

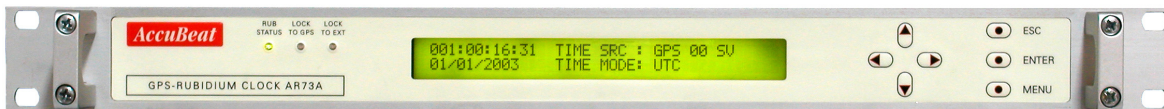
## GPS-Disciplined Rubidium Clock

### AR73A-16

### Industrial/Semi Military

#### Key Features

- ❖ Frequency Accuracy :  $2E-12$
- ❖ 1PPS Accuracy: 100ns relative to GPS
- ❖ Holdover: 1 $\mu$ s/24 hours, 5E-11/month
- ❖ Outputs: 3x10MHz, 3x1PPS (TTL/50 $\Omega$ ), IRIG-B, RS232, 1PPS (ICD-GPS-060 opt.)
- ❖ AUX Outputs: 1MHz (10PPS/Have Quick/5MHz as an option)
- ❖ Inputs: 1 PPS, IRIG-B
- ❖ UTC/GPS Time Source
- ❖ Delay Correction for Input & Output
- ❖ Network Time Server: NTP Time Accuracy < 300  $\mu$ s
- ❖ Display of Time, Date, Status & BIT
- ❖ RS232 Remote control
- ❖ Supply Voltage: 90/260 VAC
- ❖ Graphic User Interface (GUI) Software for PC (opt.)



#### Description

The **AR73A-16** is a **Rubidium Atomic Clock**, which is synchronized to the **Global Positioning System (GPS)**, thereby providing extremely accurate time & frequency.

The AR73A-16 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. Various options include a variety of different output frequencies, display options and several output Time Codes. The Rubidium Clock is phase-locked to the GPS or to other inputs. All outputs are derived from the Rubidium Clock, which maintains time and frequency when GPS or other inputs are interrupted.

The AR73A-16 is based on a 19" x 1U rack-mountable encasement.

It is available as a basic standards version with various options denoted as Additional Options.

Special Note: AccuBeat specializes in customized solutions based on the customer's distinctive requirements.

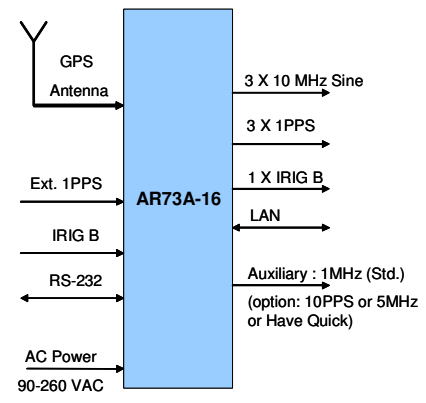
#### Applications

- ❖ Test Equipment
- ❖ Scientific Equipment
- ❖ Calibration
- ❖ Telecommunication
- ❖ Secure Communication
- ❖ TV Stations
- ❖ Cellular Base Stations
- ❖ Mobile Radio Base Stations
- ❖ Internet

