

## Rubidium Frequency Standard

### High Stability Under Vibration

The **AR133-03** 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



### 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

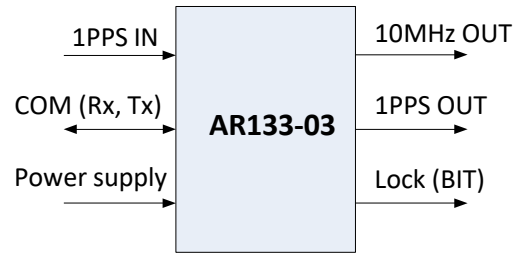
The **AR133-03** features very fast warm-up and could be disciplined to an external 1PPS from GPS or other sources. It is one of the smallest, high performance disciplined rubidium frequency standards available today. The AR133-03 is comprised of a unique *DFLL (Digital Frequency Lock Loop)* where a high performance crystal oscillator is locked to the rubidium atomic line using an embedded microprocessor and a special patented algorithm.

### Applications

All specs are @ 25°C, quiescent conditions and sea level ambient unless otherwise specified

## Specifications

Input & Outputs	
<b>Outputs</b>	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)
<b>Input</b>	1PPS TTL 50Ω
<b>Monitor &amp; Control</b>	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		
	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	

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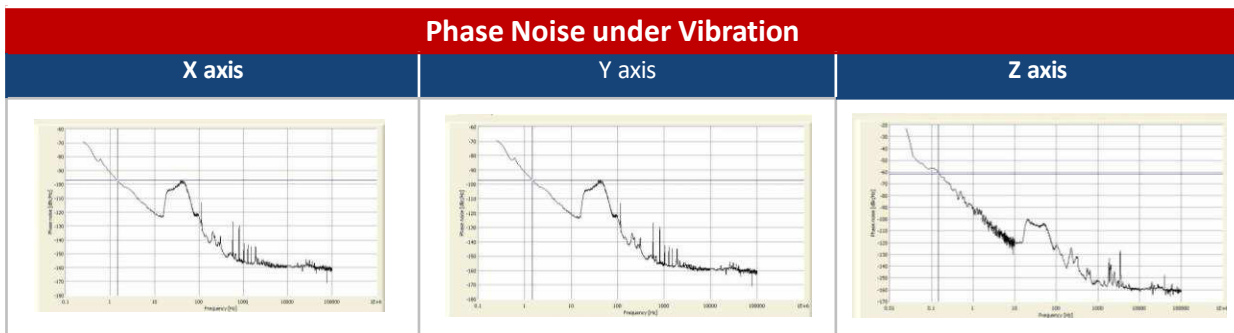
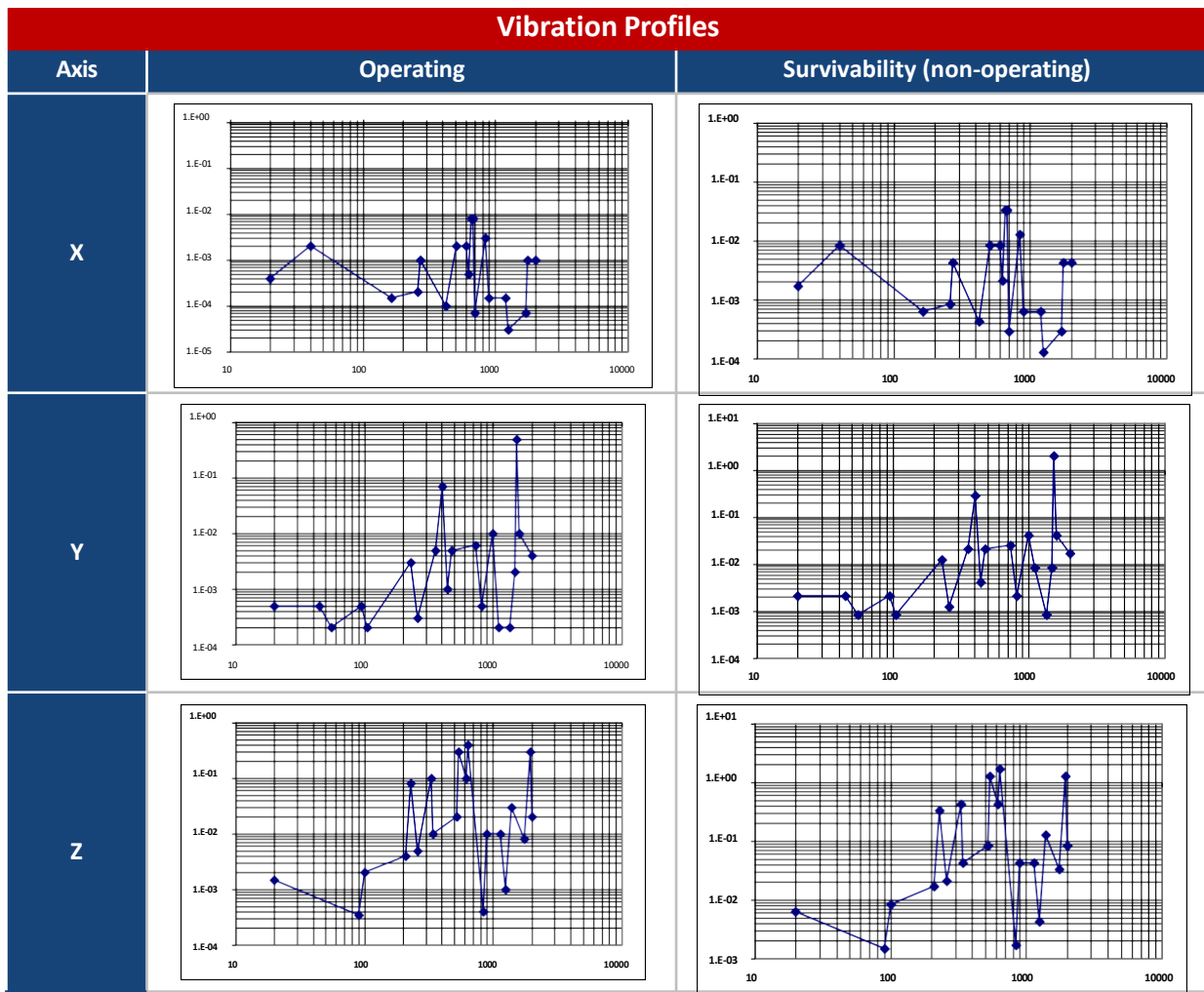
Power Supply, Dimensions & Weight	
DC	15±0.3 VDC
Size	77mm (width) x 77mm (depth) x 49.65 mm (high) – for details see mechanical ICD
Weight	≤ 360g

