NAVMAN

Jupiter GPS receiver module

Labmon application note

Related products

Jupiter 11 (low power)

- Development kit TU10-D007-051

Jupiter 11 (standard 5V)

- Development kit TU10-D007-061

Jupiter 11 (dead-reckoning)

- Development kit TU10-D007-101

Jupiter 12 (standard)

- Development kit TU10-D007-351

Jupiter 12 (dead-reckoning)

- DR Development kit TU10-D007-352

Jupiter Pico (standard)

- Development kit TU10-D007-361

Jupiter Pico (timing)

- Development kit TU10-D007-363

Related documents

Jupiter T

- Product brief LA010039
- Data sheet LA010050

Jupiter 12

- Product brief LA010040
- Data sheet LA010065

Jupiter Pico (and Pico T)

- Product brief LA010041
- Data sheet LA010066
- Data sheet LA010093

Jupiter series (T/12/Pico/Pico T)

- Development kit: Quick start guide LA010088
- Development kit: Guide LA010089
- Designer's guide MN02000
- DR receiver: Gyro application note LA010090

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1.0 Using Labmon

This document explains the use of the Labmon Global Positioning System (GPS) monitor and controller software provided with the receiver development kit.

Labmon runs on a PC and allows the user to control the receiver and display receiver outputs. RTCM SC-104 data can also be logged using a second PC serial port.

1.1 Labmon compatibility

1.1.1 Labmon compatibility with Navman receivers

The current version of Labmon can be used to operate the Jupiter 12/Pico series of receivers. However, some Labmon commands might not be supported by these receivers.

1.1.2 Serial communication protocols

The receivers may use either a binary or National Marine Electronics Association (NMEA) -0183 type of serial interface protocol for communication.

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.

The Jupiter series receivers come standard with both Navman binary and NMEA. The protocol to be used is selected by software command, or by controlling the voltage applied to an external pin on the receiver.

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.

1.2 Installing Labmon

1.2.1 Operating environment

Labmon was designed to run using an MS-DOS/ PC-DOS or compatible DOS operating system. It will also run from the DOS prompt under Windows

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 disabled if Labmon does not function properly. Whilst Labmon can be run from the CD provided in the development kit, it is recommended to copy the program and associated files to a hard disk and keep the CD as a backup.

1.2.2 DOS Installation

To install Labmon for use with DOS:

1. Create a directory on the PC's hard drive and copy all the Labmon files from the CD provided to the directory that you created.
2. Edit your AUTOEXEC.BAT file to include this directory as part of the path.
3. Remove the CD containing the Labmon files.
4. Re-boot the PC to update the path.

1.2.3 Windows 3.x Installation

To install Labmon for use with Windows 3.x:

1. Perform steps 1 to 4 as for DOS installation above.
2. To run Labmon, use 'Browse' to select the working directory (i.e. the one you created) and open the labmon executable file.

1.2.4 Windows (95/98/2000/XP) installation

To install Labmon for use with Windows 95 or later:

1. Create a directory on the PC's hard drive and copy all the Labmon files from the CD provided to the directory that you created.
2. Remove the CD containing the Labmon files.
3. Create a shortcut icon to the Labmon executable (see the Win95 manual or use the Win95 on-line help).

1.3 Configuring Labmon

1.3.1 The Labmon.CFG file

Using keyboard <function> keys, or certain <Alt> plus <function> key combinations, Labmon can be configured for the message protocol mode (binary or NMEA), display datum, Universal Time Coordinated (UTC) time offset, speed units, display colours, reference position, and filtering parameters. This is the easiest way to change the configuration settings and will automatically be saved in the labmon.cfg file when the program is terminated.

These parameters can also be changed by editing the Labmon.CFG file. If difficulties are encountered processing the settings, examine the Labmon.CFG file to see if extraneous or incorrect information

has corrupted it. The file may be deleted as the program will automatically reconstruct it with default values (which can be modified).

Labmon checks for 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 33.660355 LON –117.861847 ALT
25.309999 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.

