

FEI-Zyfer

Option 1 Manual Supplement

Pulse Rate and Frequency Output For NanoSync Model 380 GPS Synchronized Time and Frequency Module

Document 380-8001

Revision B

November 1, 2000

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DATE	REVISIONS
11/01/2000	Rev A: Changed “Odetics” and “Odetics Telecom” to “Zyfer” throughout the document. Moved address information from page i to page iv and added additional contact information
02/04/2004	Rev B: Changed “Zyfer” to “FEI-Zyfer” throughout the document.

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Section 1

General Information

1.1 DESCRIPTION

This document contains information pertaining to *Option 1, Pulse Rate and Frequency Output*, installed in NanoSync Time and Frequency Module Model 380. For detailed description, configuration, and operation of the basic NanoSync, refer to User's Manual 380-8000.

In addition to the option described in this document, the instrument can be factory configured with different oscillators and input power requirements. The *NanoSync Configuration* sheet, located in the User's Manual, indicates the configuration of your particular unit.

1.2 PURPOSE OF OPTION

This option is used in conjunction with the NanoSync GPS MPU board to provide programmable pulse rate and frequency outputs. The type number of the option board installed can be read over the instrument's serial command port using the VERS command. Refer to the FEI-Zyfer NanoSync User RS-232 Communication Protocol document 380-8020 for details.

1.3 FUNCTIONS

The following paragraphs describe the basic functions of the option's output signals and indicators. All output signals are available through a 14-pin ribbon type connector.

1.3.1 Frequency Output

One output port provides a frequency signal that is user programmable from 1 to 250 Hz with a resolution of 1 Hz, over the instrument's RS-232 control port. The frequency selection is saved in non-volatile memory and is restored when power is cycled.

1.3.2 Pulse Rate Outputs

Three output ports provide user programmable pulse rate signals, with periods that are individually settable from 1 second to 9999 seconds, via the instrument's RS-232 control port. The pulse rate selections are saved in non-volatile memory and are restored when power is cycled. The pulse rate outputs are on-time between other instruments that have been set to the same time reference mode (GPS, UTC, Local GPS or Local UTC). The pulse rate outputs are based on a midnight start time. Any odd programmed rates will result in a truncated period when they are re-synchronized at midnight.

1.3.3 Additional Outputs

A 10 MHz square wave and a 1 PPS pulse output are also provided.

1.3.4 Indicators

Five visual indicators are provided.

- **WRM** - This indicator illuminates when power is first applied to the instrument, and remains illuminated during the warm-up period until the instrument achieves Time Locked status.
- **GPS** - This indicator illuminates when the instrument tracks one or more satellites. In the event the instrument detects an open or short circuit condition in the external antenna system, the indicator flashes at a 1 second rate.
- **LCK** - When this indicator is illuminated, the instrument's timing and frequency signals are within specification. The disciplining of the internal oscillator is in progress, and its aging characteristics are being learned.
- **RCM** - This indicator is illuminated during the recovery mode, when the instrument is adjusting the frequency of the internal oscillator after the instrument has determined that the instrument's output signals are out of specification.
- **HLD** - This indicator is illuminated when the instrument is in holdover (not locked to GPS). Time is kept using the output of the internal oscillator, that is being corrected for aging and temperature effects through a special algorithm using data obtained during satellite lock.

Section 2

Getting Started

2.1 INTRODUCTION

This section contains the procedures to setup the NanoSync Option1 output ports.

2.2 GETTING ASSISTANCE

If you need assistance or have any questions relating to setup or operation, contact Technical Support. Please refer to the CONTACT INFORMATION page for detailed information.

2.3 PREPARING FOR USE

Prior to the configuration of the output ports, install and connect the instrument as outlined in NanoSync User's Manual *Section 2*.

2.4 MAKING THE OUTPUT CONNECTIONS

Connect the option output signals to external equipment using a 14-conductor flat ribbon type cable. The output signals have fast rise and fall times; therefore, long cable lengths may cause ringing and overshoots at the end of the cable. It is recommended to terminate each signal line with the proper impedance; typically, a 100 Ω termination impedance is sufficient. The output signals are available at the connector labeled *OUTPUT* as follows:

PIN NUMBER	SIGNAL	PIN NUMBER	SIGNAL
1	GND	2	GND
3	10 MHZ	4	GND
5	1 PPS	6	GND
7	OUTPUT 1	8	GND
9	OUTPUT 2	10	GND
11	OUTPUT 3	12	GND
13	OUTPUT 4	14	GND

The connector is a keyed 14-pin IDC connector, that mates with receptacle connector, such as 3M type 3385. (User supplied).

