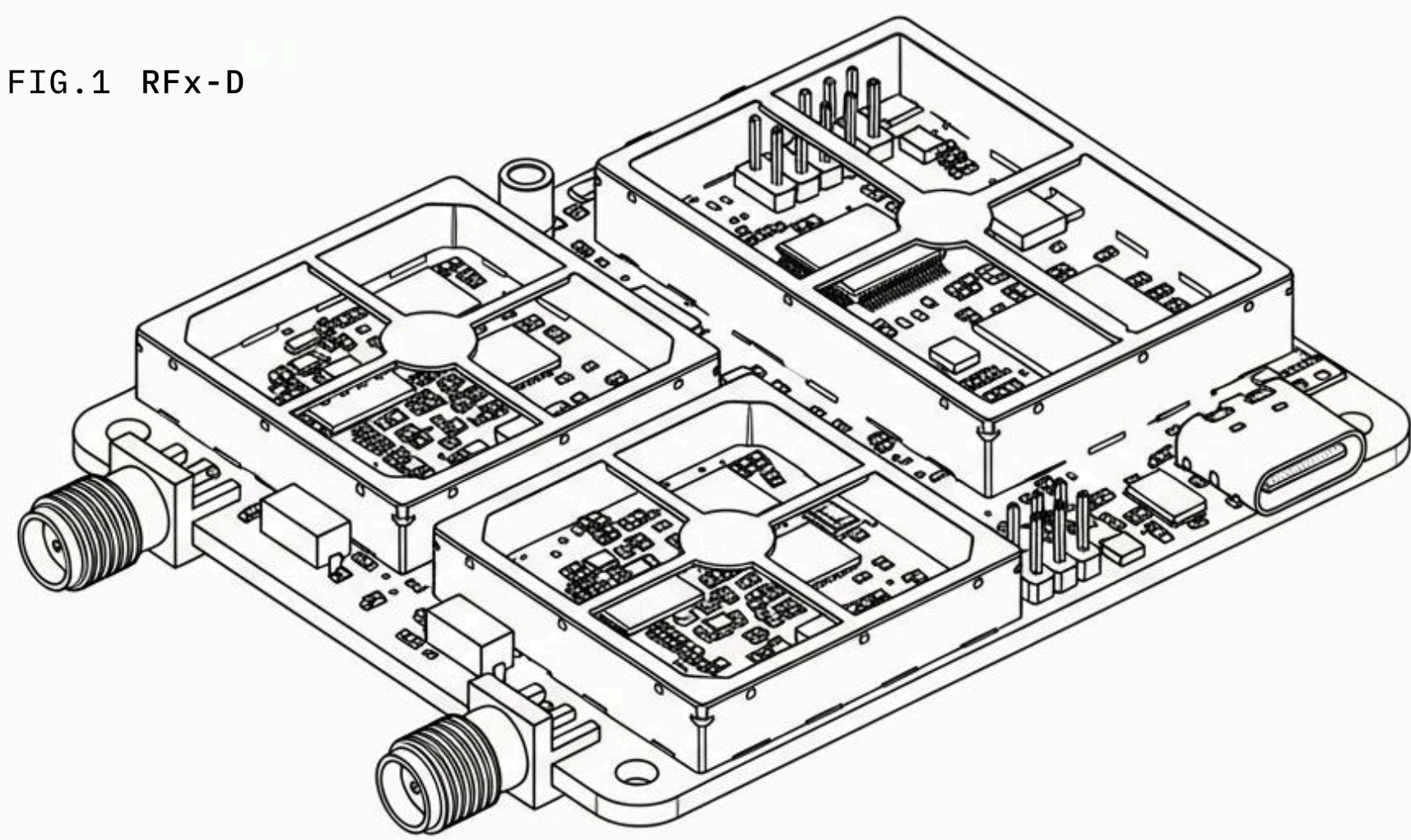


■ PRECISE, RESILIENT POSITIONING IN DYNAMIC & CONTESTED ENVIRONMENTS

# Leo200-D GNSS SDR

FIG.1 RFX-D



MADE IN USA 



## ABOUT

Leo200-D is Locus Lock's dual antenna variant of the turnkey software-defined GNSS receiver for precise, resilient Positioning, Navigation, and Timing (PNT) in dynamic and contested environments. It combines Locus Lock's PpRx software-defined GNSS receiver with the RFX-D dual-antenna, triple-frequency RF front end. RFX-D receives, filters, and digitizes GNSS signals for real-time processing by PpRx running on general-purpose compute. This software-defined architecture allows GNSS capabilities to be configured and upgraded through software rather than constrained by fixed-function receiver hardware.

