

TUBE TESTING INSTRUCTIONS
FOR PRECISION SERIES 910-912-914-915-920-922-954

ALL the tube testing circuits of these instruments make use of the PRECISION ELECTRONIC tube test system, which in one operation, effectively performance checks the electrical performance characteristics of a radio tube.

IMPORTANT:

1. In addition to tube testing, all of the instruments listed, EXCEPT Series 910 have facilities for battery testing. Series 910 owners should disregard all data other than that for tube testing.

2. Series 920 and 922 have additional 1000 ohms per volt circuit testing facilities for which instructions are included. This material should be disregarded for all other models.

3. Series 954 has additional 20,000 ohms per volt circuit testing facilities for which instructions are included. This material should be disregarded for all other models.

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. In positions 1 through 9, it selects the control grid of the particular tube under test and when in any one of these 9 positions, also allows for line-check meter indication.
2. In the A.C. or D.C. position, it provides multi-range meter facilities at the two "EXT. TEST" pin jacks of Series 920, 922 and 954.

CONTROL "B" provides a complete range of filament voltages from 1.4 through 110 volts. Set according to roller chart data listed under column "B".

CONTROL "C" serves a double purpose:

1. When testing tubes, it provides a variable A.C. signal 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 three resistance ranges of Series 920, 922 and 954.

CONTROL "D" functions as a variable meter shunt enabling the setting of tube test calibration limits.

CONTROL "E" is primarily a screen-grid selector. Its major function is to pick out the screen-grid of tubes and apply correct screen voltage and load. It also provides:

- a) proper voltages and loads for testing general purpose triodes, rectifiers, diodes and gaseous rectifiers.
- b) proper circuit connections for visible test of cathode ray tuning indicators.

CONTROL "F" serves a dual purpose:

In tube testing it is the filament return selector. In set testing, it is the MASTER RANGE SELECTOR for all A.C. and D.C. measurements (except 1200v., 3000v. and 12 Amperes). This feature is available ONLY when CONTROL "A" is set to either the A.C. or D.C. position of Series 920, 922 and 954.

THE LINE ADJUSTMENT CONTROL serves a double purpose:

For tube analyzing, it adjusts the line voltage to arrow head center of the scale plate marked "LINE". When employing the High Megohms Range of Series 920, 922 or 954, this control is also used to adjust the tester power supply.

THE AUTOMATIC PUSH BUTTON SYSTEM consists of 12 push buttons which perform the following functions:

OFF BUTTON:

In depressed position, it shuts instrument "off" and also releases any other buttons 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 performs two 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 mechanical arrangement which allows any required number of the lettered buttons "A" through "J" to 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), provides meter readings for tube quality indications.

LETTERED BUTTONS A-B-C-D-E-F-G-H-J connect to corresponding prong positions of the socket, and operate in conjunction with CONTROLS "A", "E" AND "F", providing FREE-POINT TUBE ANALYSIS.

Button functions are:

- a) BUTTON "A" provides for VISIBLE (NEON LAMP) FILAMENT CONTINUITY TESTS unless otherwise noted on roller tube chart.
- b) Provide for HOT INTER-ELEMENT SHORT AND CATHODE LEAKAGE TESTS.
- c) Provide for proper tube circuit selections for quality indications.

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

OVERHEAD CONNECTOR CAP:

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.

"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" affords visible indication for filament continuity tests and short checking tubes.

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

GENERAL TUBE TESTING INSTRUCTIONS

With "OFF" BUTTON depressed, connect instrument to any 50-60 cycle 110-125 volt A.C. source.

- a) Refer to tube test roller chart for the tube number required and set CONTROLS "A", "B", "C", "D", "E" and "F" to positions designated for that tube.
- b) Lightly press (and then remove finger from) the "double action" "TUBE MERIT" BUTTON to turn instrument "ON". (It will be noted that this button thereby remains in the normal "UP" position.) Then rotate "LINE ADJUSTMENT" knob to bring pointer of meter to arrow-head (center of scale) marked "LINE".

NOTE: In the event that "TUBE MERIT" BUTTON is accidentally fully depressed, then "LINE" indication will not be had. To disengage this button, merely depress the "OFF" button (which will ALWAYS release any previously depressed buttons); "LINE" indication will be had on meter ONLY when CONTROL "A" is at a tube test position 1 through 9.

