" to record both Host and Auxiliary port data.

3. Type "EXIT" to return to Windows after quitting LABMON.

3.5.4 Starting LABMON Within Windows 3.x. To run LABMON from within Windows 3.x, do the following (the filenames used are examples only; others may be used):

1. Double-click the LABMON icon to start LABMON. (To record data, the program item Command Line field must be changed to include the GPS and/or RTCM filenames. To do this, select the LABMON icon and choose Properties from the File menu under the Windows Program Manager.)

NOTE: To display data, both the GPS message type and serial communication protocol parameters used for LABMON must be set to match those used by the receiver. If data is being received but not displayed by the receiver, a buffer overflow will result after a short time and a message will be displayed to indicate this. If the settings of the receiver are unknown and communication cannot be established, the receiver should be reset after enabling ROM defaults using the appropriate configuration switch as described in Section 2 of this Designer's Guide.

3.5.5 Starting LABMON Within Windows 95. To run LABMON from within Windows 95, do the following (the filenames used are examples only; others may be used):

For no data recording:

1. Start Windows, select Start, select Programs, and finally select Windows Explorer.

2. Select the LABMON folder.

3. Double click on the LABMON application file.

4. To create a Shortcut to LABMON, select the LABMON application file and drag to a location within the main screen.

To record all data to and from the Host port:

1. Start Windows, select Start, then select Run. Type "LABMON -RGPS.DAT" on the command line.

To record both Host and Auxiliary port data:

1. Start Windows, select Start, then select Run. Type "LABMON -RGPS.DAT -SRTCM.RTC" on the command line.

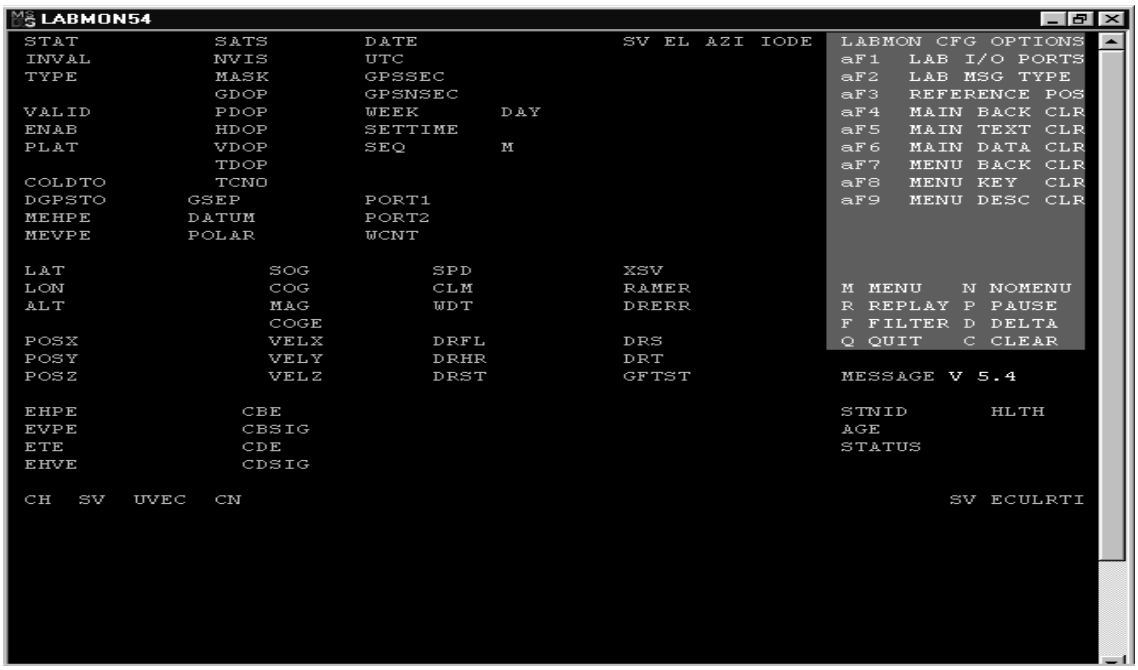

Figure 3-2. LABMON Main Display For Zodiac GPS Receivers

3.6 Stopping LABMON

Avoid using either Ctrl-Break or Ctrl-C to exit LABMON. LABMON replaces certain interrupt handlers that may be required by other programs during its initialization and restores them upon exiting. Therefore, any abnormal termination may affect the execution of another program. If this occurs, the PC may need to be rebooted.

To terminate the execution of LABMON software, press the <Q> key. This will stop LABMON and return the user to either the DOS prompt or to Windows.

3.7 LABMON Displays

To support the many new features available in the Zodiac family of GPS receivers, the screen display and key functions have been revised from earlier versions of LABMON. There is space provided for many new data items on the screen. Some of these items are not shown if LABMON v5.4 is used with NavCore GPS receivers.

There are two types of displays that LABMON uses to output information, the main display and the Built-In Test (BIT) display.

3.7.1 Main Display. Depending on the message protocol type used (binary or NMEA), the data labels shown on the main display change slightly to more accurately reflect the data available from that configuration. The actual label used for the data is described, together with the output message description, in Section 3.8.

