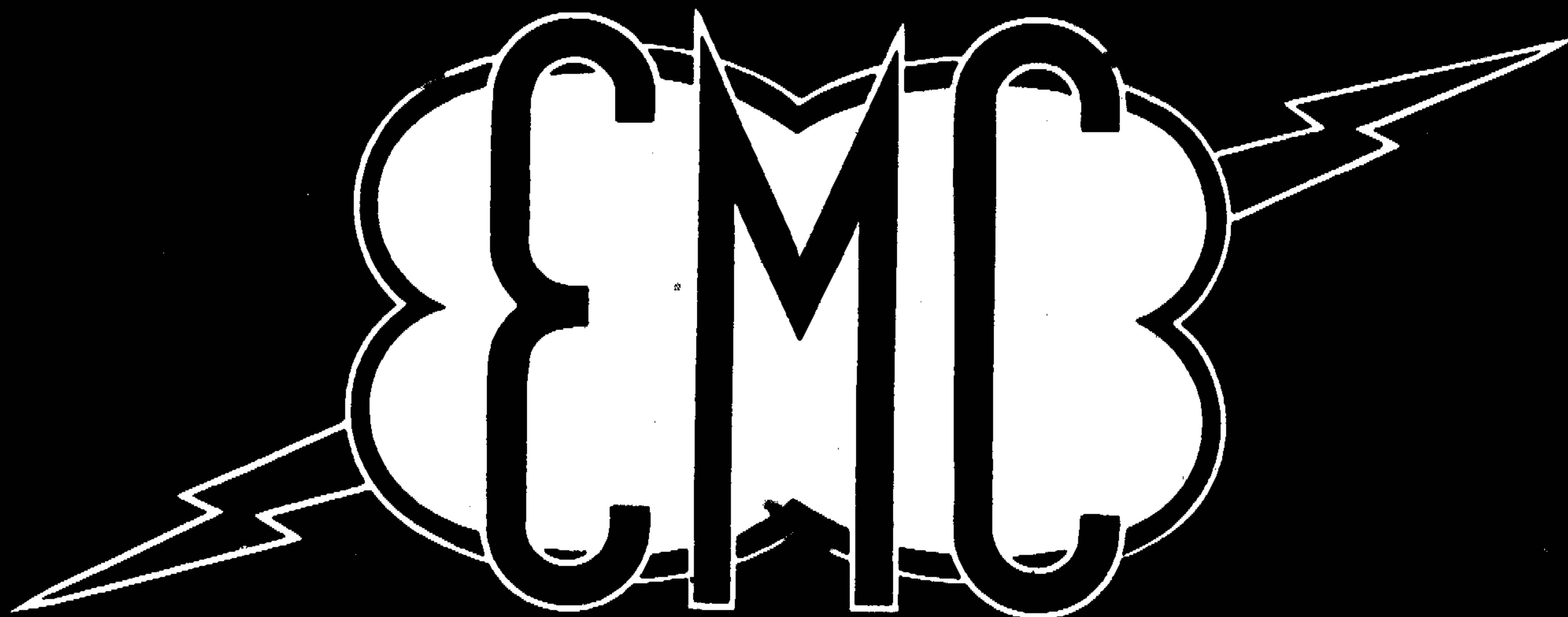


OPERATING MANUAL

EMC Model 802



WARNING: Do not misplace this book. It contains complete instructions necessary for the operation of this instrument. **DO NOT** plug instrument into a DC POWER LINE! Unless otherwise indicated, this instrument is designed for 105-135 volt, 60 cycle, AC power.

ELECTRONIC MEASUREMENTS
CORPORATION

OPERATING INSTRUCTIONS FOR MODEL 802 SIGNAL TRACER AND GENERATOR

GENERAL

The EMC Model 802 is a combination signal tracer and generator. In the absence of a signal, the Model 802 generates its own signal for Audio, IF or RF testing. In addition, Model 802 incorporates a noise locator circuit.

