

SIGNAL GENERATOR/COUNTER

MODEL SG-9500

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DESCRIPTION

This unit is a LED digit display RF Signal Generator and Frequency Counter combined together in portable type. It means that this unit can be used for RF Signal Generator as well as the Frequency Counter. Since it is a LED digital display for RF Signal Oscillation, the RF output signal of this unit can be considered as a standard RF Signal generator for which its accuracy is only ± 1 count digit.

A) FOR THE RF SIGNAL GENERATOR USED

This oscillation frequency range of RF Signal Generator is usually from 100KHz to 150MHz in six range. Which is most suited for checking and aligning the IF circuit and tuner in AM, FM and TV Sets.

B) FOR THE FREQUENCY COUNTER USED

This unit can measure the frequency range from 10Hz to 150MHz.

1. PREPARATION

- (1) Set the POWER switch at OFF.
- (2) Connect the AC plug to the AC supply.
- (3) Connect the RF output leads to OUTPUT terminals.
- (4) Set the FREQ RANGE switch at the operating band and rotate the frequency dial knob to the desired frequency.
- (5) The output connecting leads should be as short as possible to prevent pickup of unwanted noise. A long shielded cable will degrade the output response at high frequencies, especially when square waves are in use.

- (6) Make certain that the line voltage changeover switch at the rear of cabinet is at the proper setting for the AC line voltage in use.
The AC line voltage should be kept constant.

2. **CONNECTIONS**

The RF leads are connected to the input of the circuit under test. The red terminal is at high potential, or "hot", and black is at earth potential for chassis connection.

For the RF signal at the receiver antenna input, connect a 50 to 200 Ω resistor, 1/4W, in series. When checking sets with a rod antenna, connect leads to a coil with a few turns of wire and couple the coil to the antenna.

In checking RF and IF amplifier circuits, connection should be made through a small capacitor, 1-5pF, in order to prevent detuning effects.

NOTE: When connecting directly to the input circuit, make certain there is no high DC voltage present. Otherwise, connect a blocking capacitor, 0.05 μ F — 100pF, depending on the frequency.

SPECIFICATION

A) RF SIGNAL GENERATOR

| | |
|---------------------------------------|--|
| FREQUENCY RANG..... | A 100KHz – 300KHz B 300KHz – 1000KHz C 1MHz – 3.2MHz D 3.0MHz – 10MHz E 10MHz – 35MHz F 32MHz – 150MHz (UP TO 450MHz ON THIRD-HARMONICS) |
| FREQUENCY ACCURACY..... | ±COUNT ACCURY ±1 DIGIT. |
| RF OUTPUT..... | 100mV, RMS. APPROX (UP TO 35MHz) |
| OUTPUT CONTROL..... | 0dB/20dB AND FINE ADJUSTER |
| MODULATION..... | INTERNAL 1KHz EXTERNAL 50Hz – 20KHz, AT LESS THAN 1V RMS. |
| AUDIO OUTPUT..... | 1KHz, MIN. 1V. VRMS (FIXED) |
| CRYSTAL OSCILLATOR HC-6/u HOLDER..... | FOR 1 – 15MHz USE CRYSTAL IN TYPE HC-6u HOLDER (NOT INCLUDED) |
| POWER REQUIREMENT..... | 110V OR 220V AC 50Hz OR 60Hz SELECT SWITCH |

