OPERATING INSTRUCTIONS

10GW

TYPE 783-A

OUTPUT-POWER METER

GENERAL RADIO COMPANY

548-F

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OUTPUT-POWER METER

Form 548-F
January, 1960

GENERAL RADIO COMPANY
WEST CONCORD, MASSACHUSETTS, USA

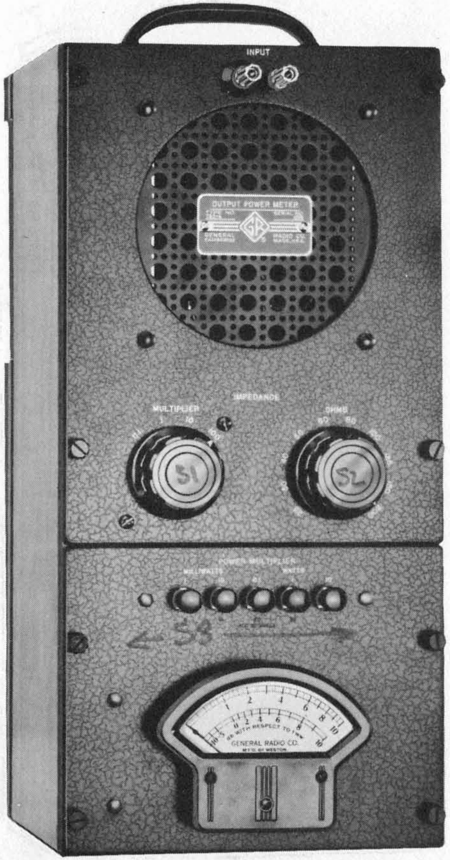

Figure 1.
Type 783-A Output-Power Meter

SPECIFICATIONS

Power Range: 0.2 mw to 100 w in five ranges. Auxiliary db scale on the meter reads from -10 to +10 db above 1 mw. With multiplier, total range is -10 to +50 db above 1 mw.

Impedance Range: 2.5 to 20,000 ohms. Forty discrete impedances, distributed approximately logarithmically, are obtained by a 10-step selector and 4-step multiplier.

Impedance Accuracy: ±2% except for high impedances at high audio frequencies (refer to Section 3).

Power Accuracy: ±0.25 db at full-scale reading. At lowest impedance multiplier setting (2.5 to 20 ohms) an additional error of 0.2 db may appear due to switch contact resistance with power multiplier set at 10 (10 to 100 watt range).

Over-all frequency characteristic of power indication is flat within ±0.5 db from 20 to 10,000 cps; within 0.75 db to 15,000 cps.

Waveform Error: Nonsinusoidal voltages may cause error, since meter is not a true rms indicator. With waveforms normally encountered in communications, error is not serious (refer to Section 3).

Temperature and Humidity Effects: Instrument calibrated at 77 F, and if ambient temperature varies widely from this value, additional errors will result. At high temperatures (95 F), this error may approach the nominal calibration error, especially at higher audio frequencies. The heat dissipated by the instrument has a negligible effect on accuracy.

Humidity conditions have negligible effect on accuracy.

Mounting: Walnut cabinet, with aluminum panel.

Dimensions: Width 8 in., length 18 in., depth 7 in., over-all.

Weight: 17 lb.

TYPE 783-A
OUTPUT-POWER METER

1 INTRODUCTION

1.1 PURPOSE. The Type 783-A Output-Power Meter (Figure 1) gives a direct indication of the power output of audio-frequency circuits, and can be used to test amplifiers, transformers, oscillators, filters, and similar networks. Often used to simulate loud-speaker or other load impedances in high-power audio systems, the Output-Power Meter will handle power outputs up to 100 watts, yet is sensitive enough to measure directly the power output of a phonograph pickup.

1.2 DESCRIPTION.

1.2.1 GENERAL. (See Figure 2.) The Output-Power Meter is functionally an adjustable load impedance, with a voltmeter calibrated directly in watts dissipated in the load.

