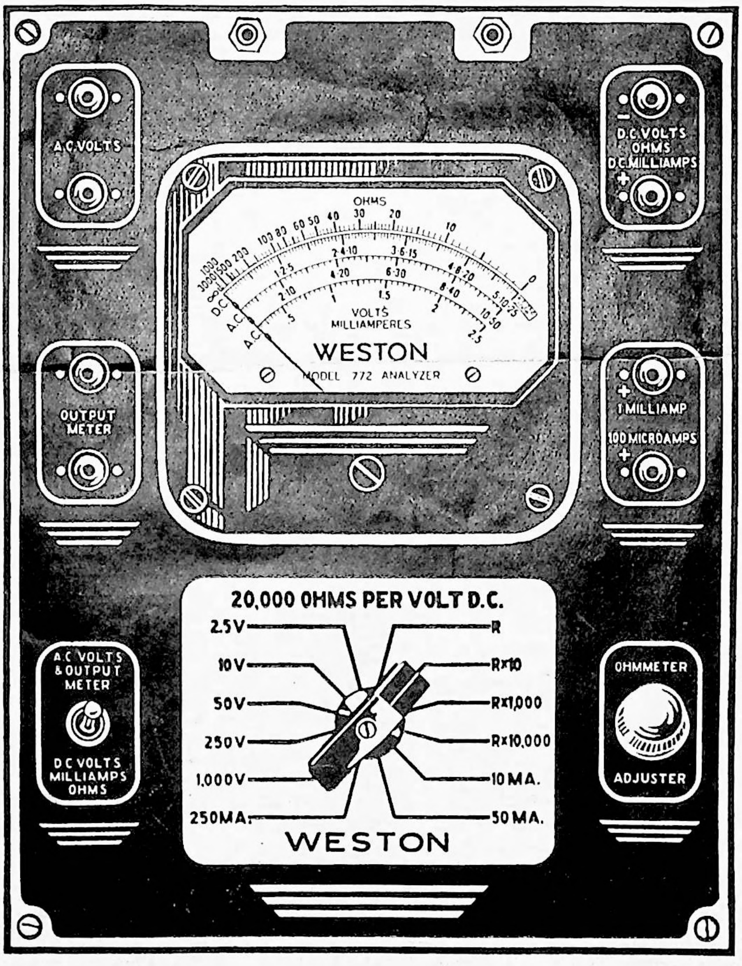
Instruction Book

for the

WESTON MODEL 772

SUPER SENSITIVE ANALYZER



WESTON ELECTRICAL INSTRUMENT CORPORATION

Newark, N. J., U. S. A.

PRINTED IN U. S.

Instructions for Model 772 Analyzer

I. DESCRIPTION OF THE ANALYZER

1.1 — General. This model 772 analyzer has been specifically designed to place in the hands of the service man an ultra sensitive and complete analyzer for all types of service work. In designing this equipment every possible extra cost has been eliminated and the design kept as clean and free as possible from gadgets and other unnecessary frills. All the equipment with the exception of the batteries for the ohmmeter is mounted directly on the heavy brass panel, this panel mounting directly in the instrument carrying case. The complete analyzer is of rugged construction and with reasonable care should give many years of accurate service.

1.2 — Instrument. The heart of any piece of test equipment is the electrical measuring instrument. If this particular part is not carefully and accurately designed and constructed no matter how many other parts are used in the equipment the device cannot give accurate readings. The instrument in the Model 772 is of the 4¼" type having a movement considerably larger than that used in the 301 size meters. The meter is purposely designed with a large open face so that light will be admitted to the scale from all sides giving maximum visibility of the scale. In addition a large scale plate is used with a long pointer length so that maximum scale arc length is available. The instrument is equipped with a tubular type pointer having an extended knife edge covering all of the arcs. Considerable work has been done on the design of the scale to increase ease of readability and to make possible a maximum accuracy. The d.c. scale which is the most important of the voltage and current measurements consists of a 100 line or division arc. A large instrument of this type makes possible such a finely divided scale. Directly above this d.c. scale appears a carefully laid out ohm scale extending from 0 to 3000. This arc has been carefully divided to give accurate ohm readings. The a.c. scales have been calibrated in red to differentiate them from the d.c. Note that the scales extend from the center of the instrument in the order of their importance, that is, the 2.5 a.c. which calls for the least number of readings has the shortest arc length, while the ohm and d.c. scales which will be used more often for the measurements, have the longest arc lengths. The a.c. scales have been separated so that they will be much easier to read. The low a.c. ranges require separate calibration if this accuracy is to be maintained and, therefore, these scales are entirely separate from the d.c. and high range a.c. scales. The 2.5 volt range is read on an inner arc while the 10 and 50 volt a.c. ranges are read on the second arc. The 250 and 1000 volt a.c. ranges are, however, read directly on the 100 line or d.c. arc.