2.5 SETUP AND CONFIGURATION

The output signals are controlled and monitored using the instrument's RS-232 interface command port. Through commands, the user can read and select the frequency, pulse rate, and enable/disable status the option signal output ports. The applicable commands are described at the end of this document. Additional user commands can be found in FEI-Zyfer NanoSync User RS-232 Communication Protocol Document 380-8020.

2.5.1 Setting the Frequency of Output 1

Through RS-232 setup command FSEL, the frequency of Output 1 can be selected from 1 Hz to 250 Hz in 1 Hz increments.

Example 1: \$FSEL,100*<cr/lf> . In this example, the selected frequency is 100 Hz.

Example 2: \$FSEL,5*<cr/lf>. In this example, the selected frequency is 5 Hz.

The selected frequency can be read by using query command FSEL. In order for the signal to be available at the output port, the output port must be enabled.

2.5.2 Enabling Output 1

Through RS-232 setup command PCTL, the Output 1 port can be set to be always ON, always OFF, or OFF only during the warm-up period. Note: This command also contains the control fields for selection of output port 2, 3, and 4.

Example: \$PCTL,2,0,1,1*<cr/lf

In this example, Output 1 is selected to be disabled during the warm-up period (2), Output 2 is always OFF (0), Output 3 is always ON (1), and Output 4 is always ON (1).

The status of the output ports can be read by using query command PCTL.

2.5.3 Setting the Pulse Rates of Output 2 through 4

Through RS-232 setup command RSEL, the pulse rate period of the Output 2, 3, and 4 signals can be selected from 1 second to 9999 seconds in 1 second increments.

Example 1: \$RSEL,2,8*<cr/lf> . In this example, Output 2 is set to 1 pulse every 8 seconds.

Example 2: \$RSEL,3,12*<cr/lf>. In this example, Output 3 is set to 1 pulse every 12 seconds.

Example 3: \$RSEL,4,1000*<cr/lf>. In this example, Output 3 is set to 1 pulse every 1000 seconds.

The pulse rate of an output port can be read by using query command \$RSEL,M*<cr/lf>, where "M" = the port of interest. For example, to read Output 2, send \$RSEL,2*<cr/lf> and observe the response:

\$RSEL,2,99*<cs/cr/lf> This example indicates Output 2 is set to 1 pulse every 99 seconds.

In order for a signal to be available at an output port, the output port must be enabled.

2.5.4 Enabling Output 2 through 4

Through RS-232 setup command PCTL, any output port can be set to be always ON, always OFF, or OFF only during the warm-up period. This command also contains the control field for selection of output port 1.

Example: \$PCTL,2,0,1,1*<cr/lf

In this example, Output 1 is selected to be disabled during the warm-up period (2), Output 2 is always OFF (0), Output 3 is always ON (1), and Output 4 is always ON (1).

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Section 3

Specifications

3.1 INTRODUCTION

The following paragraphs contain the specifications for the *NanoSync Option1, Pulse Rate and Frequency Output*.

3.2 MECHANICAL

This option is contained on a printed circuit board assembly installed within the NanoSync enclosure.

The output signals are routed through a 14-Pin ribbon type connector.

The mechanical dimensions of an instrument configured with the option are as specified in *Section 3* of the NanoSync User's Manual, except as follows:

Height

With Input Power Configuration -1 and:

Oscillator Option -1 and -22.02" (52 mm) maximum

Oscillator Option -32.75" (70 mm) maximum

With Input Power Configuration -2 through -4 and:

Oscillator Option -1 and -22.50" (64 mm) maximum

Oscillator Option -33.25" (83 mm) maximum

3.3 ENVIRONMENTAL

Operating Altitude -60 m to 4000 m

Storage Altitude -60 m to 9000 m

Operating Temperature -5° C to +55° C

Temperature Rate of Change ±10° C/Hour maximum

Storage Temperature. -40° C to +85° C

Relative Humidity 5% to 95%, non-condensing

3.4 POWER REQUIREMENTS

Power is supplied by the NanoSync in which the option is installed.

3.5 ELECTRICAL SIGNALS

3.5.1 Output 1 (Frequency Output)

Frequency..... User selected, 1 Hz to 250 Hz,
through serial command. Non-volatile.

Duty Cycle 50 +/-1%

Synchronization Rising (leading) edge on-time
within 50 ns to NanoSync main 1 PPS output

Accuracy / Stability Same as NanoSync main 10 MHz Output

Output Enable..... User selected ON, OFF, ON except warm-up,
through serial command. Non-volatile

Output Drive

High Level $\geq +2.0$ V into $50\ \Omega$ load
(> 3.0 V open circuit)

Low Level < +0.5 V into 50 Ω load

Connector Pin Number Signal = Pin 7, Return = Pin 8

3.5.2 Output 2 through 4 (Pulse Rate Outputs)

Pulse Rate.....User selected, 1 sec to 9999 sec
through serial command. Non-volatile.