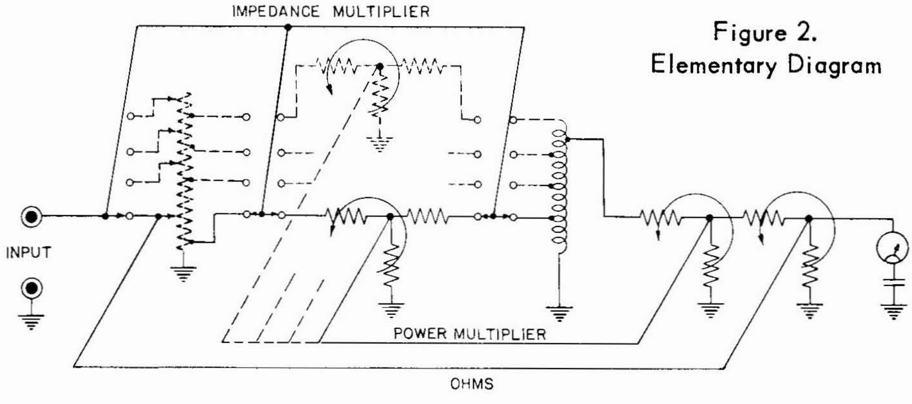

Figure 2.
Elementary Diagram

1.2.2 CONTROLS AND CONNECTIONS. The following controls and connections are on the front panel of the instrument:

Name	Type	Function
INPUT	Jack-top binding posts (2)	Output from circuit under test should be connected here. Right-hand post is ground.

1.2.2 CONTROLS AND CONNECTIONS. (Continued)

Name	Type	Function
IMPEDANCE OHMS MULTIPLIER	10-position selector switch 4-position selector switch	Product of these settings equals load impedance. Forty steps, from 2.5 to 20,000 ohms, are available.
POWER MULTIPLIER	Pushbuttons (5)	Product of POWER MULTIPLIER setting and meter reading (upper scale) equals measured output power. Range is from 0.2 milliwatt to 100 watts.

2 OPERATION. To measure the power that a circuit can deliver into a given impedance, simply connect the circuit output terminals to the Output-Power Meter INPUT terminals, set the load impedance to the desired value, and determine the power output from the meter indication and the POWER MULTIPLIER setting.

The Output-Power Meter can also measure the internal impedance of the circuit under test, since that impedance equals the impedance into which maximum power is delivered.

To determine the loss in a transformer working from a given source, measure the maximum output from the source, then insert the transformer between the source and the Output-Power Meter and measure the maximum output from the transformer. The difference in the two readings on the db (lower) scale equals the loss in the transformer.

3 ACCURACY OF MEASUREMENT

3.1 GENERAL. The input impedance is accurate to ± 2%. The full-scale indicated power is accurate to ± 0.25 db. When the IMPEDANCE MULTIPLIER switch is at 0.1 there may be an additional error of 0.2 db due to switch contact resistance when the POWER MULTIPLIER is at 10 watts.

The Output-Power Meter is not intended to be a precision instrument, and the uses for which it is designed usually do not justify precision methods. It combines convenience and wide range with a reasonable degree of accuracy, and permits high accuracy over a somewhat smaller range.

3.2 FREQUENCY ERRORS. At high impedances and high frequency, there is an input-impedance error, which at 15,000 cycles is about 5 percent for impedances from 10,000 to 20,000 ohms.

Power indication is essentially independent of frequency (±0.5 db to 10,000 cycles; ± 0.75 db to 15,000 cycles).

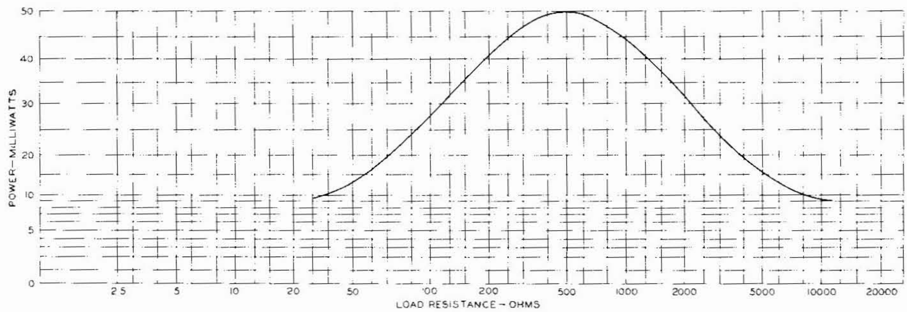

Figure 3. Power Output vs Load Resistance for a Generator with 500-ohm Internal Impedance.

Figure 3 shows power output plotted against load resistance for a generator with an internal impedance of 500 ohms. An analysis of the accuracy figures with reference to this curve shows that errors are negligible over most of the frequency range.

3.3 WAVEFORM ERRORS. The copper-oxide rectifier-type meter used in the instrument is calibrated in rms values for sinusoidal applied voltages, and nonsinusoidal voltages may cause errors, since the meter is not a true rms instrument. The degree of error depends on the magnitude and phase of the harmonics present, and will be small with waveforms normally encountered in communications.