## SPECIFICATIONS

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

Input & Outputs							
<b>Outputs</b>	3 x 10MHz sine wave, 5±2dBm/ 50Ω						
	3 x 1PPS (TTL/50Ω) 1PPS (ICD-GPS-060 opt.)						
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%; padding: 5px;">AUX Output*</td> <td style="width: 15%; padding: 5px;">1MHz</td> <td style="padding: 5px;"> <u>Options:</u> <ul style="list-style-type: none"> <li>10PPS TTL/ 50Ω 64% Duty Cycle</li> <li>Have-Quick (ICD-GPS-060)</li> <li>5MHz</li> </ul> </td> </tr> <tr> <td colspan="2" style="padding: 5px;">IRIG B 1KHz modulated (4Vptp/ 600Ω)</td> <td style="padding: 5px;"> <u>Options:</u> <ul style="list-style-type: none"> <li>IRIG B 4Vptp/ 50Ω</li> <li>IRIG-B Abolishment (AUX output will be cancel too in this option)*</li> </ul> </td> </tr> </table>	AUX Output*	1MHz	<u>Options:</u> <ul style="list-style-type: none"> <li>10PPS TTL/ 50Ω 64% Duty Cycle</li> <li>Have-Quick (ICD-GPS-060)</li> <li>5MHz</li> </ul>	IRIG B 1KHz modulated (4Vptp/ 600Ω)		<u>Options:</u> <ul style="list-style-type: none"> <li>IRIG B 4Vptp/ 50Ω</li> <li>IRIG-B Abolishment (AUX output will be cancel too in this option)*</li> </ul>
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LAN – NTP < 300µs							
<b>Input</b>	GPS Antenna / 50Ω						
	1PPS / 50Ω (1PPS ICD-GPS-060 opt.)						
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	Manual setting of data via display keypad or via PC (RS232)						
Inputs Priorities for synchronization: (1) 1 PPS, (2) IRIG B , (3) GPS							
<b>Monitor &amp; Control</b>	RS-232 , PC channel for data remote control						



Performance			
Mode of work:		Disciplined to GPS or to Ext. 1PPS	Free running Rubidium-Standard
<b>Time (1PPS)</b>	<b>Long- term accuracy</b>	100ns RMS relative to GPS or Ext. input @ 25°C without S/A	1 µs/ 24 hours
<b>Frequency</b>	<b>Long Term Stability</b>	<2E-12	5E-11 / month
	<b>Short Term Stability</b>	3E-11 @ 1s, 3E-12 @ 100s	
	<b>Temperature Stability</b>	±2E-10 over -10°C to +60°C	
	<b>Phase Noise</b> (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
	<b>Harmonics (10MHz)</b>	-48dBc	
	<b>Spurious (10MHz)</b>	-75dBc ±100KHz	
	<b>Warm-up</b>	5E-10 within <7 min ; 5E-11 within < 60 min 1E-11 within <4hrs ; 2E-12 within <24 hrs.	
	<b>Acquisition Time (Typical)</b>	Warm Start	<1min (90%).
	Cold Start	<3 min (90%).	

Environmental			
<b>Operating Temperature</b>	-10°C to +55 °C for AR73A-16 unit -20°C to +70°C for antenna		
<b>Storage Temperature</b>	-20°C to +70°C for AR73A-16 unit -40°C to +70°C for antenna		
<b>Humidity</b>	Up to 95% at 35°C, non-condensed for AR73A-16 unit Up to 100% condensing, fully outdoor for antenna		
<b>Vibration (non-operating)</b>	MIL-STD-810D, Method 514.3 (2.5g RMS, 5-500Hz) & RTCA/D0 160D Section 8.7.2, Table 8-1, Figure 8-1, Curve B		
<b>Shock</b>	MIL-STD-810C, Method 516.2, Proc. I (7.5g / 30ms / Half sine) & RTCA/D0-160D Section 7, Paragraph 7.3.1 (15g/11ms)		
<b>EMI</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">MIL-STD-461C CE03, CS06, RE02 (14KHz-1MHz)</td> <td style="width: 50%;">MIL-STD-461D RS103, CS114, CS115, RS101</td> </tr> </table>	MIL-STD-461C CE03, CS06, RE02 (14KHz-1MHz)	MIL-STD-461D RS103, CS114, CS115, RS101
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## SPECIFICATIONS *(continue)*

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GPS Receiver	
<b>GPS Tracking</b>	L1 frequency 1575 MHz C/A code (SPS) 8 parallel tracking channels
<b>GPS Position</b>	Latitude, Altitude, longitude
<b>Position Accuracy</b>	Horizontal: < 6m (CEP 50%) Altitude: < 11m (CEP 50%) Option - DGPS- Position Accuracy 2m CEP 50% (for operating DGPS, RTCM at Baud rate of 4800 should be provided)
<b>GPS Antenna DC Voltage</b>	5VDC