1.3 — Panel. The panel for this instrument has been carefully worked out to provide simplicity of operation along with modern appearance. Brief instructions for each of the controls are etched directly in the panel so that once the general operation of the tester is understood no further instructions need be referred to. The molded bakelite pin jacks used in this model are of a new and highly efficient design. When working with sensitivities of 20,000 ohms per volt, leakage paths in the mechanical structure of the tester must be kept at a minimum. It is easy to see that on the 1000 volt d.c. range 20 megohms of adjusted resistance is required. If, therefore, a shunt leakage path of even 200 megohms should appear across any of the pin jacks then a 10% error in reading might occur. It is, therefore, vital that these jacks should be of the best molded bakelite and they have been designed with a very long leakage path. The phosphor bronze clip in the jack is mounted from the back end and, therefore, the leakage path across the jack is from the panel all the way down to the base of the jack at the back to the insert or approximately ½". Eight active jacks appear on the panel, the two above the meter being available only for mounting the type 666, selector block. The use of this block as a part of the analyzer equipment will be covered later on in the instructions. The two upper right-hand jacks labelled d.c. volts, ohms, and d.c. milliamperes are used for all of the d.c. volt ranges, all of the ohm ranges and for all of the d.c. milliampere ranges appearing on the switch. There are available then from these jacks the following:

D.C. Volts 20,000 Ohms per Volt	Ohms	D.C. Milliamperes
2.5	0 — 3000	10
10	0 — 30,000	50
50	0 — 3 megohms	250
250	0 — 30 megohms	
1000		

1.31—All measurements on these ranges are made by connecting the test leads to these two pin jacks and setting the selector switch to the proper range. For making measurements of 1 milliampere or 100 microamperes THE SELECTOR SWITCH SHOULD BE SET ON ONE OF THE MILLIAMPERE RANGES, SAY FOR INSTANCE THE 10 MA. RANGE. The test lead in the — pin jack should be left in position and the test lead from the + pin jack moved over to the 1 milliampere or 100 microampere + pin jack as required. THE 1 MIL. AND 100 MICROAMPERE RANGES HAVE PURPOSELY BEEN BROUGHT OUT TO PIN JACKS AND ARE NOT CONTROLLED FROM THE SWITCH SO THAT WHEN CHANGING POSITIONS ON THE ROTARY SWITCH THE METER WILL NOT BE SUBJECT TO SEVERE OVERLOADS IN PASSING THROUGH THESE RANGES.

1.32—To take reading of a.c. volts, the test leads should be plugged into the jacks carrying this marking. The toggle switch in the lower left-hand corner should be thrown to the A.C. VOLTS—OUTPUT METER POSITION. This connects the rectifier and its associated circuit to the meter. The rotary switch can then be set to the desired volt range required.

1.33—For taking output meter readings where d.c. is to be kept out of the instrument circuit, the test leads should be plugged into the 2 output meter jacks. Note that a series condenser is used in this circuit to keep out the direct current. As this condenser has a definite impedance which varies with frequency, these jacks should not be used where actual measurements of voltage are to be taken. For comparative readings from a previous level or for comparisons in output of receivers or amplifiers these jacks can be used to great advantage. The condenser in this circuit has a 400 volt rating and therefore potentials much higher than this should be avoided.

1.34—The rotary switch sets up the equivalent volt range for each of the measurements. When ready to take readings the switch may be thrown immediately to the particular measurement required and readings taken directly on the instrument.

1.35—All d.c. volt ranges are available at a sensitivity of 20,000 ohms per volt. This is made possible only by the modern design of the large 50 microampere instrument. Readings on any of these ranges may be taken with only a few microamperes drain taken by the tester. This makes possible much more accurate readings of grid bias, screen and plate voltages in all types of equipment where high resistance circuits are used.

1.36—OHMS. Four well selected ohm ranges provide accurate resistance measurements from ¼ ohm to 30 megohms. For making resistance measurements plug one end of the test leads into the jacks marked D.C. Volts-Ohms-D.C. Milliamps and touch the free ends to the circuit being measured. For readings from ¼ ohm to 100 ohms, the Selector Switch should be in the R position. For readings between 100 and 1,000 ohms set the Switch to R x 10. Readings from 1,000 ohms to 1 megohm are taken with the switch set to R x 1,000 and for measurements up to 30 megohms the R x 10,000 range is used. Before making resistance measurements and when changing ranges the operator should short the test leads and rotate the OHMMETER ADJUSTER until the pointer indicates exactly full scale. The accuracy of the readings obtained depends largely upon the care with which this setting is made. The d.c. battery potential on the three lower ohm ranges is 1.5 volts. On the R x 10,000 range 15 volts is used. This means that the ohm ranges can be used on all types of low voltage condensers and other low voltage equipment to measure leakage, resistance, etc.