The main display, shown in Figure 3-2, appears when LABMON processes Zodiac binary data. There are two portions to this display: data and menu options. Additional data is displayed behind the menu that may be viewed by pressing <N>, the No Menu key. The data portion is comprised of satellite data and status information from binary or NMEA messages.

In addition to data from the receiver, additional useful information such as the number of data bytes recorded, the number of messages sent or received, the number of checksum errors, and the number of message "no acknowledgements" is also displayed.

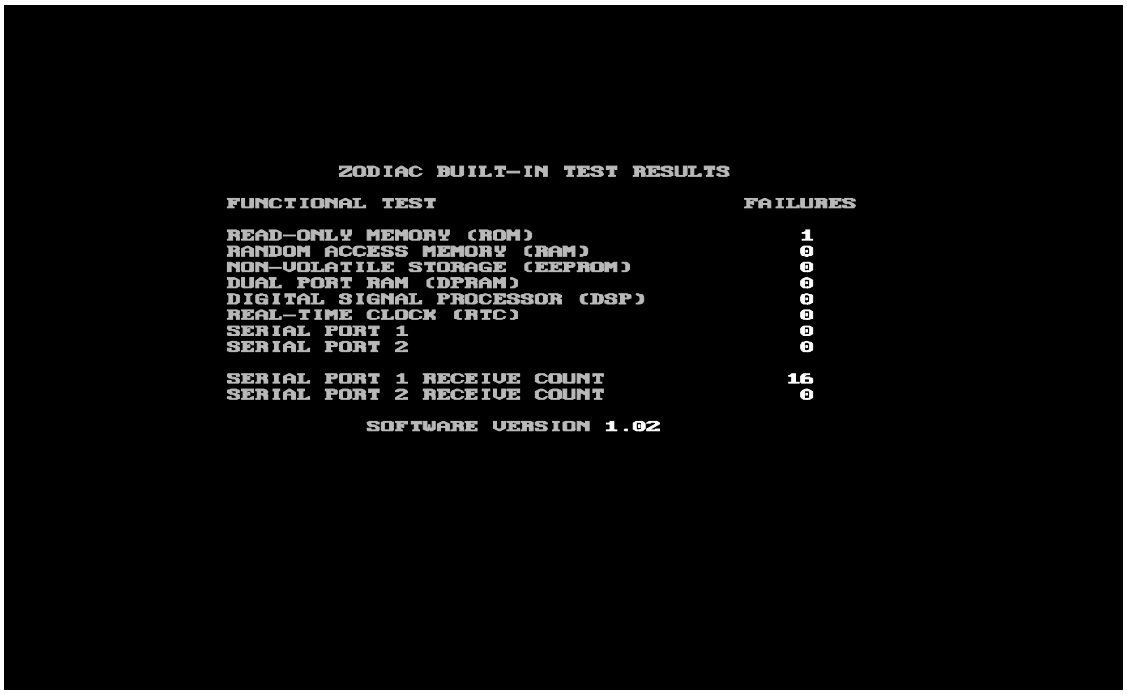

Figure 3-3. LABMON BIT Display For Zodiac GPS Receivers

3.7.2 The BIT Display. The LABMON BIT display screen is different depending on whether a Zodiac GPS receiver or a NavCore GPS receiver is used.

3.7.2.1 BIT Display For Zodiac Receivers. For Zodiac receivers, a typical LABMON BIT display is shown in Figure 3-3. This display contains information from Message 1100 (Built-In Test Results). Refer to Section 5 of this Designer's Guide for detailed information on the Zodiac BIT message.

3.7.2.2 BIT Display For NavCore Receivers. The BIT display screen for Conexant NavCore receivers is different from the Zodiac receivers. The BIT display for Conexant NavCore receivers is shown in Figure 3-4. On this display, information from Message 101, Built-In Test Results, is shown.

For detailed information on the NavCore series BIT message, refer to the Designer's Guide that corresponds to the specific NavCore series GPS receiver (NavCore, MicroTracker LP, NavCard LP, etc.).

3.8 Receiver Output Messages

LABMON decodes and displays most of the available messages. Either Conexant binary or NMEA messages can be in use at a time. Data from these messages is shown in various fields on the screen. Some of the data from binary messages is converted into more commonly used units of measurement (such as degrees and minutes instead of radians).

NOTE: Some of the data contained in messages is not shown on the screen due to space limitations. Data which is omitted is not needed to evaluate receiver performance.

Each of the data fields on the LABMON main display screen is listed alphabetically in Table 3-1 along with a brief description of the data item and the source of the data (i.e., the binary or NMEA messages containing that data item).

Refer to Section 5 of this Designer's Guide for detailed information on each message used by the Zodiac receiver.

For detailed information on each message used by the NavCore series of GPS receivers, refer to the Designer's Guide that corresponds to the specific receiver (NavCore, MicroTracker LP, NavCard LP, etc.).