3.4 REACTANCE ERRORS. The Output-Power Meter is designed to work out of a resistive impedance, and will be subject to error when used in measurements on a highly reactive source. Unless the reactance is large enough to affect materially the power factor of the internal impedance of the circuit under test, this error is negligible.

3.5 DIRECT-CURRENT ERROR. The error in indicated power because of a d-c component from the power source is usually negligible even under the least favorable circumstances. At a 60-cycle power-source frequency, a 0.5-amp d-c component will introduce an error of less than 0.2 db in indicated power reading.

3.6 TEMPERATURE AND HUMIDITY EFFECTS: The Output-Power Meter was calibrated at a temperature of 77 degrees Fahrenheit, and errors in indication will result if the ambient temperature departs widely from this value. At high temperatures (about 95 degrees F) this additional error may approach the nominal calibration error, especially at the higher audio frequencies. The instrument is so designed that the heat dissipated inside the instrument itself has a negligible effect on accuracy. Humidity conditions also have a negligible effect on the accuracy of the instrument.

PARTS LIST

	REF DES			GR NO.
RESISTORS (NOTE A)	R1	5.242	±2%	783-301
	R2	5.242	±2%	783-301
	R3	0.557	±2%	
	R4	1.152	±2%	783-302
	R5	1.210	±2%	
	R6	1.278	±2%	
	R7	2.000	±2%	783-303
	R8	2.000	±2%	
	R9	2.500	±2%	
	R10	2.500	±2%	783-304
	R11	5.000	±2%	
	R12	5.392	±2%	
	R13	5.570	±2%	783-305
	R14	11.52	±2%	
	R15	12.10	±2%	
	R16	12.78	±2%	783-306
	R17	20.00	±2%	
	R18	20.00	±2%	
	R19	25.00	±2%	783-307
	R20	25.00	±2%	
	R21	50.00	±2%	
	R22	53.92	±2%	783-308
	R23	57.70	±2%	
	R24	115.2	±2%	
	R25	121.0	±2%	783-309
	R26	127.8	±2%	
	R27	200.0	±2%	
	R28	200.0	±2%	783-311
	R29	250.0	±2%	
	R30	250.0	±2%	
	R31	500.0	±2%	783-312
	R32	539.2	±2%	
	R33	557.0	±2%	
	R34	1152	±2%	783-313
	R35	1210	±2%	
	R36	1278	±2%	
	R37	2000	±2%	783-314
	R38	2000	±2%	
RESISTORS (NOTE A)	R39	2500	±2%	
	R40	2500	±2%	783-315
	R41	5000	±2%	
	R42	49,450	±1%	Part of 783-316
	R43	5446	±¼%	
	R44	560	±¼%	783-320
	R45	1292	±½%	
	R46	4945	±1%	Part of 783-316
	R47	544.6	±¼%	
	R48	56.0	±¼%	783-321
	R49	129.2	±¼%	
	R50	494.5	±1%	Part of 783-317
	R51	54.46	±¼%	
	R52	5.60	±½%	783-322
	R53	12.92	±½%	
	R54	49.45	±1%	Part of 783-317
	R55	5.44	±½%	
	R56	0.558	±½%	Part of 783-326
	R57	1.284	±½%	
	R58	11,700	±½%	REPR-16
	R59	1444.4	±¼%	Part of 783-326
	R60	8889	±½%	REPR-16
	R61	6012	±½%	REPR-16
	R62	1741	±¼%	
	R63	982.5	±¼%	Part of 783-318
	R64	1083.5	±¼%	
	R65	971	±¼%	
	R66	1101	±¼%	
	R67	221	±¼%	783-319
	R68	46.0	±1%	
	R69	1155	±¼%	Part of 783-318
	R70	1042	±¼%	
	R71	20,000	±5%	REC-20BF