- c) Insert tube to be tested into its respective socket and allow to heat (connect overhead cap when necessary). Any deviation of the meter pointer from the "LINE" position should be corrected by rotating the "LINE ADJUSTMENT" knob to again bring meter pointer to arrow-head at center of scale.

FILAMENT CONTINUITY, HOT CATHODE LEAKAGE AND INTER-ELEMENT SHORT TESTS.

After settings are made as noted above, then proceed to obtain these tests by simply depressing lettered buttons A-B-C-D-E-F-G-H-J in consecutive order and watch neon lamp SHORT INDICATOR for glow or continuous flicker.

IMPORTANT: NEON LAMP INDICATION SHOULD BE HAD ONLY ON FILAMENT CONTINUITY "A" BUTTON, OR WHATEVER OTHER BUTTON OR BUTTONS MAY BE DESIGNATED ON TUBE CHART FOR FILAMENT CONTINUITY.

Inasmuch as the filament of the tube under test is disengaged when the "FILAMENT CONTINUITY" BUTTON is depressed, it is necessary that this button be immediately returned to normal position (by depressing any other button) and thereby allow tube to remain in a heated condition for further test. Tube under test should be rejected as defective (open filament) if neon lamp fails to glow when the "FILAMENT CONTINUITY" BUTTON is depressed.

DISREGARD ANY MOMENTARY NEON LAMP FLASHES AS BUTTONS ARE DEPRESSED. These flashes are merely the discharge of condenser in short check circuit.

NOTE: When manipulating the lettered push-buttons for obtaining FILAMENT CONTINUITY, CATHODE LEAKAGE and INTER-ELEMENT SHORT TESTS, it is important that the "TUBE MERIT" button be in its normal or "UP" position. This will allow for individual tube element tests and automatic release action on each of the previously depressed buttons, thereby permitting only one button at a time to be in the down position.

A discernible neon lamp glow or continuous flickering, when any one of the other lettered buttons "B" to "J" are depressed, indicates an inter-electrode high resistance leakage or short in the tube under test and it should be rejected without further testing, (unless otherwise noted on the tube test roller chart).

While making these tests, gently tap the tube as each of the lettered buttons is depressed.

AUDIBLE NOISE TEST.

An audible noise test of defective and noisy tubes can be had, if desired, by inserting an earphone or low gain audio amplifier system into the "NOISE TEST" tip jacks. The test procedure is the same as outlined for obtaining CATHODE LEAKAGE and INTER ELECTRODE SHORT TESTS.

An intermittent or constant LOUD audible hum when making CATHODE LEAKAGE and HOT INTER-ELECTRODE SHORT TESTS will indicate loose or shorted tube elements. A LOUD audible hum when "FILAMENT CONTINUITY" BUTTON is depressed, is normal and is indicative of a continuous filament.

DO NOT ATTEMPT TO OBTAIN TUBE QUALITY METER INDICATION UNTIL AFTER SHORT TESTS ARE MADE ELSE SERIOUS DAMAGE MAY RESULT TO INSTRUMENT.

TUBE QUALITY INDICATION.

With all controls set at their respective positions for the tube under test and line adjustment made, first fully depress "TUBE MERIT" button and then depress, one at a time, ONLY THOSE LETTERED PUSH BUTTONS DESIGNATED ON THE TUBE TEST ROLLER CHART for that particular tube. After the buttons called for have been depressed, a tube quality indication on the meter will be obtained when the "READ METER" button is depressed and held down.

In the event that the wrong lettered push-button has been depressed, merely depress the "OFF" button which also functions as a GENERAL RELEASE. This action will disengage and return all buttons up to normal position. This same procedure should be followed after completion of test is made on a tube and it is desired to continue test procedure on another tube (or another section of a tube as noted below).

DIODE TEST INDICATION (NOTE CAREFULLY).

When testing a "DIODE", as noted on the tube chart, DO NOT REFER TO THE ENGLISH READING SCALE. It will be noted that within the red REPLACE sector, there is an arrow line with small letters marked "DIODES". A poor DIODE reading will be indicated if the pointer of meter does NOT reach the line marked "DIODES". A good DIODE reading will be indicated if the needle pointer falls anywhere beyond this line even though the pointer still remains in the REPLACE sector.

