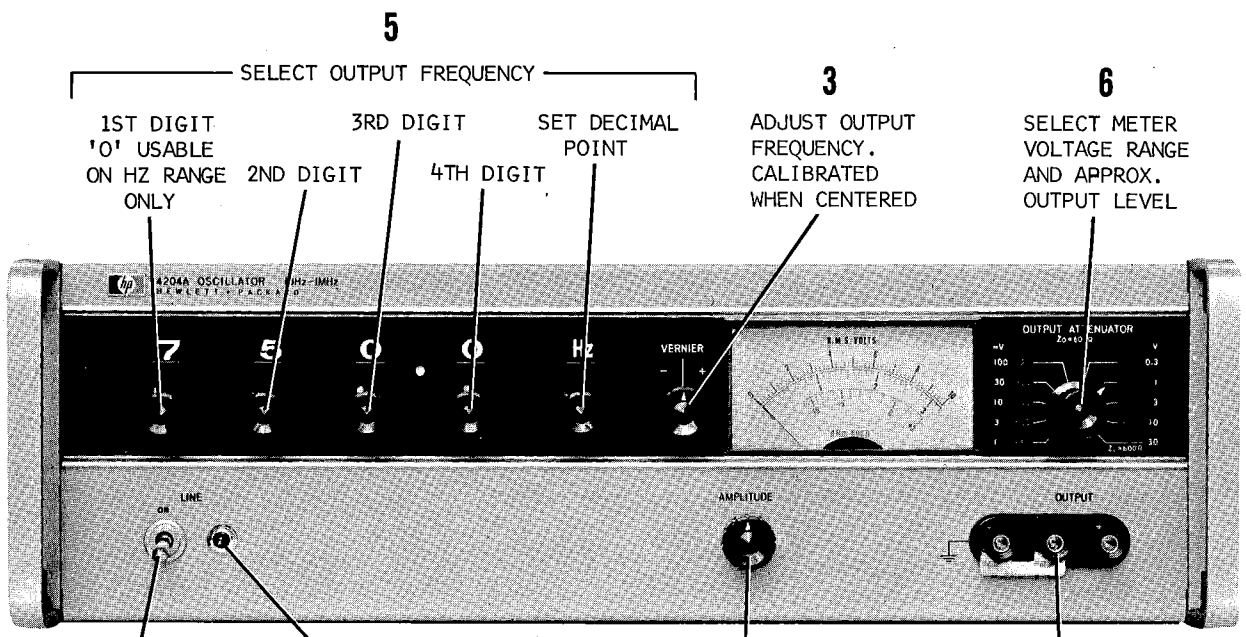
OSCILLATOR

4204A



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SPECIFICATIONS

Frequency Range: 10 Hz to 1 MHz, 4 ranges.

Frequency Accuracy: ±0.2% or ±0.1 Hz (at 25°C).

Frequency Stability
±10% Line Voltage Variation: Less than ±0.01%.
Change of Frequency with Temperature: ±100 ppm/°C.
Drift: 10 ppm/minute

Frequency Response: Flat within ±3%.

Output: 10 V (22 dBm) into 600 ohms (160 mW). 20 V Open Circuit.

Output Attenuator: 80 dB in 10 dB steps; ±0.5 dB error.

Output Monitor: Voltmeter monitors level at input of attenuator in volts or dB.

Accuracy: ±2% of full scale.
Flatness: ±1% at full scale, 10 Hz to 500 kHz.
±2% at full scale, 500 kHz to 1 MHz.

Distortion: Less than 0.3%, 30 Hz to 100 kHz, Less than 1%, 10 Hz to 1 MHz.

Hum and Noise: Less than 0.05% of output.

Temperature Range: 0°C to + 50°C.

Power: 115 V/230 V switch, ±10%, 10 watts, 50 to 60 Hz.

Weight: Net, 19 lbs. (8,5 kg). Shipping, 28 lbs. (11 kg).

Accessories Available:

HP 11004A Line Matching Transformer has a frequency response of 5 kHz to 600 kHz providing fully balanced outputs for 135 or 600 ohms.

