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INSTRUCTIONS FOR OPERATING THE PRECISION
SERIES 954 SUPER-SENSITIVE DYNAMIC ELECTRONOMETER
and 954G

The Series 954 Super-Sensitive Dynamic Electronometer is a modern push-button operated radio tube analyzer combined with an ultra-sensitive rotary range selector system for obtaining measurements of A.C. and D.C. voltages, ohms, decibels and current for all modern radio set (A.M., F.M. and Television) analyses. A system is also provided for obtaining qualitative analysis of ballast units and of both paper and electrolytic condensers.

The tube analyzer circuit of this instrument makes use of an exclusive PRECISION engineered tube test system, which in one operation, effectively checks the two most important electrical characteristics of a radio tube, namely, MUTUAL CONDUCTANCE and CATHODE STRUCTURE (EMISSION).

The novel automatic interlocking PUSH-BUTTON element selector, incorporated in the Series 954 provides for simplicity in operation, visible filament continuity tests, speedy short check, cathode leakage, ballast unit tests, and rapidly locates all tube elements for application of individual test voltages.

From the features listed, it will be noted how both tube test and set testing can be efficiently and easily accomplished with the Series 954 laboratory tester.

TUBE ANALYZING FEATURES

1. A DYNAMIC TUBE TESTER employing an exclusive PRECISION engineered circuit, which in one operation, effectively tests all radio receiving tubes for both MUTUAL CONDUCTANCE and CATHODE STRUCTURE (EMISSION).
2. TESTS ALL TYPE TUBES: ACCOMMODATES ALL FILAMENT VOLTAGES from 1.4 to 117 volts, including the new 35, 45, 50, 70, 85 and 117 volt filaments. TESTS ALL LOKTALS, BANTAM JUNIOR and BUTTON 7 PIN BATTERY HEARING AID AND PORTABLE RADIO TYPES, SINGLE-ENDED (Television and F.M. Amplifiers), REGULAR OCTALS (MG, G, GT and METALS), SPRAY-SHIELD AND GLASS TYPES.
3. TUBE MERIT indications are read directly on a three colored ENGLISH READING SCALE.
4. DOUBLE WINDOW ROLLER TUBE CHART provides speedy, easy reading tube references. New charts furnished from time to time at no charge.
5. DUAL FREE-POINT FILAMENT TERMINAL SELECTION locates terminals of ALL filaments (single, double, center-tapped and tapped) regardless of any rotating pin positions.
6. VISIBLE FILAMENT CONTINUITY TESTS show up open filaments for ALL types of tubes regardless of filament base connections. This PRECISION developed feature eliminates delay by immediately determining whether or not the filament of a tube under test is intact.
7. AUTOMATIC PUSH-BUTTON SYSTEM: PRECISION designed interlocking push-button selector system affords the extreme in flexibility for non-obsolete FREE POINT TUBE ANALYSIS and insures ability to accommodate future tube releases.
8. SPECIFIC INDIVIDUAL LOADS AND VOLTAGES (control grid, screen, plate, etc.) applied to respective elements of tube under test.
9. VARYING A.C. SIGNAL applied to control grids.
10. METER READS IN PLATE CIRCUIT: Indications therefore are entirely dependent upon control of ALL intervening elements.
11. OPEN ELEMENTS: Shows up tubes with any open element. The PRECISION DYNAMIC TEST NECESSITATES ALL ELEMENTS intact for proper reading.
12. TESTS diodes, triodes, rectifiers, tetrodes, pentodes, multi-purpose tubes, gaseous types OZ3-OZ4 and remote control gaseous types OA4 and 2A4 regardless of varying filaments or other element positions.
13. MULTI-SECTION TUBES: Individual tests for each section of multi-section tubes including visible tests of the fluorescent screen and winking effect on cathode ray indicator tubes. No shifting of tubes necessary to obtain all tests.