1.3.1.1 DATA TYPE parameter

This parameter determines the desired message protocol mode, binary or NMEA. Use 4 for Navman binary, and 8 for NMEA-0183. This is done using the <Alt><F2> keys.

1.3.1.2 DATUM NUMBER parameter

The datum number for display of position output is set by using the <Ctrl><F6> keys to enter any of the datum numbers shown in the Jupiter datum table (refer to Navman document MN02000, Designer's guide, appendix E).

Whilst the Jupiter series receivers support many datums internally, the older NavCore series of receivers supported only WGS-84 with the desired transformation being performed by Labmon. The inclusion of the datum number in the configuration file is for backward compatibility of Labmon with NavCore GPS receivers. Labmon ignores the datum number contained in the Labmon.CFG file when processing Jupiter data.

1.3.1.3 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 initialisation. It is important to verify (and correct if necessary) the PC time for correct initialisation when using the defaults provided by Labmon. This is done using the <F1> key.

1.3.1.4 SPD UNITS parameter

This parameter configures the speed units displayed in the SPD field on the Labmon display. Speed units will default to metres per second (m/s) unless modified in the Labmon.CFG file (there are no keys or key combinations that will do this). The setting for speed units in the Labmon.CFG file should be 0 for m/s, 1 for miles per hour (m.p.h.), or 2 for kilometres per hour (k.p.h.).

1.3.1.5 COLOUR parameters

Screen colours are changed using keyboard <Alt><function> key combinations as shown on the screen menu.

1.3.1.6 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 (start-up location). This is used as the default position when initialising the receiver from Labmon The <F2> key can be used to send the new default position to GPS.

1.3.1.7 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 all criteria are not 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 all criteria are 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 not meeting the user's criteria for solution quality.

Note: The filter does not prevent any data from being written to the logfile when recording data.

The STATMASK parameter is a 16-bit bitmask that is used to mask any desired invalid bits returned in Message 1000. These invalid bits report the reasons for not navigating, and the STATMASK parameter masks any of these reasons.

1.3.2 The Labmon.INI file

Labmon can be configured to select the COM ports it uses for serial I/O by choosing settings from within the program, or by editing the Labmon. INI file before starting the program.

Labmon checks for 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 for the GPS and one 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.

1.3.2.1 Default settings

The default settings for the Jupiter receiver are COM1, IRQ4, 9600 baud, no parity, 8 data bits and 1 stop bit

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. Please 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. Alternatively, edit the Labmon.INI file. If difficulties are encountered setting the ports, examine the Labmon.INI file to see if extraneous or incorrect information has corrupted it. If deleted, this file will be automatically reconstructed.

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 upper case 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 initialisation 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.

1.4 Using differential RTCM data

1.4.1 Differential RTCM data and Jupiter GPS receivers

When using differential corrections with a Jupiter receiver, the data is directly input using the Jupiter receiver'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 Navman binary protocol. The protocol may be changed to 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 1.3.2.1 of this document.

Note: An indirect DGPS data input capability is available with Jupiter GPS receivers for those applications that are limited to one serial port.

1.5 Starting Labmon

1.5.1 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). (See 1.11.7.2.)

-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,). For example, - C1ZB would be the command line for setting COM1 with Navman binary messages as the default.

Note: Each command line option may be entered in upper or lower case and each must be preceded by a dash. The message protocol codes ZB and ZN may also be entered in upper or lower case.

When using DOS, the data filenames are selected on the command line. When using 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 using later Windows versions, the 'Run' window under the 'Start' icon must be used so that the command line parameters can be included on the command line. Alternatively, a shortcut command can be created.

1.5.2 Starting Labmon from DOS

To run Labmon from DOS (the filenames used are examples only):

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.

1.5.3 Starting Labmon from the DOS prompt In Windows 3.x

To run Labmon from Windows 3.x using the DOS prompt (the filenames used are examples only):

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

1.5.4 Starting Labmon within Windows 3.x.

To run Labmon from within Windows 3.x (the filenames used are examples only):

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.)

