The Chairman of the Joint Chiefs of Staff (CJCS) issued a mandate to begin SAASM GPS receiver deployment as of October 2002 and with full enforcement as of October 2006.

What is SAASM?
SAASM (Selective Availability Anti-Spoof Module) is the new generation military GPS receiver technology, providing a new security architecture and crypto key management infrastructure. Receiver hardware and software assets are protected by a tamper-resistant security module on the GPS receiver board. Crypto key security is protected by a new unclassified Black-Key infrastructure. Having unclassified hardware and key logistics greatly reduces the complexities of deploying military GPS.

What is Direct P(Y) acquisition?
The pre-SAASM GPS receiver technology requires the Civil C/A-Code signal to facilitate the acquisition of the crypto P(Y)-Code signal. In addition to a properly keyed receiver, the C/A signal provides the receiver with precision time and other parameters needed to acquire the P(Y) signal. The Hot Start acquisition functionality bypasses this need, able to come on-line in the absence of the Civil, in-the-clear C/A signal. This is a vital function of the SAASM receiver technology, because in today's tactical warfare scenarios, the C/A signal may not be available in the local area of conflict.

Why use GPS SAASM in time/frequency product applications?
Many existing communications and data networks used by the government and DoD receive precision time and frequency from GPS-C/A-aided synchronization products. GPS-C/A signals/receivers can be easily jammed or degraded, causing degradation or loss of synchronization and communications, unacceptable in vital applications. The use of GPS-SAASM receivers prevents such loss of synchronization.

Although GPS-SAASM receivers are “controlled items,” they are not classified. Only the U.S. Government and its NATO partners are authorized to use such military receivers.

Are the systems upgradeable to M-Code?
Yes, when available.

Notes:
(a) After 48 hours of continuous operation.
(b) 2σ (95.5% probability).
(c) Detailed specifications for various frequency output modules: see “Option Module User Manual”.
(d) SAASM receiver restrictions: 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.
**CommSync II and CommSync II-D Redundant Modular Time & Frequency**

**FEATURES**

- **Accuracy**
  - Time: <50ns Peak (UTC)
  - <25ns RMS
  - Frequency: 1E-12
- **GPS Receivers**
  - Standard Civil C/A-Code (L1) Frequency
  - multi-GNSS
  - SAAHM Military C/A-P(Y)-Codes (L1, L2)
- **User interface**
  - Standard RS-232
  - Keypad/display
  - Ethernet I/O
    - (Telnet, SNMP)
  - Zyfer Monitor™ GUI
- **Time Server**
  - SNTP, NTP
  - PTPv2 IEEE 1588-2008
- **Standard Outputs**
  - 1PPS (front panel)
  - 10MHz (front panel)
  - 13 output slots (CS II)
  - 8 output slots (CS II-D)
  - Gigabit Ethernet with Fiber Options available
- **External synchronization and time inputs**
- **Automatic switchover in the event of a failure**
- **Expandable with distribution shelves**
- **Increased reliability due to fewer system components**
- **Shorter MTTR due to “hot swappable” spare modules**
- **Lower field maintenance costs due to less system complexity**
- **Lower training costs due to commonality across family**

**CommSync II Model 385 Modular Time and Frequency System**

- 3U Chassis
- Redundant and Field Replaceable GTF/DTF, I/O, Output, Power Modules
- 13 Rear Expansion Slots for Option Modules
- Field Upgradable to M-Code when available

**CommSync II-D Model 407 Modular Time and Frequency System**

- 2U Chassis
- Redundant and Field Replaceable GTF/DTF, I/O, Output, Power Modules
- 8 Rear Expansion Slots for Option Modules
- Field Upgradable to M-Code when available
## Specifications

### Output Specifications (GTF Front Panel)

After 24 hours of GPS locked operation, fixed antenna location, antenna delays entered.

**Frequency Accuracy (a)**

<table>
<thead>
<tr>
<th></th>
<th>Rubidium OSC</th>
<th>Quartz OSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Hour average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locked to GPS</td>
<td>&lt;1E-12</td>
<td>&lt;1E-12</td>
</tr>
<tr>
<td>Holdover(a) – first 24 hours</td>
<td>&lt;5E-11</td>
<td>&lt;1E-10</td>
</tr>
</tbody>
</table>

**Time Accuracy to UTC, for calibrated units (b)**

<table>
<thead>
<tr>
<th></th>
<th>Rubidium OSC</th>
<th>Quartz OSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Locked to GPS</td>
<td>&lt;50ns Peak</td>
<td>&lt;50ns Peak</td>
</tr>
<tr>
<td>Holdover(a) – first 24 hours</td>
<td>&lt;3us</td>
<td>&lt;7us</td>
</tr>
</tbody>
</table>

**Short-Term Stability (c) typical**

<table>
<thead>
<tr>
<th>Allan Deviation</th>
<th>Rubidium OSC</th>
<th>Quartz OSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 sec</td>
<td>&lt;3E-11</td>
<td>&lt;1E-11</td>
</tr>
<tr>
<td>10 sec</td>
<td>&lt;1E-11</td>
<td>&lt;1E-11</td>
</tr>
<tr>
<td>100 sec</td>
<td>&lt;3E-12</td>
<td>&lt;1E-10</td>
</tr>
</tbody>
</table>