BIT and GUI			
<b>LED Indications</b>	3 LEDs on the front panel: Power, Status, Lock to GPS, Lock to Ext		
<b>Graphic User Interface (GUI) Software for PC</b>	<table style="width: 100%; border: none;"> <tr> <td style="border: none; vertical-align: top;"> <ul style="list-style-type: none"> <li>o Time/date display</li> <li>o Time source</li> <li>o Time zone</li> <li>o Satellites in view</li> <li>o Navigation data from GPS</li> <li>o Leap seconds (from UTC to GPS)</li> <li>o BIT (Built In Test)</li> </ul> </td> <td style="border: none; vertical-align: top;"> <ul style="list-style-type: none"> <li>o Antenna Cable delay</li> <li>o Ext Input Delay</li> <li>o 1PPS output delay</li> <li>o Comm. Parameters</li> <li>o Daylight Saving/ STD</li> <li>o Time Setting GPS/UTC/LOCAL</li> <li>o Additional parameters</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li>o Time/date display</li> <li>o Time source</li> <li>o Time zone</li> <li>o Satellites in view</li> <li>o Navigation data from GPS</li> <li>o Leap seconds (from UTC to GPS)</li> <li>o BIT (Built In Test)</li> </ul>	<ul style="list-style-type: none"> <li>o Antenna Cable delay</li> <li>o Ext Input Delay</li> <li>o 1PPS output delay</li> <li>o Comm. Parameters</li> <li>o Daylight Saving/ STD</li> <li>o Time Setting GPS/UTC/LOCAL</li> <li>o Additional parameters</li> </ul>
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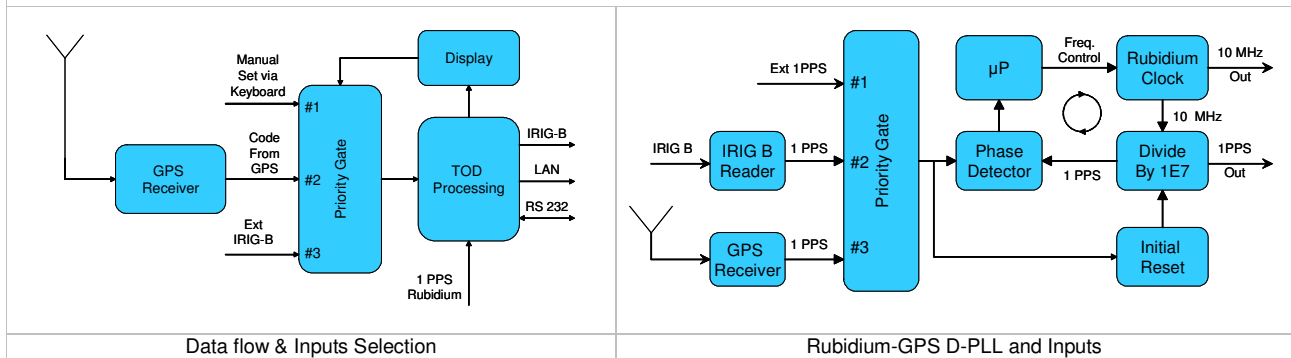
Power Supply	
<b>AC</b>	90-260 VAC 47/63 Hz

Dimensions & Weight		
<b>19" x 1U Rack Mount</b>	Size	19" X 1U (1.75") X 16"
	Weight	< 4kg

MTBF	
<b>@ mission profile</b> (35°C, 20% GM, 80% GF)	> 45,000 hours
<b>@ AIC 50°C</b>	> 20,000 hours

