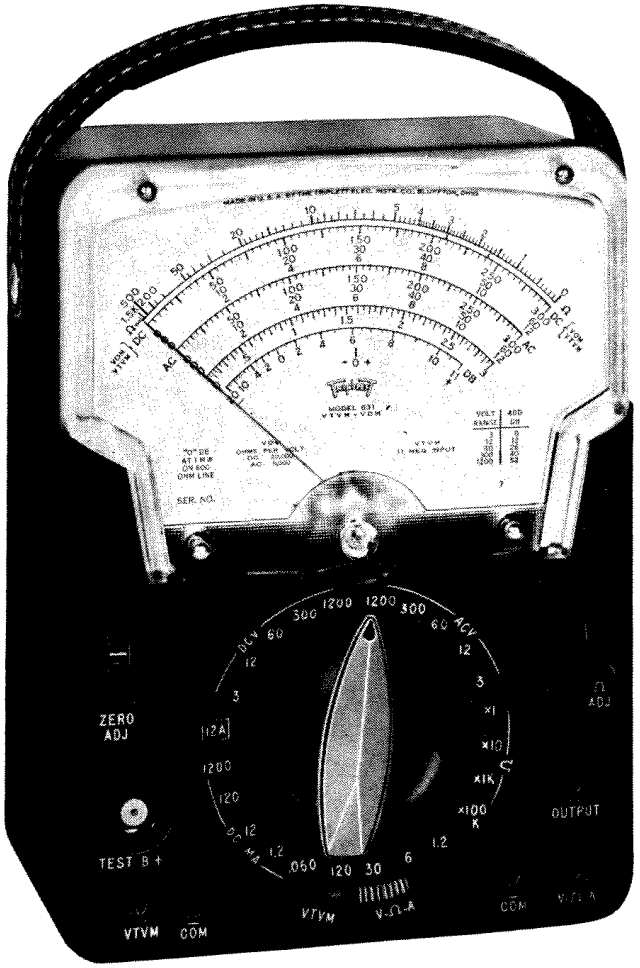
# INSTRUCTION MANUAL

## MODEL 631
## Vacuum Tube Voltmeter
## a n d
## Volt-Ohm-Milliammeter




**The Triplett Electrical Instrument Company**
**Bluffton, Ohio**

## FOREWORD

With your purchase of a Triplett Model 631 Vacuum Tube Voltmeter and Volt-Ohm-Milliammeter, you have made a worthwhile investment, not only in a fine instrument, but backed up by a company which has been making instruments for half a century. The Triplett Company stands behind your 631 and will give all possible assistance in its use and maintenance.

### TRIPLETT WARRANTY AND CONDITIONS OF SALE

The Triplett Electrical Instrument Company warrants instruments manufactured by it to be free from defective material or factory workmanship and agrees to repair or replace such instruments which under normal use and service, disclose the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing or replacing any instrument or test equipment which proves to be defective, when returned to us transportation prepaid, within ninety (90) days from the date of original purchase.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgment, to injure their stability or reliability or which have been subject to misuse, negligence or accident or which have had the serial number altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories including all vacuum tubes and batteries not of our manufacture used with this product are not covered by this warranty.

The Triplett Electrical Instrument Company reserves the right to discontinue models at any time, or change specifications or design, without notice and without incurring any obligation.

Upon acceptance of the material covered by this invoice the purchaser agrees to assume all liability for any damages and bodily injury which may result from the use or misuse of the material by the purchaser, his employees, or others, and that The Triplett Electrical Instrument Company shall incur no liability for direct or consequential damage of any kind.

Parts will be made available for a maximum period of five (5) years after the manufacture of this equipment has been discontinued. Parts include all materials, charts, instructions, diagrams, accessories, et cetera, which were furnished in the standard or special models.

This warranty and conditions of sale are in lieu of all others expressed or implied and no representative or person is authorized to assume for us any other liability in connection with the sale of our products.

**The Triplett Electrical Instrument Company**
**Bluffton, Ohio**

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Above serial 25,000



## MODEL 631

## TECHNICAL DATA

**VTVM:**

DC Volt ranges: 0-1.2, 6, 30, 120
11 Megohm input impedance
Battery operated

**VOM:**

DC Volt ranges: 0-3, 12, 60, 300, 1200
(20,000 ohms per volt)
AC Volt ranges: 0-3, 12, 60, 300, 1200
(5000 ohms per volt)
DC-MA 0-.060, 1.2, 12, 120, 1200
DC Amps 0-12

Ohms X1 0-1500 (center scale 6.8Ω)
X10 0-15,000 (center scale 68Ω)
X1K 0-1,500,000 (center scale 6800Ω)
X100K 0-150 Meg. (center scale .68 meg.)
DB —20 to +63

**ACCURACY:**

VTVM: DC Volts ±4% (with battery voltage of 22.5)
VOM: DC Volts, MA, Amp ±3%
Ohm ±3% of linear scale
AC Volts ±4%

Overall accuracy is given as percent of full scale at any part of the scale. The values given are maximum and in many cases the actual tester accuracy is considerably better.

**BATTERIES:**

Two Burgess No. XX15 or equivalent and one Burgess No. 2 size D flashlight battery or equivalent not installed at factory. See page 25 for battery installation instructions.

**LEADS:**

One shielded lead for VTVM readings. One pair test leads for VOM (one Black one Red). Two alligator clips.

## GENERAL DESCRIPTION

The Model 631 VTVM and VOM is a rugged long scale multi-range instrument in a compact portable case. It fulfills a long felt need for a combination instrument capable of making the most common measurements with the convenience of a conventional VOM and making the high impedance VTVM measurements by a flip of the switch.

Battery life is long, since the tube for the VTVM circuit draws power only when used on VTVM measurements — not on VOM.

Remove the test leads from the small envelope and notice the two alligator clips enclosed. The clips slide over the ends of the VOM test prods and make very convenient connectors. Rubber bumpers also have been supplied. Insert them in panel screw holes in back of case.

### Scales

Notice there are five scales on the meter. The top red scale is used when measuring ohms. This scale is marked from 0 to 1.5K (at left side). With the switch knob turned to ΩX1, the ohms scale is read just as it is marked. With the switch knob turned to ΩX10, the numbers on ohms scale must all be multiplied by 10. Likewise ΩX1K and ΩX100K mean to multiply by 1000 and 100,000 respectively.

The second scale down (black) is used to read all DC and VTVM voltages. The third scale (red) is used for all AC voltages except the 3 volt range—the latter is read on the bottom red scale (marked 3 at full scale).

The lowest scale is used for all decibel measurements. Notice the chart near the lower right hand corner of the dial. This is used in conjunction with the DB scale as explained on page 18.

### Panel

Just below the meter is a small plastic screw. This is rotated with a small screwdriver to adjust meter pointer to exactly zero. It need be adjusted only occasionally, but for best accuracy the pointer should always be on zero before making a measurement.



The large knob in the lower center of the panel is used to select all ranges. The markings are self explanatory.

To the right of the large range selector knob is a small recessed ΩADJ control used when making resistance measurements.

Observe the jacks and note carefully the marking for each. You will use the COM and V-Ω-A jacks for all VOM measurements and the VTVM and COM jacks for vacuum tube voltmeter measurements.

### Accuracy

Your 631 instrument is accurate to within 3% of full scale reading on all DC and VOM ranges—on all AC and VTVM ranges 4% of full scale. Precision film type resistors insure lasting accuracy. All units are calibrated at 77°F. AC ranges are calibrated on a sine wave. In choosing ranges always endeavor to have the readings fall in the upper (or right hand) half of the scale for greatest accuracy.