1.37—MILLIAMPERES AND MICROAMPERES. Five d.c. current ranges are available. To take current readings, plug the test leads into the jacks marked D.C. VOLTS-OHMS-D.C. MILLIAMPS and set the switch to the 10, 50 or 250 milliampere range as required. If readings below these values are needed, the — test lead should be left in its jack but the + lead should be plugged into the 1 MILLIAMP or 100 MICROAMPS jack. The circuit should be checked before connecting the meter into these last two ranges. This is especially true on the 100 microampere range where the instrument is sensitive enough to read all kinds of leakage and shunt currents. When taking readings on the 1 MILLIAMP or 100 MICROAMPS ranges, the rotary switch should be set to the 10 MA. position. Note that for all d.c. measurements the toggle switch in the lower left-hand corner should always be in the D.C. VOLTS-MILLIAMPS-OHMS position. Readings of 50 microamperes full scale may be taken when this extreme sensitivity is required. This is accomplished by plugging the test leads into the D.C. VOLTS-OHMS-D.C. MILLIAMPS jacks and setting the rotary switch to the 2.5 volt position. The instrument is now converted into a 50 microampere high resistance microammeter and readings may be taken directly and accurately in terms of 50 microamps full scale. Some resistance is still in this circuit due to the 2.5 volt range but this is advantageous as it tends to protect the meter from heavy overloads. Note that when taking readings on this 50 microampere range, the first full division on the scale is .5 microampere.

1.38—A.C. VOLTS. Five a.c. volt ranges are available for the same full scale values as the d.c. ranges. All of these a.c. ranges operate at 1000 ohms per volts. This sensitivity is entirely sufficient for the most sensitive a.c. readings and is far preferred to higher sensitivity as much more accurate readings can be obtained. When the current density in an instrument rectifier gets far below a 1 mil. or 1000 ohm per volt value, its temperature and resistance characteristics become very critical and therefore, standard 1000 ohms per volt a.c. ranges are supplied. Note that when taking readings on a.c. or across the output jacks, the toggle switch in the lower left-hand corner must be thrown to the a.c. volts-output meter position. This switch might really be called an a.c.-d.c. switch as it converts the meter from a.c. to d.c. and connects into the circuit the proper set of resistors for the a.c. ranges. Accurate readings can be taken on the a.c. ranges over a wide band of frequecies extending over the complete audio spectrum. The meter has a substantially flat frequency characteristic up to 7000 cycles and at this point starts to drop off at approximately .5% per thousand cycles. This slight error is generally considered negligible as it is far smaller than the errors introduced by even the best of transformers and other such equipment. When taking a.c. readings, if the switch is in the 2.5 volt position, readings must be taken directly on the inside or 2.5 volt red scale. If readings are required on the 10 or 50 volt ranges, the second red scale must be used. For the top two a.c. ranges, the 100 line black scale is used as these check very closely with the d.c. calibration. Note that each scale has been individually numbered to save considerable time in reading the exact scale division.

1.39—OUTPUT METER. The output meter jacks should be used only when d.c. must be kept out of the circuit. A blocking condenser of .2 microfarad is connected in series with these jacks protecting the meter from d.c. current. It is not advisable to take actual volt readings on these jacks except on the higher ranges. While the readings on each of the volt switch positions will be approximately the same as the readings appearing across the a.c. volt jacks, the reactance of the condenser will add vectorially to the resistors in the meter circuit and therefore will cause a slight drop in instrument reading. Likewise reactance of the condenser will vary with frequency and therefore accurate readings of a.c. volts should not be made using these jacks but should be taken with the leads connected to the a.c. volt jacks.

1.4 — Batteries. Two 7.5 volt batteries are mounted in the bottom of the tester case by means of suitable clamps. Should it be found impossible to bring the instrument pointer to the top mark when shorting the test leads on any of the ohm ranges, the batteries should be examined. To do this remove the four corner panel screws and lift the complete panel out of the case. The battery leads are long enough so that the tester may be laid in the cover or on the bench beside the case. As mentioned before a potential of 1.5 volts is used on the 3 low ohm ranges. If it appears that the pointer cannot be brought to top mark on the R, R x 10 and R x 1000 ranges but will still come up to top mark on the R x 10,000 range, this means that the single cell used on the three low ranges has dropped down considerably, but that the remaining cells in the two batteries are still good. If this is the case, it is not necessary to discard the batteries but instead the connection should be changed around so that the 1.5 volt cell on the other battery may be used. In other words, the battery circuit consists of 15 volts in individual cells, with a top at 1.5 volts making use of the first cell. It is obvious that if the batteries are changed around, the first cell in the second battery may be used on the three lower ranges thus prolonging for a little while the useful life of the units. To make this change over, carry out the following operations.

