NanoSync IV

Military-Grade Position, Navigation, Timing (PNT) & Frequency Reference System, With SAASM GPS

- Suitable for Fixed, Ground Mobile, Airborne and Maritime Systems
- Flexible Choice of SAASM Receivers for Specific Applications
- Rubidium Atomic Clock for High Precision Time & Frequency Outputs with Extended Holdover Performance when GPS is Degraded or Denied
- Ethernet Interface Supporting PTPv2 Grandmaster, NTP & Status & Control For Network-Based Applications
- JASA Version 3, Annex 1, TFNG Compliant
The NanoSync IV is a small form factor GPS Position, Navigation, Time (PNT) and Frequency reference system that provides multiple reference outputs and includes support for NTP & PTPv2 IEEE 1588-2008. The NanoSync IV has a Rubidium oscillator and is equipped with a SAASM receiver (Rockwell-Collins MPE-S GB-GRAM or Trimble Force 22E MRU) for military users. The NanoSync IV is packaged in a small, rugged enclosure ideally suited for embedded electronic warfare applications.

The NanoSync IV incorporates proven features designed into all FEI-Zyfer products, including exceptional holdover performance when GPS signals are lost or degraded. This assures continued system operation as a time and frequency reference. The NanoSync IV can be monitored and controlled through an RS-232 port using FEI-Zyfer’s Serial Communication Protocol and via the 10/100Base-TX RJ-45 Ethernet port.

As with all FEI-Zyfer time and frequency products, the NanoSync IV incorporates advanced, proprietary learning algorithms that compensate for external temperature changes and aging characteristics of the oscillator while operating in holdover. This FEI-Zyfer feature ensures accuracy and consistent performance throughout the specified operating temperature range.
Specifications Common to Both Force 22E and MPE-S Models

Output Specifications

**10 MHz Output:**
- **Waveform:** Sine wave, AC coupled
- **Connectors:** (2) SMA Female
- **Amplitude:** 13 dBm +3/-1 dBm @ 50 Ω
- **Coherency:** Coherent to 1 PPS
- **Harmonic Distortion:** ≤ -50 dBc
- **Non-Harmonic Distortion:** ≤ -60 dBc

**Frequency Accuracy:**
- **Locked to GPS:** ≤ 1E-12 (24 hr. average)
- **Holdover with FE-5680B Rb Atomic Clock (a):** ≤ 7.5E-11 (at 24 hours, ± 10 °C change)

**Phase Noise:**
- 10 Hz: ≤ -100 dBc/Hz
- 100 Hz: ≤ -125 dBc/Hz
- 1 kHz: ≤ -145 dBc/Hz

**Short Term Stability (Allan Deviation, typical):**
- 1 second: ≤ 3E-11
- 10 seconds: ≤ 1E-11
- 100 seconds: ≤ 3E-12

**1PPS Output (b):** Pulse, Rising Edge on-time
- **Connectors:** (2) SMA Female
- **Drive Level:** TTL into 50 Ω
- **Synchronization:** Rising edge on-time
- **Pulse Rise Time:** ≤ 20 ns
- **1PPS Jitter:** ≤ ± 5 ns.2σ (95 %)

**Time Accuracy:**
- **Locked to GPS:** ≤ 25 ns 2σ (95 %) to UTC
- **Holdover with FE-5680B Rb Atomic Clock (a):** @ 24 hours after 48 hrs locked operation: < 4.3 μs

**Time Code Output Options (User Programmable):**
- **Connector:** (1) SMA Female
- **BCD:** 24b or 40b
- **HaveQuick:**
  - HaveQuick 2 (STANAG 4246)
  - PTTI HaveQuick (ICD-GPS-060)
  - Extended HaveQuick (STANAG 4430)
- **IRIG-B02x:** (x=2,3,6,7)

**GPS Antenna Interface:**
- **Power:** 5 VDC @ 100 mA
- **Connector Type:** SMA Female
- **Input Gain Required:** +10 dB

Notes:
(a) After 48 hours of GPS locked operation, fixed antenna location and antenna delays entered.
(b) 1 PPS output can be disabled until GPS lock is achieved and time offset error is less than a user programmable amount.

Specifications subject to change without notice.