### Ranges

The following ranges are self contained in your 631:

| | |
|---|---|
| DC Volts (VTVM) | 0-1.2-6-30-120 |
| DC Volts (VOM) | 0-3-12-60-300-1200 at 20,000 Ohms per Volt |
| AC Volts | 0-3-12-60-300-1200 at 5,000 Ohms per Volt |
| DC Microamperes | 0-60 at 250 Mv. |
| DC Milliamperes | 0-1.2-12-120-1200 at 250 Mv. |
| DC Amperes | 0-12 at 250 Mv. |
| Ohms | 0-1500-15,000 (6.8-68 at center scale) |
| Megohms | 0-1.5-150 . . . (6800-6.8 meg at center scale) |
| Output Volts | 0-3-12-60-300-1200 AC at 5,000 Ohms per Volt |
| Decibels | —20 to +11, 23, 37, 51, 63 on 600 Ohm line |

## Vacuum Tube Voltmeter
## Measuring DC Volts

To turn on the VTVM section, move the slide switch (located beneath the range switch) from position marked V-Ω-A to VTVM — pausing momentarily at the middle detent to allow the tube filament to heat. This will prevent pointer from banging.

Plug the VTVM cable into the VTVM panel jacks. This cable consists of two leads molded into a common plug, and with a red and a black insulator at the probing end of these leads. The "G" engraved on the plug indicates the plug tip to be inserted into the COM jack.

Select range with the main selector switch, then zero the meter pointer by shorting test leads together and rotating the small recessed control marked ZERO ADJ.

Voltage readings may be taken with a very short warm up period. The first few minutes it may be necessary to readjust pointer to zero. This will not affect the accuracy of your readings. After the battery voltage has stabilized itself frequent zero adjustment will not be necessary.

Connect the black prod to ground side of the circuit under test. Use the red prod (containing an isolating resistor for probing to eliminate hand capacity effects.)

The V-Ω-A jacks are not used for VTVM measurements.

Read all DC voltages on the top black meter scale. The 0-1.2 volt range is read on the 0-12 scale by dividing by 10. Similiarly the 0-6 range is read on the 0-60 scale and 0-30 is read on the 0-300 scale. Read the 0-120 volt range on the 0-12 scale by multiplying by 10.

**CAUTION: Return the slide switch to V-Ω-A position after VTVM readings are completed to save the batteries. Do not leave switch in center position. Use only one COM lead at a time. Do not connect COM leads together.**

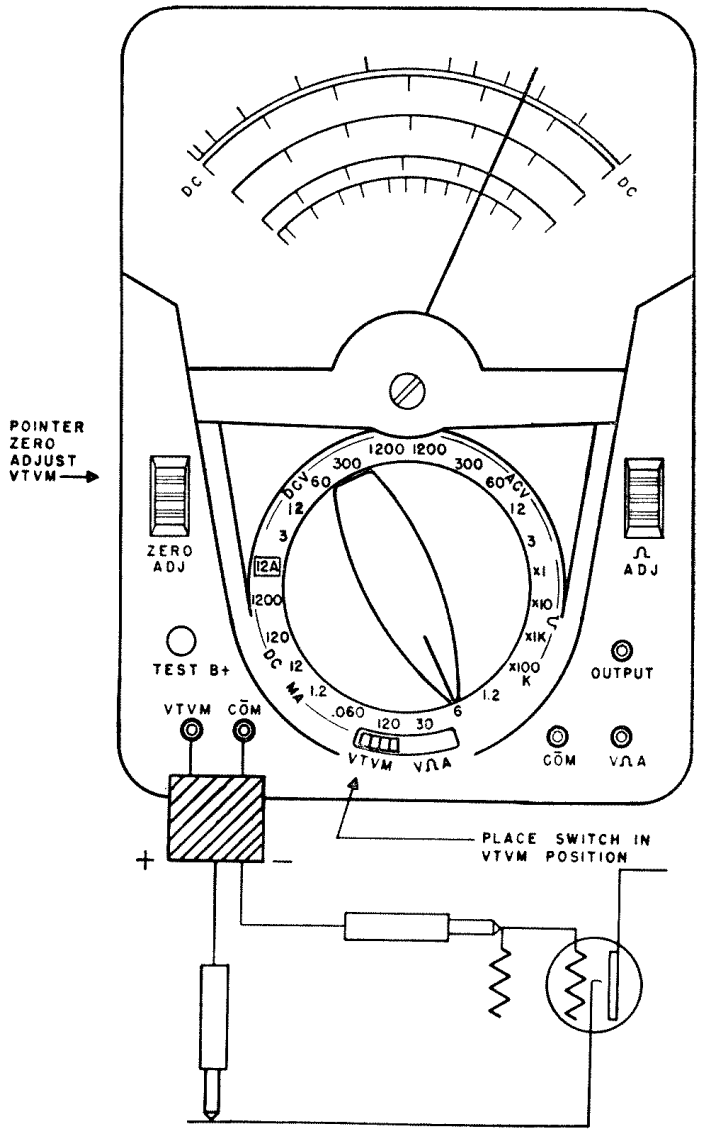
The VTVM high sensitivity of 11 Megohms is valuable for measurements in low current circuits such as grid and discriminator circuits.

See page 25 for procedure to check condition of the internal batteries which operate the VTVM circuit.

**For handy operation chart see pages 16 and 17.**



## Measuring DC Volts



## OPERATING INSTRUCTIONS

### Measuring DC Volts

### 20,000 ohms per volt

Rotate the selector switch to the appropriate range for DC volts. Always start with the highest range if in doubt as to the approximate voltage.

In choosing ranges, endeavor to have the readings fall in the upper, or right hand, half of the scale for greatest accuracy.

Plug the black test lead into the COM jack and the red lead into the V-Ω-A jack as shown on page 9.

Connect the test prods ACROSS the voltage source. The red lead is positive. Where polarity is difficult to determine, the meter may read backwards. No damage will be done if this occurs. Simply reverse the leads.

Read all DC voltages on the top black meter scale. Notice that the scales are not all marked exactly the same as the range indicated by the knob position. Thus 0-3 volts is read on the 0-300 scale by omitting two zeros (i. e.÷by 100) on all readings; the 0-1200 range is read on the 0-12 scale by adding two zeros.

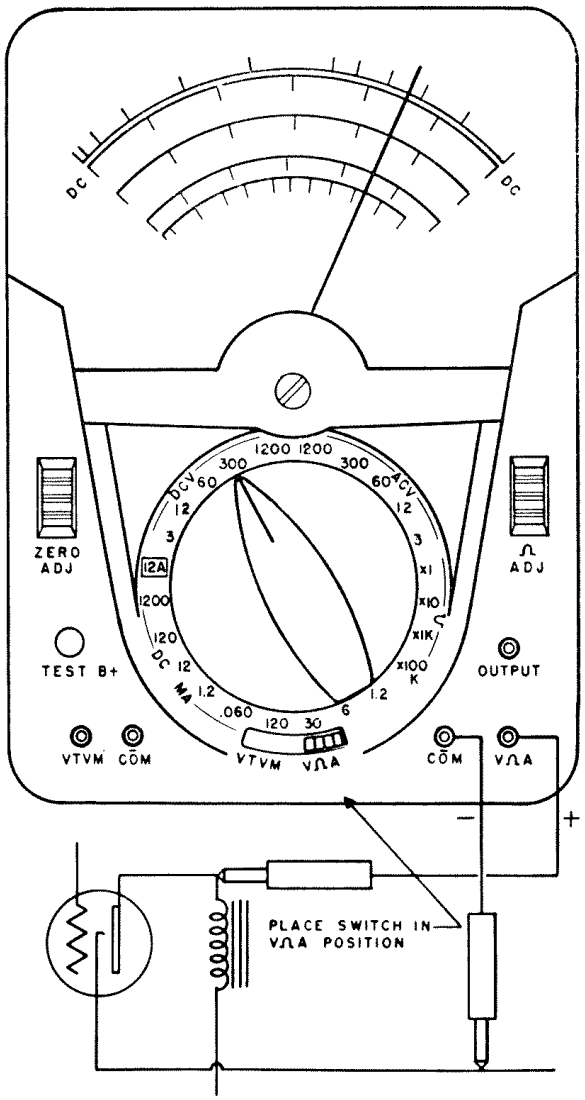
The high sensitivity of the VTVM will allow you to take measurements in low current circuits such as grid and discriminator circuits. See page 6.

