Specification	AXRB9000	Rev.: 7	Date: 2022-09-08

Oscillator type: **Very High Stability Ultra-Low Noise Rubidium Frequency Reference in 19” rack (1 HU) with integrated distribution amplifiers for 1PPS and 10 MHz**

Features:

- **Very High Long-term Frequency Stability <$2 \cdot 10^{-10}$ per year**
- **Short-term Stability (ADEV) typical $1 \cdot 10^{-12}$ @ τ = 100 sec**
- **Ultra-Low Phase Noise 10 MHz output**
- **Integrated distribution amplifiers for 1PPS & 10 MHz**
- **Integrated disciplining circuit for 1PPS reference input**
- **RS-232 communication interface**
- **Designed for long life time**
- **Slim 19” rack with 1 HU**

Models:

Item	(D)OCXO	(D)OCXO with integrated Distribution Amplifier	GPS-disciplined OCXO/Rubidium	Rubidium
Model*	AXIOM9000	AXDO9000	AXGPS9000(RB)	**AXRB9000**
Features	DOCXO option Ultra-Low Noise Very High Stability	AXIOM9000 Performance Low Noise High Isolation Frequency Distribution Amplifier with 4 to 16 Outputs	GPS Long-Term Stability < 1E-13 Ultra-Low Noise	Excellent Long-Term Stability 1E-12 Ultra-Low Noise
Optional Distribution Amplifier(s)	AXDA9000	AXDA9000	AXDA9000 AXDA9100	AXDA9000 AXDA9100

**See also our Cesium Primary Reference Clocks on our website*

Parameter	min.	typ.	max.	Unit	Condition
Nominal output frequency RF1		10.000		MHz	
Nominal output frequency RF2		1PPS			
Frequency stability					
Initial tolerance at delivery @ +25°C			±0.05	ppb	
vs. operating temperature range			±0.30	ppb	steady state
Long term (aging) per day			±0.005	ppb	
Long term (aging) per month			±0.05	ppb	
Long term (aging) per year			±0.30	ppb	
Long term (aging) over 10 years			±1.00	ppb	
Retrace @ +25°C			±0.02	ppb	1 h after 24 hrs OFF
Short-term stability (ADEV)		$1\cdot10^{-11}$ $5\cdot10^{-12}$ $1\cdot10^{-12}$	$3\cdot10^{-11}$ $1\cdot10^{-11}$ $3\cdot10^{-12}$		@ τ = 1 sec @ τ = 10 sec @ τ = 100~100,000 sec
Frequency adjustment range					
RS-232 Frequency Control	±1			ppb	(Note 2, 4)
RF output RF1					
Number of output ports		8			
Signal waveform		Sine wave			
Load R_L		50		Ω	±5%
Output level per port	+12	+14	+16	dBm	
Isolation between ports	100			dB	
Harmonics			-40	dBc	
Spurious			-80	dBc	
Phase noise		 -140 -160 -165 -170	-100 -135 -155 -160 -165	dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz	@ 1 Hz @ 10 Hz @ 100 Hz @ 1 kHz @ ≥10 kHz
Warm-up time @ +25°C			15	min	< ±0.5 ppb
Output level indicator		LED at front panel			
RF output RF2					
Number of output ports		2			
Signal waveform		HCMOS/TTL			
Load R_L		50		Ω	±5%
Output level	3	4		Vpp	
Rise & decay time			5	ns	
1PPS indicator		LED at front panel			
External disciplining input (Note 3)					
Number of input ports		1			
Input frequency		1PPS			
Signal waveform		HCMOS/TTL			
Load R_L		50		Ω	
Input level	2.8			Vpp	
Interface					
RX/TX level		RS-232			
Communication		See user manual			
Lock Detect Indicator		LED at front panel			

Parameter	min.	typ.	max.	Unit	Condition
AC Supply voltage V_S	100	230	240	V	IEC 60320-1 / C14
AC Supply input frequency	50		60	Hz	
Power consumption			50	W	
Operating temperature range	+10		+50	°C	
Enclosure (see drawing) (WxDxH)	483x250x44			mm	Color “black”
Drawing number	AXZ10.01097.05				
RF Connectors	BNC female				@ Rear plate
Communication Connector	9-Pin D-Sub male with jack posts				@ Rear plate
Weight			8	kg	
Life time	Designed for >10 years				(Note 4)

