ProductBulletin

Lassen iQ 1.16v

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ANNOUNCING THE NEW LASSEN IQ FIRMWARE VERSION 1.16

Trimble announces a new firmware version, 1.16 for the Lassen iQ. This firmware version will be available in production units starting June 2006.

This will coincide with the release of the new ROHS compliant (Lead-free) Lassen iQ, P/N 46240-25.

This Bulletin will describe the differences between the Lassen iQ FW v1.12 and the new version of 1.16 including the firmware fix for the leap second anomaly, performance improvements and feature enhancements. Version 1.12 can be upgraded to version 1.16, using the flash loader, Lassen iQ starter kit and the 1.16 Firmware image. The new firmware and the flash loader are available on the Web under the ftp://ftp.trimble.com for downloading.

Copy and paste this link into your internet explorer.

ftp://ftp.trimble.com/pub/sct/embedded/bin/iQ/FIRMWARE%20DOWNLOADS/

Updated SW tools, iQ_Monitor and iQ_Chat, will be developed and distributed with the new Lassen iQ starter kits.

If you have problems with the ftp:\\ site please contact Kathy_jasso@trimble.com or (408) 481-8056.

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PERFORMANCE ENHANCEMENTS IN LASSEN IQ FW V1.16

Garage Effect

Description

When the Lassen iQ receiver has been left running for several hours in a location where no GPS satellite signals are received (like in a garage), the unit may fail to output the position, velocity, and time solution even after strong signals become available.

This condition is fixed in Lassen iQ FW version 1.16.

Jammer

Description

In general, GPS modules can produce bad fixes (such as large position jumps) or no fixes at all when subjected to strong in band RF jamming. In addition, GPS modules can also produce bad fixes after being subjected to weak in-band RF jamming in very weak GPS signal environments (such as driving through a tunnel).

Firmware version 1.16 has improved filtering to assist with position jumps resulting from in-band RF jamming as described above.

Silent IO

Description

In very rare cases and only after extended periods of operation in environments where no GPS satellite signals are received, the Lassen iQ might fail to reacquire and track GPS satellite signals even when those signals become available. Though similar to the Garage Effect described above, this problem is different in that the unit does not reacquire and track the satellites.

When leaving the obscured environment after a long stay, the Lassen iQ may not reacquire or track real GPS signals. The tracking list “locks” and does not change over movement and time. The satellite list indicates fixed satellite numbers and AMU levels.

The receiver does not calculate fixes and does not output position, velocity, or time until restarted.

This condition is fixed in Lassen iQ FW version 1.16.

False Lock

Description

When the antenna is disconnected from the Lassen iQ the receiver may lock onto false signals. The false lock only occurs when the module is powered up but an antenna is not attached.

The Lassen iQ can lock onto spurious signals when powered up without an antenna attached. The information from spurious signals can sometimes be used in

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calculations resulting in incorrect fixes and bad positions. The False Lock may even generate COCOM violations, causing the receiver to perform an automatic cold reset; all information in RAM memory will be lost.

This condition is fixed in Lassen iQ FW version 1.16.

Leap Second Fix

Lassen iQ applies a leap second to the calculation of UTC as soon as leap second is announced by the GPS system in the almanac page in the navigation data message. The actual event for applying the leap second typically occurs at midnight December 31st.

Lassen iQ firmware version 1.16 correctly applies the scheduled leap second, at midnight December 31st.

COCOM Limits

The Lassen iQ firmware version 1.16 conform to COCOM standards. The Lassen iQ 1.16 firmware will stop outputting position information when the velocity exceeds 515 m/sec.

When the velocity COCOM limit is violated, the receiver will do a Warm Start instead of a Cold Reset.

Baud Rate Improvements

While previous versions of the Lassen iQ firmware were within the specifications for baud rates, Lassen iQ firmware version 1.16 improves the accuracy of the input and output baud rates to be as close as possible to the selected standard baud rates.

TAIP Port Settings

In Lassen iQ firmware version 1.16, TAIP port settings for both ports 1 and 2 can be stored in flash individually.