1.5.5 Starting Labmon within Windows 95 or Windows (98/2000/XP)

To run Labmon from within Windows 95 (the filenames used are examples only):

(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. create a Shortcut icon for Labmon by selecting the Labmon application file and dragging to 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.

1.5.6 Displaying data (pertains to all operating systems)

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.

1.6 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 initialisation 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 re-booted.

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. It will also save the current Labmon configuration.

1.7 Labmon displays

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

1.7.1 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 labels used for the data, together with the output message descriptions, are contained in Table 1-1 of this document.

The main display, shown in Figure 1-1, appears when Labmon processes Navman 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, other useful information such as the number of data bytes recorded, number of messages sent or received, number of checksum errors, and the number of message 'no acknowledgements' is displayed.

1.7.2 The BIT display

For Jupiter receivers, a typical Labmon BIT display is shown in Figure 1-2. This display contains information from message 1100 (BIT Results).

1.8 Receiver output messages

Labmon decodes and displays most of the available messages. Either Navman binary or NMEA messages can be in use at a given 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 1-1 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).

1.9 Labmon menu keys

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.

Each of the <function> keys may be used separately or in combination with the <Shift>, <Ctrl>, or <Alt> keys to control and communicate with the GPS receiver.

Many of the main functions from earlier versions of Labmon have been renamed or grouped together with related functions under a single menu or key, e.g. the 'cold start enable' function is now under the 'cold start' key in the 'solution control' menu.

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

Table 1-2 lists the keyboard keys, and key combinations, along with their respective functionality and (where applicable) the binary or NMEA message that is sent.

While all of the key functions shown in Table 1-2 are supported in the Navman binary mode, not all are 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.

1.10 Receiver evaluation using Labmon

There are many powerful features in Labmon that are useful to evaluate receiver performance. These features are described in the following sub-sections along with other information related to receiver configuration and operation.