1. Remove the black battery lead connecting the 2 batteries.

2. Remove the black battery lead connecting to the center case post and connect the other black lead, that is, the one that previously connected the two cells together, to this post. This will effectively change the —7.5 volt position from the one battery to the other.

3. Remove the red tester lead from the terminal of its battery and connect the black battery lead that formerly connected to the center post, to this battery stud.

4. The red tester lead just removed should then be connected to the + of the opposite battery.

5. The green tester lead should be removed from the —6 post of the one battery and connected to the —6 post of the other battery. Having made this change a new 1.5 volt cell is connected into the circuit to be used on the lower ranges and this should make possible extended life of the battery. The three leads are color coded as follows:
The black lead is negative and should connect to the negative end of the battery circuit. The green lead is positive at 1.5 volts potential and the red lead is positive at 15 volts potential.
Should it be found impossible to bring the pointer up to top mark on any of the ranges including the top ohm range, the batteries are completely worn out and must be replaced. In making this replacement order Burgess No. 5540, 7.5 volt battery. These are available from all radio parts distributors and jobbers.

1.5 — Case. This tester is equipped with a sturdily constructed wooden case which will stand considerable abuse. The covering on this case is a heavy grade of Dupont Fabricoid with extra heavy graining. This cover has a slight cushioning effect and the case will, therefore, stand shocks and wear considerably better than a plain wood case. The case is finished in a tan-gray to lend the tester a snappy appearance. Should the case become soiled it may be cleaned very easily by sponging with a soft moist cloth. This may be done at any time without any damage to the covering.

1.6 — Test Leads. One standard pair of test leads is supplied with this instrument. These may be used at all times in conjunction with the tester proper or with the Model 666 Selector Block. If the leads are lost or broken, they may be replaced by ordering Test Leads Nos. 70033 and 70034 at a list of $1.50, normal discounts applying.

1.7 — Instruction Book A complete instruction book is supplied with each tester. This book contains abundant data in regard to the operation of the tester as well as some information on circuit analysis or receiver and amplifier trouble shooting. The book should be kept inside of the tester when it is being transported so that it will be available for immediate use at any time should any question arise in service work.

Test Procedure

II. SELECTION OF RANGES

2.1 — D. C. Volts

a. Plug red test lead in the + jack marked D.C. VOLTS-OHMS-MA. Plug black test lead in — jack.

b. Set toggle switch in D.C. position.

c. Rotate range switch to any one of 5 ranges required.

d. Take reading on black d.c. 100 line arc using figuring that goes with this arc. Multiply by 1, 10, or 100 in accord with the switch range being used.

NOTE: All ranges are 20,000 ohms per volt. The current that the voltmeter draws may be calculated on any measurement in terms of a full scale deflection of 50 microamperes.

e. The resistance of the volt ranges are as follows:

2.5 volt range —	50,000 ohms
10 volt range —	200,000 ohms
50 volt range —	1 megohm
250 volt range —	5 megohms
1000 volt range —	20 megohms

2.2 — Ohms

a. Plug test leads in D.C. VOLTS-OHMS-MA. jacks.

b. Set toggle switch in D.C. position.

c. Rotate range switch to ohm range desired.

R range	0 — 3,000 ohms
R x 10	0 — 30,000 ohms
R x 1000	0 to 3 megohms
R x 10,000	0 to 30 megohms

d. Short test leads and set pointer to top mark by rotating OHMMETER ADJUSTER.

e. Take ohm readings on top arc using multiplying factor in accord with the switch position.

2.3 — D. C. Milliamperes

a. Plug leads in D.C. VOLTS-OHMS-MA. jacks.

b. Set toggle switch in D.C. position.

c. Rotate range switch to milliampere range desired. (250, 50 or 10 MA.)

d. Take readings on 100 line d.c. arc.

NOTE: For 1 milliampere or 100 microamperes:

e. Leave black lead in — jack.

f. Plug red lead in + 1 MA. or + 100 MICRO-AMPERES jack as required.

g. Leave range switch in 10 MA. POSITION.

h. Take reading on 100 line d.c. arc.

NOTE: For 50 microamperes:

i. Set up tester for d.c. volts.

j. Rotate range switch to 2.5 volt position.

k. Take readings of 50 microamperes full scale on d.c. arc.

