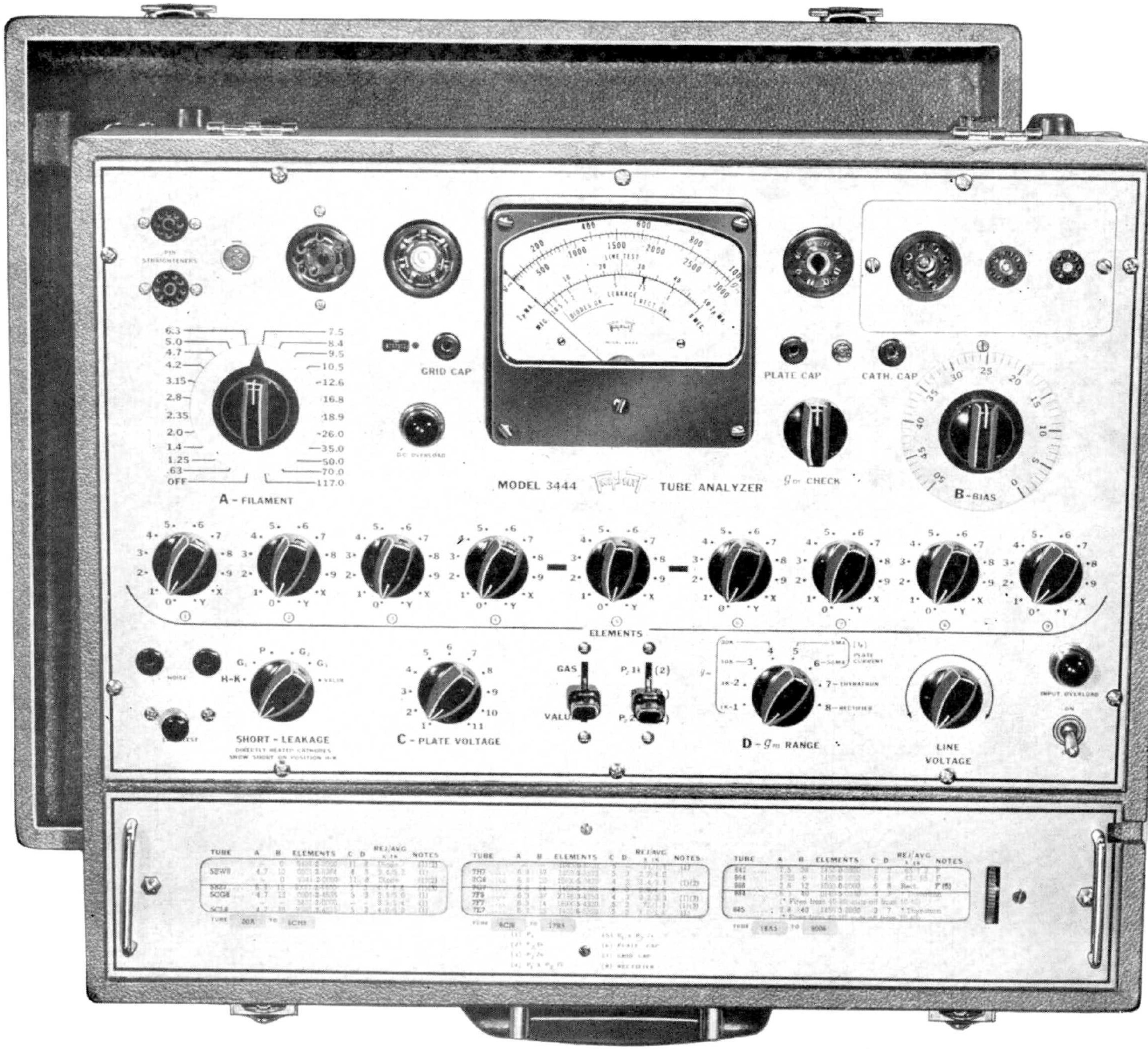
TRIPLETT

INSTRUCTION MANUAL
MODEL 3444
TUBE ANALYZER

PRICE $ 1.00


MODEL 3444
TUBE ANALYZER
A - FILAMENT
GRID CAP
PLATE CAP
CATH. CAP
B-BIAS
ELEMENTS
SHORT - LEAKAGE
C - PLATE VOLTAGE
GAS
LINE
VOLTAGE

Model 3444

TECHNICAL DATA

MODEL 3444

Gm SIGNAL POTENTIALS AND RANGES

Four direct reading Gm ranges

1. 1,000 micromhos
2. 3,000 micromhos
3. 10,000 micromhos
4. 30,000 micromhos

Four signal potentials @ 5 kc

1. 1000 millivolts
2. 333 millivolts
3. 100 millivolts
4. 33 millivolts

SHORT TEST

Filtered DC, 85 Volts. In accordance with EIA G-8 Committee recommendations.

LEAKAGE

0 to 10 megohms at 85 volts (measurements made directly on the meter.)

PLATE POTENTIALS AND CURRENT RANGES

Four DC plate potentials.

12 volts
30 volts
100 volts
250 volts

Two DC plate current ranges (can be used for plate current cut-off measurements and grid current readings to determine cut-off point of tube.)

5 ma } full scale
50 ma }

BIAS

Two DC bias ranges (on 50 division dial so that actual bias voltages can be read directly.)

0 to 5 volts
0 to 50 volts

SCREEN POTENTIALS

Five DC screen potentials

12 volts
30 volts
45 volts
100 volts
250 volts

FILAMENT VOLTAGES

Twenty-three AC voltages, closely regulated:
.63, 1.25, 1.4, 2.0, 2.35, 2.8, 3.15, 4.2, 4.7, 5.0, 6.3, 7.5, 8.4, 9.5, 10.5, 12.6, 16.8, 18.9, 26.0, 35.0, 50.0, 70.0, 117.0.

Gm CIRCUIT CHECK

Self checking Gm circuit with 5 kc signal source and vacuum tube microammeter.

GRID CURRENT

Grid current test under operating conditions.

PLATE CUT-OFF

Cut-off measurement on voltage amplifiers.

RECTIFIER TEST

Test for rectifiers is made under load.

DUAL PURPOSE TUBES

Single element switching set up for dual purpose tubes.

THYRATRON TEST

Firing voltage, grid current and cut-off measurements in thyratrons.

VACUUM TUBE MICROAMMETER

Sensitivity 33 mv full scale.
Current degenerated and highly stable.

SIGNAL OSCILLATOR

Output 1.5 volts, 5000 cps.
Hartley oscillator circuit.

METER

Rugged 200 microammeter, illuminated, with 4" scale length and knife edge pointer.

NOISE TEST

Noise test jacks for checking noisy or intermittent tubes.

TUBE CHART

Roll chart illuminated and removable.

SOCKETS

Combination 4-5-6 prong; combination 7 prong; octal; loctal; 7 pin subminiature; 8 pin subminiature (round); 7 pin miniature; 9 pin miniature; nuvistor on serial number above 3,000; Octal, 7 pin miniature, 9 pin miniature are socket-savers for easy replacement from the panel.

NOTE—The red dot on the panel next to the 7 pin subminiature socket indicates pin No. 1. This usually is indicated on the subminiature tube with a red dot.

PIN STRAIGHTENER DIES

7 pin and 9 pin straightener dies on panel.

CASE

Wood, gray leatherette covered, 15-3/16" x 18-13/16" x 7¾".

OVERLOADS—DC AND INPUT

Red bulb lights with excessive overload.

FUSE

3 amp, 250 volt, type 3AG in roll chart compartment.

WEIGHT

24 pounds.

POWER

117 AC volts, 50-60 cps.

ACCESSORIES

One black grid cap or cathode cap lead, one red plate cap lead.