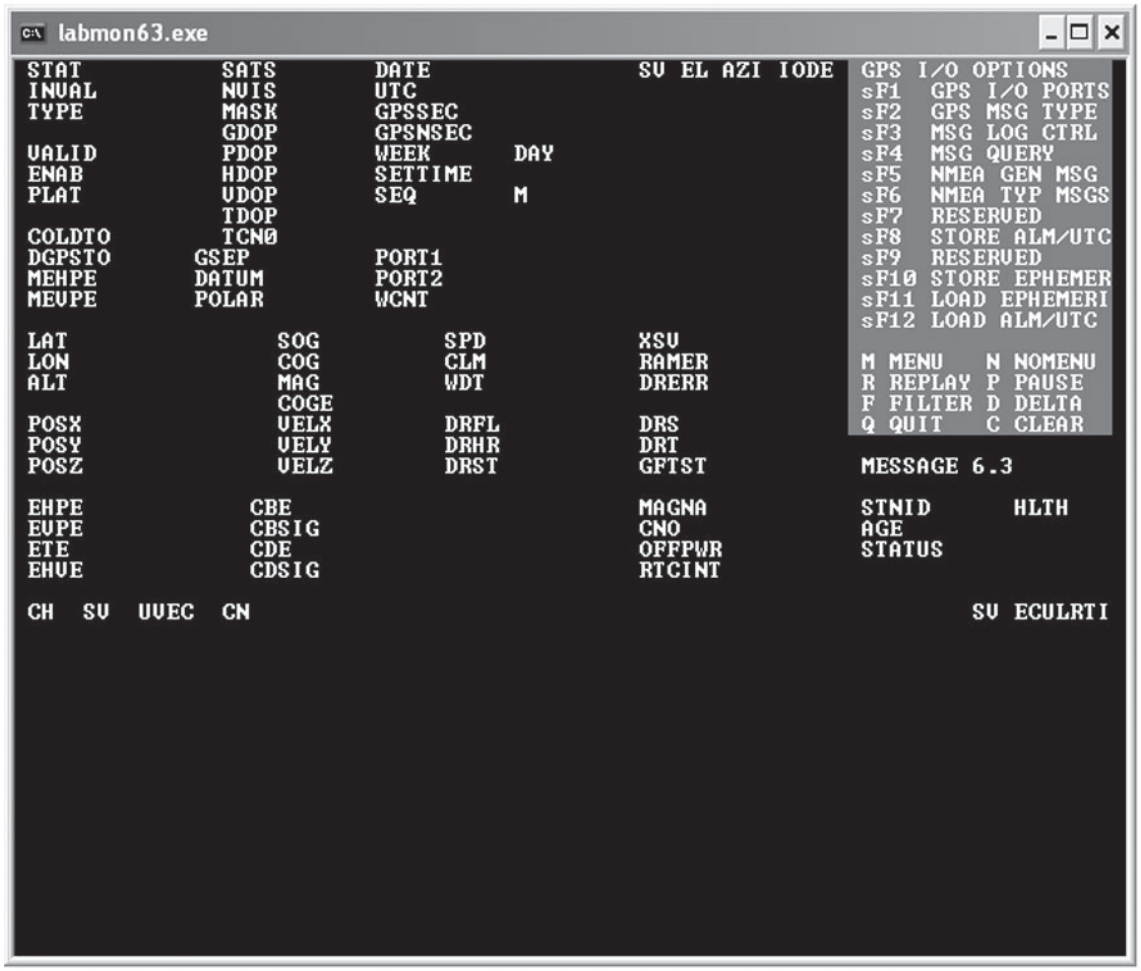

Figure 1-1 LABMON main display for Jupiter GPS receivers

1.10.1 Message set

The Jupiter 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 Original Equipment Manufacturer (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.

1.10.2 Baud rates

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

1.10.3. Message logging

The user should turn off messages that are not required and that occur at a high periodic rate if others are to be turned on. The default Jupiter message output timing prompt in Labmon is ‘time’, but the ‘update’ option for data output should be used where appropriate.
To obtain a one time output of a message, use a query message. This avoids unnecessary loading of the receiver with periodic outputs 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 Navman binary mode, use a log

