ExacTime 6000

GPS Time & Frequency Generator

KEY 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 Saving 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 95/98/2000/XP

INTRODUCTION

Symmetricom's 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 saving 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 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.

ExacTime GPS Time & Frequency Generator

BASIC CONFIGURATION

ExacTime units are optionally equipped with a variety of Oscillators designed to suit your precise needs. Table 1 lists the part numbers and specifications for these Oscillator Options. Please contact the factory for guidance in configuring the ExacTime to meet your requirements. For more information, contact Global Services or your local Sales Rep.

SPECIFICATIONS

The capability of selecting 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. Figure 1 illustrates the capability. Four pulse rate multiplexers each produce a selected output of 1 PPM, 0.1 PPS, 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 shown in Figure 2.

| OSCILLATOR OPTION	TCXO	OCXO	RUBIDIUM
Part number	ET6000-TCXO	ET6000-OCXO	ET6000-RB1
Aging rate	1E-7/Day	5E-10/Day	5E-11/Month
Phase noise			
1Hz	-72dBc/Hz	-94dBc/Hz	-82dBc/Hz
10Hz	-93dBc/Hz	-115dBc/Hz	-91dBc/Hz
100Hz	-115dBc/Hz	-136dBc/Hz	-134dBc/Hz
1KHz	-126dBc/Hz	-144dBc/Hz	-144dBc/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

TABLE 1 ExacTime Oscillator Options
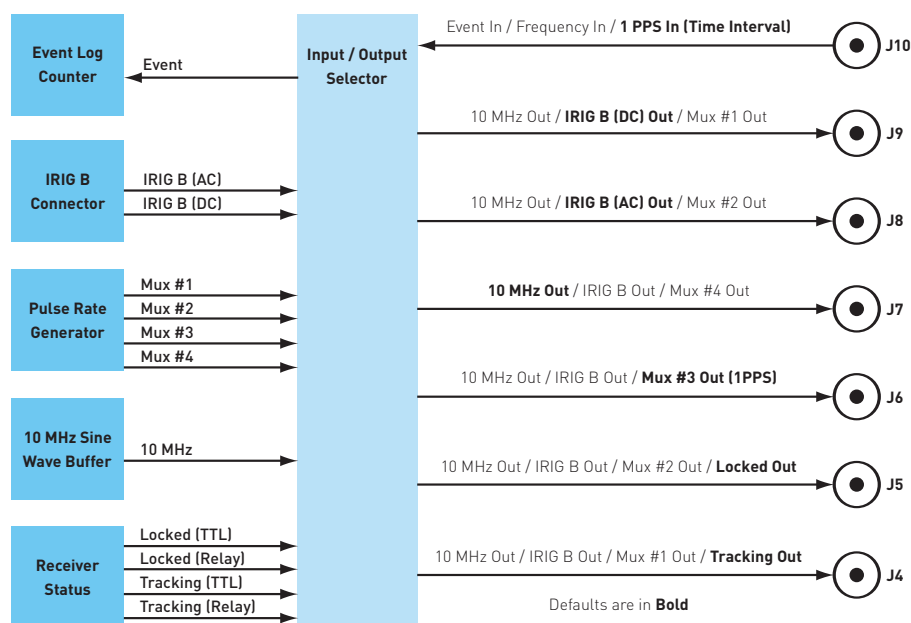
FIG.1 Flexible input/output signal selection

FIG.2 ExacTime 6000 Back (1U chassis: 1.75"/4.44 cm)

OPTIONS GUIDE

This guide is designed to assist the user in customizing the ExacTime 6000 Time and Frequency Generator. The BNC connectors on the rear panel are configurable to provide the outputs listed on the data sheet. The factory selections are:

J4 = Tracking (TTL)
J5 = Locked (TTL)
J6 = 1 PPS (TTL)
J7 = 10 MHz (sine)
J8 = IRIG B (AC)
J9 = IRIG B (DCLS, TTL)
J10 = Time Interval Input
(1 PPS, TTL)

The ExacTime unit has a plug-in option motherboard with four (4) option pads (refer to the Option Motherboard, GPS Option 40x). Options are implemented with plug-in modules. The following information identifies available options. Some option modules may be stacked to provide additional functionality. Always consult the factory for assistance with stacked option configurations.