CAUTION: For maximum safety do not handle tester or leads when connected to high voltages. Make certain that no condensers are charged to a high voltage.

**For handy operation chart see pages 16 and 17.**



**Measuring DC Volts**
**20,000 ohms per volt**



## OPERATING INSTRUCTIONS

### Measuring AC Volts

Rotate the Selector switch to the appropriate range for AC volts. Always start with the highest range if in doubt about the approximate voltage.

In choosing ranges, endeavor to have the readings fall in the upper, or right hand, half of the scale for greatest accuracy.

Plug the black lead into the COM jack and the red lead into the V-Ω-A jack as shown on page 11.

Connect the test prods ACROSS the voltage source. As there is no polarity on AC, the red and black leads may be interchanged without causing the meter to read backwards.

Use the two lower red scales for AC volt readings. Note that the bottom scale is to be used ONLY for one range, namely the 0-3.

When using the 0-1200 AC volt range, read on the 0-12 scale by adding two zeros.

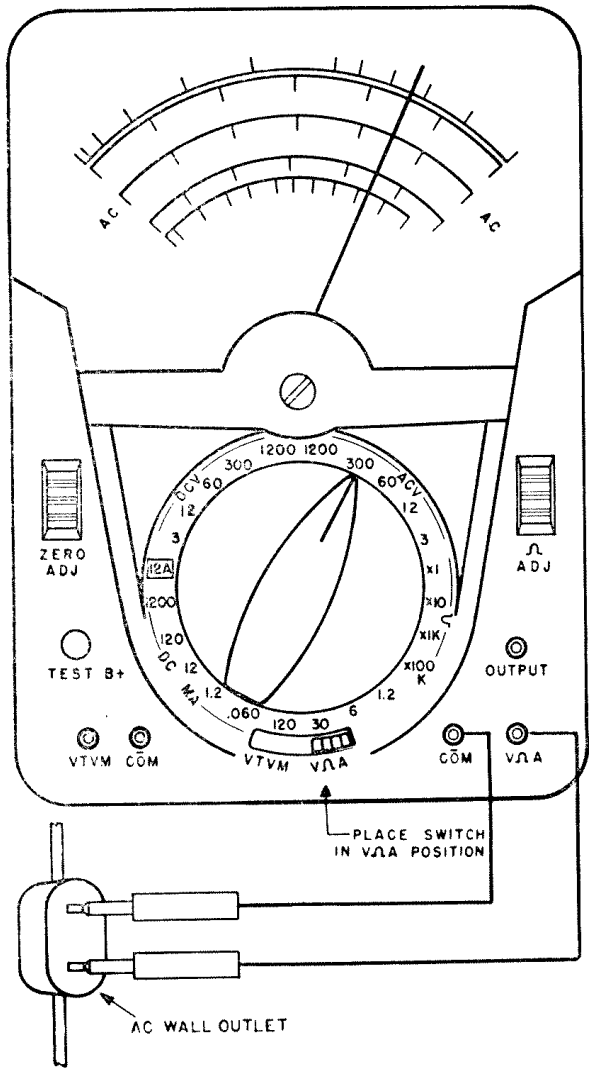
No correction for frequencies is necessary from 25 c. p. s. to 1000 c. p. s.

CAUTION: For maximum safety do not handle tester or leads when connected to high voltages.

**For handy operation chart see pages 16 and 17.**



### Measuring AC Volts
### 5000 ohms per volt



### Resistance Measurements DC

Rotate the selector switch to the appropriate range for ohms determined for the following chart:

| To Read | Set Switch to |
|---|---|
| 0-1500 ohms | Ω×1 |
| 0-15,000 | Ω×10 |
| 0-15 Meg. | Ω×1K |
| 0-150 Meg. | Ω×100K |

Plug the black test lead into the COM jack and the red lead into the V-Ω-A jack as shown on page 13.

Short the test prods together and adjust the Ω ADJ knob until the meter pointer reads 0 on the top red (Ω) scale. (The 0 for the ohms scale is at the extreme right side of the scale).

Connect the test prods across the resistor as shown. If the resistor is wired in a circuit, disconnect one end of the resistor before taking the reading.

Each time an ohm range is changed, it is well to check the 0 setting as outlined in paragraph 3 above.

The basic scale 0-1.5K (0-1500) is used for reading on all ohm ranges. Simply multiply the scale numbers by 1, 10, 1000, or 100,000 as indicated by the selector switch setting.

It should be kept in mind that in the measurement of resistance a current is passed through the unknown resistor. Generally this current is so small as to be negligible. However on the 0-1500 range fairly high current is employed.

**CAUTION: On X1 ohm position, the current drain from the 1.5 volt battery at center scale reading is approximately 100 MA. It is desirable to make a practice of using one of the higher ohm ranges for general continuity or circuit testing. This will give much longer battery life.**

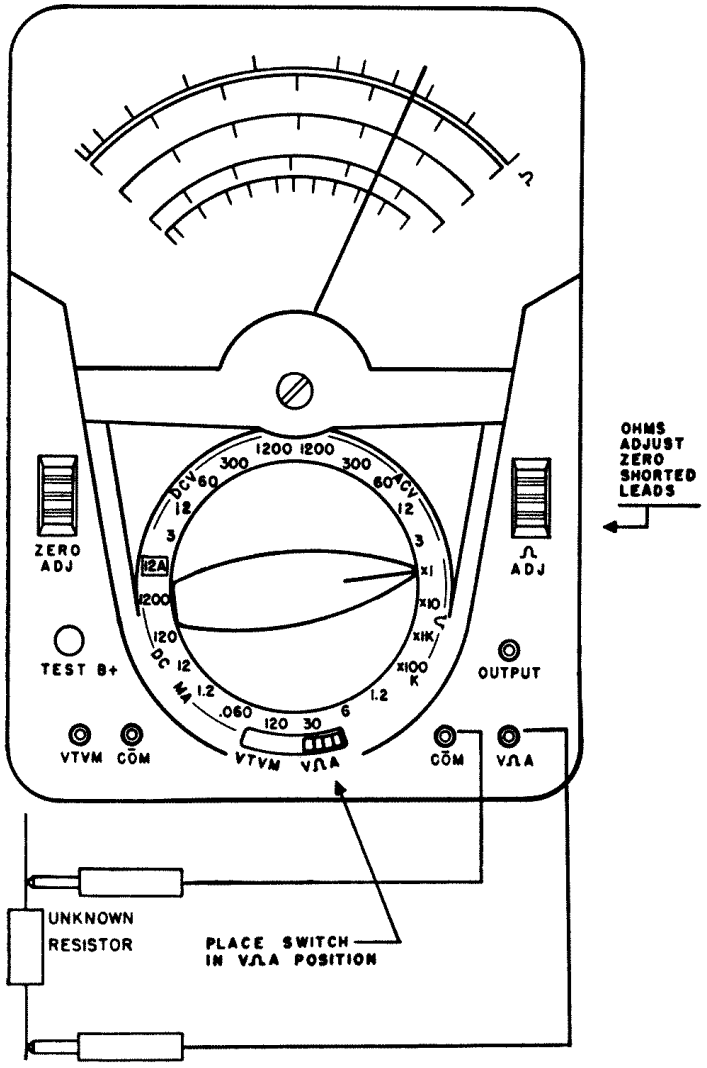
**NOTE: In the ohms circuit the battery polarity at the leads is reversed from what the lead colors would seem to indicate (i. e., the red lead is actually the negative of the battery.) In checking diodes and transistors, reverse the leads in the tester to provide the proper indicated direction of current flow.**

Since the scale of an ohmmeter is non-linear, the accuracy of the reading cannot be expressed as a per cent of full scale. Ohmmeter accuracy is generally referred to a linear scale such as the DC volt scale. Thus ±3% ohmmeter accuracy means an allowable ±1.8 divisions on the DC scale. For example 2 ohms could read from about 1.7 to 2.3 ohms and be within tolerance.