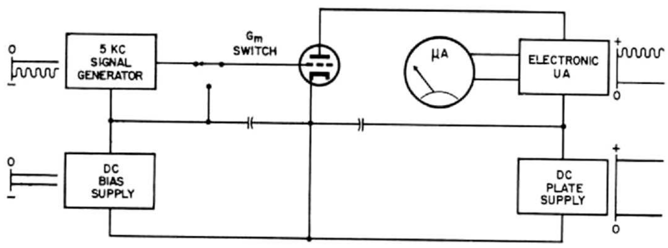
THEORY OF OPERATION

This Tube-Analyzer has been designed to provide a portable vacuum tube measuring device that will test and measure tubes under applied potentials and signal amplitudes similar or identical to those in standard laboratory Gm testers or the General Radio Bridge. Full wave filtered dc plate and screen potentials are selected from divider circuits in steps to fit the book values for these potentials listed by the tube manufacturers. The bias control is calibrated in volts, two ranges, zero to 5 and zero to 50. Plate current ranges of 5 and 50 milliamperes are available, and mutual conductance is measured in a self checking circuit on 4 independent ranges.

MUTUAL CONDUCTANCE CIRCUIT

Steady state (non pulsating) dc voltages are applied to all elements of amplifier tubes except the heater. These potentials are selected to fit published book values for each tube under test, within the potential limits of 250 volts for plate and screen, and 50 volts for control grid. Heater voltage is available in 23 steps from .63 to 117 volts from a tapped transformer. The source of the grid signal is a 5000 cycle sine wave oscillator. This operates in conjunction with a vacuum tube microammeter to read micromhos. Both the oscillator and electronic microammeter receive power from the main transformer. Solid state rectifiers are used in all circuits for long life and best regulation. All circuits are adequately by-passed for minimum circuit impedance at 5 kilocycles.

BASIC Gm TEST CIRCUIT



BASIC G_m MEASUREMENT

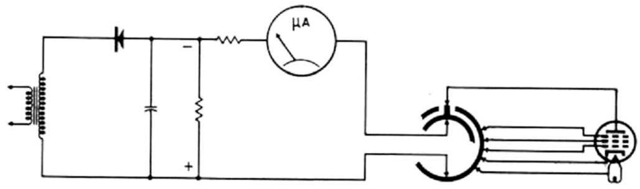
Fig. 1

When the Gm test switch is closed, the 5000-cycle signal is applied to the control grid of the tube under test, and this produces a 5 kc plate current component in the plate circuit. Before this component is measured, it must be separated from the DC plate current and 120 cycle supply ripple. This is done by means of a band-pass amplifier whereby only the 5 kc current reaches the meter. This current is in microamperes per volt of input signal and is therefore micromhos of transconductance at the applied set of plate, screen and grid potentials. As shown in the diagram the vacuum tube microammeter may also be switched into the signal circuit to measure the signal current flowing thru a precision resistance divider. It may be shown mathematically that by cross checking the output current against this input current a very high order of Gm accuracy can be obtained.

LEAKAGE TEST CIRCUIT

The leakage test circuit is controlled by a SHORT-LEAKAGE SWITCH, which in its five designated positions disconnects all of the tube elements from the other testing circuits and connects them into the leakage testing circuit (see Fig. 2). In each designated position a specific tube element is isolated and connected into a series circuit consisting of the isolated element, an 85 VDC source, a current limiting resistor, a microammeter and the other elements of the tube. The meter deflection in each position is determined by the insulation resistance existing between the isolated element and the other elements of the tube. Since this deflection is inversely proportional to the leakage resistance, a full-scale deflection indicates a low resistance short. The LEAKAGE scale of the meter is calibrated for a resistance range of zero to 10 megohms.

SHORT TEST CIRCUIT



SHORT TEST CIRCUIT

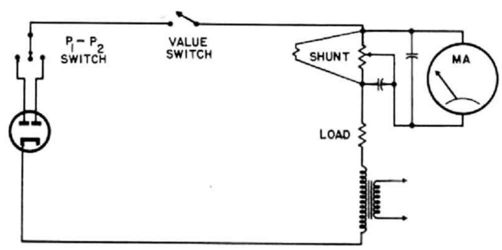
Fig. 2

Using the meter to measure insulation resistance provides a more accurate indication of tube condition, and is particularly useful for selecting tubes that have a high heater-cathode leakage resistance for critical applications. Tubes that have a heater-cathode leakage resistance of less than 250,000 ohms may still function satisfactorily in many circuits. However, leakage resistances as high as several megohms, not detected by the conventional neon bulb short test circuit, may prevent a tube from functioning properly in some applications.

CATHODE EMISSION TEST CIRCUIT

The useful life of a diode or rectifier type tube ends when its ability to emit electrons falls below some level, the exact value of which may differ for each type. In Fig. 3 a DC milliammeter is connected in series with the plate of the tube under test. The meter is protected by a shunt resistor and the tube is protected by a load resistor.

BASIC EMISSION CIRCUIT



BASIC EMISSION CIRCUIT

Fig. 3

With the D-Gm RANGE switch in the RECTIFIER position, the quantity of electrons reaching the plate from the cathode is measured by the milliammeter in the plate circuit. Since rectifier and diode type tubes are rated in terms of emissive capacity, the loss of this capacity will be noted by failure of the meter pointer to reach the lo-limit value.

PLATE CURRENT MEASUREMENT

Plate current is measured on either one of two ranges as shown in Fig. 4. The meter reads, directly in DC milliamperes, the plate current drawn by the tube at the grid voltage shown on the B-BIAS dial and the plate and screen voltages listed for the various positions of the C-PLATE VOLTAGE switch.

PLATE CURRENT MEASUREMENT

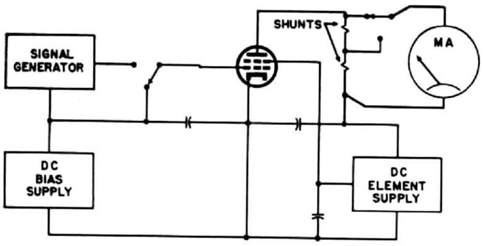


PLATE CURRENT MEASUREMENT

Fig. 4

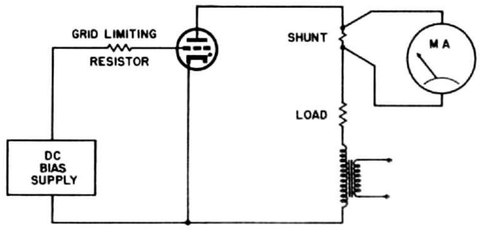
CUT OFF CHARACTERISTIC

On many tubes it is important to know the DC grid voltage required to "cut-off" or cause the plate current to be reduced to zero. This value can be determined, using the Plate Current circuit, by rotating the B-BIAS or bias control in a negatively increasing direction until the meter just reaches the zero line. The approximate cut-off bias may then be read in volts from the B-BIAS dial. This is a particularly important measurement on dual triodes where balanced cut-off as well as normal characteristics are required, such as in computer flip-flop circuits, integrator and memory circuits.

THYRATRON TEST CIRCUIT

In Fig. 5 a DC milliammeter is connected in series with the anode of the tube under test. AC voltage is applied to the plate of the tube by the element transformer, and the heater is energized by the filament transformer. When the DC bias is increased in a negative sense, a point will be reached where the tube will no longer conduct. This point is referred to as cut-off, and is indicated on the meter by a sudden deflection to zero. In operation, the B-BIAS control, is gradually increased between the limits specified in the REJ/AVG column of the tube data chart.

THYRATRON TEST CIRCUIT



THYRATRON TEST CIRCUIT

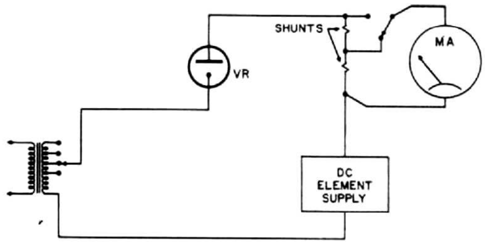
Fig. 5

Any thyratron which fails to cut-off within these limits does not have normal characteristics.

