

October 18, 2018

Smart & Fully Integrated GPS/GNSS Receiver & Crystal Oscillator Module (GXClock-500)

Patented Smart GXClock-500 Auto-Adaptive GPS/GNSS SmarTiming+[®] Technology



The GXClock-500 is a smart, low cost, compact and fully integrated GPS/GNSS receiver & crystal oscillator module. It uses the adaptive SmarTiming+ technology, disciplining the GPS/GNSS reference noise at 1ns resolution, providing a host of complex time and frequency features in one package, while achieving state-of-the-art performance, reliability and extended lifetime.



Key Features

- Low aging in holdover mode: $< \pm 3E-10$ / day
- Low g sensitivity options available
- Frequency offset over temperature: $< 2E-10^*$
- Integrated GPS/GNSS receiver: MMCX input connector (1575.42MHz signal from GPS/GNSS antenna)
- SmarTiming+ GPS/GNSS disciplining technology: 1ns resolution
- Short-term stability: $< 2E-12$ @ 1s
- Output frequency accuracy/stability:
PRS/Stratum 1 locked: typical $\pm 1E-12$ (avg 24 hrs)
Holdover (no GPS/GNSS/PRS): $< 10\mu s$ / 24hrs
- Output time accuracy/stability:
GPS locked: $< 50ns$
- Small volume: 3.6 inch³ (3x0.8x1.5" / 76*20*38 mm)
- Single power supply: 12V
- Communication & control:
RS232 interface (9600 b/s)
NMEA 0183 messages (standard \$GPRMC and \$GPZDA)

* For any 10°C temperature change within the full operating range



APPLICATIONS

Telecom | Navigation | Broadcast | Defense | Instrument

SPECIFICATIONS

ELECTRICAL

Spec	Smart GXClock-500	
	Standard	Options
Type	Standard	Options
RFOUT Frequency	10 MHz	Not applicable
Frequency Change	≤6E-9	
Operating temperature range (Thermal chamber with air flow)	-10°C to +70°C	-40°C to +85°C (order code : E85)
Frequency Accuracy locked to GPS		+ 1E-12 (24h avg)
Frequency Accuracy when not locked to GPS		+ 3E-10 (24h avg)
Aging (After 3 months of continuous operation)	± 3E-10 / day	(order code: A) ± 1E-10 / day
Short Term Stability 1sec	5E-12	(order code: S) 2E-12
Phase Noise (dBc/Hz) (RFOUT=10MHz)		
1 Hz		-95
10 Hz		-120
100 Hz		-140
1k Hz		-145
10K Hz		-150
Frequency Retrace Off/On (In stable temperature, gravity, pressure & magnetic field conditions)		< 1E-8 24 hrs / 15 minutes
Warm-up Time @ +25°C Frequency Stability		< 7 minutes < 1E-7
Frequency accuracy when locked to GPS signals		< 3 E-12
Digital Frequency Adjustment Internal crystal oscillator freq. Resolution (Through RS-232 commands)		>±4E-7 divided in 65536 steps < 2E-11 / step
RFOUT SINE Outputs	3 floating sine waves, 0.5 Vrms (± 10% / 50Ω)	(order code: NF) No floating
Output impedance	50 Ω ±20%	
Harmonics	< -25dBc	
Spurious f ₀ ± 100kHz	< -80dBc	
RFOUT TTL Output level		0-5V (10mA sink/source)
RFOUT LVDS Differential Output voltage magnitude Steady-state common-mode output voltage		Typ. 340 mV / 100Ω Typ. 1.2V
Communication Interface Protocol speed	RS-232 control & monitoring (see commands below) 9600, n, 8, 1	

ELECTRICAL

Spec	Smart GXClock-500	
	Standard	Options
Type	Standard	Options
Supply Voltage (DC)	12V (11.7V to 12.9V)	
Max Power Supply Ripple	< 50 mV peak to peak (from 1Hz to 1 MHz frequency band)	
Input Current Warm up @ +25°C (typical) +25°C		< 700 mA < 250 mA
Conformal coating	None	Included (order code: CC)
Reverse Voltage Protection	< -40V (up to -40V on power input / no damage)	

ENVIRONMENTAL

Spec	Smart GXClock-500	
	Standard	Options
Type	Standard	Options
Magnetic Field Sensitivity	< 2E-10 / Gauss in worst axis	
Storage Temperature	-55°C to +85°C	
Humidity	GR-CORE-63, Section 5.1.2	
Operating Vibration	GR-CORE-63, Section 5.4.2 Random and Sinusoidal MIL-PRF-28800F, Class 3, 4	
Shock	Survival: 40g / 11ms	
G-Tip-Over Test	< 2E-9 / g in worst axis	
Dynamic sensitivity	< 2E-9 / g in worst axis	(order code: g1) < 1E-9 / g in worst axis (order code: g2) < 5E-10 / g in worst axis

