# MODEL SRG - 418A

# RC OSCILLATOR

# INSTRUCTION MANUAL

ULTRON - ELEKTRONIK

# Power Requirements of this Product

Power requirements of this product have been changed and the relevant sections of the Operation Manual should be revised accordingly.
(Revision should be applied to items indicated by a check mark ☑.)

☐ Input voltage

The input voltage of this product is _____ VAC,
and the voltage range is _____ to _____ VAC. Use the product within this range only.

☐ Input fuse

The rating of this product's input fuse is _____A, _____VAC, and _____.

**WARNING**

- To avoid electrical shock, always disconnect the AC power cable or turn off the switch on the switchboard before attempting to check or replace the fuse.
- Use a fuse element having a shape, rating, and characteristics suitable for this product. The use of a fuse with a different rating or one that short circuits the fuse holder may result in fire, electric shock, or irreparable damage.

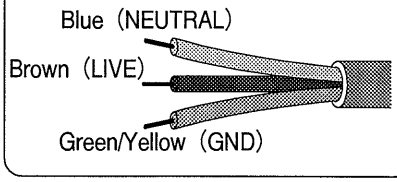
☐ AC power cable

The product is porvided with AC power cables described below. If the cable has no power plug, attach a power plug or crimp-style terminals to the cable in accordance with the wire colors specified in the drawing.

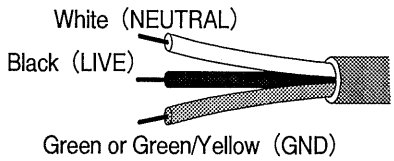
**WARNING**

- The attachment of a power plug or crimp-style terminals must be carried out by qualified personnel.

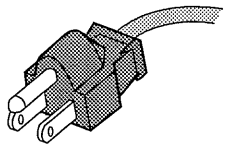
☐ Without a power plug



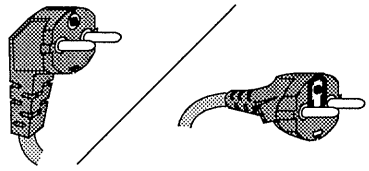

☐ Without a power plug




☐ Plugs for USA



☐ Plugs for Europe



☐ Provided by Kikusui agents

Kikusui agents can provide you with suitable AC power cable.
For further information, contact your Kikusui agent.

☐ Another Cable _____

 Kikusui Part No. Z9-000-027 IB001681

KIKUSUI

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# 1. GENERAL

The Model SRG-418A RC Oscillator employs a solid-state Wien bridge which oscillates at 10 Hz ~ 1 MHz in five ranges. Being incorporated with a thermistor amplitude control circuit, the oscillator provides a sine wave with very minor output voltage variation against switching of the frequency range selector and turning of the frequency dial. Since no output voltage readjustment accompanying frequency range switching is required, the Oscillator is very convenient in actual use.

The oscillator incorporates a square wave generator circuit ( Schmitt circuit ) which provides a square waveform with a fast rise time.

The output voltage level is adjustable for a very wide range through combined use of a continuously variable attenuator and a -20 dB stepwise attenuator.

## 2. SPECIFICATIONS

| | |
|---|---|
| Power requirements | 220 V 50/60 Hz, approx. 8 VA |
| Weight | Approx. 2.4 kg |
| Dimensions<br>( Maximum dimensions ) | 110W x 140H x 252D mm<br>(115W x 160H x 280D mm) |
| Ambient temperature | 5 °C ~ 35 °C ( Humidity: less than 85% ) |
| Oscillation frequency | 10 Hz ~ 1 MHz, in 5 range |
| Frequency ranges | x 10 ····· 10 ~ 100Hz<br>x 100 ····· 100 ~1000Hz<br>x 1K ····· 1k ~ 10 kHz<br>x 10K ····· 10k ~100 kHz<br>x 100K ····· 100k ~ 1 MHz |
| Frequency accuracy | ± ( 3% + 1 Hz ) |
| Output impedance | 600Ω ± 10% |
| Output attenuator | Continuously variable control plus<br>( 0dB ) / ( -20dB ) selector buttons |
| Output terminal | 12/16, 5-way type, 19 mm ( 3/4" ) distance |
| Output waveform | Sine wave and square wave |

