GPS-Disciplined Rubidium Clock

AR73A-11

Industrial

Key Features

- *Frequency Accuracy : 2E-12*
- *1PPS Accuracy: 100ns relative to GPS*
- *Holdover: 1µs/24 hours, 5E-11/month*
- *Outputs: 3x10MHz, 3x1PPS (TTL/50Ω), 1xIRIG-B* (AC), *Havequick (Options 2 & 6), RS232*
- *Inputs: 1 PPS TTL/50Ω, IRIG-B* (AC)
- *UTC/GPS Time Source*
- *Delay Correction for Input & Output*
- *Network Time Server: NTP server V3 per RFC1305*
- *Display of Time, Date, Status & BIT*
- *RS232 Remote control*
- *Supply Voltage: 22-32VDC.*
- *Graphic User Interface (GUI) Software for PC (opt.)*

Description

The AR73A-11 is a **Rubidium Atomic Clock,** which is synchronized to the **Global Positioning System (GPS)**, thereby providing extremely accurate time & frequency.
The AR73A-11 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-11 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

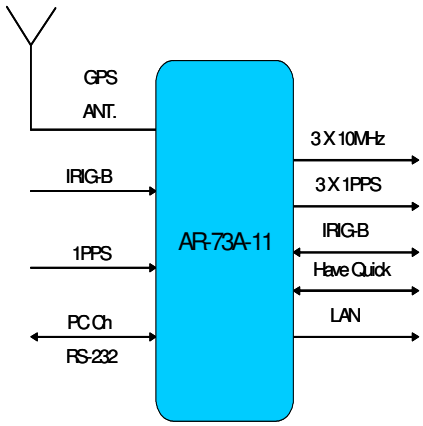
- Test Equipment
- Scientific Equipment
- Calibration
- Telecommunication
- TV Stations
- Cellular Base Stations
- Mobile Radio Base Stations
- Internet

SPECIFICATIONS

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

Input & Outputs

Outputs	3 x 10MHz sine wave, 5±2dBm/ 50Ω
	3 x 1PPS (TTL/50Ω)
	Have-Quick (ICD-GPS-060) – Options 2& 6.
	IRIG B AC 1KHz modulated (4Vptp/ 600Ω)
	LAN – NTP server V3 per RFC1305
Input	GPS Antenna / 50Ω
	1PPS TTL/ 50Ω
	IRIG B AC, 1KHz modulated (4Vptp/ 600Ω)
	Manual setting of data via display keypad or via PC (RS232)
	Inputs Priorities for synchronization: (1) 1 PPS, (2) IRIG B , (3) GPS
Monitor & Control	RS-232 , PC channel for data remote control



Performance

	Mode of work:	Disciplined to GPS or to Ext. 1PPS	Free running Rubidium-Standard
Time (1PPS)	**Long- term accuracy**	100ns RMS relative to GPS or Ext. input @ 25℃ without S/A	1 µs/ 24 hours (Typical)
Frequency	**Long Term Stability**	<2E-12	5E-11 / month
	Short Term Stability	3E-11 @ 1s, 3E-12 @ 100s	
	Temperature Stability	±2E-10 over -10℃ to +60℃	
	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 2E-12 within < 24 hrs.	

SPECIFICATIONS *(continue)*

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Environmental	
Operating Temperature	-10℃ to +60 ℃ for AR73A-11 unit -20℃ to +70℃ for antenna
Storage Temperature	-40℃ to +70℃ for AR73A-11 unit -40℃ to +70℃ for antenna
Humidity	Up to 95% at 35°C, non-condensed for AR-73A unit Up to 100% condensing, fully outdoor for antenna
Vibration (non-operating)	MIL-STD-810D, Method 514.3 & RTCA/D0 160D Section 8.7.2, Table 8-1, Figure 8-1, Curve B (2.3g RMS, 5-2000Hz)
Shock	MIL-STD-810C, Method 516.2, Proc. I (7.5g / 30mSec / Half sine) & RTCA/D0-160D Section 7, Paragraph 7.3.1 (15g/11mSec)
EMI	MIL-STD-461E CEO3, RE02, CS06, RS03

GPS Receiver		
GPS Tracking	L1 frequency 1575 MHz C/A code (SPS) 8 parallel tracking channels	
GPS Position	Latitude, Altitude, longitude	
Position Accuracy	Horizontal: < 6m (CEP 50%) Altitude: < 11m (CEP 50%)	
Acquisition Time (Typical)	Warm Start	<1min (90%).
	Cold Start	<3 min (90%).
GPS Antenna DC Voltage	5VDC	

BIT and GUI		
LED Indications	3 LEDS on the front panel: Power, Status, Lock to GPS, Lock to Ext	
Graphic User Interface (GUI) Software for PC	○ Time/date display ○ Time source ○ Time zone ○ Satellites in view ○ Navigation data from GPS ○ Leap seconds (from UTC to GPS) ○ BIT (Built In Test) ○ IP address configuration	○ Antenna Cable delay ○ Ext Input Delay ○ 1PPS output delay ○ Comm. Parameters ○ Daylight Saving/ STD ○ Time Setting GPS/UTC/LOCAL ○ Additional parameters

