



# CDMA Position Location Test System PLTS

## The first integrated test solution for location-capable CDMA mobile devices

Spirent Communications' CDMA Position Location Test System (PLTS) is the only commercial single-source solution for comprehensive, automated testing of CDMA mobile-based wireless position location technologies. These technologies are being rapidly deployed by CDMA network service providers, driven by the FCC E911 Phase II mandate in the United States and by Location-Based Services' (LBS) commercial potential in Asia and North America.

PLTS is a fully integrated, automated test solution for all CDMA mobile devices that use Assisted GPS (A-GPS), Advanced Forward Link Trilateration (AFLT), Hybrid (AFLT and A-GPS) or GPS-only technologies. Current industry standard tests define only minimum performance specifications. PLTS allows performance evaluation well beyond these baseline test scenarios to identify performance breakpoints under real-world conditions.

PLTS benefits from Spirent's global leadership in CDMA network emulation and GPS system simulation. The system's AirAccess C2K CDMA Network Emulator is a highly configurable, real-time CDMA network. A GSS5060 GPS

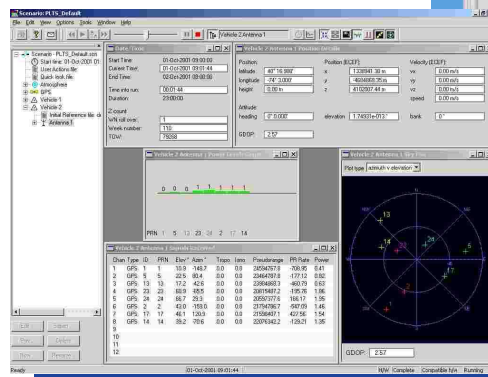
Location Simulator provides fully programmable, accurate simulation of GPS signals and associated propagation effects. Integrated commercial Position Determination Entity (PDE) algorithms emulate the location server element of a network.

The system's TASKIT/PLTS test executive software provides a single point of control for configuration and execution of test scenarios with pass/fail criteria and results analysis.

Chosen by leading CDMA carriers, PLTS supports Spirent's global leadership in mobile-based wireless position location technology testing. Spirent is committed to reducing time-to-market for products and services utilizing new technologies, and to reducing the business risk of their deployment.



*PLTS delivers a complete, automated test solution for performance analysis of LBS capable mobile devices.*



**Spirent Communications**  
541 Industrial Way West  
Eatontown, New Jersey  
07724, U.S.A.  
Tel: +1 732-544-8700  
Fax: +1 732-544-8347  
Sales: +1 800-927-2660  
tas.sales@spirentcom.com

**Sales Contacts:**  
**North America**  
+1 800-927-2660  
**Europe, Middle East, Africa**  
+33-1-6137-2250  
**Asia Pacific**  
+852-2166-8382  
**All Other Regions**  
+1 818-676-2683

www.spirentcom.com

## Major Features:

- The only single-source, fully integrated and accurately synchronized solution available
- Supports AFLT, A-GPS, Hybrid (AFLT and A-GPS) and GPS-only technologies
- Integrated commercial PDE algorithms
- Emulates CDMA2000 1xRTT, & 1xEV-DO, IS-95A/B, TSB-74 and J-STD-008 networks
- Generates up to 6 CDMA pilots and 12 GPS satellite signals
- Provides control over all critical CDMA and GPS parameters, test location and time

- Optional CDMA impairments emulate real-world field scenarios
- Simple Pass/Fail criteria based on performance criteria, including statistical analysis
- Fully automated control of mobile device using Universal Diagnostic Monitor (UDM)
- Supports both control plane and user plane (TCP/IP) transport mechanisms
- Supports commercial user plane technologies

## Applications:

- Product Development
- Design Verification
- Minimum Performance Verification (such as IS-916)
- Quality Assurance
- Product Evaluation
- Carrier Compliance Test



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### PLTS System Architecture

