Rubidium Frequency Generator HG 414A

Preliminary data

The rubidium frequency generator HG 414A provides for separate outputs RF signals of 0.1, 1, 5 and 10 MHz with an accuracy of about 2 * 10 ^ -11 for control or calibration of Frequenzesynthesizern, frequency counters, etc.

Second pulses of approximately 17.4 microseconds duration and a rise time of about 30 nanoseconds are available.

The built-in digital display can be used as a fast and accurate frequency counter (resolution 1 * 10 ^ -11) used. The fast gate time of one second due to a limitation of the measuring range of 5 MHz + / - is 500 Hz at a measurement time of 10 seconds det area still + / - 50 Hz and the display 1 * 10 ^ -12, offers the measurement time of 100 seconds det range of + / - 5 Hz limited. Different frequencies may need to be accommodated by dividing or multiplying at 5 MHz.

The time interval of external to internal second pulses can be close shows in microseconds.

The digital display can be used as a Clock.

The accuracy of 2 * 10 ^ -11 at 10 GHz corresponds to a deviation of 0.2 Hz!

Principle

In the Rb-normal optical selection of rubidium gas is utilized. An excited by a VHF generator Rb (87)-spectral filtered through a Rb (85) gas cell, sends light into a Rb (87) resonance cell, which is located in the cavity, as shown in Fig. This light caused by a so-called pumping that Rb atoms are raised einern of Low-energy state E1 to a drift, much higher level E3. From there they turn back, preferably on an average level of E2, so that there is an accumulation of E2. E2 and E1 differ by a frequency of 6.834 GHz 685 ... the amount of energy.

After Anreicberung levels of E2 may be a redistribution of the kind made by the action of the external field that the Nieveaus E1 and E2 are re-occupied the same frequency. This occurs when the frequency of the field agrees with the Rb resonance frequency as accurately as possible.

This leads to a re-onset of absorption of the pump light (wavelength 780 nm). The resulting change in the transparency of the resonance cell is used to detect the resonant frequency of a photodiode. The detector signal is used to Nachsteuerung of the excitation frequency supplied auxiliary oscillator which simultaneously provides the output signal.

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New production from the Russian space research, for Deutchland modified.

User manual

Power supply:

Netzchalter # 1 with Jack # 2 = 230 volts AC
Power supply by DC is also possible:
Socket # 3, Pin 1 Ground, Pin 4 +24 to 27 volts DC, max. 2.5 Amp
The possibly Gleischspannungversorgung is not turned off the power switch turns on. It can remain connected and does offer the Netzaufall Strömversorgung.

Screen # 4 displays the function:
Red LED and / or 0/1/3 = thermostat or control loop is not ready.
Green LED = function given.
Break-in period at 20 C room temperature for about 30 minutes 1x10 ^ -10.
Result after about 120 min at 2x10 ^ -11.

Betreibsarten

Key # 5 = function selection loop:
Pos A = display off, item B = time difference, Post C = Frequenzeabweichung, item D = Clock.
3xLED Control # 6, display the data in the display # 11

Item A: Off
Seven segment display of all outputs but in operation.

Item B: - Δ t -
Time difference measurement:
Second pulses at the back entrance Eingangsschaiter # 21 # 22 "EXT ". Difference is displayed in microseconds. Leitzte point 0.1 ms.

With "START" will spend 17.4 microseconds long second pulses with 5V and female # 19. Ansteigzeit 30 ns.
Jack # 20 time-shifted second pulses with 5 V supply. The input switch # 22 to "INT", the difference in 0.1 microseconds is read. When switching from switch # 14 10 Hz output (0.1 microseconds).

The setting of the shifted second pulse to the internal or ext second pulses kan be changed via the keys # 7 and 8. With "START" # 10, 3 packages are selected coarse medium-fine with overflow. The adjustment is faster when it is activated only to 10 Hz. Reciprocal input - If the time setting + / works. With external measurement of the initial value is to write down and calculate the difference in later Abel Sung. Display last digit = 0.1 microseconds. The harmonic meetings Synchronisatio is pressing key # 9 and # 10.

Item C: - DELTA.F f / -
Device works as a frequency counter with 5 MHz center frequency.
Input jack on the back # 18, Level 0.2 to 5 Vpp, 50 Ohm BNC connector.
1 sec gate time (switch # 12) Advertisement (7th) 1x10 ^ -11, capture range + / - 500 Hz
Gate 10 S (relative measure) display (7th) 1x10 ^ -12, Fangbereisch + / - 50 Hz
Gate 100 S, ad (6th place) 1x10 ^ -12, capture range + / - 5 Hz
Other frequencies have to be tting and / or multiplication brought to 5 Mhz. With enough levels and operate within the area covered flashing LED # 6 (middle).

Item D: - t -
Clock set: switch # 13 aug "TIME SET", including seconds (+ / - # 7 and 8) with "START" # 10 and minutes shall continue, then hours. Here for example 1 minutes and turn with pretend switch # 13 to "count ": Clock starts.

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Crystal oscillator center settings have been made in the factory (# 16) and is engaged with det AFC switched # 15.

All inputs and outputs (in Russian) BNC connectors. The second pulses to socket # 20, and the frequency output to the terminals # 17 (10, 5, 1 and 0.1 Mhz) are stän conditions at 3 to 5 Vpp.
Subject to change without notice