AR- 133A-03

Rubidium Frequency Standard
High Stability Under Vibration

Features

- Short-term-stability: <1.2E-11 @ 1s (typical, improved version)
- Phase noise: -159dBc/Hz floor (typical)
- Outputs: 10MHz and 1PPS
- Input: 1PPS for discipling
- Supply voltage: 15 Vdc
- Steady-state power: <8W
- Size: 77 x 77 x 49.65 mm
- Vibration isolated

Applications

- Secure Communication
- ELINT
- C41

Description

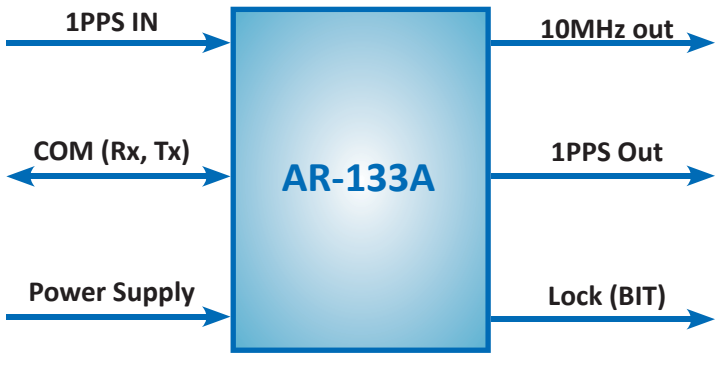
The AR133A-03 is a ruggedized version of Rubidium Frequency Standard model AR133A which is designed for airborne applications. A vibration isolator included in the AR133A-03 enables the unit to maintain high frequency stability and accuracy in vibration environments such as airborne platforms.

The unit features very fast warm-up and could be disciplined to an external 1PPS from GPS or other sources. It is one of the smallest, high performance disciplined rubidium frequency standards available today. The AR133A is comprised of a unique DFLL (Digital Frequency Lock Loop) where a high performance crystal oscillator is locked to the rubidium atomic line using an embedded microprocessor and a special patented algorithm.

Performance Specifications

All specifications defined at 25°C, quiescent conditions, ambient sea level and nominal supply voltage unless otherwise specified.

Input & Outputs	
Outputs	- 10MHz sine wave +12±2 dBm into 50Ω
	1PPS, 3V TTL into 50Ω Rise time < 10nSec Pulse width <20µSec (in AR-133A-03-02 the pulse width is 400µSec
Input	1PPS TTL 50Ω
Monitor & Control	RS-232 control and monitor interface provides: ID, Status, frequency adjustment. Protocol: 9600, 1, 8, 1, no parity for details see software ICD
	Digital frequency adjustment: 7.6E-13 steps over > 5E-7 range



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Performance					
Frequency	Short Term Stability	Improved Version (*)	<1.5E-11 @ 1 second (typical < 1.2E-11 @ 1 second) < 2E-11 @ 1sec – under vibration		
		Standard Version (*)	< 3E-11 @ 1 second		
	Phase Noise		Quiescent	Quiescent (Typical)	Under Vibration (Typical) *see also the phase noise plots below*
			<-110 dBc/Hz @ 10Hz <-135 dBc/Hz @ 100Hz <-150 dBc/Hz @ 1kHz <-155 dBc/Hz @ 10kHz	<-121 dBc/Hz @ 10Hz < -146 dBc/Hz @ 100Hz < -156 dBc/Hz @ 1kHz < -159 dBc/Hz @ 10kHz	<- 121dBc/Hz @ 10Hz <- 125 dBc/Hz @ 100Hz <- 145dBc/Hz @ 1kHz <- 159dBc/Hz @ 10kHz
	Harmonics		< -50 dBc (up to 70MHz)		
	Spurious		< -105 dBc in the range 10Hz to 100kHz from carrier		
	Warm-up	Improved Version (*)	Typical time to lock 2.5 minutes @ 25°C		
		Standard Version (*)	< 5E-8 (Lock) within 4 minutes @ 25°C ±5E-10 within 5 minutes @ 25°C		
	Retrace		< 5E-11 with on-off-on cycle: 24 hours, 48 hours, 12 hours		
	Accuracy @ Shipment		< 5E-11		
	Magnetic Field Sensitivity		< 8E-11 / gauss up to 3 gauss DC (worst direction)		
	Long Term Stability (Free run Rubidium aging)		<±5E-10 / year (after 3 month operation) (for improved aging contact factory)		
	Accuracy under disciplining		Disciplined to external 1PPS - <±1E-11 (averaging from 30-90 minutes after power up)		
	Temperature Stability and Range		±3E-10 relative to 25°C over -20°C to +65°C (up to 70ºC in the improved version)		
Time Accuracy (1PPS)	Long Term Accuracy		±100ns (±50ns typ.) RMS relative to external 1PPS when disciplined	≤±1µs / 24 hrs. in holdover (typical) (after 4 hours of disciplining before holdover)	
Power Consumption			@ Steady-state	< 8.25W @ 25°C	
			@ Warm-up	< 18W@ 25°C	

