The CALIBRATE switch should be in the OPERATE position during the testing procedure. The P, G and K switches should be in position 1. The DISCONNECT and LIFE TEST switches should be in the NORMAL position, the LEAKAGE switch in TUBE TEST position, and the PLATE switch in position D. Other switch and control positions will be called for as required. BE SURE to observe normal safety precautions during testing of this instrument. Disconnect power when making connections to terminals (connecting meter leads, etc.).

Ohmmeter and continuity readings may be difficult to make due to the complexity of the tube tester switching. In no case, however, should there be DC continuity shown from the circuitry to the chassis or panel. The only connection to chassis ground are the common terminals of the oscillation suppressors (P.E.C.'s). A connection between chassis and any other point indicates incorrect wiring or a faulty component.

In the event the unit does not perform as outlined in the testing procedure, troubleshooting is greatly simplified by comparing the wiring of the switches, transformer, etc. with the terminal code data shown on the Schematic Diagram.

1. LINE CONTROL CIRCUIT

Plug the line cord into a 105-125 volt 60 cycle AC source and move the OFF-ON switch to the ON position. The panel lamps should light to a normal brightness level with the SET LINE control at the halfway point of its rotation. Turning the SET LINE control clockwise from this position should brighten the panel lamps. Turning the SET LINE control counterclockwise should cause the panel lamps to dim.

Pull down the LINE TEST switch. The meter should deflect upscale. The reading of the meter will be dependent upon the position of the SET LINE control, a clockwise rotation of the control producing an increase in meter indication. Assuming an input voltage of 117 volts, the meter indication should vary from approximately 1/4" to the left of the LINE CHECK arrow at midscale (maximum counterclockwise position of SET LINE control) to about 1/2" to the right of the arrow (maximum clockwise position of the SET LINE control).

2. FILAMENT SUPPLY CIRCUIT

Connect the leads of an AC voltmeter to SX21 (see Figure 43) and CD1 (see Figure 63) (use the 150 volt range or higher). Turn the instrument ON and adjust the line voltage (pull down the LINE TEST switch and adjust the meter to the LINE CHECK arrow with the SET LINE control).

For all voltage positions of the FILAMENT switch, the voltmeter should read essentially the same voltage as that shown on the PANEL. The important consideration is that the voltmeter reading should increase with each successive clockwise step of the FILAMENT switch. If the voltmeter shows a decrease when the switch is rotated clockwise, the switch has been incorrectly wired. If this situation occurs, it should be corrected before proceeding further.

With the FILAMENT switch at any convenient voltage position, depressing the LIFE switch should decrease the voltmeter reading by approximately 10%.

Select a tube designed for series string hookup (heater current of 600 ma preferred) and set the SELECTOR switches corresponding to the heater connections to positions 6 and 7, respectively. Set all other SELECTOR switches to 0. The top row of SELECTOR switches corresponds to tube pin 1 through 5, starting at the left. The bottom row corresponds to tube pins 6 through 9, starting at the left. Turn the filament switch to the correct current position.

Now plug in the tube. It will probably be necessary to readjust the SET LINE control. The voltmeter should now indicate essentially the same voltage as that listed for the particular tube type you are using. Here again, depressing the LIFE switch should decrease the voltage reading by approximately 10%.

If everything is operating as outlined above, the filament supply circuit has been correctly wired. Remove the tube and go on to the plate voltage testing section.

3. PLATE VOLTAGE SUPPLY

Connect the leads of the AC voltmeter to SP2 and SQ2 (see Figure 29). The voltmeter should indicate as shown below for various positions of the PLATE switch.

Position A	20 V AC
Position B	45 V AC
Position E	177 V AC

Connect a DC voltmeter to SP2 and SQ2 (negative to SP2). The voltmeter should indicate as shown below for various positions of the PLATE switch.

Position O	26 V DC
Position C	90 V DC
Position D	135 V DC
Position F	225 V DC

Remove the voltmeter leads and put the PLATE switch in position G. This connects the variable DC supply used for voltage regulator testing. This supply is constantly monitored by the TT-1 meter, which should now be reading the value of the voltage applied to the plate circuit of the tester. This voltage may be varied by either the FILAMENT switch or the SET LINE control. If either one or both fails to change the value of the meter reading or if no reading is present, check the wiring of the PLATE switch and associated circuitry before proceeding.

