LITEPOINT

LitePoint IQnav™

One and Six Channel
GPS Manufacturing Test Solutions

GPS Manufacturing Test Solution

Introduction

LitePoint IQnav™ is a test solution for GPS device manufacturing. It provides GPS signal generation capability for L1 (1575.42 MHz) frequencies over a wide power range supporting both conducted and radiated test methods. The instrument offers both C/C++ level API interfaces for rapid integration into production test systems along with Graphical User Interfaces (GUI) for simple and rapid debug in verification environments.

For GPS testing, all key parameters for GPS signal creation are user-definable including navigation data, space vehicle number, and Doppler shift (+/- 10 kHz). Additionally, the IQnav test system supports accurate CW signal output levels up to -60 dBm through a single test port connector allowing a simple power meter to be used to verify fixture losses as well as overall system accuracy.

The IQnav test system is available in one- and six-channel models to support various GPS test needs. A six-channel model allows for Carrier to Noise (C/N) and location “fix” testing to be performed using the same connection, saving device test time and providing better test quality than using “over the air” GPS signals to verify location “fix” capabilities.

For CDMA-equipped handset models, the IQnav has specially engineered input and output triggers for synchronization with handset testers. This allows for seamless testing of assisted GPS (A-GPS) handsets.

Figure 1. IQnav Test System

Features

- Wide GPS Power Range: -145 to -60 dBm through a single connector supports conducted and radiated test needs.
- CW signal mode allows fixture loss characterization and validation with a power meter.
- One- and six-channel models with +/- 10 kHz Doppler shift capability allow both C/N and location fix testing.
- Synthetic Power Sweep allows up to 6 power levels to be verified in 1 sensitivity measurement.
- A-GPS testing through trigger in and out connections for handset tester synchronization.

Performance Optimization of GPS Test Solutions

The IQnav test system offers multiple features to improve the cost and efficacy of GPS manufacturing tests, including:

Location Fix and C/N test using a single connection

The six-channel IQnav test system allows for both C/N and location fix testing to be performed using a single test connection. This allows for better quality test than using over-the-air signals which can vary from day to day based on weather conditions, etc. Additionally, by performing all tests in one test station, material flow is improved and costs are reduced.

Synthetic Power Sweep

The IQnav test system's multi-channel capability with a +/- 15 dB power range from the nominal power level allows for up to six different sensitivity measurements to be made in a single measurement. This results in up to a 1/6th reduction in test time over sequential power sweep approaches.

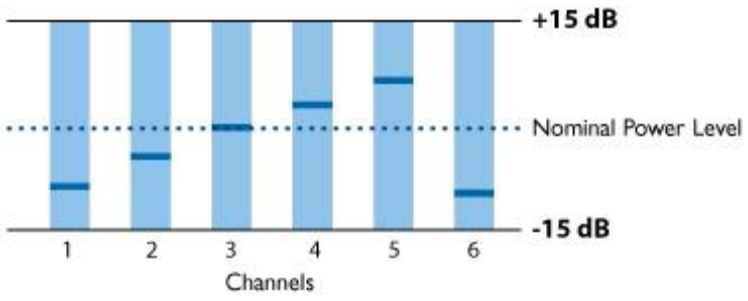

Figure 2. Synthetic Power Sweep

Basic Functionality

The IQnav test system contains a fully independent vector signal generator and offers either one or six channels along with a 10 MHz external reference connection for synchronization with other test equipment.

Hardware

General

The IQnav test system hardware is packaged in a 1U high, 19-inch rack-compatible case and comes assembled with front-mount handles for convenient laboratory use. Rack mounting brackets are included with the instrument for conversion to rack mounting. An N-type RF port is located on the front panel and a BNC reference input along with the USB port and the main power switch is located on the rear panel. Connection to the external PC is made through the USB port. The AC main supplies power to the connection in the rear panel. The supplied AC cable is for USA-style AC plugs. The AC cable can be easily replaced if the local AC plug specifications are different. The instrument will auto-configure for all common AC voltage and frequency mains. There are no user-serviceable components inside the instrument case. Opening of the instrument's case by unauthorized persons voids the instrument certification and hardware warranty.