2. 4 — A. C. Volts

a. Plug leads into A.C. VOLT jacks.

b. Set toggle switch in A.C. VOLTS-OUTPUT METER position.

c. Rotate range switch to any one of the five volt ranges.

d. Read on inside red arc for 2.5 volt range.

e. Read on 2nd red A.C. arc for 10 and 50 volt ranges.

f. Read on black 100 line arc for 250 and 1000 volt ranges.

2. 5 — Output Meter

a. Plug test leads in OUTPUT METER jacks.

b. Set toggle switch in OUTPUT METER position.

c. Rotate range switch to any one of the five volt ranges desired.

d. Readings will be relative as condenser in circuit will cause error on low ranges.

NOTE: A .2 mfd. series condenser is built in the analyzer protecting the instrument from d.c. Do not use output jacks on d.c. circuits having potentials much over 400 volts, as this is the working voltage of the condenser.

III. MODEL 772 ANALYZER WITH MODEL 666 SOCKET SELECTOR

3. 1 — This tester has been designed for use as an analyzer using Weston's well known method of socket selector analysis. The tester panel is equipped with two jacks directly above the instrument correctly spaced to fit the pins on the base of the Model 666 Selector Block. By fitting the block in position and using the small jumper leads supplied with the block, voltage, current, resistance and output readings can be taken rapidly and accurately on any type of tube base regardless of its pin arrangement and electrode position. The tester case has been provided with a compartment at the top for carrying this block and its set of skirted adapters. These adapters carry over the tube pin numbering on each type of base in accord with the standard Weston and R.M.A. tube base charts which are supplied with the socket selector unit. The adapters fit into the holes in the wooden block mounted in the bottom of this compartment.

3.2 — To obtain readings set the socket selector block in position using the two above mentioned jacks, as shown in figure 2. Select the adapter that has the base corresponding to that of the tube under test. These adapters are color coded so that they can be picked out rapidly.

4 prong—red	small 7 prong—none required
5 prong—green	large 7 prong—black
6 prong—blue	8 prong—orange.

Place the skirted adapter in the selector block and the plug adapter on the end of the analyzer plug. Remove the tube on which measurements are to be taken from the chassis and insert plug. Place the tube in the block socket. If the operator is familiar with the tube electrode positions, measurements of current, voltage or resistance on any electrode may be rapidly made by connecting the jumper cables

View Showing Model 666 Socket Selector Block Mounted on Model 772 Analyzer

Figure 2

from the block jacks to any of the tester jacks. IF THE TUBE ELECTRODE POSITIONS ARE NOT KNOWN, REFERENCE SHOULD BE MADE TO THE TUBE BASE DATA CONNECTION CHART, A COPY OF WHICH IS ENCLOSED. These charts tie any tube base to the numbers on the selector block.

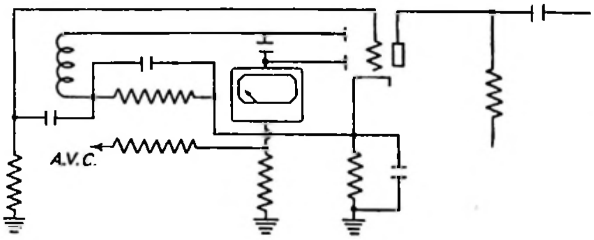
THIS METHOD IS ESPECIALLY VALUABLE AS A CURRENT JACK IN EACH CIRCUIT ALLOWS INSERTION OF ANY MILLIAMPERE RANGE IN ANY ELECTRODE CIRCUIT. CURRENT READINGS ARE VITAL AS THEY TELL JUST WHAT THE TUBES ARE DRAWING.

Convenient point to point resistance checks are also valuable and can be most easily made across the readily available selector block jacks. Note the picture of the analyzer set-up for measurements of plate current on a type 6-A-8 tube.

IV. UNUSUAL MEASUREMENTS MADE WITH THE MODEL 772 ANALYZER

4.1 — Measurements of grid, plate, screen and cathode voltage can be made with far better accuracy on a 20,000 ohm per volt analyzer than on those with lower sensitivity. The high resistances used in these circuits will cause large voltage drops when an instrument of low sensitivity is inserted in the circuit. Power detectors using high resistance cathode circuits are difficult to measure for exact bias as the current in these circuits is quite small. By using the 50 volt range on the Model 772 such voltage can be accurately measured in the vicinity of 20 volts which is often required for power detection. When making a measurement of this type only 20 microamperes would be drawn by the meter, this being a fraction of the current in the cathode circuit of these tubes. In general, for making all types of voltage measurement, the instrument can be handled like any other voltmeter but if there is any doubt in the serviceman's mind as to the greatly increased value of this sensitivity, an easy test can be made by taking measurements on a 250,000 ohm plate circuit of the resistance coupled to it. A comparison is shown below, giving the readings that would be obtained on this modern analyzer as against the old 125 ohm per volt and later 1000 ohm per volt types.

