TRAK Microwave GPS Time And Frequency Systems

TRAK Microwave Time and Frequency Systems has a long history in design and production of precise timing instruments dating back to 1957. Through these years, TRAK Microwave has developed the reputation for innovative, high quality instruments ranging from small board level products to multi-rack triple redundant master timing systems. Even though designs and products have changed drastically through the years, our unmatched commitment to customers has not. We consider it our privilege to supply products and services that meet or exceed your expectations.

**Global Applications**
- Telecommunication Base Stations
- Simulcast
- Digital Broadcast
- Defense Systems
- Missile Tracking
- Telemetry Data Acquisition
- Government Standards Agencies
- Satellite Communications
- Spacecraft Tracking Stations
- Observatories

**Product Portfolio**
- Precise Synchronization
- Code Generation
- Code Distribution
- Signal Distribution
- Frequency Distribution
- Timekeeping
- Clocks

TRAK Microwave is widely recognized for the quality of our products and for our excellent level of customer support and field service. Our engineering and sales staff work closely with you to ensure that all your needs are met for your particular applications. We are available for consultation and to provide custom modifications of our standard designs to meet your specific requirements. TRAK Microwave is ISO 9001:2000 and AS9100 registered. GSA pricing is available.

For detailed specification sheets, call 813-901-7200, fax 813-901-7491, or visit our web site at www.trak.com.

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**Product Feature Matrix**

<table>
<thead>
<tr>
<th>Function</th>
<th>8821</th>
<th>9000/S</th>
<th>9100</th>
<th>9300</th>
<th>9100B</th>
<th>8833</th>
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Specifications in this brochure subject to change without notice.
Model 9000S GPS SAASM Modular Time Code Processor

Features

- Integral SAASM Based GPS Receiver
- Precise Time and Frequency Processing
- Front Panel and Remote Set Up and Status
- Wide Variety of Plug-In Modules
- GPS, Time Code, VHF Synchronizing Options
- Built in Fault Location and Isolation
- Network, RS-232 and IEEE-488 Interfaces

Applications

- Range Timing
- Communications Networks
- Satellite Communications
- Test and Measurement Systems

The Model 9000S incorporates an integral SAASM based GPS receiver and utilizes the Precise Positioning Service (PPS) of GPS, providing direct P(Y) code acquisition, all SAASM capabilities, and increased timing accuracy. Like the standard Model 9000, it can be customized for a wide variety of timing applications using available rear-panel plug-in modules. For synchronizer redundancy, a secondary synchronizer such as a time code reader can be added with GPS SAASM acting as primary. Incorporated are proven microprocessor and field programmable gate array designs for time keeping, oscillator discipline, signal generation, and fault location/isolation.

Model 9000S Modules

Synchronizers
Integral GPS SAASM Synchronizer
Antenna Connector: "TNC" type female
Note: Unless otherwise specified, the Model 9000S is supplied with an L1/L2 antenna and 50 feet of RG58 coaxial cable. Other cable lengths and types are available.

Key Load Interface: Accepts KYK-13, KOI-18, and AN/CYZ-10 standard key loaders 6 pin IAW J1 defined in ICD-GPS-154
Key Fill: DS-102

Model 9002 IRIG-A, IRIG-B, and IRIG-G Reader and Synchronizer
Model 9017 VHF Receiver/Synchronizer

Serial Time Code Generators
Model 9005 Dual Time Code Generator, Various popular time codes and HAVEQUICK with both modulated and DC level shift outputs
Model 9013 Slow Code Generator, Seven rate formats, in DC level shift

Rate Generators
Model 9009 Sine wave Rate Generator, 1 KHz - 10MHz
Model 9011 Telecom Generator, T1 or E1, Clock or Framed
Model 9014 Digital Rate Generator, Selectable, 1 PPS - 5MPPS
Model 9021 Digital Frequency Synthesizer, 1 Hz to 50 MHz in 1 Hz steps