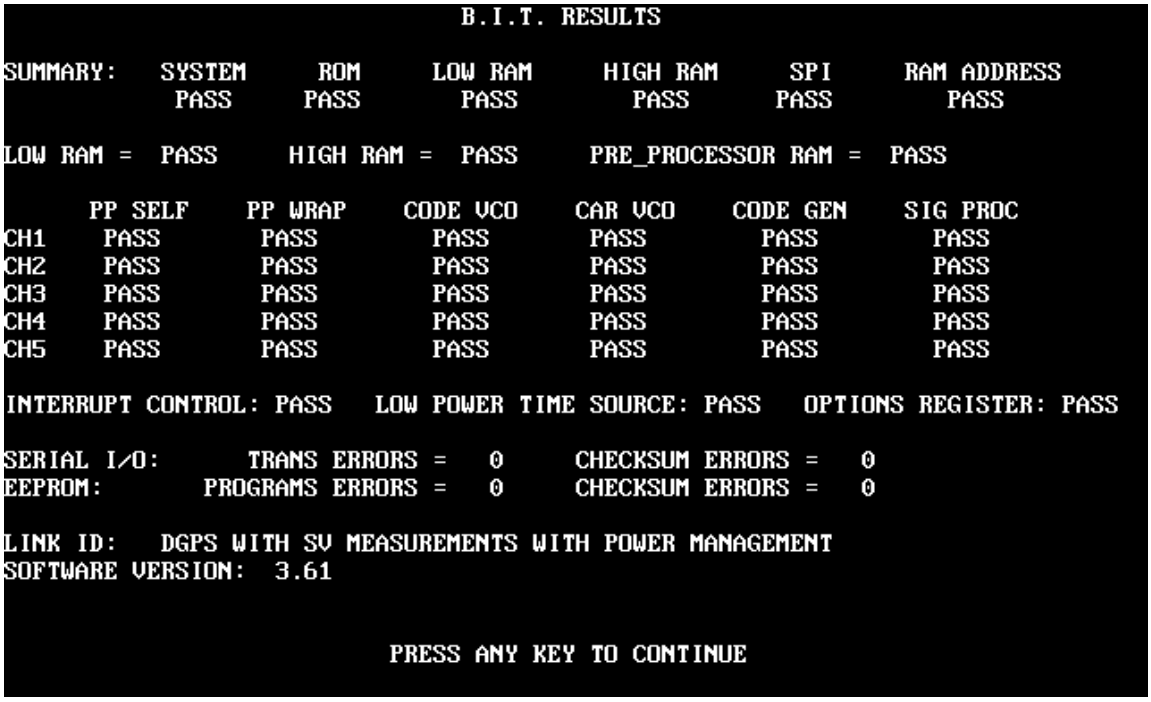

Figure 3-4. LABMON BIT Display For NavCore GPS Receivers

3.9 Receiver Input Messages

LABMON makes extensive use of the keyboard function keys to control program and receiver operation. Most of the keys result in a message being sent to the receiver. The message sent depends on the message protocol in use.

When a key is pressed, there is often a prompt or series of prompts which are used to obtain the required data. These prompts may differ in content or number based on the message protocol in use. Only those that are applicable to the current message protocol are shown. In most cases, default values, units, or allowable ranges are supplied.

Each of the function keys, singly or in combination with the <Shift>, <Ctrl>, or <Alt> keys, that are used to control program operation are listed in Table 3-2 along with their respective functionality and, where applicable, the binary and/or NMEA message that is sent.

3.10 LABMON's Menu Keys

Many of the key functions from earlier versions of LABMON have been renamed or grouped together with related functions under a single menu or key. For example, the Cold Start Enable function is now under the Cold Start key of the Solution Control menu.

The LABMON software uses several keyboard keys and the keyboard's function keys, alone or together with the <Shift>, <Ctrl>, and <Alt> keys. The functions provided by these keys allow the user to control, and communicate with, the GPS receiver. Each key and key combination is listed in Table 3-3 together with its respective function.

While all of the key functions shown in Table 3-3 are supported in the Conexant binary mode, all of them are not supported in the NMEA data mode. An error message is displayed if a key is pressed that is not supported by the current data mode.

Table 3-1. Output Data Shown On The Main Display Screen (1 of 4)

Item Label	Description	Units	Source			
			Zodiac		NAVCORE	
			Binary	NMEA	Binary	NMEA
AGE	Age of last correction	sec	1005	GGA	n/a	GGA
ALT	Height above ellipsoid (Note 1)	m	1000	ALT, GGA	103	ALT, GGA
ATO	Acquisition timeout	sec	n/a	n/a	107	n/a
AZI	Visible satellite azimuth	deg	1003	GSV	102	GSV
CBE	Clock bias error	m	1000	n/a	n/a	n/a
CBSIG	Clock bias error standard deviation	m	1000	n/a	n/a	n/a
CDE	Clock drift error	m/sec	1000	n/a	n/a	n/a
CDSIG	Clock drift error standard deviation	m/sec	1000	n/a	n/a	n/a
CH	Channel	n/a	1002	ZCH	103, 106, 111	n/a
CLM	Climb rate	m/sec	1000	n/a	n/a	n/a
CN	Carrier to noise ratio	dBHz	1002	ZCH, GSV	103	GSV
CODE	Tracking state code	n/a	n/a	n/a	111	n/a
COG	Course over ground	deg	1000	RMC	n/a	RMC, VTG
COLDTO	Cold start timeout	sec	1012	n/a	n/a	n/a
COM	Auxiliary port settings	n/a	n/a	n/a	117	n/a
DATE	Date	n/a	1000	n/a	103	ZDA
DATUM	Datum in use	n/a	1012	n/a	n/a	n/a
DAY	UTC day	n/a	1000	n/a	103	ZDA
DGPSTO	DGPS correction timeout	sec	1012	n/a	n/a	n/a
ECULRTI	DGPS status bits	n/a	1005	n/a	n/a	n/a
ECULRTSI	DGPS status bits	n/a	n/a	n/a	106	DGP
EHPE	Expected horizontal position error	m	1000	n/a	106	n/a
EHVE	Expected horizontal velocity error	m/sec	1000	n/a	n/a	n/a
EL	Visible satellite elevation	deg	1003	GSV	102	GSV
ENAB	Receiver enable option bits	n/a	1012	n/a	103, 106, 107, 111	DGP