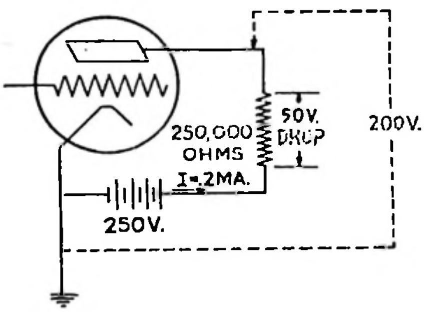
4. 2 — Measurements of rectified diode current are of vital importance in making tests of a.v.c and diode detector receivers. Diode currents seldom run over 100 microamperes except on very strong signals and, therefore, measurements as low as 1 microampere will be very valuable. Diagrams showing the method of taking these measurements in a typical diode detector and a.v.c. circuit is shown in figure 3. If the one megohm resistor is used in the a.v.c. circuit, the a.v.c. bias can be read directly on the instrument by converting each reading in microamperes directly to volts, as one microampere through a megohm will give a reading of one volt. Note that the 100 microampere range is used for some readings as its resistance is quite low i.e., in the order of 1250 ohms. For more sensitive readings the 2.5 volt position can be used for reading 50 microamperes, but the 50,000 ohms in this circuit will sometimes upset the a.v.c. and detector circuits. With either of these ranges note that accurate readings can be taken down to .5 microampere.



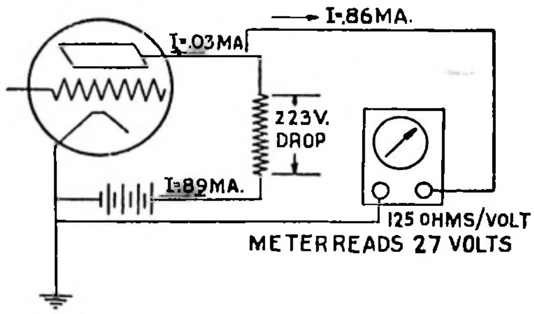
Meter in A. V. C. Diode Circuit to Check A. V. C. Action

Figure 3

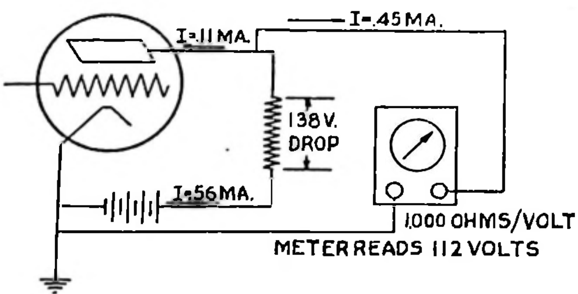
EFFECT OF DIFFERENT METER SENSITIVITIES ON A TYPICAL RESISTANCE COUPLED PLATE CIRCUIT



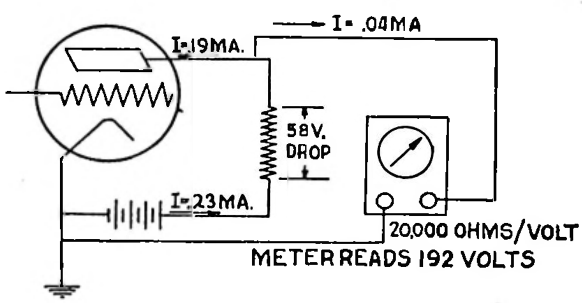
Normal Operation No Meter In Circuit



Conditions Using 125 Ohms Per Volt Meter



Conditions Using 1,000 Ohms Per Volt Meter



Conditions Using 20,000 Ohms Per Volt Meter

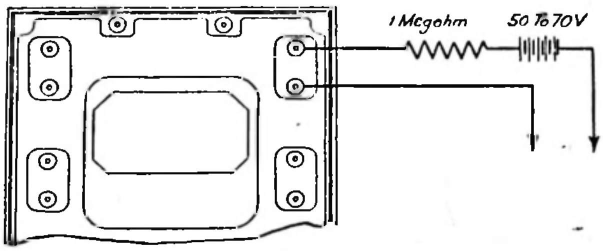
Meter Range—250 Volts Full Scale in All Cases