HP 11005A Line Matching Transformer has a frequency response of 20 Hz to 45 kHz providing full balanced output into 600 ohms.

HP 16252A Matching Transformer has a frequency response of 10 kHz to 1 MHz providing unbalanced 75 ohm output, terminated in UG-657/U female BNC connector.

HP 11000A Cable: Dual Banana Plugs.

HP 11001A Cable: Banana Plug to BNC Male Connector.

Option 01: 4204A Output Monitor top scale calibrated in dBm/600Ω. Bottom scale calibrated in volts.

BLOCK DIAGRAM

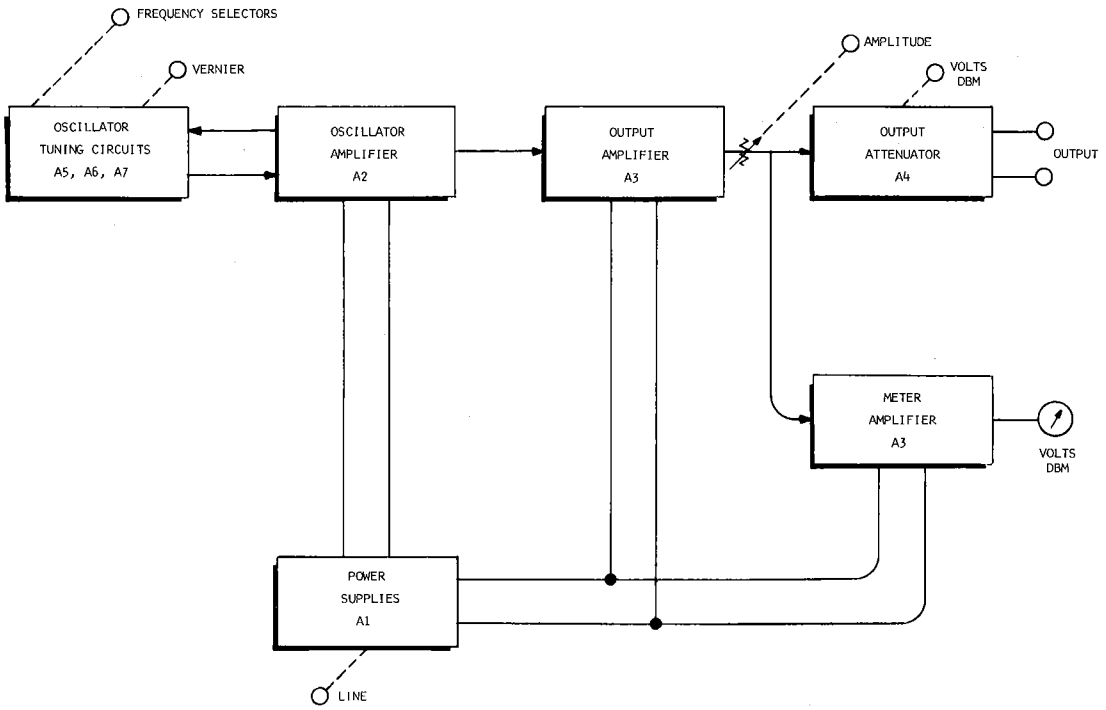

Figure 2

GENERAL DESCRIPTION

DESCRIPTION.

The Hewlett-Packard Model 4204A Oscillator is a general-purpose digital oscillator that produces a sine wave output signal continuously adjustable in frequency from 10 Hz to 1 MHz and in amplitude from 0 to 10 volts rms into a 600-ohm load (-60 to +22 dBm). Frequency selection is by four, in-line, indicating switches, one for each digit and by a frequency control that provides continuous adjustment between digital settings.

An output attenuator provides accurate attenuation in 10-dB steps and an amplitude control provides continuous adjustment between steps. The output signal level is measured by a front-panel meter calibrated in both rms volts and dBm.

The 4204A Oscillator is isolated from power-line ground to permit connecting the output terminals to external circuits above and below ground potential with minimum shunting, and to avoid undesirable ground loops.

The 4204A uses stabilized amplifiers and regulated power supplies to obtain the frequency stability needed for 4-place resetability.

