

# **MODEL SR625**

## **RUBIDIUM TIMEBASE / PRESCALER**



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## Safety and Preparation for Use

**WARNING:** Dangerous voltages, capable of causing death, are present in this instrument. Use extreme caution whenever the instrument covers are removed.

**This instrument may be damaged if operated with the LINE VOLTAGE SELECTOR set for the wrong ac line voltage or if the wrong fuse is installed.**

### LINE VOLTAGE SELECTION

The SR625 operates from a 100V, 120V, 220V, or 240V nominal ac power source having a line frequency of 50 or 60 Hz. Before connecting the power cord to a power source, verify that the LINE VOLTAGE SELECTOR card, located in the rear panel fuse holder, is set so that the correct ac input voltage value is visible.

Conversion to other AC input voltages requires a change in the fuse holder voltage card position and fuse value. Disconnect the power cord, open the fuse holder cover door and rotate the fuse-pull lever to remove the fuse. Remove the small printed circuit board and select the operating voltage by orienting the board so that the desired voltage is visible when it is pushed firmly back into its slot. Rotate the fuse-pull lever back into its normal position and insert the correct fuse into the fuse holder.

### LINE FUSE

Verify that the correct line fuse is installed before connecting the line cord. For 100V/120V, use a 1 Amp slow blow fuse and for 220V/240V, use a 1/2 Amp slow blow fuse.

### LINE CORD

The SR625 has a detachable, three-wire power cord for connection to the power source and to a protective ground. The exposed metal parts of the instrument are connected to the outlet ground to protect against electrical shock. Always use an outlet which has a properly connected protective ground.

# SPECIFICATIONS:

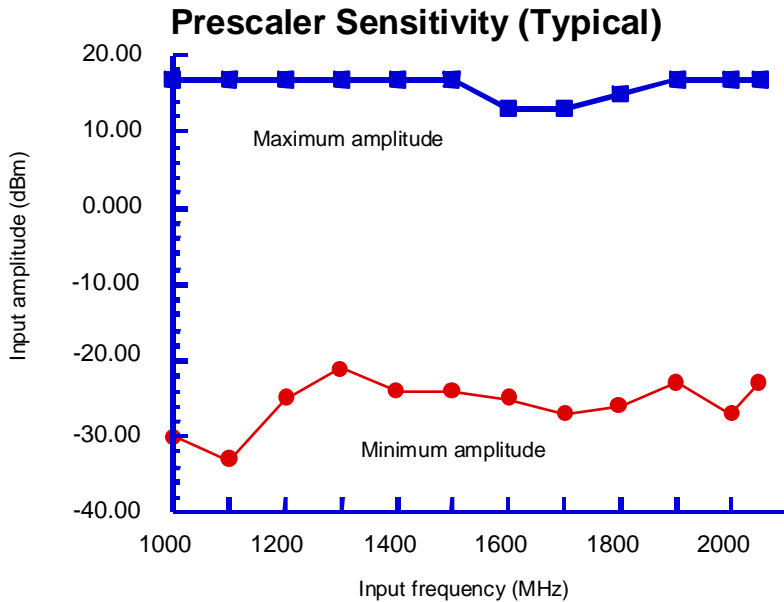
## 2.0 GHz Prescaler

### Input

Impedance	50 $\Omega$
Maximum Input level	+23dBm
Frequency Range	50 MHz - 2.0 GHz
Sensitivity	See Figure below

### Output

Expected Load	50 $\Omega$
Frequency	1/10 of the input frequency
Waveform	square wave, 700 mV pk-pk, +500 mV DC



## Rubidium Timebase

(see Operation Manual of Rb Oscillator)

Frequency	10 MHz
Accuracy at Shipment	$\pm 5 \text{ E}-11$
One Day Stability	$4\text{E}-11/\text{day}$
Long Term Drift	$\leq 5\text{E}-11/\text{month}, \leq 5\text{E}-10/\text{yr}$
Short Term Stability	1 Second (Allan Variance): $1 \text{ E}-10$ 10 Second (Allan Variance): $3.16 \text{ E}-11$ 100 Second (Allan Variance): $1 \text{ E}-11$
Warm-up time	10 minutes to meet short term stability

## INTRODUCTION

The SR625 Rubidium Timebase and Prescaler is designed to extend the frequency measurement range of the SR620 Time Interval Counter to 2.0 GHz and to provide an extremely stable timebase. The prescaler is a divide by 10 circuit with variable sensitivity adjustment for

measuring signals up to 2.0 GHz. The timebase is an atomic-resonance (Rubidium) standard that provides a stable 10 MHz signal once locked. The 10 MHz output from the Rb timebase can be used to increase the resolution and accuracy of the of the SR620 time interval counter.