Table 3-1. Output Data Shown On The Main Display Screen (2 of 4)

Item label	Description	Units	Source			
			Zodiac		NAVCORE	
			Binary	NMEA	Binary	NMEA
ERPFLBC	Data validity/track state bits	n/a	n/a	n/a	111	n/a
ETE	Expected time error	m	1000	n/a	n/a	n/a
EVPE	Expected vertical position error	m	1000	n/a	106	n/a
FIX	Fix (2-D, 3-D, or altitude fix not available)	n/a	n/a	GSA	n/a	GSA
FOM	Figure of merit	n/a	n/a	n/a	103	n/a
GDOP	Geometric Dilution of Precision	n/a	1003	n/a	103	n/a
GPSSEC	GPS seconds into week	sec	1000	n/a	102, 103, 104	n/a
GSEP	Geoidal separation	m	1000	ALT, GGA	n/a	ALT, GGA
GPSNSEC	GPS nanoseconds from epoch	nsec	1000	n/a	n/a	n/a
HDOP	Horizontal Dilution of Precision	n/a	1003	GGA, GSA	103	GGA, GSA
HLTH	DGPS station health	n/a	1005	n/a	106	DGP
INVAL	Solution invalidity bits	n/a	1000	n/a	n/a	n/a
LAT	Latitude (Note 1)	deg	1000	GGA, RMC	103	GGA, GLL, RMC
LON	Longitude (Note 1)	deg	1000	GGA, RMC	103	GGA, GLL, RMC
LPTO	Low power acquisition timeout	sec	n/a	n/a	107	n/a
M	Measurement sequence number	n/a	1000, 1002	n/a	n/a	n/a
MAG	Magnetic variation	deg	1000	RMC	n/a	RMC
MASK	Antenna elevation mask angle	deg	1012	n/a	n/a	n/a
MEHPE	Minimum expected horizontal position error	m	1012	n/a	n/a	n/a
MESSAGE	Message sent or acknowledged	n/a	n/a	n/a	n/a	n/a
MEVPE	Minimum expected vertical position error	m	1012	n/a	n/a	n/a
NVIS	Number of visible satellites	n/a	1003	GSV	102	GSV
PDOP	Position Dilution of Precision	n/a	n/a	n/a	n/a	n/a
PLAT	Platform type	n/a	1012	n/a	n/a	n/a
PMGMT	Power management status	n/a	n/a	n/a	107	n/a
POLAR	Polar navigation flag	n/a	1000	n/a	n/a	n/a

Table 3-1. Output Data Shown On The Main Display Screen (3 of 4)

Item label	Description	Units	Source			
			Zodiac		NAVCORE	
			Binary	NMEA	Binary	NMEA
PORT1	Host port settings	n/a	1130	n/a	n/a	n/a
PORT2	Auxiliary port settings	n/a	1130	n/a	n/a	n/a
POSX	ECEF position X	m	1009	n/a	103	n/a
POSY	ECEF position Y	m	1009	n/a	103	n/a
POSZ	ECEF position Z	m	1009	n/a	103	n/a
QUAL	GPS quality indicator	n/a	n/a	GGA	n/a	GGA
RAMER	RAM status	n/a	1050	n/a	n/a	n/a
RATE	Solution update rate	sec	n/a	n/a	107	n/a
SATS	Satellite used in solution	n/a	1000	GSV	103	GSV
SEQ	Sequence number	n/a	all	n/a	n/a	n/a
SETTIME	Receiver set time	ticks	all	n/a	102, 103, 104, 107, 111	n/a
SOG	Speed over ground	knots	n/a	RMC	n/a	RMC, VTG
SPD	Speed (Note 2)	m/sec	1000	n/a	n/a	n/a
STAT	Navigation status	n/a	1000	GSA, GGA, RMC	103	GSA, GGA, RMC
STATUS	DGPS status	n/a	1005	n/a	103, 106	n/a
STNID	DGPS station ID	n/a	1005	GGA	106	GGA, DGP
SV	Satellite vehicle PRN	n/a	1002, 1003, 1005	GSA, GSV, ZCH	102, 103, 111	GSA, GSV
TDOP	Time Dilution of Precision	n/a	1003	n/a	103	n/a
TRK	Channel tracking status	n/a	n/a	n/a	103	n/a
TYPE	Solution type bits	n/a	1000	GGA, GSA	n/a	GGA, GSA
UTC	UTC seconds (Note 3)	sec	1000, 1108	GGA, RMC	n/a	GGA, GLL, RMC, ZDA
UVEC	Channel tracking status bits	n/a	1002	ZCH	n/a	n/a
VALID	Solution validity bits	n/a	1012	n/a	n/a	n/a
VDOP	Vertical Dilution of Precision	n/a	1003	GSA	103	GSA

