



# 5401 & 5402

## Disciplined Rubidium Oscillator

### KEY FEATURES

- Primary Standard Time & Frequency Accuracy
- Six Buffered Low Phase Noise 10 MHz Outputs
- Six Buffered 1 PPS Outputs
- RS-232 Input/Output Control Port
- Rugged Airborne Package - Model 5401
- Rack Mount Chassis - Model 5402

### INTRODUCTION

Symmetricom's Model 5401 and Model 5402 Disciplined Rubidium Oscillators track a 1 PPS reference input to provide frequency outputs (1 PPS and 10 MHz) with the stability and accuracy of a primary standard, provided that the reference input is exact. Typically, the 1 PPS input would be obtained from a GPS receiver that outputs a corrected 1 PPS epoch.

The difference between the 1 PPS reference input and the internally generated 1 PPS (derived from the rubidium oscillator) is measured and then used to continuously correct the oscillator frequency.

The correction algorithm compensates for oscillator error. It smooths jitter from the GPS receiver module due to ephemeris and satellite switching errors. The result is a smoothed, coherent 1 PPS reference and 10 MHz frequency.

The 1 PPS reference (rising edge on time) is buffered and output via six SMA connectors on the front panel of the Model 5401 and via six BNC connectors on the rear panel of the Model 5402. The 10 MHz frequency from the rubidium oscillator is used to discipline an oven-stabilized quartz oscillator. The oven oscillator is the source of the low phase noise frequency outputs, which are buffered and output via six SMA or BNC connectors. An RS-232 input/output port is provided for setup and control input as well as for status output.

The Model 5401 is built in a rugged airborne package, and is powered by +28 VDC, standard aircraft power voltage. The Model 5402 is built in a standard 3.5-inch rack mountable chassis, and is powered by 90 to 240 VAC for world-wide utility. The performance specifications for both configurations are identical.



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## 5401 & 5402 Specifications

### 10 MHz SINE WAVE OUTPUTS

- Signal level: 1.6 to 3.0 V P-P into 50, adjustable
- Output impedance: 50Ω
- Short term accuracy: <3.0X10-11 RMS @ 1 sec
- Long term accuracy: <5X10-12 RMS @ 1000 sec (while disciplining)
- Short term stability: (Alan Deviation)  $t=100$  sec: <2.5X10-12
- Phase noise:
  - <94 dBc/Hz @ 1 Hz
  - <110 dBc/Hz @ 10 Hz
  - <140 dBc/Hz @ 100 Hz
  - <147 dBc/Hz @ 1000 Hz
  - <152 dBc/Hz @ >10 kHz
- Spurs:
  - <40 dBc harmonic
  - <50 dBc non-harmonic
- Port-to-Port isolation: >99 dB
- Coherence: <2 ns (zero crossing of the 10 MHz sine wave relative to 1 PPS input)
- Connector type
  - Model 5401: SMA (isolated)
  - Model 5402: BNC (isolated)

### 1 PPS OUTPUT

- Rise time: <5 ns (20% to 80%)
- Fall time: <1 μs (80% to 20%)
- Pulse width: 20 μs ±0.1μs
- Level: 5.75 VDC ±0.5 VDC into 50
- Output impedance: 50Ω
- Coherence: <10 ns relative to mean 1 PPS input
- Port-to-Port isolation: >90 dB
- Isolation: >90 dB (ref 1 PPS in)
- Connector type
  - Model 5401: SMA (isolated)
  - Model 5402: BNC (isolated)

### 1 PPS REFERENCE INPUT

- Rise time: <20 ns (10% to 90%)
- Fall time: <1 μs (90% to 10%)
- Pulse width: 20 ns to 100 μs
- Level: TTL or +10 VDC ±1 VDC, selectable via RS-232 I/O
- Input impedance: 50Ω
- Connector type
  - Model 5401: SMA (isolated)
  - Model 5402: BNC (isolated)

### RS-232 INPUT/OUTPUT

- Baud rate: 9600
- Parity: None
- Word length: 8
- Stop bits: 1
- Connector type
  - Model 5401: MS27499E10B35S
  - Model 5402: DB9(F)

### POWER INPUT

- Model 5401
  - Voltage: +28 VDC, MIL-STD-704A
  - Power: <80 W (power on)  
<40 W (after warmup)
- Connector type: MS27499E10B5P
- Model 5402
  - Voltage: 90-240 VAC, 47-440 Hz
  - Power: <80 W (power on)  
<40 W (after warmup)
- Connector type: Commercial IEC

### ENVIRONMENT

- Temperature
  - Operating: -20° C to + 50° C
  - Storage: -55° C to + 85° C
- Humidity: 0 to 95% (non-condensing)
- EMI: Compliant with FCC Class B for conducted and radiated emissions
- Vibration: Designed to meet MIL-E-5400, Curve II & III
- Crash safety shock: 30 g's for 11 ms
- MTBF: Approximately 100,000 hours

### CHASSIS

- Model 5401
  - Dimensions: 6.0"H x 5.0"W x 10.0"D
  - Weight: Approximately 8 pounds
- Model 5402
  - Dimensions: 3.5"H x 17"W x 12"D
  - Weight: Approximately 12 pounds



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