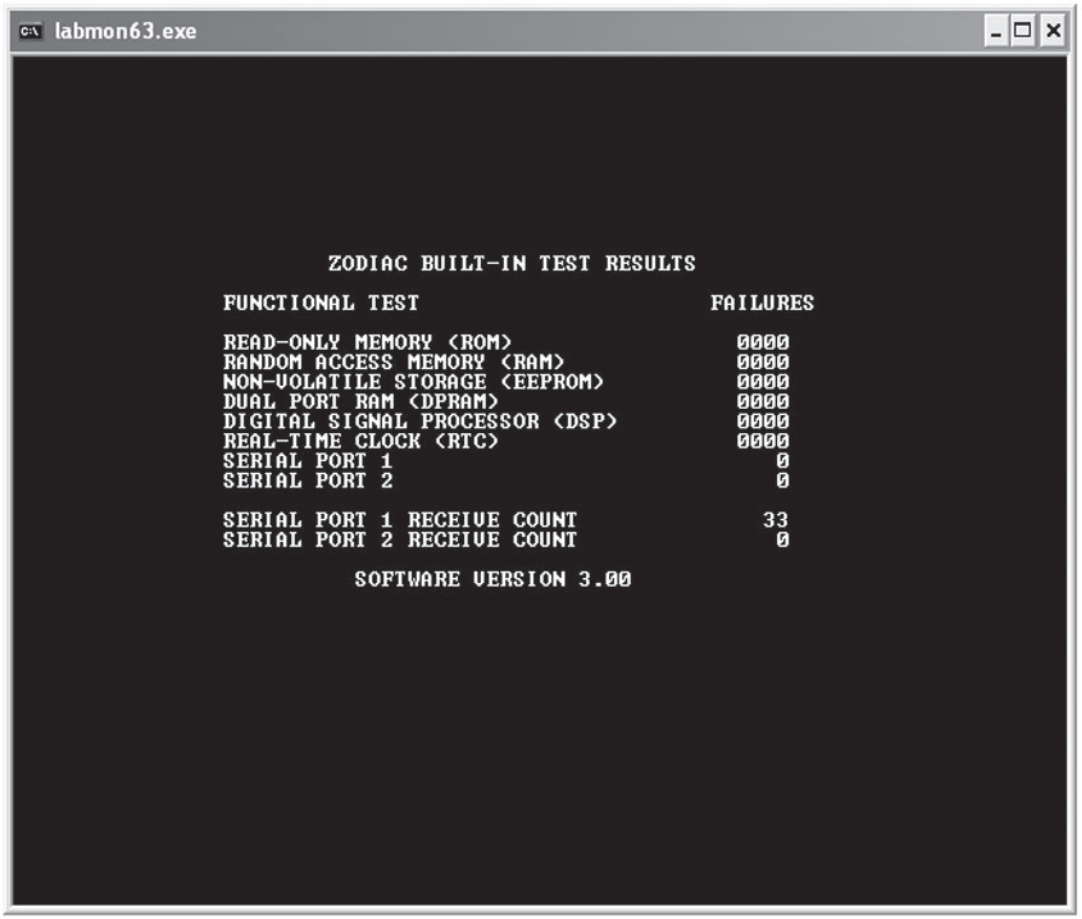

Figure 1-2 LABMON BIT display for Jupiter GPS receivers

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 Jupiter 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.

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.

1.10.4 Screen clearing

Clearing the screen after the output message configuration has changed is recommended to clear data 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. To clear the screen, press the <C> key.

1.10.5 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 forwards and backwards to examine events or specific time periods.

1.10.6 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.

1.10.7 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.

1.10.7.1 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: LL\. Only one extraction type is offered in the current version of Labmon—the LL\ extraction. The LL\ 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 ground track. Once selected, the LL\ 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 metres, from the reference position are also recorded. Format of the LL\ extracted file is:

GPSTIMESECS LON LAT ALT rLON rLAT rALT

Message 1000 must be enabled while logging this data.

1.10.7.2 Logging a data file

To log a data file, type 'Labmon-R <filename.ext>', where <filename.ext> is any legal DOS filename and extension (see section 1.5.1). 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.

1.10.7.3 Extracting data from a log file

To extract data from a previously recorded log file, do the following:

1. Start Labmon as described in Section 1.5 for no data recording.
2. Press the 'R' key for replay.
3. Enter Log <filename.ext>. This must be the exact filename and extension including any drive and path designations.
4. Press the 'X' key for extract.
5. Enter 'LL\' (see section 1.10.7.1).
6. Enter a <filename.ext> that will contain the extracted data.
7. Press <spacebar> to start playback and extraction.

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

1.10.8 DGPS operation

When evaluating DGPS operation, it is recommended to use the Labmon logging function.

Note: RTCM SC-104 data should also be gathered so that its format and integrity may be verified with the RTCMCHK utility program available from Navman.

Some DGPS reference station equipment may be configured in such a way as to output data which is non-compliant with the RTCM standard. Navman 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.

2.0 Acronyms used in this document

GMT: Greenwich Mean Time
GPS: Global Positioning System
HDOP: Horizontal Dilution Of Precision
NMEA: National Marine Electronics Association
OEM: Original Equipment Manufacturer
PDOP: Position Dilution Of Precision
UTC: Universal Time Coordinated
VDOP: Vertical Dilution Of Precision