B) FREQUENCY COUNTER

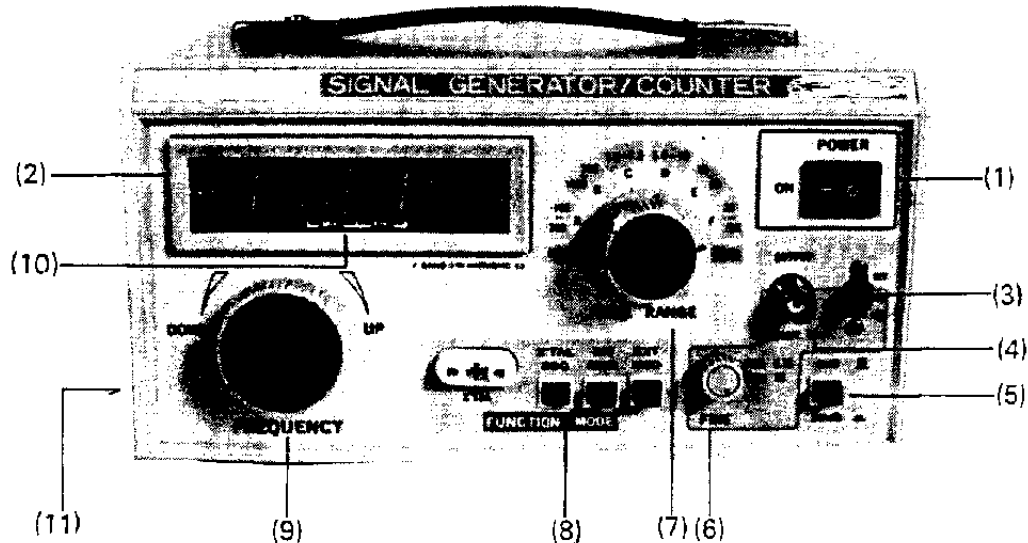
| | |
|----------------------------|---|
| FREQUENCY RANGE..... | HF 10Hz TO 10MHz VHF 10MHz TO 150MHz |
| INPUT VOLTAGE..... | LESS 50mV |
| MAXIMAL INPUT VOLTAGE..... | LESS ABOUT 3V EFFECTIVE |
| GATE TIMES..... | 0.1SEC. 1SEC. |
| DEFINITION..... | HF 1Hz/VHF 10Hz |
| INPUT IMPEDANCE..... | HF 1 MOHM VHF 50 OHM |
| OPERATION TEMPERATURE..... | 0 TO 40°C. |

PANEL CONTROLS AND TERMINALS FUNCTION

- (1) POWER SWITCH: For turning on the AC power
- (2) MONITOR DISPLAY: LED to display up to 6-digits mantissa of count value for the frequency Hz of output RF Signal Generator and input of frequency counter. The number of displayed digits is determined by Gate Time.
The dot "." on the monitor is indicated MHz or KHz.
And the dot "." light is flashed because dot "." is also to be used as Gate Time display.
PLEASE NOTE THAT WHEN "OVER" LAMP IS LIGHT "ON" FLASHED, IT MEANS THAT COUNTER IS OVERFLOW AND INDICATED THAT ONE OF THE MORE OF THE MOST SIGNIFICANT DIGITS ARE NOT DISPLAYED. SO, PLEASE PULL (6) FINE KNOB UP IN 0.1sec.
- (3) "INT/VHF/HF" SWITCH: To select on "INT" position, this unit is used as RF Signal Generator.
To select on "VHF" position this unit is used as frequency counter for measuring frequency range from 10MHz to 150MHz.
To select on "HF" position this unit is used as frequency counter for measuring frequency range from 10Hz to 10MHz.
PLEASE NOTE THAT WHEN THE SWITCH IS SET ON "HF" POSITION THE DOT "." OF (2) "MONITOR DISPLAY" IS INDICATED KHz AND THE SWITCH IS SET ON "VHF" POSITION THE DOT "." IS INDICATED MHz NO MATTER HOW THE GATE TIME OF (6) "FINE" KNOB IS PULL UP "0.1S" OR PUSH DOWN "1S".