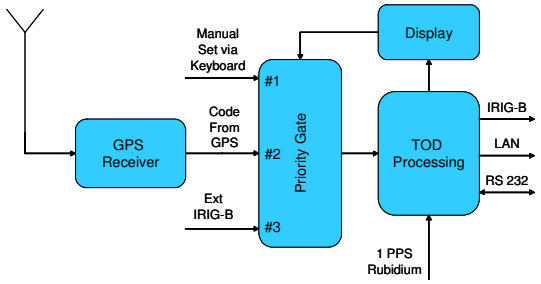
Power Supply	
DC	22-32V
Power	<45W Warm-up , <30W Steady state

Dimensions & Weight		
19" x 1U Rack Mount	Size	19" X 1U (1.75") X 11"
	Weight	< 2.5kg

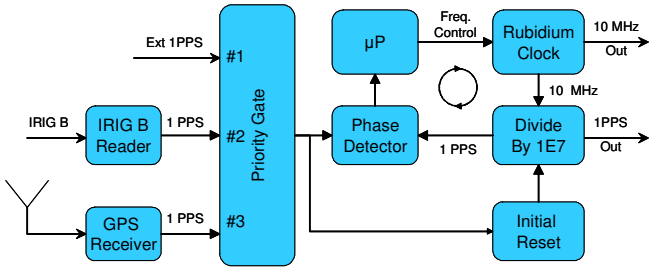
MTBF	
@ mission profile (35°C, 20% GM, 80% GF)	> 52,000 hours
@ mission profile AIC 50°C	> 25,000 hours

Principles of Operation

The following block diagrams describe the operation of the **AR73A-11**. 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.
Note: When two IRIG B inputs configuration is been used; only one input should be connected at a time.



Data flow & Inputs Selection



Rubidium-GPS D-PLL and Inputs

SPECIFICATIONS *(continue)*

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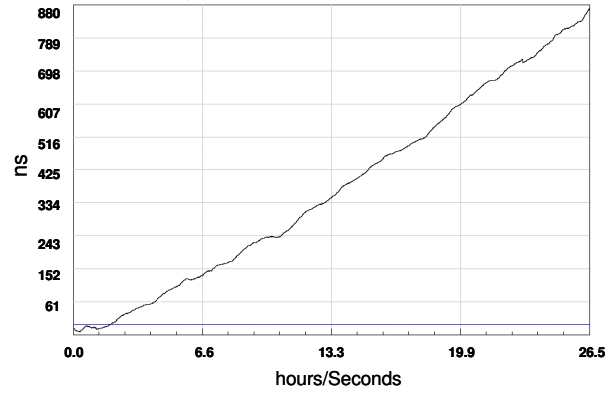
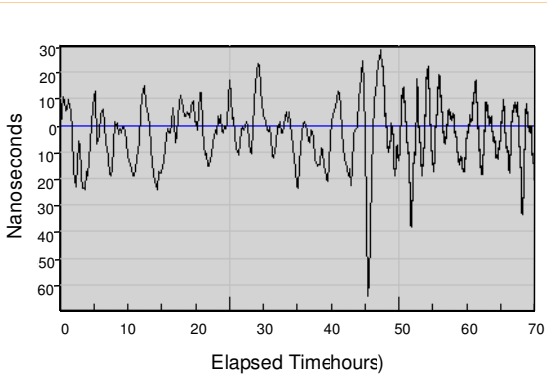
Typical Performance Plots

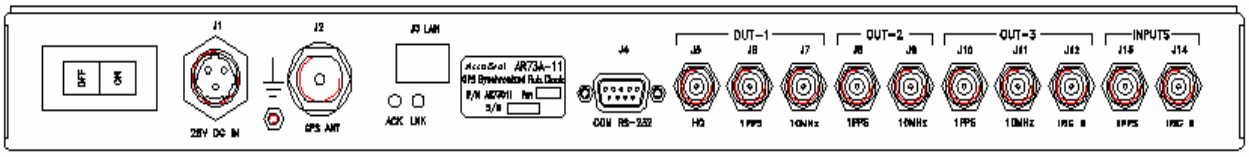


Typical time error in Holdover (without GPS)



Typical time error fluctuations when disciplined to GPS

Mechanical ICD



OPTIONS		AccuBeat P/N	Note
Number	Description		
00	1MHz (standards)	AR73011-00	
01	10 PPS	AR73011-01	TTL/ 50Ω 64% Duty cycle
02	HAVE QUICK	AR73011-02	
03	No IRIG-B & No AUX	AR73011-03	
04	5MHz	AR73011-04	
05	No IRIG-B & No AUX & No Navigation Values	AR73011-05	
06	1PPS ICD-GPS-060 output	AR73011-06	
07	OCXO instead of Rubidium, No IRIG-B	AR73011-07	
08	2 x IRIG B inputs (DC or AC), 3 x IRIG B (DC) outputs, 3 x IRIG B (AC) outputs	AR73011-08	

HOW TO ORDER

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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