Data field item label	Description	Units	Source	
			Message ID	
			Binary	NMEA
AGE	Age of last correction	s	1005	GGA
AIT	Height above ellipsoid (Note 1)	m	1000	ALT, GGA
ALI	Visible satellite azimuth	deg	1003	GSV
CBE	Clock bias error	m	1000	n/a
CBSIG	Clock bias error standard deviation	m	1000	n/a
CDE	Clock drift error	m/s	1000	n/a
CDSIG	Clock drift error standard deviation	m/s	1000	n/a
CH	Channel	nfa	1002	ZCH
CLM	Climb rate	m/s	1000	n/a
CN	Carrier to noise ratio	dBHz	1002	ZCH, GSV
COG	Course over ground	deg	1000	RMC
COLDTO	Cold start timeout	s	1012	n/a
DATE	Date	n/a	1000	n/a
DATUM	Datum in use	n/a	1012	n/a
DAY	UTC day	n/a	1000	n/a
DGPSTO	DGPS correction timeout	s	1012	n/a
ECULRTI	DGPS status bits	n/a	1005	n/a
EHPE	Expected horizontal position error	m	1000	n/a
EHVE	Expected horizontal velocity error	m/s	1000	n/a
EL	Visible satellite elevation	deg	1003	GSV
ENAB	Receiver enable option bits	n/a	1012	n/a
ETE	Expected time error	m	1000	n/a
EVPE	Expected vertical position error	m	1000	n/a
FIX	Fix (2-D, 3-D, or altitude fix not available)	n/a	n/a	GSA
GDOP	Geometric Dilution of Precision	n/a	1003	n/a
GPSSEC	GPS seconds into week	s	1000	n/a
GSEP	Geoidal separation	m	1000	ALT, GGA
GPSNSEC	GPS nanoseconds from epoch	ns	1000	n/a
HDOP	Horizontal dilution of precision	n/a	1003	GGA, GSA
HLTH	DGPS station health	n/a	1005	n/a
INVAL	Solution invalidity bits	n/a	1000	n/a
LAT	Latitude (Note 1)	deg	1000	GGA, RMC
LON	Longitude (Note 1)	deg	1000	GGA, RMC
M	Measurement sequence number	n/a	1000, 1002	n/a
MAG	Magnetic variation	deg	1000	RMC
MASK	Antenna elevation mask angle	deg	1012	n/a
MEHPE	Minimum expected horizontal position error	m	1012	n/a
MESSAGE	Message sent or acknowledged	n/a	n/a	n/a
MEVPE	Minimum expected vertical position error	m	1012	n/a
NVIS	Number of visible satellites	n/a	1003	GSV
PDOP	Position dilution of precision	n/a	1003	GSA
PLAT	Platform type	n/a	1012	n/a
PMGMT	Power management status	n/a	n/a	n/a
POLAR	Polar navigation flag	n/a	1000	n/a

Table 1-1 (1 of 2) Output data shown on the main display screen

Data field item label	Description	Units	Source	
			Message ID	
			Binary	NMEA
PORT1	Host port settings	n/a	1130	n/a
PORT2	Auxiliary port settings	n/a	1130	n/a
POSX	ECEF position X	m	1009	n/a
POSY	ECEF position Y	m	1009	n/a
POSZ	ECEF position Z	m	1009	n/a
QUAL	GPS quality indicator	n/a	n/a	GGA
RAMER	RAM status	n/a	1050	n/a
SATS	Satellite used in solution	n/a	1000	GSV
SEQ	Sequence number	n/a	all	n/a
SETTIME	Receiver set time	ticks	all	n/a
SOG	Speed over ground	knots	n/a	RMC
SPD	Speed (Note 2)	m/s	1000	n/a
STAT	Navigation status	n/a	1000	GSA, GGA, RMC
STATUS	DGPS status	n/a	1005	n/a
STNID	DGPS station ID	n/a	1005	GGA
SV	Satellite vehicle PRN	n/a	1002, 1003, 1005	GSA, GSV, ZCH
TDOP	Time dilution of precision	n/a	1003	n/a
TYPE	Solution type bits	n/a	1000	GGA, GSA
UTC	UTC seconds (Note 3)	s	1000, 1108	GGA, RMA
UVEC	Channel tracking status bits	n/a	1002	ZCH
VALID	Solution validity bits	n/a	1012	n/a
VDOP	Vertical dilution of precision	n/a	1003	GSA
VELX	ECEF velocity X	m/s	1009	n/a
VELY	ECEF velocity Y	m/s	1009	n/a
VELZ	ECEF velocity Z	m/s	1009	n/a
WEEK	GPS week number	weeks	1000,1002	n/a
XSV	Excluded candidate SV	n/a	1012	n/a

