

KS-19353, L5 OSCILLATOR
DESCRIPTION AND OPERATION

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1. GENERAL

1.01 This section describes the KS-19353, L5 oscillator and lists normal operating procedures for it. The oscillator is used primarily in manual trunk measuring and troubleshooting.

1.02 This section is reissued to include the KS-19353, L5 oscillator. The KS-19353 L1, L2, and L4 oscillators and the KS-19353 L3 power supply have been rated Manufacture Discontinued. The KS-19353, L5 replaces the 19C oscillator for portable applications. Change arrows are not used since this is an extensive revision. This reissue does not change the Equipment Test List.

1.03 The KS-19353, L5 oscillator is a portable oscillator having applications in both the voice and carrier frequency ranges (see Fig. 1). Its output frequency can be controlled continuously from 50 Hz to 20 kHz for an output impedance of

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600 or 900 ohms balanced and from 5 kHz to 560 kHz for an output impedance of 135 ohms balanced. The oscillator's output power level is adjustable from -42 dBm through +10 dBm in 0.1 dB increments. It can be operated by 115 or 230 Vac (47 Hz through 480 Hz) or by a self-contained 45-volt battery.

1.04 The L5 oscillator provides improved level range over the L4. The low end of the calibrated output power range has been reduced by 12 dB to -42 dBm which increases the output power range to 52 dB (-42 dBm through +10 dBm). This permits manual testing at lower test levels which is required by automatic testing at -16 dBm0 test tone levels. Both the CAROT 52A responder and the 107 test line use -16 dBm0 gain-slope tone levels, which require a -32 dBm signal at a -16 TLP for a manual comparison.

1.05 The L5 oscillator also provides a 10 dB improvement in the total harmonic distortion in the voice frequency range. Harmonic distortion is 50 dBm below the fundamental in the voiceband for frequencies between 300 Hz and 3000 Hz. The KS-21567 C-notch network requires portable holding tone oscillators of at least this purity.

1.06 The output power of the oscillator is flat within ± 0.2 dB in the temperature range of 60°F to 80°F and flat-within ± 0.4 dB in the temperature range of 20°F to 120°F.

2. PHYSICAL CHARACTERISTICS

A. Power Requisites

2.01 The oscillator is powered from either the internal 45-volt battery or an external source of 115 or 230 volts ac. The AC/BAT switch selects the power source. The switch is located on the side panel.

AC Operation

2.02 The internal circuitry of the L5 oscillator actually requires 26 volts dc for operation. Consequently, the oscillator fully rectifies the AC signal and steps down the voltage. With the AC/BAT switch in the AC position, the line voltage (either 115 or 230 volts) must be selected. The 115/230 VAC switch is on the rear panel. The oscillator has a detachable three-connector power cable packed in the cover.

Warning: *Correct ac voltage setting (115 or 230V) must be selected before plugging in the power cable.*

Battery Operation

2.03 With the AC/BAT switch in the BAT position, the oscillator operates from a 45-volt self-contained battery. A voltage regulator circuit reduces the battery voltage to the 26V dc required by the oscillator circuitry. The voltage regulator circuit also ensures a constant output voltage for the useful life of the battery. The battery access panel is on the rear of the L5. To replace the battery, open the access panel with a screwdriver, take the battery out, and remove the connector. Attach the connector to the replacement battery, insert the battery into the battery recess, and close the access panel. Table A gives a listing of retail batteries that can be used with the KS-19353.

B. KS-19353 Specifications

Frequency

2.04 The frequency range of the oscillator is 50 Hz through 560 kHz. There are four bands within the frequency range. The bands are 50 Hz through 560 Hz, 500 Hz through 5.6 kHz, 5 kHz through 56 kHz, and 50 kHz through 560 kHz. The L5 is accurate to within $\pm 3\%$ of the setting with a maximum variation of $\pm 0.1\%$ per hour.

