

## Features

GPS Time and Frequency Reference  
Disciplined Quartz Oscillator Time Base  
Optional Disciplined Rubidium Oscillator  
Rapid Acquisition and Time Stabilization  
Six Programmable Output Signals  
1 PPS Time Interval Measurement to 1 Nanosecond  
Automatic Daylight Savings Time Update  
External Frequency Measurement to  $10^{-14}$   
External Event Time Logging - Up to 256 Event Storage  
Over 40 Signal Output and Function Options  
RS-232 Input/Output Port  
RS-232 Printer Port  
Free Remote Control Software for Windows® 3.1/95/98/2000

# ExacTime™ GPS Time & Frequency Generator



## GPS INSTRUMENTATION

## Overview

ExacTime™ Time and Frequency Generators are full featured GPS receivers that offer three time base oscillator options and a wide range of 'off-the-shelf' optional features. ExacTime fits virtually any GPS time and frequency application.

The ExacTime 6000 is a 1.75" rack mount chassis that is configured to meet or exceed the demands of many applications, including test and measurement, metrology, range instrumentation and telecommunications. The extreme flexibility of this instrument allows configurations including time codes, low phase noise frequencies, pulse rates, parallel time and many other outputs to support specific needs. The

internal quartz time base oscillator can be upgraded to an oven quartz oscillator or to a rubidium oscillator. A time zone offset control is included with 1/2-hour resolution, and a daylight savings time capability can be set for ten years. These controls affect the LCD display, time code output and the time in the RS-232 outputs. The year can be preset to any value for test purposes. For situations in which it is desirable to disable the oscillator disciplining process temporarily, a 'flywheel' mode is provided. While in flywheel mode, the oscillator loop is opened, and the natural purity of the oscillator is not perturbed by the disciplining function.

The ExacTime 6010 is a 3.5-inch rack mount chassis that is available to accommodate configurations that require more option space than is available in the ExacTime 6000 1.75-inch chassis.

The basic unit provides six output BNC ports and one input BNC port. The six output ports are user selectable via box pin jumpers and front panel controls to generate frequency (10 MHz), pulse rates (1 PPM to 10 MPPS) and time code (IRIG B). Other frequency and time code outputs can be optionally added. A front panel LCD panel gives the user a simple and intuitive control interface. Remote control software for Windows is included upon request.



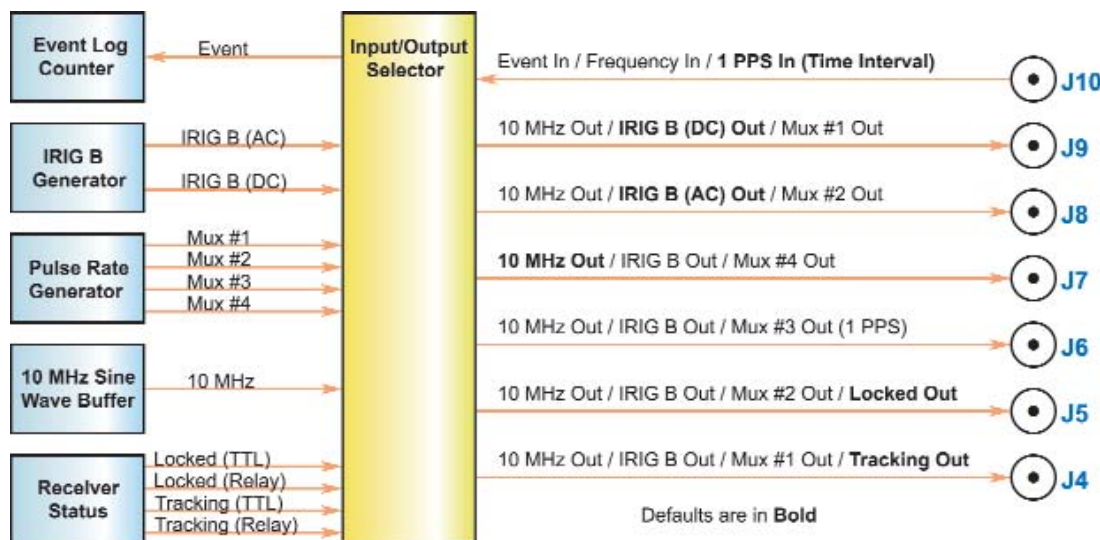
# Datum

Timing, Test & Measurement

# ExacTime™ GPS Time & Frequency Generator

## Specifications

The capability to select any of several signals as inputs and outputs to and from the basic ExacTime unit make it possible to meet most requirements with a basic unit without the necessity for adding options. The simplified block diagram below illustrates the capability.