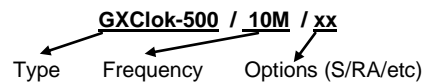
PHYSICAL

Spec	Smart GXClock-500	
	Standard	
Type	Standard	
Volume / Size (L x W x H)	3.6inch3 (3x0.8x1.5" / 76°20'38 mm)	
Weight	40g (1.4 oz)	
Mounting & Mechanical Layout	See drawings	
Connectors		
Dual in line 16 pins (2*8) 2mm	Hirose DF11-16DP-2DSA01	
RFOUT coaxial	3 MMCX (10MHz output each)	
GPS/GNSS Input coaxial	1 MMCX straight	

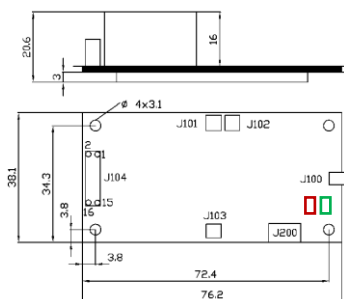
INTEGRATED GPS/GNSS RECEIVER WITH SMARTIMING+® DISCIPLINING TECHNOLOGY

Spec	Smart GXClock-500	
	Standard	Options
Type	Standard	Options
Integrated GPS/GNSS Receiver	GPS/GNSS	-
GPS/GNSS Antenna Kit Input Cable connector Active antenna voltage Antenna type	None	(order code : PA) MMCX 5V Patch antenna 6 m/19.7' Included
GPS/GNSS Antenna Kit Antenna type	Not applicable	(order code: PA) Patch antenna (order code: RA) Rooftop antenna
Lightning surge protector		Not applicable Included
Cable length		(order code: CA) 5+15m/16.4' +49'
Antenna mounting bracket	Not applicable	(order code: BRA)
Disciplining mode	Auto-adaptive thru SmartTiming+® technology (request White Paper)	Not applicable
Architecture Model	Sync (phase alignment) or Track (frequency alignment) See Operational Principles below	
GPS/GNSS Receiver Control T-RAIM @ startup time Position hold @ startup time	Request GPS/GNSS iSync+ Connectivity AppNotes Auto-configured, if supported by receiver Auto-configured, if supported by receiver	Auto-configured Auto-configured
PPSOUT TTL Output Level Pulse Width or duty cycle (PW)		1PPS 0-5V (10 mA sink/source) User settable, 0 to 1s in 50ns/step
PPSOUT LVDS Differential Output voltage magnitude Steady-state common-mode output voltage		1PPS Typ. 340 mV / 100Ω Typ. 1.2V
PPSREF Level Pulse width Rising edge GPS/GNSS vs. PPSREF		1PPS IN CMOS 0-5V (< 0.8V, >3.7V) >100 ns, <0.5 sec <20 ns User settable by software
PPSOUT to PPSREF Sync Error Conditions (Sync Mode)		< 50 ns No PPSref noise, ± 1°C temp fluctuations
PPSOUT to PPSREF (DE) Programmable delay (Track mode)		0 to 1s in 50ns/step
PPSOUT Holdover Time Stability (Under stable temperature conditions)	< 25 μs / 24 hrs	(order code: A) < 10 μs / 24 hrs
Smart Loop Time Constant Phase/Frequency User settable		Auto-adaptive 10 to 10000 sec Sync/Trk mode RS-232 command interface
Communication Interface GPS/GNSS Protocol speed	RS-232 control & monitoring (see commands below) 9600, n, 8, 1	

MODEL ORDERING INSTRUCTIONS



MECHANICAL DRAWING



J104 Connector*				
	I/O		I/O	
1	+10MHz LVDS	O	2	-10MHz LVDS
3	10MHz TTL	O	4	1PPS LVDS
5	+1PPS LVDS	O	6	GND
7	Device OK 0-3V +5k	O	8	RX 232 (0-5V)
9	TX RS232 (0-5V)	O	10	1PPS OUT TTL
11	1PPSIN C-MOS	I	12	GND
13	Alarm Track/Sync 0-3V +5k	O	14	GND
15	+12V	I	16	+12V

