

Rubidium Frequency Standard

AR133A-03

High Stability Under Vibration

Key Features

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



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.

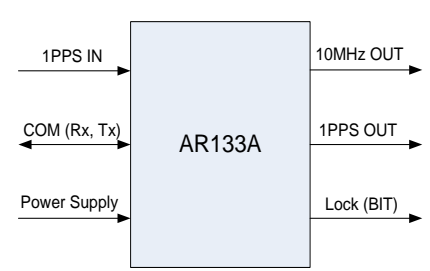
Applications

❖ Secure Communication

❖ ELINT

❖ C4I

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

PRODUCT SPECIFICATIONS		
Input & Outputs		
Outputs	10MHz sine wave +12±2 dBm into 50Ω	
	1PPS, 3V TTL into 50Ω Rise time < 10nSec Pulse width <20µSec (in AR133A-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	

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
			< -50 dBc (up to 70MHz)		
			< -105 dBc in the range 10Hz to 100kHz from carrier		
	Harmonics		< -50 dBc (up to 70MHz)		
	Spurious		< -105 dBc in the range 10Hz to 100kHz from carrier		
	Warm-up	Standard Version (*)	< 5E-8 (Lock) within 4 minutes @ 25°C ±5E-10 within 5 minutes @ 25°C		
		Improved Version (*)	Typical time to lock 2.5 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 70°C 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	< 8W @ 25°C	
			@ Warm-up	< 16W @ 25°C	

(*) See how to order table below.