### Flexible Input/Output Signal Selection

The four pulse rate multiplexers each produce a selected output of 1 PPM, .1PPS, 1 PPS, 10 PPS, 100 PPS, 1 KPPS, 10 KPPS, 100 KPPS, 1 MPPS, 5 MPPS, 10 MPPS, IRIG B (DC), GPS status (Locked, Tracking), or +5 V. These outputs are selected either through the LCD menu or by remote control over the RS-232 input/output port. A 10 MHz sine wave can be chosen by internal jumper for any (or all) of the six output connectors. Likewise, IRIG B (AC) can be chosen for any (or all) of the six output connectors. The factory default function of J10 is 1 PPS (TTL) input for displacement measurement, but it can be selected as the input to the Event Log Counter or as an

External Frequency Measurement input. J9 is factory set to output IRIG B (DC), while J8 is factory set to output IRIG B (AC). J6 is factory set to output Mux #3 digital signals with Mux #3 set to output 1 PPS. Finally, J5 and J4 can either be used to output GPS status or as duplicate outputs of Mux #2 and/or Mux #1.

Additional signal outputs are generated by the ExacTime 6000 through the option bay, which uses the 'J3' area. The larger ExacTime 6010 uses both the 'J3' and 'J13' areas, as illustrated below.



J11 = Printer Port

J12 = Input/Output Port



J11 = Printer Port

J12 = Input/Output Port

## ET6000 & ET6010

# Basic Configuration

The two members of the ExacTime family of Time and Frequency Generators are pictured below. The ExacTime 6010 provides additional internal space for option installation, and also provides more rear panel space for input/output connectors. Please contact the factory for guidance in configuring the ExacTime to meet your requirements.

ExacTime 6000



ExacTime 6010



ExacTime Units can be optionally equipped with a variety of Oscillators designed to suit your precise needs. The table below illustrates the part numbers and specifications for these Oscillator Options. For more information contact Datum-TT&M or your local Sales Rep.

| Oscillator Option | TCXO                       | OCXO                       | Rubidium                 |
|-------------------|----------------------------|----------------------------|--------------------------|
| Part Number       | ET6000-TCXO<br>ET6010-TCXO | ET6000-OCXO<br>ET6010-OCXO | ET6000-RB1<br>ET6010-RB1 |
| Aging Rate        | 1E-7/Day                   | 5E-10/Day                  | 5E-11/Month              |
| Phase Noise       |                            |                            |                          |
| 1Hz               | -72 dBc/Hz                 | -94 dBc/Hz                 | -82 dBc/Hz               |
| 10Hz              | -93 dBc/Hz                 | -115 dBc/Hz                | -91 dBc/Hz               |
| 100Hz             | -115 dBc/Hz                | -136 dBc/Hz                | -134 dBc/Hz              |
| 1KHz              | -126 dBc/Hz                | -144 dBc/Hz                | -144 dBc/Hz              |
| Stability         |                            |                            |                          |
| 1 Sec             | 2E-10                      | 3E-11                      | 3E-11                    |
| 10 Sec            | 2E-10                      | 2E-11                      | 1E-11                    |
| 100 Sec           | 1E-9                       | 4E-11                      | 3E-12                    |

# ET6000 & ET6010

## Specifications

### ELECTRICAL SPECIFICATIONS

#### Outputs

|                        |                                                                                                                           |
|------------------------|---------------------------------------------------------------------------------------------------------------------------|
| 10 MHz Sinusoid        | 1 Vrms into 50Ω                                                                                                           |
| 1 PPS Digital Output   | TTL level into 50Ω                                                                                                        |
| Selectable Pulse Rates | TTL level into 50Ω, 1PPM to 10 MPPS in decade steps, and 5 MPPS                                                           |
| Time Code              | IRIG B into 50 , 3V P-P (AC & DC) IEEE 1344 compliant. Time code output is suppressed until accurate time is established. |

|          |      |         |
|----------|------|---------|
| Status   | TTL* | Relay** |
| +5 VDC   | X    | —       |
| LOCKED   | X    | X       |
| TRACKING | X    | X       |

\*TTL level into 50Ω

\*\*Relay N.O. Contact, 100 mA

|                  |                                                                    |
|------------------|--------------------------------------------------------------------|
| Printer Outputs: | RS-232, 9-pin 'D' connector                                        |
| Format A         | Year, time, status, position and interval at a programmed interval |
| Format B         | Time (D:H:M:S), CR on-time, every second (Sysplex Timer)           |

