

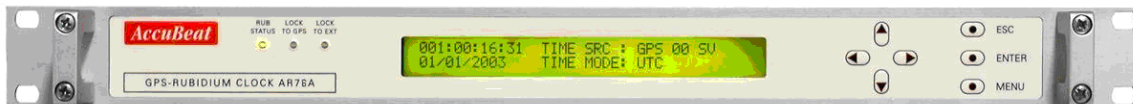
GPS-Disciplined Rubidium Clock

AR76A-00

Industrial, Multi Function

Key Features

- ❖ Frequency Accuracy : 1E-12
- ❖ 1PPS Accuracy: 30ns relative to GPS
- ❖ Holdover: 1µs/24 hours, 5E-11/month
- ❖ 10 coax outputs (2 fixed, 8 configurable): 10MHz, 1PPS, IRIG B and more
- ❖ TOD (IRIG B) - input & output
- ❖ Network Time Server: NTP server V3 per RFC1305 ≤1ms
- ❖ 12 channel c(a) code GPS receiver, Option - P(Y) code (SAASM) receiver
- ❖ SNMP Monitor & Control (opt.)
- ❖ 3 x LAN interfaces (opt.)
- ❖ Display of Time, Date, Status & BIT
- ❖ Delay Correction for Input & Output
- ❖ RS232 Monitor & control
- ❖ Supply Voltage: 90/260 VAC (DC or DC&AC – opt.)
- ❖ Graphic User Interface (GUI) Software for PC (opt.)



Description

The **AR76A** is a **Rubidium Atomic Clock**, which is synchronized to the **Global Positioning System (GPS)**, thereby providing extremely accurate time & frequency.

The AR76A incorporates numerous features into a single box, including a Rubidium Standard, an internal GPS receiver (or input from external 1PPS) and Rubidium-GPS DPLL (disciplining) circuit. The various options include a variety of different output frequencies and several output Time Codes. The Rubidium Standard is phase-locked to the GPS or to other inputs. All outputs are derived from the Rubidium Clock, which maintains the accurate time and frequency when GPS or other inputs are interrupted.

The unit includes up to three physical LAN interfaces and supports UDP (SNMP – opt.) for management and NTP. A typical configuration is to use two LAN cards for external applications and one LAN card for redundancy. Another configuration is to use all three LAN connections for three different networks (with three different IP network addresses).

The AR76A provides multiple outputs: 10 coax outputs with two fixed ones (10MHz and 1PPS) and where the others configurable outputs are selected from 1PPS, 10MHz, TOD (IRIG B) and more. Additional outputs are available on the D-Type connector including differential RS232 outputs, TOD outputs and more.

The AR76A uses a 19" x 1U rack-mountable encasement.

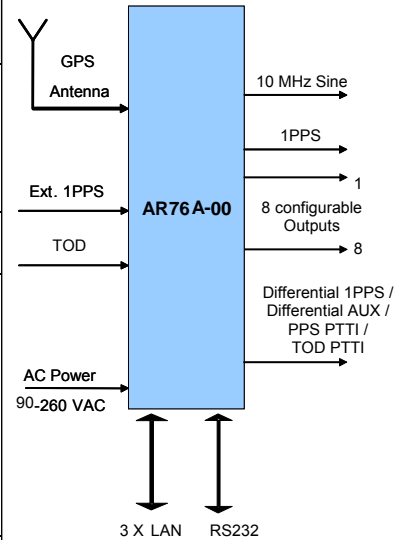
Applications

- ❖ Test Equipment
- ❖ Scientific Equipment
- ❖ Calibration
- ❖ Telecommunication
- ❖ TV Stations
- ❖ Cellular Base Stations
- ❖ Mobile Radio Base Stations
- ❖ C4I

SPECIFICATIONS

All specs are at room temperature, quiescent conditions, sea level ambient unless otherwise specified