VOLTAGE REGULATOR TEST CIRCUIT

Voltage regulators are checked with a DC potential applied to the anode and a super-imposed AC potential. The peak voltage is increased in steps until the minimum firing or ionizing voltage specified by the tube manufacturer is exceeded. The tube should fire or start to regulate within the limits specified in the roll chart if it is operating correctly. (See Fig. 6)

VOLTAGE REGULATOR TEST CIRCUIT



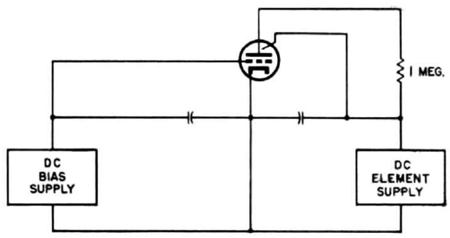
VR TUBE MEASUREMENT

Fig. 6

CATHODE RAY TUNING INDICATOR TEST CIRCUIT

Fig. 7 shows the basic tuning indicator circuit. The 1 meg resistor is used to drop the plate voltage so that the voltage directly at the plate will vary widely with grid bias and thus control the target shadow. The bias is then varied to control the shadow as noted on the roll chart.

CATHODE RAY TUNING INDICATOR TEST CIRCUIT



TUNING INDICATOR (eye tube) TEST CIRCUIT

Fig. 7

INSTALLATION AND INITIAL ADJUSTMENT

The Model 3444 as received from the factory is ready for immediate use. Place the Tube-Analyzer on a solid bench or table within 6 feet of a 105-127 volt 50-60 cycle outlet.

Open the cover, take the line cord out of the accessory compartment and plug it into the AC line.

Set LINE VOLTAGE to its maximum counterclockwise position.

Snap the ON-OFF switch to the ON position.

Set the SHORT-LEAKAGE switch to the VALUE position.

Press the LINE TEST switch and check to see that the instrument pointer can be set to the LINE TEST position by adjusting the LINE VOLTAGE control. The Tube Analyzer is now ready for operation.

To the right of the meter and below the PLATE CAP jack is located the Gm CHECK control. This is a combination push button and variable potentiometer to check accurately the signal voltage and the vacuum tube microammeter. The Gm check is to be adjusted BEFORE inserting the tube under test into a socket, and does not need to be repeated except as an occasional check. This provides a method of balancing the 5 kc input signal and the output micromho circuit through this amplifier under varied environmental conditions, and thus eliminating errors caused by the same. This check is made by first rotating and slightly pushing the Gm CHECK control until it engages in the slot of the potentiometer, then with the Tube-Analyzer "ON" and the VALUE switch depressed, (the D-Gm RANGE switch must be on one of the Gm ranges, position 1, 2, 3 or 4 and the SHORT-LEAKAGE switch in the VALUE position), the control should be pushed and turned, in one operation, until the meter reads full scale. This check need only be made at periodic intervals and **must not** be made unless the LINE TEST is **exactly** on.

Looking at the panel view of the Tube-Analyzer note that the sockets are grouped to the left and right of the illuminated meter along the upper edge of the panel assembly. Reading from left to right these include: 7 and 9 pin straighteners; a combination 4-5-6 prong socket; a 7 prong socket and a subminiature 7 pin socket, all to the left of the meter. Continuing to the right of the meter are mounted: a loctal; an octal, 9 pin and 7 pin miniature sockets with socket savers; and, below the loctal an 8 pin subminiature socket.

To the left and right of the meter, the GRID CAP, CATH. CAP and PLATE CAP jacks for top cap connection leads are located. These are used with the red and black leads found in the accessory compartment. Where it is necessary to test tubes having top cap connectors, one or both of these leads may be used. When not in use, these leads should be kept in the accessory compartment to avoid damage and to keep them out of the way of the various controls. Between the A-FILAMENT switch and the meter, an OVERLOAD warning light will flash when excessive anode or screen current is drawn from the power transformer. When this lamp glows at any time, the Tube-Analyzer should be turned off. All controls should then be carefully checked, and if no errors are found, the tube should be examined carefully for an intermittent short.

THE CONTROLS

The A-FILAMENT switch is mounted to the left of the meter, and is clearly marked on the panel. In the tube data chart, under the column marked A, the correct setting is shown for each type of tube. Failure to make this adjustment correctly may result in burning out the filament of the tube under test.

To the right of the meter is mounted the control for the grid bias, B-BIAS. When testing amplifier tubes this control should be set for the correct bias condition specified on the tube data roll chart under the column marked B. This control is calibrated directly in volts, either 5 volts full scale or 50 volts full scale dependent upon the position of the C-PLATE VOLTAGE switch.

The nine ELEMENT switches located below the meter are used to connect the tube base pins to the tube testing circuit. To set these switches correctly, consult the tube data roll chart under the column marked ELEMENTS. For example, numbers 0351-**2**-5004 will appear on the tube data chart for the tube type 6S4. Working from left to right rotate the switches, setting the first four switches, the middle or No. 5 switch and then the last four switches.

In the next row reading from left to right, the first rotary switch is the SHORT-LEAKAGE switch, which when in the short test positions, disconnects all of the tube electrodes from the other tube testing circuits, and connects them into the leakage test circuit. By slightly tapping the tube under test at each of the five positions on this switch, leakage between the tube elements will be indicated by a deflection of the meter. If a filament type tube or a tube with internal heater-cathode connection is being tested, the meter should read full scale when the switch is in the H-K position. This is noted on the panel under the SHORT-LEAKAGE switch—"Directly Heated Cathodes Show Short on Position H-K".

Switch Position	**Leakage between**
H-K	Heater to Cathode
G_1	Control Grid and other tube elements
P	Plate and other tube elements
G_2	Screen Grid and other tube elements
G_3	Suppressor Grid and other tube elements
VALUE	Used for all other tests

The C-PLATE VOLTAGE switch selects the plate and screen voltages for the tube under test, and also controls the range of the B-Bias control. Potentials ranging from 250 volts DC to 12 Volts DC are available for amplifier tubes while AC voltages from approximately 300 volts to 15 volts are available for rectifier and diode types.

C-Plate Voltage Position	**DCV Plate**	**DCV Screen**	**Bias Range (DCV)**
1	250	250	0-5
2	250	250	0-50
3	250	100	0-50
4	250	100	0-5
5	100	100	0-5
6	100	100	0-50
7	100	45	0-50
8	100	45	0-5
9	30	30	0-5
10	30	12	0-5
11	12	12	0-5

The D-Gm RANGE switch has several functions. On positions 1-4 it selects full scale mutual conductance ranges from 1,000 through 30,000 micromhos. On amplifier types this switch must always be indexed to one of these ranges for a transconductance measurement. On the next two positions, No. 5 and No. 6, this switch provides full scale DC plate current, (Ip) readings of 5 and 50 milliamperes full scale respectively. These ranges are used for studying the plate current, grid current and cut-off characteristics of amplifier types. The seventh position is used for Thyratrons where a DC bias is applied to the control grid and an AC plate or anode potential used. Cut-off and control characteristics of these tubes are measured in this position. The eighth position is used for emission tests on rectifiers and diodes.

The LINE VOLTAGE control is located in the lower right corner next to the ON-OFF switch. The SHORT-LEAKAGE switch must be in the VALUE position, then the LINE TEST button is depressed and LINE VOLTAGE control can be adjusted to LINE TEST mark on the scale.

STEP BY STEP OPERATING INSTRUCTIONS

TESTING AMPLIFIER TUBES

1. Set the LINE VOLTAGE control to the minimum voltage (extreme counter-clockwise position).

2. Plug the LINE CORD into a 105-127 volt, 50-60 cycle supply.

3. Set the SHORT-LEAKAGE switch to its VALUE position.

4. Locate the tube type number on the tube roll chart, and set the A-FILAMENT switch as specified in the A column.

5. Set the grid bias control B-BIAS as specified in the B column of the tube chart.

6. Set the nine ELEMENTS to their correct positions as specified in the ELEMENTS column of the tube roll chart.

7. Apply power by snapping the ON-OFF toggle switch to the ON position and allow to warm up.

8. Plug the tube to be tested into the proper socket.

9. Rotate the C-PLATE VOLTAGE switch to the position specified in the C column of the tube roll chart.

10. Set the D-Gm RANGE switch to the position specified in the D column of the tube roll chart.

11. Press the LINE-TEST switch and turn the LINE VOLTAGE knob to set the instrument pointer exactly over the red LINE-TEST mark on the scale.