Sine wave ( at maximum output voltage )

| | | |
|---|---|---|
| Output voltage | 8 V rms or over ( open ) | |
| | 4 V rms or over (with 600Ω load, at 25 °C ) | |
| Distortion factor | 10 ~ 30 Hz | 2% or less |
| | 30 ~ 100 Hz | 1% or less |
| | 100 ~500 Hz | 0.5% or less |
| | 500~100 kHz | 0.15% or less |
| | 100k ~500 kHz | 0.5 % or less |

| | | |
|---|---|---|
| Frequency characteristics | Within ± 0.5 dB | 10 Hz ~ 1 MHz |
| ( 1 kHz reference ,600Ω load ) | Within ±0.3 dB | 20 Hz ~500kHz |

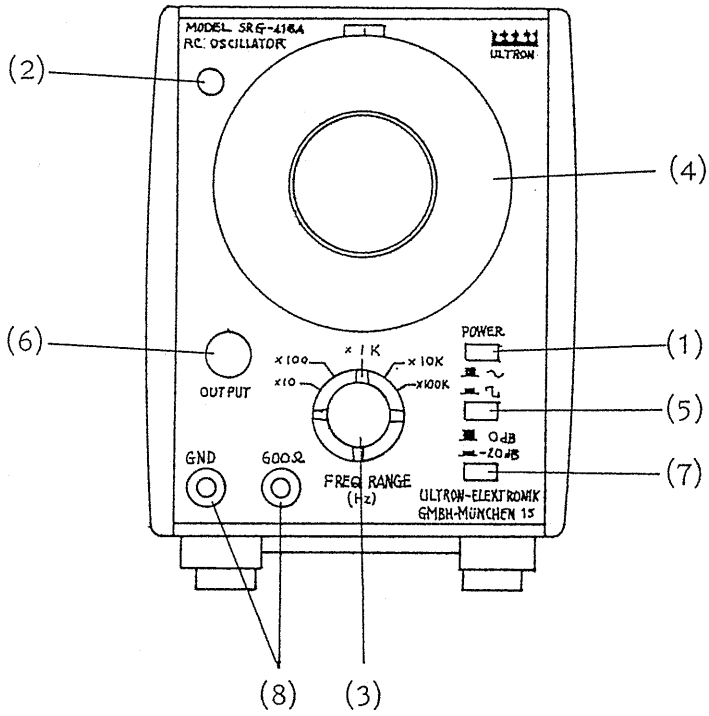
Square wave ( at maximum output voltage )

| | |
|---|---|
| Output voltage | 8 Vp-p or over ( 600 Ω load ) |
| Rise time | 0.2 μsec or faster |
| Overshoot | 2% or less |
| Sag | 5% or less ( at 50 Hz ) |

Accessories Instruction manual ..... 1 copy

# 3. OPERATION PROCEDURE

## 3.1 EXPLANATION OF PANEL CONTROLS AND SWITCHES




(1) POWER — The main power switch. Depressed state is for power on. Pressing again the switch resets it to the popped up state or the power off state.

(2) Power pilot lamp — Lights when the power is on. The lamp actually is a light emitting diode and is free from filament failure unlike the incandescent pilot lamp.

(3) FREQ RANGE ( Hz ) — Frequency range selector rotary switch. The dial reading multiplied by the factor selected by the corresponding button denotes the oscillating frequency.

(4) FREQ DIAL — For continuous variation ( up to 10 times ) of the oscillating frequency.

(5) ∿ ⊓ — Buttons to select either sine wave or square wave output.
Depressed position (▬) : square wave (⊓).
Non-locked position(▮) : sine wave (∿).