Note 1: When operating Labmon using delta positions, the LAT, LON, and ALT fields display the difference between the current and reference positions in metres.
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 1-1 (2 of 2) Output data shown on the main display screen

Keyboard key	Function	Action		
M	Menu change	Cycles through the Function, <Shift>+Function, <Ctrl>+Function, and <Alt>+Function key menus		
N	No menu	Toggles menu option portion of main display screen on or off		
R	Replay	Replays a log file		
P	Pause	Toggles between 'pause the receiver output data displayed' and 'resume data updates' (The screen may also be paused by pressing the spacebar.)		
F	Filter	Sets the parameters used to 'filter' data (see section 1.3.1.7)		
D	Delta (Note 1)	Toggles Labmon between the current location (deg) and the delta position (m)		
X	Extract data	Pressing the 'X' key after starting to replay a log file (using the 'R' key) extracts data from the file to a selected tab delimited file for plotting purposes.		
+,-	Replay speed	Increases (+) or decreases (-) the rate at which messages are processed during the replay of log files		
<>	Single step in replay	Steps a single message backward (<) or forward (>) during replay of log files		
Q	Quit	Exits Labmon		
C	Clear screen	Clears the Labmon screen outputs until normal refresh		
<Esc>	Exit prompt without changes	Exits a prompt without sending the command		
Function keys (GPS initialisation)			**Command ID**	
			Binary	**NMEA**
F1	Time initialisation	Sends estimated user time and date. Note: 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, time and position do not need to be initialised.	1200	INIT
F2	Position and velocity initialisation	Sends latitude, longitude, speed, heading, and height to be used as the estimated user state. Note: 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 metres above the datum ellipsoid. The WGS-84 datum is assumed if no datum is selected.	1200	INIT
F3	Altitude input	Sends a value to be used as the estimated user altitude. Note: Unless the force option is used, this value is only used while in 2D navigation or acquisition modes.	1219	INIT
F4	Datum definition	Sends datum definition parameters to be used.	1210	n/a
F5	Time mark initialisation	Not implemented	n/a	n/a
F6	Factory test	Factory use only	1304	n/a
F7	DR initialisation	Initialises DR parameters.	1270	n/a
F8	Built-in test	Sends a Built-In Test (BIT) command. Note: Navigation and tracking of satellites is interrupted during this test. When the BIT ends, the receiver is reset.	1300	IBIT
F9	Gyro factory test	Performs a gyro test (for factory use only).	1305	n/a
F10	Send ASCII characters to receiver	Sends a string of characters to the receiver	n/a	n/a
F11	Reset receiver	Sends a reset command (resets certain receiver parameters and message counters)	1303	INIT
F12	Reset counters	Resets the message and error counters.	n/a	n/a

Table 1-2 (1 of 3) Labmon menu key functions

Shift + (function key)			Command ID	
			Binary	NMEA
Shift + F1	GPS I/O port settings	Sends 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	1330	n/a
Shift + F2	GPS message protocol type	Selects the message protocol type to be used by the receiver	1331	IPRO
Shift + F3	Message log control	Sends a log control message to request messages on a periodic basis or upon update Note: When using Navman binary protocol, the message timing may need to be modified to obtain message output (see note 1).	log	ILOG
Shift + F4	Message query	Sends a query message to request a one-time output of a message from the Jupiter receiver.	query	Q
Shift + F5	NMEA generic message	enters the ASCII text for a non-supported generic NMEA message to send to the receiver. Note: Enter the entire message following the $ prompt using null fields as required. The checksum will be computed and appended by Labmon before the message is transmitted.	n/a	n/a
Shift + F6	NMEA typical message request	Sends a series of NMEA log messages to enable the receiver to output a set of messages containing the typical data needed for performance evaluation	n/a	ILOG
Shift + F7	Reserved	None	n/a	n/a
Shift + F8	Store almanac UTC data	Requests raw almanac UTC data (Labmon receives the data and stores it in the files ALMANAC.GPS and UTC.GPS.)	1040/ 1042	n/a
Shift + F9	Reserved	None	n/a	n/a
Shift + F10	Request ephemeris data	Requests output of all available ephemeris data or new ephemeris data when available.	1041	n/a
Shift + F11	Load ephemeris	Uploads raw ephemeris data from a selected ephemeris binary file to the receiver	1241	n/a
Shift + F12	Load almanac and UTC data	Uploads raw almanac and UTC data to the receiver from selected binary almanac and UTC data files.	1240/ 1242	n/a
Note 1: The special values of '???' when using NMEA protocol, or '65535' when using Navman binary protocol, disable 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).				