12. Check for a leakage indication with the SHORT-LEAKAGE switch in the H-K position. If a filament type tube is being tested, the meter will indicate approximately full scale deflection when the switch is in this position (no indication indicates open filament). Tap the tube lightly and observe momentary or sustained meter deflection changes.

13. Rotate the SHORT-LEAKAGE switch through the five leakage positions. While the switch is in each of these positions, tap the tube lightly and note any momentary or sustained meter deflection changes. On the H-K position the heater is isolated from the cathode, and all cathode to heater leakage resistance or intermittent shorts are measured in this position. On the G_1 position the Control Grid is isolated; on the P position the Plate is isolated; on the G_2 position the Screen Grid is isolated; and on the G_3 position the Suppressor Grid is isolated. If a multi-section tube is being checked, this procedure must be repeated for each section of the tube. Refer to the NOTES column on the roll chart. This will usually indicate P_1 and P_2 showing that the tube has two sections or two plates to be tested. Hold the P_1-P_2 switch in the $P_2$2k or $P_2$1k position as also indicated in the NOTES column and repeat the short test procedure checking positions H-K thru G_3 on the leakage switch for second section shorts. Release the P_1-P_2 switch. The abbreviations for the roll chart notes are:

Note	Description or use	Note	Description or use
(1)	P_1	(5)	P_1 & $P_2$2k
(2)	$P_2$1k (one cathode)	(6)	Plate Cap
(3)	$P_2$2k (two cathodes)	(7)	Grid Cap
(4)	P_1 & $P_2$1k (one cathode)	(8)	Rectifier

F Filament type tube (will show short on H-K position)

For convenience (1) P_1, (2) $P_2$1k and (3) $P_2$2k are marked on the panel so that no reference to notes (1), (2), (3), 4) or (5) on the roll chart panel need be made.

14. Set the SHORT-LEAKAGE switch to the VALUE position.

15. Pull the VALUE lever switch to the VALUE position. Read the mutual conductance of the tube on the range corresponding to the position of the D-Gm RANGE switch. On position 1 the meter reads directly in micromhos on the top or 1000 arc. On position 2 of this switch, the meter reads directly on the 2nd., or 3000 arc. On position 3, use the top, or 1000 arc, and add a zero, or multiply by ten for 10,000 micromhos full scale. On the 4th switch position, use the 2nd., or 3000 arc, and add a zero, or multiply by ten for 30,000 micromhos full scale. Compare the reading with the figure listed in the roll chart or instruction book in the column headed REJ/AVG. The first figure X 1000 is the customary reject value in micromhos based on 65% of the average or published value for new voltage amplifiers and general purpose types, and about 50% of the average or "bogie" value for power amplifier and converter types. The second figure is the average or "bogie" value for that type tube.

EXAMPLE:

Tube	A	B	Elements	C	D	REJ/AVG X 1K	Notes
6L6	6.3	18	0146-**5**-0230	2	3	2.4/4.7	

The reject value for a 6L6 is 2400 micromhos and the "bogie" value is 4700 micromhos.

16. If the tube has two plates, is a dual triode or has two sections more or less similar, the P_1 & P_2 notation will appear in the NOTES column. Refer to step number 13 where the short testing procedure is given for double section tubes, and be sure this procedure is followed before continuing with the Mutual Conductance

measurement of the second section. If the tube has two separate cathodes such as is usually encountered in dual triodes, pull the P_1-P_2 lever switch to the $P_2$2k or (3) position and also pull the VALUE switch. The instrument will then read the Gm of the second section. Where the two sections or plates of the tube share a common cathode, as shown in the NOTES column of the roll chart, use the $P_2$1k position.

17. Tubes with unlike sections such as triode-heptodes, triode-pentodes and multi-diode-triodes are handled in one of two ways. Where it is practical, one setting of the ELEMENT switches programs the testing procedure for both sections. Here, different settings of B, C and/or D switches may be required for each section. Test the first section just as a single tube would be handled. Then make the settings for the B, C and/or D controls as required on the roll chart for the second position. Move the P_1-P_2 switch to the required P_2 position as set up on the roll chart and pull the VALUE lever switch to read the meter. Release the VALUE switch first and then the P_2 switch.

EXAMPLE:

Tube	A	B	Elements	C	D	Notes REJ/AVG X 1K
6T8	6.3	29	0981-**2**-0354	1	2	.79/1.2 (1)
	–	0	— — —	11	8	Diode (3)
	–	–	4001-**2**-9300	–	–	Diode (1)(2)

Where dashes (–) appear in the roll chart, the same setting of the controls is made as is in the preceding test. The first test is made as in steps (1)-(15). The second test is made by changing B-BIAS, C-PLATE VOLTAGE and D-Gm RANGE switches **only** as noted, then note (3) on roll chart indicates to use P_1-P_2 lever in $P_2$2k or (3) position while holding the VALUE lever in the VALUE position and read the meter for good DIODE indication (should read above DIODE OK point on the scale.) The same procedure applies for the third test i. e. change ELEMENT switches **only** as noted on the chart leaving A, B, C, and D controls the same as the preceding (second) test, then note (1)(2) on roll chart indicates to use both P_1 and $P_2$1k so that two tests are made with one setting, both tests should indicate above DIODE OK point on the scale (the note DIODE under REJ/AVG column refers to this scale).

18. Some tubes with unlike sections may require two settings of the ELEMENT switches. In such cases each section should be treated as a separate tube. Make the first test as in steps (1)-(17). Make the new settings of the ELEMENT switches and then proceed with the second test as in steps (1)-(17).

GAS TEST

1. Where Gas or Grid Current readings are of interest, this test may follow the Mutual Conductance reading. This test applies to power amplifier, general purpose and long cut-off types and is not practical in many instances for hi-mu triodes, sharp cut-off pentodes and other types that normally operate in or close to the grid current region.

2. Switch the D-Gm RANGE control to position 6 with all other controls and switches remaining in the position listed on the chart for Gm readings.

3. Pull the VALUE switch and note the reading on the 3rd., arc from the top. This reads directly in milliamperes, zero to fifty ma. If the tube draws less than 5 ma., switch to position 5, but always try the 50 ma. range first to avoid any overload of the meter.

4. Check the plate current reading in ma., and then shift the VALUE switch to the GAS position and again note the reading. The difference in milliamperes is caused by gas or grid current flowing thru a one half megohm resistor introduced in the grid circuit. Grid or Gas Current varies widely for different tube designs, but on power amplifiers 2 microamperes is often permissable. This is equivalent to 1 volt change in grid bias when the VALUE switch is shifted to the GAS position, caused by 2 microamperes multiplied by one-half megohm. For a tube in the 2000 Gm region this would be about 2 ma. change in plate current for 2 microamperes of grid current; for a tube in the 5000 Gm region the change in plate current would be about 5 ma. for 2 microamperes of grid current.

5. The exact grid current can be determined by noting the grid current change as described above, returning the VALUE switch to the VALUE position, and by careful rotation of the B-BIAS control, find out how many volts of bias change cause the same change in plate current. Since the B-BIAS control reads directly in volts, either 0-50 or 0-5 volts, this bias change can be read directly. Multiply the figure in volts by 2 to determine exact grid current. There is no signal applied to the tube on positions 5 thru 8 of switch D, so this Gas or Grid Current is the **true value** taken under **operating conditions.**

6. To determine the bias range of the B control, note the position to which the C switch is indexed, and refer to the following table or the one on page 6.

C-PLATE-VOLTAGE Switch Position	0-5 DCV Bias	0-50 DCV Bias
1	X	
2		X
3		X
4	X	
5	X	
6		X
7		X
8	X	
9	X	
10	X	
11	X	

CUT OFF CHARACTERISTIC

1. On many applications of vacuum tubes, it is desirable to know the grid voltage necessary to reduce the plate current to zero, or "cut-off" the tube. This measurement can easily be made on the Ip or plate current positions of the D-Gm RANGE switch.

2. Use the roll chart settings for mutual conductance.

3. Switch D-Gm RANGE to position 6.

4. Pull the VALUE switch. The meter will read plate current on the 50 ma. range.

5. Rotate the B-BIAS control to increasing or higher bias voltage. The meter will indicate lower and lower plate current. Continue until the pointer just reaches zero.