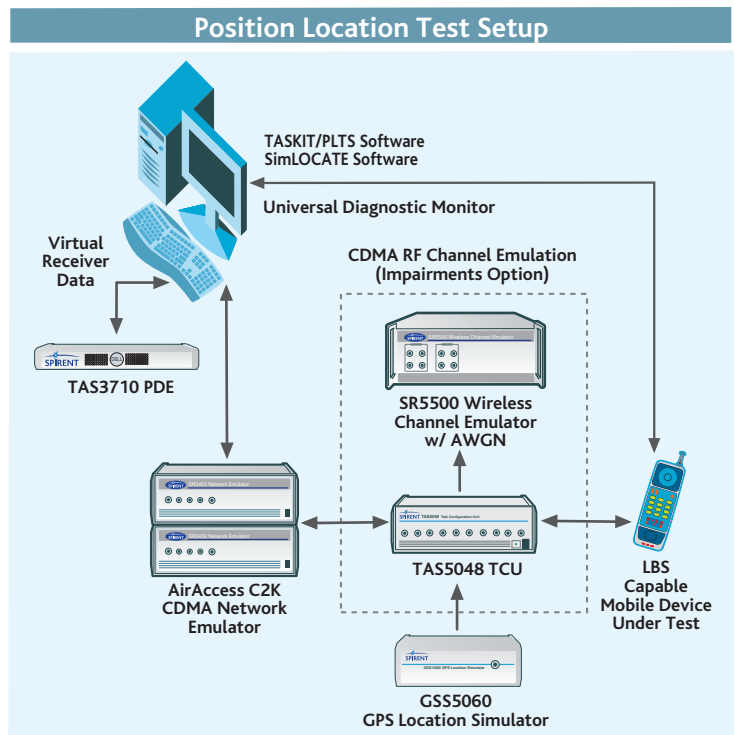
PLTS provides a complete turnkey test setup for evaluation of location-capable CDMA mobile device performance. It is a highly integrated, automated and accurately synchronized test system that builds on Spirent's global leadership in GPS and CDMA environment emulation.

The AirAccess C2K CDMA Network Emulator provides advanced protocol control, including support for the IS-801-1 Position Determination Service standard. Simultaneous multi-sector, multi-BSC emulation enables comprehensive AFLT and handoff scenario performance testing, and an EV-DO option provides a proven test platform for 1xEV-DO LBS-capable devices. An impairments option adds the SR5500 Wireless Channel Emulator and the TAS5048 Test Configuration Unit instruments. This system configuration allows performance to be characterized under representative field conditions.

The GSS5060 GPS Location Simulator with SimLOCATE software

provides highly accurate simulation of signals and associated propagation effects from up to 12 GPS satellites at two independent locations – one for the mobile device under test, and one for a static PDE reference receiver. An integral Position Determination Entity (PDE) performs network-based position determination, using algorithms identical to those deployed in actual network entities. SimLOCATE's Virtual Receiver function emulates the PDE reference receiver and outputs reference data directly to the PDE to reduce test time.

Two powerful software programs enable automated, closed-loop device testing. The TASKIT/PLTS test executive configures the system, executes the tests, then collects, analyzes and displays the test results. The Universal Diagnostic Monitor (UDM) controls the mobile device under test while simultaneously monitoring its real-time performance. Use of UDM allows both mobile-terminated and mobile-originated calls to be automated.



PLTS is a complete, automated test setup for LBS capable mobile devices.



## Spirent System Components

PLTS is comprised of several key Spirent instruments and associated software. Each component adds unique value as part of the automated system.



TASKIT/PLTS Software

### TASKIT/PLTS Test Executive Software

Controls system configuration, test execution, results logging and analysis.

- Eliminates the need for complex software programming
- Supports industry standard (IS-916) and custom test cases for both control and user plane (TCP/IP)
- Displays results graphically with statistical analysis and pass/fail criteria



UDM Software

### UDM V2 Universal Diagnostic Monitor

Automates testing through simultaneous mobile device monitoring and control.

- Full-featured mobile diagnostic monitor
- Enables automated configuration and control of mobile device under test
- Capable of supporting any mobile device



AirAccess C2K

### AirAccess C2K CDMA Network Emulator

Provides highly configurable, real-time CDMA network emulation.

- Real-time CDMA2000 1xRTT & 1xEV-DO, IS-95A/B, TSB-74 and J-STD-008 network emulation
- Support for IS-801-1 signaling with Data Burst and TCP/IP delivery methods and full message decode
- Multi-sector, multi-BSC emulation permits true soft, softer, hard and inter-generation handoffs



GSS5060

### GSS5060 GPS Location Simulator

Highly accurate simulation supports all-in-view and multi-path environments.