14. HOT CATHODE LEAKAGE TEST: Sensitive neon method quickly shows up poor cathode structure in accord with leakage specifications of leading tube manufacturers.
15. HOT INTER-ELEMENT SHORT TESTS made ingeniously simple through the use of PRECISION Automatic Interlocking Push-Buttons.
16. NOISE TEST pin jacks incorporated for earphone or amplifier connection. Each element can be separately tested for noise through use of free-point Automatic Interlocking PUSH-BUTTON ELEMENT SELECTOR SYSTEM.
17. BALLAST TESTS: The regular tube test sockets accommodate all ballast unit tests for open and loose elements and leakage between sections of multi-section ballasts; made possible through the Precision Push-Button system.
18. PILOT LIGHT TESTS for all miniature screw base and bayonet type lamps.
19. ACCURACY of the tube test circuit is closely maintained by the use of individual calibrating controls, adjusted and sealed against laboratory standards.
20. LARGE MODERN PRECISION SQUARE METER.
21. TUBE SELECTION REFERENCES plainly marked on panel. Nothing to remember.
22. PILOT LIGHT ON-OFF INDICATOR: Fused line plug.
23. MICRO-LINE ADJUSTMENT read directly on meter, provided by use of variable heavy duty line voltage control. No arbitrarily tapped transformer employed.
24. TELEPHONE CABLED WIRING EMPLOYED THROUGHOUT.

SET ANALYZING FEATURES

25. SEVEN A.C. VOLTAGE RANGES at 1000 ohms per volt:
0-3; 0-12; 0-60; 0-300; 0-600; 0-1200; 0-6000 volts.
26. SEVEN D.C. VOLTAGE RANGES at 20,000 ohms per volt:
0-3; 0-12; 0-60; 0-300; 0-600; 0-1200; 0-6000 volts.
27. SEVEN D.C. CURRENT RANGES:
0-60; 0-300 MICROAMPERES.
0-3; 0-30; 0-120; 0-600 MA; and 0-12 AMPERES.
28. THREE RESISTANCE RANGES:
LOW OHMS - 0-6000 ohms (35 ohms at center of scale).
MEDIUM OHMS - 0-600,000 ohms.
HIGH OHMS - 0-60 MEGOHMS.
ALL ohmmeter ranges powered by self-contained supply. A 1½ volt battery powers the low and medium ranges.
29. SIX DECIBEL RANGES FROM -12 to 70 DB.
30. SIX OUTPUT RANGES:
0-3; 0-12; 0-60; 0-300; 0-600; 0-1200; 0-6000 volts.
31. PAPER CONDENSER LEAKAGE TESTS. Sensitive neon method.
32. LEAKAGE MEASUREMENTS on all types of electrolytic condensers read directly on meter in terms of current per microfarad.
33. MASTER RANGE SELECTOR SYSTEM provides for obtaining all measurements and tests at only two polarized pin jacks except for the extremely high voltages (1200 and 6000 volts), 12 AMPERES, and the two sensitive microampere scales.
34. SHUNTS WIRE WOUND to 1% accuracy on impregnated moisture proof bobbins. Metallized multipliers matched to 1% accuracy.
35. LARGE MODERN PRECISION SQUARE METER 2% accurate, D'Arsonval type. Base sensitivity of meter 50 microamps.
36. LARGE EASY READING scales and numbers. A.C. correction scales printed in red.

37. ACCURACY of the A.C. voltage and Decibel ranges is closely maintained through two individual calibrating controls, adjusted and sealed against laboratory standards.

It is strongly suggested that the following be read carefully in order to obtain the utmost benefit in accurate tube and set testing results, afforded by the Series 954 Super-Sensitive Dynamic Electrometer.

To obtain a quicker understanding for ease in operation, it is first best to take into consideration the function of each control, switch and part incorporated on the instrument panel.

CONTROL "A" serves a double purpose:

1. When rotated to 1,2,3,4,5,6,7,8 or 9, it selects the control grid of the particular tube under test regardless of element pin positions and when in any one of these 9 positions, also allows for the line-check meter indication.
2. When set to either the A.C. or D.C. position, it allows the super-sensitive multi-range meter facilities to be available at the two polarized "EXT. TEST" pin jacks located directly below CONTROL "D".

CONTROL "B" selects the correct filament voltage for the tube under test, providing a complete range of operating potentials from 1.4 through 117 volts. It will be noted that this control may be set to any one of 18 positions numbered from 1 to 18. Necessary filament voltages are applied when set according to roller chart data listed under column "B".

CONTROL "C" is a dual potentiometer and serves a double purpose:

1. When testing tubes, this control provides a variable A.C. signal which is automatically applied to the control grid selected by CONTROL "A".
2. When multi-range meter functions are being utilized, this control acts as ohmmeter adjustment for the first two resistance ranges.