Input & Outputs			
		Basic Configuration	Options
Outputs	Coax Connectors	2 fixed outputs	1PPS (TTL/50Ω) 10MHz (sine)
		8 configurable outputs	Selected from: 1PPS (TTL/50Ω), 10MHz (sine / square), TOD (IRIG B (AM)),
	D Type Connector	4 x 1PPS (Differential RS-422) 2 x 10MHz (Differential RS-422) 5 x 1PPS (PTTI) 5 x TOD (PTTI)	Square-wave signals: 1MHz, 2.048MHz 5MHz, 10MHz and more <i>For details contact factory</i>
	H/W BIT (open collector)		
LAN	The unit includes up to 3 LAN ports (option). Each can be configured as NTP or UDP or SNMP (option).		
Inputs (*)	GPS Antenna / 50Ω		
	Coax Connectors	Frequency input: 1PPS (TTL/50Ω), 10MHz and more. TOD input: IRIG-B AM (1KHz modulated, 4Vptp/ 600Ω)	1PPS : ICD-GPS-060 Frequency: 1MHz, 5MHz, 2.048MHz and more
Monitor & Control	<ul style="list-style-type: none"> RS-232 (single ended and differential), PC channel for data remote control UDP SNMP (as an option) 		



(*) Inputs priorities for synchronization: (1) 1PPS (2) TOD (IRIG B) (3) GPS

(**) Manual setting of data via display keypad or via the communication channels (RS232 or LAN)



SPECIFICATIONS *(continue)*

All specs are at room temperature, quiescent conditions, sea level ambient unless otherwise specified

Performance			
Mode of work		Disciplined to GPS or to Ext. 1PPS	Free running Rubidium-Standard
Time (1PPS)	Long- term accuracy	30ns RMS relative to GPS or Ext. input @ 25°C	1 µs/ 24 hours (Typical)
Frequency	Long Term Stability	≤ 1E-12	5E-11 / month
	Short Term Stability	3E-11 @ 1s, 3E-12 @ 100s	
	Temperature Stability	±2E-10 over -10°C to +60°C	
	Phase Noise (10MHz, Quiescent)	Specification ≤-95dBc/Hz @ 10Hz ≤-130dBc/Hz @ 100Hz ≤-140dBc/Hz @ 1KHz ≤-143dBc/Hz @ 10KHz	Typical Results ≤-100dBc/Hz @ 10Hz ≤-130dBc/Hz @ 100Hz ≤-144dBc/Hz @ 1KHz ≤-148dBc/Hz @ 10KHz
	Harmonics (10MHz)	≤-48dBc	
	Spurious (10MHz)	≤-75dBc @±100KHz	
	Warm-up time	Rb Lock < 4 min 5E-11 within < 60 min, 1E-11 within < 4hrs 1E-12 within < 24 hrs.	

Environmental	
Operating Temperature	-10°C to +65 °C -20°C to +70°C, emergency for one hour
Storage Temperature	-20°C to +85°C
Humidity	Up to 95% at 35°C, non-condensing
Vibration (non-operating)	Method 514.3 (2.5g RMS, 5-500Hz) & RTCA/DO 160D Section 8.7.2, Table 8-1, Figure 8-1, Curve B

GPS Receiver	
GPS Tracking	L1 frequency 1575 MHz C/A code (SPS) 12 parallel tracking channels. Option to install P(Y) code SAASM GPS receiver. For more details contact factory.
GPS Position	Latitude, Altitude, longitude
Position Accuracy	Latitude, Altitude: < 6m (CEP 50%) Altitude: < 11m (CEP 50%)
Acquisition Time (Typical)	Warm start 45 second, Cold start < 50 second (worst case)
GPS Antenna DC Voltage	5VDC

LAN	
NTP server	LAN – NTP server V3 per RFC1305 ≤ 1ms
LAN Options	The unit includes up to 3 LAN boards and functions with different modes: <ol style="list-style-type: none"> 1. Each LAN board has different IP serving 3 separates networks. 2. Two active boards and one redundant board for high reliability



Front panel display & indications and GUI

Display	<p>The LCD front panel display enables the user to view internal parameters and to configure the unit (without PC).</p> <p>NOTE: some configurations still require use of CLI and a PC..</p> <p>Display Data: time, date, position, BIT, GPS parameters (antenna current, satellite status) and more.</p> <p>Unit settings: time source, 1PPS output delay and more.</p> <p>Florescent display is available as option (instead of the LCD display).</p>	
LED Indications	3 LEDs on the front panel: Status, Lock to GPS, Lock to Ext	
Graphic User Interface (GUI) Software for PC	<ul style="list-style-type: none"> o Time/date display o Time source o Time zone o Satellites in view o Navigation data from GPS o Leap seconds (from UTC to GPS) o BIT (Built In Test) o IP address configuration 	<ul style="list-style-type: none"> o Antenna Cable delay o Ext Input Delay o 1PPS output delay o Comm. Parameters o Daylight Saving/ STD o Time Setting GPS/UTC/LOCAL o Additional parameters

Power Supply

Power Supply	90-260 VAC 47/63 Hz (DC power supply as an option. 28VDC± 4V, -48VDC)	
Power Consumption	< 35W Warm-up , < 20W Steady state	
Power Supply Redundancy (option)	<p>There are several option for power supply redundancy:</p> <ol style="list-style-type: none"> 1. DC power supply: the unit includes two internal DC / DC converters. When one converter failed, the other one is automatically selected (warm redundancy). 2. AC power supply: the unit supplied with an AC power source, when the main source is fails or shut down, the supply switch automatically to the backup batteries (note: this option requires an external adaptor cable). 	

