

Specification	AXCS9000HP	Rev.: 2	Date: 2022-06-22
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Oscillator type: **Optically-pumped Cesium Atomic Clock
High Performance Model**

Features:

- Ultra-High Stability Primary Reference Clock (PRC)
- Standard for Time Synchronisation, Calibration and Test Labs
- Full monitoring and control features with modern user interface
- Remote access/health monitoring via Ethernet & RS-232
- Long Cesium tube life time – 10 years warranty
- No subject to U.S. export control (ITAR free)
- Compatible with popular Cesium Clocks
- Applications: 4G/5G networks, DTV, DAB, CMDA and Tetra, IPTV etc.
- Equivalent to ELECSPN TA1000A “High Performance”

The AXCS9000HP is a High-Performance Cesium Primary Reference Clock with supreme long-term stability below $1E-14$. It is the first commercially available Optically-Pumped Cesium Clock. This principle has several advantages, compared to the common magnetic deflection method, like higher reliability, higher stability and lesser influence of physical factors. The guaranteed operating life time of the tube is min. 10 years. The AXCS9000HP has multiple outputs for 5 MHz, 10 MHz and 1PPS with very low phase noise and very low jitter. System synchronization is possible via 1PPS input. It also offers a state-of-the-art control & monitor interface via touch-screen or remotely via LAN or RS-232 connection.

Frequency & 1PPS pulse distribution is possible with optional distribution amplifiers AXDA9000 & AXDA9100. For further phase noise improvement and/or frequency generation the AXPLO-series of ultra-low noise “clean-up” modules are available.



Electrical & Environmental Specification

Parameter	min.	typ.	max.	Unit	Condition
Nominal output frequency RF1	5.000			MHz	
Nominal output frequency RF2	10.000			MHz	
Nominal output frequency RF3	1PPS				
Frequency stability					
Frequency accuracy			$5 \cdot 10^{-13}$		
Short- and long-term stability			$5.0 \cdot 10^{-12}$ $3.5 \cdot 10^{-12}$ $8.5 \cdot 10^{-13}$ $2.7 \cdot 10^{-13}$ $8.5 \cdot 10^{-14}$ $2.7 \cdot 10^{-14}$ $1.0 \cdot 10^{-14}$		@ $\tau = 1$ sec @ $\tau = 10$ sec @ $\tau = 100$ sec @ $\tau = 1,000$ sec @ $\tau = 10,000$ sec @ $\tau = 100,000$ sec @ Floor (≥ 5 days)
Frequency reproducibility			$5 \cdot 10^{-13}$		
RF output RF1					
Number of output ports	2				
Signal waveform	Sine wave				
Load R_L	50			Ω	$\pm 5\%$
Output level per port	+7	+10	+13	dBm	
Isolation between ports	100			dB	
Harmonics			-40	dBc	
Spurious			-80	dBc	
Phase noise @ 5 MHz			-105	dBc/Hz	@ 1 Hz
			-135	dBc/Hz	@ 10 Hz
			-145	dBc/Hz	@ 100 Hz
			-156	dBc/Hz	@ 1 kHz
			-158	dBc/Hz	@ ≥ 10 kHz
RF output RF2					
Number of output ports	2				
Signal waveform	Sine wave				
Load R_L	50			Ω	$\pm 5\%$
Output level per port	+7	+10	+13	dBm	
Isolation between ports	100			dB	
Harmonics			-40	dBc	
Spurious			-80	dBc	
Phase noise @ 10 MHz		-105	-100	dBc/Hz	@ 1 Hz
		-132	-130	dBc/Hz	@ 10 Hz
		-150	-145	dBc/Hz	@ 100 Hz
		-154	-150	dBc/Hz	@ 1 kHz
		-158	-155	dBc/Hz	@ ≥ 10 kHz
RF output RF3					
Number of output ports	3				
Signal waveform	Square wave / TTL				
Load R_L	50			Ω	$\pm 5\%$
Output level	2.4			V _{pp}	
Rise & fall time			5	ns	
RMS Jitter			1	ns	
Pulse width	20			μ s	
Synchronization accuracy			20	ns	