As a signal tracer, Model 802 incorporates a high gain RF amplifier and a low gain audio amplifier. It is provided with a crystal demodulator probe for RF applications and a direct probe for Audio applications.

Both a speaker as well as a magic eye tube are used for signal detection. The magic eye permits estimations of relative signal strengths and gain per stage.

Provisions are made for using the instrument as a substitute speaker or amplifier. As an amplifier it can be used to check phonograph pickups. For magnetic pickups connect directly to RF input with audio probe. For crystal pickups connect to audio input. An output jack for a VTVM or an oscilloscope is provided so that the exact signal output or wave form may be measured.

An internal audio signal of approximately 400 cycles is provided for testing audio systems.

An IF modulated signal of 455KC is provided for testing IF's in radios using this IF frequency.

The above signal can also be used for an RF modulated signal of 910KC and tuned in on a radio (2nd harmonic) at 910KC. The instrument is designed for 105-130 volt 50-60 cycle operation.

PANEL CONNECTIONS

TEST AMPLIFIER- FUNCTION SWITCH is set to TEST SPKR-TEST AMPL. position. The internal speaker is disconnected and connections can be made to the output transformer secondary by using the TEST AMP and GND jacks. This enables the Model 802 amplifier to be used as a substitute amplifier or as a check for an external speaker.

TEST SPEAKER- FUNCTION SWITCH is set to TEST SPKR-TEST AMPL. position. The internal speaker is disconnected from the output transformer in this position and direct connections can be made to it using the TEST SPKR. and GND jacks. This is desirable whenever an additional speaker is required for a particular purpose.

TEST OUTPUT TRANSFORMER PLUS SPEAKER- FUNCTION SWITCH is set to "OFF-TEST OUT-XMFR" position as the power must be shut off before this function of the Model 802 can be used. The plate lead of a single ended amplifier is then connected to the "P" jack and the B + lead to the B + pin jack. The Model 802 then serves as a substitute output transformer and speaker. In the case of a push pull amplifier either plate lead is used. After one section of the amplifier has been checked, the plate lead is removed from the "P"

place leads have been removed from the instrument.

VTVM-SCOPE- This pin jack connects directly to the grid of the power output tube and a VTVM or a scope may be connected between this pin jack and ground for obtaining exact gain per stage measurements or observing wave form.

CIRCUIT DESCRIPTION

The signal generator section uses a 6AB4 triode in a Hartley circuit to generate the 456KC signal. The 400 cycle modulation is provided by an NE51 neon lamp which produces a saw tooth 400 cycle wave. The attenuator control adjusts the amplitude of the modulated signal.

The amplifier section is essentially a 3 stage high gain audio amplifier. The first stage is used as a preamplifier for an A-M broadcast signal or the internal signal generated by the Model 802.

When used with an RF or IF signal, the RF demodulator probe is used in connection with it. However, if the signal comes from a magnetic pick up or is a low level audio signal use the direct probe and connect to the RF input.

The last two stages of the amplifier constitute a low gain audio amplifier with a separate input. The direct probe only is used with this input. Because of the low gain, distortion and noise are minimized. The gain control is in the grid circuit of the second stage and is therefore effective when either RF or audio inputs are used. The magic eye tube is connected to the grid of the third stage and provides a visual indication of the signal level. The speaker is coupled to the output of the 3rd stage and gives an aural indication of the signal level. The 2 triode sections of a 12AX7 tube are used for the first 2 stages. The output is coupled to an EL84 power output tube which acts as the third amplifier. The EL84 is in turn coupled to the speaker through an output transformer.

In the noise position a 120 volt DC voltage is applied to the audio input jack by means of the INPUT SELECTOR.

The FUNCTION SELECTOR switches in the proper circuit for the various functions or substitution tests. When using the Model 802 as a substitute output transformer, the power must be "off". This is why the OFF and TEST OUT. XMFR are at the same position.

The power is ON for the TRACE and TEST AMP.-TEST SPKR positions. It is required for checking an external speaker. In this same position the internal speaker is disconnected from the output transformer and is available as a test speaker.