DECIBEL READINGS

Power Level DB	Volts—Based on 6 M.W. at 0 DB in 500 ohms	600 ohms	Power Ratio to 0 DB	Power 6 MW at 0 DB Watts	Voltage Ratio to 0 DB
-10	0.5477	.6000	0.1000	0.0006000	0.31623
- 9	0.6145	.6732	0.1259	0.0007553	0.35481
- 8	0.6895	.7554	0.1585	0.0009509	0.39811
- 7	0.7737	.8475	0.1995	0.0011972	0.44668
- 6	0.8681	.9509	0.2512	0.0015071	0.50119
- 5	0.9740	1.0670	0.3162	0.0018975	0.56234
- 4	1.0928	1.1972	0.3981	0.0023886	0.63096
- 3	1.2262	1.3433	0.5012	0.0030071	0.70795
- 2	1.3758	1.5071	0.6310	0.0037857	0.79433
- 1	1.5437	1.6910	0.7943	0.0047660	0.89125
0	1.7321	1.8974	1.0000	0.0060000	1.00000
+ 1	1.9434	2.1289	1.2589	0.0075535	1.1220
+ 2	2.1805	2.3886	1.5849	0.0095093	1.2589
+ 3	2.4466	2.6801	1.9953	0.0119716	1.4125
+ 4	2.7451	3.0071	2.5110	0.0150713	1.5849
+ 5	3.0801	3.3741	3.1623	0.0189747	1.7783
+ 6	3.4559	3.7867	3.9811	0.0238865	1.9953
+ 7	3.8776	4.2477	5.0119	0.030071	2.2387
+ 8	4.3507	4.7660	6.3096	0.037857	2.5119
+ 9	4.8816	5.3475	7.9433	0 047660	2.8184
10	5.4772	6.0000	10.0000	0.060000	3.1623
11	6.1455	6.7321	12.589	0.075535	3.5481
12	6.8954	7.5536	15.849	0.095093	3.9811
13	7.7368	8.4752	19.953	0.119716	4.4668
14	8.6808	9.5094	25.119	0.150713	5.0119
15	9.7400	10.670	31.623	0.189747	5.6234
16	10.9285	11.972	39.811	0.238865	6.3096
17	12.2620	13.433	50.119	0.30071	7.0795
18	13.7582	15.071	63.096	0.37857	7.9433
19	15.4369	16.910	79.433	0.47660	8.9125
20	17.3205	18.974	100.000	0.60000	10.0000
21	19.434	21.289	125.89	0.75535	11.220
22	21.805	23.886	158.49	0.95093	12.589
23	24.466	26.801	199.53	1.19716	14.125
24	27.451	30.071	251.19	1.50713	15.849
25	30.801	33.741	316.23	1.89747	17.783
26	34.559	37.867	398.11	2.38865	19.953
27	38.776	42.477	501.19	3.0071	22.387
28	43.507	47.660	630.96	3.7857	25.119
29	48.816	53.475	794.33	4.7660	28.184
30	54.772	60.000	1000.00	6.0000	31.623
31	61.455	67.321	1258.9	7.5535	35.481
32	68.954	75.536	1584.9	9.5093	39.811
33	77.368	84.752	1995.3	11.9716	44.668
34	86.808	95.094	2511.9	15.0713	50.119
35	97.400	106.70	3162.3	18.9747	56.234
36	109.285	119.72	3981.1	23.8865	63.096
37	122.620	134.33	5011.9	30.071	70.795
38	137.582	150.71	6309.6	37.857	79.433
39	154.369	169.10	7943.3	47.660	89.125
40	173.205	189.74	10000.0	60.000	100.000
41	194.34	212.89	12589.2	75.535	112.20
42	218.05	238.86	15848.9	95.093	125.89
43	244.66	268.01	19952.6	119.716	141.25
44	274.51	300.71	25118.9	150.713	158.49
45	308.01	337.41	31622.8	189.747	177.83
46	345.59	378.67	39810.7	238.865	199.53
47	387.76	424.77	50118.7	300.71	223.87
48	435.07	476.60	63095.7	378.57	251.19
49	488.16	534.75	79432.7	476.60	281.84
50	547.72	600.00	100000.0	600.00	316.25