**Phase Noise (c) typical**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Standard</th>
<th>Low Noise 5 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hz</td>
<td>&lt;-90 dBc/Hz</td>
<td>&lt;-100 dBc/Hz</td>
</tr>
<tr>
<td>10 Hz</td>
<td>&lt;-105 dBc/Hz</td>
<td>&lt;-130 dBc/Hz</td>
</tr>
<tr>
<td>100 Hz</td>
<td>&lt;-125 dBc/Hz</td>
<td>&lt;-150 dBc/Hz</td>
</tr>
<tr>
<td>1 kHz</td>
<td>&lt;-135 dBc/Hz</td>
<td>&lt;-158 dBc/Hz</td>
</tr>
</tbody>
</table>

### Input/Output (GTF Front Panel)

1) 1PPS, 50 Ω, TTL level, SMA, External Sync input
2) RS-232 I/O, DE-9 Connector
3) 10MHz, 50 Ω, TTL level, SMA connector
4) 1PPS, 50 Ω, TTL level, SMA connector

**SAASM Option**

1) Key Load connector
2) Hot Start connector
3) Zeroize button

### Power Options

**CommSync II**

- AC input (115-230 VAC) 100 to 240 VAC, 150 Watts max., 47-63 Hz
- DC input (24 VDC) 18-36 VDC, 150 Watts max.
- DC input (48 VDC) 36-76 VDC, 150 Watts max.
- DC input (12 VDC) 11.5-18 VDC, 150 Watts max.
- DC input (28 VDC) 22-29 VDC, 150 Watts max.

**CommSync II-D**

- AC input (115/230 VAC) 100-120 and 200-240 VAC, 130 Watts max., 47-63 Hz
- DC input (24 VDC) 18-36 VDC, 100 Watts max.
- DC input (48 VDC) 36-76 VDC, 100 Watts max.

### GPS Receiver Options

**Standard GPS Receiver - Civil C/A-Code**

- Type: 8-12 channel, independent tracking
- Frequency: 1575.42 MHz (L1)
- Code: C/A only
- Acquisition Time (b): Warm Start: <2 min. Cold Start: <20 min.

**Optional multi-GNSS Receiver Available**

- Type: GPS/GLONASS/BeiDou/QZSS/Galileo

**Upgradable to M-Code**

**SAASM GPS Receiver**

- Type: Military P(Y)-Code
- MPE-S GB-GRAM: 12 channel, independent tracking
- FORCE 22E MRU: 24 channel, independent tracking
- Frequency: 1575.42 MHz and 1227.60 MHz (L1 & L2)
- Code: C/A and P(Y)
- Acquisition Time (b): Warm start: <2 min. Hot / Cold Start: Dependent on accuracy of initialization parameters from PLGR or DAGR handheld military GPS receivers, or other initialization devices

**Key Load Interface**: DS-102

### Physical

<table>
<thead>
<tr>
<th>Height</th>
<th>134 mm (5.25&quot;) (3U) - CS II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
<td>87 mm (3.50&quot;) (2U) - CS II-D</td>
</tr>
<tr>
<td>Depth</td>
<td>381 mm (15&quot;) - CommSync II</td>
</tr>
<tr>
<td>Weight</td>
<td>25lb. Max - CommSync II</td>
</tr>
</tbody>
</table>

**Panel Color**

- Black Satin finish (Front Panel)

### Environmental

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Operating: 0°C to 50°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate of Change</td>
<td>10°C/Hour</td>
</tr>
<tr>
<td>Storage</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>5% to 95%, non-condensing</td>
</tr>
<tr>
<td>Altitude</td>
<td>Operating: -60m to 4000m</td>
</tr>
<tr>
<td></td>
<td>Storage: -60m to 9000m</td>
</tr>
</tbody>
</table>

Specifications subject to change without notice.
FEATURES

• Accuracy
  – Time: <50ns Peak (UTC) <25ns RMS
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• GPS Receivers
  – Standard Civil C/A-Code (L1) Frequency
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  – SAASM Military C/A-Code P(Y)-Codes (L1, L2)
• User interface
  – Standard RS-232
  – Keypad/display
• Zyfer Monitor™ GUI

Time Server

– SNTP, NTP
– PTPv2 IEEE 1588-2008

Standard Outputs

– 1PPS
– 10MHz
– 8 output slots (GSync II)
– 4 output slots (GSync)
– Gigabit Ethernet with Fiber Options available

Multi-purpose Embedded Ethernet supports:

– NTP / PTP
– SSH / Telnet
– IPv4 / IPv6
– SNMP
– NMEA

External synchronization and time inputs

GSync II Model 402 Modular Time and Frequency System

- 2U Chassis
- Chassis Level 1PPS In/Output, Ethernet with NTP/PTP, RS-232, 10MHz
- 8 Rear Expansion Slots for Option Modules
- Factory Upgradable to M-Code when available

GSync Model 391 Modular Time and Frequency System

- 1U Chassis
- Chassis Level 1PPS In/Output, Ethernet with NTP/PTP, RS-232, 10MHz
- 4 Rear Expansion Slots for Option Modules
- Factory Upgradable to M-Code when available
Specifications

Output Specifications
After 24 hours of GPS locked operation, fixed antenna location, antenna delays entered.