Table 3-1. Output Data Shown On The Main Display Screen (4 of 4)

Item Label	Description	Units	Source			
			Zodiac		NAVCORE	
			Binary	NMEA	Binary	NMEA
VELE	Velocity - east	m/sec	n/a	n/a	103	n/a
VELN	Velocity - north	m/sec	n/a	n/a	103	n/a
VELU	Velocity - up	m/sec	n/a	n/a	103	n/a
VELX	ECEF velocity X	m/sec	1009	n/a	n/a	n/a
VELY	ECEF velocity Y	m/sec	1009	n/a	n/a	n/a
VELZ	ECEF velocity Z	m/sec	1009	n/a	n/a	n/a
WEEK	GPS week number	weeks	1000, 1002	n/a	102, 103, 104, 111	n/a
XSV	Excluded candidate SV	n/a	1012	n/a	n/a	n/a
ZCOUNT	DGPS modified zcount	counts	n/a	n/a	106	DGP

Note 1: When operating LABMON using delta positions, the LAT, LON, and ALT fields display the difference between the current and reference positions in meters.

Note 2: Speed units depends on the configuration data contained in the LABMON.CFG file (refer to paragraph 3.3.1.4 for additional information).

Note 3: UTC seconds uses data from binary message 1108 if available. Otherwise, data from binary message 1000 is used.

Table 3-2. Input Data Provided By Keyboard Keys (1 of 2)

Item Label	Description	Source			
		Zodiac		NAVCORE	
		Binary	NMEA	Binary	NMEA
Menu: GPS INPUT OPTIONS					
F1	Time initialization	1200	INIT	201	INIT
F2	Position and velocity initialization	1200	INIT	201	INIT
F3	Altitude input	1219	INIT	201	INIT
F4	Datum definition	1210	n/a	n/a	n/a
F5	Time Mark initialization (not implemented)	n/a	n/a	n/a	n/a
F6	Factory test (for factory use only)	1304	n/a	n/a	n/a
F7	DR initialization (for DR-enabled receiver)	1270	n/a	n/a	n/a
F8	Built-In Test	1300	IBIT	101	n/a
F9	Gyro factory test (for factory use only)	1305	n/a	n/a	n/a
F10	Send ASCII text to receiver	n/a	n/a	n/a	n/a
F11	Reset receiver	1303	INIT	201	INIT
F12	Reset counters	n/a	n/a	n/a	n/a
Menu: GPS I/O OPTIONS					
<Shift>F1	GPS I/O port settings	1330	n/a	217	ICOM
<Shift>F2	GPS message protocol type	1331	IPRO	n/a	n/a
<Shift>F3	Message log control (Note 1)	log	ILOG	n/a	LOG
<Shift>F4	Message query (Note 1)	query	Q	n/a	Q
<Shift>F5	NMEA generic message (Note 2)	n/a	n/a	n/a	n/a
<Shift>F6	NMEA typical message request (Note 3)	n/a	ILOG	n/a	LOG
<Shift>F7	Reserved	n/a	n/a	n/a	n/a
<Shift>F8	Store almanac UTC data	1040/1042	n/a	206	n/a
<Shift>F9	Request pseudoranges (Note 1)	n/a	n/a	213	n/a
<Shift>F10	Request ephemeris data	1041	n/a	n/a	n/a
<Shift>F11	Load ephemeris data	1241	n/a	n/a	n/a
<Shift>F12	Load almanac UTC data	1240/1242	n/a	205	n/a

Table 3-2. Input Data Provided By Keyboard Keys (2 of 2)

Item Label	Description	Source			
		Zodiac		NAVCORE	
		Binary	NMEA	Binary	NMEA
Menu: SOLUTION CONTROL					
<Ctrl>F1	Navigation validity criteria	1217	n/a	201	INIT
<Ctrl>F2	Platform type	1220	n/a	n/a	n/a
<Ctrl>F3	Navigation configuration	1221	n/a	201	n/a
<Ctrl>F4	Reserved	n/a	n/a	n/a	n/a
<Ctrl>F5	Cold start	1216	n/a	201	n/a
<Ctrl>F6	Datum select	1211	n/a	n/a	n/a
<Ctrl>F7	Antenna type	1218	n/a	n/a	n/a
<Ctrl>F8	Antenna elevation mask	1212	n/a	208	n/a
<Ctrl>F9	SV selection	1213	n/a	208	n/a
<Ctrl>F10	DGPS control	1214	n/a	209	IDGP
<Ctrl>F11	Power management	1317	n/a	211	n/a
Menu: LABMON CONFIGURATION OPTIONS					
<Alt>F1	LABMON I/O port settings	n/a	n/a	n/a	n/a
<Alt>F2	LABMON message protocol type	n/a	n/a	n/a	n/a
<Alt>F3	Reference position	n/a	n/a	n/a	n/a
<Alt>F4	Main display background color	n/a	n/a	n/a	n/a
<Alt>F5	Main display text color	n/a	n/a	n/a	n/a
<Alt>F6	Main display data color	n/a	n/a	n/a	n/a
<Alt>F7	Menu background color	n/a	n/a	n/a	n/a
<Alt>F8	Menu key color	n/a	n/a	n/a	n/a
<Alt>F9	Menu description color	n/a	n/a	n/a	n/a

Note 1: The Zodiac binary "log" and "query" messages inherit the numeric identifier of the message being requested.