Distribution
Model 9006 4-Channel Digital Driver (TTL levels)
Model 9007 4-Channel RS-422 Driver
Model 9008-1 4-Channel Linear Driver, DC - 10 MHz
Model 9008-3 4-Channel Linear Driver, 100 Hz - 10 KHz (600Ω output transformers)

Miscellaneous
Model 9010 Dual RS-232 Serial Time Output
Model 9016 Time Tag and Event Trigger
Model 9018 Rubidium Oscillator

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

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The Model 9000 Modular Time Code Processor can be customized to fit a wide variety of timing applications by using available rear-panel plug-in modules. The unit can be configured as a simple stand-alone generator or support GPS synchronized timing functions by selecting appropriate modules. It incorporates proven microprocessor and gate array designs for timekeeping, oscillator discipline, fault location and isolation and signal generation. The Model 9000 is available in two size configurations. The Model 9000A is a 1.75 inch panel height unit and has six module positions, while the Model 9000B is a 3.5-inch panel height unit that has space for 12 modules. DC power input available in the Model 9000B.

### Features
- Precise Time and Frequency Processing
- Front Panel and Remote Set Up and Status
- Wide Variety of Plug-in Modules
- GPS, Time Code, and VHF Synchronizing Options
- Built in Fault Location and Isolation
- Network, RS-232 and IEEE-488 Interfaces

### Applications
- Range Timing
- Communications Networks
- Satellite Communications
- Test and Measurement Systems

### Model 9000 Modules

#### Synchronizers
- Model 9001 GPS Synchronizer, with Antenna
- Model 9002 IRIG-A, IRIG-B, and IRIG-G Reader and Synchronizer
- Model 9017 VHF Receiver with Synchronizer

#### Rate Generators
- Model 9009 Sine Wave Rate Generator, 1 KHz – 10 MHz
- Model 9011 Telecom Generator, T1 or E1, Clock or Framed
- Model 9014 Digital Rate Generator, Selectable, 1 PPS – 5MPPS
- Model 9021 Digital Frequency Synthesizer

#### Distribution
- Model 9006 4-Channel Digital Driver (TTL levels)
- Model 9007 4-Channel RS-422 Driver
- Model 9008-1 4-Channel Linear Driver, DC–10 MHz
- Model 9008-2 4-Channel Linear Driver, 100 Hz–10 KHz (output transformers)

#### Parallel Code Generators
- Model 9012 PB and Group Binary

#### Input/Output
- Model 9003-1 Auxiliary I/O, with RS-232 I/O, External Standard Input and 1 PPS Output (Included with Model 9000A)
- Model 9003-2 Auxiliary I/O, as above with Additional Serial Printer Port and Status Output (Included with 9000B)
- Model 9004 IEEE-488 I/O
- Model 9019 Network Interface (NTS-NTP/Telnet)

#### Serial Time Code Generators
- Model 9005 Dual Time Code Generator, Various Popular IRIG Time Codes and HAVEQUICK Available
- Model 9013 Slow Code Generator, Seven Rate Formats, in DC Level Shift

#### Miscellaneous
- Model 9010-1 Dual RS-232 Serial Time Output
- Model 9010-2 Dual RS-422 Serial Time Output
- Model 9016 Time Tag and Event Trigger
- Model 9018 Rubidium Oscillator
Model 9001S GPS SAASM Synchronizer Module

Features
- Field Upgrade for Model 9000
- Full SAASM Capabilities

Specifications:
Receiver: Twelve channels, dual frequency L1 (1.575 GHz) and L2 (1.227 GHz)
Codes: Both C/A and P(Y)
Time to First Fix: Approximately 1 minute for a warm start
Antenna Connector: "TNC" type female

Note: Unless otherwise specified, the Model 9001S is supplied with an L1/L2 antenna and 50 feet of RG58 coaxial cable. Other cable lengths and types are available.