Amplitude

2.05 Total harmonic distortion is at least 50 dB below the fundamental between 300 Hz and 3000 Hz. For all other frequencies in the oscillator's range, the harmonic distortion is at least 40 dB below. For any frequency within the specified range, the output noise level is at least 65 dB below the total output level from -25 dBm through +10 dBm. For all other output levels the output noise is less than -90 dBm.

Output

2.06 The output level range is -42.1 dBm through +10 dBm in 0.1 dB increments. The L5 output is designed for matching impedances of 600 ohms or 900 ohms at frequencies of 50 Hz through 20 kHz, and 135 ohms at frequencies of 5 kHz through 560 kHz. The output circuit is balanced

to 80 dB at 60 Hz and 70 dB at 540 Hz for 600 and 900 ohm outputs. For 135 ohm outputs, it is balanced to 50 dB at 5 kHz and 50 dB at 560 kHz. The output circuit is insulated to withstand 500V dc between the floating output and the oscillator chassis ground. This L5 is not damaged by the nominal line voltage of -48v dc, nor is it damaged by a superimposed ringing signal of 105V at 20 Hz for a duration of 10 seconds.

2.07 The oscillator output jacks accepts WECO 241A, 309, and 310 plugs. Binding posts are provided for tip (T) and ring (R) and sleeve (S). The S binding post has a captive link connecting it to the ground post (G). Dial jacks accept WECO 309 and 310 plugs. Dial clip posts are for 1011B handset clips.

3. DESCRIPTION OF CONTROLS

A. Power Switch

3.01 The power switch is located in the lower left portion of the front panel and labeled POWER (See Fig. 2). It is a toggle switch and it controls the power to the oscillator. The ON and OFF switch positions are clearly labeled.

B. DC Test Meter

3.02 The DC test meter is located in the upper left portion of the front panel and labeled DC TEST (see Fig. 2). The test meter provides a check of the rectified AC voltage or the battery voltage depending on the power supply selected with the AC/BAT switch. The vertical line at the center of the scale marks the lowest limit of battery voltage on which the oscillator can operate. If the reading is to the left of the vertical mark the battery must be replaced.

C. Frequency Dial

3.03 The frequency dial is the large, graduated dial in the upper right portion of the front panel labeled FREQUENCY (see Fig. 2). The dial is graduated from 4.9 through 56 increasing in the clockwise direction of rotation. The dial settings in conjunction with the FREQ. RANGE switch selects the desired frequency between 50 Hz and 560 kHz. The frequency dial is accurate to within $\pm 3\%$ of the indicated setting. The frequency VERNIER switch allows a more precise frequency selection than $\pm 3\%$ (see paragraph 3.05).

D. Frequency Range Switch

3.04 The frequency range switch is located to the left of the frequency dial in the upper left portion of the front panel and labeled FREQ. RANGE (see Fig. 2). It is a decade multiplier type switch which multiplies the value of the setting indicated on the FREQUENCY dial. The FREQ. RANGE switch has four settings labeled X10, X100, X1K, and X10K. The number at each setting is the number by which the FREQUENCY dial setting is multiplied to give the actual frequency of the signal generated by the oscillator. If the FREQUENCY dial is set at 8 and the FREQ. RANGE switch is set at X100, the frequency of the signal generated is 800 Hz. The product of the FREQUENCY dial and the FREQ. RANGE switch is the signal frequency.

E. Frequency Vernier Control

3.05 The frequency vernier control knob is located adjacent to the FREQUENCY dial in the middle right portion of the front panel and labeled VERNIER (see Fig. 2). The VERNIER control provides a 5:1 reduction of rotation compared to the FREQUENCY dial. It ensures setability to any frequency within $\pm 0.1\%$ of a desired frequency when the oscillator output signal frequency is measured by an external frequency measuring device.

F. Function Switch

3.06 The function switch is located in the middle left portion of the front panel and labeled FUNCTION (see Fig. 2). It is capable of matching three possible external line impedances, providing a holding circuit for DC signalling through external lines, and enabling external dial through condition or power supply check.