Leo200-D uses dual-antenna carrier-phase differential GNSS (CDGNSS) together with an integrated inertial measurement unit (IMU) and magnetometer to provide precise heading and 3D attitude estimation. GNSS/inertial sensor fusion supports continued navigation as signal conditions degrade, including in obstructed, jammed, and spoofed environments.

Leo200-D supports L1, L2, and L5 frequency bands across both antenna inputs, with multi-constellation support for GPS, Galileo, BeiDou, SBAS, QZSS, and emerging commercial LEO PNT constellations. Its software-defined signal processing architecture enables new signals, algorithms, and threat-mitigation capabilities to be deployed through software as operating requirements and RF threats evolve.

## DEPLOYMENT

Leo200-D is available as a turnkey evaluation kit optimized for rapid setup and evaluation. The kit includes a preconfigured Linux host with PpRx, GUI, and supporting tools installed, providing immediate access to receiver configuration, visualization, data collection, and analysis. For platform deployment, PpRx can run directly on compatible general-purpose computers. Headless, CLI-only configurations require significantly fewer resources than the full evaluation environment, enabling real-time GNSS processing on resource-constrained edge computers.

## KEY FEATURES

- Software-Defined & Upgradeable: GNSS signal processing and navigation capabilities can be configured and upgraded through software without redesigning the receiver hardware.
- Multi-Band, Multi-Constellation: Dual-antenna L1, L2, and L5 reception across global, regional, and emerging GNSS/PNT signals.
- Resilient PNT: Anti-jam, anti-spoof, inertial aiding, PVT holdover, and rapid reacquisition capabilities for degraded and contested GNSS environments.
- Precision Heading & Attitude: Dual-antenna carrier-phase GNSS combined with inertial sensing for precise heading and 3D attitude estimation.
- Flexible Deployment: Evaluate with a turnkey, preconfigured host or deploy PpRx directly on resource-constrained edge computers.
- Integration-Ready: CLI and GUI interfaces, external IMU support, USB-C connectivity, and configurable high-rate RF sample streaming.

## COMMON APPLICATIONS

- Unmanned Air, Ground & Maritime Systems: Precise, resilient PNT for autonomous platforms operating across dynamic and contested RF environments.
- Manned Aircraft & Ground Vehicles: Multi-band GNSS, inertial aiding, and configurable threat-mitigation capabilities for integration with existing navigation and mission systems.
- Low Earth Orbit: Software-configurable GNSS processing for orbital dynamics and non-terrestrial signal conditions, with capability changes delivered through software rather than receiver hardware redesign.
- ISR & Mission Systems: Real-time PNT and GNSS observables for integration with navigation, sensing, and mission-compute architectures.

|                       |                                                                                          |                     |
|-----------------------|------------------------------------------------------------------------------------------|---------------------|
| Leo200-D CAPABILITIES |                                                                                          |                     |
| ■                     | RFx-D                                                                                    |                     |
|                       | • DUAL-ANTENNA, TRIPLE-FREQUENCY RFX-D RF FRONT END                                      |                     |
|                       | • INTEGRATED IMU AND MAGNETOMETER                                                        |                     |
|                       | • [OPTIONAL] EXTERNAL CLOCK INPUT                                                        |                     |
|                       | • 1 PPS OUTPUT                                                                           |                     |
|                       | PpRx                                                                                     |                     |
|                       | • OPTIMIZED DIGITAL SIGNAL PROCESSING FOR DEPLOYMENT ON LOW-SWAP GENERAL-PURPOSE COMPUTE |                     |
|                       | • REAL-TIME AND POST-PROCESSING OPERATIONAL MODES                                        |                     |
|                       | • SOFTWARE-UPGRADEABLE SIGNAL PROCESSING AND NAVIGATION CAPABILITIES                     |                     |
|                       | • GNSS/INERTIAL SENSOR FUSION FOR 3D POSITION, VELOCITY, AND ATTITUDE ESTIMATION         |                     |
|                       | • DUAL-ANTENNA HEADING ESTIMATION WITH SUB-DEGREE ACCURACY                               |                     |
| ■                     | SUPPORTED GLOBAL SIGNALS                                                                 |                     |
|                       | GPS                                                                                      | L1C/A, L1C, L2C, L5 |
|                       | GALILEO                                                                                  | E1b, E1c, E5a       |
|                       | SBAS                                                                                     | L1                  |
|                       | BEIDOU                                                                                   | B1C, B2a            |
|                       | SUPPORTED REGIONAL SIGNALS                                                               |                     |
|                       | QZSS                                                                                     | L1C/A               |
|                       | EMERGING COMMERCIAL LEO PNT CONSTELLATIONS                                               |                     |
|                       |                                                                                          |                     |
|                       |                                                                                          |                     |
|                       |                                                                                          |                     |