EQUIPMENT SUPPLIED.

4204A	Oscillator	(1)
8120-0078	Power Cord	(1)
5060-3997	Rack mounting adapter kit	(1)

CIRCUIT DESCRIPTION.

The 4204A Oscillator consists of a Wein Bridge oscillator, an output amplifier followed by continuously adjustable amplitude control, a step adjustable attenuator feeding the output terminals, and an electronic voltmeter that measures the signal level applied to the output attenuator. Each step on the attenuator switch indicates the full-scale voltage to be read from the meter.

The output attenuator presents a 600-ohm source resistance to the output terminals. In the 10 and 30-volt positions of the attenuator, the attenuator is out of the circuit, and the amplitude control and amplifier together present a 600-ohm internal impedance to the load.

The output amplifier completely isolates the oscillator tuning circuits from the output terminals. The amplifier maintains good waveform purity with a wide range of load impedances; specified purity is obtained with any load above 600 ohms.

INSTALLATION INSTRUCTIONS

UNPACKING AND INSPECTION.

When receiving a shipment from a carrier, inspect the shipping container with carrier present. If the shipping carton shows evidence of rough handling when received, take exception on the carrier delivery receipt before accepting the shipment.

If no apparent damage is noted, but physical damage is discovered upon opening of the carton, preserve the carton and packing matials intact, notify the carrier immediately, and have them perform a written inspection of the condition of the carton and its contents.

SHIPMENT.

If possible, use original shipping container and cushions for reshipment. Otherwise, wrap instrument in wrapping paper, completely surround it with a 1-1/2 inch thick urethane cushions (or equivalent), and pack firmly in a strong corrugated paper container. Seal with strong tape and mark box "FRAGILE". If loose fill dunnage such as "flakes" or "straws" is used, use at least three inches thickness all around and pack the dunnage very tightly. Loose fill compresses after a short time and allows the load to shift.

STORAGE.

When storing the oscillator, wrap in paper to prevent air circulation and accumulation of dust. Do not subject the oscillator to temperatures below -40°C or above +75°C (-53°F to +167°F).

RACK INSTALLATION.

The Model 4204A is ready for bench operation as shipped from the factory. Additional parts necessary for rack mounting are packaged with the instrument. To convert for rack installation, proceed as follows:

a. Remove tilt stand from bottom.

b. Remove feet from bottom. (press the foot-release button, slide foot toward center of instrument, and lift off)

c. Remove adhesive-backed trim strips near front end of each side panel.

d. Attach rack filler strip along bottom edge of front panel.

e. Attach flanges to side panels where trim strips were removed. Instrument is now ready to mount in a standard rack.

OPERATION ON 115 OR 230-VOLT LINES.

The Model 4204A can be operated on either 115 or 230-volt (±10%), 50 to 60 Hz power lines. A slide switch on the rear panel permits quick conversion for operation from either voltage. Insert a narrow blade screwdriver in the switch slot and slide the switch to expose "115" marking for 115-volt operation, or "230" marking for 230-volt operation. A 0.2-ampere, slow-blow fuse (HP part number 2110-0106) is used for either 115 or 230-volt operation.

CAUTION

Do Not change the line voltage selector switch setting during operation.

GROUNDING THE OSCILLATOR CABINET.

The 4202A is equipped with a detachable, 3-wire power cord. (HP part number 8120-0078). The round pin on the plug connects the instrument cabinet (but not the inner chassis) to the power-line ground. When connecting to a 2-blade outlet, use a connector adapter (HP part number 1251-0048), and connect the short lead on the adapter to ground. Do not disconnect this ground wire to obtain "ungrounded" operation; instead, disconnect the captive ground strap between the red and black OUTPUT terminals on the front panel.

OPERATING INSTRUCTIONS

OPERATING PROCEDURE.

The step-by-step procedure for operating the 4204A Oscillator is shown on the Title Page.

FREQUENCY STABILITY AFTER TURN ON.

The 4204A output frequency is within specified accuracy a few seconds after turn on; however, best frequency stability is obtained after a 5-minute warmup. After the warmup, and with a stable ambient temperature, frequency drift is less than 10 PPM/minute.