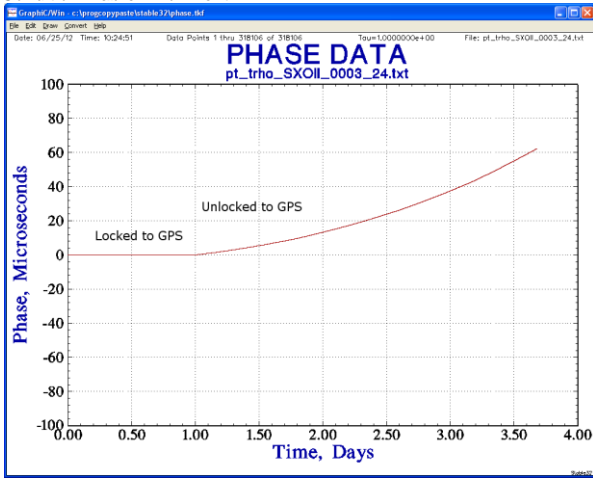
***J104 Mating Connector Supplier:**

Header PN 1688348 at www.newark.com/hrs-hirose/df11-16dp-2dsa-24/header-2mm-16way/dp/49P5026?Ntt=1688348
 Dual cable PN 1688308 at www.newark.com/hrs-hirose/df11-16ds-2c/wire-to-board-connector-receptacle/dp/49P5027?Ntt=1688308
 End cable crimp tin PN at 1688393 at www.newark.com/hrs-hirose/df11-2428sc/contact-socket-28-24awg-crimp/dp/49P5045?Ntt=1688393
 Crimp tool PN 1688394 at www.newark.com/hrs-hirose/df11-ta2428hc/tool-crimp-df11-awg-24-28/dp/49P5012?Ntt=1688394

TYPICAL PERFORMANCE DATA

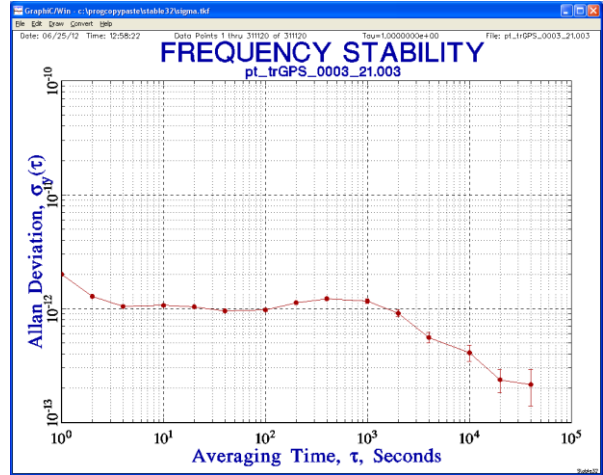
HOLDOVER (Locked & Unlocked to GPS)

Condition: Lab environment



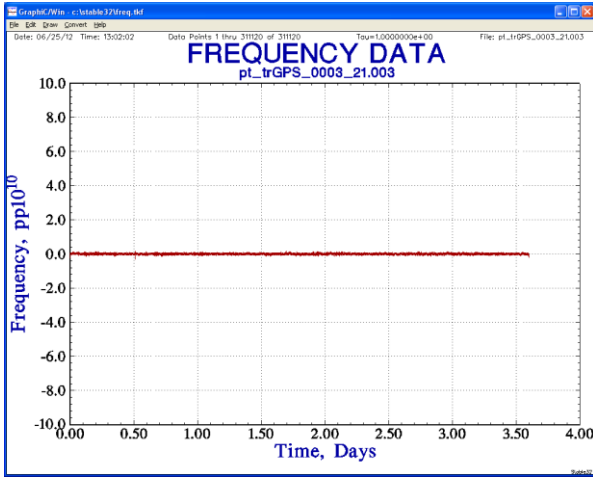
FREQUENCY STABILITY (Locked to GPS)

Condition: Time constant set at 4000s & insulated environment



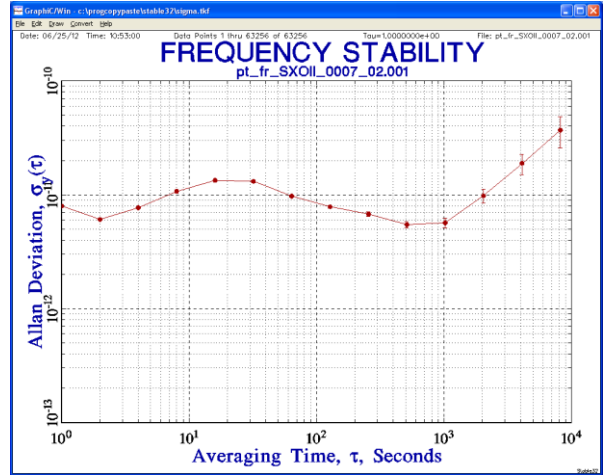
FREQUENCY (Locked to GPS)

Condition: Time constant set at 4000s & insulated environment



FREQUENCY STABILITY (Unlocked)

Condition: Lab environment



PHASE NOISE (10MHz)

Condition: Lab environment

