

# Monarch-M Receiver

*Precise positioning service*



Design Based on Legacy Monarch™ Space-  
Qualified Digital Design

100+ Equivalent Years of Accumulated Trouble-Free  
DoD Space Heritage; > 500K Orbits

Same Reliable Position, Velocity, Time,  
Pseudorange, and Carrier Phase @ 10 Sec

Relative Navigation Position, Velocity, and Time  
Modes

Same Legacy Monarch Footprint and MIL-STD-  
1553B Interface & Control

General Dynamics' M-Code Receiver provides Precise Positioning Service position, velocity, and time information for Department of Defense Low Earth Orbit (LEO) and Geostationary Earth Orbit (GEO) applications. Performance and satellite visibility are enhanced through the use of dual antennas; each of the 32 GPS channels can be assigned to either antenna.

## Key Benefits

- Qualified and Tested for the Space Environment: Pyrotechnic Shock, Random Vibration, Thermal-vacuum and EMI/EMC
- Modular Design Allows for Multiple Configuration Options
- Provides Near Real-time Position, Velocity and Time Measurements for Superior User Performance
- Relative Navigation Capability Allows for Differential Position, Velocity and Time Determination Between Co-orbiting Spacecraft.
- Precision Time Stamping Allows Unprecedented Accuracies in Space
- Precise Position Service Key Management Supports All Selective Availability Anti-spoof Module (SAASM) Unique Keying
- Single or Dual Antenna Capability Allows the Spacecraft User Installation Flexibility and Performance
- Available In LEO, MEO or GEO Configurations
- Integrated Anti-Jam Technology
- 32 Channels, L1 and L2 Capable
- C/A, P(Y) and Modernized M-Code

# Precision positioning service in space

## Performance Characteristics

### Receiver Architecture

- 32 Channels PPS-GPS C/A, P(Y), M-Code Channels
- Dual Antenna – any channel to either antenna
- Frequencies & Codes: L1 & L2, C/A Code, P(Y), M-Code
- Narrow Bandwidth Acceleration-Aided Carrier/Code Tracking
- Tracking, and Navigation Algorithms based on Legacy Monarch
- Software Reprogrammable Cryptographic Solution

### Input/Output

- MIL-STD-1553B, Follows Legacy Monarch ICD
- One Pulse per Second (GPS, UTC, or Measurement Epoch Time)
- Time Strobe Input Signal

### Solution Accuracy

- Autonomous Position: 4 meters, 1 sigma, < 1 meter typical
- Autonomous Velocity: < 2 cm/sec, 1 sigma, < 0.5 cm/sec typical
- Clock and 1PPS Absolute: < 10 ns 1 sigma, < 5 ns typical
- Time Strobe Input: < 10 ns, 1 sigma
- Relative PVT Mode: 0.5m, 0.5 cm/sec, 4 ns (1 sigma)

### Cold Start Time to First Fix

- < 60 minutes 95% probability Cold Start, < 20 minutes typical (w keys)
- < 10 minutes 95% probability Warm Start, < 5 minutes typical (w keys)

### Orbital Dynamics

- Altitude: LEO, MEO, GEO (200 km – 45,000 km)
- Velocity: up to 16,000 meters/second
- Acceleration: 1G

## Optional and Custom Features

- External Reference Oscillator or Internal Precision OCXO
- GEO Side Lobe Acquisition and Tracking Software
- High Dynamics Acquisition & Tracking

## Physical/Environmental

- Radiation: 100 Krads
- Single Event Upset: < 1 per year
- Single Event Latchup: Immune
- Reliability: 0.91 10 year, 35°C Baseplate, 100% duty cycle
- Vibration: 16.6 Grms
- Pyro Shock: 3000 G
- Temperature: -34°C to +71°C
- Size: 6.2" x 5.4" x 3.7" (158 x 138 x 94 mm)
- Weight: 8 lbs (3.6 kg) max.
- DC Power: 33 watts

**GENERAL DYNAMICS**

Mission Systems

Joseph Verderame • Manager, Business Development • 480.586.9973 • joseph.verderame@gd-ms.com • gdmissionsystems.com/space

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