If the ambient temperature changes, the resulting change in frequency will be less than 100 PPM/°C. If the power-line voltage changes, the resulting change in frequency will be less than 100 PPM/10% line voltage change. Momentary turn-off causes a minor frequency shift and about three minutes are needed to return to original frequency.

FREQUENCY VERNIER.

The 4204A output frequency is calibrated when the VERNIER control is centered. Adjusting the VERNIER clockwise increases frequency; maximum rotation gives about 0.1% frequency change.

OPERATING PRECAUTIONS.

WARNING

When operating the oscillator ungrounded, the inner chassis assumes the electrical potential of the circuit to which the output terminals are connected. This potential exists on the control knob set screws.

Do not connect the OUTPUT terminals to circuits that are more than 600 volts from ground potential.

Do not apply potentials across the OUTPUT terminals. Excessive current applied to the output attenuator can impair its accuracy.

The first (left-hand) frequency selector should be set to "0" only on the Hz frequency range.

When switching to the lowest frequencies, a few seconds are required for oscillation buildup.

On 1v range and below, the OUTPUT terminals must be connected to a 600-ohm load for the meter to be accurate.

OUTPUT TERMINAL ISOLATION FROM GROUND.

The entire oscillator circuit and red OUTPUT terminals are ungrounded; they are isolated from the power-line ground by over 15,000 ohms in parallel with approximately 1,000 picofarads.

The oscillator cabinet is connected through a third wire in the power cord to the power line ground.

The black binding post to the left of the OUTPUT terminals connects directly to the instrument cabinet and power line ground. The captive grounding strap on this binding post can be connected to the adjacent red OUTPUT terminal to ground the low-side of the oscillator output.

If the load connected to the oscillator output is already grounded, it may be desirable to leave the oscillator output ungrounded to avoid having two ground points. This prevents unwanted ground currents from flowing through the signal leads, especially important when generating very low-level signals.

Figure 3 shows an example of using the oscillator output ungrounded and connected to a circuit at high potential.