CONTROL "D" is a special tapered potentiometer. When tube analyses are taken, it functions as a variable meter sensitivity control, enabling the setting of calibration limits for all tubes as noted on the tube test roller chart.

CONTROL "E" is primarily a screen-grid selector. Its major function is to pick out (regardless of element pin position) the screen-grid of multi-element tubes and at the same time, apply correct screen voltage and load. CONTROL "E" also provides for the following:

- (a) correct voltages and loads for general purpose triodes.
- (b) correct voltages and loads for testing rectifiers and diodes.
- (c) correct voltages and loads for testing the gaseous types OZ3-OZ4 rectifiers.
- (d) proper circuit connections for obtaining visible test of the fluorescent screens of all cathode ray tuning indicators.

CONTROL "F" serves a dual purpose:

When tube test functions are employed, this control acts as a free-point filament return terminal selector, with reference to the circled numbers, positions 1 through 12.

When multi-range meter functions are employed, this control acts as a MASTER RANGE SELECTOR allowing for all A.C. and D.C. measurements from the two polarized "EXT. TEST" pin jacks and from the special current and extra high voltage pin jacks. This feature is available ONLY when CONTROL "A" is set to either the A.C. or D.C. position.

THE LINE ADJUSTMENT CONTROL serves a double purpose:

For tube analyzing, it is used to adjust the line voltage by bringing the meter pointer to arrow head center of the scale plate marked "LINE", and when employing the 60 Megohms Range, this control is used to accurately regulate the tester power supply. This control is a heavy duty wire wound potentiometer, thus assuring positive micro-voltage adjustment.

THE AUTOMATIC PUSH-BUTTON SYSTEM consists of 12 push buttons identified as "OFF - A (Filament Continuity) - B - C - D - E - F - G - H - J - READ METER - TUBE MERIT". These buttons perform the following functions:

OFF BUTTON:

"OFF" button, when in the down or depressed position, shuts instrument "off" and simultaneously releases any other buttons that may have been previously depressed.

To turn instrument "ON", press lightly on "double action" "TUBE MERIT" button located at opposite end of the push-button system.

TUBE MERIT BUTTON:

This double action button has been so designed as to perform two entirely different functions depending upon the operating pressure.

1. A light pressure, as described above, releases the "OFF" button and thereby turns instrument "on", and provides immediate "LINE" indication on meter, as long as CONTROL "A" is in any one of the tube testing positions 1 through 9.

2. When fully depressed, the "TUBE MERIT" button, aside from interrupting the "LINE" indication on METER, also provides an ingenious mechanical arrangement which allows any required number of the lettered buttons "A" through "J" to be held down ("locked") and remain in the depressed position.

READ METER BUTTON:

This button, (which is in no way mechanically interlocked with the rest of the push-button system), merely provides meter reading for tube quality indications.

LETTERED BUTTONS A-B-C-D-E-F-G-H-J connect to corresponding prong positions of the sockets, permitting an arrangement whereby any combination of electrodes required, may be connected into the appropriate portion of the test circuit, regardless of element pin positions. This lettered set of push buttons operates through the circuit in conjunction with CONTROLS "A", "E" and "F", providing a complete FREE-POINT TUBE ANALYSIS SYSTEM affording extreme flexibility for future tube releases.

The manipulation of these lettered buttons serves the following purposes:

(a) Lettered BUTTON "A" provides for VISIBLE (NEON LAMP) FILAMENT CONTINUITY TESTS unless otherwise noted on roller tube chart.

(b) Provides for HOT INTER-ELEMENT SHORT CHECK and CATHODE LEAKAGE TESTS.

(c) Provides for proper tube circuit selections for quality indications.

(d) Provides for qualitative BALLAST UNIT TESTS, with CONTROLS "A" and "F" in position #7 and #12 respectively.

THE PROPER CONTROL AND PUSH BUTTON SETTINGS FOR EACH TUBE TO BE TESTED ARE INDICATED ON THE TUBE TEST ROLLER CHART.

SOCKETS:

This instrument employs individual 10ktal, octal, combination 7 prong, miniature Button 7 pin, Bantam Jr., 6 prong, 5 prong and 4 prong sockets. All tube analyses, i.e., filament continuity, hot cathode leakage, hot neon short check, tube quality tests and ballast unit tests are obtained from ANY ONE of the required sockets without the necessity of shifting the tube or ballast unit under test.