Notes:

1. Terminology and test conditions are according to IEC60679-1 and MIL-PRF-55310, unless otherwise stated
2. Adjustment range sufficient for 10 years operation. Please see programming manual for tuning.
3. Disciplining by default active as soon as 1PPS reference input is present (see control function)
4. Please consult factory for extended warranty options and calibration service

Absolute Maximum Ratings

Parameter	min.	max.	Unit	Condition
AC Supply Voltage V_S	90	260	V	
AC Supply input frequency	47	63	Hz	
AC Supply input current		2	A	Fuse accessible at rear plate
Maximum 1PPS input level	-0.5	+6	V	
Load R_L	25	∞	Ω	No damage
Storage Temperature	-20	+70	°C	

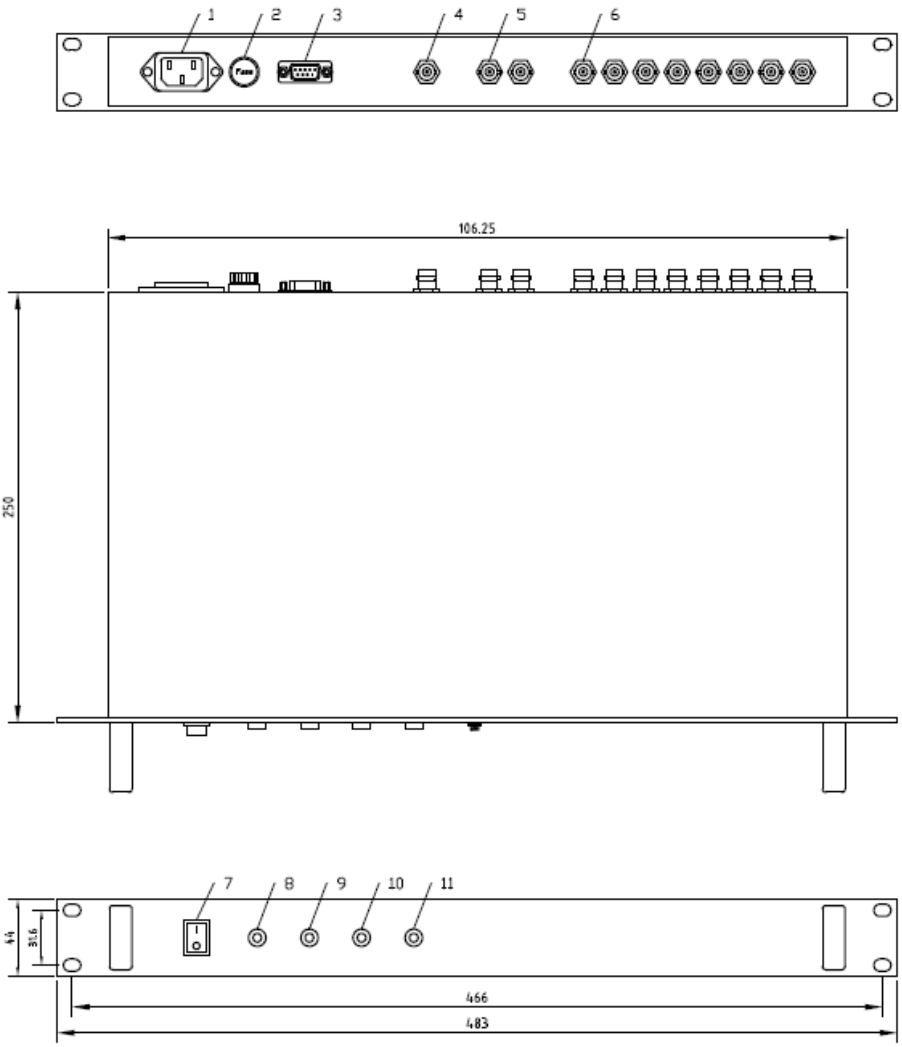
Ordering Code

Model	Revision	Frequency [MHz]
AXRB9000	Rev.7	10.000

Handling & Testing

Parameter	Procedure / Test condition
Sinusoidal vibration	max. 0.15 mm <10 Hz, 1 g at 10~2000 Hz
Random vibration	max. 0.001 g²/Hz, 10~2000 Hz
Mechanical shock	max. 10 g, 6 ms half sine
Handling and Testing	Careful handling. Avoid excessive air flow, vibration and shock during operation.
VDE 0701-0702 Tested	✖ Yes ☐ No
RoHS-Compliant	✖ Yes ☐ No
CE Conformity	✖ Yes ☐ No

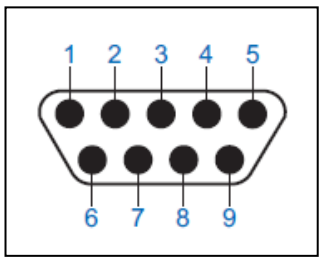
Enclosure drawing



Connections and operation

#	Panel	Symbol	Function
1	**Rear**	POWER IN	AC Supply Input (IEC 60320-1 / C14)
2		FUSE	2 A Slow 5x20 mm Fuse
3		COMM	Interface for Monitoring & Control (see pin connections below)
4		RF IN	External Disciplining Input 1PPS
5		RF OUT	RF Outputs 1…2 RF2 – 1PPS
6		RF OUT	RF Outputs 1…8 RF1 – 10 MHz
7	**Front**	POWER SWITCH	Power Switch ON/OFF
8		POWER ON	LED – Power ON Indicator
9		LOCK DETECT	LED – Rubidium Ready Indicator (Locked)
10		OL	LED – Output Level Indicator (Internal Rubidium)
11		PPS	LED – 1PPS Indicator (Internal Rubidium)