SPECIAL ROLLER CHART NOTATIONS.

1. As will be noted on the roller tube chart, certain few tubes are accompanied by notations such as "OK over 1/4 of scale" or "OK over 1/3 of scale". This implies that even though the meter pointer may fall within the red REPLACE sector, the tube is NOT to be rejected unless it falls below the portions of the scale mentioned.

2. VISIBLE EYE TEST. As noted on the tube test roller chart, your instrument provides two visible fluorescent screen (eye) tests aside from the regular triode section test.

- a) Visible indications of the fluorescent screen.
- b) Open and close effect of the shadow section.

PROCEDURE: Upon completion of triode section test, (as noted on tube test roller chart), reset controls for EYE SECTION TEST and depress "TUBE MERIT" button. Depress the first button called for, and a visible luminous screen will be had when "READ METER" button is depressed. Then depress the second button called for, with "READ METER" button still held down, to obtain closing eye effect. DISREGARD METER INDICATIONS ON EYE TESTS.

3. 70A7 and 117N7 RECTIFIER TEST. Because of unusual internal connections, the 70A7 and 117N7 RECTIFIER sections require a special test procedure.

Buttons (A and E) or (A) respectively, as noted on the tube chart, must be depressed simultaneously along with the "READ METER" button. Normal meter indication will be obtained for a few seconds, and will then gradually recede (fade) because the 70A7 and 117N7 filament connections must necessarily be isolated from the test circuit to provide merit indication for the rectifier section. RECTIFIER merit is therefore to be judged only by the initial meter deflection. Buttons (A) or (A and E) must be immediately returned to normal position if it is desired to keep the filaments of the 70A7 or 117N7 in a heated condition.

GAS TYPE RECTIFIERS OZ3 and OZ4.

When testing these types, it will be noted that the meter pointer will remain, for a short interval, in the REPLACE sector and then deflect into the GOOD sector. This condition is normal for a good gas rectifier. However, should the meter pointer remain constantly in the REPLACE sector (after the lapse of several seconds), then the gas rectifier can be termed as defective.

MULTI-SECTION TUBE TESTS

Treat each section as if testing an individual tube for "TUBE QUALITY", by setting controls and lettered push-buttons designed for each section.

GENERAL NOTE: When obtaining a TUBE QUALITY indication, tap the tube under test. At times such tapping may cause a noticeable meter pointer fluctuation. Such fluctuation indicates loose internal element structure.

PILOT LIGHT TESTS.

The miniature base socket in the center of the combination seven prong socket accommodates miniature screw and bayonet base pilot lamps.

- a) Select proper filament voltage with CONTROL "B".
- b) Turn instrument "ON" and adjust for "LINE" before inserting bulb into miniature socket. Also set CONTROL "F" at position number 1 and CONTROL "A" at number 2.

IMPORTANT NOTE: If difficulty is ever experienced when testing tubes with OVERHEAD grid caps, always FIRST check for continuity between flexible grid cap lead and bakelite encased dual cap connector. The flexible wire occasionally breaks at the pointer of entrance to the cap connector.

QUALITATIVE PAPER CONDENSER TESTS:

The CENTER PIN of the "Bantam Junior" socket, located at the upper left hand side of panel, is used in conjunction with either one of the "NOISE TEST" pin jacks to obtain paper condenser tests by the sensitive neon lamp method. The self-contained power supply applies the necessary rectified voltage to the paper condenser.

PROCEDURE:

1. Connect instrument to power source and turn "ON".
2. With CONTROL "A" set to #1 position, rotate "LINE ADJUSTMENT" knob to obtain "LINE" indication on meter.
3. Then fully depress "TUBE MERIT" button and insert test leads into the previously mentioned jacks. Apply free ends across paper condenser to be tested, while observing indications on neon glow lamp.
 - a) A steady glow of the neon lamp indicates a low D.C. resistance or short circuited condenser.
 - b) A flickering neon lamp glow indicates a high resistance leakage condition.
 - c) No indication on neon lamp indicates that the condenser under test is open or the capacity is too small to cause neon lamp to register visibly.
 - d) A good condenser will cause an instantaneous neon lamp flash, the duration of which is dependent upon the capacity being tested. The greater the capacity, the longer the duration and vice versa.