- Simulates up to 12 GPS L1 C/A Code satellite signals
- Emulates signal impairments, such as atmospheric and multi-path effects
- SimLOCATE software supports two locations: one for Mobile, one for PDE Reference Receiver with Virtual Receiver software



TAS3710 PDE

### TAS3710 Position Determination Entity (PDE)

Hosted on a compact server platform. Allows realistic system tests to be performed.

- Uses algorithms identical to those in the equivalent deployed network entity
- Key parameters are user-selectable via TASKIT/PLTS software
- PDE software supported by PLTS, tracks software release of the equivalent deployed network entity



SR5500

### SR5500 Wireless Channel Emulator

The industry standard for accurate and repeatable wireless channel emulation.

- Accurately emulates multi-path fading, delay spread, path loss and AWGN
- Enables modeling of representative field conditions for meaningful AFLT testing
- Exceeds requirements of 3G test specifications



TAS5048

### TAS5048 Test Configuration Unit

Automatically manages the switching of RF connections in the system.

- Integrates system instruments for calibrated levels at device antenna
- Provides RF connection to mobile devices with one or two test ports
- Dynamically reconfigures system under software control

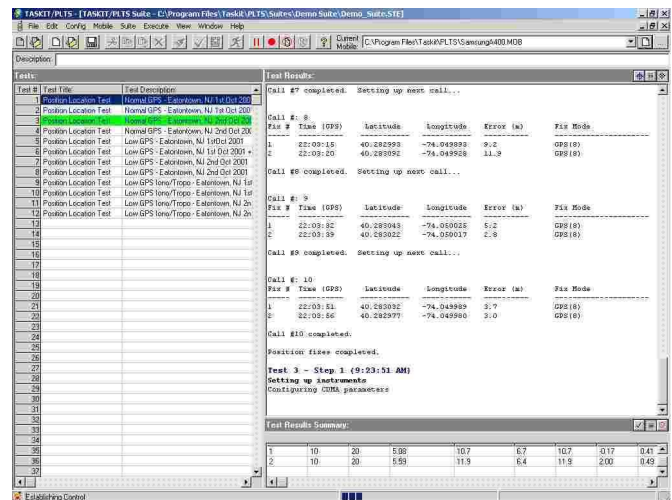
### TASKIT/PLTS Test Executive Software

TASKIT/PLTS is an advanced, application-specific test executive that automates every aspect of position location test execution, data collection, results reporting and results analysis. Test suites are defined in terms of the parameters required in a particular test, instead of instrument-specific settings, making it simple to correlate parameter values to industry standard test conditions. TASKIT/PLTS automatically translates the parameters in the test standards to the appropriate instrument configurations.

TASKIT/PLTS automatically configures all of the system elements and coordinates the test execution required to evaluate the position location performance of a mobile device. TASKIT/PLTS collects and

archives all relevant test conditions and results in an industry-standard Microsoft Access database. Integrated report generation makes it easy to extract and display key performance metrics from the archived data.

The TASKIT/PLTS test executive provides a structured means to automatically execute a series of test procedures. Test suites are a collection of individual tests, each designed to evaluate a particular aspect of the mobile device's performance. One or more related test suites are organized into a test session. Any combination of tests, test suites and test sessions can be saved and recalled, allowing test campaigns to be quickly set up and executed.

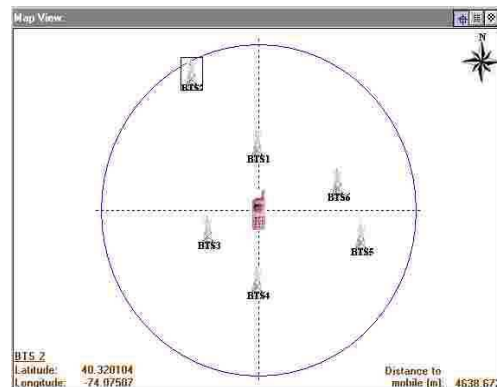


TASKIT/PLTS automates all aspects of test execution, data collection, and results reporting and results analysis.

### CDMA Network Topology

TASKIT/PLTS automatically converts BTS and mobile device location parameters into a graphical display, allowing the

impact of CDMA network geometry on AFLT and hybrid positioning performance to be characterized.



TASKIT/PLTS's graphical display capabilities facilitate rapid diagnosis of performance issues due to poor network geometry.