01 MULTIPLE TIME CODE OUTPUT

This option is described in detail in a separate data sheet. Three (3) simultaneous modulated time code outputs can be programmed with either the same or different time code formats.
Option slots: 2 / Prerequisite: Option 40
Connectors: J3A, B & C or J3D, E & F

01A MULTIPLE TIME CODE DC LEVEL OUTPUT

If Option 01 is selected, this option provides DC level shift outputs for the output time codes.
Option slots: 0 / Prerequisite: GPS Option 01
Connectors: J3D, E & F

06A 1 MHz SINE WAVE OUTPUT

The 1 MHz Sine Wave output is derived from the internal disciplined oscillator by frequency division. The long term accuracy and stability is the same as the internal crystal oscillator.
Option slots: 1 / Prerequisite: Option 40
Connectors: J3A, B, D or E

07A 5 MHz SINE WAVE OUTPUT

The 1 MHz Sine Wave output is derived from the internal disciplined oscillator by frequency division. The long term accuracy and stability is the same as the internal crystal oscillator.
Option slots: 1 / Prerequisite: Option 40
Connectors: J3A, B, D or E

08G -48 VDC POWER

Negative 48 VDC input power is connected via a 4-pin nylon Molex connector. The input connections are completely isolated from the chassis and the signal ground the unit into the DC/DC converter power supply. Not available with Option 15A.
Option slots: 0 / Prerequisite: None
Connectors: J1

08CE 10 to 32 VDC POWER

DC input power is connected via a nylon Molex connector. The input connections are completely isolated from chassis and the signal ground of the the DC/DC converter power supply.
Not available with Option 15A.
Option slots: 0 / Prerequisite: None
Connectors: J1

13A PARALLEL BCD OUTPUT (D-mS)

Time is output by parallel BCD digits representing days, hours, minutes, and three digits of fractional seconds (millisecond resolution). The outputs standard HCMOS compatible. Each capable of sinking and sourcing 4 mA. Included in the output is a strobe signal is normally low, going high when the data is being updated, and going low the data is stable. This signal's falling can be used as a clock to load data external registers.
Option slots: 2 / Prerequisite: Option 40A

14A IEEE-488 BUS INTERFACE

This option provides the same remote control commands and responses as the standard RS-232 I/O.
Option slots: 2 / Prerequisite: Option 40D
Connectors: J3

21A 10 MHz SINE WAVE OUTPUT

The 10 MHz Sine Wave output is derived directly from the internal disciplined oscillator. The long term stability is the same as the internal oscillator.
Option slots: 1 / Prerequisite: Option 40
Connectors: J3A, B, D or E

25 RACK MOUNT SLIDES

The ExacTime 6000 and is provided with rack mount flanges, but body support should be provided to avoid twisting the mounting flanges and front panel. The slides are furnished with hardware for mounting front and rear RETMA rails.
Option slots: 0 / Prerequisite: None

33A 1.544/2.048 MHz SQUARE WAVE OUTPUT

This module provides a square wave frequency output of either 1.544 MHz or 2.048 MHz (selected by DIP switch) that is phase locked to the internal disciplined oscillator. The ET6000-TCXO will provide Stratum III performance, Stratum II with the OCXO, and Stratum 1 with the rubidium oscillator (RB1).
Option slots: 1 / Prerequisite: Option 40

33B T1 (1.544) FRAMED ONES OUTPUT

Provides an output of framed all ones T1 signal to operate in telecommunications systems typically within the United States. The ET6000-TCXO will provide Stratum III performance, Stratum II with the OCXO, and Stratum 1 with the rubidium oscillator (RB1).
Option slots: 2 / Prerequisite: Option 40B
Connectors: J3A