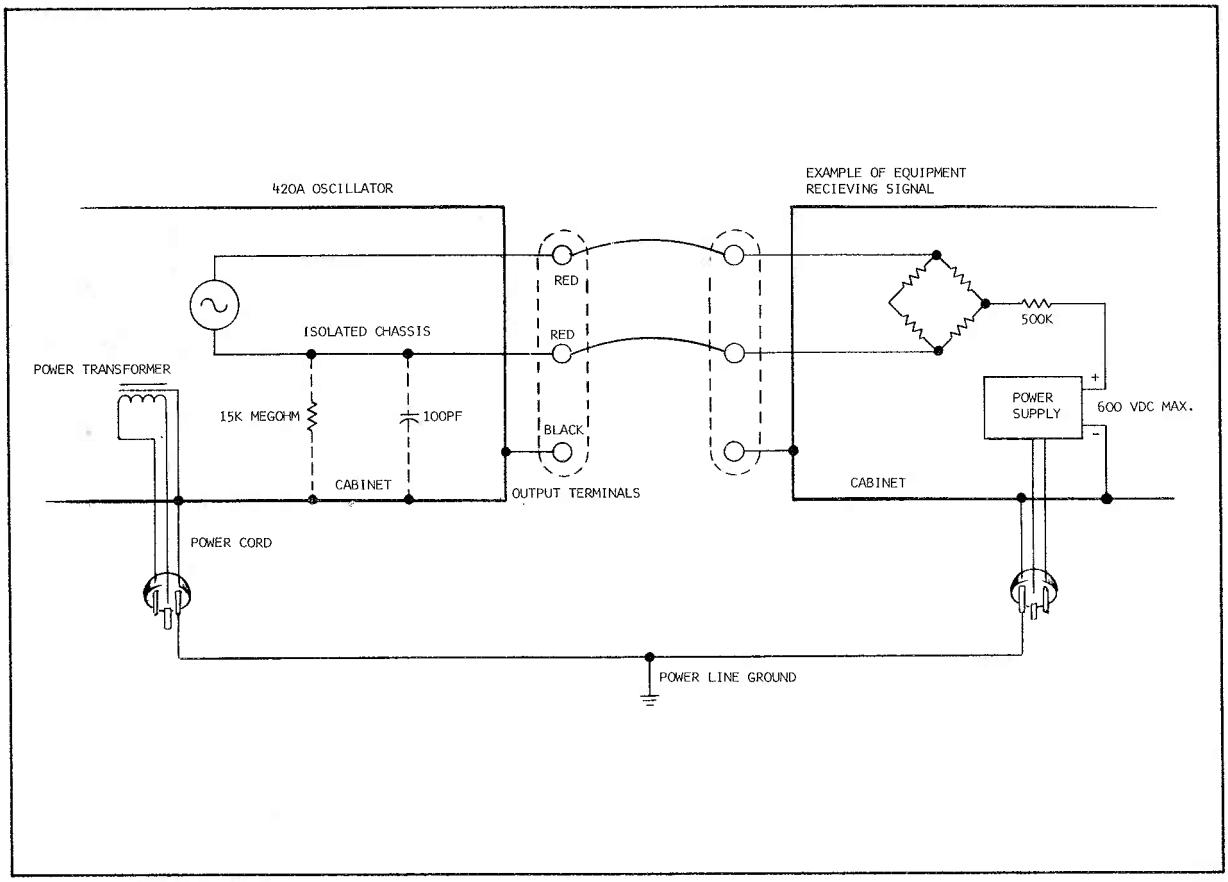

Figure 3

READING THE OUTPUT METER.

The front-panel meter indicates the rms value of the voltage at the OUTPUT terminals, using the full-scale voltage indicated by the setting of the output attenuator. For the meter to be read accurately, the OUTPUT terminals must be connected to a 600-ohm load. Any other value of load resistance changes the actual output voltage from that read on the meter, except on the 10 and 30-volt ranges when all attenuator resistance is out of the circuit. The actual output voltage or dBm for other values of load resistance can be determined from the equations which follow.

Equations for obtaining actual output voltage for external loads other than 600 ohms:

10v and
30v ranges:

$$E_{output} = E_{meter}$$

3v range:

$$E_{output} = \frac{2 \times E_{meter}}{1 + \frac{600}{R_{load}} + 0.1\left(1 - \frac{600}{R_{load}}\right)}$$

1v to 1 mv ranges:

$$E_{output} = \frac{2 \times E_{meter}}{1 + \frac{600}{R_{load}}}$$

ZERO SETTING THE METER.

Set the meter pointer to the zero calibration mark with the oscillator turned off. Adjust the meter pointer by turning the black disk below the meter face. There is a small recess in the disk to receive a pointed tool.

LOADING THE OUTPUT TERMINALS.

The 4204A output terminals may be connected to any load impedance above 600 ohms without impairing waveform purity. Load impedances very much lower than 600 ohms increase waveform distortion approximately as shown in the graph on the following page.