Pulse Width 2 ms

Synchronization.....Rising (leading) edge on-time within
50 ns to 1 PPS. All rates reset at midnight.

Accuracy / Stability Same as NanoSync main 1 PPS Output

Output Enable..... User selected ON, OFF, ON except warm-up,
through serial command. Non-volatile

Output Drive

High Level $\geq +2.0$ V into $50\ \Omega$ load
(≥ 3.0 V open circuit)

Low Level..... < +0.5 V into 50 Ω load

Connector Pin NumberOutput 2 = Pin 9, Return = Pin 10
.....Output 3 = Pin 11, Return = Pin 12
.....Output 4 = Pin 13, Return = Pin 14

3.5.3 10 MHz Output

Frequency.....	10 MHz
Duty Cycle	50 +/-1%
Accuracy / Stability	Same as NanoSync main 10 MHz Output
Output Drive	
High Level	$\geq +2.0$ V into 50 Ω load (≥ 3.0 V open circuit)
Low Level	$\leq +0.5$ V into 50 Ω load
Connector Pin Number	Signal = Pin 3, Return = Pin 4

3.5.4 1 PPS Output

Pulse Rate.....	1 PPS
Pulse Width	2 ms
Synchronization	Rising (leading) edge on-time within 50 ns to NanoSync main 1 PPS
Accuracy / Stability	Same as NanoSync main 1 PPS Output
Output Drive	
High Level	$\geq +2.0$ V into 50 Ω load (≥ 3.0 V open circuit)
Low Level	$\leq +0.5$ V into 50 Ω load
Connector Pin Number	Signal = Pin 5, Return = Pin 6

3.5.5 Serial Interface Port and Commands

A bi-directional DCE RS-232 interface port is provided for remote control and monitor of the option's output signals. This port is fixed to a baud rate of 19200, 8 data bits, 1 stop bit and no parity. FEI-Zyfer NanoSync User RS-232 Communication Protocol Document 380-8020 describes all of the functions and controls available through the instrument's control port. The control interface port is accessible through the instrument's DE-9S (female) connector labeled *CONTROL* as follows:

CONTROL INTERFACE CONNECTOR PIN DESIGNATION		
PIN	SIGNAL	DESCRIPTION
1,4	NO CONNECTION	
2	OUTPUT (TXD)	RS-232 OUTPUT
3	INPUT (RXD)	RS-232 INPUT
5,9	GROUND	SIGNAL RETURN, GROUND POTENTIAL
6	NOT TIMELOCKED	DISCRETE SIGNAL (Open Collector)o
7	ALARM	DISCRETE SIGNAL (Open Collector)
8	DEVICE PRESENT	+5 V (THROUGH INTERNAL 4.7K Ω RESISTOR)

The following is a description of the serial commands used with *NanoSync Option 1, Pulse Rate and Frequency Output*. These commands are provided to enable/disable the output signal ports, and select the output signal frequency or pulse rates.

Frequency Output Select (input/output) command**FSEL**

Query Command: \$FSEL*cr/lf>**Response:** \$FSEL,F*<cs/cr/lf>**Setup Command:** \$FSEL,F*<cr/lf>

Description: This command allows the user to read or set the output signal frequency of Output 1. To output the signal, the port must be enabled. (See command PCTL).

Fields:	Symbol	Value	Description
	F	1 - 250	Output frequency in Hz

Non-Volatile: Yes**Factory Default:** 250 Hz

Output Signal Port Control (input/output) command**PCTL**

Query Command: \$PCTL*cr/lf>**Response:** \$PCTL,S1,S2,S3,S4*<cs/cr/lf>**Setup Command:** \$PCTL,S1,S2,S3,S4*<cr/lf>

Description: This command allows the user to read the enable/disable status of the output ports, and enable or disable the output port signals.

Fields:	Symbol	Value	Description
	S1	0 - 2	Output 1 control (see table)
	S2	0 - 2	Output 2 control (see table)
	S3	0 - 2	Output 3 control (see table)
	S4	0 - 2	Output 4 control (see table)

Value	Description
0	Always OFF
1	Always ON
2	OFF during Warm-up, otherwise ON

Non-Volatile: Yes**Factory Default:** 2 (all ports)

Rate Output Select (input/output) command**RSEL**

Query Command: \$RSEL,M*<cr/lf>**Response:** \$RSEL,M,R*<cs/cr/lf>**Setup Command:** \$RSEL,M,R*<cr/lf>

Description: Allows the user to read or setup the pulse rates of Output 2 through Output 4 ports. To output a signal, a port must be enabled. (See command PCTL).

Fields:	Symbol	Value	Description
	M	2 - 4	Selected output port
	R	1 - 9999	Repetition rate of pulse in seconds

Non-Volatile: Yes**Factory Default:** 1 sec (all ports)

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