**For handy operation chart see pages 16 and 17.**



### Resistance Measurements DC



## Measuring DC Current

Rotate the selector switch to the appropriate range for DC current. Always start with the highest range if in doubt as to the approximate current.

In choosing ranges, endeavor to have the readings fall in the upper, or right hand, half of the scale for greatest accuracy.

Plug the black test lead into the COM jack and the red lead into the V-Ω-A jack as shown on page 15.

Connect the test prods in SERIES with the circuit to be measured. Do not test directly across any potential circuits as this may burn out the instrument and shunt. The red lead is positive. Where polarity is difficult to determine, the meter may read backwards. No damage will be done if this occurs. Simply reverse the leads.

Read all current ranges (including microamperes, milliamperes, and amperes) on the upper black scale. When on the 1.2 Ma. range use the 0-12 scale and divide by 10. On the 120 Ma. range again use the 0-12 scale by multiplying by 10.

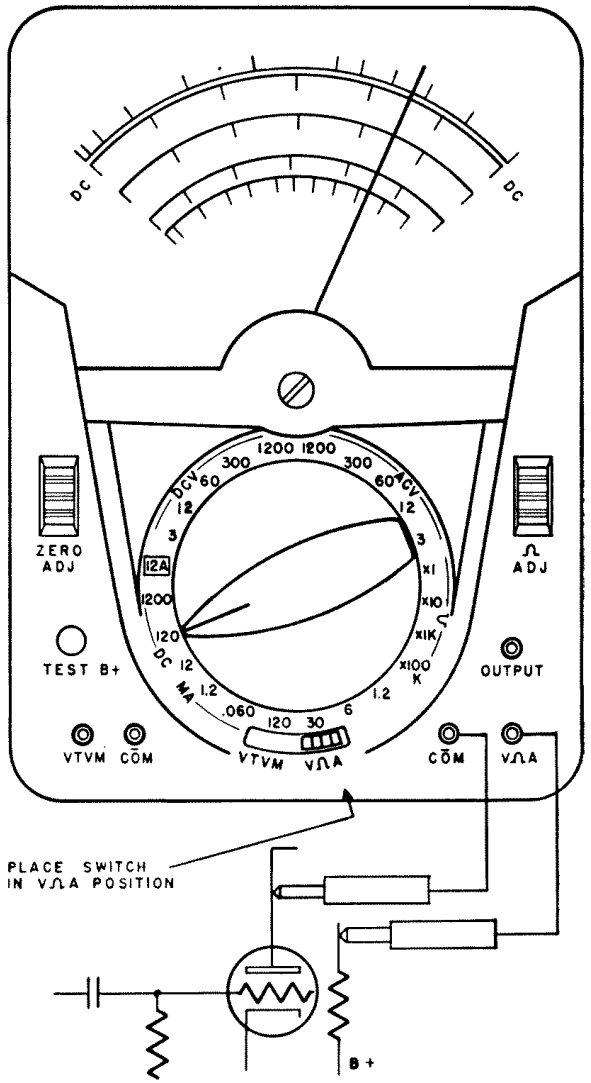
CAUTION: Turn off the power before connecting the meter to the circuit. Do not handle tester or leads in high voltage circuits.

In using the 60 microampere range, the meter may read differently than calculations would indicate. This is sometimes caused in low current circuits by a slight leakage of voltage due to moisture. Other times a slight potential is generated by soldering or joining of dissimilar metals. Even the proximity of fumes or liquid acids and alkalies may react with the metal parts of the circuit and generate slight currents. The fingers should not be permitted to touch the metal parts of the prods or circuit as body resistance can also upset some circuits.

**For handy operation chart see pages 16 and 17.**



## Measuring DC Current



| To Measure | Set Range Selector Switch | VTVM-V-Ω-A Switch Position | Lead Connection | Read Scale | Scale Factor |
|---|---|---|---|---|---|
| DC VOLTS VTVM | | | | BLACK SCALE | |
| 0-1.2 | 1.2 | VTVM | VTVM Leads | 12 | ÷10 |
| 0-6 | 6 | | | 60 | ÷10 |
| 0-30 | 30 | | | 300 | ÷10 |
| 0-120 | 120 | | | 12 | ×10 |
| DC VOLTS 20,000 | DCV | | | BLACK SCALE | |
| 0-3 | 3 | V-Ω-A | COM. & V-Ω-A | 300 | ÷100 |
| 0-12 | 12 | | | 12 | |
| 0-60 | 60 | | | 60 | |
| 0-300 | 300 | | | 300 | |
| 0-1200 | 1200 | | | 12 | ×100 |
| AC VOLTS (rms) | ACV | | | RED SCALE | |
| 0-3 | 3 | V-Ω-A | COM. & V-Ω-A | 3 | |
| 0-12 | 12 | | | 12 | |
| 0-60 | 60 | | | 60 | |
| 0-300 | 300 | | | 300 | |
| 0-1200 | 1200 | | | 12 | ×100 |
| OHMS | OHMS | | | RED OHM SCALE | |
| 0-1500 | ×1 | V-Ω-A | COM. & V-Ω-A | 0-1.5K | |
| 0-15000 | ×10 | | | 0-1.5K | ×10 |
| 0-1.5 Meg. | ×1K | | | 0-1.5K | ×1000 |
| 0-150 Meg. | ×100K | | | 0-1.5K | ×100,000 |
| MILLIAMP. DC | DC-MA | | | | |
| 0-.060 | .060 | V-Ω-A | COM. & V-Ω-A | 60 | ÷1000 |
| 0-1.2 | 1.2 | | | 12 | ÷10 |
| 0-12 | 12. | | | 12 | |
| 0-120 | 120. | | | 12 | ×10 |
| 0-1200 | 1200. | | | 12 | ×100 |
| AMPERES DC | | | | | |
| 0-12 | 12A | V-Ω-A | COM. & V-Ω-A | 12 | |
| DECIBELS | | | | BLACK SCALE | |
| −20 to +11 | 3 ACV | V-Ω-A | COM. & Output | DB | +0 |
| − 8 to +23 | 12 ACV | | | DB | +12 |
| + 6 to +37 | 60 ACV | | | DB | +26 |
| +20 to +51 | 300 ACV | | | DB | +40 |
| +32 to +63 | 1200 ACV | | | DB | +52 |

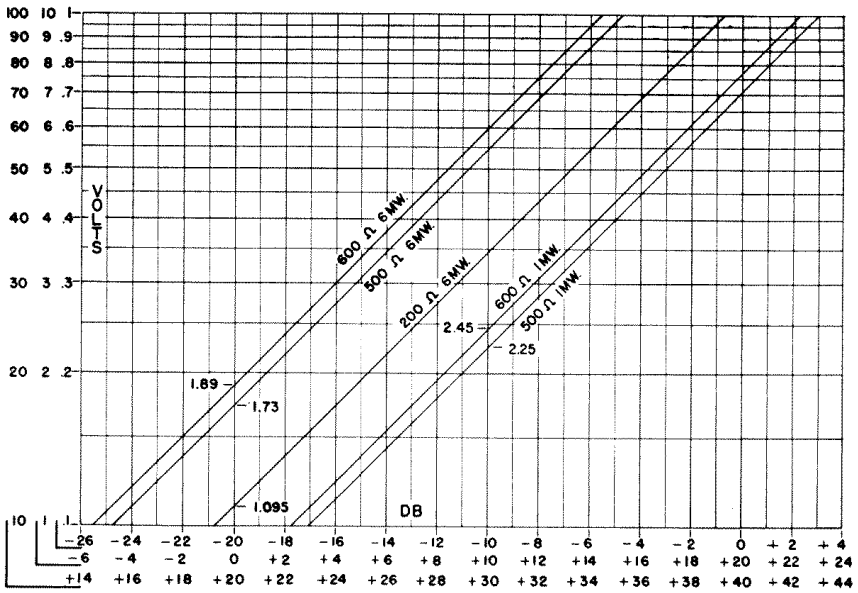
## A. F. or Decibels

Audio output generally is measured in units called the Decibel, a terminology used to indicate audio power levels in an amplifier or telephone work. Zero DB is set at .775 Volts, this being the voltage developed across a 600 Ohm line when .001 Watt is dissipated in the line.