GPS Block Diagram

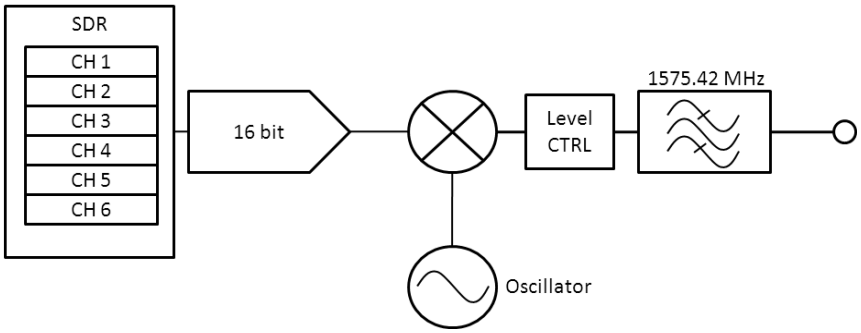

Figure 3. GPS Block Diagram

The IQnav test system uses a software-defined radio (SDR) architecture to generate multiple channels with precise timing between channels. The resulting digital signal is then converted to an analog signal with a 16-bit A/D converter and upconverted using a low-phase-noise local oscillator. A solid-state level-control section provides an 85dB power range at the output of the unit. Integral power-level feedback and detection circuits provide both diagnostic and power monitoring capabilities.

Calibration

The instrument is fully calibrated and certified at the factory. The recommended calibration cycle is 12 months. LitePoint offers various post-purchase calibration programs to support this activity.

Software Description

IQnav API

Both a C/C++ software API and a Graphical User Interface (GUI) are provided for integration into automated test flows, or bench-level debugging of devices. All relevant parameters such as power level, space vehicle number, etc. may be set or queried through either the API or GUI.

IQnav Graphical User Interface

The IQnav GUI provides a rapid way to generate signals without developing any test code. All unit parameters can be controlled via the GUI.

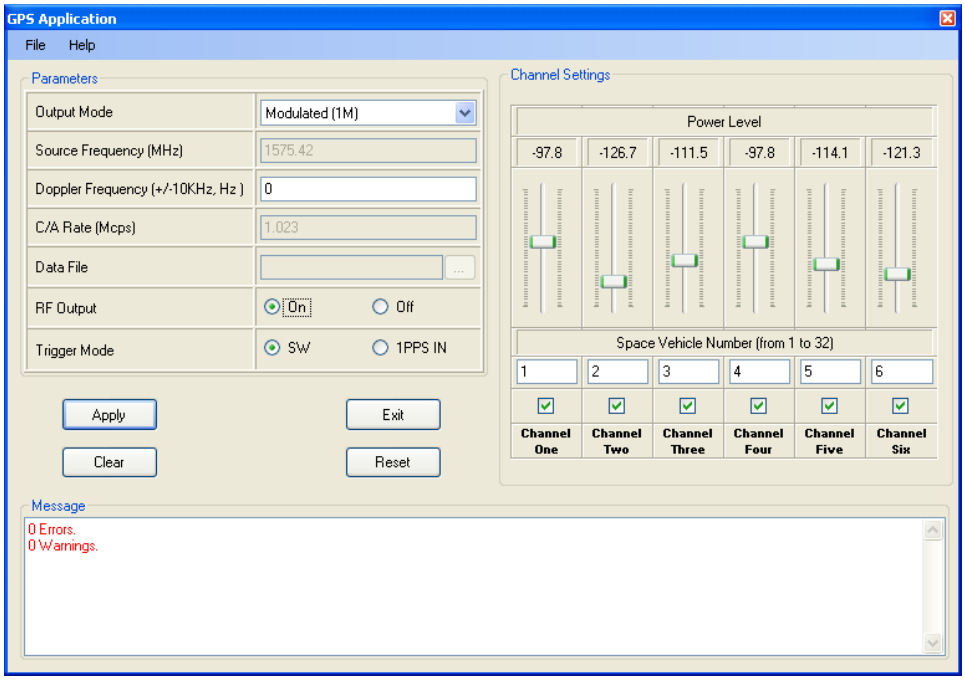

Figure 4. IQnav GPS Test System Graphical User Interface

Applications Information

Developers

For more advanced and/or automated product or design verification (e.g. in QA or DVT testing), the system offers the LitePoint Unified (C++) software API as a standardized interface. A developer can build custom test scripts or complete automated test programs, taking full advantage of the capabilities of the IQnav test instrument. This provides a powerful means to automate product characterization, regression testing, etc.