Polarity need not be observed when testing paper condensers.

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BATTERY TESTING INSTRUCTIONS
FOR PRECISION SERIES 912-914-915-920-922-954

ALL SELECTORS MUST ALWAYS BE SET TO THE APPROPRIATE POSITIONS BEFORE MAKING ANY BATTERY TESTS.

- Instrument MUST be "OFF" or else disconnected from the power line.
- Set Selector Switch "A" to position #1.
 " " " " "B" " " " #18.
 " " " " "F" " " " #11.
- Selector "E", in addition to its functions in the tube testing circuit, serves as the combination voltage and load selector for battery testing, and is set to the required position as follows:

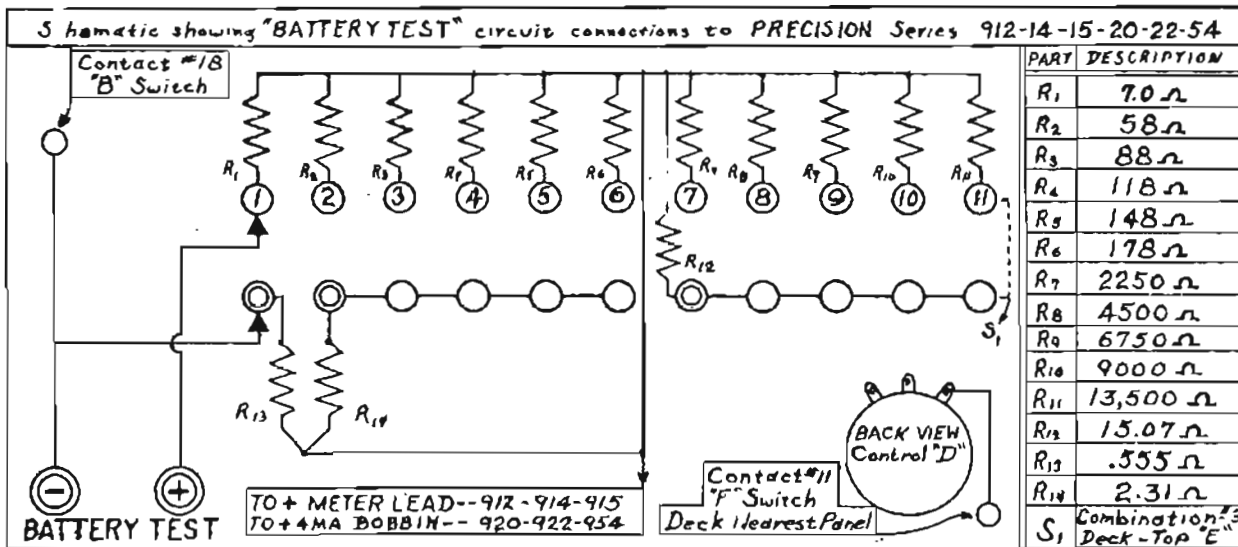
#1 - 1½ volt batteries	#5 - 7½ volt batteries	#9 - 67½ volt batteries
#2 - 3 " "	#6 - 9 " "	#10 - 90 " "
#3 - 4½ " "	#7 - 22½ " "	#11 - 135 " "
#4 - 6 " "	#8 - 45 " "	#12 - Not Used

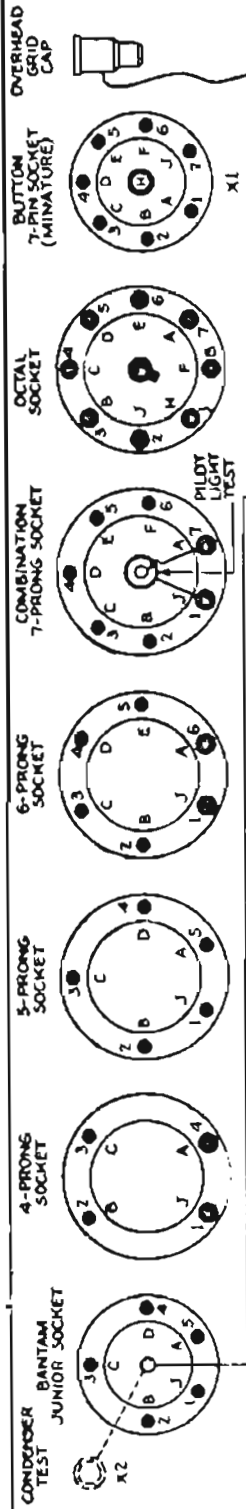
- Insert test leads into (-) and (+) "BATTERY TEST" pin jacks. Apply test prods (in proper polarity) directly across appropriate terminals of battery under test (*). -- Meter will immediately indicate the condition of the battery on the "REPLACE-WEAK-GOOD" scale.