DO NOT confuse the DB with the VU (Volume Unit.) The VU is based on .001 Watt dissipated in a 600 ohm line and is measured with a meter having special ballistic characteristics.

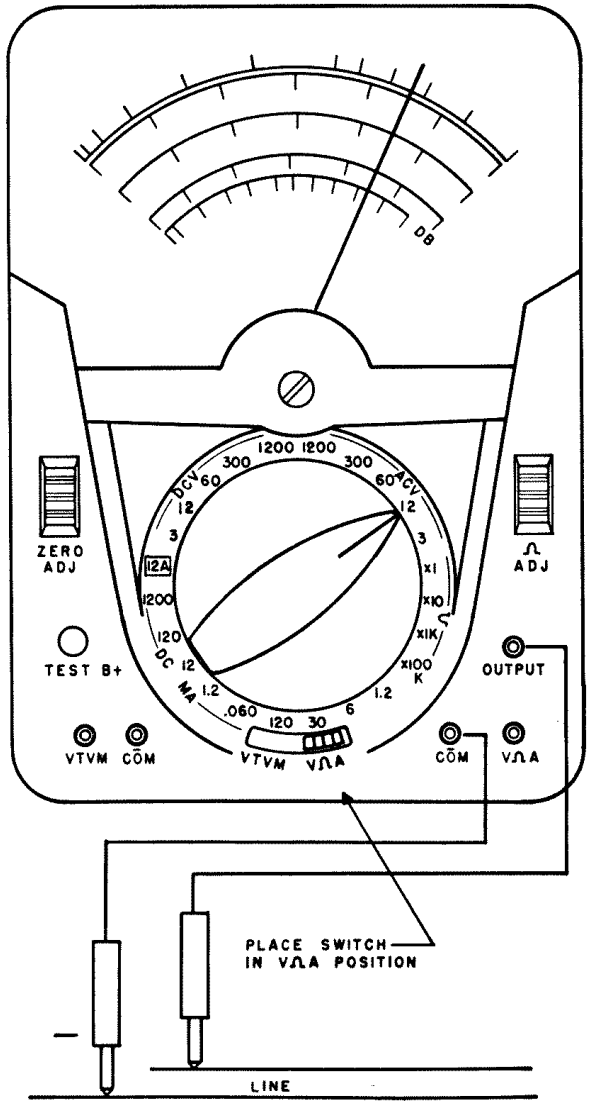
Decibels are measured by means of the Black DB Scale. Leads connected as shown on page 19.

For reading DB other than 600 ohm line and 1 MW reference level use chart below.






## Reading A. F. or Decibels



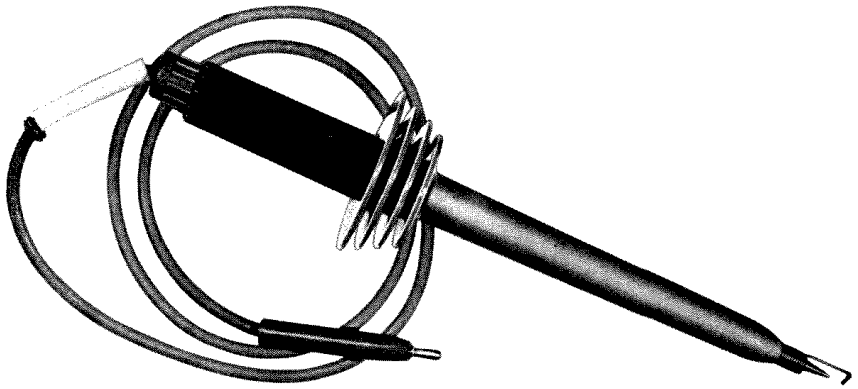
## ADDITIONAL MEASUREMENTS

### Measuring Kilovolts

For measuring the high voltage employed in television receivers and in other applications, an external probe is available. See figure below. Probes are made in three ranges, 0-12,000, 0-30,000, and 0-60,000 volts. Common usage is on DC but probes for AC also are available in the lower ranges.

To use, set the 631 selector switch to 3 volts (AC if an AC probe is used, and DC if DC probe is used). Plug the probe lead into the V-Ω-A jack on the panel and the black test lead into the COM jack. V-Ω-A—VTVM selector set to V-Ω-A position.

Extremely high voltages are present in television sets. Use EXTREME CAUTION in measuring these and other sources of high voltage.





### Measuring High DC Current

External plug-in shunts are available to extend the DC current ranges of your 631 from the self-contained 0-12 to 0-30 amps. External portable shunts up to 120 amperes also are available. (See paragraph on accessories.)

Set the 631 selector switch to the 12 Ma. position and plug the desired external shunt into the COM and V-Ω-A jacks. Connect the line to be measured to the binding posts on top of the shunts. The external portable shunts are too large to plug into the panel and must be connected to the panel jacks by the leads furnished with the shunts.

### Accessories

The following accessories for your 631 are available from your distributor:

| Item | Part No. |
|---|---|
| RF Probe 50Kc to 250Mc ± 3 DB | T-79A-145 |
| DC Hi-Voltage probe 0-12 Kv | T-79-68 |
| AC Hi-Voltage probe 0-12 Kv | T-79-69 |
| DC Hi-Voltage probe 0-30 Kv | T-79-70 |
| AC Hi-Voltage probe 0-30 Kv | T-79-71 |
| DC Hi-Voltage probe 0-60 Kv | T-79-93 |
| Carrying cases | 639, 639-N & 639-P |
| Plug-in external shunt 0-30 DC Amp. | T-91-247 |
| Portable external shunt 0-60 DC Amp. | T-91-248 |
| Portable external shunt 0-120 DC Amp. | T-91-255 |
| Clamp-on Adapter, Model 10 | 60A-211 |
| Lead assembly, No. 611 (used in conjunction with Model 10) | 79A-160 |
| Line separator, Model 101 (used in conjunction with Model 10) | 60A-218 |

Special instruments or testers can be obtained from the Triplett Company which manufactures a complete line of electrical measuring instruments, radio and TV test equipment.

### In The Home

When your refrigerator motor fails to "kick out" the starting winding use the 631 to measure the AC line voltage. If the voltage is below about 100 volts, notify your power company.

If your electric stove does not seem to heat quickly enough, measure the voltage input to the stove with all burners turned on and again with all burners turned off. If the difference between these two voltages is 10 or 15 volts, the power cable to the stove has defective connections or is not of large enough current carrying capacity.

Blown fuses sometimes do not visibly indicate they are burned out. With your 631, measure the voltage ahead after the fuse. Voltage ahead of the fuse but no voltage following indicates a blown, defective, or loose fuse. Sometimes it is easier to remove the fuse and measure its resistance. This should be substantially zero.

Your 631 is handy for locating trouble in desk and floor lamps. Pull the plug from the wall socket and check for a faulty cord, plug, switch, socket, or bulb by measuring resistance on the $\Omega \times 1$ range. 100 watt 120 volt bulbs should read 10 to 20 ohms. 50 watt 120 volt bulbs should read 20 to 40 ohms.