6. Read the B-BIAS dial. Refer to the table above noting the C-PLATE VOLTAGE switch position and Bias range. This dial reads 0-5 or 0-50 approximate volts Bias

depending on the position of the C-PLATE VOLTAGE switch. Read the cut-off bias in volts.

7. On dual triodes, this test is particularly important to determine balanced cut-off. Return B-BIAS control to its original position. Pull both VALUE and P_1-P_2 switches with left hand.

8. Rotate B-BIAS with right hand to read cut-off on second section.

TESTING RECTIFIER AND DIODE TYPES

1. All rectifiers and diodes are checked with the D-Gm RANGE switch in position 8 marked RECTIFIER.

2. In this position, the B-BIAS control is changed to a meter sensitivity or variable shunt to provide means for reading emission current over a wide range. It must be set correctly for each tube type.

3. Rotate the nine ELEMENT switches to the correct positions.

4. Set A-FILAMENT and B-BIAS controls.

5. Plug tube in the correct socket.

6. Set C-PLATE VOLTAGE and D-Gm RANGE controls.

7. Set SHORT-LEAKAGE switch to VALUE position.

8. Press LINE-TEST button and adjust LINE VOLTAGE.

9. Check for shorts and leakage.

10. Pull VALUE lever switch and read condition of Rectifier or Diode compared to the DIODE OK or RECT. OK arrows on the meter scale.

11. Repeat for dual tubes using the correct position of the P_1-P_2 switch.

TESTING THYRATRONS

1. All thyratron tubes are tested with the D-Gm RANGE switch in position 7 marked THYRATRON. Here DC bias is applied to the control electrode, and AC potential at the power line frequency is applied thru a current limiting resistor to the anode. The most important measurements on thyratrons are control grid firing voltage, cut-off or extinction voltage and grid current.

2. Set A-FILAMENT and B-BIAS controls.

3. Index the nine ELEMENT switches.

4. Plug tube in correct socket.

5. Set C-PLATE VOLTAGE and D-Gm RANGE controls.

6. Set SHORT-LEAKAGE switch to VALUE position.

7. Press LINE TEST button and adjust LINE VOLTAGE.

8. Check for shorts and leakage.

9. Pull VALUE lever switch and hold.

10. Slowly rotate the B-BIAS dial to reduce the control grid bias until the instrument pointer suddenly deflects up-scale. Note the reading on the bias dial.

11. From this position still holding the VALUE switch, rotate the bias dial to increase the bias or negative control electrode voltage, and note the cut-off or extinction potential where the instrument pointer deflects to zero. The difference between these two bias dial readings is the firing range and should be within the limits shown in the chart. These readings may be converted to volts by refering to paragraph 6 under GAS TEST on page 8.

EXAMPLE:

Tube	A	B	Elements	C	D	REJ/AVG	Notes
2D21 ...	6.3	40	5312-**7**-4700	1	7		* Thyratron

(* Fires from 40-5, cuts off from 5-40)

Set up as indicated and while holding the VALUE switch down the tube should fire when rotating the B-BIAS control from 40 to 5 and should cut-off when B-BIAS is rotated from 5 to 40.

12. The tube may also be tested for grid current by repeating step 10. Note the exact value by checking the firing voltage two or three times.

13. Cut-off the tube.

14. Shift the VALUE switch to the GAS position.

15. Slowly check the firing voltage. For most thyratrons, the low or 5 volt bias range is used on the B dial. Also the grid current limit usually published is not over 2 microamperes. This would be equivalent to 2 ua X .5 megohm or 1 volt. This is 10 dvisions on the B-BIAS dial on the 5 volt range. Therefore if the tube has less than 2 ua grid current, the firing reading of the B-BIAS dial in the GAS position should not differ more than 10 divisions from the firing reading in the VALUE position.

16. The anode current reading or magnitude of meter deflection should be over 30 on the Ip arc or above the Rectifier rejection limit.

TESTING VOLTAGE REGULATOR (VR) TUBES

1. Set the A-FILAMENT and B-BIAS controls.

2. Set the ELEMENT switches.

3. Set the C-PLATE VOLTAGE and D-Gm RANGE switches.

4. Plug the tube into the correct socket.

5. Rotate the A-FILAMENT switch to the position as noted on chart. Tube should fire when switch is at this position.

6. Read meter, it should read in **RECT. OK section,** unless otherwise noted on the **roll chart.**

EXAMPLE:

Tube	A	B	Elements	C	D	REJ/AVG X 1K	Notes
0C3	5.0	–	0200-**4**-0000	5	6	*	(1)

(* No leakage test. Increase A to 26.0, firing is indicated by upscale deflection.)

Make set up as noted and rotate A-FILAMENT control to 26.0 volts, tube should fire. The meter should now read in RECT. OK section, unless **otherwise noted** on the roll **chart.**

TESTING CATHODE RAY TUNING INDICATORS

1. Set the A-FILAMENT and B-BIAS controls.

2. Set the ELEMENT switches.

3. Set the C-PLATE VOLTAGE and D-Gm RANGE switches.

4. Plug tube into correct socket.

5. Move B-BIAS control for 90° and for shadow closed as indicated on chart.

EXAMPLE:

Tube	A	B	Elements	C	D	REJ/AVG	Notes
2E5 ..	2.5	0	1Y54-**3**-2000	3	6		

B = 0, 90 Degrees; B = 8, Shadow Closed

Set up in normal manner following roll chart. With Bias (B) at "0" shadow will be open or 90 degrees, with (B) at 8 shadow should close.

NOISE TEST

1. Connect head phones or a radio receiver using the antenna and ground terminals to the NOISE jacks with the two top cap leads provided.

2. This test checks microphonic noises of an extremely short duration. Set up the test for a normal SHORT-LEAKAGE test, steps (1)-(12) of Testing Amplifier Tubes, page 7.

3. Noise will be indicated in the head phones or speaker of receiver when rotating the SHORT-LEAKAGE switch. The tube should be tapped slightly at each position of the switch.

4. Oscilloscopes may be used as visual indicator by connecting the vertical input to the NOISE jacks.

TESTING CATHODE RAY PICTURE TUBES

Cathode Ray Picture tubes can be tested with the TRIPLETT BV Adapter for duo-decal base picture tubes and Triplett CD & CE with BV Adapter for 110° picture tubes. These adapters are supplied on special order.

TESTING SPECIAL TUBES

Transmitting tubes, industrial tubes and some receiving tubes using the not so common basing arrangements such as lighthouse, septar, pencil triode, acorn or special lead arrangements can be checked using the CG Adapter. This adapter is supplied on special order. Individual adapters for these bases are also available on special order. Tubes with the Septar base can be tested with the CM ADAPTER. Tubes with the Lighthouse base can be tested with the CN ADAPTER.

TESTING NUVISTORS

Nuvistors may be tested in special socket on testers with serial number above 3,000 and with adapter CI on serial number below 3,000.

TESTING ACORN BASE TUBES

Acorn base tubes can be tested with the CC Adapter which is available on special order. Acorn base tubes can also be tested on the CG Adapter which is supplied on special order.

TESTING 10 PIN MINIATURE TUBES

Ten pin miniature tubes can be tested with the CJ ADAPTER which is supplied on special order.

TESTING COMPACTRON TUBES

The compactron tubes with the 12 pin base can be tested with the CK Adapter which is supplied on special order.

TESTING NOVAR TUBES

The Novar base tubes can be tested with the CL ADAPTER which is supplied on special order.

FILAMENT CONTINUITY TEST:

1. Plug a set of test leads into the Plate and Grid Cap Jacks.

2. Switch the Shorts-Leakage Switch to either P or G position.

3. Locate the tube type number on the tube Roll Chart and determine from the ELEMENT Setting which pins are connected to the filament of the tube. (NOTE: Each switch position and its function is listed under LINE TEST CALIBRATION in the MAINTENANCE section of the Instruction Book.)

4. Clip one of the test leads to one of the filament pins. The meter will deflect to full scale when the other lead is connected to the second filament pin. If it does not the filament of the tube is open.