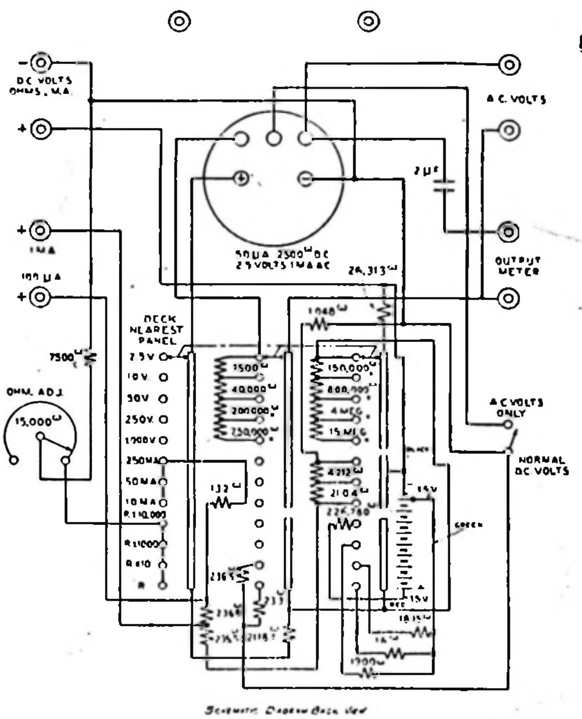
4.3 — Condenser leakage measurements are very valuable in segregating shorted or leaky condensers. The sensitive ohm ranges on the Model 772 make these tests very easy. Measurements of paper condensers should always be made using the top or R x 10,000 range. All paper condensers should not show any appreciable leakage on this range due to the fact that leakage lower than 50 megohms is liable to indicate moisture in the condenser which may result later on in a final breakdown. Electrolytic condensers should in most cases be measured on the R x 1000 range as their resistance is always a finite value somewhere in the low megohm group. A true advantage of a sensitive ohmmeter of this type is shown here where a maximum potential on any range of only 15 volts d.c. is used to obtain the high megohm readings. Any ohm test can, therefore, be taken on any electrolytic condenser regardless of its voltage rating as it will never be exceeded on this model. In general electrolytic condensers used in power supplies should be rejected if their leakage resistance is below 400,000 ohms. Any value much below this will cause heating in the condenser which may in turn result in further injury and final breakdown. On by-pass condensers used on cathode circuits of the 5, 10 and 25 microfarad types with voltage ratings as low as 50 volts, considerably lower resistance readings may be obtained, and where they are shunted by cathode resistors having low values they will probably function alright. However, any electrolytic condenser should have a resistance of at least 100,000 ohms to function correctly in receiver circuits. The condenser should be connected with its + terminal to the — terminal on the tester.

4.4 — A multiplier for the top d.c. *ohm* range can be made if even higher ohm readings are desired. The extreme sensitivity of the tester makes it possible and by adding 60 volts of "B" battery (anything from 50 to 70 volts will do) in series with the ohm jacks shown in the circuit below a 5 to 1 multiplier giving readings up to 150 megohms may be used. It should be noted that a 1 megohm resistor is used and to obtain accurate readings this resistor should be adjusted to 1%. If the voltage in the battery allows adjustment of the pointer to top mark when the leads are shorted together, the readings on this top range will multiply exactly by 5 if the external resistor used has been accurately adjusted and is so constructed that it will hold its accuracy through moisture and temperature variations. This additional 5 to 1 multiplier is often valuable in measuring paper condensers for leakage as estimates of as high as 200 and 250 megohms can be made by watching the pointer. Top reading on this range would be 150 megohms.



Circuit for Rx50,000 Used on Top or Rx10,000 Ohm Switch Position

Figure 4



Wiring Diagram for Model 772 Analyzer

4.5 — Decibel readings can be taken easily on this instrument by referring to the table on the previous page. It was felt not wise to add a d.b. scale to this instrument as in most cases it would be confusing unless the a.c. ranges were specifically laid out for decibels. By taking the readings in a.c. volts and referring to the table following, the plus or minus d.b. values above a zero level of 6 milliwatts in a 500 ohm line will be obtained directly. This zero level is standard for all broadcasting lines and is used widely by telephone companies. It is, therefore, the most commonly used line impedance and zero level.

4.6 — For example on a 500 ohm line with the Model 772 switch in the 10 volt position and the a.c. pin jacks connected across the line, a reading of 3.87 volts might be obtained. This would be read on the second red arc marked 10-50 volts a.c. Referring to the d.b. readings on the previous page the column headed "VOLTS—BASED ON 6 MILLI-WATTS AT 0 D.B." should be located. Under this heading two individual columns should be noted, one entitled "500 OHMS" and the other "600 OHMS". As the particular line in question is a 500 ohm line the operator should run his finger down this column and locate the nearest reading to 3.87. This happens to be the 18th figure in this column, the exact reading here being 3.8776. Referring horizontally to the left-hand column entitled "POWER LEVEL IN D.B." a reading of +7 will be noted. The level on this line is therefore +7 d.b. or , 7 d.b. above zero level of 6 milliwatts. If the line in question happens to be a 600 ohm line, then the 3rd column from the left should be referred to. If the power ratio to zero db. is required or the actual power in watts in this particular line is to be determined, then the figure in the 4th or 5th column should be located.