Key Load Interface: Accepts KYK-13, KOI-18, and AN/CYZ-10 standard key loaders
6 pin IAW J1 defined in ICD-GPS-154
Key Fill: DS-102
Panel space: Two panel spaces high

Applications
- Range Timing
- Communications Networks
- Satellite Communications
- Test and Measurement Systems

The Model 9001S SAASM based GPS Receiver Module utilizes the Precise Positioning Service (PPS) of GPS and provides direct P(Y) code acquisition, all SAASM capabilities, and increased timing accuracy when the receiver is keyed. When un-keyed, it operates as a standard GPS C/A code receiver. As a Model 9000 plug in module, it allows a simple and cost effective GPS SAASM upgrade for fielded Model 9000’s.

Model L32B GPS SAASM Antenna

Features
- Low Profile
- Rugged Construction

Applications
- Use with Model 9000S System and 9001S Module

The L32B GPS Antenna provides both L1 and L2 carrier signals to TRAK Microwave GPS SAASM synchronized systems.
Model 9100 Modular Time and Frequency System

The Model 9100 is a robust and versatile modular frequency and time system. Ultra-stable frequencies, rates, and telecom outputs are all referenced to GPS. Disciplined oscillators include a double oven crystal oscillator as well as a rubidium oscillator. Once synchronized to GPS, sophisticated oscillator discipline algorithms maintain a high degree of precision and smoothness on all outputs. With a wide selection of plug-in functional modules, the Model 9100 is highly configurable. Dual redundant configurations include two antennas, GPS receivers, and power supplies. For increased distribution versatility, a Distribution Unit, Model 9300, is available and produces as many as 48 additional digital outputs. Model 9300 may be "daisy – chained" for system users requiring very large numbers of reference signals.

Features

- Single or Dual Redundant Configurations
- GPS Discipline of Crystal and Rubidium Oscillators
- Low Phase Noise and Spurious on 10 MHz Outputs
- Hot Swappable Modules
- Network and RS-232 Interfaces
- Network Time Server
- 1 PPS, 5 MHz, 10 MHz, IRIG-B

Applications

- Communications Networks
- Simulcast
- Satellite Communications
- Mobile Radio Synchronization
- BITS Clock

Model 9100 Modules

GPS Reference
Model 9101 Available with Double Oven Crystal Oscillator, or Rubidium Oscillator with Antenna

Fault Sense Unit
Model 9104 RS-232 I/O Standard, available with Network Interface (NTS-NTP/ Telnet)

Distribution Line Drivers
Model 9106 Digital Distribution Module (TTL levels)
Model 9107 Frequency Distribution Module

Telecommunications Signal Generator
Model 9111 T1 or E1, Clock (TTL and RS-422) and Framed

Generators
Model 9114 Digital Rate Generator
Model 9109 SineWave Generator

Power Supplies
Model 9120 Universal AC Input 110 to 240 VAC
Model 9121 DC Input (20-60 VDC)
The Model 9300 is designed for two modes of distribution. One is distribution expansion for the Model 9100, effectively extending its bus structure into the Model 9300. As many as four Model 9300's may be connected to a single Model 9100, with Fault/Status reporting through the Model 9100. The other mode is stand alone distribution. This mode permits operation without a Model 9100, with customer supplied timing signal inputs either from redundant or non-redundant sources. The Model 9300 has 12, four channel distribution module positions providing a maximum of 48 signal outputs. Digital, Frequency, and Telecom distribution and power supply modules from the Model 9100 are utilized.

**Features**
- Model 9100 Expansion or Stand-Alone Unit
- Digital, Frequency, Time Code, and Telecom Distribution
- 12 Module Positions Available for 48 Outputs
- Hot Swappable Modules

**Applications**
- Communications Networks
- Satellite Communications
- Mobile Radio Synchronization
- BITS Clock
- Test and Measurement Systems

**Model 9300 Modules**

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Terminator and Fault Logic</th>
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<tbody>
<tr>
<td>Model 9106 Digital Distribution Module (TTL Levels)</td>
<td>Model 9350 The TFL module, in conjunction with the Model 9360 IIM, selects operational mode and is the fault collection point for distribution module faults. In addition, it provides serial communications to the Model 9100 or external RS-232/422 devices in the stand alone mode.</td>
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<tr>
<td>Model 9107 Frequency Distribution Module, Sine Wave and Time Code Distribution</td>
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<tr>
<td>Model 9109 Sine Wave Generator, 5 MHz From System 10 MHz</td>
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<tr>
<td>Model 9111 Telecom Generator, T1 or E1 Framed and Clock</td>
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<tr>
<td>Model 9114 Digital Rate Generator, Various Digital Rate Outputs Available</td>
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</table>

**Input Interface**
- Model 9360 The IIM is essentially an input patch panel to route external input timing signals to appropriate internal signal buses.