#### Inputs

|                      |                                   |
|----------------------|-----------------------------------|
| 1 PPS Time Interval: |                                   |
| Signal               | TTL level, pos or neg edge select |
| Resolution           | 1 nanosecond                      |
| Accuracy             | <10 nanoseconds                   |

|                     |                                   |
|---------------------|-----------------------------------|
| External Event Log: |                                   |
| Signal              | TTL level, pos or neg edge select |
| Resolution          | 100 nanoseconds                   |
| Storage             | Up to 256 events                  |

|                                 |                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| External Frequency Measurement: |                                                                                                                                                                             |
| Square Wave                     | Logic "0" +0.2 ±0.2 VDC<br>Logic "1" +2.4 to +15 VDC<br>1 Hz to 10 MHz<br>1 to 5 V P-P, 100 kHz to 10 MHz<br>nnnnX10 <sup>-9</sup> to nnnnX10 <sup>-14</sup><br>Autoranging |
| Sine Wave                       | 1 to 5 V P-P, 100 kHz to 10 MHz                                                                                                                                             |
| Offset Range                    |                                                                                                                                                                             |

#### GPS Subsystem

|               |                                                                                                                                                                                                                                           |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Time Accuracy | After power-up, when LOCKED and using 200 Position Averages, will be better than ±125 nanoseconds relative to UTC with SA on within:<br>3 hour using Rubidium oscillator<br>2 hours using Oven oscillator<br>1 hour using TCXO oscillator |
|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                    |                                                                                |
|--------------------|--------------------------------------------------------------------------------|
| Frequency Accuracy | 90% of time, better than:<br>1E-9 (TCXO)<br>1.5E-10 (OCXO)<br>1E-11 (Rubidium) |
|--------------------|--------------------------------------------------------------------------------|

|                   |                                                     |
|-------------------|-----------------------------------------------------|
| Position Accuracy | 100m 2drms with SA.<br>Less than 25m SEP without SA |
|-------------------|-----------------------------------------------------|

|                    |                                    |
|--------------------|------------------------------------|
| Maximum Velocity   | 515 meters/second (1,000 KPH)      |
| Tracking Channels  | 8 parallel                         |
| Receiver Frequency | L1, 1.575 GHz, C/A code            |
| Acquisition Time   | Typically <5 minutes to first fix. |

#### Oscillator Aging

|                     |                    |
|---------------------|--------------------|
| TCXO (standard)     | Aging: 1E-7/day    |
| OCXO LPN (optional) | Aging: 5E-10/day   |
| Rubidium (optional) | Aging: 5E-11/month |

#### Input/Output

|                                |                   |
|--------------------------------|-------------------|
| Remote Control and Data Output | RS-232, 9-pin 'D' |
|--------------------------------|-------------------|

#### Front Panel

|         |                                                                                                                                                |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Display | LCD, 2x40 characters. Displays time, status, satellite position data, frequency and control menus 0-9, Menu. Provides control of all functions |
| Keypad  |                                                                                                                                                |

### ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

#### Temperature

|           |          |                                |
|-----------|----------|--------------------------------|
| Operating | Unit:    | 0° C to 50° C                  |
|           | Antenna: | -40° C to 85° C                |
| Storage   | Unit:    | -20° C to 70° C                |
|           | Antenna: | -55° C to 100° C               |
| Humidity  | Unit:    | 0-95% relative, non condensing |
|           | Antenna: | Unlimited                      |

#### Power Requirements

85-264 VAC, 47-440 Hz, <40 watts

#### Dimensions

|               | H (in/cm)                      | W (in/cm) | D (in/cm) |
|---------------|--------------------------------|-----------|-----------|
| ExacTime 6000 | 1.75/4.45                      | 17/43.18* | 12/30.48  |
| ExacTime 6010 | 3.5/8.89                       | 17/43.18* | 12/30.48  |
|               | *19/48.26 with rack mount ears |           |           |

#### Standard Equipment

- GPS Antenna
- 50-ft. of RG58 Antenna Cable
- 18-inch Antenna Mast
- Complete Antenna Mounting Kit
- User's Manual
- Power Cord

| Options *                                       | Option P/N   |
|-------------------------------------------------|--------------|
| • Multiple Time Code Outputs                    | 01           |
| • Parallel BCD, Days - milliseconds             | 13A          |
| • IEEE-488 Interface                            | 14           |
| • Extended Antenna Cable Lengths                | 20A thru 20E |
| • Lightning Arrestor                            | 23A/23B      |
| • High Gain Antenna                             | 26B          |
| • 12 Channel Distribution Motherboard           | 27A          |
| • 1.544/2.048 MHz Square Wave Output            | 33A          |
| • T1 Output (framed ones, balanced transformer) | 33B          |
| • E1 Output (framed ones, balanced transformer) | 33C          |

\* See ExacTime Configuration Guide for additional options and option details.

Specifications subject to change without notice.