OVERHEAD CONNECTOR CAP:

The bakelite encased twin grid cap, (connected to flexible lead) accommodates the top caps of both octal and non-octal types of tubes. This connector cap is attached to tubes requiring same, while all tests are made.

THE METER:

The meter employed is of large square, modern design and ruggedly constructed. The movement is a 50 microampere D'Arsonval type of 2% accuracy. The English reading scale plate incorporates a wide three color sector divided into markings of REPLACE - WEAK - GOOD for tube merit indication.

CONDENSER TESTING:

The center pin of the Bantam Junior Socket, in conjunction with either one of the "NOISE TEST" jacks, provides for checking leakages in paper condensers by the neon lamp method and also provides for neon lamp continuity testing.

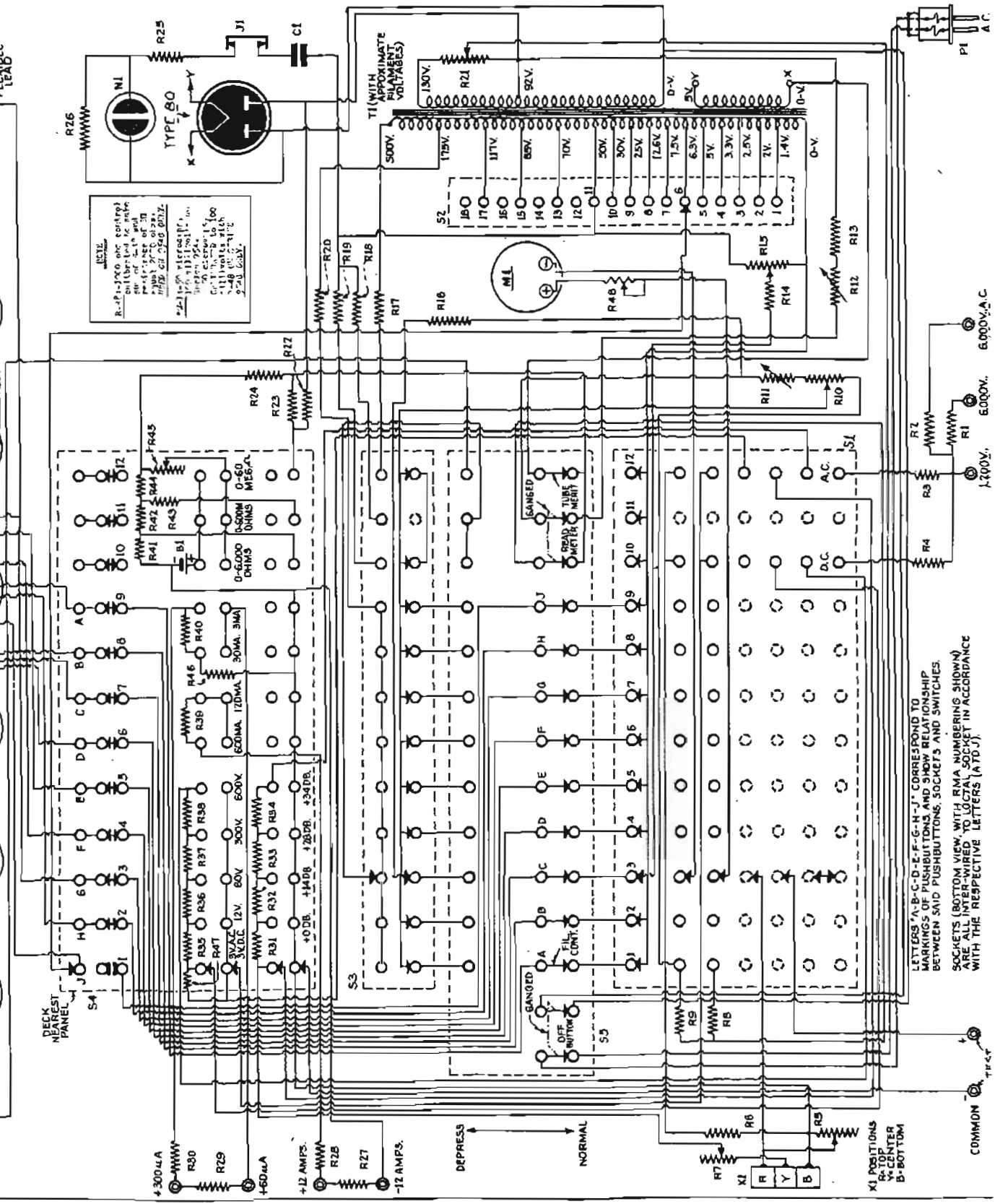
"NOISE TEST" TIP JACKS: provide for the insertion of an earphone or amplifier to obtain audible noise tests on tubes.