(6) OUTPUT CONTROL — For continuously-variable adjustment of output voltage ~~witch~~ which increases as this control is turned clockwise.

(7) 0 dB, -20 dB — Select the factor ( 0 dB (▮), -20 dB (▬) ) to be multiplied to the level adjusted by OUTPUT CONTROL ( 6 ).

(8) GND, 600Ω — The output binding-post terminals. The black derminal( GND terminal ) is grounded to the chassis.

## 3.2 OPERATING PROCEDURE

(1) Turning on the power — Press the power switch. The pilot lamp ( light emitting diode ) will turn on and the oscillator will become the stabilized oscillating state within a few seconds.

(2) Setting the oscillation frequency — Set the oscillation frequency with the FREQ RANGE selector and the FREQ dial. The oscillation frequency is determined by the FREQ dial reading multiplied by the factor selected by the FREQ RANGE selector.

Example 1 Setting 50 kHz
(1) Set the FREQ GANGE selector to x 10k.
(2) Set the FREQ dial in the 5 position.

(3) Output waveform selection

Select (∿) (▮) or (⊓) (▬) for a sine wave output or a square wave output.

(4) Output voltage setting

Adjust the output voltage with the OUTPUT control (6) . The output voltage increases as this control is turned clockwise. The output attenuator (7) decreases the output voltage by the factor of -20dB ( 1/10 ) to be multiplied to the level adjusted by the OUTPUT control (6).

## 3.3 CHANGE OF SUPPLY LINE VOLTAGE

Change the white wire connected to the 220V terminal to the 100V, 110V, 117V. 230V, or 240V terminal of the power transformer, when operating this instrument with the supply line voltage of 100V , 110V, 117V, 230V or 240V.

## 3.4 PRECAUTIONS

(1) Use this instrument under the range of 50Hz ~ 60Hz and 198V ~ 242V. ( Refer to "3.3 CHANGE OF SUPPLY LINE VOLTAGE " when changing the supply line voltage. )

(2) If the lead wires are too long, the specified output voltage/frequency characteristics may not become attainable.
Make the lead wires as short as possible.

(3) Since a thermister is employed as the oscillation voltage control element, the output voltage is affected by ambient temperature. If a constant output voltage is required for a long period, check the output with a voltmeter.

(4) Ambient temperature must be 5 °C ~ 35 °C.
Avoid using the oscillator in dusty environment or highly humid atmosphere.

## 4. OPERATING PRINCIPLE

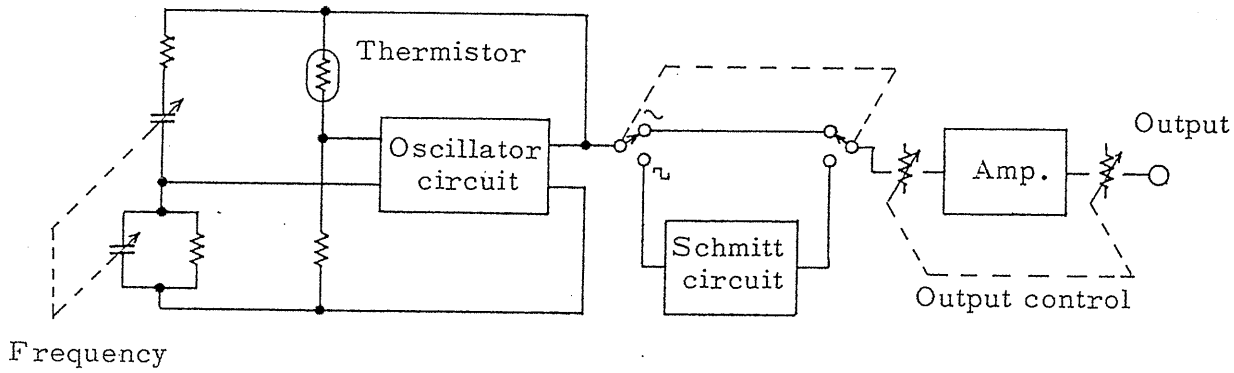



Fig. 1 Block diagram

Among low frequency oscillators, RC oscillators which employ R and C as frequency-determining elements are most common. Among RC oscillators, Wien bridge type is most popular. The Wien bridge has many advantages over other oscillation circuits. Its frequency is easily variable, and small distortion. The operating principle of the Wien bridge oscillator circuit is shown in Fig. 2.