Note 2: The <Shift>F5 keys are used to transmit a NMEA message entered by the user.

Note 3: The <Shift>F6 keys are used to send a series of log messages requesting a pre-defined set of output messages that can be used for receiver evaluation.

Table 3-3. LABMON Keyboard Key Functions (1 of 4)

Keyboard Key	Function	Action
KEYBOARD KEYS		
M	Menu change	Press the "M" key to cycle through the Function, <Shift>+Function, <Ctrl>+Function, and <Alt>+Function key menus.
N	No menu	Press the "N" key to toggle the display of the menu option portion of the main display screen on or off. This allows data to be viewed that is normally hidden behind the menu options.
R	Replay	Press the "R" key to replay a log file.
P	Pause	Press the "P" key to pause the receiver output data displayed on the screen. Press the "P" key again to resume data updates. The screen may also be paused by pressing the spacebar.
F	Filter	Press the "F" key to set the parameters used to "filter," or screen, data (refer to Section 3.3).
D	Delta (Note 1)	Press the "D" key to toggle LABMON between the current location (in degrees) and the delta position (in meters).
X	Extract data	Press the "X" key after starting to replay a log file (using the "R" key) to extract data from the file to a selected tab delimited file for plotting purposes.
+,-	Speed of replay	Press the "+" or "-" keys to increase or decrease the rate at which messages are processed during the replay of log files.
< >	Single step in replay	Press the "<" or ">" keys to step a single message backward or forward during replay of log files.
Q	Quit	Press the Q key to exit LABMON.
C	Clear screen	Press the "C" key to clear the LABMON screen outputs until they are refreshed at their normal time.
<Esc>	Exit prompt without changes	Press the <Esc> key to exit a prompt without sending the command.
FUNCTION KEYS		
F1	Time initialization	Press the F1 key to send the estimated user time and date. The time must be entered in 24-hour format and referenced to UTC or Greenwich Mean Time (GMT) rather than local time. The time input should be accurate to within an hour to acquire the first satellite when Cold Start is disabled. If Cold Start is enabled, the time and position do not need to be initialized.
F2	Position and velocity initialization	Press the F2 key to send latitude, longitude, speed, heading, and height to be used as the estimated user state. The latitude and longitude data must be referenced to the datum selected and entered in decimal degrees rather than degrees:minutes:seconds. South latitude and west longitude must be entered as negative numbers. The height is the altitude in meters above the datum ellipsoid. The WGS-84 datum is assumed if no datum is selected.
F3	Altitude input	Press the F3 key to send a value to be used as the estimated user altitude. Unless the force option is used, this value is only used while in 2-D navigation or acquisition modes.
F4	Datum definition	Press the F4 key to send datum definition parameters to be used.
F5	Time Mark initialization	Not implemented.

Table 3-3. LABMON Keyboard Key Functions (2 of 4)

Keyboard Key	Function	Action
FUNCTION KEYS (continued)		
F6	Factory test	For factory use only.
F7	DR initialization	Press the F7 key to initialize DR parameters.
F8	Built-In Test	Press the F8 key to send a Built-In Test (BIT) command. Navigation and tracking of satellites is interrupted during this test. When the BIT ends, the receiver is reset.
F9	Gyro factory test	Press F9 to perform a gyro test (for factory use only).
F10	Send ASCII characters to receiver	Sends a string of characters to the receiver.
F11	Reset receiver	Press the F11 key to send a reset command. This will reset certain receiver parameters. The message counters are reset at this time also.
F12	Reset counters	Press the F12 key to reset the message and error counters.
SHIFT + FUNCTION KEYS		
Shift + F1	GPS I/O port settings	Press the <Shift>F1 keys to send the receiver serial port settings for the baud rate, parity, number of data bits, and number of stop bits to be used by the receiver.
Shift + F2	GPS message protocol type	Press the <Shift>F2 keys to select the message protocol type used by the receiver.
Shift + F3	Message log control	Press the <Shift>F3 keys to send a log control message to request messages on a periodic basis or upon update. When using Zodiac binary protocol, the message timing may need to be modified to obtain message output. *NOTE: The special values of "???" when using NMEA protocol, or "65535" when using Zodiac binary protocol, disables all messages. After this, no messages are output by the receiver unless a query message is sent, the receiver is reset, or messages are turned back on using the log control message. In binary mode, press the <Shift>F3 keys followed by "65535." Respond to the modify timing prompt with a "Y" (for yes).*
Shift + F4	Message query	Press the <Shift>F4 keys to send a query message to request a one-time output of a message from the Zodiac receiver.
Shift + F5	NMEA generic message	Press the <Shift>F5 keys to enter the ASCII text for a non-supported generic NMEA message to send to the receiver. The entire message should be entered following the $ prompt; use null fields as required. The checksum will be computed and appended by LABMON before the message is transmitted.
Shift + F6	NMEA typical message request	Press the <Shift>F6 keys to send a series of NMEA log messages to enable the receiver to output a set of messages containing the typical data needed for performance evaluation.
Shift + F7	Reserved	None
Shift + F8	Store almanac UTC data	Press the <Shift>F8 keys to request raw almanac UTC data. LABMON receives the data and stores it in the files ALMANAC.GPS and UTC.GPS.
Shift + F9	Reserved	None
Shift + F10	Request ephemeris data	Press the <Shift>F10 keys to request output of all available ephemeris data or new ephemeris data when available.