### Standard and Commercial Test Suites

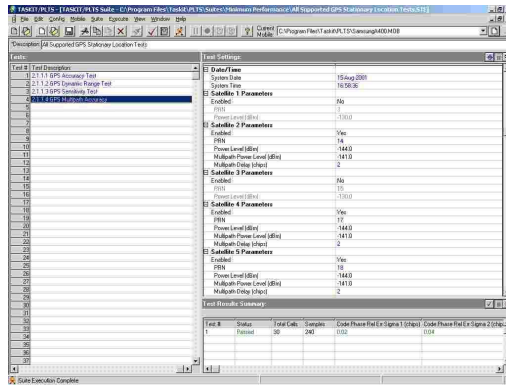
TASKIT/PLTS is a cohesive solution for testing a mobile device to key industry standards. With this software, pre-defined test suites can be quickly loaded and executed at the touch of a button. Test suites for the Minimum Performance Tests developed by 3GPP2 (IS-916) are included with TASKIT/PLTS. IS-916 is intended to ensure that a mobile device's location can be determined in any CDMA wireless system that is compliant with the IS-801-1 Position Determination Service standard. The statistical confidence determination method in the

specification is automatically applied by TASKIT/PLTS to determine pass/fail criteria.

Utilizing TASKIT/PLTS test suites eliminates the need to comb through test standards and attempt to map the test conditions to instrument settings. Industry standard tests are regularly updated and Spirent provides the corresponding software updates. Pre-defined tests can be easily modified through TASKIT/PLTS's graphical user interface to create an unlimited number of custom test conditions.

With the focus of service providers expanding into commercial location-based services, it is critical to characterize the end-user experience of those applications. Since the IS-916 Minimum Performance Tests have only been designed for Control Plane (IS-801-1) transport mechanisms, PLTS offers User Plane implementations of these tests as part of its User Plane option. With these test suites, key characteristics that affect end-user experience, such as accuracy and time-to-fix (TTF), can be analyzed.

*With pre-defined test suites, TASKIT/PLTS provides a simple, efficient approach to ensuring compliance with industry standards.*



### Field Scenario Test Suites

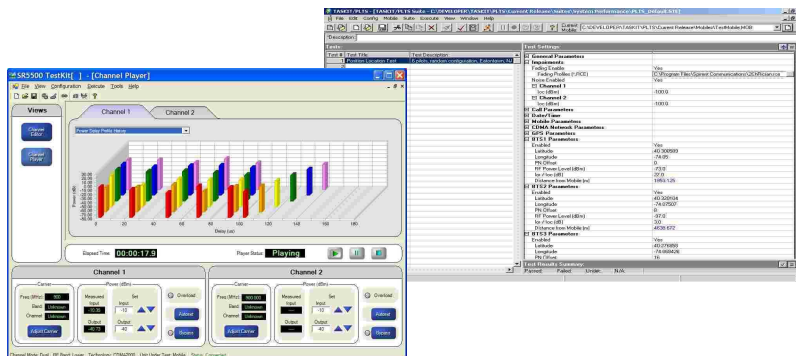
The impairments option combined with specific test suites gives PLTS field test-like functionality. PLTS emulates representative field conditions where propagation impairments, such as varying levels of GPS and CDMA signal blockage, multipath interference and Doppler spreading, may be present. Rural, suburban, urban and highway environments, as well as indoor vs. outdoor operation, can present very different operating conditions to location-capable mobile devices.

Spirent's PLTS enables a large number of test parameters to be controlled. Multiple tests can be automatically conducted over a very wide range of times, locations and CDMA/GPS environments. The controlled test environment ensures

that results are accurate and repeatable, greatly facilitating diagnosis of performance issues and reducing the need for expensive field trials to validate mobile device performance.

Lab-based testing is not yet accepted as a substitute for the field test methodology described in the FCC's OET Bulletin No. 71. However, the test methodology described in the Bulletin can be simulated by PLTS. The statistical analysis (required accuracy and reliability requirements for E911 Phase II mobile-based solutions: 50 meters for 67 percent of calls, 150 meters for 95 percent of calls) may be carried out automatically by PLTS on the results. Using this analysis, TASKIT/PLTS can also apply pass/fail criteria.

*The flexibility of PLTS enables a very wide range of field test scenarios to be created, reducing the need for expensive field trials.*





### CDMA Network Emulation

AirAccess C2K's dynamic state machine engine and interactive GUI make implementation of complex tests, such as handoffs, a simple task.