3.07 The FUNCTION switch has six settings and they are labeled DIAL/DC, 600 HOLD, 900 HOLD, 600, 900, and 135. The DIAL/DC position provides the capability either to dial through external lines or to make a check of the battery voltage or the rectified AC source with the DC TEST meter (see paragraph 3.02). The 600 and 900 HOLD settings are for impedances of 600- and 900-ohms with a line holding function. Both HOLD settings produce an "off-hook" condition which holds the dialed line while the oscillator remains connected to the output jacks. The 600 and 900

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settings are for an impedance match for 600 ohms and 900 ohms. The 600 HOLD, 900 HOLD, 600, and 900 settings are balanced for a frequency range of 50 Hz to 20 kHz. The 135 setting is for an impedance match of 135 ohms balanced for a frequency range of 5 kHz through 560 kHz.

G. Output Level Switches

3.08 The output level switches are three selector switches located above the jack field in the lower portion of the front panel. They are labeled OUTPUT LEVEL (see Fig. 2). The OUTPUT LEVEL switch on the right provides level selection in 0.1 dB increments from -1.1 through 0 and the center OUTPUT LEVEL switch has 1.0 dB increments from -11 through 0. The switch on the left has only five settings. It provides level selection in 10 dB increments from -30 through +10. The 0.1 switch and the 1.0 switch contain a full decade range plus an overstep to 1.1 and 11, respectively. Because of the overstep of these two switches, the low end of the output level range is actually -42.1 dBm.

H. Output Level Calibration Adjustment

3.09 The output level calibration adjustment is located in the middle right portion of the front panel and labeled OUTPUT CAL ADJUST (see Fig. 2). It is a screwdriver adjustment that provides a means by which the actual output power level can be calibrated to agree with the settings on the OUTPUT LEVEL switches. An external power measuring device must be used for this calibration.

I. Output Terminals

3.10 The output terminals are the jacks and binding posts at the bottom of the front panel labeled OUTPUT (see Fig. 2). From left to right the first binding posts are designated S for sleeve and G for ground. Adjacent to the S and G binding posts are binding posts labeled T and R for tip and ring, respectively. Next to the T and R binding posts is a pair of jacks labeled 241. They are WECO 223 jacks which accept WECO 241 plugs. The last two jacks of the OUTPUT section are designated 309 and 310. The jack labeled 309 is a WECO 246A jack that mates with the WECO 309 plug. The jack labeled 310 is a WECO 238A jack that mates with the WECO 310 plug.

J. Dial Terminals

3.11 The dial terminals are the jacks and clip posts to the right of the OUTPUT terminals at the bottom of the front panel (see Fig. 2). They are labeled DIAL. These terminals consist of two jacks and two clip posts. The jack labeled 309 is a WECO 246A jack that mates with the WECO 309 plug. The jack labeled 310 is a WECO 238A jack which accepts the WECO 310 plug. The clip posts marked T (tip) and R (ring) are for the WECO 1011B handset clips.

K. Power Selection Switch

3.12 The power selection switch is located on the left side panel and it is labeled AC/BAT. The AC/BAT switch selects the power source either AC line current or self-contained battery. Power requisites are discussed in part 2.

L. AC Voltage Selection Switch

3.13 The AC voltage selection switch is located on the rear panel of the oscillator and is labeled 115/230 VAC. With the AC/BAT switch in the AC position, the 115/230 VAC switch selects AC voltage of either 115 volts ac or 230 volts ac. This switch is also discussed in part 2 of this section.

4. OPERATION

A. Apply Power

4.01 Before power is actually applied to the oscillator the power source must be selected and, if required, the AC voltage must be selected. First select the power with the AC/BAT switch. If AC power is selected the 115/230 VAC switch must be set to the appropriate ac voltage. Now turn the POWER switch to ON. Check the battery voltage or rectified AC voltage by setting the FUNCTION switch to the DIAL/DC position. Read the DC TEST meter to determine if the oscillator is receiving adequate power. The following is a list of the steps for applying power that have just been discussed:

- (1) Set AC/BAT switch
- (2) Set 115/230 VAC switch if AC power is selected

- (3) Turn POWER SWITCH to ON position
- (4) Turn FUNCTION switch to DIAL/DC position
- (5) Read DC TEST meter.