|                         |                                      |                                     |
|-------------------------|--------------------------------------|-------------------------------------|
| RFx-D RF HARDWARE SPECS |                                      |                                     |
| ■                       | RF SAMPLING                          |                                     |
|                         | L1/L2 SAMPLING RATE                  | 10 MSPS                             |
|                         | L5 SAMPLING RATE                     | 20 MSPS                             |
|                         | PHYSICAL                             |                                     |
|                         | DIMENSIONS, EXCLUDING SMA CONNECTORS | 56 × 65 × 9 mm                      |
|                         | DIMENSIONS, INCLUDING SMA CONNECTORS | 56 × 75 × 9 mm                      |
|                         | WEIGHT                               | 22 g                                |
|                         | POWER CONSUMPTION                    |                                     |
|                         | CONNECTED, IDLE                      | 0.79 W                              |
|                         | CONNECTED, STREAMING <sup>1</sup>    | 1.62 W                              |
|                         | INTERFACES                           |                                     |
| ■                       | POWER CONSUMPTION                    |                                     |
|                         | CONNECTOR                            | 1 x USB 2.0 Type-C                  |
|                         | SUPPLY VOLTAGE                       | 5 VDC                               |
|                         | DATA OUTPUT                          | RAW RF & IMU DATA                   |
|                         | RF INPUTS                            |                                     |
|                         | CONNECTOR                            | 2 x SMA Female                      |
|                         | ANTENNA BIAS                         | CONFIGURABLE, OFF (0V) OR ON (3.3V) |
|                         | ANTENNA BIAS CURRENT                 | < 50 mA                             |
|                         | TIMING                               |                                     |
|                         | EXTERNAL CLOCK INPUT                 | 1 x MMCX FEMALE                     |
|                         | PPS OUTPUT                           | HEADER PIN                          |
| ■                       | ENVIRONMENTAL                        |                                     |
|                         | OPERATING TEMP                       | -20 C TO +70 C                      |
|                         | STORAGE TEMP                         | -40 C TO +85 C                      |
|                         | OPERATING HUMIDITY                   | 5 - 95% RH, NON-CONDENSING          |
|                         | VIBRATION                            | 7.7 G RMS [MIL-STD-810H]            |
|                         | SHOCK MIL-STD-810H - OPERATIONAL     | 40 G                                |
|                         | SHOCK MIL-STD-810H - SURVIVAL        | 75 G                                |
|                         |                                      |                                     |
|                         |                                      |                                     |
|                         |                                      |                                     |
|                         |                                      |                                     |

|                              |                                                        |                                    |
|------------------------------|--------------------------------------------------------|------------------------------------|
| PpRx SOFTWARE SPECIFICATIONS |                                                        |                                    |
| ■                            | POSITIONING ACCURACY <sup>2, 3</sup> (STANDALONE GNSS) |                                    |
|                              | STATIC                                                 | < 0.3 m H, < 0.6 m V               |
|                              | LOW SPEED <sup>4</sup>                                 | < 0.5 m H, < 1.5 m V               |
|                              | HIGH SPEED <sup>5</sup>                                | < 1.5 m H, < 0.5 m V               |
|                              | ULTRA HIGH SPEED <sup>6</sup>                          | < 1.8 m H, < 4.3 m V               |
|                              | HEADING ACCURACY                                       | < 1 deg RMS                        |
|                              | VELOCITY ACCURACY                                      | < 3 cm/s RMS                       |
|                              | TIME ACCURACY <sup>7</sup>                             | < 5 ns RMS                         |
|                              | 1 PPS GPIO                                             | ± 0.1 - ± 0.25 ppm (Undisciplined) |
|                              | LATENCY <sup>8</sup>                                   |                                    |
|                              | 50TH PERCENTILE                                        | < 6 ms                             |
| ■                            | TIME TO FIRST FIX (TTFF)                               |                                    |
|                              | COLD START <sup>9</sup>                                | ~30 s                              |
|                              | WARM START <sup>10</sup>                               | ~25 s                              |
|                              | HOT START <sup>11</sup>                                | ~1 s                               |
|                              | MINIMUM C/NO THRESHOLDS                                |                                    |
|                              | ACQUISITION                                            | 35 dB-Hz                           |
|                              | TRACKING                                               | 20 dB-Hz                           |
|                              | OPERATIONAL LIMITS <sup>12</sup>                       |                                    |
|                              | MAX VELOCITY                                           | 515 m/s                            |
|                              | MAXIMUM ALTITUDE                                       | 18,000 ft                          |
|                              |                                                        |                                    |