(*) See how to order table below

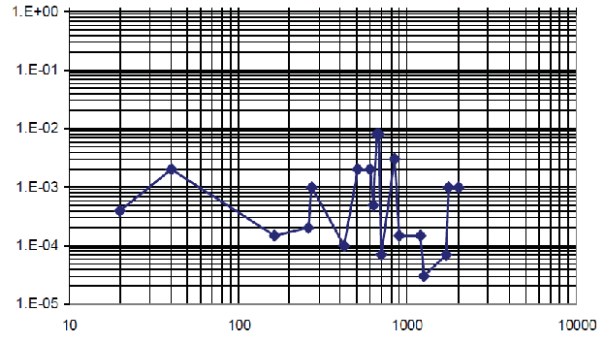
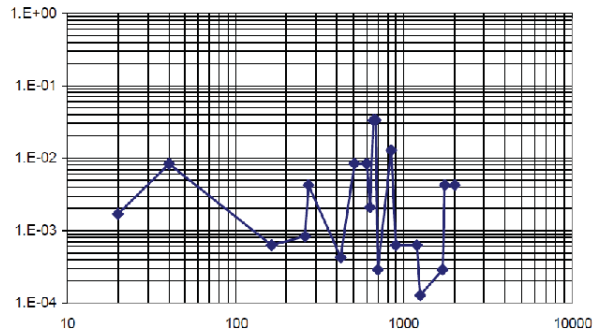
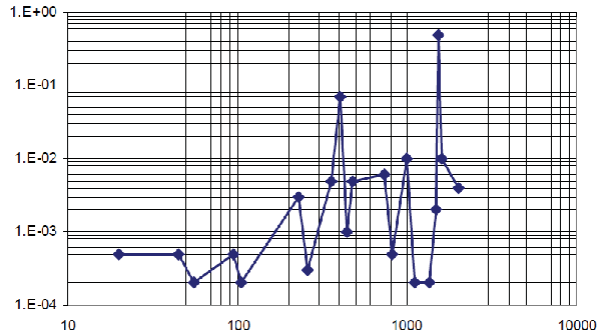
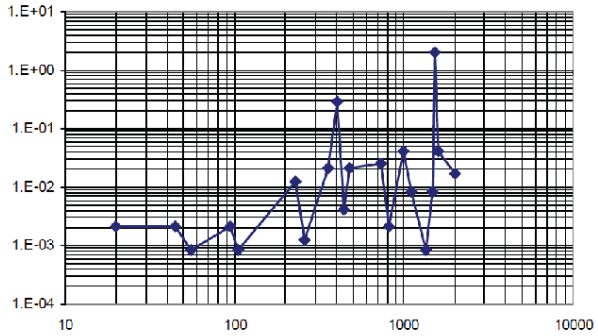
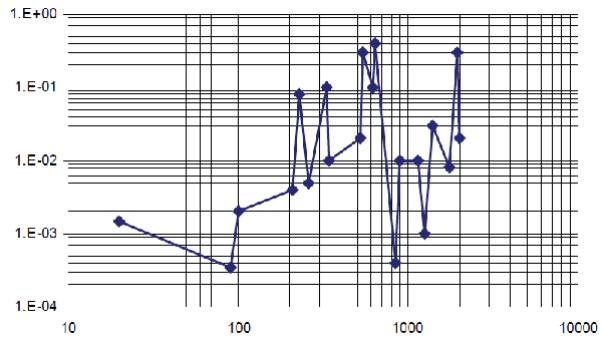
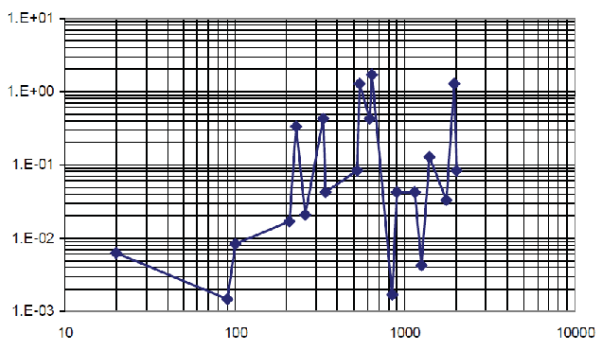
Power Supply, Dimensions & Weight	
DC	15±0.3 VDC
Size	77 mm x 77mm x 49.65 mm - for details see mechanical ICD
Weight	≤ 360 g