Dimensions & Weight

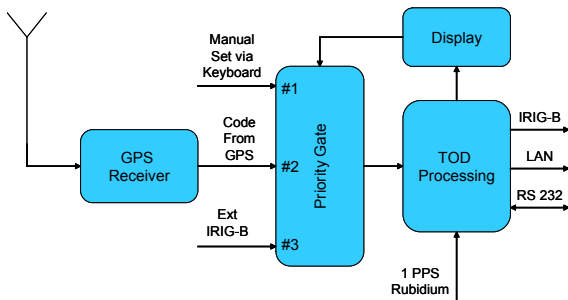
19" x 1U Rack Mount	Size	19" X 1U (1.75") X 16"
	Weight	< 4.5kg

MTBF

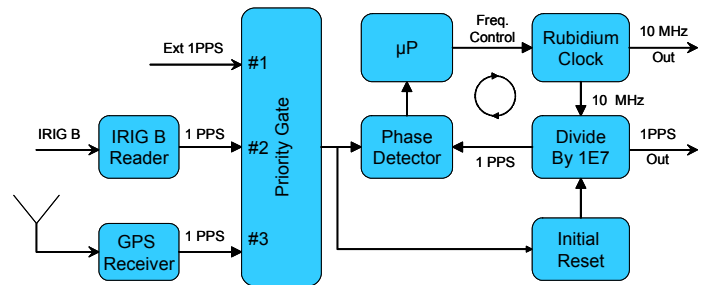
MTBF	> 153,000 Hours @ 30°C, GB, ,MIL-HDB-217F
-------------	---

Principles of Operation

The following block diagrams describe the operation of the **AR76A**. The unit includes Rubidium Clock and accepts inputs from either internal GPS receiver, or external GPS. All outputs are derived from the internal Rubidium Clock, which is phase-locked via a digital PLL to the internal GPS receiver or to one of the external inputs. In this way, the Rubidium Clock follows the GPS long term accuracy and cleans the jitter and the noise on the short/medium-term. When the GPS reception is lost, for short or long periods of time, the Rubidium continues to maintain accurate time and frequency.