INSTRUCTIONS FOR SETTING TUBES UP BY THE MANUFACTURERS TUBE DATA

Prior to starting this procedure, it is recommended the pages 6 through 11 in the 3444 Instruction Manual be carefully read until familiar with their content.

1. In order to set a tube up by the manual, it is suggested that first of all, the maximum ratings of the tube elements be observed in the data given, and that they be kept in mind as the tube is being set up.

2. For familiarization with the procedure to be used, let us take a simple triode, the 6C4, and set it up. Refer to your tube manual, and pages 6 through 11 in the 3444 Instruction Manual. Look for "Heater Characteristics" in the tube manual. The heater voltage indicated may be set up on the 3444 by selecting the correct indicated value of the A-FILAMENT switch, in this case setting the arrow at the 6.3 volt mark.

3. The next two element settings are related, and must thus be considered carefully before selecting their values. Refer to the C-PLATE VOLTAGE chart at the bottom of page 6 in the Instruction Manual. You will note the three columns of voltages, and that selection of the proper Screen voltage, as well as the proper Bias voltage range, is dependent upon the selection of the correct C-PLATE VOLTAGE position. In the data for the 6C4 tube, refer to the "Typical Operation Characteristics." You may select either set of values given for Class A Amplifier. We will set the tube up using the 250 volt plate potential. Note also, the bias or control-grid voltage specification, in this case —8.5 volts. Now refer to the C-PLATE VOLTAGE chart on page 6 and note that positions #1, 2, 3 and 4 all will apply 250 volts plate potential, so obviously one of these four positions will be used for this tube. Next, observe that there is no screen grid on the 6C4, thus eliminating the Screen voltage as a factor of selecting the correct C-PLATE VOLTAGE position. You will next observe that there are two Bias voltage ranges available, 0-5 and 0-50 volts. Since we need —8.5 volts bias, we must select the C-PLATE VOLTAGE position which will place the 0-50 bias voltage on the grid of the tube, and at the same time 250 volts on the plate.

The C-PLATE VOLTAGE switch must thus be on either position #2 or #3. Rotate to one of these positions.

4. Since the proper Bias range has been selected by the correct selection of the plate voltage switch, it is now necessary to adjust the B-BIAS control to the correct value. In the data, for the 250 volt plate operation a —8.5 volt bias is needed. Set the B-BIAS control on 8.5 volts.

5. To select the correct value of D-Gm RANGE switch, refer to the manufacturers data, in this case for the 250 volt class A operation, the typical transconductance is 2200 micromhos. The D-Gm RANGE switch may thus be placed in the #2 (3K) position. In most cases it is desirable to set this switch one range higher to avoid possible past full scale meter delections.

6. Next, is the setting of the ELEMENT switches. Refer to the element schematic, and observe that there

are seven pins which are used in the 6C4, which means that elements one through seven will be used. You will now refer to page 11 in the 3444 Instruction Manual, where the ELEMENT switch positions and their circuit functions are indicated. It is best to make these selections by starting with the first pin of the tube, and working on around consecutively. You will note that pin number one is connected to the plate. Now refer to page 11, and note that the plate switch position is #4. You will thus, turn ELEMENT switch 1 to position #4. Proceeding, you see that tube pin #2 has no electrical connection, thus ELEMENT switch 2 should be placed on 0. Pin #3 of the tube shows an "x", which refers to the filament. Again referring to page 11 of the Manual, you will see that ELEMENT switch positions #1 and #2 are filament positions. Unless a tube specifies that one pin is to be positive and the other negative, polarity selection of the filament connections need not be noted. We may now set ELEMENT switch 3 in position #1. Pin #4 is next; note that the filament return is at that position. You must place the other side of the filament circuit on this pin, thus if you used position #1 on ELEMENT 3, you must use position #2 on ELEMENT 4, and set switch as such. Pin #5 indicates a connection to the plate, and as referenced on page 11, ELEMENT switch 5 is also placed at the #4 position, as this tube has only one plate. Tube pin #6 is connected to the control grid of the tube (G_1), which function may be obtained by setting ELEMENT switch 6 in the #5 position. Pin #7 you will see is connected to the cathode, and referring to page 11 again, you see that ELEMENT switch position #3 is the cathode position. Set ELEMENT switch 7 to position #3.

7. Check through your set up again to be sure switches have been positioned correctly. Plug the tube into the socket, and proceed with the testing as indicated in the STEP BY STEP INSTRUCTIONS on page 7 of the Instruction Manual.

This set up of a simple triode is merely to illustrate the manner in which a tube may be set up from a tube manual. More complex tubes may be set up by going through the same procedure and referring to the ELEMENT switch position functions, for instance, tubes with screen grids, suppressor grids, and dual section tubes. The dual section will use the separate functions for each side, that is plate #1, control grid #1, and cathode #1, for one side; plate #2, control grid #2, and cathode #2 for the second side. Use of the P_1-P_2 lever switch will be governed by the number of plates and cathodes in a tube, as described on page 7 of the Manual.

NOTES:

(a) Many tubes may be set up on the 3444 at exact tube manual values. For testing those which do not have the same exact voltage values, such as plate and screen voltage, always observe the maximum rating of the tube. It is best to use the next lower value of plate and screen voltages than typical operation calls for if typical operation is not the exact voltage available on the 3444.

A representative indication of the condition of these tubes may be obtained by setting them up and switching the D-Gm RANGE switch to the "Plate Current" position applicable to the plate current requirements of the tube in typical operation. Next, pull the value lever, and adjust the B-BIAS control to the plate current value indicated as typical. Rotate the D-Gm RANGE switch back to the applicable Gm or transconductance range, pull the value lever, and read Gm of the tube.

(b) On tubes which require connections to external plate, grid, or cathode caps, it must be noted that the caps are connected electrically to the test circuit when the P_1-P_2 lever is in the center or relaxed position. On dual section tubes which have caps, set up one section at a time, making two tests.

CAUTION: The maximum plate current which should be used on the 3444 is 50 milliamperes. For tubes to be set up which exceed this value, it will be necessary to set the tubes up on a different portion of the curve, at 50 milliamperes plate current or less.

PRECAUTIONS

AGAINST HARM TO OPERATOR, TUBE AND TUBE-ANALYZER

1. Do not plug Model 3444 into a DC line. Be sure the power line to be used is a 105-127 volt 50-60 cycle source.

2. Do not turn on Tube-Analyzer with LINE CONTROL near its extreme clockwise position.

3.. Do not insert a tube in a socket before setting the A-FILAMENT switch and the ELEMENT switches.

4. Do not change the position of the A-FILAMENT switch when any tube except a VR tube is in one of the test sockets.

5. Consult the tube data roll chart before setting the C and D controls.

6. Observe OVERLOAD lights and immediately shut off the Tube-Analyzer when either of these light up.

TO AVOID FAULTY READINGS & MISINTERPRETATIONS

1. Read the correct scale.

2. Understand the divisions on each scale.

3. Follow step-by step instructions.

PREVENTIVE MAINTENANCE

1. Do not plug the Model 3444 into a DC line. Be sure the power line to be used operates at a nominal potential of 115 volts at a frequency of 50-60 cycles.

2. Do not insert a tube in a socket before setting the A-FILAMENT switch and the ELEMENT switches, as incorrect setting of either may result in burning out the filament of the tube.

3. Consult the tube data chart before setting the B-BIAS, C-PLATE VOLTAGE and D-Gm RANGE controls.

4. If the meter lamp or the roll chart lamps become excessively dim, a SHORT-LEAKAGE test should be made immediately to ascertain if the tube has developed a short, i. e. a shorted filament overloading the heater circuit without showing on the overload lamp. If so the tube should be immediately removed from the socket to prevent damage to the tube tester.

5. Shut off the Tube-Analyzer when through using it and store leads and accessories in the roll chart compartment.

DC OVERLOAD

If the OVERLOAD lamp lights up, a short or overload condition exists somewhere in the tube analyzer or in the tube being tested and must be located and corrected before proceeding with the tube tests.