Table 1-2 (2 of 3) Labmon menu key functions

CTRL + (function key)			Command ID	
			Binary	NMEA
Ctrl+F1	Navigation validity criteria	Sends navigation solution validity parameters (2D navigation allowed, DGPS required, number of satellites used, and expected position errors)	1217	n/a
Ctrl+F2	Platform type	Selects the application platform type	1220	n/a
Ctrl+F3	Navigation confirmation	Sends navigation configuration parameters (held altitude, ground track smoothing, position pinning, measurement filtering)	1221	n/a
Ctrl+F4	Reserved	None	n/a	n/a
Ctrl+F5	Cold start	Sends a cold start command. Note: If 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.	1216	n/a
Ctrl+F6	Datum select	Sends a datum number to the receiver. Note: Out of range numbers default to zero (corresponds to WGS-84). (Refer to Navman document MN02000, appendix E for datum names and numbers.)	1211	n/a
Ctrl+F7	Antenna type	Selects passive or active antenna	1218	n/a
Ctrl+F8	Antenna elevation mask	Sends the elevation mask angle to be used. Note: Angles below the horizon must be entered as negative numbers. The default value for Jupiter receivers is +10 degrees.	1212	n/a
Ctrl+F9	SV selection	Sends satellite selection commands to enable or disable use of selected satellites by the receiver Note: Enter a satellite's SV number to toggle between enabled and disabled. Enter zero to enable all satellites. Disabled satellites are displayed after XSV below the satellite visibility list on the main display.	1213	n/a
Ctrl+F10	DGPS control	Sends a DGPS control command.	1214	n/a
Ctrl+F11	Power management	Sends power management parameters to be used for power conservation.	1317	n/a
ALT + (function key)				
Alt+F1	Labmon I/O port settings	Changes the parameters associated with the PC serial ports (including the PC COM port number, PC IRQ interrupt number, baud rate, parity, number of data bits, and number of stop bits, see section 1.3) Note: 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.	n/a	n/a
Alt+F2	Labmon message protocol type	Sets the Labmon message processing protocol to Navman binary, NMEA.	n/a	n/a
Alt+F3	Reference position	Sets the reference position as a default for the position initialisation function (using the F2 key) and as a reference for computing delta position	n/a	n/a
Alt+F4	Main display bg colour	Changes the background colour of the data area of the main display screen	n/a	n/a
Alt+F5	Main display text colour	Changes the colour of the field titles in the data area of the main display screen	n/a	n/a
Alt + F6	Main display data colour	Changes the colour of the data shown in the data area of the main display screen	n/a	n/a
Alt+ F7	Menu bg colour	Changes the background colour of the menu options area of the main display screen	n/a	n/a
Alt + F8	Menu F key colour	Changes the colour of the function key designations in the menu options area of the main display screen	n/a	n/a
Alt + F9	Menu description colour	Changes the colour of the function key descriptions in the menu options area of the main display screen	n/a	n/a
Note 1: Labmon's delta position is useful to monitor changes in position relative to the reference position. Use the 'D' key to toggle between the current location (deg) and the distance (m) from the reference position.				

Table 1-2 (3 of 3) Labmon menu key functions