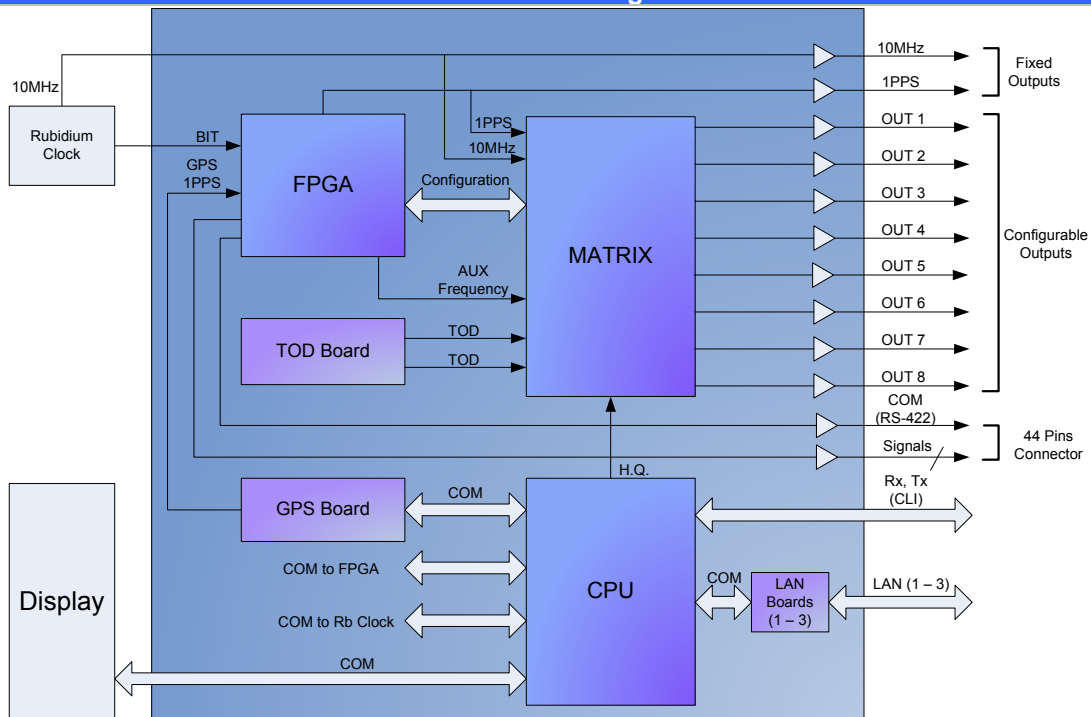


Data flow & Inputs Selection



Rubidium-GPS D-PLL and Inputs

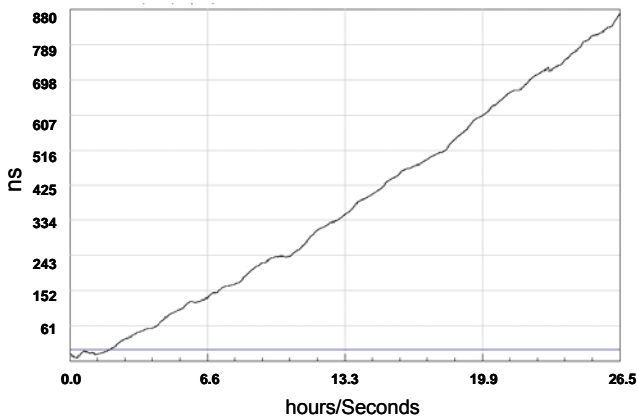
General Block Diagram



SPECIFICATIONS *(continue)*

All specs are at room temperature, quiescent conditions, sea level ambient unless otherwise specified

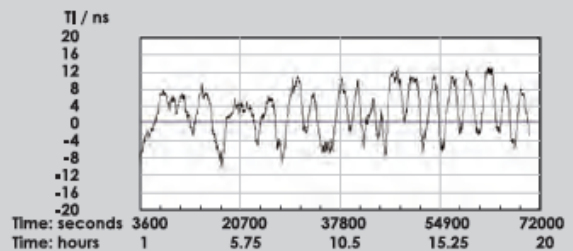
Typical Performance Plots



Typical time error in Holdover (without GPS)

GPS-Rubidium Typical Time Error (5.4ns RMS)

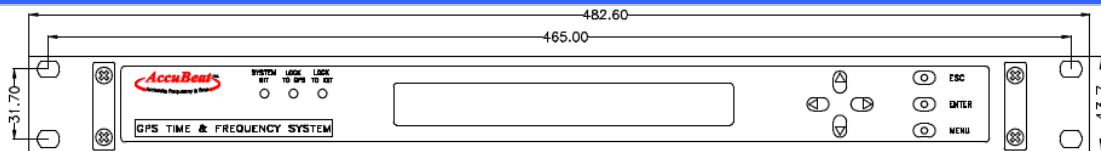
Between two systems @ 25°C



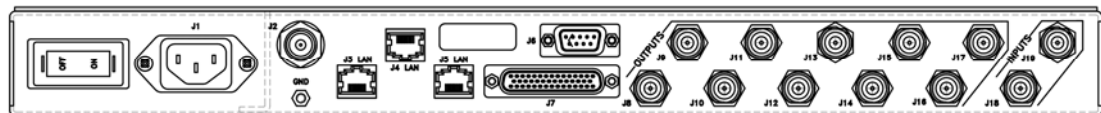
Typical time error fluctuations when disciplined to GPS

Electrical ICD			
Connector	Description	Standard Type	Options
J1	Power supply	AC, Standard Inlet (IEC320) C14)	28VDC / -48VDC
J2	GPS antenna	TNC, Female	
J3 – J5	LAN	RJ-45	
J6	CLI and Overall BIT	D9, Female	
J7	Additional I/O	D type, 44 pin, Female	
J8 – J17	Coax outputs	BNC, Female	TNC, Female
J18 - J19	Inputs	BNC, Female	TNC, Female