The power supply uses a full wave rectifier and a 4 section electrolytic. The tube heaters have a negative bias put on them with respect to the cathode. All this assures maximum filtering for hum-free operation. However, at the RF input, the amplifier has high gain. Since the RF probe connects to the grid of the input tube, there will be some hum pick up when the gain control is near the maximum gain position. Although the triode input tends to minimize the noise level, some microphonic noise may be encountered with the gain at maximum position and RF input being used.

CHECKING AND ADJUSTMENT

1. Double check all your wiring and connections to make sure they are right and that there are no accidental shorts on the switches or tube sockets. Remove all loose pieces of solder.
 2. Any excess rosin should be removed by cleaning with carbon tetrachloride.
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3. Use an ohm meter and measure resistance to ground from any lug on the metal can electrolytic condenser. It should be at least 50,000 ohms after it has reached its final value. If it is lower, double check the rectifier circuit until the trouble has been located. Refer to resistance chart for proper resistances to ground.
 4. Plug instrument into 105-130 volt 60 cycle line and allow about a minute for it to heat up.
 5. Insert Audio output lead into "MOD RF OUTPUT" jack and connect to antenna and ground terminals of a radio receiver. Set Radio dial to 910KC and set "MOD RF ATTENUATOR" control to maximum.
 6. Adjust slug of coil until maximum sound is heard. Reduce setting of attenuator control to prevent overloading the radio. A sound should also be heard at 1365 KC on radio dial (3rd harmonic).
 7. Set Input Selector to "RF". Set Function Selector to "TRACE".
 8. Connect "Mod. RF Output" to "RF Input". A sound should be heard as gain control is turned up.
 9. Set Input Selector to AUDIO"
 10. Connect "Audio Output" to "Audio Input". A sound should be heard as gain control is turned up and magic eye should close as gain control is turned from minimum to maximum position. If sound gets too loud, the eye itself can be observed by setting "Function Selector" to "TEST AMP" - TEST SPKR" position. This cuts out the sound.
 11. If the instrument does not work properly, check for resistance and voltage to ground using a VTVM or 20,000 ohms per volt instrument for measuring voltage. The reading should be within 15% of values indicated on chart below:-

VOLTAGE CHART FOR 802 KIT

Tube	1	2	3	4	5	6	7	8	9
EZ81	160AC	-	315DC	10DC	10DC	-	160AC	-	-
12AX7	75DC	-	0	10DC	10DC	75DC	-	.2DC	10DC
6AB4	65DC	-	10DC	10DC	-	-	1.7DC	-	-
EL84	-	-	9DC	10DC	10DC	-	280DC	-	300DC

RESISTANCE CHART IN OHMS

Tube	1	2	3	4	5	6	7	8	9
EZ81	350	-	-	300	300	-	350	-	-
12AX7	-	2.2 meg	0	300	300	-	100K	300	300
6AB4	-	-	300	300	2 meg	1 meg	2200	-	-
EL84	-	100K	250	300	300	-	-	-	-

12. If the instrument works properly push the line cord through the opening in the rear of cabinet and insert the instrument into the cabinet. Align the hole in the rear of the chassis with the one in the rear of the cabinet and tighten with a #6 self tapping screw. Fasten the panel to the case using 8 - #6 self tapping screws.

GUARANTEE

IMPORTANT - READ CAREFULLY

OPERATION - GENERAL DESCRIPTION

The Model 802 will trace a signal from the antenna input of a radio receiver through the various RF, IF and audio stages. Either a broadcast signal or the RF modulated signal from the Model 802 may be used. The instrument is connected first to the input and then to the output of each succeeding stage until the signal disappears, is reduced too much in intensity, or hum, noise or oscillation appear. Once the defective section is located, each component is checked for noise with the Model 802 if it is noise that is giving the trouble. If it is a loss of signal or a weak signal that is the trouble, a volt-ohm-milliammeter and a tube checker are required to check the individual components and operating voltages.