B. Pre-Operation Test

4.02 To perform the pre-operation test, two additional instruments are required. They are the General Radio GR 1192 electronic counter or equivalent and the Hewlett-Packard HP-400 EL voltmeter or equivalent.

4.03 After power is applied as described in paragraph 4.01, proceed with the pre-operation test. Connect a 600-ohm resistor across the T and R binding posts. Set the FUNCTION switch to 600. Select a signal frequency between 50 Hz and 20 kHz. Frequency selection is discussed in paragraph 4.09. Measure the signal frequency output by connecting the electronic counter to the T and R terminals. To measure the signal output power level, remove the electronic counter and connect the voltmeter to the T and R terminals. If the measured frequency or output power level does not coincide with the oscillator's settings, refer to the maintenance section of the manufacturer's manual supplied with the oscillator.

C. Connections

4.04 Output connections are made by inserting a plug from the circuit under test into the proper OUTPUT jack.

Warning: *Do not use more than one OUTPUT jack at the same time. When using a patch cord to connect a circuit, plug the cord into the oscillator first.*

4.05 The sleeves of all the jacks connect through the S binding post to ground (G). A captive link on the front panel connects the S binding post to the G binding post. To use the sleeve (S) terminal for supervision, disconnect the captive link between the S and G posts.

4.06 The DIAL terminals provide connections to be used in the DIAL/DC mode of the FUNCTION switch. The T and R clip posts connect the oscillator to a lineman's handset, eg, WECO 1011B. The DIAL jacks connect to a dial set with

impulse springs connected to tip and ring of a 309 or 310 plug.

Warning: *Do not expose oscillator to a superimposed ringing voltage for more than 10 seconds.*

D. Function Switch Selection

4.07 The FUNCTION switch selects proper output impedance with or without a holding circuit or a dial through and DC test condition. In the DIAL/DC position, the DIAL jacks connect directly to the OUTPUT terminals. The oscillator output signal is isolated from the OUTPUT terminals. The circuit connected to the OUTPUT terminals can be dialed in this mode. The DC/TEST meter also can be read in this position.

4.08 To hold the dialed line, set the FUNCTION to the appropriate 600 or 900 HOLD position. To release the line, set the FUNCTION switch to appropriate 600 or 900 position. The 600, 900, and 135 positions provide impedance matching with an on hook condition.

E. Frequency Selection

4.09 To select output signal frequency set the most significant digits on the FREQUENCY dial and set the appropriate multiplier on the FREQ RANGE switch. To set 2000 Hz on the oscillator, set the FREQ RANGE switch to X100 position and rotate the FREQUENCY dial to 20. The output signal frequency is the product of the two frequency related controls.

4.10 To set a frequency of exactly 2010 Hz an external counter must be used to read precise output signal frequency. Set FREQ RANGE switch and FREQUENCY dial as described in paragraph 4.09. Rotate VERNIER switch until counter reads 2010 Hz.

F. Output Level Selection

4.11 The output power level is the summation of the settings on the three OUTPUT LEVEL switches. To set an output power level of -18.5 dBm, set the 10 dBm switch to -10 dBm, set the 1 dBm switch to -8 dBm, and set the 0.1 dBm switch to -0.5 dBm. The summation of -10 and -8 and -0.5 dBm is -18.5 dBm.

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5. MAINTENANCE AND CALIBRATION

5.01 Maintenance and calibration for the KS-19353 L5 oscillator is described in Chapter 5 of

the manufacturer's manual which is supplied with each unit. Performance tests discussed in the manufacturer's manual should be performed as needed.