### Principles of Operation

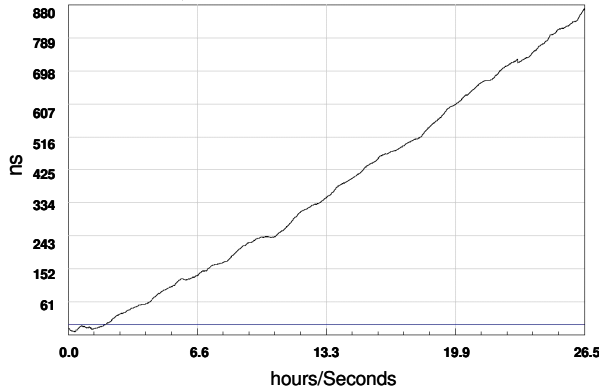
The following block diagrams describe the operation of the **AR73A-16**. The unit includes Rubidium Standard and accepts Input from either internal GPS receiver, or external GPS, or external 1PPS or external IRIG B. All outputs are derived from the internal Rubidium Clock, which is phase locked via a digital PLL to the internal GPS receiver or to one of the external inputs. Thus, the Rubidium Clock - frequency and time - follows the GPS and clean it's jitter and noise. If GPS reception is lost for short or long periods of time the Rubidium Clock continues to maintain accurate time and frequency.



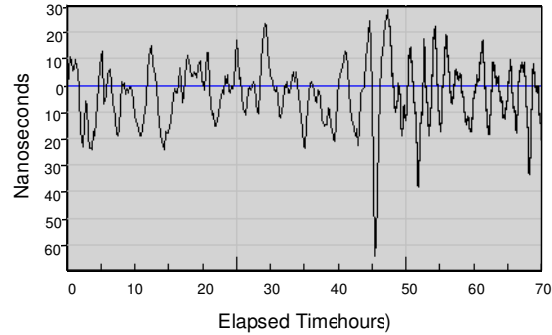
## SPECIFICATIONS (continue)

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### Typical Performance Plots

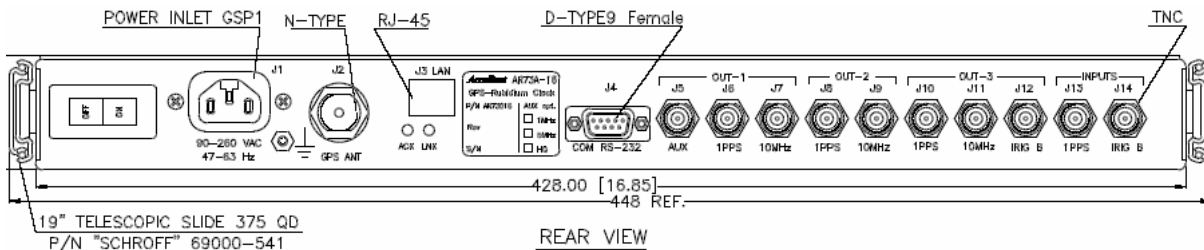


Typical time error in Holdover (without GPS)



Typical time error fluctuations when disciplined to GPS

### Mechanical ICD



## HOW TO ORDER

OPTIONS		AccuBeat P/N	Note
Number	Description		
00	1MHz (standards)	AR73016-00	
01	10 PPS	AR73016-01	TTL/ 50Ω 64% Duty cycle
02	HAVE QUICK	AR73016-02	
03	No IRIG-B & No AUX	AR73016-03	
04	5MHz	AR73016-04	
05	No IRIG-B & No AUX & No Navigation Values	AR73016-05	
06	1PPS ICD-GPS-060 output	AR73016-06	
07	OCXO instead of Rubidium, No IRIG-B	AR73016-07	

ACCESSORIES	AccuBeat P/N:
GPS Antenna 26 dB	EM30018
GPS Antenna 36 dB	EM30039
Antenna Cable RG-142 5m	AA50204
Antenna Cable RG-213 25m	AC50501
GUI Software for PC for Remote Control	SW50010

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