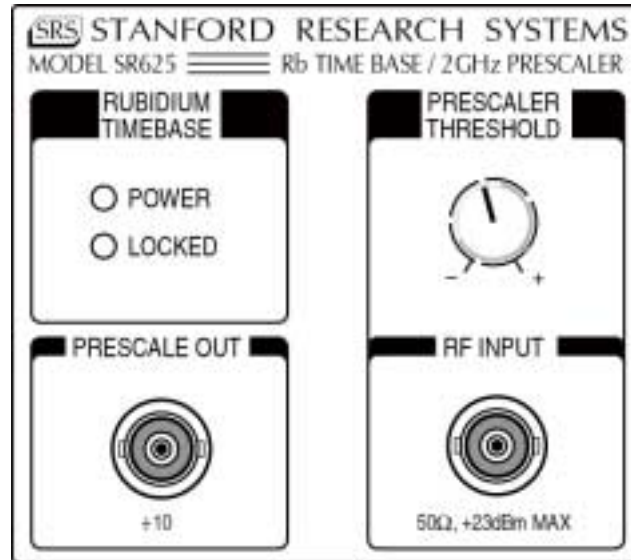


Figure 1 – SR625 Front Panel

## FRONT PANEL FEATURES

**POWER** indicator is lit when the SR625 is powered from line voltage.

**LOCK** indicator is lit when the 10 MHz oscillator is locked to the Rubidium atomic resonance (Note: this light may turn on momentarily after power is turned on.)

**RF INPUT BNC** accepts signals from 50 MHz to 2.0 GHz (see Figure 3 for sensitivity curve.) The input impedance is 50 Ω. The maximum allowable input level is +23dBm (3.15 Vrms into 50 Ω). **The shield of the prescaler input is connected to earth ground.**

**PRESCALE OUTPUT BNC** provides an output signal that is one-tenth ( $\div 10$ ) the

frequency of the input signal. When terminated into a 50 Ω load the output is a 700 mV pk-pk square wave with a 500 mV DC offset. This output is connected to the input of the SR620 to measure frequencies from 50 MHz to 2.0 GHz. The SR620 input (channel A or B) should be DC coupled, 50 Ω impedance, and the trigger level set to autolevel. **The shield of this output is connected to earth ground.**

**PRESCALE ADJUST** knob adjusts the amplitude necessary to trigger the prescaler. The threshold is closest to the zero crossing voltage (i.e. the prescaler is most sensitive) when the knob is pointing straight up. Turning the knob changes the threshold and makes the prescaler less susceptible to false triggers due to noise.

## REAR PANEL FEATURES



Figure 2 – SR625 Rear Panel

**POWER ENTRY MODULE** contains the fuse and line voltage selector of the prescaler/timebase. Use a 1 amp slow blow fuse for 100/120 volt operation, and a 1/2 amp fuse for 220/240 volt operation. To set the line voltage selector for the correct line voltage, first remove the fuse. Then, remove the line voltage selector card and rotate the card so that the correct line voltage is displayed when the card is reinserted. Replace the fuse.

**10 MHz OUTPUT** should be connected to the 10 MHz timebase input on the back panel of the SR620 with a standard BNC cable. The Rb oscillator can also be independently used as a high stability source through this output. The timebase will operate independently of the SR620 as long as power to the module is applied. The output is a 1 V pk-pk 10 MHz sine wave (50  $\Omega$  impedance). **The shield of this output is connected to earth ground.**

### CONFIGURING SR620

The SR620's default timebase is its own internal source. To use the Rb timebase the configuration of the SR620 must be changed.

To change the settings of the SR620 press the SEL button in the CONFIG area of the front panel (right hand side) until the "CAL" menu flashes. Now press the SET button in the CONFIG area until "CLOCK SOURCE" is displayed. Press either the up or down arrow key in the SCOPE and CHART area to toggle the clock source from "INT"ernal to "REAR" panel. The 10 MHz Rb output from the prescaler/timebase must be connected to the rear connector of the SR620. Pressing the SET key again should show that the clock frequency is 10 MHz. If it is not use the arrow keys in the SCOPE and CHART section to toggle the value to 10 MHz. To exit the configuration menus press any other key outside the configuration area of the keyboard. The unit is ready for operation once the locked light on the front of the SR625 module is lit.