INPUT OVERLOAD

If the INPUT OVERLOAD lamp lights up, it indicates a short or overload condition exists somewhere in the tube analyzer, or in the tube being tested. It is in series with the primary of the power transformer, and as above, the condition causing this overload should be located before proceeding. NOTE: Some tubes which draw a large current such as the 5U4 will cause a slight or dim glow. This is not an overload.

FUSE

If a fuse has blown, remove the roll chart so that the bayonet-type 3 amp. removable fuse may be replaced. This fuse is located in the lower right corner inside the roll chart compartment.

Gm CHECK

To check the Gm calibration, follow procedure outlined under INSTALLATION and INITIAL ADJUSTMENT on page 6. Be sure line test adjustment is exact before touching this adjustment.

LINE TEST CALIBRATION

1. Set A-FILAMENT to 6.3 volts.

2. Set all ELEMENT switches to 0 position except Switch 1 which is to be set on position 1 and switch 2 which is to be set on position 2.

NOTE: The ELEMENT switch numbers encircled on the panel refer to the tube socket pin numbers and the following switch positions indicate these functions:

Switch Pos.	**Function**
0	OFF
1	FIL (—)
2	FIL (+)
3	K_1 (Cathode #1)
4	P_1 (Plate #1)
5	G_1 (Control Grid #1)
6	G_2 (Screen Grid)
7	G_3 (Suppressor)
8	K_2 (Cathode #2)
9	P_2 (Plate #2)
X	G_1 (Control Grid #2) ² (Second section)
Y	Plate for Eye Tubes

Note also that the combination 4-5-6 pin socket has the following pin element numbering:

4-pin Pin #	Use ELEMENT Sw. #	**5-pin** Pin #	Use ELEMENT Sw. #	**6-pin** Pin #	Use ELEMENT Sw. #
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	6	4	5	4	4
		5	6	5	5
				6	6

3. Set SHORT-LEAKAGE switch to VALUE position.

4. Set C-PLATE VOLTAGE switch to #1 position.

5. Set D-Gm RANGE switch to #1 position.

6. B-BIAS dial not used.

7. Turn tester ON and allow to warm up for 15 minutes.

8. Use an accurate AC voltmeter (±½% or better) with sensitivity of at least 5,000 ohms per volt and connect across pins #1 and #2 in parallel with an 18 ohm, 5 watt load.

9. Note the meter reading while adjusting the LINE VOLTAGE control for LINE TEST.

10. If at 6.3 volts, the alignment of the LINE TEST is off, no attempt should be made to change the calibration resistor R4 unless absolute certainty of the accuracy of the voltmeter is known to be ±½% at 6.3 volts.

NOTE—Due to the importance of this adjustment, it is recommended that it be made only at the factory or Field Service Station.

TO REPLACE ILLUMINATION LAMPS

Roll chart lamps may be replaced by first removing the roll chart from its compartment, then remove the lights by compressing the bracket of the socket so that it can be removed from the base plate of the roll chart assembly. Remove the defective lamp and replace with a 6.3V (GE #47 or equivalent) bayonet type lamp.

To replace the meter lamp, unscrew the four corner screws to remove the meter front. Replace the defective lamp with a 6.3V bayonet type lamp (GE #44 or equivalent.)

To replace the overload lamps, unscrew the red plastic covering and replace with a 6.3V bayonet type lamp (GE #47 and #43 or equivalent.)

TRANSFORMER LUG VOLTAGES

Lug No.	**Voltage**	**Lug No.**	**Voltage**
1	195	17	7.5
2	—	18	6.3
3	8.4	19	5.0
4	10.5	20	4.7
5	18.9	21	4.2
6	26.0	22	3.15
7	70.0	23	1.25
8	117.0	24	0
9	0	25	—
10	18.0	26	—
11	30.0	27	—
12	83.0	28	2.8
13	9.5	29	2.35
14	12.6	30	2.0
15	34.0	31	1.4
16	50.0	32	0.63
		33	16.8

SOCKET SAVERS

The octal, 9 pin and 7 pin socket savers may be replaced simply by removing the two screws holding the plate over these sockets and then pulling out the old socket saver and replacing it with one identical to one of the following TRIPLETT Part Numbers: 2455-201 . . . 7-pin miniature; 2455-200 . . . 9-pin miniature; 2455-199 . . . 8-pin octal.

INSTALLING NEW ROLL CHART

From time to time there will be a new roll chart to install. This will be only a few minutes work if you follow these instructions.

1. Remove the roll chart assembly from tube analyzer.

2. Remove the two screws and take off the rear panel of the roll chart assembly.

3. Roll chart to the extreme end on the top roller. Remove tape holding chart to roller. Pull out chart and remove tape from top roller.

4. Thread new chart under bottom roller up to top roller and tape chart to roller. Take special care that the chart is taped straight on the roller. Roll chart on top roller fairly loose. Now tape bottom chart to the bottom roller. If the chart has not been rolled loosely on the rolls it will bind when rolled to the extreme ends.

CROSS REFERENCE TO TUBE TYPES

Tube Type	Listed Under
2B22	R6279
6AG6	EL33
6F18	6EC7
6/30L2	6GA8
6GE7	6DL7
10F18	10EC7
12A/11A	12A
30F5	7ED7
30FL1	9GB8
30P4	25GF6
30P12	12FB5
30PL1	13GC8
51	35
57S	57
X99	99
108C1	0B2
150C2	0A2
150C3	0D3
396A	2C51
403B	5591
417A	5842
482B	182B
483	183
585	50
1003	0Z4
1649	6AC7
1662	3A4
2523NI	128A
5913	6007
6046	25L6
6187	6AS6
6678	6U8
6687	E91H
7034	4X150A
18042	6086
A2521	6CR4
AX9903	5894
B152	12AT7
B309	12AT7
BPM04	6AQ5
C1J	5683
CK568AX	5677
CK569AX	5678
CK1003	0Z4
DA90	1A3
DAC32	1H5
DAF91	1S5
DAF92	1U5
DAF96	1AH5
DCC90	3A5
DDR7	6AM5
DF33	1N5
DF60	5678
DF62	1AD4
DF91	1T4
DF92	1L4
DF96	1AJ4
DH63	6Q7
DH77	6AT6
DK91	1R5
DL33	3Q5
DL35	1C5
DL36	1Q5
DL92	3S4
DL93	3A4
DL94	3V4
DL95	3Q4
DL96	3C4
DL98	3B4
DM70	1M3
DP61	6AK5
E80CC	6085
E80CF	7643
E80L	6227
E80F	6084
E83F	6689
E88CC	6922
E90CC	5920
E180CC	7062
E180F	6688
E182CC	7119
E188CC	7308
EA76	5647
EAA91	6AL5
EABC80	6AK8
EB34	6H6
EB91	6AL5
EBC81	6BD7
EBC90	6AT6
EBC91	6AV6
EBF80	6U8
EBF89	6DC8
EC80	6Q4
EC86	6CM4
EC90	6C4
EC92	6AB4
ECC33	6SN7
ECC83	12AX7
ECC85	6AQ8
ECC86	6GM8
ECC88	6DJ8
ECC91	6J6
ECC189	6ES8
ECF82	6U8
ECF86	6HG8
ECH81	6AJ8
EF22	7G7
EF86	6267
EF93	6BA6
EF94	6AU6
EF95	6AK5
EF183	6EH7
EF184	6EJ7
EH90	6CS6
EK90	6BE6
EL37	6L6
EL81	6CJ6
EL86	6CW5
EL91	6AM5
EL94	3V4
EL620	5672
EL821	6CH6
EM80	6BR5
EM81	6DA5
EN70	5643
EM84	6FG6
EN92	5696
EN93	6D4
EQ80	6BE7
EY80	6U3
EY88	6AL3
EZ35	6X5
EZ90	6X4
G84	2Z2
GZ30	5Z4
GZ32	5V4
H63	6F5
HABC80	19T8
HBC90	12AT6
HBC91	12AV6
HD14	1H5
HD30	3B4
HF93	12BA6
HF94	12AU6
HK90	12BE6
HL92	50C5
HL94	30A5
HM04	6BE6
HY90	35W4
KH183	3EH7
KR1	1V
KR5	6A4
KR25	2A5
KR98	6Z4
L77	6C4
N14	1C5
N17	3S4
N18	3Q4
N19	3V4
N144	6AM5
OE3	85A1
PC86	4CM4
PCC85	9AQ8
PCC88	7DJ8
PCF80	9A8
PCF82	9U8
PJ7	5742
PL81	21A6
PL82	16A5
PL83	15A6
PM04	6BA6
PY80	19X8
QV03-12	5763
QV06-20	6146
RR3-250	3B28
U25	2L2
U78	6X4
U147	6X5
V2M70	6X4
W17	1T4
X17	1R5
X155	55
XCC189	4ES8
XF184	3EJ7
XL	7A4
XXB	3C6
XXD	14AF7
XY88	16AQ3
Z63	6J7
ZD17	1S5

