

ASSEMBLY INSTRUCTIONS

RCA WO-33A(K)

OSCILLOSCOPE



SECTION A INTRODUCTORY INSTRUCTIONS



RADIO CORPORATION of AMERICA

ELECTRON TUBE DIVISION
ELECTRONIC INSTRUMENTS

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Introductory Instructions

The RCA WO-33A(K) is a portable, wide band, 3-inch oscilloscope, featuring exceptional high-gain qualities. Whether you are an Electronic Hobbyist, TV Technician, or Engineer, it will provide you with an extremely useful test instrument. You can use this scope for many testing operations, including the construction, modification, or maintenance of PA systems, radio receivers, Hi Fi equipment, and both black and white and color TV.

The WO-33A(K) utilizes a laminated circuit board to provide a rugged, pre-wired mounting for the components, yet making assembly of the instrument as easy for you as possible. If you insert the parts properly and solder carefully, you will have a neat and trouble-free assembly.

The assembly instructions are separated into functional sections, with the instructions, illustrations, and parts lists complete within each section. Each worksheet has its own work area — you actually construct the assembly right on the sheet. All of the instructions and illustrations are available to you at a glance, and no cross-referencing to other sections will be necessary. The sections are lettered, and each individual operation is numbered, e.g. Section A, step 1,2,3, etc. Each step is checked upon completion, thereby reducing the possibility of missing parts or unsoldered connections.

Before you start assembling your WO-33A(K), read this Introductory Instruction Booklet carefully, paying particular attention to the sections entitled “Glossary of Terms,” and “Abbreviations, Definitions, and Symbols.” The information contained in these sections will help you to understand and follow the assembly instructions.

Examine the component parts in the kit and check each item against the parts list at the beginning of each step. The schematic diagram contained in this booklet may also be helpful in identifying certain parts.

Finally, read the entire sentence or paragraph of each step before you proceed with the actual construction. Follow the step-by-step procedure exactly as written. Position each part and lead according to the description and illustrations. Solder carefully. Above all, take your time. The few extra minutes the construction will take may save you many hours of checking to find a mistake.

NOTE: If any difficulties are experienced in the assembly of this kit, consult the RCA Distributor from whom it was purchased. He will advise you, or give you the name of the nearest service depot if expert service appears to be required.

Soldering

A good many of the troubles experienced by kit builders are due to improper soldering. Soldering a part in the circuit does more than hold the part in place. The solder forms the electrical connection, and unless you make it properly, the instrument may be inoperative or have erratic operation.

Preparation of the Soldering Iron or Gun

If you have a new soldering iron, or one that has not been used for some time, it should be cleaned and “tinned” before it is used. To tin the iron, file the tip (keeping the original shape of the tip) so that the copper is exposed. Then heat the iron and apply rosin-core solder until the tip is coated with solder. Remove the excess solder with a clean cloth or soft wire brush of the type used for cleaning suede shoes.

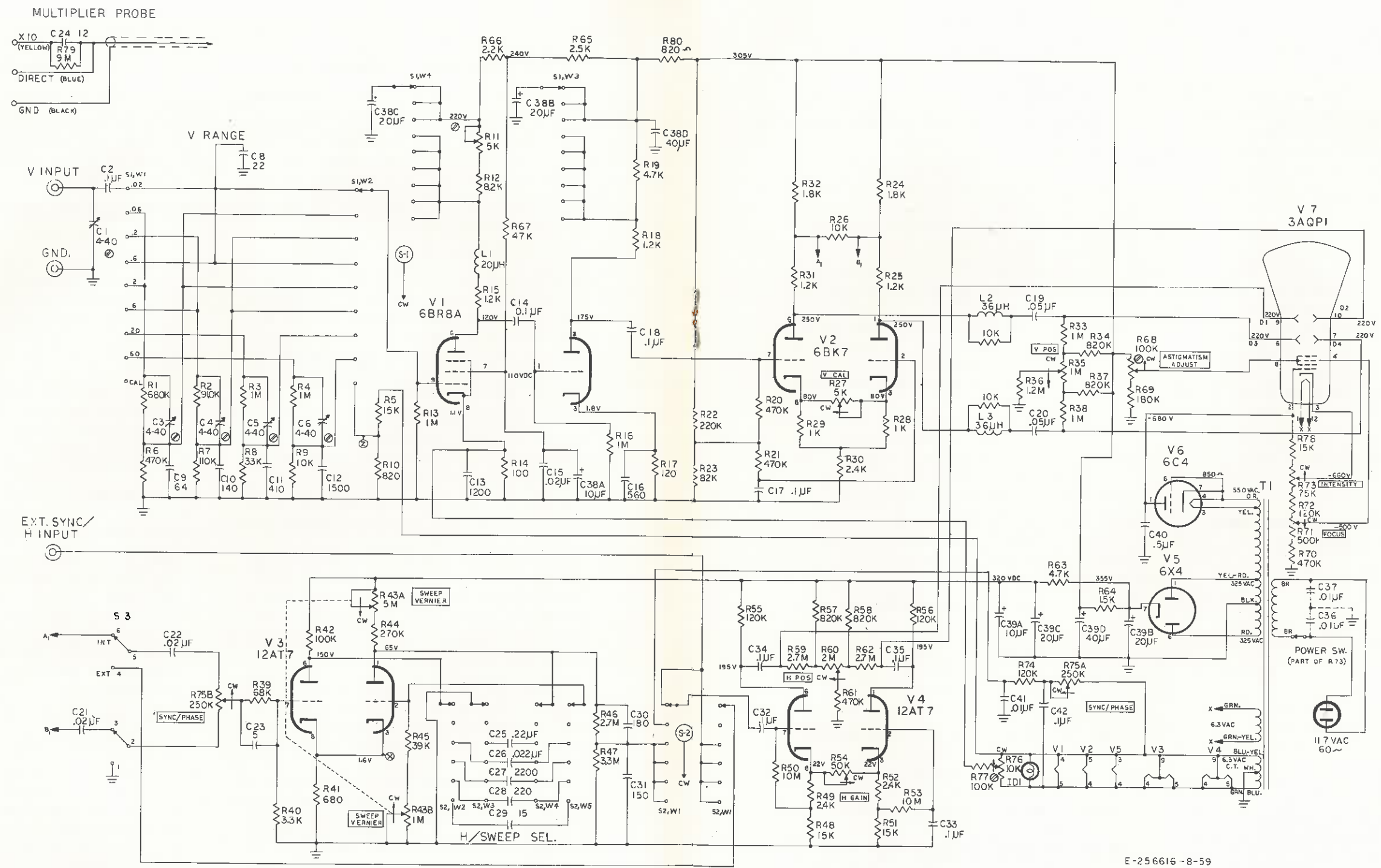
NOTE: Some new irons are pre-tinned. These irons have a tip with a bright silver colored coating. Never file this coating off the tip. Simply clean when hot, using soft wire brush.