BIT and Remote Control	
Built In Test (BIT):	The Built in Test detects > 95% of all failures. Detected via pin number 3 in the D Type connector - open collector (10mA max). High impedance = BIT Fail; short to ground = BIT Pass & Lock. BIT also is obtained also via the serial communication (see software ICD)

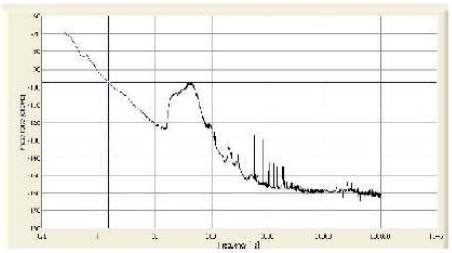
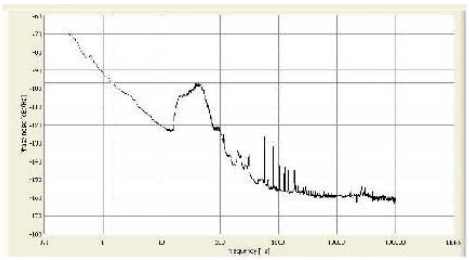
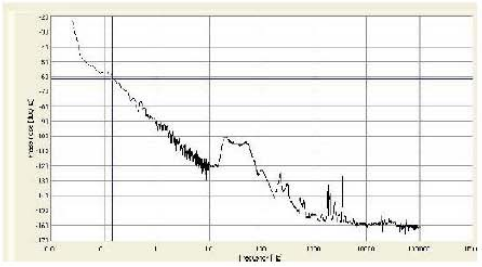
Environmental	
Operating Temperature	-20°C to +65 °C (up to 70°C in the improved version)
Storage Temperature	-40°C to +80°C
Humidity	95% at 35°C, non-condensed
Acceleration	9g operation, 17g non-operating
Vibration	See graphs below

Vibration Levels (g RMS)		
Axis	Operation	Survivability
X	1.1079	2.2713
Y	4.5346	9.2958
Z	8.376	17.1708