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ADDED FEATURES

New NMEA Sentences

In Lassen iQ FW version 1.16, two new NMEA messages BA and TF have been implemented. The BA message reports the antenna status. The TF reports the BBRAM status and the almanac status.

- **NMEA BA Sentence – Antenna Status**

This sentence outputs the status of the GPS antenna connection.

The report format of the BA sentence is:

$PTNLRBA,a,a*hh<CR><LF>

Field	Description
a	Status (0 = status unavailable, 1 = status available)
	Antenna feedline fault : 0 = normal 1 = open 2 = short

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- **NMEA TF Sentence– Receiver Status and Position Fix**

This NMEA sentence gives receiver status including BBRAM status, almanac status, position, position source and velocity.

The format of the TF sentence is:
$PTNLRTF,a,a,xxxxxx,xx,x,llll.llllll,a,yyyyy.yyyyy,a,xxxxx,x.x,x.x,x.x*hh<CR><LF>

Field	Description
a	BBRAM status on startup (A = valid; V = invalid)
a	Almanac completion status (A = complete; V = incomplete)
xxx xxx	GPS time of week (in seconds)
xx	Number of satellites in use, 00 – 12, may be different from the number in view.
x	Position fix source (0 = no fix; 2 = 2D fix; 3 = 3D fix)
llll. llllll	Latitude of the current position fix
a	N | S
yyy yy. yyy yy	Longitude of the current position fix
a	E | W
xxx xx	Antenna altitude re: mean-sea-level (MSL geoid, meters)
x.x	‘East’ component of ENU velocity (m/s)
x.x	‘North’ component of ENU velocity (m/s)
x.x	‘Up’ component of ENU velocity (m/s)

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Updated TSIP Packet 0x7A

The packet 0x7A is updated in the Lassen iQ FW v1.16 to accommodate the new NMEA sentences BA and TF.

The NMEA message determines whether or not a given NMEA message will be output. If the bit for a message is set, the message will be sent every “interval” second. Use the values shown below to determine the NMEA interval and message mask. While fixes are being generated, the output order is: ZDA, GGA, GLL, VTG, GSA, GSV, RMC, TF, BA.

Byte	Bit	Item	Type	Value	Definition
0		Subcode	UINT8	0	
1		Interval	UINT8	1-255	Message interval in seconds
2		Reserved	UINT8	0	
3		Reserved	UINT8	0	
4	0	RMC	Bit	0 1	Off On
4	1	TF	Bit	0 1	Off On
4	2-4	Reserved	Bit	0	
4	5	BA	Bit	0 1	Off On
4	6-7	Reserved	Bit	0	
5	0	GGA	Bit	0 1	Off On
5	1	GLL	Bit	0 1	Off On
5	2	VTG	Bit	0 1	Off On
5	3	GSV	Bit	0 1	Off On
5	4	GSA	Bit	0 1	Off On
5	5	ZDA	Bit	0 1	Off On
5	6-7	Reserved	Bit	0	

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Kalman Filter

In the Lassen iQ FW version 1.16 includes a Kalman filter in addition to the traditional Position-Velocity (PV) Filter. These filters can be turned on and off using the updated TSIP Packet 0 x 70 described below. The PV filter and the Kalman filters are mutually exclusive. Only one at a time can be used.

Drive tests conducted by Trimble using the new Kalman filter yielded approximately 12% fewer fixes than when using the Position-Velocity (PV) Filter. The Kalman filter does smooth positions fixes when exiting occluded environments such as tunnels. The Kalman filter is included for users who may find it more appropriate to their applications.

Updated TSIP Packet 0x70

The packet 0 x 70 has been updated in Lassen iQ FW v1.16 to accommodate the new Kalman Filter (KF).

Command Packet 0x70 - Filter Control

The Lassen iQ GPS receiver has a number of filters. Command 0x70 provides control for these filters. It returns Report 0x70. There are four filters associated with 0x70:

- Position-Velocity (PV) Filter
- Static Filter
- Altitude Filter
- Kalman Filter

The Position-Velocity (PV) Filter is the main filter and is used to “soften” the effect of constellation switches on position fixes. The filter has virtually no effect on velocity output and there is no lag due to vehicle dynamics. There may be a small increase in accuracy however.