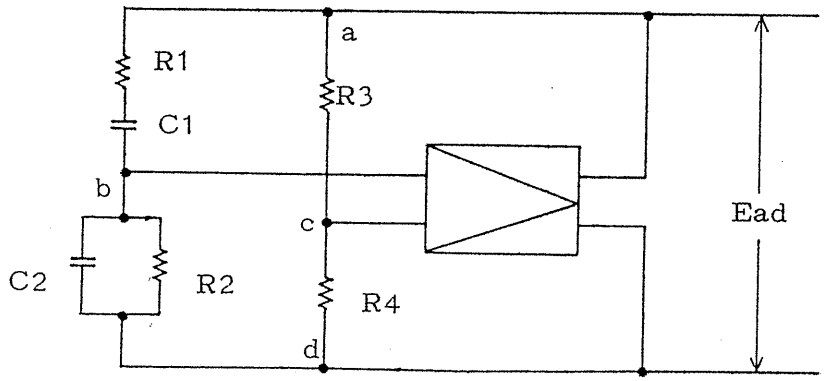



Fig. 2 Wien bridge oscillator circuit

Referring to Fig. 2, the phase of Ebc becomes the same with that of Ead when the below condition is satisfied.

$$f = \frac{1}{2\pi\sqrt{R1\ R2\ C1\ C2}} \tag{1}$$

The circuit oscillates when the below condition is satisfied.

$$Ebc = \left( \frac{1}{1 + \frac{R1}{R2} + \frac{C2}{C1}} - \frac{R4}{R3 + R4} \right) Ead \tag{2}$$

The circuit oscillates when the below condition is satisfied

$$\frac{1}{1 + \frac{R1}{R2} + \frac{C2}{C1}} - \frac{R4}{R3 + R4} \geq \frac{1}{A} \tag{3}$$

The circuit oscillates stably when the below condition is satisfied.

$$\frac{1}{1 + \frac{R1}{R2} + \frac{C2}{C1}} - \frac{R4}{R3 + R4} = \frac{1}{A} \tag{4}$$

It is very difficult for the circuit of Fig. 2 to satisfy constantly the condition of equation (4). Oscillation will not start if the condition of equation (4) is satisfied from the beginning. The conditions of oscillation are determined by equations (1) and (3), and they are not related with the oscillation amplitude. Therefore, the condition of equation (3) must be maintained until the oscillation builds up to the required amplitude. Then the circuit must satisfy the condition of equation (4). To accomplish this requirement, the resistance of R3 or R4 must automatically vary in response to the oscillation amplifier. This is accomplished by using a thermistor as for R3.

# 5. MAINTENANCE

## 5.1 CHASSIS INSPECTION

Remove two screws from the side of the case and two screws from the bottom of the case. Remove three rubber caps from the left side of the case and pull out the chassis from the housing.