Place the PLATE switch in position O. Connect a DC voltmeter to terminals N1 and O1 (negative to N1). The voltmeter should indicate 26 V DC. This voltage supply is connected to the space charge grid of space charge grid tubes.

4. BIAS VOLTAGE SUPPLY

Connect the leads of a DC voltmeter to SP2 and SR2 (negative SR2). Place the BIAS RANGE switch in the L (low) position and the BIAS control maximum clockwise. Turn the internal bias adjust control CD throughout its entire rotation. The voltmeter should indicate from 0 to 20 volts, depending on the setting of CD. Adjust CD to give a voltmeter reading of approximately 5 volts. Now turn the BIAS control on the front of the panel. This should vary the voltmeter reading from O V (maximum counterclockwise) to 5 V (maximum clockwise). Now change the BIAS RANGE switch to the H (high) position. Rotation of the BIAS control should now give a voltmeter indication from 0 to 20 volts. Remove voltmeter leads.

5. LEAKAGE TESTING CIRCUIT

Set the instrument controls as shown below. These are the settings for a 6AU6 tube.

PLATE	C
FILAMENT	6.3
SELECTORS	52763-4100
BIAS	9L
METER	45
SIGNAL	4

Select a convenient value of resistance (preferably between 100 KΩ and 500 KΩ). With this resistor between pins 4 and 7 of any of the tube sockets, the meter should indicate the resistance value directly on the LEAKAGE meter scale when the LEAKAGE switch is in the #1 position. Move the LEAKAGE switch to position 2 - the meter pointer should return to its rest position. Now move the resistor to pins 2 and 7. The resistance reading should now reappear on the meter. Check the remaining positions of the LEAKAGE switch as shown below.

Switch Position	Resistor between
3	Pins 5 and 7
4	Pins 6 and 7
5	Pins 1 and 7

If the leakage testing circuit does not operate as outlined above, recheck the wiring of the LEAKAGE switch and associated circuitry before continuing the testing procedure, otherwise, remove resistor.

NOTE: The meter pointer will normally be a little above zero with the LEAKAGE switch in position 2, 3, 4, or 5.

6. TUBE SOCKET AND SELECTOR SWITCH WIRING

Place the LEAKAGE switch in the TUBE TEST position. The other controls should be positioned as outlined in the previous section. The instrument is now set up to test a 6AU6. With the negative lead of a DC voltmeter connected to pin 7 of any of the tube sockets, you should measure the following voltages at the pin numbers indicated.

PIN NO.	VOLTAGE
1	-1 volt (approx)
2	0 volts
5	+90 volts ±10%
6	+90 volts ±10%

An AC voltmeter connected between pins 3 and 4 should indicate approximately 6 volts AC.

Operation of the DISCONNECT switch should reduce the above listed voltage readings to 0.

7. Gm TESTING CIRCUIT

Insert a 6AU6 tube which is known to be good in the proper socket and allow it to warm up (knob positions should be as indicated in Section 5). While it is heating, position the two tab mounted controls CF and CG (mounted on the subchassis) at the mid-point of rotation. The METER control should now be turned maximum counterclockwise (0).

Pull down the Gm test switch; the meter should now deflect up-scale. The meter reading should increase and decrease accordingly as CF and CG are varied. Changing the position of the SIGNAL switch should also cause a variation in meter reading, a decrease in meter reading corresponding to clockwise motion of the SIGNAL switch. This action should also occur as the METER control is varied, an increase in meter reading corresponding to clockwise rotation of the control.

If no meter reading is obtained during this test, the oscillator transformer connections, oscillator tube socket connections, oscillator tube (3A4) and choke connections could be possible sources of trouble. Remove 6AU6 tube.

8. GRID CURRENT TESTING CIRCUIT

Turn the PLATE switch to position "0". Connect a large resistance value (22 megohms or higher) from SR2 to SQ2. Turn the instrument on and allow a few minutes for the 12AV6 tube to heat.

Turn the GRID CURRENT switch to the TEST position and hold it there. The meter should deflect up-scale.

If no meter reading is observed during this test, the GRID CURRENT switch wiring and associated circuitry should be checked carefully. Remove the resistor between SR2 and SQ2 before proceeding further.

