



AOG-110

Auxiliary Output Generator

KEY FEATURES

- 5 MHz Low Phase Noise Outputs
- Output Phase Offset Programmable to 1 Picosecond
- Output Frequency Programmable to 1.0E-19 Fractionally Over 5.0E-8 Range
- Temperature Control Insures Thermal Stability
- RF Subsystem Developed from Hydrogen Maser Technology
- Second Generation Microprocessor Control
- Digital Phase and Frequency Control Menu Driven Interface with Keypad Access
- LCD Display Provides Easy Access to Configuration and Performance Information
- Full System Control via RS-232 Compatible Interface
- Password Protected Remote Operation Provides Security
- Absolute and Relative Frequency Control
- Dual-Mode, Timed Frequency Control Allows Interval Frequency and Final Frequency Settings
- Output Relative Phase Control Over User Defined Intervals
- Suspend And Resume Available on Programmed Intervals
- Real-Time Clock Set and Adjust

Symmetricom's Auxiliary Output Generator™, designated the AOG-110, solves performance and capability issues associated with the use of high stability frequency standards. Until now, intermediate offset generators that extended a standard's frequency range without a performance sacrifice were difficult or impractical to obtain. Now, the AOG-110 is available with a 5 MHz output, programmable over a broad frequency range with extremely high resolution and precise phase control at an economical price.

The 5 MHz output, available on three buffer-isolated output ports, features a high performance crystal oscillator phase-locked to the external standard's output reference and employs heterodyne techniques developed for Symmetricom's Atomic Hydrogen Maser. Internally, the 5 MHz is used to develop

one pulse per second (1 PPS) which is available as an output. The 1 PPS output can be synchronized to an external 1 PPS reference by the AOG's operator controls.

The output frequency is controlled by directly offsetting a phase accumulator (synthesizer) in the PLL chain. The maximum synthesized fractional frequency range is $\pm 1E-7$, with a fractional resolution of $1E-19$. By altering the frequency output over a precise time interval, output phase control is achieved. Typically, the user defines the desired phase offset and time interval within which the offset is made. Once set, the AOG-110 automatically implements the appropriate frequency offset and precise time interval. Direct control over both frequency and time interval is available.



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The frequency, phase and 1 PPS synchronization of the AOG are independently controlled through a menu-driven interface on the front panel. The interface also provides operational status information. The local interface consists of an LCD display, a real-time clock display, and a 16-key keypad coupled to a microprocessor. An RS-232 serial port is available for remote operation. Generally the operator uses either exclusive local control or exclusive remote control. Shared control between local and remote interface is available. Remote control supports password protection that requires entry of a code before the use of local controls is possible. Numerous other options include: baud rate, parity and data format; unit identification number; settable VCO phase-locked loop (PLL) bandwidth and real time clock format. Storage of these options in a nonvolatile memory prevents loss due to power failure or removal.

The AOG-110 remote command set includes 11 commands for frequency, phase control, security control, status, on-line help and 1 PPS synchronization control. All commands are parsed for correct syntax and operational range prior to execution. Commands that contain errors are rejected and reported to the remote console without affecting the 5 MHz output.

AOG-110 Specifications

PERFORMANCE

- One second stability better than $3.0E-13$
- Approximate $1/t$ stability from one second
- Phase noise: $<3\text{dB}$ over Maser
- Three 5 MHz outputs: $+13\text{dBm}$ into 50Ω
- VCXO range: $>1.0E-6$
- Output isolation: $>80\text{dB}$
- 5 MHz input range: $+3\text{dBm}$ to $+15\text{dBm}$
- Temperature sensitivity: <10 picosecond per degree C

TIMING OUTPUT

- Format: 1 PPS (positive going pulse)
- Amplitude: $>3\text{ V}$ into 50Ω (TTL compatible)
- Pulswidth: $20\ \mu\text{s}$
- Rise time: $<5\ \text{ns}$
- Jitter: $<1\ \text{ns RMS}$

TIMING INPUT

- Sync input: 1 PPS
- Amplitude: $>3\text{ V}$ into 50Ω (TTL compatible)
- Pulswidth: $\geq 20\ \mu\text{s}$
- Rise time: $<5\ \text{ns}$
- Jitter: $<1\ \text{ns RMS}$
- Synchronization input to output: $<15\ \text{ns}$

POWER REQUIREMENTS

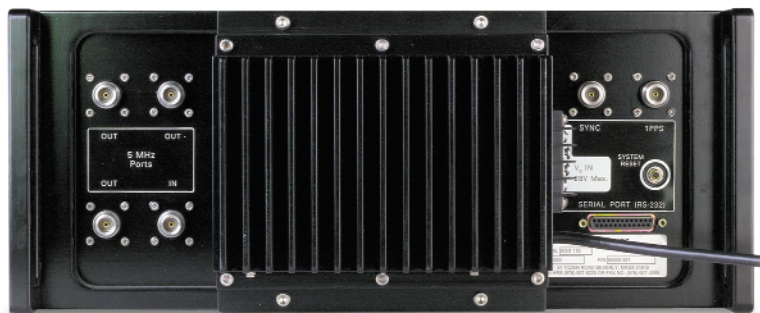
- Universal supply: 85-265 VAC, 47-440 Hz
- Secondary DC input: 18-30 Vdc
- 20 Watt operational power, 40 Watt start-up

DIMENSIONS

- 7.0" x 16.75" x 21.0" rack-mount chassis (17.78 cm x 42.54 cm x 53.34 cm)
- Weight: approximately 40 lbs.

COMPUTER INTERFACE

- RS-232 compatible control port
- Supports 1200, 2400, 4800, 9600 and 19200 baud rates
- Remote lockout mode requires password for keypad control
- All frequency, phase and clock controls available remotely
- Operational data and identification available remotely



The AOG-110 is used by calibration laboratories, engineering facilities and metrology laboratories with high stability frequency standards such as Masers to generate high quality RF sine wave signal offsets without sacrificing performance.



SYMMETRICOM, INC.
 2300 Orchard Parkway
 San Jose, California
 95131-1017
 tel: 408.433.0910
 fax: 408.428.7896
 info@symmetricom.com
 www.symmetricom.com