Parameter	min.	typ.	max.	Unit	Condition
External synchronisation input					
Input frequency	1PPS				
Signal waveform	Square wave / TTL				
Number of input ports	1				
Load R_L	50			Ω	
Frequency tuning					
Tuning range	$\geq \pm 1 \cdot 10^{-9}$				
Resolution	$\leq 6.5 \cdot 10^{-15}$				
Lock Time			60	min	@ +25°C
DC Supply voltage V_{S1} (Note 1, 2)	22		75	V	
AC Supply voltage V_{S2} (Note 1)	200		240	V	
AC Supply input frequency	50		60	Hz	
Power consumption (steady state)			120	W	
Power consumption (warm-up)			200	W	
Operating temperature range (Note 3)	+18	+23	+28	°C	$\Delta T_{\text{OPERATION}} = \pm 1K$
Storage temperature range	0		+50	°C	
Relative humidity (Note 3)	0		40	%	
Enclosure (see drawing) (LxDxH)	456x553x177			mm	19" rack 4 HU
Weight			40	kg	
MTBF	$\geq 100,000$			hrs	
Cesium tube warranty	10			years	designed for 12 years
System factory warranty	2			years	

Notes:

1. If both supply inputs AC and DC are present, then AC power supply is automatically selected.
2. The clock does not have an internal battery. It is recommended to use an UPS unit to ensure continuous power.
3. Please see operation manual for details.

Operation & Test Documents

Title
Operation Manual
Health Monitoring Manual
Safety Mechanisms Description
Factory Acceptance Plan/Report
Site Acceptance Plan/Report

Please consult AXTAL

Reference Documents

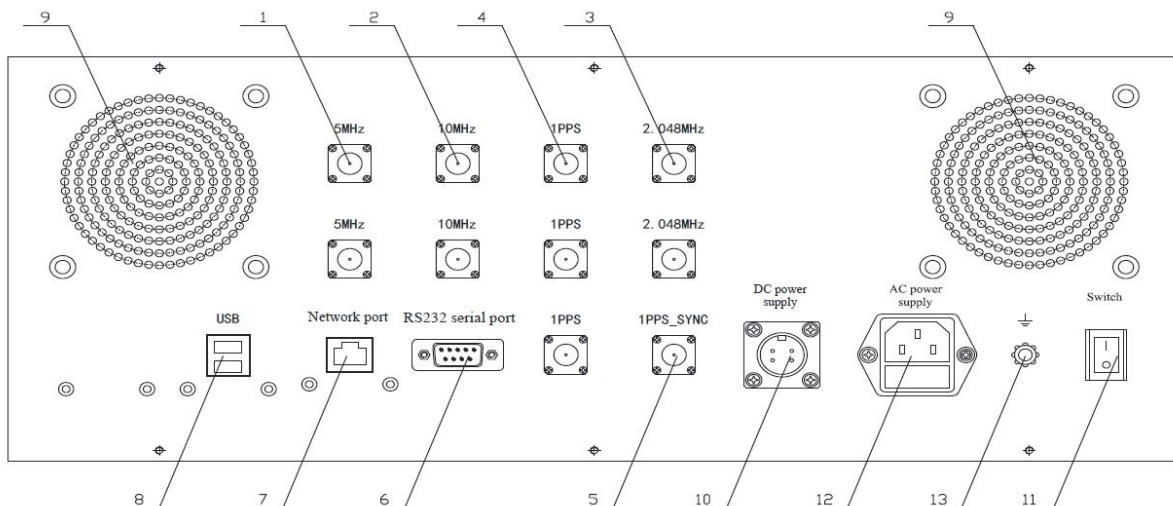
Title
Test Report National Institute of Metrology (NIM), China
Test Report National Time Service Center (NTSC), China

Please consult AXTAL

Ordering Code

Model	Revision	Frequency [MHz]
AXCS9000HP	Rev.2	10.000

Backplane / Connections



#	Description	#	Description
1	5 MHz Outputs (x2)	8	USB Interface
2	10 MHz Outputs (x2)	9	Fan vents
3	TA1000-M1 model only	10	DC Power Supply Input
4	1PPS Outputs (x3)	11	AC Power Switch
5	1PPS Synchronization Input	12	AC Power Supply Input
6	RS-232 Interface	13	Ground connection
7	LAN Interface		

Revision History

Rev.	Drawing	Date [dd.mm.yyyy]	Remarks	Author	Checked
1	D0	30.07.2019	First issue – High Performance Model	HH	HH
1	D1	13.11.2019	Editorial changes	HH	HH
2	D0	28.09.2020	Major update – Various parameters added/updated	HH	ME
2	D1	22.01.2021	Warranty information added/updated	HH	HH
2	D2	27.05.2021	Max. humidity corrected, temperature details added	HH	HH
2	D3	22.06.2022	Operating temperature range corrected	HH	HH