## CIRCUIT DESCRIPTION

Prescaler-

The combination of R18,R19 and R20 attenuate the input signal to provide input protection for the circuit. U9 amplifies the input signal. U5 frequency divides the signal by two. P1 adjusts the threshold at which the differential clock of U5 will trigger. Components U4, U7 and U8 are configured to act as a synchronous divide by five counter. Transistor Q1 drives the output signal. R10 provides reverse termination of 50Ω.

## PARTS LIST

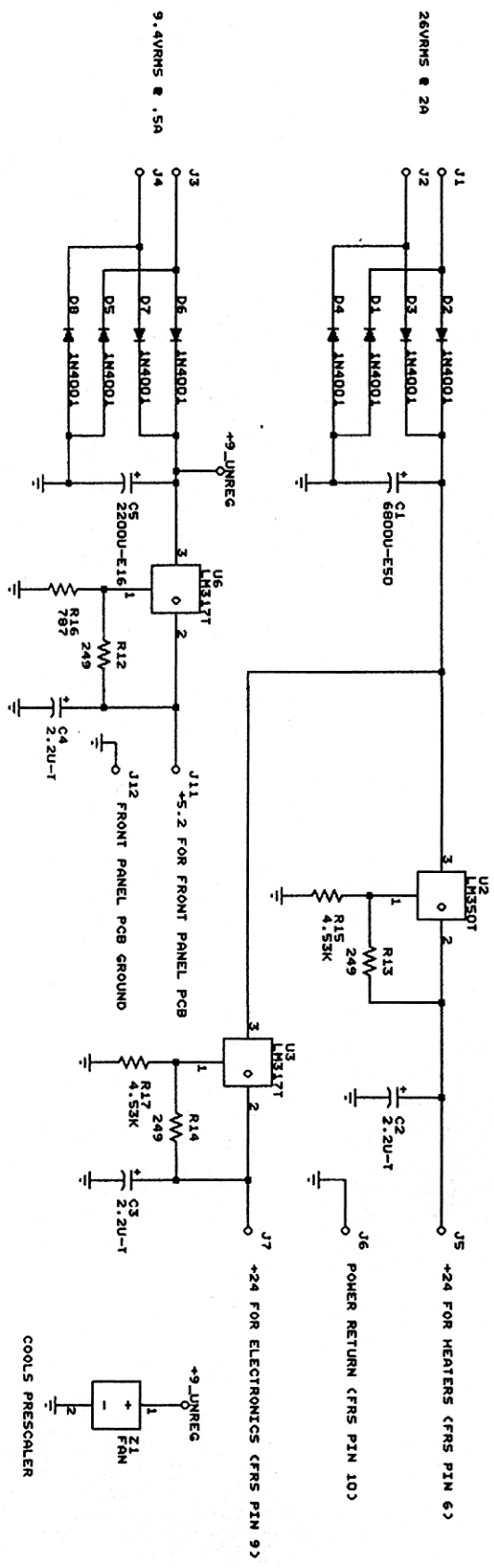
<u>REF.</u>	<u>SRS part#</u>	<u>VALUE</u>	<u>DESCRIPTION</u>
C 1	5-00170-509	6800U	Capacitor, Electrolytic, 50V, 20%, Rad
C 2	5-00100-517	2.2U	Capacitor, Tantalum, 35V, 20%, Rad
C 3	5-00100-517	2.2U	Capacitor, Tantalum, 35V, 20%, Rad
C 4	5-00100-517	2.2U	Capacitor, Tantalum, 35V, 20%, Rad
C 5	5-00030-520	2200U	Capacitor, Electrolytic, 16V, 20%, Rad
C 6	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 7	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 8	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 9	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 10	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 11	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 12	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 13	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 14	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 15	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 16	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 17	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 18	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 19	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 20	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 21	5-00298-568	.01U	Cap, Ceramic 50V SMT (1206) +/-10% X7R
C 22	5-00219-529	.01U	Cap, Monolythic Ceramic, 50V, 20%, Z5U
D 1	3-00001-301	1N4001	Diode
D 2	3-00001-301	1N4001	Diode
D 3	3-00001-301	1N4001	Diode
D 4	3-00001-301	1N4001	Diode
D 5	3-00001-301	1N4001	Diode
D 6	3-00001-301	1N4001	Diode
D 7	3-00001-301	1N4001	Diode
D 8	3-00001-301	1N4001	Diode
D 9	3-00424-307	GREEN	LED, T-3/4
D 10	3-00424-307	GREEN	LED, T-3/4
D 11	3-00203-301	1N5711	Diode
P 1	4-00445-447	SR620-48	Pot, Single Control
PC1	7-00577-701	SR625 SIDECAR	Printed Circuit Board