AR133A-03 DATA SHEET 26.01.2016

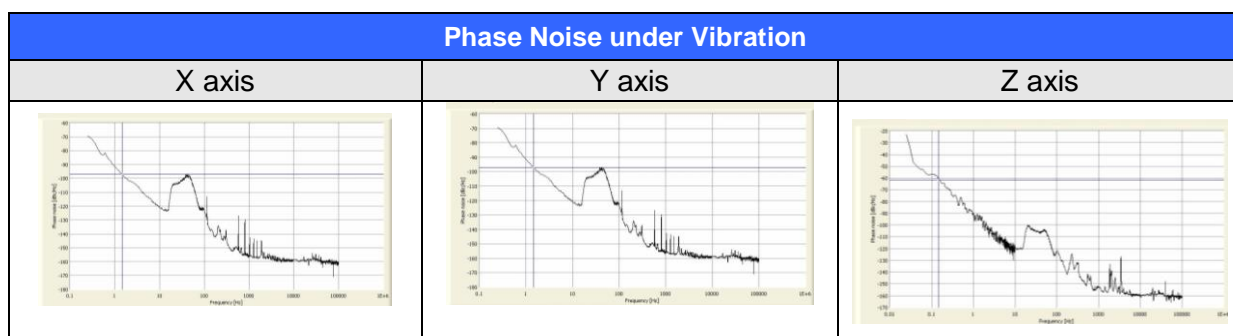
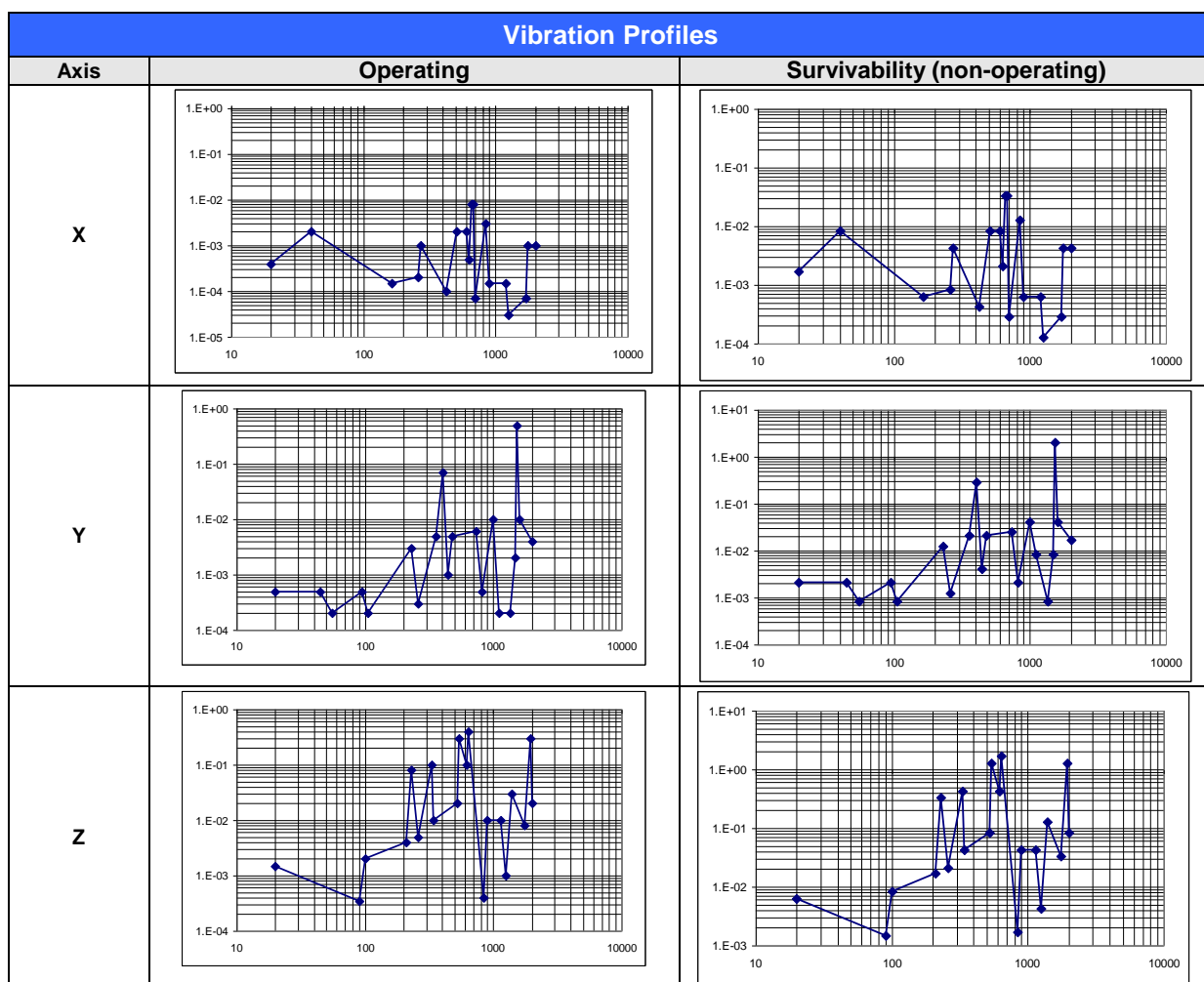
SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE. THE BINDING SPECIFICATIONS ARE ONLY THOSE STATED IN OUR

Power Supply, Dimensions & Weight	
DC	15±0.3 VDC
Size	77mm (width) x 77mm (depth) x 49.65 mm (high) – for details see mechanical ICD
Weight	≤ 360g

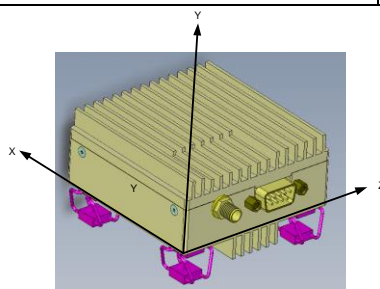
BIT and Remote Control	
Built In Test (BIT)	<p>The Built in Test detects > 95% of all failures.</p> <p>Detected via pin number 3 in the D Type connector - open collector (10mA max).</p> <p>High impedance = BIT Fail; short to ground = BIT Pass & Lock.</p> <p>BIT also is obtained also via the serial communication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

Environmental	
Operating Temperature	-20°C to +65 °C (up to 70°C in the improved version)
Storage Temperature	-40°C to +85°C
Humidity	95% at 35°C, non-condensing
Acceleration	9g operation, 17g non-operating
Vibration	See graphs below