For accurate gain per stage measurements a VTVM should be used for measurement of output voltage. The internal mod. RF signal of the Model 802 is used for this purpose. If no VTVM is available an estimated gain per stage is made by observing the change in shadow angle on the magic eye tube. While distortion in the modulated RF signal can be detected by ear, it is preferable to use a broadcast signal for measuring distortion. As it is easier to detect distortion in music or speech by ear than to detect distortion in a single tone. However, in areas where the signal is weak, the internal modulated RF signal may be used for distortion measurements as well. The receiver is tuned to 910KC when the signal is injected into the antenna input or any place in the RF section. If the IF frequency of the receiver is close to 455KC as is the case with most receivers, the signal may be used to align the IF circuit. The audio circuit of the receiver is traced with the 400 cycle audio signal of the Model 802.

If a scope is used to measure distortion, the signal from the Model 802 is used. Its shape is determined at the input and output of the stage being checked to see if its shape has been altered.

For checking the audio section of a TV or FM Receiver, the audio signal from the Model 802 may be used. When checking all wave receivers, the receiver is traced through on the broadcast band. If the trouble is on some other band only it will then have to be on the RF mixer or oscillator sections since the rest of it is the same as for the broadcast band.

NOISE TEST

The instrument can be used to locate noisy or intermittent components. A 120 volt filtered DC voltage at a maximum current of 1 milliamperes is applied through the audio probe to the audio component under test for noise or being intermittent. Any noise is amplified and heard on the speaker.

The Procedure is as follows: -

1. Make sure the receiver or component under test is completely disconnected from any source of power.
2. Set INPUT SELECTOR TO NOISE position.
3. Set FUNCTION SELECTOR TO TRACE position.
4. Set Gain Control to maximum clockwise position.
5. Connect audio probe to audio input jack.
6. Connect one end of the circuit or component being checked to the ground lead of the audio probe.
7. Connect the probe end of the audio probe to the other end of the component such as resistor, capacitor or volume control.
8. Jiggle the part under test.

9. A sharp, clean click should be heard only at the instant of contact if the component is not noisy or intermittent.
10. If a crackling or frying sound persists, the component being tested is noisy or intermittent.
11. To avoid shock, do not touch the tip of the audio probe with the fingers or any part of the body.

RF SIGNAL TRACING

1. Set INPUT SELECTOR to RF position.
2. Set FUNCTION SELECTOR to TRACE position.
Note: If it is desired to use only the magic eye tube for indication set FUNCTION SELECTOR to "EXT. SPK-TEST SPK" position. This will disconnect the speaker from the circuit.
3. Connect RF probe to RF input jack.
4. Connect audio probe with alligator clip to RF mod. jack.
5. Connect alligator clip end of audio probe to antenna input terminal and ground lead to chassis or ground terminal of receiver.
6. Tune receiver to 910KC.
7. Turn down the volume control of the receiver under test.
8. Touch the tip of the RF probe to the various parts of the RF oscillator and mixer stages and observe magic eye indication or listen to sound from the instrument speaker. If it is the magic eye that is being observed for gain per stage indications, please note that the indication is the size of the shadow angle or dark sector. A signal causes the shadow angle to narrow or to close entirely if the signal is large enough. Both the magic eye opening as well as the volume of the sound coming from the speaker are determined both by the magnitude of the signal as well as the GAIN control setting. For gain per stage measurements using the magic eye as an approximate indicator a constant reference shadow angle at the input level to a stage must be obtained. To do this, it is necessary to reduce the GAIN control setting as the signal is traced through the receiver. With some practice, the gain for any particular stage may be estimated by the amount of decrease in the GAIN control setting required to maintain a constant shadow angle as the RF probe is moved from the input to the output of the stage. For a more accurate measurement of the gain per stage a VTVM should be used to measure the input and output voltages of the stage under test.
9. The applied signal to the stage under test may be increased or decreased in amplitude by using the attenuator control on the Model 802.
10. When checking tuned circuits, the RF probe may in some cases cause slight detuning if the capacities in the tuned circuit are small and in some cases oscillation may occur. Before deciding that the receiver is at fault, use another check point for the signal measurement. If the oscillation disappears then it can be ignored.