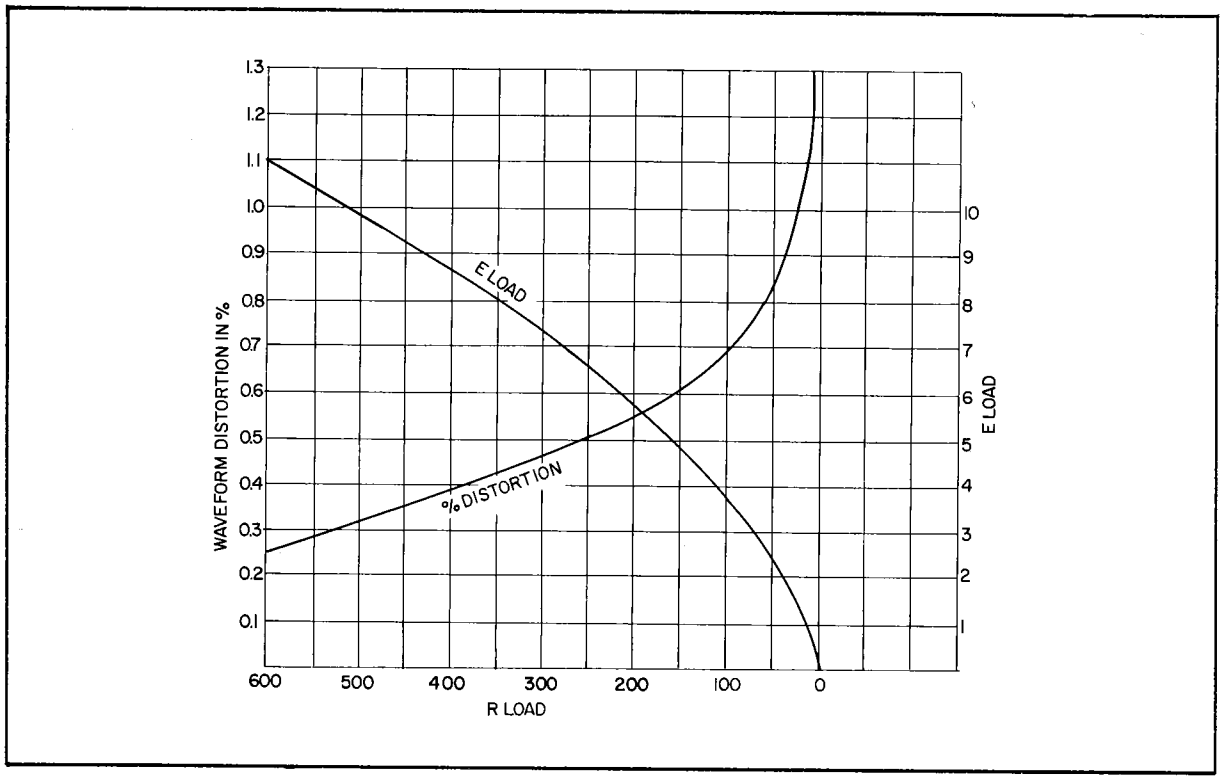

Figure 4

OPERATOR'S MAINTENANCE.

Operator's preventive maintenance consists of observing and reporting any sign of deterioration to repair facilities. Examples of deterioration are inaccurate frequency or amplitude indication, inadequate output level, difficult operation of controls or physical damage.

Lubrication is used only on a sliding bar that carries the decimal point across the frequency indicators. A small amount of grease can be applied when needed, after wiping off old lubricant.

The following check-out procedure is provided for an operator's quick test of oscillator performance. Perform this test after every shipment or prolonged storage, and after rough handling or use in severe climatic conditions.

OSCILLATOR PERFORMANCE CHECK.

The following test procedure is a quick check of oscillator performance. The procedure checks frequency response, signal level adjustment and amplitude, and internal impedance. Frequency and waveform are then checked on an oscilloscope. More accurate frequency tests require an electronic counter; more accurate waveform tests require a distortion analyzer.

a. Connect the oscillator to the power source and turn on.

b. Set the frequency switches to 1.000 kHz; set the AMPLITUDE control and OUTPUT ATTENUATOR maximum clockwise. The output meter must read at least 20v.

c. Connect a 600-ohm load to the OUTPUT terminals, and set the OUTPUT ATTENUATOR to the 10v range. The output meter must read at least 10v.

d. Set the AMPLITUDE control for a meter reading of 9. Switch the frequency range switch to each other range. The meter must read between 8.6 and 9.4 on each other range.

e. Set the frequency switches to 9.999 kHz. Turn the frequency range switch to each other range. The output meter must read between 8.6 and 9.4 on each range except the top range where it may read between 8.5 and 9.5.

f. Observe the oscillator output on an oscilloscope at the following frequencies, at maximum output level into the 600-ohm load. Use the sweep speeds listed; with the slow sweep speeds, the display must be one sine wave per centimeter.

010.0 Hz	100 and 10 msec/cm
999.9 Hz	1 and 0.1 msec/cm
1.000 kHz	1 and 0.1 msec/cm
9.999 kHz	100 and 10 usec/cm
10.00 kHz	100 and 10 usec/cm
99.99 kHz	10 and 1 usec/cm
100.0 kHz	10 and 1 usec/cm
999.9 kHz	1 and 0.1 usec/cm

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