BIT and Remote Control	
Built In Test (BIT)	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)

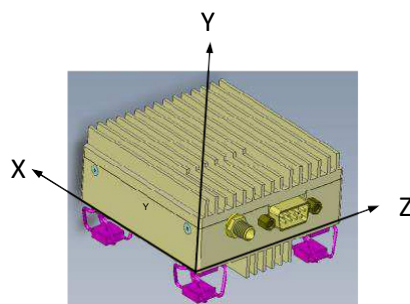
Environmental	
Operating Temperature	-20°C to +65 °C (up to 70°C in the improved version)
Storage Temperature	-40°C to +85°C
Humidity	95% at 35°C, non-condensing
Acceleration	9g operation, 17g non-operating
Vibration	See graphs below

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

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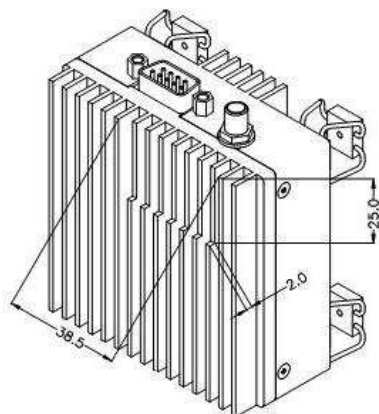
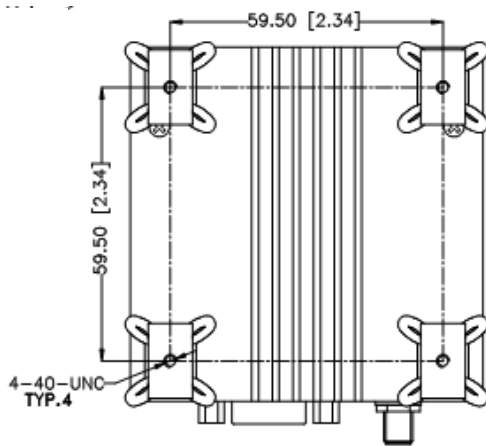
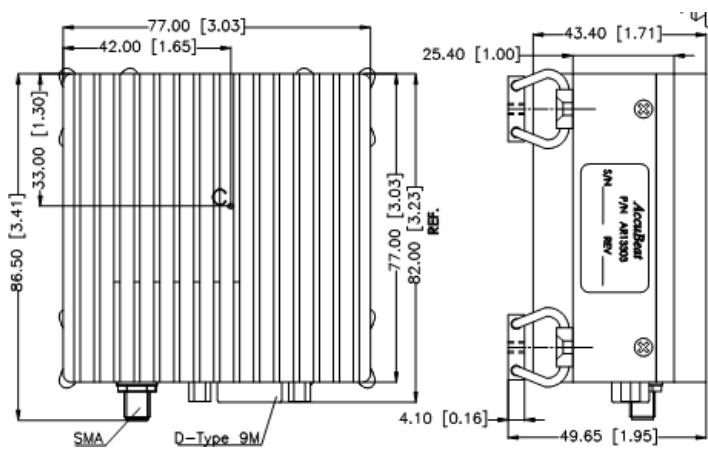
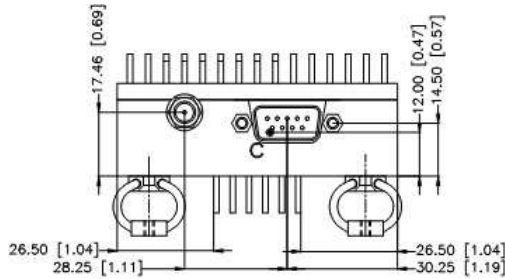


(\*) The above plots are measurement results obtained with one of the units



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**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**

**NOTE:**

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

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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.