A feature of the PV filter is the “Static Filter” which engages when the receiver is moving very slowly. This feature improves accuracy in the urban environment. The static filter should be turned off for the following applications:

- Slow-moving environments such as walking or drifting with the current
- When rooftop testing of receivers for moving applications

The altitude filter is a simple averaging filter with a time constant of a few seconds. It should be left on in marine and land applications.

To query for the current settings, use Command Packet 0x70 with no data bytes. To input new settings, Command Packet 0x70 is sent with four data bytes.

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Command Packet 70 Data Formats

Byte	Item	Type	Value	Definition
0	Position Velocity Filter	UINT8	0 1	Off On
1	Static Filter	UINT8	0 1	Off On
2	Altitude Filter	UINT8	0 1	Off On
3	Kalman Filter (KF)	UINT8	0 1	Off On

Report Packet 0x70

This report is sent as a response to Command Packet 0x70 as either a query or a set. It contains four bytes as shown in the Table above.

Extended Versioning Scheme

The Extended Versioning Scheme has been implemented in Lassen Firmware Version 1.16. The new TSIP packets are 0x1C-01/81, 02/82, and 03/83.

Here are the descriptions of the new extended versioning packet: TSIP Packets 0x1C-01/81, 02/82, and 03/83.

Command Packet 0x1C: 01 - Firmware version

- The command packet 0x1C: 01 may be issued to obtain the firmware version.
- The product name is “Lassen iQ”.
- The packet format is defined as the followings.

Byte	Item	Type	Value	Definition
0	Packet ID	UINT8	0x1C	Packet ID 0x1C
1	Sub-code	UNIT8	0x01	Sub-code 0x01 for software component version information request

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Report Packet 0x1C: 81 – Report Firmware version

Byte	Item	Type	Value	Definition
0	Packet ID	UINT8	0x1C	Packet ID 0x1C
1	Sub-code	UINT8	0x81	Sub-code 0x81 for software component version information report
2	Reserved	UINT8	Any	Reserved
3	Major version	UINT8	Any	Firmware major version
4	Minor version	UINT8	Any	Firmware minor version
5	Build number	UINT8	Any	Firmware build number
6	Month	UINT8	1-12	Firmware build month
7	Day	UINT8	1-31	Firmware build Day
8…9	Year	UINT16	Any	Firmware build Year
10	Length of first module name	UINT8	Any	The length of the product name (L_1)
11… (10+L_1)	Product name	UINT8	String	Product name in ASCII

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Command Packet 0x1C: 03 - Hardware Component Version Information

- The command packet 0x1C: 03 may be issued to obtain the hardware component version information.
- The report packet is of variable length, depending on the length of the hardware ID.
- The serial number, build date fields, and the hardware ID are programmed into the Lassen iQ FW v1.16 at production.
- The hardware code for the Lassen iQ is 1001.
- ID for the Lassen iQ FW v1.16 is "Lassen iQ GPS Receiver"
- The packet format is defined as the followings.

Byte	Item	Type	Value	Definition
0	Packet ID	UINT8	0x1C	Packet ID 0x1C
1	Sub-code	UINT8	0x03	Sub-code 0x03 for hardware component version information request

Report Packet 0x1C: 83 - Hardware Component Version Information

Byte	Item	Type	Value	Definition
0	Packet ID	UINT8	0x1C	Packet ID 0x1C
1	Sub-code	UINT8	0x83	Sub-code 0x83 for hardware component version information report
2…5	Serial number	UINT32	Any	Board serial number
6	Build day	UINT8	1-31	Day of the board's build date
7	Build month	UINT8	1-12	Month of the board's build date
8…9	Build year	UINT16	Any	Year of the board's build date
10	Build hour	UINT8	0-23	Hour of the board's build date
11…12	Hardware Code	UINT16	Any	Hardware Code associated with Hardware ID
13	Length of Hardware ID	UINT8	Any	The length of the Hardware ID (L)
14... (13+L)	Hardware ID	UINT8	String	Hardware ID string in ASCII

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