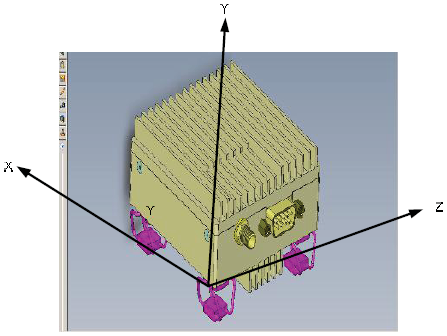
Vibration Profiles

Axis	Operating	Survivability (non-operating)
X		
Y		
Z		

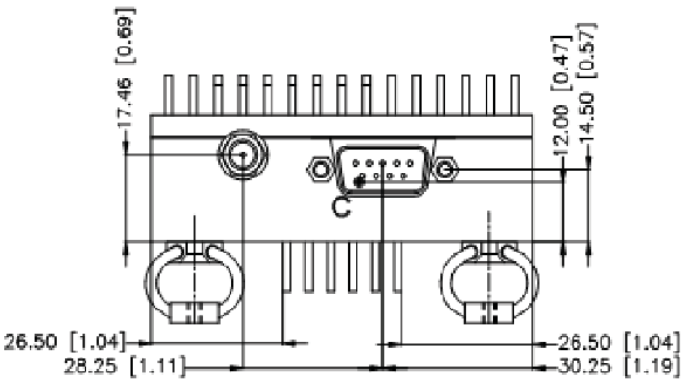
Phase Noise Under Vibration

X axis	Y axis	Z axis
		

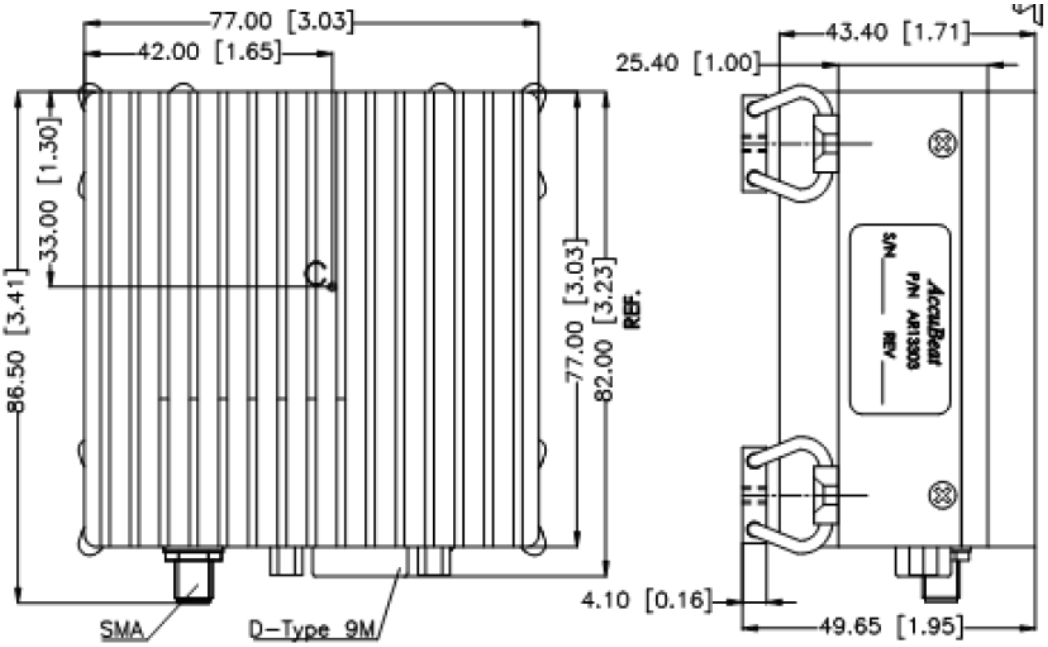
(*) The above plots are measurement results obtained with one of the units.

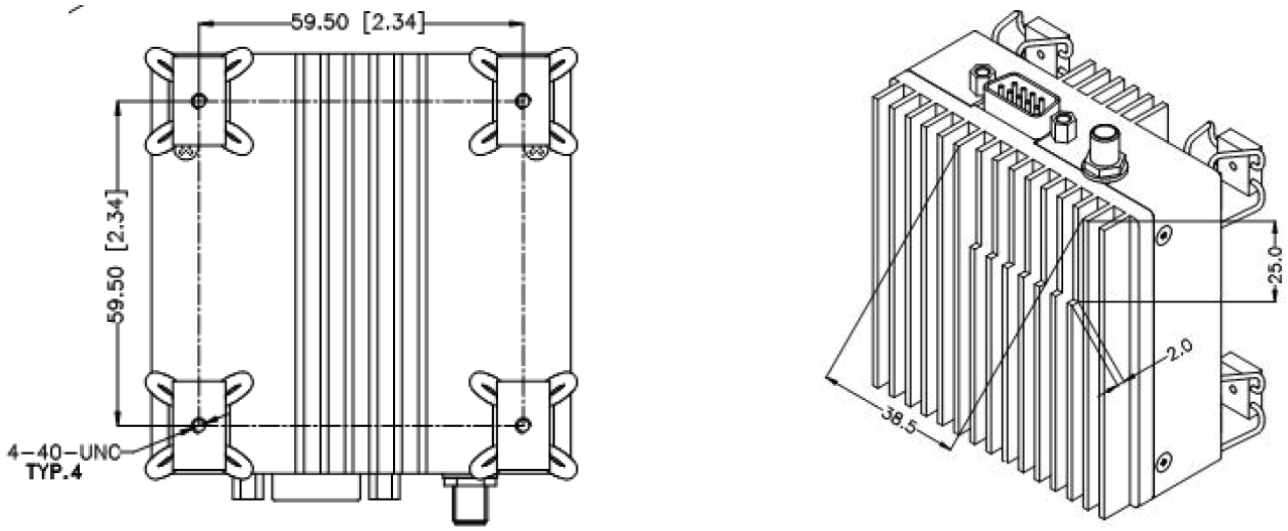


Mechanical & Electrical ICD



D-Type subminiature 9 pins (male)	
Pin 1	Supply
Pin 2	GND
Pin 3	Lock (BIT)
Pin 4	1PPS IN
Pin 5	Factory Use
Pin 6	TxD
Pin 7	Factory Use
Pin 8	1PPS OUT
Pin 9	RxD
SMA: RF OUT	





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How To Order

HOW TO ORDER		
Description	**Vectron P/N**	**Note**
Standard	**AR-133-03-01**	AR-133A with Vib. Isolator, Standard Performance
Improved	**AR-133-03-02**	AR-133A with Vib. Isolator, Improved Performance

ACCESSORIES (Option)		
Description	**Vectron P/N**	**Note**
Gui (Graphic User Interface)	**SW50029**	Custom GUI for AR-133A
Operation Cable	**AC50549**	Operation Cable for AR-133A with RS232 Com.

Revision History

Revision	Change Summary	Date
1.0	Product Release	May 2015

For Additional Information, Please Contact

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