How to Solder

If you follow the steps outlined below, you should have no trouble in soldering properly.

1. Make good mechanical connections; wrap the wire $\frac{1}{2}$ turn around the terminal, and crimp tight with pliers.
2. First place the soldering iron against the joint to be soldered. Then place the solder against both the joint and the soldering iron, and allow the solder to flow into the joint. Let the solder cool and solidify.
3. A good joint is bright and smooth; while a poor solder joint is lumpy and grainy. If there is any doubt about the connection, re-heat the joint.
4. Reasonable care should be used in handling the soldering iron. Do not allow it to touch nearby components or melt the insulation on other wires. Take time to solder properly and carefully. A little extra time spent in this operation may save you many hours of troubleshooting.
5. Only rosin-core solder should be used. If the solder supplied with your kit is not enough to complete the job, it is imperative that you purchase solder which is specifically labeled “Rosin-core Radio Solder”. If acid-core solder or paste flux is used in the construction of this kit, your instrument can not be serviced and all warranties are voided.

(Continued on Page 6)



NOTES

ALL CAPACITORS IN μF , UNLESS OTHERWISE SPECIFIED.
 ALL RESISTORS IN OHMS.
 ALL VOLTAGES POSITIVE FROM GROUND, AND MEASURED WITH A VOLTOHMYST*
 SWITCHES S-1 AND S-2 SHOWN IN MAXIMUM CCW POSITION
 INSTRUMENTS WITH SERIAL NO.'S 1001 THRU 2300 HAVE TWO 0.01 μF DISC CAPACITORS BETWEEN THE AC LINE AND CASE GROUND

| V RANGE | FULL SCALE VOLTS (P-P) | S-1 POSITION | RANGE |
|---------|------------------------|--------------|-------------|
| 1 | 0.02 | 1 (CCW MAX) | NARROW BAND |
| 2 | 0.06 | 2 | 0.6 |
| 3 | 0.2 | 3 | 2.0 |
| 4 | 0.6 | 4 | 6.0 |
| 5 | 2.0 | 5 | 20 |
| 6 | 6.0 | 6 | 60 |
| 7 | 20 | 7 | CAL |
| 8 | 60 | 8 | |
| 9 | CAL | 9 | |

| H/SWEEP SEL. SW. | S-2 POSITION | RANGE |
|------------------|--------------|-----------|
| 1 | 1 (CCW MAX) | HOR. IN. |
| 2 | 2 | LINE |
| 3 | 3 | 15-150 |
| 4 | 4 | 150-1500 |
| 5 | 5 | 1500-15KC |
| 6 | 6 | 15KC-75KC |

| SYNC. SW. S-3 | POSITION | RANGE |
|---------------|----------|-------|
| 1 | RIGHT | EXT. |
| 2 | LEFT | INT. |

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Circuit Diagram

Tinning

In assembling precise test instruments and other electronic equipment, all lead wires should be "tinned". Tinning consists of stripping some of the insulation from the end of the wire to be soldered, twisting the strands tightly together and applying a small amount of solder to the tip of the wire. This prevents the strands from parting, thereby providing a better mechanical connection.