- (4) "OUTPUT/COUNT IN" TERMINAL: When "INT/VHF/HF" switch selected on "INT" position, this terminal is used for the output of RF Signal Generator, and "INT/VHF/HF" switch selected on "VHF" or "HF" position, this terminal is used for input terminal of frequency counter.
- (5) ATTENUATOR SWITCH: Push down the switch, the output level will be lowed 20dB.
- (6) "FINE" KNOB: When this switch is pull up or push down, it can be used for continuous "FINE" adjustment of output voltage of RF Signal Generator. When switch is pulled up, this switch can be used for GateTime 0.1sec. of frequency counter and pushed down, this switch can be used for GateTime 1sec. of frequency counter.
- (7) FREQUENCY RANGE BAND: A 100K – 300KHz
B 300 – 1000KHz
C 1M – 3.2MHz
D 3M – 10MHz
E 10M – 35MHz
F 32M – 150MHz
(UP TO 450MHz ON THIRD HARMONICS)
- (8) FUNCTION MODE:
1. EXT MOD: For modulation of carrier with an external source
 2. INT. MOD: Used of internal 1KHz for modulation of external circuit testing.
 3. X'TAL OSC.: Crystal oscillator output frequency depends on crystal
 4. X'TAL: Crystal socket, for insertion of quartz cryystal 1 – 15MHz in type HC-6/u holder.
- (9) FREQUENCY DIAL: Set the RF output frequency in the range selected by the freq. range band.

- (10) FREQUENCY DISPLAY: For digital display of the output frequency Hz.
- (11) MOD. IN/OUT JACK: On the rear side of the unit, for external modulation input or output from internal 1KHz oscillator.



OPERATION OF RF SIGNAL GENERATOR AND FREQUENCY COUNTER

A) RF SIGNAL GENERATOR

PREPARATION: a. Set the power switch at off.

b. Connect the AC plug to the AC supply.

c. Connect the RF output leads to output terminals.

d. Set the fine control at center and push down (5) ATTENUATOR SWITCH.

1. Power switch at "ON" position.

2. INT/VHF/HF switch at "INT" position.

3. CONNECTIONS: The RF leads are connected to the input of the circuit under test and "OUTPUT" terminal of the unit. For the RF Signal at the receiver antenna input, connect a 50 to 200 ohm resistor, 1/4W in series. When checking sets with a rod antenna, connect leads to a coil with a few turns of wire and couple the coil to the antenna. In checking RF and IF amplifier circuits, connection should be made through a small capacitor, 1-5pF, in order to prevent detuning effect.

NOTE: WHEN CONNECTING DIRECTLY TO THE INPUT CIRCUIT, MAKE CERTAIN THE THERE IS NO HIGH DC VOLTAGE PRESENT. OTHERWISE, CONNECT A BLOCKING CAPACITOR, 0.05 μ F – 100 μ F, DEPENDING ON THE FREQUENCY.

4. MODULATED CARRIER, INTERNAL SOURCE:

Push down mode switch at "INT. MOD."

By tuning the receiver to the generator frequency, or vice versa, an audio tone will be heard in the loudspeaker. An audio voltmeter should be connected across the speaker terminals when aligning

the internal circuits. A dummy resistor with suitable power rating can be used in place of the speaker.

It is advisable to keep the RF Signal level as low as possible in order to prevent overloading the transistors or electron tubes in the circuit. Excessive input voltage will cause **AGC action and/or two resonance points** to appear and proper alignment or adjustment would be impossible.

5. **MODULATED CARRIER, EXTERNAL SOURCE:**

Push down switch at "EXT. MOD."

Connect leads from an external audio generator to the "EXT/INT MOD."

"MOD. IN/OUT" jack on the rear side of unit. Frequencies up to 15KHz can be used for modulation at RF above 3MHz. The audio input voltage should not exceed 2V. this is to prevent modulation distortion.

6. **UNMODULATED CARRIER:** Push down mode switch at "EXT". MOD." There should be no connection to the "MOD. IN/OUT" jack on the rear side of unit.

The RF Signal can be used in testing a receiver equipped with a beat oscillator, or circuits that do not require a modulated signal.

The RF signal can be applied to a sweep generator for the marker signal.