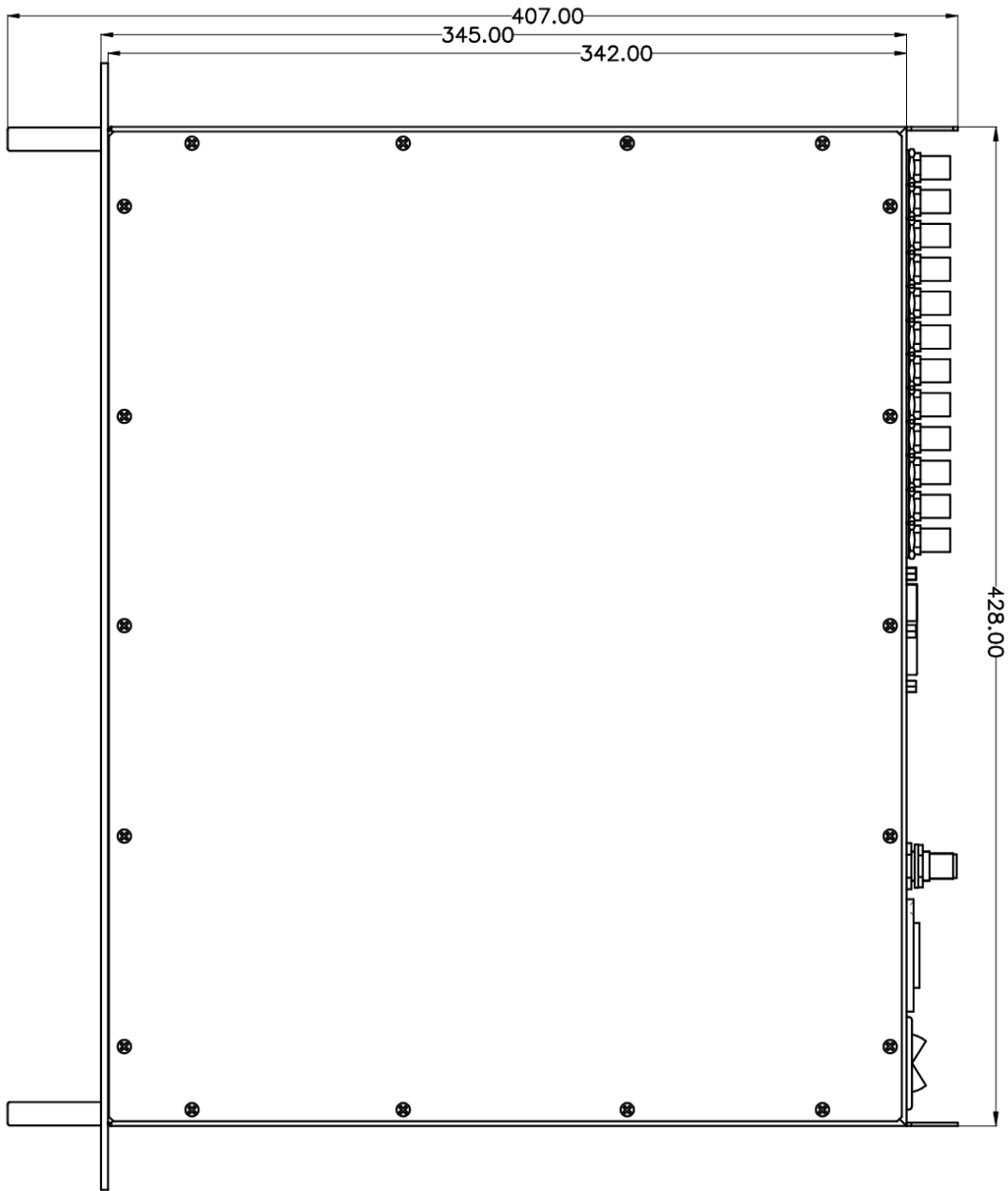
Mechanical ICD



Front panel



Rear panel



Upper view



HOW TO ORDER

AccuBeat P/N	Monitor & Control		GPS Type	Coax I/O Connectors Type	Power Supply	Outputs		
	RS-232	LAN				J7 (44 pins Connector)	J9 – J15	J16
AR76000 (Basic Configuration)	√	1 port (UDP, NTP)	C/A code	BNC	AC	As described in the data sheet above	As described in the data sheet above	1PPS (TTL/50Ω)
For all other options – contact factory								

AccuBeat Ltd, 5 Ha'Marpeh St., Har Hotzvim, P.O.Box 45012, Jerusalem 91450, Israel
 Tel: +972-2-5868330, Fax: +972-2-5868550, E-Mail: marketing@accubeat.com
<http://www.accubeat.com>