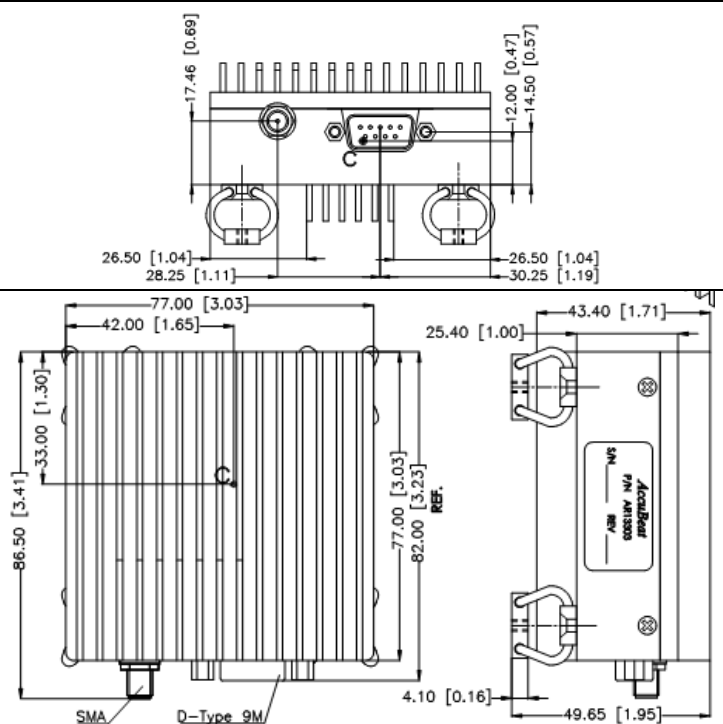
Vibration Levels (g RMS)		
Axis	Operation	Survivability
X	1.1079	2.2713
Y	4.5346	9.2958
Z	8.376	17.1708



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



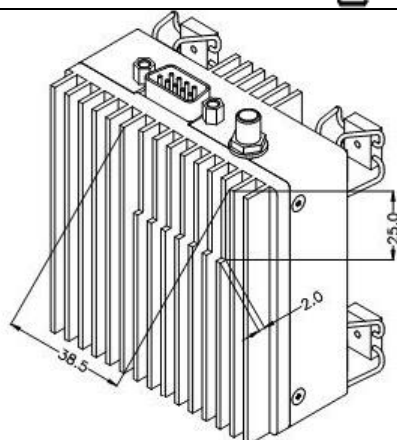
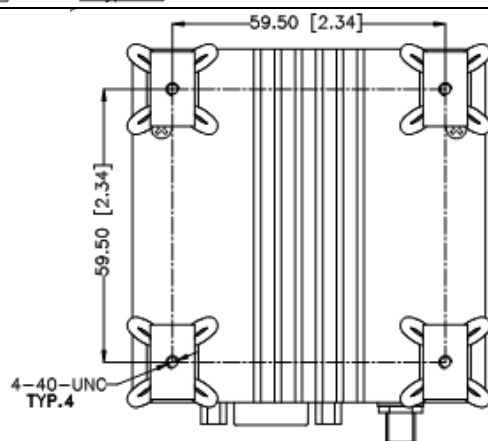
Mechanical & Electrical ICD



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 – Tx D
- Pin 7 – Factory use
- Pin 8 – 1PPS Out
- Pin 9 – Rx D

SMA: RF Out



NOTE:

Please pay attention to the mechanical structure of the unit, especially to the fins in the bottom side of the unit.



The customer should take in account the sway of the unit caused under vibration and shock conditions.

HOW TO ORDER		
Description	AccuBeat P/N	Note
Standard	AR13303-01	AR133A WITH VIB. ISOLATOR, STANDARD PERFORMANCE
Improved	AR13303-02	AR133A WITH VIB. ISOLATOR, IMPROVED PERFORMANCE

ACCESSORIES (OPTION)		
Description	AccuBeat P/N	Note
GUI (Graphic User Interface)	SW50029	CUSTOMER GUI FOR AR133A
Operation cable	AC50549	OPERATION CABLE FOR AR133A WITH RS232 COM.