7. **CRYSTAL OSCILLATOR OUTPUT:**

CONTROL SETTING: MODE switch at X'TAL, insert a crystal in the X'TAL socket.

RF output switch push down 20dB switch to attenuated output level 20dB.

Freq. range switch at "F" and frequency dial at 100KHz.

FINE control at minimum.

The output signal is treated in the same manner as for the unmodulated carrier with exception that the output level cannot be adjusted.

In certain calibration procedures a short lead near the test circuit will provide sufficient coupling.

NOTE: IF and RF Signal is required at the same time, set the output frequency with the freq. range switch and frequency dial as required. Adjust the FINE control.

8. AF OUTPUT, 1KHz

CONTROL SETTING: Function mode switch push down "INT MOD".

Freq. range switch at "F" and frequency dial at 100MHz.

Connect leads from output to the circuit.

Use an external potentiometer, 100K -1M ohm, to lower the voltage.

9. OSCILLATOR FREQUENCY CALIBRATION:

The RF oscillator frequency can be calibrated to a high degree of precision using the harmonics of the internal crystal oscillator and an external all-wave receiver. The latter is utilized as a frequency transfer unit.

1. Function mode switch push down at "X'TAL OSC".

2. Insert the "STANDARD FREQUENCY" crystal, preferably at a multiple of 1MHz. For spot frequency checking, at say 10.7MHz use a 10.7MHz crystal.

3. Push down the attenuator switch down 20dB adjust the FINE control as required.

4. Connect the RF output to the receiver input, direct or through a small coupling capacitor to the rod antenna. **of the all-band receiver**

5. In the following example, use of a 1MHz crystal will be given.

6. Tune the receiver to 5MHz, or 5th harmonic of 1MHz. Then by carefully tuning both the oscillator and is adjusted to zero beat and the dial reading is noted. At other frequencies spaced 1MHz apart,

the same procedure is repeated, namely, oscillator setting – tuning the receiver – retuning oscillator and noting the reading on the dial. Practical use of harmonics up to the tenth or higher is possible. However, care must be exercised in selecting the proper harmonic, especially at high RF when a relatively low frequency crystal is used.

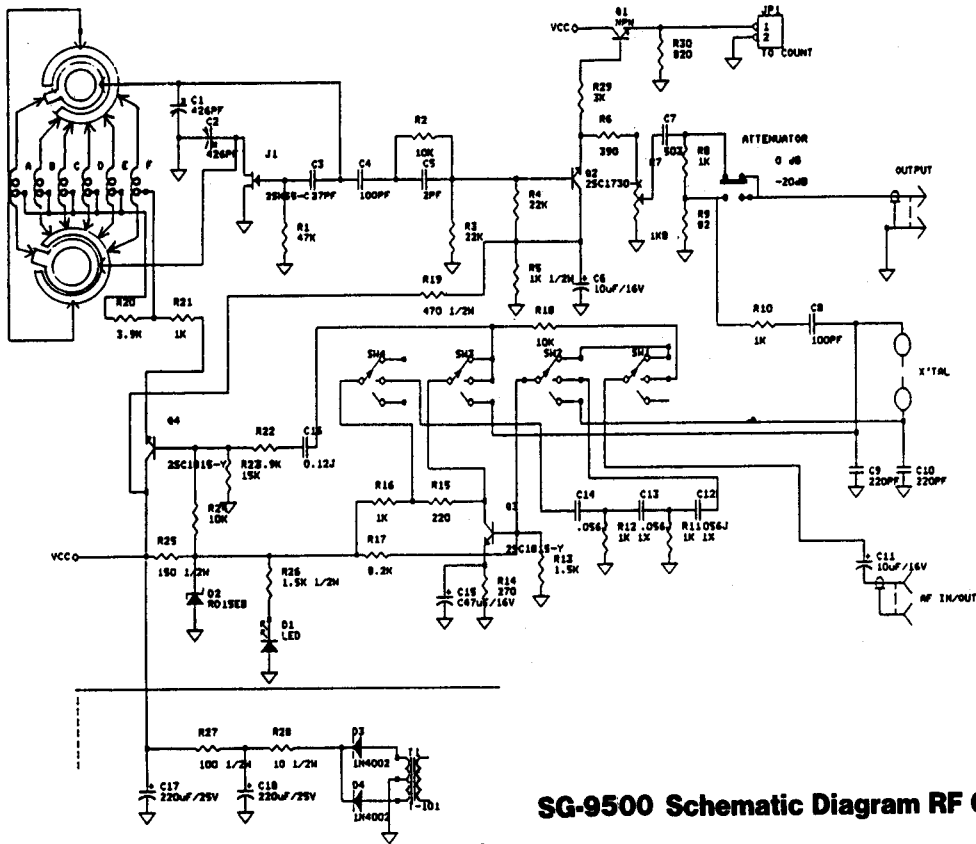
NOTE: When a receiver equipped with a beat frequency oscillator is used the measurements can be simplified the “ZEROBEAT” condition is at the point where the steady beat is heard most clearly.

