

AS-210 Time & Frequency Standard System

Module List

AS210A-PM	Portable Mainframe
AS210-RM, -LM	Mainframe (manual not found yet)
AS210-01A	Module Controller
AS210-02	Frequency Comparator
AS210-03	Frequency Generator
AS210-04	Digital Delay Generator
AS210-05	Standby Battery
AS210-06	Microwave Frequency Generator
AS210-08	Distribution Amplifier (manual not found yet)
AS210-20	Time Clock (manual not found yet)
Efratom FRK	Low Noise Rubidium Frequency Standard

AS-210-PM Portable Mainframe Specifications

Table 1-1
AS210 MAINFRAME SPECIFICATIONS

	SPECIFICATION	TYPICAL
INTERNAL RUBIDIUM FREQUENCY STANDARD FREQUENCY RETRACE (AFTER TURN-ON)	$\pm 3 \times 10^{-11}$	$\pm 1 \times 10^{-11}$
STABILITY VERSUS TIME	$\pm 2 \times 10^{-11}$ per month	$\pm 1 \times 10^{-11}$ per month
TEMPERATURE (0 to 40°C)	$\pm 1 \times 10^{-10}$	$\pm 5 \times 10^{-11}$
VIBRATION, SHOCK, PULSE, TRANSIT, DROP, AND BENCH HANDLING (PER MIL-T-28800B)	$\pm 1 \times 10^{-10}$	$\pm 5 \times 10^{-11}$
+10 PERCENT LINE VOLTAGE VARIATION	$\pm 1 \times 10^{-10}$	$\pm 5 \times 10^{-11}$
LINE FREQUENCY VARIATION (50-400 Hz)	$\pm 1 \times 10^{-10}$	$\pm 5 \times 10^{-11}$
WARM-UP CHARACTERISTICS	Less than 1×10^{-10} in 20 minutes maximum Less than 1×10^{-10} in 10 minutes typical	
OUTPUT FREQUENCY	10 MHz	
OUTPUT LEVEL	1 volt peak-to-peak	
INTERNAL RUBIDIUM FREQUENCY ADJUSTMENT		
RANGE	$\pm 5 \times 10^{-10}$	
RESOLUTION	3×10^{-11}	

TABLE 1-1 (Continued)

	SPECIFICATION	TYPICAL
EXTERNAL REFERENCE FREQUENCY INPUT FREQUENCY LEVEL	1, 5, or 10 MHz 1 VRMS	
REMOTE PROGRAMMING	IEEE-488	
OPERATING ENVIRONMENT TEMPERATURE ALTITUDE HUMIDITY	0-40°C To 15,000 ft 0-85% relative humidity	
NON-OPERATING ENVIRONMENT TEMPERATURE ALTITUDE HUMIDITY	-55 to +75°C To 40,000 ft To 95% relative humidity	
PHYSICAL CHARACTERISTICS POWER (AS210A-PM) SIZE (AS210A-PM) WEIGHT (AS210A-PM)	115V or 230V ac, 2 amps 50-400 Hz Depth 20.35" Width 15.25" Height 6.81" 30.5 lbs without plug-ins	

AS-210-01 Module Controller Specification

See the AS-210-PM Portable Module Specification

AS-210-02 Frequency Comparator Module Specification

Table 1-1
AS210-02 EQUIPMENT SPECIFICATION

INPUTS	Six
INPUT VOLTAGE RANGE	0.5V to 10V RMS
INPUT IMPEDANCE	1000 ohms nominal
INPUT FREQUENCY	0.1, 1, 5, or 10 MHz
RESOLUTION	10^{-8} , 10^{-9} , 10^{-10} , or 10^{-11} selectable
SAMPLE TIME	0.5 seconds for 10^{-8} resolution 5.0 seconds for 10^{-9} resolution 50 seconds for 10^{-10} resolution 500 seconds for 10^{-11} resolution
SAMPLE RATE	
MAX MODE	Approximately 0.5 seconds between readings
1-PER-HOUR MODE	Each input sampled once per hour
RESOLUTION ACCURACY	
10^{-8} RANGE	± 1 part in 10^{-8}
10^{-9} RANGE	± 1 part in 10^{-9}
10^{-10} RANGE	± 1 part in 10^{-10}
10^{-11} RANGE	± 1 part in 10^{-11}
OPERATING TEMPERATURE	0° to 40°C
POWER	Supplied by AS210 Mainframe
WEIGHT	2.0 lbs

AS-210-03 Frequency Generator Module Specification

Table 1-1
AS210-03 EQUIPMENT SPECIFICATION

OUTPUT FREQUENCIES	1, 10, 50, 100, 200, 300, 400, or 500 MHz selectable
FREQUENCY ACCURACY	$\pm 6 \times 10^{-11}$ maximum from 10°C to 40°C Less than $\pm 5 \times 10^{-11}$ maximum per day
HARMONIC CONTENT	
2nd HARMONIC	24 dB minimum below desired frequency
3rd HARMONIC AND ABOVE	30 dB minimum below desired frequency
NON-HARMONIC SPURIOUS RESPONSE	50 dB minimum below desired frequency
OUTPUT LEVELS	1, 10, 20, 32, 40, 50, 100, 500, or 1000 millivolts selectable
OUTPUT LEVEL ACCURACY	
1 MHz TO 300 MHz	± 10 percent maximum, 5 percent typical
400-500 MHz	± 15 percent maximum, 5 percent typical
OPERATING TEMPERATURE	0° to 40°C
POWER REQUIREMENT	Supplied by AS-210 Mainframe
WEIGHT	2.75 pounds