Pin connections D-Sub connector



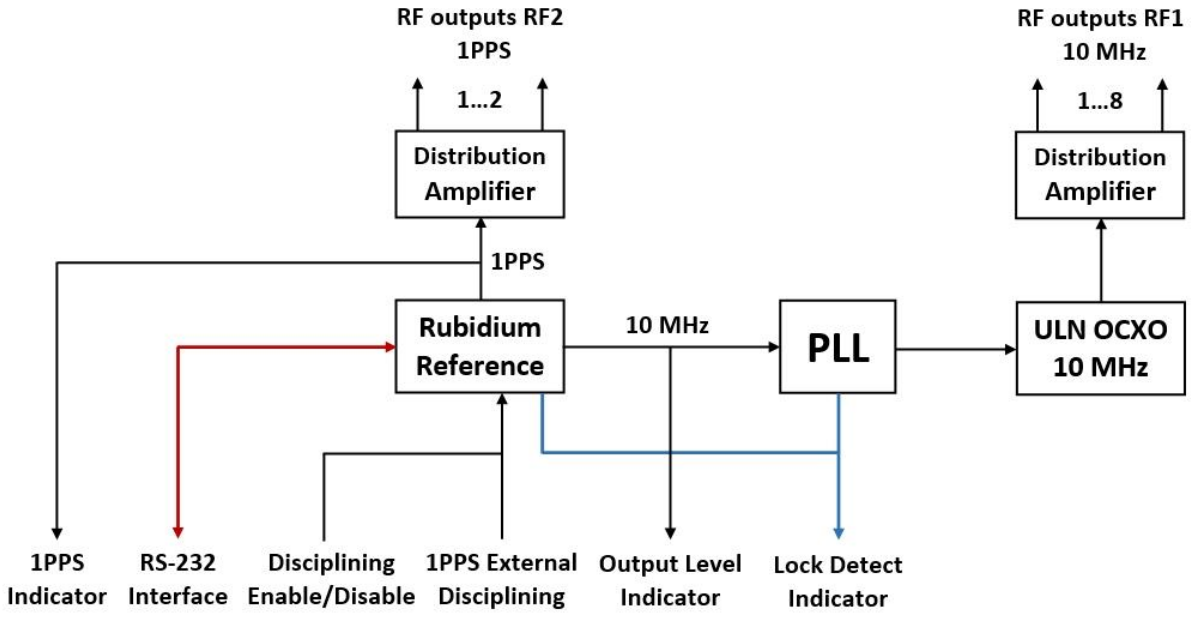
Front View D-Sub connector

Pin connections

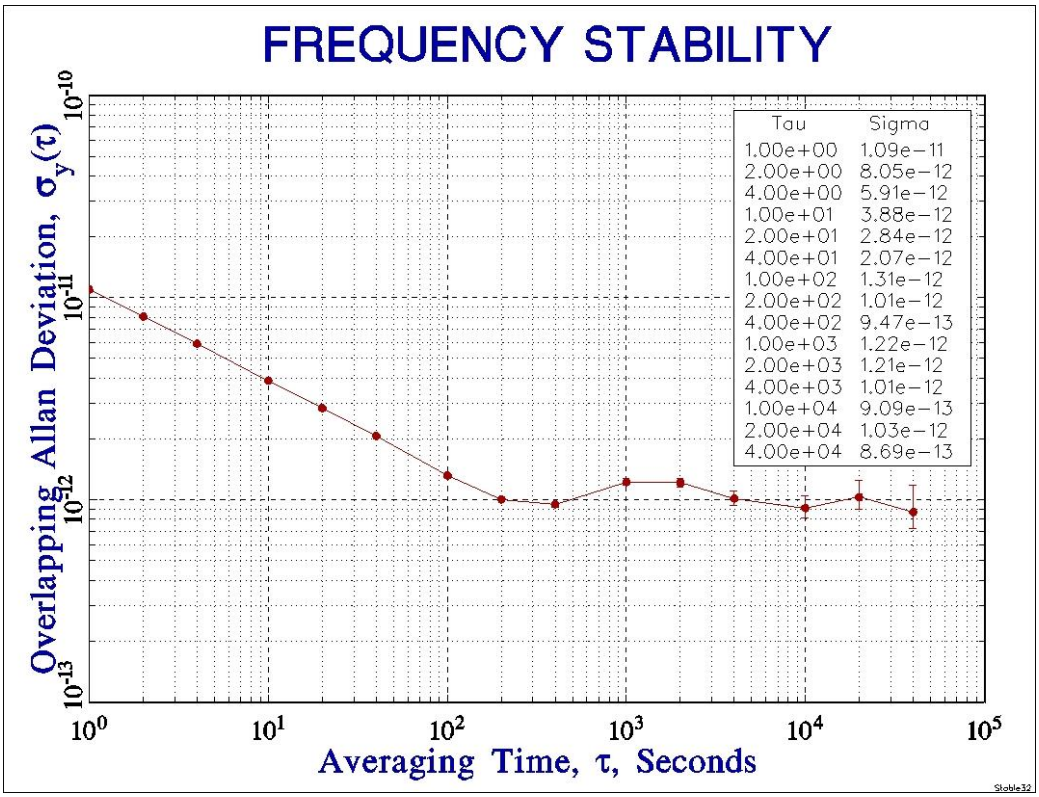
#	Symbol	Function	Type	Description
1	N.C.	No Connection	-	-
2	RX	Receive Data	Monitor/Control	RS-232 Logic Level
3	TX	Transmit Data	Monitor/Control	RS-232 Logic Level
4	N.C.	No Connection	-	-
5	GND	Ground	-	-
6	DIS	Disciplining Enable/Disable	Control	5V Logic Level, High = Disciplining enabled (default – internal pull-up) Low = Discipling disabled (ignores 1PPS input signal)
7	LD	Lock Detect	Monitor	5V Logic Level, High = Rubidium & OCXO Locked
8	OL	Output Level	Monitor	5V Logic Level, High = Output Level Rubidium OK
9	PPS	1PPS	Monitor	5V Logic Level, 1PPS HCMOS Pulse Rubidium

Note: Please be aware of the different logic levels for the various monitor & control functions.