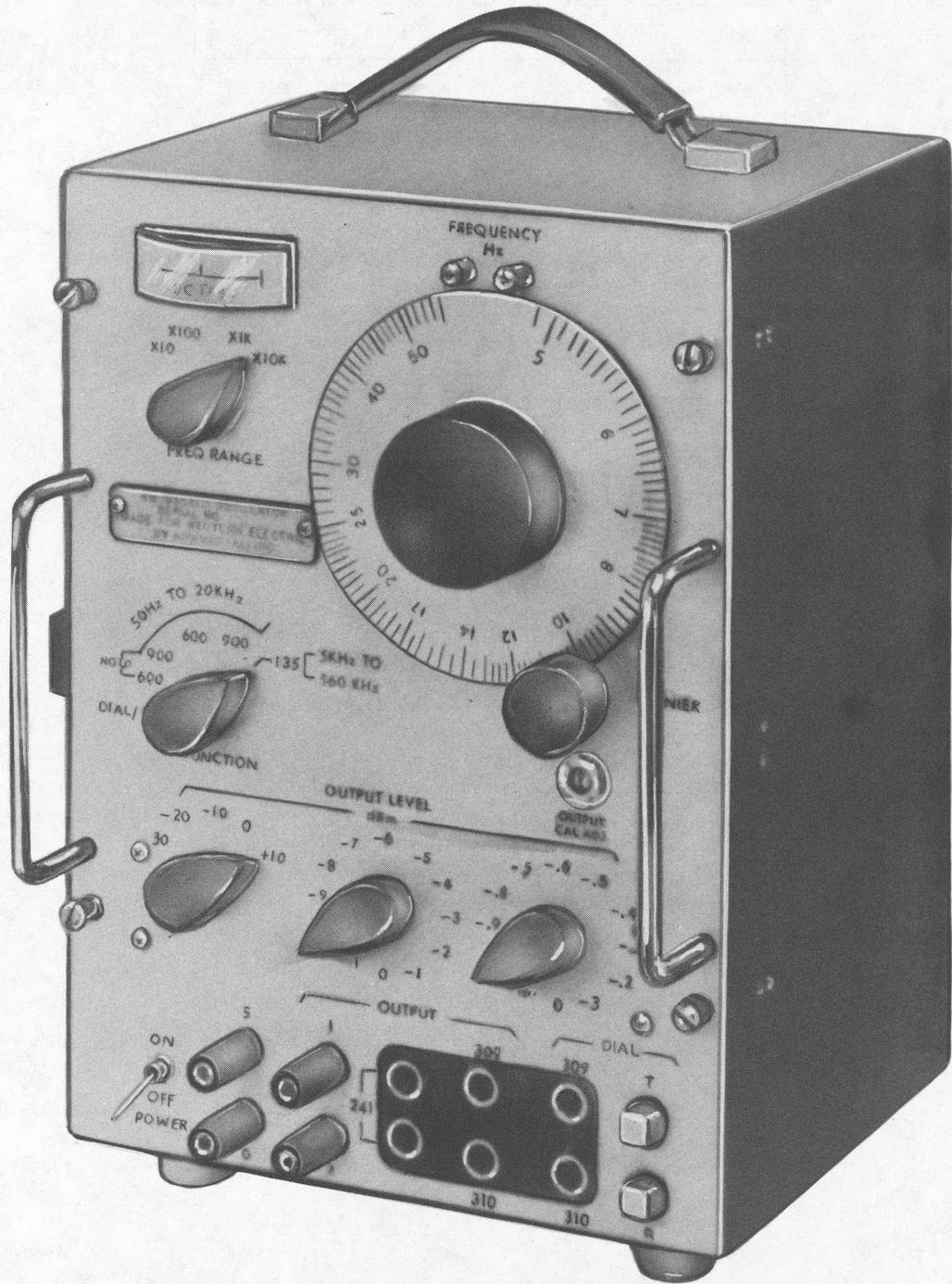


Figure 1—KS-19353 L5 Oscillator

TABLE A
REPLACEMENT BATTERIES

MANUFACTURER	PART NO.
Western Electric	KS-14370
NEDA	202
Eveready	482
Burgess	M-30
RCA	VS 013
Hewlett-Packard	1420-0026
Bright Star	3033-158, 30-33
Mallory	M-202
Ray-O-Vac	202, P7830
Sears	6461
Wards	42
Wizard (Western Auto)	3B6241
Zenith	2783
General	W30B
Marathon	4202
National Carbon	482
Armed Forces	BA-59