**Power Supplies**
- Model 9120 Universal AC Input, 100 to 240 VAC
- Model 9121 DC Input, 20 to 60 VDC
The Model 9100B is a robust and versatile modular frequency and time system, all in a 1U chassis height. A shock mount system is available for critical mobile applications. Ultra-stable frequencies, rates, and telecom outputs are all referenced to GPS. Disciplined oscillators include a double oven crystal oscillator as well as a rubidium oscillator. Once synchronized to GPS, sophisticated oscillator discipline algorithms maintain a high degree of precision and smoothness on all outputs. The Model 9100B is highly configurable with a wide selection of hot swappable, plug-in functional modules. Dual redundant configurations include two antennas, GPS receivers, oscillators, and power supplies.

**Features**
- Dual Redundancy in 1 Unit Chassis Height
- GPS Discipline of Crystal and Rubidium Oscillators
- Low Phase Noise and Spurious on Sine Wave Outputs
- Hot Swappable Modules
- Shock Mount System Available

**Applications**
- Communications Networks
- Satellite Communications
- Mobile Radio Synchronization
- BITS Clock
- Test and Measurement Systems

**Model 9100B Modules**

**Reference Modules**

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<th>Model</th>
<th>Description</th>
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<tr>
<td>Model 9101B</td>
<td>GPS Reference, with double oven crystal or rubidium oscillators, antenna, and 50 feet of coaxial cable</td>
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<tr>
<td>Model 9102B</td>
<td>Disciplined Frequency Standard, accepting an external 1 PPS input for oscillator discipline.</td>
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**Distribution**

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<td>Model 9106B</td>
<td>4-Channel Digital Distribution Module, TTL levels</td>
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<td>Model 9107B</td>
<td>6-Channel Frequency Distribution Module, Sine wave and time code distribution</td>
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**Fault Sense**

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<td>Model 9104B</td>
<td>Fault Sense Unit monitors status of all installed modules, provides several communications I/O types, alarms, and network interface with Network Time Server</td>
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**Auxiliary I/O**

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<td>Model 9103B</td>
<td>Furnishes the communications I/O port(s) as well as GPS antenna or 1 PPS inputs</td>
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**Power Supply**

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<td>Model 9120B</td>
<td>Universal AC input, 100 to 240 VAC, 48 - 62 Hz</td>
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The Model 8833 GPS Clock Module is intended primarily for embedded wireless system designs and provides GPS time and frequency references in one compact PCB assembly or in a custom module design. Standard outputs include time, frequency, and rates. Special outputs are available to meet particular system requirements. For critical holdover requirements in wireless applications, a double oven crystal oscillator is available. With the double oven oscillator holdover (no GPS satellites tracked) is < 7µS in a 24-hour period over operating ambient temperature. Frequency stability of $3 \times 10^{-10}$ over the temperature range of -20°C to +70°C.

**Features**
- OEM Board Module Level GPS Time and Frequency
- Double Oven Crystal Oscillator Available for Long Hold Over Applications
- Custom Configured Board Module Configurations Available
- 1 PPS, Even Pulse, TOD, 19.6608 MHz
- Low Phase Noise 10 MHz

**Applications**
- Embedded System Designs
- CDMA and TDMA Base Stations

The Model 8821 GPS Clock is a versatile and cost effective unit for general timing, telecommunications, and wireless applications. Like typical GPS based systems, an internal crystal oscillator is disciplined to GPS through a microprocessor subsystem and provides references for time, frequency, and rate outputs. Standard outputs include 10 MHz, selectable pulse rates, and IRIG-B serial time code. An RS-232 interface provides time as well as status and control. Options include telecom rates, additional frequency and rate distribution.