- No need to write complex programs or scripts
- Real-time emulation with response times representative of a real network
- Multi-sector and multi-BSC emulation with two independent carriers
- Support for IS-801-1 messages
- Comprehensive control over critical network services, parameters and messages
- Real-time message and event analysis with comprehensive time-stamped Layer 2 and Layer 3 message logging

AirAccess' powerful Message Analyzer includes full IS-801-1 message decoding capabilities. In conjunction with CDMA event analysis logs and GPS logs, this presents a uniquely powerful tool for comprehensive protocol verification before a mobile device is deployed on the real network.

The screenshot displays the AirAccess C2K software interface. At the top, there's a menu bar with options like File, View, Instance, Network, Call, Test, Tools, and Help. Below the menu is a toolbar and a 'Test Configuration' window showing a network diagram with an MSC, BSC, and several BTS units. The main area is divided into a 'Message Analyzer' window at the bottom, which shows a table of captured messages with columns for Message #, Time Stamp, Message, PN, Chan, Code Channel, Protocol, and Destination. To the right, a 'Message #64: Data Burst Message' window is open, showing a detailed decode of the message with fields like MSG\_SEQ, MSG\_TYPE, and various request and response indicators.

*AirAccess' real-time message analysis with full IS-801-1 message decode simplifies verification of location-capable mobile devices.*

### Network Parameters

AirAccess' powerful state machine allows a CDMA mobile device to be tested as if it were interacting with real network infrastructure. Unlike a real network, however, the user is given complete control over network configuration parameters. Test parameters can be modified interactively in real time without the need to go offline to create individual test programs.

Key programmable network parameters include:

- Band classes
- Code channels
- Radio configurations
- All overhead message fields on a per-BTS basis
- Insertion of user-configurable IS-801-1 messages

*AirAccess offers the user comprehensive control over network parameter settings.*

The screenshot shows the 'Configure BTS: PN 0' dialog box. It has two tabs: 'Sector #1' and 'Code Channels'. The 'Sector #1' tab is active, showing 'Configure Sector' options like PN Offset and Level (dBm). Below that are 'Overhead Message Options' with checkboxes for various messages like 'IS-95 Mobile Sync Channel Workaround', 'General Neighbor List Message', etc. To the right is the 'Configure Overhead Message' section, which shows a list of 'System Parameters Message' fields and their values, such as MSG\_TYPE (0x1), PILOT\_PN (0x0), and CONFIG\_MSG\_SEQ (0x0).

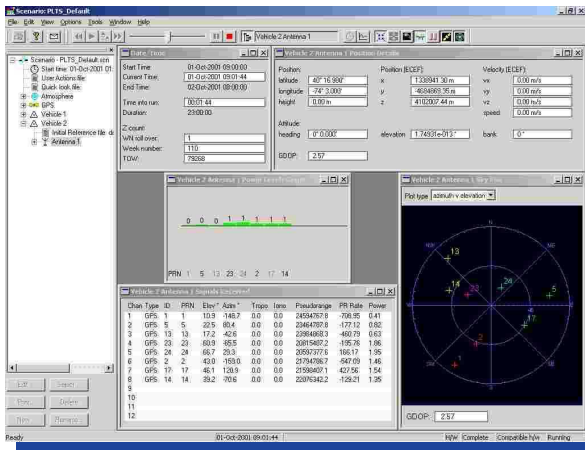


**GPS Environment Emulation**

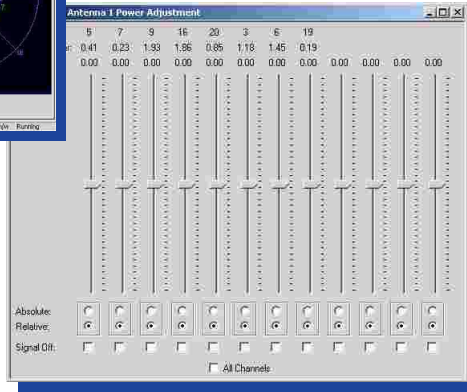
Spirent's world leadership position in GPS simulation is reflected in the capabilities of the GSS5060 GPS Location Simulator. This all-digital L1 C/A code simulator employs advanced modulation techniques to offer exceptional repeatability, low phase noise and code/carrier coherence. Up to 12 signal channels support all-in-view and multi-path environments.