<b><u>REF.</u></b>	<b><u>SRS part#</u></b>	<b><u>VALUE</u></b>	<b><u>DESCRIPTION</u></b>
Q 1	3-00570-360	MMBR536L	Integrated Circuit (Surface Mount Pkg)
R 1	4-01464-461	240	Thick Film, 5%, 200 ppm, Chip Resistor
R 2	4-01479-461	1.0K	Thick Film, 5%, 200 ppm, Chip Resistor
R 3	4-01459-461	150	Thick Film, 5%, 200 ppm, Chip Resistor
R 4	4-01475-461	680	Thick Film, 5%, 200 ppm, Chip Resistor
R 5	4-01464-461	240	Thick Film, 5%, 200 ppm, Chip Resistor
R 6	4-01457-461	120	Thick Film, 5%, 200 ppm, Chip Resistor
R 7	4-01457-461	120	Thick Film, 5%, 200 ppm, Chip Resistor
R 8	4-01457-461	120	Thick Film, 5%, 200 ppm, Chip Resistor
R 9	4-00833-406	24	Resistor, Thick Film, (SMT1206) 5% 1/8W
R 10	4-01448-461	51	Thick Film, 5%, 200 ppm, Chip Resistor
R 11	4-00031-401	100	Resistor, Carbon Film, 1/4W, 5%
R 12	4-00169-407	249	Resistor, Metal Film, 1/8W, 1%, 50PPM
R 13	4-00169-407	249	Resistor, Metal Film, 1/8W, 1%, 50PPM
R 14	4-00169-407	249	Resistor, Metal Film, 1/8W, 1%, 50PPM
R 15	4-00187-407	4.53K	Resistor, Metal Film, 1/8W, 1%, 50PPM
R 16	4-00241-407	787	Resistor, Metal Film, 1/8W, 1%, 50PPM
R 17	4-00187-407	4.53K	Resistor, Metal Film, 1/8W, 1%, 50PPM
R 18	4-01459-461	150	Thick Film, 5%, 200 ppm, Chip Resistor
R 19	4-01459-461	150	Thick Film, 5%, 200 ppm, Chip Resistor
R 20	4-01444-461	36	Thick Film, 5%, 200 ppm, Chip Resistor
R 21	4-01448-461	51	Thick Film, 5%, 200 ppm, Chip Resistor
R 22	4-01448-461	51	Thick Film, 5%, 200 ppm, Chip Resistor
R 23	4-01448-461	51	Thick Film, 5%, 200 ppm, Chip Resistor
R 24	4-01448-461	51	Thick Film, 5%, 200 ppm, Chip Resistor
R 25	4-01448-461	51	Thick Film, 5%, 200 ppm, Chip Resistor
R 26	4-01448-461	51	Thick Film, 5%, 200 ppm, Chip Resistor
R 27	4-01448-461	51	Thick Film, 5%, 200 ppm, Chip Resistor
R 28	4-01448-461	51	Thick Film, 5%, 200 ppm, Chip Resistor
R 29	4-00021-401	1.0K	Resistor, Carbon Film, 1/4W, 5%
R 30	4-00062-401	270	Resistor, Carbon Film, 1/4W, 5%
R 31	4-00062-401	270	Resistor, Carbon Film, 1/4W, 5%
R 32	4-00021-401	1.0K	Resistor, Carbon Film, 1/4W, 5%
R 33	4-01464-461	240	Thick Film, 5%, 200 ppm, Chip Resistor
R 34	4-01455-461	100	Thick Film, 5%, 200 ppm, Chip Resistor
R 35	4-00851-407	340	Resistor, Metal Film, 1/8W, 1%, 50PPM
R 36	4-00021-401	1.0K	Resistor, Carbon Film, 1/4W, 5%
RX0	4-00056-401	22	Resistor, Carbon Film, 1/4W, 5%
RX2	5-00313-552	1P	Capacitor, Chip (SMT1206), 50V, 5%, NPO
U 2	3-00384-329	LM350T	Voltage Reg., TO-220 (TAB) Package
U 3	3-00149-329	LM317T	Voltage Reg., TO-220 (TAB) Package
U 4	3-00568-360	MC10EL35D	Integrated Circuit (Surface Mount Pkg)
U 5	3-00573-360	MC10EL32D	Integrated Circuit (Surface Mount Pkg)
U 6	3-00149-329	LM317T	Voltage Reg., TO-220 (TAB) Package
U 7	3-00568-360	MC10EL35D	Integrated Circuit (Surface Mount Pkg)
U 8	3-00568-360	MC10EL35D	Integrated Circuit (Surface Mount Pkg)
U 9	3-00569-360	MAR6SM	Integrated Circuit (Surface Mount Pkg)
X 0	1-00321-165	10 PIN SOLDER	Connector, D-Sub, Female