IF SIGNAL TRACING

If the IF of the receiver under test is 455KC, the IF section is signal traced from its input to the detector stage in a similar manner to the RF section described above. If the IF frequency is other than 455KC, the

internal signal of the Model 802 cannot be used and a regular signal generator signal must be used.

AUDIO SIGNAL TRACING

1. Set INPUT SELECTOR to AUDIO position.
2. Set FUNCTION SELECTOR to TRACE POSITION.
3. Connect audio probe to AUDIO INPUT jack.
4. Connect audio probe with alligator clip to AUDIO OUTPUT jack.
5. Connect alligator clip end of the audio probe to the input of the audio circuit or audio amplifier under test and the ground lead to the ground of the circuit on audio amplifier being checked.
6. Touch the probe end of the audio probe to the various stages of the audio amplifier and listen to the 400 cycle signal in the speaker or observe the magic eye tube shadow opening, until the defective stage or part has been located. Please note that it is normal for the audio signal to drop sharply as the probe is moved from the primary winding of the output transformer to the secondary winding. Until then the signal should increase as the probe is moved from the input terminals toward the speaker.

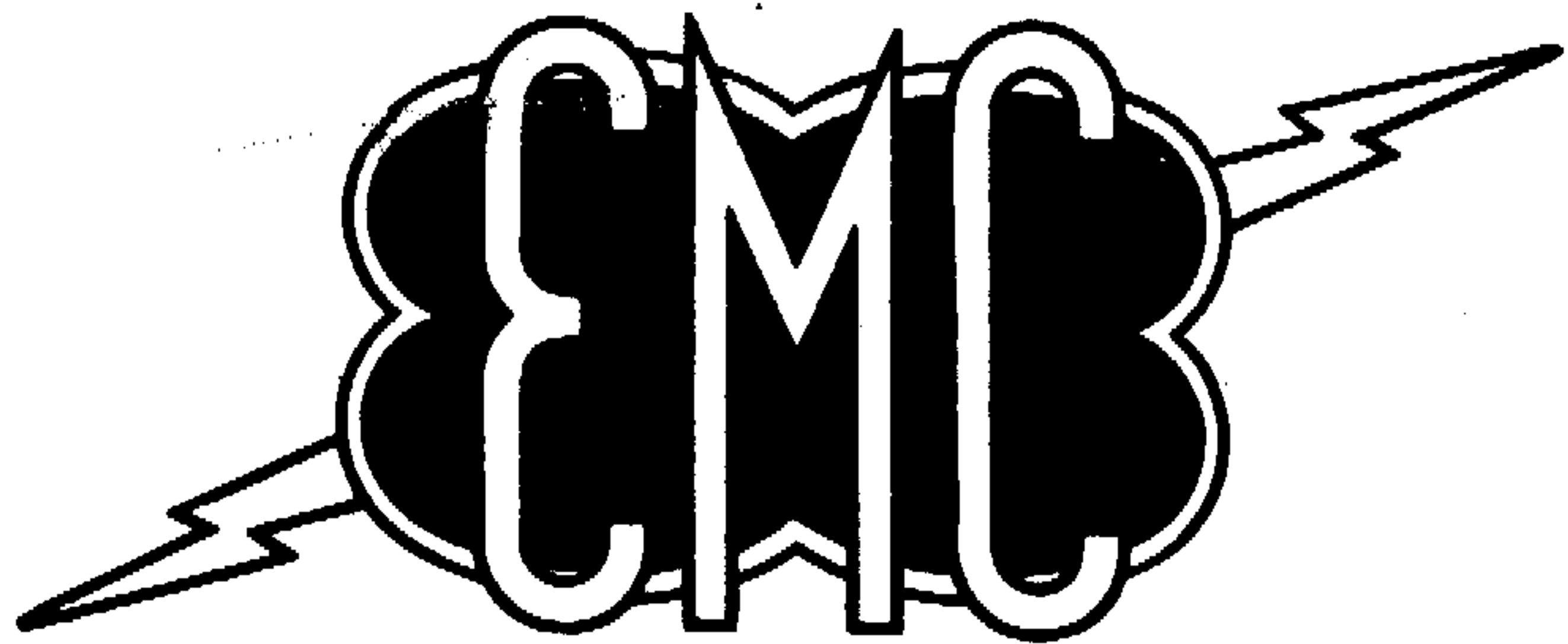
GUARANTEE

This instrument is guaranteed for 90 days from date of purchase to be free from any defect in workmanship or material. ELECTRONIC MEASUREMENTS CORPORATION will replace any defective part or parts within this period without charge, if tests at our factory show that the defect was not caused by abuse or tampering.

PARTS LIST FOR MODEL 802 KIT

<u>PART NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>	<u>PART NO.</u>	<u>ITEM</u>	<u>QUANTITY</u>
1	Panel	1	45	3.3K resistor	1
2	Case	1	46	51K resistor	2
3	5 inch speaker	1	47	6.2 meg resistor	1
4	Output transformer	1	48	100 ohm resistor	2