(* CAUTION: IN THE EVENT THAT BATTERY TERMINALS ARE NOT IDENTIFIED AS TO POLARITY OR VOLTAGE, ALWAYS FIRST REFER TO RECEIVER OR BATTERY MANUFACTURER'S DATA SHEETS FOR THE NECESSARY INFORMATION BEFORE TESTING, TO AVOID THE POSSIBILITY OF OVERLOADING AND DAMAGING METER.

Batteries reading in the RED "REPLACE" sector should immediately and unquestionably be replaced.

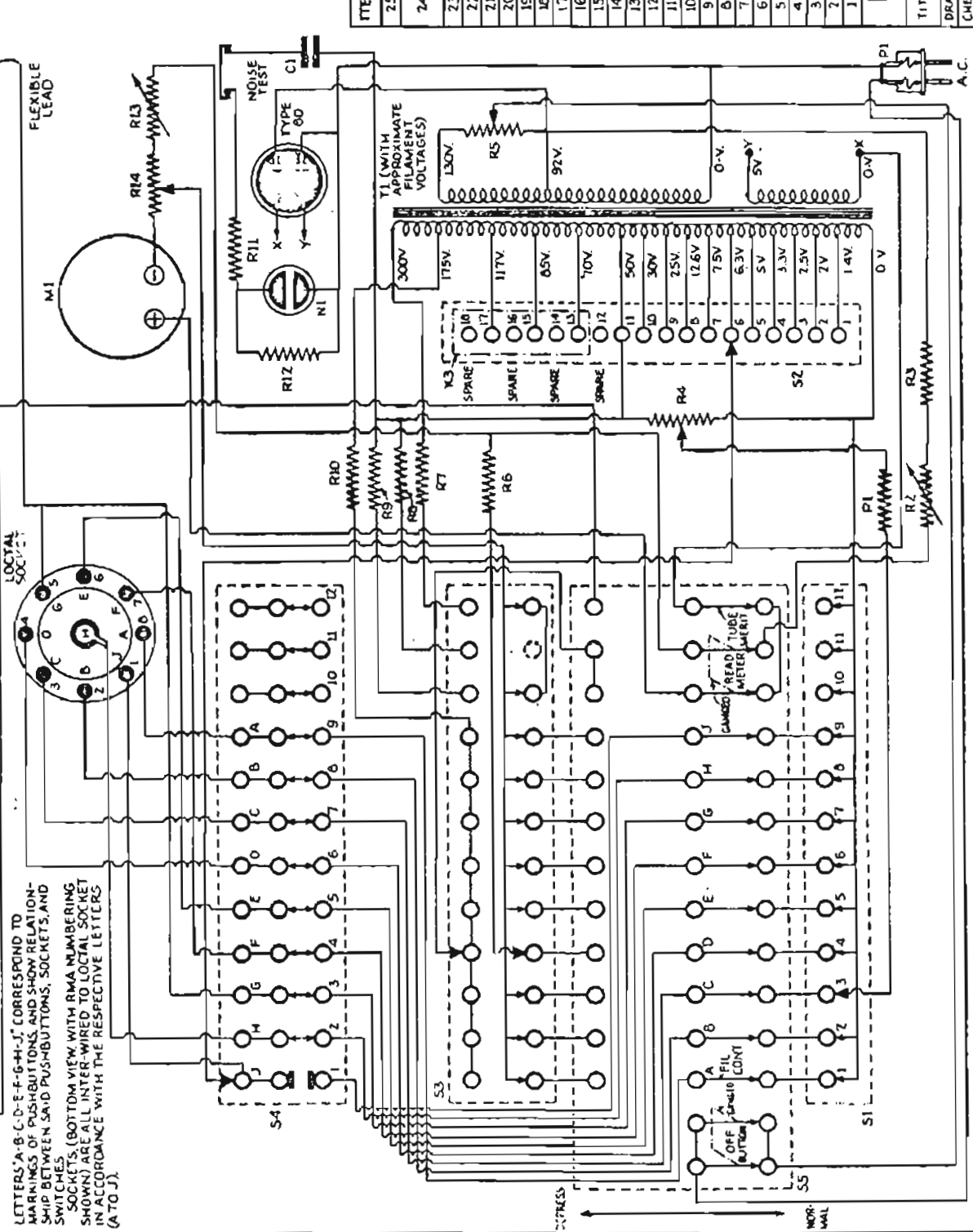
Batteries reading in the YELLOW "WEAK" sector, although normally still capable of use for a short period of time, should also be replaced. "WEAK" batteries are known causes of slow "fade-outs", drift and other receiver instabilities.