REPLACEABLE PARTS
FOR ABOVE SERIAL #6000

Part Name	Ref. No. Req.		Description	Triplett Part No.
	1	Socket	4-5-6 hole combination, black	2455-202
	1	Socket	7 hole, (with pilot socket)	T-2455-165
	1	Socket	7 hole, miniature, for tube mounting	T-2455-203
A1	1	Socket	7 hole, miniature, black	T-2455-59
	1	Socket	5-6-7 hole subminiature, black	T-2455-80
	1	Socket-Saver	7 hole, miniature, black	2455-201
	1	Socket	8 hole, octal, black	T-2455-164
	1	Socket	8 hole, loctal, black	T-2455-163
	1	Socket	8 hole, subminiature, black	T-2455-162
	1	Socket-Saver	8 hole, octal, black	2455-199
	1	Socket	9 hole, miniature	2455-206
	1	Socket	9 hole, miniature	2455-185
	1	Socket-Saver	9 hole, miniature, black	2455-200
	1	Pin Straightener	Tube, 7 hole miniature, black	T-2600-PP7002
	1	Pin Straightener	Tube, 9 hole miniature, black	2455A-259
M1	1	Instrument	420 Illuminated	52-1353
S1 thru S9	9	Switch	12 position, 12 active, 1 deck	22A-328
S10, S12	2	Switch	3 position, 4 pole, lever type	T-22A-360
S11	1	Switch	12 position, 6 active, 4 deck	22A-326
S13	1	Switch	Push button, line test	T-22-259
S14	1	Switch	Push button, Gm test	T-22-355
S15	1	Switch	12 position, 8 active, 5 deck	22A-327
S16	1	Switch	24 position, 23 active, 1 deck	22A-334
S17	1	Switch	12 position, 11 active, 1 deck	22A-325
S18	1	Switch	Toggle, Bat Handle	T-22-116
T1	1	Transformer	Power	23-105
T2	1	Transformer	Oscillator	23A-106
V1	1	Tube	6C4	2600-6C4
V2	1	Tube	12AU7	2600-12AU7
	13	Knob	Pointer type	34-64
	1	Knob	Push button	T-34-7
	1	Knob	Round, Harry Davies #1700	34-79
	1	Cord	Line, 7 ft.	T-2566-43
I1	1	Lamp	Mazda #47, 6-8V, bayonet base	T-67-65
I2	1	Lamp	Mazda #43	65-105
	1	Fuse	3 amp, 250 volt	3207-12
	1	Assembly	Roll Chart	11184A
	1	Roll Chart	Paper, printed	84-95 (C)
	1	Roll Chart	Supplement, Paper printed	84-130 (S)
	1	Lead	Assembly, 1 red, 1 black	T-79A-146
	1	Case	Carrying	10A-1523
	4	Contact	Jack for banana plugs	9686
X1	1	Rectifier	Full wave, 4 lead, yellow base	T-2248-4A
X2	1	Rectifier	Full wave, large tubular	2250-39
X3, X4	2	Rectifier	Half wave, small tubular	2250-55
R1, R10, R18	3	Resistor	1 Meg. ±10%, 1/2W	T-2601-1/2-1 Meg.
R2	1	Resistor	470K, ±10%, 1/2W	T-15-1465
R3	1	Resistor	450K, ± 1 %, 1/2W	15-2890
*R4	1	Resistor	51K to 62K 1/2W	
R5	1	Resistor	1.5 Meg. ± 1 %, 1/2W	15-2892
R6	1	Resistor	Variable, 175 ohm, ±10%	16-129
R7	1	Resistor	200K, ±10%, 1/2W	T-2601-1/2-200K
R8	1	Resistor	180K, ±10%, 1/2W	T-15-2204
R9	1	Resistor	47K, ±10%, 1/2W	T-15-2498
R11	1	Resistor	33.3 ohms, 4 section ceramic, wirewound Non-inductive, ±1/4%	15-3075
R12	1	Resistor	2 ohms, ±1/2% wirewound	15-3043
R13	1	Resistor	18.84 ohm, ±1/2% wirewound	15-3044
R14	1	Resistor	66.7 ohm, ±1/4% wirewound, non-inductive	15-3040
R15	1	Resistor	233.0 ohm, ±1/4%, W. W. non-inductive	15-3041
R16	1	Resistor	667.0 ohm, ±1/4%, W. W. non-inductive	15-3042
R17	1	Resistor	33.3 ohm, ±1/4%, W. W. non-inductive	15-3039
R19	1	Resistor	Variable, 1000 ohm, ±10%, 2W, W.W.	16A-127
R20	1	Resistor	4700 ohm, ±10%, 1/3W	15-3054
R21	1	Resistor	Variable, 5K, ±5%, 4W, 2% Linear Taper	16A-128
R22	1	Resistor	20 ohm, ±1/2%, wirewound	15-3045
R23, R24	2	Resistor	20K, ±1%, 1W	15-877

REPLACEABLE PARTS

Ref. No.	Req.	Part Name	Description	Triplett Part No.
R25	1	Resistor	2K, ±5%, 10W	15-3056
R26	1	Resistor	5600 ohm, ±5%, 1/3W	15-3197
R27	1	Resistor	25 ohm, ±10%, 10W	15-3055
R28	1	Resistor	75K, ±1% 1/2W	15-1166
R29	1	Resistor	Variable, 1750 ohm, ±10%	T-16-62
R30	1	Resistor	2K ohm, ±10%, 1/2W	15-3995
R31	1	Resistor	Variable, 175 ohm, 25W	8595
*R32	1	Resistor	15K, ±10%, 1/2W	
*R33	1	Resistor	8200 to 10K, 1/2W	
R35	1	Resistor	3.16Ω, ±1% WW	15-1256
C1	1	Capacitor	.03 Mfd, ±10%, 200V.	43-222
C2	1	Capacitor	470 Mmfd. ceramic disk	T-43-149
C3, C9	2	Capacitor	750 Mmfd. ±10%, 1000V	43-226
C4	1	Capacitor	.002 Mfd. ±10%, 600V	43-228
C5	1	Capacitor	560 Mmfd. ±10%, 1000V	43-224
C6	1	Capacitor	330 Mmfd. ±10%, 1000V	43-223
C7	1	Capacitor	50 Mfd, 350 WVDC	43-221
**C8	1	Capacitor	560 Mmfd. ±10%, 1000V	43-224
		Capacitor	680 Mmfd. ±10%, 1000V	43-225
		Capacitor	750 Mmfd. ±10%, 1000V	43-226
		Capacitor	800 Mmfd. ±10%, 1000V	43-227
C10, C11, C12, C13	4	Capacitor	30 Mfd 150 WVDC	T-43-103
C14	1	Capacitor	30 Mfd 250 WVDC	43-230

**C8, C9 are calibrating capacitors
*R4, R32, R33 are calibrating resistors

Check page 10 for additional adapters available on special order.

REVISIONS

Testers with serial number above 2,000 have center pin of loctal socket connected to pin 9 of 9 pin miniature socket for use with CG Adapter.

Testers with serial number above 3,000 have nuvistor socket in panel for testers below number 3,000 use CI Adapter.

Testers with serial number above 3,000 have a cathode cap jack in panel.

Testers with serial number above 5000 have a bias voltage applied to both control grids of all dual section tubes.

WIRING DIAGRAM, MODEL 3444
ABOVE SERIAL #6000