Table 3-3. LABMON Keyboard Key Functions (3 of 4)

Keyboard Key	Function	Action
SHIFT + FUNCTION KEYS (continued)		
Shift + F11	Load ephemeris	Press the <Shift>F11 keys to upload raw ephemeris data from a selected ephemeris binary file to the receiver.
Shift + F12	Load almanac and UTC data	Press the <Shift>F12 keys to upload raw almanac and UTC data to the receiver from selected binary almanac and UTC data files.
CONTROL + FUNCTION KEYS		
Ctrl + F1	Navigation validity criteria	Press the <Ctrl>F1 keys to send navigation solution validity parameters (2-D navigation allowed, DGPS required, number of satellites used, and expected position errors).
Ctrl + F2	Platform type	Press the <Ctrl>F2 keys to select the type of application platform to be used.
Ctrl + F3	Navigation confirmation	Press the <Ctrl>F3 keys to send navigation configuration parameters (held altitude, ground track smoothing, position pinning, measurement filtering)
Ctrl + F4	Reserved	None
Ctrl + F5	Cold start	Press the <Ctrl>F5 keys to send a Cold Start command. When Cold Start is enabled, the receiver will only enter Cold Start after failing to acquire satellites that should be visible based on the current receiver position and time. The receiver automatically searches the entire sky for satellites in Cold Start.
Ctrl + F6	Datum select	Press the <Ctrl>F6 keys to send a datum number to the Zodiac receiver or to set the datum used by LABMON to transform NavCore receiver outputs. Out of range numbers default to zero which corresponds to WGS-84. Refer to Appendix E for datum names and numbers.
Ctrl + F7	Antenna type	Press the <Ctrl>F7 keys to select between a passive and active antenna.
Ctrl + F8	Antenna elevation mask	Press the <Ctrl>F8 keys to send the elevation mask angle to be used. Angles below the horizon must be entered as negative numbers. The default value for the Zodiac receiver is +10 degrees.
Ctrl + F9	SV selection	Press the <Ctrl>F9 keys to send satellite selection commands to enable or disable the use of selected satellites by the receiver. Enter a satellite's SV number to toggle between enabled and disabled. Enter zero to enable all satellites. Disabled satellites are displayed after XSV beneath the satellite visiblity list on the main display.
Ctrl + F10	DGPS control	Press the <Ctrl>F10 keys to send a Differential GPS Control command.
Ctrl + F11	Power management	Press the <Ctrl>F11 keys to send power management parameters to be used for power conservation. Valid NavCore update rates must be from one to five seconds

Table 3-3. LABMON Keyboard Key Functions (4 of 4)

Keyboard Key	Function	Action
ALT + FUNCTION KEYS		
Alt + F1	LABMON I/O port settings	Press the <Alt>F1 keys to change the parameters associated with the PC serial ports. These include the PC COM port number, the PC IRQ interrupt number, baud rate, parity, number of data bits, and number of stop bits (refer to Section 3.3 for additional information about these settings). After these values have all been entered, LABMON displays the selected COM port, the PC interrupt number, and the port address at the bottom of the screen.
Alt + F2	LABMON message protocol type	Press the <Alt>F2 keys to set the LABMON message processing protocol to Zodiac binary, Zodiac NMEA, NavCore binary, or NavCore NMEA.
Alt + F3	Reference position	Press the <Alt>F3 keys to set the reference position as a default for the position initialization function (using the F2 key) and as a reference for computing delta position.
Alt + F4	Main display background color	Press the <Alt>F4 keys to change the background color of the data portion of the main display screen.
Alt + F5	Main display text color	Press the <Alt>F5 keys to change the color of the field titles in the data portion of the main display screen.
Alt + F6	Main display data color	Press the <Alt>F6 keys to change the color of the data shown in the data portion of the main display screen.
Alt + F7	Menu background color	Press the <Alt>F7 keys to change the background color of the menu options portion of the main display screen.
Alt + F8	Menu key color	Press the <Alt>F8 keys to change the color of the function key designations in the menu options portion of the main display screen.
Alt + F9	Menu description color	Press the <Alt>F9 keys to change the color of the function key descriptions in the menu options portion of the main display screen.
Note 1: LABMON's delta position is useful to monitor changes in position relative to the reference position. The "D" key is used to toggle between the current location, in degrees, and the distance, in meters, from the reference position (set using the <Alt>F3 keys).		

3.11 Receiver Evaluation Using LABMON

There are a number of powerful features in LABMON that are useful to evaluate receiver performance. The features are described below along with other useful information related to receiver configuration and operation.

3.11.1 Message Set. The Zodiac Family and NavCore Series receivers have a very extensive message set that can provide a great deal of information from the receiver. When operating the receiver for evaluation purposes, it is likely that the user will require a different message set than the default set. The default set is chosen to provide typically needed data for use in the OEM product, without extra data needed for detailed evaluation or analysis.