**Features**
- Cost Effective GPS Time and Frequency
- IRIG-B, 1 PPS, and Selectable Rate Outputs
- Low Phase Noise 10 MHz

**Applications**
- Communications Networks
- Satellite Communications
- Test and Measurement Systems
Model 8451 Frequency Distribution Unit

Features
- Frequency and Digital Distribution
- 12 Outputs, Single Input
- 3 Vrms Output Drive into 50 Ω
- Low Spurious and Phase Noise
- 80 dB Port to Port Isolation

Applications
- Range Timing
- Communications Networks
- Satellite Communications
- Test and Measurement Systems

The Model 8451 Frequency Distribution Unit may be used in a wide variety of applications which require Distribution of signals in the range of DC - 10 MHz. Driver and output buffer power supplies are post regulated insuring very low output spurious noise levels. Fault sensing is provided on each output channel and all channels are summed together providing one common fault output.

Model 8451 Modules
Model 8451-7  General Distribution, DC – 10 MHz

Model 8424 Timing Buffer Unit

Features
- Frequency and Digital Distribution
- Modular Design
- 8 Input Channels
- 64 Output Channels

Applications
- Range Timing
- Communications Networks
- Satellite Communications
- Test and Measurement Systems

The Model 8424 Timing Buffer Unit is an extremely versatile distribution system. It accepts sine wave or digital signals through an eight input bus structure, and depending on installed module types, provides a maximum of 64 sine wave or digital outputs. Buffer module types include both sine wave and digital types and may be intermixed as required. Each module includes a one of eight input signal selector and four individually buffered outputs. Up to 16 buffer modules may be installed in the Model 8424 main frame. Fault sensing is provided on each output channel and all channels are summed together providing one common fault output. Redundant power supplies are available.
General Information

TRAK Microwave

TRAK Microwave is a world class supplier of precise time and frequency systems, high reliability microwave and RF subsystems used in the world's most demanding applications and environments. Our 40 years of experience in defense, space and wireless markets led us to becoming a major global supplier to manufacturers of military electronics, satellite, navigation and wireless communication systems around the world. Our product lines consist of GPS Time and Frequency Systems, Integrated Microwave Assemblies, Frequency Source products, Signal Control products, RF and microwave components and Ferrites.

TRAK Microwave defense and government products are found in test ranges, ground stations, airborne communications equipment, electronic warfare equipment, radar and missile applications. Space applications include communications, television broadcast, meteorological, earth resource and intelligence gathering satellites. Our commercial products are used in point-to-point radio, wireless communications, base stations, collision avoidance systems, distance measuring equipment and airborne weather radar.

OEM's choose us as their supply partner because we meet demanding delivery schedules and provide tomorrow's technical solutions today. Our engineering experts combine the most advanced design tools and manufacturing techniques to ensure high quality products with on-time deliveries. TRAK Microwave's philosophy supports consistent control of the product development process, which guarantees excellent performance and price benefits to our customers.

TRAK Microwave is an ISO 9001:2000 and AS9100 registered company, which are the highest accreditations under the ISO international quality system. Our versatile design software allows custom units to be produced efficiently and rapidly with a high confidence factor. Our internal design processes and manufacturing capabilities insures that the most robust, flexible, cost-efficient, and high performance products are manufactured for optimum solutions.

Products

Visit the TRAK Microwave web site at www.trak.com, from the main navigation bar, click on Product Search, then click on Product Type Search, highlight GPS Time and Frequency and click search. When you get to the results page, click on the model of choice to view a PDF data sheet. Brochures, catalogs and CDs are also available on the web site under PDF Catalogs or you may contact TRAK Microwave for hard copies.

GSA Schedule Discount Pricing


Product Warranty Policy

TRAK warrants that subsequent to the time of delivery, the supplies will be free from any defects in material or workmanship and will conform to all applicable specifications for a period of one year. Optional extended warranties are available.