33C E1 (2.048) FRAMED ONES OUTPUT

Provides an output of framed all ones E1 signal to operate in telecommunications systems typically outside the United States. The ET6000-TCXO will provide Stratum III performance, Stratum II with the OCXO, and Stratum 1 with the rubidium oscillator (RB1).
Option slots: 2 / Prerequisite: Option 40B
Connectors: J3A

40x OPTION MOTHERBOARD

This assembly provides the GPS unit with four option slots. It is required for most of the option modules described in this Configuration Guide. There is more than one version of this motherboard, so care must be taken to select the Option Motherboard that is required to support a particular option.
Option slots: 0 / Prerequisite: None

LONG ANTENNA CABLE

Cable type is Belden 9104 (RG59) cable with BNC & TNC terminations at each end.
Option 340-75-5 = 75 foot cable
Option 340-100-5 = 100 foot cable
Option 340-125-5 = 125 foot cable
Option 340-150-5 = 150 foot cable
Option 340-200-5 = 200 foot (60 m) cable*
Option 340-250-5 = 250 foot (75 m) cable*
Option 340-275-5 = 275 foot cable*
Option 340-300-5 = 300 foot cable*
Option slots: 0
* Requires In-line Amplifier (option 150-200)

LIGHTNING ARRESTOR WITH CABLE

The lightning arrestor option provides an inline unit that protects the GPS receiver from lightning surges. It is provided with 25 or 50 feet low loss cable. This option is desirable in lightning areas of the country. Connectors are Type TNC at both ends of the cable.
Option 150-709 = 25' (7.5 m) cable
Option 150-710 = 50' (15 m) cable
Option slots: 0 / Prerequisite: None

ADDITIONAL GPS ANTENNA OPTIONS

• GPS in-Line Amplifier for extended cable runs up to 300' (91m)
• GPS Antenna Down/Up Converter for long cable runs up to 1500' (457 m)
• GPS Antenna splitter kit

ET6000 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 50Ω, 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

- 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 Logic "1" +2.4 to +15 VDC 1 Hz to 10 MHz
Sine wave:	1 to 5 V P-P, 100 kHz to 10 MHz
Offset range:	nnnnX10-9 to nnnnX10-14 Autoranging

- GPS subsystem

Time accuracy:	After power-up, when LOCKED and using 200 position averages, will be better then ±125 nanoseconds relative to UTC with SA on within: 3 hour using Rubidium oscillator 2 hours using Oven oscillator 1 hour using TCXO oscillator
Frequency accuracy:	90% of time, better than: 1.0E-9 (TCXO) 1.5E-10 (OCXO) 1.0E-11 (Rubidium)
Position accuracy:	100m 2drms with SA. Less than 25m SEP without SA
Maximum velocity:	515 meters/second (1,000 KPH)
Tracking channels:	12 parallel
Receiver frequency:	L1, 1.575 GHz, C/A code
Acquisition time:	Typically <5 minutes to first fix.

- Oscillator aging

TCXO (standard):	Aging: 1.0E-7/day
OCXO LPN (optional):	Aging: 5.0E-10/day
Rubidium (optional):	Aging: 5.0E-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 menu
Keypad:	0-9, Menu. Provides control of all functions

ENVIRONMENTAL & PHYSICAL SPECIFICATIONS

- Temperature

Operating	
Unit:	0ºC to 50ºC
Antenna:	-40ºC to 85ºC
Storage	
Unit:	-20ºC to 70ºC
Antenna:	-55ºC to 100ºC
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)
	1.75/4.45	17/43.18*	12/30.48
	*19/48.26 with rack mount ears		

- Standard equipment

  GPS Antenna
  50' (15 m) of Beldon 9104 antenna cable
  18" (45.72 cm) antenna mast
  Complete antenna mounting kit
  User's manual
  Power cord

* See ExacTime Options Guide for additional options and option details.