9. RECTIFIER AND DIODE TESTING CIRCUIT

Set the panel controls as shown below. These are the settings used for testing a 6AL5 tube.

PLATE	A
FILAMENT	6.3
SELECTORS	K3761 - 2P00
METER	39

Insert a 6AL5 tube which is known to be good into the proper socket. After allowing sufficient time for the tube to heat, pull down the AMPL.-RECT. and DIODES switch to the RECT and DIODES position. The meter should deflect up-scale into the section marked "DIODES O.K." Remove 6AL5 tube.

10. CALIBRATION CIRCUIT

Turn the CALIBRATE switch to position 1 (BIAS) and the BIAS controls to 20L; the meter should deflect up-scale. This meter reading should increase or decrease accordingly as CD is varied.

Turn the BIAS control to 0, change the CALIBRATE switch to position 2 (SIGNAL), and pull down the Gm test switch. The meter reading with the CALIBRATE switch in this position should change with rotation of control CG.

Turn the METER control maximum clockwise and change the CALIBRATE switch to position 3 (METER). The PLATE SWITCH should be in position C. Pull down the Gm test switch. The meter reading should vary with rotation of control CF.

Return the CALIBRATE switch to the OPERATE position.

If all circuits check out as indicated, proceed with the roll chart installation. If difficulty is encountered it will be easier to correct before the roll chart mechanism is installed.

CALIBRATION

The instrument should be placed on a flat rigid surface. With the line cord removed, check the mechanical zero position of the meter needle. If it is not directly over the 0 position of the meter scale, adjust it by turning the zero adjust screw in the front of the meter case.

All SELECTOR switches should be set at 0 for the calibration procedure. Turn the LEAKAGE switch to the TUBE TEST position.

Make all adjustments as carefully and accurately as possible; the accuracy of the test information derived from this tester is dependent upon proper calibration.

1. BIAS CALIBRATION

The purpose of this adjustment is to set the low range of grid bias voltage to a predetermined level. Set the controls as follows:

PLATE	A
BIAS	20 L
METER	Maximum clockwise
SIGNAL	8
CALIBRATE	Operate

Pull down the LINE TEST switch and adjust the SET LINE control until the meter needle is over the LINE CHECK arrow. Turn the CALIBRATE switch to position 1 (BIAS) and adjust CD until the meter needle is again over the LINE CHECK arrow. Return the CALIBRATE switch to the OPERATE position and again check the line. If necessary, reset the SET LINE control and recheck the bias level by moving the CALIBRATE switch back to position 1. Repeat as many times as necessary.

2. SIGNAL CALIBRATION

The purpose of this adjustment is to set the output level of the oscillator circuit (signal input to Gm testing circuit).

Set the controls as follows:

PLATE	A
BIAS	Maximum counterclockwise (0)
METER	Maximum clockwise
SIGNAL	1
CALIBRATE	Operate

Make a line voltage check. When the SET LINE control has been properly adjusted, move the CALIBRATE switch to position 2 (SIGNAL). Pull down the Gm test switch and adjust CG until the meter needle is over the LINE CHECK arrow. Move the CALIBRATE switch back to OPERATE and recheck the line. Repeat the above procedure, if required.

3. METER CIRCUIT CALIBRATION

The purpose of this adjustment is to set the source impedance presented to the metering circuit to a specified value.

Set the controls as shown below:

PLATE	C
BIAS	Maximum counterclockwise (0)
METER	Maximum clockwise
SIGNAL	1
CALIBRATE	Operate

Make a line voltage check. With the SET LINE control properly adjusted, move the CALIBRATE switch to position 3 (METER). Pull down the Gm test switch and adjust the meter needle to 1100 micromhos by turning control CF. Now rotate the METER control until the meter reads 600 micromhos. The METER control knob should now be set exactly at 40. If it is not, loosen the knob setscrew and adjust it to point directly at 40. The two requirements that must be met are:

a. The meter should indicate 1100 micromhos with the METER control turned maximum clockwise (adjust by control CF).

b. The meter should indicate 600 micromhos with the METER control at 40 (adjust control knob).

Return the CALIBRATE switch to OPERATE and recheck the line. Repeat the above procedure, if necessary.

K4XL's  BAMA

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