### For the Radio Man

In addition to all common voltage, current, and resistance measurements used in servicing radios, the high sensitivity of your 631 is well adapted for measuring AFC, AVC, bias, and FM discriminator voltages.

Measurements of the high voltage up to 27,000 volts used in some television receivers for the picture tube can be effected with the special high voltage probe shown on page 20.

Considerable trouble is had with leakage in automobile radio antennas (due to moisture). Your 631 with the high ohm range 0-150 meg. is ideal to check this leakage. Disconnect the antenna from the receiver before making this check.



### In The Industrial Plant

Your 631 will be a big help in checking voltage drop caused by adding that extra machine on the already overloaded line. Correcting this will often save time later when a rush comes and the line "just happens" to burn up.

Measure the voltage at the machine first with the machine turned off and again with the machine in operation. If the voltage is proper with the machine off but low with the machine in operation, the circuit wiring or transformers have too small a capacity. If the voltage is low even with the machine off, the circuit is probably already overloaded and the machine should be wired into another circuit.

Equipment using automatic electric controls can be checked with the 631. Faulty relay or control action is often caused by low voltage applied to the relay or control. This low voltage in turn, may be caused by burned or dirty contacts on the control device. Use the $\Omega \times 1$ range to check for high or unstable contact resistance.

When a phone on your dial telephone system fails, measure the line current and the voltage to the particular relay in question. If the voltage is proper, measure the contact resistance of the relay contacts using the $\Omega \times 1$ scale on your 631. If this resistance is over a fraction of an ohm or if the resistance seems to waver, clean and adjust the relay contacts.

### In The Garage

Fuses in the automobiles have a tendency to look perfectly good and yet not function due to corrosion under the metal end cap. Measure voltage ahead and behind the fuse to determine a defective unit; or remove the fuse and measure its resistance. Anything over a fraction of an ohm is too high.

Checking automobile wiring, light switches, heaters, radios, etc., can be speeded up by simple use of your 631.

**In The Laboratory**

Your 631 is built with all precision, non-aging resistors. The specially designed switch and special banana type plugs insure lasting accuracy. The meter with specially finished and selected pivots and jewels and a well designed stable magnet further makes the 631 a must for the laboratory.

**Special Applications**

The unusually high range ohmmeter in your 631 permits some indication of condenser leakage resistance. Measure as a resistor, see page 12, using the highest range. A good paper or mica condenser under 1 mfd. will indicate at the 150 Meg mark or above. If a steady reading (taken after the initial surge required to charge the condenser) of less than 150 megohms is obtained, the condenser probably has defective insulation. Good paper condensers over 1 mfd. may read somewhat less than 150 megohms. Electrolytic condensers should read above .1 megohm. In checking electrolytic condensers, the black test lead ("com" jack) should be connected to the positive terminal of the condenser.

Checks of insulation resistance for motors, generators, telephone cables, power cables, etc., can be made on the high ohmmeter range of your 631. The actual value of resistance may vary from a few megohms to over 150 meg, depending on weather conditions and quality of insulation. The best method, therefore, is to make periodic checks on important cables or equipment and observe the trend in readings. As the readings tend to be lower and lower, it is time to start drying out the equipment or determine the cause of deterioration. Dirt, mice, or foreign matter can sometimes cause excessive leakage.

**VTVM Applications**

The VTVM section of your Model 631 has a constant input impedance of 11 megohms. This high impedance together with the shielded and isolated probe permit measurements in very low current circuits without upsetting the circuit. Grid and discriminator circuits used in radio and television are typical examples.



**Pointer Zero Adjust**

When using VOM ranges the pointer can be zero adjusted with the pointer zero adjust screw shown on page 26.

**Checking And Replacing Batteries**

VTVM batteries can be checked without removing the case. To check the VTVM plate batteries, place slide switch in VTVM position, and press the button marked Test B+. See page 26. The plate battery should read approximately 21 to 24 i.e. between the two short red marks immediately above the DC V scale.

The VTVM filament battery (1.5v) is satisfactory as long as the X1 ohm range of the VOM section can be adjusted to zero as explained on page 12.

The 1.5 volt battery also powers the X1, X10, and X1K ohm ranges. It is satisfactory as long as these ranges can be adjusted to zero.

The X100K ohm range operates from the two 22½ volt batteries. As long as this range can be adjusted to zero these batteries are satisfactory for ohms (but not necessarily for VTVM).

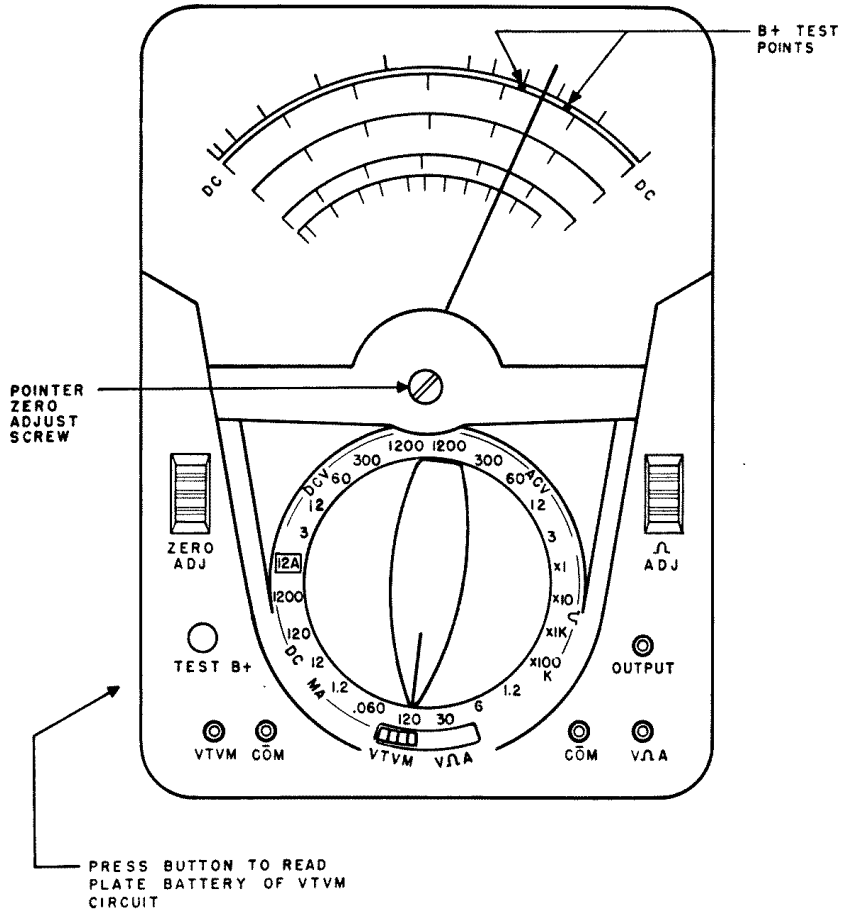
To replace the batteries, remove the four case screws in the back corner holes in which the rubber feet are mounted. Use a narrow screwdriver to avoid breaking out the corners of the case. After case has been removed, the batteries can easily be changed. Both 22½ volt batteries should be changed together as they work in a balanced bridge circuit.

**Cleaning Procedure For Lucite Window**

If the window needs cleaning, it should be done with absorbent cotton dipped in a solution made by dissolving ½ teaspoon of detergent, such as Vel or Dreft, in one gallon of water. Allow this solution to air dry and do not rinse with clear water.

**Replacing 1R5 Tube**

Should it become necessary to replace the 1R5 tube, it will be necessary to recalibrate by adjusting resistor R32.



