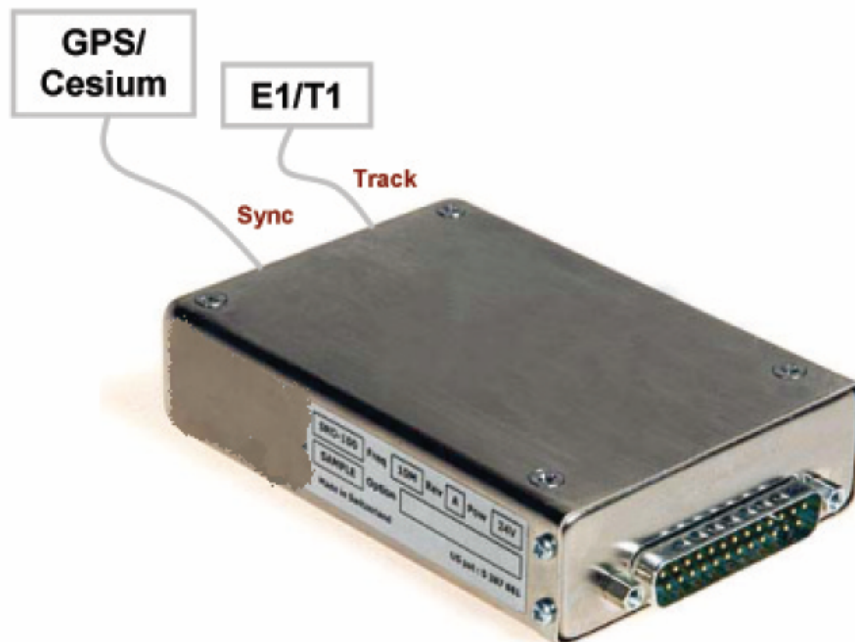


ANDHRA ELECTRONICS LIMITED

Low Cost GPS/E1/T1/Cesium-Synchronized Rubidium Clock (SRO-100)

Patented SRO-100 SynClock+®



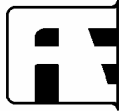
APPLICATIONS

Telecom | Navigation | Broadcast | Defense | Instrument

Plot Nos.34 & 35, Industrial Development Area, KAKINADA - 533 005, INDIA.
Phone: 91-884-2342203 / 2341850 / 2379407 ♣ Fax: 91-884-2341145 / 2341698
E-mail: info@andhraelec.com ♣ www.andhraelec.com



ISO 9001:2000



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KEY FEATURES

Smart SRO-100 SynClock+®

- Single power supply voltage : 11 - 16V or 20 - 32V
- Small volume : 11 in³ (2.78x4x1")
- Frequency offset over temp. range : ± 1E-10
- Short-term stability : 1E-12 / 100 sec.
- Industry's first SmarTiming+® technology
 - REF locking resolution : 1 ns
 - REF disciplining/filtering/controlling : Auto adaptive^(a)
 - Smart loop time constant : 1000 - 100,000 sec
 - E1/T1 jitter & wander : ITU-T G.823/824
 - REF locking mode (user settable) : Sync^(b) or Track^(c)
 - REF types (PRS^(d)/Stratum 1 source) : GPS, Cesium, E1/T1, LORAN-C, Maser
 - OUT frequency accuracy/stability
 - PRS^(d)/Stratum 1 locked : 1E-12, typical
 - Holdover (No PRS^(d)) : <5E-11/month
 - OUT time accuracy/stability
 - GPS locked : <50ns
 - Holdover (no GPS) : <2µs/48 hr or <1µs/24 hr
 - Standards compliance
 - PRS^(d) locked/unlocked : ANSI T1.101, Stratum 1 / 2, GR-1244
ITU-T G.811/G.812, PRC, Type II
CDMA IS-95, UMTS 3GPPS 25.104
- Low warm-up current : < 1.2A
- Ultra low aging : < 5E-11/ month
- Ultra low phase noise output : 10MHz –100dBc @ 10 Hz
- High frequency LV CMOS output : 60MHz
- RS232 standard interface : Control & monitoring commands, 9600 b/s

Notes

- (a) Request our SmarTiming+® Technology White Paper to compare performance at SynClock@spectratime.com
- (b) REF/OUT phase alignment
- (c) REF/OUT frequency alignment
- (d) PRS: Stratum 1 Primary Reference Source such as GPS, Cesium, E1/T1, LORAN-C, Maser



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REVISION TRACKING LIST

Software Revision			Hardware Revision
Date	Version	Comment	
11 Jun 2002	1.01	Internal Correction	
09 Jul 2002	1.02	Now commands PW and TC store data in EEPROM	
23 Jul 2002	1.03	Internal Correction	
19 sep 2002	1.04	New command "MCsdd" for interfacing with GPS receiver	
27 Sep 2002	1.05	Internal Correction	
07 Feb 2003	1.06	New command DT, Date. New command COsddd, time comparator offset	
11 Mar 2003			New low power version <17W
19 Aug 2003	1.07	Improved behavior at the start of tracking. Frequency save (FSx) improved. Command MCsdd extended. New commands VS, view PPSRef stability, VT, view time constant. Internal corrections	
23 Sep 2003	1.08	New command RAsddd. Internal corrections.	
25 Feb 2004	1.09	Back to simple start of tracking. GPS messages for Jupiter-Pico, SuperStar II. NMEA messages.	



