

# **FS725 Benchtop Rubidium Frequency Standard**

- **10 MHz and 5 MHz rubidium disciplined outputs**
- **20 year aging less than 0.005 ppm**
- **Ultra low phase noise (<-130 dBc/Hz at 10 Hz)**
- **Built-in distribution amplifiers (up to 22 outputs)**
- **1 pps input and output for GPS synchronization**
- **RS-232 computer interface**
- **Two status alarm relays**

**\$2495** (U.S. list)

**The FS725** integrates a rubidium oscillator (SRS model PRS10), a low noise universal AC power supply, and distribution amplifiers in a compact half-width 2U chassis. It provides stable and reliable performance, with an estimated 20 year aging of less than  $5 \times 10^{-9}$  and a demonstrated rubidium oscillator MTBF of over two hundred thousand hours.

There are two 10 MHz and one 5 MHz outputs with exceptionally low phase noise of -130 dBc/Hz at 10 Hz offset and low one second Allan Variance of  $<2 \times 10^{-11}$ . The 1 pps output has less than 1 ns of jitter and may be set with 1 ns resolution.

Up to three internal distribution modules can be added to the FS725. Each module has four 10 MHz outputs, one 5 MHz output, and one 1 pps output, all with the same low phase noise, harmonic distortion and jitter.

In most cases the FS725 will be used as a stand-alone frequency standard due to its extremely low aging. However, it can also be phase-locked to an external 1 pps reference (like GPS) for Stratum 1 performance.



FS725 Front Panel



FS725 Rear Panel with option 03 distribution amplifier installed

An RS-232 interface allows direct communication with the rubidium oscillator. Using the provided Windows® software you can easily monitor and control 1 pps timing and determine the instrument's operational status.

There are two alarm relays that indicate the rubidium oscillator lock state and its synchronization to an external 1pps input. The relays are SPDT providing both normally-open and normally-closed operation.

The FS725 is an ideal instrument for calibration and R&D laboratories, or for any application requiring a precision frequency standard. You can now inexpensively deploy accurate frequency references throughout a facility.

For additional information about the FS725 (or the PRS10) contact SRS at 408-744-9040 or [info@thinkSRS.com](mailto:info@thinkSRS.com), or visit our web site at [www.thinkSRS.com](http://www.thinkSRS.com)

## Specifications

<b>Output frequencies</b>	10 MHz sine, 5 MHz sine, 10 $\mu$ s wide 1 pps pulse
<b>10 MHz / 5 MHz amplitude</b>	0.5 Vrms, $\pm 10\%$ (1.41 Vpp or +7 dBm) into 50 $\Omega$
<b>1 pps pulse amplitude</b>	2.5 V into 50 $\Omega$ , 5 V into Hi Z
<b>Phase noise (SSB)</b>	<-130 dBc/Hz (10 Hz) <-140 dBc/Hz (100 Hz) <-150 dBc/Hz (1 kHz) <-155 dBc/Hz (10 kHz)
<b>Spurious</b>	<-100 dBc (100 kHz BW)
<b>Harmonics</b>	<-60 dBc
<b>Accuracy at shipment</b>	$\pm 5 \times 10^{-11}$
<b>Aging (after 30 days)</b>	< $5 \times 10^{-11}$ (monthly) < $5 \times 10^{-10}$ (yearly) $5 \times 10^{-9}$ (20 years, typical)
<b>Short term stability (Allan variance)</b>	< $2 \times 10^{-11}$ (1 s) < $1 \times 10^{-11}$ (10 s) < $2 \times 10^{-12}$ (100 s)
<b>Holdover</b>	72 hour Stratum 1 level ( $1 \times 10^{-11}$ )
<b>Frequency retrace</b>	$\pm 5 \times 10^{-11}$ (72 hrs off, then 72 hrs on)
<b>Setability</b>	< $5 \times 10^{-12}$
<b>Trim range</b>	$\pm 2 \times 10^{-9}$ (0 to 5 VDC) $\pm 0.5$ ppm (via RS-232)
<b>Warm-up time</b>	<6 minutes (time to lock) <7 minutes (time to $1 \times 10^{-9}$ )

## Front Panel Indicators *(Green LEDs)*

<b>Power</b>	"On" when AC power is applied
<b>Locked</b>	"On" when frequency is locked to rubidium
<b>1 pps input</b>	Blinks "on" with each 1 pps reference input applied to rear panel
<b>1 pps sync</b>	"On" when 1 pps output is synchronized within $\pm 1 \mu$ s of 1 pps input
<b>Receive</b>	Blinks "on" when RS-232 characters are received by FS725
<b>Send</b>	Blinks "on" when RS-232 characters are sent by FS725

## Rear Panel Connections

<b>Frequency adjust</b>	0 to 5 VDC to adjust frequency by +/- 0.002 ppm (normally unconnected)
<b>1 pps input</b>	One 100 k $\Omega$ input. Requires CMOS level pulses (0 to 5 VDC). If an external 1 pps input is applied, lock is maintained between the 1 pps input and 1 pps output with RS-232 adjustable time constant from 8 minutes to 18 hours.
<b>10 MHz outputs</b>	Two 50 $\Omega$ isolated 10 MHz sine outputs
<b>5 MHz output</b>	One 50 $\Omega$ , 5 MHz sine output
<b>1 pps output</b>	One 50 $\Omega$ pulse output
<b>Optional outputs</b>	Each option board provides four 10 MHz, one 5 MHz and one 1 pps outputs. Up to 3 boards may be installed.
<b>Alarm relays</b>	Max current, 3 A. SPDT, normally open or normally closed. May be wired in parallel with other relays to "wire-or" a single alarm.
<b>Rb lock</b>	Relay status matches the front panel "Locked" LED
<b>1 pps</b>	Relay status matches the front panel "1 pps sync" LED
<b>RS-232</b>	9 pin connector configured as DCE, 9600 baud. Windows <sup>®</sup> RbMon software is provided.

## Environmental

<b>Operating temperature</b>	+10 $^{\circ}$ C to +40 $^{\circ}$ C
<b>Temperature stability</b>	$\Delta f/f < \pm 1 \times 10^{-10}$ (+10 $^{\circ}$ C to +40 $^{\circ}$ C)
<b>Storage temperature</b>	-55 $^{\circ}$ C to +85 $^{\circ}$ C
<b>Magnetic field</b>	$\Delta f/f < 2 \times 10^{-10}$ for 1 Gauss field reversal
<b>Relative humidity</b>	95% (non-condensing)

## General

<b>AC power</b>	90 to 132 VAC or 175 to 264 VAC, 47 to 63 Hz, 50 Watts
<b>Dimensions</b>	8.5"×3.5"×13" (WHL)
<b>Weight</b>	9 lbs
<b>Warranty</b>	One year parts and labor on materials and workmanship

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## Ordering Information *(all prices U.S. list)*

FS725	Benchtop Rubidium Frequency Standard	\$2495
Options		
01	Distribution amp, 6 additional outputs	\$ 300
02	Distribution amp, 12 additional outputs	\$ 600
03	Distribution amp, 18 additional outputs	\$ 900
O725RMS	Single Rack Mount	\$ 85
O725RMD	Double Rack Mount	\$ 85



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