AS-210-04 Digital Delay Generator Module Specification

Table 1-1
AS210-04 EQUIPMENT SPECIFICATION

DELAY CHARACTERISTICS BETWEEN REFERENCE PULSE AND DELAYED PULSE	
RANGE	0-999.99 microseconds
RESOLUTION	10 nanoseconds
UNCERTAINTY	.01 - .09 microseconds delay <u>+1</u> nanosecond .1 - .99 microseconds delay <u>+2</u> nanoseconds 1.0 - 999.99 microseconds delay <u>+3</u> nanoseconds
REPEATABILITY	.01 - .99 microseconds <u>+0.2</u> nanoseconds maximum 1.0 - 999.9 microseconds <u>+0.6</u> nanoseconds maximum
OUTPUT PULSE CHARACTERISTICS WITH A 50 OHM TERMINATION	
OUTPUTS AVAILABLE	BNC connectors Referenced and delayed pulses; BNC connectors
TRANSITION TIMES	Less than or equal to 5 nanoseconds
PULSE WIDTH	10 microseconds nominal
LEVEL	-2.5 to +2.5 volts (5 VPP minimum)
PULSE REPETITION RATES	1, 10, 100, 1K or 10 KHz selectable
PHYSICAL CHARACTERISTICS	
OPERATING TEMPERATURE RANGE	0 to 40°C
POWER	Supplied by AS210 mainframe
SIZE	Single width plug-in
WEIGHT	2.25 pounds

AS-210-05 24V Battery Backup Module Specification

None

AS-210-06 Microwave Frequency Generator Module Specification

Table 1-1
AS210-06 EQUIPMENT SPECIFICATIONS

FEATURES	VALUES						
OUTPUT FREQUENCIES							
RANGE	1 to 18 GHz						
STEP SIZE	1 GHz						
FREQUENCY ACCURACY							
VS TEMPERATURE	$\pm 6 \times 10^{11}$ maximum						
VS TIME	$\pm 2 \times 10^{11}$ per month						
SPURIOUS							
SECOND HARMONIC	20 dB minimum below desired frequency output						
THIRD- AND HIGHER-ORDER HARMONICS	30 dB minimum below desired frequency output						
NONHARMONIC	30 dB minimum below desired frequency output						
OUTPUT LEVELS							
RANGE	<table border="0"> <tr> <td>- 5 to -35 dBm</td> <td>1 to 8 GHz</td> </tr> <tr> <td>-10 to -35 dBm</td> <td>8 to 12 GHz</td> </tr> <tr> <td>-15 to -35 dBm</td> <td>12 to 18 GHz</td> </tr> </table>	- 5 to -35 dBm	1 to 8 GHz	-10 to -35 dBm	8 to 12 GHz	-15 to -35 dBm	12 to 18 GHz
- 5 to -35 dBm	1 to 8 GHz						
-10 to -35 dBm	8 to 12 GHz						
-15 to -35 dBm	12 to 18 GHz						
STEP SIZE	5 dB						
ACCURACY	± 2 dB						
OUTPUT CHARACTERISTICS							
IMPEDANCE	50 ohms						
VSWR	Less than 2:1						
CONNECTOR	Precision N, male, at leveling head (3-foot cable supplied to connect output to leveling head)						
PHYSICAL CHARACTERISTICS							
OPERATING TEMPERATURE	+10 to 40°C						
SIZE	Single width plug-in						
WEIGHT	6 lb.						

Ball Efratom FRK Low Noise Rubidium Frequency Standard Specification

Table 1.1. Specifications

CHARACTERISTICS	MODEL FRK-L (LN)	MODEL FRK-H (LN)
Output	5 or 10 MHz sine wave 1.0 V _{rms} into 50 ohms, floating ground (not floating with filter connector).	
Accuracy	Factory set to 5.0 MHz $\pm 5E-11$ at shipment.	
Signal to Noise (SSB 1 Hz BW)	125 dB at 10 Hz and 155 dB at 100 Hz from carrier.	(5 MHz) 120 dB at 10 Hz and 147 dB at 100 Hz from carrier. (10 MHz)
Input Power	13W at 24 Vdc, 25°C ambient; 22 to 32 Vdc; peak during warm-up, 1.8A.	
Warm-up Characteristics	≤ 10 minutes to reach $2E-10$ at 25°C ambient.	
Retrace	$\pm 2E-11$	
Long-term Stability	$< 4E-11$ /month	$< 1E-11$ /month
Short-Term Stability	3E-11 $\tau = 1$ sec 1E-11 $\tau = 10$ sec 3E-12 $\tau = 100$ sec	1E-11 $\tau = 1$ sec 4E-12 $\tau = 10$ sec 1E-12 $\tau = 100$ sec
Trim Range	$\geq 2E-9$	
Voltage Variation	$< 1E-11$ /10% change (within input power limit noted above)	
*Operating Temperature	$< 3E-10$ from -25°C to +65°C	$< 1E-10$ from -25°C to +65°C
Storage Temperature	-55°C to +75°C	
Magnetic Field	$< 4E-13$ /AM ⁻¹ (3E-11/0.1 millitesla)	
Altitude	$< 1E-13$ /mbar (sea level to 21,000m)	
Humidity	95% MIL-T-5422F	
Shock	MIL-STD-810C, Method 516.2, Procedure 1	
Vibration	MIL-STD-810C, Method 514.2, Procedure 1	
Size	100mm x 99 mm x 112 mm (3.9 in. x 3.9 in. by 4.4 in.)	
Weight	1.3 Kg (2.9 lbs); 1.55 Kg (3.5 lbs.), with optional heat sink	

*Highest operating temperature as measured at the baseplate. The highest ambient temperature the unit may be operated in is dependent on the heat transfer between the unit's baseplate and the ambient.