SimLOCATE software features:

- An accurate and dynamic GPS environment
- Includes real-time models for satellite constellations, satellite errors, atmospheric signal degradation, terrain obscuration and multipath
- User-specified dates, times and geographic locations
- Comprehensive GUI displays real-time sky plot, date/time, vehicle and PDE reference receiver positions, received power levels, satellite signal details
- Full interactive control of individual satellite power levels
- Simultaneous simulation of two independent receiver locations, one for the PDE reference receiver, one for the mobile device under test



*The GSS5060 with SimLOCATE software allows full control over the GPS environment, including real-time interactive control of satellite power levels.*



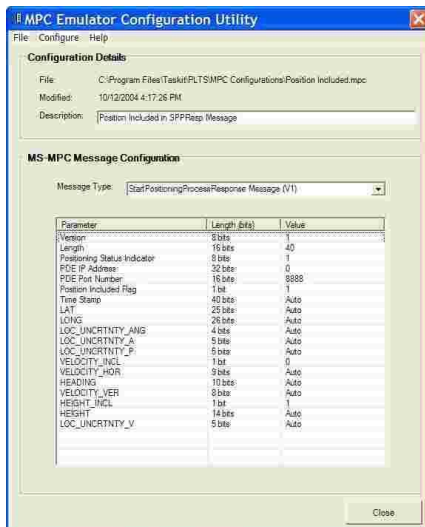
**User Plane Network Emulation**

With the emergence of commercial location-based services (LBS), user plane technologies are rapidly being deployed to support these next generation services. Instead of control plane implementations, where location-sensitive information is transferred

between the mobile device and the network using standard CDMA signaling, user plane implementations employ a TCP/IP connection between the MS and the location server (PDE).

The User Plane option provides a software enhancement to the PLTS system, providing a platform for analyzing the performance and behavior of mobile devices designed for interoperability with the QUALCOMM® User Plane Architecture. This option adds test support for a wide range of LBS applications to PLTS, together with an integrated Mobile Positioning Center (MPC) emulator that supports non-trusted LBS applications requiring MPC authentication. With the User Plane option, the performance analysis capabilities of the system are extended with a set of test suites based on the control plane TIA-916 Minimum Performance specification. Coupled with optional EV-DO support, a comprehensive platform is provided for analyzing 1xRTT and 1xEV-DO commercial LBS devices.

*The MPC emulator allows thorough performance analysis of commercial location services.*



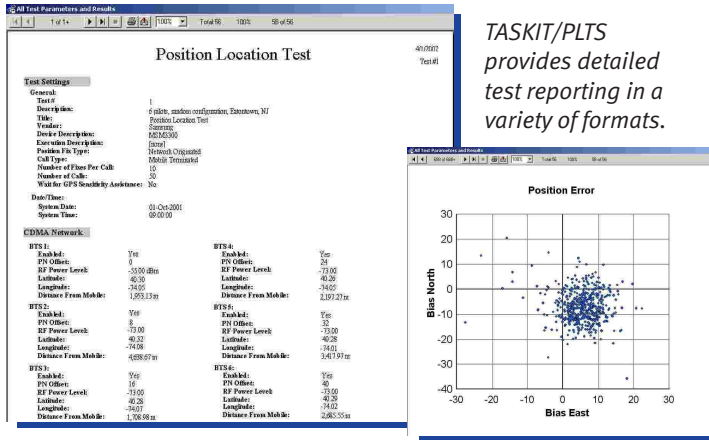
## Comprehensive Test Results

TASKIT/PLTS makes it easy to collect and analyze mobile device test results and over-the-air message logs. All test parameters and results are stored in a Microsoft Access database for post-processing.

Storing a complete set of test data ensures the traceability of test results. This data includes detailed information describing the identity and characteristics of the device under test.

TASKIT/PLTS is equipped with a flexible and powerful report generation feature that uses the data to deliver results in a variety of user-friendly meaningful formats. Standardized results formats in TASKIT/PLTS enable service providers, test labs and manufacturers to make meaningful comparisons of mobile device performance.

For measurements that benefit from a graphical results format, TASKIT/PLTS captures, archives, and displays detailed plot data.