Manufacturing

In manufacturing, the IQnav test system offers a convenient and complete solution for production test and calibration of wireless products. The system supports all tests that are typically used in manufacturing, and allows for full test coverage at optimized test times, using a single test instrument that integrates all required functionality.

Customers can develop their own optimized production code using the LitePoint Unified (C++) software API as a standardized interface.

Specifications

GPS

Parameters	Value
Frequency	L1 – 1575.42 MHz
Modulation	BPSK
Number of channels	1 or 6
Simulated signals	1 to 32 selectable; independent per channel
Output power level	-60 to -145 dBm
Power resolution	0.25dB
Power accuracy *[1]	-60 to -100 dBm ±0.5 dB RSS -100 to -145 dBm ±1 dB RSS
Frequency accuracy *[2]	±0.002 ppm / day (±2 x10^{-9})
Navigation data	GPS C/A @1.023 MHz with 50 bps; independent per channel
Carrier doppler	Frequency offset +/-10.0 kHz with 1 Hz resolution
Channel power level range	± 15 dB (from nominal output level)
Transmitted signal quality	Harmonic: < -40dBc Non-Harmonic: < -40 dBc (+/- 10 MHz)
Carrier phase noise	1deg RMS (1kHz to 1 MHz SSB)

Note: *[1] @20°C to 30°C - measured using CW tone

*[2] After a 30-min. warm-up time.

Interfaces

Front Panel	RF port (1)
Rear Panel	USB port
	10 MHz reference IN (BNC-f) (50 Ω)
	AC in
	PWR Switch
	1 PPS IN 50 Ω TTL Level
	1 PPS OUT 50 Ω TTL Level

General

Control interfaces	LitePoint API—command set with DLL interface to support C++ programming of test scripts and automated test software
Connectivity	USB 2.0

Physical and Environmental

Dimensions	18”D = 458mm 17”W = 433mm 13/4”H = 45mm
Weight	6 kg
Power consumption	<20W
Operating temperature	20°C to +55°C (IEC 68-2-1, 2, 14)
Storage temperature	-40°C to +70°C (IEC 68-2-1, 2, 14)
Operating humidity	15% to 95% relative humidity, non-condensing (IEC 68-2-30)
Recommended calibration cycle	12 months
Warranty	12 months hardware

External PC Requirements

PC	Intel Pentium processor or compatible, 500MHz (1GHz or higher recommended)
Operating system	Microsoft Windows 2000 (SP3 or higher), Windows XP (SP1 or higher) US English versions
Memory	512MB of RAM
Disk space	500MB of available hard disk space
Monitor	1024 x 768 resolution
Connectivity	USB 2.0

Compliance

EMI compatibility	• 89/336/EEC revised by 91/263/EEC, 92/31/EEC, 93/68/EEC • EN55011/ CISPR 11: 1998 + A1+A2 • EN61326-1: 1997 + A1 + A2 • FCC Part 15 Class A / 04.99 • IC CS003
Safety	• 73/23/EEC revised by 93/68/EEC • EN61010-1: 1993 + A2: 1995 • UL 61010A R4.02 • CAN/CSA c22.2 No. 1010

Shipping Contents

GPS Generator
AC power cable
Quick Start Guide
IQnav CD

Order Information

ORDER CODE	PRODUCT DESCRIPTION
IQ-NAV-GPS-01	LitePoint IQnav One Channel GPS Manufacturing Test System
IQ-NAV-GPS-06	LitePoint IQnav Six Channel GPS Manufacturing Test System

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