<u>REF.</u>	<u>SRS part#</u>	<u>VALUE</u>	<u>DESCRIPTION</u>
X 0	1-00322-100	COAX INSERT	Connector, Misc.
Z 0	0-00000-000	UNDECIDED PART	Hardware, Misc.
Z 0	0-00014-002	6J4	Power_Entry Hardware
Z 0	0-00025-005	3/8"	Lugs
Z 0	0-00042-010	4-40 HEX	Nut, Hex
Z 0	0-00089-033	4"	Tie
Z 0	0-00100-040	1/4X1/16	Washer, Flat
Z 0	0-00109-050	1-1/2" #18	Wire #18 UL1007 Stripped 3/8x3/8 No Tin
Z 0	0-00128-053	4" #24	Wire #24 UL1007 Strip 1/4x1/4 Tin
Z 0	0-00129-053	5" #24	Wire #24 UL1007 Strip 1/4x1/4 Tin
Z 0	0-00150-026	4-40X1/4PF	Screw, Black, All Types
Z 0	0-00153-057	GROMMET2	Grommet
Z 0	0-00208-020	4-40X3/8PF	Screw, Flathead Phillips
Z 0	0-00209-021	4-40X3/8PP	Screw, Panhead Phillips
Z 0	0-00211-020	4-40X5/8PF	Screw, Flathead Phillips
Z 0	0-00212-021	6-32X2PP	Screw, Panhead Phillips
Z 0	0-00228-052	17" #22 GREEN	Wire #22 UL1007
Z 0	0-00231-043	#4 SHOULDER	Washer, nylon
Z 0	0-00241-021	4-40X3/16PP	Screw, Panhead Phillips
Z 0	0-00243-003	TO-220	Insulators
Z 0	0-00251-004	SR620-49	Knobs
Z 0	0-00256-043	#6 SHOULDER	Washer, nylon
Z 0	0-00263-052	3" #22	Wire #22 UL1007
Z 0	0-00264-052	9-1/2" #22 RD	Wire #22 UL1007
Z 0	0-00266-052	8-1/2" #22 BLK	Wire #22 UL1007
Z 0	0-00306-026	4-40X3/16PP	Screw, Black, All Types
Z 0	0-00317-000	40MM 24V	Hardware, Misc.
Z 0	0-00418-000	CLIP, CABLE	Hardware, Misc.
Z 0	0-00419-056	RG178B/U	Cable, Coax & Misc.
Z 0	0-00421-032	SOLDR SLV RG178	Termination
Z 0	0-00440-052	2-1/2" #22 RED	Wire #22 UL1007
Z 0	0-00493-021	10-32X1/2"PP	Screw, Panhead Phillips
Z 0	0-00523-048	5-5/8" #18	Wire, #18 UL1015 Strip 3/8 x 3/8 No Tin
Z 0	0-00854-031	PEM 4-40	Standoff
Z 0	1-00003-120	BNC	Connector, BNC
Z 0	1-00218-120	227699-2	Connector, BNC
Z 0	1-00220-170	3" BNC	Cable Assembly, Multiconductor
Z 0	1-00227-172	Y JUNCTION	Line Cord
Z 0	1-00228-172	USA 3'	Line Cord
Z 0	4-00541-435	130V/1200A	Varistor, Zinc Oxide Nonlinear Resistor
Z 0	6-00004-611	1A 3AG	Fuse
Z 0	6-00167-610	SR625	Transformer
Z 0	7-00571-709	SR625	Lexan Overlay
Z 0	7-00572-720	SR625	Fabricated Part
Z 0	7-00573-720	SR625	Fabricated Part
Z 0	7-00574-720	SR625	Fabricated Part
Z 0	7-00576-720	SR625	Fabricated Part
Z 0	7-00581-721	SR625-6	Machined Part







POWER SUPPLY PCB (ALL COMPONENTS ARE THRU-HOLE PARTS)  
 PRESCALER PCB (ALL COMPONENTS ARE SURFACE MOUNT PARTS)