B) FREQUENCY COUNTER

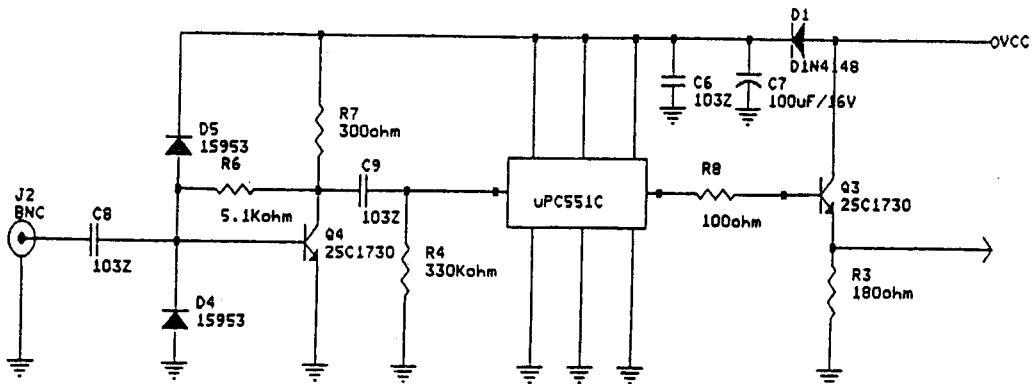
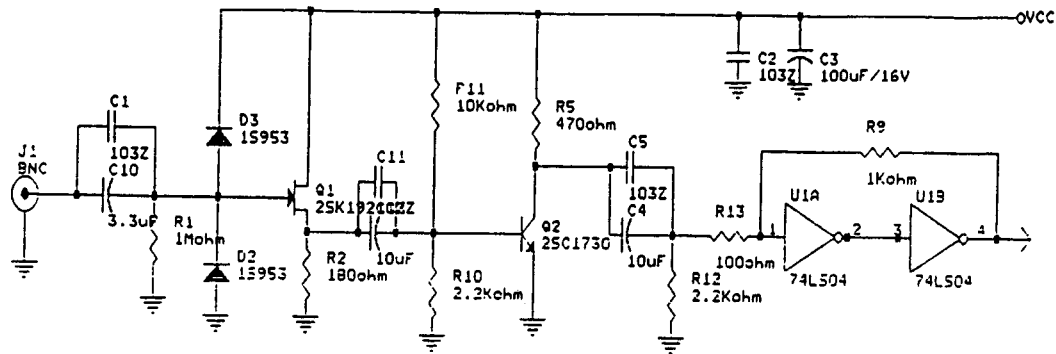
1. Power switch at “ON”
2. “INT/VHF/HF” switch at “VHF” or “HF” position, it depends on what input measurement range, from 10Hz to 10MHz in “HF” position or from 10MHz to 150MHz in “VHF” position.
3. Connecting the output of measured signal oscillator to the “OUTPUT/COUNT IN” terminal of this unit as frequency counter input terminal.
4. The user can pull up “FINE” switch for Gate Time 0.1sec. and push down “FINE” switch for Gate Time 1sec. of the display of frequency counter.

