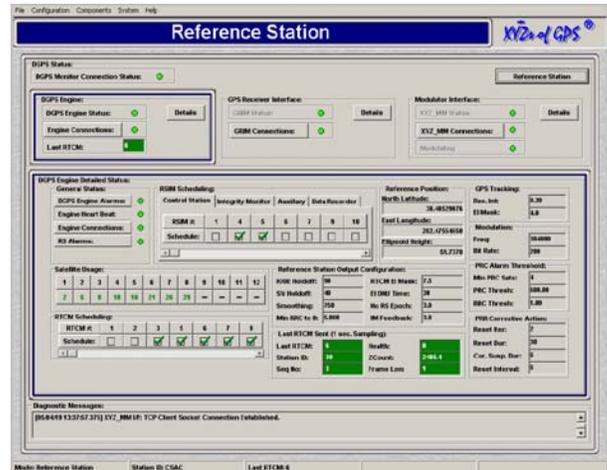


Charisma™ (C-RS/IM-A)

DGPS Software for Providing Pseudorange Correctors with Integrity.

Charisma is a configurable, Reference Station/Integrity Monitor Architecture manifested as a DGPS software application. Inspired by the United States Coast Guard's successful legacy system, Charisma is its modernized counterpart. Charisma is a software system and architecture, created to be hardware and network independent. While its initial creation was guided by the USCG's NDGPS radio beacon system, it has been written so that it can be configured or adapted for a variety of government or commercial applications.



Background

The DoD's GPS was conceived in the 60's, launched in the 70's and tested in the 80's. Operations began on Feb. 14, 1989. While GPS was capable of delivering 15-meter positioning in support of DoD missions, it was provided open and clear to the public at arguably 100 meters by adding intentional errors. Even in the absence of these errors, GPS could not be expected to provide for example 1 meter accuracy. GPS pioneers knew that errors experienced at one location were much the same in the surrounding area – even out to several hundred kilometers. They proposed DGPS. The DGPS method is to place a GPS receiver/antenna at a known geodetic location so as to determine the GPS errors and broadcast those correctors to others.

By the mid 1990s the USCG established DGPS radio beacons along coasts and rivers and territories. Later the nation decided to expand the system inland. This is called NDGPS; it has worked extremely well. Today, a full decade later, it is considered critical infrastructure. So much technology has emerged in the past 10 years, the NDGPS system needed to be modernized and recapitalized.

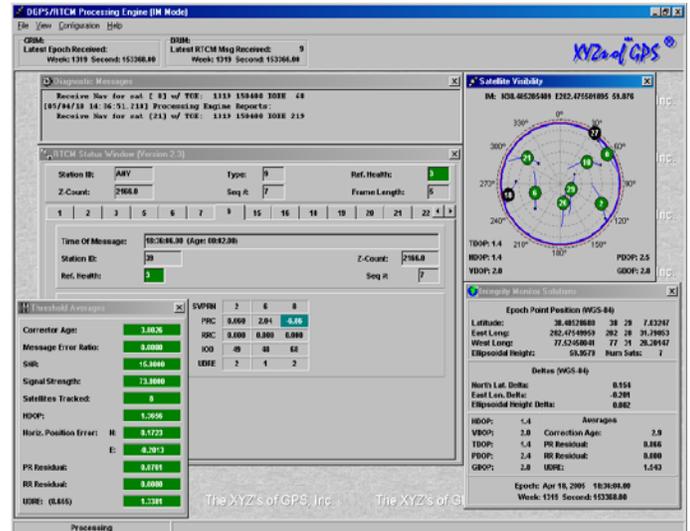
DGPS Modernization

Enter Charisma. Charisma begins with NDGPS as a model and adds several technology upgrades. Charisma is a Windows-based software solution which can operate with generic hardware and can be configured with different communications protocols. It uses RTCM correctors and RSIM messages according to RTCM standards. Charisma is network oriented and has a user friendly Graphical User Interface (GUI). When configured to modulate RTCM messages on an MSK carrier for later amplification, it operates from 150 – 535 kHz (in steps of 0.5 kHz) with 15 bps choices from 50 – 1800 bps. MSK, GMSK, RCMASK standards are possible.

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Modernization Details

- **Configurable:** Supports different communications protocols such as TCP/IP, RS-232, and so on.
- **Flexible:** Supports generic hardware equipment for all hardware components including server, GPS receiver, demodulator, and so on.
- **Adaptable:** Supports different hardware architectures and redundancy assumptions.
- **Network Oriented:** supports distributed processing
- **GUI based:** (See included graphics)
- **Monitor Desktop:** Fixed technician presentation plus information layering to improve productivity
- **Section 508 Compliant**
- **Capable of capture and playback**
- **Capable of data archival levels**
- **RTCM compliant:** 2.0, 2.1, 2.2, 2.3
- **RTCM message 60-63 capable**
- **RSIM 1.2 compliant:** Including full support of local/remote control station needs such as control commands, message scheduling, and status requests
- **Selectable system parameters including thresholds, timeouts, resets, GPS tracking and more**
- **Password Protection capable**
- **Windows based and multithreaded**
- **Computationally efficient:** low resource usage



Pre and Post Integrity

The Integrity Monitor component of the USCG’s NDGPS system evaluates RTCM messages after they are broadcast, and sends RSIM messages (to RS and CS) when correctors are out of bounds, and the RS sends satellite warnings to users. This is called post-broadcast integrity. Trimble Charisma introduces pre-integrity to the system. The concept is simple: Why not also evaluate the correctors before they are broadcast when that is possible. Pre-integrity is under development and will be available in an upcoming release.

System Requirements

- The system can be designed with one to four servers depending on redundancy and integrity assumptions:
- Windows XP operating system or later
- 1 GB RAM recommended
- 2 hard disks recommended (software & data)
- Network or RS-232 capable
- Modulator/DSP board for D/A message creation and analog signal to broadcast transmitter
- Demodulator radio and receiver
- GPS inputs (single or dual; code and carrier)