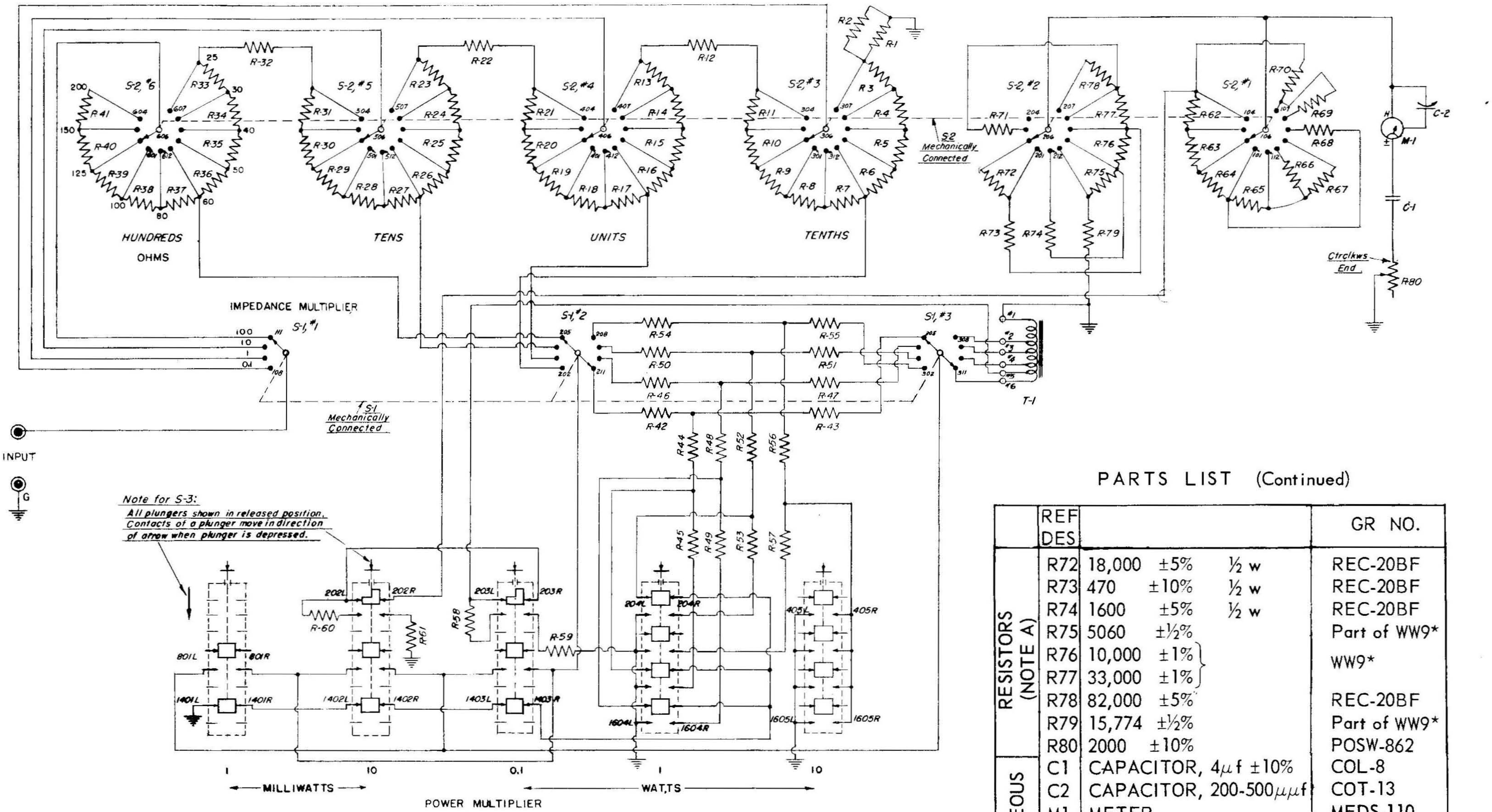

Figure 4. Schematic Diagram

PARTS LIST (Continued)

	REF DES		GR NO.
RESISTORS (NOTE A)	R72	18,000 ±5% ½ w	REC-20BF
	R73	470 ±10% ½ w	REC-20BF
	R74	1600 ±5% ½ w	REC-20BF
	R75	5060 ±½%	Part of WW9*
	R76	10,000 ±1%	WW9*
	R77	33,000 ±1%	
	R78	82,000 ±5%	REC-20BF
	R79	15,774 ±½%	Part of WW9*
	R80	2000 ±10%	POSW-862
MISCELLANEOUS	C1	CAPACITOR, 4μf ±10%	COL-8
	C2	CAPACITOR, 200-500μμf	COT-13
	M1	METER	MEDS-110
	S1	SWITCH	783-32
	S2	SWITCH	783-34
	S3	SWITCH	783-323-2
	T1	TRANSFORMER	485-418

NOTES: (A) All resistances are in ohms.
* IRC Part No.

GENERAL RADIO COMPANY

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