

5061A-22

S E R V I C E N O T E

SUPERSEDES: None

HP 5061A Cesium Beam Frequency Standard

Serial Numbers: 0000A00000 / 9999A99999

Specifications for replacement standard cesium beam tube for HP 5061A Cesium Beam Frequency Standard

Standard cesium beam tubes are available from several manufacturers including Hewlett-Packard Co. When considering the purchase of a non-HP replacement cesium beam tube, give careful consideration to the following information. Minimum specifications for a replacement tube are given below.

Hewlett-Packard Co. has not tested or certified non-HP cesium beam tubes for operation in the HP 5061A. Thus, if a non-HP cesium beam tube is installed in the HP 5061A, Hewlett-Packard Co. cannot guarantee the unit will meet its published specifications.

The various cesium beam tube interface circuits were designed to operate with the loads provided by, and signals derived from, the HP tube. Thus, there is the possibility that a non-HP cesium beam tube could stress these circuits beyond their design limits leading to premature failure. In addition, the HP cesium beam tube contains elements of three different feedback loops. These elements must not only have the correct static characteristics, but also the correct dynamic characteristics to ensure stable operation of the feedback circuits under all specified environmental conditions.

Continued

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ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION:

INFORMATION ONLY

AUTHOR:

ENTITY:

ADDITIONAL INFORMATION:

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Because of these conditions Hewlett-Packard Co. cannot repair any HP 5061A which contains a cesium beam tube not certified by Hewlett-Packard Co. for operation in these products.

The following specifications describe the required characteristics of a standard cesium beam tube which is to be installed in an HP 5061A. Adherence to these specifications is a minimum requirement for proper operation when so installed. However, adherence to these specifications does NOT guarantee that an HP 5061A will meet all specifications when equipped with a non-HP cesium beam tube.

Specifications

Peak microwave-induced beam current

The cesium beam tube in the HP 5061A is operated with fixed operating voltages. Changes in the cesium tube output signal are compensated by changing the gain of the signal amplifier circuit (LOOP GAIN) and adjusting the sensitivity of the BEAM I meter (BEAM I METER ADJUST). In order for the replacement cesium beam tube to operate properly in the HP 5061A, the initial set-up parameters (Note 1) must result in a peak beam current of at least 100 nA. This will ensure the tube will operate for long periods of time without requiring the 5061A be removed from service for in-cabinet adjustments.

INITIAL VALUES		END OF LIFE VALUES	
Peak Microwave Induced Beam Current	EM Voltage	Peak Microwave Induced Beam Current	EM Voltage
100 nA	-1500 to -2500V	8 nA	Maximum

Signal quality specifications (Standard cesium beam tube only)

Signal to Background ratio (Note 2):

New: 2.5 minimum

End of life: <1

Signal-to-noise ratio (Note 3):

New: > 1100

End of life: < 300

Line width (Note 4): < 600 Hz

Oven heater resistance

Minimum value: 2 Ohms

Maximum value: 32 Ohms

Maximum steady state cesium oven power after warm-up (at 25 C): 3 W

Cesium Oven thermistor resistance at operating temperature:**NOTE:**

Thermistor minimum value is important to maintain cesium oven controller circuit stability over the specified range of operating temperatures and line voltages.

Minimum value: 230 Ohms

Maximum value: 1050 Ohms

Oven control stability

When properly adjusted for the new cesium tube, the oven power level to the tube must not oscillate. Oscillations can lead to unstable frequency output from the HP 5061A, wrong cesium oven temperature, or premature failure of the cesium oven controller circuit.

To test oven control stability, check oven power input to the tube using an oscilloscope. Look for oscillations in the .01 to 500 Hz range: look for oscillations of less than 3 Hz on the front panel CS OVEN meter. Look for oscillations of greater than 3 Hz on the thermistor input lead from the tube (junction of R14 and R15) in the A11 Cesium Oven Controller. For the latter, use an oscilloscope probe of at least 10 megohms input impedance, and ac couple the oscilloscope input amplifier. This test is not necessary on HP tubes as performance is checked on an HP 5061A oven controller as part of the factory test procedure.

C-Field Current at operating Zeeman frequency (mA)

Minimum value: 15 mA

Maximum value: 26 mA

Hot wire ionizer current

Maximum value: 3.2 A

Maximum power: 4 W

Mass Spectrometer voltage for peak output current (Volts)

Maximum value: 16 V

Electron Multiplier bias string resistance:

Between P3 and A12P17(A2):

Minimum value: 45 Megohms

Maximum value: 76 Megohms

Leakage resistance between P3 (white wire) and cesium tube case:

Minimum value: 100,000 Megohms (10e11 Ohms)

Electron Multiplier voltage required:

-1200 to -2500 V

Note:

The Electron Multiplier circuit must be able to produce these voltages with the cesium beam tube installed.

Internal Ion Pump:

Must be able to operate continuously at a maximum voltage of 4000 V

Must be able to start pumping at 2500 V minimum

Notes:

1. Initial set-up parameters are Oven temperature and Electron Multiplier voltage. All measurements are made with the cesium beam tube properly installed in an HP 5061A chassis.
2. Procedure for Signal-to-background ratio from paragraphs 5-180 through 5-182, starting on page 5-24 in the HP 5061B operating and service manual. The initial value of signal-to-background ratio allows for any signal-quality degradation which may occur over the life of the tube, ensuring a long service life.
3. Procedure for Signal-to-noise ratio from paragraphs 5-184 through 5-187, starting on page 5-25 in the HP 5061B Operating and Service Manual HP P/N 05061-9078). The initial value of signal-to-noise ratio allows for any signal-quality degradation which may occur over the life of the tube, ensuring a long service life.
4. The line width is defined as the distance in frequency, between points located midway between the peak and the valley on the main lobe of the cesium resonance characteristic (Ramsey pattern).