Please make sure that the voltage of your test signal is in the given range. If the voltage is too high or too low, you have to use either a **potentiometer divider** or a **per-amplifier**.

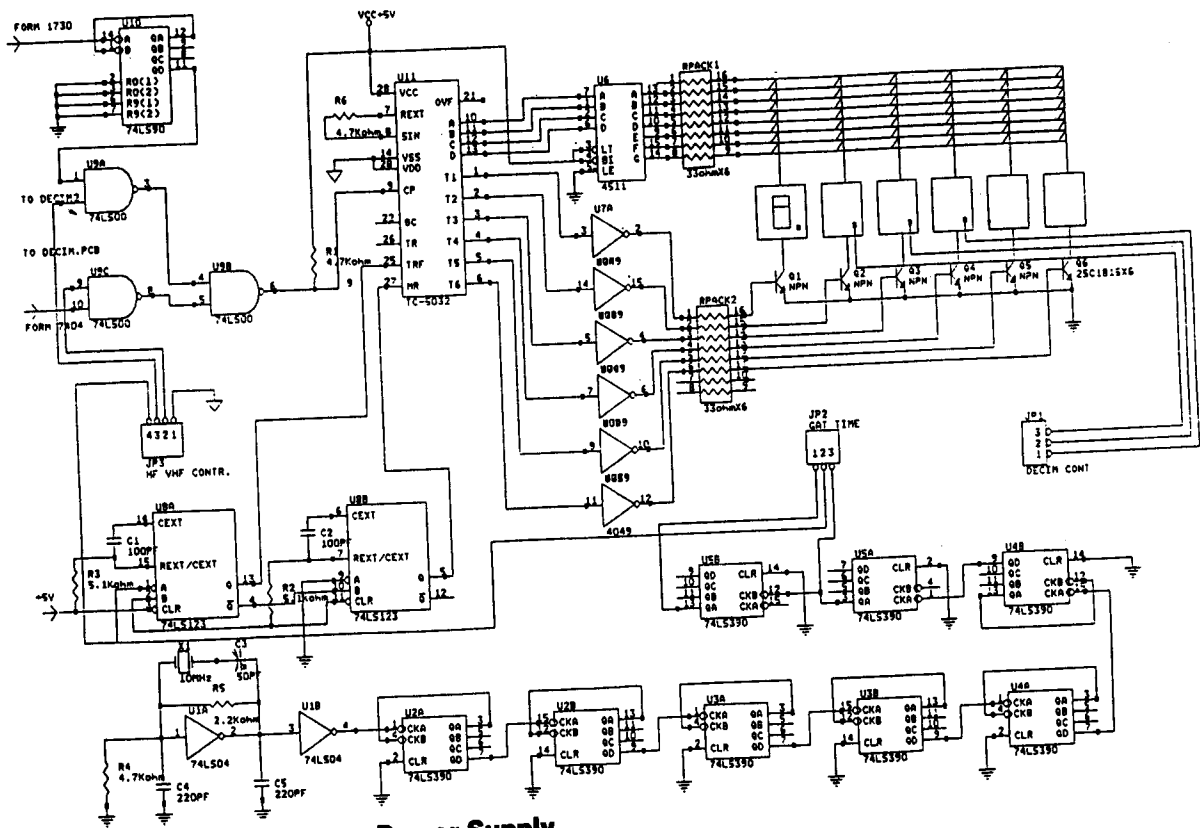
5. For detail operating information, please refer to panel of RF Signal Generator and Frequency Counter (2) (3) (4) (6).



SG-9500 Schematic Diagram RF Generator



SG-9500 Schematic Diagram Frequency Counter



Power Supply