Status & Control Ports:

**Serial Port:**
- **Interface:** RS-232C
- **Connector:** (1) DE-9 (9-pin D-sub), Female
- **Baud Rate:** 19200 Fixed
- **1 Start Bit, 8 Data Bits, 1 Stop Bit**
- **No Parity**
- **Protocol:** FEI-Zyfer Serial Comm Protocol

**Ethernet Port:**
- **Ethernet Type:** 10/100Base-TX
- **Connector:** RJ-45
- **Configuration:** IPv4, IPv6 address, netmask & gateway user-selectable
- **Compatibility:** TCP/IP, Ethernet ver. 2.0 / IEEE 802.3 TELNET, SSH, SNMP (v1, v2c, v3)

**Time & Synchronization Protocols:**
- **NTP v2, v3, v4 & SNTP v4**
  - NTP Server Performance: Stratum 1
  - Client synchronization accuracy: 1-10 ms (typical)
  - NTP requests per second: ≥ 100
- **PTPv2 Grandmaster Performance:**
  - Packet throughput: > 100 Delay Requests/second

**Input Voltage / Power Consumption:**
- **Standard:** +24 VDC (18 to 28 VDC)
  - (externally regulated)
  - Warm Up: 40 W maximum @ 25 °C
  - Warm Up time: ≤ 10 minutes
  - Steady State: 20 W maximum @ 25 °C
- **Option:** 704A / 1275 D Compliant (15 to 33 VDC)
  - Warm Up: 50 W maximum @ 25 °C
  - Warm Up time: ≤ 10 minutes
  - Steady State: 30 W maximum @ 25 °C

Note: Input return connected to chassis/signal ground

**Key Load Interface:**
- **Electrical Interface per IS-GPS-153C & IS-GPS-164**
- **Communication Protocol per DS-102**

**PLGR/DAGR Interface:**
- **Electrical Interface per IS-GPS-154C & IS-GPS-164**
- **Serial Interface Protocol per IS-GPS-153C**

**Chassis Dimensions:**
- **Height:** 3.50” (89 mm)
- **Width:** 4.02” (102 mm) excluding I/O connectors
- **Length:** 8.27” (211 mm) excluding connectors
- **Weight:** < 4.9 lbs. (2.2 kg)

**Environmental:**
- **Operating Temperature:** -20 °C to 50 °C (@ Baseplate)
- **Rate of Change:** 10 °C / Hour maximum
- **Storage Temperature:** -40 °C to +100 °C
- **Relative Humidity:** 5 % to 95 %, non-condensing
- **Altitude, Operating:** 0 to 15000 feet
- **Altitude, Storage:** 0 to 40000 feet
SAASM Receiver Options*

Trimble Force 22E (MRU) GRAM SAASM Receiver

For Use in Man-Portable through High Dynamic Environments:
- Velocity (High Dynamic Limit): Up to ± 400 meters/sec
- Acceleration (High Dynamic Limit): Up to ± 40 meters/sec²
- Jerk (High Dynamic Limit): Up to ± 4 meters/sec³

All-in-view 24 Channel Receiver, with continuous independent tracking:
- Simultaneous L1 (C/A, P(Y)) and L2 (P(Y)) Dual Frequency Tracking
- Receiver Interface Protocols: ICD-TNL-153C, ICD-TNL-167 SHCI, NMEA 0183 v3.2

Time Accuracy:
- UTC(USNO): ≤ 100 ns 1σ (68.3 %)
- GPS Time: ≤ 40 ns 2σ (95.5 %)

Acquisition Time / TTFF:
- Hot Start: ≤ 10 seconds
- Warm Start: ≤ 60 seconds

Position & Velocity Accuracy (in State 5, L1&L2, WAGE enabled & within operating parameters):
- SDGPS: ≤ 2 meters CEP
- WAGE: ≤ 4 meters CEP
- Velocity (High Dynamic Environment): 0.1 meters/sec (RMS)

Rockwell Collins MPE-S GB-GRAM SAASM Receiver

For Use in Man-Portable, Surface Vehicle or Low Dynamic Environments

US Army Standard Embedded Receiver:
- Velocity (Surface Vehicle Limit): Up to ± 25 meters/sec
- Acceleration (Surface Vehicle Limit): Up to ± 3 meters/sec²
- Jerk (Surface Vehicle Limit): Up to ± 2 meters/sec³

All-in-view 12 Channel Receiver, with continuous independent tracking:
- Simultaneous L1 (C/A, P(Y)) and L2 (P(Y)) Dual Frequency Tracking
- Receiver Interface Protocols: ICD-TNL-153C, NMEA 0183 v3.2
- RAM/FLASH and FLASH/FLASH versions of the MPE-S available and supported

Time Accuracy (in State 5, L1&L2, WAGE enabled & within other operating parameters):
- UTC(USNO): ≤ 200 ns 2σ (95.5 %)
- GPS Time: ≤ 52 ns 2σ (95.5 %)

Acquisition Time / TTFF:
- Hot Start: ≤ 10 seconds
- Warm Start: ≤ 90 seconds

Position & Velocity Accuracy (in State 5, L1&L2, WAGE enabled & within operating parameters):
- SDGPS: ≤ 2 meters CEP
- WAGE: ≤ 4 meters CEP
- Velocity (Surface Vehicle): Better than 4.0 meters/sec (3D, 2σ)

Supports GB-GRAM Type I and Type II Form-Factors

* U.S. Government policy restricts the sale of Precise Positioning Service (PPS) equipment to those authorized by the U.S. Department of Defense. Non-U.S. authorized users must purchase PPS equipment through the Foreign Military Sales (FMS) process.