5	Speaker grill	1	49	1K ohm resistor	1
6	Chassis	1	50	8.2K	1
7	Magic eye tube bracket	1	51	27K ohm resistor	1
8	Magic eye tube clamp	1	52	22K ohm resistor	1
9	Power transformer	1	53	2.2 meg resistor	2
10	Electrolytic Condenser	1	54	110K ohm resistor	1
	20 mfd - 450V		55	100K ohm resistor	5
	20 mfd - 450V		56	450 ohm resistor	1
	20 mfd - 450V			5W	
	20 mfd - 450V	1	57	270 ohm resistor	2
11	Electrolytic condenser	2	58	1N65 diode	1
	40 mfd - 200V		59	Coil	1
12	.05 mfd condenser	1	60	6AB4 tube	1
13	.01 mfd condenser	3	61	EZ81/6CA4 tube	1
14	.15 mfd condenser	3	62	EL84/6BQ5 tube	1
15	.02 mfd condenser	1	63	ECC83/12AX7 tube	1
16	100 mmfd condenser	4	64	1629 magic eye	1
17	20 mmfd condenser	1		tube	
18	.003 mfd condenser	1	65	4/40 screws	18
19	phone jacks	4	66	4/40 nuts	18
20	Red tip jacks and washers	5	67	6/32 screws	9
			68	6/32 nuts	9
21	Black tip jack and washer	1	69	#6 self tapping screws - 1/4"	8
22	Bar knobs	2	70	3/8 Nuts	4
23	Small round knobs with pointer	2	71	#6 self tapping x 1/2" -1"	
			72	3/8 lockwashers	4
24	Grommets (3/8" O.D.)	3	73	Line Cord	1
25	Alligator Clips	4	74	RF probe casing	1
26	Input Selector Switch	1	75	<i>RED</i> Black prod handle	1
27	Function Selector Switch	1	76	Grey shielded leads with phone tip	3
28	500K control	1	77	<i>RED</i> Black test lead wire	3 ft.
29	1.8K control	1	78	Hook up wire blue	4 ft.
30	9 pin sockets	3		grey	1 1/2 ft.
31	7 pin miniature socket	1		black	3 ft.
32	8 pin socket	1		red	2 ft.
33	5 lug terminal strip	1		yellow	2 ft.
34	4 lug terminal strip	2		green	2 ft.
35	3 lug terminal strip	1		white	3 ft.
36	2 lug terminal strip	2	79	Instruction manual and kit instructions	1
37	Neon Socket	1		Spaghetti	1 ft.
38	Neon Bulb (NE51 or NE15)	1	80		
39	43K resistor	1			
40	470K resistor	1			
41	620K resistor	1			
42	1 meg resistor	4			
43	10K resistor	1			
44	47 ohm resistor	1			

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