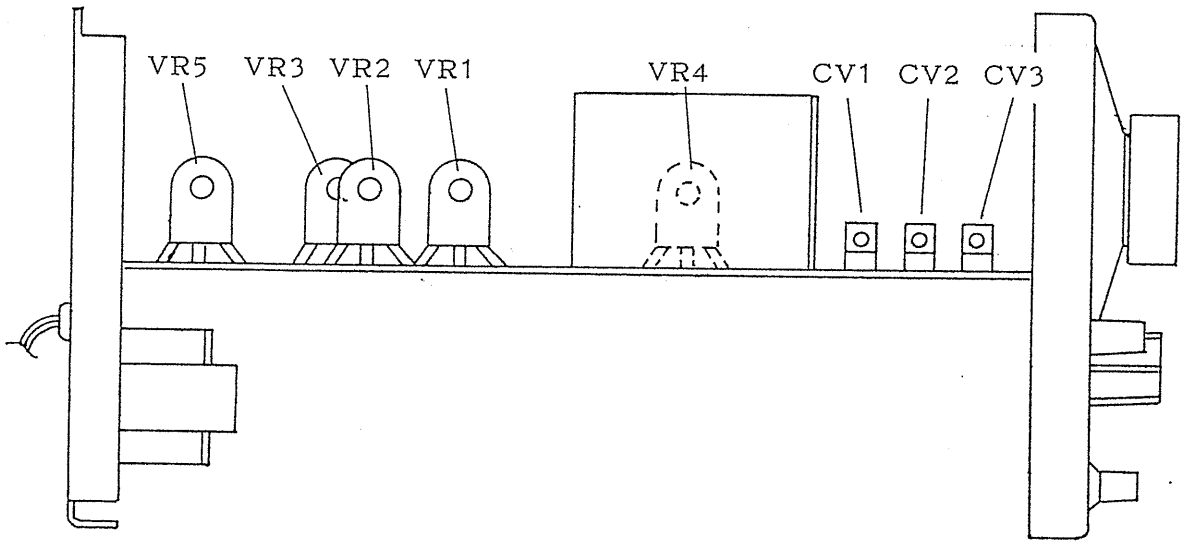



Fig. 3 Locations of controls

VR1, VR2, VR3 → Oscillation circuit DC balance adjustment

| | |
|---|---|
| VR4 | Schumit circuit waveform symmetry adjustment of square wave. |
| VR5 | +40V power supply circuit, voltage adjustment. |
| CV1 | Frequency adjustment of the position 10 of the frequency dial. |
| CV2 | Frequency adjustment in the x10K range. |
| CV3 | Frequency adjustment in the x100K range. |

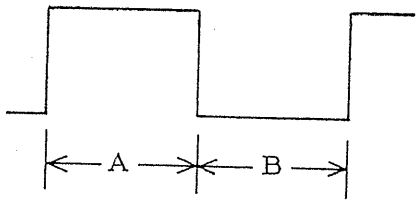
## 5.2 ADJUSTMENTS

Referring to Fig. 3, make adjustments as below.

(1) DC supply voltage ( +40V ) adjustment.
Adjust the voltage as measured at TP6 of printed circuit board to -40V +0.5V by means of semi-fixed resistor VR5.

(2) Oscillator DC balance adjustment
Set the FREQ RANGE selector to x 1K.
Adjust the voltage as measured at TP3 of printed circuit board to +18.6V ±0.3V by means of semi-fixed resistor VR3.
( This adjustment must be performed patiently because the response is slow as a large capacitor is connected in this circuit. )

(3) Waveform symmetry adjustment of square wave
Set the FREQ RANGE selector to x1K and set the output waveform to square wave. Observing the output with an oscilloscope, adjust the output waveform by means of semi-fixed resistor VR4 so that dimensions A and B illustrated below are made equal.




(4) Frequency adjustment
Follow the below procedure for this adjustment.
1. Join surely the case to the chassis by tightening with screw.
2. Measure the frequencies corresponding to "1" position of the FREQ dial and x100, x1K and x10K ( 100Hz, 1kHz and 10kHz respectively. ).

Adjust the FREQ dial to the position where the errors are made minimum, and fix the dial in this position.

3. Set the FREQ dial in the "10" position and set the FREQ RANGE selector to x1K position, and adjust CV1 so that the oscillation frequency is made 10.000kHz. In a similar manner, set to x10K position and adjust CV2 so that the frequency is made 100.0 kHz. In a similar manner, set to x100K position and adjust CV3 so that the oscillation frequency is made 1000 kHz.