Frequency Accuracy (a)
24 Hour average
Locked to GPS <1E-12 <1E-12
Holdover(a) – first 24 hours <5E-11 <1E-10

Time Accuracy to UTC, for calibrated units(b)
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Holdover(a) – first 24 hours <3us <7us

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(Allan Deviation) Rubidium OSC Quartz OSC
1 sec <3E-11 <1E-11
10 sec <1E-11 <1E-11
100 sec <3E-12 <1E-10

Phase Noise(c) typical
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1 Hz <-90 dBc/Hz <-100 dBc/Hz
10 Hz <-105 dBc/Hz <-130 dBc/Hz
100 Hz <-125 dBc/Hz <-150 dBc/Hz
1 kHz <-135 dBc/Hz <-158 dBc/Hz

Input/Output (Rear Panel)
(1) 1PPS, 50 Ω, TTL level, BNC, External Sync input
(1) RS-232 I/O, DE-9 Connector
(1) GPS Antenna Connector, TNC
(1) 10MHz, 50 Ω, TTL level, BNC
(1) 1PPS, 50 Ω, TTL level, BNC
(1) RJ-45 10 / 100 Ethernet

SAASM Option (front panel)
(1) Key Load connector
(1) Hot Start connector
(1) Zeroize button

Power Options
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Physical
Height 87 mm (3.50") (2U) - GSync II
44 mm (1.75") (1U) - GSync
Width 438 mm (17.25") - GSync II
448 mm (17.65") - GSync
Mounts in 19" EIA rack
Depth 381 mm (15") - GSync II / GSync
Weight 15lb. Max - GSync II
10lb. Max - GSync
Panel Color Black Satin finish (Front Panel)

Environmental
Temperature Operating 0°C to 50°C
Rate of Change 10°C/ Hour
Storage -40°C to +85°C
Relative Humidity 5% to 95%, non-condensing
Altitude Operating -60m to 4000m
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Visit www.fei-zyfer.com

Optional Accessories
• L1 Antenna Kit
• L1/L2 Antenna Kit
• Antenna Cables
• Antenna Inline Amplifier
• Fiber Optic Antenna Link

Additional information on our website:
• GSync User Manual
• Option Module User Manual
• A list of detailed specifications of more than 200 time and frequency plug-in modules and network I/O modules
Modular Construction Provides the Ultimate in Configuration Versatility.

**Design Concept**

Customer requirements range from just one or two standard frequency (10 MHz) and/or time (1PPS) outputs to hundreds of outputs of various frequencies and time codes. Additional consideration must be given to:

- Redundancy
- Hot-swappable and hitless plug-in modules
- Phase coherent and/or aligned output signals
- Remotely upgradable software
- Remote monitoring and control
- Holdover performance in case of loss of GPS
- Various harsh environments

In response to such diverse demands, FEI-Zyfer integrated these design considerations and developed a family of 19" rack-mountable, modular products, 1U, 2U, and 3U high, to satisfy requests for:

- Redundant power supplies, both AC and DC
- Fully redundant GTF (GPS receiver with integrated OXCO or Rb oscillator)

**Applications include:**

- Fully redundant Master Clock Systems for Satellite Ground Systems, Gateways, or Mobile SatCom Terminals
- Primary Reference Source for Telecom and Secure Communications and Data Networks
- Radar, C4ISR, and Air Traffic Control Systems
- Military Test Ranges and Calibration Laboratories, etc.

Most applications can be satisfied with a vast selection of hot-swappable Plug-In Modules, allowing easy and economical product configurations for GSync and CommSync II systems.

**CommSync II Output Capability Diagram – Master/Slave Configuration**

![Diagram of CommSync II Output Capability Diagram – Master/Slave Configuration](image-url)
**Commsync II**

**Family of available Plug-In Modules:**
- Power Supplies (DC and/or AC)
- Standard and Special Frequencies (1MHz to >100MHz)
- Time Codes (IRIG, HQ, PTTI) and Pulse Rates from 1PPS to 10M PPS
- Clock Rates (programmable) from 1PPS to 54M PPS
- E1/T1 for Telecom Synchronization at Stratum 1
- Standard GPS C/A, multi-GNSS, and Military SAASM Receivers
- System Management and Control via RS-232 and/or Ethernet I/O (Telnet, SSH, and SNMP)
- Network Synchronization (NTPv4, PTPv2, IEEE-2008)
- Simple software upgrades via Ethernet

For special applications, FEI-Zyfer will ruggedize the product, perform ESS testing, calibrate to UTC or design new modules to meet customer’s needs.

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