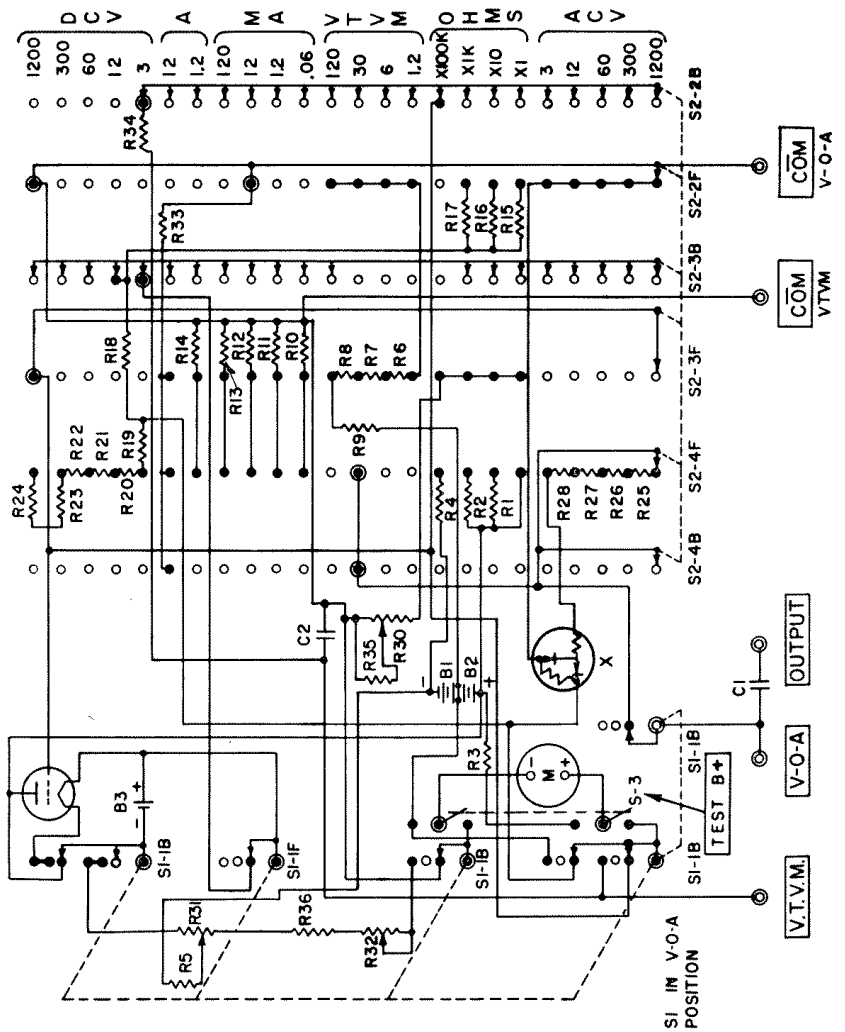

Avoid placing your tester on a bench where machine tools are used or severe vibration is encountered.

If the unit has not been in use for a long period of time, rotating the switch in both directions several times will wipe the **contacts clean for good contact.**

In use, don't take chances on overloading the meter. If in doubt as to the approximate reading **always start with the highest range.** The meter can be burned out **by applying** voltage when the switch is set on the current or **ohms scale.**