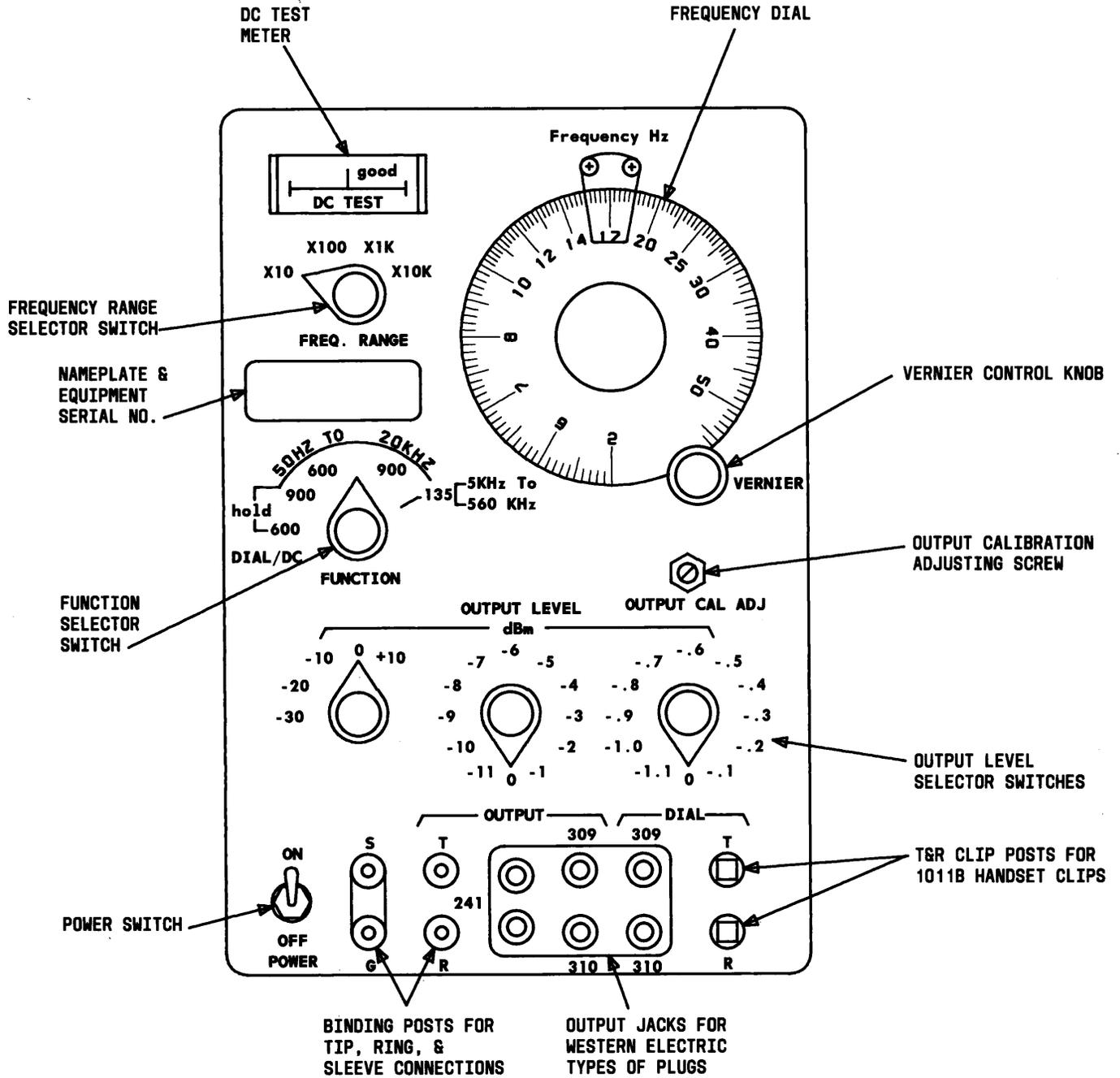


Fig. 2—Front Panel