## Universal Diagnostic Monitor (UDM)

The Universal Diagnostic Monitor (UDM) enables rapid test configuration by automatically interrogating the network settings of the device under test and setting the corresponding test parameters. This greatly simplifies test setup by eliminating the need to manually enter mobile device settings such as NID, SID, Channel Number, and Band Class. UDM also captures the key

mobile device identity data such as ESN, Model Name, Hardware Version, and Software Version that are used to label mobile device test results.

In addition, position location test procedures may require run-time control of the mobile device under test. Using the UDM's powerful software router, TASKIT/PLTS automates mobile control, eliminating the need for user intervention when placing mobile-originated calls, significantly reducing test time. UDM also features the ability to remotely capture positioning measurements that are computed internally by the mobile when executing in MS-Based mode. The UDM simultaneously monitors the device's performance. Its full-featured diagnostic monitor can display real-time mobile device performance parameters during test execution, resulting in complete closed-loop automation.

*UDM enables closed-loop automation and logging of mobile device messages.*

Message Type	System Time	FIELD	HEX	DEC	BETA
OTA-F-801-Position Determination Data Message	1/30/01 01:01:18.905	BURST_TYPE	0015	5	Position Determination Services
OTA-F-801-Position Determination Data Message	1/30/01 01:01:18.908	NUM_MESSAGES	0011	11	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:18.910	NUM_RESPONSES	0018	18	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:18.905	RESERVED	0000	0	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:18.915	SESS_START	0000	0	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:18.903	SESS_END	0000	0	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:18.902	SESS_SOURCE	0000	0	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:18.902	SESS_TAG	0004	4	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:18.903	REQ_MSG_TYPE	0000	0	Position Determination Data Message
OTA-F-801-Position Determination Data Message	1/30/01 01:01:20.963	NUM_RESPONSES	0011	11	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:20.965	RESERVED	0000	0	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:20.969	REQ_TYPE	0011	11	Request Location Response
OTA-F-801-Position Determination Data Message	1/30/01 01:01:20.968	REQ_PAR_LEN	0011	11	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:20.950	HEIGHT_REQ	0011	11	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:20.984	ROLL_COR_GPS_REQ	0011	11	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:21.364	VELOCITY_REQ	0011	11	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:21.361	RESERVED	0000	0	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:22.985	RESERVED	0000	0	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:22.974	INSTR_RESP	0000	0	Skipped response element
OTA-F-801-Position Determination Data Message	1/30/01 01:01:22.944	RESP_TYPE	0008	8	Provides Positioning Measurement
OTA-F-801-Position Determination Data Message	1/30/01 01:01:22.907	RESP_PAR_LEN	0048	48	
OTA-F-801-Position Determination Data Message	1/30/01 01:01:24.007	PART_NUM	0000	0	1 = part number
OTA-F-801-Position Determination Data Message	1/30/01 01:01:24.003	TOTAL_PARTS	0000	0	1 = total number of parts
OTA-F-801-Position Determination Data Message	1/30/01 01:01:24.000	NUM_P1_RANGES_P	0018	18	18 = number of satellites
OTA-F-801-Position Determination Data Message	1/30/01 01:01:24.000	TIME_TAG	00000000	0	Time tag
OTA-F-801-Position Determination Data Message	1/30/01 01:01:24.000				

**Spirent Communications**  
 541 Industrial Way West  
 Eatontown, New Jersey  
 07724, U.S.A.  
 Tel: +1 732-544-8700  
 Fax: +1 732-544-8347  
 Sales: +1 800-927-2660  
 tas.sales@spirentcom.com

**Sales Contacts:**  
**North America**  
 +1 800-927-2660  
**Europe, Middle East, Africa**  
 +33-1-6137-2250  
**Asia Pacific**  
 +852-2166-8382  
**All Other Regions**  
 +1 818-676-2683

www.spirentcom.com

## Ordering Information PLTS Systems and Options

Name	Description
<b>PLTS Systems</b>	
PLTS-FX	CDMA Position Location Test System
PLTS-SW-ASA	PLTS Software Annual Support Agreement (Required)
<b>PLTS Options</b>	
PLTS-IMP4	Impairment Option for PLTS
PLTS-EVDO-U03	EV-DO Option for PLTS
PLTS-API	Application Programming Interface for PLTS
PLTS-JPN	Japanese Network Support
PLTS-USER-PLANE	User Plane Support for PLTS
PLTS-KDDI-TS*	KDDI Section 2 and Section 4 Test Suites

\* Prior KDDI authorization required

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