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SPECIFICATIONS

ELECTRICAL

Spec	Smart SRO-100 SynClock+®			
Type	Standard	Options		
RFOUT Frequency	10 MHz	Optional 5 MHz, 15 MHz (ordering code: 5M or 15M)		
Frequency Change Operating temperature range (Thermal chamber with air flow)	< 1E-10 -20°C to +60°C	-30 to 65°C (ordering code: E) -10 to 60°C (ordering code: LP)		
Frequency Accuracy @ Shipment	< 5E-11 (+25°C), typical			
Aging (After 3 months of continuous operation)	< 5E-11 / month (typical: 3E-11 / month)	< 3E-11 / month or 2E-10 / year (ordering code: A) (typical: ±1E-11 / month)		
Short Term Stability		(ordering code: S)		
	1s	3E-11	1E-11	
	10s	1E-11	3 E-12	
	100s	3E-12	1E-12	
Phase Noise (dBc/Hz) (RFOUT 10 MHz)			(ordering code: S)	
	1 Hz	-75	-80	
	10 Hz	-95	-100	
	100 Hz	-125		
	1k Hz	-145		
	10K Hz	-145		
Frequency Retrace Off/On (In stable temperature, gravity, pressure & magnetic field conditions)		< 5E-11 24 hr / 1 hr		
Warm-up Time @ +25°C Frequency stability	12 min 5E-10	7 min 5E-10 (ordering code: F)	< 4min 5E-10 (ordering code: FE)	25 min 5E-10 (Low Power ordering code: LP)
Analog Frequency Adjustment Tolerance [An external voltage (0-5 VDC) can be applied to pin 6 (FA). The cursor pin of a 10 kΩ variable resistor placed between pin 7 and GND can provide this voltage. If not used, pin 7 must be floating]	5 x 10 ⁻⁹ ±20%			
Digital Frequency Adjustment Internal crystal oscillator freq. Resolution (Through RS-232 commands)	±1.67E-8 60MHz 5.12E-13			
RFOUT Output level Output impedance Harmonics Spurious f ₀ ± 100kHz 60MHz sub-harmonics	Sine wave 0.5 Vrms (± 10% / 50Ω) 50 Ω ±20% < -25dBc < -80dBc < -45dBc			

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ELECTRICAL

Spec	Smart SRO-100 SynClock+®		
60MHz Out	Square wave 3.3V LV CMOS		
Supply Voltage (DC)	24V (20 to 32 V)	12V (11.2 to 16 V) (ordering code: 12V)	
Input Power		With following options	
Warm up @+25°C (typical)	<28W @12V or <35W @ 24V	(F/E) <40 W	(FE) <50 W
0°C	<14 W		(LP) <17W
+25°C	< 11 W		
+60°C	< 7 W		
Communication Interface	RS-232 commands for control & monitoring (see commands below) Timing and locking control functions VMGA messages		
Protocol speed	9600, n, 8, 1		
Compatible with	SRO model		
Conformal coating	None	(with CC option)	
Reverse Voltage Protection	< -40V (up to -40V on power input / no damage)		

SMARTIMING+® DISCIPLINING & FILTERING

Spec	Smart SRO-100 SynClock+®		
PPSREF Level	CMOS 0-5V or 0-3.3V rising edge		
Reference types	GPS, E1, T1, Cesium, LORAN-C, Maser, etc		
Disciplining & filtering	Auto-adaptive through SmartTiming+® technology (request white paper)		
Disciplining mode	Sync (phase alignment) or Track (frequency alignment)		
Architecture Model	See Principles of Operation below		
GPS Receiver Control	(Request GPS/SRO Connectivity AppNote)		
T-RAIM	Auto-configured at startup, if supported by GPS		
Position hold	Auto-configured at startup, if supported by GPS		
PPSOUT Output Level	CMOS 0-5V		
Current	+20 mA sink/source		
PPSOUT Adjustable Duty Cycle	133 ns step from 0 to 1sec		
Pulse Width (PW)			
PPSOUT to PPSREF Sync Error	< 50 ns		
Conditions (Sync Mode)	No PPSRef noise, ± 1°C temp fluctuations		
PPSOUT to PPSREF (DE)	0 to 1s in 133ns/step		
Programmable delay (Track mode)			
PPSOUT Holdover Time Stability	< 1µs / 24 hr	< 3µs / 24 hr	< 7µs / 24 hr
Temperature window	< 7µs / 1 week	Within 20°C	Within 40°C
(After learning phase > 10 τ)	Within ±2°C		
Smart Loop Time Constant	Auto-adaptive 1,000 to 100,000 sec		
Phase/Frequency	Sync/Trak mode		
User settable	RS-232 command interface		

ENVIRONMENTAL

Spec	Smart SRO-100 SynClock+®		
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		
Shock	Random and Sinusoidal MIL-PRF-28800F, Class 3, 4		
Helium concentration sensitivity	Survival: 40g / 11ms		
G-Tip-Over Test	< 1E-10 per ppm of Helium concentration change		
	< 2E-10 / g in worst axis		

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PHYSICAL

Spec	Smart SRO-100 SynClock+®
Size (L x W x H)	4" x 2.78" x 0.1" (101.6 x 70.61 x 25.4 mm)
Weight	234g (8.25oz)
Mounting & Mechanical Layout	See drawings below
Connector	Male D-sub 25 pins (see drawing below)
Compatible with	SRO model

MODEL ORDERING INSTRUCTIONS