Requesting too much data from the receiver on a periodic basis may result in processing problems by an OEM processor or the receiver. If too many output messages are created, a data checksum error may occur on a receiver output message during receipt of a new input message. This is an indication that a large number of periodic messages are being output.

3.11.2 Baud Rates. The user must ensure that the baud rates chosen will support the number and size of the messages requested. It is possible to request enough messages to prevent the receiver from keeping up at rates lower than 9600, for example. In this case, some of the messages cannot be output until the number is decreased or the baud rate is increased.

3.11.3. Message Logging. The user should turn off unneeded messages that occur at a high periodic rate if others are to be turned on. The default Zodiac message output timing prompt in LABMON is Time, but the Update option for data output should be used where appropriate. The NavCore Series supports message output based on time only.

To obtain a one time output of a message, use a query message. This avoids loading down the receiver with periodic output of fixed data. To obtain message output only when the data has changed or new data is available, use a log message with the Update output option. This will result in a message output upon change of the data only. To obtain periodic output use a log message with the Time output option. To turn off all messages in NMEA mode, use a log message with '???' as the message identifier. To turn off all messages in Zodiac binary mode, use a log message with '65535', which corresponds to FFFF Hex, as the message identifier; then, respond to the modify timing prompt by entering "Y" (for yes).

For Zodiac receiver evaluation, the following changes to the default message configuration are recommended:

- Turn on message 1012 for output on update.
- Message 1005 should also be turned on for output at a rate of once per second for DGPS evaluation. For NavCore receiver evaluation, the 106 message should be turned on for output at a rate of once per second for DGPS evaluation.

Use the message counters to monitor the number and rate at which messages are output from the receiver and to keep track of which input messages have been sent. It is often useful to reset these after changing the output messages to verify the desired configuration has been achieved. If the list of messages sent or received grows long enough to begin blocking other data, the message counters should also be reset.

3.11.4 Screen Clearing. Clearing the screen after the output message configuration has changed is recommended to clear data which will become stale if it is no longer being updated. This also makes it easy to see if data that is no longer requested has been turned off.

3.11.5 Data Logging. To review data carefully, the data should be logged and then replayed using LABMON. During replay, the user can single step through messages forward and backward to examine events or time periods of interest.

3.11.6 Data Reduction. The Extract function can be used to extract data from a log file, decode it if necessary, and write it into a tab-delimited file for plotting or data reduction using spreadsheet programs.

The Filter parameters are used to control which data points are written to the file. Using different settings for these and plotting the resultant ground tracks may help determine what criteria should be used in the OEM application to obtain the best performance of the operating environment. The Filter parameters are also used during normal receiver monitoring to indicate at a glance whether the navigation solution is meeting the current Filter criteria.

3.11.7. Post Processing Of Logged Data. LABMON has the capability to post-process previously logged data and to extract certain information that has been written to a text file.

3.11.7.1 Data Extraction. When the "X" key is pressed after starting to replay a log file (using the "R" key), a prompt is displayed requesting the operator to enter an extraction type: LLA. Only one extraction type is offered in the current version of LABMON, the LLA extraction.

The LLA extraction command extracts the longitude, latitude, and altitude into a tab-delimited text file. This file may be directly imported into a spreadsheet and plotted, producing a "bread crumb" ground track. Once selected, the LLA extraction offers the option of removing the sign of the extracted data, thereby recording only the absolute values of the data. The delta locations, in meters, from the reference position are also recorded.

Format: `GPSTIMESECS LON LAT ALT ΔLON ΔLAT ΔALT`

Message 1000 must be enabled while logging this data.

3.11.7.2 Logging A Data File. To log a data file, type "LABMON <filename.ext>," where <filename.ext> is any legal DOS filename and extension (see paragraph 3.5). This action causes all data on the Host port to be written to the specified file. The full path and drive designation must also be included if logging to a specific location is desired.

When logging data to a file, be sure that the message that contains the data to be post-processed has been enabled and is being output by the receiver.

3.11.7.3 Extracting Data From A Log File. To extract data from a previously recorded log file, do the following:

a. Start LABMON as described in Section 3.5 for no data recording.

b. Press the "R" key for replay.

c. Enter Log <filename.ext>. This must be the exact filename and extension including any drive and path designations.

d. Press the "X" key for extract.

e. Enter "LLA" (paragraph 3.11.7.1).

f. Enter a <filename.ext> that will contain the extracted data.

g. Press <spacebar> to start playback and extraction.

h. When finished, quit LABMON and edit the extraction file using any text editor.

3.11.8 DGPS Operation. When evaluating DGPS operation, it is recommended to use the LABMON logging function. RTCM SC-104 data should also be gathered so that its format and integrity may be verified with the RTCMCHK utility program provided on the LABMON software diskette.

Some DGPS reference station equipment may be configured in such a way as to output data which is non-compliant with the RTCM standard. Conexant GPS receivers are designed to be tolerant of these format errors where possible, but in some circumstances, intermittent loss of DGPS operation may result. There may also be excessive latency or problems in the data links which can be observed and corrected by examination of this raw input data to the receiver.

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