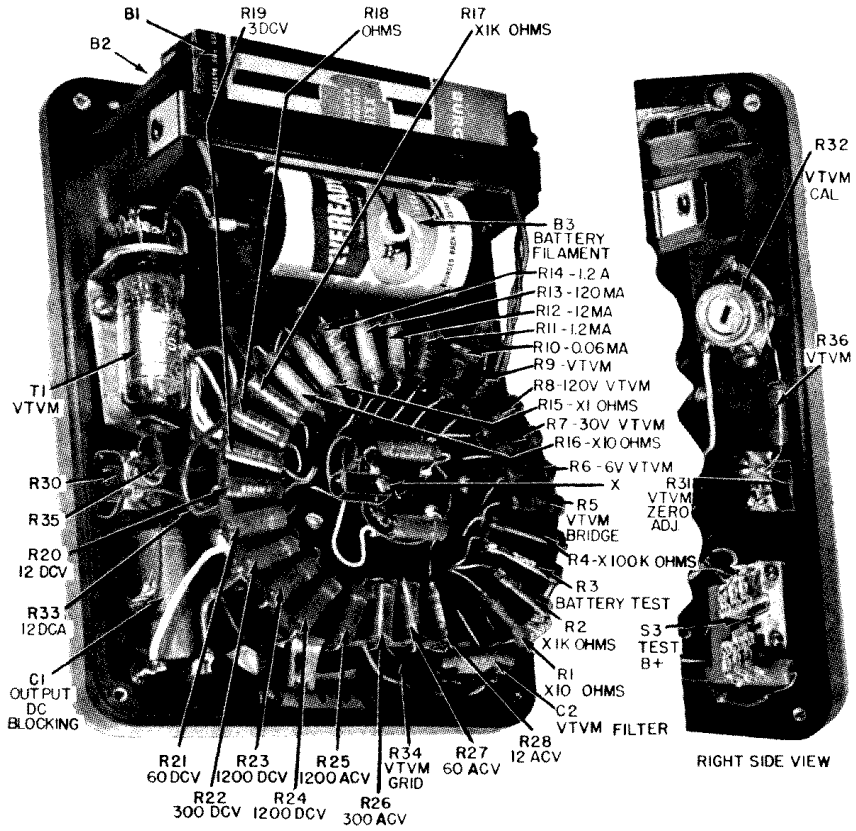


## CIRCUIT DIAGRAM



## Interior View

## PARTS LOCATION



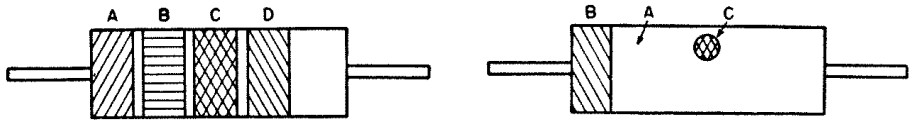

# REPLACEABLE PARTS 631

Above Serial 25,000



| NO. REF. | QUAN. | NAME PART | DESCRIPTION | TRIPLETT PART NO. |
|---|---|---|---|---|
| B1, B2 | 2 | Battery | 22 ½V Burgess No. XX15 | T-37-20 |
| B3 | 1 | Battery | 1½V Eveready No. E95 D cell (Alt. Mallory M13F) (NEDA No. 13) | 37-24 |
| C1 | 1 | Capacitor | 0.1 Mid. 400V Midget | T-43-69 |
| C2 | 1 | Capacitor | 0.01 Mfd. 400V | T-2631-P14 |
| R1 | 1 | Resistor | 4 ohm, Wirewound | T-15-1258 |
| R2 | 1 | Resistor | 530 ohm, ±1% Film, ½W | T-15-2558 |
| R3 | 1 | Resistor | 600K ohm, ±1% Film ½W | T-15-2430 |
| R4 | 1 | Resistor | 656K ohm, ±1% Film ½W | T-15-1768 |
| R5 | 1 | Resistor | 40K ohm, ±1% Film ½W | T-15-1131 |
| R6 | 1 | Resistor | 8 megohm, ±1% Film ½W | T-15-2431 |
| R7 | 1 | Resistor | 1.6 megohm, ±1% Film ½W | T-15-2432 |
| R8 | 1 | Resistor | 300K ohm, ±1% Film, ½W | T-15-2433 |
| R9 | 1 | Resistor | 100K ohm, ±1% Film, ½W | T-15-2442 |
| R10 | 1 | Resistor | 25K ohm, ±1% Film, ½W | T-15-1235 |
| R11 | 1 | Resistor | 217.4 ohm, ±1%, ½W | T-15-1255 |
| R12 | 1 | Resistor | 20.9 ohm, ±1%, Wirewound | T-15-1254 |
| R13 | 1 | Resistor | 2.09 ohm, ±1%, Wirewound | T-15-1253 |
| R14 | 1 | Resistor | 0.208 ohm, ±1%, Wirewound | T-15-1853 |
| R15 | 1 | Resistor | 6.4 ohm, ±1%, Wirewound | T-15-2413 |
| R16 | 1 | Resistor | 63 ohm, ±1%, Wirewound | T-15-2414 |
| R17 | 1 | Resistor | 9.2K ohm, ±1%, Film, ½W | T-15-1163 |
| R18 | 1 | Resistor | 15K ohm, ±1%, Film, ½W | T-15-1206 |
| R19 | 1 | Resistor | 55K ohm, ±1%, Film, ½W | T-15-2434 |
| R20 | 1 | Resistor | 180K onm, ±1%, Film, ½W | T-15-1237 |
| R21 | 1 | Resistor | 960K ohm, ±1%, Film, ½W | T-15-2435 |
| R22 | 1 | Resistor | 4.8 megohm, ±1%, Film, ½W | T-15-2436 |
| R23 R24 | 2 | Resistor | 9 megohm, ±1%, Film, ½W | T-15-2437 |
| R25 | 1 | Resistor | 4.5 megohm, ±1%, Film, ½W | T-15-1231 |
| R26 | 1 | Resistor | 1.2 megohm, ±1%, Film, ½W | T-15-2438 |
| R27 | 1 | Resistor | 240K ohm, ±1%, Film, ½W | T-15-1238 |
| R28 | 1 | Resistor | 45K ohm, ±1%, Film, ½W | T-15-1060 |
| R30 | 1 | Resistor | 20K ohm, variable | T-16-31 |
| R31 | 1 | Resistor | 6K ohm, variable | T-16-123 |
| R32 | 1 | Resistor | 3500 ohm, variable | T-16-90 |
| R33 | 1 | Resistor | Shunt, 12A 250MV | T-90A-371 |
| R34 | 1 | Resistor | 10 megohm, ±10%, ½W | T-2601-½-10 meg |
| R35 | 1 | Resistor | 5.1K ±5%, Composition ½W | T-15-1411 |
| R36 | 1 | Resistor | 3K ±1%, Composition ½W | T-15-1195 |
| X | 1 | Rectifier | Assembly | T-2250-13N |
| | 1 | Knob | 2 5/16L Red with clip | 34B-62 |
| | 1 | Clip | Tinnerman | T-2451-51 |
| | 1 | Knob | Slide switch | 34B-47 |
| | 1 | Button | Switch | T-62A-2 |
| S1-S2 | 1 | Switch | 24 pos. and 2 pos. w/out resistors | T-22A-317 |
| S1-S2 | 1 | Switch | 24 pos. and 2 pos. with resistors | 22-318 |
| S3 | 1 | Switch | Push Button | T-22-247 |
| | 1 | Switch | 24 pos. with resistors | 22-318 |
| | 1 pr. | Leads | Banana Type | T-79-127 |
| | 1 | Leads | VTVM | T-79A-142 |
| | 1 | Case | Bakelite, with Strap Handle | T-10-784 |
| | 1 | Front | Clear Plastic with Zero Adj. | T-10-1225 |
| | 1 | Ball | Bearing, 1/8D | 10779 |
| | 1 | Spring | Helical | T-42-148 |
| | 1 | Plate | Slide Type | 10784 |
| | 5 | Contact | Jack | 8944 |
| T1 | 1 | Tube | 1R5 | T-2600-1R5 |
| M | 1 | Instrument | 50 UA, 250 MV, with panel | 52-1423 |

## EIA RESISTOR COLOR CODE




| COLOR | INDICATES |
|---|---|
| A | First number |
| B | Second number |
| C | Number of zeros |
| D | Tolerance |

| Color | Number | Color | Number |
|---|---|---|---|
| Black | 0 | Violet | 7 |
| Brown | 1 | Gray | 8 |
| Red | 2 | White | 9 |
| Orange | 3 | Gold | 5% tolerance |
| Yellow | 4 | Silver | 10% tolerance |
| Green | 5 | None | 20% tolerance |
| Blue | 6 | | |

The resulting value is in ohms.

**Example:**

A 250,000 ohm 20% resistor.

A red
B green
C yellow
D no color

## EIA SPEAKER COLOR CODE

**Voice—Coil:**
Green—finish
Black—start

**Field Coils:**
Black and red—start
Yellow and red—finish
Slate and red—tap (if any)

## EIA WIRING COLOR CODE

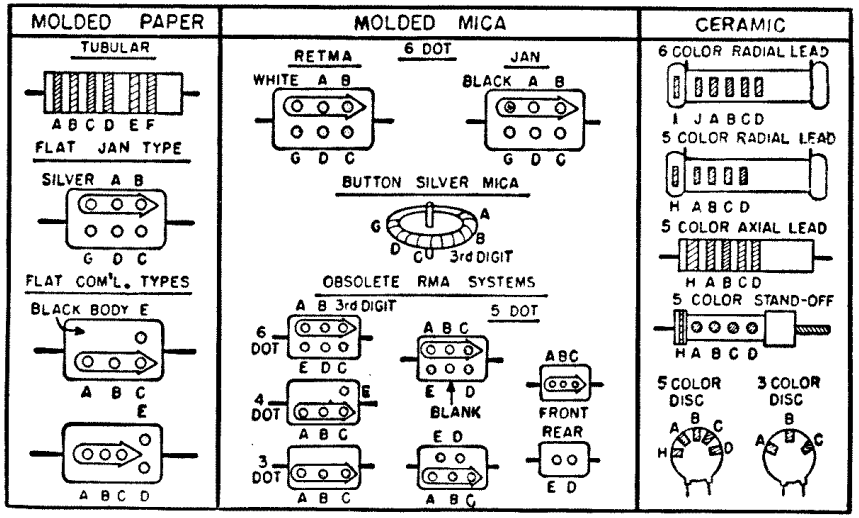
| | |
|---|---|
| B+ | Red |
| Ground | Black |
| Plate | Blue |
| Grid | Green |
| Cathode | Yellow |
| High Heater | Brown |
| Low Heater | Black |
| Screen Grid | Orange |
| AVC | White |



## EIA MICA CONDENSER COLOR CODE

| | MOLDED PAPER | | MOLDED MICA | | CERAMIC | |
|---|---|---|---|---|---|---|
| **Color** | **Multiplier** | **Tolerance** | **Multiplier** | **Tolerance** | **Multiplier** | **Tolerance** |
| **Black** | 1 | 20% | 1 | 20% | 1 | 20% or 2.0μμfd.* |
| **Brown** | 10 | | 10 | | 10 | 1% |
| **Red** | 100 | | 100 | 20% EIA | 100 | 2% |
| **Orange** | 1000 | | 1000 | 3% EIA | 1000 | 2.5% EIA |
| **Yellow** | 10,000 | 5% | 10,000 | | 10,000 | |
| **Green** | | | | 5% EIA | | 5% or 0.5μμfd.* |
| **Blue** | | | | | | |
| **Violet** | | | | | | |
| **Gray** | | | | | 0.01 | 0.25μμfd.* |
| **White** | | 10% | | | 0.1 | 10% or 1.0μμfd.* |
| **Gold** | 0.1 | 5% | 0.1 | 5% (JAN) | | |
| **Silver** | | 10% | 0.01 | 10% | | |
| **None** | | 20% | | | | |

* Capacitance less than 10μμfd.




(Courtesy Popular Electronics)

Capacitance is given in μμfd.
Colors—Same value as on resistors except as indicated in tables.

| COLORS | INDICATES |
|---|---|
| **A** | First digit |
| **B** | Second digit |
| **C** | Multiplier |
| **D** | Tolerance |
| **E & F** | Voltage Rating in hundreds of volts |

**[(E) Ratings less than 1000 volts. (E) & (F) First two digits of ratings 1000 volts or more. Values of colors for (E) & (F) are same as in resistance values. (G) is class or characteristics of capacitor. (H), (I) & (J) give temperature coefficient. (G), (H), (I) & (J) are not listed in the tables.]**

# INDEX