LETTERS 'A'-'B'-'C'-'E'-'F'-'G'-'H'-'J' CORRESPOND TO MARKINGS OF PUSHBUTTONS, AND SHOW RELATIONSHIP BETWEEN SAID PUSHBUTTONS, SOCKETS, AND SWITCHES. (BOTTOM VIEW WITH RMA NUMBERING SHOWN) ARE ALL INTERWIRED TO LOCAL SOCKET IN ACCORDANCE WITH THE RESPECTIVE LETTERS (A TO J).

- X1 - MINIATURE BUTTON 7-PIN SOCKET, INCLUDED IN ALL SERIAL NUMBERS ABOVE THE FOLLOWING: SERIES 910 - SERIAL NO. 9749; SERIES 912 - SERIAL NO. 5372; SERIES 914 - NONE; SERIES 915 - SERIAL NO. 1171
- X2 - CONDENSER TEST PIN JACK, INCLUDED IN MODELS BEARING SERIAL NUMBERS BELOW THE FOLLOWING: SERIES 910 - SERIAL NO. 9749; SERIES 912 - SERIAL NO. 5372; SERIES 914 - NONE; SERIES 915 - SERIAL NO. 1171
- ALL INSTRUMENTS BEARING THESE SERIAL NUMBERS AND ABOVE USE THE CENTER CONTACT OF THE BANTAM JUNIOR SOCKET FOR CONDENSER TEST.
- X3 - 10 POSITION FILAMENT VOLTAGE SELECTOR SWITCH FOR FILAMENT VOLTAGES ABOVE 50 VOLTS, INCLUDED IN ALL INSTRUMENTS BEARING SERIAL NUMBERS ABOVE THE FOLLOWING: SERIES 910 - SERIAL NO. 9060; SERIES 912 - SERIAL NO. 5024; SERIES 914 - ALL; SERIES 915 - ALL



ITEM NO.	PART NO.	SPECIFICATION
25	S5	PUSHBUTTON ASSEMBLY
24	S4	FILAMENT POSITION SELECTOR OPEN CIRCUITING TYPE ROTARY SWITCH
23	S3	SELECTOR SWITCH 'E'
22	S2	FILAMENT VOLTAGE SELECTOR 'B'
21	S1	SELECTOR SWITCH 'A'
20	R14	300Ω CONTROL 'D'
19	R13	40Ω SEALED (CALIBRATED)
18	R12	500MΩ
17	R11	35MΩ
16	R10	2MΩ
15	R9	5MΩ
14	R8	300Ω
13	R7	3MΩ
12	R6	40MΩ
11	R5	300Ω LINE CONTROL
10	R4	1MΩ CONTROL 'C'
9	R3	15MΩ
8	R2	17MΩ SEALED (CALIBRATED)
7	R1	500Ω
6	T1	POWER TRANSFORMER
5	P1	DOUBLY-FUSED LINE PLUG
4	M1	4MA, 160MV METER
3	C1	0.1 MFD. 300V
2	N1	0-10 NEON LAMP
1	J1	CLOSED CIRCUIT NOISE TEST JACK

PRECISION APPARATUS CO. INC.
 GLENDALE, LL. N.Y.
 TITLE - SCHEMATIC FOR SERIES 910-912-914-915
 DRAWN BY - P.J.M.-A-1 DATE 1/13/40
 CHECKED BY - J.M.S. DATE 1/17/40