THE NEON LAMP "SHORT INDICATOR" located immediately above "NOISE TEST" pin jacks, affords a sensitive visible indication for filament continuity tests, short checking tubes and testing ballast units.

THE PILOT LIGHT TEST SOCKET located in center of combination 7 prong socket, accommodates all miniature screw and bayonet base pilot lamps. Voltages are selected at CONTROL "B" in accord with corresponding filament voltage switch position, and CONTROL "F" at number 1.



ITEM	PART NO.	SPECIFICATION
60	S5	PUSHBUTTON ASSEMBLY
59	S4	FILAMENT POSITION SELECTOR "F" AND RANGE SELECTOR FOR MULTI-RANGE TESTS.
58	S3	SELECTOR SWITCH "E"
57	S2	FILAMENT VOLTAGE SELECTOR "B" AND A.C.-D.C.
56	S1	SELECTOR SWITCH "A"
55	J1	CLOSED CIRCUIT "NOSE TEST" JACK
54	N1	6-10 NEON LAMP
53	C1	0.1 MFD. 400 MV.
52	M1	50 MA. 100 M.V. METER
51	T1	POWER TRANSFORMER
50	F1	DOUBLE-FUSED LINE PLUG
49	X1	RECTIFIER
48	B1	1.5VOLT BATTERY
47	R47	55M Ω
46	R46	50 Ω
45	R45	10M Ω . DHMS CONTROL "C"
44	R44	16,180 Ω
43	R43	470 Ω . CALIBRATED
42	R42	3,435 Ω
41	R41	34.7 Ω . CALIBRATED
40	R40	450 Ω
39	R39	1,667 Ω
38	R38	6 MEG. Ω
37	R37	4.8 MEG. Ω
36	R36	960M Ω
35	R35	180M Ω
34	R34	300M Ω
33	R33	240M Ω
32	R32	48M Ω
31	R31	9M Ω
30	R30	4,500 Ω
29	R29	20M Ω
28	R28	0.396 Ω
27	R27	0.021 Ω
26	R26	500M Ω
25	R25	35M Ω
24	R24	340M Ω
23	R23	20M Ω
22	R22	20M Ω
21	R21	300 Ω . "LINE CONTROL"
20	R20	2M Ω
19	R19	5M Ω
18	R18	300 Ω
17	R17	3M Ω
16	R16	4DM Ω
15	R15	1M Ω . CONTROL "C"
14	R14	500 Ω
13	R13	15M Ω
12	R12	12M Ω . SEALED (CALIBRATED)
11	R11	40 Ω . SEALED (CALIBRATED)
10	R10	300 Ω . CONTROL "D"
9	R9	40.5 Ω
8	R8	1,200 Ω
7	R7	5M Ω . SEALED (CALIBRATED)
6	R6	3M Ω
5	R5	7M Ω . SEALED (CALIBRATED)
4	R4	12 MEG. Ω
3	R3	600M Ω
2	R2	4.8 MEG. Ω
1	R1	96 MEG. Ω



PRECISION APPARATUS CO.
ELMHURST, N.Y.

TITLE SCHEMATIC FOR 954-954-G
SUPER-SENSITIVE TESTER

DRAWN BY W. KAPLEKIN DATE 8/13/45

LETTERS "A-C-D-E-F-G-H-J" CORRESPOND TO MARKINGS OF PUSHBUTTONS AND SHOW RELATIONSHIP BETWEEN SAID PUSHBUTTONS, SOCKETS AND SWITCHES.

SOCKETS (BOTTOM VIEW, WITH RMA NUMBERING SHOWN) ARE ALL INTER-CONNECTED TO ONE SOCKET IN ACCORDANCE WITH THE RESPECTIVE LETTERS (A-D-J).

COMMON