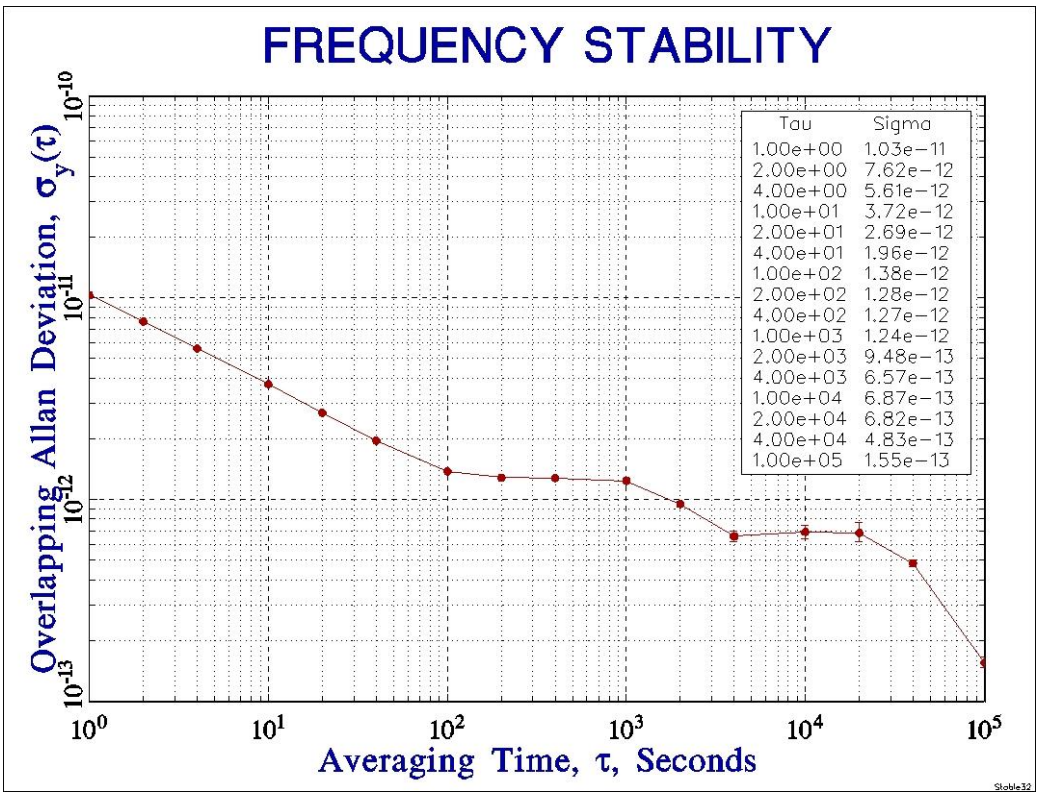
Block diagram



Typical frequency stability (free-running & GPS-locked)



Frequency stability (ADEV) – Free-running



Frequency stability (ADEV) – Locked to AXTAL GPSDO AXGPS9000

Data sheet is for information purposes only and may be subject to modifications or may be discontinued without notice.

Revision History

Rev.	Drawing	Date [dd.mm.yyyy]	Remarks	Author	Checked
1	D0	07.07.2016	First issue	HH	BN
2	D0	18.07.2016	Retrace and PN options added	HH	HH
3	D0	24.07.2018	Major update with Rubidium options	HH	BN
4	D0	22.07.2021	Major update: Fixed High Stability Rubidium with Clean-up ULN OCXO, integrated distribution amplifier for 1PPS & 10 MHz and synchronization input added, additional monitoring functions added, editorial changes	HH	ME
5	D0	24.11.2021	External 1PPS description corrected and disciplining control input added, CE conformity added	HH	HH
6	D0	15.12.2021	Package size and outputs changed, phase noise updated, additional information & performance data added	HH	HH
6	D1	01.02.2022	Minor corrections	HH	HH
7	D0	08.09.2022	Mechanical frequency control (MCF) via trimmer at front panel removed, additional notes added/updated	HH	HH