|                   |                                                                                                               |                               |
|-------------------|---------------------------------------------------------------------------------------------------------------|-------------------------------|
| AVAILABLE OUTPUTS |                                                                                                               |                               |
| ■                 | NAVIGATION & GNSS DATA                                                                                        |                               |
|                   | GNSS OBSERVABLES                                                                                              |                               |
|                   | UNCORRECTED PSEUDORANGE, DOPPLER, CARRIER PHASE, C/NO, SIGNAL HEALTH, ATMOSPHERIC PARAMETERS, AND CODE BIASES |                               |
|                   | NAVIGATION SOLUTION                                                                                           |                               |
|                   | 3D POSITION, 3D VELOCITY, CLOCK BIAS, CLOCK DRIFT, ANGULAR RATE, ACCELEROMETER AND GYROSCOPE BIASES           |                               |
|                   | CONFIGURABLE SOLUTION & OBSERVABLES RATE                                                                      | 1 - 100 Hz                    |
|                   | RAW SENSOR DATA                                                                                               |                               |
|                   | RAW RF                                                                                                        | 2-BIT IF SAMPLES, ~1.2 GB/min |
|                   | RAW IMU & MAGNETOMETER MEASUREMENTS                                                                           | ~100 Hz                       |
|                   | OUTPUT FORMATS & PROTOCOLS                                                                                    |                               |
|                   | GRID BINARY EXCHANGE (GBX), NMEA 0183, RINEX V2.11/V3.05, ROS2, MATLAB (.MAT), CSV (.LOG), KML, ASPN 2023     |                               |

|                                     |                           |  |
|-------------------------------------|---------------------------|--|
| Leo200-D HOST COMPUTER REQUIREMENTS |                           |  |
| SPECIFICATION                       | PPRX + GUI (REQUIREMENTS) |  |
| CPU                                 | 64-BIT, 4+CORES, 1+GHZ    |  |
| RAM                                 | 2 GB                      |  |
| STORAGE                             | 5 GB                      |  |
| OPERATING SYSTEM                    | UBUNTU LTS (22,24,26)     |  |

|                                                                                                                                                                                                               |  |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| FOOTNOTES                                                                                                                                                                                                     |  |  |
| 1. RFX IS ACTIVELY STREAMING RAW INTERMEDIATE FREQUENCY (IF) GNSS DATA TO A CONNECTED GENERAL-PURPOSE PROCESSOR.                                                                                              |  |  |
| 2. TYPICAL PERFORMANCE FOR PpRx. PERFORMANCE SPECIFICATIONS SUBJECT TO GNSS SYSTEM CHARACTERISTICS, IONOSPHERIC AND TROPOSPHERIC CONDITIONS, SATELLITE GEOMETRY,                                              |  |  |
| 3. POSITION ACCURACY IS EXPRESSED AS CEP (CIRCULAR ERROR PROBABLE) 50%, INDICATING THE RADIUS WITHIN WHICH 50% OF POSITION MEASUREMENTS ARE EXPECTED TO FALL.                                                 |  |  |
| 4. LOW SPEED IS <12 m/s.                                                                                                                                                                                      |  |  |
| 5. HIGH SPEED IS >22 m/s. TEST ENVIRONMENT INCLUDED OBSTRUCTIONS, INCLUDING BUILDINGS AND TREES.                                                                                                              |  |  |
| 6. ULTRA HIGH SPEED IS >60 m/s AND <2000 m/s.                                                                                                                                                                 |  |  |
| 7. TIME ACCURACY DOES NOT INCLUDE BIASES DUE TO RF FRONT-END AND/OR ANTENNA DELAY.                                                                                                                            |  |  |
| 8. THESE NUMBERS INCLUDE THE ENTIRE RF CHAIN AND DSP PIPELINE UP THROUGH PVT ESTIMATE PUBLICATION VIA GBX. THEY DO NOT INCLUDE ANY EXTERNAL DECODING OR PROCESSING OUTSIDE OF PpRx.                           |  |  |
| 9. COLD START: NO ALMANAC OR EPHEMERIDES AND NO APPROXIMATE POSITION OR TIME.                                                                                                                                 |  |  |
| 10. WARM START: EPHEMERIS AND ALMANAC KNOWN.                                                                                                                                                                  |  |  |
| 11. HOT START: EPHEMERIS, ALMANAC, AND INITIAL STATE ARE KNOWN.                                                                                                                                               |  |  |
| 12. EXPORT LICENSING TO COUNTRIES OUTSIDE OF THE US RESTRICTS OPERATION TO 515 m/s AND AN ALTITUDE OF 18,000 feet. PLEASE CONTACT LOCUS LOCK AT SALES@LOCUSLOCK.COM IF YOUR APPLICATION EXCEEDS THESE LIMITS. |  |  |