

October 18, 2018

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

## Patented Smart GXClock-500 Auto-Adaptive GPS/GNSS SmarTiming+<sup>®</sup> 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 inch<sup>3</sup> (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
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 (In stable temperature, gravity, pressure & magnetic field conditions)	Off/On	< 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) Output impedance 50 Ω ±20% Harmonics < -25dBc Spurious f <sub>0</sub> ± 100kHz	(order code: NF) No floating
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
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
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

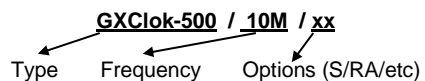
**PHYSICAL**

Spec	Smart GXClock-500	
	Standard	
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	Hirose DF11-16DP-2DSA01 3 MMCX (10MHz output each) 1 MMCX straight	

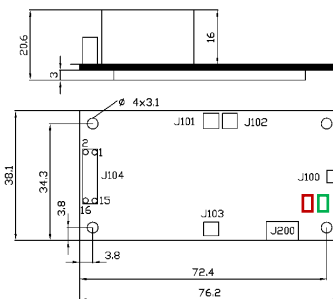
**INTEGRATED GPS/GNSS RECEIVER WITH SMARTIMING+® DISCIPLINING TECHNOLOGY**

Spec	Smart GXClock-500	
	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		≥5 m/16.4' (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)	
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/Trak mode RS-232 control interface	
Communication Interface GPS/GNSS Protocol speed	RS-232 control & monitoring (see commands below) 9600, n, 8, 1	

**MODEL ORDERING INSTRUCTIONS**



**MECHANICAL DRAWING**



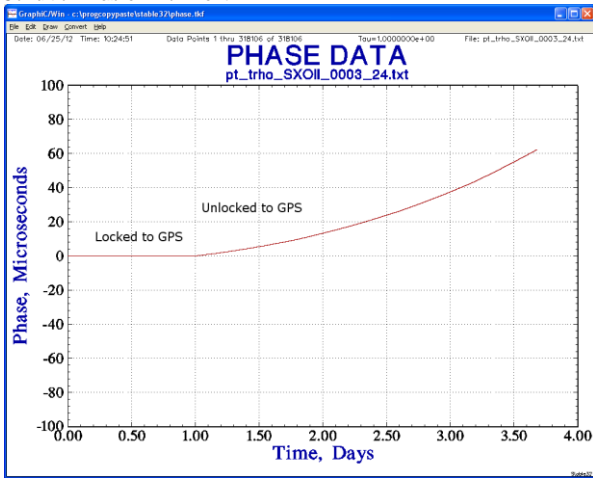
J104 Connector*					
	I/O		I/O		I/O
1	+10MHz LVDS	O	2	-10MHz LVDS	O
3	10MHz TTL	O	4	1PPS LVDS	O
5	+1PPS LVDS	O	6	GND	I
7	Device OK 0-3V +5k	O	8	RX 232 (0-5V)	I
9	TX RS232 (0-5V)	O	10	1PPS OUT TTL	O
11	1PPSIN C-MOS	I	12	GND	I
13	Alarm Track/Sync 0-3V +5k	O	14	GND	I
15	+12V	I	16	+12V	I

**\*J104 Mating Connector Supplier:**

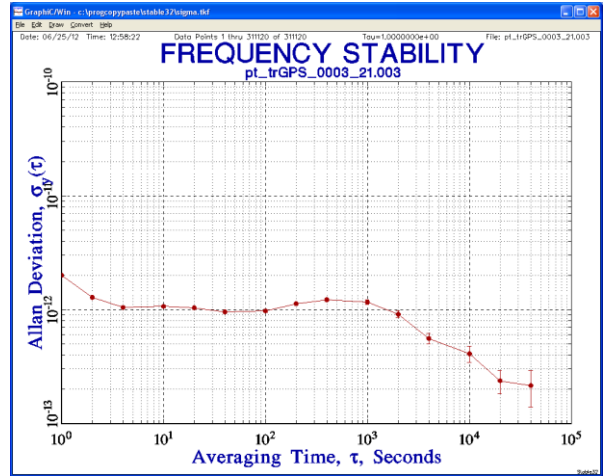
Header PN 1688348 at [www.newark.com/hrs-hirose/df11-16dp-2dsa-24/header-2mm-16wav/dp/49P50267?Ntt=1688348](http://www.newark.com/hrs-hirose/df11-16dp-2dsa-24/header-2mm-16wav/dp/49P50267?Ntt=1688348)  
 Dual cable PN 1688308 at [www.newark.com/hrs-hirose/df11-16ds-2c/wire-to-board-conector-receptacle/dp/49P5027?Ntt=1688308](http://www.newark.com/hrs-hirose/df11-16ds-2c/wire-to-board-conector-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](http://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/df11-242428hc/tool-crimp-df11-awg-24-28/dp/49P5012?Ntt=1688394](http://www.newark.com/hrs-hirose/df11-242428hc/tool-crimp-df11-awg-24-28/dp/49P5012?Ntt=1688394)

**TYPICAL PERFORMANCE DATA**

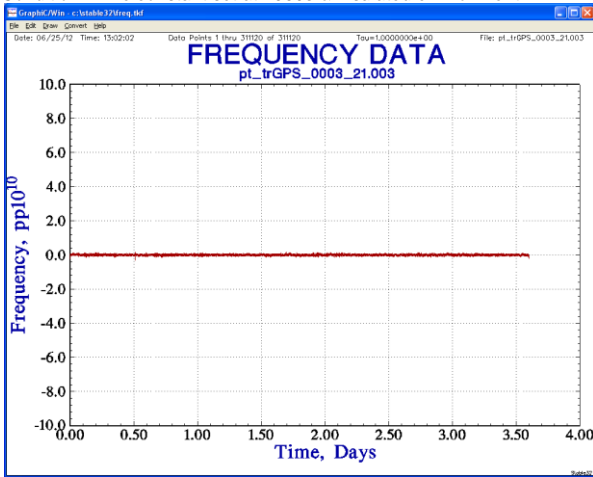
**HOLDOVER (Locked & Unlocked to GPS)**  
 Condition: Lab environment



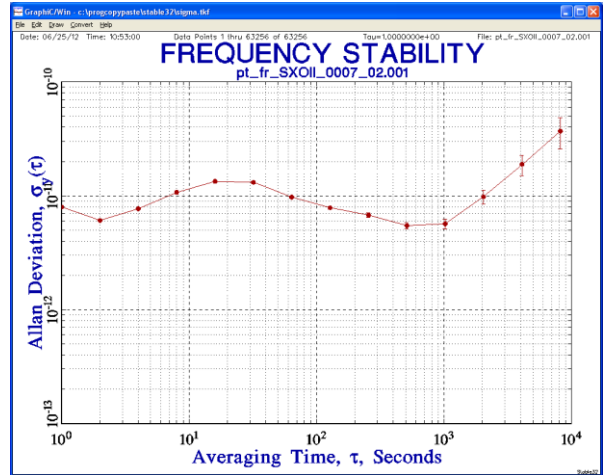
**FREQUENCY STABILITY (Locked to GPS)**  
 Condition: Time constant set at 4000s & insulated environment



**FREQUENCY (Locked to GPS)**  
 Condition: Time constant set at 4000s & insulated environment



**FREQUENCY STABILITY (Unlocked)**  
 Condition: Lab environment



**PHASE NOISE (10MHz)**  
 Condition: Lab environment