Laminated Circuit Board Soldering

Place the tip of the soldering iron against both the wire and the copper foil. Apply the solder to the tip of the iron and to the junction point of the wire and the copper foil. Use only enough heat to cause the solder to flow smoothly onto the wire and the copper foil. The solder should flow out and cover the circular section of foil through which the wire or pin protrudes. A 25 to 50 watt iron should provide enough heat. If a higher wattage iron is used, shorten the soldering time so as not to overheat the board. In case of a break in the foil, bridge the damaged portion with a bare wire, and solder the wire to the copper foil on both sides of the break.

Abbreviations, Definitions and Symbols

Microfarad—Unit of Capacitance.

Abbreviated "ufd" or "uf", also "MFD" or "MF".

Micro-microfarad—One millionth microfarad.

Abbreviated "uufd" or "uuf", also "MMFD" or "MMF".

Ohm—Unit of Resistance.

Symbolized by Greek letter Omega " Ω ".

To multiply by 1000, add letter "K".

To multiply by 1,000,000 use prefix "MEG" or "M".

Thus $100K\Omega = 100,000$ ohms, and $10M\Omega =$ ten megohms = ten million ohms.

Henry—Unit of Inductance.

Symbolized by letter "L".

Millihenry—One-thousandth Henry.

Microhenry—One-millionth Henry.

R = Resistor.

C = Capacitor.

L = Inductor.

T = Transformer.

(S)—Indicates solder any and all connections on designated lug or terminal.

(NS)—Means do not solder.

Glossary of Terms

To avoid misinterpretation of any of the instructions given in the assembly of the WO-33A(K), check the following list of terms, and their intended meanings.

| | |
|----------|--|
| ALIGN | to place into position; adjust; arrange. |
| CLIP | to cut back the length of a lead, to cut off. |
| CONNECT | to make a mechanical joint preparatory to soldering. The wire should go through the hole in the lug or terminal, make a $\frac{1}{2}$ turn around the lug or terminal, and be crimped tight with pliers. |
| CRIMP | to make a hook-shape in the end of a wire, and squeeze the two parts of the bend together. |
| CUT | to sever a wire or lead from a component. |
| DRESS | to adjust the position, contour and placement of a wire or component. |
| GROUP | to place together in a specified position. |
| IDENTIFY | to select by a visual appearance. |
| INSERT | to place a lead or wire into a hole, or other receptacle. |
| INSPECT | to observe and analyze. |
| INSTALL | to mount mechanically. |
| PLACE | to hold or put into a specified position. |
| PRESS | to push or force. |
| SCRAPE | to cut away, remove with a knife; refers to a surface operation. |
| SELECT | to take, pick up. |
| SPLIT | to divide. |
| STRIP | to remove an outer covering of insulation or shielding. |
| TIN | to cover with solder; to bond together many strands of wire with solder. |
| TWIST | to wrap together in lineal form. |

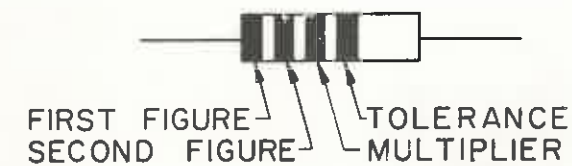
Tools Recommended for Use in Assembling the WO-33A(K)

Screwdriver with $\frac{1}{8}$ " blade.
Screwdriver with $\frac{1}{4}$ " blade.
Neutralizing tool (insulated screwdriver).
Pair of long-nosed pliers.
Pair of diagonal cutting pliers.
Pair of slip joint pliers.
25 to 50 watt soldering iron or gun.

Color Codes of Resistors and Capacitors

| COLOR | FIGURE | MULTIPLIER | TOLERANCE |
|----------|--------|-------------|------------|
| BLACK | 0 | NONE | |
| BROWN | 1 | 0 | |
| RED | 2 | 00 | |
| ORANGE | 3 | 000 | |
| YELLOW | 4 | 0,000 | |
| GREEN | 5 | 00,000 | |
| BLUE | 6 | 000,000 | |
| VIOLET | 7 | 0,000,000 | |
| GRAY | 8 | 00,000,000 | |
| WHITE | 9 | 000,000,000 | |
| GOLD | | 0.1 | $\pm 5\%$ |
| SILVER | | 0.01 | $\pm 10\%$ |
| NO COLOR | | | $\pm 20\%$ |

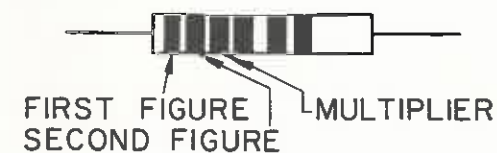
STANDARD RESISTOR COLOR CODE



K = X 1000 OR 3 ZEROS
MEG = X 1,000,000 OR 6 ZEROS

EXAMPLE: RED-VIOLET-YELLOW-SILVER =
270,000 OHMS $\pm 10\%$,
WHICH IS USUALLY WRITTEN
270K $\pm 10\%$.

STANDARD COLOR CODE FOR MOLDED TUBULAR PAPER TYPE CAPACITORS



EXAMPLE: RED-VIOLET-YELLOW =
270,000 MICRO-MICRO
FARADS, WHICH IS
USUALLY WRITTEN
.27 MICRO-FARADS.